REPORT TO

HEALTH INFRASTRUCTURE

ON

GEOTECHNICAL INVESTIGATION

FOR

LOT 73, MAITLAND HOSPITAL SITE

AT

METFORD ROAD, METFORD, NSW

Date: 28 June 2023

Ref: 35924BFrpt

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Table of Contents

ATTACHMENTS

1 INTRODUCTION

This report presents the results of a geotechnical investigation for the proposed development within the Eastern Zone of the Maitland Hospital, Metford Road, Metford, NSW. The location of the site is shown in Figure 1. The investigation was commissioned by Health Infrastructure by signed Consultancy Agreement, Ref: HI22694, and was carried out in general accordance with our fee proposal, Ref: P57857LF Rev1, dated 2 February 2023.

We understand that it is proposed to extend the Maitland Hospital Precinct into the Eastern Zone by construction of a multi-storey building in similar fashion to the current Hospital. Details of the proposed development have not been provided at the time of this report; however, we assume it will be similar to the existing Maitland Hospital comprising a five-storey building without any basement levels. Therefore, structural loads are expected to be relatively high for structures of this type. We also understand the building is likely to be located within the southern portion of the site that is currently relatively clear of vegetation. Due to the current slope of the site, we expect that some cut and fill earthworks will be required, likely to be to maximum depths of about 4m. Additional external car parking is also envisaged also within the southern area of the Eastern Zone, and potentially in other areas as well.

The purpose of the investigation was to obtain geotechnical information on the subsurface conditions, and to use this as a basis for providing comments and recommendations on geotechnical aspects of the proposed development, such as site preparation, excavation conditions, retention systems, site classification, footings as well as earthquake and pavement design parameters.

2 INVESTIGATION PROCEDURE

The field work for the investigation was carried out between 27 March and 6 April 2023, and comprised the following:

- Forty (40) boreholes were drilled to depths ranging from 1.2m to 6m below existing surface levels using our truck mounted JK500 and track mounted JK308 drill rigs using spiral auger techniques and a Tungsten Carbide (TC) drill bit.
- Eighteen (18) of those boreholes were then extended to depths ranging from 7.52m (BH28) to 11.20m (BH2) using an NMLC triple tube barrel with water flush.
- Where rig access was not possible due to either dense vegetation or adverse ground conditions, seven (7) boreholes were drilled using hand auger equipment to depths ranging from 0.2m to 0.55m. These boreholes were augmented by seven Dynamic Cone Penetration (DCP) tests, which extended to refusal at depths ranging from 0.01m (BH22) to 4.90m (BH45). The refusal depth of the DCP tests may provide an indicative depth to rock, though we note that premature refusal can also occur on obstructions in the fill, 'floaters' and other hard layers.
- Groundwater monitoring wells were installed in to five (5) boreholes, BH5, BH12, BH19, BH32 and BH36, comprising Class 18 machine slotted PVC with the annulus backfilled with coarse grained sand.

The inferred compaction of the fill and the strength of the natural clayey soils encountered in the boreholes were assessed from either Standard Penetration Test (SPT) 'N' values for the rig drilled boreholes or DCP blow counts for the hand auger drilled boreholes. The assessment was augmented by hand penetrometer test results on cohesive samples recovered in the SPT split tube sampler.

Groundwater observations were made during and on completion of auger drilling. No longer term monitoring of groundwater levels was carried out.

Selected samples were tested by Soil Test Services (STS), a NATA accredited laboratory, to determine moisture contents, Atterberg limits, linear shrinkages, shrink-swell index values and California Bearing Ratio (CBR) values. The results are summarised in the attached STS Tables A to C. Selected samples were also sent to Envirolab Services Pty Ltd, another NATA accredited laboratory, to determine pH, sulphate, chloride and resistivity values. The results are summarised in the attached Envirolab Services Certificate of Analysis No. 321946.

Where bedrock was diamond cored, the recovered core was returned for photographing and Point Load Strength Index (Is_{50}) testing. Using established correlations the Unconfined Compressive Strength (UCS) of the bedrock was then calculated from the Is_{50} results. The results are shown in the attached Table D and graphically on the cored borehole logs. Colour photographs of the rock cores and included with the cored logs.

The fieldwork was completed in the full-time presence of our geotechnical engineers who set out the investigation locations, nominated the testing and sampling, and prepared the attached borehole logs and DCP test results sheet. The investigation locations are shown on the attached Figure 2, and these were set out by a differential GPS unit, which also provided the relative surface levels shown on the attached logs. Unfortunately at BH28 due to interference from trees, the GPS unit was unable to achieve an accuracy suitable to determine the surface level. The height datum used is the Australian Height Datum (AHD). Graphical borehole summaries for the cored boreholes have been prepared and these are presented in Figure 3 to 6. For more details of the investigation procedures and their limitations and a glossary of terms and symbols used, reference should be made to the attached Report Explanation Notes.

3 RESULTS OF INVESTIGATION

3.1 Site History

The site has historically been used as part of a quarry and brickworks, commonly known as the Metford Clay Mine, operated by CSR Buildings Products Ltd (CSR), which we understand occurred to some degree since the late 1800's. Based on a review of publicly available historical aerial imagery, evidence of mine works were observed in the 1944 image within the northern portion of the overall Maitland Hospital site, however not within the Eastern Area which is the subject of this report. However, by 1954 the mining works appear to have expanded to be within the subject site, although appears to be relatively minor. The mining then

gradually expanded over the following decades to cover an area shown in Plate 1 below based on the publicly available aerial imagery. The site then appears to undergo remediation in 2017 and then again in 2019 as part of the existing Maitland Hospital development.

Plate 1 – Historical aerial imagery dated 12 November 2006 showing extent of clay mine (courtesy of Google Earth)

3.2 Site Description

Maitland Hospital is located within a gently undulating area, which generally slopes down towards the north at about 2-3°. The site of this investigation is bound by the existing Maitland Hospital and an external asphaltic concrete (AC) paved on-grade carpark to the north-west, and is enclosed by reserve bushland around the remaining perimeter of the site.

The site itself appears to have been cut to level, evident by the presence of batter slopes along the north-western and southern boundaries. The excavations are associated with the historical use as a clay mine. The batter slope present along the north-western boundary is about 3m in height, slopes at about 10° to 12° down towards the subject site and is covered by loose gravel over the surface. Beyond the crest of the north-western batter slope is the on-grade car park. The southern batter slope is a maximum of approximately 6m in height and slopes down to the north at approximately 20° to 30°. The batter slope exposes weathered sandstone and siltstone estimated to be up to low strength, with bands of coal. The batter face appears eroded in parts, most likely due to surface run-off from beyond the batter crest. Small to large trees and vegetation are present atop the slope, however the majority of slope is unvegetated. Typically sub-vertical joints and sub-horizontal bedding partings are present in the cut face as shown in Plate 2 below.


Plate 2 - Left: The exposed outcrop within the southern boundary; Right: Joints observed on the exposed cut face

The level of the northern half of the site is a maximum of about 6m lower than the southern area, separated by a northern facing batter that slopes at approximately 10° to 15°. Towards the northern and north-eastern boundaries are areas of overgrown vegetation and reserve bushland, grading at about 2° to 3° down towards the east. A drainage gully traverses through this portion of the site close to the eastern boundary. The gully is relatively shallow with a maximum depth of about 0.7m and a width of 1.2m, with sandstone bedrock of at least low strength exposed within the base. The gully flows westerly towards a detention basin located approximately midway along the north-western boundary of the site. The depth of the detention basin is unknown.

3.3 Subsurface Conditions

The 1:250,000 series geological map of Newcastle (Geological Survey of NSW, Geological Series Sheet SI 56-2) indicates the site to be underlain by Tomago Coal Measures, generally comprising shale, mudstone, sandstone, tuff and coal. An alluvial profile associated with Hunter River is present about 700m north-east of the site.

The investigation comprised a large number of boreholes and therefore below provides a general overview of the conditions encountered. Reference should be made to the attached borehole logs for further details at specific locations. Graphical summaries of the cored borehole information are provided as Figures 3 to 6.

Fill

Clayey fill was encountered in the majority of boreholes and was highly variable in depth ranging from a nominal cover of no deeper than 0.1m to a maximum encountered depth of 5.9m. The deepest fill was generally present within the southern and western portions of the site, with shallower fill typically within the northern portion of the site. The fill was predominantly clay with varying amounts of sand and gravel. The fill was assessed to be of low to medium plasticity and appeared to generally vary between poorly and moderately compacted.

Natural Soil

A small portion of the boreholes appeared to encountered natural soils, although we noted on a few boreholes that it may also be clayey fill, possibly reworked natural soil. The natural soils typically comprised silty clay of medium plasticity and of very stiff to hard strength. The clays contained varying amounts of sand and fine to medium grained gravel, including coal.

Weathered Bedrock

Weathered bedrock was encountered, or inferred to be encountered, in all boreholes. At some locations rock was encountered at the ground surface, but within other boreholes the rock was encountered below the fill and natural soils at a maximum depth of ?m. The rock typically comprised sandstone and siltstone bedrock, although some laminite was also encountered. Within BH2 an approximately 1.5m thick layer of coal was encountered at a depth of 1.75m, which was assessed to be of very low strength. Generally, the upper bedrock was extremely to highly weathered and varied between hard soil strength and very low to low rock strength. The bedrock then gradually improved with depth to low to medium strength, but with some higher strength bands.

We have classified the rock in general accordance with Pells et al "Classification of Sandstones and Shales in the Sydney Region: A Forty Year Review", Australian Geomechanics, June 2019. It must be acknowledged that the site is located outside of the Sydney Region and the bedrock encountered is somewhat variable with both sandstone and siltstone (shale) encountered in the boreholes. In addition, within each rock class there may be bands of rock that are a higher or lower rock classification than the overall classification given below. For the purposes of this report the rock classifications adopted are summarised as follows:

- Class V Rock: extremely weathered rock of hard soil strength to rock of very low strength.
- Class IV Rock: distinctly weathered rock of at least low strength.
- Class III Rock: Slightly weathered to fresh rock of at least medium strength with relatively widely spaced defects.

The table below provides the depths and levels where each class of rock was encountered in each borehole.

Table Showing Assessed Rock Classification

Borehole	Depth and Level To the Top of Each Rock Class					
	Class V Rock		Class IV Rock		Class III Rock	
	Depth (m)	RL (AHD)	Depth (m)	RL (AHD)	Depth (m)	RL (AHD)
1	0.5*	14.0*	3.0*	11.5*	-	-
2	0.0	14.65	3.3*	11.3*	9.0	
3	0.8*	13.6*	2.8*	11.6	-	
4	0.1*	14.3*	2.1*	12.3*	-	-
5	0.1*	14.4*	0.8*	13.7*	-	-
6	0.1 7.6	14.35 6.8	6.0 8.9	8.4 5.5	-	-

Borehole	Depth and Level To the Top of Each Rock Class					
	Class V Rock		Class IV Rock		Class III Rock	
	Depth (m)	RL (AHD)	Depth (m)	RL (AHD)	Depth (m)	RL (AHD)
7	1.1*	13.3*	2.8*	11.6*	-	-
8	3.0	8.4	3.9*	7.5*	8.2	3.2
9	0.0*	14.6*	1.0*	13.6*	-	-
10	0.1	14.1	4.5		5.1	9.1
11	3.8*	9.9*	5.0*	8.7*	8.4	5.3
12	0.3*	14.4*	1.5*	13.2*	-	-
13	1.7*	12.6*	2.9*	11.4*	-	-
14	4.5*	8.75	5.5	7.8	7.3	5.9
15	4.6*	8.9*	4.6*	8.9*	-	-
16	4.3*	8.3*	6.5*	6.1*	-	-
17	5.5*	7.0*	7.0	5.4	7.2	5.2
18	3.15*	10.3	5.0		-	-
19	4.9*	7.7*	6.5*	6.1*	-	-
20	3.5	9.3	3.5	9.3	5.7	7.1
21	0.3*	8.6*	-	-	-	-
22	0.1*	9.0*	-	-	-	-
23	0.3*	8.1*	-	-	-	-
24	0.4	7.9	0.4	7.9	7.7**	0.6**
25	0.4*	7.8*	0.4*	7.8*	-	-
26	0.4	7.7	4.6	3.6	7.6	0.5
27	0.6		0.7*	7.5*	-	-
28	1.6	6.8	1.6	6.8	-	-
29	2.0*	N/A	2.5*	N/A	-	-
30	1.2 4.0	7.2 4.4	1.2 5.8	7.2	-	-
31	0.8*	8.5*	1.6*	7.7*	-	-
32	0.7		0.9*	7.7*	-	-

Borehole	Depth and Level To the Top of Each Rock Class					
	Class V Rock		Class IV Rock		Class III Rock	
	Depth (m)	RL (AHD)	Depth (m)	RL (AHD)	Depth (m)	RL (AHD)
33	1.0	7.4*	1.0	7.4*	-	-
34	3.9		4.4	7.0	8.5	2.9
35	1.1*	7.8*	1.1*	7.8*	-	-
36	3.4*	8.0*	4.0*	7.3*	-	-
37	2.2*	8.0*	2.2*	8.0*	8.2	2.1
38	2.9*	6.6*	2.9*	6.6*	8.1	1.4
39	2.9*	6.7*	4.5*	5.1*	9.3	0.3
40	1.3*	7.0*	1.3*	7.0*	-	-
41	5.9*	8.5*	5.9*	8.5*	-	-
42	0.7* 5.8 9.5	13.7* 4.9	1.8	12.6	7.4	7.0
43	4.6*	8.3*	4.6*	8.3*	-	-
44	0.4*	N/A	-	-	-	-
45	0.4*	N/A	-	-	-	-
46	0.5*	N/A	-	-	-	-
47	0.2*	9.3*	-	-	-	-

Notes

* Classification based on augered portion of borehole and therefore classification may vary by a magnitude.

** Further proving of Class III bedrock required.

Groundwater

Groundwater was not encountered during or on completion of drilling for all boreholes, except BH8 and BH19 which encountered seepage during drilling at depths of 1.6m and 6.0m, respectively. The introduction of water as part of the coring process prevented any further groundwater measurements during drilling within the cored boreholes. The presence of detention basin and drainage gully observed surface water may impact groundwater readings. Regardless, the water observed in these features is not considered the groundwater table but rather surface run-off or seepage through the profile.

3.4 Laboratory Test Results

Based on the Atterberg limits and linear shrinkage test results, the clayey fill and natural clay tested is of low to medium plasticity. The moisture content test results on samples of the weathered rock recovered from the augered portions of the boreholes showed reasonably good correlation with our field assessment of rock strengths. Reference should be made to the attached STS Table A for further details.

The four day soaked CBR tests on a clayey fill samples compacted to 98% of their Standard Maximum Dry Density (SMDD) returned CBR values ranging from 2% to 5%. The CBR test on natural clay from BH39 returned a CBR value of 3%. Reference should be made to the attached STS Table B for further details.

The results of the shrink-swell testing from samples taken from BH8, BH14 and BH37 returned values of 0.61%/pF, 0.54%/pF and 1.53%/pF, respectively. This indicates the soils tested have a slight potential for shrink/swell reactivity with changes in moisture content. Reference should be made to the attached STS Table C for further details.

The results of the point load strength index tests on the recovered rock core correlated well with our field assessments of rock strength. The results generally indicated an Unconfined Compressive Strength (UCS) ranging from 2MPa to 16MPa, although occasional lower and higher UCS values as low as 1MPa and as high as 26MPa were also recorded. Reference should be made to the attached Table D for further details.

The following table summarises the soil chemistry test results from Envirolab Services. Reference should be made to the attached Certificates of Analysis No. 321946 for further details.

Samples	Material	pH	Chloride (mg/kg)	Sulphate (mg/kg)	Resistivity (ohm.cm)
BH4 0.5-0.95m	Weathered SILTSTONE	8.6	140	1,800	1,000
BH7 0.5-0.95m	FILL: Clayey sand	6.6	100	390	2,700
BH11 3.0-3.45m	FILL: Sandy clay	4.7	27	1,300	1,400
BH17 4.5-4.95m	Silty CLAY	5.0	48	1,300	1,400
BH19 3.4-3.95m	Silty CLAY	7.3	390	380	1,700
BH20 1.5-1.95,	FILL: Sandy clay	5.4	96	810	1,700
BH29 1.5-1.95m	FILL: Silty clay	8.6	460	1,100	1,000
BH38 1.5-1.95m	FILL: Silty clay	5.6	300	1,900	900
BH43 1.5-1.95m	FILL: Sandy clay	5.4	56	880	1,800

4 COMMENTS AND RECOMMENDATIONS

No specific details of the proposed development are available at the time of preparing this report, only our understanding of the likely development as summarised in Section 1. Therefore, the comments and recommendations provided below should be considered general advice only and must be reviewed and amplified once development details are known.

4.1 Geotechnical Issues

Whilst details of the development are not known, we expect that cut and fill earthworks will be required, which will likely extend through the soils and weathered bedrock. Fill was encountered within most of the boreholes to variable depths ranging from no more than 0.1m to a maximum depth of 5.9m. Following completion of the investigation we were supplied with a Level 1 Testing report prepared by Robert Carr & Associates (RCA) (Ref: 15351-214 dated 14 October 2021) for the site. The RCA report states that the existing fill has been placed under Level 1 inspection and testing, although we note the SPT 'N' values indicate that the fill is variably compacted, with some poorly compacted layers. The end client will need to assess if the RCA report is sufficient for them to accept that the fill is controlled fill and the risk of supporting any structures or slabs on the fill. Regardless, given the depth of the fill, consideration still needs to be given to the potential long-term elastic and creep settlement of fill, as well as the potential for differential settlements due to the variable depth of the fill. If lightweight structures are proposed there may be the potential to support them on the existing fill, but we recommend a site specific geotechnical assessment be undertaken at each specific location to determine the feasibility.

Where heavy structural loads are proposed, then the existing fill is unlikely to have sufficient capacity and the proposed building should be designed to be supported on a piled footing system. Floor slabs may be able to be supported on the fill if the RCA report is accepted, but additional investigation, such as DCP testing, should also be carried out if this is proposed.

If areas of the site are to be filled using the existing fill excavated from some areas of the site to save on disposal costs, then a suspended slab may be required if the fill is considered to be unsuitable, such as containing a high organic content, although based on the boreholes and from a geotechnical perspective it generally appears the fill should be suitable for re-use but would require further assessment.

The depth to bedrock varies within the site, being exposed at the surface within the southern portion of the site and deepening significantly within the central portion due to the fill that appears to have been placed. Therefore, a combination of high level footings where rock is exposed and piled footings where rock is deeper will be required. The upper bedrock is generally of poor quality, being Class V or IV, and so limited design parameters will be appropriate. If the building needs to be supported on the better Cass III rock, then piles may need to be utilised across the whole building footprint in order to reach such rock.

4.2 Excavation

If excavations are required, then we expect the excavations to encounter clayey fill and sandstone bedrock, potentially up to medium strength. Excavation of soils and bedrock up to very low strength will be achievable using conventional excavation equipment, such as the buckets of hydraulic excavators.

Excavation of low or higher strength bedrock will require assistance using rock excavation techniques, such as ripping tynes fitted to excavators or dozers, hydraulic impact hammers, rock saws or rock grinders. Whilst there appears to be no structures that may be impacted by the vibrations generated by rock excavation, consideration should still be given where any rock excavations occur near the north-western boundary in proximity to the existing Maitland Hospital. We recommend that where hydraulic impact hammers are to be used, at least some initial quantitative vibration monitoring by the geotechnical engineers be carried out to assess if transmitted vibrations are within tolerable limits. However, if excavation using rock hammers is proposed close to existing structures full time monitoring of the transmitted vibrations may be required. We recommend that this be assessed once the area of the proposed excavation is known and further geotechnical advice obtained.

Where vibrations are found to be excessive then alternative lower vibration emitting equipment would need to be used. Reference should be made to the attached Vibration Emission Design Goals for further details.

4.3 Existing Fill

As discussed in Section 4.1 above, the Level 1 Testing report prepared by Robert Carr & Associates (RCA) (Ref: 15351-214 dated 14 October 2021), states that the existing fill within the north-eastern area was placed under Level 1 inspection and testing in accordance with AS3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments". Whilst we have not been provided with the compaction test results, the RCA report states the following for Fill 2 Area, which is in the vicinity of BH11, BH14 to BH20 and BH43:

- "Prior to fill placement all surfaces were stripped and free of vegetation, topsoil and loose material."
- "Density tests and inspections were carried out during fulltime presence and fill placement during the period 29/4/21 to 2/6/21."
- "The tests carried out indicated density ratio values ranging from 98.0% to 104.0% with an average of 101.2%. Tests carried out indicated moisture contents ranging from 10.9% to 23.5% with an average of 16.6%, and Standard Optimum Moisture ranging from 0.1% to 5.5% dry of Standard Optimum Moisture with an average of 2.2% dry."
- "Our observations and measurements indicated 3.9 metres deep of fill was placed in 13 layers of 300mm to enable compaction, and thorough and uniform compaction was given to each layer using a 15-tonne padfoot roller and smooth drum roller." We note that in some of our boreholes, the fill depth was as deep as 4.6m. Furthermore, the Bulk Earthworks Plan prepared by TTW (Dwg. TTW_CIV_DWG_GXO_C230, Issue A dated 29 January 2021) indicates a fill depth up to 7m in this area, although this drawing is not an 'As-Built' drawing but rather prepared prior to the filling and therefore

appears to not reflect the actual fill depths. This indicates that additional fill other than that testing and inspected by RCA may be present.

- RCA assessed "the fill covered by this report is assessed to have been placed in accordance with Level 1 requirements of AS3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments".

We note that the RCA reports does not specifically state that it is their opinion that the works as a whole comply with the specification and drawings, which is required under Level 1 Inspection and Testing in accordance with AS3798-2007. It may be implied from the comment by RCA that the fill has been "placed in accordance with Level 1 requirements of AS3798-2007", but is not specifically stated. In addition, there is no information in the RCA report on what the specification for the earthworks was.

The RCA report may be taken as certification from RCA of the fill placed, on the understanding of the limitations stated above. Based on this, generally we consider it feasible for the fill to support high level footings and floor slabs for lightly loaded structures. However, some variable SPT 'N' values were measured during our geotechnical investigation and there will be a risk of poorly compacted fill layers being present. In addition, the depth of the fill tested by RCA does not match the depth of the fill encountered in our boreholes or the depth shown on the bulk earthworks plan so there may be additional fill not inspected and tested by RCA. If structures or floor slabs are to be supported on the fill, we recommend a site specific assessment be carried out once building locations are known. Where not considered practical or the results of the specific assessment indicate poorly compacted fill, the slabs should be designed as a fully suspended floor slabs or the existing fill fully excavated and replaced with controlled, engineered fill.

Consideration must also be given to the effect of the depth of the fill on any structures supported on the fill due to ongoing settlement. This is discussed further in Section 4.8.2.

4.4 Earthworks and Filling

We expect that some earthworks will be required, but the extent of that has not been determined. The design of the structures will need to assess if they can be supported on the existing fill as discussed in Section 4.3 or if suspended slabs or excavation and replacement of the existing fill is required.

Where the existing fill will remain in place it must be proof rolled as recommended below and treatment of any weak areas carried out. Within landscaped areas the recommendations provided below may be followed, but density testing of any placed fill would not be required.

Where a fully suspended floor slab is adopted, no particular subgrade preparation would be required, but any vegetation, root affected soils or deleterious fill material should be stripped. Fill may then be placed as 'form fill' with only nominal compaction and without the need for density testing of the fill during placement.

The following subgrade preparation measures should be followed:

- Strip all vegetation, root affected soils or any deleterious fill material exposed.

- If backfilling of the existing detention basin and gullies are proposed, then it will be critical that all softened materials are removed down to a sound base prior to placement of the fill.
- Where excavation and replacement of the fill is required, remove all existing fill to expose the residual soils or bedrock.
- Proof roll the exposed soil subgrade with at least 6 passes of a minimum 12 tonne dead weight, smooth drum, vibratory roller. The final pass of the proof rolling should be carried out without vibration and in the presence of a geotechnical engineer to detect any weak subgrade areas.
- Care must be taken during proof rolling and fill compaction due to the vibrations generated by the roller. Where rolling is required close to existing structures or movement sensitive services the vibrations may need to be reduced or ceased. If this is the case the layer thickness of any fill placed should also be reduced.
- Any weak subgrade areas detected during proof rolling should be locally excavated to a sound base and the excavated material replaced with controlled, engineered fill, or as directed by the geotechnical engineer during the proof rolling inspection.
- Within pavement areas, if the unsuitable fill extends to significant depth the use of a bridging layer may be required to avoid excessive excavation. The bridging layer would need to be designed at the time, but we expect it would comprise good quality granular fill, containing geotextile layers, of at least 0.5m to 0.6m thick. If weak areas below slabs extend to significant depths, then the slabs may then need to be redesigned as fully suspended slabs.
- Following treatment of any weak layers, engineered fill should be placed as required in thin horizontal layers to the design levels.

We expect that some weak subgrade areas may be encountered where the existing uncontrolled fill is left in place in pavement areas. The extent of the weak areas may be reduced if the earthworks are carried out during dry weather and adequate site drainage is provided and maintained. If the clay fill or residual silty clay is exposed to prolonged periods of rainfall, softening will result and site trafficability will be poor. If soil softening occurs, the subgrade should be over-excavated to below the depth of moisture softening and the excavated material replaced with engineered fill. The placement of a layer of good quality granular material as the final fill layer is recommended to improve the trafficability of the site during construction.

Any fill to be removed from site should be appropriately classified by an environmental consultant for disposal prior to removal from site.

During construction of the fill platform runoff should be enhanced by providing suitable falls to reduce ponding of water on the surface of the fill. Ponding of water may lead to softening of the fill and subsequent delays in the earthworks program.

4.5 Engineered Fill and Compaction Control

Engineered fill should preferably comprise well graded granular materials, such as crushed sandstone, free of deleterious substances and having a maximum particle size not exceeding 75mm. From a geotechnical perspective, the existing fill generally appears suitable for re-use as engineered fill. However, we understand there areas of buried capped asbestos and contaminated fill may be present at the site, which we presume will not be suitable for re-use and further advice should be sought from an environmental consultant in this regard. Furthermore, where carbonaceous materials, such as the coal encountered in some boreholes, are to be used as engineered fill, then we recommend the material should blended with non-carbonaceous materials to a ratio of at least 1:1. Any excavated fill proposed for re-use should be inspected by a geotechnical engineer following excavation to confirm the suitability as deleterious inclusions may not have been identified within our small diameter boreholes.

Fill should be compacted in horizontal layers of not greater than 200mm loose thickness, to a density of at least 98% of Standard Maximum Dry Density (SMDD). For backfilling confined excavations such as service trenches, a similar compaction to engineered fill should be adhered to, but if light compaction equipment is used then the layer thickness should be limited to 100mm loose thickness.

Density tests should be regularly carried out on the fill to confirm the above specifications are achieved. The frequency of density testing should be at least one test per layer per 1,000m^2 or 1 test per 200m^3 distributed reasonably evenly throughout the fill depth, whichever requires the most tests. Preferably the geotechnical testing authority should be engaged directly on behalf of the client and not by the earthworks subcontractor.

4.6 Hydrogeological Considerations

We do not expect any excavations to encounter the groundwater table, however seepage will likely be encountered along the soil-rock interface and through defects in the bedrock. However, the subsurface profile is low permeability and therefore any seepage encountered should be easily managed by either gravity or sump and pump drainage systems. Furthermore, we do not expect stormwater infiltration systems will likely be a viable option, particularly given the low permeability and the assumed size of the proposed building. As such, any captured stormwater will need to be disposed of appropriately into Council stormwater systems or waterways, pending approval.

Since the proposed development will be constructed at the ground surface, with no basement proposed, drainage will only be required to control any surface water and direct it into the stormwater system.

4.7 Retention Systems

Given that any proposed excavation are likely to be sufficiently away from site boundaries, the use of temporary batters appears feasible to allow construction of permanent retaining walls at the base of the batters. Alternatively, permanent batters could be adopted if space allows. If this is not the case then retention systems may need to be installed prior to the start of excavation and additional advice on such walls should be obtained once the extent of any such walls are known.

Temporary batters of no more than 3m in height should be no steeper than 1 Vertical in 1 Horizontal (1V:1H). Where batter heights exceed 3m, further advice should be sought from a geotechnical engineer once the exact batter locations and heights are known. However typically a 2m wide bench at about mid height of the batter slope should be allowed for higher batters. Such batters should remain stable in the short term provided all surcharge loads, including construction loads, are kept well clear of the crest of the batters.

Bedrock of low strength or better should be able to be excavated sub-vertically unsupported, provided the cut face is inspected by a geotechnical engineer to assess the presence of any adverse defects that may require stabilisation, such as rock bolts. Such inspections should be carried out at depth intervals of no more than 1.5m so that any stabilisation required can be installed prior to further excavation.

Permanent batters through soils and weathered bedrock up to very low strength should be no steeper than 1V:2H, but flatter batters of the order of 1V:3H are preferred to allow access for maintenance of vegetation. Where soils are exposed, permanent batters should be covered with topsoil and planted with a deep rooted runner grass, or other suitable coverings, to reduce erosion. All stormwater runoff should be directed away from all temporary and permanent batters to also reduce erosion.

Where fill is placed to form permanent batters, the fill should be placed in horizontal layers that extend at least 1.5m past the final geometry of the permanent batters. Following placement of the fill, the batter should then be cut back to the final geometry so that the loose fill on the edge of the fill layers that cannot be adequately compacted is removed.

Permanent retaining walls supporting no more than about 3m may be designed as cantilevered walls. The major consideration in the selection of lateral earth pressures for the design of retaining walls is the need to limit deformations occurring outside the excavation. Walls retaining soils and bedrock up to very low strength may be designed based on a triangular earth pressure distribution. Where the resulting ground movements are of little concern design may be based on an active earth pressure coefficient, K_a, of 0.33. Where movements are to be reduced, or where walls are restrained from movement by other structural elements in front of the wall, an 'at rest' earth pressure coefficient, K_0, of 0.6 should be used for the design of cantilevered walls. A bulk unit weight of 20kN/m^3 should be adopted for the retained material.

The above coefficients assume horizontal backfill surfaces and where inclined backfill is proposed the coefficients should be increased or the inclined backfill taken as a surcharge load. All surcharge loads should be allowed for in the design, plus full hydrostatic pressures, unless measures are undertaken to provide complete and permanent drainage behind the wall.

4.8 Footings

4.8.1 Footings Founded within Rock

Given the expected high column loads, we expect that the proposed structure will need to be supported on footings founded within the weathered bedrock. This will be achieved through a combination of high level pad/strip footings where rock is exposed or is at shallow depths and piles where rock is deeper. Lightweight structures may be supported by the existing fill but special consideration needs to be given as discussed in Section 4.8.2 below.

The design of footings founded within the rock may be based on the following parameters. We note that the serviceability parameters given are based on settlement of less than 1% of the pile diameter or footing width. The ultimate parameters may be used with limit state design methodology on the understanding that detailed settlement analysis of footings must also be carried out to assess likely settlements under these higher pressures. We note that the use of ultimate pressures can produce settlements up to 5% of the pile diameter or footing width. Differential settlements of about half the total settlements would be expected. The designer may use the modulus values given below to estimate the settlements of particular footings.

Rock Class	Allowable End Bearing Pressure	Allowable Shaft Adhesion in Compression	Ultimate End Bearing Pressure	Ultimate Shaft Adhesion in Compression	Elastic Modulus
Class V	700kPa	70kPa	2,000kPa	100kPa	100MPa
Class IV	1,000kPa	100kPa	3,000kPa	200kPa	200MPa
Class III	3,000kPa	300kPa	15,000kPa	800kPa	700MPa

As discussed in Section 3.3, whilst a rock classification has been applied to the bedrock, it must be acknowledged that within each unit there may be thin bands of poorer quality bedrock that may affect the pile design. We therefore recommend that the pile design be reviewed by a geotechnical engineer against the available borehole information to confirm the adopted pile design parameters are appropriate. Where bands of poorer quality bedrock within say Class III bedrock is present, we recommend the pile toe is founded no closer than 4 pile diameters above the bands of poorer quality bedrock.

Whilst the bedrock was typically of low to medium strength with some bands of lower and higher strength rock, we noted high resistance and even refusal within the auger portion of the boreholes. As such, we recommend the piling contractor take this into consideration as we would expect greater equipment wear and tear than would be usual for low to medium strength. Decreased productivity should also be allowed for in the piling program.

Ultimate values must be used in conjunction with an appropriate geotechnical strength reduction factor (ϕ_g) which must be calculated in accordance with the methodology outlined in AS2159-2009 '*Piling Design and Installation*'. It is not possible at this stage to accurately determine the geotechnical strength factor as we have no knowledge of the design and installation factors.

All piles should be founded with a nominal socket of at least 0.3m into the appropriate class of rock. For the design of sockets into the rock, the shaft adhesion should be ignored within the 0.3m nominal socket. For the design of piles in uplift, shaft adhesions of half the shaft adhesions in compression may be used. The shaft adhesion values assume that adequate socket roughness and cleanliness is maintained.

Where footings are founded within Class V or Class IV Rock, we recommend that at least 50% of the footing excavations be inspected by a geotechnical engineer to confirm that a suitable founding stratum has been achieved. The requirements for further inspections can be decided at that time, and the frequency will depend on the level of 'sign-off' required.

Where footings are founded within Class III bedrock, targeted drilling of additional boreholes at selected pile locations must be carried out and the drilling of all piles inspected by a geotechnical engineer.

Some groundwater seepage may occur into the bored piers and therefore we recommend that piles be drilled, inspected, and poured within minimal delay. Where seepage does occur it should be pumped from the pier holes prior to pouring of concrete and all concrete poured using tremie techniques, which should be used anyway given the expected depth of the piles. However, some difficulties due to collapse of the uncontrolled fill may be experienced requiring the use of temporary liners.

A piling platform will need to be constructed to support the piling rig. The platform should be constructed using good quality granular material, but the thickness will depend on the piling rig and platform material used and will need to be determined once details of the piling rig are known. Where bedrock is exposed at the surface, then the bedrock will likely be suitable to support the piling rig from a stability perspective without the need for a working platform, however, it is still good practice to place a minimum 300mm thick working platform to assist with workability of the area. Working platforms will typically comprise of a crushed sandstone or a similarly approved material.

4.8.2 Shallow Footings

Due to the presence of fill greater than 0.4m thickness and the possibility of abnormal moisture conditions due to existing trees, we consider that the site classifies as Class 'P' in accordance with AS2870 - 2011 'Residential Slabs and Footings'. If the footings for minor structures are designed to by founded within the existing fill or founded below the fill on the natural residual soils or weathered rock consideration must still be given to the potential for the clayey soils to shrink and swell with changes in moisture content. In our opinion, any new footings must be designed on the assumption that shrink-swell movements of the residual silty clays similar to Class 'M' type movements will occur. We note in the strictest sense AS2870-2077 does not apply to a development such as this, however the standard provides useful design guidance for reactive site. Reference should also be made to AS2870 for design, construction, performance criteria and maintenance precautions on reactive clay sites.

If the designer considered that the report by RCA is sufficient to consider the fill as controlled fill, footings for lightly loaded structures could be founded within the existing fill. Such footings may be design based on an

allowable bearing pressure of 100kPa. However, we recommend a geotechnical assessment be undertaken to assess the feasibility of the building design supported by the existing fill and to determine whether further investigations are warranted once the building locations are known. We consider the following are potential risks for structures founded on the existing fill:

- The existing fill in 'Area 2' was encountered within the boreholes to a maximum depth of 4.6m and therefore there is potential for long-term elastic and creep settlement of the fill to occur. Even with well compacted fill settlement may occur, which can be significant for deep fill. Whilst the compaction of the fill would have removed the majority of the elastic settlement, further elastic settlement could occur due to the building loads applied. Elastic settlement is dependent on the footing geometry but may be in the order of 10mm to 15mm for a 0.6m wide strip footing loaded to 100kPa.
- Longer term creep settlement of the fill may occur, which increase with the increased depth of fill. Settlements due to creep are difficult to predict and are dependent on the composition of the fill, the time the material has been placed, degree of compaction and the fill thickness. Based on published papers, such as Waddell and Wong (2005) and Waddell (2013), for well compacted fill a creep strain rate of 0.5% of the fill depth may occur over a log cycle of time. For example, where 4.6m depth of fill is present, then potentially up to 23mm of creep settlement may occur over a log cycle of time.
- Hydroconsolidation/collapse settlement of the fill can occur due to saturation of the compacted fill material due to either a rising water table or from infiltration from surface run-off. Given the existing fill appears to have achieved a compaction between 98.0% and 104.0%, we consider the risk of this to be low to negligible but should still be reviewed once further structure details are known.
- Based on the Bulk Earthworks Plan by TTW, the sides of the fill area appear to be sloping, and therefore if a building is constructed over the sloping area, there will be a variable fill depth across the building footprint which may result in differential settlements occurring. Furthermore, if the sides of the fill area are relatively steep, then there is potential for lateral movements of the fill, although we consider this a relatively low risk.

4.9 Soil Aggressiveness

Based on the soil aggressivity testing, the soils and weathered rock would be classified as having a 'Mild' exposure classification for concrete piles in accordance with Table 6.4.2(c) of AS2159-2009 'Piling – Design and Installation'. For steel piles, the soils would be classified as 'Moderate' in accordance with Table 6.5.2(c) of AS2159-2009.

4.10 Earthquake Design Classification

Based upon AS1170.4-2007 "*Structural Design Actions, Part 4: Earthquake Actions in Australia*", the following design parameters may be adopted:

- Hazard Factor (Z) – 0.10;
- Class C_e – Shallow soil site.

We note that depending on the location of the proposed building, the Class may be revised to Class B_e-Rock Site given that within portions of the site, in particular the south side of the site, there is less than 3m depth of highly weathered or completely weathered rock/soil and if excavation is carried out rock may be exposed. We therefore recommend the earthquake design classification is reviewed once building locations and levels are known to determine if an alternate classification is warranted.

4.11 Pavements

We presume that new access roads and external on-grade car parks will be constructed requiring pavement design. Any pavement subgrade should be prepared as recommended in Section 4.3.

The CBR testing of soil samples returned CBR values ranging from 2% to 5%. We consider that design of the pavement thickness may be based on a soaked CBR of 2%, or a modulus of subgrade reaction of 20kPa/mm (750mm plate). Where fill is used to raise site levels, or replace unsuitable subgrade by the appropriate depth, pavement design may reflect the thickness and four day soaked CBR value of the imported material.

Where the subgrade will comprise the clay, the measured CBR value is typically low and this must be taken into account during pavement design. consideration could be given to some form of subgrade improvement to reduce the thickness of the pavement materials. The following are possible options for improving the subgrade.

1. Design the pavements for a CBR value of 2% or an estimated subgrade reaction modulus (for concrete slabs or pavements) of 20kPa/mm (750mm diameter plate). Reference should be made to the attached Table 1 for possible pavement thickness designs based on $9x10^5$ ESA and $4x10^3$ ESA resulting in pavement total thicknesses of 635mm and 385mm, respectively.

OR

2. Provide an appropriate select fill layer as part of the overall pavement thickness. The select fill should be well graded ripped or crushed sandstone or good quality granular material with a minimum soaked CBR value of 10%. The pavement sections where imported fill is used to raise site levels may be designed taking into account the thickness and soaked CBR value of the imported fill material.

OR

3. Stabilise the subgrade to a depth of 200mm to 300mm by the addition of lime or cement. When thoroughly mixed and re-compacted to a minimum of 98% of SMDD, a reduction in reactivity along with substantial increase in strength will be achieved. As a guide, the addition of approximately 4% lime by dry weight of clay should result in a soaked CBR value of around 6% or an equivalent subgrade reaction modulus of 40kPa/mm. This should, however, be confirmed by laboratory testing. If lime stabilisation is undertaken, an experienced contractor with appropriate equipment should complete it. Appropriate dust suppression will be required, particularly given the proximity of the existing Hospital.

Where bedrock is exposed at the subgrade level, then a higher CBR value of 10% may be used. One of the problems with a rock subgrade is the poor drainage that can occur. The rock is effectively impermeable and water can pond on the surface becoming trapped in the subbase/base courses, having an adverse effect on pavement performance. As recommended by the Transport for NSW (TfNSW) guidelines, the upper say 300mm of the rock should be ripped and recompacted to reduce such risks.

Surface and subsoil drainage should be provided on both sides of the pavements to prevent moisture ingress into the subgrade and pavement. The subsoil drains should have an invert level of at least 300mm below the adjacent subgrade level and be excavated with a uniform longitudinal fall to appropriate discharge points so as to reduce the risk of ponding in the base of the drain. In addition, the surface of the adjacent pavement subgrade should be provided with a uniform cross fall towards the subsoil drain to assist with drainage.

Concrete pavements should have a subbase layer of at least 100mm thickness of crushed rock to TfNSW QA Specification 3051 unbound base material (or similar good quality and durable fine crushed rock), which is compacted to at least 100% of SMDD. Concrete pavements should be designed with effective shear transmission at all joints by way of either doweled or keyed joints.

4.12 Mine Subsidence

Based upon the NSW Government ePlanning Spatial Viewer and at the date of this report, the site does not fall within an identified Mine Subsidence District and therefore does not require approval from Subsidence Advisory NSW.

4.13 Acid Sulfate Soils

A review of the 1:250,000 Acid Sulfate Soils (ASS) risk maps prepared by Department of Land and Water Conservation (1997) indicates that the site is within a Class 5 risk area. The Class 5 risk define works within 500m of adjacent Class 1, 2, 3, 4 land which are likely to lower the water table below 1m AHD on the adjacent land.

Based on the weight of evidence collected and evaluated for this assessment including the elevation of the site (RL8m to RL15m AHD), review of risk and planning maps and the presence of predominantly residual natural soils encountered during drilling, there is considered to be a low potential for ASS occurrence at the site. Therefore, in our opinion the development poses a negligible risk of disturbing ASS materials. On this basis, an Acid Sulfate Soil Management Plan (ASSMP) is not considered necessary for the proposed development.

4.14 Further Geotechnical Input

The following is a summary of the further geotechnical input which is required and which has been detailed in the preceding sections of this report:

- Review of the recommendations provided in this report once development details are known.
- Additional cored boreholes if design based on parameters for Class III Rock are adopted;
- Regular inspections of any near vertical cuts within rock;
- Inspection of proof roiling of soil areas;
- Density testing of any fill placed;
- Inspection of footing excavations or pile drilling.

5 GENERAL COMMENTS

The recommendations presented in this report include specific issues to be addressed during the design and construction phase of the project. In the event that any of the advice presented in this report is not implemented, the general recommendations may become inapplicable and JK Geotechnics accept no responsibility whatsoever for the performance of the structure where recommendations are not implemented in full and properly tested, inspected and documented.

The long term successful performance of floor slabs and pavements is dependent on the satisfactory completion of the earthworks. In order to achieve this, the quality assurance program should not be limited to routine compaction density testing only. Other critical factors associated with the earthworks may include subgrade preparation, selection of fill materials, control of moisture content and drainage, etc. The satisfactory control and assessment of these items may require judgment from an experienced engineer. Such judgment often cannot be made by a technician who may not have formal engineering qualifications and experience. In order to identify potential problems, we recommend that a pre-construction meeting be held so that all parties involved understand the earthworks requirements and potential difficulties. This meeting should clearly define the lines of communication and responsibility.

Subsurface conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact this office.

This report provides advice on geotechnical aspects for the proposed civil and structural design. As part of the documentation stage of this project, Contract Documents and Specifications may be prepared based on our report. However, there may be design features we are not aware of or have not commented on for a variety of reasons. The designers should satisfy themselves that all the necessary advice has been obtained. If required, we could be commissioned to review the geotechnical aspects of contract documents to confirm the intent of our recommendations has been correctly implemented.

A waste classification is required for any soil and/or bedrock excavated from the site prior to offsite disposal. Subject to the appropriate testing, material can be classified as Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM), General Solid, Restricted Solid or Hazardous Waste. Analysis can take up to seven to ten working days to complete, therefore, an adequate allowance should be included in the construction program unless testing is completed prior to construction. If contamination is encountered, then substantial further testing (and associated delays) could be expected. We strongly recommend that this requirement is addressed prior to the commencement of excavation on site.

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SOIL TEST SERVICES

ABN 43 002 145 173

TABLE A
MOISTURE CONTENT, ATTERBERG LIMITS AND LINEAR SHRINKAGE TEST REPORT

Client:	JK Geotechnics	**Report No.:**	35924LF - A
Project:	New Maitland Hospital Project	**Report Date:**	2/05/2023
Location:	Maitland Hospital, Metford Road, Maitland, NSW	**Page 1 of 2**	

AS 1289	TEST METHOD	2.1.1	3.1.2	3.2.1	3.3.1	3.4.1
BOREHOLE NUMBER	DEPTH m	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX %	LINEAR SHRINKAGE %
1	2.40 - 2.80	13.3	-	-	-	-
2	2.70 - 2.90	18.9	-	-	-	-
3	2.80 - 3.00	10.2	-	-	-	-
5	1.50 - 1.80	7.9	-	-	-	-
7	2.80 - 3.00	10.3	-	-	-	-
8	1.50 - 1.95	23.7	40	22	18	6.5
9	1.30 - 1.50	6.5	-	-	-	-
11	0.50 - 0.95	14.9	32	16	16	7.0
11	5.00 - 5.50	9.6	-	-	-	-
15	4.80 - 5.00	9.4	-	-	-	-
17	3.00 - 3.45	20.3	41	19	22	9.5
17	5.80 - 6.00	12.5	-	-	-	-
19	6.50 - 6.80	7.1	-	-	-	-
24	1.00 - 1.20	8.3	-	-	-	-
25	0.60 - 0.70	8.1	-	-	-	-
26	1.30 - 1.80	9.7	-	-	-	-
27	1.00 - 1.20	8.4	-	-	-	-
29	0.50 - 0.95	14.4	34	14	20	9.0
29	2.50 - 3.00	9.6	-	-	-	-
31	2.50 - 3.00	8.0	-	-	-	-
32	2.00 - 2.50	9.4	-	-	-	-
33	1.70 - 2.20	8.0	-	-	-	-
34	1.50 - 1.95	20.6	42	20	22	9.5

Notes: Refer to page 2

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02/05/2023
Authorised Signature / Date
(D. Treweek)

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SOIL TEST SERVICES

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TABLE A
MOISTURE CONTENT, ATTERBERG LIMITS AND LINEAR SHRINKAGE TEST REPORT

Client:	JK Geotechnics	**Report No.:**	35924LF - A
Project:	New Maitland Hospital Project	**Report Date:**	2/05/2023
Location:	Maitland Hospital, Metford Road, Maitland, NSW	**Page 1 of 1**	

AS 1289	TEST METHOD	2.1.1	3.1.2	3.2.1	3.3.1	3.4.1
BOREHOLE NUMBER	DEPTH m	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX %	LINEAR SHRINKAGE %
35	1.50 - 1.60	7.2	-	-	-	-
38	0.50 - 0.95	18.4	41	21	20	9.0
38	2.90 - 3.00	12.5	-	-	-	-
40	1.30 - 1.50	11.6	-	-	-	-
42	2.40 - 2.60	8.0	-	-	-	-
43	5.50 - 6.00	9.1	-	-	-	-

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: 17/04/2023.
- Sampled and supplied by client. Samples tested as received.

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SOIL TEST SERVICES
ABN 43 002 145 173

TABLE B
FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: JK Geotechnics
Project: New Maitland Hospital Project
Location: Maitland Hospital, Metford Road, Maitland, NSW

Report No.: 35924LF - B
Report Date: 19/04/2023
Page 1 of 1

BOREHOLE NUMBER		BH 3	BH 20	BH 34	BH 39
DEPTH (m)		0.00 - 0.65	0.00 - 1.00	0.40 - 1.40	0.40 - 1.00
Surcharge (kg)		4.5	4.5	4.5	4.5
Maximum Dry Density (t/m^3)		1.79 STD	1.60 STD	1.67 STD	1.65 STD
Optimum Moisture Content (%)		14.4	20.4	18.0	18.5
Moulded Dry Density (t/m^3)		1.75	1.56	1.64	1.62
Sample Density Ratio (%)		98	98	98	98
Sample Moisture Ratio (%)		101	103	100	100
Moisture Contents					
Insitu (%)		14.1	23.5	17.6	20.5
Moulded (%)		14.6	21.0	18.1	18.4
After soaking and					
After Test, Top 30mm(%)		22.1	26.2	27.9	26.2
Remaining Depth (%)		16.9	21.7	20.2	22.1
Material Retained on 19mm Sieve (%)		5*	0	2*	0
Swell (%)		1.0	0.5	2.0	0.0
C.B.R. value:	@2.5mm penetration		2.5	2.0	3.0
	@5.0mm penetration	5			

NOTES: Sampled and supplied by client. Samples tested as received.
- Refer to appropriate Borehole logs for soil descriptions
- Test Methods : AS 1289 6.1.1, 5.1.1 & 2.1.1.
- BH's 3, 20, 34 & 39 had insufficient material supplied to complete a 4-point compaction curve.
- BH 34 had the material recycled to complete the compaction curve.
- Date of receipt of sample: 06/04/2023.
- * Denotes not used in test sample.

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19/04/2023
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SOIL TEST SERVICES
ABN 43 002 145 173

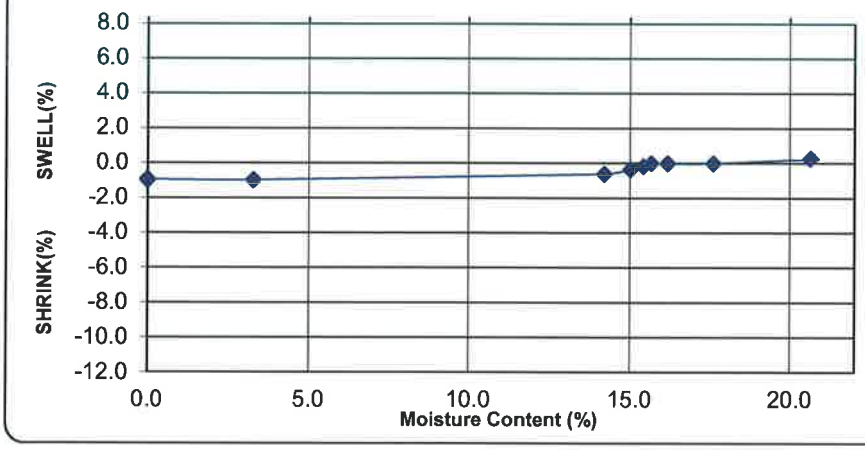
TABLE C
SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

Client: JK Geotechnics
Project: New Maitland Hospital Project
Location: Maitland Hospital, Metford Road, Maitland, NSW

Report No.: 35924LF - C
Report Date: 2/05/2023
Page 1 of 3

Borehole No.: 8		Depth: 1.00 - 1.18m			
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH			
BEFORE TEST	AFTER TEST	BEFORE TEST		AFTER TEST	
17.6%	20.6%	>520	kPa	>420	kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION			SWELL ON SATURATION	SHRINKAGE
25	-1.1%			0.3%	1.0%

SHRINK SWELL GRAPH



SHRINK SWELL INDEX
0.61 %/pF

Notes: Sampled and supplied by client. Sample tested as received.
- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 17/04/2023.

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NATA Accredited Laboratory Number:1327

Authorised Signature / Date (D. Treweek) 2/5/23

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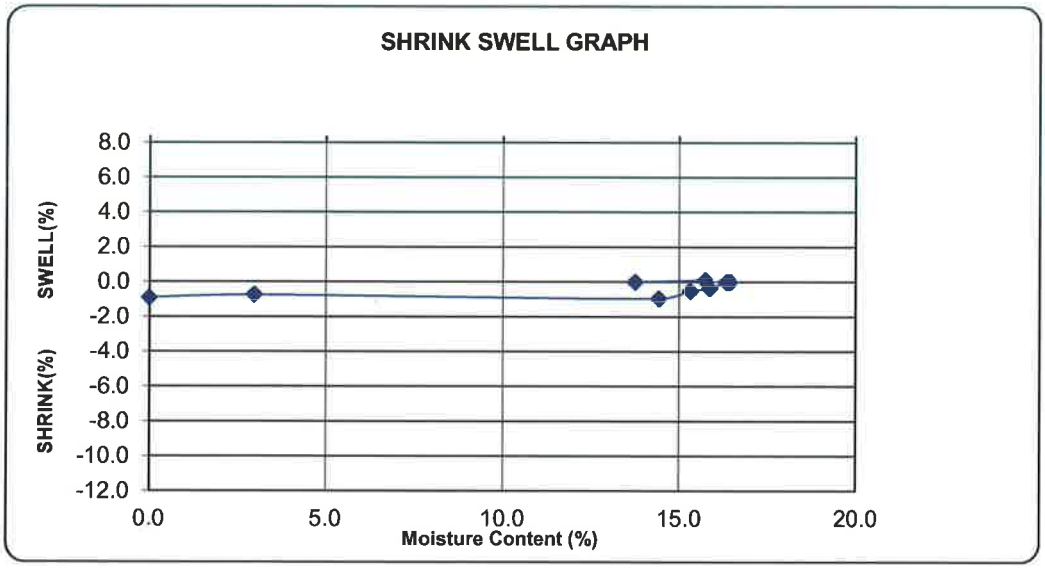
SOIL TEST SERVICES
ABN 43 002 145 173

TABLE C
SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

Client: JK Geotechnics
Project: New Maitland Hospital Project
Location: Maitland Hospital, Metford Road, Maitland, NSW

Report No.: 35924LF - C
Report Date: 2/05/2023
Page 2 of 3

Borehole No.: 14		Depth: 0.50 - 0.90m			
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH			
BEFORE TEST	AFTER TEST	BEFORE TEST		AFTER TEST	
13.8%	15.7%	360,520	kPa	>300	kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION		SWELL ON SATURATION	SHRINKAGE	
25	-0.8%		0.1%	0.9%	



SHRINK SWELL INDEX
0.54 %/pF

Notes: Sampled and supplied by client. Sample tested as received.
- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 17/04/2023.

NATA
NATA Accredited Laboratory Number:1327

Authorised Signature / Date (D. Treweek) 2/5/23

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

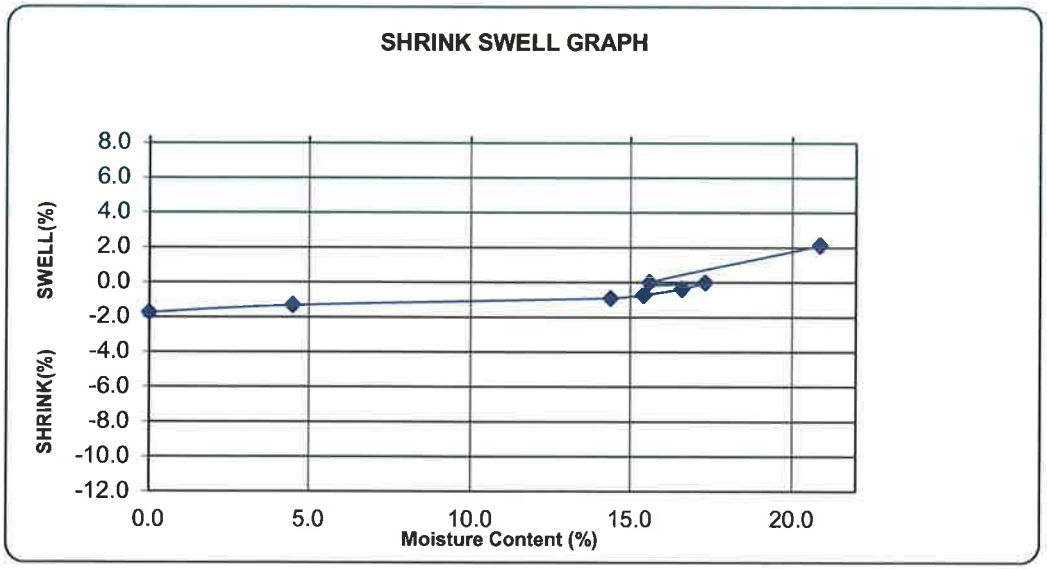
SOIL TEST SERVICES
ABN 43 002 145 173

TABLE C
SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

Client: JK Geotechnics
Project: New Maitland Hospital Project
Location: Maitland Hospital, Metford Road, Maitland, NSW

Report No.: 35924LF - C
Report Date: 2/05/2023
Page 3 of 3

Borehole No.: 37		Depth: 1.00 - 1.27m			
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH			
BEFORE TEST	AFTER TEST	BEFORE TEST		AFTER TEST	
15.6%	20.9%	>600	kPa	>450	kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION			SWELL ON SATURATION	SHRINKAGE
25	-1.0%			2.1%	1.7%



SHRINK SWELL INDEX
1.53 %/pF

Notes: Sampled and supplied by client. Sample tested as received.
- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 17/04/2023.

NATA
NATA Accredited Laboratory Number:1327

Accredited for compliance with ISO/IEC 17025 - Testing.
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Authorised Signature / Date (D. Treweek) 2/5/23

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 321946

Client Details

Client	JK Geotechnics
Attention	O Fraser
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**35924LF**
Number of Samples	9 soil
Date samples received	28/04/2023
Date completed instructions received	28/04/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	05/05/2023
Date of Issue	05/05/2023

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Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		321946-1	321946-2	321946-3	321946-4	321946-5
Your Reference	UNITS	BH4	BH7	BH11	BH17	BH19
Depth		0.5-0.95	0.5-0.95	3.0-3.45	4.5-4.95	3.4-3.95
Date Sampled		27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
Date analysed	-	05/05/2023	05/05/2023	05/05/2023	05/05/2023	05/05/2023
pH 1:5 soil:water	pH Units	8.6	6.6	4.7	5.0	7.3
Chloride, Cl 1:5 soil:water	mg/kg	140	100	27	48	390
Sulphate, SO4 1:5 soil:water	mg/kg	1,800	390	1,300	1,300	380
Resistivity in soil*	ohm m	10	27	14	14	17

Misc Inorg - Soil					
Our Reference		321946-6	321946-7	321946-8	321946-9
Your Reference	UNITS	BH20	BH29	BH38	BH43
Depth		1.5-1.95	1.5-1.95	1.5-1.95	1.5-1.95
Date Sampled		27/04/2023	27/04/2023	27/04/2023	27/04/2023
Type of sample		soil	soil	soil	soil
Date prepared	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023
Date analysed	-	05/05/2023	05/05/2023	05/05/2023	05/05/2023
pH 1:5 soil:water	pH Units	5.4	8.6	5.6	5.4
Chloride, Cl 1:5 soil:water	mg/kg	96	460	300	56
Sulphate, SO4 1:5 soil:water	mg/kg	810	1,100	1,900	880
Resistivity in soil*	ohm m	17	10	9.0	18

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons. Resistivity is calculated from Conductivity (non NATA). Resistivity (calculated) may not correlate with results otherwise obtained using Resistivity-Current method, depending on the nature of the soil being analysed.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	321946-2
Date prepared	-			28/04/2023	1	28/04/2023	28/04/2023		28/04/2023	28/04/2023
Date analysed	-			05/05/2023	1	05/05/2023	05/05/2023		05/05/2023	05/05/2023
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	8.6	8.7	1	101	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	140	140	0	101	#
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	1800	1800	0	103	#
Resistivity in soil*	ohm m	1	Inorg-002	<1	1	10	10	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

MISC_INORG_DRY: # Percent recovery is not applicable due to the high concentration of the analyte/s in the sample/s. However an acceptable recovery was obtained for the LCS.

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Health Infrastructure	**Ref No:**	35924LF
Project:	New Maitland Hospital Project	**Report:**	A
Location:	Maitland Hospital, Metford Road, MAITLAND, NSW	**Report Date:**	14/04/23

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
2	4.14 - 4.17	0.1	2	A
	4.62 - 4.65	0.2	4	A
	5.17 - 5.20	0.2	4	A
	5.80 - 5.84	0.2	4	A
	6.17 - 6.21	0.2	4	A
	6.90 - 6.93	0.3	6	A
	7.13 - 7.17	0.2	4	A
	7.83 - 7.86	0.09	2	A
	8.03 - 8.06	0.3	6	A
	8.47 - 8.50	0.2	4	A
	8.78 - 8.81	0.2	4	A
	9.20 - 9.23	0.2	4	A
	9.54 - 9.57	0.2	4	A
	9.80 - 9.83	0.2	4	A
	10.08 - 10.12	0.3	6	A
	10.59 - 10.62	0.4	8	A
	10.80 - 10.84	0.6	12	A
	11.12 - 11.15	0.4	8	A
6	2.52 - 2.55	0.2	4	A
	2.90 - 2.93	0.3	6	A
	3.20 - 3.23	0.1	2	A
	3.73 - 3.76	0.2	4	A
	4.22 - 4.25	0.1	2	A
	4.56 - 4.59	0.1	2	A
	4.96 - 4.99	0.6	12	A

NOTE: SEE PAGE 10

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Health Infrastructure	**Ref No:**	35924LF
Project:	New Maitland Hospital Project	**Report:**	A
Location:	Maitland Hospital, Metford Road, MAITLAND, NSW	**Report Date:**	14/04/23

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
6	5.09 - 5.11	0.3	6	A
	5.86 - 5.90	0.7	14	A
	6.15 - 6.19	0.06	1	A
	6.68 - 6.70	0.3	6	A
	7.27 - 7.30	0.2	4	A
	8.34 - 8.37	0.2	4	A
	9.14 - 9.19	0.2	4	A
	9.74 - 9.78	0.2	4	A
8	5.90 - 5.95	0.4	8	A
	6.05 - 6.08	0.4	8	A
	6.35 - 6.40	0.8	16	A
	6.80 - 6.82	0.3	6	A
	7.00 - 7.02	0.3	6	A
	7.25 - 7.28	0.7	14	A
	7.77 - 7.80	0.3	6	A
	8.18 - 8.21	0.7	14	A
	8.48 - 8.52	0.5	10	A
	9.19 - 9.22	0.6	12	A
	9.32 - 9.36	0.4	8	A
	9.71 - 9.75	0.2	4	A
	10.13 - 10.17	0.3	6	A
10	5.23 - 5.26	0.4	8	A
	5.83 - 5.86	0.8	16	A
	6.28 - 6.32	0.6	12	A
	6.87 - 6.90	0.8	16	A

NOTE: SEE PAGE 10

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client: Health Infrastructure **Ref No:** 35924LF

Project: New Maitland Hospital Project **Report:** A

Location: Maitland Hospital, Metford Road, MAITLAND, NSW **Report Date:** 14/04/23

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
10	7.15 - 7.19	0.6	12	A
	7.87 - 7.90	0.8	16	A
	8.23 - 8.26	0.6	12	A
	8.84 - 8.87	1.1	22	A
	9.19 - 9.22	0.1	2	A
	9.79 - 9.82	1.3	26	A
	10.08 - 10.12	0.2	4	A
11	5.76 - 5.79	0.2	4	A
	5.90 - 5.93	0.2	4	A
	6.07 - 6.10	0.7	14	A
	6.34 - 6.37	0.6	12	A
	6.57 - 6.60	0.3	6	A
	6.78 - 6.81	0.3	6	A
	7.09 - 7.12	0.4	8	A
	7.52 - 7.56	0.3	6	A
	7.70 - 7.73	0.2	4	A
	8.11 - 8.14	0.3	6	A
	8.49 - 8.52	0.6	12	A
	8.86 - 8.88	0.2	4	A
	9.10 - 9.13	0.4	8	A
	9.35 - 9.39	1	20	A
	9.62 - 9.65	0.2	4	A
14	5.61 - 5.64	0.3	6	A
	5.87 - 5.91	0.3	6	A
	6.17 - 6.21	0.5	10	A

NOTE: SEE PAGE 10

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Health Infrastructure	**Ref No:**	35924LF
Project:	New Maitland Hospital Project	**Report:**	A
Location:	Maitland Hospital, Metford Road, MAITLAND, NSW	**Report Date:**	14/04/23
		Page 4 of 10	

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
14	6.65 - 6.69	0.2	4	A
	7.17 - 7.21	0.2	4	A
	7.79 - 7.82	0.8	16	A
	8.11 - 8.14	0.9	18	A
	8.91 - 8.95	0.4	8	A
	9.10 - 9.13	0.5	10	A
	9.69 - 9.72	0.3	6	A
17	7.12 - 7.15	0.1	2	A
	7.81 - 7.84	0.7	14	A
	8.15 - 8.17	0.5	10	A
	8.93 - 8.96	0.4	8	A
	9.12 - 9.14	0.4	8	A
	9.82 - 9.86	0.1	2	A
	10.01 - 10.04	0.3	6	A
18	5.51 - 5.53	0.2	4	A
	5.94 - 5.96	0.3	6	A
	6.10 - 6.13	0.3	6	A
	6.59 - 6.64	0.2	4	A
	7.18 - 7.21	0.2	4	A
	7.73 - 7.76	0.1	2	A
	8.03 - 8.05	0.1	2	A
	8.68 - 8.71	0.7	14	A
	9.11 - 9.14	0.3	6	A
	9.54 - 9.58	0.2	4	A
	9.84 - 9.87	0.3	6	A

NOTE: SEE PAGE 10

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Health Infrastructure	**Ref No:**	35924LF
Project:	New Maitland Hospital Project	**Report:**	A
Location:	Maitland Hospital, Metford Road, MAITLAND, NSW	**Report Date:**	14/04/23
		Page 5 of 10	

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
20	5.18 - 5.21	0.2	4	A
	5.93 - 5.95	0.3	6	A
	6.15 - 6.19	0.6	12	A
	6.85 - 6.88	0.5	10	A
	7.07 - 7.10	0.5	10	A
	7.71 - 7.75	0.4	8	A
	8.12 - 8.15	0.8	16	A
	8.80 - 8.83	0.2	4	A
	9.18 - 9.21	0.2	4	A
	9.82 - 9.85	0.2	4	A
24	1.82 - 1.86	0.2	4	A
	2.31 - 2.35	0.4	8	A
	2.51 - 2.55	0.2	4	A
	2.72 - 2.76	0.3	6	A
	3.19 - 3.22	0.4	8	A
	3.78 - 3.82	0.2	4	A
	4.13 - 4.17	0.2	4	A
	4.72 - 4.75	0.3	6	A
	5.10 - 5.14	0.1	2	A
	5.49 - 5.52	0.2	4	A
	5.76 - 5.79	0.6	12	A
	6.09 - 6.13	0.2	4	A
	6.16 - 6.19	0.2	4	A
	6.50 - 6.54	0.2	4	A
	6.78 - 6.81	0.03	1	A

NOTE: SEE PAGE 10

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Health Infrastructure	**Ref No:**	35924LF
Project:	New Maitland Hospital Project	**Report:**	A
Location:	Maitland Hospital, Metford Road, MAITLAND, NSW	**Report Date:**	14/04/23
		Page 6 of 10	

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
24	7.76 - 7.80	0.6	12	A
	8.08 - 8.12	1	20	A
	8.23 - 8.27	0.6	12	A
	8.42 - 8.46	0.3	6	A
26	4.60 - 4.64	0.2	4	A
	4.91 - 4.95	0.6	12	A
	5.36 - 5.40	0.3	6	A
	5.76 - 5.79	0.5	10	A
	6.08 - 6.12	0.3	6	A
	6.45 - 6.49	0.6	12	A
	6.85 - 6.88	0.2	4	A
	7.23 - 7.26	0.1	2	A
	7.64 - 7.68	0.4	8	A
	8.17 - 8.20	0.6	12	A
	8.50 - 8.53	1.3	26	A
	8.92 - 8.96	0.9	18	A
	9.15 - 9.19	0.7	14	A
28	1.68 - 1.71	0.9	18	A
	1.95 - 1.97	0.4	8	A
	2.07 - 2.10	0.2	4	A
	2.68 - 2.72	0.4	8	A
	3.10 - 3.14	0.4	8	A
	3.53 - 3.57	0.2	4	A
	3.87 - 3.90	0.2	4	A
	4.10 - 4.14	0.3	6	A

NOTE: SEE PAGE 10

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Health Infrastructure	**Ref No:**	35924LF
Project:	New Maitland Hospital Project	**Report:**	A
Location:	Maitland Hospital, Metford Road, MAITLAND, NSW	**Report Date:**	14/04/23
		Page 7 of 10	

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
28	4.72 - 4.76	0.3	6	A
	5.14 - 5.17	0.2	4	A
	5.49 - 5.52	0.2	4	A
	5.96 - 5.99	0.2	4	A
	6.14 - 6.17	0.3	6	A
	6.62 - 6.65	0.2	4	A
	7.12 - 7.15	0.2	4	A
	7.40 - 7.43	0.3	6	A
30	1.33 - 1.37	0.7	14	A
	1.85 - 1.88	0.4	8	A
	2.10 - 2.14	0.3	6	A
	2.27 - 2.30	0.1	2	A
	2.53 - 2.57	0.1	2	A
	2.78 - 2.81	0.09	2	A
	3.16 - 3.19	0.2	4	A
	3.73 - 3.75	0.2	4	A
	4.14 - 4.17	0.07	1	A
	4.63 - 4.66	0.09	2	A
	5.06 - 5.08	0.1	2	A
	5.42 - 5.46	0.07	1	A
	6.20 - 6.23	0.1	2	A
	6.84 - 6.87	0.3	6	A
	7.14 - 7.18	0.3	6	A
	7.71 - 7.75	0.2	4	A
	8.15 - 8.18	0.1	2	A

NOTE: SEE PAGE 10

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Health Infrastructure	**Ref No:**	35924LF
Project:	New Maitland Hospital Project	**Report:**	A
Location:	Maitland Hospital, Metford Road, MAITLAND, NSW	**Report Date:**	14/04/23
		Page 8 of 10	

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
30	8.45 - 8.47	0.1	2	A
	8.72 - 8.75	0.3	6	A
34	4.61 - 4.65	0.1	2	A
	4.88 - 4.92	0.4	8	A
	5.09 - 5.12	0.5	10	A
	5.37 - 5.40	0.1	2	A
	5.74 - 5.77	0.08	2	A
	6.08 - 6.12	0.2	4	A
	6.58 - 6.62	0.2	4	A
	7.19 - 7.22	0.6	12	A
	7.59 - 7.62	0.3	6	A
	7.91 - 7.94	0.4	8	A
	8.09 - 8.13	0.4	8	A
	8.50 - 8.53	0.3	6	A
	8.84 - 8.86	0.6	12	A
	9.72 - 9.75	0.5	10	A
	10.19 - 10.22	0.4	8	A
37	5.78 - 5.81	1	20	A
	6.19 - 6.22	0.5	10	A
	6.90 - 6.94	0.2	4	A
	7.19 - 7.22	0.6	12	A
	7.50 - 7.53	0.2	4	A
	8.13 - 8.16	0.2	4	A
	8.56 - 8.59	0.5	10	A
	9.06 - 9.10	0.6	12	A

NOTE: SEE PAGE 10

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Health Infrastructure	**Ref No:**	35924LF
Project:	New Maitland Hospital Project	**Report:**	A
Location:	Maitland Hospital, Metford Road, MAITLAND, NSW	**Report Date:**	14/04/23

BOREHOLE NUMBER	DEPTH (m)	$I_{S(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
37	9.53 - 9.57	0.9	18	A
	10.12 - 10.15	0.7	14	A
	10.38 - 10.40	0.6	12	A
38	5.83 - 5.87	0.4	8	A
	6.13 - 6.17	0.2	4	A
	7.30 - 7.35	0.3	6	A
	7.77 - 7.80	0.3	6	A
	8.04 - 8.07	0.6	12	A
	8.83 - 8.87	0.4	8	A
	9.19 - 9.22	0.2	4	A
	9.70 - 9.74	0.2	4	A
	10.24 - 10.26	0.2	4	A
	10.70 - 10.73	0.4	8	A
39	5.95 - 5.97	0.1	2	A
	6.25 - 6.28	0.2	4	A
	6.75 - 6.78	0.3	6	A
	7.31 - 7.34	0.7	14	A
	7.84 - 7.87	0.2	4	A
	8.24 - 8.28	0.2	4	A
	8.84 - 8.87	0.2	4	A
	9.13 - 9.16	0.1	2	A
	9.57 - 9.60	1.3	26	A
	10.20 - 10.23	0.7	14	A
	10.48 - 10.51	0.6	12	A
42	2.50 - 2.54	0.2	4	A

NOTE: SEE PAGE 10

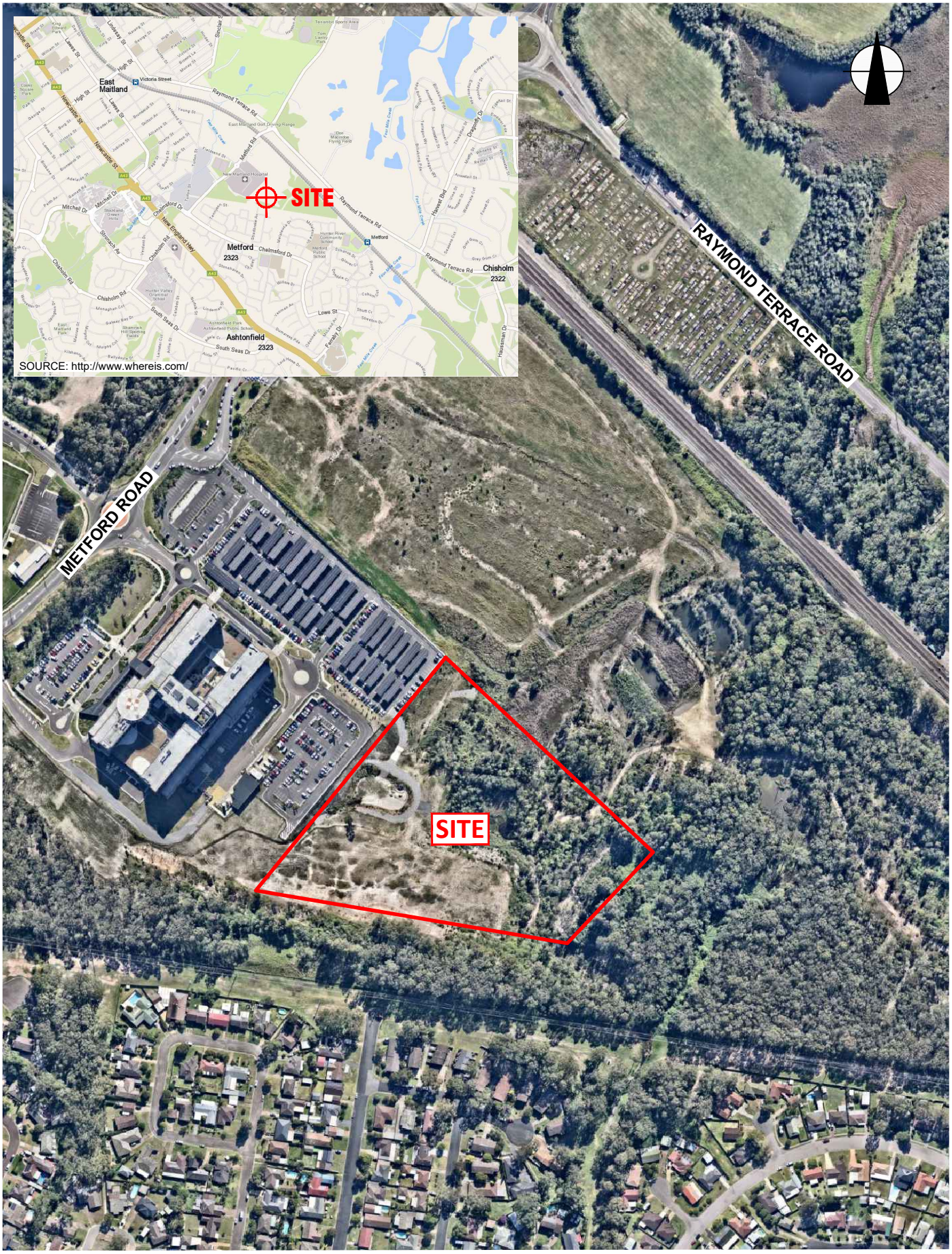
TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	Health Infrastructure	**Ref No:**	35924LF
Project:	New Maitland Hospital Project	**Report:**	A
Location:	Maitland Hospital, Metford Road, MAITLAND, NSW	**Report Date:**	14/04/23

BOREHOLE NUMBER	DEPTH (m)	$I_{S(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
42	2.85 - 2.88	0.2	4	A
	3.18 - 3.21	0.2	4	A
	3.68 - 3.71	0.3	6	A
	4.16 - 4.19	0.1	2	A
	4.70 - 4.72	0.3	6	A
	5.30 - 5.33	0.07	1	A
	5.92 - 5.94	0.1	2	A
	6.46 - 6.48	0.1	2	A
	6.74 - 6.78	0.2	4	A
	7.14 - 7.17	0.1	2	A
	7.66 - 7.70	0.7	14	A
	8.09 - 8.12	0.7	14	A
	8.71 - 8.73	0.5	10	A
	8.83 - 8.87	0.4	8	A
	9.21 - 9.24	0.4	8	A
	10.10 - 10.12	0.2	4	A
	10.42 - 10.44	0.07	1	A

NOTES

1. In the above table, testing was completed in test direction A for the axial direction, D for the diametral direction, B for the block test and L for the lump test.
2. The above strength tests were completed at the 'as received' moisture content.
3. Test Method: RMS T223.
4. For reporting purposes, the $I_{S(50)}$ has been rounded to the nearest 0.1MPa, or to one significant figure if less than 0.1MPa.
5. The estimated Unconfined Compressive Strength was calculated from the Point Load Strength Index based on the correlation provided in AS1726:2017 'Geotechnical Site Investigations' and rounded off to the nearest whole number: U.C.S. = 20 $I_{S(50)}$.



AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

This plan should be read in conjunction with the JK Geotechnics report.

Title: **SITE LOCATION PLAN**

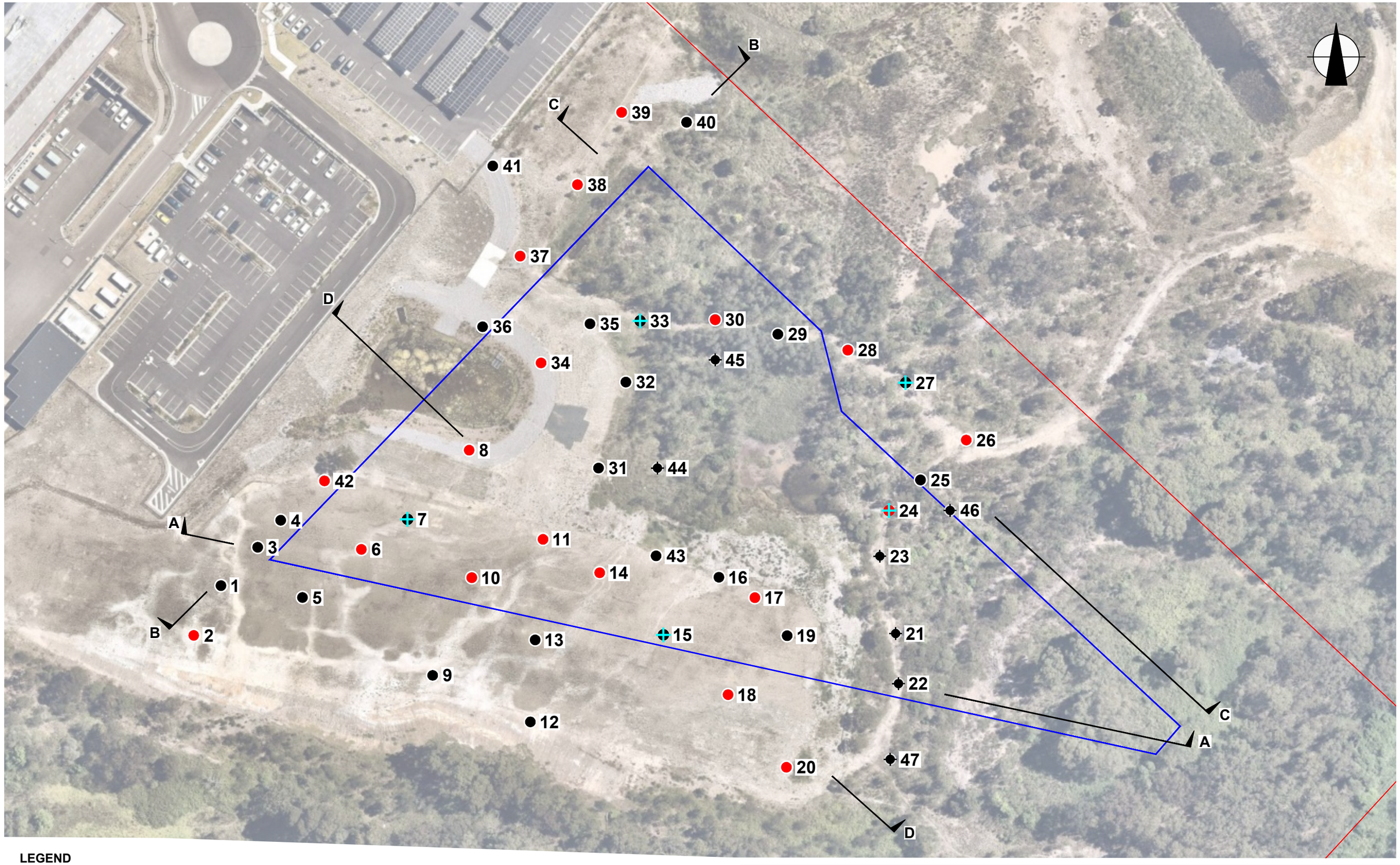
Location: MAITLAND HOSPITAL, METFORD ROAD, MAITLAND, NSW

Report No: 35924LF

Figure No: 1

JKGeotechnics

PLOT DATE: 12/05/2023 9:34:24 AM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\35000'S\35924LF MAITLAND\CAD\35924LF.DWG



LEGEND

- AUGERED BOREHOLE
- HAND AUGERED BOREHOLE AND DCP TEST
- AUGERED BOREHOLE AND GROUNDWATER MONITORING WELL
- CORED BOREHOLE
- CORED BOREHOLE AND GROUNDWATER MONITORING WELL

NOTES:
1. REFER TO FIGURE 3 FOR CROSS SECTION A-A.
2. REFER TO FIGURE 4 FOR CROSS SECTION B-B.
3. REFER TO FIGURE 5 FOR CROSS SECTION C-C.
4. REFER TO FIGURE 6 FOR CROSS SECTION D-D.

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 10 20 30 40 50
SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the JK Geotechnics report.

Title: **INVESTIGATION LOCATION PLAN**

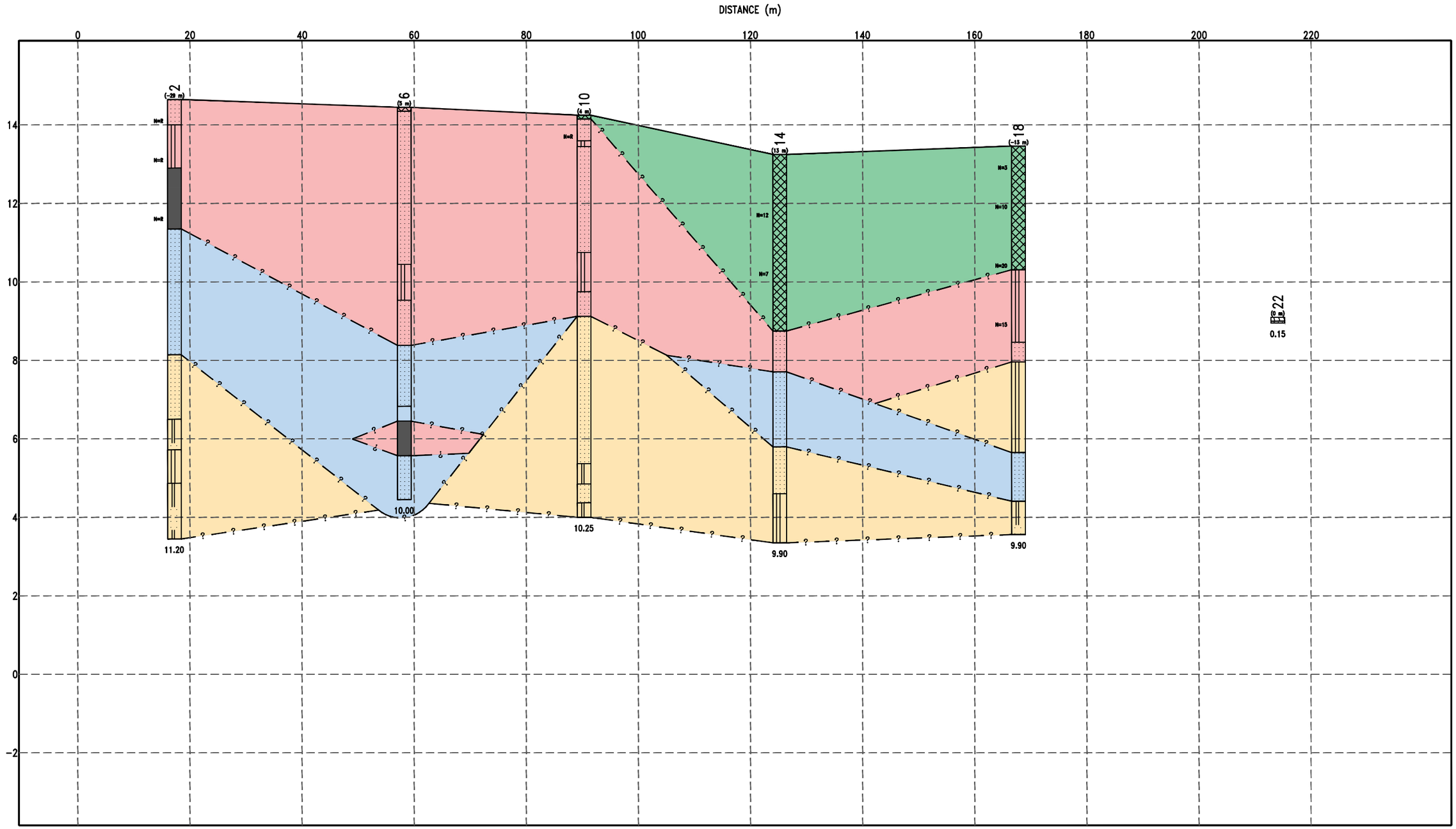
Location: MAITLAND HOSPITAL, METFORD ROAD, MAITLAND, NSW

Report No: 35924LF

Figure No: 2

JKGeotechnics

PLOT DATE: 12/05/2023 9:34:43 AM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\35000'S\35924LF MAITLAND\CAD\35924LF.DWG



MATERIAL GRAPHIC

- NO CORE
- COAL
- FILL
- LAMINITE (SILTSTONE, SANDSTONE)
- SANDSTONE
- SILTSTONE
- TOPSOIL
- SOILS
- CLASS V
- CLASS IV
- CLASS III

0 7 14 21 28 35
H: SCALE 1:700 @A3 METRES
0 1 2 3 4 5
V: SCALE 1:100 @A3 METRES

This plan should be read in conjunction with the JK Geotechnics report.

Title: **GRAPHICAL BOREHOLE SUMMARY SECTION A-A**

Location: MAITLAND HOSPITAL, METFORD ROAD, MAITLAND, NSW

Report No: 35924LF

Figure No: 3

JKGeotechnics

PLOT DATE: 12/05/2023 9:35:20 AM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\35000'S\35924LF MAITLAND\CAD\35924LF.DWG

DISTANCE (m)

0 20 40 60 80 100 120 140 160 180 200 220

ELEVATION (m AHD)

14 12 10 8 6 4 2 0 -2

BH2 (3 m)
BH42 (1 m)
BH8 (~21 m)
BH37 (7 m)
BH38 (12 m)
BH39 (15 m)

11.20
10.51
10.22
10.63
10.80
10.70

MATERIAL GRAPHIC

- GRAVEL (GP, GW)
- NO CORE
- SILTY CLAY (CL, CI, CH)
- COAL
- FILL
- LAMINITE (SILTSTONE, SANDSTONE)
- SANDSTONE
- SILTSTONE
- SOILS
- CLASS V
- CLASS IV
- CLASS III

H:SCALE 0 7 14 21 28 35 METRES 1:700 @A3

V:SCALE 0 1 2 3 4 5 METRES 1:100 @A3

This plan should be read in conjunction with the JK Geotechnics report.

Title: **GRAPHICAL BOREHOLE SUMMARY SECTION B-B**

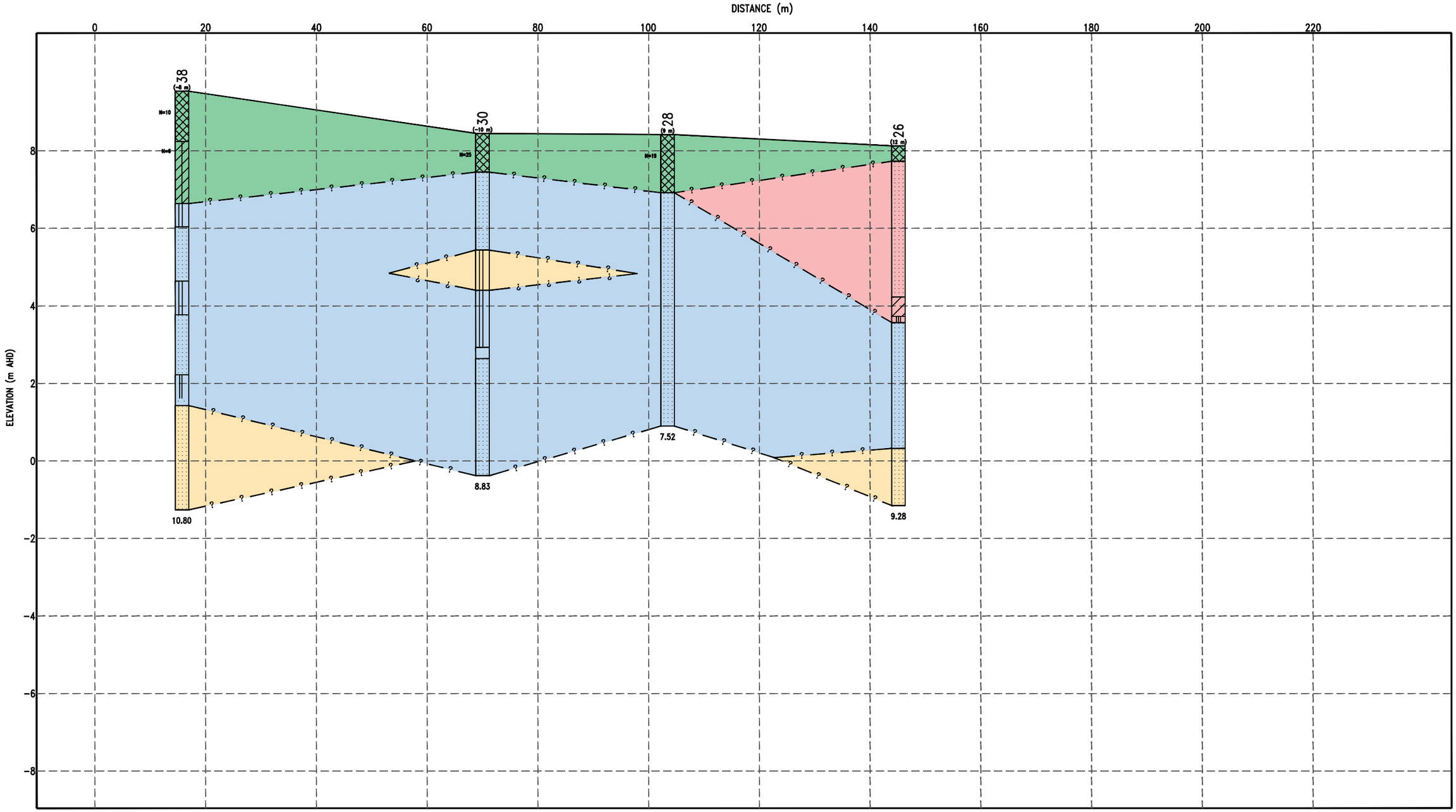
Location: MAITLAND HOSPITAL, METFORD ROAD, MAITLAND, NSW

Report No: 35924LF

Figure No: 4

JKGeotechnics

PLOT DATE: 12/05/2023 9:35:32 AM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\35000'S\35924LF MAITLAND\CAD\35924LF.DWG



MATERIAL GRAPHIC

- CLAY (C, CI, CH)
- CLAYEY SILT (ML, MH)
- NO CORE
- SILTY CLAY (CL, CI, CH)
- FILL
- LAMINITE (SILTSTONE, SANDSTONE)
- SANDSTONE
- SILTSTONE
- SOILS
- CLASS V
- CLASS IV
- CLASS III

H:SCALE 0 7 14 21 28 35 METRES 1:700 @A3

V:SCALE 0 1 2 3 4 5 METRES 1:100 @A3

This plan should be read in conjunction with the JK Geotechnics report.

Title: **GRAPHICAL BOREHOLE SUMMARY SECTION C-C**

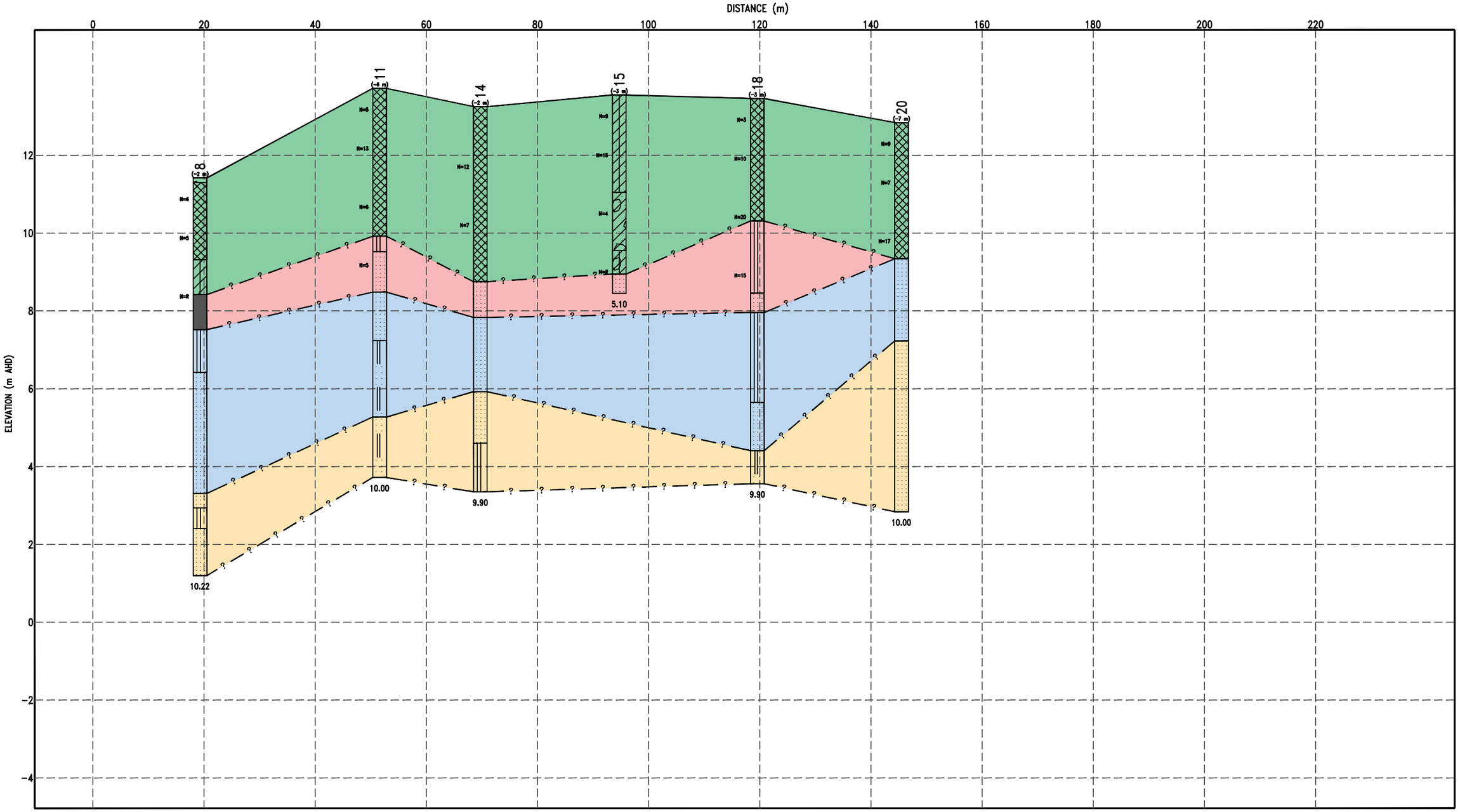
Location: MAITLAND HOSPITAL, METFORD ROAD, MAITLAND, NSW

Report No: 35924LF

Figure No: 5

JKGeotechnics

PLOT DATE: 12/05/2023 9:35:43 AM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\35000S\35924LF MAITLAND\CAD\35924LF.DWG



MATERIAL GRAPHIC

- GRAVEL (GP, GW)
- GRAVELLY SANDY CLAY (CL, CI, CH)
- GRAVELLY SILTY CLAY (CL, CI, CH)
- SANDY SILTY CLAY (CL, CI, CH)
- SILTY CLAY (CL, CI, CH)
- COAL
- FILL
- LAMINITE (SILTSTONE, SANDSTONE)
- SANDSTONE
- SILTSTONE
- SOILS
- CLASS V
- CLASS IV
- CLASS III

H:SCALE 0 7 14 21 28 35 1:700 @A3 METRES

V:SCALE 0 1 2 3 4 5 1:100 @A3 METRES

This plan should be read in conjunction with the JK Geotechnics report.

Title: **GRAPHICAL BOREHOLE SUMMARY SECTION D-D**

Location: MAITLAND HOSPITAL, METFORD ROAD, MAITLAND, NSW

Report No: 35924LF

Figure No: 6

JKGeotechnics

PLOT DATE: 12/05/2023 9:38:26 AM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\35000'S\35924LF MAITLAND\CAD\35924LF.DWG

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BOREHOLE LOG

Borehole No. 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.51 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						14			CI-CH	Silty CLAY: medium to high plasticity, light grey mottled orange brown.	w<PL	(Hd)		RESIDUAL
					N > 21 9,16,5/ 50mm REFUSAL				-	Extremely Weathered siltstone: gravelly silty CLAY, high plasticity, light grey, siltstone and coal gravel, trace of root fibres.	XW	Hd		TOMAGO COAL MEASURES
						13	1				DW	VL		
										SILTSTONE: dark grey, with low strength coal bands.				VERY LOW 'TC' BIT RESISTANCE
						12	2							
							3			SANDSTONE: fine to medium grained, light grey, with siltstone laminae.		L - M		MODERATE TO HIGH RESISTANCE
						11								
							4			END OF BOREHOLE AT 3.80 m				'TC' BIT REFUSAL
						10								
							5							
						9								
							6							
						8								

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BOREHOLE LOG

Borehole No. 2

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.65 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING					N > 22 6,22/ 150mm REFUSAL	14	1			Extremely Weathered sandstone: sandy SILT, low plasticity, brown, fine grained sand, trace of fine grained sandstone gravel and clay nodules.	XW	Hd		TOMAGO COAL MEASURES
										Extremely Weathered siltstone: gravelly sandy silt, low plasticity, light grey, fine grained sand, fine to medium grained sandstone gravel, trace of clay nodules.				VERY LOW 'TC' BIT RESISTANCE BANDED WITH MODERATE RESISTANCE
					N > 22 6,8,14/ 100mm REFUSAL	13	2			COAL: dark grey, banded with very low strength siltstone.	DW	Hd - VL		VERY LOW RESISTANCE
					N=SPT 20/ 150mm REFUSAL	12	3							
						11	4			SANDSTONE: light grey.		VL - L		VERY LOW RESISTANCE BANDED WITH LOW TO MODERATE RESISTANCE
						10	5			REFER TO CORED BOREHOLE LOG				
						9	6							
						8								

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 2

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 14.65 m

Date: 28/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
85% RETURN		10	5		SANDSTONE: fine to coarse grained, light grey, faintly bedded at 5-20°, trace of siltstone and coal striations, bedded at 0-20°. START CORING AT 4.07m	SW	L	0.10, 0.20, 0.20, 0.20, 0.20, 0.30, 0.20		(5.59m) Be, 13°, P, Vr, Cb FILLED, 4 mm.t (5.71m) Be, 3°, Ir, Vr, Cb Ct (5.91m) Be, 3°, P, R, Cb Ct (6.70m) J, 80°, Un, Cn (7.25m) Cr, 0°, 30 mm.t (7.33m) Be x12, 0 - 5°, P, R, Cn, ~ 5mm apart (7.60m) Be x8, 0 - 5°, P, R, Cn, ~ 15-20mm apart (7.80m) Be x3, 0 - 3°, P, R, Cn, ~ 30mm apart	Tomago Coal Measures
		9	6								
		8	7								
		7	8		LAMINITE: Siltstone, light grey and grey, with fine grained sandstone laminae, bedded at 0-10°.	FR		0.090, 0.30, 0.20, 0.20		(8.15m) Be, 5°, C, S, Cn (8.22m) Be, 3°, P, S, Cn (8.67m) Be, 5°, P, R, Cn	
		6	9		SILTSTONE: grey, with carbonaceous laminae, faintly bedded at 0-15°.		M	0.20, 0.40, 0.40		(8.92m) Cr, 5°, 30 mm.t (9.14m) Be, 10°, Ir, Vr, Cn (9.31m) Be, 15°, C, Vr, Cn (9.36m) Ji, 33°, Ir, Vr, Cb Ct	
		5	10		LAMINITE: Siltstone, grey, with fine grained sandstone laminae, bedded at 0-20°.			0.30, 0.40, 0.60		(10.15m) Be, 3°, P, S, Cb Ct (10.77m) Be, 10°, St, Vr, Cb Ct	
		4									

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 2

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 14.65 m

Date: 28/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					LAMINITE: Siltstone, grey, with fine grained sandstone laminae, bedded at 0-20°.	FR	M	0.40			
					END OF BOREHOLE AT 11.20 m						

RL (m AHD): 3, 2, 1, 0, -1, -2, -3

Depth (m): 12, 13, 14, 15, 16, 17

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 3

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.38 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION					N > 21 5,6,15/ 50mm REFUSAL	14				FILL: Gravelly silty clayey sand, fine to coarse grained, brown, low to medium plasticity clay, fine to medium grained sandstone, siltstone and coal gravel, trace of brick and tile fragments and ash.	w>PL			GRASS COVER
						13	1		-	SILTSTONE: dark grey.	DW	Hd - VL		TOMAGO COAL MEASURES VERY LOW 'TC' BIT RESISTANCE
						12	2			SANDSTONE: fine to medium grained, light grey, with siltstone and carbonaceous laminae.		VL - L		LOW TO MODERATE RESISTANCE
							3					L		MODERATE RESISTANCE
						11				END OF BOREHOLE AT 3.00 m				'TC' BIT REFUSAL
						10	4							
						9	5							
						8	6							

JKGeotechnics

BOREHOLE LOG

Borehole No. 4

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.37 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION										FILL: Gravelly sandy silty clay, low to medium plasticity, brown, fine to coarse grained sand, fine to medium grained sandstone, siltstone and coal gravel.	w>PL			GRASS COVER
						14			-		XW	Hd		TOMAGO COAL MEASURES
					N = 33 7,13,20					Extremely Weathered siltstone: gravelly silty CLAY, medium to high plasticity, grey, fine to coarse grained siltstone and ironstone gravel, trace of root fibres.				
							1			SANDSTONE: fine to coarse grained, light grey, with siltstone and coal bands.	DW	VL - L		LOW 'TC' BIT RESISTANCE
						13								
							2			SANDSTONE: fine to medium grained, light grey, with siltstone laminae.		L - M		MODERATE TO HIGH RESISTANCE
						12								
										END OF BOREHOLE AT 2.70 m				'TC' BIT REFUSAL
							3							
						11								
							4							
						10								
							5							
						9								
							6							
						8								

JKGeotechnics

BOREHOLE LOG

Borehole No. 5

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.51 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION									-	FILL: Gravelly silty clayey sand, fine to coarse grained, brown, low to medium plasticity, fine to medium grained sandstone, siltstone and coal gravel.	XW	Hd		TOMAGO COAL MEASURES
					N=SPT 5/ 100mm REFUSAL	14				Extremely Weathered sandstone: gravelly silty SAND, fine to medium grained, light grey, fine to medium grained sandstone and coal gravel.		VL - L		VERY LOW 'TC' BIT RESISTANCE
							1			SANDSTONE: fine to coarse grained, light grey, with coal bands.	DW	L - M		MODERATE TO HIGH RESISTANCE
						13				as above, but without coal bands, with siltstone laminae.				
							2			END OF BOREHOLE AT 1.90 m				'TC' BIT REFUSAL
						12	3							
						11	4							
						10	5							
						9	6							
						8								

JKGeotechnics

BOREHOLE LOG

Borehole No. 6

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.45 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						14	0		-	FILL: Gravelly clayey sand, fine to coarse grained, brown, low plasticity, fine to medium grained sandstone, igneous and ironstone gravel.	M	VL - L		TOMAGO COAL MEASURES
										SANDSTONE: fine to coarse grained, brown.	DW			LOW TO MODERATE 'TC' BIT RESISTANCE
						13	1					L		MODERATE RESISTANCE
							2			SANDSTONE: fine to medium grained, light grey.				
						12				REFER TO CORED BOREHOLE LOG				MODERATE TO HIGH RESISTANCE
						11	3							
						10	4							
						9	5							
						8	6							

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CORED BOREHOLE LOG

Borehole No. 6

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 14.45 m

Date: 28/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS SPACING (mm) DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
					START CORING AT 2.46m					
85% RETURN		12			SANDSTONE: fine to coarse grained, light grey, with carbonaceous laminae and siltstone speckles, bedded at 5-20°.	SW	VL - L	0.20	(2.67m) XWS, 5°, 2 mm.t (2.75m) Be, 10°, Ir, R, Cb Ct	Tomago Coal Measures
							L - M	0.30		
			3		SANDSTONE: fine to medium grained, grey, interbedded with dark grey siltstone, bedded at 10-15°.		VL - L	0.10	(3.06m) Be, 15°, P, Vr, Ir Ct	
		11						0.20	(3.91m) CS, 15°, 20 mm.t	
			4		SILTSTONE: dark grey, with fine grained sandstone striation and carbonaceous striation, faintly bedded at 5-15°.		VL		(4.00m) XWS, 15°, 20 mm.t	
		10						0.10		
								0.10	(4.66m) XWS, 15°, 35 mm.t	
			5		SANDSTONE: fine to medium grained, grey, with siltstone and carbonaceous laminae, bedded at 10-25°.		M	0.60	(4.90m) Be, 10°, P, S, Cn	
								0.30	(5.20m) Be, 20°, Ir, Vr, Cn	
		9			SANDSTONE: fine to coarse grained, grey, with carbonaceous laminae, faintly bedded at 5-15°.				(5.50m) Be, 15°, St, S, Cb Ct (5.57m) J, 85°, P, Vr, Cn	
								0.70	(5.75m) Be, 10°, P, R, Cb Ct	
			6		Extremely Weathered sandstone: silty SAND, fine to coarse grained, with fine to medium grained sandstone gravel.	XW	Hd			
						SW	L	0.060	(6.15m) Be x2, 3°, P, Vr, Cn (6.20m) J, 60°, Ir, Vr, Cn (6.26m) Be, 20°, P, S, Cb Ct	
		8			SANDSTONE: fine to coarse grained, grey, with carbonaceous laminae, faintly bedded at 5-15°.			0.30		
			7						(7.06m) J, 70°, P, R, Cn, mixed with caved in coal.	
		7						0.20		
30% RETURN					NO CORE 0.38m					
85% RETURN		8			COAL: dark grey.	HW	Hd-VL	0.20	(8.05m) Cr, 0°, 100 mm.t	Tomago Coal Measures
		6			SANDSTONE: as below	FR	L - M		(8.88m) Be, 3°, P, S, Cn	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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CORED BOREHOLE LOG

Borehole No. 6

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 14.45 m

Date: 28/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ VL 0.1 L 0.3 M 1 H 3 VH 10 EH	DEFECT DETAILS SPACING (mm) 600 200 60 20	DEFECT DETAILS DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
85% RETURN		5	10		SANDSTONE: fine to medium grained, light grey, with grey siltstone/coal laminae, bedded at 5-15°.	FR	L - M	0.20 0.20			
		4	11		END OF BOREHOLE AT 10.00 m						
		3	12								
		2	13								
		1	14								
		0	15								
		-1									

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 7

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.42 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION					N = 4 3,2,2	14	1			FILL: Gravelly clayey sand, fine to coarse grained, dark grey, low plasticity, fine to coarse grained coal and siltstone gravel.	M			APPEARS POORLY COMPACTED
						13	2		-	SANDSTONE: fine to coarse grained, orange brown and grey.	DW	VL - L		TOMAGO COAL MEASURES
						12				SILTSTONE: grey, with fine to medium grained sandstone laminae.				VERY LOW TO LOW 'TC' BIT RESISTANCE
						11	3			LAMINITE: Sandstone, fine to medium grained, light grey, with dark grey siltstone laminae.		L - M		LOW TO MODERATE RESISTANCE
						10	4			SANDSTONE: fine to medium grained, grey.		M		MODERATE TO HIGH RESISTANCE
						9	5			END OF BOREHOLE AT 4.60 m				'TC' BIT REFUSAL GROUNDWATER MONITORING WELL INSTALLED TO 4.6m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 4.6m TO 1.1m. CASING 1.1m TO 0m. 2mm SAND FILTER PACK 4.6m TO 0.8m. BENTONITE SEAL 0.8m TO 0.2m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A 0.6m STICK UP.
						8	6							

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BOREHOLE LOG

Borehole No. 8

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 11.42 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										PALLET: 120mm.t				GRAVEL COVER
					N = 6 2,3,3	11	1		-	FILL: Silty clay, low plasticity, brown and dark brown, trace of fine to medium grained sand, fine to medium grained sandstone and igneous gravel, slag and root fibres.	w>PL			APPEARS POORLY COMPACTED
						10				as above, but trace of carbonaceous and coal bands.			90 80 150	
▽ ON COMPLETION OF AUGERING					N = 5 2,2,3		2		CI	Silty CLAY: medium plasticity, brown.	w>PL			RESIDUAL POSSIBLY FILL
					N > 10 6,10/ 150mm REFUSAL	9	3		-	COAL: dark grey, with carbonaceous bands, trace of fine to medium grained sandstone gravel.	DW	VL - L L - M		TOMAGO COAL MEASURES SAMPLE TOO FRIABLE FOR HP TEST LOW TO MODERATE 'TC' BIT RESISTANCE
						8	4			SILTSTONE: dark grey and grey.				
						7	5			SANDSTONE: fine to medium grained, grey and dark grey, with high strength siltstone bands.				HIGH RESISTANCE
						6								
							6			REFER TO CORED BOREHOLE LOG				
						5								

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CORED BOREHOLE LOG

Borehole No. 8

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 11.42 m

Date: 31/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK308 | **Bearing:** N/A | **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		6			START CORING AT 5.74m						
90% RETURN		5	6		SANDSTONE: medium to coarse grained, light grey, trace of siltstone and carbonaceous laminae, bedded at 0-20°.	SW	L - M	0.40, 0.40, 0.80, 0.30, 0.30, 0.70, 0.30		(6.04m) Be, 5°, P, R, Cb Sn	Tomago Coal Measures
		4	7							(7.44m) J, 65°, P, R (7.56m) J, 65°, P, R	
		3	8		SANDSTONE: fine to medium grained, grey, light grey and dark grey, with siltstone and carbonaceous, bedded at 0-15°, trace of carbonaceous band.		M	0.70		(7.91m) Be, 20°, P, S, Cb Sn (7.96m) J, 65°, P, R, Cb Sn (8.02m) Be, 0°, P, S, Cb Sn (8.05m) J, 90°, P, S, Cb Sn	
					SILTSTONE: dark grey and grey, with sandstone and carbonaceous laminae, bedded at 0-5°.			0.50		(8.64m) Be, 2°, P, S, Cb Sn (8.69m) Be, 0°, P, S, Cb Sn	
		2	9		SANDSTONE: fine to medium grained, light grey and grey, with siltstone laminae, bedded at 0-10°.	FR		0.60, 0.50, 0.30, 0.40		(8.97m) CS, 0°, 51 mm.t (9.10m) Be, 0°, P, S, Clay Sn	
80% RETURN			10								
		1	11		END OF BOREHOLE AT 10.22 m						
		0									

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 9

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.58 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						14	1			Extremely Weathered sandstone: gravelly sandy CLAY, brown, fine to coarse grained sand, fine to coarse grained sandstone gravel.	XW	Hd		
											DW	EL - L		TOMAGO COAL MEASURES VERY LOW TO LOW 'TC' BIT RESISTANCE
										SILTSTONE: dark grey.				
										SANDSTONE: fine to medium grained, light grey, with siltstone and carbonaceous laminae.		L - M		MODERATE RESISTANCE
						13	2			END OF BOREHOLE AT 1.50 m				'TC' BIT REFUSAL
						12	3							
						11	4							
						10	5							
						9	6							
						8								

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BOREHOLE LOG

Borehole No. 10

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.25 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						14			-	FILL: Gravelly silty sand, fine to coarse grained, fine to medium grained igneous and sandstone gravel.	M			
											XW	Hd		TOMAGO COAL MEASURES
					N > 20 3,10,10/ 0mm REFUSAL					Extremely Weathered sandstone: sandy SILT, low plasticity, brown, trace of fine grained sandstone gravel, and clay nodules.				
							1			Extremely Weathered siltstone: gravelly silty CLAY, high plasticity, dark grey, fine to medium grained siltstone gravel.	DW	EL - VL		VERY LOW 'TC' BIT RESISTANCE
						13				SANDSTONE: fine grained, light grey, with grey siltstone laminae.				
							2							LOW TO MODERATE RESISTANCE
						12								
							3							
						11				SILTSTONE: grey, with coal laminae.				VERY LOW RESISTANCE
							4							
						10				SANDSTONE: fine to medium grained, light grey, with grey siltstone laminae.		L - M		LOW RESISTANCE
							5							
						9				REFER TO CORED BOREHOLE LOG				
							6							
						8								

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CORED BOREHOLE LOG

Borehole No. 10

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 14.25 m

Date: 28/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness)	Formation
					START CORING AT 5.10m			VL -0.1, L -0.3, M -1, H -3, VH -10, EH	600, 200, 60, 20	Specific / General	
85% RETURN		9	6		SANDSTONE: fine to medium grained, grey, with dark grey siltstone laminae, bedded at 0-25°, interbedded with fine to coarse grained sandstone.	FR	M	0.40, 0.80		(5.64m) Be, 5°, P, Vr, Cn (5.79m) Be, 5°, P, R, Cb Ct	Tomago Coal Measures
		8	7		SANDSTONE: fine to coarse grained, grey, faintly bedded at 10-15°, with carbonaceous laminae, bedded at 5-10°.			0.60, 0.80, 0.60, 0.80, 0.60		(6.10m) Be, 10°, Ir, Vr, Cb Ct (6.20m) Be, 10°, P, R, Cn	
		7	8								
		6	9		LAMINITE: Siltstone, grey, with fine grained sandstone laminae, bedded at 0-10°.		VL - L	1.1, 0.10		(8.75m) J, 70°, P, Vr, Cn (8.88m) CS, 0°, 10 mm.t (8.94m) Be, 5°, P, S, Clay, 1 mm.t (9.15m) Be, 10°, P, S, Clay Vn	
		5	10		SANDSTONE: fine to coarse grained, grey, faintly bedded at 5°.		M - H	1.3		(9.60m) J, 70°, P, Vr, Fe Sn	
		4	11		LAMINITE: Sandstone, fine to medium grained, grey, with dark grey siltstone laminae, bedded at 0-10°.			0.40		(10.24m) J, 60°, Ir, Vr, Fe Sn	
		3			END OF BOREHOLE AT 10.25 m						

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 11

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 13.72 m

Date: 29/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING				■						FILL: Gravelly sandy clay, low plasticity, brown, fine to medium grained sand, fine to medium grained igneous, ironstone and sandstone gravel, trace of fine to medium grained coal gravel, brick fragments and asphalt clumps.	w>PL			GRASS COVER APPEARS POORLY COMPACTED
				■	N = 5 3,2,3	13	1						310 380 390	
										as above, but dark grey, with fine to medium grained ironstone gravel.			560 420 >600	APPEARS WELL COMPACTED
				■	N = 13 6,5,8	12	2							
						11	3						320 310 400	APPEARS MODERATELY COMPACTED
				■	N = 6 2,3,3	10	4		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of fine to medium grained siltstone gravel.	XW	Hd		TOMAGO COAL MEASURES
										Extremely Weathered sandstone: silty SAND, fine to coarse grained, light grey and red brown.				VERY LOW 'TC' BIT RESISTANCE
				■	N = 5 2,2,3	9	5			SANDSTONE: fine to medium grained, light grey.	DW	L - M		LOW TO MODERATE RESISTANCE
				■						REFER TO CORED BOREHOLE LOG				
						8	6							
						7								

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CORED BOREHOLE LOG

Borehole No. 11

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 13.72 m

Date: 29/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 5.50m						
100% RETURN		8	6		SANDSTONE: fine to coarse grained, light grey and orange brown, bedded at 5-10°, with carbonaceous laminae, bedded at 10-30°.	SW	L - M	0.20, 0.20, 0.70		(5.57m) Be, 20°, P, Vr, Cb Ct (5.61m) Be, 20°, P, Vr, Cb Ct	Tomago Coal Measures
		7	7					0.60		(6.27m) Be, 5°, P, Vr, Cb Ct	
					LAMINITE: Sandstone, fine to medium grained, grey, with dark grey siltstone laminae, bedded at 0-10°.	FR		0.30, 0.30		(6.48m) Be, 15°, P, R, Cb Ct	
		6	8					0.40, 0.30, 0.20, 0.30		(6.80m) Be, 3°, P, S, Cn (6.88m) XWS, 5°, 10 mm.t	
		5	9				M	0.60, 0.40, 0.40, 1.0		(9.40m) Be, 3°, P, R, Cn (9.64m) Be, 12°, Un, R, Cn	
		4	10					0.20		(9.95m) J, 75°, P, Vr, Fe Sn	
					END OF BOREHOLE AT 10.00 m						
		3	11								
		2									

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 12

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.69 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						14	0		CL-Cl	Sandy CLAY: low to medium plasticity, brown, fine to coarse grained sand.	w>PL	(St)		COLLUVIAL
									-	SANDSTONE: fine to coarse grained, orange brown, with ironstone bands.	DW	L - M		TOMAGO COAL MEASURES
										COAL: dark grey.				LOW TO MODERATE RESISTANCE
						13	1							MODERATE RESISTANCE
										SANDSTONE: fine to medium grained, light grey, with siltstone laminae.		M - H		MODERATE TO HIGH RESISTANCE
						12	2							MODERATE TO HIGH RESISTANCE
										END OF BOREHOLE AT 2.70 m				'TC' BIT REFUSAL
						11	3							
						10	4							
						9	5							
						8	6							

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BOREHOLE LOG

Borehole No. 13

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.31 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						14				FILL: Gravelly silty clayey sand, fine to coarse grained, brown and grey, fine to medium grained sandstone, igneous and siltstone gravel, trace of brick fragments and root fibres.	M			GRASS COVER APPEARS MODERATELY COMPACTED
				■	N = 8 4,4,4					FILL: Gravelly sandy silty clay, medium plasticity, brown, fine to coarse grained sand, fine to coarse grained sandstone and coal gravel.	w~PL		350 380 420	
						13	1							
				■	N > 19 2,4,15/ 100mm REFUSAL								530 520 >600	
				■		12	2		-	SANDSTONE: fine to coarse grained, light grey, with siltstone and coal bands.	DW	VL		TOMAGO COAL MEASURES VERY LOW TO LOW 'TC' BIT RESISTANCE
				■						as above, but without siltstone and coal bands.		VL - L		MODERATE RESISTANCE
				■										MODERATE TO HIGH RESISTANCE
						11	3			END OF BOREHOLE AT 2.90 m				'TC' BIT REFUSAL
						10	4							
						9	5							
						8	6							

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BOREHOLE LOG

Borehole No. 14

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 13.25 m

Date: 29/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						13				FILL: Gravelly sandy silty clay, low to medium plasticity, brown, fine to coarse grained sand, fine to medium grained sandstone, ironstone, siltstone and coal gravel, trace of sandstone cobble and brick fragments.	w>PL			APPEARS MODERATELY COMPACTED
						12	1							
					N = 12 8,8,4								150 210 250	
						11	2			FILL: Sand, fine to coarse grained, light grey and brown, with silt and very low to low strength coal bands.	M			VERY LOW 'TC' BIT RESISTANCE
					N = 7 4,3,4	10	3							SOIL RESISTANCE
						9	4			FILL: Silty clay, low to medium plasticity, grey and brown, with fine to coarse grained sand, trace of fine to medium grained sandstone gravel, ash and root fibres.	w>PL			HINT OF ORGANIC ODOUR
						8	5		-	SANDSTONE: fine to medium grained, grey.	DW	VL - L		TOMAGO COAL MEASURES
														VERY LOW TO LOW RESISTANCE
						7	6			REFER TO CORED BOREHOLE LOG				

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CORED BOREHOLE LOG

Borehole No. 14

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 13.25 m

Date: 29/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		8			START CORING AT 5.45m						
85% RETURN		7	6		SANDSTONE: fine to medium grained, light grey, with dark grey siltstone laminae, bedded at 0-15°.	SW	L - M	0.30, 0.30, 0.50, 0.20, 0.20		(6.84m) Cr, 5°, 7 mm.t	Tomago Coal Measures
		6	7		SANDSTONE: fine to coarse grained, light grey and orange brown, with siltstone lenses and laminae, faintly bedded at 0-10°.		M	0.80, 0.90		(7.28m) Be, 10°, P, S, Cb Ct; (7.38m) Be, 10°, P, R, Cn; (7.41m) J, 85°, P, Vr, Cn; (7.45m) Be, 10°, Cr, R, Cn; (7.56m) Be, 0°, P, R, Cn	
		5	8							(8.58m) Be, 5°, Un, R, Fe Sn; (8.65m) Be, 7°, Cr, R, Cn; (8.76m) Be, 10°, St, R, Cn; (8.87m) Be, 15°, St, R, Cb Ct; (8.90m) Be, 13°, P, R, Cb Ct	
		4	9		SILTSTONE: dark grey, with fine grained, light grey sandstone and carbonaceous laminae, bedded at 5-15°.			0.40, 0.50, 0.40		(9.27m) Be, 10°, C, R, Cb Ct; (9.34m) Be, 5°, P, R, Cb Ct; (9.44m) Cr, 2°, 35 mm.t; (9.56m) Be, 3°, P, Vr, Cn; (9.59m) Be, 3°, P, Vr, Cn; (9.81m) Be, 0°, P, R, Cn	
		3	10		END OF BOREHOLE AT 9.90 m						
		2	11								

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 15

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 13.55 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION										FILL: Sandy silty clay, low to medium plasticity, grey and brown, fine to coarse grained sand, with fine to coarse grained sandstone, siltstone, ironstone and coal gravel.	w~PL			APPEARS MODERATELY COMPACTED
					N = 9 4,3,6	13							>600 >600 >600	
							1							
					N = 15 5,3,12	12								
							2							
						11				FILL: Gravelly sandy silty clay, low to medium plasticity, dark grey and brown, fine to coarse grained sand, fine to coarse grained coal and sandstone gravel.	w>PL			
					N = 4 3,2,2		3						310 320 330	
						10								
							4			FILL: Gravelly silty clay, low to medium plasticity, dark grey, fine to coarse grained siltstone and ironstone gravel.	w~PL	(VSt)		
					N=SPT 6/ 100mm REFUSAL	9			-	SANDSTONE: fine to coarse grained light grey and orange brown, with siltstone and carbonaceous laminae.	DW	L		TOMAGO COAL MEASURES MODERATE TO HIGH 'TC' BIT RESISTANCE
							5			END OF BOREHOLE AT 5.10 m				'TC' BIT REFUSAL
						8								
							6							
						7								

JK 9.02.4 LIB:GLB Log JK AUGERHOLE - MASTER 35924LF METFORD.GPJ <<DrawingFile>> 11/05/2023 13:47 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

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BOREHOLE LOG

Borehole No. 16

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 12.65 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION										FILL: Gravelly sandy silty clay, low to medium plasticity, brown and grey, fine to coarse grained sand, fine to medium grained sandstone, siltstone, ironstone and coal gravel, trace of sandstone cobble.	w>PL			GRASS COVER APPEARS POORLY COMPACTED
					N = 5 3,2,3	12	1						280 300 350	
					N = 7 1,3,4	11	2						350 380 320	
					N = 11 3,5,6	10	3							
						9	4							
					N > 21 4,14,7/ 0mm REFUSAL	8	5		-	Extremely Weathered sandstone: SAND, fine to coarse grained, light grey and orange brown, with fine to medium grained sandstone and coal gravel, silt and clay nodules.	XW	(Hd)		TOMAGO COAL MEASURES SOIL 'TC' BIT RESISTANCE BANDED WITH VERY LOW RESISTANCE
						7	6			SILTSTONE: dark grey.	DW	VL - L		LOW TO MODERATE RESISTANCE
						6				SANDSTONE: light grey, with low strength siltstone bands.		L - M		MODERATE TO HIGH RESISTANCE

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BOREHOLE LOG

Borehole No. 16 **2 / 2**

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 12.65 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
									-	SANDSTONE: light grey, with low strength siltstone bands. *(continued)*	DW	L - M		
						5	8			END OF BOREHOLE AT 7.50 m				
						4	9							
						3	10							
						2	11							
						1	12							
						0	13							
						-1								

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BOREHOLE LOG

Borehole No. 17

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 12.46 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						12.46	0			FILL: Gravelly sandy silty clay, low to medium plasticity, grey and brown, fine to coarse grained sand, fine to medium grained sandstone, siltstone and coal gravel, trace of ash and root fibres.	w~PL			APPEARS MODERATELY COMPACTED
				■	N = 9 2,3,6	12							510 530 480	
							1							
				■	N = 14 3,7,7	11							520 480 210	
							2							
				■	N = 12 4,5,7	10			CI	Silty CLAY: medium plasticity, grey, with fine to coarse grained sand, trace of fine to medium grained siltstone and coal gravel, and root fibres.	w~PL	VSt - Hd	260 410 300	RESIDUAL
						9	3							
							4							
				■	N = 9 2,3,6	8							320 320 450	
							5							
						7			-	SILTSTONE: dark grey.	DW	Hd - VL		TOMAGO COAL MEASURES
				■	N=SPT 12/ 50mm REFUSAL	6	6							

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REFER TO CORED BOREHOLE LOG

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CORED BOREHOLE LOG

Borehole No. 17

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 12.46 m

Date: 30/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		6	7		START CORING AT 7.00m						
85% RETURN		5	8		SILTSTONE: dark grey, interbedded with fine to medium grained sandstone, bedded at 0-15°, with carbonaceous lenses, bedded at 0-5°.	FR	L	0.10		(7.09m) Be, 5°, P, S, Cn (7.10m) CS, 5°, 7 mm.t	Tomago Coal Measures
		4					M	0.70 0.50		(7.30m) Be, 5°, P, R, Cn	
		3	9		SANDSTONE: fine to medium grained, light grey, with siltstone bands, bedded at 5-10°, and carbonaceous lenses, faintly bedded at 0-10°.			0.40 0.40		(8.54m) Be, 5°, P, R, Cn	
			10				VL - L	0.10 0.30		(9.77m) Be, 0°, P, S, Clay Vn	
		2			END OF BOREHOLE AT 10.05 m						
		1	11								
		0	12								

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 18

1 / 2

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 13.46 m

Date: 29/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING					N = 3 1,1,2	13	0			FILL: Gravelly sandy silty clay, low to medium plasticity, brown, fine to coarse grained sand, fine to medium grained sandstone, siltstone, ironstone and coal gravel, trace of brick fragments and root fibres.	w>PL		130 140 150	APPEARS POORLY COMPACTED
						12	1							
					N = 10 3,5,5	11	2						420 >600 500	APPEARS WELL COMPACTED
					N = 20 6,8,12	10	3		-	Extremely Weathered siltstone: gravelly silty CLAY, low to medium plasticity, dark grey and grey, fine to coarse grained siltstone, sandstone and coal gravel.	XW	Hd	>600 >600 >600	TOMAGO COAL MEASURES
						9	4							VERY LOW 'TC' BIT RESISTANCE BANDED WITH LOW RESISTANCE
					N = 15 3,4,11					SILTSTONE: grey, with low strength, fine to medium grained sandstone bands and coal bands.	DW	VL		LOW RESISTANCE
						8	5			SANDSTONE: fine to medium grained, grey, with low strength siltstone bands.		L		MODERATE RESISTANCE
						7	6			REFER TO CORED BOREHOLE LOG				

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CORED BOREHOLE LOG

Borehole No. 18 **2 / 2**

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 13.46 m

Date: 29/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		8			START CORING AT 5.50m						
85% RETURN		7	6		SILTSTONE: dark grey, with fine grained sandstone laminae, bedded at 0-15°.	SW	L	0.20, 0.30, 0.30, 0.20, 0.20		(5.55m) Be, 15°, P, R, Clay Ct (5.57m) Be, 0°, P, Vr, Cn (5.60m) XWS, 5°, 2 mm.t (5.66m) Be, 5°, P, Vr, Cn (5.73m) Be, 3°, P, R, Cn (5.83m) Be, 5°, St, Vr, Cn (5.89m) Be, 0°, P, Vr, Cn (5.92m) Be, 0°, P, Vr, Cn (6.08m) Be, 3°, P, Vr, Cn (6.32m) Be, 3°, P, R, Cn (6.51m) Be, 0°, P, R, Cn (6.66m) Be, 3°, P, Vr, Cn	Tomago Coal Measures
		6	7								
		5	8		SANDSTONE: fine to coarse grained, light grey, with siltstone and carbonaceous laminae, faintly bedded at 5-30°.	FR		0.10, 0.10, 0.70	200, 60, 20	(6.89m) Be, 5°, P, R, Cb Ct (6.94m) Be, 0°, P, R, Cn (7.14m) Be, 0°, P, R, Cn (7.60m) Ji, 60°, P, R, Cn (7.83m) Be, 10°, P, Vr, Cn (8.25m) J, 60°, P, associated, Vr, Cn (8.40m) Cr, 60°, 100 mm.t	
		4	9		LAMINITE: dark grey siltstone, with fine to medium grained sandstone laminae, bedded at 0-20°.			0.30, 0.20, 0.30		(8.84m) Be, 5°, P, Vr, Cn (9.49m) Be, 5°, P, R, Cn (9.71m) Be, 5°, St, Vr, Cn	
		3	10		END OF BOREHOLE AT 9.90 m						
		2	11								

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 19

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 12.63 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						12	0			FILL: Gravelly sandy silty clay, medium plasticity, grey, fine to coarse grained sand, fine to coarse grained sandstone, siltstone and coal gravel.	w>PL			GRASS COVER APPEARS POORLY COMPACTED
					N = 5 3,3,2								230 150 180	
						11	1							
					N = 7 2,4,3								210 400 430	
						10	2							
									CI-CH	Silty CLAY: medium to high plasticity, grey, with fine to coarse grained sandstone, siltstone and coal gravel, trace of root fibres.	w~PL	VSt - Hd		COLLUVIAL
					N = 13 6,6,7	9	3						350 350 420	
						8	4						320 380 450	
							5		-	SILTSTONE: dark grey, with clay bands.	DW	VL	>600	TOMAGO COAL MEASURES LOW TO MODERATE 'TC' BIT RESISTANCE BANDED WITH SOIL RESISTANCE
					N=SPT 11/ 100mm REFUSAL	7	6							
						6				SANDSTONE: fine to medium grained, light grey.		L		MODERATE TO HIGH RESISTANCE

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BOREHOLE LOG

Borehole No. 19

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 12.63 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
										SANDSTONE: fine to medium grained, light grey.	DW	L		'TC' BIT REFUSAL
										END OF BOREHOLE AT 7.10 m				GROUND WATER MONITORING WELL INSTALLED TO 7.06m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 7.06m TO 5.36m. CASING 5.36m TO 0m. 2mm SAND FILTER PACK 7.06m TO 4.76m. BENTONITE SEAL 4.76m TO 0.5m. BACKFILLED WITH SAND (AND/OR CUTTINGS) TO THE SURFACE. COMPLETED WITH A 0.64m STICKUP.

5 8 4 9 3 10 2 11 1 12 0 13 -1

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BOREHOLE LOG

Borehole No. 20

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 12.84 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING					N = 9 5,4,5	12	1			FILL: Gravelly sandy silty clay, medium plasticity, grey, fine to coarse grained sand, fine to coarse grained sandstone, siltstone and coal gravel.	w>PL			GRASS COVER APPEARS POORLY TO MODERATELY COMPACTED
					N = 7 3,3,4	11	2			as above, but with very low to low strength coal bands.			490 280 200	RESIDUAL SOIL RESISTANCE BANDED WITH VERY LOW 'TC' BIT RESISTANCE
					N = 17 4,6,11	10	3						450 500 520	
						9	4		-	SANDSTONE: light grey, with low strength siltstone bands.	DW	L - M		TOMAGO COAL MEASURES LOW TO MODERATE RESISTANCE
						8	5			as above, but without siltstone bands, trace of carbonaceous laminae.				MODERATE TO HIGH RESISTANCE
						7	6			REFER TO CORED BOREHOLE LOG				'TC' BIT REFUSAL
						6								

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CORED BOREHOLE LOG

Borehole No. 20

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 12.84 m

Date: 30/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 5.10m			VL -0.1, L -0.3, M -1, H -3, VH -10, EH	600, 200, 60, 20		
95% RETURN		7	6		SANDSTONE: fine to coarse grained, light grey, speckled siltstone, with carbonaceous and siltstone laminae, bedded at 0-5°.	FR	L - M	0.20		(5.71m) Be, 10°, P, R, Cb Sn	Tomago Coal Measures
		6	7		SANDSTONE: medium to coarse grained, light grey, with siltstone and carbonaceous laminae, faintly bedded at 0-20°/		M	0.30 0.60 0.50 0.50 0.40		(7.45m) J, 75°, P, R	
		5	8					0.80		(8.30m) Be, 10°, Un, R, Cb Cn	
100% RETURN		4	9					0.40 0.40	200	(8.71m) Be, 2°, P, R, Cb Cn	
		3	10					0.40		(9.57m) Be, 0°, P, S	
		2	11		END OF BOREHOLE AT 10.00 m						
		1							600, 200, 60, 20		

JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 35924LF METFORD.GPJ <<DrawingFile>> 11/05/2023 13:50 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

BOREHOLE LOG

Borehole No. 21

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** HAND AUGER **R.L. Surface:** 8.90 m

Date: 5/4/23 **Datum:** AHD

Plant Type: **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION				■	REFER TO DCP TEST RESULTS SHEET				CL-CI	TOPSOIL: Sand, fine to medium grained, brown, trace of fine to medium grained sandstone and coal gravel.	M			ALLUVIAL
										CLAY: low to medium plasticity, dark brown, trace of sandstone and coal gravel.	M			HAND AUGER REFUSAL ON INFERRED ROCK
						8	1			END OF BOREHOLE AT 0.30 m				
						7	2							
						6	3							
						5	4							
						4	5							
						3	6							
						2								

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BOREHOLE LOG

Borehole No. 22

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** HAND AUGER **R.L. Surface:** 9.10 m

Date: 5/4/23 **Datum:** AHD

Plant Type: **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION					REFER TO ~~DCP TEST~~ RESULTS SHEET	9			-	TOPSOIL: Sand, fine to medium grained, brown, trace of fine to medium grained sandstone gravel and clay nodules.	M	Hd		TOMAGO COAL MEASURES
											XW			HAND AUGER REFUSAL ON INFERRED ROCK
										Extremely Weathered sandstone: silty CLAY, low plasticity, brown, trace of coal gravel.				
						8	1			END OF BOREHOLE AT 0.15 m				
						7	2							
						6	3							
						5	4							
						4	5							
						3	6							

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BOREHOLE LOG

Borehole No. 23

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** HAND AUGER **R.L. Surface:** 8.41 m

Date: 5/4/23 **Datum:** AHD

Plant Type: **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION				■	REFER TO DCP TEST RESULTS SHEET					FILL: Silty clay, low plasticity, brown, trace of fine to medium grained sand, fine to medium grained sandstone and igneous gravel, and root fibres.	w>PL			GRASS COVER
						8				END OF BOREHOLE AT 0.30 m				HAND AUGER REFUSAL ON INFERRED ROCK
							1							
						7								
							2							
						6								
							3							
						5								
							4							
						4								
							5							
						3								
							6							
						2								

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BOREHOLE LOG

Borehole No. 24

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.31 m

Date: 4/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						8				FILL: Silty clay, low plasticity, dark brown, trace of fine to medium grained sandstone and igneous gravel, fine to medium grained sand, and root fibres.	w>PL			GRASS COVER
									-	SANDSTONE: fine to medium grained, light grey.	DW	L - M		TOMAGO COAL MEASURES LOW 'TC' BIT RESISTANCE
							1			SANDSTONE: fine to coarse grained, yellow brown.		M		HIGH RESISTANCE
						7				SANDSTONE: fine to medium grained, light grey.				
										REFER TO CORED BOREHOLE LOG				GROUNDWATER MONITORING WELL INSTALLED TO 8.6m. HAND SLOTTED 50mm DIA. PVC STANDPIPE 2.6m TO 8.6m. CASING 2.6m TO 0.57m STICK UP. 2mm SAND FILTER PACK 1.3m TO 8.6m. BENTONITE SEAL 0.5m TO 1.3m. BACKFILLED WITH SAND (AND/OR CUTTINGS) TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.

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CORED BOREHOLE LOG

Borehole No. 24 **2 / 3**

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 8.31 m

Date: 4/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		7			START CORING AT 1.60m						
80% RETURN			2		SANDSTONE: fine to coarse grained, light grey, with siltstone and carbonaceous laminae, bedded at 0-20°.	FR	L - M	0.20		(1.75m) J, 70°, P, R, Fe Cn	Tomago Coal Measures
		6						0.40		(2.00m) J, 70°, P, R	
								0.20			
								0.30			
		5	3					0.40			
								0.20			
		4	4					0.20			
								0.30		(4.85m) Be, 0°, P, R, Cb Sn	
			5		Interbedded SILTSTONE: dark grey, with SANDSTONE: laminae, bedded at 0-15°.			0.10			
		3			SANDSTONE: fine to medium grained, light grey and yellow brown, with siltstone and carbonaceous laminae, bedded at 0-10°.	SW				(5.26m) Be, 0°, P, R, Cb Sn (5.33m) J, 70°, P, R, Fe Cn	
								0.20			
								0.60		(5.70m) Be, 5°, P, R, Fe Cn	
			6							(5.95m) J, 80°, P, R, Fe Cn	
90% RETURN		2						0.20			
								0.20			
								0.20		(6.41m) J, 50°, P, R, Fe Cn	
					SILTSTONE: dark grey, with carbonaceous laminae, bedded at 0-5°.	HW	VL	0.030		(6.58m) Be, 2°, P, R, Fe Cn	
			7		NO CORE 0.32m					(6.97m) Be, 0°, P, S, Cb Sn	
		1			SILTSTONE: dark grey, with carbonaceous speckles, bedded at 0-5°.	HW	M			(7.55m) J, 35°, P, S, Cb Sn	
					NO CORE 0.10m						
					SANDSTONE: as below	FR	M - H	0.60			

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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CORED BOREHOLE LOG

Borehole No. 24 **3 / 3**

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 8.31 m

Date: 4/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ VL 0.1 L 0.3 M 1 H 3 VH 10 EH	DEFECT DETAILS SPACING (mm) 600 200 60 20 DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
90% RETURN		0			SANDSTONE: fine to medium grained, light grey, trace of siltstone and carbonaceous laminae, bedded at 0-10°.	FR	M	1.0 0.60 0.30		Tomago Coal Measures
		-1	9		END OF BOREHOLE AT 8.60 m					
		-2	10							
		-3	11							
		-4	12							
		-5	13							
		-6	14							

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 25

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.24 m

Date: 4/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						8				FILL: Silty Clay, low plasticity, dark brown, trace of fine to medium grained sandstone and igneous gravel, sand and root fibres.	w>PL			GRASS COVER
									-	SANDSTONE: fine to medium grained, light grey, with siltstone laminae.	DW	M - H		TOMAGO COAL MEASURES
							1					L - M		HIGH 'TC' BIT RESISTANCE
						7				END OF BOREHOLE AT 1.20 m				LOW RESISTANCE
							2							HIGH RESISTANCE
						6								
							3							
						5								
							4							
						4								
							5							
						3								
							6							
						2								

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BOREHOLE LOG

Borehole No. 26

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.13 m

Date: 4/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						8				FILL: Clayey sand, fine to medium grained, light grey mottled yellow brown, trace of fine to medium grained sandstone and igneous gravel, and root fibres.	M			GRASS COVER
									-		DW	L - M		TOMAGO COAL MEASURES
							1			SANDSTONE: fine to medium grained, light grey, with siltstone laminae, trace of carbonaceous laminae.		H		MODERATE 'TC' BIT RESISTANCE
						7								HIGH RESISTANCE
										SANDSTONE: fine to coarse grained, yellow and yellow brown.				
						6	2							
												M		MODERATE RESISTANCE
						5	3							
												VL - L		VERY LOW TO LOW RESISTANCE
ON COMPLETION OF AUGERING						4	4		CL-CI	Carbonaceous CLAY: low to medium plasticity, dark brown, with coal gravel.	w>PL			
									ML	Clayey SILT: low to medium plasticity, grey, trace of coal gravel.				HIGH RESISTANCE
										REFER TO CORED BOREHOLE LOG				
						3	5							
						2	6							

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CORED BOREHOLE LOG

Borehole No. 26 **2 / 2**

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 8.13 m

Date: 4/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness)	Formation
		4			START CORING AT 4.56m						
90% RETURN		3	5		SANDSTONE: fine to coarse grained, light grey, with carbonaceous laminae, bedded at 0-15°, trace of siltstone laminae, faintly bedded at 0-20°.	FR	L - M	0.20, 0.60		(4.83m) CS, 20°, 10 mm.t	Tomago Coal Measures
						MW		0.30		(5.49m) J, 70°, P, R, Clay Cn	
										(5.63m) J, 60°, P, R	
								0.50		(5.88m) Be, 10°, P, R, Cb Sn	
		2	6					0.30		(6.01m) J, 70°, P, R	
										(6.24m) J, 60°, Un, R, Cn	
								0.60		(6.33m) Be, 5°, P, R, Cb Sn	
80% RETURN					Interbedded SANDSTONE and SILTSTONE: fine to medium grained, dark grey and light grey, with carbonaceous laminae, bedded at 0-20°.			0.20		(6.68m) Be, 10°, P, R, Cn	
		1	7							(7.05m) Be, 20°, P, R, Cb Sn	
								0.10			
							M - H	0.40		(7.77m) Be, 5°, P, S, Cb Sn	
		0	8		SANDSTONE: fine to coarse grained, light grey, with siltstone and carbonaceous laminae, bedded at 0-15°.			0.60		(8.12m) Be, 10°, P, R	
										(8.35m) Be, 15°, P, R, Cb Sn	
								1.3		(8.70m) Be, 0°, P, R, Cb Sn	
		-1	9					0.90		(8.79m) J, 80°, P, R	
								0.70			
					END OF BOREHOLE AT 9.28 m						
		-2	10								

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 27

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.23 m

Date: 3/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION				■		8				FILL: Sandy clay, low plasticity, brown, fine to medium grained sand, with fine to medium grained sandstone gravel, trace of igneous gravel and root fibres.	w~PL			GRASS COVER
				■	N > 6 10,6/ 50mm REFUSAL				-	Extremely Weathered sandstone: CLAY, low plasticity, light grey and grey.	XW	Hd	470 520	TOMAGO COAL MEASURES
				■							DW	L - M	>600	LOW TO MODERATE 'TC' BIT RESISTANCE
				■		7	1			SANDSTONE: fine to medium grained, light grey, dark grey and grey, with low to medium strength siltstone band.				HIGH RESISTANCE
										END OF BOREHOLE AT 1.20 m				'TC' BIT REFUSAL
						6	2							GROUNDWATER MONITORING WELL INSTALLED TO 1.25m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 0.7m TO 1.25m. CASING 0m TO 0.7m. 2mm SAND FILTER PACK 0.9m TO 1.25m. BENTONITE SEAL 0.2m TO 0.9m. BACKFILLED WITH SAND (AND/OR CUTTINGS) TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						5	3							
						4	4							
						3	5							
						2	6							

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BOREHOLE LOG

Borehole No. 28

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.42 m

Date: 5/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING					N = 19 4,8,11	8				FILL: Sandy clay, low plasticity, brown, fine to medium grained sand, trace of fine to medium grained sandstone, igneous and root fibres.	w<PL			GRASS COVER APPEARS WELL COMPACTED
											D			
										FILL: Coal, dark brown, trace of fine to medium grained sandstone and carbonaceous gravel, fine to medium grained sand, and clay nodules.	w~PL		500 550 480	
						7	1			FILL: Silty clay, low plasticity, with fine to medium grained sandstone gravel, trace of fine to medium grained igneous and coal gravel, fine to medium grained sand, and root fibres.				
									-	SANDSTONE: fine to medium grained, yellow brown.	DW	L - M		TOMAGO COAL MEASURES HIGH 'TC' BIT RESISTANCE
										REFER TO CORED BOREHOLE LOG				

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CORED BOREHOLE LOG

Borehole No. 28 **2 / 2**

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 8.42 m

Date: 5/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ VL 0.1 L 0.3 M 1 H 3 VH 10 EH	DEFECT DETAILS SPACING (mm) 600 200 60 20	DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
		7			START CORING AT 1.60m						
90% RETURN		6	2		SANDSTONE: medium to coarse grained, orange brown.	FR	L - M	0.90		(1.82m) Be, 0°, P, R	Tomago Coal Measures
					SANDSTONE: fine to coarse grained, light grey, trace of siltstone band, with siltstone and carbonaceous laminae, bedded at 0-15°.			0.40			
		5	3					0.20		(2.62m) Be, 30°, Un, R, Cb Sn	
								0.40		(2.90m) J, 80°, C, R, Cb Sn	
		4	4					0.40			
							L	0.20		(3.48m) Be, 3°, St, Cn	
								0.20			
80% RETURN		3	5					0.30			
					Interbedded SANDSTONE: fine to medium grained, with siltstone and carbonaceous laminae, bedded at 0-20°.			0.20			
		2	6					0.20			
								0.30			
		1	7		SANDSTONE: fine to medium grained, light grey with siltstone and carbonaceous laminae, bedded at 0-20°.			0.20			
								0.30			
					END OF BOREHOLE AT 7.52 m						

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 29

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** N/A

Date: 3/4/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION									FILL: Silty clay, low plasticity, brown, trace of fine to medium grained sandstone and igneous gravel, and fine to medium grained sand.	w~PL			GRASS COVER
					N = 19 3,8,11	1			FILL: Sandy clay, low plasticity, brown, fine to medium grained sand, with fine to medium grained sandstone, igneous and ironstone, trace of coal and carbonaceous gravel, and root fibres.			170 170 250	APPEARS WELL COMPACTED
								CL-CI	Silty CLAY: low to medium plasticity, dark grey, trace of fine to medium grained sandstone, and root fibres.	w~PL	Hd		RESIDUAL
					N = 20 5,8,12	2						500 550 530	
								-	SANDSTONE: fine to medium grained, grey, with low to medium siltstone bands.	DW	VL - L		TOMAGO COAL MEASURES VERY LOW TO LOW 'TC' BIT RESISTANCE
						3					L - M		LOW TO MODERATE RESISTANCE MODERATE TO HIGH RESISTANCE
									END OF BOREHOLE AT 3.70 m				
						4							
						5							
						6							

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BOREHOLE LOG

Borehole No. 30

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.45 m

Date: 3/4/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						8				FILL: Silty clay, low plasticity, brown, trace of fine to medium grained sandstone and igneous gravel, fine to medium grained sand, and root fibres.	w~PL			GRASS COVER APPEARS WELL COMPACTED
					N = 25 5,9,16					FILL: Gravelly clay, low plasticity, brown, grey and orange brown, fine to medium grained, sub-angular sandstone gravel, trace of coal and carbonaceous gravel, and root fibres.			400 450 >600	
							1		-	SANDSTONE: fine to medium grained, grey, light grey and dark grey, trace of siltstone laminae.	DW	VL - L		TOMAGO COAL MEASURES
						7				REFER TO CORED BOREHOLE LOG				HIGH 'TC' BIT RESISTANCE
							2							
						6								
							3							
						5								
							4							
						4								
							5							
						3								
							6							
						2								

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CORED BOREHOLE LOG

Borehole No. 30

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 8.45 m

Date: 3/4/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK308 | **Bearing:** N/A | **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 1.20m						
90% RETURN		7	2		SANDSTONE: fine to coarse grained, light grey, light brown and grey, with siltstone and carbonaceous laminae, bedded at 0-10°, trace of speckled siltstone, bedded at 0-10°.	SW	L - M	0.70		(1.53m) Be, 5°, P, R, Cb Sn (1.58m) Be, 20°, P, R, Cb Sn	Tomago Coal Measures
		6						0.40 0.30			
							L	0.10 0.10		(2.69m) CS, 2°, 5 mm.t	
			3					0.090		(3.00m) J, 90°, P, R, Cb Cn (3.06m) Be, 0°, P, S, Clay Sn	
		5			SILTSTONE: dark grey, with carbonaceous laminae, bedded at 0-20°.			0.20		(3.34m) Be, 0°, P, S	
			4					0.20		(3.70m) Be, 10°, P, S	
		4				MW	VL - L	0.070			
								0.090		(4.72m) Be, 0°, P, S, Cb Sn (4.75m) J, 90°, P, S, Cb Sn (4.82m) CS, 10 mm.t	
			5					0.10		(5.04m) Be, 0°, P, S, Cb Sn (5.18m) J, 90°, Un, R, Cb Sn (5.26m) CS, 13 mm.t	
		3						0.070			
					NO CORE 0.29m					(5.52m) Be, 0°, P, S, Clay Sn	
80% RETURN		6			SANDSTONE: fine to medium grained, light grey, with siltstone laminae, faintly bedded at 0-20°, trace of carbonaceous laminae, bedded at 0-30°.	SW	L			(5.82m) CS, 120 mm.t (6.00m) J, 55°, P, S	Tomago Coal Measures
		2						0.10			
			7					0.30 0.30			
		1						0.20			

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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CORED BOREHOLE LOG

Borehole No. 30

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 8.45 m

Date: 3/4/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK308 | **Bearing:** N/A | **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
80% RETURN		0			SANDSTONE: fine to medium grained, light grey, with siltstone laminae, faintly bedded at 0-20°, trace of carbonaceous laminae, bedded at 0-30°. *(continued)*	SW	VL - L	0.10; 0.10; 0.30			
					SANDSTONE: fine to coarse grained, light grey.						
			9		END OF BOREHOLE AT 8.83 m						
		-1	10								
		-2	11								
		-3	12								
		-4	13								
		-5	14								
		-6									

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 31

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 9.27 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						9				FILL: Clayey gravel, fine to coarse grained, sub-angular, igneous, ironstone and sandstone, dark grey and brown, trace of fine to medium grained sand, roots and root fibres.	W			GRASS COVER
											w>PL			APPEARS MODERATELY COMPACTED
					N > 8 2,2,6/ 100mm REFUSAL								160 190 220	
										FILL: Silty clay, low plasticity, brown and dark grey, trace of fine to medium grained ironstone, sandstone and igneous gravel, fine to medium grained sand, roots and root fibres.	XW	Hd	>600	TOMAGO COAL MEASURES
						8	1		-	Extremely Weathered sandstone: silty CLAY, low plasticity, grey.	DW	L - M		LOW TO MODERATE 'TC' BIT RESISTANCE
										SANDSTONE: fine to medium grained, light grey, with low to medium strength siltstone bands.		M		MODERATE RESISTANCE
						7	2							MODERATE TO HIGH RESISTANCE
							3							
						6				END OF BOREHOLE AT 3.10 m				
							4							
						5								
							5							
						4								
							6							
						3								

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BOREHOLE LOG

Borehole No. 32

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.56 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						8				FILL: Gravelly clay, low plasticity, dark grey and brown, sub-angular, igneous and ironstone, trace of fine to medium grained sand, roots and root fibres.	w>PL			GRASS COVER
					N > 3 2,3/ 50mm REFUSAL				-	FILL: Silty clay, low plasticity, brown and grey, trace of fine to medium grained ironstone, igneous and coal gravel, fine to medium grained sand, roots and root fibres.	XW	Hd	460 450 400	TOMAGO COAL MEASURES
						7	1			Extremely Weathered sandstone: silty CLAY, low plasticity, grey and brown.	DW	L - M		LOW 'TC' BIT RESISTANCE
										SANDSTONE: fine to medium grained, dark grey and light grey, trace of low to medium strength siltstone bands.				MODERATE RESISTANCE
						6	2							MODERATE TO HIGH RESISTANCE
										END OF BOREHOLE AT 2.75 m				'TC' BIT REFUSAL ON INFERRED ROCK
						5	3							
						4	4							
						3	5							
						2	6							

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BOREHOLE LOG

Borehole No. 33

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.45 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						8				FILL: Silty clay, low plasticity, with fine to medium grained igneous gravel, trace of fine to medium grained sandstone and ironstone gravel, fine to medium grained sand, roots and root fibres.	w>PL			GRASS COVER
					N > 19 7,9,10/ 50mm REFUSAL					FILL: Clayey gravel, dark brown and brown, fine to medium grained, sub-angular sandstone, trace of coal gravel.	D			
						7	1		-	SANDSTONE: fine to medium grained, dark grey and grey.	DW	L - M		TOMAGO COAL MEASURES MODERATE 'TC' BIT RESISTANCE HIGH RESISTANCE
						6	2			END OF BOREHOLE AT 2.25 m				'TC' BIT REFUSAL GROUNDWATER MONITORING WELL INSTALLED TO 2.25m. HAND SLOTTED 50mm DIA. PVC STANDPIPE 1.5m TO 2.25m. CASING -1.5m TO 1.5m. 2mm SAND FILTER PACK 1.65m TO 2.25m. BENTONITE SEAL 0.2m TO 1.65m. BACKFILLED WITH SAND (AND/OR CUTTINGS) TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						5	3							
						4	4							
						3	5							
						2	6							

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BOREHOLE LOG

Borehole No. 34

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 11.39 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
ON COMPLETION OF AUGERING						11.39	0		GP	PALLET: 130mm.t				IGNEOUS GRAVEL COVER
									-	FILL: Silty clay, medium plasticity, brown, trace of fine to medium grained sandstone, siltstone, carbonaceous and igneous gravel, and fine to medium grained sand.	w<PL			APPEARS MODERATELY COMPACTED
					N = 8 2,3,5	11							400 350 210	
							1			as above, but brown and dark brown mottled light grey and orange brown, trace of root fibres.				
						10					w~PL			
					N = 8 2,3,5								150 250 290	
						9	2							
										FILL: Sandy clay, low plasticity, brown, orange brown and light grey, trace of fine to medium grained sand, and fine to medium grained coal, igneous and sandstone gravel.				APPEARS POORLY COMPACTED
					N = 4 2,2,2								90 90 150	
						8	3							
									-	Extremely Weathered siltstone: silty CLAY, medium to high plasticity, dark grey.	XW	Hd		TOMAGO COAL MEASURES
							4			REFER TO CORED BOREHOLE LOG				MODERATE TO HIGH 'TC' BIT RESISTANCE
						7								
							5							
						6								
							6							
						5								

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CORED BOREHOLE LOG

Borehole No. 34

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 11.39 m

Date: 30/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK308 | **Bearing:** N/A | **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 4.24m						
70% RETURN		7			Extremely Weathered siltstone: silty CLAY, medium to high plasticity, dark grey.	XW	Hd				
						SW	L - M	0.10		(4.48m) J, 90°, Un (4.51m) Be, 10°, P, S, Clay Sn	
					SANDSTONE: fine to medium grained, light grey and dark grey, with siltstone laminae, bedded at 0-20°.			0.40		(4.80m) Be, 4°, P, S	
		5			SILTSTONE: dark grey and light grey, with fine to medium grained sandstone laminae, bedded at 0-5°.			0.50			
		6			SANDSTONE: fine to medium grained, light grey, with siltstone laminae, bedded at 0-20°.			0.10		(5.47m) J, 40°, P, R	
80% RETURN						MW	L				
					SANDSTONE: medium to coarse grained, grey, with siltstone and carbonaceous laminae, faintly bedded at 0-10°.			0.080			
		6						0.20			
		5						0.20			
			7		SILTSTONE: dark grey and grey, with carbonaceous laminae, bedded at 0-10°, trace of carbonaceous lenses.		L - M			(6.90m) Be, 3°, P, S, Cb Sn (6.93m) Be, 3°, P, S, Cb Sn	
		4						0.60		(7.14m) Be, 15°, P, S, Cb Sn	
										(7.36m) Be, 10°, P, S, Cb Sn	
					SANDSTONE: fine to medium grained, grey and light grey, with siltstone and carbonaceous laminae, bedded at 0-30°, trace of siltstone lenses.	FR		0.30		(7.60m) Be, 15°, P, S	
			8					0.40		(7.96m) Be, 10°, P, S	
70% RETURN		3						0.40			
								0.30			
							M				
		2	9					0.60			
								0.50			
			10					0.40		(10.10m) Be, 10°, P, S	
		1			END OF BOREHOLE AT 10.35 m						

Tomago Coal Measures

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 35
1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.91 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						8	1			FILL: Silty clay, low plasticity, brown, with igneous gravel, trace of fine to medium grained sandstone and ironstone gravel, fine to medium grained sand, roots and root fibres.	w<PL w>PL		250 220 270	GRASS COVER APPEARS POORLY COMPACTED
					N = 5 3,2,3									
						7	2		-	SANDSTONE: fine to medium grained, light grey.	DW	M - H		TOMAGO COAL MEASURES
												H		MODERATE TO HIGH 'TC' BIT RESISTANCE
														HIGH RESISTANCE
										SILTSTONE: dark grey and grey, trace of fine to medium grained sandstone and coal bands.		M		MODERATE RESISTANCE
										SILTSTONE: dark grey and grey.		H		HIGH RESISTANCE
						6	3			END OF BOREHOLE AT 2.55 m				'TC' BIT REFUSAL
						5	4							
						4	5							
						3	6							
						2								

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BOREHOLE LOG

Borehole No. 36

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 11.37 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION									GP	PALLET: 130mm.t				GRAVEL COVER
						11			-	FILL: Gravelly clay, low plasticity, brown, sub-angular igneous, trace of fine to medium grained sand, and root fibres.	w<PL			APPEARS POORLY COMPACTED
					N = 8 2,3,5					FILL: Silty clay, medium plasticity, grey and brown, trace of fine to medium grained sandstone, igneous and coal gravel, fine to medium grained sand, and root fibres.	w>PL		400 350 600	
						10	1			FILL: Gravelly clay, low plasticity, light grey and grey, sub-angular, fine to medium grained sandstone gravel, trace of siltstone gravel and fine to medium grained sand.	w~PL			
					N = 4 1,1,3								600 500	
						9	2		CL-CI	Silty CLAY: low to medium plasticity, dark grey, trace of fine to medium grained sand, ironstone and coal gravel, silt and root fibres.	w>PL	(VSt)		RESIDUAL POSSIBLY FILL
									GC	Clayey GRAVEL: sub-angular siltstone, dark grey, trace of fine to medium grained ironstone and coal gravel.	M			
					N > 9 3,9/ 150mm REFUSAL	8	3		-	SANDSTONE: fine to medium grained, light grey, with low to medium strength siltstone bands.	DW	VL - L		TOMAGO COAL MEASURES VERY LOW TO LOW 'TC' BIT FORMATION
						7	4			END OF BOREHOLE AT 4.00 m		M - H		MODERATE TO HIGH RESISTANCE 'TC' BIT REFUSAL
						6	5							
						5	6							

JK 9.02.4 LIB:GLB Log JK AUGERHOLE - MASTER 35924LF METFORD.GPJ <<DrawingFile>> 11/05/2023 13:48 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

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BOREHOLE LOG

Borehole No. 37

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 10.22 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						10				FILL: Silty clay, low plasticity, dark brown and brown mottled yellow brown and light grey, trace of fine to medium grained sandstone and igneous gravel, fine to medium grained sand, roots and root fibres.	w>PL w~PL			GRASS COVER APPEARS WELL COMPACTED
					N = 16 5,9,7					as above, but yellow brown and light grey, trace of carbonaceous coal.	w<PL		>600	
						9	1			FILL: Gravelly clay, low plasticity, dark grey and grey, fine to medium grained sub-angular sandstone gravel, trace of coal gravel and root fibres.				
					N = 6 2,2,4				CL-CI	Silty CLAY: low to medium plasticity, yellow brown and light grey, trace of coal gravel.	w>PL	St	110 210 110	RESIDUAL POSSIBLY FILL
						8	2		-	SILTSTONE: dark grey, with high strength iron indurated bands.	DW	H		TOMAGO COAL MEASURES HIGH 'TC' BIT RESISTANCE
						7	3			SILTSTONE: dark grey and grey, trace of low strength coal and carbonaceous bands.		L		LOW RESISTANCE
						6	4					M		MODERATE RESISTANCE
						5	5			SILTSTONE: dark grey and grey, trace of fine to medium grained sandstone, coal and carbonaceous gravel.		H		HIGH RESISTANCE
						4	6			REFER TO CORED BOREHOLE LOG				

JK 9.02.4 LIB:GLB Log JK AUGERHOLE - MASTER 35924LF METFORD.GPJ <<DrawingFile>> 11/05/2023 13:48 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

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CORED BOREHOLE LOG

Borehole No. 37 **2 / 2**

Client: HEALTH INFRASTRUCTURE

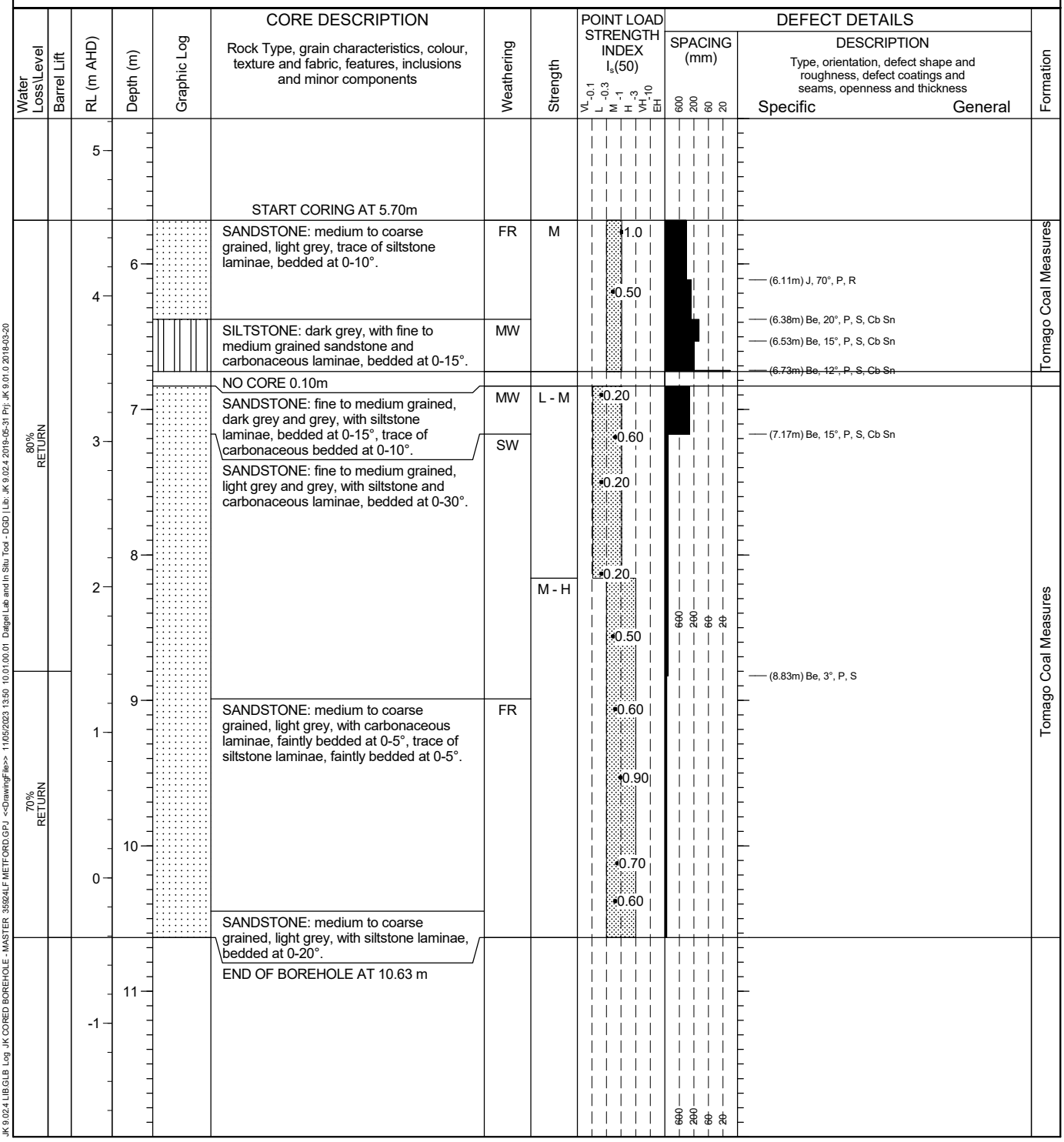
Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 10.22 m

Date: 30/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** N.A.P./O.F.



JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 35924LF METFORD.GPJ <<DrawingFile>> 11/05/2023 13:50 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

BOREHOLE LOG

Borehole No. 38

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 9.54 m

Date: 29/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						9.54	0			FILL: Silty clay, low plasticity, dark brown mottled light grey and orange brown, trace of fine to medium grained sandstone, igneous, carbonaceous coal and ironstone gravel, fine to medium grained sand, roots and root fibres.	w>PL			GRASS COVER APPEARS POORLY TO MODERATELY COMPACTED
					N = 10 4,5,5	9							320 370 320	
							1							
						8			CL	Silty CLAY: low plasticity, brown, trace of fine to medium grained ironstone, sandstone, and carbonaceous coal gravel.	w>PL			COLLUVIAL
					N = 6 2,3,3		2						190 130 140	
						7								
							3		-	SILTSTONE: dark grey.	DW	L - M		TOMAGO COAL MEASURES LOW TO MODERATE 'TC' BIT RESISTANCE
						6				SANDSTONE: fine to medium grained, grey, with low strength siltstone bands.		M		MODERATE TO HIGH RESISTANCE
							4							
						5				SILTSTONE: dark grey and grey, trace of fine to medium grained sandstone and carbonaceous bands.				
						4	5							
							6			REFER TO CORED BOREHOLE LOG				
						3								

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CORED BOREHOLE LOG

Borehole No. 38 **2 / 2**

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 9.54 m

Date: 29/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS SPACING (mm)	DEFECT DETAILS DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
		4			START CORING AT 5.77m						
80% RETURN		3	6		SANDSTONE: fine to medium grained, grey and dark grey, with siltstone laminae, bedded at 0-10°.	FR	L - M	0.40 0.20		(5.80m) CS, 0°, 30 mm.t (6.37m) CS, 0°, 15 mm.t	Tomago Coal Measures
		2	7		LAMINITE: Siltstone, dark grey, with fine to medium grained sandstone laminae, bedded at 0-10°.			0.30 0.30		(6.95m) CS, 5°, 5 mm.t	
		1	8		SANDSTONE: medium to coarse grained, grey and dark grey, with siltstone and carbonaceous laminae, bedded at 0-20°.	SW	M	0.60		(8.21m) Be, 20°, P, S, Clay Sn (8.42m) Be, 3°, P, R, Clay Sn (8.46m) Be, 5°, P, R	
60% RETURN		0	9					0.50 0.40			
		-1	10					0.40 0.40 0.50		(9.80m) Be, 30°, P, R, Cb Cn (9.88m) J, 45°, P, R, Cb Cn (10.56m) Be, 10°, P, R (10.60m) Be, 10°, P, R (10.64m) J, 94°, P, R	
		-2	11		END OF BOREHOLE AT 10.80 m						

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

BOREHOLE LOG

Borehole No. 39

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 9.57 m

Date: 29/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						9.57	0			FILL: Silty clay, low plasticity, brown and dark brown, trace of fine to medium grained ironstone, sandstone, igneous and coal gravel, fine to medium grained sand, roots and root fibres.	w<PL			GRASS COVER APPEARS WELL COMPACTED
					N = 14 5,5,9	9				as above, but dark brown, with carbonaceous coal gravel.			>600	
						8.57	1		CI	Silty CLAY: medium plasticity, light grey and yellow brown mottled dark grey, trace of fine to medium grained sandstone and coal gravel.	w<PL	St-VSt		COLLUVIAL
					N = 6 1,3,3	8								
						7.57	2							
					N=SPT 12/ 100mm REFUSAL	7			-	Extremely Weathered sandstone: silty CLAY, low to medium plasticity, light grey and dark grey.	XW	Hd		TOO FRIABLE FOR HP TESTING
						6.57	3			SANDSTONE: fine to medium grained, grey.	DW	L		TOMAGO COAL MEASURES LOW 'TC' BIT RESISTANCE
						6								
						5.57	4			SILTSTONE: dark grey and grey.		L - M		LOW TO MODERATE RESISTANCE
						5								
						4.57	5							MODERATE RESISTANCE
						4				REFER TO CORED BOREHOLE LOG				
						3.57	6							
						3								

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CORED BOREHOLE LOG

Borehole No. 39

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 9.57 m

Date: 29/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK308 **Bearing:** N/A **Logged/Checked By:** N.A.P./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS SPACING (mm)	DEFECT DETAILS DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
		4			START CORING AT 5.75m						
80% RETURN		3	6		SILTSTONE: dark grey and grey, with fine to medium grained sandstone and carbonaceous laminae, bedded at 0-15°.	MW	VL	0.10		(5.79m) CS, 4°, 40 mm.t (5.90m) J, 70°, P, S, Clay Sn (6.02m) Be, 10°, P, R, Cb Sn (6.08m) Be, 20°, P, R, Cb Sn (6.12m) Be, 25°, C, S, Cb Sn	Tomago Coal Measures
		2	7		SANDSTONE: fine to medium grained, grey and light grey, with siltstone and carbonaceous laminae, bedded at 0-10°.	FR	L	0.20 0.30 0.70		(7.75m) Be, 5°, P, S, Cb Sn	
		1	8					0.20 0.20			
			9		SILTSTONE: dark grey, with fine to medium grained sandstone laminae, bedded at 0-10°.			0.20 0.10		(8.95m) Be, 3°, P, S (9.28m) J, 70°, P, R	
70% RETURN		0			SANDSTONE: fine to medium grained, grey, trace of carbonaceous laminae, bedded at 0-10°.		M - H	1.3		(9.69m) CS, 10°, 15 mm.t	
			10		Interbedded SANDSTONE: fine to coarse grained, grey, with SILTSTONE laminae, bedded at 0-15°.			0.70		(9.97m) Be, 8°, P, R (10.12m) Be, 0°, P, R	
		-1			SANDSTONE: medium to coarse grained, grey, with dark grey siltstone and carbonaceous laminae, bedded at 0-25°.			0.60			
			11		END OF BOREHOLE AT 10.70 m						
		-2									

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 40

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 8.34 m

Date: 29/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						8				FILL: Silty clay, medium plasticity, brown and dark brown, trace of fine to medium grained sandstone and igneous gravel, roots and root fibres.	w>PL			GRASS COVER APPEARS POORLY COMPACTED
					N=0 0,0,0		1						70 150 130	
						7			-	SILTSTONE: dark grey and grey.	DW	L		TOMAGO COAL MEASURES LOW 'TC' BIT RESISTANCE
						6	2					M		MODERATE RESISTANCE
						5	3			SANDSTONE: fine to medium grained, grey and dark grey, with low to medium strength siltstone bands.				MODERATE TO HIGH RESISTANCE
														LOW RESISTANCE
										END OF BOREHOLE AT 3.60 m				HIGH RESISTANCE
						4	4							
						3	5							
						2	6							

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BOREHOLE LOG

Borehole No. 41

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.39 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						14				FILL: Silty clay, medium plasticity, dark brown, brown and light grey, trace of fine to medium grained sandstone and coal bands, fine to medium grained ironstone and igneous gravel, and sand.	w>PL			GRAVEL COVER APPEARS POORLY COMPACTED
					N = 7 2,3,4								180 210 280	
						13	1							
					N = 5 1,2,3					as above, but trace of roots and root fibres.			150 150 250	
						12	2							
					N = 13 5,5,8					FILL: Silty clay, low plasticity, brown and dark brown, with fine to medium grained sandstone gravel, trace of fine to medium grained ironstone, igneous and coal gravel, and fine to medium grained sand.			500 550 530	APPEARS MODERATELY COMPACTED
						11	3							
					N = 11 3,4,7					as above, but brown and dark brown mottled light grey and red brown.			450 450 400	
						10	4							
ON COMPLETION AFTER 16 HOURS						9	5							
						8	6		-	SILTSTONE: dark grey and grey.	DW	L		TOMAGO COAL MEASURES LOW 'TC' BIT RESISTANCE
												M		MODERATE RESISTANCE

JK 9.02.4 LIB:GLB Log JK AUGERHOLE - MASTER 35924LF METFORD.GPJ <<DrawingFile>> 11/05/2023 13:49 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

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BOREHOLE LOG

Borehole No. 41

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.39 m

Date: 28/3/23 **Datum:** AHD

Plant Type: JK308 **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						7	8		-	SILTSTONE: dark grey and grey. *(continued)*	DW	M		HIGH RESISTANCE
						6	9							
						5	10			END OF BOREHOLE AT 9.10 m				'TC' BIT REFUSAL
						4	11							
						3	12							
						2	13							
						1								

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BOREHOLE LOG

Borehole No. 42

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 14.38 m

Date: 30/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING					N > 5 3,5/ 100mm REFUSAL	14				FILL: Gravelly clayey sand, fine to coarse grained, dark grey, low plasticity, fine to medium grained sandstone and coal gravel, trace of root fibres.	M			
						13	1		-	SANDSTONE: fine to coarse grained, orange brown and grey.	DW	VL - L		TOMAGO COAL MEASURES VERY LOW TO LOW 'TC' BIT RESISTANCE
						12	2			SANDSTONE: fine to medium grained, light grey, with siltstone bands and carbonaceous laminae.		L - M		LOW TO MODERATE RESISTANCE
						11	3			REFER TO CORED BOREHOLE LOG				MODERATE TO HIGH RESISTANCE 'TC' BIT REFUSAL
						10	4							
						9	5							
						8	6							

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CORED BOREHOLE LOG

Borehole No. 42

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF | **Core Size:** NMLC | **R.L. Surface:** 14.38 m

Date: 30/3/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		12			START CORING AT 2.60m			0.20			
85% RETURN		11	3		SANDSTONE: fine to coarse grained, light grey, faintly bedded at 5-20°, with carbonaceous lenses and laminae, undulating at 5-25°.	SW	L	0.20 0.20 0.30 0.10 0.30 0.070			Tomago Coal Measures
		9	6		LAMINITE: fine to medium grained, light grey sandstone, with grey siltstone laminae, bedded at 5-10°.		VL - L	0.10		(5.53m) J, 75°, P, R, Cn (5.76m) Be, 5°, C, S, Cn (6.04m) Cr, 7°, 7 mm.t (6.12m) Cr, 15°, 25 mm.t	
		8			NO CORE 0.19m						
		7	7		SILTSTONE: dark grey, with fine to medium grained, light grey sandstone laminae, bedded at 5-35°.	SW	VL - L	0.10 0.20 0.10		(6.96m) XWS, 10°, 20 mm.t (7.05m) Be, 10°, P, R, Cn (7.20m) XWS, 5°, 10 mm.t	
		6	8		SANDSTONE: fine to coarse grained, light grey, with dark grey siltstone laminae and carbonaceous laminae, bedded at 0-10°.		M	0.70 0.70 0.50 0.40		(7.50m) J x2, 85°, P, R, Cn (7.83m) Be, 10°, P, S, Cb Ct	Tomago Coal Measures

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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CORED BOREHOLE LOG

Borehole No. 42

3 / 3

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Core Size:** NMLC **R.L. Surface:** 14.38 m

Date: 30/3/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** C.S.Y./O.F.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
50% RETURN		5	10		SANDSTONE: fine to coarse grained, light grey, with siltstone and carbonaceous laminae, bedded at 0-10°.	FR	M	0.40			
					NO CORE 0.42m						
		4	10		Extremely Weathered sandstone: gravelly silty SAND, fine to coarse grained, light grey.	XW	Hd				Tomago Coal Measures
					SANDSTONE: fine to coarse grained, light grey, with carbonaceous laminae, bedded at 0-10°.	SW	VL - L	0.20, 0.070		(10.07m) Be, 10°, C, R, Cn (10.10m) Be, 10°, C, R, Cn (10.21m) Cr, 15°, 100 mm.t (10.35m) Cr, 10°, 80 mm.t (10.47m) XWS, 5°, 7 mm.t	
					SILTSTONE: dark grey, with coal bands.						
					END OF BOREHOLE AT 10.51 m						
		3	11								
		2	12								
		1	13								
		0	14								
		-1	15								

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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BOREHOLE LOG

Borehole No. 43

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** SPIRAL AUGER **R.L. Surface:** 12.95 m

Date: 31/3/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION										FILL: Gravelly sandy silty clay, low to medium plasticity, brown, fine to coarse grained sand, fine to medium grained sandstone and coal gravel.	w~PL	VSt - Hd		GRASS COVER APPEARS MODERATELY COMPACTED
					N = 12 4,5,7								410 530 600	
						12	1			as above, but grey and dark grey.				
					N = 9 4,3,6								440 480 500	
						11	2							
					N = 15 3,9,6	10	3						400 460 410	
					N=SPT 6/ 100mm REFUSAL	9	4							
									-	LAMINITE: fine to coarse grained, light grey sandstone, with dark grey siltstone laminae.	DW	L - M		TOMAGO COAL MEASURES MODERATE TO HIGH 'TC' BIT RESISTANCE
						8	5							
										SANDSTONE: fine to coarse grained, orange brown.		M		
						7	6			END OF BOREHOLE AT 6.00 m				'TC' BIT REFUSAL
						6								

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BOREHOLE LOG

Borehole No. 44

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 31/3/23 **Datum:** AHD

Plant Type: **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION				■	REFER TO DCP TEST RESULTS SHEET				FILL: Silty clay, medium plasticity, brown, trace of roots and root fibres.	w>PL		90 90 110	GRASS COVER APPEARS POORLY COMPACTED
				■				-	Extremely Weathered sandstone: silty CLAY, low plasticity, light grey and brown.	XW	(Hd)		TOMAGO COAL MEASURES
									END OF BOREHOLE AT 0.50 m				HAND AUGER REFUSAL
						1							
						2							
						3							
						4							
						5							
						6							

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BOREHOLE LOG

Borehole No. 45

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 5/4/23 **Datum:** AHD

Plant Type: **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION				■	REFER TO DCP TEST RESULTS SHEET				TOPSOIL: Silty clay, medium to high plasticity, brown.	w>PL			GRASS COVER
								CI-CH	Silty CLAY: medium to high plasticity, dark brown.	w>PL			RESIDUAL
				■				-	Extremely Weathered sandstone: silty CLAY, low plasticity, brown mottled light grey and orange brown.	w<PL			TOMAGO COAL MEASURES
				■		1			END OF BOREHOLE AT 0.50 m				HAND AUGER REFUSAL
						2							
						3							
						4							
						5							
						6							

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BOREHOLE LOG

Borehole No. 46

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 5/4/23 **Datum:** AHD

Plant Type: **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION				■	REFER TO DCP TEST RESULTS SHEET				TOPSOIL: Silty clay, medium to high plasticity, brown, trace of fine to medium grained sandstone gravel.	w>PL			GRASS COVER
								CL	Silty CLAY: low plasticity, brown, trace of fine to medium grained sandstone gravel.	w>PL			RESIDUAL
				■				-	Extremely Weathered sandstone: silty CLAY, low plasticity, brown and light grey.	w~PL			TOMAGO COAL MEASURES
						1			END OF BOREHOLE AT 0.55 m				HAND AUGER REFUSAL
						2							
						3							
						4							
						5							
						6							

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BOREHOLE LOG

Borehole No. 47

1 / 1

Client: HEALTH INFRASTRUCTURE

Project: NEW MAITLAND HOSPITAL PROJECT

Location: MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW

Job No.: 35924LF **Method:** HAND AUGER **R.L. Surface:** 9.51 m

Date: 5/4/23 **Datum:** AHD

Plant Type: **Logged/Checked By:** N.A.P./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION				■	REFER TO DCP TEST RESULTS SHEET	9	0		-	TOPSOIL: Silty clay, medium plasticity, brown mottled orange brown, trace of fine to medium grained sandstone gravel, and fine to medium grained sand.	w>PL			GRASS COVER
											w~PL			TOMAGO COAL MEASURES
										Extremely Weathered sandstone: silty CLAY, low plasticity, brown mottled light grey.				HAND AUGER REFUSAL
						8	1			END OF BOREHOLE AT 0.20 m				
						7	2							
						6	3							
						5	4							
						4	5							
						3	6							

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DYNAMIC CONE PENETRATION TEST RESULTS

Client:	HEALTH INFRASTRUCTURE		
Project:	NEW MAITLAND HOSPITAL PROJECT		
Location:	MAITLAND HOSPITAL, METFORD ROAD, METFORD, NSW		
Job No.	35924LF	Hammer Weight & Drop: 9kg/510mm	
Date:	5-3-23	Rod Diameter: 16mm	
Tested By:	N.A.P.	Point Diameter: 20mm	

Test Location	**21**	**22**	**23**	**44**	**45**	**46**	**47**
Surface RL	8.90m	9.10m	8.41m	N/A	N/A	N/A	9.51m
Depth (mm)	Number of Blows per 100mm Penetration						
0 - 100	11	10/10mm	3	2	SUNK	SUNK	2
100 - 200	11	REFUSAL	6	15	↓	↓	9/50mm
200 - 300	4/10mm		7	10	1	3	REFUSAL
300 - 400	REFUSAL		REFUSAL	16/80mm	2	1	
400 - 500					9/90mm	2/80mm	
500 - 600					REFUSAL	REFUSAL	
600 - 700							
700 - 800							
800 - 900							
900 - 1000							
1000 - 1100							
1100 - 1200							
1200 - 1300							
1300 - 1400							
1400 - 1500							
1500 - 1600							
1600 - 1700							
1700 - 1800							
1800 - 1900							
1900 - 2000							
2000 - 2100							
2100 - 2200							
2200 - 2300							
2300 - 2400							
2400 - 2500							
2500 - 2600							
2600 - 2700							
2700 - 2800							
2800 - 2900							
2900 - 3000							

Remarks:
1. The procedure used for this test is described in AS1289.6.3.2-1997 (R2013)
2. Usually 8 blows per 20mm is taken as refusal
3. Datum of levels is AHD

VIBRATION EMISSION DESIGN GOALS

German Standard DIN 4150 – Part 3: 1999 provides guideline levels of vibration velocity for evaluating the effects of vibration in structures. The limits presented in this standard are generally recognised to be conservative.

The DIN 4150 values (maximum levels measured in any direction at the foundation, OR, maximum levels measured in (x) or (y) horizontal directions, in the plane of the uppermost floor), are summarised in Table 1 below.

It should be noted that peak vibration velocities higher than the minimum figures in Table 1 for low frequencies may be quite 'safe', depending on the frequency content of the vibration and the actual condition of the structure.

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

Table 1: DIN 4150 – Structural Damage – Safe Limits for Building Vibration

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

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

REPORT EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726:2017 *'Geotechnical Site Investigations'*. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached soil classification table qualified by the grading of other particles present (eg. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	< 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2.36mm
Gravel	2.36 to 63mm
Cobbles	63 to 200mm
Boulders	> 200mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose (VL)	< 4
Loose (L)	4 to 10
Medium dense (MD)	10 to 30
Dense (D)	30 to 50
Very Dense (VD)	> 50

Cohesive soils are classified on the basis of strength (consistency) either by use of a hand penetrometer, vane shear, laboratory testing and/or tactile engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength (kPa)	Indicative Undrained Shear Strength (kPa)
Very Soft (VS)	≤ 25	≤ 12
Soft (S)	> 25 and ≤ 50	> 12 and ≤ 25
Firm (F)	> 50 and ≤ 100	> 25 and ≤ 50
Stiff (St)	> 100 and ≤ 200	> 50 and ≤ 100
Very Stiff (VSt)	> 200 and ≤ 400	> 100 and ≤ 200
Hard (Hd)	> 400	> 200
Friable (Fr)	Strength not attainable – soil crumbles	

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'shale' is used to describe fissile mudstone, with a weakness parallel to bedding. Rocks with alternating inter-laminations of different grain size (eg. siltstone/claystone and siltstone/fine grained sandstone) is referred to as 'laminite'.

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shrink-swell behaviour, strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All methods except test pits, hand auger drilling and portable Dynamic Cone Penetrometers require the use of a mechanical rig which is commonly mounted on a truck chassis or track base.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils and 'weaker' bedrock if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for a large excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the hand auger can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of limited reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock cuttings. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be assessed from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, NMLC or HQ triple tube core barrels, which give a core of about 50mm and 61mm diameter, respectively, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as NO CORE. The location of NO CORE recovery is determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the bottom of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289.6.3.1–2004 (R2016) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)'*.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63.5kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N > 30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

A modification to the SPT is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as 'N_c' on the borehole logs, together with the number of blows per 150mm penetration.

Cone Penetrometer Testing (CPT) and Interpretation: The cone penetrometer is sometimes referred to as a Dutch Cone. The test is described in Australian Standard 1289.6.5.1–1999 (R2013) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Static Cone Penetration Resistance of a Soil – Field Test using a Mechanical and Electrical Cone or Friction-Cone Penetrometer'*.

In the tests, a 35mm or 44mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm or 165mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck. The CPT does not provide soil sample recovery.

As penetration occurs (at a rate of approximately 20mm per second), the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa. There are two scales presented for the cone resistance. The lower scale has a range of 0 to 5MPa and the main scale has a range of 0 to 50MPa. For cone resistance values less than 5MPa, the plot will appear on both scales.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

  The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between CPT and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of CPT values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

There are limitations when using the CPT in that it may not penetrate obstructions within any fill, thick layers of hard clay and very dense sand, gravel and weathered bedrock. Normally a 'dummy' cone is pushed through fill to protect the equipment. No information is recorded by the 'dummy' probe.

Flat Dilatometer Test: The flat dilatometer (DMT), also known as the Marchetti Dilometer comprises a stainless steel blade having a flat, circular steel membrane mounted flush on one side.

The blade is connected to a control unit at ground surface by a pneumatic-electrical tube running through the insertion rods. A gas tank, connected to the control unit by a pneumatic cable, supplies the gas pressure required to expand the membrane. The control unit is equipped with a pressure regulator, pressure gauges, an audio-visual signal and vent valves.

The blade is advanced into the ground using our CPT rig or one of our drilling rigs, and can be driven into the ground using an SPT hammer. As soon as the blade is in place, the membrane is inflated, and the pressure required to lift the membrane (approximately 0.1mm) is recorded. The pressure then required to lift the centre of the membrane by an additional 1mm is recorded. The membrane is then deflated before pushing to the next depth increment, usually 200mm down. The pressure readings are corrected for membrane stiffness.

The DMT is used to measure material index (I_D), horizontal stress index (K_D), and dilatometer modulus (E_D). Using established correlations, the DMT results can also be used to assess the 'at rest' earth pressure coefficient (K_o), over-consolidation ratio (OCR), undrained shear strength (C_u), friction angle (ϕ), coefficient of consolidation (C_h), coefficient of permeability (K_h), unit weight (γ), and vertical drained constrained modulus (M).

The seismic dilatometer (SDMT) is the combination of the DMT with an add-on seismic module for the measurement of shear wave velocity (V_s). Using established correlations, the SDMT results can also be used to assess the small strain modulus (G_o).

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a 16mm diameter rod with a 20mm diameter cone end with a 9kg hammer dropping 510mm. The test is described in Australian Standard 1289.6.3.2–1997 (R2013) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – 9kg Dynamic Cone Penetrometer Test'*.

The results are used to assess the relative compaction of fill, the relative density of granular soils, and the strength of cohesive soils. Using established correlations, the DCP test results can also be used to assess California Bearing Ratio (CBR).

Refusal of the DCP can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

Vane Shear Test: The vane shear test is used to measure the undrained shear strength (C_u) of typically very soft to firm fine grained cohesive soils. The vane shear is normally performed in the bottom of a borehole, but can be completed from surface level, the bottom and sides of test pits, and on recovered undisturbed tube samples (when using a hand vane).

The vane comprises four rectangular blades arranged in the form of a cross on the end of a thin rod, which is coupled to the bottom of a drill rod string when used in a borehole. The size of the vane is dependent on the strength of the fine grained cohesive soils; that is, larger vanes are normally used for very low strength soils. For borehole testing, the size of the vane can be limited by the size of the casing that is used.

For testing inside a borehole, a device is used at the top of the casing, which suspends the vane and rods so that they do not sink under self-weight into the 'soft' soils beyond the depth at which the test is to be carried out. A calibrated torque head is used to rotate the rods and vane and to measure the resistance of the vane to rotation.

With the vane in position, torque is applied to cause rotation of the vane at a constant rate. A rate of 6° per minute is the common rotation rate. Rotation is continued until the soil is sheared and the maximum torque has been recorded. This value is then used to calculate the undrained shear strength. The vane is then rotated rapidly a number of times and the operation repeated until a constant torque reading is obtained. This torque value is used to calculate the remoulded shear strength. Where appropriate, friction on the vane rods is measured and taken into account in the shear strength calculation.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The terms and symbols used in preparation of the logs are defined in the following pages.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than 'straight line' variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or 'reverted' chemically if reliable water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after the groundwater level has stabilised at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably assess the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 *'Methods of Testing Soils for Engineering Purposes'* or appropriate NSW Government Roads & Maritime Services (RMS) test methods. Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Reasonable care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.
- Details of the development that the Company could not reasonably be expected to anticipate.

If these occur, the Company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/constraints are quite complex, it is prudent to have a joint design review which involves an experienced geotechnical engineer/engineering geologist.

SITE INSPECTION

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

Requirements could range from:

i) a site visit to confirm that conditions exposed are no worse than those interpreted, to

ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types and appropriate footing or pile founding depths, or

iii) full time engineering presence on site.

SYMBOL LEGENDS

SOIL


FILL


TOPSOIL


CLAY (CL, CI, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CI, CH)


SILTY CLAY (CL, CI, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CI, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML, MH)


PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK


CONGLOMERATE


SANDSTONE


SHALE/MUDSTONE


SILTSTONE


CLAYSTONE


COAL


LAMINITE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

OTHER MATERIALS


BRICKS OR PAVERS


CONCRETE


ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

Major Divisions		Group Symbol	Typical Names	Field Classification of Sand and Gravel	Laboratory Classification	
Coarse grained soil (more than 65% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm)	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	N/A
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	

Major Divisions		Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification
				Dry Strength	Dilatancy	Toughness	% < 0.075mm
ine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075mm)	SILT and CLAY (low to medium plasticity)	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity	None to low	Slow to rapid	Low	Below A line
		CL, CI	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay	Medium to high	None to slow	Medium	Above A line
		OL	Organic silt	Low to medium	Slow	Low	Below A line
	SILT and CLAY (high plasticity)	MH	Inorganic silt	Low to medium	None to slow	Low to medium	Below A line
		CH	Inorganic clay of high plasticity	High to very high	None	High	Above A line
		OH	Organic clay of medium to high plasticity, organic silt	Medium to high	None to very slow	Low to medium	Below A line
	Highly organic soil	Pt	Peat, highly organic soil	–	–	–	–

Laboratory Classification Criteria

A well graded coarse grained soil is one for which the coefficient of uniformity $Cu > 4$ and the coefficient of curvature $1 < C_c < 3$. Otherwise, the soil is poorly graded. These coefficients are given by:

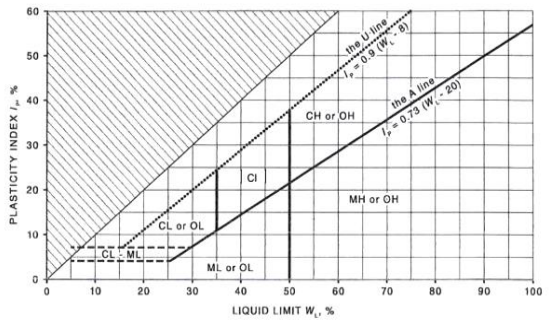
$$C_U = \frac{D_{60}}{D_{10}} \qquad and \qquad C_C = \frac{(D_{30})^2}{D_{10}\, D_{60}}$$

Where D_{10}, D_{30} and D_{60} are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

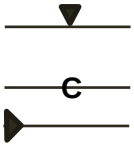
NOTES:

1. For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.
2. Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.
3. Clay soils with liquid limits > 35% and ≤ 50% may be classified as being of medium plasticity.
4. The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Modified Casagrande Chart for Classifying Silts and Clays according to their Behaviour



LOG SYMBOLS

Log Column	Symbol	Definition
Groundwater Record		Standing water level. Time delay following completion of drilling/excavation may be shown. Extent of borehole/test pit collapse shortly after drilling/excavation. Groundwater seepage into borehole or test pit noted during drilling or excavation.
Samples	ES U50 DB DS ASB ASS SAL	Sample taken over depth indicated, for environmental analysis. Undisturbed 50mm diameter tube sample taken over depth indicated. Bulk disturbed sample taken over depth indicated. Small disturbed bag sample taken over depth indicated. Soil sample taken over depth indicated, for asbestos analysis. Soil sample taken over depth indicated, for acid sulfate soil analysis. Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'Refusal' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60° solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25 PID = 100	Vane shear reading in kPa of undrained shear strength. Photoionisation detector reading in ppm (soil sample headspace test).
Moisture Condition (Fine Grained Soils)	w > PL $w \approx$ PL w < PL $w \approx$ LL w > LL	Moisture content estimated to be greater than plastic limit. Moisture content estimated to be approximately equal to plastic limit. Moisture content estimated to be less than plastic limit. Moisture content estimated to be near liquid limit. Moisture content estimated to be wet of liquid limit.
(Coarse Grained Soils)	D M W	DRY – runs freely through fingers. MOIST – does not run freely but no free water visible on soil surface. WET – free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS S F St VSt Hd Fr ( )	VERY SOFT – unconfined compressive strength ≤ 25kPa. SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa. FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa. STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa. VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa. HARD – unconfined compressive strength > 400kPa. FRIABLE – strength not attainable, soil crumbles. Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.
Density Index/ Relative Density (Cohesionless Soils)	VL L MD D VD ( )	**Density Index (I_D) Range (%)** / **SPT 'N' Value Range (Blows/300mm)** VERY LOOSE ≤ 15 / 0 – 4 LOOSE > 15 and ≤ 35 / 4 – 10 MEDIUM DENSE > 35 and ≤ 65 / 10 – 30 DENSE > 65 and ≤ 85 / 30 – 50 VERY DENSE > 85 / > 50 Bracketed symbol indicates estimated density based on ease of drilling or other assessment.
Hand Penetrometer Readings	300 250	Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.

Log Column	Symbol	Definition
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Twin pronged tungsten carbide bit.
	T_{60}	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.
	Soil Origin	The geological origin of the soil can generally be described as: RESIDUAL – soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock. EXTREMELY WEATHERED – soil formed directly from insitu weathering of the underlying rock. Material is of soil strength but retains the structure and/or fabric of the parent rock. ALLUVIAL – soil deposited by creeks and rivers. ESTUARINE – soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents. MARINE – soil deposited in a marine environment. AEOLIAN – soil carried and deposited by wind. COLLUVIAL – soil and rock debris transported downslope by gravity, with or without the assistance of flowing water. Colluvium is usually a thick deposit formed from a landslide. The description 'slopewash' is used for thinner surficial deposits. LITTORAL – beach deposited soil.

Classification of Material Weathering

Term		Abbreviation		Definition
Residual Soil		RS		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely Weathered		XW		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered	Distinctly Weathered (Note 1)	HW	DW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately Weathered		MW		The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly Weathered		SW		Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh		FR		Rock shows no sign of decomposition of individual minerals or colour changes.

NOTE 1: The term 'Distinctly Weathered' is used where it is not practicable to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock. 'Distinctly Weathered' is defined as follows: *'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'*. There is some change in rock strength.

Rock Material Strength Classification

Term	Abbreviation	Uniaxial Compressive Strength (MPa)	Guide to Strength	
			Point Load Strength Index $Is_{(50)}$ (MPa)	Field Assessment
Very Low Strength	VL	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low Strength	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium Strength	M	6 to 20	0.3 to 1	Scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High Strength	H	20 to 60	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High Strength	VH	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High Strength	EH	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Abbreviations Used in Defect Description

Cored Borehole Log Column		Symbol Abbreviation	Description
Point Load Strength Index		• 0.6	Axial point load strength index test result (MPa)
		x 0.6	Diametral point load strength index test result (MPa)
Defect Details	– Type	Be	Parting – bedding or cleavage
		CS	Clay seam
		Cr	Crushed/sheared seam or zone
		J	Joint
		Jh	Healed joint
		Ji	Incipient joint
		XWS	Extremely weathered seam
	– Orientation	Degrees	Defect orientation is measured relative to normal to the core axis (ie. relative to the horizontal for a vertical borehole)
	– Shape	P	Planar
		C	Curved
		Un	Undulating
		St	Stepped
		Ir	Irregular
	– Roughness	Vr	Very rough
		R	Rough
		S	Smooth
		Po	Polished
		Sl	Slickensided
	– Infill Material	Ca	Calcite
		Cb	Carbonaceous
		Clay	Clay
		Fe	Iron
		Qz	Quartz
		Py	Pyrite
	– Coatings	Cn	Clean
		Sn	Stained – no visible coating, surface is discoloured
		Vn	Veneer – visible, too thin to measure, may be patchy
		Ct	Coating ≤ 1mm thick
		Filled	Coating > 1mm thick
	– Thickness	mm.t	Defect thickness measured in millimetres