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CONGARINNI NORTH PTY LTD

Geotechnical Investigation

24 Coronation Road, Congarinni North, NSW

E24901.G03
16 February 2021

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Author	Technical Reviewer
	
Stephen Kim **Senior Geotechnical Engineer**	**Shahzada Rizvi** **Principal Engineering Geologist**

Revision	Details	Date	Amended By
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1. Introduction

1.1 Background

At the request of Tony Owen Partners on behalf of Ron Pomering of Congarinni North Pty Ltd (the Client), EI Australia (EI) has carried out a Geotechnical Investigation (GI) for the proposed development at 24 Coronation Road, Congarinni North, NSW (the Site).

This GI report has been prepared to provide advice and recommendations to assist with the geotechnical and hydrological aspects for the proposed development. The investigation has been carried out in accordance with the agreed scope of works outlined in EI's proposal referenced P18496.1, dated 26 August 2020, and with the Client's signed authorisation to proceed, dated 24 October 2020.

EI has completed a Detailed Site Investigation (DSI) Report concurrently for this Site, referenced E24901.E02_Rev0, dated 18 December 2020. This GI report should be read in conjunction with the DSI report.

1.2 Proposed Development

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

- Architectural drawings prepared by Tony Owen Partners– Project No. 1012, Drawing Nos. A000 to A012 , dated October 2020; and
- Site survey plan prepared by Amos and McDonals Surveyors– Reference No. 4726, dated 15 October 2002. 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 276 single-storey residential units and an aged care centre, with associated access roads and earthworks for construction of a helipad, swimming pool and sports facilities. The units will be supported by a slab on ground construction and it is anticipated that bulk excavations of ≤1.00m Below Existing Ground Level (BEGL) will be required for ground preparation and earthworks. Locally deeper excavations may be required for footings and service trenches.

1.3 Objectives

The objective of the GI was to assess site surface and subsurface conditions at eight borehole and ten test pit locations, and to provide geotechnical advice and recommendations addressing the following:

- Site classification;
- Excavation methodologies;
- Excavation support requirements, including geotechnical design parameters for retaining walls and shoring systems;
- Building foundation options, including;
  - Design parameters.
  - Earthquake loading factor in accordance with AS1170.4:2007.

- CBR for pavement design; and
- The requirement for additional geotechnical works.

1.4 Scope of Works

The scope of works for the GI included:

- Preparation of a Work Health and Safety Plan;
- Review of relevant geological maps for the project area;
- Site walkover inspection by a Geotechnical Engineer to assess topographical features and site conditions;
- Scanning of proposed borehole and test pit locations for buried conductive services using a licensed service locator with reference to Dial Before You Dig (DBYD) plans;
- Auger drilling of eight boreholes (BH1M, BH2, BH3M, BH4, BH5, BH6, BH7M and BH8M) by a truck-mounted drill rig using solid flight augers equipped with a 'Tungsten-Carbide' (T-C) bit. The boreholes were auger drilled to depths as shown in **Table1-1** below:

Table 1-1 Augering Depths

Borehole ID	Depth (m BEGL)	RL (m AHD)
BH1M	2.70	17.40
BH2	5.00	17.00
BH3M	3.40	22.60
BH4	4.00	10.00
BH5	2.70	11.30
BH6	3.80	12.70
BH7M	6.00	13.00
BH8M	4.10	8.90

  - Standard Penetration Testing (SPT) was carried out (as per AS 1289.6.3.1-2004), where possible, during auger drilling of the boreholes to assess soil strength/relative densities;
  - Measurements of groundwater seepage/levels, where possible, in the augered sections of the boreholes during and shortly after completion of auger drilling;
  - The strength of the bedrock in the augered sections of the boreholes was assessed by observation of the auger penetration resistance using a T-C drill bit and examination of the recovered rock cuttings. It should be noted that rock strengths assessed from augered boreholes are approximate and strength variances can be expected;
  - The approximate surface levels shown on the borehole logs were interpolated from spot levels shown on the supplied survey plan. Approximate borehole locations are shown on **Figure 2**;
- Ten test pits, TP9 to TP18, were excavated to termination depths between 1.80m to 3.00m BEGL using an excavator;

- Ten Dynamic Cone Penetrometer (DCP) tests (DCP9, DCP10, DCP11, DCP12, DCP13, DCP14, DCP15, DCP16, DCP17 and DCP18) were carried out adjacent to each of their respective test pits (TP9 to TP18) to deths as shown in **Table 1-2** below along with the excavated depth of test pits;

Table 1-2 Excavated Depth of Test Pits and DCP Test Results

Test Pit ID	Excavated Depth (m BEGL)	RL (m AHD)	Test ID	Termination/Refusal Depth (m BEGL)	RL (m AHD)
TP9	2.15	-0.65	DCP9	3.90	-2.40
TP10	3.00	-1.20	DCP10	3.90	-2.10
TP11	3.00	12.00	DCP11	1.30	13.70
TP12	1.80	18.70	DCP12	1.52	18.98
TP13	2.45	13.55	DCP13	2.10	13.90
TP14	2.60	9.40	DCP14	2.20	9.80
TP15	2.90	16.10	DCP15	1.90	17.10
TP16	3.00	9.00	DCP16	3.90	8.10
TP17	2.85	10.15	DCP17	2.60	10.40
TP18	2.70	8.80	DCP18	2.30	9.20

- Boreholes BH1M, BH3M, BH7M and BH8M were converted into groundwater monitoring wells with depths of 2.7m, 3.4m, 5.9m and 4.1m BEGL respectively to allow for long-term groundwater monitoring;
- Boreholes BH2, BH4, BH5 and BH6 were backfilled with drilling spoils and cuttings upon completion;
- Soil samples were sent to STS Geotechnics Pty Ltd (STS) and SGS Australia (SGS), which are National Australian Testing Authority (NATA) accredited laboratories, for testing and storage; and
- Preparation of this GI report.

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

1.5 Constraints

The GI was limited by the intent of the investigation and the presence of existing site structures. The discussions and advice presented in this report are preliminary and intended to assist with the geotechnical aspects of the proposed development. Further geotechnical investigations and inspections should be carried out during construction to confirm the geotechnical and groundwater models, and the preliminary design parameters provided in this 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 photograph of the site is presented in **Plate 1** below.

Table 2-1 Summary of Site Information

Information	Detail
Street Address	24 Coronation Road, Congarinni North, NSW
Lot and Deposited Plan (DP) Identification	Lot 188 in DP 755537 and Lot 155 in DP755537
Brief Site Description	At the time of our investigation, the eastern end of the site was occupied by a single-storey weatherboard house, located at about 150m in from the property entrance. The building structure appeared to be in a poor condition based on a cursory inspection of the exterior walls. The remaining areas of the site consist of farmland with moderately steep hills. Surrounding the perimeter of the site are wetlands and Taylors Arm river to the south-east of the site. There is evidence of a creek running through the east of the site, near the entrance to the property.
Site Area	The site area is approximately 57.3 ha (based on the referenced survey plan).

Plate 1: Aerial photograph of the site (source: Six Maps, accessed 18/12/20)

2.2 Local Land Use

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

Table 2-2 Summary of Local Land Use

Direction Relative to Site	Land Use Description
North	Property at 11-13 Schuppe Drive, consisting of wetlands and farm land.
East	Coronation Road, a two lane asphalt based road. Beyond is Taylors Arm River.
South	Property at 68-94 Coronation Road, consisting of farm lands.
West	Farm land.

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 high west side of the road within gently (0° to 10°), to moderately (10° to 18°) north to northeast dipping, undulating topography. The site levels vary from R.L. 2.61m to R.L. 30.54m along the eastern site boundary and from R.L. 0.44m to R.L. 1.28m along the western site boundary.
Regional Geology	Information on regional sub-surface conditions, referenced from the Geological Survey of NSW and Geology Department, University of New England Geological Map Dorrigo – Coffs Harbour 1:250,000 Geological Series Sheet 56 – 10 & 11 (First Edition, 1971) indicates the site is underlain by Undifferentiated Formation (Ps), which typically comprises Slate, Phyllite, schistose Sandstone, schistose Conglomerate and basic Volcanics (Psb)..

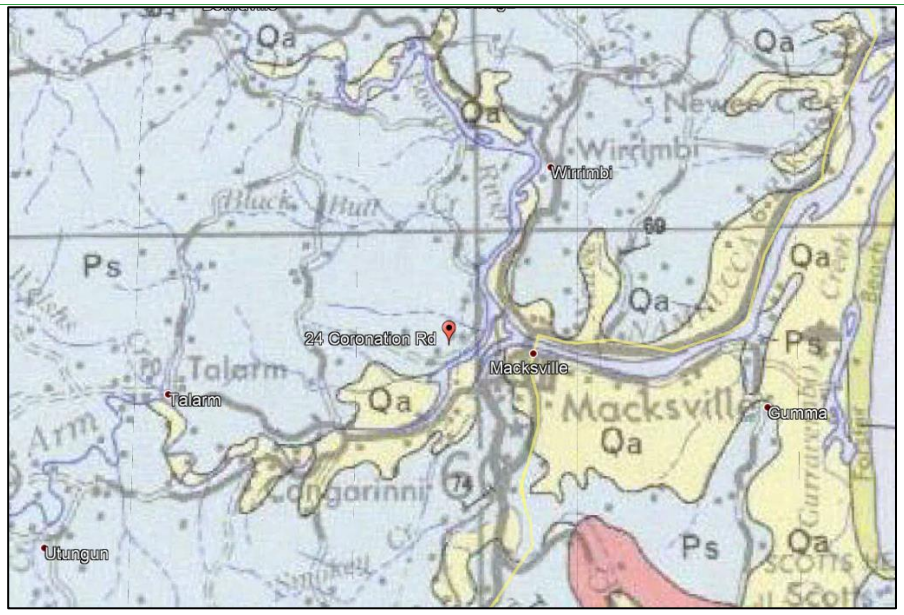

Plate 2: Excerpt of geological map showing location of site.

3. Investigation Results

3.1 Stratigraphy

For the development of a site-specific geotechnical model, the stratigraphy observed in the GI has been grouped into three geotechnical units. A summary of the subsurface conditions across the site, interpreted from the assessment results, is presented in **Table 3-1** below. More detailed descriptions of subsurface conditions at each borehole location are available on the borehole logs presented in **Appendix A**. The details of the methods of soil and rock classifications, explanatory notes and abbreviations adopted on the borehole logs are also presented in **Appendix A.**

Table 3-1 Summary of Subsurface Conditions

Unit	Material[2]	Depth to Top of Unit (m BEGL)[1]	Observed Thickness (m)	RL of Top of Unit (m AHD) [1]	Comments
1	**Topsoil**	0.00	0.20 to 0.60	26.00 to 1.50	Clayey silt, of low plasticity with roots and rootlets.
2	**Fluvial Soil**	0.20 to 0.60	0.35 to 4.20	25.70 to 1.20	Medium to high plasticity, firm to very stiff silty clay with trace quartz gravels and rootlets, SPT values ranged from 6 to 24. Occasional firm clay at surface. In TP9 and TP10 only, the clays was underlain by gravelly sand and sandy gravel from a depth of 1.0m and 1.6m BEGL, respectively. Unit 2 was not observed in BH8M.
3	**Residual Clay (Extremely Weathered Siltstone)**	0.35 to 4.50	0.50 to 3.75	25.35 to 9.70 [3]	Medium to high plasticity, stiff to hard silty clay, with remnants of rock structure observed within clay layers. SPT values ranged from 11 to refusal.
4	**Siltstone Bedrock**	2.70 to 6.00	-	22.60 to 8.90	Very low strength, distinctly weathered siltstone, inferred from T-C bit refusal depth.

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 at termination depth in all boreholes.

3.2 Groundwater Observations

Following completion of auger drilling, the boreholes were left open and groundwater levels were then measured within the boreholes after a period of time. No groundwater or significant seepage was observed during or after auger drilling of the boreholes. Groundwater seepage was observed during the excavation of test pits TP9 and TP10 at depths of 2.1m BEGL, or RL -0.6m and –0.3m, respectively.

Groundwater monitoring wells were installed in BH1M, BH3M, BH7M, and BH8M following completion. The monitoring wells remained dry up to the completed depths (up to 6m BEGL in BH7M) during the investigation.

3.3 Test Results

Six soil and five bulk samples were selected for laboratory testing to assess the following:

- Atterberg Limits and Linear Shrinkage.
- Soil aggressivity (pH, chloride and sulfate content and electrical conductivity).
- California Bearing Ratio (CBR).
- Maximum Dry Density (MDD) and Optimum Moisture Content (OMC).

A summary of the soil test results is provided in **Table 3-2 and Table 3-3** below. Laboratory test certificates are presented in **Appendix B**.

Table 3-2 Summary of Soil Laboratory Test Results

Test/ Sample ID		BH1M_0.5-0.95	BH5_0.5-0.95	BH7M_0.5-0.95	BH3M_0.5-0.65	BH4_0.5-0.95	BH6_0.5-0.95
Unit		2	2	2	2	2	2
Material Description [1]		Silty CLAY	Silty CLAY	Silty CLAY	Silty CLAY	Silty CLAY	Silty CLAY
Aggressivity	Chloride Cl (ppm)	-	-	5.3	65	3.6	7.5
	Sulfate SO_4 (ppm)	-	-	13	14	9.5	12
	pH	-	-	4.6	4.8	4.5	4.4
	Electrical Conductivity (µS/cm)	-	-	16	57	11	17
	Moisture Content (%)	23.7	20.3	17.4	18.4	14.9	21.1
Attergerg Limits	Liquid Limit (%)	41	42	-	-	-	-
	Plastic Limit (%)	29	19	-	-	-	-
	Plasticity Index (%)	12	23	-	-	-	-
	Linear Shrinkage (%)	4	10	-	-	-	-

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

The Atterberg Limits results on the selected clay samples indicated clays to be of medium plasticity and of low to moderate shrink-swell potential.

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

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

Table 3-3 Summary of CBR Test Results

Test/ Sample ID	TP9	TP11	TP13	TP14	TP15
Depth (m BEGL)	0.3-0.4	0.4-0.5	0.3-0.4	0.3-0.4	0.3-0.4
Unit	2	2	2	2	2
Material Description [1]	Silty CLAY	Silty CLAY	Silty CLAY	Silty CLAY	Silty CLAY
CBR (4-day Soaked) (%)	13.0	8.5	8.0	8.0	12.5
Maximum Dry Density (t/m^3)	1.49	1.54	1.56	1.62	1.72
Optimum Moisture Content (%)	23.3	22.4	23.9	21.7	15.9

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

Bulk samples of the Unit 2 material were tested for compaction and four day soaked CBR, resulted in values of 8.0% to 13.0% when compaction to 100% of Standard Maximum Dry Density (SMDD) and surcharged with 9kg.

4. Recommendations

4.1 Geotechnical Issues

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

- Reactivity of the underlying natural clays;
- Foundation design for building loads.

4.2 Site Preparation

Following removal of all vegetation and trees (including their root balls), demolition of the existing dwelling, slabs and pavements, all grass, topsoil, root affected soils and any deleterious fill or contaminated soil should be stripped. Based on the results of the investigation, topsoil/root affected soil should be stripped to a nominal depth. Stripped topsoil and root affected soils should be stockpiled separately as they are considered unsuitable for reuse as engineered fill.

All existing fill will need to be stripped down to the surface of the underlying natural soils and stockpiled for reuse as engineered fill, if conform to the fill specification provided in section below.

4.3 Site Classification

The investigation results have indicated variable subsurface conditions. The final site classifications will also be dependent on the following factors:

- The nature, thickness and age of proposed (site won and imported) fills;
- Level of earthworks control;
- The depth of proposed cuts;
- The depth of bedrock and groundwater if located within 1.5m depth below design surface level;
- The proximity of the proposed trees, their configuration in relation to the proposed houses, and their mature heights;
- The presence of existing mature trees, and their configuration in relation to the proposed houses;
- The control and maintenance of drainage; and
- The difference in surface levels for a particular lot between the ‘as sold’ condition and following and further preparatory earthworks (i.e. further less controlled cut and fill earthworks).

No details on the existing fill (i.e. placement method, compaction specification, density test records, etc.) have been provided to us. Notwithstanding, based on the results of our investigation, the material is not considered to be a “structural fill” (i.e. controlled fill or engineered fill), as defined in Clause 1.2.13 of AS3798-2007 ‘Guidelines on Earthworks for Commercial and Residential Developments’. Accordingly, we consider this fill to be ‘uncontrolled’ and unsuitable as a bearing stratum under new footings and of ‘moderate risk’ (poor performance) under new pavements.

Only two soil samples were tested which indicated the presence of clayey soils of medium plasticity having low to moderate shrink-swell potential. Hence where topsoil/fill is stripped and/or replaced with engineered/controlled fill and/or natural silty clay exposed, then the site can be reclassified as Class M. We note that abnormal moisture conditions could also exist after stripping of existing pavements, structures, and trees and vegetation resulting in a more severe Class H1. Reference should also be made to AS2870 for design, construction, performance criteria and maintenance precautions on Class M andH1 sites.

However, in view of the limited number of tests done, variable soil reactivity is expected across the site and further investigation is recommended closer to final design.

4.4 Excavation Methodology

4.4.1 Excavation Assessment

Prior to any excavation commencing, we recommend that reference be made to the Safe Work Australia Excavation Work Code of Practice, dated August 2019.

Based on the borehole logs, any excavations for earthworks may therefore extend through Units 1 and 2 as outlined in **Table 3-1** above. Any excavation greater than 1.0m in height should be excavated with temporary batters or be excavated following the installation of a retention system. Should advice regarding retention system design be required, EI can be contacted for further advice.

Units 1 and 2 could be excavated using buckets of conventional earthmoving hydraulic excavators.

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

4.5 Groundwater Considerations

No groundwater was observed in any of the monitoring wells as well as during drilling of all boreholes. Groundwater seepage was observed during the excavation of test pits TP9 and TP10 at depths of 2.1m BEGL, or RL -0.6m and –0.3m, respectively.

4.6 Earthworks

Earthworks recommendations provided in this report should be complemented by reference to AS3798-2007.

4.6.1 Subgrade preparation

For areas which require cutting, bulk excavation will initially carried out as per **Section 4.4** above.

For areas which require filling, then the existing uncontrolled fill has to be fully removed and replaced with engineered fill as recommended below.

1 Remove the top layer of fill, and stockpile this separately. Such excavation may need to be carried out with the excavation sides battered at an angle of no steeper than 1 Vertical to 1 Horizontal. The new fill must be ‘keyed-in’ the sides of these batters.

2 The remaining existing fill should be fully excavated down to surface of the residual clay and replaced with engineered fill.

3 The exposed subgrade at the base of the excavation should be proof rolled with a padfoot roller (say 12 tonne) used in static or non-vibratory mode of operation. Caution is required when proof rolling near existing structures, infrastructures and/or retaining walls. The purpose of the proof rolling is to detect any soft or heaving areas, and to allow for some further improvement in strength or compaction.

4 The final pass should be undertaken in the presence of a geotechnician or geotechnical engineer, to detect any unstable or soft subgrade areas, and to allow for some further improvement in compaction.

5 If dry conditions prevail at the time of construction then any exposed clayey fill subgrade may become desiccated or have shrinkage cracks prior to pouring any concrete slabs. If this occurs, the subgrade must be watered and rolled until the cracks disappear.

6 Unstable subgrade detected during proof rolling should be locally excavated down to a sound base and replaced with engineered fill or further advice should be sought. Any fill placed to raise site levels should also be engineered fill.

We recommend that the engineered fill layers extend a horizontal distance of at least 1m beyond the design geometry. The roller must extend over the edge of each placed layer in order to seal the batter surface. On completion of filling, the excess under-compacted edge fill should be trimmed back to the design geometry.

The 'tying in' of engineered fill to temporary cut batter slopes can be achieved by locally benching the cut slopes in no greater than 0.4m high steps. This can be carried out progressively as the height of engineered fill increases.

Backfilling of service trenches must be carried out using engineered fill in order to reduce post-construction settlements. Due to the reduced energy output of the rollers that can be placed in trenches, backfilling should be carried out in maximum 150mm thick loose layers and compacted using a trench roller, a pad foot roller attachment fitted to an excavator, and/or a vertical rammer compactor (also known as a 'Wacker Packer'). Due to the reduced loose layer thickness, the maximum particle size of the backfill material should also be reduced to 75mm. The compaction specification provided below is applicable.

4.6.2 Engineered Fill Specifications

From a geotechnical perspective, any excavated natural soils and weathered bedrock may be considered suitable for reuse as engineered fill on condition that they are 'clean', free of organic matter and contain a maximum particle size of 150mm.

Engineered fill comprising the above mentioned material should be compacted in maximum 300mm thick loose layers using a large pad-foot roller (say, at least 17 tonnes deadweight) to a density ratio strictly between 98% and 102% of SMDD and at a moisture content within 2% of SOMC. We note that Section 6.2.2 of AS3798-2007 states "the maximum particle size of any rocks or other lumps within the layer, after compaction, generally should not exceed two-thirds of the compacted layer thickness."

Based on the laboratory test results, we expect that moisture conditioning (i.e. 'drying out' or 'wetting up') will be required to conform to the above specification.

Density tests should be regularly carried out on any engineered fill to confirm the above specifications are achieved, as outlined below:

- The frequency of density testing for general engineered fill should be at least one test per layer per 2500m^2 or one test per 500m^3 distributed reasonably evenly throughout the full depth and area, or 3 tests per lot (as defined in Clause 1.2.8 of AS3798-2007), whichever requires the most tests (assumes maximum 300mm thick loose layers).

- The frequency of density testing for trench backfill should be at least one test per two layers per 40 linear metres (assumes maximum 150mm thick loose layers).

Based on the large scale nature of the proposed earthworks, we recommend that Level 1 control of fill placement and compaction in accordance with AS3798-2007 be carried out, including for the trench backfill. Due to a potential conflict of interest, the GITA should be directly engaged by the Client or their representative, and not by the earthworks contractor or sub-contractors.

4.7 Foundations

The most competent foundation stratum at the site is the weathered bedrock at depth. However, the option of high level footings founded in the fluvial and clayey soils is also provided.

4.7.1 High Level Footings in Clay

The option of supporting structures on high level footings on residual clay is only suitable for lightly to moderately loaded structures that are not sensitive to some uneven foundation movements. If these shallow footings are to be used, the structures should be well articulated.

High level pad, strip, or stiffened raft slab founded in at least stiff natural clays may be designed for a maximum allowable bearing pressure of 100kPa. High level footing excavations should be cleaned out, inspected by a geotechnical engineer, and poured without delay. If delays in pouring are envisaged, then we recommend that a concrete blinding layer be provided over the base to reduce deterioration due to weathering.

This footing system should be designed for characteristic shrink-swell surface movement equivalent to a ‘Class M’ site in accordance to AS2870, that is, in a range of 20mm to 40mm. Reference should also be made to AS2870 for design, construction, performance criteria and maintenance precautions on Class M sites.

4.7.2 Pile Footings

Alternatively, the proposed development may be supported on deep foundations, such as piles, founded into Unit 4 bedrock.

For piles founded in very low strength bedrock or better, these must be embedded a minimum of 0.5m into, and can be designed for a maximum allowable bearing pressure of 600kPa. The allowable shaft adhesion in bedrock may be designed as 10% of the allowable bearing pressure (or 5% for uplift) for the socket length in excess of 0.5m.

At least the initial drilling of piles should be completed in the presence of a geotechnical engineer to verify that ground conditions meet design assumptions.

Where groundwater ingress is encountered during pile excavation, concrete is to be placed as soon as possible upon completion of pile excavation. Pile excavations should be pumped dry of water prior to pouring concrete, or alternatively a tremmie system could be used. Concrete must be poured on the same day as drilling, inspection and drilling.

The aggressivity of natural soils and groundwater (if encountered) should be taken into consideration in the design.

4.8 Pavement Design

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.

Based on the laboratory test results, the samples collected from the proposed road alignments return the CBR value 8% to 13%. We recommend that pavement design may be based on the CBR value of 8.0%.

Further soaked CBR tests may 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.

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 60mm, 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 100mm 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.

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 200mm below subgrade level.

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 include subgrade preparation, selection of fill materials, control of moisture content and drainage, etc.

5. Further Geotechnical Inputs

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

- Aggressivity testing for buried concrete and steel structures;
- Additional lot classification testing;
- Classification of all excavated material transported off site;
- Geotechnical inspections of all new footings/piles by an experienced geotechnical professional before concrete or steel are placed to verify their bearing capacity and the in-situ nature of the founding strata; and

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

6. Statement of Limitations

This report has been prepared for the exclusive use of Ron Pomering and Congarinni North 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 Ron Pomering and Congarinni North 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 C** 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.

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AS2159:2009, *Piling – Design and Installation*, Standards Australia.

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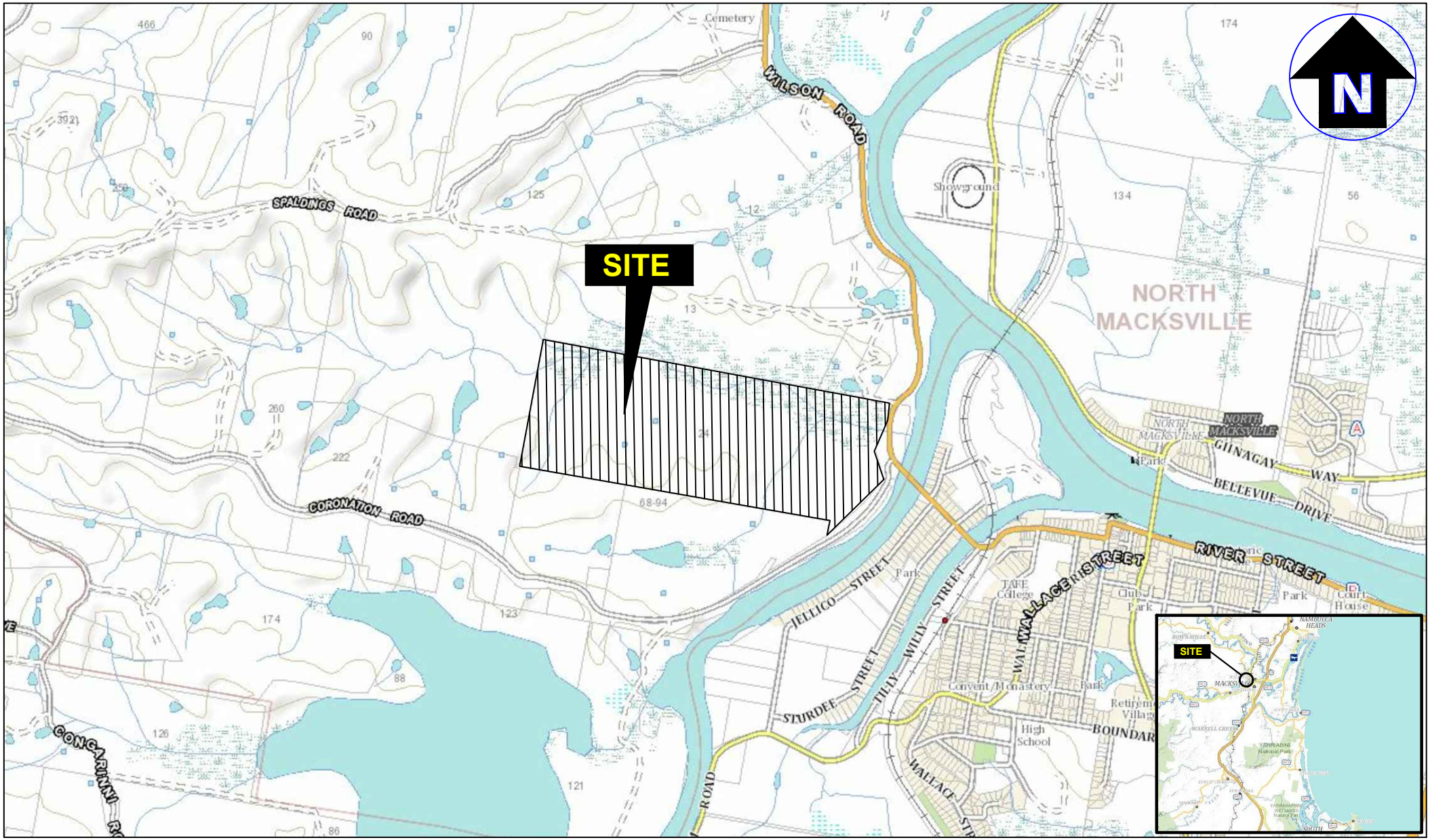
Abbreviations

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
GI	Geotechnical Investigation
NATA	National Association of Testing Authorities, Australia
RL	Reduced Level
SPT	Standard Penetration Test
T-C	Tungsten-Carbide

Figures



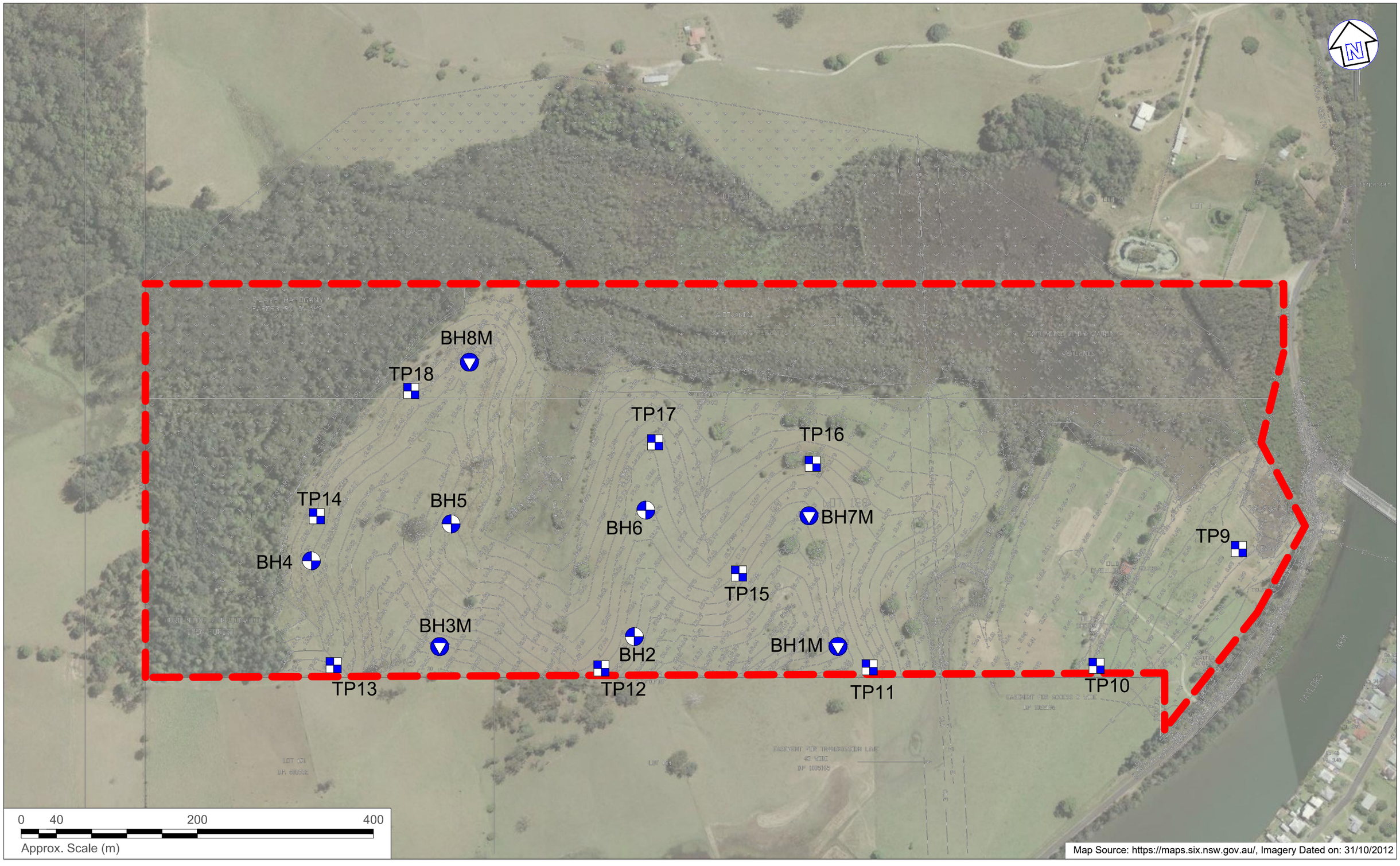
eiaustralia
Contamination | Remediation | Geotechnical
Suite 6.01, 55 Miller Street, PYRMONT 2009
Ph (02) 9516 0722 Fax (02) 9518 5088

Drawn:	AM.H.
Approved:	S.K.
Date:	22/12/20
Scale:	Not To Scale

Congarinni North Pty Ltd
Geotechnical Investigation
24 Coronation Road, Congarinni North NSW
Site Locality Plan

Figure:
1

Project: E24901.G03



LEGEND

- Approximate site boundary
- Approximate borehole location
- Approximate borehole/monitoring well location
- Approximate test pit location

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Contamination | Remediation | Geotechnical
Suite 6.01, 55 Miller Street, PYRMONT 2009
Ph (02) 9516 0722 Fax (02) 9518 5088

Drawn:	AM.H.
Approved:	S.K.
Date:	22/12/20

Congarinni North Pty Ltd
Geotechnical Investigation
24 Coronation Road, Congarinni North NSW
Borehole location plan

Figure: 2

Project: E24901.G03

Appendix A – Borehole Logs And Explanatory Notes

BOREHOLE LOG

BH NO. BH1M

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date Started**	17/11/2020
Position	Refer to Figure 2	**Date Completed**	17/11/2020
Job No.	E24901.G03	**Logged By** RS	**Date** 17/11/2020
Client	Congarinni North Pty Ltd	**Reviewed By** SK	**Date** 22/12/2020

Drilling Contactor	Total Drilling	**Surface RL**	≈20.10 m AHD
Drill Rig	Ute-mounted rig	**Inclination**	-90°

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T		GWNE	0	20.10				-	TOPSOIL: Clayey SILT; low plasticity, pale brown, with roots and rootlets.	M (<PL)	-	TOPSOIL
				0.30								
	L			19.80	BH1M_0.5-0.95 SPT 0.50-0.95 m 3,4,6 N=10			Cl	Silty CLAY; medium plasticity, pale grey mottled orange, trace rootlets.	M (<PL)	St - VSt	FLUVIAL SOIL
			1	*1.30*								
	M			18.80	BH1M_1.5-1.8 SPT 1.50-1.95 m 18,22 HB			Cl-CH	Silty CLAY; medium to high plasticity, pale grey mottled orange, remnant rock structure visible, with fine to coarse, sub-rounded to sub-angular quartz sand.	M (<PL)	H	RESIDUAL SOIL
	M-H		2	*2.70*								
									Hole Terminated at 2.70 m Refusal on bedrock			
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

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

BOREHOLE LOG

BH NO. BH2

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Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date Started**	17/11/2020
Position	Refer to Figure 2	**Date Completed**	17/11/2020
Job No.	E24901.G03	**Logged By** RS	**Date** 17/11/2020
Client	Congarinni North Pty Ltd	**Reviewed By** SK	**Date** 22/12/2020

Drilling Contactor	Total Drilling	**Surface RL**	≈22.00 m AHD
Drill Rig	Ute-mounted rig	**Inclination**	-90°

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	22.00				-	TOPSOIL: Clayey SILT; low plasticity, brown, with roots and rootlets.	M (<PL)	-	TOPSOIL
				0.30								
				21.70	BH2_0.5-0.95 SPT 0.50-0.95 m 5,5,6 N=11			CI-CH	Silty CLAY; medium to high plasticity, orange-brown to red, trace rootlets, trace fine to coarse, sub-rounded to sub-angular quartz gravels.		St	FLUVIAL SOIL
			1	*1.40*								
				20.60	BH2_1.5-1.95 SPT 1.50-1.95 m 8,9,11 N=20				From 1.4 m, grading to orange mottled yellow-brown to red-brown.			
AD/T	-	GWNE	2							M (<PL)		
				3.10	BH2_3.0-3.45 SPT 3.00-3.45 m 11,15,14 N=29							
			3	18.90					From 3.1 m, grading to pale grey mottled brown.		VSt - H	
				4.50								
	M		4	17.50	BH2_4.5-4.61 SPT 4.50-4.91 m 20/110mm HB			CI-CH	Silty CLAY; medium to high plasticity, pale grey mottled orange-brown, remnant rock structure visible.	M (<PL)	H	RESIDUAL SOIL
				5.00								
			5						Hole Terminated at 5.00 m Refusal on bedrock			
			6									
			7									
			8									
			9									
			10									

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

BOREHOLE LOG

BH NO. BH3M

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date Started**	17/11/2020
Position	Refer to Figure 2	**Date Completed**	17/11/2020
Job No.	E24901.G03	**Logged By** RS	**Date** 17/11/2020
Client	Congarinni North Pty Ltd	**Reviewed By** SK	**Date** 22/12/2020

Drilling Contactor	Total Drilling	**Surface RL**	≈26.00 m AHD
Drill Rig	Ute-mounted rig	**Inclination**	-90°

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	L	GWNE	0	26.00				-	TOPSOIL: Clayey SILT; low plasticity, brown, with roots and rootlets.	M (<PL)	-	TOPSOIL
				0.30								
				25.70				CI	Silty CLAY; medium plasticity, orange-brown mottled red-brown to pale grey, trace rootlets.	M (<PL)	St - VSt	FLUVIAL SOIL
				0.65	BH3M_0.5-0.95 SPT 0.50-0.95 m 4,4,5 N=9							
				25.35				CI-CH	Silty CLAY; medium to high plasticity, pale grey mottled orange-brown, remnant rock structure visible.			RESIDUAL SOIL
			1									
					BH3M_1.5-1.95 SPT 1.50-1.95 m 6,19,18 N=37					M (<PL)	H	
	M		2									
				3.10	BH3M_3.0-3.38 SPT 3.00-3.38 m 17,18,20/80mm HB							
	H		3	22.90					From 3.1 m, grading to pale grey to orange-brown.			
				3.40					Hole Terminated at 3.40 m Refusal on bedrock			
			4									
			5									
			6									
			7									
			8									
			9									
			10									

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

BOREHOLE LOG

BH NO. BH4

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date Started**	17/11/2020
Position	Refer to Figure 2	**Date Completed**	17/11/2020
Job No.	E24901.G03	**Logged By** RS	**Date** 17/11/2020
Client	Congarinni North Pty Ltd	**Reviewed By** SK	**Date** 22/12/2020

Drilling Contactor Total Drilling **Surface RL** ≈14.00 m AHD

Drill Rig Ute-mounted rig **Inclination** -90°

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	L	GWNE	0	14.00				-	FILL: Clayey SILT; low plasticity, dark brown, with roots and rootlets.	M (<PL)	-	FILL
				0.30								
				13.70	BH4_0.5-0.95 SPT 0.50-0.95 m 2,3,4 N=7			CI-CH	Silty CLAY; medium to high plasticity, orange-brown, with pale grey, trace rootlets.	M (<PL)	F - St	FLUVIAL SOIL
			1	*1.35*								
	L-M			12.65	BH4_1.5-1.95 SPT 1.50-1.95 m 7,9,11 N=20			CI-CH	Silty CLAY; medium to high plasticity, pale grey mottled orange-brown, remnant rock structure visible.	M (<PL)	H	RESIDUAL SOIL
			2	*2.80*								
				11.20	BH4_3.0-3.45 SPT 3.00-3.45 m 8,13,19 N=32				From 2.8 m, grading to red-brown mottled orange-brown to pale grey.			
	H		3	*4.00*					Hole Terminated at 4.00 m Refusal on bedrock			
			4									
			5									
			6									
			7									
			8									
			9									
			10									

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

BOREHOLE LOG

BH NO. BH5

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date Started**	18/11/2020
Position	Refer to Figure 2	**Date Completed**	18/11/2020
Job No.	E24901.G03	**Logged By** RS	**Date** 18/11/2020
Client	Congarinni North Pty Ltd	**Reviewed By** SK	**Date** 22/12/2020

Drilling Contactor	Total Drilling	**Surface RL**	≈14.00 m AHD
Drill Rig	Ute-mounted rig	**Inclination**	-90°

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	L	GWNE	0	14.00 *0.30*				-	TOPSOIL: Clayey SILT; low plasticity, brown, with roots and rootlets.	M (<PL)	-	TOPSOIL
				13.70 *0.80*	BH5_0.5-0.95 SPT 0.50-0.95 m 2,2,6 N=8			CI-CH	Silty CLAY; medium to high plasticity, pale brown-brown, trace rootlets.			FLUVIAL SOIL
			1	13.20					From 0.8 m, grading to red-brown to pale grey.	M (<PL)	St - VSt	
				1.50 12.50	BH5_1.5-1.95 SPT 1.50-1.95 m 6,10,13 N=23				From 1.5 m, grading to red-brown mottled pale grey to orange-brown.			
	M		2	*1.92* 12.08				CI-CH	Silty CLAY; medium to high plasticity, pale grey motttled orange-brown, remnant rock structure visible.	M (<PL)	H	RESIDUAL SOIL
				2.70					Hole Terminated at 2.70 m Refusal on bedrock			
			3									
			4									
			5									
			6									
			7									
			8									
			9									
			10									

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

BOREHOLE LOG

BH NO. BH6

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date Started**	18/11/2020
Position	Refer to Figure 2	**Date Completed**	18/11/2020
Job No.	E24901.G03	**Logged By** RS	**Date** 18/11/2020
Client	Congarinni North Pty Ltd	**Reviewed By** SK	**Date** 22/12/2020

Drilling Contactor	Total Drilling	**Surface RL**	≈16.50 m AHD
Drill Rig	Ute-mounted rig	**Inclination**	-90°

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T		GWNE	0	16.50				-	TOPSOIL: Clayey SILT; low plasticity, dark brown, with roots and rootlets.	M (<PL)	-	TOPSOIL
				0.40								
				16.10	BH6_0.5-0.95 SPT 0.50-0.95 m 3,3,3 N=6			CI-CH	Silty CLAY; medium to high plasticity, orange to red-brown, trace rootlets.			FLUVIAL SOIL
	L		1	*1.50*					From 1.5 m, grading to orange-brown mottled pale grey to red-brown.	M (<PL)	F - St	
				15.00	BH6_1.5-1.95 SPT 1.50-1.95 m 6,10,11 N=21							
			2	*2.80*								
				13.70	BH6_3.0-3.45 SPT 3.00-3.45 m 8,11,15 N=26			CI-CH	Silty CLAY; medium to high plasticity, pale grey mottled orange-brown, remnant rock structure visible.			RESIDUAL SOIL
	M		3	*3.60*						M (<PL)	H	
				12.90					From 3.6 m, with fine to medium, sub-angular to sub-rounded quartz gravels.			
				3.80					Hole Terminated at 3.80 m Refusal on bedrock			
			4									
			5									
			6									
			7									
			8									
			9									
			10									

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

BOREHOLE LOG

BH NO. BH7M

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date Started**	18/11/2020
Position	Refer to Figure 2	**Date Completed**	18/11/2020
Job No.	E24901.G03	**Logged By** RS	**Date** 18/11/2020
Client	Congarinni North Pty Ltd	**Reviewed By** SK	**Date** 22/12/2020

Drilling Contactor	Total Drilling	**Surface RL**	≈19.00 m AHD
Drill Rig	Ute-mounted rig	**Inclination**	-90°

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T		GWNE	0	19.00				-	TOPSOIL: Clayey SILT; low plasticity, dark brown, with roots and rootlets.	M (<PL)	-	TOPSOIL
				0.30								
				18.70	BH7M_0.5-0.95 SPT 0.50-0.95 m 3,3,7 N=10			CI-CH	Silty CLAY; medium to high plasticity, orange-brown to pale brown, with fine to medium, sub-angular quartz gravels.			FLUVIAL SOIL
			1									
				1.50								
				17.50	BH7M_1.5-1.95 SPT 1.50-1.95 m 6,11,13 N=24				From 1.5 m, grading to red-brown mottled orange-brown to pale grey.			
	L		2							M (<PL)	St - VSt	
				2.70								
				16.30					From 2.7 m, orange-brown mottled pale grey to red-brown.			
			3		BH7M_3.0-3.45 SPT 3.00-3.45 m 8,11,12 N=23							
				4.00								
			4	15.00				CI-CH	Silty CLAY; medium to high plasticity, orange-brown mottled pale grey and red-brown, remnant rock structure visible.			RESIDUAL SOIL
	L-M				BH7M_4.5-4.95 SPT 4.50-4.85 m 20,27,10/50mm					M (<PL)	H	
			5									
				6.00								
			6						Hole Terminated at 6.00 m Target Depth Reached.			
			7									
			8									
			9									
			10									

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

BOREHOLE LOG

BH NO. BH8M

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date Started**	18/11/2020
Position	Refer to Figure 2	**Date Completed**	18/11/2020
Job No.	E24901.G03	**Logged By** RS	**Date** 18/11/2020
Client	Congarinni North Pty Ltd	**Reviewed By** SK	**Date** 22/12/2020

Drilling Contactor	Total Drilling	**Surface RL**	≈13.00 m AHD
Drill Rig	Ute-mounted rig	**Inclination**	-90°

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	L	GWNE	0	13.00				-	TOPSOIL: Clayey SILT; low plasticity, brown-dark brown, with roots and rootlets.	M (<PL)	-	TOPSOIL
				0.35								
				12.65	BH8M_0.5-0.95 SPT 0.50-0.95 m 3,5,6 N=11			CI-CH	Silty CLAY; medium to high plasticity, orange-brown mottled pale grey and red-brown, with fine to coarse, sub-rounded to sub-angular, quartz gravel, remnant rock structure visible.			RESIDUAL SOIL
	L-M		1		BH8M_1.5-1.95 SPT 1.50-1.95 m 8,11,15 N=26					M (<PL)	H	
			2									
				3.00								
			3	10.00	BH8M_3.0-3.45 SPT 3.00-3.45 m 6,11,15 N=26				From 3.0 m, grading to pale grey mottled orange-brown to red-brown.			
	M-H			*4.10*								
			4						Hole Terminated at 4.10 m Refusal on bedrock			
			5									
			6									
			7									
			8									
			9									
			10									

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

TEST PIT LOG

TP NO. TP9

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By** RS	**Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By** SK	**Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈1.50 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	1.50				-	TOPSOIL: Clayey SILT; low plasticity, dark brown, with roots and rootlets.	M (<PL)	-	TOPSOIL
				0.20								
				1.30	TP9_0.3-0.4 DS 0.30-0.40 m			CL-CI	Silty CLAY; low plasticity, brown, trace fine to medium, sub-angular quartite gravels, rootlets.	M (<PL)	St	FLUVIAL SOIL
			1	*1.00*								
E	L-M			0.50				SP	Gravelly SAND; medium to coarse grained, brown, medium to coarse, sub-angular quartzite gravels.	M	D	
				1.80								
				-0.30				GP	Sandy GRAVEL; medium to coarse, sub-angular to sub-rounded quartzite gravel, grey, medium to coarse grained sand.	M	L - MD	
		▽	2	*2.15*						W		
									Hole Terminated at 2.15 m Test Pit Collapse.			
			3									

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

TEST PIT LOG

TP NO. TP10

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By** RS	**Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By** SK	**Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈1.80 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description						
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	1.80				-	TOPSOIL: Clayey SILT; low plasticity, brown-dark brown, trace fine to medium sub-angular quartzite gravels.	M (<PL)	-	TOPSOIL
				0.60								
E	L-M		1	1.20	TP10_0.7-0.8 ES 0.70-0.90 m			CI	Gravelly CLAY; medium plasticity, pale brown-grey, medium to coarse, sub-angular to sub-rounded quartzite gravels, with sub-rounded quartzite cobbles.	M (<PL)	F - St	FLUVIAL SOIL
				1.60								
		▽	2	0.20				SP	Gravelly SAND; medium to coarse grained, grey, medium to coarse, sub-angular to rounded quartzite gravels, trace sub-rounded quartzite cobbles.	M	D	
										W		
			3	*3.00*					Hole Terminated at 3.00 m Target Depth Reached.			

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

TEST PIT LOG

TP NO. TP11

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By** RS	**Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By** SK	**Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈15.00 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	L-M	GWNE	0	15.00				-	TOPSOIL: Clayey SILT; low plasticity, pale brown-brown, with roots and rootlets.		-	TOPSOIL
				0.35 14.65	TP11_0.4-0.5 CBR 0.40-0.50 m			Cl	Silty CLAY; medium plasticity, brown with red-brown, trace fine to medium, sub-angular to sub-rounded quartzite gravels.	M (<PL)	St	FLUVIAL SOIL
			1									
			2	*2.00* 13.00					From 2.0m: grading into orange-brown mottled red-brown		H	
			3	*3.00*					Hole Terminated at 3.00 m Target Depth Reached.			

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

TEST PIT LOG

TP NO. TP12

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By**	RS/JT **Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By**	SK **Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈20.50 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	L	GWNE	0	20.50 *0.20*				-	TOPSOIL: Clayey SILT; low plasticity, brown, with root and rootlets, trace fine to medium, sub-angular to sub-rounded quartz gravels.		-	TOPSOIL
				20.30	TP12_0.3-0.4 CBR 0.30-0.40 m			CI	Gravelly CLAY; medium plasticity, red-brown, trace medium to coarse grained sand.		St	FLUVIAL SOIL
			1	*1.40*						M (<PL)	VSt - H	
	M			19.10 *1.80*				CH	CLAY: high plasticity, red-brown mottled orange-brown, with fine to coarse sub-angular to angular quartz gravel		H	
			2						Hole Terminated at 1.80 m Refusal.			
			3									

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

TEST PIT LOG

TP NO. TP13

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By** RS/JT	**Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By** SK	**Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈16.00 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	L	GWNE	0	16.00				-	TOPSOIL: Clayey SILT; low plasticity, brown, with root and rootlets, trace fine to medium, sub-rounded quartz gravel.	M (<PL)	-	TOPSOIL
				0.25								
				15.75	TP13_0.3-0.4 CBR 0.30-0.40 m			CI	Silty CLAY; medium plasticity, orange-brown.		F - St	FLUVIAL SOIL
			1								VSt - H	
				1.70								
	M			14.30				CI-CH	Silty CLAY; medium to high plasticity, orange-brown mottled pale grey, remnant rock structure visible.		H	RESIDUAL SOIL
			2	*2.10*					From 2.1m: grading into dark grey			
				13.90								
				2.45					Hole Terminated at 2.45 m Refusal.			
			3									

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

TEST PIT LOG

TP NO. TP14

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By** RS/JT	**Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By** SK	**Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈12.00 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	12.00				-	TOPSOIL: Clayey SILT; low plasticity, brown, trace fine to medium, sub-rounded quartzite gravel.		-	TOPSOIL
				0.20								
				11.80	TP14_0.3-0.4 CBR 0.30-0.40 m			CI	Silty CLAY; medium plasticity, orange-brown mottled yellow-brown.		F - St	FLUVIAL SOIL
			1								VSt - H	
				1.20								
E	L	GWNE		10.80				CI-CH	Silty CLAY; medium to high plasticity, orange-brown mottled pale grey, remnant rock structure visible.	M (<PL)		RESIDUAL SOIL
			2								H	
	M			*2.60*								
									Hole Terminated at 2.60 m Refusal.			
			3									

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

TEST PIT LOG

TP NO. TP15

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By** RS/JT	**Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By** SK	**Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈19.00 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	L	GWNE	0	19.00				-	TOPSOIL: Clayey SILT; low plasticity, brown, with roots and rootlets, trace fine to medium sub-rounded quartz gravel.	M (<PL)	-	TOPSOIL
				0.30								
				18.70	TP15_0.3-0.4 CBR 0.30-0.40 m			CI	Silty CLAY; medium plasticity, orange-brown-red, trace fine to medium grained sand.		F - St	FLUVIAL SOIL
				0.70								
			1	18.30				CI-CH	Silty CLAY; medium to high plasticity, pale grey mottled red-brown, remnant rock structure visible.		H	RESIDUAL SOIL
	M		2	*2.90*								
			3						Hole Terminated at 2.90 m Refusal.			

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

TEST PIT LOG

TP NO. TP16

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By** RS	**Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By** SK	**Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈12.00 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0	12.00				-	TOPSOIL: Clayey SILT; low plasticity, dark brown, with roots and rootlets.		-	TOPSOIL
				0.40								
				11.60				CI-CH	Silty CLAY; medium to high plasticity, orange-brown mottled pale brown, with fine to medium, sub-rounded to sub-angular pale brown-grey, medium to coarse, sub-angular to sub-rounded quartz gravel.		F	FLUVIAL SOIL
E	L-M	GWNE	1		TP16_0.5-1.0 CBR 0.50-1.00 m					M (<PL)	St	
			2								VSt	
			3	*3.00*					Hole Terminated at 3.00 m Target Depth Reached.			

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

TEST PIT LOG

TP NO. TP17

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By** RS	**Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By** SK	**Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈13.00 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	L-M	GWNE	0	13.00				-	TOPSOIL: Clayey SILT; low plasticity, brown, with roots and rootlets.		-	TOPSOIL
				0.25 12.75	TP17_0.3-0.6 CBR 0.30-0.60 m			CI-CH	Silty CLAY; medium to high plasticity, orange-brown mottled red-brown, trace rootlets.	M (<PL)	St	FLUVIAL SOIL
			1									
											VSt	
			2									
				2.85							H	
			3						Hole Terminated at 2.85 m Refusal.			

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

TEST PIT LOG

TP NO. TP18

Project	Proposed Residential Development	**Sheet**	1 of 1
Location	24 Coronation Road, Congarinni North NSW	**Date**	18/11/2020
Position	Refer to Figure 2	**Logged By**	RS/JT **Date** 18/11/2020
Job No.	E24901.G03	**Reviewed By**	SK **Date** 22/12/2020
Client	Congarinni North Pty Ltd		

Contactor	Becker Earthmoving	**Surface RL**	≈11.50 m AHD
Machine	5.5T Excavator	**Bucket Size**	

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY REL. DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	L	GWNE	0	11.50				-	TOPSOIL: Clayey SILT; low plasticity, dark brown, with roots and rootlets, trace fine to medium sub-rounded quartz gravel.	M (<PL)	-	TOPSOIL
				0.30								
				11.20	TP18_0.4-0.5 CBR 0.40-0.50 m			CI	Silty CLAY; medium plasticity, red-brown mottled orange.		F - St	FLUVIAL SOIL
	L		1								VSt - H	
				1.80								
	M		2	9.70				CI-CH	Silty CLAY; medium to high plasticity, red-brown mottled pale grey, remnant rock structure visible.		H	RESIDUAL SOIL
				2.70								
			3						Hole Terminated at 2.70 m Target Depth Reached.			

Sketch & Other Observations

This test pit log should be read in conjunction with EI Australia's accompanying standard notes.

Dynamic Cone Penetrometer Test

AS1289.6.3.2

Project Number:	E24901.G03	Sheet: 1 of 2	Date: 18 November 2020
Project Name:	Proposed Residential Development		
Site Address/Location:	24 Coronation Road, Congarinni North, NSW		
Calibration Check:	Drop Height (510 mm +-5) [X]	Anvil Secure [X]	
	Rods & Grubs Ok [X]	Correct Cone & Good Condition [X]	

Test ID:	DCP9	DCP10	DCP11	DCP12	DCP13
Location of Test System: Zone:	See attached Plan	See attached Plan	See attached Plan	See attached Plan	See attached Plan
Depth (m)	Blows/ 100mm	Blows/ 100mm	Blows/ 100mm	Blows/ 100mm	Blows/ 100mm
0.00-0.10	2	2	3	3	2
0.10-0.20	3	3	4	2	2
0.20-0.30	2	2	5	3	3
0.30-0.40	5	2	3	2	3
0.40-0.50	3	2	3	2	2
0.50-0.60	4	1	4	3	3
0.60-0.70	3	1	3	4	4
0.70-0.80	3	2	3	4	4
0.80-0.90	3	3	3	5	3
0.90-1.00	4	3	15	7	3
1.00-1.10	4	2	16	13	4
1.10-1.20	4	4	25	16	5
1.20-1.30	4	5	28	18	4
1.30-1.40	6	4	Refusal @ 1.3m	22	5
1.40-1.50	5	4		20	5
1.50-1.60	4	6		10/20mm	10
1.60-1.70	1	7		Refual @ 1.52m	18
1.70-1.80	2	8			23
1.80-1.90	2	5			25
1.90-2.00	1	4			25
2.00-2.10	3	4			27
2.10-2.20	**2**	**3**			Refusal @ 2.1m
2.20-2.30	2	4			
2.30-2.40	1	4			
2.40-2.50	3	4			
2.50-2.60	3	6			
2.60-2.70	1	6			
2.70-2.80	0	4			
2.80-2.90	1	5			
2.90-3.00	3	7			
3.00-3.10	3	5			
3.10-3.20	2	4			
3.20-3.30	2	6			
3.30-3.40	3	5			
3.40-3.50	1	5			
3.50-3.60	2	6			
3.60-3.70	2	4			
3.70-3.80	0	6			
3.80-3.90	1	5			
3.90-4.00	Terminated @ 3.9m	Terminated @ 3.9m			
4.00-4.10					
4.10-4.20					
4.20-4.30					
4.30-4.40					
4.40-4.50					
4.50-4.60					
4.60-4.70					
4.70-4.80					
4.80-4.90					
4.90-5.00					

Dynamic Cone Penetrometer Test

AS1289.6.3.2

Project Number:	E24901.G03	Sheet: 2 of 2	Date: 18 November 2020
Project Name:	Proposed Residential Development		
Site Address/Location:	24 Coronation Road, Congarinni North, NSW		
Calibration Check:	Drop Height (510 mm +-5) [X]	Anvil Secure [X]	
	Rods & Grubs Ok [X]	Correct Cone & Good Condition [X]	

Test ID:	DCP14	DCP15	DCP16	DCP17	DCP18
Location of Test System: Zone:	See attached Plan	See attached Plan	See attached Plan	See attached Plan	See attached Plan
Depth (m)	Blows/ 100mm	Blows/ 100mm	Blows/ 100mm	Blows/ 100mm	Blows/ 100mm
0.00-0.10	2	2	3	2	3
0.10-0.20	3	2	2	3	3
0.20-0.30	3	3	2	2	2
0.30-0.40	2	2	3	3	2
0.40-0.50	4	3	2	3	3
0.50-0.60	3	4	2	4	5
0.60-0.70	4	4	3	3	3
0.70-0.80	6	7	4	4	4
0.80-0.90	5	10	3	5	3
0.90-1.00	6	15	3	6	3
1.00-1.10	7	18	4	4	5
1.10-1.20	12	21	4	5	7
1.20-1.30	20	20	4	4	6
1.30-1.40	18	22	5	6	10
1.40-1.50	22	21	5	7	9
1.50-1.60	21	24	4	5	11
1.60-1.70	23	23	5	7	15
1.70-1.80	23	25	4	8	13
1.80-1.90	24	27	6	8	16
1.90-2.00	25	Refusal @ 1.9m	6	10	18
2.00-2.10	24		4	8	20
2.10-2.20	28		4	9	22
2.20-2.30	Refusal @ 2.2m		5	11	26
2.30-2.40			7	16	Refuasl @ 2.3m
2.40-2.50			5	23	
2.50-2.60			5	28	
2.60-2.70			6	Refusal @ 2.6m	
2.70-2.80			4		
2.80-2.90			7		
2.90-3.00			6		
3.00-3.10			8		
3.10-3.20			7		
3.20-3.30			9		
3.30-3.40			10		
3.40-3.50			9		
3.50-3.60			8		
3.60-3.70			8		
3.70-3.80			10		
3.80-3.90			11		
3.90-4.00			End of test @ 3.9m		
4.00-4.10					
4.10-4.20					
4.20-4.30					
4.30-4.40					
4.40-4.50					
4.50-4.60					
4.60-4.70					
4.70-4.80					
4.80-4.90					
4.90-5.00					

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

DRILLING/EXCAVATION METHOD

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

PENETRATION RESISTANCE

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

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

WATER

Standing Water Level **Partial water loss**

Water Seepage **Complete Water Loss**

GWNO	GROUNDWATER NOT OBSERVED - Observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave-in of the borehole/ test pit.
GWNE	GROUNDWATER NOT ENCOUNTERED - Borehole/ test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/ test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following a 150mm seating drive
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported, N is not reported
RW	Penetration occurred under the rod weight only, N<1
HW	Penetration occurred under the hammer and rod weight only, N<1
HB	Hammer double bouncing on anvil, N is not reported
Sampling	
DS	Disturbed Sample
ES	Sample for environmental testing
BDS	Bulk disturbed Sample
GS	Gas Sample
WS	Water Sample
U50	Thin walled tube sample - number indicates nominal sample diameter in millimetres
Testing	
FP	Field Permeability test over section noted
FVS	Field Vane Shear test expressed as uncorrected shear strength (sv= peak value, sr= residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket Penetrometer test expressed as instrument reading in kPa
WPT	Water Pressure tests
DCP	Dynamic Cone Penetrometer test
CPT	Static Cone Penetration test
CPTu	Static Cone Penetration test with pore pressure (u) measurement

GEOLOGICAL BOUNDARIES

———— = Observed Boundary (position known)

– – – – – – – – – – = Observed Boundary (position approximate)

– –?– –?– –?– – = Boundary (interpreted or inferred)

ROCK CORE RECOVERY

TCR=Total Core Recovery (%)

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

RQD = Rock Quality Designation (%)

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

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT LOGS

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

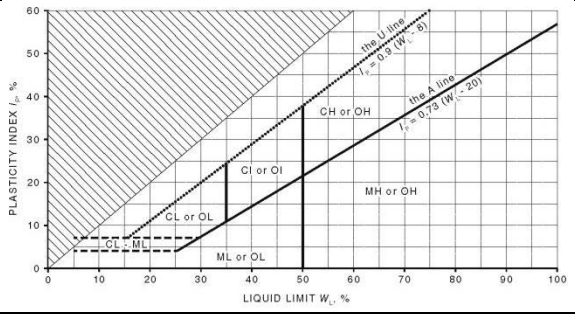
CLASSIFICATION AND INFERRED STRATIGRAPHY

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

PARTICLE SIZE CHARACTERISTICS

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

PLASTICITY PROPERTIES



GROUP SYMBOLS

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

MOISTURE CONDITION

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

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

CONSISTENCY

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

DENSITY

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

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

MINOR COMPONENTS

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

TERMS FOR ROCK MATERIAL STRENGTH AND WEATHERING

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

ROCK MATERIAL STRENGTH CLASSIFICATION

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

 # Rock Strength Test Results

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

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

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

ROCK MATERIAL WEATHERING CLASSIFICATION

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

ABBREVIATIONS AND DESCRIPTIONS FOR ROCK MATERIAL AND DEFECTS

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

DETAILED ROCK DEFECT SPACING

Defect Spacing	
Term	**Description**
Massive	No layering apparent
Indistinct	Layering just visible; little effect on properties
Distinct	Layering (bedding, foliation, cleavage) distinct; rock breaks more easily parallel to layering

Bedding Thickness (Stratification)	
Term	**Spacing (mm)**
Thinly laminated	<6
Laminated	6 – 20
Very thinly bedded	20 – 60
Thinly bedded	60 – 200
Medium bedded	200 – 600
Thickly bedded	600 – 2,000
Very thickly bedded	> 2,000

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT TYPES

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

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

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT SHAPE AND ROUGHNESS

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

Orientation: **Vertical Boreholes –** The dip (inclination from horizontal) of the defect.
Inclined Boreholes – The inclination is measured as the acute angle to the core axis.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT COATING

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

DEFECT APERTURE

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

Appendix B – Laboratory Certificates

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

GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

Atterberg Limits and Linear Shrinkage Report

Project: 24 Coronation Road, Congarini North — Project No.: 30909

Client: EI Australia Pty Ltd — Report No.: 20/4251

Address: Suite 6.01, 55 Miller Street, Pyrmont NSW 2009 — Report Date: 9/12/2020

Test Method: AS1289.3.1.1, 3.2.1, 3.3.1, 3.4.1, 2.1.1 — Page: 1 of 1

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

STS / Sample No.	4646D-L/1	4646D-L/2				
Sample Location	BH1M	BH5				
Material Description	Silty Clay, yellow brown with grey, trace of gravel	Silty Sandy Clay, orange brown with grey trace of gravel				
Depth (m)	0.5-0.95	0.5-0.95				
Sample Date	17-18/11/20	17-18/11/20				
Sample History	Oven Dried	Oven Dried				
Method of Preparation	Dry Sieved	Dry Sieved				
Liquid Limit (%)	**41**	**42**				
Plastic Limit (%)	**29**	**19**				
Plasticity Index	**12**	**23**				
Linear Shrinkage (%)	**4**	**10**				
Mould Size (mm)	250	254				
Crumbing	N	N				
Curling	N	N				

Remarks:

NATA **Accredited for compliance with ISO/IEC 17025 - Testing**
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards
NATA Accreditation Number 2750

Technician: DH

Approved Signatory.....

Orlando Mendoza - Laboratory Manager

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

GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

California Bearing Ratio Determination Report

Project: 24 CORONATION ROAD, CONGARINNI NORTH, NSW
Client: EI AUSTRALIA P/L
Address: Suite 601, 55 Miller Street, Pyrmont, NSW 2009
Test Method: AS1289.6.1.1, 2.1.1
No. of Days Soaked: 4

Project No.: 30909
Report No.: 20/4244
Report Date: 8/12/2020
Page: 1 of 1
Compactive Effort: Standard
Target Compaction (%): 100
Surcharge (Kg): 9

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

STS / Sample No.		4646D-L/3	4646D-L/4	4646D-L/5	4646D-L/6	4646D-L/7	
Sample Location		Test Pit 9	Test Pit 11	Test Pit 13	Test Pit 15	Test Pit 14	
Material Description		Sandy Clay, dark brown, trace gravel	Sandy Clay, brown, trace gravel	Silty Clay, red brown trace of gravel	Sandy Clay, dark brown, trace gravel	Gravelly Sandy Clay, red brown grey	
Depth of Sample (m)		0.3 - 0.4	0.4 - 0.5	0.3 - 0.4	0.3 - 0.4	0.3 - 0.4	
Sample Date		17/11/2020	17/11/2020	17/11/2020	17/11/2020	17/11/2020	
Oversize on Wet Basis +19mm (%)		0.0	0.0	0.0	1.0	0.8	
Field Moisture Content (%)		25.1	23.3	21.5	11.1	20.6	
Optimum Moisture Content (%)		23.3	22.4	23.9	15.9	21.7	
Maximum Dry Density (t/m³)		1.49	1.54	1.56	1.72	1.62	
Dry Density (t/m³)	Before Soaking	1.49	1.55	1.57	1.73	1.63	
	After Soaking	1.48	1.53	1.56	1.72	1.61	
Relative Compaction (%)	Before Soaking	100.0	100.5	100.5	100.5	100.5	
	After Soaking	99.4	99.0	100.0	100.0	99.5	
Moisture Content (%)	Before Soaking	23.2	22.4	23.5	15.8	21.7	
	After Soaking	28.7	27.6	26.2	18.9	24.9	
Moisture Ratio Before Soaking (%)		99.5	100.0	98.5	99.0	99.8	
Moisture Content after test (%)	Top 30mm	30.1	27.0	25.7	19.6	27.7	
	Entire Depth	28.6	24.7	25.3	17.2	24.2	
Swell after Soaking (%)		0.7	1.6	0.7	0.5	1.2	
CBR Value (%)		**13.0**	**8.5**	**8.0**	**12.5**	**8.0**	
Penetration (mm)		**5.0**	**5.0**	**2.5**	**2.5**	**5.0**	

Remarks: +19mm material excluded from test

NATA
Accredited for compliance with ISO/IEC 17025 - Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards
NATA Accreditation Number 2750

Approved Signatory.....

Technician: BV/VE

Orlando Mendoza - Laboratory Manager

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

GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

Moisture Content of Soil and Aggregate Samples

Project: 24 Coronation Road, Congarini North — Project No.: 30909

Client: EI Australia Pty Ltd — Report No.: 20/4253

Address: Suite 6.01, 55 Miller Street, Pyrmont NSW 2009 — Report Date: 9/12/2020

Test Method: AS1289.3.1.1, 3.2.1, 3.3.1, 3.4.1, 2.1.1 — Page: 1 of 1

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

STS / Sample No.	4646D-L/1	4646D-L/2				
Sample Location	BH1M	BH5				
Material Description	Silty Clay, yellow brown with grey, trace of gravel	Silty Sandy Clay, orange brown with grey trace of gravel				
Depth (mm)	0.5-0.95	0.5-0.95				
Sample Date	17-18/11/20	17-18/11/20				
Moisture Content (%)	**23.7**	**20.3**				

Remarks:

NATA
Accredited for compliance with ISO/IEC 17025 - Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards
NATA Accreditation Number 2750

Approved Signatory.....

Technician: DH — Orlando Mendoza - Laboratory Manager

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Richard Sanchez
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	richard.sanchez@eiaustralia.com.au
Project	**E24901.G03 24 Coronation Road, Congarinn**
Order Number	**E24901.G03**
Samples	4

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE213933 R0**
Date Received	23/11/2020
Date Reported	27/11/2020

COMMENTS

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

SIGNATORIES

Huong CRAWFORD
Production Manager

Shane MCDERMOTT
Inorganic/Metals Chemist

Soluble Anions (1:5) in Soil by Ion Chromatography [AN245] Tested: 24/11/2020

PARAMETER	UOM	LOR	BH7M_0.5-0.95 SOIL - 20/11/2020 SE213933.001	BH3M_0.5-0.65 SOIL - 20/11/2020 SE213933.002	BH4_0.5-0.95 SOIL - 20/11/2020 SE213933.003	BH6_0.5-0.95 SOIL - 20/11/2020 SE213933.004
Chloride	mg/kg	0.25	5.3	65	3.6	7.5
Sulfate	mg/kg	5	13	14	9.5	12

pH in soil (1:5) [AN101] Tested: 24/11/2020

PARAMETER	UOM	LOR	BH7M_0.5-0.95 SOIL - 20/11/2020 SE213933.001	BH3M_0.5-0.65 SOIL - 20/11/2020 SE213933.002	BH4_0.5-0.95 SOIL - 20/11/2020 SE213933.003	BH6_0.5-0.95 SOIL - 20/11/2020 SE213933.004
pH	pH Units	0.1	**4.6**	**4.8**	**4.5**	**4.4**

Conductivity and TDS by Calculation - Soil [AN106] Tested: 24/11/2020

PARAMETER	UOM	LOR	BH7M_0.5-0.95 SOIL - 20/11/2020 SE213933.001	BH3M_0.5-0.65 SOIL - 20/11/2020 SE213933.002	BH4_0.5-0.95 SOIL - 20/11/2020 SE213933.003	BH6_0.5-0.95 SOIL - 20/11/2020 SE213933.004
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	**16**	**57**	**11**	**17**

Moisture Content [AN002] Tested: 24/11/2020

PARAMETER	UOM	LOR	BH7M_0.5-0.95 SOIL - 20/11/2020 SE213933.001	BH3M_0.5-0.65 SOIL - 20/11/2020 SE213933.002	BH4_0.5-0.95 SOIL - 20/11/2020 SE213933.003	BH6_0.5-0.95 SOIL - 20/11/2020 SE213933.004
% Moisture	%w/w	1	**17.4**	**18.4**	**14.9**	**21.1**

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos /cm or µS/cm @ 25°C. For soils, an extract of as received sample with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B

FOOTNOTES

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

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

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

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

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

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

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

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

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

Appendix C – 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.