Our Ref: PSM3828-006L

25 March 2022

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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

The following SEARs requirements are relevant for the geotechnical investigation:

Item	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.	We assess that there is minimum or close to no impact on the soil resource at the site. This assessment is based on the following considerations: • The site has been used for hospital for many decades. • The proposed re-development does not change the site use. 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. 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.

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

Yours Sincerely

GREG FAZZONE
GEOTECHNICAL ENGINEER

AGUSTRIA SALIM
PRINCIPAL ENGINEER

Encl.

- PSM3828-002R REV 2

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 (%)	OMC (%)	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.

Table 3 - Summary of Aggressivity Testing Results

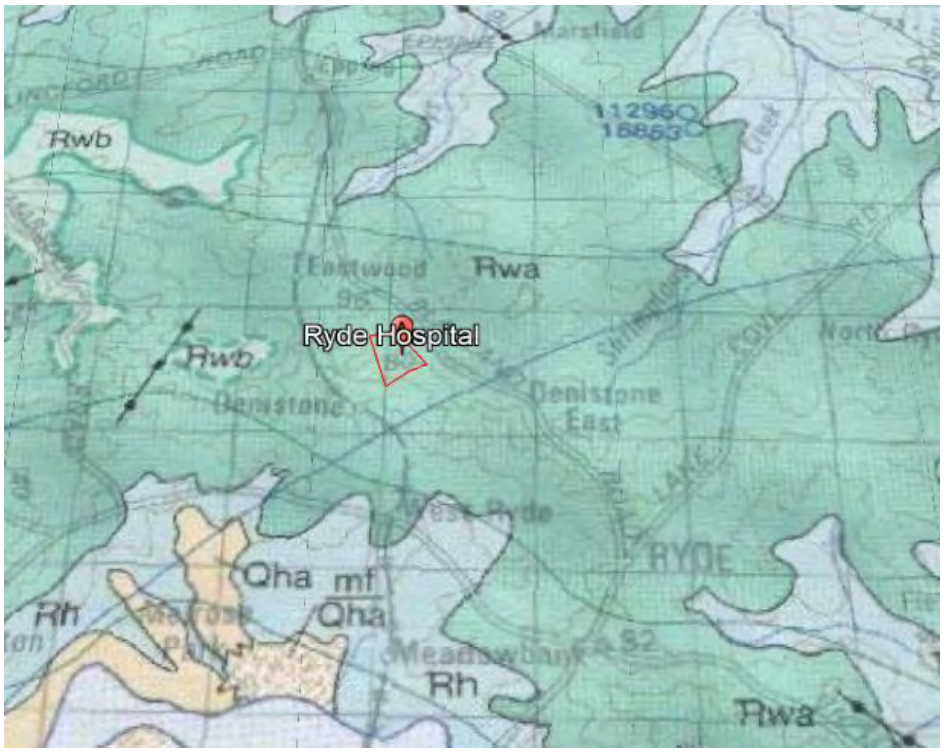
Sample ID	Sample Depth	pH	Moisture Content (%)	Chloride by Discrete Analyser (mg/kg)	Soluble Sulfate by ICPAES (mg/kg)
BH01	1.0 m	4.7	17.2	10	50
BH03	0.5 m	8.7	5.1	<10	90
BH04	1.0 m	5.1	20.1	20	40
BH07	0.5 m – 1.0 m	6.8	18.3	<50	180
BH11	0.5 m	4.7	17.4	30	110
BH13	0.5 m – 1.0 m	9.5	19.7	<10	240

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 types)		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. CLAY with gravel, dark grey and orange, medium plasticity, sub-angular gravel size up to 5mm, very stiff consistency, trace of rootlets. 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. CLAYEY SAND with 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. SILTY GRAVEL, pale grey and yellow, medium grained size, crushed sandstone rocks – moderately weathered and high strength.
Residual		SILTY CLAY: pale grey, brown and orange, low to medium plasticity, very stiff to hard consistency.
Bedrock	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.
	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.

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

BH ID	Depth to Top of Inferred Unit (m below surface level)					
	Asphalt/Concrete Topsoil	Fill	Residual	Bedrock		EOH[1]
				Class IV/V	Class III	
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[2]	N/E	0.00	3.60	4.60	N/E	5.00
BH10[2]	0	0.10	>3.00	N/E	N/E	3.00
BH11[2]	0	0.10	4.00	4.50	N/E	6.00
BH12[2]	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

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.

Table 6 – Batter Slope Angles

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

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

Inferred Unit	Bulk Unit Weight (kN/m^3)	Soil Effective Strength Parameters		Ultimate Bearing Pressure Under Vertical Centric Loading (kPa)[1, 2]	Allowable Bearing Pressure (ABP) Under Vertical Centric Loading (kPa)[1, 3]	Ultimate Shaft Adhesion (kPa)[4]	Elastic Parameters	
		c' (kPa)	ϕ' (deg)				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.A		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, Φg = 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

NGOC TUAN HOANG
GEOTECHNICAL ENGINEER

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PRINCIPAL

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LEGEND

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

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JBS&G
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

JBS&G

Ryde Hospital

Eastwood, NSW

GEOTECHNICAL INVESTIGATION

GENERAL SITE PHOTOS

PSM3828-002R	**Figure 2.1**

Pells Sullivan Meynink

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

JBS&G

Ryde Hospital

Eastwood, NSW

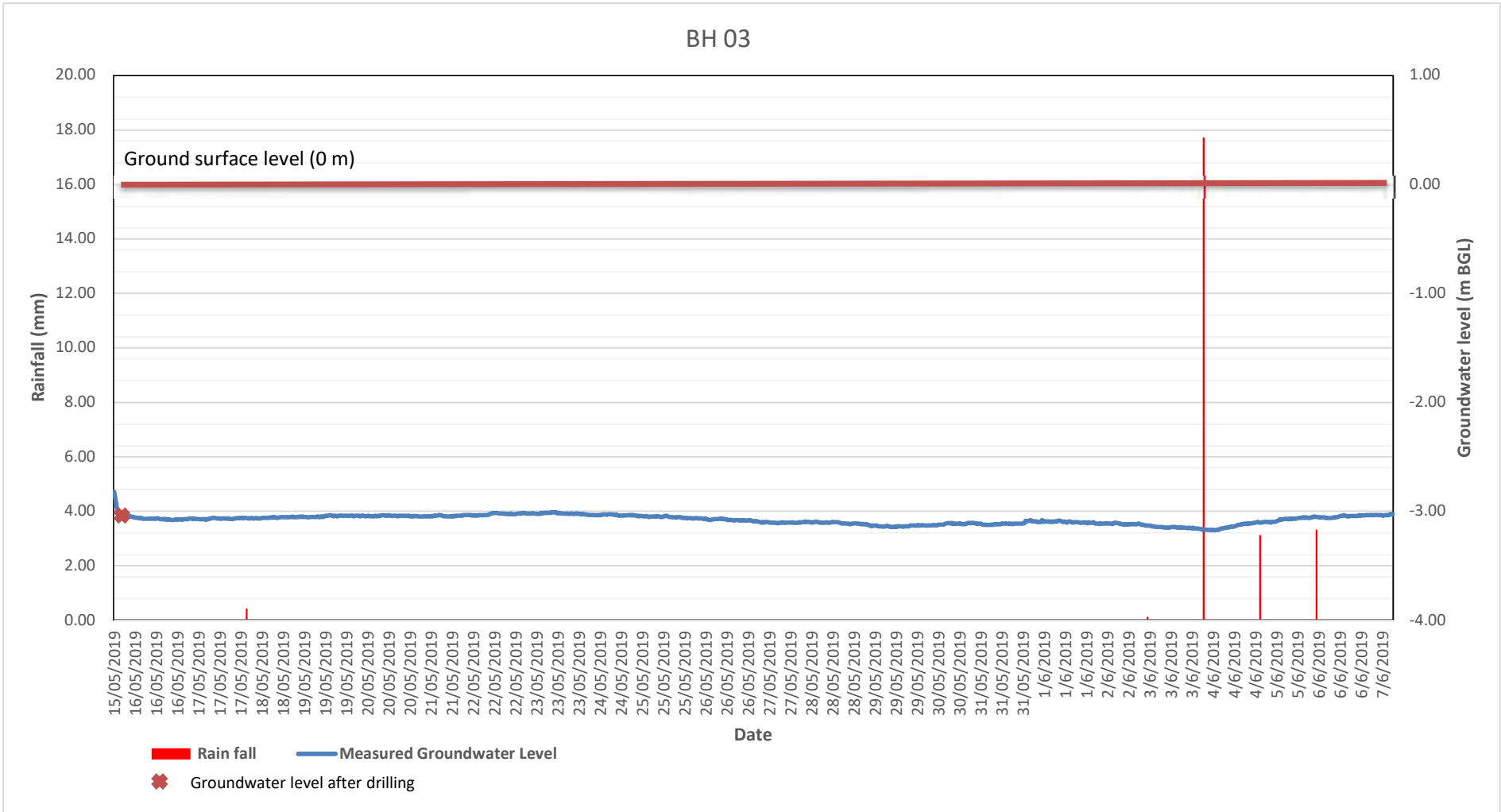
GEOTECHNICAL INVESTIGATION

GENERAL SITE PHOTOS

PSM3828-002R	**Figure 2.2**

Pells Sullivan Meynink

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



Notes:

1. Instrument elevation: 8.09 m BGL
2. Rainfall data source: BOM Website. SILO Australian Government, Eastwood Bowling Club (No: 66087)
3. Measured water level (using tape measure) on 17/05/2019: 3.01 m BGL
4. Data logger installed on 15/05/2019

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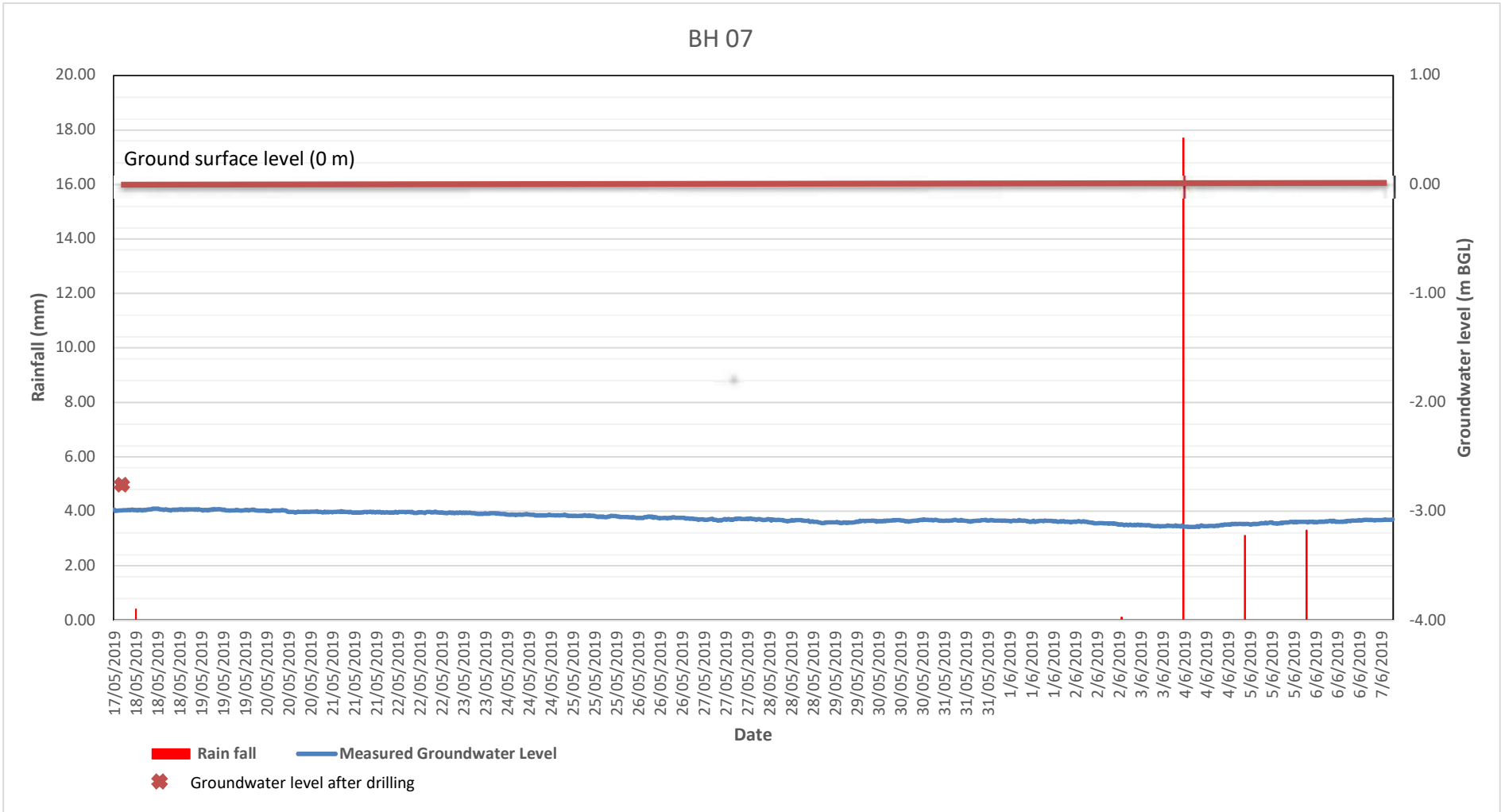
GEOTECHNICAL INVESTIGATION
GROUNDWATER MONITORING - BH03

PSM3828-002R	Figure 3.1



Notes:

1. Instrument elevation: 8.825 m BGL
2. Rainfall data source: BOM Website. SILO Australian Government, Eastwood Bowling Club (No: 66087)
3. Measured water level (using tape measure) on 17/05/2019: 2.70 m BGL
4. Data logger installed on 17/05/2019

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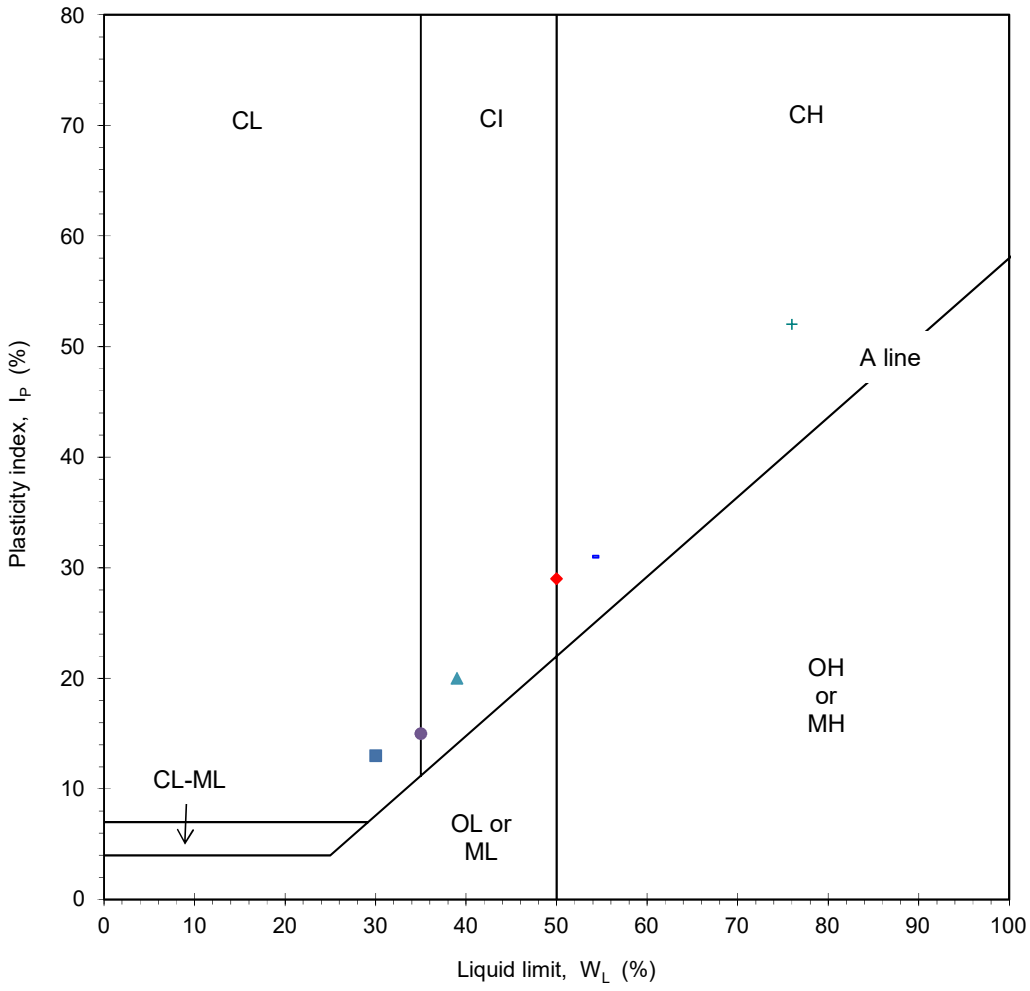
Ryde Hospital
Eastwood, NSW
GEOTECHNICAL INVESTIGATION
GROUNDWATER MONITORING - BH07

PSM3828-002R	Figure 3.2



◆ BH01, 0.5 m - 3.0 m, Silty Clay + BH03, 0.5 m - 1.9 m, Silty Clay - BH04, 0.5 m - 1.3 m, Silty Clay

■ BH07, 0.5 m - 3.0 m, Silty Clay ● BH10, 0.1 m - 2.9 m, Silty Sand ▲ BH13, 0.3 m - 3.5 m, Silty Clay

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Eastwood, NSW
GEOTECHNICAL INVESTIGATION
ATTERBERG LIMITS - PLASTICITY CHART

PSM3828-002R	Figure 4

Appendix A
Geotechnical Engineering Borehole Logs

EXPLANATION SHEET
BOREHOLE LOG

GENERAL

Method

Non-Cored Borehole
Auger
Hand Auger
Diamond Rotary
Percussion
Other

Coring Size

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	-

Testing

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

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

Moisture Condition

Term	Symbol
Dry	D
Moist	M
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	H	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_s50 (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	M	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	H	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

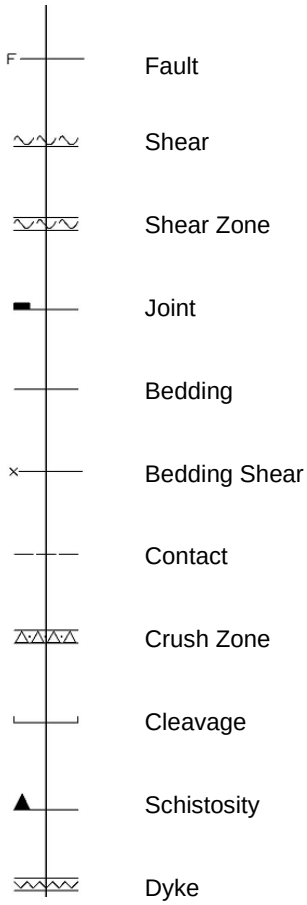
Defect Description

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

Defect Type

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.

Standard Defect Symbols



Roughness Colour Code (for summary log)

Ro1
Ro2
Ro3
Ro4
Ro4

Shape

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.

Roughness

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 Type

Symbol	Description
KL	Clean
CA	Calcite
CB	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

Infill Thickness

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

ST Iron oxide staining of less than 1 mm
VN Veneer 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.

Borehole ID

BH01

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	14/05/2019
Project Name:	Ryde Hospital	Completed:	14/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323083.0 m E 6258892.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey
Hole Diameter:	125 mm	Bearing:		Datum:	AHD Operator: Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	CBR 0.50-3.00 m					SM	Silty SAND with gravel: fine grained, dark brown; gravel sub-angular up to 5mm; trace of rootlets.	M	L		0.00: TOPSOIL 0.20: INFERRED FILL 0.25: Rootlets observed
									CI-ML	Silty CLAY with gravel: medium plasticity, dark brown, grey & black; gravel sub-angular up to 5mm.		St		
				SPT 1.00-1.45 m 5,6,10 N=16			1		CI-ML	Silty CLAY: medium plasticity, pale grey & brown; ripped siltstone and iron stone.				0.90: INFERRED RESIDUAL SOIL 1.00: SPT recovery 350mm
AD/T		N		SPT 2.00-2.45 m 10,10,17 N=27			2				M	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, extremely weathered, extremely low strength, iron staining.		H	×	3.00: SPT recovery 400mm 3.10: INFERRED BEDROCK
							4			Continued on cored borehole sheet				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID
BH01

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	14/05/2019
Project Name:	Ryde Hospital	Completed:	14/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323083.0 m E 6258892.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

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)	Weathering (XW HW MW SW FR)	Strength Is(50) (● - Axial, ○ - Diametral) (VL 0.1 L 0.3 M 1 H 3 VH 10 EH)	Defect Spacing (mm) (<20 60 200 600 1000)	Defect Descriptions / Comments (Description, alpha/beta, infilling or coating, shape, roughness, thickness, other)
						0–3.45		Continued from non-cored borehole sheet				
NMLC	Not Observed	83				3.45–4.63		LAMINITE: pale grey & red, orange banding, bedding fabric visible, well developed, iron staining.	HW to 4.3; MW	L	200–600	JT, 70°, RF, IR, RF SM, 0°, CL, PR, RF, +30 mm JT, 23°, FE SN, PR, RF
		67				4.63–5.0		NO CORE 370mm				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	14/05/2019
Project Name:	Ryde Hospital	Completed:	14/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323083.0 m E 6258892.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting: Hanjin- D8 | Inclination: -90° | RL Surface: No survey
Barrel Type and Length: Triple Tube 3 m | Bearing: | Datum: AHD | Operator: Rockwell

Drilling Information							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	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Observed	67				6		LAMINITE: pale grey & red, orange banding, bedding fabric visible, well developed, iron staining.				BP, 21°, FE SN, CU, RF JT, 14°, CN, PR, RF
		61	5.85m Is(50) d=0 a=0.1 MPa 6.46m Is(50) d=0 a=0 MPa			7		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 plasticity), iron staining.				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, +40 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 JT, 79°, FE SN, PR, RF BP, 3°, FE SN, PR, RF SM, 0°, CL, RPR, S, +20 mm 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, 21°, FE SN, PR, S JT, 62°, FE SN, PR, RF JT, 47°, FE SN, PR, S BP, 3°, FE SN, PR, S
		59	7.64m Is(50) d=0.1 a=0.1 MPa 8.86m Is(50) d=0.3 a=0.1 MPa			8		8.3m - Becomes pale grey & black with black banding, 60%-70% siltstone, 30%-40% sandstone.				SM, 7°, CL, PR, S, +10 mm FZ, 0°, RF, PR, S, +20 mm SM, 0°, SM, PR, S, +20 mm BP, 4°, FE SN, PR, RF SM, 5°, CL, PR, S, +10 mm SM, 0°, CL, PR, S, +20 mm SM, 0°, CL, PR, S, +30 mm BP, 0°, FE SN, PR, RF BP, 12°, CL, PR, S BP, 7°, FE SN, PR, S BP, 4°, RF, PR, S BP, 0°, FE SN, PR, S BP, 0°, CN, PR, S
						9		Hole Terminated at 9.00 m Target depth, hole grouted to surface and reinstated				JT, 23°, FE SN, PR, RF

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH02

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	14/05/2019
Project Name:	Ryde Hospital	Completed:	14/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323120.0 m E 6258898.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey	
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator: Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N								ASPHALT - 200m : black & dark grey	D			0.00: PAVEMENT
									CI-ML	Silty CLAY with gravel: medium plasticity, dark brown & red; gravel sub-angular up to 5mm.		St to VSt		0.20: INFERRED FILL
									CI-ML	Silty CLAY: medium plasticity, pale grey & red.		VSt		0.50: INFERRED RESIDUAL SOIL
				SPT 1.00-1.45 m 18,13,Refusal			1							1.00: SPT recovery 260mm
														1.20: V-bit refusal
										LAMINITE: pale grey, brown & orange, extremely weathered, extremely low strength, iron staining.				1.40: INFERRED BEDROCK
AD/T		N	Not Observed				2							
										LAMINITE: pale grey & orange, highly weathered, very low strength to low strength, orange banding, bedding fabric visible, well developed, iron staining.	D	H		
							3							
							4			4.5m - Becomes dark brown				4.00: Rootlets observed

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	14/05/2019
Project Name:	Ryde Hospital	Completed:	14/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323120.0 m E 6258898.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N	Not Observed				6			LAMINITE: pale grey & orange, highly weathered, very low strength to low strength, orange banding, bedding fabric visible, well developed, iron staining. *(continued)*	D			
										6.4m - Becomes dark grey & brown				
							7			LAMINITE: dark grey & brown, moderately weathered to slightly weathered, very low strength to low strength, white banding, well developed, 80%-90% siltstone, 10%-20% sandstone, thin fine-grained sandstone laminations, iron staining.		H		
										7.3m to 8.5m - Multiple clay bands (dark brown, black & high plasticity)	M			
							8							
							9			Continued on cored borehole sheet				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	14/05/2019
Project Name:	Ryde Hospital	Completed:	14/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323120.0 m E 6258898.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information							***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	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
						6						
						7						
						8		Continued from non-cored borehole sheet				
NMLC	Not Observed	98	9.31m Is(50) d=0.1 a=0.3 MPa			9		LAMINITE: pale grey & black, black banding, very well developed, 60%-70% siltstone, 30%-40% sandstone, thin fine-grained siltstone laminations.				SM, 0°, CL, PR, S, +20 mm JT, 62°, CN, ST, S BP, 0°, CN, PR, S JT, 70°, CN, ST, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	14/05/2019
Project Name:	Ryde Hospital	Completed:	14/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323120.0 m E 6258898.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting: Hanjin- D8 — Inclination: -90° — RL Surface: No survey
Barrel Type and Length: Triple Tube 3 m — Bearing: — Datum: AHD — Operator: Rockwell

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)	Weathering	Strength Is(50) (● Axial, ○ Diametral)	Defect Spacing (mm)	Defect Descriptions / Comments
NMLC	Not Observed	98	10.11m Is(50) d=0.1 a=0.5 MPa; 10.79m Is(50) d=0.1 a=0.1 MPa			11		LAMINITE: pale grey & black, black banding, very well developed, 60%-70% siltstone, 30%-40% sandstone, thin fine-grained siltstone laminations.*(continued)*	FR			BP, 7°, CN, PR, S; CZ, 0°, RF, +50 mm; BP, 0°, CN, PR, S; BP, 0°, CL, PR, S
						12, 13, 14		Hole Terminated at 11.27 m Target depth, hole grouted to surface and reinstated				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH03

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	15/05/2019
Project Name:	Ryde Hospital	Completed:	15/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323214.0 m E 6258884.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey
Hole Diameter:	125 mm	Bearing:		Datum:	AHD Operator: Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	CBR 0.50-1.90 m SPT 1.00-1.45 m 2,4,5 N=17 SPT 1.85-2.00 m 17,Refusal			1 2 3 4		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 M	St		0.00: PAVEMENT 0.10: INFERRED FILL 0.90: Rootlets observed 1.00: SPT recovery 380mm
									CH-MH	Silty CLAY: high plasticity, dark brown, black & orange; trace of rootlets.		VSt		1.30: INFERRED RESIDUAL SOIL
										1.8m - Becomes pale grey		H		1.85: SPT recovery 150mm
										LAMINITE: pale grey, orange & red, extremely weathered, extremely low strength., iron staining.				1.90: INFERRED BEDROCK
										Continued on cored borehole sheet				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH03

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	15/05/2019
Project Name:	Ryde Hospital	Completed:	15/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323214.0 m E 6258884.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information / Rock Substance / Rock Mass Defects

Columns: 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); Weathering (XW HW MW SW FR); Strength Is(50) (● - Axial, ○ - Diametral; VL 0.1 L 0.3 M 1 H 3 VH 10 EH); Defect Spacing (mm) (<20 60 200 600 1000); Defect Descriptions / Comments (Description, alpha/beta, infilling or coating, shape, roughness, thickness, other)

Method: NMLC (from 2.0 m). Water: Not Observed.

Depth (m)	RQD (%)	Samples and Field Tests	Material Description	Weathering	Defect Descriptions / Comments
2.00			Continued from non-cored borehole sheet		2.00: V-bit refusal
2.00–3.50	79 (2.0–3.2 m)		LAMINITE: pale grey, orange & red, orange banding, well developed. Some clay bands (pale & dark grey and medium plasticity), iron staining.	XW	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		2.62m Is(50) d=0 a=0.1 MPa			2.62: Rootlets observed; SM, 3°, CL, PR, S, +20 mm
~3.0					SM, 0°, CL, PR, S, +20 mm; SM, 0°, CL, PR, S, +10 mm; SM, 0°, Fe & Clay SN, PR, RF, +70 mm; SM, 0°, CL, PR, S, +10 mm; BP, 7°, Fe & Clay SN, PR, RF
3.50	83 (3.2–5.0 m)		3.5m - Becomes highly weathered	HW	CZ, 0°, RF, +20 mm
3.58		3.58m Is(50) d=0 a=0.1 MPa			
~4.0					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
4.63		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

Strength: point load tests plotted at 2.62 m, 3.58 m and 4.63 m (Axial, VL–L range). Defect spacing: approx. 200–600 mm from 2.0 to 3.0 m; approx. 60–200 mm from 3.0 to 5.0 m.

Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- HQ3- Wireline core (63.5 mm)
- PQ3- Wireline core (85.0 mm)
- SPT- Standard penetration test
- PT - Push tube
- WPT - Water pressure test

Water
- Inflow
- Partial Loss
- Complete Loss

Graphic Log/Core Loss
- Core recovered (hatching indicates material)
- No core recovery

Weathering
- XW - Extremely Weathered
- HW - Highly Weathered
- MW - Moderately Weathered
- SW - Slightly Weathered
- FR - Fresh

Strength
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH - Very High
- EH - Extremely High

Defect Type
- FT - Fault
- SS - Shear Surface
- SZ - Shear Zone
- BP - Bedding parting
- SM - Seam
- IS - Infilled Seam
- JT - Joint
- CO - Contact
- CZ - Crushed Zone
- VN - Vein
- FZ - Fracture Zone
- BSH - Bedding Shear
- DB - Drilling Break

Infilling/Coating
- CN - Clean
- SN - Stain
- VN - Veneer
- CO - Coating
- RF - Rock fragments
- G - Gravel
- S - Sand
- Z - Silt
- CA - Calcite
- CL - Clay
- FE - Iron
- QZ - Quartz
- X - Carbonaceous

Roughness
- SL - Slickensided
- POL - Polished
- S - Smooth
- RF - Rough
- VR - Very Rough

Shape
- PR - Planar
- CU - Curved
- UN - Undulating
- ST - Stepped
- IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	15/05/2019
Project Name:	Ryde Hospital	Completed:	15/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323214.0 m E 6258884.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information							***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	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Observed	83						LAMINITE: pale grey, orange & red, orange banding, well developed. Some clay bands (pale & dark grey and medium plasticity), iron staining.*(continued)* 5.45m - Becomes dark grey				SM, 0°, CL, PR, S, +30 mm SM, 0°, CL, PR, S, +20 mm SM, 0°, CL, PR, S, +20 mm SM, 0°, CL, PR, S, +20 mm SM, 0°, Fe & Clay SN, PR, RF, +20 mm SM, 0°, CL, PR, S, +20 mm BP, 0°, FE SN, PR, RF BP, 12°, Fe & Clay SN, ST, RF SM, 0°, CL, PR, S, +20 mm BP, 0°, FE SN, PR, RF BP, 0°, FE SN, PR, RF CZ, 0°, RF, +20 mm SM, 0°, CL, PR, S, +20 mm SM, 0°, CL, PR, S, +150 mm
			5.67m Is(50) d=0 a=0 MPa 6.30m Is(50) d=0 a=0 MPa			6						
		44										CZ, 0°, RF & CL, +140 mm SM, 0°, CL, PR, S, +120 mm
						7		NO CORE 600mm				SM, 0°, CL, PR, S, +30 mm BP, 0°, Fe & Clay SN, PR, S CZ, 0°, RF, +50 mm SM, 0°, CL, PR, S, +20 mm BP, 0°, FE SN, PR, S BP, 0°, FE SN, PR, S
		77	8.52m Is(50) d=0 a=0 MPa 9.09m Is(50) d=0.5 a=0.4 MPa			8		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.				SM, 0°, Fe & Clay SN, PR, S, +30 mm SM, 0°, Fe & Clay SN, PR, S, +120 mm CO, 0°, FE SN, PR, S SM, 0°, CL, PR, S, +20 mm BP, 0°, FE SN, PR, S SM, 0°, CL, PR, S, +10 mm
						9						SM, 0°, CL, PR, S, +20 mm JT, 48°, CL, IR, S
								Hole Terminated at 9.13 m Target depth. Standpipe installed				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH04

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	16/05/2019
Project Name:	Ryde Hospital	Completed:	16/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323192.0 m E 6258865.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey
Hole Diameter:	125 mm	Bearing:		Datum:	AHD

Operator: Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	CBR 0.50-1.30 m SPT 1.00-1.45 m 5,32,Refusal			0 1 2 3 4			ASPHALT - 200m : black & dark grey	D			0.00: PAVEMENT
									CI-ML	Silty CLAY with gravel: medium plasticity, dark brown, red & black; gravel sub-angular up to 5mm; trace of rootlets.		St		0.20: INFERRED FILL
									CI-CH	Silty CLAY: medium to high plasticity, dark brown, red & orange; trace of rootlets.	M	VSt	×	0.80: INFERRED RESIDUAL SOIL 1.00: SPT recovery 340mm 1.10: Rootlets observed
										1.3m - Becomes pale grey & orange		H	×	1.35: INFERRED BEDROCK
										LAMINITE: pale grey, orange & red, extremely weathered, extremely low strength., iron staining.				
										Continued on cored borehole sheet				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	16/05/2019
Project Name:	Ryde Hospital	Completed:	16/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323192.0 m E 6258865.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting: Hanjin- D8 | Inclination: -90° | RL Surface: No survey

Barrel Type and Length: Triple Tube 3 m | Bearing: | Datum: AHD | Operator: Rockwell

Drilling Information							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	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
						1		Continued from non-cored borehole sheet				1.50: V-bit refusal
NMLC	Not Observed	90	1.96m Is(50) d=0 a=0 MPa 2.24m Is(50) d=0 a=0 MPa			2		LAMINITE: pale grey, orange & red, orange banding, well developed. Some clay bands (pale grey & medium plasticity), iron staining.				BP, 8°, Fe & Clay SN, ST, VRF BP, 12°, FE SN, ST, RF BP, 0°, FE SN, PR, S JT, 87°, CN, PR, S BP, 12°, FE SN, PR, RF SM, 0°, CL, PR, S, +20 mm SM, 0°, CL, PR, S, +110 mm CZ, 0°, RF, +30 mm SM, 0°, CL, PR, S, +20 mm
		45	3.50m Is(50) d=0 a=0.1 MPa			3						BP, 0°, FE SN, UN, RF SM, 0°, CL, PR, S, +30 mm BP, 0°, CL, PR, S BP, 0°, CL, PR, S SM, 0°, CL, PR, S, +10 mm BP, 0°, Fe & Clay SN, PR, S SM, 0°, CL, PR, S, +20 mm BP, 0°, FE SN, PR, S JT, 40°, FE SN, PR, RF
						4		NO CORE 640mm				BP, 0°, FE SN, PR, S CZ, 0°, RF, +40 mm
		70	4.35m Is(50) d=0.3 a=0.4 MPa					LAMINITE: pale grey & orange, orange banding, bedding fabric visible, well developed. Some clay bands (pale & dark grey and medium plasticity), iron staining.				JT, 82°, FE SN, PR, RF JT, 87°, FE SN, PR, RF BP, 0°, FE SN, PR, S SM, 0°, CL, PR, S, +30 mm CZ, 0°, RF & CL, +20 mm

Method

AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water

Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss

Core recovered (hatching indicates material)
No core recovery

Weathering

XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength

VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type

FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating

CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness

SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape

PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	16/05/2019
Project Name:	Ryde Hospital	Completed:	16/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323192.0 m E 6258865.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information | **Rock Substance** | **Rock Mass Defects**

Columns: 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); Weathering (XW HW MW SW FR); Strength Is(50) (● - Axial, ○ - Diametral; VL 0.1 L 0.3 M 1 H 3 VH 10 EH); Defect Spacing (mm) (<20 60 200 600 1000); Defect Descriptions / Comments (Description, alpha/beta, infilling or coating, shape, roughness, thickness, other)

Method: NMLC
Water: Not Observed
RQD (%): 70; 81

Samples and Field Tests:
- 5.25m Is(50) d=0 a=0.1 MPa
- 6.79m Is(50) d=0.1 a=0.2 MPa
- 7.53m Is(50) d=0.1 a=0.2 MPa
- 8.30m Is(50) d=0.2 a=0.3 MPa

Depth (m): 6, 7, 8, 9

Material Description:

LAMINITE: pale grey & orange, orange banding, bedding fabric visible, well developed. Some clay bands (pale & dark grey and medium plasticity), iron staining.*(continued)*

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.

6.5m - Becomes pale grey & black with black banding, 70%-80% siltstone, 20%-30% sandstone

Hole Terminated at 8.40 m
Target depth, hole grouted to surface and reinstated

Defect Descriptions / Comments:
- CZ, 0°, RF, +20 mm
- BP, 0°, FE SN, PR, S
- BP, 0°, FE SN, PR, S
- BP, 3°, FE SN, PR, S
- BP, 0°, Fe & Clay SN, PR, S
- BP, 0°, FE SN, PR, S
- JT, 27°, FE SN, PR, S
- JT, 87°, FE SN, PR, S
- BP, 13°, FE SN, PR, S
- JT, 29°, FE SN, PR, S
- 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
- BP, 0°, FE SN, PR, S
- SM, 0°, CL, PR, S, +20 mm
- SM, 0°, CL, PR, S, +10 mm
- CZ, 0°, RF, +10 mm
- BP, 0°, FE SN, PR, S
- CO, 0°, CL, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH05

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	16/05/2019
Project Name:	Ryde Hospital	Completed:	16/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323107.0 m E 6258857.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey
Hole Diameter:	125 mm	Bearing:		Datum:	AHD Operator: Rockwell

Drilling Information								***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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed				0			ASPHALT - 100m : black & dark grey	D			0.00: PAVEMENT
									CL-ML	Silty CLAY with gravel: low plasticity, dark brown & grey; gravel sub-angular up to 10mm; trace of rootlets.		St		0.10: INFERRED FILL
									CL-ML	Silty CLAY: low plasticity, dark brown & grey; ripped siltstone, iron stone & trace of rootlets.	M	VSt		0.50: INFERRED RESIDUAL SOIL 0.60: Rootlets observed
AD/T		N					1			0.9m - Becomes pale grey & orange				0.90: V-bit refusal
										LAMINITE: pale grey & orange, extremely weathered, extremely low strength, iron staining.				1.20: INFERRED BEDROCK
							2				D	H		
							3			Continued on cored borehole sheet				
							4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	16/05/2019
Project Name:	Ryde Hospital	Completed:	16/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323107.0 m E 6258857.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information							***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	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
						1						
						2						
						3		Continued from non-cored borehole sheet				
NMLC	Not Observed	94	3.71m Is(50) d=0.1 a=0.3 MPa			3		LAMINITE: pale grey & orange, orange banding, bedding fabric visible, well developed. Some clay bands (pale grey & medium plasticity), iron staining.				SM, 0°, CL, PR, S, +30 mm SM, 0°, CL, PR, S, +30 mm BP, 0°, FE SN, PR, RF
						4						SM, 0°, CL, PR, S, +30 mm BP, 0°, FE SN, PR, RF BP, 0°, CL, PR, S SM, 0°, CL, PR, S, +10 mm BP, 0°, CN, PR, S
			4.48m Is(50) d=0.1 a=0.2 MPa					LAMINITE: pale grey & brown, white banding, well developed, 60%-70% siltstone, 30%-40% sandstone, fine-grained sandstone laminations, iron staining.				BP, 3°, FE SN, PR, S BP, 4°, FE SN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH05

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	16/05/2019
Project Name:	Ryde Hospital	Completed:	16/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323107.0 m E 6258857.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information / Rock Substance / Rock Mass Defects

Columns: 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) | Weathering (XW HW MW SW FR) | Strength Is(50) (● - Axial, ○ - Diametral; VL 0.1 L 0.3 M 1 H 3 VH 10 EH) | Defect Spacing (mm) (<20 60 200 600 1000) | Defect Descriptions / Comments (Description, alpha/beta, infilling or coating, shape, roughness, thickness, other)

Method: NMLC

Water: Not Observed

RQD (%): 94; 100

Depth markers: 6, 7, 8, 9

Material Description:

LAMINITE: pale grey & brown, white banding, well developed, 60%-70% siltstone, 30%-40% sandstone, fine-grained sandstone laminations, iron staining.*(continued)*

7.2m - Becomes dark grey & black with white banding, 80%-90% siltstone, 10%-20% sandstone

Hole Terminated at 8.45 m
Target depth, hole grouted to surface and reinstated

Samples and Field Tests:

- 5.54m Is(50) d=0.1 a=0.5 MPa
- 6.43m Is(50) d=0.2 a=0.2 MPa
- 7.83m Is(50) d=0.1 a=0.5 MPa
- 8.34m Is(50) d=0.1 a=0.2 MPa

Defect Descriptions / Comments:

- JT, 42°, FE SN, PR, S
- BP, 0°, FE SN, PR, S
- CZ, 0°, RF & CL, +30 mm
- CZ, 4°, RF & FE VN, +10 mm
- BP, 3°, RF, PR, RF
- JT, 84°, CN, PR, S
- BP, 0°, FE VN, PR, S
- BP, 0°, CN, PR, S
- BP, 10°, FE VN, PR, S

Method

AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water

Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss

Core recovered (hatching indicates material)
No core recovery

Weathering

XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength

VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type

FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating

CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness

SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape

PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH06

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	17/05/2019
Project Name:	Ryde Hospital	Completed:	17/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323155.0 m E 6258826.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey
Hole Diameter:	125 mm	Bearing:		Datum:	AHD Operator: Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N								ASPHALT - 100m : black & dark grey	D			0.00: PAVEMENT
									SM	Silty SAND with gravel: fine grained, yellow, brown & pale grey; gravel sub-angular up to 10mm; trace of rootlets.				0.10: INFERRED FILL 0.25: V-bit refusal
							1				M	D		
									CL-ML	Silty CLAY: low plasticity, pale brown & grey; trace of rootlets.		VSt		1.40: INFERRED RESIDUAL SOIL
							2			LAMINITE: pale grey, red & orange, extremely weathered, extremely low strength. Some clay bands (pale grey & medium plasticity), iron staining.				1.90: Rootlets observed 2.00: INFERRED BEDROCK
AD/T		N	Not Observed				3				D	H		
							4			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				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	17/05/2019
Project Name:	Ryde Hospital	Completed:	17/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323155.0 m E 6258826.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey	
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator: Rockwell

Drilling Information

Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)
NMLC	Not Observed	85	5.40m Is(50) d=0.1 a=0.1 MPa 5.87m Is(50) d=0.2 a=0.2 MPa 6.27m Is(50) d=0.5 a=0.7 MPa 7.24m Is(50) d=0.4 a=0.4 MPa			6 7 8 9

Rock Substance

Graphic Log | Material Description — ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration | Weathering (XW HW MW SW FR) | Strength Is(50) ● - Axial ○ - Diametral (VL 0.1 L 0.3 M 1 H 3 VH 10 EH)

Continued from non-cored borehole sheet

LAMINITE: dark grey & orange, white & orange banding, well developed, 70%-80% siltstone, 20%-30% sandstone, thin fine-grained sandstone laminations, iron staining.

6.2m - Becomes dark grey & black with white banding, 70%-80% siltstone, 20%-30% sandstone

Hole Terminated at 8.10 m
Target depth, hole grouted to surface and reinstated

Rock Mass Defects

Defect Spacing (mm) (<20 60 200 600 1000) | Defect Descriptions / Comments — Description, alpha/beta, infilling or coating, shape, roughness, thickness, other

- 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
- SM, 0°, CL, PR, S, +50 mm
- JT, 77°, CN, PR, S
- BP, 15°, CN, PR, S
- BP, 12°, FE VN, PR, RF
- JT, 88°, FE VN, PR, RF
- JT, 60°, FE VN, PR, RF
- SM, 0°, Fe & Clay SN, PR, S
- CO, 0°, FE SN, 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

Method

AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water

Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss

Core recovered (hatching indicates material)
No core recovery

Weathering

XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength

VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type

FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating

CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness

SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape

PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH07

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	17/05/2019
Project Name:	Ryde Hospital	Completed:	17/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323213.0 m E 6258823.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								***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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	CBR 0.50-3.00 m			0			ASPHALT - 100m : black & dark grey	D			0.00: PAVEMENT
									CI-ML	Silty CLAY with gravel: medium plasticity, dark brown & black; gravel sub-angular up to 10mm.		St		0.10: INFERRED FILL
									SM	Silty SAND with gravel: fine grained, brown & pale grey; gravel sub-angular up to 20mm; trace of rootlets.				
							1					D		0.90: V-bit refusal
AD/T		N							CL-ML	Silty CLAY: low plasticity, dark brown & grey.	M			1.20: Rootlets observed 1.30: INFERRED RESIDUAL SOIL
							2					VSt		
										LAMINITE: pale grey, red & orange, extremely weathered, extremely low strength, iron staining.	D	H		2.50: INFERRED BEDROCK
							3			Continued on cored borehole sheet				
							4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	17/05/2019
Project Name:	Ryde Hospital	Completed:	17/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323213.0 m E 6258823.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information | **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)	Weathering (XW HW MW SW FR)	Strength Is(50) (● - Axial, ○ - Diametral; VL L M H VH EH; 0.1 0.3 1 3 10)	Defect Spacing (mm) (<20 60 200 600 1000)	Defect Descriptions / Comments (Description, alpha/beta, infilling or coating, shape, roughness, thickness, other)
						1						
						2						
								Continued from non-cored borehole sheet				
NMLC	Not Observed	78				3		LAMINITE: pale grey, orange & red, orange banding, bedding fabric visible, well developed. Some clay bands (pale grey & medium plasticity), iron staining.				+100 mm, Heavily Fractured BP, 10°, Fe & Clay VN, PR, S
			3.48m Is(50) d=0 a=0 MPa									SM, 0°, CL, PR, S, +10 mm BP, 12°, Fe & Clay VN, PR, S SM, 0°, CL, PR, S, +30 mm SM, 0°, CL, PR, S, +20 mm CZ, 0°, RF & FE VN, +20 mm
						4						CZ, 0°, RF & FE VN, +20 mm SM, 0°, CL, PR, S, +20 mm CO, 0°, FE, PR, S FZ, 0°, FE VN, PR, S, +60 mm
								LAMINITE: pale grey & orange, white & orange banding, well developed, 80%-90% siltstone, 10%-20% sandstone, thin fine-grained sandstone laminations, iron staining.				
			4.82m Is(50) d=0.2 a=0.1 MPa									JT, 45°, CN, PR, S BP, 0°, CN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	17/05/2019
Project Name:	Ryde Hospital	Completed:	17/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323213.0 m E 6258823.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information							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	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Observed	78						LAMINITE: pale grey & orange, white & orange banding, well developed, 80%-90% siltstone, 10%-20% sandstone, thin fine-grained sandstone laminations, iron staining.*(continued)*				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			6						BP, 0°, FE SN, PR, RF CZ, 0°, RF, +20 mm JT, 67°, FE SN, PR, RF JT, 44°, FE SN, PR, RF BP, 0°, FE SN, PR, S JT, 45°, FE SN, PR, RF JT, 47°, FE SN, PR, RF
		78	6.49m Is(50) d=0 a=0 MPa									BP, 0°, FE SN, PR, RF, +10 mm BP, 0°, FE SN, PR, RF JT, 60°, FE SN, PR, S JT, 30°, FE SN, PR, S SM, 0°, CL, PR, S, +40 mm JT, 75°, FE SN, PR, S JT, 25°, FE SN, PR, S BP, 12°, FE VN, PR, S SM, 0°, Fe & Clay SN, PR, S, +20 mm BP, 0°, FE SN, PR, RF
			7.66m Is(50) d=0.1 a=0.2 MPa			7						
		88	8.64m Is(50) d=0.8 a=0.9 MPa			8		8.0m - Becomes dark grey & black with white banding, 70%-80% siltstone, 20%-30% sandstone.				BP, 0°, FE VN, PR, S BP, 0°, FE SN, PR, RF SM, 0°, CL, PR, S, +20 mm JT, 30°, FE VN, PR, S
						9						
								Hole Terminated at 9.17 m Target depth. Standpipe installed				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH08

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	17/05/2019
Project Name:	Ryde Hospital	Completed:	18/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323226.0 m E 6258801.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed				0			CONCRETE - 90m : Pale grey & white	D			0.00: PAVEMENT 0.09: INFERRED FILL
									CI-ML	Silty CLAY with gravel: medium plasticity, dark grey & black; gravel sub-angular up to 5mm.		St		0.50: V-bit refusal
									SM	Silty SAND with gravel: fine grained, dark brown & red; gravel sub-angular up to 15mm; trace of rootlets.	M	D		1.20: Rootlets observed
AD/T		N					1		CL-ML	Silty CLAY: low plasticity, pale grey & orange; ripped iron stone encountered at 2.3m.		VSt		1.40: INFERRED RESIDUAL SOIL
							2				D			
										LAMINITE: pale grey, red & orange, extremely weathered, extremely low strength, iron staining.		H		2.60: INFERRED BEDROCK
							3							
										Continued on cored borehole sheet				
							4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	17/05/2019
Project Name:	Ryde Hospital	Completed:	18/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323226.0 m E 6258801.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information | **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	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH (0.1 0.3 1 3 10)	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
						1						
						2						
						3		Continued from non-cored borehole sheet				
NMLC	Not Observed	51	3.77m Is(50) d=0 a=0 MPa 4.86m Is(50) d=0 a=0 MPa			4		LAMINITE: pale grey, orange & red, orange banding, bedding fabric visible, very well developed. Some clay bands (pale grey & medium plasticity), iron staining.				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 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, +130 mm SM, 0°, CL, PR, S, +20 mm FZ, 0°, FE SN, PR, S, +70 mm JT, 70°, FE SN, PR, S SM, 0°, Fe & Clay SN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	17/05/2019
Project Name:	Ryde Hospital	Completed:	18/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323226.0 m E 6258801.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information							***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	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Observed	51	5.38m Is(50) d=0 a=0.1 MPa			6		LAMINITE: pale grey & orange, white, orange & red banding, very well developed, 90% siltstone, 10% sandstone, thinly fine-grained sandstone laminations. Some clay bands (dark grey & medium plasticity), iron staining.*(continued)*				BP, 0°, FE SN, PR, S JT, 28°, FE SN, PR, S SM, 0°, CL, PR, S, +20 mm BP, 0°, FE SN, PR, S BP, 0°, FE SN, PR, S JT, 45°, FE SN, PR, S 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 JT, 79°, FE SN, PR, S JT, 37°, FE SN, PR, S JT, 75°, FE SN, PR, S BP, 0°, FE SN, PR, S JT, 0°, FE SN, PR, S JT, 0°, FE SN, PR, S BP, 0°, FE SN, PR, S JT, 37°, FE SN, PR, S SM, 0°, CL, PR, S, +40 mm CZ, 0°, RF & CL, +50 mm SM, 0°, RF, PR, RF, +20 mm SM, 0°, CL, PR, S, +40 mm 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 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, +10 mm BP, 0°, FE SN, PR, S BP, 0°, FE SN, PR, RF BP, 4°, FE SN, PR, RF BP, 3°, FE SN, PR, RF BP, 10°, FE SN, PR, RF BP, 0°, FE SN, PR, RF BP, 0°, FE SN, PR, RF JT, 44°, FE SN, PR, S BP, 0°, FE SN, PR, S JT, 90°, FE SN, PR, S BP, 0°, FE, PR, S BP, 0°, FE, PR, S
		30	6.64m Is(50) d=0 a=0 MPa			7		6.4m - Becomes dark grey & black with white & orange banding, 80%-90% siltstone, 10%-20% sandstone 6.5m to 7.0m - Mutiple clay bands (dark grey & high plasticity)				
		75	7.83m Is(50) d=0 a=0.1 MPa 8.18m Is(50) d=0 a=0 MPa 8.63m Is(50) d=0.3 a=0.3 MPa			8						
						9		Hole Terminated at 8.80 m Target depth, hole grouted to surface and reinstated				

Method

AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water

Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss

Core recovered (hatching indicates material)
No core recovery

Weathering

XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength

VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type

FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating

CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness

SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape

PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH09

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	18/05/2019
Project Name:	Ryde Hospital	Completed:	18/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323178.0 m E 6258799.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								***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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed				0		SW	SAND with gravel: fine to medium grained, dark brown & grey; gravel angular up to 20mm; trace of rootlets.		MD		0.00: INFERRED FILL 0.20: Concrete fragments observed
									SW-SC	Clayey SAND with gravel: fine to medium grained, brown & yellow; gravel sub-angular up to 15mm.		D		
							1		CI	CLAY with gravel: medium plasticity, dark brown & black; gravel sub-angular up to 10mm.				1.00: Bricks observed
							2				M	St to VSt		
							3							3.00: Bricks observed
									CH	CLAY: high plasticity, dark brown & black.		VSt		3.60: INFERRED RESIDUAL SOIL
							4							
AD/T		N								SILTSTONE: pale grey & brown, extremely weathered, extremely low strength, iron staining. Hole Terminated at 5.0m.Target depth, hole grouted to surface and reinstated	D	H		4.55: V-bit refusal 4.60: INFERRED BEDROCK

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH10

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Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	18/05/2019
Project Name:	Ryde Hospital	Completed:	18/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323214.0 m E 6258775.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed	CBR 0.30-2.90 m			0			ASPHALT - 100m : black & dark grey	D			0.00: PAVEMENT
									SC	SAND with gravel: fine to medium grained, dark brown & grey; gravel angular up to 10mm; trace of rootlets.				0.10: INFERRED FILL
									SC	SAND with gravel: fine to medium grained, dark brown & grey; gravel angular up to 20mm; trace of rootlets.				0.50: Rootlets observed
							1							1.00: Rootlets observed
											M	D		1.50: Plastics and electricity wires observed
							2							2.00: Bricks observed
											D			
									GM	Silty GRAVEL: medium grained, pale grey & yellow; crushed sandstone gravel - moderately weathered, high strength.		VD		2.95: V-bit refusal
							3			Hole Terminated at 3.00 m Target depth, hole grouted to surface and reinstated				
							4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH11

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	18/05/2019
Project Name:	Ryde Hospital	Completed:	18/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323254.0 m E 6258797.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								***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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
										ASPHALT - 100m : black & dark grey	D			0.00: PAVEMENT
AD/V		N							CI-CH	CLAY with gravel: medium to high plasticity, pale grey & red; gravel sub-angular up to 5mm.				0.10: INFERRED FILL
							1				M	VSt		
														1.30: V-bit refusal
AD/T		N	Not Observed						GM	Silty GRAVEL: medium grained, pale grey & red; crushed sandstone gravel - moderately weathered, high strength.				
							2							
												VD		
							3				D			
							4		CL-ML	Silty CLAY: low plasticity, pale grey & red; ripped iron stone encountered at 4.5m.				4.00: INFERRED RESIDUAL SOIL
												VSt		
										SILTSTONE: pale grey & red, highly weathered, low strength.				4.50: INFERRED BEDROCK
												H		

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	18/05/2019
Project Name:	Ryde Hospital	Completed:	18/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323254.0 m E 6258797.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								***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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N	Not Observed				6		SILTSTONE: pale grey & red, highly weathered, low strength. *(continued)*	D	H		
									Hole Terminated at 6.00 m Target depth, hole grouted to surface and reinstated				
							7						
							8						
							9						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH12

Page 1 of 1

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	18/05/2019
Project Name:	Ryde Hospital	Completed:	18/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323178.0 m E 6258799.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								***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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Observed				0			ASPHALT - 150m : black & dark grey	D			0.00: PAVEMENT
									CI	CLAY with gravel: medium plasticity, dark brown & grey; gravel sub-angular up to 10mm.	M	St		0.15: INFERRED FILL
							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.	D	VSt		2.00: INFERRED RESIDUAL SOIL
AD/T		N								SILTSTONE: pale grey & yellow, extremely weathered, extremely low strength.		H		2.75: V-bit refusal 2.80: INFERRED BEDROCK
							3			Hole Terminated at 3.00 m Target depth, hole grouted to surface and reinstated				
							4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH13

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	19/05/2019
Project Name:	Ryde Hospital	Completed:	19/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323075.0 m E 6258816.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N	Not Observed	CBR 0.30-3.50 m			0			CONCRETE - 180m : Pale grey & white	D			0.00: PAVEMENT
									SM	Silty SAND with gravel: fine grained, dark brown & black; gravel sub-angular up to 10mm.		D		0.18: INFERRED FILL
							1		CI	CLAY with gravel: medium plasticity, dark grey & orange; gravel sub-angular up to 5mm.				0.90: Bricks encountered
							2		CI-ML	Silty CLAY with gravel: medium plasticity, dark grey & black; gravel sub-angular up to 20mm.	M	VSt		
							3							
							4		CI-ML	Silty CLAY: medium plasticity, pale grey & brown.		H		4.40: INFERRED RESIDUAL SOIL
										Continued on cored borehole sheet				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

PSM

Borehole ID

BH13

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	19/05/2019
Project Name:	Ryde Hospital	Completed:	19/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323075.0 m E 6258816.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:	Triple Tube 3 m	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information / Rock Substance / Rock Mass Defects

Columns: 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; Continued from non-cored borehole sheet) | Weathering (XW HW MW SW FR) | Strength Is(50) (● - Axial, ○ - Diametral; VL 0.1 L 0.3 M 1 H 3 VH 10 EH) | Defect Spacing (mm) (<20 60 200 600 1000) | Defect Descriptions / Comments (Description, alpha/beta, infilling or coating, shape, roughness, thickness, other)

Method: NMLC

Water: Not Observed

RQD (%): 63 (5.0 m – 6.65 m); 68 (6.65 m – 8.45 m)

Samples and Field Tests:
- 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 a=0.2 MPa
- 8.36m Is(50) d=0.1 a=0.1 MPa

Strength test points plotted: axial (●) at 6.78 m, 7.29 m and 8.36 m; diametral (○) at 6.78 m.

Depth (m) marks: 6, 7, 8, 9

Material Description:
- LAMINITE: pale grey & orange, Some clay bands (dark grey & medium plasticity).
- LAMINITE: pale grey & orange, white, orange & red banding, very well developed, 70-80% siltstone, 20%-30% sandstone, thin fine-grained sandstone laminations. Some clay bands (pale grey & medium plasticity), iron staining.
  - 7.2m - Becomes dark grey & orange with black & orange banding, 80%-90% siltstone, 10%-20% sandstone. Multiple carbonaceous bands.
- Hole Terminated at 8.45 m
  Target depth, hole grouted to surface and reinstated

Defect Descriptions / Comments:
- 5.00: INFERRED BEDROCK
- +330 mm, Heavily Fractured
- CZ, 0°, RF, PR, RF, +70 mm
- CZ, 0°, RF, PR, RF, +140 mm
- SM, 0°, CL, PR, S, +20 mm
- SM, 10°, Fe & Clay SN, PR, S, +10 mm
- SM, 0°, CL, PR, S, +10 mm
- SM, 0°, CL, PR, S, +60 mm
- CZ, 0°, RF, PR, RF, +20 mm
- SM, 0°, CL, PR, S, +50 mm
- CZ, 5°, RF & CL, PR, S, +50mm
- CZ, 0°, RF, PR, RF, +40 mm
- FZ, 0°, RF & CL, PR, S, +40 +40 mm
- JT, 80°, FE SN, PR, S
- JT, 42°, FE SN, PR, S
- SM, 0°, CL, PR, S, +70 mm
- CZ, 0°, RF, PR, S, +60 mm
- JT, 75°, CL, PR, S, +40 mm
- CZ, 0°, RF, PR, S, +20 mm
- SM, 0°, CL, PR, S, +70 mm
- CZ, 0°, RF, PR, S, +10 mm
- CZ, 0°, RF, PR, S, +30 mm
- CZ, 0°, RF, PR, S, +10 mm
- JT, 77°, CL, PR, S
- SM, 0°, CL, PR, S, +10 mm
- BP, 12°, FE SN, PR, S
- BP, 12°, FE SN, PR, S
- SM, 0°, CL, PR, S, +20 mm
- SM, 0°, CL, PR, S, +10 mm
- CZ, 0°, RF & CL, PR, S, +90 mm
- BP, 0°, X, PR, S
- BP, 10°, X, PR, S

Legend

Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- HQ3- Wireline core (63.5 mm)
- PQ3- Wireline core (85.0 mm)
- SPT- Standard penetration test
- PT - Push tube
- WPT - Water pressure test

Water
- Inflow
- Partial Loss
- Complete Loss

Graphic Log/Core Loss
- Core recovered (hatching indicates material)
- No core recovery

Weathering
- XW - Extremely Weathered
- HW - Highly Weathered
- MW - Moderately Weathered
- SW - Slightly Weathered
- FR - Fresh

Strength
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH - Very High
- EH - Extremely High

Defect Type
- FT - Fault
- SS - Shear Surface
- SZ - Shear Zone
- BP - Bedding parting
- SM - Seam
- IS - Infilled Seam
- JT - Joint
- CO - Contact
- CZ - Crushed Zone
- VN - Vein
- FZ - Fracture Zone
- BSH - Bedding Shear
- DB - Drilling Break

Infilling/Coating
- CN - Clean
- SN - Stain
- VN - Veneer
- CO - Coating
- RF - Rock fragments
- G - Gravel
- S - Sand
- Z - Silt
- CA - Calcite
- CL - Clay
- FE - Iron
- QZ - Quartz
- X - Carbonaceous

Roughness
- SL - Slickensided
- POL - Polished
- S - Smooth
- RF - Rough
- VR - Very Rough

Shape
- PR - Planar
- CU - Curved
- UN - Undulating
- ST - Stepped
- IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	19/05/2019
Project Name:	Ryde Hospital	Completed:	19/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323048.0 m E 6258856.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								***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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N	Not Observed				0			ASPHALT - 100m : black & dark grey	D			0.00: PAVEMENT 0.10: INFERRED FILL
									SM	Silty SAND with gravel: fine grained, pale brown & orange; gravel angular up to 20mm.	M	MD		
							1		SM	Silty SAND with gravel: fine grained, pale brown & grey; gravel sub-angular up to 5mm.				
							2							
							3			3.0m - Becomes dark brown with sub-angular gravel up to 10mm	D	D		
							4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	19/05/2019
Project Name:	Ryde Hospital	Completed:	19/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323048.0 m E 6258856.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting:	Hanjin- D8	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	125 mm	Bearing:		Datum:	AHD	Operator:	Rockwell

Drilling Information								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	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N	Not Observed				6		CL-ML	Silty CLAY: low plasticity, dark brown & grey; ripped iron stone encountered at 5.0m.		VSt		5.00: INFERRED RESIDUAL SOIL
										LAMINITE: dark grey & brown, extremely weathered, extremely low strength., iron staining.	D	H		5.50: INFERRED BEDROCK
							7			Continued on cored borehole sheet				
							8							
							9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
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
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3828

Client:	JBS&G	Commenced:	19/05/2019
Project Name:	Ryde Hospital	Completed:	19/05/2019
Hole Location:	Eastwood, NSW	Logged By:	NTH
Hole Position:	323048.0 m E 6258856.0 m N MGA94 Zone 56	Checked By:	BS

Drill Model and Mounting: Hanjin- D8 | Inclination: -90° | RL Surface: No survey
Barrel Type and Length: Triple Tube 3 m | Bearing: | Datum: AHD | Operator: Rockwell

Drilling Information							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	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
						6		Continued from non-cored borehole sheet				
NMLC	Not Observed	87	7.26m 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=0.5 MPa 9.51m Is(50) d=0.3 a=0.5 MPa			7 8 9		LAMINITE: dark grey & brown, iron staining. 6.7m - Becomes more laminated LAMINITE: dark grey & orange, white & orange banding, well developed, 70-80% siltstone, 20%-30% sandstone, thin fine-grained sandstone laminations, iron staining. 7.7m - Becomes pale grey with white banding, 50%-60% siltstone, 40%-50% sandstone.				CO, 0°, CN, PR, S BP, 0°, FE SN, PR, RF BP, 0°, FE SN, PR, RF JT, 0°, FE SN, PR, RF CZ, 0°, RF, PR, S, +10 mm CZ, 0°, RF, PR, S, +50 mm BP, 0°, RF & 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°, CN, PR, S BP, 0°, CN, PR, S BP, 3°, CN, PR, S BP, 7°, FE VN, PR, S BP, 10°, CN, PR, S BP, 12°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S
								Hole Terminated at 9.58 m Target depth, hole grouted to surface and reinstated				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

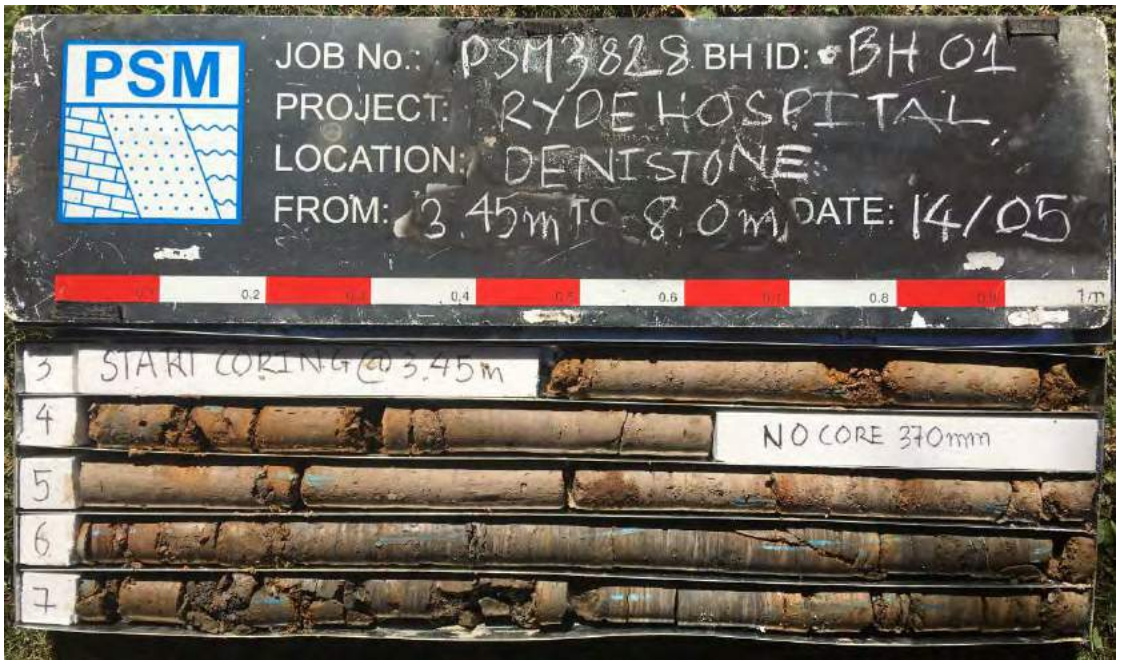
Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Appendix B
Core Photos

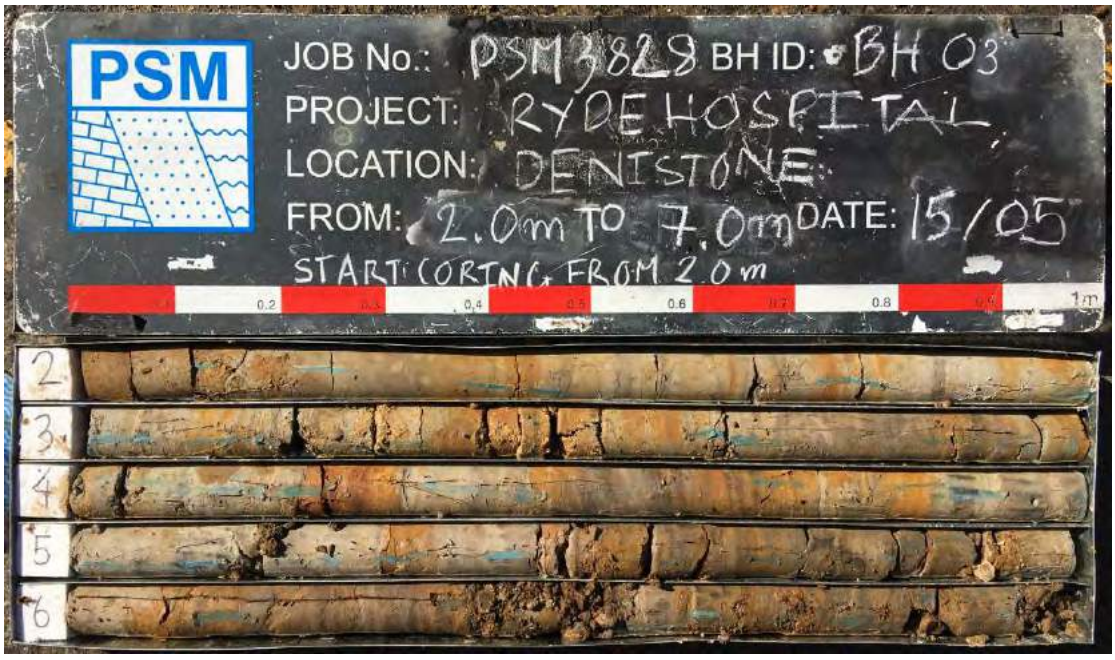


JBS&G **Ryde Hospital** **Eastwood, NSW** **GEOTECHNICAL INVESTIGATION** **CORE PHOTOGRAPHY - BH01**	
PSM3828-002R	**Appendix B**

Pells Sullivan Meynink

JBS&G **Ryde Hospital** **Eastwood, NSW** **GEOTECHNICAL INVESTIGATION** **CORE PHOTOGRAPHY - BH02**	
PSM3828-002R	**Appendix B**

Pells Sullivan Meynink



JBS&G	
Ryde Hospital	
Eastwood, NSW	
GEOTECHNICAL INVESTIGATION	
CORE PHOTOGRAPHY - BH03	
PSM3828-002R	**Appendix B**

Pells Sullivan Meynink

JBS&G Ryde Hospital Eastwood, NSW GEOTECHNICAL INVESTIGATION CORE PHOTOGRAPHY - BH04	
PSM3828-002R	Appendix B

Pells Sullivan Meynink

JBS&G	
Ryde Hospital	
Eastwood, NSW	
GEOTECHNICAL INVESTIGATION	
CORE PHOTOGRAPHY - BH05	
PSM3828-002R	**Appendix B**

Pells Sullivan Meynink

Pells Sullivan Meynink

JBS&G Ryde Hospital Eastwood, NSW GEOTECHNICAL INVESTIGATION CORE PHOTOGRAPHY - BH06	
PSM3828-002R	Appendix B

JBS&G	
Ryde Hospital	
Eastwood, NSW	
GEOTECHNICAL INVESTIGATION	
CORE PHOTOGRAPHY - BH07	
PSM3828-002R	**Appendix B**

Pells Sullivan Meynink

JBS&G	
Ryde Hospital	
Eastwood, NSW	
GEOTECHNICAL INVESTIGATION	
CORE PHOTOGRAPHY - BH08	
PSM3828-002R	**Appendix B**

Pells Sullivan Meynink

JBS&G Ryde Hospital Eastwood, NSW GEOTECHNICAL INVESTIGATION CORE PHOTOGRAPHY - BH13	
PSM3828-002R	Appendix B

Pells Sullivan Meynink

JBS&G	
Ryde Hospital	
Eastwood, NSW	
GEOTECHNICAL INVESTIGATION	
CORE PHOTOGRAPHY - BH14	
PSM3828-002R	**Appendix B**

Pells Sullivan Meynink

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*

Test Method	*AS 4133.4.1 - 1993 Methods of Testing Rocks for Engineering Purposes, Determination of Point Load Strength Index*	Sampling Technique	*NMLC*	Sampling Date	*14-19/05/2019*
		Storage History	*Field*	Testing Date	*14-19/05/2019*
Test Machine	*GSA 6500*	Moisture Condition	*Field*	Tested By	*NTH*
Calibration Date	*16/8/2018*	Loading Rate	*< 30 seconds*		

Rock Type	Location	Depth	Diametral Tests					Axial, Block, and Irregular Lump Tests							AS 1726 Strength Class
		(m)	D (mm)	L (mm)	P (kN)	$I_{s(50)}$ (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	I_s (MPa)	$I_{s(50)}$ (MPa)	Failure Mode	
Laminite	***BH01***	***5.85***	*50*	*50*	*0.1*	***0***	*Parallel to bedding*	*50*	*49*		*0.2*	*0.1*	***0.1***	*Through substance*	***VL***
Laminite	***BH01***	***6.46***	*50*	*60*	*0.1*	***0***	*Parallel to bedding*	*50*	*43*		*0.1*	*0*	***0***	*Through substance*	***VL***
Laminite	***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***
Laminite	***BH01***	***8.86***	*50*	*64.5*	*0.7*	***0.3***	*Parallel to bedding*	*50*	*33*		*0.3*	*0.2*	***0.2***	*Through substance*	***L***
Laminite	***BH02***	***9.31***	*50*	*36*	*0.3*	***0.1***	*Parallel to bedding*	*50*	*37*		*0.7*	*0.3*	***0.3***	*Through substance*	***L***
Laminite	***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***
Laminite	***BH02***	***10.79***	*50*	*51.5*	*0.3*	***0.1***	*Parallel to bedding*	*50*	*47*		*0.3*	*0.1*	***0.1***	*Through substance*	***L***
Laminite	***BH03***	***2.62***	*50*	*50*	*0.1*	***0***	*Parallel to bedding*	*50*	*42*		*0.2*	*0.1*	***0.1***	*Through substance*	***VL***
Laminite	***BH03***	***3.58***	*50*	*55.5*	*0.1*	***0***	*Parallel to bedding*	*50*	*37*		*0.2*	*0.1*	***0.1***	*Through substance*	***VL***
Laminite	***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***
Laminite	***BH03***	***6.30***	*50*	*51*	*0*	***0***	*Parallel to bedding*	*50*	*33*		*0.1*	*0*	***0***	*Through substance*	***VL***
Laminite	***BH03***	***8.52***	*50*	*60*	*0.1*	***0***	*Parallel to bedding*	*50*	*46*		*0.1*	*0*	***0***	*Through substance*	***VL***
Laminite	***BH03***	***9.09***	*50*	*57.5*	*1.2*	***0.5***	*Parallel to bedding*	*50*	*49*		*1.3*	*0.4*	***0.4***	*Bad break*	***M***
Laminite	***BH04***	***1.96***	*50*	*56.5*	*0.1*	***0***	*Parallel to bedding*	*50*	*41*		*0.1*	*0*	***0***	*Through substance*	
Laminite	***BH04***	***2.24***	*50*	*68.5*	*0.1*	***0***	*Parallel to bedding*	*50*	*39*		*0.1*	*0*	***0***	*Through substance*	
Laminite	***BH04***	***3.50***	*50*	*55.5*	*0.1*	***0***	*Parallel to bedding*	*50*	*48*		*0.4*	*0.1*	***0.1***	*Through substance*	***L***
Laminite	***BH04***	***4.35***	*50*	*50*	*0.7*	***0.3***	*Parallel to bedding*	*50*	*44*		*1.2*	*0.4*	***0.5***	*Through substance*	***L / M***
Laminite	***BH04***	***5.25***	*50*	*51*	*0.1*	***0***	*Parallel to bedding*	*50*	*42*		*0.3*	*0.1*	***0.1***	*Through substance*	***VL***
Laminite	***BH04***	***6.79***	*50*	*74*	*0.3*	***0.1***	*Parallel to bedding*	*50*	*42*		*0.5*	*0.2*	***0.2***	*Through substance*	***L***
Laminite	***BH04***	***7.53***	*50*	*50*	*0.2*	***0.1***	*Parallel to bedding*	*50*	*48*		*0.5*	*0.2*	***0.2***	*Through substance*	***VL / L***
Laminite	***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* **Date:** *14-19/05/2019*

Pells Sullivan Meynink

POINT LOAD STRENGTH INDEX TEST RESULTS

Job No. *PSM3828* **Sheet** 1 of 1

Project *Ryde Hospital*

Test Method	*AS 4133.4.1 - 1993 Methods of Testing Rocks for Engineering Purposes, Determination of Point Load Strength Index*	Sampling Technique	*NMLC*	Sampling Date	*14-19/05/2019*
		Storage History	*Field*	Testing Date	*14-19/05/2019*
Test Machine	*GSA 6500*	Moisture Condition	*Field*	Tested By	*NTH*
Calibration Date	*16/8/2018*	Loading Rate	*< 30 seconds*		

Rock Type	Location	Depth (m)	Diametral Tests					Axial, Block, and Irregular Lump Tests							AS 1726 Strength Class
			D (mm)	L (mm)	P (kN)	$I_{s(50)}$ (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	I_s (MPa)	$I_{s(50)}$ (MPa)	Failure Mode	
Laminite	***BH05***	***3.71***	*50*	*51.5*	*0.2*	***0.1***	*Parallel to bedding*	*50*	*46*		*0.8*	*0.3*	***0.3***	*Through substance*	***VL / L***
Laminite	***BH05***	***4.48***	*50*	*51.5*	*0.4*	***0.1***	*Parallel to bedding*	*50*	*48*		*0.6*	*0.2*	***0.2***	*Through substance*	***L***
Laminite	***BH05***	***5.54***	*50*	*80*	*0.3*	***0.1***	*Parallel to bedding*	*50*	*49*		*1.5*	*0.5*	***0.5***	*Through substance*	***L / M***
Laminite	***BH05***	***6.43***	*50*	*56*	*0.5*	***0.2***	*Parallel to bedding*	*50*	*49*		*0.7*	*0.2*	***0.2***	*Through substance*	***L***
Laminite	***BH05***	***7.83***	*50*	*65*	*0.3*	***0.1***	*Parallel to bedding*	*50*	*38*		*1.2*	*0.5*	***0.5***	*Through substance*	***L / M***
Laminite	***BH05***	***8.34***	*50*	*69*	*0.2*	***0.1***	*Parallel to bedding*	*50*	*47*		*0.5*	*0.2*	***0.2***	*Bad break*	***VL / L***
Laminite	***BH06***	***5.40***	*50*	*55*	*0.2*	***0.1***	*Parallel to bedding*	*50*	*42*		*0.2*	*0.1*	***0.1***	*Through substance*	***VL***
Laminite	***BH06***	***5.87***	*50*	*62.5*	*0.5*	***0.2***	*Parallel to bedding*	*50*	*45*		*0.6*	*0.2*	***0.2***	*Through substance*	***L***
Laminite	***BH06***	***6.27***	*50*	*55.5*	*1.3*	***0.5***	*Parallel to bedding*	*50*	*37*		*1.6*	*0.7*	***0.7***	*Through substance*	***M***
Laminite	***BH06***	***7.24***	*50*	*51*	*1*	***0.4***	*Parallel to bedding*	*50*	*47*		*1.1*	*0.4*	***0.4***	*Through substance*	***M***
Laminite	***BH07***	***3.48***	*50*	*51.5*	*0.1*	***0***	*Parallel to bedding*	*50*	*49*		*0.1*	*0*	***0***	*Through substance*	***VL***
Laminite	***BH07***	***4.82***	*50*	*52.5*	*0.5*	***0.2***	*Parallel to bedding*	*50*	*40*		*0.3*	*0.1*	***0.1***	*Through substance*	***L***
Laminite	***BH07***	***5.55***	*50*	*50*	*0.2*	***0.1***	*Parallel to bedding*	*50*	*49*		*0.3*	*0.1*	***0.1***	*Bad break*	***VL***
Laminite	***BH07***	***6.49***	*50*	*50*	*0.1*	***0***	*Parallel to bedding*	*50*	*33*		*0.1*	*0.1*	***0.1***	*Through substance*	***VL***
Laminite	***BH07***	***7.66***	*50*	*60*	*0.2*	***0.1***	*Parallel to bedding*	*50*	*49*		*0.5*	*0.2*	***0.2***	*Through substance*	***VL / L***
Laminite	***BH07***	***8.64***	*50*	*61*	*2*	***0.8***	*Parallel to bedding*	*50*	*37*		*2.1*	*0.9*	***0.9***	*Through substance*	***M***
Laminite	***BH08***	***3.77***	*50*	*50*	*0*	***0***	*Parallel to bedding*	*50*	*42*		*0*	*0*	***0***	*Through substance*	
Laminite	***BH08***	***4.86***	*50*	*56*	*0*	***0***	*Parallel to bedding*	*50*	*41*		*0.1*	*0*	***0***	*Through substance*	
Laminite	***BH08***	***5.38***	*50*	*53.5*	*0.1*	***0***	*Parallel to bedding*	*50*	*39*		*0.2*	*0.1*	***0.1***	*Through substance*	***VL***
Laminite	***BH08***	***6.64***	*50*	*51*	*0.1*	***0***	*Parallel to bedding*	*50*	*49*		*0.1*	*0*	***0***	*Through substance*	***VL***
Laminite	***BH08***	***7.83***	*50*	*57*	*0.1*	***0***	*Parallel to bedding*	*50*	*32*		*0.2*	*0.1*	***0.1***	*Through substance*	***VL***
Laminite	***BH08***	***8.18***	*50*	*58*	*0.1*	***0***	*Parallel to bedding*	*50*	*40*		*0.1*	*0*	***0***	*Through substance*	
Laminite	***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*

Test Method	*AS 4133.4.1 - 1993 Methods of Testing Rocks for Engineering Purposes, Determination of Point Load Strength Index*	Sampling Technique	*NMLC*	Sampling Date	*14-19/05/2019*
		Storage History	*Field*	Testing Date	*14-19/05/2019*
Test Machine	*GSA 6500*	Moisture Condition	*Field*	Tested By	*NTH*
Calibration Date	*16/8/2018*	Loading Rate	*< 30 seconds*		

Rock Type	Location	Depth (m)	Diametral Tests					Axial, Block, and Irregular Lump Tests							AS 1726 Strength Class
			D (mm)	L (mm)	P (kN)	$I_{s(50)}$ (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	I_s (MPa)	$I_{s(50)}$ (MPa)	Failure Mode	
Laminite	***BH13***	***5.85***	*50*	*50*	*0*	***0***	*Parallel to bedding*	*50*	*48*		*0.1*	*0*	***0***	*Through substance*	
Laminite	***BH13***	***6.78***	*50*	*60*	*1.2*	***0.5***	*Parallel to bedding*	*50*	*49*		*2.4*	*0.8*	***0.8***	*Bad break*	***M***
Laminite	***BH13***	***7.29***	*50*	*50*	*0.1*	***0***	*Parallel to bedding*	*50*	*49*		*0.7*	*0.2*	***0.2***	*Through substance*	***VL / L***
Laminite	***BH13***	***8.36***	*50*	*65.5*	*0.2*	***0.1***	*Parallel to bedding*	*50*	*35*		*0.3*	*0.1*	***0.1***	*Through substance*	***VL / L***
Laminite	***BH14***	***7.26***	*50*	*64.5*	*0.3*	***0.1***	*Parallel to bedding*	*50*	*38*		*0.4*	*0.2*	***0.2***	*Through substance*	***L***
Laminite	***BH14***	***7.80***	*50*	*72.5*	*0.5*	***0.2***	*Parallel to bedding*	*50*	*38*		*0.5*	*0.2*	***0.2***	*Through substance*	***L***
Laminite	***BH14***	***8.28***	*50*	*59*	*0.5*	***0.2***	*Parallel to bedding*	*50*	*47*		*2.6*	*0.9*	***0.9***	*Through substance*	***L / M***
Laminite	***BH14***	***8.95***	*50*	*50*	*0.5*	***0.2***	*Parallel to bedding*	*50*	*39*		*1.3*	*0.5*	***0.5***	*Through substance*	***L / M***
Laminite	***BH14***	***9.51***	*50*	*56.5*	*0.8*	***0.3***	*Parallel to bedding*	*50*	*30*		*1*	*0.5*	***0.5***	*Through substance*	***M***

By: ***NTH*** **Checked:** ***BS*** **Date:** ***14-19/05/2019***

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Appendix D
Piezometer Construction Record

Pells Sullivan Meynink
Engineering Consultants
Rock - Soil - Water

JOB no.: PSM3828

PROJECT: Ryde Hospital

PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH03
PIEZOMETER: BH03
COLLAR EASTING: 323214.0 m E
COLLAR NORTHING: 6258884.0 m N
COLLAR RL(m): No Survey

DRILLING CONTRACTOR: Rockwell
RIG: HANJIN - D8
DEPTH OF HOLE (m): 8.3m
BOREHOLE INCLINATION: -90°
PIEZO INSTALLATION DATE: 15/05/2019
SUPERVISED BY: NTH

Tick boxes

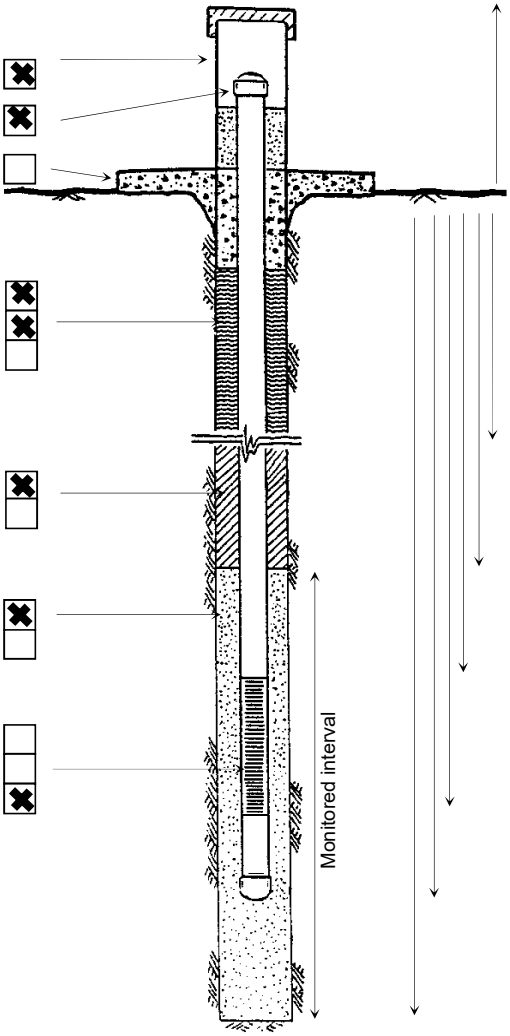
Steel protective well cover [x]
PVC cap [x]
Concrete colar [ ]

Back fill type:
Cement bentonite [x]
Soil [x]
None [ ]

Seal:
Bentonite pellets [x]
Other [ ]

Gravel type:
2-5mm gravel [x]
Other [ ]

Perforation type:
Drill holes [ ]
Hack saw cuts [ ]
40um machine slots [x]



Complete dimensions if appropriate

Height of stickup (m)	NONE
Diameter of PVC (mm)	60 mm
Depth to top of seal	3.1m
Depth to top of gravel pack	5.1m
Depth to top of screen	5.2m
Depth to base of screen	8.2m
Depth to base of piezo	8.3m
Depth to base of gravel	8.3m

COMMENTS: Water level after installation 15/05/2019- depth 3.01m BLG

Pells Sullivan Meynink
Engineering Consultants
Rock - Soil - Water

JOB no.: PSM3828

PROJECT: Ryde Hospital

PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH07
PIEZOMETER: BH07
COLLAR EASTING: 323213.0 m E
COLLAR NORTHING: 6258823.0 m N
COLLAR RL(m): No Survey

DRILLING CONTRACTOR: Rockwell
RIG: HANJIN - D8
DEPTH OF HOLE (m): 8.85m
BOREHOLE INCLINATION: -90°
PIEZO INSTALLATION DATE: 17/05/2019
SUPERVISED BY: NTH

Tick boxes

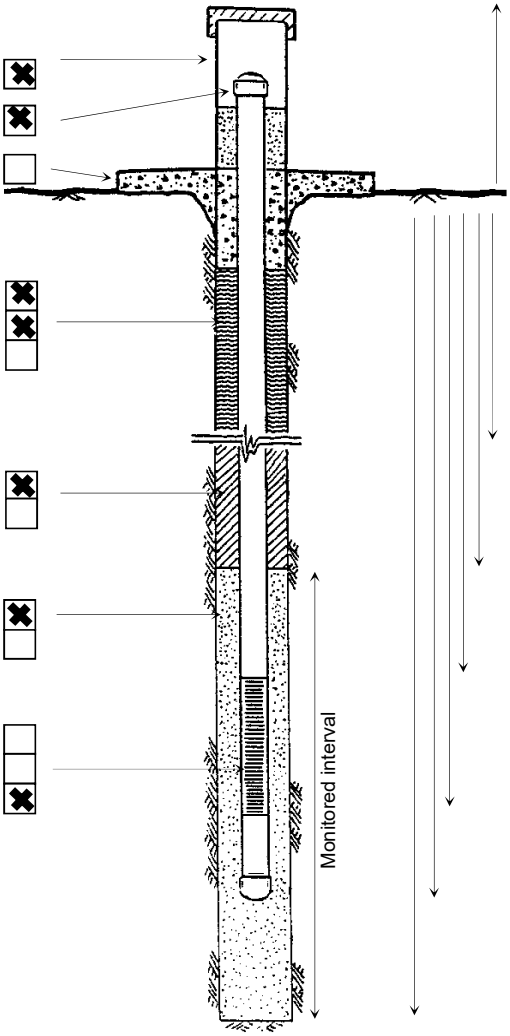
Steel protective well cover [x]
PVC cap [x]
Concrete colar [ ]

Back fill type:
Cement bentonite [x]
Soil [x]
None [ ]

Seal:
Bentonite pellets [x]
Other [ ]

Gravel type:
2-5mm gravel [x]
Other [ ]

Perforation type:
Drill holes [ ]
Hack saw cuts [ ]
40um machine slots [x]



Complete dimensions if appropriate

Height of stickup (m)	NONE
Diameter of PVC (mm)	60 mm
Depth to top of seal	1.2 m
Depth to top of gravel pack	5.65 m
Depth to top of screen	5.75 m
Depth to base of screen	8.75 m
Depth to base of piezo	8.85 m
Depth to base of gravel	8.85 m

COMMENTS: Water level after installation 17/05/2019 - depth 2.7m BLG

Appendix E
CBR 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
Email: dtreweek@jkgroup.net.au

SOIL TEST SERVICES
ABN 43 002 145 173

FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM3828 - Ryde Hospital

Ref No: L4290E
Report: 2
Report Date: 29/05/2019
Page 1 of 1

BOREHOLE NUMBER	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 Density (t/m^3)	1.69 STD	1.70 STD	1.63 STD	1.81 STD	1.79 STD	1.79 STD
Optimum Moisture Content (%)	18.5	19.6	23.3	16.0	15.0	17.4
Moulded Dry Density (t/m^3)	1.66	1.66	1.59	1.78	1.75	1.75
Sample Density Ratio (%)	98	98	98	98	98	98
Sample Moisture Ratio (%)	99	95	100	99	101	101
Moisture Contents						
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 and						
After Test, Top 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.

Approved Signatory / Date (D. Treweek) 29/5/19

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

SOIL TEST SERVICES

ABN 43 002 145 173

ATTERBERG LIMIT AND LINEAR SHRINKAGE TEST REPORT

Client: Pells Sullivan Meynink
Project: Ryde Hospital
PSM Job No.: PSM3828

Ref No: L4290E
Report: 1
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.

NATA

NATA Accredited Laboratory Number:1327

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Authorised Signature / Date
(D. Treweek)
29/5/19

Appendix G
Aggressivity Test Results Sheet

ALS Environmental

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 NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
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		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 6		
No. of samples analysed	: 6		

Accreditation No. 825
Accredited for compliance with
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.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH01 1m	BH03 0.5m	BH04 1m	BH07 0.5-1m	BH11 0.5m
				Client sampling 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 @ 105-110°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**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH13 0.5-1m	----	----	----	----
			Client sampling 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 @ 105-110°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

New kitchen, stores and Loading Dock

Build new access road

Demolish Physio, Loading dock, stores and kitchen

RYEDALE ROAD

DENISTONE ROAD

FOURTH AVENUE

17 Aged Care 596.3 m²

18 Staff office

Staff Lunch

LOADING DOCK

Rotary Apartment

20

Staff 127.9 m²

13 Ward 2 894.4 m² Medical 28 beds (incl 1 iso)

courtyard

14 Ward 3 611.2 m² Surgical 25 beds

10 Denistone House 551.4 m²

9 Ward 7 555.3 m² Medical Aged Care 23 beds

7

3 Critical Care 898.0 m² ICU and Coronary care 11 Beds 4 Enclosed bays 1 Isolation bed

2 Theatres 875.7 m²

Perioperative 319.4 m² 4 x Pre-op Holding Bays 1 x Isolation bed 6 x recliners 2 x Trolley

4

Administration 157.0 m²

5 Administration 86.7 m²

Administration 173.3 m²

ACUTE 7 Bays (incl 1 iso)

HOLDING 2 Bays

Pathology 175.6 m²

6

Pharmacy 96.5 m²

FAST TRACK 4 Beds

Emergency 911.8 m²

Medical Imaging 381.8 m² 2x X-ray 1x CT 1x ultrasound

Med Gas 21.6 m²

65 m 70 m 75 m 80 m 85 m 90 m 95 m 100 m

Possibly fitout undercrof now and activate docks/stores/kitchen

Build Stage 1

Demolish Maintenance

RYEDALE ROAD

STAGE 1

17 Aged Care 596.3 m²

Rotary Apartment

18 Staff office

LOADING DOCK

Staff Lunch

20

LINK

Staff 127.9 m²

13 Ward 2 894.4 m² Medical 28 beds (incl 1 iso)

courtyard

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FAST TRACK 4 Beds

Emergency 911.8 m²

Medical Imaging 381.8 m² 2x x-ray 1x CT 1x ultrasound

Med Gas 21.6 m²

4

DENISTONE ROAD

FOURTH AVENUE

65 m 70 m 75 m 80 m 85 m 90 m 95 m 100 m

Client

NSW GOVERNMENT 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: **22.11.2018**
Sheet Size: **A3**
Scale: **1:1000**
Drawing Number: **10889_SK006**
Issue: **2**

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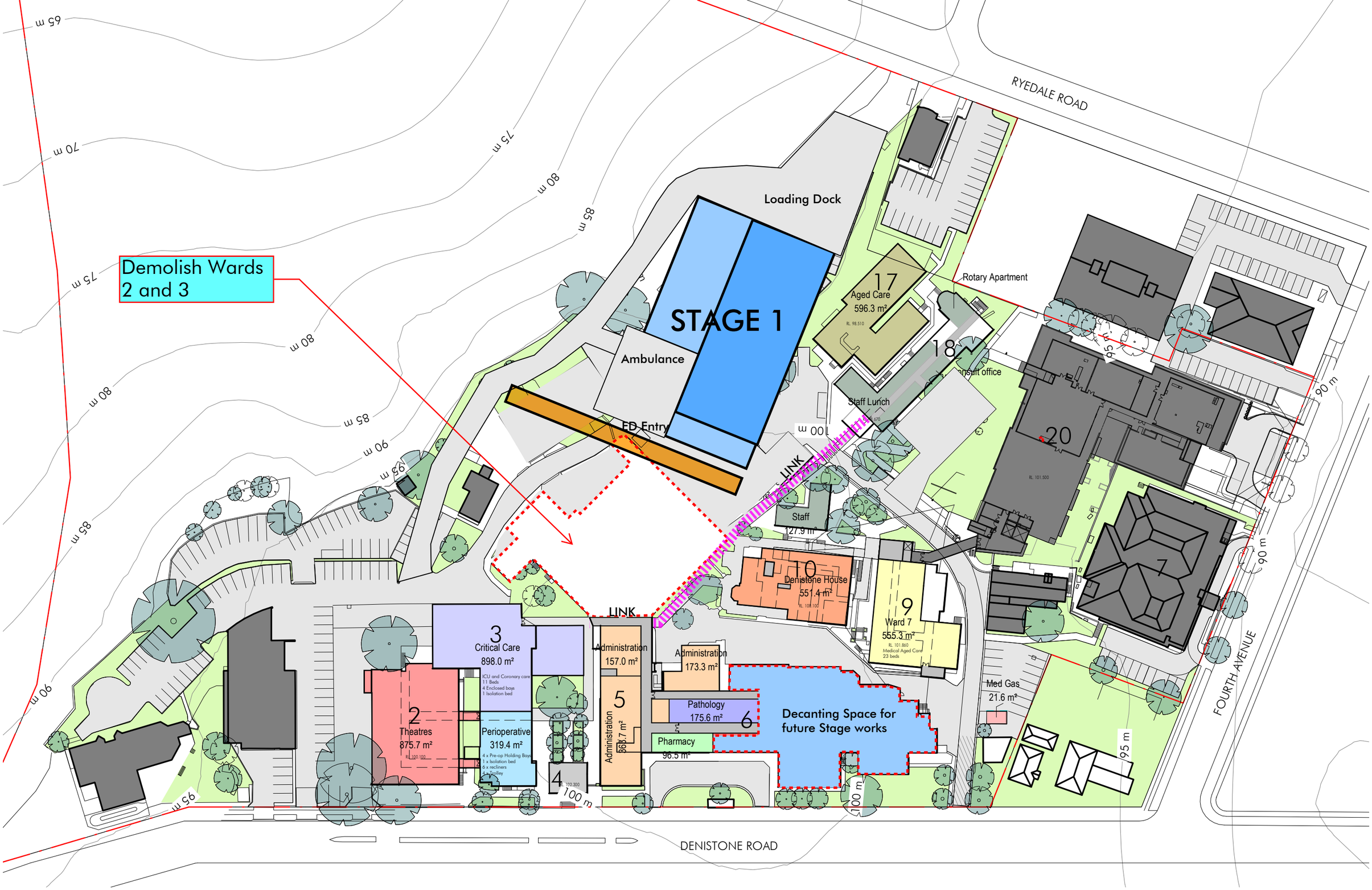

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Issue: **2**

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Road circulation and drop off zone

Alternative location of Community Health

STAGE 1

COMMUNITY HEALTH

Loading Dock

Ambulance

ED Entry

LINK

LINK

RYEDALE ROAD

DENISTONE ROAD

FOURTH AVENUE

17 Aged Care 596.3 m²

18

Rotary Apartment

Staff Lunch

Staff 127.9 m²

20

10 Denistone House 551.4 m²

9 Ward 7 555.3 m²
Medical Aged Care
23 beds

7

3 Critical Care 898.0 m²
ICU and Coronary care
11 Beds
4 Enclosed bays
1 Isolation bed

2 Theatres 875.7 m²

Perioperative 319.4 m²
4 x Pre-op Holding Bays
1 x Isolation bed
6 x recliners
2 x trolley

4

5 Administration 868.7 m²

Administration 157.0 m²

Administration 173.3 m²

Pathology 175.6 m²

6

Pharmacy 96.5 m²

Community Mental Health

Med Gas 21.6 m²

65 m 70 m 75 m 80 m 85 m 90 m 95 m 100 m

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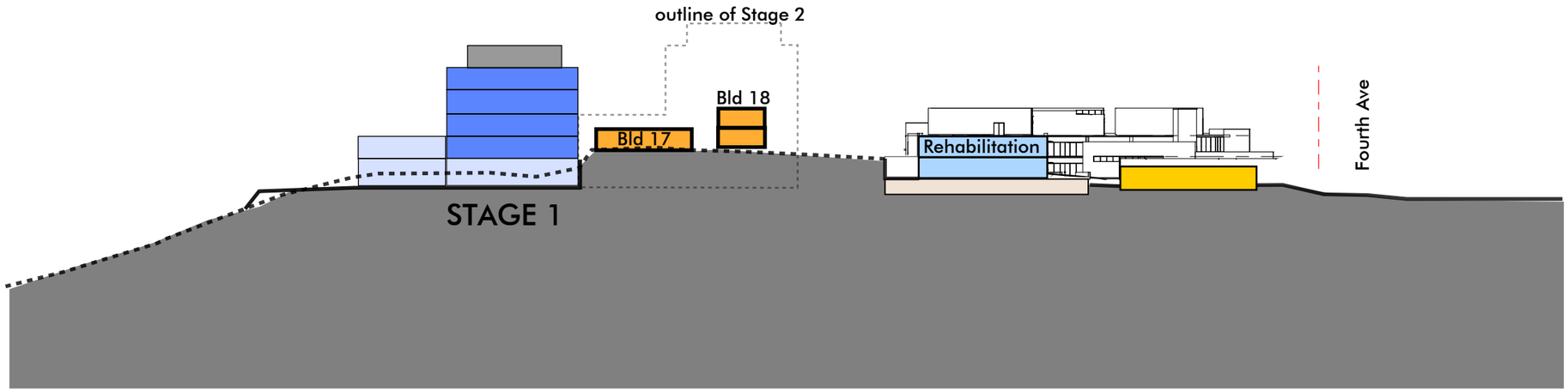

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Client

NSW GOVERNMENT Health Infrastructure

Project Name
Ryde Hospital Site Evaluation

Project Address
Denistone Road, Eastwood, NSW, 2122

Document Status
For Information

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Sections blocking and stacking

Date:

Sheet Size:
A3

Scale:
0 20000

Drawing Number:
10889_SK019

Issue:

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