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Our Ref: PSM3828-006L

25 March 2022

JBS&G Level 1, 50 Margaret St Sydney NSW 2000 mhodgins@jbsg.com.au

Attention: Mitchell Hodgins

Dear Mitchell

# RE: GEOTECHNICAL INVESTIGATION FOR THE RYDE HOSPITAL REDEVELOPMENT (CONCEPT AND STAGE 1)

#### 1. Introduction

The attached report (Ref. PSM3828-002R REV 2 dated 13 June 2019) to this letter presents the results of the geotechnical investigation undertaken by Pells Sullivan Meynink (PSM) in 2019 for the proposed Ryde Hospital Redevelopment (Concept and Stage 1).

#### 2. Project Descriptions

The Ryde Hospital site is located at 1 Denistone Road, Denistone and comprises Lots 10-11 DP 1183279 and Lots A-B DP 323458. It has an area of approximately 7.69Ha and currently accommodates the existing Ryde Hospital Campus.

This report accompanies a Concept State Significant Development Application that seeks approval for the establishment of a maximum building envelope and gross floor area to facilitate the development of a new hospital services development, car-park and refurbishment works.

A second SSDA will seek approval for the physical Stage 1 Early Works to prepare the site for the future development. The Stage 1 Early Works application will include the following relevant to the Enabling works construction zone as shown on the architectural drawings:

- Establishing access to the Project site and general establishment;
- Site preparation including environmental clearing;
- Bulk earthworks, including, cut and fill, associated with stage 1 footprint and proposed stage 1 internal roads
- Shoring associated with bulk earthworks
- Establishment of construction access roads;
- Relocation and upgrades of in-ground building services works and utility adjustments to facilitate bulk earthworks.

For a detailed project description refer to the Environmental Impact Statement prepared by Ethos Urban.

#### 3. SEARs Requirements

ltem	SEARs Requirement	Response
13.	Ground and Water Conditions:	
13. i)	Provide an assessment of the potential impacts on soil resources, including related infrastructure and riparian lands on and near the site.	<ul> <li>We assess that there is minimum or close to no impact on the soil resource at the site.</li> <li>This assessment is based on the following considerations: <ul> <li>The site has been used for hospital for many decades.</li> <li>The proposed re-development does not change the site use.</li> </ul> </li> <li>We understand that the stormwater system, surface gradients and landscaping have been and or will be designed to control surface flows and minimise soil erosion and the effects of soil erosion on waterways.</li> <li>The vast majority of the site have been and will be sealed by the proposed development (eg. paved) and appropriate surface runoff collection and disposal systems have been included. We understand that appropriate erosion control will also be included during construction.</li> </ul>

The following SEARs requirements are relevant for the geotechnical investigation:

Should you have further queries, please do not hesitate to contact the undersigned.

**Yours Sincerely** 

GREG FAZZONE GEOTECHNICAL ENGINEER

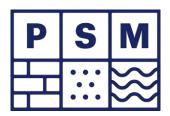
Encl.

• PSM3828-002R REV 2

AGUSTRIA SALIM PRINCIPAL ENGINEER

# Ryde Hospital Denistone, NSW Geotechnical Investigation

PSM3828-002R 14 June 2019



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# 1 Introduction

This report presents the results of the geotechnical investigation undertaken by Pells Sullivan Meynink (PSM) for the proposed re-development of Ryde Hospital, Denistone. The investigation was undertaken in accordance with our proposal PSM3828-001L, dated 9 April 2019. Approval to proceed was provided in an email from Mitchell Hodgins dated 2 May 2019.

The aim of the geotechnical investigation was to assess the subsurface conditions and provide geotechnical advice for the proposed development. The investigation involved assessment and classification of subsurface conditions for the purpose of providing advice on excavation conditions, permanent and temporary batters, retention and foundations.

# 2 Proposed Development

Based on architectural drawings provided by JBS&G (Ref: Ryde Sketches Staging.pdf, attached as Appendix H), we understand that the site is located at Ryde Hospital, Denistone. The site is currently occupied by existing buildings with internal roads and carparking areas.

The proposed re-development comprises:

- Three buildings with up to six (6) storeys above ground (Stage 1 and Stage 2) with up to two (2) basement levels
- A new multistorey carpark with no basement
- A new community health building with no basement.

A site locality plan is presented in Figure 1.

# 3 Geotechnical Investigation

#### 3.1 Fieldwork

The fieldwork was undertaken from 14 to 19 May 2019 under the full-time supervision of a PSM Geotechnical Engineer, who undertook the following tasks:

- Setting out the investigation locations
- Directing the reinstatement of concrete and asphalt surfaces where required
- Preparing engineering logs of the materials encountered
- · Collection of disturbed samples for laboratory testing
- Point load testing of recovered core samples.

Prior to the investigation, on-site service location "scans" were undertaken by a licenced service locator under the direction of PSM.

Fourteen (14) boreholes (BH01 to BH14) were drilled at the site, locations presented on Figure 1. Drilling was undertaken by Rockwell Drilling using a tracked drilling rig. The investigation locations of boreholes were recorded with a hand-held GPS unit with a horizontal accuracy of approximately +/- 5 m. Borehole collar levels cannot be estimated as a survey of the site had not been made available. The logs can be updated to included elevations if a survey plan is provided or survey completed.

Boreholes were drilled to depths of between 3.0 m and 11.27 m, with augering in soils and low strength rock and coring in rock. Rock coring was undertaken for boreholes BH01 to BH08, BH13 and BH14.

Two (2) standpipe piezometer were installed within BH03 and BH07 upon completion to allow ongoing monitoring of groundwater levels. The geotechnical borehole logs prepared as part of the investigation together with core photos are included in Appendix A and Appendix B. Explanation sheets to allow interpretation of the logs are also provided. Point load strength index testing was performed on the recovered core at approximately 1 m intervals with results tabulated in Appendix C and presented on the logs. Piezometer construction records are presented in Appendix D.



Figures 2.1 and 2.2 presents selected photos showing the general conditions of the existing site at the time of the fieldwork and typical drilling rig setup.

# 3.2 Geotechnical Laboratory Testing

#### 3.2.1 California Bearing Ratio (CBR)

Six (6) bulk soil samples from the site were recovered for California Bearing Ratio (CBR) testing at an accredited geotechnical laboratory.

The following sample preparation was undertaken for the CBR testing:

- Compact to 98% standard MDD, at optimum moisture content (OMC);
- Four (4) day-soaked sample; and
- 4.5 kg surcharge.

Table 1 presents a summary of the CBR test results. The test result sheets are included in Appendix E.

#### Table 1 – CBR Test Results

Sample ID (depth)	Material Description	Soaked CBR (%)	ОМС (%)	Standard Maximum Dry Density (t/m3)	Swell (%)
BH01 (0.5 m – 3.0 m)	Silty clay	1.5*	18.5	1.69	1.5
BH03 (0.5 m – 1.9 m)	Silty clay	3.0*	19.6	1.70	2.0
BH04 (0.5 m – 1.3 m)	Silty clay	1.5*	23.3	1.63	4.5
BH07 (0.5 m – 3.0 m)	Silty clay	7.0*	16.0	1.81	0.0
BH10 (0.1 m – 2.9 m)	Silty sand	7.0*	15.0	1.79	1.0
BH13 (0.3 m – 3.5 m)	Silty clay	6.0*	17.4	1.79	0.5

Note: \* Indicates Soaked CBR value at 2.5 mm penetration

#### 3.2.2 Atterberg Limits

Six (6) bulk soil samples from the site were recovered for Atterberg Limits testing at an accredited geotechnical laboratory. Table 2 presents a summary of the test results. The results all plot above the A-line on Casagrande's plasticity chart (Figure 4), ranging from low to high plasticity (i.e., CL to CH), with majority of the samples indicating medium to high plasticity.

The test result sheets are included in Appendix F.

#### Table 2 – Atterberg Limit Results

Sample ID (depth)	Sample Description	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH01 (0.5 m – 3.0 m)	Silty clay	50	21	29	14
BH03 (0.5 m – 1.9 m)	Silty clay	76	24	52	19
BH04 (0.5 m – 1.3 m)	Silty clay	54	23	31	15
BH07 (0.5 m – 3.0 m)	Silty clay	30	17	13	7.5
BH10 (0.1 m – 2.9 m)	Silty sand	35	20	15	1.0
BH13 (0.3 m – 3.5 m)	Silty clay	39	19	20	0.5



# 3.3 Analytical Soil Testing

Analytical laboratory testing for soil aggressivity was carried out on six (6) samples. The results are presented in Appendix G and summarised in Table 3.

Sample ID	Sample Depth	рН	Moisture Content (%)	Chloride by Discrete Analyser (mg/kg)	Soluble Sulfate by ICPAES (mg/kg)
BH01	1.0 m	4.7	17.2	10	50
BH03	0.5 m	8.7	5.1	<10	90
BH04	1.0 m	5.1	20.1	20	40
BH07	0.5 m – 1.0 m	6.8	18.3	<50	180
BH11	0.5 m	4.7	17.4	30	110
BH13	0.5 m – 1.0 m	9.5	19.7	<10	240

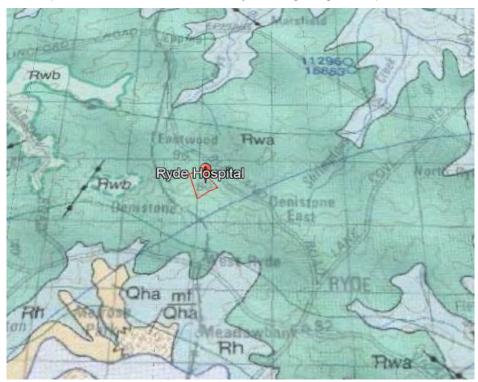
#### **Table 3 - Summary of Aggressivity Testing Results**

# 4 Site Conditions

# 4.1 Geological Setting

The 1:100,000 Sydney Geological Map indicates the site is underlain by Ashfield Shale of the Wianamatta group (Rwa) which consist of black to dark-grey Shale and Laminite. The published information is consistent with the subsurface conditions encountered in the field investigation.

Inset 1 presents an indicative site locality on the geological map.



Inset 1: Sydney geological map indicating approximate site location



# 4.2 Surface Conditions

The site is currently occupied by existing buildings, internal roads and various carparking areas with an asphalt or concrete pavement surface.

The site is bound by Fourth Ave to the north, Denistone Rd to the east, and Ryedale Rd to the west (Figure 1). The site is sloped from the northeast boundary towards the southwest (based on the supplied architectural drawings).

At the time of the fieldwork, the ground surface was dry with minimal traffic. The boreholes were drilled through asphalt, concrete and topsoil surface.

# 4.3 Subsurface Conditions

The subsurface conditions are summarised in Table 4 and the depth at which each unit was encountered are summarised in Table 4.

We note that it is difficult to discriminate between fill and natural insitu material in augered boreholes where the fill is composed of locally excavated natural material; it is possible that the fill is thicker than interpreted. The laminite/siltstone bedrock unit has been classified using the system developed by Pells et al (1998). The rock mass classification system is based on rock strength, defect spacing and allowable seams.

#### Table 4 – Summary of Inferred Subsurface Conditions Encountered in the Boreholes

Inferred Geotechnical Unit		Material Description				
Asphalt/Concrete/Topsoil		Current pavement – 100 to 200 mm thick ASPHALT: black and dark grey CONCRETE: pale grey and white TOPSOIL: silty sand with gravel, fine grained sand, dark brown, sub-angular gravel size up to 5mm, some clay. Rootlets and barks observed.				
Fill (varying typ	es)	<ul> <li>SILTY CLAY with gravel, dark brown, grey and black, low to medium plasticity, sub-angular gravel size up to 10mm, stiff to very still consistency, trace of rootlets.</li> <li>CLAY with gravel, dark grey and orange, medium plasticity, sub-angular gravel size up to 5mm, very stiff consistency, trace of rootlets.</li> <li>SILTY SAND with gravel and crushed rocks, brown and yellow, fine to medium grained sand, sub-angular gravel size up to 20 mm, medium dense to dense consistency, trace of rootlets.</li> <li>CLAYEY SAND with gravel, brown and yellow, fine to medium grained sand, sub-angular gravel, brown and yellow, fine to medium grained sand, sub-angular gravel, brown and yellow, fine to medium grained sand, sub-angular gravel size up to 15 mm, medium dense to dense consistency, trace of rootlets.</li> <li>SILTY GRAVEL, pale grey and yellow, medium grained size, crushed sandstone rocks – moderately weathered and high strength.</li> </ul>				
Residual		SILTY CLAY: pale grey, brown and orange, low to medium plasticity, very stiff to hard consistency.				
Deducate	Class IV/V	LAMINITE: pale grey, dark grey and brown with orange banding, thin fine-grained sandstone laminations, rock fabric faint with developed bedding. Extremely to highly weathered. Extremely low to very low strength.				
Bedrock	Class III	LAMINITE: grey and dark grey with occasional orange banding, thin fine-grained sandstone laminations, rock fabric visible with well-developed bedding. Moderately to fresh. Low to medium strength.				



		Depth to Top of Inferred Unit (m below surface level)								
BH ID	Asphalt/Concrete	<b>F</b> :11	Destitut	Bed						
	Topsoil	Fill	Residual	Class IV/V	Class III	EOH <sup>(1)</sup>				
BH01	0	0.20	0.90	3.00	7.65	9.00				
BH02	0	0.20	0.50	1.40	6.50	11.27				
BH03	0	0.10	1.30	1.90	8.05	9.13				
BH04	0	0.20	0.80	1.35	4.30	8.40				
BH05	0	0.10	0.50	1.20	3.70	8.45				
BH06	0	0.10	1.40	2.00	5.40	8.10				
BH07	0	0.10	1.30	2.50	3.50	9.17				
BH08	0	0.09	1.40	2.60	8.18	8.80				
BH09 <sup>(2)</sup>	N/E	0.00	3.60	4.60	N/E	5.00				
BH10 <sup>(2)</sup>	0	0.10	>3.00	N/E	N/E	3.00				
BH11 <sup>(2)</sup>	0	0.10	4.00	4.50	N/E	6.00				
BH12 <sup>(2)</sup>	0	0.15	2.00	2.80	N/E	3.00				
BH13	0	0.18	4.40	5.00	5.80	8.45				
BH14	0	0.10	4.50	5.50	6.80	9.58				

#### Table 5 – Approximate Depth to Top of Inferred Geotechnical Units Encountered in the Boreholes

Note: 1. End of hole

2. Augered borehole

3. N/E - Not encountered

## 4.4 Groundwater

Spot measurement of the groundwater level was taken on 15 and 17 May 2018 in BH03 and BH07 following completion of the drilling. The measured groundwater level was 3.01 m below surface level in BH03 and was 2.70 m below surface level in BH07.

Continuous measurements of the groundwater level were taken at half hour intervals from 15 May 2019 to 7 June 2019 in BH03 and BH07 (with a HOBO water level logger). The groundwater level in both boreholes had not changed significantly during this period. Figures 3.1 and 3.2 present the results of groundwater level monitoring in both standpipe piezometers and monitoring will continue for the next 3 months.

# 5 Discussion and Recommendations

## 5.1 Site Classification

We have classified the site in accordance with Australian Standard AS2870 – 2011, "Residential slabs and footings – Construction". Based on our field observations the depth of clay in the profile is greater than 1.8 m within most of the boreholes spread across the site, we recommend that structures which are within the scope of AS2870 be designed for a site classification of Class "H1" Highly Reactive.

The site can be re-classified during the works for specific areas where required.



# 5.2 Bulk Excavation Conditions

We expect excavation to depths of approximately 7 m is required for the proposed development which may comprise up two (2) basement levels for the new buildings.

Based on the geotechnical investigation, excavation in the Asphalt, Concrete, Fill, Residual Soil and highly weathered Bedrock should be achievable using conventional earth moving equipment with minor rock breaking. Excavation of more competent Bedrock may require the use of hydraulic impact breakers, rock saws and/or rock grinders and must be undertaken by contractors with suitable experience in rock excavation close to existing structures..

Prospective contractors should make their own assessment of excavatability based on the borehole logs and their site inspection and experience. It is our experience that excavatability is heavily dependent on both the operator and the plant used. Heavy rock breaking equipment will generate vibrations that may impact on neighbouring structures. Where controls on vibrations are required, the contractor should consider the use of smaller hammers, rock saws and grinders to undertake the excavation. The contractor should recognise that there is a potential for damage to adjacent buildings or infrastructure (if any) and consider this in its planning.

## 5.3 Earthworks and Disposal of Excavated Material

We anticipate that some earthworks may be required as part of the redevelopment. We consider that topsoil is not suited for reuse as engineered fill (but could be potentially blended in small quantities) but may be reused for landscaping purposes. It is our opinion that most of the remaining cut material (i.e., Fill, Residual Soil and Bedrock) would be suitable for reuse on the site as engineered fill.

We envisage that the earthworks proposed at the site will require the preparation of a detailed fill specification developed following the guidelines in AS3798 (2007), "Guidelines on earthworks for commercial and residential developments". Preparation of this fill specification is outside the scope of this report. We consider that the fill specification should address at least the following:

- 1. Subgrade preparation and base geometry requirements.
- 2. Material requirements, including a clear definition of:
  - a. Suitable and unsuitable material.
  - b. Grading or maximum particle size requirements. We note that a conservative definition of maximum particle size may result in some of the materials on site being excluded from reuse as engineered fill. It is our opinion that this restriction may not significantly benefit fill performance.
- 3. Fill placement requirements, including a clear definition of compacted layer thickness, we suggest 300 mm.
- 4. Compaction requirements. We suggest that a minimum and maximum density ratio be adopted to control any potential shrink swell of the clayey fill material and to limit the effect of fill material variability on the fill performance, we suggest 98 to 102 % standard.
- 5. Moisture control requirements. We consider that control on placement moisture variation should be adopted to control any potential shrink swell of the clayey fill material, we suggest moisture variation of +- 2%.
- 6. Inspection and testing requirements, including a clear definition of:
  - a. Level of control testing, e.g. Level 1 as per AS3798.
  - b. Lot testing, this is an important aspect of earthworks control but often ignored in acceptance of the works.
  - c. Testing methodology.
  - d. Testing frequency.
- 7. Responsibilities of the contractor. We envisage that such responsibilities would include:
  - a. Undertake the earthworks in accordance with fill specification.
  - b. Seek approvals by the GITA as required by the fill specification, in particular prior to placing any new fill.
  - c. Responsibilities of the Geotechnical Inspection and Testing Authority (GITA). The fill specification should define:
  - d. The inspection and testing responsibilities of the GITA.
  - e. The reporting responsibilities of the GITA.



f. The final certification responsibilities of the GITA. We note that the specification should require the GTA to certify that "all the earthworks have been documented and have been undertaken in accordance with the relevant fill specification". It is not adequate just to refer to AS3798 Level 1.

The majority of the basement excavation material is likely to comprise Virgin Excavated Natural Material (VENM). For disposal purposes, it is likely the Residual Soil and Bedrock units (Laminate and Siltstone) are able to be validated as VENM. However, the Fill unit encountered can either be disposed as General Solid Waste or validated as Excavated Natural Material (ENM). Based on the Fill observed during the geotechnical investigation, we consider it likely that the existing fill will be able to be so validated, but this can only be done once the material is stockpiled on site during construction.

The most economical outcome may be to re-use the existing Fill on site as much as possible and dispose the VENM off site. VENM verification would be required during construction for material disposal.

The existing fill will be suitable for incorporating in any earthworks on site. We note that the earthwork contractor should go to considerable effort to segregate different materials and not dilute/contaminate the VENM with Fill.

## 5.4 Permanent and Temporary Batters

The excavation to construct the new building will be in proximity to existing buildings, vehicle and pedestrian pavements and utilities. Subject to the sensitivity and proximity of these elements, the excavation may require support and/or protection. This should be assessed on a case by case basis.

The batter slope angles shown in Table 6 are recommended for the design of batters up to a nominal 5 m height subject to the following recommendations:

- The batters shall be protected from erosion. Permanent batters will require face protection such as vegetation or shotcrete.
- Permanent batters shall be drained for a distance behind the faces at least equal to the height.
- Temporary batters shall not be left unsupported for more than 3 months without further advice, and inspection by a suitably experienced geotechnical engineer should be undertaken following significant rain events
- No buildings, surcharge loads or services should be located within 1 batter height of the crest.

If the conditions above cannot be met, further advice should be sought.

Where Fill is not engineered/controlled fill, batter slope angles should be assessed by a suitable experienced geotechnical engineer.

Exposed rock faces should be inspected by a geotechnical engineer or engineering geologist to assess the need for localised rock bolting to control adverse jointing in the Bedrock unit and shotcreting for overall face support and weather protection.

Unit	Temporary	Permanent
Engineered Fill	2H: 1V	2.5H: 1V
Residual Soil	1.5H: 1V	2H: 1V
Bedrock Class IV/V	0.5H: 1V	1.5H: 1V
Bedrock Class III	0.5H: 1V	1H: 1V

#### Table 6 – Batter Slope Angles

Steeper batters may be possibly subject to further advice, probably including inspection during construction and shortcreting and rock bolting etc.



# 5.5 Excavation Support

Permanent cuts in the Fill, Residual Soil and Bedrock units steeper than the recommended permanent batter slopes in Table 6 will need to be supported by some form of retaining structure.

The selection of the appropriate retention system is a matter of design. The designer should consider the following factors in making its selection:

- Technical factors
  - Performance
  - Ground conditions (this is addressed below with the design parameters)
  - Surcharge loading and
  - Proximity of structures, buildings and roads, etc.
- Non- technical factors
  - Cost (to build and to maintain)
  - Other constraints such as real estate, neighbouring site / boundary, aesthetics, legislation, etc.

The design of these structures should be based on the following geotechnical properties:

- Effective strength parameters in Table 7 when assessing the earth pressure on retaining structures
- A lateral pressure of 10 kPa for vertical cuts in the Bedrock units (Class III or better). This is to allow for blocks and rock wedges formed due to adverse defects that may exist within the unit.
- Water pressure (depending on the type of structure).

Note that design of retention systems may be based on either  $K_a$  or  $K_o$  earth pressures. Design using active earth pressures provides the minimum lateral earth pressure that must be supported to avoid failure and requires a wall that can rotate or translate to allow the pressures to reduce to these values (vertical and lateral movements up to 2% of height may occur, typical movements will be much less).

Where the design is based on  $K_o$  pressures, construction should be carefully controlled to avoid unwanted effects. It should be noted that designing for  $K_o$  pressures do not, of themselves, ensure that movement does not occur. Movements are controlled by the construction method, especially sequence.

Both surface and sub-surface drainage needs to be designed and constructed properly to prevent pore water pressures from building up behind the retaining walls and in the retained material. Otherwise, appropriate water pressures must be included in the design.

Where excavations are proposed in the vicinity of existing structures designers shall consider the effects of the excavation including horizontal and vertical deflections on the neighbouring structures.

If relying on passive support from embedment of piles into the Bedrock units. (e.g. cantilever piled wall or propped or anchored piled wall) the designer shall ignore the support provided in the upper 1.0 m of embedment and can adopt a lateral resistance of one third of the allowable bearing pressure (ABP) in Table 7.



#### Table 7 – Engineering Parameters of Inferred Geotechnical Units

	Soil Effective Strength Parameters		Ultimate Allowable Bearing Bearing Pressure Pressure		Ultimate	Elastic Parameters		
Inferred Unit	Unit Weight (kN/m³)	c' (kPa)	<i>ø</i> (deg)	Under Vertical Centric Loading (kPa) <sup>1, 2</sup>	(ABP) Under Vertical Centric Loading (kPa) <sup>1, 3</sup>	Shaft Adhesion (kPa)⁴	Long Term Young Modulus (MPa)	Poisson's Ratio
Fill	18	0	30		N/A		10	0.3
Residual soil	18	0	30	450	150	N/A	15	0.3
Bedrock Class IV/V	22	10	30	3000	700	50	50	0.3
Bedrock Class III	22	N	.А	6,000	2000	350	200	0.25
Bedrock Class II (or better)	22		.~	30,000	3500	600	700	0.25

Notes: 1. Minimum plan dimension of 1.0 m and a minimum embedment depth of 0.5 m.

2. Ultimate values occur at large settlement (>5% of minimum footing dimensions).

3. End bearing pressure to cause settlement of <1% of minimum footing dimensions).

4. Clean socket of roughness category R2 or better.

#### 5.6 Foundations

#### 5.6.1 Preamble

In general, the designer should note the following with regards to foundation design for both piles and shallow pad footings:

- The bearing capacities provided are contingent on piles or footings being vertically and centrally loaded. Further advice should be sought if the footings are not vertically centrically loaded.
- Where adjacent foundation details differ (e.g. pile and pad, differing loads or ground conditions) differential settlement will need to be assessed.
- Deflections should be checked using the recommended elastic parameters in Table 7.

#### 5.6.2 Shallow pad footings

Pad footings can be proportioned on the basis of an allowable bearing pressure (ABP) for centric vertical loads provided in Table 7.

We note that an allowable bearing pressure (ABP) is not a soil property. It depends on many factors such as the size of the footings, the embedment depth, the load direction and eccentricity, the stiffness of the footing, the adopted factor of safety (FOS), as well as the soil properties. As footings get bigger or deeper the capacity increases rapidly. As the load gains eccentricity or becomes inclined, the capacity reduces rapidly.

Settlements can be estimated using the elastic parameters provided in Table 7. When assessing the settlement of the shallow footings, the designer needs to consider the additional ground settlement due to the total building load on both shallow and deeper units. The differential settlement due to the building load shall also be assessed.

Foundations conditions at the proposed shallow pad footings locations should be inspected by a suitably qualified geotechnical engineer prior to the pouring of concrete.



#### 5.6.3 Piles

We envisage that piles would be founded within the Bedrock unit.

Piles should be designed in accordance with the requirements in AS 2159 (2009), Piling – Design and Installation. The parameters provided in Table 7 may be adopted in the design of piles founded in Bedrock unit.

The designer should note the following with regards to the pile design:

- The ABP needs to be confirmed by a geotechnical engineer through pile inspections prior to pouring concrete
- Under permanent load, the contribution of side adhesion for soils including Fill and Residual Soil should be ignored
- Deflection should be checked using the recommended elastic parameters in Table 7
- Where adjacent foundation details differ (e.g., pile and pad, differing loads or ground conditions), differential settlement should also be assessed.

Should higher bearing capacities be required of the Bedrock, this may be available subject to further advice.

With regards to the pile design we recommend that:

- A geotechnical strength reduction factor,  $\Phi g = 0.60$  (AS2159 CL. 4.3.2) be adopted for a high redundancy system for an assessed average risk rating (ARR) between 2.5 and 3.0. This should be reviewed to suit the specific design and appropriate pile testing proposed by the structural designers in accord with the requirements of AS2159
- It may be possible to increase the pile reduction factors, if the details of the proposed pile installation procedures indicate a high level of quality control with regards to concrete placement, base cleanliness, etc.
- If a geotechnical strength reduction factor, Φg = 0.40 is adopted then no pile testing will be required (AS2159 Clause 8.2.4 (b)).

#### 5.7 Pavements

Subgrade CBR for pavement design depends on the material at the finished subgrade levels. Based on the CBR tests undertaken by PSM (refer to Table 1) we recommend a design subgrade CBR of 1.5% be adopted for the pavement design at site. Should a higher design CBR be required, further testing at specific locations may be required and further advice should be sought.

# 5.8 Corrosivity / Aggressivity

Table 4.8.1 of AS3600-2009 "Concrete Structures" provides criteria for exposure classification for concrete in sulphate soils based on sulphates in soil and groundwater, and pH of soil. According to the sulphate and pH testing completed, we assess the exposure classification for concrete in sulphate soils to be A2.

Table 6.4.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for concrete piles based on sulfates in the soil and groundwater, soil and groundwater pH, and chlorides in groundwater. According to the soil sulfates and pH testing completed we assess the exposure classification for concrete piles in the soil to be mild for the site.

Table 6.5.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for steel piles based on resistivity, soil and groundwater pH, and chlorides in soil and groundwater. On the basis of soil chlorides and pH testing completed we assess the exposure classification for steel piles in the soil to be non-aggressive for the site.

#### 5.9 Dewatering

Where excavation below the water table is proposed for the basement, construction stage dewatering may be required.

We note that recent experience indicates that the New South Wales Office of Water (NoW) have been conditioning approval of basement excavations on the basis of the following:

• Temporary dewatering allowed during excavation. Permits will need to be sought for both extraction of the water and disposal.



- No inflows into the basement allowed in the permanent condition. That is the final basement needs to be watertight, i.e. tanked. Such a requirement results in the basement floor slab, and the walls needing to be designed for the full hydrostatic load below a maximum foreseeable water table. This requirement, if enforced by the regulatory authorities, may influence decisions regarding the feasibility of deep basement excavations. It is our experience that NoW may relax the requirement for tanking where monitoring of groundwater levels in combination with analysis of inflows in the permanent condition indicate yearly inflow into the excavation of less than 3 ML/yr and that the extraction of groundwater has no adverse impact on other groundwater users.
- The developments are usually conditioned on monitoring of groundwater levels, assessment and estimation of temporary inflows during construction, and assessment of effect on neighbouring structures.

Given the topography, we expect that a decent pump out system should suffice for basements excavation on this site.

PSM can provide advice on the above, but this is outside the scope of this report.

# 6 General

If at any time, the conditions are found to vary from those described in this report, further advice should be sought.

Please do not hesitate to contact the undersigned if you have any questions.

For and on behalf of PELLS SULLIVAN MEYNINK

Leur

NGOC TUAN HOANG GEOTECHNICAL ENGINEER

BERNARD SHEN PRINCIPAL



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# LEGEND

- APPROXIMATE CORED BOREHOLE LOCATION
- APPROXIMATE AUGERED BOREHOLE LOCATION
- SITE BOUNDARY



Pells Sullivan Meynink

Ryde Hospital Denistone Rd, Eastwood NSW

Geotechnical Investigation LOCALITY PLAN

PSM3828-002R

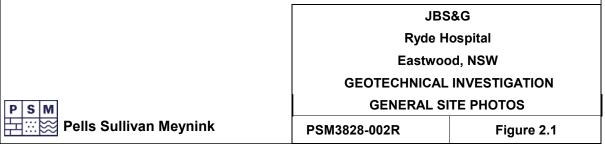
Figure 1



Photo 1 - Main internal road of the site looking South



Photo 2 - Carpark areas in the South of the site looking North



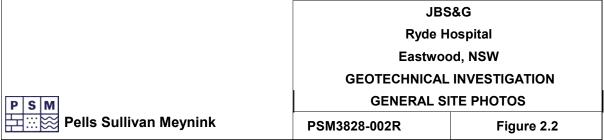
C:\Users\ngoctuan.hoang\Desktop\Essentials\[Figure 2 - general site photo.xlsx]General 2



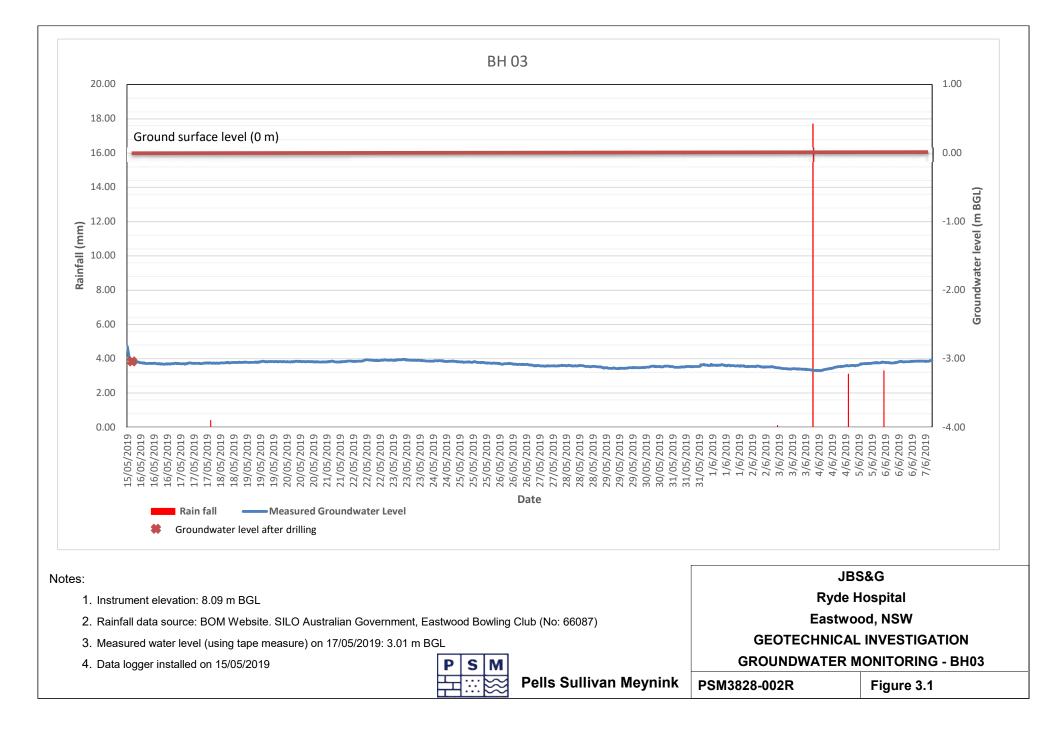
Photo 3 - Carpark areas in the West of the site looking North

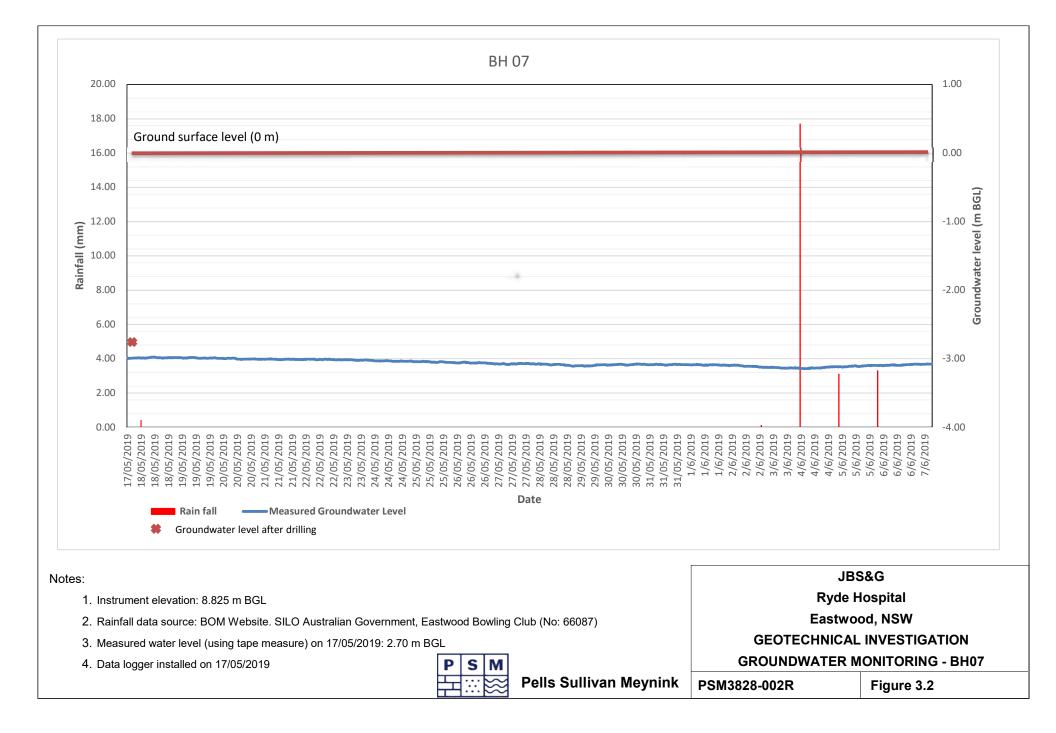


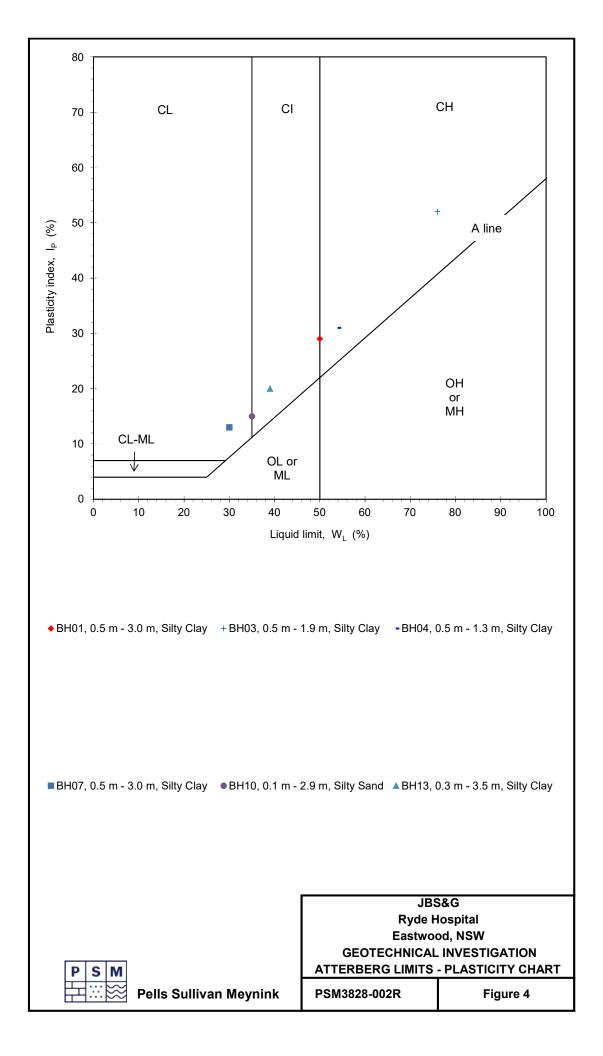
Photo 4 - Setting up the drilling rig -Hanjin D8



C:\Users\ngoctuan.hoang\Desktop\Essentials\[Figure 2 - general site photo.xlsx]General 2







Appendix A Geotechnical Engineering Borehole Logs





# Pells Sullivan Meynink Engineering Consultants Rock-Soil-Water

# **EXPLANATION SHEET BOREHOLE LOG**

# **GENERAL**

## Method

# **Coring Size**

Non-Cored Borehole	
Auger	
Hand Auger	
Diamond Rotary	
Percussion	
Other	

# Testing

Symbol	Description
UCS	Uniaxial Compressive Strength
TXL	Triaxial Test
BT	Brazilian Test
DT	Direct Tensile
SD	Slake Durability
Packer	Rock Mass Permeability

Cored Borehole	Nominal Core Diameter (mm)
NMLC	51.9
BQ	36.5
BQ3	33.5
NQ	47.6
NQ3	45.1
HQ	63.5
HQ3	61.1
PQ	85
PQ3	83.1
Diatube	Variable
Other	-

# Samples

Symbol	Description
U50	50 mm undisturbed tube sample
D	Disturbed sample
Bs	Bulk sample

Water

Symbol	Description
	Water level
►	Water inflow
	Complete water loss
	Partial water loss

# SOIL DESCRIPTIONS

# Unified Soil Classification System (USCS)

Major Divisions		Symbol	Typical Names	
	Clean		GW	Well-graded gravels and gravel-sand mixtures, little or no fines.
Coarse-	Gravels (more than 50%	Gravels	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines.
Grained Soils	coarser than 2mm)	Gravels	GM	Silty gravels, gravel-sand-silt mixtures.
More than	,	With Fines	GC	Clayey gravels. gravel-sand-clay mixtures.
50% coarser	Sands	Clean	SW	Well-graded sands and gravelly sands, little or no fines.
than 0.075mm	(more than 50% of coarse	Sands	SP	Poorly graded sands and gravelly sands, little or no fines.
	fraction finer than 2mm)	···	SM	Silty sands, sand-silt mixture.
	,		SC	Clayey sands, sand-clay mixtures.
	Silts and Clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour silty or clayey fine sands.
Fine- Grained			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
Soils 50% or			OL	Organic silts and silty clays of low plasticity.
finer than 0.075mm	Silts and Clays		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.
0.0701111		Liquid limit greater than 50%		Inorganic clays of high plasticity, fat clays.
			ОН	Organic clays of medium to high plasticity.
	Highly Organic So	ils	PT	Peat etc.

# **Moisture Condition**

Term	Symbol
Dry	D
Moist	М
Wet	W
Wet at Plastic Limit	WP
Wet at Liquid Limit	WL



#### Strength

**COHESIVE SOILS** are described in terms of undrained shear strength, colour and structure with comments on minor constituents or apparent special features. Undrained shear strength is measured by hand penetrometer or determined by laboratory testing or estimated from experience. Classification in terms of undrained shear strength is as follows:

Term	Symbol	Description for Field Estimation	Shear Strength (kPa)	UCS (kPa)
Very Soft	VS	Easily penetrated several centimetres by fist.	<12	<25
Soft	S	Easily penetrated several centimetres by thumb. Can be moulded by light finger pressure.	12-25	25-50
Firm	F	Can be penetrated by thumb with moderate effort. Can be moulded by strong finger pressure.	25-50	50-100
Stiff	ST	Readily indented by thumb.	50-100	100-200
Very Stiff	VST	Readily indented by thumbnail.	100-200	200-400
Hard	Н	Indented with difficulty by thumbnail	>200	>400

**NON-COHESIVE SOILS** are described in terms of density, colour, with comments on minor constituents or special features. Density (density index) is generally based on standard penetration testing (AS1289 Method 6.3.1), or other forms of penetration testing. Terms used in describing density are set out below:

Term	Symbol	Density Index	SPT N Values
Very Loose	VL	<15%	<5
Loose	L	15-35 %	5-10
Medium Dense	MD	35-65 %	10-30
Dense	D	65-85 %	30-50
Very Dense	VD	>85 %	>50



# ROCK DESCRIPTIONS

# Weathering

Term	Symbol	Description
Fresh	FR	Rock substance unaffected by weathering.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.
Moderately Weathered	MW	Rock substance affected by weathering to the extent staining extends throughout whole of the rock substance and the original colour of the fresh rock is no longer recognisable.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and signs of chemical or physical decomposition of individual minerals are usually evident. Porosity and strength may be increased or decreased when compared to the fresh rock substance, usually as a result of the leaching or deposition of iron. The colour and strength of the original fresh rock substance is no longer recognisable.
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties, i.e. it can be remoulded and can be classified according to the Unified Soil Classification System, but the texture of the original rock is still evident.

# Strength

Term	Symbol	Description for Field Estimation	Point Load Index I <sub>s</sub> 50 (MPa)
Very Low	VL	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; pieces up to 30 mm thick can be broken by finger pressure.	<0.1
Low	L	Easily scored with a knife; indentations 1 mm to 3 mm show with firm blows of a pick point; has a dull sound under hammer. Pieces 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.	0.1 to 0.3
Medium	М	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.	0.3 to 1.0
High	Н	A piece of core 150mm long by 50mm cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.	1 to 3
Very High	VH	Hand specimen breaks after more than one blow of a pick; rock rings under hammer.	3 to 10
Extremely High	EH	Specimen requires many blows with geological pick to break; rock rings under hammer.	>10



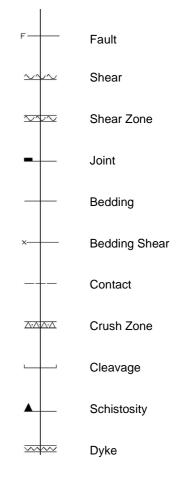
#### **Defect Description**

Order of description: type, inclination, shape, roughness, infill type, infill thickness, number

Oursels a l	Description
Symbol	Description
CL	Clay Seam
FL	Fault - fracture along which displacement is recognisable.
SR	Shear - a fracture along which movement has taken place but no displacement is recognisable. Evidence for movement may be slickensides, polishing and/or clay gouge.
SH	Sheared Zone - zone of multiple closely spaced fracture planes with roughly parallel planar boundaries usually forming blocks of lenticular or wedge shaped intact material. Fractures are typically smooth, polished or slickensided; and curved.
BG	Bedding parting - arrangement in layers of mineral grains or crystals parallel to surface of deposition along which a continuous observable parting occurs.
BSH	Bedding plane shear - a shear formed along a bedding plane
JN	Joint - a single fracture across which rock has little or no tensile strength and is not obviously related to rock fabric.
CN	Contact - surface between two lithologies.
SC	Schistosity - plane formed by the preferred orientation of the constituent minerals in a parallel arrangement in a coarse grained rock which has undergone regional metamorphism (schist).
CV	Cleavage - plane of mechanical fracture in a rock normally sufficiently closely spaced to form parallel- sided slices.
FO	Foliation
CZ	Crushed Zone - zone with roughly parallel, planar boundaries (commonly slickensided) containing disoriented usually angular rock fragments of variable size often in a soil matrix.
VN	Vein - fracture in which a tabular or sheet-like body of minerals have been intruded.
DK	Dyke - Igneous intrusion - often weathered and altered to a clay like substance.
DZ	Decomposed Zone - zone of any shape but commonly with parallel planar boundaries containing moderately to gradational boundaries into fresher rock.
FZ	Fractured Zone - a zone of closely spaced defects (mainly joints, bedding, cleavage and/or schistosity) comprised of core lengths in the order of 50 mm or less.

# **Defect Type**

# **Standard Defect Symbols**



# Roughness Colour Code (for summary log)

– Ro1	-
– Ro2	
– Ro3	
— Ro4	
– Ro4	



# Shape

Roughness
-----------

Term	Symbol	Description
Planar	PL	Forms a continuous plane without variation in orientation.
Curved	CU	Has a gradual change in orientation.
Undulating	UN	Has a wavy surface shape.
Stepped	ST	Has one or more well defined steps
Irregular	IR	Many changes of orientation.

# Infill Type

Symbol	Description
KL	Clean
CA	Calcite
СВ	Carbonaceous
CHL	Chlorite
FE	Iron oxide
QZ	Quartz
MG	Manganese
SU	Sulphides
SE	Sericite
RF	Rock fragments
G	Gravel
S	Sand
Z	Silt
CL	Clay

Term	Symbol	Description
Slickensided or polished	Ro1	Very smooth, reflects light.
Smooth	Ro2	Roughness not detected with finger.
Defined ridges	Ro3	Sandpaper feel (fine to medium sandpaper).
Small steps	Ro4	Sandpaper feel (medium to coarse sandpaper).
Very rough	Ro5	Very well defined ridges and/or steps.

## Infill Thickness

Where infilling is present, the thickness of infill is recorded using the following convention:

STIron oxide staining of less than 1 mmVNVeneer coating of less than 1 mm

If the infilling is greater than 1 mm, the actual thickness of infill is recorded in millimeters.

If infill is not present, a dash (-) is recorded

#### Number

Number of defects with similar characteristics.



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Borehole ID

BH01

Page 1 of 3

Client:JBS&GProject Name:Ryde HospitalHole Location:Eastwood, NSWHole Position:323083.0 m E 625889						NSW		2.0 m	N MG		Commenc Complete Logged B Checked I	d: y:			/05/ TH	'201 '201	
	ill M			d Mounting:		njin- [ 5 mm	08				RL Surfac Datum:	e:	Nc Al-	sur	vey		perator: Rockwell
				ing Informat		,				Soil Description						0	Observations
	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behavio particle characteristics of prima component, colour, secondary com additional observations		Moisture Condition	Consistency / Relative Density	Pene	Hand etron UCS (kPa	neter S )	
ľ									SM	Silty SAND with gravel: fine grained, brown; gravel sub-angular up to 5mm	dark	м	L	9 5	3 8 3	24 02	0.00: TOPSOIL
				CBR 0.50-3.00 m			-		CI-ML	Sity CLAY with gravel: medium plas dark brown, grey & black; gravel sub up to 5mm.	ticity,						0.20: INFERRED FILL 0.25: Rootlets observed
		z	served	SPT 1.00-1.45 m 5,6,10 N=16			1		CI-ML	Silty CLAY: medium plasticity, pale g brown; ripped siltstone and iron ston	 jrey & e.						0.90: INFERRED RESIDUAL SOIL 1.00: SPT recovery 350mm
		z	Not Observed	SPT 2.00-2.45 m 10,10,17 N=27			2 - -					М	VSt		×		1.85: V-bit refusal 2.00: SPT recovery 350mm
				SPT 3.00-3.45 m 20,20,31 N=51			3			LAMINITE: pale grey & brown, extrer weathered, extremely low strength, ir staining. Continued on cored borehole sheet			H				3.00: SPT recovery 400mm 3.10: INFERRED BEDROCK
AD AD SP PT	)/T - 1 )/V - 1 3 -W	Auğe asht anda ısh ti	er dril er dril oore ard po ube	ling TC bit ling V bit enetration test wing	-	a_	4		$>$ Inflo $\lhd$ Par	ater Samples and T ow U - Undisturbed Sam tial Loss D - Disturbed Samp mplete Loss ES - Environmental S TW - Thin Walled LB - Large Disturbed	nple le ration Test Sample	M	ioistu D M W	re Co - [ - N - V	)ry /loist		Consistency/Relative Dens VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard VSt - Very losse L - Loose MD - Medium dense

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Borehole ID

BH01

Page 2 of 3

Pr	-	ct Na	ame:	Ry		ospita				Commene	<b>d</b> : 1	14/05/2019 14/05/2019	
		Loca Posi	ition: tion:			od, NS 0 m F		892.0 m N MGA94 Zone 56		Logged B Checked	-	NTH BS	
			and M			Hanjir				RL Surfac	-	urvey	
			e and L		-	Triple				Datum:	AHD	•	rator: Rockwell
		Drill	ing Info	rmat	ion	-		Rock Substa	nce			F	Rock Mass Defects
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain character colour, fabric/texture, inclusions or m components, moisture, mineral composition	ristics, ninor n alteration	Weathering ≷ ≩ ≩ 중 ಱ :	Strength Is(50) • - Axial O - Diametral · · · · · · · · · · · · · · · · · · ·	Defect Spacing (mm)	Defect Descriptions / Commer Description, alpha/beta, infillir or coating, shape, roughness thickness, other
NMLC	Not Observed	7 83				  4 		Continued from non-cored borehole sheet LAMINITE: pale grey & red, orange bandir bedding fabric visible, well developed, iron NO CORE 370mm	ng,				— JT, 70°, RF, IR, RF ⊐- SM, 0°, CL, PR, RF, +30 mm — JT, 23°, FE SN, PR, RF
		67					$/ \setminus$						
	AD/\ WB HQ3 PQ3 SPT PT	- Aug - Aug - Was - Wire - Wire - Star - Pus	ethod er drilling T er drilling V shbore eline core (i eline core (i ndard pene h tube	bit 63.5 mr 35.0 mr tration t	n)	<	> Inflov ☐ Partia 【 Comp <b>Comp</b> Core r	inv - inginy v	y Weathered /eathered ely Weathered Weathered	Defect FT - Faul SS - Shea SZ - Shea BP - Bedd SM - Sear IS - Infille JT - Joint CO - Cont CO - Cont CZ - Crus VN - Vein	ar Surface ar Zone hing parting n ed Seam act hed Zone	Infilling/Coa CN - Clean SN - Stain VN - Veneer CO - Coating RF - Rock fr G - Gravel S - Sand Z - Silt CA - Calcite CL - Clay	SL - Slickensided POL - Polished S - Smooth agments VR - Rough VR - Very Rough PR - Planar

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Borehole ID

BH01

Page 3 of 3

P		ct Na	ame: ation:	Ry		ospita od, NS			Commenc Completed Logged By	d: 1	4/05/2019 4/05/2019 NTH	
			tion:					892.0 m N MGA94 Zone 56	Checked I		BS	
			el and M be and L		•	Hanjiı Triple		Inclination: -90° 3 m Bearing:	RL Surfac Datum:	e: Nosu AHD	urvey Ope	erator: Rockwell
		Dril	ling Info	ormat	ion			Rock Substance			F	Rock Mass Defects
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteratio		Strength Is(50) ● - Axial ○ - Diametral	Defect Spacing (mm) <sup>ତ୍</sup> ତ <sub>ଛ</sub> ବ୍ଦ ତ୍ତି ତ୍ର	Defect Descriptions / Commer Description, alpha/beta, infillin or coating, shape, roughness thickness, other
		67				-		LAMINITE: pale grey & red, orange banding, bedding fabric visible, well developed, iron staining.				—BP, 21°, FE SN, CU, RF
	-		5.85m ls(50)			-						- JT, 14°, CN, PR, RF
		61	d=0 a=0.1 MPa 6.46m Is(50) d=0			6— - -		LAMINITE: dark grey & orange, white banding, well developed, 70%-80% siltstone, 20%-30% sandstone, thin fine-grained sandstone laminations. Some clay bands (dark grey & black and medium plasticit), irea tetristication				□-SM, 0°, CL, PR, S, +50 mm □ BP, 10°, Fe & Clay, UN, RF □ CZ, 0°, RF, +20 mm □ SM, 0°, CL, PR, S, +50 mm □ SM, 0°, CL, PR, S, +50 mm □ CO, 0°, FE, PR, RF □ SM, 0°, CL, PR, S, +20 mm □ SM, 0°, CL, PR, S, +20 mm □ BP, 3°, FE SN, PR, S
NMLC	Not Observed		a=0 MPa			- 7- -		plasticity), iron staining.				- JT, 79°, FE SN, PR, RF - BP, 3°, FE SN, PR, RF - SM, 0°, CL, RPR, S, +20 mr - SM, 0°, Fe & Clay SN, PR, RF, +30 mm - SM, 0°, CL, PR, S, +40 mm - CZ, 5°, RF, +20 mm - JT, 52°, FE SN, PR, RF - JT, 52°, FE SN, PR, S - JT, 62°, FE SN, PR, RF
		59	7.64m ls(50) d=0.1 a=0.1 MPa			- - 8 -		8.3m - Becomes pale grey & black with black banding, 60%-70% siltstone, 30%-40% sandstone.				JT, 47°, FE SN, PR, S BP, 3°, FE SN, PR, S - SM, 7°, CL, PR, S, +10 mm FZ, 0°, RF, PR, S, +20 mm SM, 0°, SM, PR, S, +20 mm SM, 0°, CL, PR, S, +10 mm SM, 0°, CL, PR, S, +10 mm SM, 0°, CL, PR, S, +20 mm SM, 0°, CL, PR, S, +20 mm BP, 0°, FE SN, PR, RF BP, 12°, CL, PR, S BP, 12°, CL, PR, S
			8.86m Is(50) d=0.3 a=0.1 MPa					Hole Terminated at 9.00 m				BP, 4°, RF, PR, S BP, 0°, FE SN, PR, S 
	AD/ WB HQ3 PQ3 SPT	T-Aug V-Aug - Wa 3- Wir 3- Wir 3- Sta	ethod per drilling 1 per drilling v shbore leline core ( core ( ndard pene sh tube	/ bit 63.5 mr 85.0 mr	n)	<	> Inflov ☐ Partia ■ Com ■ <b>Com</b>	Target depth, hole grouted to surface and reinstated  ter  Weathering  XW - Extremely Weathered  WW - Highly Weathered  HW - Highly Weathered	I         I         I           I         I         I	r Surface r Zone ing parting 1 d Seam act	I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I         I           I         I         I         I         I           I         I         I         I         I           I         I         I         I         I           I         I         I         I	SL - Slickensided POL - Polished S - Smooth agments VR - Rough VR - Very Rough <b>Shape</b> PR - Planar

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Borehole ID

BH02

Page 1 of 4

								Commen Complete Logged B 8.0 m N MGA94 Zone 56 Checked					14/05 14/05 NTH BS		
Drill Hole				Mounting:		njin- [ 5 mm	28	Inclination: -90° RL Surfac Bearing: Datum:					survey D		perator: Rockwell
		Ľ	Drilli	ing Informati	ion					Soil Description					Observations
	reneuauon	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Han Penetro UC (kPa 00 00 00	d neter 3 1)	Structure, Zoning, Origin Additional Observations
										ASPHALT - 200m : black & dark grey	D				0.00: PAVEMENT
		z					-		CI-ML	Silty CLAY with gravel: medium plasticity, dark brown & red; gravel sub-angular up to 5mm. Silty CLAY: medium plasticity, pale grey & red		St to VSt			0.20: INFERRED FILL 0.50: INFERRED RESIDUAL SOIL
				SPT 1.00-1.45 m			-   1-					VSt			1.00: SPT recovery 260mm
			Not Observed	18,13,Refusal			2			LAMINITE: pale grey, brown & orange, extremely weathered, extremely low strength, iron staining. LAMINITE: pale grey & orange, highly weathered, very low strength to low strength, orange banding, bedding fabric visible, well	D				1.20: V-bit refusal 1.40: INFERRED BEDROCK
		z					3			4.5m - Becomes dark brown		н			4.00: Rootlets observed
AD/\ WB SPT PT -	- A / - A -Wa	uge shb nda sh tu	r drill r drill ore rd pe be	ing TC bit ing V bit enetration test ving	_	<u>a</u> _	t <b>ion</b> stance efusal	-	> Inflo ⊲ Par	ater Samples and Tests ow U - Undisturbed Sample tial Loss D - Disturbed Sample SPT - Standard Penetration Tes ES - Environmental Sample TW - Thin Walled LB - Large Disturbed Sample		D M	e Cond - Dry - Mois - Wet		Consistency/Relative Dens VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense

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Borehole ID

BH02

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Client: Project Name: Hole Location: Hole Position:			tion:	JBS&G Ryde H Eastwo 323120	osp od,	NSW		8.0 m	A94 Zone 56	Project No.: Commenced: Completed: Logged By: Checked By:			PSM3828 14/05/201 14/05/201 NTH BS				
			and eter:	Mounting:		njin- [ 5 mm	08			Inclination: -90° Bearing:	RL Surfa Datum:	ace:		o su HD	rvey		perator: Rockwell
				ng Informati		, , , , , , , , , , , , , , , , , , , ,				Soil Desci			AI			0	Observations
	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	    Graphic Log	Classification Symbol	Material Descriptio SOIL NAME: Plasticity, bet particle characteristics of component, colour, secondary additional observatio LAMINITE: pale grey & orange,	aviour or primary components, ns	Moisture Condition	Consistency / Relative Density	Pen	Hand etron UCS (kPa	neter S )	Structure, Zoning, Origin Additional Observations
		Z	Not Observed							<ul> <li>6.4m - Becomes dark grey &amp; orange, weathered, very low strength to orange banding, bedding fabric developed, iron staining. (contined to be stated to be strength) weathered to slightly weathered, strength to low strength, white be developed, 80%-90% siltstone, sandstone, thin fine-grained san laminations, iron staining.</li> <li>7.3m to 8.5m - Multiple clay ban brown, black &amp; high plasticity)</li> </ul>	ow strength, visible, well ued) poderately very low anding, well 10%-20% dstone	M	н				
Ì							-			Continued on cored borehole sh	eet						
		etho		ng TC bit	Pe	netrat	9 — - - - -		<b>₩</b> > Infl	later Samples a ow U - Undisturber		 Л	Moistu D				Consistency/Relative Dens
AD WE SP PT	D/V - / B -W PT-St - Pu	Auge asht anda ush ti	er drilli ore ard pe	nğ V bit netration test		o resis			Par	tial Loss D - Disturbed S SPT - Standard P ES - Environmer TW - Thin Wallec LB - Large Distu	Sample enetration Test ntal Sample I	t	V	1 -   V - V	Dry Moist Wet	:	VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense

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Borehole ID

BH02

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	iyi	nee	ering	LOĘ	) - C	ore	d Bo	prehole	Project No	D.: F	SM3828		
Client: JBS&G Project Name: Pude Hespital									Commenc		4/05/2019		
	Project Name: Ryde Hospital Hole Location: Eastwood, NSW								Completed Logged By		4/05/2019 ITH		
			tion:					898.0 m N MGA94 Zone 56	Checked E		S		
С	Drill I	Mode	el and M	ounti	ing:	Hanjir	ו- D8	Inclination: -90°	RL Surfac	e: No si	urvey		
E	Barre	ә Ту	be and L	.engt	h:	Triple	Tube	3 m Bearing:	Datum:	AHD	Oper	rator: Rockwell	
		Dril	ling Info	ormat	tion			Rock Substance			Rock Mass Defects		
			p	ons)			5	Material Description		Strength Is(50)		Defect Descriptions / Comme	
		(%)	Samples and Field Tests	WPT (Lugeons)			Graphic Log	ROCK NAME: particle/grain characteristics,	Weathering	● - Axial ⊃ - Diametral	Defect Spacing	Description, alpha/beta, infilli	
INIEILIOU	Water	RQD (%)	amp ield	VPT (	RL	Depth	ìraph	colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	n	0.1 0.3 3 10	(mm)	or coating, shape, roughnes thickness, other	
≥	5	£	ωш	5	(m)	(m)	U		W A A S A A	╡┘ᇗᅚ≩ᅖ	200 60 1000		
						_							
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										iiiii	i i i i i		
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						6-				iiiii			
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						7-							
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										i i i i i i			
						-							
						8-				i i i i i i			
						_							
						-							
								Continued from non-cored borehole sheet					
								LAMINITE: pale grey & black, black banding, very well developed, 60%-70% siltstone, 30%-40%				⊐- SM, 0°, CL, PR, S, +20 mm	
								sandstone, thin fine-grained siltstone laminations.					
	ed					9-							
	Not Observed												
	tob	98	9.31m Is(50)										
	å		d=0.1 a=0.3			-							
			MPa										
												↓ JT, 62°, CN, ST, S BP, 0°, CN, PR, S	
												JT, 70°, CN, ST, S	
		м	ethod					nter Weathering	Defect	TVDe	Infilling/Coa	ting Roughness	
		T - Aug	er drilling T				> Inflov	XW - Extremely Weathered	FT - Fault SS - Shear	••	CN - Clean SN - Stain	SL - Slickensided POL - Polished	
	WB	- Wa	ger drilling \ shbore		>		□ Parti	al Loss MW - Moderately Weathere SW - Slightly Weathered	I SZ - Shear BP - Beddi	r Zone ing parting	VN - Veneer CO - Coating	S - Smooth RF - Rough	
	PQ	3- Wir	eline core ( eline core (	85.0 m	m)			Strongth	SM - Seam IS - Infilled	d Seam	RF - Rock fra G - Gravel	agments VR - Very Rough	
			ndard pene sh tube	ration	iest	Grap		ecovered (batching L - Low	JT - Joint CO - Conta CZ - Crush	act	S - Sand Z - Silt CA - Calcite	<b>Shape</b> PR - Planar CU - Curved	
	WP	T-Wa	ter pressure	e test			indica	tes material) M - Medium H - High	VN - Vein FZ - Fractu		CL - Clay FE - Iron	UN - Undulating ST - Stepped	
							<ul> <li>NO CO</li> <li>investigation</li> </ul>	EH - Extremely High	BSH - Beddi DB - Drilling	ing Shear	QZ - Quartz X - Carbona	IR - Irregular	

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Borehole ID

BH02

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	Clien		ering		S&G				Commen	ced: 1	4/05/2019	
-			ame:	Ry	de H	ospita			Complete	ed: 1	4/05/2019	
			ation: tion:			od, NS 0 m F		898.0 m N MGA94 Zone 56	Logged B Checked		NTH BS	
			el and M			Hanjii		Inclination: -90°	RL Surfac	-	urvey	
			be and L		0	Triple			Datum:	AHD	•	erator: Rockwell
		Dril	ling Info	ormat	ion			Rock Substance				Rock Mass Defects
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration		Strength Is(50) - Axial O - Diametral U H H H H H H H	Defect Spacing (mm)	Defect Descriptions / Comme Description, alpha/beta, infilli or coating, shape, roughnes thickness, other
	Not Observed	98	10.11m ls(50) d=0.1 a=0.5 MPa			-		LAMINITE: pale grey & black, black banding, very well developed, 60%-70% siltstone, 30%-40% sandstone, thin fine-grained siltstone laminations.( <i>continued</i> )				— BP, 7°, CN, PR, S ]- CZ, 0°, RF, +50 mm
	N		10.79m ls(50) d=0.1 a=0.1 MPa			- 11		Hole Terminated at 11.27 m				— BP, 0°, CN, PR, S — BP, 0°, CL, PR, S
						- 12— -	•					
						- 13-						
						- 14 — - -						
	AD/ WB HQ3 PQ3 SP1	T-Aug V-Aug - Wa 3- Wir 3- Wir 3- Wir Γ- Sta	ethod ger drilling ] ger drilling \ shore eline core ( eline core ( ndard pene sh tube	/ bit 63.5 mi 85.0 mi	m)	<	> Inflov ⊲ Parti <b>⊲</b> Com phic Lo	al Loss MW - Moderately Weathered plete Loss FR - Fresh bg/Core Loss VL - Very Low ecovered (hatching L - Low	Defect FT - Faul SS - Shea SZ - Shea BP - Bedd SM - Sea IS - Infill JT - Joint CO - Cons	ar Surface ar Zone ding parting m ed Seam t t	Infilling/Coa CN - Clean SN - Stain VN - Venee CO - Coatin RF - Rock f G - Gravel S - Sand Z - Silt CA - Calcite	SL - Slickensided POL - Polished rg RF - Rough ragments VR - Very Rough <b>Shape</b> PR - Planar
			ter pressur			chnical site	indica No co	tes material) M - Medium H - High re recovery VH - Very High	CZ - Crus VN - Vein FZ - Frac BSH - Bedo DB - Drilli	ı ture Zone ding Shear	CA - Calcite CL - Clay FE - Iron QZ - Quartz X - Carboi	UN - Undulating ST - Stepped IR - Irregular

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BH03

Client Proje Hole Hole	ct Na Loca	ition:	Eastwo	losp ood,	NSW		4.0 m	N MG	Comme Comple Logged A94 Zone 56 Checke	ted: By:			)5/20 <sup>7</sup> )5/20 <sup>7</sup> 	
Drill N Hole			d Mounting: 		njin- [ 5 mm	28			Inclination: -90° RL Surf Bearing: Datum:	ace:	No AH	surv		Dperator: Rockwell
			ing Informat		,		Soil Description							Observations
Penetration	Support	Samples Tests Remarks X X X X X X X X X X X X X X X X X X X			Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Ha Peneti U (k	and romete CS Pa)	er Structure, Zoning, Origir Additional Observations	
	Z	Not Observed	CBR 0.50-1.90 m SPT 1.00-1.45 m			- - - 1		CI-CH	ASPHALT - 100m : black & dark grey Silty CLAY with gravel: medium to high plasticity, dark brown & black; gravel sub- angular up to 5mm.	D	 St			0.00: PAVEMENT 0.10: INFERRED FILL 0.90: Rootlets observed 1.00: SPT recovery 380mm
			2,4,5 N=17 SPT 1.85-2.00 m 17,Refusal					CH-MH	Silty CLAY: high plasticity, dark brown, black & orange; trace of rootlets. <u>1.8m - Becomes pale grey</u> LAMINITE: pale grey, orange & red, extremely weathered, extremely low strength., iron staining. Continued on cored borehole sheet		– – VSt – – H		×	1.30: INFERRED RESIDUAL SOIL 1.85: SPT recovery 150mm 1.90: INFERRED BEDROCK
AD/T - AD/V - VB - V	Aug Nash Stand Push	er dril er dril bore ard p tube	lling TC bit lling V bit enetration test wing		lo resis	stance	-	> Inflo ⊲ Par	Samples and Tests           ow         U         - Undisturbed Sample           bit         D         - Disturbed Sample           tial Loss         SPT         - Standard Penetration Test           mplete Loss         ES         - Environmental Sample           TW         - Thin Walled         - LB           LB         - Large Disturbed Sample		M	re Cor. - Dr. - Mc - We	/ vist	Consistency/Relative Den VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense

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BH03

En	ıgiı	nee	ering	Log	J - C	ore	d Bo	orehole			Project N	lo.:	PSM3828	
P H	lole	ct N Loca	ame: ation: tion:	Ry Ea	stwo	ospita od, NS	SW	3884.0 m N MGA94 Zone	56		Commer Complet Logged I Checked	ed: 3y:	15/05/2019 15/05/2019 NTH BS	
											RL Surfa	,		
			el and M be and L		-	Hanjiı Triple	Tube		nation: -90° ring:		Datum:	AHI	survey D Ope	erator: Rockwell
			ling Info	-				Ro	ock Substance					Rock Mass Defects
q		(%)	Samples and Field Tests	WPT (Lugeons)			ic Log	Material Des ROCK NAME: particle/gi	•	З,	Weathering	Strength Is(50) • - Axial O - Diametral	Defect Spacing	Defect Descriptions / Commer Description, alpha/beta, infillir
Method	Water	RQD (%)	Sampl Field 7	WPT (	RL (m)	Depth (m)	Graphic I	colour, fabric/texture, ir components, moisture, minera		eration	HW MW SW	снага 1937 - 20 1937 - 20		or coating, shape, roughness thickness, other
						- - - 1- - - - - - - - - -		Continued from non-cored bo						- 2.00: V-bit refusal
	- cq	79	2.62m Is(50) d=0 a=0.1 MPa					LAMINITE: pale grey, orange banding, well developed. Sor dark grey and medium plastic	ne clay bands (pa	le &				2.05: Rootlets observed BP, 12°, FE SN, PR SM, 0°, CL, PR, S, +40 mm - SM, 7°, CL, PR, S, +10 mm - 2.62: Rootlets observed - SM, 3°, CL, PR, S, +20 mm SM, 0°, CL, PR, S, +10 mm SM, 0°, Fe & Clay SN, PR,
NMLC	Not Observed	83	3.58m Is(50) d=0 a=0.1 MPa			- - 4 -		3.5m - Becomes highly weath	nered					RF, +70 mm SM, 0°, CL, PR, S, +10 mm → BP, 7°, Fe & Clay SN, PR, R → CZ, 0°, RF, +20 mm → SM, 0°, CL, PR, S, +20 mm → SM, 0°, CL, PR, S, +20 mm → SM, 0°, CL, PR, S, +40 mm → SM, 0°, CL, PR, S, +10 mm → SM, 0°, CL, PR, S, +70 mm
			4.63m Is(50) d=0 a=0.1 MPa			-								⊐- SM, 0°, CL, PR, S, +30 mm ⊒- SM, 0°, CL, PR, S, +30 mm □ SM, 0°, CL, PR, S, +50 mm
	AD/ WB HQ3 PQ3 SPT PT	T-Aug - Wa 3- Wir 3- Wir 1- Sta - Pus	ethod ger drilling T ger drilling V shbore eline core ( eline core ( eline core ( ndard pene sh tube ter pressure	/ bit 63.5 mr 85.0 mr tration f	m)	<	> Inflov ☐ Partia ■ Com <b>ohic Lo</b> Core i indica		Weathering           XW         Extremely Weather           HW         Highly Weather           WW         Moderately We           Stightly Weather         Sightly Weather           FR         Fresh           Strength         VL           VL         Very Low           L         Low           M         Medium           H         High           VH         Very High	ed athered	FT - Fau SS - Shu BP - Beu SM - Seu IS - Infi JT - Joi CO - Co CZ - Cru VN - Vei	ear Surface ear Zone Iding parting am lled Seam nt nt ntact ushed Zone	Infilling/Co CN - Clean SN - Stain VN - Venet CO - Coatit RF - Rock G - Grave S - Sand Z - Sitt CA - Calcit CL - Clay FE - Iron	SL - Slickensided POL - Polished or S - Smooth ng RF - Rough fragments VR - Very Rough i Shape PR - Planar

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Borehole ID

BH03

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	lien roje		ame:		S&G de Ho	ospita	I		Commen Complete	ed:	5/05/2019 5/05/2019	
		Loca Posi	ation:			od, NS 0 m F		884.0 m N MGA94 Zone 56	Logged B Checked	-	NTH BS	
			el and M			Hanji		Inclination: -90°	RL Surfac		urvey	
			pe and L		0		Tube		Datum:	AHD	•	rator: Rockwell
		Dril	ling Info	ormat	ion			Rock Substance			F	Rock Mass Defects
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	> > < > ~ ~	Strength Is(50) ● - Axial O - Diametral	Defect Spacing (mm) ଝି ଡ ଝି ଡ ଡି	Defect Descriptions / Commer Description, alpha/beta, infillin or coating, shape, roughness thickness, other
NMLC	Not Observed	44 83	5.67m Is(50) d=0 a=0 MPa 6.30m Is(50) d=0 MPa					LAMINITE: pale grey, orange & red, orange banding, well developed. Some clay bands (pale & dark grey and medium plasticity), iron staining. <i>(continued)</i> 5.45m - Becomes dark grey NO CORE 600mm				<ul> <li>SM, 0°, CL, PR, S, +30 mm</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>BP, 0°, FE SN, PR, RF</li> <li>CZ, 0°, RF, +20 mm</li> <li>SM, 0°, CL, PR, S, +100 mm</li> <li>SM, 0°, CL, PR, S, +30 mm</li> <li>SM, 0°, CL, PR, S, +30 mm</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>SM, 0°, CL, PR, S, +30 mm</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>SM, 0°, CL, PR, S, +30 mm</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>SM, 0°, CL, PR, S, +30 mm</li> <li>SM, 0°, CL, PR, S, +30 mm</li> <li>SM, 0°, CL, PR, S, +30 mm</li> <li>SM, 0°, CL, PR, S, HAR, S</li> <li>P, 0°, FE SN, PR, S</li> <li>BP, 0°, FE SN, PR, S</li> <li>BP, 0°, FE SN, PR, S</li> <li>BP, 0°, FE SN, PR, S</li> </ul>
		77	8.52m Is(50) d=0 MPa 9.09m Is(50) d=0.5 a=0.4 MPa					LAMINITE: pale grey & red, red banding, well developed. Some clay bands (pale grey and medium plasticity), iron staining. LAMINITE: dark grey & black, white banding, well developed, 80%-90% siltstone, 10%-20% sandstone, thin fine-grained sandstone laminations. Hole Terminated at 9.13 m Target depth. Standpipe installed				<ul> <li>⇒ SM, 0°, Fe &amp; Clay SN, PR, S</li> <li>+30 mm</li> <li>SM, 0°, Fe &amp; Clay SN, PR, S</li> <li>+120 mm</li> <li>CO, 0°, FE SN, PR, S</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>SM, 0°, CL, PR, S, +10 mm</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>JT, 48°, CL, IR, S</li> </ul>
	AD/ WB HQ: PQ: SP1 PT	T-Aug V-Aug - Wa 3- Wir 3- Wir 3- Wir Γ- Sta - Pus	ethod ger drilling T ger drilling V shbore eline core ( eline core ( eline core ( ndard pene sh tube ter pressure	/ bit 63.5 mr 85.0 mr tration f	n)		> Inflov ☐ Partia ■ Com <b>ohic Lo</b> Core i indica	The Highly House of	FT - Faul SS - Shea SZ - Shea BP - Bedd SM - Sear IS - Infill JT - Joint CO - Cont CZ - Crus VN - Vein FZ - Frac	ar Surface ar Zone ding parting m ed Seam t tact shed Zone	Infilling/Coa CN - Clean SN - Stain VN - Veneer CO - Coating RF - Rock fr G - Gravel S - Sard Z - Silt CA - Calcite CL - Clay FE - Iron QZ - Quartz	SL - Slickensided POL - Polished S - Smooth RF - Rough

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**BH04** 

Engi	nee	rin	g Log - N	Nor	n Co	ored	Bo	reho	le	Project N	No.:		PS	SM3	∟ 828	
Clien Proje			JBS&G Ryde H		ital					Commer Complet					201 201	
Hole	Loca	tion:	Eastwo	ood,	NSW					Logged	By:		NΤ	Н	201	5
Hole							5.0 m	N MG	A94 Zone 56	Checked		NL	BS			
Hole			d Mounting:		njin- I 5 mm	78			Inclination: -90° Bearing:	RL Surfa Datum:	ace:		sur ID	vey		perator: Rockwell
		Drill	ling Informat	tion					tion						Observations	
Method Penetration	Support	Water	Samples Tests Remarks	Recovery	RL	Depth	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behav particle characteristics of prin component, colour, secondary col	mary	Moisture Condition	Consistency / Relative Density	Pene	Hand etron UCS (kPa	neter	Structure, Zoning, Origin, Additional Observations
Pe Me	su Su	Ň		Re	(m)	(m)	ő	သို့လို	additional observations ASPHALT - 200m : black & dark gr	- 		ပိမိ		300		0.00: PAVEMENT
						-	××××	CI-ML	Silty CLAY with gravel: medium pla		D					0.20: INFERRED FILL
		Not Observed	CBR 0.50-1.30 m			-			brown, red & black; gravel sub-ang 5mm; trace of rootlets.			St				
ADN	z	Not Ot				-		СІ-СН	Silty CLAY: medium to high plastic		м					0.80: INFERRED RESIDUAL SOIL
	     		SPT 1.00-1.45 m			1-			brown, red & orange; trace of root	ets.		VSt		××		1.00: SPT recovery 340mm 1.10: Rootlets observed
			5,32,Refusal	H		-			1.3m - Becomes pale grey & orang LAMINITE: pale grey, orange & red weathered, extremely low strength.		-	н				1.35: INFERRED BEDROCK
100 February 2001 2012 February 2021						2			staining.							
and many and						3										
	Image: Second							⊳ Inflo ⊲ Par	ater Samples and Dw U - Undisturbed S tial Loss D - Disturbed San SPT - Standard Pen- mplete Loss ES - Environmenta TW - Thin Walled LB - Large Disturbe	ample ople etration Test I Sample		loistu D M W	re Cc - E - N - V	)ry ⁄loist		Consistency/Relative Density         VS       - Very soft         S       - Soft         F       - Firm         St       - Stiff         VS       - Very stiff         H       - Hard         VL       - Very loose         L       - Loose         MD       - Medium dense         D       > Dense         VD       - Very dense         Ce       - Cempact

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	<u> </u>		ering	-	·	ore	a Bo	orehole		Project N	0	PSM3828			
	Clier Proje		ame:		S&G de H	ospita	I			Commen Complete		16/05/2019 16/05/2019			
H	lole	Loca	ation:	Ea	stwo	od, NS	SW			Logged E	By:	NTH			
-		Posi						865.0 m N MGA94 Zone 56	90°	Checked RL Surfa		BS			
			el and M be and L		•	Hanjiı Triple			90	Datum:	AHE	survey ) Ope	rator: Rockwell		
		Dril	ling Info	ormat	ion			Rock Substar	ıce			F	Rock Mass Defects		
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteri colour, fabric/texture, inclusions or m components, moisture, mineral composition	istics, inor alteration	Weathering ≳ ≩ ≩ ≳ ଝ	Strength Is(50) • - Axial O - Diametral	Defect Spacing (mm) i ୖୖୖୖ & ଋ ରି ଡି	Defect Descriptions / Commer Description, alpha/beta, infillir or coating, shape, roughness thickness, other		
						- - - 1									
		06	1.96m Is(50) d=0 MPa 2.24m Is(50) d=0 a=0 MPa			2		Continued from non-cored borehole sheet LAMINITE: pale grey, orange & red, orange banding, well developed. Some clay bands grey & medium plasticity), iron staining.	; (pale				1.50: V-bit refusal 		
INIVILO	Not Observed	45	3.50m ls(50) d=0 a=0.1 MPa					NO CORE 640mm							
		20	4.35m Is(50) d=0.3 a=0.4 MPa			4   -		LAMINITE: pale grey & orange, orange bar bedding fabric visible, well developed. Som bands (pale & dark grey and medium plasti staining.	ie clay				JT, 82°, FE SN, PR, RF JT, 87°, FE SN, PR, RF JT, 87°, FE SN, PR, S 		
	AD/ WB HQ PQ SP PT	T - Aug V - Aug - Wa 3- Wir 3- Wir 3- Wir Γ- Sta - Pus	ethod jer drilling \ er drilling \ shbore eline core ( eline core ( ndard pene h tube ter pressur	/ bit 63.5 mr 85.0 mr etration f	n)	<	> Inflo ☐ Parti ■ Com <b>ohic L</b> o Core indica		r Weathered sathered ly Weathered /eathered	FT - Fau SS - She BP - Bed SM - Sea IS - Infill JT - Join CO - Con CZ - Cru VN - Veir FZ - Frac	ar Surface ar Zone ding parting m ed Seam t tact shed Zone h	Infilling/Coa CN - Clean SN - Stain VN - Veneer CO - Coating RF - Rock fr G - Gravel S - Sand Z - Sitt CA - Calcite CL - Clay FE - Iron QZ - Quartz	SL - Slickensided POL - Polished S - Smooth agments VR - Rough VR - Very Rough PR - Planar CU - Curved UN - Undulating ST - Stepped		

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Borehole ID

BH04

Page 3 of 3

F	lole	ect N Loca	ame: ation: ition:	Ry Ea	stwo	ospita od, NS	SW	865.0 m N MGA94 Zone 56	Commence Completed Logged By Checked E	d: 1 /: N	6/05/2019 6/05/2019 ITH 3S		
C	Drill I	Mode	el and M	ounti	ng:	Hanjii	ח- D8	Inclination: -90°	RL Surface	e: No su	urvey		
E			be and L			Triple	Tube	3 m Bearing: Rock Substance	Datum:	AHD	HD Operator: Rockwell  Rock Mass Defects		
			-					Nock Substance		Strength			
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration		Is(50) ● - Axial D - Diametral	Defect Spacing (mm)	Defect Descriptions / Commer Description, alpha/beta, infillin or coating, shape, roughness thickness, other	
		20	5.25m ls(50) d=0 a=0.1 MPa			-		LAMINITE: pale grey & orange, orange banding, bedding fabric visible, well developed. Some clay bands (pale & dark grey and medium plasticity), iron staining.(continued)					
						6		5.7m - Becomes dark grey LAMINITE: dark grey & orange, orange banding & white banding, well developed, 80%-90% siltstone, 10%-20% sandstone, thin fine-grained sandstone laminations, iron staining.				- JT, 27°, FE SN, PR, S JT, 87°, FE SN, PR, S - BP, 13°, FE SN, PR, S - JT, 29°, FE SN, PR, S	
INIMILO	Not Observed	81	6.79m ls(50) d=0.1 a=0.2 MPa			- - 7-		6.5m - Becomes pale grey & black with black banding, 70%-80% siltstone, 20%-30% sandstone				BP, 0°, FE SN, PR, S JT, 37°, FE SN, PR, S CZ, 0°, RF, +20 mm BP, 0°, FE SN, PR, S JT, 49°, FE SN, PR, S JT, 49°, FE SN, PR, S	
			7.53m Is(50) d=0.1 a=0.2 MPa			-							
			8.30m Is(50) d=0.2 a=0.3 MPa			8						CZ, 0°, RF, +10 mm BP, 0°, FE SN, PR, S CO, 0°, CL, PR, S	
						- - 9		Hole Terminated at 8.40 m Target depth, hole grouted to surface and reinstated					
	AD/ WB HQ3	T-Aug V-Aug - Wa 3- Win	ethod ger drilling \ ger drilling \ shbore eline core ( eline core (	/ bit 63.5 mr		<	> Inflov ∃ Partia	al Loss MW - Moderately Weathered Nete Loss SW - Slightly Weathered FR - Fresh	I     I       I <td>Surface Zone ng parting</td> <td>I         I           I         I</td> <td>SL - Slickensided POL - Polished S - Smooth RF - Rough</td>	Surface Zone ng parting	I         I           I         I	SL - Slickensided POL - Polished S - Smooth RF - Rough	
	SPT PT	F- Sta - Pus	ndard pene sh tube ter pressur	tration		Gra	Core r indicat	Strength           vg/Core Loss         VL         - Very Low           ecovered (hatching         L         - Low           es material         M         - Medium           re recovery         VH         - Very High	JT - Joint CO - Conta CZ - Crush VN - Vein FZ - Fractu	ct ed Zone	S - Sand Z - Silt CA - Calcite CL - Clay FE - Iron	Shape PR - Planar CU - Curved UN - Undulating ST - Stepped	

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Borehole ID

**BH05** 

P H	ilient: rojec lole L lole F	t Na .oca	tion:	JBS&G Ryde H Eastwo 323107	losp od,	NSW	25885	7.0 m	N MG	A94 Zone 56	Commer Complet Logged I Checked	ed: By:			5/05/ TH	/201 /201	
			and eter:	Mounting:		njin- [ 5 mm	08			Inclination: -90° Bearing:	RL Surfa Datum:	ice:	No Al-	sui Sui	rvey		perator: Rockwell
				ng Informati		,				Soil Descrip			7.1				Observations
	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaven particle characteristics of pr component, colour, secondary co additional observations	mary mponents,	Moisture Condition	Consistency / Relative Density	Pen	Hand etron UCS (kPa	neter S )	· Structure, Zoning, Origin Additional Observations
		z					-		CL-ML	ASPHALT - 100m : black & dark g Silty CLAY with gravel: low plastici brown & grey; gravel sub-angular 10mm; trace of rootlets.	y, dark	D					0.00: PAVEMENT 0.10: INFERRED FILL
		2					-		CL-ML	ripped siltstone, iron stone & trace	of rootlets.	м	VSt				0.50: INFERRED RESIDUAL SOIL 0.60: Rootlets observed
			trved				1			0.9m - Becomes pale grey & orang LAMINITE: pale grey & orange, ex							0.90: V-bit refusal 1.20: INFERRED BEDROCK
		z	Not Observed							weathered, extremely low strength staining.		D	Н				
							- - - 4 - -										
SI P	<b>//</b> D/T - D/V - /B - W PT - S T - P	fetho Auge Auge /asht tanda ush t	er drillin er drillin oore ard pen	ng TC bit ng V bit netration test ing	-	netrat			$>$ Inflo $\lhd$ Par	ater Samples an bw U - Undisturbed 3 tial Loss D - Disturbed Sa SPT - Standard Per ES - Environmenta TW - Thin Walled LB - Large Disturb	Sample nple etration Test Il Sample		M	re C - [ - N - \	Dry Moist		Consistency/Relative Dens VS - Very soft S - Soft VS - Siff VSt - Very stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense Ce - Cermented

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Borehole ID

**BH05** 

Ξn	ıgi	nee	ering	Log	g - C	ore	d Bo	orehole			Projec	t No.:		PSM3828	В	
	lien		omo:		S&G	ospita	1				Comm Comp		d:	16/05/20 16/05/20		
	-		ame: ation:	-		ospita od, NS					Logge			NTH	19	
H	lole	Posi	tion:	32	23107	.0 m E	6258	8857.0 m N MGA94 Zon	e 56		Check	-	':	BS		
			el and N		-	Hanji			lination:	-90°	RL Su			survey		
В	Barre	эі Тур	be and l	_engt	h:	Triple	Tube	a 3 m Be	aring:		Datum	1:	AHI		Oper	ator: Rockwell
-	1	Dril	ling Info	ormat	tion			F	Rock Subs	stance	1				R	ock Mass Defects
			pu o	WPT (Lugeons)			Log	Material De	escription				strength Is(50)	Defea		Defect Descriptions / Comm
3	Ļ	(%)	oles a Testi	(Lug			hic Lo	ROCK NAME: particle/ colour, fabric/texture,			Weather		- Axial Diametral	Defec Spacin	g	Description, alpha/beta, infil
	Water	RQD (%)	Samples and Field Tests	WPT	RL (m)	Depth (m)	Graphic I	components, moisture, mine			NX A MW	г Л 0.1	л д н д с 9 м - 9 9 м - 9	(mm) 5 8 8 8 8		or coating, shape, roughne thickness, other
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						-										
+						3-		Continued from non-cored LAMINITE: pale grey & orai							+	
						-		bedding fabric visible, well o bands (pale grey & medium	leveloped. S	Some clay					i	⊐- SM, 0°, CL, PR, S, +30 mn
									1 ,77	5						
																SM, 0°, CL, PR, S, +30 mn BP, 0°, FE SN, PR, RF
	p		3.71m			-										. , . ,
	serve		ls(50) d=0.1 a=0.3			-										⊐- SM, 0°, CL, PR, S, +30 mn
	Not Observed	94	MPa			4-										
	Ŷ															—BP, 0°, CL, PR, S
								LAMINITE: pale grey & brow	wn white ba	inding well						-– SM, 0°, CL, PR, S, +10 mn ⁻→ BP, 0°, CN, PR, S
			4.48m Is(50)			-		developed, 60%-70% siltsto sandstone, fine-grained sar	one, 30%-40	)%						
			d=0.1 a=0.2 MPa			-		staining.	NOTIC MIT	au0115, 11011						—BP, 3°, FE SN, PR, S
						-										—BP, 4°, FE SN, PR, S
	<u>م</u> م		ethod					ater	XW - Extre	hering emely Weathered	FT -	efect T Fault		Infilling/ CN - CI	ean	SL - Slickensided
	AD/	V - Aug	ger drilling <sup>-</sup> ger drilling \ shbore	/ bit			> Inflo ⊲ Parti		HW - High MW - Mode	ly Weathered erately Weathered	SS - SZ -	Shear Su Shear Zo	one	SN - St VN - Ve	ain eneer	POL - Polished S - Smooth
	HQ: PQ3	3-Wir 3-Wir	eline core (	85.0 m	m)			plete Loss	FR - Fresl		SM -	Bedding Seam Infilled S		CO - Co RF - Ro G - Gi	ock fra	
	SP1 PT	F- Sta	ndard pene sh tube	etration	test	Gra		<b>og/Core Loss</b> recovered (hatching	VL - Very L - Low	Low	JT - CO -			S - Sa Z - Si CA - Ca	and It	<b>Shape</b> PR - Planar CU - Curved
	WP	T-Wa	ter pressur	e test			indica	tes material) re recovery	M - Medi H - High VH - Very		VN - FZ -	Vein Fracture	Zone	CL - CI FE - Irc	ay on	UN - Undulating ST - Stepped
bac	ded in a	accorda	nce with AS	1726:20	17 Geote	chnical site		,	EH - Extre	emely High		· Bedding Drilling E		QZ - Q X - Ca		IR - Irregular ceous

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Borehole ID

**BH05** 

Page 3 of 3

F	lole	ect Na	ame: ation: tion:	Ry Ea	istwo	ospita od, NS .0 m E	SW	857.0 m N MGA94 Zone 56	Commend Complete Logged B Checked	ed: 1 Sy: N	16/05/2019 16/05/2019 NTH 3S	
			el and M		•	Hanji		Inclination: -90°	RL Surfac	ce: No s	urvey	aratari Daalayali
			be and L ling Info	-		Inple	Tube	3 m Bearing: Rock Substance	Datum:	AHD		erator: Rockwell Rock Mass Defects
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	> > < > ~ ~	Strength Is(50) ● - Axial O - Diametral	Defect Spacing (mm)	Defect Descriptions / Commen Description, alpha/beta, infillin or coating, shape, roughness
		94	5.54m Is(50) d=0.1 a=0.5			-		LAMINITE: pale grey & brown, white banding, well developed, 60%-70% siltstone, 30%-40% sandstone, fine-grained sandstone laminations, iron staining.(continued)				<sup>×</sup> JT, 42°, FE SN, PR, S → BP, 0°, FE SN, PR, S
	q		MPa 6.43m			- 6— -						⊐- CZ, 0°, RF & CL, +30 mm
NIMILC	Not Observed	100	Is(50) d=0.2 a=0.2 MPa			- - 7—						← CZ, 4°, RF & FE VN, +10 mn — BP, 3°, RF, PR, RF — JT, 84°, CN, PR, S
			7.83m Is(50) d=0.1			-		7.2m - Becomes dark grey & black with white banding, 80%-90% siltstone, 10%-20% sandstone				— BP, 0°, FE VN, PR, S — BP, 0°, CN, PR, S
			8.34m Is(50) d=0.1 a=0.2 MPa			8		Hole Terminated at 8.45 m				— BP, 10°, FE VN, PR, S
						- - 9		Target depth, hole grouted to surface and reinstated				
	AD/ WB HQ3 PQ3	T-Aug V-Aug - Wa 3- Wir 3- Wir	ethod ger drilling T ger drilling S shore eline core ( eline core (	/ bit 63.5 mr 85.0 mr	n)	<	> Inflov ⊲ Parti <b>⊲</b> Com	al Loss MW - Moderately Weathered blete Loss FR - Fresh Strongsth	I         I           I         I	ar Surface ar Zone ding parting m ed Seam	I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I           I         I         I         I         I           I         I         I         I         I           I         I         I         I         I           I         I         I         I         I           I         I         I         I         I           I         I         I         I         I           I         I	SL         Slickensided           POL         Pollshed           er         S         Smooth           ng         RF         Rough           fragments         VR         Very Rough
	PT	- Pus	ndard pene sh tube ter pressure				_ Core indica	bg/Core Loss     Startiger       ecovered (hatching     L     - Very Low       ecovered (hatching     M     - Medium       tes material)     H     - High       re recovery     VH     - Very High       r     -     -	JT - Joint CO - Cont CZ - Crus VN - Vein FZ - Frac BSH - Bedo	act hed Zone ture Zone	S - Sand Z - Silt CA - Calcit CL - Clay FE - Iron QZ - Quart	PR - Planar ce CU - Curved UN - Undulating ST - Stepped

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Borehol	e ID

BH06

Client: Project Nam Hole Locatio Hole Positior	n: Eastwood, NSW	58826.0 m N MG	Comme Comple Logged GA94 Zone 56 Checke	ed: 17/05/20 By: NTH	
Drill Model a Hole Diamet	nd Mounting: Hanjin- D er: 125 mm	8	Inclination: -90° RL Surf Bearing: Datum:	,	Operator: Rockwell
Dr	illing Information		Soil Description		Observations
Penetration Support	Samples Tests Remarks	(w) (m) (m) (m) (m) (m) (m) (m) (m) (m) (m	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition Consistency / Consistency	Additional Observations
z		- SM	ASPHALT - 100m : black & dark grey Silty SAND with gravel: fine grained, yellow, brown & pale grey; gravel sub-angular up to 10mm; trace of rootlets.	D MD	0.00: PAVEMENT 0.10: INFERRED FILL 0.25: V-bit refusal
		2 	Silty CLAY: low plasticity, pale brown & grey; trace of rootlets.	D H	1.40: INFERRED RESIDUAL SOIL 1.90: Rootlets observed 2.00: INFERRED BEDROCK
Method AD/T - Auger c WB -Washbor SPT - Standard PT - Push tube	Irilling V bit e penetration test	ance	LAMINITE: dark grey & orange, highly weathered, very low to low strength. Some clay bands (pale grey & medium plasticity), iron staining. Continued on cored borehole sheet Vater Samples and Tests low U - Undisturbed Sample rtial Loss SPT - Standard Penetration Te: mplete Loss ES - Environmental Sample TW - Thin Walled	Moisture Conditio D - Dry M - Moist it W - Wet	n Consistency/Relative Dens VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard

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Borehole ID

**BH06** 

me: tion: and Mou e and Ler	ounting: ength:	ospital od, NS	6258 D8 Tube	Rock Substance	Completed: 1 Logged By: N	Оре	rator: Rockwell Rock Mass Defects
and Mou e and Len ing Inform pus saldwe saldwe saldwe saldwe saldwe saldwe saldwe saldwe a saldwe sa	ounting: ength: mation	Hanjin Triple Depth	n- D8 Tube	3 m Inclination: -90° Bearing: Rock Substance Material Description	RL Surface: No si Datum: AHD	urvey Opei	
Addition of the set of	mation	Depth		Rock Substance	Strength	•	
5.40m Leield Tests and Participation Partici			Graphic Log	Material Description		R	COCK Mass Defects
5.40m Is(50) d=0.1 a=0.1 MPa	WPT (Lugeons () () ()		Graphic Log	·			1
ls(50) d=0.1 a=0.1 MPa 5.87m			-	ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration Continued from non-cored borehole sheet	Weathering • Axial O - Diametral • 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0	Defect Spacing (mm)	Defect Descriptions / Commer Description, alpha/beta, infillin or coating, shape, roughness thickness, other
IS(50) d=0.2 a=0.2 MPa S.27m IS(50) d=0.5 a=0.7 MPa IS(50) d=0.4 a=0.4 MPa				<ul> <li>LAMINITE: dark grey &amp; orange, white &amp; orange banding, well developed, 70%-80% siltstone, 20%-30% sandstone, thin fine-grained sandstone laminations, iron staining.</li> <li>6.2m - Becomes dark grey &amp; black with white banding, 70%-80% siltstone, 20%-30% sandstone</li> <li>6.2m - Becomes dark grey &amp; black with white banding, 70%-80% siltstone, 20%-30% sandstone</li> </ul>			-JT, 70°, FE SN, PR, RF -JT, 46°, FE SN, PR, RF JT, 82°, FE SN, PR, RF JT, 75°, Fe & Clay VN, PR, RF SM, 0°, CL, PR, S, +20 mm JT, 77°, CN, PR, S -BP, 12°, FE VN, PR, RF JT, 60°, FE VN, PR, RF JT, 60°, FE VN, PR, RF JT, 60°, FE & Clay SN, PR, S -BP, 0°, CN, PR, S -BP, 0°, CN, PR, S -JT, 90°, CN, PR, S -SM, 0°, CL, PR, S, +20 mm -SM, 0°, CL, PR, S, +30 mm JT, 90°, CN, PR, S
thod	oit 3.5 mm) 5.0 mm)	<	<ul> <li>Inflow</li> <li>Partia</li> <li>Comp</li> </ul>	XW     - Extremely Weathered       HW     - Highly Weathered       HW     - Highly Weathered       HU     - Moderately Weathered       SW     - Slightly Weathered       Pole     - Slightly Weathered       FR     - Fresh       Pg/Core Loss     VL       ecovered (hatching     L       L     - Low       es material)     M	Defect Type         FT - Fault         SS - Shear Surface         SZ - Shear Zone         BP - Bedding parting         SM - Seam         IS - Infilled Seam         JT - Joint         CO - Contact         C2 - Crushed Zone         VN - Vein	CN - Clean SN - Stain VN - Veneer CO - Coating RF - Rock fre G - Gravel S - Sand Z - Silt CA - Calcite CL - Clay	SL - Slickensided POL - Polished S - Smooth RF - Rough
the	rilling TC rilling V I re core (63 core (85 d penetr	rilling TC bit rilling V bit recore (63.5 mm) core (85.0 mm) d penetration test be	rilling TC bit re core (63.5 mm) core (85.0 mm) d penetration test De ressure test	nilling TC bit re core (63.5 mm) core (65.0 mm) d penetration test pe ressure test ↓ Inflow ↓ Partie Comp Graphic LC No con	filling TC bit       >>>       Inflow       XW - Extremely Weathered         filling V bit       >>       Partial Loss       HW - Highy Weathered         re       >>       Partial Loss       Sightly Weathered         core (63.5 mm)       <	nilling TC bit nilling V bit re core (63.5 mm) core recovered (hatching) minicates material) No core recovery H = High H = High H = High H = High H = Kytempt/High EXT = Joint No core recovery H = Very High EXT = Joint No core recovery H = Very High EXT = Joint Core Figure Zone EXT = Strength H = High H = Kytempt/High EXT = Strength H = Kytempt/High EXT = Strength Strength H = Kytempt/High EXT = Strength Strength H = Kytempt/High Strength S	nilling TC bit nilling Y bit re core (63.5 mm) core recovered (hatching) m core recoverey core (hatching) m core recoverey core (1 mm) core recovered (hatching) m core recoverey core (1 mm) core (63.5 mm) cor

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BH07

P H	lient: rojec ole L ole F	t Na ocat	ion:		osp od,	NSW	25882	3.0 m	N MG	Comple Logged	Commenced: Completed: Logged By: Checked By:				9 9
	rill M ole D			0		njin- E 5 mm	08			Inclination: -90° RL Sur Bearing: Datum:	ace:	Nc Al-	sur\ Sur\		perator: Rockwell
				ing Informati				Soil Description							Observations
Michiga	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	۲ Pene ۱) ۱)	land tromete JCS (Pa)	r Structure, Zoning, Origir Additional Observations
								$\times\!\!\times\!\!\times$	CI-ML	ASPHALT - 100m : black & dark grey Silty CLAY with gravel: medium plasticity, dark	D				0.00: PAVEMENT 0.10: INFERRED FILL
		z		CBR			-		OFINE	brown & black; gravel sub-angular up to 10mm.		St			
				0.50-3.00 m			- - 1-		SM	Silty SAND with gravel: fine grained, brown & pale grey; gravel sub-angular up to 20mm; trace of rootlets.	-				0.90: V-bit refusal
		N	Not Observed				- - 2- -		CL-ML	Silty CLAY: low plasticity, dark brown & grey.	- M				1.20: Rootlets observed 1.30: INFERRED RESIDUAL SOIL
										LAMINITE: pale grey, red & orange, extremely weathered, extremely low strength, iron staining.	D	н			2.50: INFERRED BEDROCK
							- - - 4 - - - -			Continued on cored borehole sheet					
W SF P	D/T - D/V - ′В -W	ashb anda ush tu	er drill er drill ore ird pe ube	ing TC bit ing V bit enetration test wing		netrat o resis		-	> Inflo ⊲ Par	ater         Samples and Tests           bw         U         - Undisturbed Sample           tial Loss         D         - Disturbed Sample           splete Loss         SPT - Standard Penetration Te           mplete Loss         ES         - Environmental Sample           TW         - Thin Walled         LB         - Large Disturbed Sample		D M	re Co - Di - M ' - W	óist	Consistency/Relative Den VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense

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Borehole ID

BH07

Eng	gin	nee	ring	Log	- C	ore	d Bo	orehole			Project	No.:	PS	SM382	28			
Pro Ho	le L	ct Na Loca	ame: ition: tion:	Ry Ea	stwoo	ospital od, NS .0 m E	SW	823.0 m N MGA94 Zone	÷ 56		Comme Comple Loggeo Checke	eted: I By:						
			and M		0	Hanjir			ination:	-90°	RL Sur	face: N	lo su	•				
Ba			be and L	-		Triple	Tube		aring:		Datum:	Α	HD					
	-	Drill	ing Info		ion			R	ock Subst	tance	1	Ctropet	<b>b</b>		F	Rock Mass Defects		
Mater V	water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Des ROCK NAME: particle/g colour, fabric/texture, i components, moisture, miner	rain charact nclusions or	minor	Weatherir ≳ ≩ ≩ &	O - Diame	il tral	Defe Spaci (mm	ng ı)	Defect Descriptions / Comme Description, alpha/beta, infili or coating, shape, roughnes thickness, other		
Not Observed		78	3.48m ls(50) d=0 a=0 MPa 4.82m ls(50) d=0.2					Continued from non-cored b LAMINITE: pale grey, orange banding, bedding fabric visib Some clay bands (pale grey iron staining.	e & red, orar le, well deve & medium p ge, white & c %-90% sittst	nge eloped, jlasticity), prange one,						<ul> <li>+100 mm, Heavily Fractured</li> <li>BP, 10°, CL, PR, S, +10 mm</li> <li>BP, 12°, Fe &amp; Clay VN, PR,</li> <li>SM, 0°, CL, PR, S, +30 mm</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>CZ, 0°, RF &amp; FE VN, +20 mi</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>CZ, 0°, FE &amp; FE VN, +20 mi</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>CZ, 0°, FE VN, PR, S, +60 n</li> <li>JT, 45°, CN, PR, S</li> </ul>		
			a=0.1 MPa						147	anin c						BP, 0°, CN, PR, S		
A V F F S F	AD/V WB - HQ3- PQ3- SPT- SPT -	-Aug -Aug -Was -Win -Win -Stai -Pus	ethod er drilling T er drilling V shbore eline core ( eline core ( ndard pene h tube ter pressure	/ bit 63.5 mr 85.0 mr tration f	n)	<	> Inflov ☐ Partia ■ Com Dhic Lo _ Core i indica		HW - Highly	nely Weathered Weathered ately Weathered y Weathered y Weathered m m tigh	FT - F SS - S SZ - S BP - E SM - S IS - F JT - S CO - ( CZ - ( VN - ) FZ - F	Shear Surface Shear Zone Bedding parting Seam nfilled Seam loint Contact Crushed Zone	,	G - (	Clean Stain Veneer Coating Rock fra Gravel Sand Sand Salt Calcite Clay ron	SL - Slickensided POL - Polished S - Smooth		

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Borehole ID

BH07

Page 3 of 3

_!!	iyii	liee	ering	LOĆ	g - C	ore	a Bo	orehole	Project No	).: F	'SM3828					
-	lien				S&G				Commence		7/05/2019					
			ame: ation:	-		ospita od, N\$			Completed Logged By		17/05/2019 NTH					
		Posi				,		823.0 m N MGA94 Zone 56	Checked E		II TI IS					
D	)rill N	Mode	el and M	lounti	ina:	Hanji	n- D8	Inclination: -90°	RL Surface	-	Irvev					
			be and l		0	Triple			Datum:	AHD	•	erator: Rockwell				
		Drill	ling Info	ormat	tion			Rock Substance			F	Rock Mass Defects				
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL	Depth	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteratic		Strength Is(50) ● - Axial D - Diametral	Defect Spacing (mm)	Defect Descriptions / Commer Description, alpha/beta, infillir or coating, shape, roughness thickness, other				
ž	Š	RC	Fie Se	×	(m)	(m)	ڻ 	LAMINITE: pale grey & orange, white & orange	×¥₹%£4		1000 1000					
		78				-		banding, well developed, 80%-90% siltstone, 10%-20% sandstone, thin fine-grained sandstone laminations, iron staining. <i>(continued)</i>				JT, 72°, FE SN, PR, S JT, 70°, FE SN, PR, S BP, 0°, FE SN, PR, RF BP, 0°, FE SN, PR, RF				
			5.55m Is(50) d=0.1 a=0.1 MPa									—BP, 0°, FE SN, PR, RF				
						6-						→ CZ, 0°, RF, +20 mm → JT, 67°, FE SN, PR, RF → JT, 44°, FE SN, PR, RF → BP, 0°, FE SN, PR, S				
			6.49m			-						- JT, 45°, FE SN, PR, RF <sup>™</sup> JT, 47°, FE SN, PR, RF				
		æ	ls(50) d=0 a=0			-						BP, 0°, FE SN, PR, RF, +10 mm → BP, 0°, FE SN, PR, RF				
	σ	78	MPa									∐ JT, 60°, FE SN, PR, S				
	Not Observed											H JT, 30°, FE SN, PR, S SM, 0°, CL, PR, S, +40 mm				
	t Obs					7-						<sup>11</sup> JT, 75°, FE SN, PR, S JT, 25°, FE SN, PR, S BP, 12°, FE VN, PR, S				
ź	Ň					-						SM, 0°, Fe & Clay SN, PR, S				
						-						BP, 0°, FE SN, PR, RF				
			7.66m Is(50) d=0.1													
			a=0.2 MPa			-										
						8-		8.0m - Becomes dark grey & black with white				BP, 0°, FE VN, PR, S BP, 0°, FE SN, PR, RF				
						-		banding, 70%-80% siltstone, 20%-30% sandstone.				<sup>L</sup> SM, 0°, CL, PR, S, +20 mm				
		88														
		-	8.64m Is(50) d=0.8			-						JT, 30°, FE VN, PR, S				
			a=0.9 MPa			-										
						9-										
								Hole Terminated at 9.17 m Target depth. Standpipe installed								
						-										
						-										
		Me	ethod	1			l Wa	ater Weathering	Defect	Type	Infilling/Coa	ating Roughness				
	AD/ AD/	T - Aug	jer drilling <sup>-</sup> jer drilling <sup>\</sup>	ΓC bit ∕ bit			> Inflov	V XW - Extremely Weathered W HW - Highly Weathered	FT - Fault SS - Shear	Surface	CN - Clean SN - Stain	SL - Slickensided POL - Polished				
	WB	- Wa	shbore eline core (		m)		☐ Parti ■ Com	al Loss MW - Moderately Weathered plete Loss FR - Fresh	I SZ - Shear BP - Beddir SM - Seam	ng parting	VN - Veneer CO - Coating RF - Rock fr	g RF - Rough				
	PQ3 SPT	3- Wire 1- Star	eline core ( ndard pene	85.0 m	m)			bog/Core Loss VL - Very Low	IS - Infilled JT - Joint	d Seam	G - Gravel S - Sand	Shape				
	PT	- Pus	h tube				Core	recovered (hatching L - Low tes material) M - Medium	CO - Contac CZ - Crushe		Z - Silt CA - Calcite	PR - Planar				
	WP.	T-Wat	ter pressur	e test		$\ge$		re recovery VH - Very High EH - Extremely High	VN - Vein FZ - Fractu BSH - Beddir		CL - Clay FE - Iron QZ - Quartz	ST - Stepped				

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Borehole ID

**BH08** 

P H	lient: rojec ole L ole F	t Na .oca	tion:	JBS&G Ryde H Eastwo 323226	osp od,	NSW	25880	1.0 m	N MG	Compl Logged	Commenced: Completed: Logged By: Checked By:					9 9
	rill M ole D			-		njin- [ 5 mm	08			Inclination: -90° RL Su				rvey		perator: Rockwell
				ng Informati		)		Bearing: Datum: AHD O							Observations	
	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components additional observations	Moisture	Consistency / Relative Density	Per	Hand letron UCS (kPa	neter S )	
		z					-		CI-ML SM	CONCRETE - 90m : Pale grey & white Silty CLAY with gravel: medium plasticity, dar grey & black; gravel sub-angular up to 5mm. Silty SAND with gravel: fine grained, dark	_	 St	-			0.00: PAVEMENT 0.09: INFERRED FILL 0.50: V-bit refusal
			q				-   1   -		CL-ML	brówn & red; gravel sub-angular up to 15mm trace of rootlets. Silty CLAY: low plasticity, pale grey & orange		D	-			1.20: Rootlets observed 1.40: INFERRED RESIDUAL SOIL
		z	Not Observed				- 2 -		OL-IVIL	ripped iron stone encountered at 2.3m.	D	VSt	-			
							- - 3- -			LAMINITE: pale grey, red & orange, extreme weathered, extremely low strength, iron staining.	y	н				2.60: INFERRED BEDROCK
							- 4 - - -			Continued on cored borehole sheet						
AI W SI P	D/T - D/V - 'B -W	Auge /asht tanda ush t	er drilli er drilli oore ard pe ube	ng TC bit ng V bit netration test <i>v</i> ing		netrat o resis			> Inflo ⊲ Par	ater Samples and Tests ow U - Undisturbed Sample tial Loss D - Disturbed Sample SPT - Standard Penetration Te ES - Environmental Sample TW - Thin Walled LB - Large Disturbed Sample	st	N	) - (	Dry Moist		Consistency/Relative Dens VS - Very soft S - Soft St - Sitf VSt - Stiff VSt - Very stiff H - Hard VL - Very losse L - Loose MD - Medium dense D - Dense

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Borehole ID

**BH08** 

Er	ngi	nee	ering	Log	) - C	ore	d Bo	orehole			Proje	ct No	0.:	F	PSM3	ـــ 8828		Fage 2 01 3
F	lole	ect N Loca	ame: ation: ition:	Ry Ea	stwoo	ospital od, NS 0 m E	SW	3801.0 m N MGA94 Zor	e 56		Comr Comp Logge Chec	olete ed B	d: y:	1 <b>N</b>	17/05 18/05 NTH 3S			
0	Drill I	Mode	el and M	lounti	ng:	Hanjir	ו- D8	Ine	clination:	-90°	RL S			No s	urvey			
E	Barre		be and L	-							Datur	AHD						
		Dril	ling Info		ion			<b>I</b>	stance						Rock Mass Defects			
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material D ROCK NAME: particle colour, fabric/texture, components, moisture, min	/grain charac inclusions c	or minor	Weathe ≳ ≩ ≩		sl • 0.1 0.3 • 0.1	ength (50) Axial iametral ᠸ ॢ ♀ ᡓ ᇁ 못 픏	Sp (r	efect acing nm) ରୁତ୍ତି		Defect Descriptions / Commen Description, alpha/beta, infillin or coating, shape, roughness thickness, other
						- - 1_ - - 2_ - - - - - - - - - - - - - - - -		Continued from non-cored										
NMLC	Not Observed	51	3.77m Is(50) d=0 a=0 MPa 4.86m Is(50) d=0 a=0					LAMINITE: pale grey, oran banding, bedding fabric vis Some clay bands (pale gre iron staining.	ge & red, ora ible, very we	ange II developed.								- BP, 0°, FE SN, PR, S - SM, 0°, FE & CL SN, PR, S, +10 mm JT, 71°, FE SN, PR, S - JT, 45°, FE SN, PR, S - BP, 0°, FE SN, PR, S - JT, 39°, FE SN, PR, S - JT, 37°, FE SN, PR, S - CZ, 0°, RF, +20 mm - FZ, 0°, FE SN, PR, S, +10 mm - FZ, 0°, FE SN, PR, S, +70 mm - JT, 70°, FE SN, PR, S - SM, 0°, Fe & Clay SN, PR, S - SM, 0°, FE &
			MPa ethod				Wa	ater		hering		Defec		pe		ing/C		ing Roughness
	AD/ WB HQ: PQ: SP1 PT WP	V - Aug 3- Wir 3- Wir 3- Wir 7- Sta - Pus	ger drilling \ shbore eline core ( eline core ( ndard pene sh tube	in diming Yo bit bore i dilling V bit bore (63.5 mm) ine core (63.5 mm) dard penetration test tube r pressure test ↓ Inflow ↓ Partial Loss ↓ Partial Loss ↓ Complete Loss ↓ Core recovered (hatching ↓ H · · · · · · · · · · · · · · · · · ·			HW - High MW - Mode SW - Sligh FR - Fres <b>Stren</b> VL - Very L - Low M - Medi	<b>gth</b> Low High	SS         Shear Surface         SN         Stain         Ff           red         SZ         Shear Zone         VN         - Veneer         SS           BP         Bedding parting         CO         - Coating         F           SM         Seam         RF         - Rock fragments         VI           IS         Infilled Seam         G         - Gravel           JT         - Joint         S         - Sand           CO         - Contact         Z         - Sith         F           CZ         Crushed Zone         CA         - Calcite         C           VN         Vein         CL         - Clay         C         FZ           FZ         Fracture Zone         FE         Iron         S				SL - Slickensided POL - Polished S - Smooth RF - Rough VR - Very Rough PR - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular					

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Borehole ID

**BH08** 

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	lien				S&G	oonito	1		Commence		7/05/2019	
			ame: ation:	-		ospita od, NS			Completed Logged By		8/05/2019 ITH	
H	lole	Posi	tion:	32	3226	.0 m E	6258	801.0 m N MGA94 Zone 56	Checked E	By: B	S	
			el and M be and L		0	Hanjiı Triple		Inclination: -90° 3 m Bearing:	RL Surfac Datum:	e: No su AHD	•	rator: Rockwell
			ling Info					Rock Substance				Rock Mass Defects
			σ	(su				Material Description		Strength Is(50)		Defect Descriptions / Commer
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL	Depth	Graphic Log	ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration		● - Axial O - Diametral	Defect Spacing (mm)	Description, alpha/beta, infilir or coating, shape, roughness thickness, other
≥	\$	R	οĒ	\$	(m)	(m)	5	LAMINITE: pale grey & orange, white, orange & red	W H M S H I	, _ z ± <u>?</u> ∰	1000 1000	P(BP, 0°, FE SN, PR, S
		51				-		banding, very well developed, 90% siltstone, 10% sandstone, thinly fine-grained sandstone				- <sup>1</sup> JT, 28°, FE SN, PR, S  - SM, 0°, CL, PR, S, +20 mm  - BP, 0°, FE SN, PR, S
			5.38m Is(50)			-		laminations. Some clay bands (dark grey & medium plasticity), iron staining. <i>(continued)</i>				BP, 0°, FE SN, PR, S
			d=0 a=0.1 MPa			-						CZ, 0°, RF, +60 mm BP, 0°, RF & FE SN, PR, RF
												BP, 0°, FE SN, PR, RF JT, 70°, FE SN, PR, S
						-						☐ JT, 45°, FE SN, PR, S ☐ JT, 70°, FE SN, PR, S
						6-						→ JT, 79°, FE SN, PR, S → JT, 37°, FE SN, PR, S
		30				-						☐ JT, 75°, FE SN, PR, S ☐ BP, 0°, FE SN, PR, S
						_						I JT, 0°, FE SN, PR, S JT, 0°, FE SN, PR, S
	_							6.4m - Becomes dark grey & black with white & orange banding, 80%-90% siltstone, 10%-20%				BP, 0°, FE SN, PR, S JT, 37°, FE SN, PR, S
	Not Observed		6.64m ls(50) d=0			-		sandstone 6.5m to 7.0m - Mutiple clay bands (dark grey & high				SM, 0°, CL, PR, S, +40 mm CZ, 0°, RF & CL, +50 mm
2	Obse		a=0 MPa			-		plasticity)				SM, 0°, RF, PR, RF, +20 mr SM, 0°, CL, PR, S, +40 mm
	Not					7-						SM, 0°, CL, PR, S, +30 mm SM, 0°, CL, PR, S, +40 mm
						_						SM, 0°, CL, PR, S, +20 mm SM, 0°, CL, PR, S, +20 mm
												<sup>B</sup> BP, 0°, FE SN, PR, RF SM, 0°, CL, PR, S, +30 mm
						-						FZ, 0°, RF, PR, RF, +40 mm SM, 0°, CL, PR, S, +10 mm
						-						SM, 0°, Fe & Clay SN, PR, S
		75	7.83m Is(50)			-						BP, 0°, FE SN, PR, S BP, 0°, FE SN, PR, RF
		1	d=0 a=0.1 MPa			8-						BP, 4°, FE SN, PR, RF BP, 3°, FE SN, PR, RF
			8.18m									BP, 10°, FE SN, PR, RF
			ls(50) d=0 a=0			-						BP, 0°, FE SN, PR, RF JT, 44°, FE SN, PR, S
			MPa			-						BP, 0°, FE SN, PR, S
			8.63m Is(50) d=0.3			-						EP, 0°, FE, PR, S BP, 0°, FE, PR, S
			a=0.3 MPa									
						9—		Hole Terminated at 8.80 m Target depth, hole grouted to surface and reinstated				
						-						
						-						
	AD/		e <b>thod</b> Jer drilling 1	C bit		2		Ater Weathering XW - Extremely Weathered	Defect FT - Fault	••	Infilling/Coa CN - Clean	SL - Slickensided
	AD/ WB	V-Aug - Wa	er drilling \ shbore	/ bit		<	> Inflov ∃ Partia	al Loss MW - Moderately Weathered	SS - Shear SZ - Shear BP - Beddi	r Zone	SN - Stain VN - Veneer CO - Coating	
	PQ3	3- Wir	eline core ( eline core (	85.0 mi	m)			Strongth	SM - Seam IS - Infille	1	RF - Rock fr G - Gravel	agments VR - Very Rough
			ndard pene h tube	tration	test	Graj	Core	recovered (hatching L - Low L - Very Low	JT - Joint CO - Conta CZ - Crush		S - Sand Z - Silt CA - Calcite	<b>Shape</b> PR - Planar CU - Curved
	WP <sup>.</sup>	T-Wa	ter pressure	e test			indica	tes material) M - Medium H - High re recovery VH - Very High	VN - Vein FZ - Fractu		CL - Clay FE - Iron	UN - Undulating ST - Stepped

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BH09

Hole	Client:JBS&GProject Name:Ryde HospitalHole Location:Eastwood, NSWHole Position:323178.0 m E 62587								N MG	Comme Comple Logged A94 Zone 56 Checke	9 9				
Drill Hole				Mounting:		njin- [ 5 mm	28			Inclination: -90° RL Surf Bearing: Datum:	ace:	No AH	surve	-	perator: Rockwell
TIOLE	Dia			g Informati		,				Soil Description				0	Observations
Penetration			Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Ha Penetro UC (kF	nd ometer CS Pa)	Structure, Zoning, Origin Additional Observations
			>		<u> </u>	(11)	(11)	$\propto$	SW	SAND with gravel: fine to medium grained,	20		200	200	0.00: INFERRED FILL
							-			dark brown & grey; gravel angular up to 20mm; trace of rootlets.		MD			0.20: Concrete fragments observed
							- 1-		SW-SC	Clayey SAND with gravel: fine to medium grained, brown & yellow; gravel sub-angular up to 15mm.		D			1.00: Bricks observed
		Ζ	Not Observed				- - - 2 - - - -		CI	CLAY with gravel: medium plasticity, dark brown & black; gravel sub-angular up to 10mm.	м	St to VSt			
							3		СН	CLAY: high plasticity, dark brown & black.	-				3.00: Bricks observed 3.60: INFERRED RESIDUAL SOIL
		z					-			SILTSTONE: pale grey & brown, extremely weathered, extremely low strength, iron staining. Hole Terminated at 5.0m.Target depth, hole		 H			4.55: V-bit refusal 4.60: INFERRED BEDROCK
NB - SPT - PT -	Was Stan Pusł	ger ger hbo dare i tub	drillin drillin re 1 pen	g TC bit g V bit etration test ng	_	a_	l stance efusal	-	> Inflo ⊲ Par	Igrouted to surface and reinstated fater Samples and Tests ow D - Disturbed Sample tial Loss SPT - Standard Penetration Tes mplete Loss ES - Environmental Sample TW - Thin Walled LB - Large Disturbed Sample		D M	re Cond - Dry - Moi - We	st	Consistency/Relative Den VS - Very soft S - Soft St - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense

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BH10

P H	lient: rojec lole L lole P	t Na ocai	ion:	Eastwo	losp od,	NSW	25877	5.0 m	Completed: 18/0 Logged By: NTH 0.0 m N MGA94 Zone 56 Checked By: BS						05/201 05/201 H	
	rill M lole D			Mounting:		njin- E 5 mm	08			Inclination: -90° Bearing:	RL Surfa Datum:	ace:	No AF	o sur∖ HD		perator: Rockwell
Drilling Information										Soil Descri						Observations
	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, beha particle characteristics of p component, colour, secondary c additional observation	rimary omponents,	Moisture Condition	Consistency / Relative Density	H Pene U (F 0000	and romete ICS :Pa)	r Structure, Zoning, Origir Additional Observations
				CBR 0.30-2.90 m			- - - 1-		SC	ASPHALT - 100m : black & dark s SAND with gravel: fine to medium dark brown & grey; gravel angula 10mm; trace of rootlets. SAND with gravel: fine to medium dark brown & grey; gravel angula 20mm; trace of rootlets.	grained, up to	D				0.00: PAVEMENT 0.10: INFERRED FILL 0.50: Rootlets observed 1.00: Rootlets observed
		z	Not Observed				- - - 2-					м	D			1.50: Plastics and electricity wires observed 2.00: Bricks observed
									GM	Silty GRAVEL: medium grained, j yellow; crushed sandstone grave moderately weathered, high strer Hole Terminated at 3.00 m Target depth, hole grouted to sur reinstated	- gth.	D				2.95: V-bit refusal
							- 4 - - -									
SI P	D/T - D/V - /B -W	anda Jsh ti	er drill er drill ore ard pe ube	ling TC bit ling V bit enetration test wing	_	netrat o resis		-	> Inflo ⊲ Par	ater Samples a bw U - Undisturbed tial Loss D - Disturbed Sc SPT - Standard Pe es - Environmen TW - Thin Walled LB - Large Distur	Sample Imple netration Tes al Sample	<b>A</b>	D M	/ - M	óist	Consistency/Relative Den         VS       - Very soft         S       - Soft         F       - Firm         St       - Stiff         VSt       - Very stiff         H       - Hard         VL       - Very loose         L       - Loose         MD       - Medium dense         D       - Dense         VD       - Very dense

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BH11

Client Projec	t Na		JBS&G Ryde H	osp						Commen Complete	d: 18/05/20				
Hole I Hole F			Eastwo 323254			25879	7.0 m	N MG		Logged B Checked	-		NTH BS		
					njin- E					RL Surfac		No	surve	y	
Hole [	Diam	eter:		125	5 mm				Bearing:	Datum:		AH	D	O	perator: Rockwell
	1	Drilli	ng Informati	on					Soil Descriptio	on					Observations
Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behavior particle characteristics of prima component, colour, secondary comp additional observations	ur or ary ponents,	Moisture Condition	Consistency / Relative Density	Har Penetro UC (kPa 00 00 000	nd meter S a)	
							****	CI-CH	ASPHALT - 100m : black & dark grey CLAY with gravel: medium to high pla		D				0.00: PAVEMENT 0.10: INFERRED FILL
	z					- - - 1			pale grey & red; gravel sub-angular u 5mm.	p to	М	VSt			1.30: V-bit refusal
	Z	Not Observed						GM	Silty GRAVEL: medium grained, pale red; crushed sandstone gravel - mod weathered, high strength.	grey & erately	D	VD			
						4		CL-ML	Silty CLAY: low plasticity, pale grey & ripped iron stone encountered at 4.5r	 red; n.		VSt			4.00: INFERRED RESIDUAL SOIL
						-			SILTSTONE: pale grey & red, highly weathered, low strength.			н			4.50: INFERRED BEDROCK
AD/T - AD/V - WB -V	Auge /asht tanda ush ti	er drilli er drilli ore urd per ube	ng TC bit ng V bit netration test <i>r</i> ing	_	netrat lo resis		-	> Inflo ⊲ Par	ater Samples and T Dw U - Undisturbed Samp tial Loss D - Disturbed Samp SPT - Standard Penetr Standard Penetr ES - Environmental S TW - Thin Walled LB - Large Disturbed	nple le ration Test sample	M	D M	e Cond - Dry - Mois - Wet	st	Consistency/Relative Den VS - Very soft F - Soft VS - Soft VS - Stiff VS - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense

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BH11

Ρ	lient: rojec	t Na		JBS&G Ryde H	osp						Comme Comple	eted:		18	3/05/ 3/05/		
	lole L lole P			Eastwo 323254				7.0 m	N MG	A94 Zone 56	Logged Checke			N' B	TH S		
						njin- [				Inclination: -90°	RL Sur		No	o su		,	
	lole D			-		5 mm		Bearing: Datum: AHD								Dperator: Rockwell	
			Drilli	ing Informati	on					Soil Descr	ption						Observations
	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, beh particle characteristics of p component, colour, secondary o additional observation	aviour or primary components,	Moisture Condition	Consistency / Relative Density	Pen	Han etror UCS (kPa	nete S	Additional Observations
		z	Not Observed				-			SILTSTONE: pale grey & red, hig weathered, low strength. <i>(continu</i>		D	н				
		etho	d			netrat				Hole Terminated at 6.00 m Target depth, hole grouted to sur reinstated			foistu				Consistency/Relative Den
A W S P	D/T - / D/V - / /B -W	Auge Auge asht anda ush t	er drill er drill ore ard pe ube	ing TC bit ing V bit enetration test ving	-	lo resis	stance		⊳ Inflo ⊲ Par		Sample ample enetration Tes tal Sample		D M	-     -   / - \	Dry Moist		VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense

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BH12

P H	Client: Projec Hole L Hole F	t Na .oca	tion:	JBS&G Ryde H Eastwo 323178	losp od,	NSW		9.0 m	N MG	Commo Comple Logged A94 Zone 56 Checke	eted: I By:				)5/201 )5/201 	
	Drill M Hole D			Mounting:		njin- [ 5 mm	08	Inclination: -90° RL Surface: Bearing: Datum:						surv D		perator: Rockwell
				ng Informat		,				Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture	Condition	Consistency / Relative Density	Ha Penetr U(kl	and romete CS Pa)	
							-		CI	ASPHALT - 150m : black & dark grey CLAY with gravel: medium plasticity, dark brown & grey; gravel sub-angular up to 10mm.	M	)	St			0.00: PAVEMENT 0.15: INFERRED FILL
		z	Not Observed				1 - - -		SM-SC	Silty SAND with gravel: fine to medium grained, dark brown & black; gravel sub-angular up to 10mm.			D			
							2		CI	CLAY: medium plasticity, pale grey & orange.	_	,	VSt			2.00: INFERRED RESIDUAL SOIL
i		Z								SILTSTONE: pale grey & yellow, extremely weathered, extremely low strength. Hole Terminated at 3.00 m Target depth, hole grouted to surface and reinstated			н			2.80: INFERRED BEDROCK
P	.D/T - .D/V - VB -W	tanda ush t	er drilli er drilli oore ard pe ube	ng TC bit ng V bit netration test <i>i</i> ing	_	<u>a</u> _	t <b>ion</b> stance efusal		> Inflo ⊲ Par	ater Samples and Tests bw U - Undisturbed Sample D - Disturbed Sample D - Disturbed Sample SPT - Standard Penetration Te mplete Loss ES - Environmental Sample TW - Thin Walled LB - Large Disturbed Sample	st	Mo	D M	e Con - Dry - Ma - We	ist	Consistency/Relative Dens VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense Ce - Cemented

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Borehole ID

**BH13** 

P H	lient: rojec lole L lole F	t Na .oca	tion:	Eastwo	osp od,	NSW		6.0 m	N MG	A94 Zone 56	Commer Complet Logged Checked	ed: By:		19/05 19/05 NTH BS		
	rill M Iole D			d Mounting:		njin- [ 5 mm	28			Inclination: -90° Bearing:	RL Surfa Datum:	ace:	No AH	surve	-	perator: Rockwell
_				ing Informat						Soil Descri						Observations
	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, beh particle characteristics of p component, colour, secondary o additional observation	aviour or primary components,	Moisture Condition	Consistency / Relative Density	Har Penetro UC (kPi 00 00 2 00	nd meter S a) 8 8	Structure, Zoning, Origin, Additional Observations
										CONCRETE - 180m : Pale grey a	& white	D		<u>≂ ⊼ ∓</u>	4 0	0.00: PAVEMENT
		2		CBR 0.30-3.50 m			-		SM	Silty SAND with gravel: fine grain brown & black; gravel sub-angula 10mm.			D			0.18: INFERRED FILL
							1		CI	CLAY with gravel: medium plastic & orange; gravel sub-angular up	to 5mm.					0.90: Bricks encountered
		z	Not Observed				2		CI-ML	Silty CLAY with gravel: medium p grey & black; gravel sub-angular		M	VSt			
		lotha				201-2			CI-ML	Silty CLAY: medium plasticity, pa brown. Continued on cored borehole sh ater Samples a	eet		— — -		lition	4.40: INFERRED RESIDUAL SOIL
A N S P	D/T - D/V - /B -W	Auge asht anda ush t	er drill er drill oore ard pe ube	ling TC bit ling V bit enetration test wing	-	a_	stance efusal		> Inflo ⊲ Par		Sample ample enetration Tes tal Sample		D M	re Cond - Dry - Mois - Wet	st	Consistency/Relative Dens VS - Very soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense

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BH13

F	lole	ct Na Loca	ame: ation: tion:	Ry Ea	stwo	ospita od, NS	SW	816.0 m N MGA94 Zone 56	Comm Compl Logge Check	d By:	19/05 19/05 NTH BS		
			el and M be and L		•	Hanjii Triple		Inclination: -90 3 m Bearing:	° RL Su Datum		o survey HD		rator: Rockwell
			ling Info					Rock Substance					Rock Mass Defects
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristi colour, fabric/texture, inclusions or mino components, moisture, mineral composition, a Continued from non-cored borehole sheet	r	O - Diameti	al Sp	efect acing nm)	Defect Descriptions / Commer Description, alpha/beta, infillin or coating, shape, roughness thickness, other
NMLC	Not Observed	68 63	5.85m Is(50) d=0 a=0 MPa 6.78m Is(50) d=0.5 a=0.8 MPa 7.29m Is(50) d=0.2 MPa 8.36m Is(50) d=0.1 a=0.1					LAMINITE: pale grey & orange, Some clay ba (dark grey & medium plasticity). LAMINITE: pale grey & orange, white, orange banding, very well developed, 70-80% siltston 20%-30% sandstone, thin fine-grained sandst laminations. Some clay bands (pale grey & me plasticity), iron staining.	& red e, one adium				<ul> <li>5.00: INFERRED BEDROCF</li> <li>+330 mm, Heavily Fractured</li> <li>-CZ, 0°, RF, PR, RF, +70 mm</li> <li>-CZ, 0°, RF, PR, RF, +140 mi</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>SM, 0°, CL, PR, S, +20 mm</li> <li>SM, 0°, CL, PR, S, +10 mm</li> <li>SM, 0°, CL, PR, S, +60 mm</li> <li>CZ, 0°, RF, PR, RF, +20 mm</li> <li>SM, 0°, CL, PR, S, +60 mm</li> <li>CZ, 0°, RF, PR, RF, +20 mm</li> <li>SM, 0°, CL, PR, S, +50 mm</li> <li>CZ, 0°, RF, PR, RF, +40 mm</li> <li>JT, 80°, FE SN, PR, S</li> <li>JT, 42°, FE SN, PR, S</li> <li>JT, 42°, FE SN, PR, S, +40 mm</li> <li>CZ, 0°, RF, PR, S, +70 mm</li> <li>CZ, 0°, RF, PR, S, +10 mm</li> <li>DF, 12°, FE SN, PR, S</li> <li>SM, 0°, CL, PR, S, +10 mm</li> <li>BP, 12°, FE SN, PR, S</li> <li>SM, 0°, CL, PR, S, +10 mm</li> <li>BP, 12°, FE SN, PR, S</li> <li>BP, 12°, A, PR, S</li> <li>BP, 12°, A, PR, S</li> </ul>
	AD/ WB HQ3 PQ3 SP1	T-Aug V-Aug - Wa 3- Wir 3- Wir 1- Sta	MPa ethod per drilling T ger drilling V shbore eline core ( eline core ( ndard pene h tube	/ bit 63.5 mi 85.0 mi	m)	<	> Inflow ☐ Partia ■ Comp ■ <b>Com</b> p	The second	I         I           I         I	Shear Surface Shear Zone Bedding parting Seam Infilled Seam	CN SN VN CC RF G S Z	image: Coal in the second se	SL - Slickensided POL - Polished S - Smooth agments VR - Rough VR - Very Rough PR - Plahar

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BH14

						NSW	25885	6.0 m	6.0 m N MGA94 Zone 56 C			Commenced:19/05/2Completed:19/05/2Logged By:NTHChecked By:BS			)5/201			
	rill M ole D			Mounting:		njin- [ 5 mm	08			Inclination: -90° Bearing:	RL Surfa Datum:	ace:	No A⊢	surv	-	perator: Rockwell		
				ng Informati		,				Soil Descri			7.0		0	Observations		
	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, beha particle characteristics of p component, colour, secondary c additional observation	iviour or rimary omponents,	Moisture Condition	Consistency / Relative Density	Penet U (k	and rometer CS Pa)			
							-		SM	ASPHALT - 100m : black & dark Silty SAND with gravel: fine grain brown & orange; gravel angular u	ed, pale	M	MD			0.00: PAVEMENT 0.10: INFERRED FILL		
		N	Not Observed						SM	Silty SAND with gravel: fine grains brown & grey; gravel sub-angular 3.0m - Becomes dark brown with gravel up to 10mm	up to 5mm.	D	D					
AC WI SP PT	D/T - 1 D/V - 1 B -W	Auge ashb anda ush tu	r drilli r drilli ore rd pe ıbe	ng TC bit ng V bit netration test <i>i</i> ing	-	netrat		-	> Infl ⊲ Par	ater Samples au ow U - Undisturbed D - Disturbed Sa SPT - Standard Pe ES - Environmeni TW - Thin Walled LB - Large Disturb	Sample ample netration Tes al Sample		D M	re Cor - Dr - Mo - We	bist	Consistency/Relative Den VS - Very soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense		

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BH14

Client: Project Name: Hole Location: Hole Position:	JBS&G Ryde Hospital Eastwood, NSW 323048.0 m E 625885	6.0 m N MGA94 Zone 56	Commenced Completed: Logged By: Checked By:	19/05/20 <sup>2</sup> NTH		
Drill Model and M Hole Diameter:	Aounting: Hanjin- D8 125 mm	Inclination: -90° Bearing:	RL Surface: Datum:	No survey AHD C	perator: Rockwell	
	g Information	Soil Descri			Observations	
Penetration Support Water	Samples Tests Remarks $\mathcal{L}$	Bornerial Description Material Description SOIL NAME: Plasticity, beha particle characteristics of p component, colour, secondary c additional observation	rimary   אַנָּקָ omponents, אַנָּקָ	Consistency / Relative Density S200 (bev) S300 (bev) S500 (bev) Consistency / Consistency / Consiste	r Structure, Zoning, Origin Additional Observations	
Not Observed	6-	LAMINITE: dark grey & brown, ex weathered, extremely low strengt	5.0m.	VSt 	5.00: INFERRED RESIDUAL SOIL	
IIIIII         IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	7- 7- 8- 9- 9- 10- 10- 10- 10- 10- 10- 10- 10- 10- 10	Water       Samples and Construction         > Inflow       U         > Partial Loss       D         > Partial Loss       SPT - Standard Per	nd Tests	Moisture Condition D - Dry M - Moist W - Wet	Consistency/Relative Dens VS - Very soft S - Soft S - Soft S - Sift VS - Very suff	

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Borehole ID

BH14

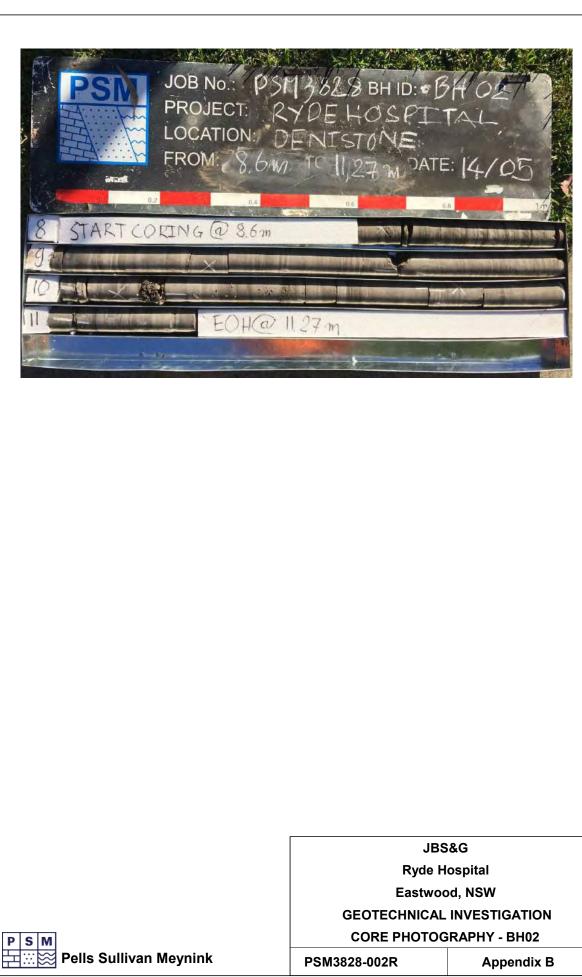
Page 3 of 3

Er	ngi	nee	ering	Log	) - C	ore	d Bo	orehole	Project No.:	F	•SM3828	-
F	lole	ect N	ame: ation:	Ry Ea	stwo	ospita od, NS 0 m F	SW	856.0 m N MGA94 Zone 56	Commenced: Completed: Logged By: Checked By:	1 N	9/05/2019 9/05/2019 ITH SS	
			el and M			Hanjii		Inclination: -90°			urvey	
			be and L		•	Triple		3 m Bearing:		AHD	•	rator: Rockwell
		Dril	ling Info	rmat	ion	-		Rock Substance			F	Rock Mass Defects
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Strengi Is(50) Weathering → Axia O - Diame S → S ↔ C → J → S ⊥	) etral	Defect Spacing (mm)	Defect Descriptions / Commer Description, alpha/beta, infillin or coating, shape, roughness thickness, other
						- - - 6 -		Continued from non-cored borehole sheet LAMINITE: dark grey & brown, iron staining.				
NMLC	Not Observed	87	7.28m Is(50) d=0.1 a=0.2 MPa 7.80m Is(50) d=0.2 a=0.2 MPa 8.28m Is(50) d=0.2 a=0.9 MPa 8.95m Is(50) d=0.2 a=0.2 MPa 8.95m Is(50) d=0.2 a=0.2 MPa 8.28m Is(50) d=0.2 a=0.2 MPa					<ul> <li>6.7m - Becomes more laminated</li> <li>LAMINITE: dark grey &amp; orange, white &amp; orange banding, well developed, 70-80% siltstone, 20%-30% sandstone, thin fine-grained sandstone laminations, iron staining.</li> <li>7.7m - Becomes pale grey with white banding, 50%-60% siltstone, 40%-50% sandstone.</li> </ul>				- CO, 0°, CN, PR, S BP, 0°, FE SN, PR, RF - BP, 0°, FE SN, PR, RF - CZ, 0°, RF, PR, S, +10 mm - CZ, 0°, RF, PR, S, +50 mm - BP, 0°, FE SN, PR, S - BP, 0°, FE SN, PR, S - BP, 0°, FE SN, PR, S - BP, 0°, FE SN, PR, RF - BP, 0°, FE SN, PR, RF - BP, 0°, FE SN, PR, RF - BP, 0°, FE SN, PR, S - BP, 0°, CN, PR, S - BP, 10°, CN, PR, S - BP, 10°, CN, PR, S - BP, 12°, CN, PR, S - BP, 0°, CN, PR, S
	AD/ WB HQ3 PQ3 SP1 PT WP	T-Aug V-Aug - Wa 3- Wir 3- Wir T-Sta - Pus T-Wa	ethod ger drilling T ger drilling V shbore eline core ( eline core ( ndard pene sh tube ter pressure nce with AS -	/ bit 63.5 mr 85.0 mr tration f tration f	n) test	Graj	<ul> <li>&gt; Inflor</li> <li>□ Parti</li> <li>□ Com</li> <li>□ Core</li> <li>□ Core</li> <li>□ indica</li> <li>− No co</li> </ul>	al Loss MW - Moderately Weathered SW - Slightly Weathered SW - SW -	Image: Construct of the second sec		Infilling/Coa CN - Clean SN - Stain VN - Veneer CO - Coating RF - Rock fr G - Gravel S - Sand CA - Calcite CL - Clay FE - Iron Q2 - Quartz X - Carbon	SL - Slickensided POL - Polished S - Smooth RF - Rough VR - Very Rough PR - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular

## Appendix B Core Photos















**GEOTECHNICAL INVESTIGATION** 

**CORE PHOTOGRAPHY - BH06** 

PSM3828-002R



Appendix B





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JBS&G

Ryde Hospital Eastwood, NSW

**GEOTECHNICAL INVESTIGATION** 

**CORE PHOTOGRAPHY - BH13** 

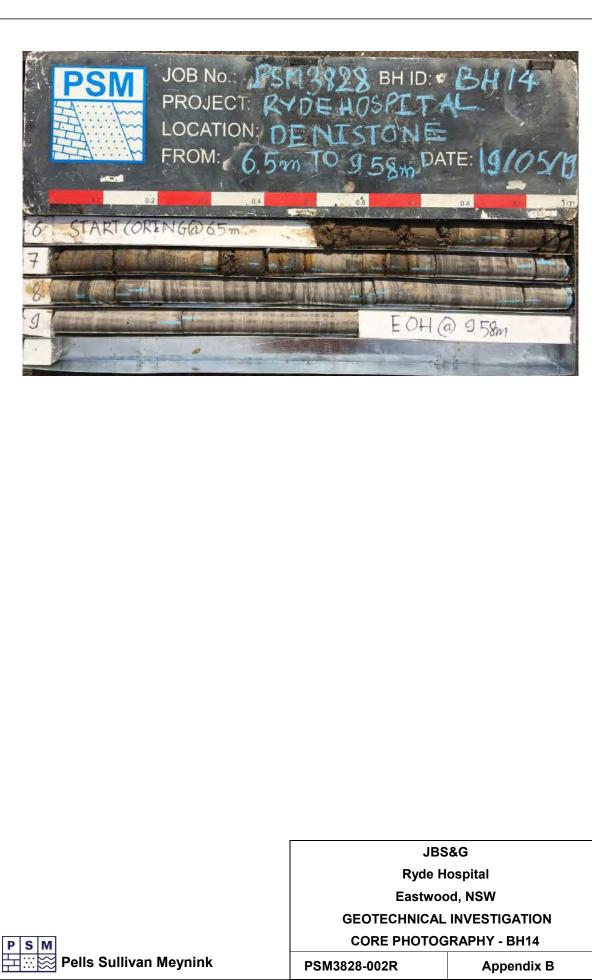


Pells Sullivan Meynink

PSM3828-002R

Appendix B

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Appendix C Point Load Strength Index Test Results





## Pells Sullivan Meynink

#### POINT LOAD STRENGTH INDEX TEST RESULTS

Job No.	PSM3828														Sheet 1 of	1	
Project	Ryde Hospital																
Fest Method	AS 4133.4.1 - 1993 Method	ls of Testing Rocks fo	r Engineer	ing Purpos	es, Detern	nination c	of Point	Sampling Technique	NMLC						Sampling Date 14-19/05/2019		
	Load Strength Index							Storage History	Field						1 0	05/2019	
Test Machine	GSA 6500							Moisture Condition	Field						Tested By NTH		
Calibration Date	e 16/8/2018							Loading Rate	< 30 se	conds					,		
	-					Diame	etral Test	0			Axial, F	Block a	nd Irred	ular I ur	mp Tests	AS 172	
	Rock Type	Location	Depth	D	L	P	I <sub>s(50)</sub>		W	D	I	P	l <sub>s</sub>	I <sub>s(50)</sub>		Strengt	
	51		(m)	(mm)	(mm)	(kN)	(MPa)	Failure Mode	(mm)	(mm)	(mm)	(kN)	(MPa)	(MPa)	Failure Mode	Class	
aminite		BH01	5.85	50	50	0.1	0	Parallel to bedding	50	49	()	0.2	0.1	0.1	Through substance	VL	
aminite		BH01	6.46	50	60	0.1	0	Parallel to bedding	50	43		0.1	0	0	Through substance	VL	
aminite		BH01	7.64	50	50.5	0.1	0.1	Parallel to bedding	50	43		0.3	0.1	0.1	Through substance	VL/L	
aminite		BH01	8.86	50	64.5	0.7	0.3	Parallel to bedding	50	33		0.3	0.2	0.2	Through substance	L	
.aminite		BH02	9.31	50	36	0.3	0.1	Parallel to bedding	50	37		0.7	0.3	0.3	Through substance	L	
aminite		BH02	10.11	50	52.5	0.2	0.1	Parallel to bedding	50	44		1.5	0.5	0.5	Bad break	VL / M	
.aminite		BH02	10.79	50	51.5	0.3	0.1	Parallel to bedding	50	47		0.3	0.1	0.1	Through substance	L	
aminite		BH03	2.62	50	50	0.1	0	Parallel to bedding	50	42		0.2	0.1	0.1	Through substance	VL	
aminite		BH03	3.58	50	55.5	0.1	0	Parallel to bedding	50	37		0.2	0.1	0.1	Through substance	VL	
aminite		BH03	4.63	50	59	0.1	0	Parallel to bedding	50	43		0.2	0.1	0.1	Through substance	VL	
Laminite		BH03	5.67	50	52.5	0	0	Parallel to bedding	50	37		0.1	0	0	Through substance	VL	
aminite		BH03	6.30	50	51	0	0	Parallel to bedding	50	33		0.1	0	0	Through substance	VL	
aminite		BH03	8.52	50	60	0.1	0	Parallel to bedding	50	46		0.1	0	0	Through substance	VL	
aminite		BH03	9.09	50	57.5	1.2	0.5	Parallel to bedding	50	49		1.3	0.4	0.4	Bad break	М	
aminite		BH04	1.96	50	56.5	0.1	0	Parallel to bedding	50	41		0.1	0	0	Through substance		
.aminite		BH04	2.24	50	68.5	0.1	0	Parallel to bedding	50	39		0.1	0	0	Through substance		
aminite		BH04	3.50	50	55.5	0.1	0	Parallel to bedding	50	48		0.4	0.1	0.1	Through substance	L	
aminite		BH04	4.35	50	50	0.7	0.3	Parallel to bedding	50	44		1.2	0.4	0.5	Through substance	L/M	
aminite		BH04	5.25	50	51	0.1	0	Parallel to bedding	50	42		0.3	0.1	0.1	Through substance	VL	
aminite		BH04	6.79	50	74	0.3	0.1	Parallel to bedding	50	42		0.5	0.2	0.2	Through substance	L	
aminite		BH04	7.53	50	50	0.2	0.1	Parallel to bedding	50	48		0.5	0.2	0.2	Through substance	VL/L	
aminite		BH04	8.32	50	55	0.4	0.2	Parallel to bedding	50	38		0.8	0.3	0.3	Through substance	L/M	
By:	NTH			Checked	: BS			1							Date: 14-19/	/05/2019	

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## Pells Sullivan Meynink

#### POINT LOAD STRENGTH INDEX TEST RESULTS

Job No.	PSM3828														Sheet 1 of	1	
Project	Ryde Hospital																
est Method	AS 4133.4.1 - 1993 Method	ls of Testing Rocks fo	or Engineer	ring Purpos	es, Deterr	nination o	of Point	Sampling Technique	NMLC						Sampling Date 14-19/05/2019		
	Load Strength Index	-	•	• ·				Storage History	Field						Testing Date 14-19/0	05/2019	
Fest Machine	GSA 6500							Moisture Condition	Field						Tested By NTH		
Calibration Date								Loading Rate	< 30 se	conds					· ,		
						Diame	etral Test	0	< 00 3C		Avial B	Block a	and Irred	nular Lur	mp Tests	AS 172	
	Rock Type	Location	Depth	D	L	P			W	D		P		· .	•	Strengt	
	rtook rypo	Loodion	(m)	(mm)	(mm)	۲ (kN)	I <sub>s(50)</sub> (MPa)	Failure Mode	(mm)	(mm)	L (mm)	r (kN)	I <sub>s</sub> (MPa)	I <sub>s(50)</sub> (MPa)	Failure Mode	Class	
aminite		BH05	3.71	50	51.5	0.2	0.1	Parallel to bedding	50	46	(1111)	0.8	0.3	0.3	Through substance	VL/L	
aminite		BH05	4.48	50	51.5	0.4	0.1	Parallel to bedding	50	48		0.6	0.2	0.2	Through substance	1	
aminite		BH05	5.54	50	80	0.3	0.1	Parallel to bedding	50	49		1.5	0.5	0.5	Through substance	L/M	
aminite		BH05	6.43	50	56	0.5	0.2	Parallel to bedding	50	49		0.7	0.2	0.2	Through substance	L	
aminite		BH05	7.83	50	65	0.3	0.1	Parallel to bedding	50	38		1.2	0.5	0.5	Through substance	L/M	
aminite		BH05	8.34	50	69	0.2	0.1	Parallel to bedding	50	47		0.5	0.2	0.2	Bad break	VL/L	
aminite		BH06	5.40	50	55	0.2	0.1	Parallel to bedding	50	42		0.2	0.1	0.1	Through substance	VL	
aminite		BH06	5.87	50	62.5	0.5	0.2	Parallel to bedding	50	45		0.6	0.2	0.2	Through substance	L	
aminite		BH06	6.27	50	55.5	1.3	0.5	Parallel to bedding	50	37		1.6	0.7	0.7	Through substance	м	
aminite		BH06	7.24	50	51	1	0.4	Parallel to bedding	50	47		1.1	0.4	0.4	Through substance	M	
aminite		BH07	3.48	50	51.5	0.1	0	Parallel to bedding	50	49		0.1	0	0	Through substance	VL	
aminite		BH07	4.82	50	52.5	0.5	0.2	Parallel to bedding	50	40		0.3	0.1	0.1	Through substance	L	
aminite		BH07	5.55	50	50	0.2	0.1	Parallel to bedding	50	49		0.3	0.1	0.1	Bad break	VL	
aminite		BH07	6.49	50	50	0.1	0	Parallel to bedding	50	33		0.1	0.1	0.1	Through substance	VL	
aminite		BH07	7.66	50	60	0.2	0.1	Parallel to bedding	50	49		0.5	0.2	0.2	Through substance	VL/L	
aminite		BH07	8.64	50	61	2	0.8	Parallel to bedding	50	37		2.1	0.9	0.9	Through substance	М	
aminite		BH08	3.77	50	50	0	0	Parallel to bedding	50	42		0	0	0	Through substance		
aminite		BH08	4.86	50	56	0	0	Parallel to bedding	50	41		0.1	0	0	Through substance		
aminite		BH08	5.38	50	53.5	0.1	0	Parallel to bedding	50	39		0.2	0.1	0.1	Through substance	VL	
aminite		BH08	6.64	50	51	0.1	0	Parallel to bedding	50	49		0.1	0	0	Through substance	VL	
aminite		BH08	7.83	50	57	0.1	0	Parallel to bedding	50	32		0.2	0.1	0.1	Through substance	VL	
aminite		BH08	8.18	50	58	0.1	0	Parallel to bedding	50	40		0.1	0	0	Through substance		
aminite		BH08	8.63	50	53.5	0.7	0.3	Parallel to bedding	50	48		0.8	0.3	0.3	Through substance	L	
By:	NTH			Checked	: BS										Date: 14-19/	/05/2019	

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## Pells Sullivan Meynink

#### POINT LOAD STRENGTH INDEX TEST RESULTS

Job No.	PSM3828														Sheet '	1 of	1
Project	Ryde Hospital																
Fest Method Fest Machine Calibration Date	AS 4133.4.1 - 1993 Method Load Strength Index GSA 6500 16/8/2018	's of Testing Rocks for	<sup>-</sup> Engineeri	ing Purpos	es, Deterr	mination c	of Point	Sampling Technique Storage History Moisture Condition	NMLC Field Field						Sampling D Testing Dat Tested By		′05/2019 ′05/2019
JailDration Date	10/0/2010					Diam	etral Test	Loading Rate	< 30 se				and Irro	aular Lur	np Tests		AS 1726
	Rock Type	Location	Depth (m)	D (mm)	L (mm)	P (kN)	I <sub>s(50)</sub> (MPa)	Failure Mode	W (mm)	D (mm)	(mm)	P (kN)	Ind Integ I <sub>s</sub> (MPa)	Julai Lui I <sub>s(50)</sub> (MPa)	-	Mode	Strengtl
Laminite Laminite Laminite Laminite Laminite Laminite Laminite Laminite		BH13 BH13 BH13 BH14 BH14 BH14 BH14 BH14 BH14	5.85 6.78 7.29 8.36 7.26 7.80 8.28 8.95 9.51	50 50 50 50 50 50 50 50	50 60 50 65.5 64.5 72.5 59 50 56.5	0 1.2 0.1 0.2 0.3 0.5 0.5 0.5 0.8	0 0.5 0 0.1 0.2 0.2 0.2 0.3	Parallel to bedding Parallel to bedding	50 50 50 50 50 50 50 50	48 49 35 38 38 47 39 30		0.1 2.4 0.7 0.3 0.4 0.5 2.6 1.3 1	0 0.8 0.2 0.2 0.2 0.9 0.5 0.5	0 0.8 0.2 0.1 0.2 0.2 0.9 0.5 0.5	Through s Bad break Through s Through s Through s Through s Through s Through s	ubstance ubstance ubstance ubstance ubstance ubstance ubstance	M VL/L L L/M L/M M
By:	NTH			Checked	BS										Date:	14-19	/05/2019

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Appendix D Piezometer Construction Record



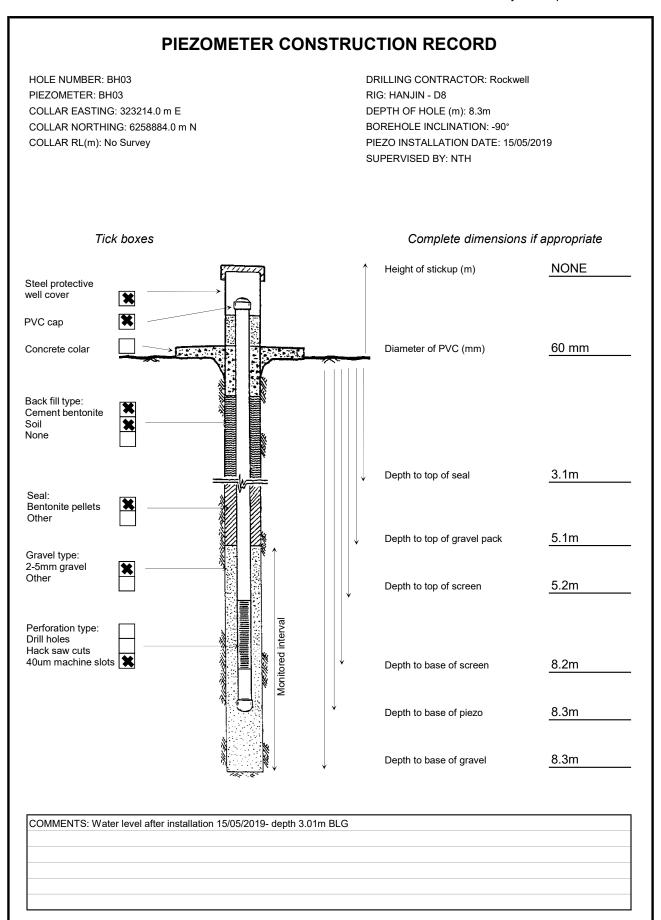
Pells Sullivan Meynink Engineering Consultants

SM

Rock - Soil - Water

JOB no.: PSM3828

PROJECT: Ryde Hospital



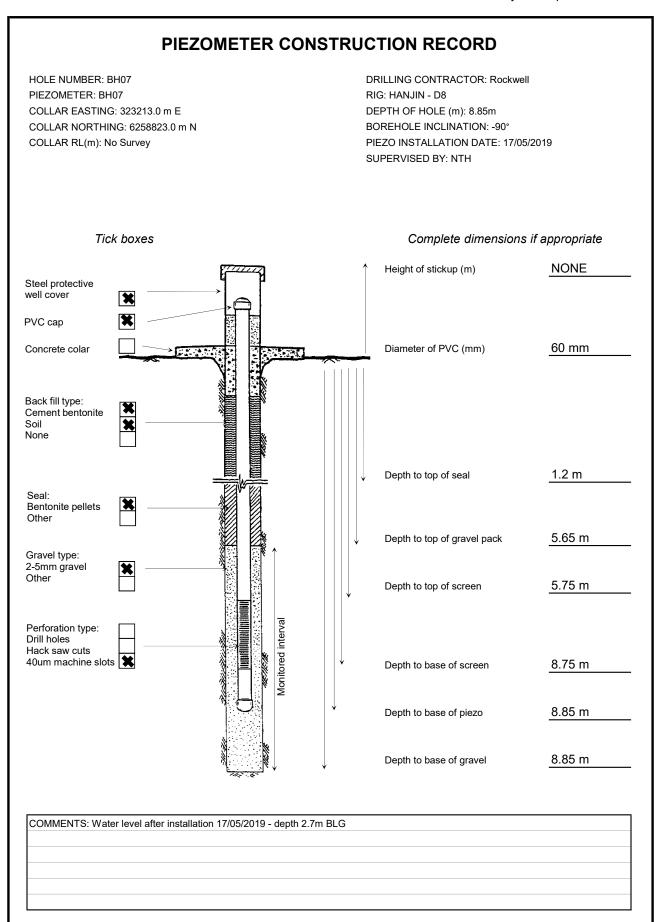
Pells Sullivan Meynink Engineering Consultants

SM

Rock - Soil - Water

JOB no.: PSM3828

PROJECT: Ryde Hospital



Appendix E CBR Test Results Sheet





#### FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: PSM Job No	Pells Sullivan Meynink o.: <b>PSM3828 - Ryde Hospital</b>				-0	Ref No: Report: Report Date: Page 1 of 1	L4290E 2 29/05/2019
BOREHOLE NUM	IBER	BH 1	BH 3	BH 4	BH 7	BH 10	BH 13
DEPTH (m)		0.50 - 3.00	0.50 - 1.90	0.50 - 1.30	0.50 - 3.00	0.10 - 2.90	0.30 - 3.50
Surcharge (kg)		4.5	4.5	4.5	4.5	4.5	4.5
Maximum Dry Der	nsity (t/m³)	1.69 STD	1.70 STD	1.63 STD	1.81 STD	1.79 STD	1.79 STD
Optimum Moisture	e Content (%)	18.5	19.6	23.3	16.0	15.0	17.4
Moulded Dry Dens	sity (t/m³)	1.66	1.66	1.59	1.78	1.75	1.75
Sample Density R	atio (%)	98	98	98	98	98	98
Sample Moisture I	Ratio (%)	99	95	100	99	101	101
<b>Noisture</b> Contents	5						
Insitu (%)		15.7	24.2	23.1	14.2	10.2	17.6
Moulded (%)		18.3	18.5	23.2	15.8	15.2	17.6
After soaking	g and						
After Test, T	op 30mm(%)	27.0	28.1	37.7	18.5	21.4	18.4
	Remaining Depth (%)	21.4	26.3	31.4	17.4	17.4	18.0
Material Retained	on 19mm Sieve (%)	0	1*	0	0	4*	2*
Swell (%)		1.5	2.0	4.5	0.0	1.0	0.5
C.B.R. value;	@2.5mm penetration	1.5	3.0	1.5	7	7	6

NOTES: Sampled and supplied by client.

Refer to appropriate Borehole logs for soil descriptions

• Test Methods : AS 1289 6.1.1, 5.1.1 & 2.1.1.

- Date of receipt of sample: 20/05/2019.
- \* Denotes not used in test sample.

NATA Accredited Laboratory Number:1327

Accredited for compliance with ISO/IEC 17025 - Testing. This document shall not be reproduced except in full.

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Approved Signatory / Date (D. Treweek) 29/51

Appendix F Atterberg Limit Test Results sheet



115 Wicks Road Macquarie Park, NSW 2113 PO Box 976 North Ryde, Bc 1670 Telephone: 02 9888 5000 Facsimile: 02 9888 5001



### ATTERBERG LIMIT AND LINEAR SHRINKAGE TEST REPORT

Client:	Pells Sullivan Meynink	Ref No: L4290E	
Project:	Ryde Hospital	Report: 1	
PSM Job N	lo.: PSM3828	Report Date: 29/05/2019	
		Page 1 of 1	

AS 1289	TEST METHOD	3.1.2	3.2.1	3.3.1	3.4.1	
BOREHOLE NUMBER	DEPTH m	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX %	LINEAR SHRINKAGE %	
1	0.50 - 3.00	50	21	29	14.0	
3	0.50 - 1.90	76	24	52	19.0	
4	0.50 - 1.30	54	23	31	15.0	
7	0.50 - 3.00	30	17	13	7.5 *	
10	0.10 - 2.90	35	20	15	9.0	
13	0.30 - 3.50	39	19	20	11.0	

#### Notes:

· The test sample for liquid and plastic limit was air-dried & dry-sieved

The linear shrinkage mould was 125mm

· Refer to appropriate notes for soil descriptions

Date of receipt of sample: 20/05/2019.

· Sampled and supplied by client.

• \* Denotes Linear Shrinkage cracked.



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Authorised Signatu 29/5/19 (D. Troweek)

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Appendix G Aggressivity Test Results Sheet





#### **CERTIFICATE OF ANALYSIS**

Work Order	ES1915695	Page	: 1 of 4
Client	: PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: NGOC TUAN HOANG	Contact	: Customer Services ES
Address	: G3, 56 DELHI ROAD	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
	NORTH RYDE NSW, AUSTRALIA 2113		
Telephone	:	Telephone	: +61-2-8784 8555
Project	: PSM3828 RYDE HOSPITAL	Date Samples Received	: 22-May-2019 15:00
Order number	:	Date Analysis Commenced	: 24-May-2019
C-O-C number	:	Issue Date	28-May-2019 18:00
Sampler	: NGOC TUAN HOANG		Iac-MRA NATA
Site	:		
Quote number	: EN/333		Accreditation No. 825
No. of samples received	: 6		Accredited for compliance with
No. of samples analysed	: 6		ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

#### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW



#### **General Comments**

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key: CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

• ED045G: LOR raised for Chloride on sample 4 due to sample matrix.

# Page : 3 of 4 Work Order : ES1915695 Client : PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD Project : PSM3828 RYDE HOSPITAL



#### Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	BH01 1m	BH03 0.5m	BH04 1m	BH07 0.5-1m	BH11 0.5m
	Cl	ient sampli	ng date / time	14-May-2019 09:00	15-May-2019 10:00	15-May-2019 09:00	17-May-2019 09:00	18-May-2019 11:00
Compound	CAS Number	LOR	Unit	ES1915695-001	ES1915695-002	ES1915695-003	ES1915695-004	ES1915695-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value		0.1	pH Unit	4.7	8.7	5.1	6.8	4.7
EA055: Moisture Content (Dried @ 105-1	10°C)							
Moisture Content		1.0	%	17.2	5.1	20.1	18.3	17.4
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	50	90	40	180	110
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	10	<10	20	<50	30

# Page : 4 of 4 Work Order : ES1915695 Client : PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD Project : PSM3828 RYDE HOSPITAL

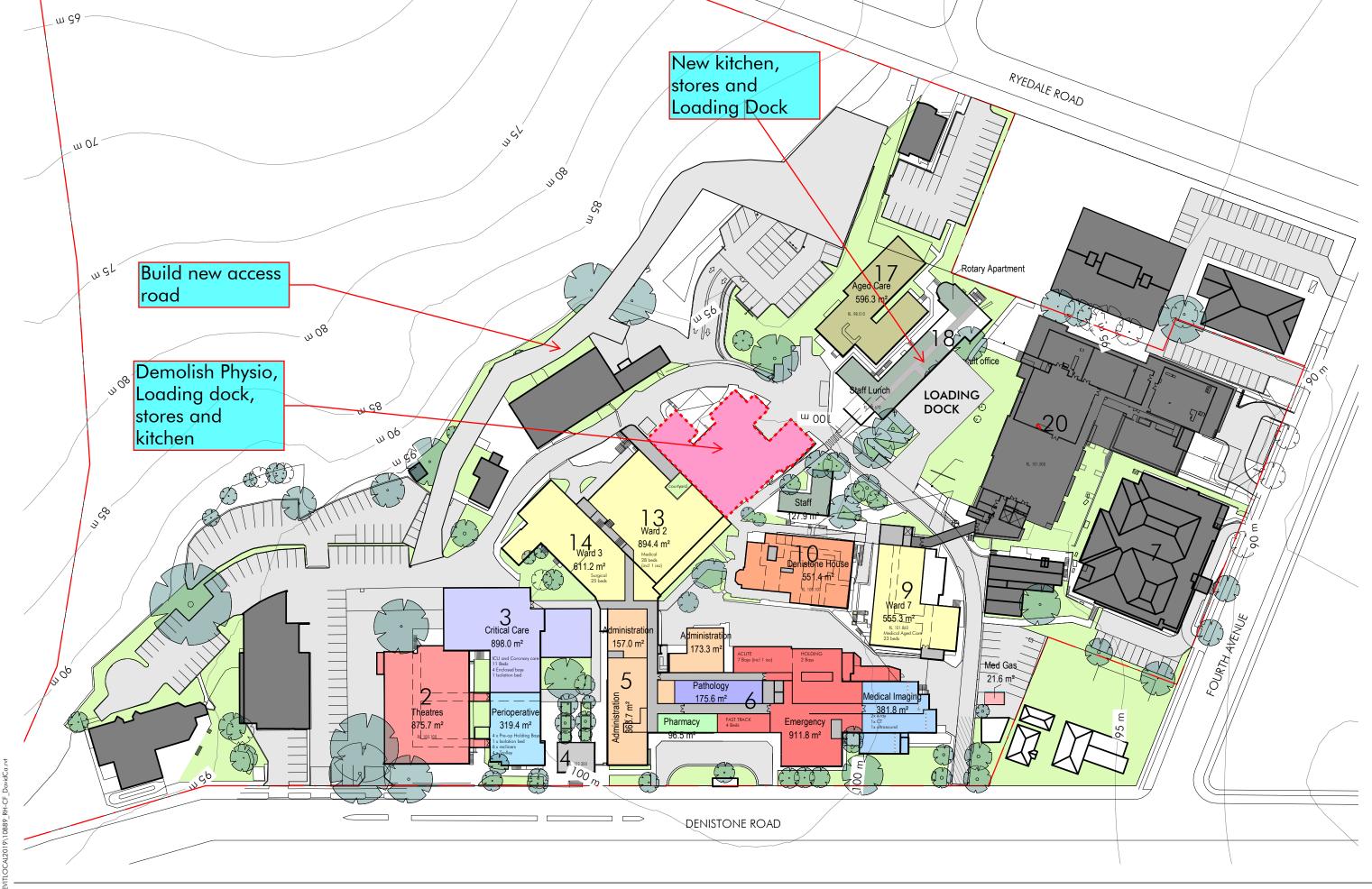


#### Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	BH13 0.5-1m	 	 
	CI	ient sampli	ng date / time	19-May-2019 07:00	 	 
Compound	CAS Number	LOR	Unit	ES1915695-006	 	 
				Result	 	 
EA002: pH 1:5 (Soils)						
pH Value		0.1	pH Unit	9.5	 	 
EA055: Moisture Content (Dried @ 105-1	10°C)					
Moisture Content		1.0	%	19.7	 	 
ED040S : Soluble Sulfate by ICPAES						
Sulfate as SO4 2-	14808-79-8	10	mg/kg	240	 	 
ED045G: Chloride by Discrete Analyser						
Chloride	16887-00-6	10	mg/kg	<10	 	 

Appendix H Ryde Hospital Sketches





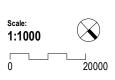


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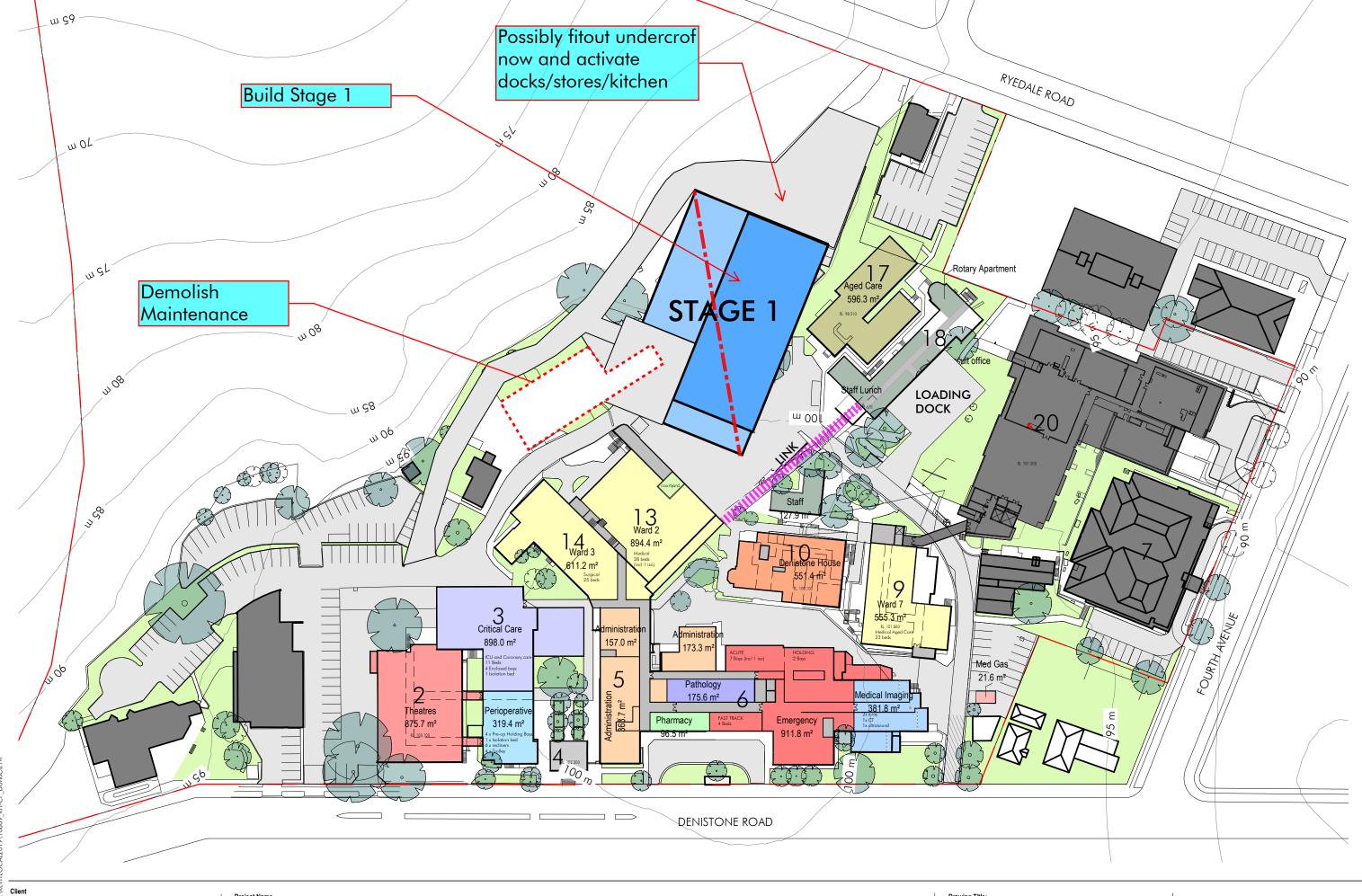
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Drawing Title: Level 1 - Departments





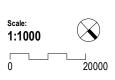




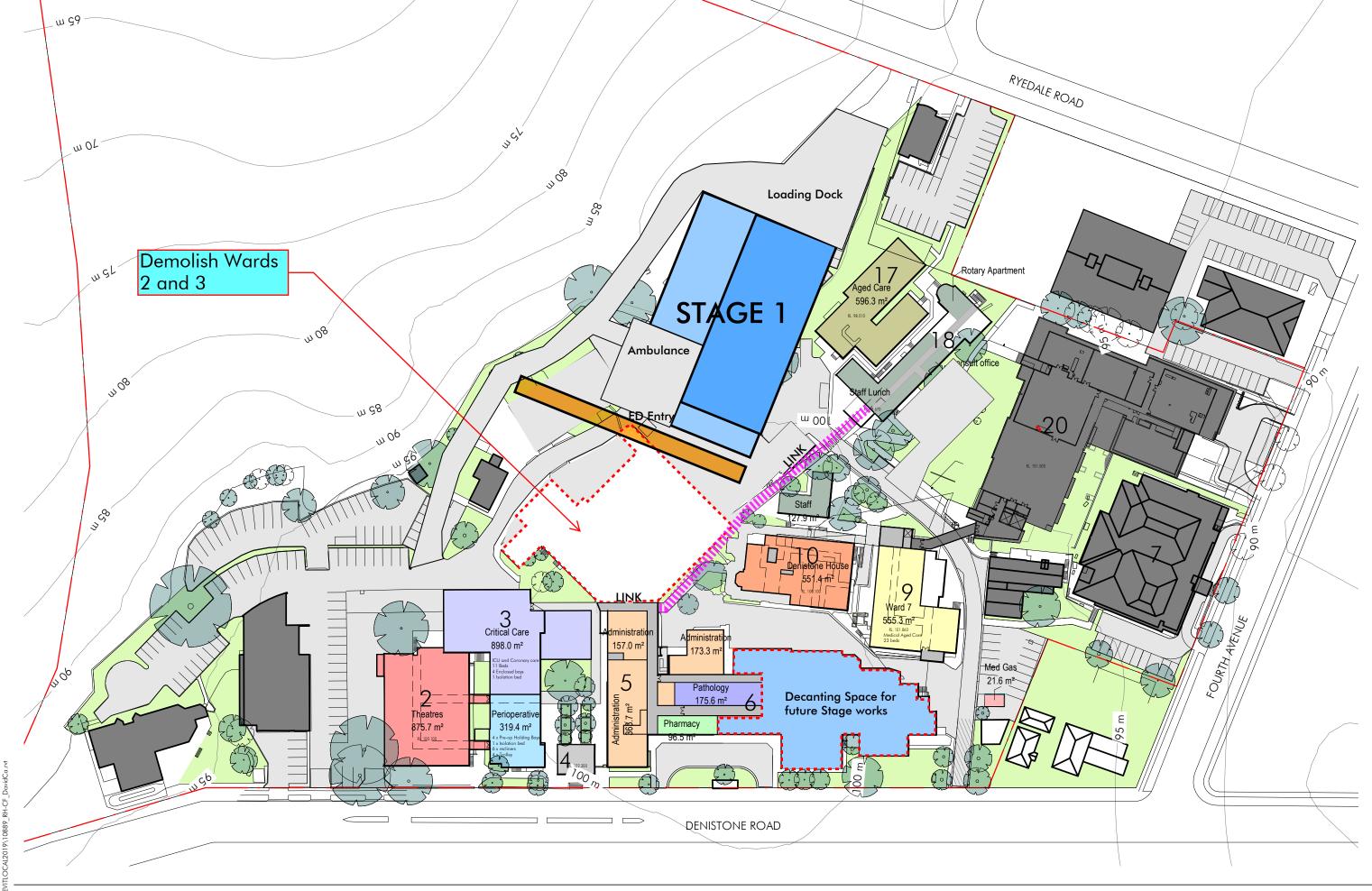
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Project Address Denistone Road, Eastwood, NSW, 2122

Document Status For Information Drawing Title: Level 1 - Departments Date: Sheet Size 22.11.2018 A3 Drawing Number: Issue: 10889\_SK006 2





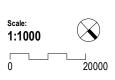




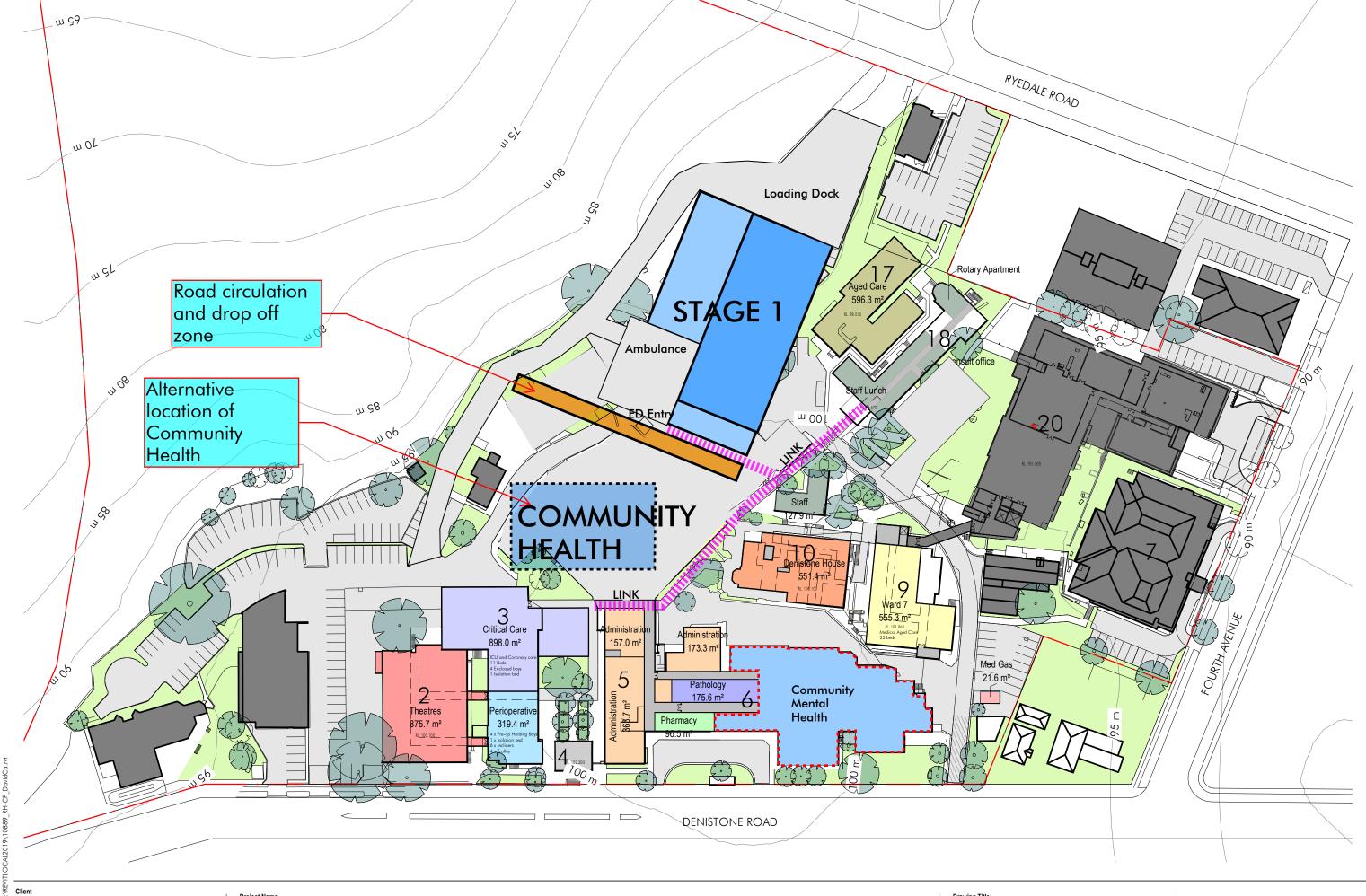
Health Infrastructure Project Name Ryde Hospital Site Evaluation

Project Address Denistone Road, Eastwood, NSW, 2122

Document Status For Information Drawing Title: Level 1 - Departments Date: Sheet Size 22.11.2018 A3 Drawing Number: Issue: 10889\_SK006 2







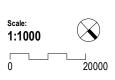


Project Name Ryde Hospital Site Evaluation

Project Address Denistone Road, Eastwood, NSW, 2122

Document Status For Information Date: Sheet Size 22.11.2018 A3 Drawing Number: Issue: 10889\_SK006 2

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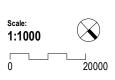
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Infrastructure

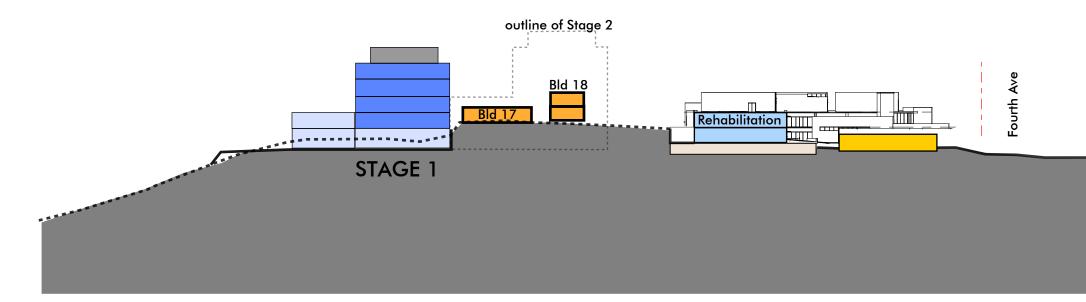
Project Name Ryde Hospital Site Evaluation

Project Address Denistone Road, Eastwood, NSW, 2122

Document Status For Information Drawing Title: Level 1 - Departments Date: Sheet Size 22.11.2018 A3 Drawing Number: Issue: 10889\_SK006 2





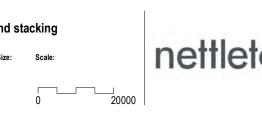




Project Name Ryde Hospital Site Evaluation

Project Address Denistone Road, Eastwood, NSW, 2122

Document Status For Information Drawing Title: Sections blocking and stacking Date: Sheet Size: Scale: A3 Drawing Number: Issue: \_\_\_\_\_ 10889\_SK019 0



## **nettleton**tribe