REPORT TO

TTW

ON

GEOTECHNICAL INVESTIGATION

FOR

PROPOSED S5 DATA CENTRE

AT

269 LANE COVE ROAD, MACQUARIE PARK, NSW

Date: 23 September 2025
Ref: 36466BFrpt Rev4

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EXECUTIVE SUMMARY

The geotechnical investigation undertaken by JK Geotechnics (JKG) encountered a surficial cover of pavements and fill overlying residual clays and then weathered siltstone bedrock at depths ranging from 0.2m to 5.0m, or between about RL55.7m and RL67.7m. The upper portion of the siltstone bedrock was typically of hard soil strength and very low rock strength before improving to medium to high and high strength bedrock with depth. Groundwater was encountered between about RL63.4m towards the south-western end grading down to RL49.7m towards the north-eastern end of the site.

Based our understanding of the proposed development (refer to Section 1 of this report), from a geotechnical perspective, we consider the site to be suitable to support the proposed development. Furthermore, we have summarised the principal geotechnical findings, issues and recommendations to be considered in the planning, design, and construction of the development, as follows.

1. Excavation for the proposed basement will be through pavements, fill, natural clays and then siltstone bedrock of initially very low to low strength, with higher strength iron indurated bands, and then medium to high strength bedrock over the southern portion of the site. Excavation of any bedrock of medium strength or better will require the use of "hard rock" excavation equipment for effective excavation, which may transmit vibrations through the rock mass that could affect adjoining infrastructure.
2. Retention systems will be required to support the proposed excavations. Although rock will be encountered, it is of poor quality and is not suitable to stand unsupported. Therefore, the retention system will need to extend for the full depth of the proposed excavation. Retention systems may comprise soldier pile walls with shotcrete infill panels where some movements are tolerable or more rigid contiguous pile walls if movements are to be kept low. Lateral support for the piles comprising temporary ground anchors may be required.
3. Groundwater is expected to be intersected and will need to be appropriately managed. Notwithstanding this, from a geotechnical perspective, we consider a drained basement to be feasible. In the long term, we consider that the use of a drained basement will be appropriate for this development.
4. The proposed structure will need to be supported on piled footings founded within the good quality siltstone bedrock, although better quality bedrock within portions at the southern end of the site may allow for high level pad/strip footings. Suitable geotechnical inspections and testing of the footing excavations will be required, but the extent will depend on the design allowable bearing pressure adopted.
5. The proposed basement footprint will overlie bedrock and therefore no particular subgrade preparation will be required for the basement slabs. However, the north-eastern corner , in the vicinity of BH5, the slabs may overlie fill to a limited extent and therefore suitable subgrade preparation below the slab will be necessary. If the slab is fully suspended, then no particular subgrade preparation is required. Where pavements are proposed external to the basement subgrade preparation works will be required.

6. The building appears to be outside the second reserve of the nearby Sydney Metro with the station box at the corner of Lane Cove Road and Waterloo Road and the tunnels present below Waterloo Road. However, there will be minor works associated with the plaza over the second reserve, as well as construction works, such as establishment of site sheds which may require an assessment to satisfy Metro.

7. Lane Cove Road is a Transport for NSW (TfNSW) State Road and therefore finite element modelling of the retention system and the expected movements may be required by the TfNSW prior to their approval. Furthermore, geotechnical instrumentation and monitoring may be required during construction, which would be detailed within a geotechnical monitoring plan may approved by TfNSW.

8. Sydney Water assets are in close proximity to the subject site and therefore Sydney Water may request a Specialist Engineering Assessment (SEA) to assess the potential impact the proposed development may have on their assets.

Further comments on these issues and geotechnical design parameters are provided in the following report. Further geotechnical input that may be required at later project stages as per the following:

- Additional geotechnical investigations following demolition depending on the bearing pressures adopted.
- Additional investigations, including permeability testing, monitoring and analysis to address WaterNSW/NRAR requirements.
- Analysis of potential retention system deflections for both Lane Cove Road and the Sydney Metro, depending on Council/TfNSW/Sydney Metro requirements.
- Vibration monitoring at least during initial bulk excavation using rock hammers.
- Nominal inspections during piling for the retention system to confirm founding conditions.
- Regular groundwater observations during and on completion of excavation.
- Witnessing installation and proof testing of anchors.
- Inspection of footing excavations and pile drilling, possibly including spoon testing and additional cored boreholes at specific pile locations depending on the design bearing pressures adopted.

We recommend a review by a geotechnical engineer after initial structural design has been completed to confirm that our recommendations have been correctly interpreted. It is possible that further advice/input will be required during the structural design to address issues that may not have been addressed in this report. We also recommend a meeting at the commencement of construction to discuss the primary geotechnical issues and inspection requirements.

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ATTACHMENTS

1 INTRODUCTION

1.1 Project Description

The following is the provided project description for the proposed development:

- Site preparation works including demolition and removal of existing structures, tree removal and bulk earthworks.
- Staged construction and operation of two connected data centre buildings (Building A and Building B) with a maximum height of 65 metres and a combined total gross floor area (GFA) of 47,285m^2 comprising 33,142m^2 of technical data hall floor space and 14,143m^2 of office, retail and innovation hub floor space.
  - Building A will be delivered in Stage 1 and will comprise the following:
    - Basement parking for 51 car spaces including two accessible spaces and 10 EV spaces
    - Seven storeys of technical data floor space accommodating seven data houses: 16,571m^2
    - Utilities including diesel generators (3MWe), above-ground water tanks for industrial water (600kL each), above-ground diesel storage tanks (100kL each) and an aboveground water tank for fire water (400kL each).
    - Business identification signage facing Waterloo Road and Land Cove Road.
    - Integrated 'Building O' component within Building A, comprising:
      - Two retail tenancies at ground level: 326m^2
      - Lobby and innovation hub including auditorium and training rooms: 3,186m^2
      - NEXTDC and ancillary office floor space on upper levels: 10,631m^2
  - Building B will be delivered in Stage 2 and will comprise the following:
    - Seven storeys of technical data floor space accommodating seven data halls: 16,571m^2
    - Utilities including diesel generators (3MWe), above-ground water tanks for industrial water (600kL each), above-ground diesel storage tanks (100kL each) and an aboveground water tank for fire water (400kL each).
    - Business identification signage on the western and southern building facades.
- Landscaping across the site in accordance with the project staging, delivering a mix of native and endemic plant species, shrubs and grasses, including 139 additional trees within a total area of 4,959m^2 deep soil and a resultant tree canopy cover of 5,707m^2
- Staged delivery of public domain works including:
  - Stage 1: construction of Road 13 within the subject site and public plaza.
  - Stage 2: construction of Road 6 (half-width) within the subject site, including provision for a future pedestrian/cycle overbridge (to be delivered by others), and works along Lane Cove Road.
- Delivery of 90 megawatts of power with a 33kV switching station to be accommodated on site, as well as other site services, including stormwater infrastructure.

The following table provides a comparative analysis of the original proposal and revised proposal based on the key development features.

Element	Original Proposal	Revised Proposal	Change
Land Use Activity	Data centre with 14 data halls, ancillary office and innovation space plus two retail premises	Data centre with 14 data halls, ancillary space office and innovation plus two retail premises	Nil change
Total Site Area	22,381m^2	22,381m^2	Nil change
Total GFA	46,935m^2	47,285m^2	+350m^2
Data Hall	33,643m^2	33,142m^2	-501m^2
Lobby/Innovation Hub	3,192m^2	3,186m^2	-6m^2
Ancillary Office	9,765m^2	10,631m^2	+866m^2
Total Retail GFA	335m^2	326m^2	-9m^2
Floor Space Ratio	2.1:1	2.11:1	+0.01:1
Car Parking	105 spaces	51 spaces	-54 spaces
Bicycle Parking	12 spaces	20 spaces	+8 spaces
Motorbike Parking	11 spaces	17 spaces	+6 spaces
Maximum Building Height	Building O: office and innovation hub – 49 metres over 10-storeys Building A: data centre – 65 metres over nine-storeys Building B: data centre – 65 metres over nine-storeys	Building O: office and innovation hub – 49 metres over 10-storeys Building A: data centre – 65 metres over nine-storeys Building B: data centre – 60 metres over nine-storeys	Nil change to Building O Nil change to Building A -5 metres for Building B
Deep Soil and Landscaped Area	Deep soil zone: 1,825m^2 (8.1% total site area, 13.1% future site area) Soft landscape: 5,251m^2 (23.5% site area)	Deep soil zone: 4,959m^2 (22.16% total site area, 35.6% future site area) Soft landscape: 6,570m^2 (29.4% site area)	+3,134m^2 deep soil (+14.06% site area, +22.5% future site area) +1,319m^2 soft landscape (+5.9% site area)
Tree Removal	Tree removal = 146 Retained trees = 70 Proposed trees = 81 Total trees = 151	Tree removal = 126 Retained trees = 90 Proposed trees = 139 Total trees = 229	-20 trees removed +20 trees retained +58 trees proposed +78 additional trees
Tree Canopy Cover	5,688m^2 (25.4%)	5,707m^2 (28.7%)	+19m^2 (+0.1%)
Cut and Fill Volume	Net cut 46,530m^3	Net cut of 75,650m^3	-29,120m^3
Power Consumption	90 megawatts	90 megawatts	Nil
Operating Hours	24-hours, 7 days a week	24-hours, 7 days a week	Nil

Element	Original Proposal	Revised Proposal	Change
Jobs - full-time equivalent (FTE) employees	Construction: 942 Operation: 490	Construction: 942 Operation: 490	Nil
Utilities and services	60 x diesel generators (@2Mwe = 120Mwe)	48 x diesel generators (@3Mwe = 144MWe)	-12 x diesel generators (+24MWe)
	12 x above-ground diesel storage tanks (@110kL = 1,320kL)	16 x above ground diesel storage tanks (@100kL = 1600kL)	+4 x above-ground diesel storage tanks(+280kL)
	8 x above-ground water tanks for industrial water (@460kL= 3,680kL)	8 x above ground water tanks for industrial water (@600kL = 4,800kL)	Nil change to number of tanks (+1,120kL)
	2 x above-ground water tanks for fire water (@350kL = 700kL)	1 x above-ground water tank for fire water (@400kL) total)	-1 above-ground water tank (-300kL)
	1 x 33kV switching station	1 x 33kV switching station	Nil
Public domain works	2 x roads (Road 5 and Road 13) and road widening: 4,945m^2	2 x roads (Road 13 and part Road 6) and roadwidening: 4,734m^2	-211m^2 roads (Road 5 deleted and Road 6 introduced)
	Public plaza: 3,522m^2	Public plaza: 3,762m^2	+240m^2 public plaza

This report assists in responding to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 8 November 2023 issued for the SSDA (SSD-63168959). The following table details the relevant SEARs condition.

Item	Description of Condition	Section Reference (this Report)
Ground and Water Conditions	• Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site, including soil erosion, salinity and acid sulfate soils. • Provide a Surface and Groundwater Impact Assessment that assesses potential impacts on: o Surface water resources (quality and quantity) including related infrastructure, hydrology, dependent ecosystems, drainage lines, downstream assets and watercourses o Groundwater resources in accordance with the Groundwater Guidelines	Refer to Section 5.4 for discussion on hydrogeological considerations. Refer to JK Environments Additional Contamination Investigation report, Ref: E36466PRrpt4Rev3, for details addressing other items for the condition

1.2 Report Introduction

This report presents the results of a geotechnical investigation to accompany a detailed SSDA for the proposed NextDC S5 data centre development at 269 Lane Cove Road, Macquarie Park, NSW. The location of the site is shown in Figure 1. The investigation was commissioned by Wystan Alexander of TTW. The commission was on the basis of Section 2.2 '*Reduced* Scope' of our fee proposal dated 2 November 2023, Ref. P58920BF Rev1 as revised by discussion between TTW and JKG.

We have been supplied with the following relevant documents to assist with the preparation of this report:

- Earthworks Cut and Fill Volumes Plan prepared by TTW, Dwg. No. 221661-TTW-00-DR-CI-02011, Rev N dated 19 September 2025.
- Architectural drawings prepared by HDR, Drawing Numbers as per the Cover Page, Ref: S5-ARC-HDR-DRG-00000-0000, Rev CP03 dated 20 August 2025.
- Survey Plan prepared by Aurecon (Project No. 525121, dated 30 October 2023).

We understand from the above documents that it is proposed to demolish the existing site structures and construct a data centre comprising a multi-storey building over partial basement levels. The approximate outline of the building is shown on Figure 2. The proposed bulk excavation level will be relatively similar to existing site levels at the Waterloo Road end of the site at RL57.75m, however there will be locally deeper excavations to RL55.05m along the eastern side of the proposed footprint. We expect excavations in the order of 8m deep at the southern end gradually decreasing to less than 1m at the northern end. We expect high structural column loads for buildings of this type. Outside of the buildings an on-grade public plaza will be constructed at the northern end of the site and internal roads along the eastern boundary.

The purpose of the investigations was to obtain geotechnical information on subsurface conditions as a basis for comments and recommendations on excavations, retention, hydrogeological considerations, footings, subgrade preparation, basement slabs and the effect of the development on the adjacent Sydney Metro.

This investigation was carried out in conjunction with an environmental site assessment by our environmental division, JK Environments (JKE). Reference should be made to the separate report by JKE, Ref: E36466PRrpt4Rev3, for the results of the environmental site assessment.

2 INVESTIGATION PROCEDURE

2.1 Initial Geotechnical Investigation

The fieldwork of the investigation was caried out between 27 November to 5 December 2023 and 2 to 5 January 2024. The geotechnical investigation comprised the drilling of fourteen (14) boreholes (BH5, BH7, BH9, BH12, BH14, BH18, BH21, BH24, BH26, BH27, BH29 and BH33) using our truck mounted JK500 drill rig and tracked mounted JK330 drill rig to depths ranging from 12.22m to 19.24m below the existing ground surface. BH1 to BH4, BH6, BH8, BH10, BH11, BH13, BH15 to BH17, BH19, BH20, BH22, BH23, BH25, BH28, BH30 to BH32 and BH34 were drilled by JKE as part of the environmental assessment and so were terminated at shallow depths. Copies of the JKE borehole logs are included in Appendix A.

The geotechnical boreholes were initially auger drilled using spiral auger techniques with a Tungsten Carbide (TC) drill bit and were then extended using diamond coring techniques using a NMLC core barrel with water flush to their termination depths. The borehole locations were set out using a differential GPS unit. The relative levels shown on the attached logs were interpolated from spot heights shown on the survey plan and are therefore approximate. The survey datum is the Australian Height Datum (AHD).

The approximate compaction of the fill and strength of the natural clayey soils were assessed from Standard Penetration Test (SPT) 'N' values, augmented by hand penetrometer test results on cohesive samples recovered in the SPT split tube sampler. Within the augered portions of the boreholes, the strength of the weathered rock was assessed from observation of the resistance to drilling of a Tungsten Carbide (TC) bit attached to the augers, together with inspection of the recovered rock chip samples and subsequent correlation with laboratory moisture content test results. The strength of the cored rock was assessed from Point Loads Strength Index ($I_{S(50)}$) test results completed on the recovered core. The results of the point load strength index tests are summarised in the attached Table B and on the cored borehole logs.

Groundwater observations were made during and on completion of auger drilling. The use of water for core drilling limited further meaningful measurements of groundwater levels. Groundwater monitoring wells were installed in BH8, BH18, BH24 and BH29 to allow further groundwater readings to be made. JKE also installed a monitoring well into their BH8. Readings were taken within these wells while our crews were on site and then by JKE during return visits on 5 and 12 December 2023. Longer term groundwater monitoring was carried out between 4 April 2024 and 19 September 2024 by installation of data loggers into the groundwater monitoring wells.

Selected soil samples were returned to NATA accredited laboratories (Soil Test Services Pty Ltd [STS] and Envirolab Services Pty Ltd) for moisture content, Atterberg limit, linear shrinkage, soil pH, chloride content, sulphate content and resistivity testing. The test results are summarised in the attached STS Tables A and A1 and Envirolab Services Certificate of Analysis 339676.

2.2 Additional Pavement Investigation

An additional pavement investigation was carried out to obtain CBR samples for testing to provide further advice on pavement design parameters. The locations of the boreholes were based on the original building scheme; however we consider it still applicable to the current scheme. The field work for the investigation was carried out on 9 and 10 December 2024 and comprised of eight boreholes, BH201 to BH208, drilled to depths ranging from 2.5m to 4.0m below existing surface levels using our track mounted JK205 drill rig with spiral augers fitted with a Tungsten Carbide (TC) drill bit. The inferred compaction of the fill and the strength of the natural clayey soils encountered in the boreholes were assessed from Standard Penetration Test (SPT) 'N' values. The assessment was augmented by hand penetrometer test results on cohesive samples recovered in the SPT split tube sampler or remoulded samples obtained from the auger.

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 California Bearing Ratio (CBR) values . The results are summarised in the attached STS Tables B.

2.3 Additional Deep Borehole Investigation for Metro

Due to delays in obtaining approval from Metro for the drilling of the deep boreholes within their second reserve, the fieldwork for the investigation was carried out on 2, 3 and 28 January 2025 and comprised of two boreholes, BH301 and BH302, using out track mounted JK309 and truck mounted JK500 drill rigs. We note the gap in the dates was due to temporarily pausing the drilling of BH301 given sudden water loss that occurred. It was subsequently confirmed via a downhole camera that the water loss was due to a wide open joint. The boreholes were drilled initially drilled using augers with a 'TC' but attachment to depth of 8.69m and 8.60m in BH301 and BH302, respectively. The boreholes were then extended using diamond coring techniques using an HQ core barrel with water flush to their termination depths of 40.20m and 36.18m, respectively, below existing surface levels. On completion, the boreholes were fully grouted to surface.

The approximate compaction of the fill and strength of the natural clayey soils were assessed from Standard Penetration Test (SPT) 'N' values, augmented by hand penetrometer test results on cohesive samples recovered in the SPT split tube sampler. Within the augered portions of the boreholes, the strength of the weathered rock was assessed from observation of the resistance to drilling of a Tungsten Carbide (TC) bit attached to the augers, together with inspection of the recovered rock chip samples. The strength of the cored rock was assessed from Point Loads Strength Index ($I_{S(50)}$) test results completed on the recovered core. The results of the point load strength index tests are summarised in the attached Table C and on the cored borehole logs.

Groundwater observations were made during and on completion of auger drilling. The use of water for core drilling limited further meaningful measurements of groundwater levels. No longer term groundwater monitoring were carried out within these wells.

2.4 General

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. The investigation locations are shown on the attached Figure 2, and these were set out using a differential GPS unit, which also provided the relative surface levels shown on the attached logs. The height datum used is the Australian Height Datum (AHD). 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 Description

The site is located in near the crest of a hill within gently undulating topography dipping towards north-east at about 2° to 3°. The site itself had been levelled around the existing two building by cut and fill, with the driveway surrounding the buildings following the local topography and dipping north-easterly at about 2° to 3°. The site is bound by Lane Cove Road and Waterloo Road to the north-west and north-east, respectively.

At the time of fieldwork, the site was occupied by two separate two storey concrete buildings with metal clad roofing. An on-grade asphaltic concrete (AC) carpark was located between the buildings with a single suspended parking level above the on-grade carpark. Both concrete buildings and the carpark appeared in good condition, based on cursory examinations. Outside of the buildings, the site was generally AC paved, with the exception of the north-western side of south-western building where it was generally concrete paved, which appeared in moderate to good condition based on a cursory examination. A grass covered fill mound was present in the northern corner of the site and is up to 3m high at the north-eastern end d but only 1m high at the south-western end due to the topography.

We note that access to the neighbouring south-eastern and south-western properties was not possible and our observations are therefore limited to from within the subject site. The neighbouring south-eastern property contained a multi-storey building that appears to be setback greater than 10m from the common boundary. Site levels across this boundary generally appeared to be similar to those within the subject site for the majority of the length, with the exception at the south-eastern end where the neighbouring property was retained by a block retaining wall of less than about 1m in height.

The neighbouring south-western property contained a two storey building that appeared to be setback greater than 20m from the common boundary. The ground surface within the neighbouring property was higher than the subject site by about 1.5m to 2m and was retained by a block retaining wall within the subject site that generally appears to be in good condition.

The Sydney Metro Macquarie Park station box is present at the corner of Lane Cove Road and Waterloo Road, adjoining in the northern corner of the subject site. The above ground structure comprised a single storey structure over the station box that was estimated to extend about 20m below street level. We understand

the train tunnels for the Sydney Metro are present approximately below Waterloo Road at a similar depth to the bottom of the station box.

3.2 Subsurface Conditions

The 1:100,000 Series Geological Series Sheet of Sydney (Geological Survey of NSW, Geological Series Sheet 9130) indicates the site to be underlain by Ashfield Shale comprising black to light grey shale and laminite. This could potentially be underlain by the Minchinbury Sandstone unit, which may be relatively thin, and then Hawkesbury Sandstone, which is mapped to occur about 90m to the east of the subject site.

The boreholes have disclosed a generalised profile of pavement and fill overlying residual silty clay that graded into weathered siltstone bedrock. The bedrock generally had a relatively deep weathered profile, assessed as Class V Shale, but improved with depth to Class II Shale in all boreholes. No groundwater was encountered during auger drilling of the boreholes but was measured in the monitoring wells on return visits at variable depths.

Reference should be made to the attached borehole logs for specific details at each location. A summary of the subsurface conditions encountered in the geotechnical boreholes is provided below:

Pavement and Fill

The majority of boreholes encountered an asphaltic concrete (AC) wearing surface at the surface, which was measured to range from 18mm to 50mm thick. BH26 encountered two concrete slabs of 400mm thick and 280mm thickness, respectively, containing 8mm diameter reinforcement in the top slab with a 140mm top cover. The AC wearing surface was generally underlain by gravelly silty sand fill with various inclusions comprising igneous and ironstone gravel. This may represent the base or subbase layers of the pavement, but this could not be confirmed from our small diameter boreholes. BH27 encountered a 140mm thick concrete slab with 8mm diameter reinforcement with a 50mm top cover.

Fill was encountered either below the pavement wearing surface/slabs or at the surface in all boreholes to depths ranging from 0.3m (BH14) to 4.0m (BH29). The deeper fill in BH29 was associated with the fill mound in the northern corner of the site. Below the gravelly sand fill that was present below the AC wearing surface, the fill comprised silty clay with inclusions such as siltstone and ironstone gravel, construction rubble and plastics. Topsoil-like silty clayey sand fill was only encountered in BH29 (and BH28 of the JKE boreholes) and appeared to be about 50mm thick, although the root zones may extend deeper. The compaction of silty clayey fill was assessed to be poorly to well compacted.

Residual Soil

The residual silty clay, where encountered, was typically a thin layer of no more than about 2m thickness, with the exception of BH24 where it was approximately 3.8m thick. The clays were generally assessed to be of high plasticity and of stiff to very stiff strength when first encountered and improving to hard strength with depth. The clays contained varying amounts of siltstone and ironstone gravel.

Weathered Bedrock

Weathered bedrock was encountered in all boreholes at depths ranging from 0.2m to 5.0m, or between about RL55.7m and RL67.7m indicating the top of bedrock has a general gradient down to the north-east. Generally, on first contact the siltstone was assessed to be extremely weathered and of 'hard' soil strength or very low rock strength. The bedrock in all boreholes increased to medium to high strength below depths ranging from 3.3m and 13.0m, or between about RL49.1m and RL61.8m. In the deep boreholes, BH301 and BH302, sandstone was encountered below the siltstone and was encountered at depths of approximately 17.9m and 12.2m, respectively, extending to the borehole termination depths.

The bedrock in all boreholes contained numerous near horizontal clay, extremely weathered and crushed seams of generally less than 50mm thickness, although occasional thicker seams up to 150m were also encountered. The bedrock also contained frequent joints at about 30° to 90°. The occasional 'no core' zones encountered during coring typically indicates bands of clay or extremely weathered material that was washed away during the coring process. With depth the defects became less frequent, as shown on the cored borehole logs. The deeper sandstone bedrock was of good quality and contained fewer defects than the upper siltstone bedrock, with the defects generally comprising of sub-horizontal bedding partings and the rare inclined joints and clay/extremely weathered seams.

Within each of the boreholes the rock encountered has been classified in general accordance with the classification system given in Pells et al (2019) '*Classification of Sandstone and Shales in the Sydney Region: A Forty Year Review*'. Reference should be made to the attached Table 1 for a summary of the rock classification and Figures 3 to 6 for the graphical borehole summaries. The classification system uses the term "Shale" for the rock type, but due to changes to AS1726-2017 the rock encountered within the boreholes is logged as "siltstone".

We note that this classification system was formulated to assist with design of footings and as such the classification should take into account the footing width, pile diameter and pile socket length, which are not known at the time of preparing this report. The classifications given in Table 1 are based on representative lengths of core and some judgement and should be treated as approximate only. In addition, within each rock class there may be some subsections of rock being a rock class higher or lower than the overall rock classification. These classifications can be further refined once the footing widths, pile diameters and pile socket lengths are known.

Groundwater

All boreholes were 'dry' on completion of auger drilling. In BH8 (JKE), BH18, BH24 and BH29, groundwater monitoring wells were installed to allow for longer term monitoring. The table below summarises the groundwater readings taken during the return visits by JKE on 5 and 12 December 2023.

Borehole	Approx. Surface Level (mAHD)	Groundwater Measurement on 5 December 2023		Groundwater Measurement on 12 December 2023	
		Depth (m)	≈RL (mAHD)	Depth (m)	≈RL (mAHD)
BH8	61.1	Dry	-	Dry	-
BH18	68.5	4.56	63.9	5.15	63.4
BH24	65.7	9.7	56.0	10.16	55.5
BH29	63.0	6.69	56.3	13.26	49.7

The above indicates a generally groundwater gradient down to the east and is wholly within the bedrock profile.

Furthermore, based on the longer term groundwater monitoring, the following table summarises the basic statistics of the groundwater monitoring based on the information obtained from the data loggers. Reference should also be made to the attached Figures 7 to 10 which provide the groundwater monitoring plots.

Borehole	Basic Statistics (m) [mAHD]			
	Minimum	Average	Median	Maximum
BH8	5.1 [RL56.8]	5.0 [RL56.9]	5.1 [RL56.8]	4.6 [RL57.3]
BH18	4.9 [RL63.1]	4.5 [RL63.5]	4.4 [RL63.6]	4.1 [RL63.9]
BH26	10.1 [RL55.3]	10.0 [RL55.4]	10.0 [RL55.4]	9.8 [RL55.6]
BH29	11.2 [RL51.8]	10.0 [RL53.0]	10.0 [RL53.0]	8.8 [RL54.2]

We note that BH8 was mostly 'dry' with the groundwater level below the data logger, except roughly between June and September 2024 where it appears to rise above the data logger level.

3.3 Laboratory Test Results

The moisture content test results correlated reasonably well with our field assessment of the rock strength. Reference should be made to the attached STS Tables A and A1 for the test results.

The four day soaked CBR tests on sample of the existing fill and residual clay compacted to 98% of their Standard Maximum Dry Density (SMDD) returned CBR values between 2.5% and 13% for the existing fill and between 1.5% and 2.5% for the residual clay. Reference should be made to the attached STS Table B for further details.

The point load strength index test results correlated reasonably well with our field assessment of the rock strength. The estimated UCS values based on a correlation of 20 times the $I_{s(50)}$ value generally ranging from less than 2MPa to 48MPa, although occasional higher values up to 88MPa were measured. Reference should be made to the attached Table C for further details.

The following table summarises the pH, sulphate, chloride and resistivity results provided by Envirolab Services:

Borehole	Depth (m)	Sample Type	pH	Sulphates SO_4 (ppm)	Chlorides CL (ppm)	Resistivity (ohm.cm)
9	0.9-1.0	FILL: Clay	8.8	170	<10	4,400
9	3.0-3.35	CLAY	4.5	77	<10	19,000
14	1.4-1.5	SILTSTONE	4.5	140	73	11,000
24	2.9-3.0	CLAY	4.6	110	10	9,900
26	3.9-4.2	SILTSTONE	5.6	100	10	40,000
27	0.5-0.7	FILL: Clay	7.6	100	10	5,700
29	7.5-7.8	SILTSTONE	5.2	110	10	23,000

4 PRELIMINARY GROUNDWATER SEEPAGE ANALYSIS

The purpose of the preliminary groundwater seepage analysis was to assess the potential seepage volumes into the proposed basement excavation during construction and over the long-term, assuming steady state seepage conditions. Permeability testing will be required at a later stage and the analysis revised, which is discussed in further detail in the following sections.

4.1 Methodology

From the results of the investigation, site survey and geometry of the proposed basement excavation, a two dimensional (2D) hydrogeological model was developed, with the soil and bedrock profiles divided into separate units as shown on the attached Figure 11. Existing surface levels within and immediately adjacent to the site were interpolated from spot level heights and ground contour lines shown on the supplied survey plans. Survey levels remote from the site were extrapolated from the survey information and complemented by our site observations, aerial imagery and Google street view.

4.2 Hydraulic Model and Boundary Conditions

The proposed basement was modelled with a BEL varying between RL55.05m and RL57.75m as per the cut and fill volumes plan. It is assumed that the excavation will be supported by a soldier pile wall with shotcrete and mesh infill panels and consequently the basement will be drained. As a result the proposed basement floor slab was assumed to be 'drained' with a zero pressure head modelled at BEL.

In our analysis we have adopted the highest average groundwater level which varies between RL53.0m and RL63.5m, as detailed in Section 3.2 above. We have then also assessed an increase in these groundwater level of 1m to model potential climatic variations in groundwater level. Beyond the site boundaries, standing groundwater levels at similar depths to those encountered within the site were modelled.

Based on the borehole logs, permeability test results, well-established correlations and experience with similar materials, we have adopted a horizontal coefficient of permeability of 1.0×10^{-8} m/sec. This value must be confirmed via permeability testing within the groundwater monitoring wells.

Based on experience and available literature for the Sydney region, seepage through the rock mass will occur through defects and not the intact rock. The most dominant continuous defects within siltstone bedrock are near horizontal bedding partings. Consequently, within the bedrock we have assumed that the horizontal permeability (k_h) is 10 times greater than the vertical permeability (k_v) (i.e. a k_v/k_h ratio of 0.1) while within the soil we have assumed that the permeability in the horizontal and vertical directions is equal (i.e. a k_v/k_h ratio of 1).

4.3 Analysis Results

The following table summarises the estimated total groundwater seepage inflow into a drained basement excavation:

Groundwater Level	Anisotropic Value	Estimated Dewatering Rate (ML/year)
Case 1: Maximum Level	1.0	0.29
	0.1	0.15
Case 2: Maximum Level + 1m Rise	1.0	0.34
	0.1	0.18
Case 3: Average Level	1.0	0.27
	0.1	0.14

As can be seen, based on current levels, we expect relatively minor groundwater dewatering will be required, however should the groundwater level rise by 1m, we estimate a maximum dewatering rate of 0.34ML/year, or about 930L/day. We consider the values where the anisotropic value is 0.1 are more likely to occur, i.e. a maximum dewatering rate of 0.18ML/year, or about 500L/day These values are considered reasonable given the site location extending down from the crest of a hill.

The seepage results for a representative section through the basement excavation (i.e. Section B-B as shown on Figure 2) showing the total groundwater head where maximum groundwater levels have risen 1m above measured levels and with k_v/k_h ratio of 1 is presented as Figure 12. Figure 12 also shows groundwater levels outside the proposed basement excavation under steady state conditions for the same analysis case.

4.4 Overview

The seepage analysis presented above has been based on our initial assumptions of likely permeability values within the subsurface profile. The monitoring to date indicates groundwater levels were relatively stable and not very responsive to rainfall events.

There will almost certainly be variations in permeability and with the vertical to horizontal permeability ratio (k_v/k_h) within the bedrock units. In this regard, it is not uncommon for the results of the seepage analysis to be only accurate to within one order of magnitude, possibly more. With that being said, from our experience, actual seepage inflows are more likely to be less than those predicted, unless large open water bearing defects (e.g. shear zones, joint swarms etc.) are encountered, for which localised grouting could be undertaken to limit inflows. From the geological data obtained from the Metro, it is known that a shear zone exists east of the site, however does not appear to intersect the site.

From the results of our analysis, the total groundwater inflow into the proposed basement excavation is expected to be in the order of 0.34ML/year as a worst case scenario, although is unlikely. We reiterate that in our experience, the actual measured seepage flows are often significantly below the flow rates suggested by seepage modelling.

Based on the estimated total groundwater inflow rates, we consider a drained basement to be feasible. Appropriately sized sumps with automatic level control pumps will be required to intermittently discharge the seepage water to the stormwater system. Discharge will require approval from the relevant authorities.

During construction, we recommend that an inspection of the bulk excavation be carried out by both JK Geotechnics and the hydraulic engineer to measure the actual inflow rate and confirm that initial assumptions and predictions are correct. Should higher than expected inflows occur, the basement design and proposed groundwater management system will need to be re-evaluated..

Where the results of the preliminary seepage analysis are used to inform the preliminary design of the basement floor drainage system we recommend that a suitable factor of safety (not less than 2) be applied to the seepage volumes. In addition the drainage system should have some redundancy for un expected higher flows and the potential for some siltation (or clogging) of drainage layers with time.

Construction of a drained basement will result in the drawdown of the groundwater levels outside of the basement.. While drawdown of the groundwater table will occur immediately adjacent to the basement excavation, this drawdown will be within the clay and bedrock profile. As such, we consider that such drawdown will have negligible adverse geotechnical effects on the surrounding properties.

Construction of a basement that intersects the groundwater table is considered to be an aquifer interference activity. Such activities are subject to the Water Management Act 2000 and NSW Aquifer Interference Policy and are regulated by the Department of Planning and Environment (DPE), WaterNSW and Natural Resource Access Regulator (NRAR). The DPE's policy on basements is that ongoing or frequent dewatering of basements over their life is inconsistent with the principals of sustainable development and, where such dewatering is required, basements should be tanked. Dewatering during construction is permitted but is regulated through licencing which must either be obtained from WaterNSW or NRAR. Notwithstanding this, as discussed above, given the very low predicted inflow, we consider that from a geotechnical perspective a drained basement to be suitable for the site. The DPE's document, "Minimum Requirements for Building Site Groundwater Investigations and Reporting", dated October 2022 outlines the minimum scope of investigation required where a basement is proposed and may intersect the groundwater table. Additional investigation will be required to meet these minimum requirements.

5 COMMENTS AND RECOMMENDATIONS

5.1 Summary of Principal Geotechnical Findings and Issues

As discussed in more detail in Section 3.2, the boreholes penetrated a surficial cover of pavements and fill overlying residual clays and then weathered siltstone bedrock at depths ranging from 0.2m to 5.0m, or between about RL55.7m and RL67.7m. The upper portion of the siltstone bedrock was typically of hard soil strength and very low rock strength before improving to medium to high and high strength bedrock with depth. Groundwater was encountered between about RL63.4m towards the south-western end grading down to RL49.7m towards the north-eastern end of the site.

Based on the results of the boreholes and our understanding of the proposed development (refer to Section 1), we have summarised the principal geotechnical findings, issues and recommendations to be considered in the planning, design, and construction of the development, as follows.

1. Excavation for the proposed basement will be through pavements, fill, natural clays and then siltstone bedrock of initially very low to low strength, with higher strength iron indurated bands, and then medium to high strength bedrock over the southern portion of the site. Excavation of any bedrock of medium strength or better will require the use of "hard rock" excavation equipment for effective excavation, which may transmit vibrations through the rock mass that could affect adjoining infrastructure.
2. Retention systems will be required to support the proposed excavations. Although rock will be encountered, it is of poor quality and is not suitable to stand unsupported. Therefore, the retention system will need to extend for the full depth of the proposed excavation. Retention systems may comprise soldier pile walls with shotcrete infill panels where some movements are tolerable or more rigid contiguous pile walls if movements are to be kept low. Lateral support for the piles comprising temporary ground anchors may be required.
3. Based on Section 4 above, groundwater is expected to be intersected and will need to be appropriately managed. Notwithstanding this, from a geotechnical perspective, we consider a drained basement to

be feasible. In the long term, we consider that the use of a drained basement will be appropriate for this development.

4. The proposed structure will need to be supported on piled footings founded within the good quality siltstone bedrock, although better quality bedrock at the southern end of the site may allow for high level pad/strip footings. Suitable geotechnical inspections and testing of the footing excavations will be required, but the extent will depend on the design allowable bearing pressure adopted.

5. The proposed basement footprint will overlie bedrock and therefore no particular subgrade preparation will be required for the basement slabs. However, the north-eastern corner , in the vicinity of BH5, the slabs may overlie fill to a limited extent and therefore suitable subgrade preparation below the slab will be necessary. If the slab is fully suspended, then no particular subgrade preparation is required. Where pavements are proposed external to the basement subgrade preparation works will be required.

6. The building appears to be outside the second reserve of the nearby Sydney Metro with the station box at the corner of Lane Cove Road and Waterloo Road and the tunnels present below Waterloo Road. However, there will be minor works associated with the plaza over the second reserve, as well as construction works, such as establishment of site sheds which may require an assessment to satisfy Metro.

7. Lane Cove Road is a Transport for NSW (TfNSW) State Road and therefore finite element modelling of the retention system and the expected movements may be required by the TfNSW prior to their approval. Furthermore, geotechnical instrumentation and monitoring may be required during construction, which would be detailed within a geotechnical monitoring plan may approved by TfNSW.

8. Sydney Water assets are in close proximity to the subject site and therefore Sydney Water may request a Specialist Engineering Assessment (SEA) to assess the potential impact the proposed development may have on their assets.

Further comments on these issues and geotechnical design parameters are provided in the subsequent sections of this report.

5.2 Excavations Conditions

All earthworks recommendations should be complemented by reference to the latest edition of Safe Work Australia's 'Excavation Work Code of Practice'.

For the proposed basements , excavations to depths of about 8m are expected. Such excavations will encounter pavements, fill, natural clays and siltstone bedrock of medium to high strength. Excavation of the soils and rock of up to very low strength will be achievable using conventional excavation equipment, such as the buckets of large hydraulic excavators, possibly with some light ripping from a ripping hook fitted to the excavator. Excavation of siltstone bedrock of low strength or higher strength will represent 'hard rock' excavation conditions and will require the use of rock excavation equipment, such as hydraulic rock hammers, rotary grinders, ripping hooks or rock saws. The excavator contractor should be made aware of

this by being supplied with all geotechnical information, particularly the borehole logs and point load strength test results. Low productivity and increased equipment wear should be expected due to the rock strength.

Demolition and rock excavations using hydraulic rock hammers will need to be strictly controlled as there could be direct transmission of ground vibrations to nearby structures and buried services. We recommend that initial quantitative vibration monitoring be carried out when using hydraulic rock hammers to determine if the transmitted vibrations are within acceptable limits for the nearby structures and services. Reference should be made to the attached Vibration Emission Design Goals sheet for acceptable limits of transmitted vibrations. Where the transmitted vibrations are excessive, it would be necessary to change to alternative excavation methods, such as smaller rock hammers, rotary grinders, ripping hooks or rock saws. If there are concerns regarding the transmitted vibrations, monitoring may need to be carried out full time during rock hammer use.

Alternatively, rock excavations using low vibration emitting equipment, such as rock saws and rock grinders fitted to a hydraulic excavator may be used. If rock saws or rock grinders are used, the resulting dust should be suppressed with water. Use of this low vibration emitting equipment would reduce the likelihood of vibration induced damage to the neighbouring structures and services. With the use of the low vibration equipment we do not consider that it will be necessary to carry out any quantitative vibration monitoring.

The use of excavation contractors with appropriate experience and with a competent supervisor who is aware of vibration damage risks, is also recommended. The contractor should have all appropriate statutory and public liability insurances.

The excavated material will need to be disposed off-site and therefore will need to be suitably classified for waste disposal purposes. Reference should be mad to the JKE report for advice on waste classification.

5.3 Retention

Excavation for the proposed basement and tank level will be required to depths of 8m and will be in relatively close proximity to the site boundaries. Therefore, insufficient space will generally be available for temporary batters. Where space does not allow or batters are no appropriate, the excavations will need to be supported by full depth retention systems installed prior to the commencement of excavation, which will be required on the eastern, southern and western side of the proposed basement.

Where temporary batters are feasible and are of less than 3m height, they should be no steeper than 1 Vertical (V) to 1 Horizontal (H). Such batters should remain stable in the short term provided surcharge loads, including construction loads, are kept well clear of the crest of the batters, say at least twice the batter height.

Due to the close proximity of Lane Cove Road along the north-western boundary which is a Transport for NSW (TfNSW) State Road, we expect that retaining wall deflections will need to be limited, typically limited to 0.5% of the excavated height or 30mm, whichever is the lesser. Finite element modelling of the retention system and the expected movements may be required by the TfNSW prior to their approval. We can

complete such modelling, but it would be an iterative process with the structural engineer. Additional boreholes may also be required as the current boreholes are outside the required 30m spacing of TfNSW. Furthermore, a geotechnical monitoring plan would need to be prepared to satisfy TfNSW detailing the required geotechnical instrumentation and monitoring during construction. Further reference should be made to the TfNSW Technical Direction, *'Excavation adjacent to TfNSW infrastructure'*, Ref: GTD 2020/001, Version 1 dated 2 July 2020 which details the TfNSW requirements. Similar additional investigation and analysis may be required for the adjacent Sydney Metro as discussed in Section 5.9.

Although rock will be encountered in the excavations it is generally of poor quality and not suitable to be left unsupported. Even the medium to high and high strength siltstone has the potential to contain large continuous inclined joints which can adversely affect stability. Inclined joints within the siltstone may not become apparent until the bulk excavation is reached and at that time it would be too late to install the necessary lateral support to retain the rock wedges isolated by the inclined joints. Therefore, we do not recommend vertical unsupported excavations within the siltstone, although batters in the medium to high strength siltstone bedrock as steep as 1V:0.5H may be feasible pending inspection by a geotechnical engineer.

We consider that soldier pile walls with shotcrete infill panels would be suitable for this site. However, wall deflections may need to be reduced along the Lane Cove Road and adjacent to the Metro due to TfNSW/Sydney Metro requirements, and potentially along the other boundaries, and the use of more rigid contiguous pile wall may be necessary. The piles should be founded with a minimum embedment of at least 1m below bulk excavation level. A greater embedment may be necessary to satisfy overall stability and founding considerations.

We consider that bored piles would be suitable for the site, but difficulties due to groundwater seepage may occur. Given the presence of groundwater, we recommend that all piles are either tremie poured or pumped dry prior to pouring concrete (although tremie methods are likely to be required due to the depth of the piles to prevent concrete segregation). Consideration should be given to drilling trial bored piles to assess the feasibility of such piles. The piles will need to be socketed into high strength siltstone and as such piling rigs with adequate capacity to penetrate such rock should be used. We do not recommend sheet piles for the site due to the potential damage to nearby structures and infrastructure caused by the installation process and difficulty of the sheet piles to penetrate into the bedrock.

During the excavation, if soldier piles are adopted, reinforced shotcrete panels should be sprayed progressively with the excavation to support the soils and weathered siltstone between the piles, such that there is no more than 1.5m vertical face of material exposed between the piles at any one time. It will be necessary to install strip drains behind each panel of shotcrete to dissipate the pore pressures from immediately behind the shotcrete facing.

5.3.1 Retaining Wall Design Parameters

Where retention heights are less than about 3m, it may be feasible to adopt a cantilevered retaining walls. However, where retention heights exceed 3m or deflections need to be limited, then a propped or anchored retaining wall will be required.

For cantilevered retaining walls supporting soils and siltstone bedrock up to low strength, we recommend that walls can be designed on the basis of an active earth pressure co-efficient (K_a) of 0.35 where some wall movements are tolerable. A bulk unit weight of 20kN/m^3 should be adopted for the soil profile and 22kN/m^3 for the siltstone profile. Where movements are to be reduced then we recommend the walls be designed on the basis of an 'at rest' earth pressure coefficient (K_o) of 0.6. We recommend that walls be designed with full and effective rear of wall drainage. These coefficients assume horizontal backfill behind the wall and where inclined backfill is proposed the coefficients would need to be increased or the inclined backfill taken as a surcharge load.

Propped or anchored walls may be designed based on a trapezoidal earth pressure distribution of 6H kPa , where H is the retained height of soils and weathered bedrock up to and including low strength, where some resulting ground movement is tolerable and adjacent structures or services are located beyond a horizontal distance of 2H from the wall. Where structures or movement sensitive services are located within 2H of the wall, a higher trapezoidal lateral pressure of 8H kPa should be used. These maximum lateral pressures should be held constant for the central 50% of the trapezoidal lateral pressure distribution. Whilst not to be expected, where the retention systems support medium and high strength weathered bedrock, we recommend a uniform pressure of 10kPa to support small local wedges of rock.

Appropriate surcharge loads (such as adjoining buildings, traffic, sloping backfill, footing loads etc.) are additional to the above earth pressures and should be allowed for in the design. The additional earth pressures from surcharge loads may be calculated using an 'at rest' earth pressure coefficient of 0.6.

We expect the presence of groundwater within the southern portion of the site and potentially within the locally deeper excavations along the eastern side of the building and therefore the retention system should be designed for hydrostatic pressures, unless appropriate behind wall drawings is provided, such as strip drains behind the shotcrete facing between soldier piles, discharging into the stormwater drainage system. Even where the basement excavations are not expected to encounter groundwater, drainage must be provided behind retaining walls to collect and control seepage that may occur during and following rainfall. Further discussion is provided in Section 5.4 below on basements below the groundwater which is considered an aquifer interference activity and therefore approvals from relevant authorities may be required.

If contiguous pile walls are proposed then they must be designed for hydrostatic pressures, unless measures can be undertaken to provide complete and permanent drainage. We recommend adopting a design level 1m higher than the measured groundwater levels provided above to allow for a rise in groundwater levels.

Passive toe resistance of the retention system below the base of the bulk excavation may be estimated based on a maximum allowable lateral resistance of:

- 150kPa for siltstone of very low strength;
- 300kPa for siltstone of low strength, or;
- 400kPa for siltstone of medium or higher strength.

The passive resistance should be ignored to at least 0.5m below the base of the excavation, including footing, lift pit and service excavations due to the potential for fracturing of the upper siltstone during bulk excavation.

Anchors should have their bond length formed within siltstone and may be provisionally designed based on an allowable bond stresses of:

- 150kPa for very low strength siltstone;
- 300kPa for low strength siltstone, or;
- 400kPa for siltstone of medium strength or higher strength.

The anchor bond should be formed outside a line drawn up at 45° from the bulk excavation level, with a minimum free length of 4m and a minimum bond length of 3m. All anchors should be proof loaded to at least 1.3 times their design working load before locking off at about 85% of the working load. Lift-off tests should be carried out on at least 10% of the anchors 24 to 48 hours following locking off to confirm that the anchors are holding their load. Generally anchors are installed on a design and construct contract so that optimisation of bond stresses does not become a contractual issue in the event of an anchor failing the test load. We have assumed that the permanent lateral support will be provided by the floor slabs for the proposed structure.

If temporary anchors are to run below neighbouring properties, then permission from the adjoining owners must be obtained prior to installation. We recommend that requests for permission commence early in the construction process as our experience has shown that it can take significant time for such permission to be granted. If permission is not forthcoming, such as potentially from TfNSW for anchors below Lane Cove Road, then the alternative is to provide lateral support by internal bracing or propping. The location of any services within the roadways should also be considered during anchor design.

Specific shoring wall analysis should be undertaken, including an assessment of the likely ground movements beyond the shoring walls. We can assist with such analysis if required. The structural engineer should then be requested to provide comment on whether such movements will be problematic to any adjoining structures or services. We assume this will be requested by TfNSW due to the close proximity of Lane Cove Road and Sydney Metro due to the adjoining rail tunnels.

5.4 Hydrogeological Considerations

Groundwater was encountered between about RL63.4m towards the south-western end grading down to RL49.7m towards the north-eastern end of the site. The groundwater was measured to be within the rock profile, which will be of low permeability, however, given the gradient within the measured groundwater levels, we expect that the groundwater encountered is seepage flowing though the rock profile and not the standing groundwater table.

Based on these measurements, the groundwater is expected to be intersected at the southern end of the site, as discussed in Section 4 above. Notwithstanding this, we re-iterate that from a geotechnical perspective, we consider a drained basement to be suitable for the site given the expected relatively low groundwater inflow volumes.

Seepage during construction, such as during or shortly after rainfall periods, are not expected to be excessive and should be readily controlled using gravity or sump and pump drainage. In the long term, drainage should be provided behind all basement retaining walls and possibly below the basement slabs to collect and control any seepage that does occur. The completed excavation should be inspected by the hydraulic engineer to confirm that the designed drainage system is adequate for the actual seepage flows, if any. From a geotechnical perspective the adoption of a drained basement is considered appropriate, but the necessary approvals may require a tanked basement to be adopted as discussed below. Reference should be made to Section 4 above with respects to the regulatory requirements for basements that are considered an aquifer interference activity. Please note, the default stance of the WaterNSW/NRAR is typically for all basements to be fully 'tanked' and the onus is then on the developer to provide sufficient information for a drained basement to be accepted.

Given the proposed basement will extend across the hillside, construction of a tanked (undrained) basement would be expected to result in significant damming of regional groundwater flows. We consider the adoption of a drained basement would have negligible impact on any nearby foundations, services, assets, structures and ecosystems. We consider that an undrained (tanked) basement would probably have more significant adverse effects than the recommended drained basement.

5.5 Footings

Based on the results of the investigation and the rock classifications given in Section 3.2, we expect the following conditions will be exposed at the bulk excavation level for the proposed buildings:

- Over the southern portion of the site, in the vicinity of BH14, BH18, BH26 and BH33, at the deeper bulk excavation level we expect Class III/II siltstone bedrock is expected to be exposed at BEL. However, where BEL steps up RL62.95m, we expect Class V/IV siltstone bedrock to be exposed;
- The remainder of the building footprint will predominantly expose Class IV siltstone bedrock, although there will likely be areas of poorer quality Class V siltstone bedrock and soils at the Waterloo Road end of the building.
- As previously mentioned, there may be a limited extent of fill exposed at BEL within the vicinity of BH5.

Since rock is expected within the excavations of the building, it should be supported on footings founded within the rock to provide uniform support and reduce the risk of differential settlements. The proposed structures may be supported on pad or strip footings founded within the exposed siltstone, but given the expected high column loads and the depth to the better quality bedrock, piles founded within at least Class II bedrock will presumably be required. Where excavations are not proposed or are minimal, piles will be required to reach the rock. If portions of the above ground structure extend outside the footprint of the basement, the structure should be supported on piles founded within the siltstone below a line drawn at 45° up from the base of the excavation so that additional surcharge loads are not placed on the shoring walls.

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 for limit state design on the understanding that settlement of the footing may be 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.

Shale 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	3,000kPa	100kPa	70MPa
Class IV	1,000kPa	100kPa	3,000kPa	150kPa	300MPa
Class III	2,000kPa	200kPa	15,000kPa	400kPa	800MPa
Class II	6,000kPa	600kPa	70,000kPa	800kPa	1,500MPa

Appropriate load factors and geotechnical reduction factors, in accordance with AS2159-2009, must be used in the design. The geotechnical strength reduction factor must be determined by the designer once all details of the design methods and installation requirements are known. It is not possible at this stage to accurately determine the geotechnical strength reduction factor as we have no knowledge of the design and installation factors. However, as a guide we have estimated the Average Risk Rating and geotechnical strength reduction factor based on the following assumptions:

- The designer has extensive experience with similar foundations in similar geological conditions.
- The design method adopted is well established and soundly based method.
- The method for utilising results of in-situ test data and installation data is based on indirect measurements used during installation and not calibrated to static load tests.
- Detailed level of construction control with professional geotechnical supervision, construction processes that are well established and relatively straightforward.
- No monitoring of the structure after construction will be undertaken.

Based on the above assumptions and our geotechnical knowledge, we estimate an Average Risk Rating (ARR) of 2.4 in accordance with Equation 4.3.2 and Table 4.3.2(A) of AS2159-2009. Accordingly, the overall risk

category is Low resulting in a geotechnical strength reduction factor (ϕ_{gb}) of 0.56 for low redundancy systems or 0.64 for high redundancy systems, in accordance with Table 4.3.2(C) of AS2159-2009.

Based on the subsurface profile adopting a 'Soil Condition B' is appropriate for the site. For concrete piles, we recommend adopting a 'Mild' exposure classification in accordance with Table 6.4.2(C) of AS2159-2009 *'Piling-Design and Installation'*. For steel piles, we recommend adopting a 'Non-Aggressive' exposure classification in accordance with Table 6.5.2(C) of AS2159-2009.

All piles should be founded with a nominal socket of at least 0.3m into the appropriate class of shale. 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 70% 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 Shale, we consider that at least the initial stages of footing excavation should 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/piles are to be founded within Class III or Class II Shale, additional cored boreholes should be drilled following demolition to determine the rock quality and depth in the area of the suite not currently accessible. In addition, inspection of the footing excavations or pile drilling during construction should be carried out as detailed below.

Where footings are founded within Class III Shale, we recommend that all of the footing excavations or pile drilling be inspected by a geotechnical engineer.

Where footings are founded on Class II Shale, we recommend all footing excavations and pile drilling be visually inspected by a geotechnical engineer and that where pad footings are adopted, at least half of all footing excavations also be spoon tested. Spoon testing involves drilling a 50mm diameter hole in the base of the footing excavation to a depth of at least 1.5 times the minimum footing width, but no less than 1.5m deep. The hole is scraped with a grooving tool to assess the location and thickness of any defects below the base of the footing. Where significant defects are encountered then deepening of the footing excavations may be required. Where piles are adopted spoon testing is not possible and additional cored boreholes should be drilled at particular pile locations to confirm the depth of the Class II Shale. The final extent of the boreholes should be determined once the footing layout has been determined but will encompass the areas of the existing buildings and therefore will need to be undertaken following demolition.

Assuming some seepage will occur into the basement excavation, the rock exposed in the base of the footing excavations will likely weather if left exposed and inundated with water. Therefore we recommend that footing excavations be inspected, tested and poured within minimal delay, preferably on the same day as excavation. If a delay in pouring the footing is expected, then we recommend that a thick blinding layer of concrete be placed in the base of the footing excavations for protection.

5.6 Subgrade Preparation

Earthworks recommendations in this report should be read in conjunction with AS3798-2007: '*Guidelines on Earthworks for Commercial and Residential Developments*'.

The proposed basement will overlie bedrock for the majority of the footprint and therefore no particular subgrade preparation will be required for the basement slabs. However, a granular subbase layer should be provided to provide a separation between the slabs and the rock subgrade. The eastern corner of Building A, in the vicinity of BH5, may overlie fill or natural soils and therefore suitable subgrade preparation below the slab will be necessary.

Fill was encountered within the boreholes to varying depths. We are unaware of any records of placement or compaction control of the fill and as such it must be considered "uncontrolled" and is not suitable to support floor slabs. Where the uncontrolled fill is not removed as part of the bulk excavations it will need to be excavated and replaced with controlled, engineered fill or the floor slabs designed as fully suspended slabs. Where pavements are proposed the existing fill may remain in place provided it performs adequately during proof rolling as recommended below.

If the slabs are fully suspended, then no particular subgrade preparation is required other than stripping of topsoil and any obvious deleterious materials. However, a subbase layer should be provided below the slab as recommended in Section 5.7 below. If clayey fill is present, we also recommend void formers below the suspended slab of at least 40mm thickness to account for the potential shrink-swell reactivity of the underlying clayey soils.

Where soils will be present, following excavation to the design subgrade level the following subgrade preparation measures should be followed:

- Strip the subgrade of all existing pavements, vegetation, root affected soils or other deleterious materials.
- Excavation of any remaining uncontrolled fill from within building areas unless fully suspended slabs are adopted.
- Following stripping and excavation, proof roll the subgrade with a minimum of 6 passes of a smooth drum non-vibratory roller of no less than 12 tonnes static weight. All proof-rolling should be completed in the presence of an experienced geotechnical engineer.
- The purpose of proof rolling is to improve the near surface density of the soils and identify any soft or unstable areas. Any soft or unstable areas identified should be excavated down to a sound base and reinstated with engineered fill as described below, or as directed by the geotechnical engineer during the inspection.
- Care must be taken when rolling close to existing structures or services and the vibrations may need to be reduced or ceased where they are of concern.
- Place fill as required in thin horizontal layers compacted to the density recommended below.

5.6.1 Engineered Fill and Compaction Control

Engineered fill should preferably comprise well graded granular materials, such as ripped rock or crushed sandstone, free from organic materials, other contaminants and deleterious substances and have a maximum particle size not exceeding 70mm. Such fill should be placed in layers of maximum 200mm loose thickness and compacted to a density of at least 98% of Standard Maximum Dry Density (SMDD), but a reduced layer thickness should be adopted if light compaction equipment is used.

From a geotechnical perspective, we expect the excavated soils and bedrock may be suitable for reuse as engineered fill, but are less desirable due to the plasticity of the clays. Clayey materials, including siltstone, used as engineered fill should also be compacted to a density strictly between 98% and 102% of SMDD and at a moisture contents within 2% of Standard Optimum Moisture Content (SOMC). The use of clay as fill will require a greater control of fill compaction and moisture content and may extend the earthworks program than if granular material was used.

Density tests should be carried out at a frequency of one test per layer per 500m^2 or three tests per visit, whichever requires the most tests, to confirm the above specification has been achieved. For backfilling of localised excavations, such as service trenches or localised soft spots, testing should consist of one test per two layers per 50m^2. Where the fill is to support building loads it should be placed under Level 1 inspection and testing, as defined by AS3798. Preferably the geotechnical testing authority should be engaged directly on behalf of the client and not by the earthworks subcontractor.

5.7 Basement Slab

Based on the investigation results, the exposed subgrade below the basement slab will mostly comprise the weathered siltstone bedrock, except in the eastern corner in the vicinity of BH5. In these areas where bedrock is exposed the basement slab should be underlain by a layer of durable igneous granular material such as DGB20 or other approved material to act as a separation layer between the rock and the basement slab. Given the possible presence of extremely weathered bedrock at subgrade level, we recommend the subgrade be inspected by a geotechnical engineer to confirm the above assessment and provide further advice as required. Where basements will not be underlain by bedrock, then the subgrade preparation as detailed in Section 5.6 above should be adopted.

If a drained basement is permitted then drainage should be provided around the basement perimeter and below the lowest basement slab to direct seepage into sumps with permanent and fail safe automatic pumps to remove water from the basement. The completed excavation should be inspected by the hydraulic engineer to confirm that the designed drainage is sufficient for the actual seepage flows. The underfloor drainage should comprise a strong, durable, single-sized washed aggregate such as ‘blue metal’ gravel.

5.8 Earthquake Design Parameters

Based upon AS1170.4:2024 "Structural Design Actions, Part 4: Earthquake Actions in Australia", the following design parameters may be adopted:

- Hazard Factor (Z) = 0.08;
- Class C_e – Shallow soil site

5.9 Sydney Metro

The Sydney Metro rail tunnel is present below Waterloo Road, with the Macquarie Park station box present at the corner of Waterloo Road and Lane Cove Road. Based on the document "*Sydney Metro Underground Corridor Protection Technical Guidelines*" prepared by Sydney Metro dated April 2021, we understand the Sydney Metro comprises twin tunnels of approximately 6.2m and 7.0m external and internal diameter, respectively. The tunnels were constructed using a tunnel boring machine (TBM) supported by precast concrete segmental liners. The document provides details on the extent of the first and second reserves of the tunnels and station boxes/shafts

We understand the proposed building will be within the Metro second reserves for the station box, cavern and rail tunnels. Regardless, the proposed plaza between the building and Waterloo Road will presumably require minor structures, such as light poles, landscape walls, etc. These structures will likely fall within the second reserve as the first reserve is unlikely to extend to the ground surface. The following table shown in Plate 1 details the construction restrictions for developments in relation to the first and second reserves.

Table 4.5 Construction restrictions

Types of construction	First reserve	Second reserve
Excavation for basements, footings	Not allowed	• Excavations less than 2.0 m depth from surface level, assessment not required. • Excavation greater than 2.0 m depth, assessment required.
Shallow footings or pile foundations	Not allowed	Allowed, subject to load restrictions. Assessment required.
Tunnels and underground excavations	Not allowed	Allowed, subject to assessment.
Ground anchors	Not allowed	Allowed, subject to assessment.
Demolition of existing subsurface structures	Not allowed	Allowed, subject to assessment.
Penetrative subsurface investigations e.g. boreholes, instrumentation	Allowed away from support zone. Assessment required.	Allowed, subject to assessment (refer to Section 7.1 for requirements)

Plate 1 – Excerpt taken from Sydney Metro Underground Corridor Protection Technical Guidelines, pg. 11.

Based on the above table and the proposed development, we expect the following construction activities/restrictions:

- An assessment will likely be required given excavations 2m deep or greater may occur in the second reserve.
- For the expected shallow footings or pile foundations for the minor structures in the plaza, as well as deep piled footings for Building A, an assessment will be required for these structure within the second reserve.
- We do not expect that any structures will be proposed within the first Reserve, which should be the case as structures will not be allowed within the first reserve.

Reference should be made to the Sydney Metro document for the requirements to obtain approval, but from a geotechnical perspective it will be necessary to drill deep cored boreholes to below the tunnel invert in order to the confirm the ground conditions. Approval will need to be obtained from Sydney Metro to drill these boreholes as they will likely be located within the second reserve (and possibly the first reserve). To obtain approval a survey plan and section will need to prepared by a registered surveyor (who will also need to set out the borehole locations). This survey plan and section will need to be submitted to Sydney Metro with a description of the works proposed and a Safe Work Method Statement (SWMS) to obtain approval. Following the investigation, a finite element analysis will likely be required to assess the potential impact of the proposed development on the station box and tunnels.

5.10 Sydney Water Assets

Based on the 'Before You Dig Australia' drawings, we note the presence of Sydney Water assets along Waterloo Road and near the south-eastern and south-western site boundaries. The Sydney Water assets appear to comprise of 150mm to 225mm water and sewer pipes. Our understanding is that if the development falls within 10m of any Sydney Water assets or within the basement excavation zone of influence that Sydney Water may then request a Specialist Engineering Assessment (SEA) in accordance with Sydney Water Specialist Engineering Assessment document (Doc No. D0001870, Version 1 dated 19 February 2021). The sewer pipes present near the south-western boundary are likely to fall within the excavation zone of influence. The need for an SEA can even include construction of new roads and movement of construction vehicles and as such the water piles along Waterloo Road may also need to be assessed. Reference should be made to the Sydney Water Technical Guideline, Building Over and Adjacent (BOA) to Pipe Assets, for further advice in this regard.

The SEA will require varying amounts of input from geotechnical, structural and civil engineers. The preparation of an SEA and obtaining approval from Sydney Water can be a lengthy process and therefore, if required, we recommend the process commences as soon as possible to avoid potential project delays.

5.11 Pavement Design Parameters

The CBR testing of soil samples returned CBR values ranging from 1.5% to 6%. We consider that design of the pavement thickness may be based on a soaked CBR of 1.5%, 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. Pavement subgrade and engineered fill should be prepared as recommended in the Section 5.6 above.

The measured CBR value for the clayey subgrade 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 preliminary CBR value of 1.5% or an estimated subgrade reaction modulus (for concrete slabs or pavements) of 20kPa/mm (750mm diameter plate).

OR

2. Provide an appropriate select fill layer as part of the overall pavement thickness. The select fill should be well graded crushed sandstone or good quality shale 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. 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. We note that use of lime close to residential and office areas is generally not preferred unless an acceptable method of dust suppression can be adopted.

Concrete pavements should have a sub-base layer of at least 100mm thickness of crushed rock to the latest revision of Transport for NSW QA specification 3051 (2010) unbound base material (or equivalent good quality and durable fine crushed rock) which is compacted using a heavy roller to at least 98% of Modified Maximum Dry Density (MMDD). Adequate moisture conditioning to within 2% of Modified Optimum Moisture Content (MOMC) should be provided during placement so as to reduce the potential for material breakdown during compaction. Concrete pavements should be designed with an effective shear transmission of all joints by way of either doweled or keyed joints. If flexible pavements are proposed then the base and sub-base materials must also comply with the above Transport for NSW QA specification 3051.

Careful attention to subsurface and surface drainage is required in view of the effect of moisture on the clay subgrade. The surface of the pavement and the subgrade should be sloped to shed water, and adequate

subsurface drainage should be installed around the pavement to intercept and dispose of water flows. The subsoil drainage should extend at least 0.3m below the subgrade levels.

The pavement sections where imported fill is used to raise site levels, or replace unsuitable (heaving) subgrade by a depth of at least 0.5m may be designed on the basis of a four-day soaked CBR value of the imported fill material.

5.12 Further Geotechnical Input

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

- Additional geotechnical investigations following demolition depending on the bearing pressures adopted.
- Additional investigations, including permeability testing, monitoring and analysis to address WaterNSW/NRAR requirements.
- Analysis of potential retention system deflections for both Lane Cove Road and the Sydney Metro, depending on Council/TfNSW/Sydney Metro requirements.
- Vibration monitoring at least during initial bulk excavation using rock hammers.
- Nominal inspections during piling for the retention system to confirm founding conditions.
- Regular groundwater observations during and on completion of excavation.
- Witnessing installation and proof testing of anchors.
- Inspection of footing excavations and pile drilling, possibly including spoon testing and additional cored boreholes at specific pile locations depending on the design bearing pressures adopted.

We recommend a review by a geotechnical engineer after structural design has been completed to confirm that our recommendations have been correctly interpreted. It is possible that further advice/input will be required during the structural design to address issues that may not have been addressed in this report. We also recommend a meeting at the commencement of construction to discuss the primary geotechnical issues and inspection requirements.

6 GENERAL COMMENTS

The recommendations presented in this report include specific issues to be addressed during the construction phase of the project. In the event that any of the construction phase recommendations presented in this report are 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.

Occasionally, the 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.

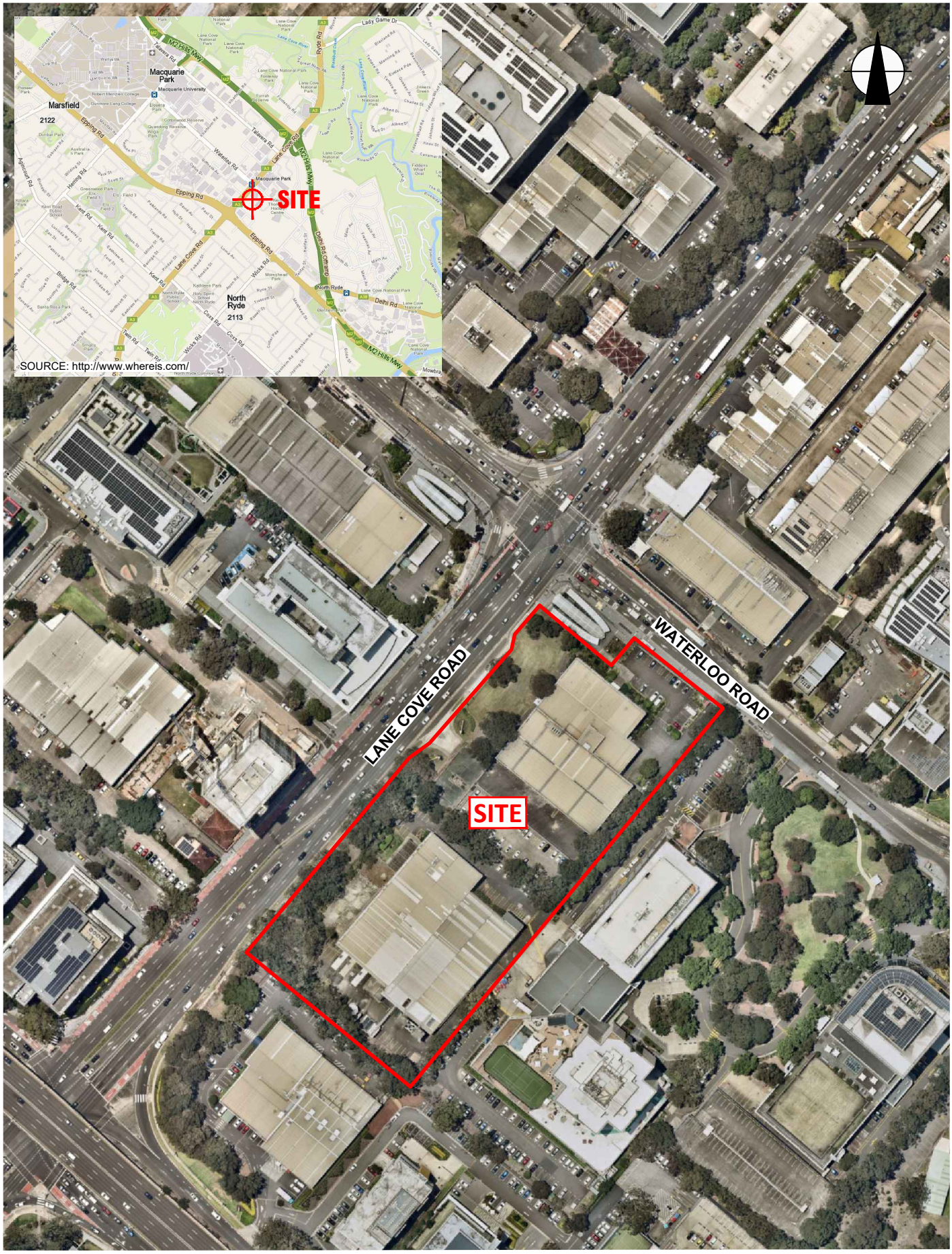
A waste classification is required for any soil and/or bedrock excavated from the site prior to offsite disposal. Subject to the appropriate testing, material can be classified as Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM), General Solid, Restricted Solid or Hazardous 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.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development described in this report then all recommendations should be reviewed. Copyright in this report is the property of JK Geotechnics. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

TABLE 1

ROCK CLASSIFICATION SUMMARY

Borehole	Surface RL	Depth/RL to Top of Unit									
		Unit 3a: Class V Shale		Unit 3b: Class IV Shale		Unit 3c: Class III Shale		Unit 3d: Class II Shale		Unit 3e: Class II Sandstone	
		Depth (m)	RL (mAHD)	Depth (m)	RL (mAHD)	Depth (m)	RL (mAHD)	Depth (m)	RL (mAHD)	Depth (m)	RL (mAHD)
5	58.5	2.8	55.7	3.5	55.0	8.0	50.5	9.4	49.1	13.2	45.3
7	61.1	1.2	59.9	1.8	59.3	5.9	55.2	8.5	52.6	-	-
9	62.3	3.5	58.8	5.1	57.2	7.2	55.1	7.9	54.4	-	-
12	65.0	2.4	62.6	3.6	61.4	10.3	54.7	11.0	54.0	-	-
14	65.8	1.0	64.8	4.8	61.0	8.2	57.6	8.2	57.6	-	-
18	68.0	0.3	67.7	3.3	64.7	7.4	60.6	7.4	60.6	-	-
21	65.0	2.8	62.2	4.0	61.0	6.5	58.5	8.9	56.1	-	-
24	65.7	5.0	60.7	8.0	57.7	8.3	57.4	9.9	55.8	-	-
26	65.4	0.7	64.7	2.5	62.9	6.2	59.2	6.2	59.2	-	-
27	63.0	1.5	61.5	4.0	59.0	8.0	55.0	9.1	53.9	-	-
29	63.0	4.0	59.0	5.8	57.2	7.5	55.5	13.0	50.0	-	-
33	66.0	0.2	65.8	3.5	62.5	4.4	61.6	6.7	59.3	-	-



AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

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

Title: **SITE LOCATION PLAN**

Location: S5 AT WATERLOO ROAD, MACQUARIE PARK, NSW

Report No: 36466BF

Figure No: 1

JKGeotechnics

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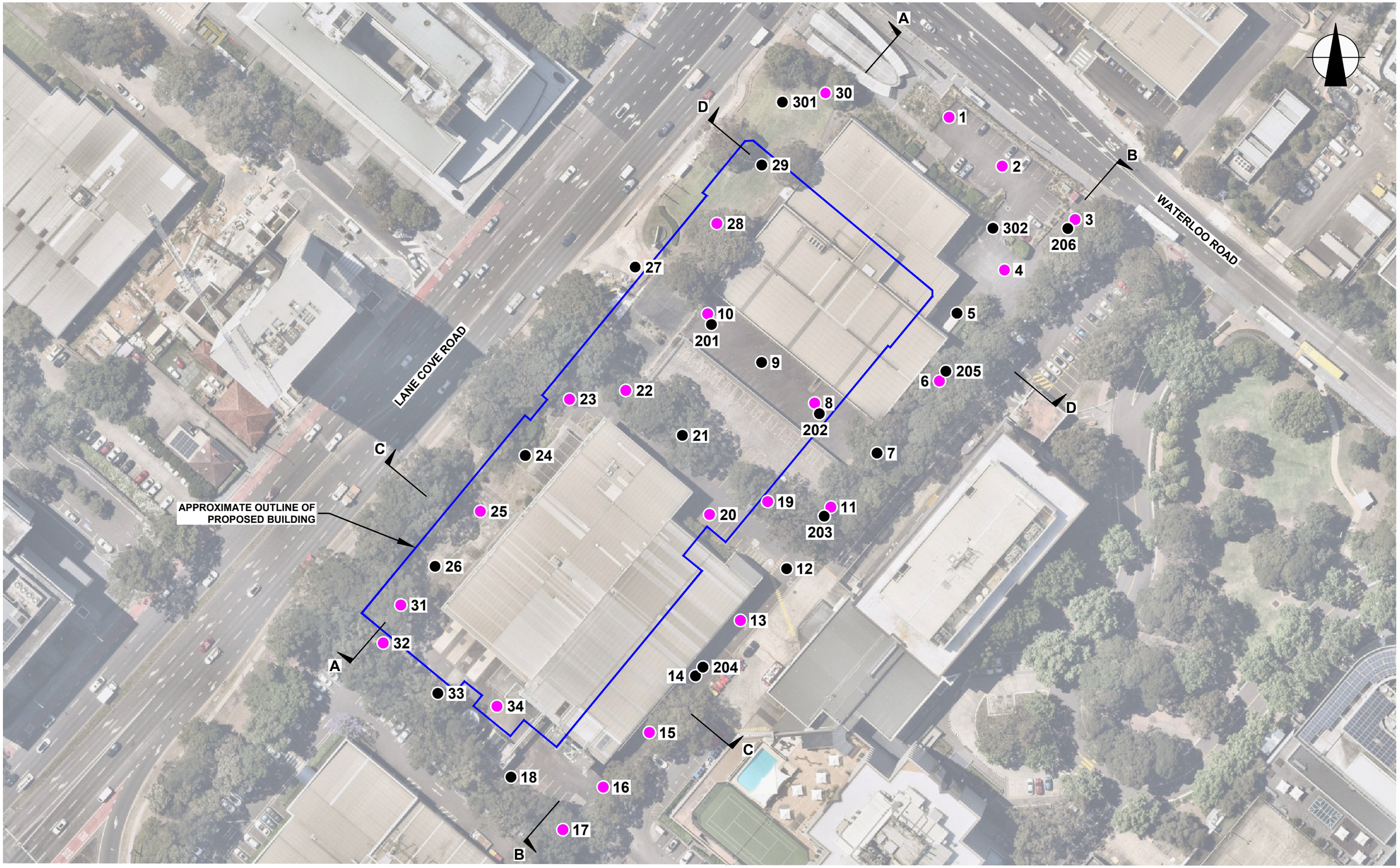

LEGEND

- JK GEOTECHNICS BOREHOLE
- JK ENVIRONMENT BOREHOLE

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: **BOREHOLE LOCATION PLAN**

Location: S5 AT WATERLOO ROAD, MACQUARIE PARK, NSW

Report No: 36466BF

Figure No: 2

JKGeotechnics

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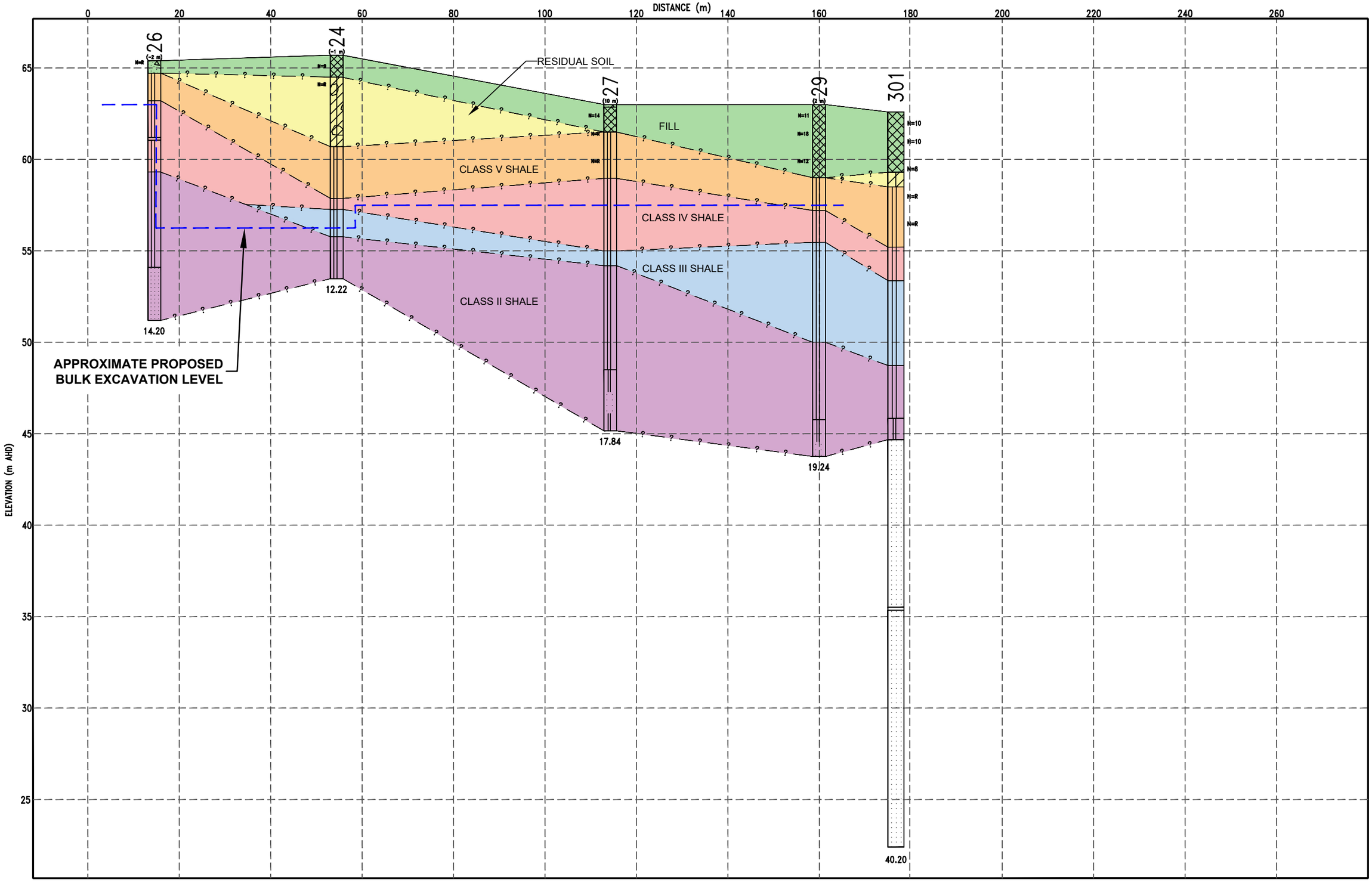

MATERIAL GRAPHIC

GRAVELLY SILTY CLAY (CL, CI, CH)
NO CORE
CONCRETE
FILL
LAMINITE (SILTSTONE, SANDSTONE)
SANDSTONE
SILTSTONE

LEGEND

- FILL
- RESIDUAL SOIL
- CLASS V SHALE
- CLASS IV SHALE
- CLASS III SHALE
- CLASS II SHALE
- CLASS II SANDSTONE

0 8 16 24 35 40
H:SCALE 1:800 @A3 METRES

0 2 4 6 8 10
V:SCALE 1:200 @A3 METRES

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

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

Location: S5 AT WATERLOO ROAD, MACQUARIE PARK, NSW

Report No: 36466BF

Figure No: 3

JKGeotechnics

PLOT DATE: 23/09/2025 10:56:07 AM DWG FILE: J:\6F GEOTECHNICAL JOBS\36000'S\36466BF MACQUARIE PARK\CAD\36466BF.DWG

DISTANCE (m)

ELEVATION (m AHD)

RESIDUAL SOIL

FILL

CLASS V SHALE

CLASS IV SHALE

CLASS III SHALE

CLASS II SHALE

CLASS II SANDSTONE

APPROXIMATE PROPOSED BULK EXCAVATION LEVEL

302

5

7

12

14

18

13.07

15.00

17.20

16.26

16.98

36.18

MATERIAL GRAPHIC

ASPHALTIC CONCRETE

GRAVELLY SILTY CLAY (CL, CI, CH)

NO CORE

SILTY CLAY (CL, CI, CH)

FILL

LAMINITE (SILTSTONE, SANDSTONE)

SANDSTONE

SILTSTONE

LEGEND

FILL

RESIDUAL SOIL

CLASS V SHALE

CLASS IV SHALE

CLASS III SHALE

CLASS II SHALE

CLASS II SANDSTONE

H: SCALE 1:800 @A3 METRES

V: SCALE 1:200 @A3 METRES

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

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

Location: S5 AT WATERLOO ROAD, MACQUARIE PARK, NSW

Report No: 36466BF

Figure No: 4

JKGeotechnics

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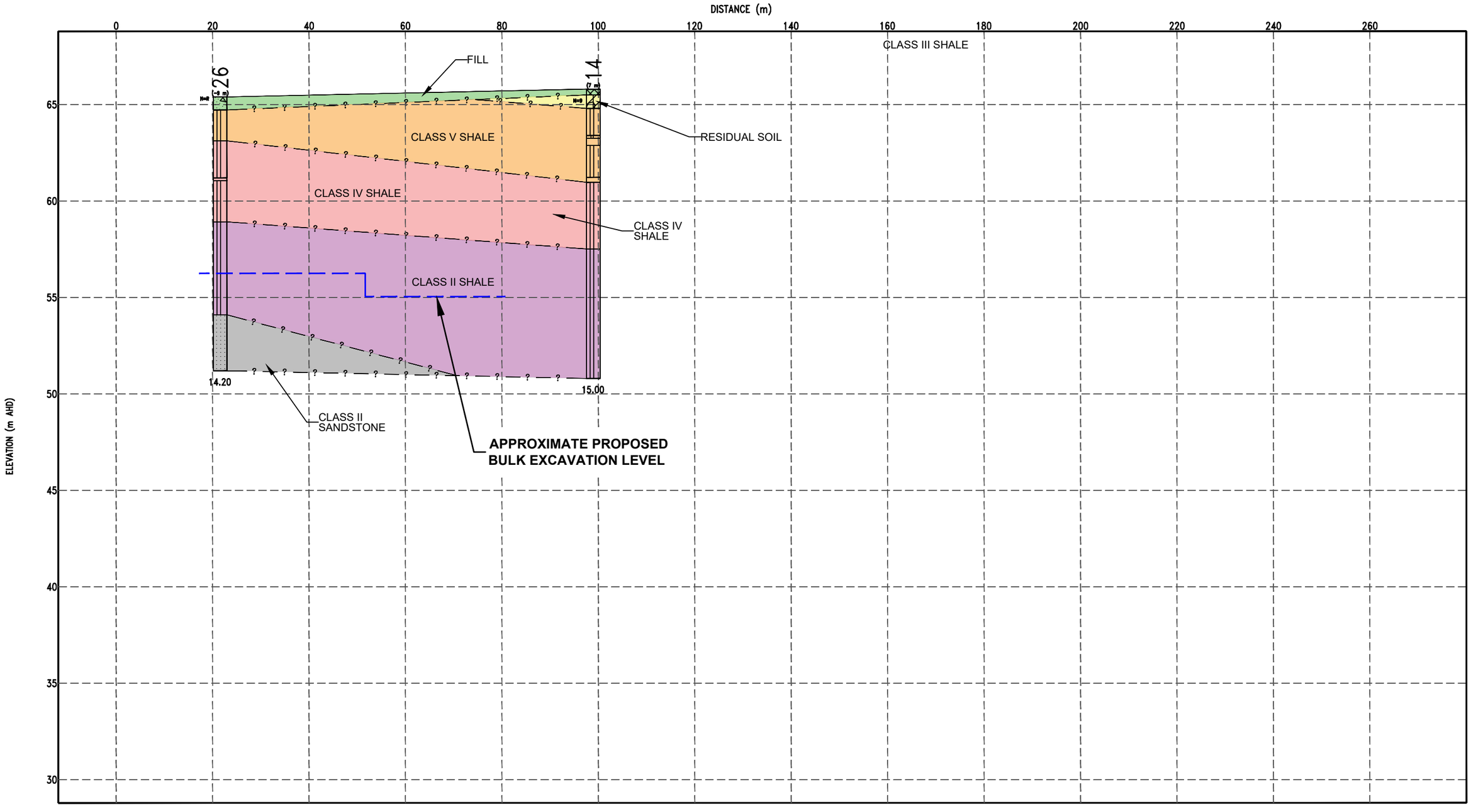

MATERIAL GRAPHIC

- ASPHALTIC CONCRETE
- CONCRETE
- SANDSTONE
- GRAVELLY SILTY CLAY (CL, CI, CH)
- FILL
- SILTSTONE
- NO CORE
- LAMINITE (SILTSTONE, SANDSTONE)

LEGEND

- FILL
- RESIDUAL SOIL
- CLASS V SHALE
- CLASS IV SHALE
- CLASS III SHALE
- CLASS II SHALE
- CLASS II SANDSTONE

0 8 16 24 35 40
H: SCALE 1:800 @A3 METRES

0 2 4 6 8 10
V: SCALE 1:200 @A3 METRES

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

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

Location: S5 AT WATERLOO ROAD, MACQUARIE PARK, NSW

Report No: 36466BF

Figure No: 5

JKGeotechnics

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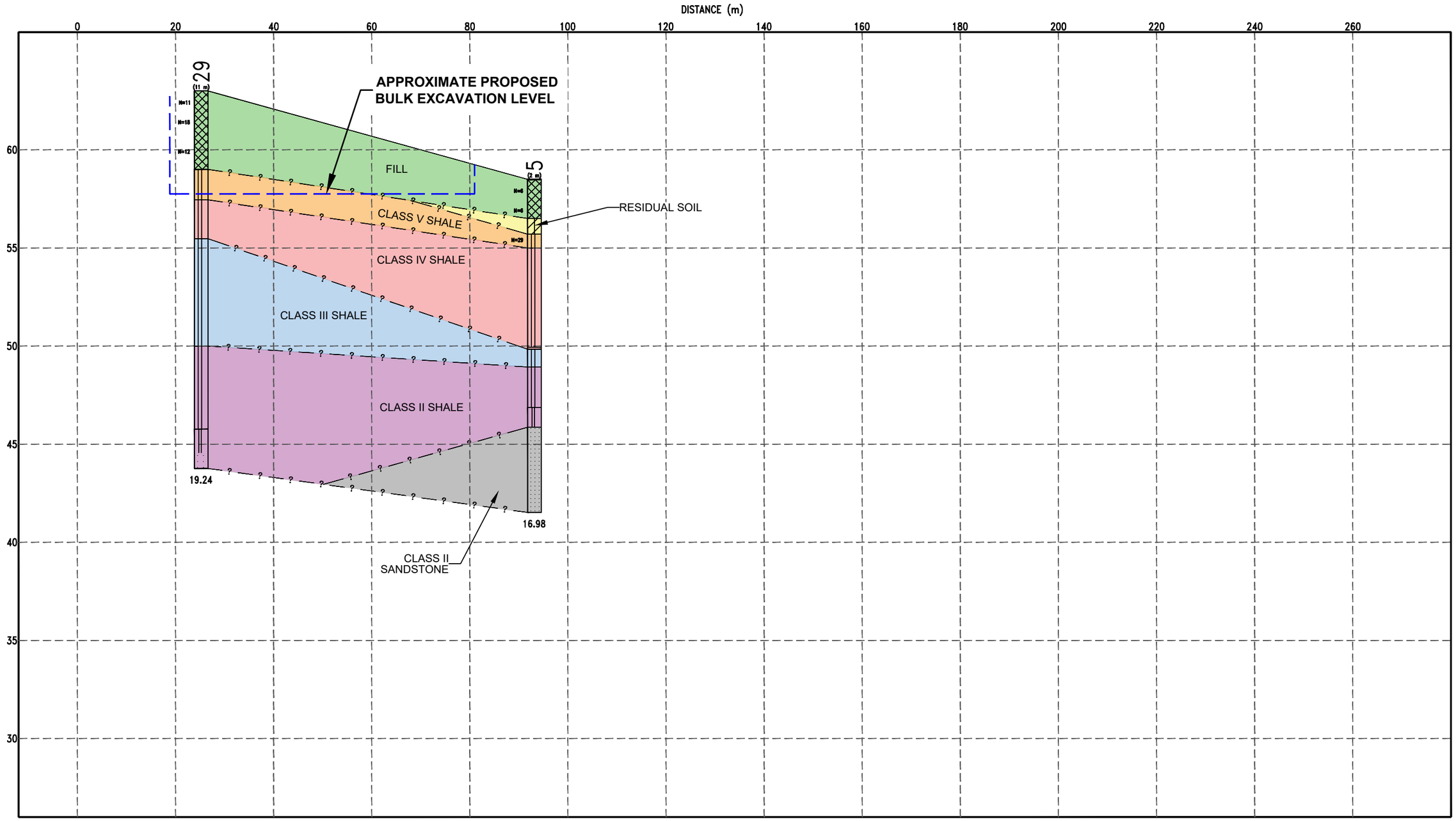


MATERIAL GRAPHIC

- ASPHALTIC CONCRETE
- NO CORE
- SILTY CLAY (CL, CI, CH)
- FILL
- LAMINITE (SILTSTONE, SANDSTONE)
- SANDSTONE
- SILTSTONE

LEGEND

- FILL
- RESIDUAL SOIL
- CLASS V SHALE
- CLASS IV SHALE
- CLASS III SHALE
- CLASS II SHALE
- CLASS II SANDSTONE

0 8 16 24 35 40
H: SCALE 1:800 @A3 METRES

0 2 4 6 8 10
V: SCALE 1:200 @A3 METRES

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

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

Location: S5 AT WATERLOO ROAD, MACQUARIE PARK, NSW

Report No: 36466BF

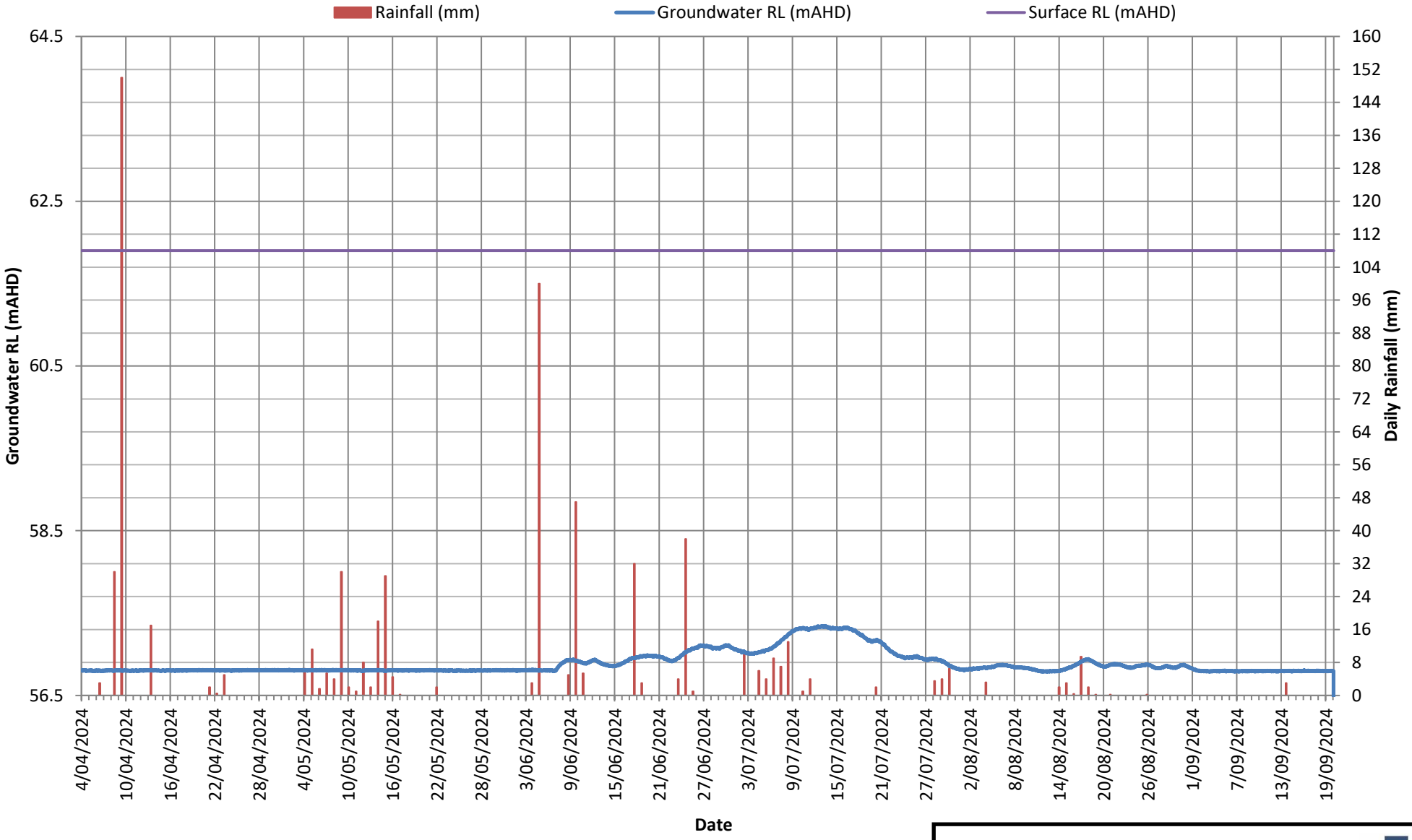
Figure No: 6

JKGeotechnics

PLOT DATE: 23/09/2025 10:21:34 AM DWG FILE: J:\6F GEOTECHNICAL JOBS\36000'S\36466BF MACQUARIE PARK\CAD\36466BF.DWG

File Name: BH8
Date Printed: 16/12/2024

Groundwater Level and Daily Rainfall -v- Time Plot
BH8



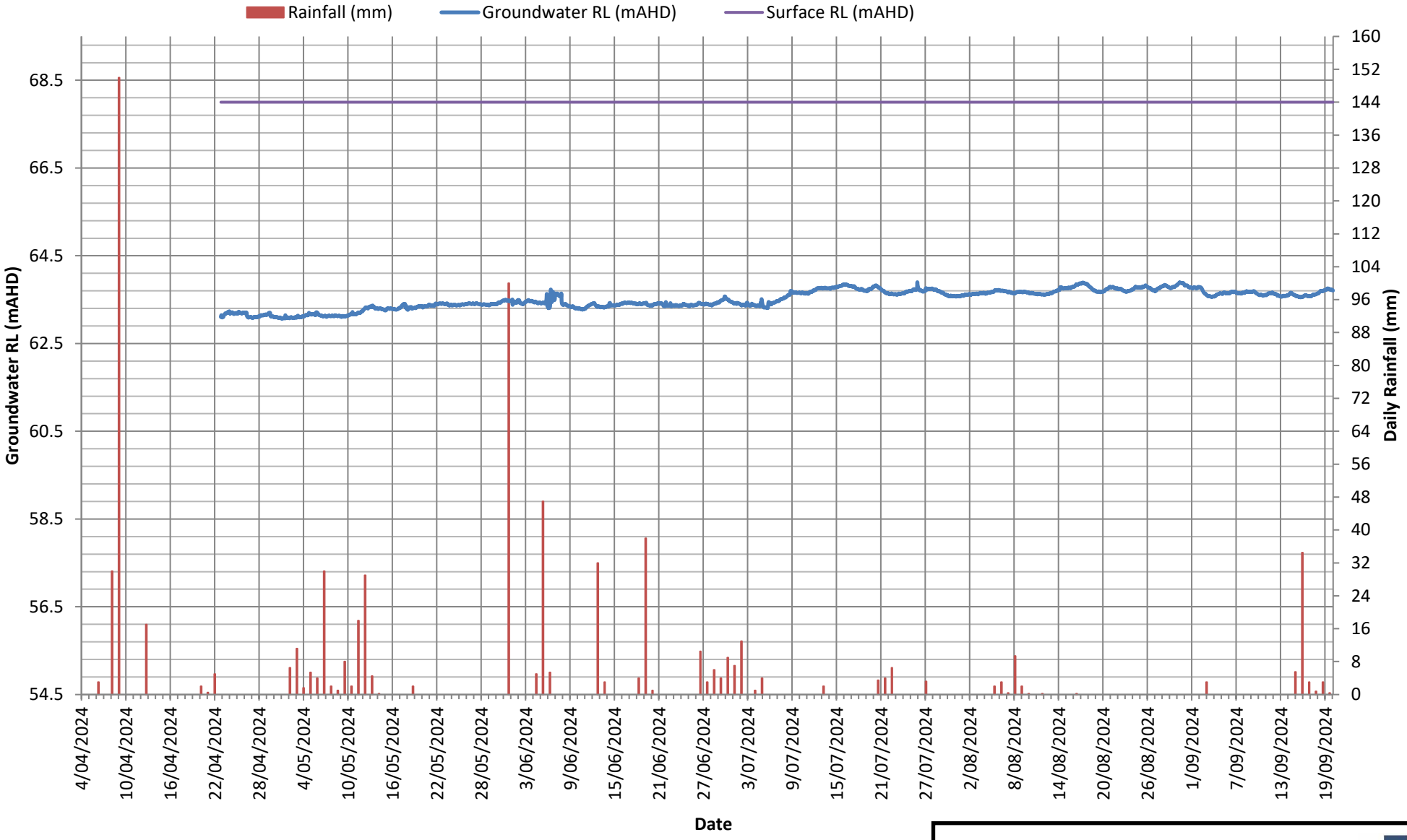
Rainfall data from Macquarie park, (Gordon golf club), Station number : 066120

JKGeotechnics

Report No. 36466BF Figure No. 7

File Name: BH18 Rev1
Date Printed: 16/12/2024

Groundwater Level and Daily Rainfall -v- Time Plot
BH18



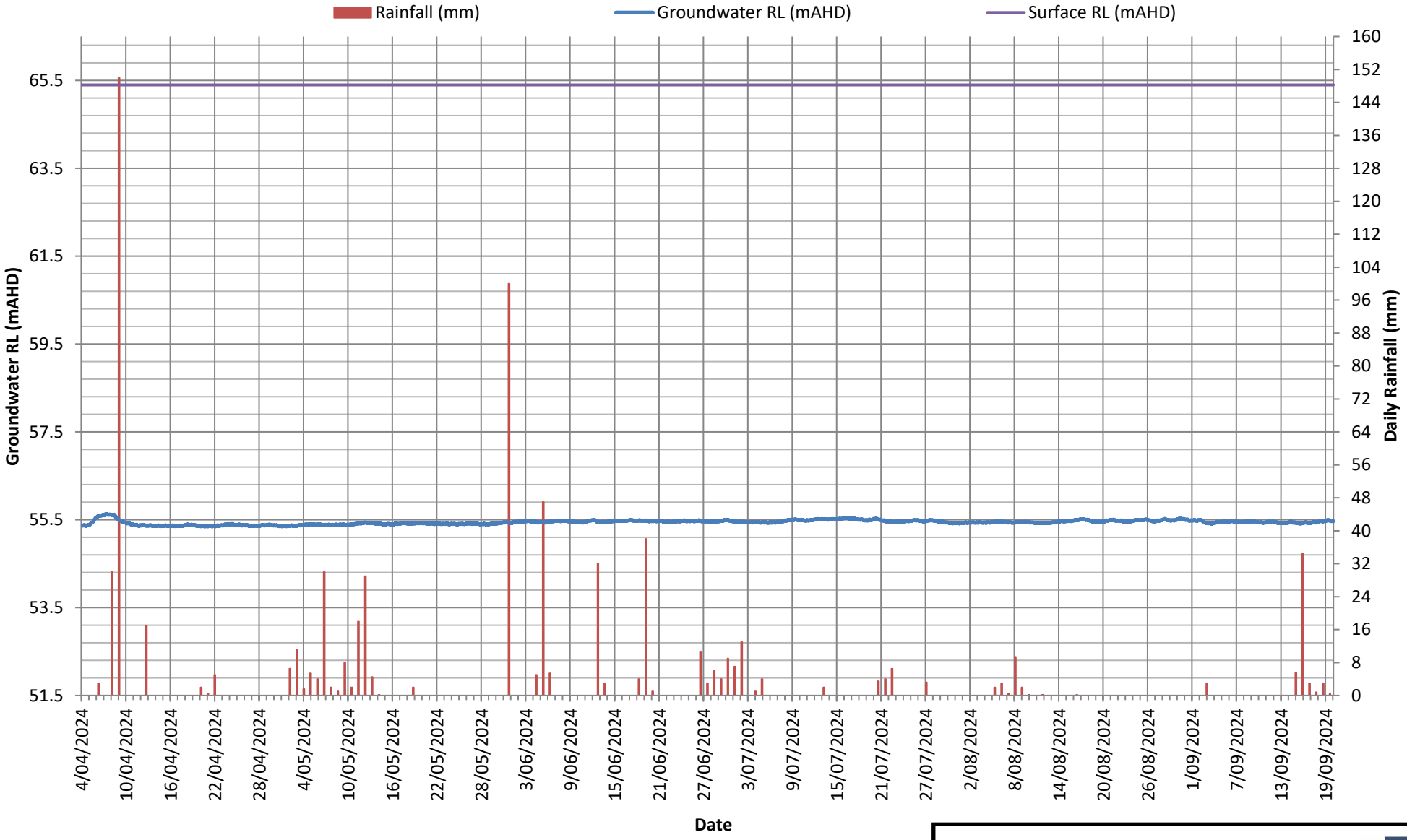
Rainfall data from Macquarie Park, (Gordon Golf Club), Station number : 066120

JKGeotechnics

Report No. 36466BF Figure No. 8

File Name: BH26
Date Printed: 16/12/2024

Groundwater Level and Daily Rainfall -v- Time Plot
BH26



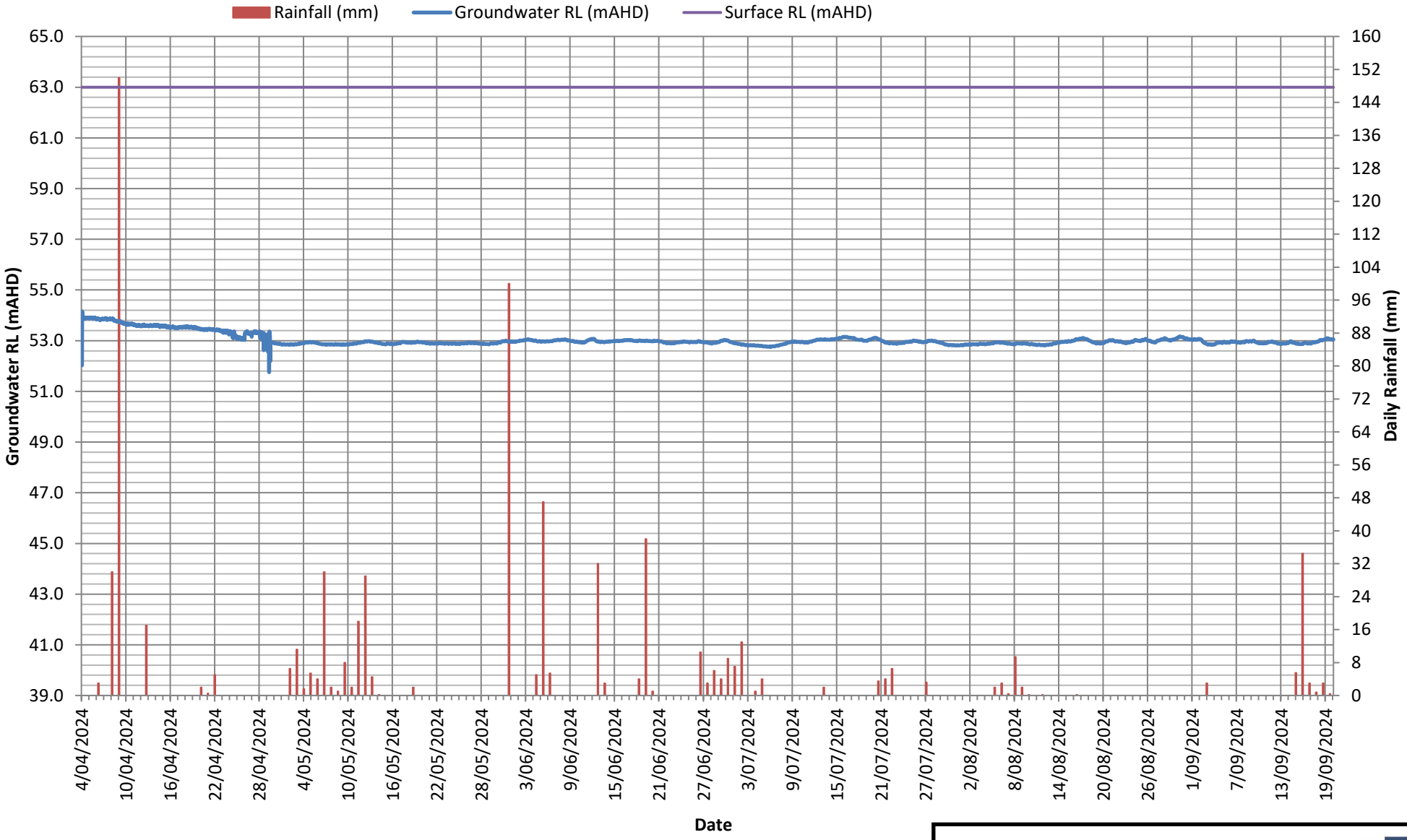
Rainfall data from Macquarie Park, (Gordon Golf Club), Station number : 066120

JKGeotechnics

Report No. 36466BF Figure No. 9

File Name: BH29 Rev1
Date Printed: 16/12/2024

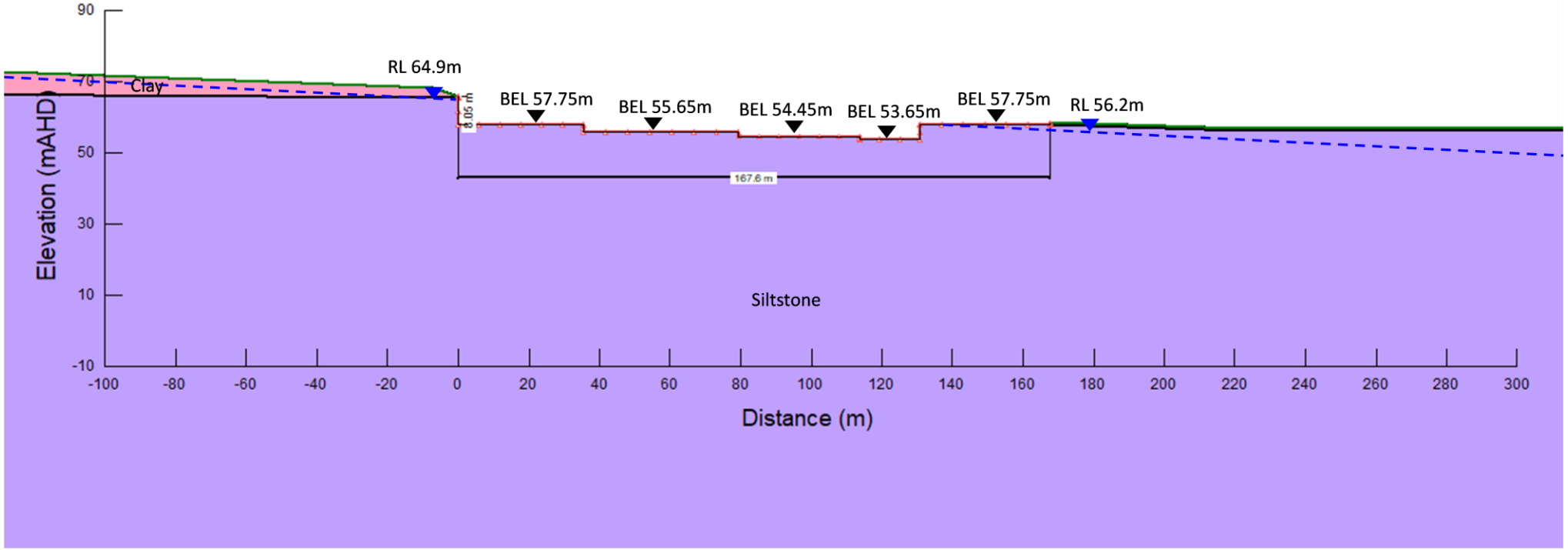
Groundwater Level and Daily Rainfall -v- Time Plot
BH29



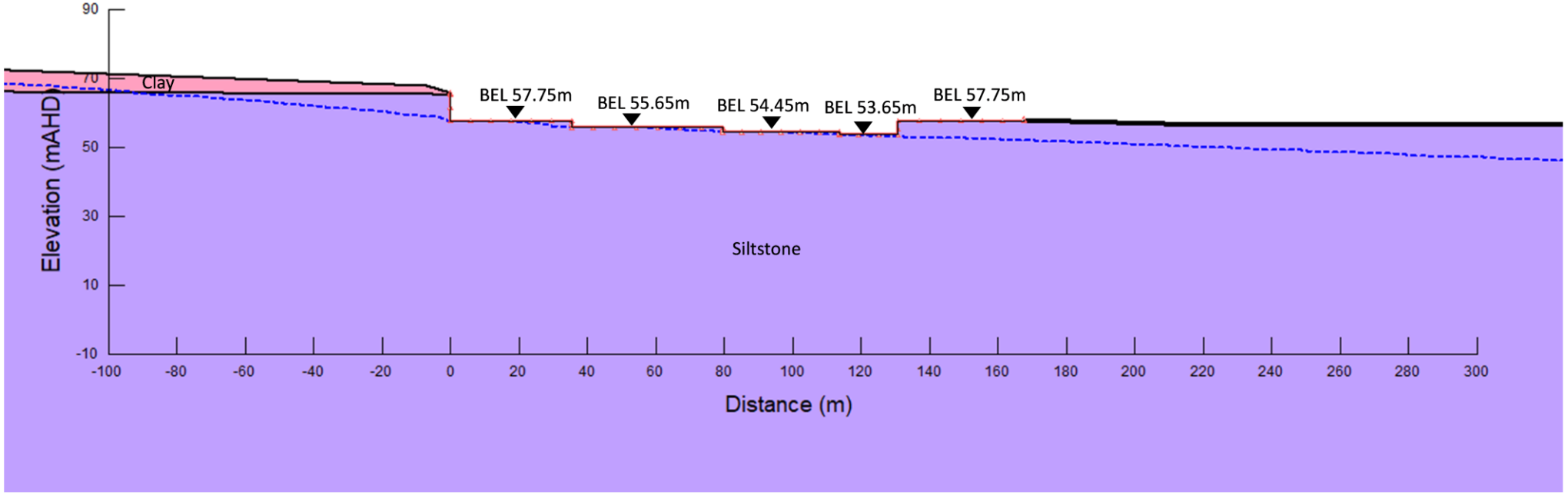
Rainfall data from Macquarie Park (Gordon Golf Club), Station number : 066120

JKGeotechnics

Report No. 36466BF Figure No. 10



HYDROGEOLOGICAL MODEL



Section A-A Seepage Analysis Results – Total Seepage Inflow

(Maximum Groundwater Level with 1m Rise and kv/kh ratio of 1)

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 A

MOISTURE CONTENT TEST REPORT

Client:	JK Geotechnics	**Report No.:**	36466BF - A
Project:	Proposed S5 Data Centre	**Report Date:**	8/12/2023
Location:	34 Waterloo Road, Macquarie Park, NSW	**Page 1 of 1**	

AS 1289	**TEST METHOD**	**2.1.1**
BOREHOLE NUMBER	**DEPTH m**	**MOISTURE CONTENT %**
9	6.90 - 7.00	10.3
14	2.50 - 3.00	9.2
18	0.50 - 1.00	6.3
24	6.50 - 6.70	10.9
26	2.50 - 3.00	8.8
27	6.50 - 7.00	7.9
29	6.50 - 7.20	7.6
33	3.50 - 4.00	11.7

Notes:

- Refer to appropriate notes for soil descriptions
- Date of receipt of sample: 07/12/2023.
- Sampled and supplied by client. Samples tested as received.

NATA

NATA Accredited Laboratory Number:1327

08/12/2023

Authorised Signature / Date
(D. Treweek)

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 A1

MOISTURE CONTENT TEST REPORT

Client:	JK Geotechnics	**Report No.:**	36466BF - A1
Project:	Proposed S5 Data Centre	**Report Date:**	9/01/2023
Location:	34 Waterloo Road, Macquarie Park, NSW	**Page 1 of 1**	

AS 1289	**TEST METHOD**	**2.1.1**
BOREHOLE NUMBER	**DEPTH m**	**MOISTURE CONTENT %**
5	5.50 - 6.00	11.5
7	3.90 - 4.30	8.6
12	8.10 - 8.50	8.8
21	4.00 - 4.50	6.4

Notes:

- Refer to appropriate notes for soil descriptions
- Date of receipt of sample: 08/01/2024.
- Sampled and supplied by client. Samples tested as received.

NATA

NATA Accredited Laboratory Number:1327

09/01/2024

Authorised Signature / Date
(D. Treweek)

115 Wicks Road
Macquarie Park, NSW 2113
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES
ABN 43 002 145 173

TABLE B
FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: JK Geotechnics
Project: Proposed Data Centre
Location: 34 Waterloo Road, Macquarie Park, NSW

Report No.: 36466BF - B
Report Date: 22/10/2024
Page 1 of 1

BOREHOLE NUMBER		BH 201	BH 202	BH 203	BH 204	BH 205	BH 206
DEPTH (m)		0.50 - 1.00	0.50 - 1.00	0.50 - 1.00	0.50 - 1.00	1.00 - 1.50	1.00 - 2.00
Surcharge (kg)		9.0	9.0	9.0	9.0	9.0	9.0
Maximum Dry Density (t/m^3)		1.76 STD	1.81 STD	1.80 STD	1.85 STD	1.58 STD	1.70 STD
Optimum Moisture Content (%)		15.9	14.8	14.4	15.1	22.6	18.7
Moulded Dry Density (t/m^3)		1.72	1.77	1.77	1.82	1.55	1.67
Sample Density Ratio (%)		98	98	98	98	98	98
Sample Moisture Ratio (%)		102	98	101	98	99	97
Moisture Contents							
Insitu (%)		14.7	11.9	11.9	14.9	19.9	18.0
Moulded (%)		16.2	14.4	14.5	14.7	22.3	18.2
After soaking and							
After Test, Top 30mm(%)		19.5	18.3	25.5	21.6	37.6	27.4
Remaining Depth (%)		18.2	17.3	20.2	17.0	26.5	21.5
Material Retained on 19mm Sieve (%)		0	0	0	1*	0	0
Swell (%)		0.0	0.0	2.5	1.0	2.5	1.0
C.B.R. value:	@2.5mm penetration	9		1.5	3.5	2.5	2.5
	@5.0mm penetration		13				

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.
- Date of receipt of sample: 10/10/2024.
- * Denotes not used in test sample.

NATA Accredited Laboratory Number:1327

22/10/2024
Authorised Signature / Date
(D. Treweek)

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client: TTW **Ref No:** 36466BF

Project: Proposed S5 Data Centre **Report:** C

Location: 34 Waterloo Road, MACQUARIE PARK, NSW **Report Date:** 11/01/24

BOREHOLE NUMBER	DEPTH (m)	$I_{S(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
5	8.74 - 8.77	0.3	6	A
	9.39 - 9.42	0.6	12	A
	9.72 - 9.75	0.6	12	A
	10.39 - 10.43	0.5	10	A
	10.76 - 10.80	0.6	12	A
	11.27 - 11.30	0.5	10	A
	11.72 - 11.75	0.9	18	A
	12.32 - 12.35	0.7	14	A
	12.74 - 12.77	1.3	26	A
	13.14 - 13.18	2.3	46	A
	13.50 - 13.52	1.3	26	A
	13.76 - 13.80	1	20	A
	14.31 - 14.34	2.5	50	A
	14.76 - 14.79	1.7	34	A
	15.22 - 15.26	2.3	46	A
	15.74 - 15.78	1.8	36	A
	16.20 - 16.24	1.9	38	A
	16.73 - 16.77	2.4	48	A
	16.91 - 16.95	2.2	44	A
7	6.24 - 6.26	0.2	4	A
	6.76 - 6.79	0.3	6	A
	7.16 - 7.18	0.5	10	A
	7.69 - 7.71	0.4	8	A
	8.24 - 8.26	2	40	A
	8.71 - 8.75	1.1	22	A

NOTE: SEE PAGE 10

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client: TTW **Ref No:** 36466BF

Project: Proposed S5 Data Centre **Report:** C

Location: 34 Waterloo Road, MACQUARIE PARK, NSW **Report Date:** 11/01/24

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
7	9.24 - 9.28	1	20	A
	9.87 - 9.89	0.7	14	A
	10.54 - 10.57	1	20	A
	10.83 - 10.85	2.3	46	A
	11.54 - 11.56	0.6	12	A
	11.85 - 11.87	1.2	24	A
	12.16 - 12.20	1.5	30	A
	12.61 - 12.63	0.8	16	A
	12.89 - 12.91	1.4	28	A
	13.16 - 13.19	0.6	12	A
	13.61 - 13.64	1.6	32	A
	14.27 - 14.30	1.8	36	A
	14.72 - 14.75	2	40	A
	15.21 - 15.24	1	20	A
	15.83 - 15.87	2.1	42	A
	16.08 - 16.11	0.6	12	A
9	7.30 - 7.33	0.5	10	A
	7.71 - 7.73	0.4	8	A
	8.21 - 8.24	0.7	14	A
	8.76 - 8.78	0.9	18	A
	9.05 - 9.07	1	20	A
	10.10 - 10.14	0.9	18	A
	10.71 - 10.74	0.6	12	A
	11.23 - 11.26	0.7	14	A
	11.77 - 11.80	0.6	12	A

NOTE: SEE PAGE 10

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client: TTW **Ref No:** 36466BF

Project: Proposed S5 Data Centre **Report:** C

Location: 34 Waterloo Road, MACQUARIE PARK, NSW **Report Date:** 11/01/24

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
9	12.19 - 12.21	0.7	14	A
	12.89 - 12.92	0.4	8	A
	13.16 - 13.19	1	20	A
	13.40 - 13.43	0.8	16	A
	13.67 - 13.71	1.2	24	A
	14.23 - 14.27	2.6	52	A
	14.81 - 14.85	1.2	24	A
	15.21 - 15.24	2.7	54	A
	15.76 - 15.80	1.6	32	A
	16.07 - 16.10	4.4	88	A
	16.21 - 16.24	1.5	30	A
	16.34 - 16.38	2.5	50	A
12	10.46 - 10.49	1.2	24	A
	10.61 - 10.63	0.5	10	A
	11.26 - 11.29	1.3	26	A
	11.79 - 11.81	1.7	34	A
	12.31 - 12.35	1.7	34	A
	12.76 - 12.79	2.1	42	A
	13.28 - 13.32	2	40	A
	13.77 - 13.80	2.3	46	A
	14.30 - 14.33	1.8	36	A
	14.75 - 14.77	1	20	A
	15.32 - 15.35	1.3	26	A
	15.70 - 15.74	0.9	18	A
	16.18 - 16.21	0.9	18	A

NOTE: SEE PAGE 10

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	TTW	**Ref No:**	36466BF
Project:	Proposed S5 Data Centre	**Report:**	C
Location:	34 Waterloo Road, MACQUARIE PARK, NSW	**Report Date:**	11/01/24

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
12	16.67 - 16.71	1.1	22	A
	17.10 - 17.13	0.4	8	A
14	5.21 - 5.24	0.4	8	A
	6.44 - 6.47	0.6	12	A
	7.27 - 7.29	0.2	4	A
	7.60 - 7.63	0.4	8	A
	8.26 - 8.28	1.2	24	A
	8.82 - 8.84	0.8	16	A
	8.92 - 8.94	0.8	16	A
	9.15 - 9.18	0.8	16	A
	9.53 - 9.55	0.7	14	A
	10.23 - 10.25	0.5	10	A
	10.83 - 10.86	1.6	32	A
	11.71 - 11.73	1.6	32	A
	13.09 - 13.11	1	20	A
	13.68 - 13.70	0.8	16	A
	14.35 - 14.38	0.7	14	A
	14.64 - 14.66	0.6	12	A
18	1.70 - 1.73	0.6	12	A
	2.05 - 2.08	0.3	6	A
	2.55 - 2.59	0.3	6	A
	3.43 - 3.45	0.3	6	A
	3.90 - 3.92	0.3	6	A
	4.55 - 4.57	0.5	10	A
	5.13 - 5.15	0.2	4	A

NOTE: SEE PAGE 10

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	TTW	**Ref No:**	36466BF
Project:	Proposed S5 Data Centre	**Report:**	C
Location:	34 Waterloo Road, MACQUARIE PARK, NSW	**Report Date:**	11/01/24

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
18	5.86 - 5.88	0.3	6	A
	6.25 - 6.29	0.9	18	A
	6.47 - 6.49	0.4	8	A
	7.09 - 7.11	0.7	14	A
	7.78 - 7.81	1.4	28	A
	8.03 - 8.06	1.1	22	A
	8.87 - 8.90	1	20	A
	9.26 - 9.28	2.1	42	A
	10.21 - 10.25	0.8	16	A
	10.76 - 10.80	0.7	14	A
	11.04 - 11.06	1.8	36	A
	11.40 - 11.44	0.9	18	A
	11.75 - 11.78	0.8	16	A
	12.23 - 12.26	0.5	10	A
	12.57 - 12.60	0.7	14	A
	12.77 - 12.80	0.9	18	A
21	7.65 - 7.67	0.4	8	A
	7.81 - 7.83	0.2	4	A
	8.29 - 8.32	0.5	10	A
	8.91 - 8.94	0.5	10	A
	9.25 - 9.28	0.8	16	A
	9.74 - 9.77	0.9	18	A
	10.00 - 10.04	1	20	A
	10.74 - 10.78	0.8	16	A
	11.18 - 11.20	1.6	32	A

NOTE: SEE PAGE 10

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	TTW	**Ref No:**	36466BF
Project:	Proposed S5 Data Centre	**Report:**	C
Location:	34 Waterloo Road, MACQUARIE PARK, NSW	**Report Date:**	11/01/24

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
21	11.68 - 11.71	1.1	22	A
	12.19 - 12.22	1.3	26	A
	12.70 - 12.73	0.6	12	A
	13.24 - 13.27	1	20	A
	13.71 - 13.74	0.7	14	A
	14.25 - 14.28	0.8	16	A
	14.87 - 14.89	0.8	16	A
	15.24 - 15.27	1	20	A
	15.55 - 15.58	1.6	32	A
	15.80 - 15.82	0.6	12	A
	16.31 - 16.34	0.7	14	A
	16.75 - 16.77	1.2	24	A
	17.28 - 17.31	0.4	8	A
	17.61 - 17.65	1.5	30	A
	18.00 - 18.01	0.8	16	A
24	8.02 - 8.04	0.3	6	A
	8.36 - 8.38	0.2	4	A
	9.43 - 9.46	0.9	18	A
	9.95 - 9.99	1	20	A
	10.16 - 10.19	0.9	18	A
	10.76 - 10.79	0.8	16	A
	11.29 - 11.32	0.6	12	A
	11.71 - 11.74	0.6	12	A
	12.16 - 12.19	0.8	16	A
26	6.41 - 6.43	0.6	12	A

NOTE: SEE PAGE 10

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	TTW	**Ref No:**	36466BF
Project:	Proposed S5 Data Centre	**Report:**	C
Location:	34 Waterloo Road, MACQUARIE PARK, NSW	**Report Date:**	11/01/24

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
26	6.88 - 6.91	0.8	16	A
	7.30 - 7.34	0.8	16	A
	7.90 - 7.93	0.9	18	A
	8.12 - 8.15	1.8	36	A
	8.66 - 8.68	1	20	A
	9.27 - 9.31	0.7	14	A
	9.57 - 9.61	0.9	18	A
	10.20 - 10.23	1	20	A
	10.70 - 10.73	1.3	26	A
	11.16 - 11.20	0.8	16	A
	11.52 - 11.55	0.5	10	A
	12.21 - 12.24	0.9	18	A
	12.82 - 12.86	0.9	18	A
	13.17 - 13.19	0.4	8	A
	13.73 - 13.76	0.8	16	A
	14.08 - 14.11	1.4	28	A
27	7.09 - 7.12	0.1	2	A
	7.97 - 7.99	0.5	10	A
	8.08 - 8.12	0.2	4	A
	8.58 - 8.61	0.5	10	A
	9.16 - 9.20	1.3	26	A
	9.75 - 9.79	0.7	14	A
	10.13 - 10.16	0.6	12	A
	10.82 - 10.85	0.8	16	A
	11.17 - 11.21	1.2	24	A

NOTE: SEE PAGE 10

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	TTW	**Ref No:**	36466BF
Project:	Proposed S5 Data Centre	**Report:**	C
Location:	34 Waterloo Road, MACQUARIE PARK, NSW	**Report Date:**	11/01/24

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
27	11.67 - 11.71	1	20	A
	12.42 - 12.45	1.2	24	A
	12.72 - 12.76	0.8	16	A
	13.21 - 13.23	0.6	12	A
	13.66 - 13.68	1	20	A
	14.58 - 14.61	0.3	6	A
	14.93 - 14.96	1.4	28	A
	15.27 - 15.31	0.8	16	A
	15.57 - 15.60	1.4	28	A
	15.95 - 15.98	2.8	56	A
	16.09 - 16.12	2.6	52	A
	16.83 - 16.86	2.7	54	A
	17.10 - 17.14	1	20	A
	17.48 - 17.51	1.1	22	A
	17.70 - 17.74	1.5	30	A
29	10.05 - 10.09	1.1	22	A
	10.91 - 10.93	1.6	32	A
	11.06 - 11.08	2.4	48	A
	11.40 - 11.42	0.5	10	A
	11.76 - 11.78	0.6	12	A
	12.30 - 12.32	1	20	A
	12.93 - 12.95	0.9	18	A
	13.16 - 13.18	1.1	22	A
	13.87 - 13.91	0.9	18	A
	14.16 - 14.19	1.1	22	A

NOTE: SEE PAGE 10

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	TTW	**Ref No:**	36466BF
Project:	Proposed S5 Data Centre	**Report:**	C
Location:	34 Waterloo Road, MACQUARIE PARK, NSW	**Report Date:**	11/01/24
		Page 9 of 10	

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
29	14.60 - 14.64	0.7	14	A
	15.31 - 15.34	0.7	14	A
	15.77 - 15.80	0.8	16	A
	16.15 - 16.17	1	20	A
	16.72 - 16.74	0.8	16	A
	17.14 - 17.17	1.1	22	A
	17.75 - 17.78	1.6	32	A
	18.20 - 18.23	2	40	A
	18.74 - 18.77	3.6	72	A
	19.01 - 19.04	3.6	72	A
33	4.59 - 4.61	0.2	4	A
	4.82 - 4.84	0.4	8	A
	5.23 - 5.26	0.4	8	A
	5.69 - 5.71	1.5	30	A
	6.04 - 6.07	0.7	14	A
	6.58 - 6.62	1.2	24	A
	6.88 - 6.91	0.8	16	A
	7.21 - 7.24	1.2	24	A
	7.81 - 7.83	0.9	18	A
	8.38 - 8.41	1.1	22	A
	8.93 - 8.96	1.2	24	A
	9.19 - 9.22	1.1	22	A
	9.73 - 9.76	0.7	14	A
	9.86 - 9.89	1.1	22	A
	10.39 - 10.41	1.9	38	A

NOTE: SEE PAGE 10

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	TTW	**Ref No:**	36466BF
Project:	Proposed S5 Data Centre	**Report:**	C
Location:	34 Waterloo Road, MACQUARIE PARK, NSW	**Report Date:**	11/01/24

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
33	10.61 - 10.65	0.9	18	A
	10.81 - 10.84	0.8	16	A
	11.22 - 11.25	0.5	10	A
	11.88 - 11.91	0.4	8	A
	12.23 - 12.25	1.3	26	A
	12.72 - 12.75	0.4	8	A
	13.05 - 13.08	0.4	8	A
	13.45 - 13.49	0.6	12	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 $I_{S(50)}$.

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client: TTW **Ref No:** 36466BF

Project: Proposed S5 Data Centre **Report:** C

Location: 34 Waterloo Road, Macquarie Park **Report Date:** 30/01/25

BOREHOLE NUMBER	DEPTH (m)	$I_{S(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
301	8.91 - 8.93	0.5	10	A
	9.29 - 9.31	0.3	6	A
	9.29 - 9.31	0.3	6	A
	9.79 - 9.82	0.2	4	A
	10.11 - 10.15	0.5	10	A
	10.63 - 10.68	1.7	34	A
	11.22 - 11.26	1.5	30	A
	11.87 - 11.90	2	40	A
	12.28 - 12.32	1.4	28	A
	12.80 - 12.84	1.1	22	A
	13.09 - 13.12	1	20	A
	13.46 - 13.50	0.9	18	A
	13.77 - 13.80	1	20	A
	14.27 - 14.30	0.6	12	A
	14.88 - 14.93	0.9	18	A
	15.37 - 15.41	1.3	26	A
	15.80 - 15.84	1.7	34	A
	16.25 - 16.29	1.8	36	A
	16.87 - 16.91	3.1	62	A
	17.18 - 17.23	2.8	56	A
	17.66 - 17.70	1.9	38	A
	18.09 - 18.14	3.5	70	A
	18.81 - 18.85	3.2	64	A
	19.20 - 19.25	2.4	48	A
	19.70 - 19.73	2.8	56	A

NOTE: SEE PAGE 5

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client: TTW **Ref No:** 36466BF

Project: Proposed S5 Data Centre **Report:** C

Location: 34 Waterloo Road, Macquarie Park **Report Date:** 30/01/25

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
301	20.09 - 20.14	2.3	46	A
	20.85 - 20.89	2.3	46	A
	21.22 - 21.26	2.8	56	A
	21.75 - 21.80	2	40	A
	22.00 - 22.04	2.3	46	A
	23.07 - 23.12	1.8	36	A
	23.90 - 23.95	2.4	48	A
	24.14 - 24.18	2.5	50	A
	24.56 - 24.59	2.5	50	A
	25.05 - 25.07	2.2	44	A
	26.32 - 26.36	1.6	32	A
	26.87 - 26.91	1.4	28	A
	27.03 - 27.06	2.1	42	A
	27.43 - 27.46	0.9	18	A
	27.88 - 27.91	0.8	16	A
	28.10 - 28.14	1	20	A
	28.78 - 28.83	0.8	16	A
	29.15 - 29.19	1.3	26	A
	29.69 - 29.72	1.3	26	A
	30.08 - 30.11	0.8	16	A
	30.80 - 30.83	0.7	14	A
	31.18 - 31.21	0.8	16	A
	31.80 - 31.82	1	20	A
	32.21 - 32.24	0.9	18	A
	32.89 - 32.92	1	20	A

NOTE: SEE PAGE 5

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client: TTW **Ref No:** 36466BF

Project: Proposed S5 Data Centre **Report:** C

Location: 34 Waterloo Road, Macquarie Park **Report Date:** 30/01/25

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
301	33.05 - 33.09	1.1	22	A
	33.64 - 33.68	1.1	22	A
	34.15 - 34.17	1.1	22	A
	34.74 - 34.78	0.9	18	A
	35.13 - 35.16	0.8	16	A
	35.83 - 35.86	0.9	18	A
	36.21 - 36.25	1	20	A
	36.77 - 36.81	0.9	18	A
	37.15 - 37.19	1.3	26	A
	37.72 - 37.76	1.6	32	A
	38.15 - 38.18	1.7	34	A
	38.87 - 38.90	1.8	36	A
	39.16 - 39.20	1.6	32	A
	39.81 - 39.84	1.8	36	A
	40.03 - 40.07	1.5	30	A
302	8.78 - 8.82	0.3	6	A
	9.34 - 9.37	0.2	4	A
	9.75 - 9.80	0.6	12	A
	10.26 - 10.29	0.8	16	A
	10.90 - 10.93	0.8	16	A
	11.13 - 11.17	1.2	24	A
	11.88 - 11.91	0.8	16	A
	12.01 - 12.06	0.4	8	A
	12.91 - 12.94	1.3	26	A
	13.33 - 13.37	2.3	46	A

NOTE: SEE PAGE 5

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	TTW	**Ref No:**	36466BF
Project:	Proposed S5 Data Centre	**Report:**	C
Location:	34 Waterloo Road, Macquarie Park	**Report Date:**	30/01/25
		Page 4 of 5	

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
302	13.74 - 13.78	1.3	26	A
	14.04 - 14.08	1.5	30	A
	14.88 - 14.92	0.7	14	A
	15.15 - 15.19	0.7	14	A
	15.69 - 15.74	1.5	30	A
	16.25 - 16.29	1.5	30	A
	16.87 - 16.90	1.3	26	A
	17.32 - 17.36	1	20	A
	17.75 - 17.78	2	40	A
	18.19 - 18.23	0.7	14	A
	18.88 - 18.91	2.5	50	A
	19.12 - 19.16	1.6	32	A
	19.70 - 19.75	1.5	30	A
	20.22 - 20.25	0.4	8	A
	20.82 - 20.86	2.1	42	A
	21.14 - 21.19	1	20	A
	21.74 - 21.77	0.8	16	A
	22.21 - 22.26	0.6	12	A
	22.88 - 22.91	1.3	26	A
	23.25 - 23.29	0.5	10	A
	23.75 - 23.80	0.6	12	A
	24.21 - 24.25	1.6	32	A
	24.87 - 24.91	0.5	10	A
	25.28 - 25.32	0.8	16	A
	25.69 - 25.74	1.1	22	A

NOTE: SEE PAGE 5

TABLE C
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	TTW	**Ref No:**	36466BF
Project:	Proposed S5 Data Centre	**Report:**	C
Location:	34 Waterloo Road, Macquarie Park	**Report Date:**	30/01/25
		Page 5 of 5	

BOREHOLE NUMBER	DEPTH (m)	$I_{S\,(50)}$ (MPa)	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)	TEST DIRECTION
302	26.17 - 26.22	1.3	26	A
	26.87 - 26.91	0.9	18	A
	27.23 - 27.28	1.5	30	A
	27.76 - 27.79	0.9	18	A
	28.35 - 28.39	1.3	26	A
	28.86 - 28.90	1	20	A
	29.20 - 29.23	1	20	A
	29.65 - 29.68	0.9	18	A
	30.05 - 30.09	1.1	22	A
	30.63 - 30.66	1.6	32	A
	31.02 - 31.05	1.4	28	A
	31.88 - 31.92	1.3	26	A
	32.25 - 32.29	1.2	24	A
	32.70 - 32.75	0.6	12	A
	33.03 - 33.07	1.1	22	A
	33.90 - 33.94	1.3	26	A
	34.15 - 34.20	1.9	38	A
	34.71 - 34.75	1.7	34	A
	35.04 - 35.09	2.6	52	A
	35.84 - 35.89	2.2	44	A
	36.08 - 36.12	1.6	32	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 $I_{S(50)}$.

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CERTIFICATE OF ANALYSIS 339676

Client Details

Client	JK Geotechnics
Attention	Cho Sum Yip
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**36466BF, Propsed S5 Data Centre - Macquarie Park**
Number of Samples	5 Soil, 2 Aggregate
Date samples received	07/12/2023
Date completed instructions received	07/12/2023

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	14/12/2023
Date of Issue	14/12/2023

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Results Approved By
Diego Bigolin, Inorganics Supervisor

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		339676-1	339676-2	339676-3	339676-4	339676-5
Your Reference	UNITS	BH9	BH9	BH14	BH24	BH26
Depth		0.9-1.0	3-3.35	1.4-1.5	2.9-3.0	3.9-4.2
Date Sampled		04/12/2023	04/12/2023	28/11/2023	30/11/2023	30/11/2023
Type of sample		Soil	Soil	Soil	Soil	Aggregate
Date prepared	-	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023
Date analysed	-	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023
pH 1:5 soil:water	pH Units	8.8	4.5	4.5	4.6	5.6
Chloride, Cl 1:5 soil:water	mg/kg	<10	<10	73	10	10
Sulphate, SO4 1:5 soil:water	mg/kg	170	77	140	110	100
Resistivity in soil*	ohm m	44	190	110	99	400

Misc Inorg - Soil			
Our Reference		339676-6	339676-7
Your Reference	UNITS	BH27	BH29
Depth		0.5-0.7	7.5-7.8
Date Sampled		04/12/2023	05/12/2023
Type of sample		Soil	Aggregate
Date prepared	-	13/12/2023	13/12/2023
Date analysed	-	13/12/2023	13/12/2023
pH 1:5 soil:water	pH Units	7.6	5.2
Chloride, Cl 1:5 soil:water	mg/kg	10	10
Sulphate, SO4 1:5 soil:water	mg/kg	100	110
Resistivity in soil*	ohm m	57	230

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	339676-2
Date prepared	-			13/12/2023	1	13/12/2023	13/12/2023		13/12/2023	13/12/2023
Date analysed	-			13/12/2023	1	13/12/2023	13/12/2023		13/12/2023	13/12/2023
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	8.8	8.7	1	101	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	<10	<10	0	105	104
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	170	160	6	100	125
Resistivity in soil*	ohm m	1	Inorg-002	<1	1	44	43	2	[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

Samples received in good order: Holding time exceedance

JKGeotechnics

BOREHOLE LOG

Borehole No. 5

1 / 4

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~58.5 m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** Q.V./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									-	ASPHALTIC CONCRETE: 30mm.t	D			APPEARS POORLY COMPACTED
										FILL: Gravelly sand, fine to coarse grained, dark grey and grey, fine to medium grained igneous and ironstone gravel, trace of clay nodules.	w>PL			
				■	N = 6 2,3,3	58				FILL: Silty clay, high plasticity, grey, brown and dark grey, with fine to medium grained igneous, ironstone and sandstone gravel, trace of fine to medium grained sand and ash.			200 210 220	
							1							
				■	N = 6 2,3,3	57							230 210 180	
							2		CH	Silty CLAY: high plasticity, light grey, orange brown and red brown, with fine to medium grained ironstone gravel.	w~PL	Hd		RESIDUAL
				■	N = 29 13,14,15	56			-	Extremely Weathered siltstone: silty CLAY, low plasticity, light grey, grey and red brown, with fine to medium grained ironstone gravel.	XW	Hd	>600 >600	ASHFIELD SHALE
						55	3			SILTSTONE: grey, dark grey and red brown, with occasional extremely weathered and iron indurated bands.	DW	VL		VERY LOW 'TC' BIT RESISTANCE
				■		54	4							
							5							
				■		53								
							6							
						52								VERY LOW TO LOW RESISTANCE

JKGeotechnics

BOREHOLE LOG

Borehole No. 5

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~58.5 m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** Q.V./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
						51			-	SILTSTONE: grey, dark grey and red brown, with occasional extremely weathered and iron indurated bands. *(continued)*	DW	VL - L		
						50	8			SILTSTONE: dark grey and grey, with occasional iron indurated bands.		L - M		LOW TO MODERATE RESISTANCE
										REFER TO CORED BOREHOLE LOG		M		MODERATE RESISTANCE
						49	9							
						48	10							
						47	11							
						46	12							
						45	13							

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 5 3 / 4

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~58.5 m

Date: 3/1/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** Q.V./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			START CORING AT 8.56m						
80% RETURN		49	9		NO CORE 0.10m SILTSTONE: dark grey and grey, bedded at 0-5°.	SW	M	0.30 0.60 0.60 0.50 0.60 0.50		(8.69m) J x 2, 90°, Ir, S, Fe Sn (8.92m) J, 90°, Ir, S, Fe Sn (9.07m) Be, 0°, P, S, Fe Vn (9.26m) J, 90°, Ir, S, Fe Sn (9.87m) J, 90°, Un, S, Fe Ct (10.04m) J, 20°, P, S, Cn (10.28m) J, 90°, C, S, Clay FILLED, 1 mm.t (10.90m) J, 10°, P, S, Clay FILLED, 2 mm.t	Ashfield Shale
		48	10								
		47	11								
		46	12		LAMINITE: Siltstone, dark grey and grey, and Sandstone, fine grained, light grey, bedded at 0-10°.			0.90 0.70	600 200 60 20	(11.40m) Be, 0°, P, S, Clay FILLED, 1 mm.t (11.65m) J, 90°, C, S, Cn (11.87m) Be, 0°, P, S, Clay FILLED, 1 mm.t (12.11m) XWS, 0°, 10 mm.t (12.25m) XWS, 0°, 25 mm.t (12.39m) XWS, 0°, 10 mm.t (12.43m) XWS, 5°, 10 mm.t	
30% RETURN		45	13		SANDSTONE: fine to medium grained, light grey, with dark grey laminae and occasional siltstone bands, bedded at 0-15°.	FR	H	1.3 2.3 1.3 1.0		(12.63m) CS, 0°, 55 mm.t (12.82m) J, 25°, Un, R, Cn (13.04m) Be, 0°, P, R, Cn (13.11m) Be, 0°, P, R, Clay FILLED, 1 mm.t	Hawkesbury Sandstone
		44	14					2.5 1.7	600 200 60 20	(14.25m) Be, 5°, P, S, Cn (14.64m) Be, 15°, P, S, Cn	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 5

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~58.5 m

Date: 3/1/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** Q.V./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
30% RETURN		43	16		SANDSTONE: fine to medium grained, light grey, with dark grey laminae and occasional siltstone bands, bedded at 0-15°. *(continued)*	FR	H	2.3, 1.8, 1.9, 2.4, 2.2			Hawkesbury Sandstone
		42									
			17		END OF BOREHOLE AT 16.98 m						
		41	18								
		40	19								
		39									
		38	20								
		37	21								

JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 36466BF MACQUARIEPARK.GPJ <<DrawingFile>> 12/03/2024 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

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466BF
Borehole No: BH5
Depth: 8.56m to 16.98m
KODAK Gray Scale
KODAK Color Control Patches
36466 BF BH5 START CORING AT 8.56 m.
8
9
10
11
12
13
14
15
16
NO CORE 0.10m.
END OF BOREHOLE AT 16.98m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 7

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~61.1 m

Date: 5/1/24 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** J.F./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						61			-	ASPHALTIC CONCRETE: 50mm.t	M			APPEARS WELL COMPACTED
										FILL: Gravelly sand, fine to medium grained, grey, fine to medium grained igneous gravel.	w<PL			
				■	N = 28 4,11,17					FILL: Silty clay, high plasticity, light grey and red brown, trace of fine to medium grained ironstone gravel.			>600 >600 >600	
						60	1							
									-	Extremely Weathered siltstone: silty CLAY, high plasticity, grey, with iron indurated bands.	XW	Hd		ASHFIELD SHALE
				■	N > 16 8,16/ 100mm REFUSAL								>600 >600 >600	
										SILTSTONE: grey, with iron indurated bands.	DW	VL		VERY LOW 'TC' BIT RESISTANCE WITH MODERATE BANDS
						59	2							
						58	3			as above, but with extremely weathered and iron indurated bands.		L		LOW RESISTANCE WITH VERY LOW AND MODERATE BANDS
				■		57	4							
							5							
				■		56				SILTSTONE: dark grey, with iron indurated bands.		L - M		LOW TO MODERATE RESISTANCE WITH VERY LOW BANDS
										REFER TO CORED BOREHOLE LOG				
						55	6							

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 7

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~61.1 m

Date: 5/1/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** J.F./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
		56			START CORING AT 5.42m						
					NO CORE 0.46m						
98% RETURN		55	6		SILTSTONE: dark grey, with grey laminae and red brown bands, bedded at 0-10°.	HW	L - M	0.20		(5.90m) Be, 0°, P, S, Fe Vn (5.91m) Be, 0°, P, S, Fe Vn (5.96m) Be, 0°, P, S, Fe Vn (5.97m) Be, 0°, P, S, Fe Vn (6.00m) Be, 0°, P, S, Fe Vn (6.01m) Be, 0°, P, S, Fe Vn (6.03m) Be, 0°, P, S, Fe Ct (6.04m) Be, 0°, P, S, Fe Vn (6.11m) Be, 0°, P, S, Fe Vn (6.31m) Cr, 0°, 10 mm.t (6.38m) Be, 10°, P, S, Fe Vn (6.40m) Cr, 0°, 10 mm.t (6.42m) Be, 10°, Ir, S, Fe Vn (6.46m) Be, 0°, P, S, Fe Vn (6.47m) Be, 0°, P, S, Fe Vn (6.49m) Cr, 0°, 10 mm.t (6.52m) Cr, 0°, 10 mm.t (6.55m) Be, 5°, P, S, Fe Vn (6.55m) Be, 0°, P, S, Fe Vn (6.63m) J, 15°, P, S, Fe Vn (6.64m) Be, 0°, P, S, Fe Ct (6.73m) Cr, 0°, 70 mm.t (6.81m) Cr, 0°, 10 mm.t (6.85m) Be, 0°, P, S, Fe Vn (6.93m) Cr, 0°, 80 mm.t (7.00m) Be, 5°, P, S, Fe Ct (7.07m) Cr, 5°, 10 mm.t (7.10m) Be, 10°, P, S, Fe Vn (7.14m) Cr, 0°, 10 mm.t (7.34m) J, 65°, Un, S, Cn (7.51m) Cr, 0°, 90 mm.t (7.60m) Jh, 20°, P (7.61m) Be, 0°, P, S, Fe Vn (7.64m) Be, 5°, P, S, Fe Vn (7.68m) Be, 0°, P, S, Fe Vn (7.75m) Cr, 10°, 6 mm.t (7.81m) Cr, 0°, 6 mm.t (7.88m) Be, 0°, P, S, Fe Vn (7.90m) Be, 0°, P, S, Fe Vn (8.16m) Be, 10°, P, S, Fe Vn (8.19m) J, 25°, P, S, Cn (8.27m) J, 40°, P, S, Cn (8.31m) J, 35°, P, S, Fe Vn (8.36m) J, 40°, P, S, Fe Vn (8.43m) J, 75°, P, S, Fe Vn (8.48m) Cr, 0°, 70 mm.t (8.79m) J, 30°, Ir, S, Cn (9.40m) J, 60°, P, S, Cn (9.46m) Jh, 60°, P (9.52m) J, 70°, P, S, Cn (9.58m) J, 30°, P, S, Cn (9.69m) J, 60°, P, S, Cn (9.72m) J, 25°, P, S, Cn (9.82m) J, 20°, P, S, Cn (10.02m) J, 80°, P, S, Cn (10.16m) J x 2, 80°, P, S, Cn (10.26m) J, 80°, P, S, Cn (10.49m) J, 30°, P, S, Clay Vn (11.14m) J, 75°, P, S, Cn (11.30m) J, 75°, P, S, Cn (11.36m) CS, 0°, 15 mm.t (11.40m) Jh, 65°, P	Ashfield Shale
		54	7			MW	M	0.50			
		53	8		SILTSTONE: dark grey, with grey laminae, bedded at 0-10°.	SW	M - H	0.40 2.0 1.1			
		52	9					1.0			
		51	10					0.70 1.0			
		50	11					2.3 0.60 1.2			

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 7 **3 / 3**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~61.1 m

Date: 5/1/24 **Inclination:** VERTICAL **Datum:** AHD

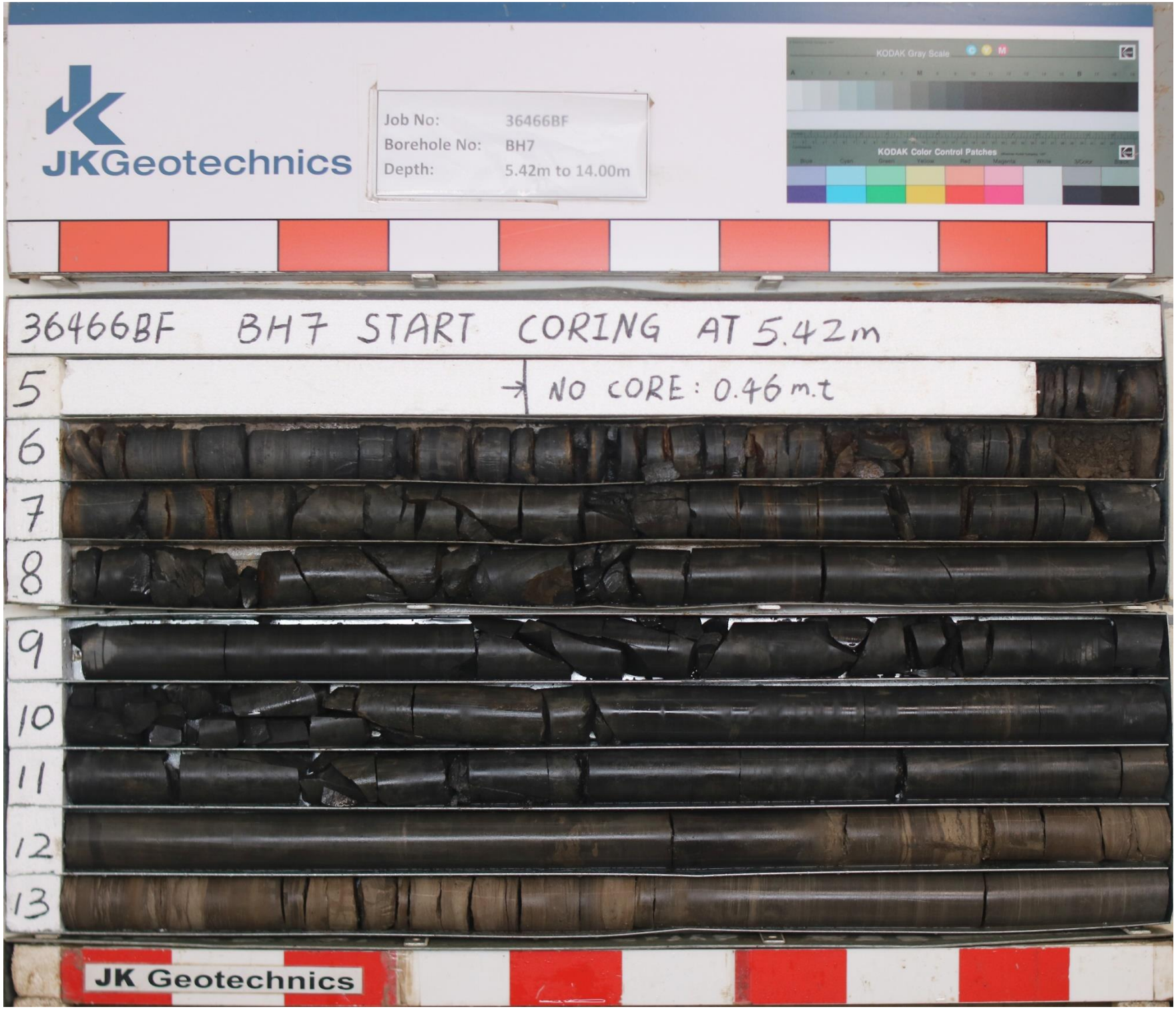
Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** J.F./O.F.

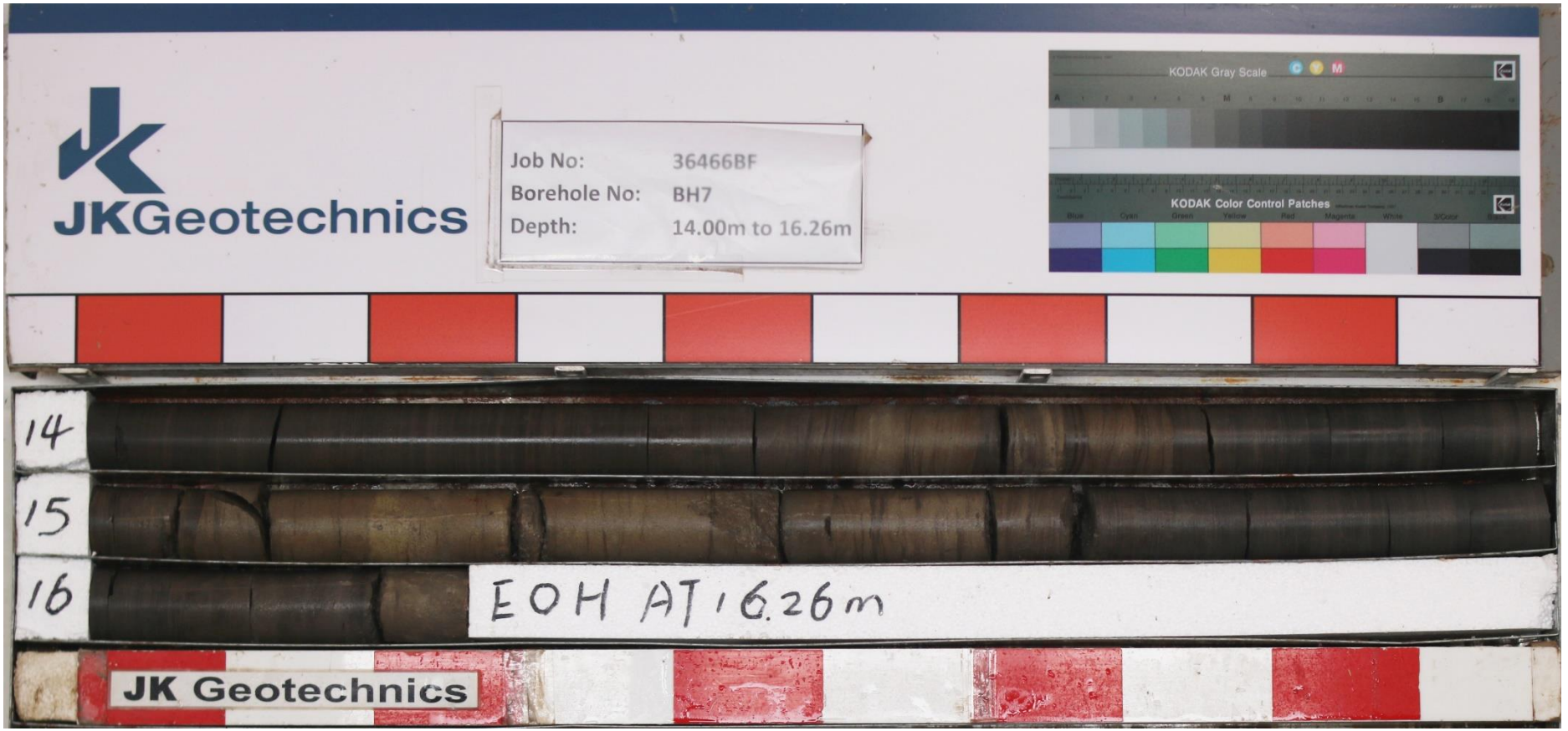
Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness)	Formation
98% RETURN		49			SILTSTONE: dark grey, with grey laminae, bedded at 0-10°. *(continued)*	SW	M - H	1.5			
								0.80		(12.71m) Be, 0°, P, S, Clay FILLED	
										(12.84m) XWS, 0°, 5 mm.t	
			13		LAMINITE: Siltstone, dark grey and grey, and Sandstone, fine to medium grained, light grey, bedded at 0-10°.			1.4		(12.98m) Jh, 85°, P	
		48						0.60		(13.24m) Be, 5°, P, R, Cb Vn	
								1.6			
			14								
		47						1.8			
								2.0		(14.66m) CS, 10°, 10 mm.t	
										(14.76m) Be, 5°, P, R, Clay Vn	
			15							(15.06m) Be, 0°, P, S, Clay Vn	
		46			SANDSTONE: fine to medium grained, grey, with dark grey laminae, bedded at 0-5°.			1.0		(15.29m) Be, 0°, P, R, Clay Vn	
										(15.44m) J, 65°, P, R, Cn	
					as above, but fine grained and dark grey.					(15.67m) Be, 5°, P, R, Clay Vn	
								2.1			
		45	16					0.60		(16.11m) Be, 0°, P, S, Clay Vn	
										(16.20m) Be, 0°, P, S, Clay Vn	
					SANDSTONE: fine to medium grained, grey, bedded at 0-5°.						
					END OF BOREHOLE AT 16.26 m						
		44	17								
		43	18								

Ashfield Shale

JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 36466BF MACQUARIEPARK.GPJ <<DrawingFile>> 12/03/2024 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

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466BF
Borehole No: BH7
Depth: 5.42m to 14.00m
KODAK Gray Scale
KODAK Color Control Patches
36466BF BH7 START CORING AT 5.42m
5
NO CORE : 0.46 m.t
6
7
8
9
10
11
12
13
JK Geotechnics


JKGeotechnics
Job No: 36466BF
Borehole No: BH7
Depth: 14.00m to 16.26m
KODAK Gray Scale
KODAK Color Control Patches
14
15
16
EOH AT 16.26m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 9

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~62.3 m

Date: 4/12/23 TO 5/12/23 **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						62			-	ASPHALTIC CONCRETE: 35mm.t	M			
					N=SPT 8/ 50mm REFUSAL					FILL: Gravelly silty sand, fine to coarse grained, grey brown, fine to medium grained igneous and ironstone gravel. as above, but dark grey.				
							1			FILL: Silty clay, low plasticity, grey and brown, trace of fine grained igneous gravel and fine to medium grained sand.	w>PL			APPEARS POORLY COMPACTED POSSIBLY REWORKED NATURAL
					N = 8 2,3,5	61			CH	Silty CLAY: high plasticity, light grey mottled red brown, trace of fine to medium grained ironstone gravel, root fibres and ash.	w>PL	(St - VSt)	180 200 220	RESIDUAL
							2				w<PL	Hd		VERY LOW 'TC' BIT RESISTANCE BANDS
					N > 30 14,15,15/ 50mm REFUSAL	60							>600 >600 >600	
							3							
						59			-	Extremely Weathered siltstone: gravelly silty CLAY, medium plasticity, grey and red brown, with ironstone bands.	XW	Hd		ASHFIELD SHALE BANDED LOW RESISTANCE
							4							
						58								
							5			SILTSTONE: dark grey, with extremely weathered bands and iron indurated bands.	DW	VL - L		BANDED MODERATE RESISTANCE
						57								
							6							BANDED LOW RESISTANCE
						56								

JKGeotechnics

BOREHOLE LOG

Borehole No. 9

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~62.3 m

Date: 4/12/23 TO 5/12/23 **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
									-	SILTSTONE: dark grey, with extremely weathered bands and iron indurated bands.	DW	VL - L		MODERATE RESISTANCE
										REFER TO CORED BOREHOLE LOG				
						55								
							8							
						54								
							9							
						53								
							10							
						52								
							11							
						51								
							12							
						50								
							13							
						49								

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 9

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~62.3 m

Date: 4/12/23 TO 5/12/23 **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 7.15m						
90% RETURN		55	8		SILTSTONE: dark grey, bedded at 0-5°.	SW	M	0.50		(7.18m) J, 65°, P, S, Clay FILLED (7.25m) Jh, 20 - 30°, St, S, Fe Vn, x 2 (7.29m) Jh, 10 - 20°, Un, S, Fe Vn (7.34m) J, 10°, P, S, Cn (7.41m) J, 20°, St, S, Cn, x 2 (7.45m) J, 40 - 60°, P, S, Cn, x 2 (7.51m) Be, 0°, P, S, Fe Ct, and Clay, FILLED (7.54m) J, 45°, P, S, Fe Ct, and Clay, FILLED x 2 (7.58m) Be, 0°, S, Fe Vn (7.60m) J, 15°, P, S, Clay FILLED (7.64m) Be, P, S, Clay FILLED (7.74m) Be, P, S, Clay FILLED (7.88m) XWS, 0°, 40 mm.t (7.91m) J, 45°, P, S, Fe Sn	Ashfield Shale
		54				FR		0.40			
								0.70			
										(8.41m) Be, 0°, P, S, Fe Sn (8.49m) J, 50°, P, S, Fe Sn	
										(8.61m) J, 30°, P, S, Cn (8.68m) J, 40°, P, S, Cn	
		53	9					0.90			
								1.0			
										(9.60m) J, 90°, P, S, Cn	
		52	10					0.90		(10.20m) J, 30 - 40°, P, S, Cn, x 2 (10.24m) J, 25°, P, S, Cn (10.28m) Ji, 30°, P, S, Cn (10.30m) J, 80°, P, S, Cn (10.31m) J, 15°, P, S, Cn (10.39m) J, 30°, P, S, Cn (10.49m) J, 20°, P, S, Cn (10.68m) J, 40°, P, S, Cn	
								0.60			
		51	11							(10.96m) J, 80°, P, S, Cn	
								0.70			
										(11.34m) J, 30°, P, S, Cn (11.40m) J, 55°, C, S, Cn	
										(11.58m) J, 90°, Ir, S, Cn	
								0.60			
		50	12							(12.00m) J, 90°, C, S, Cn	
								0.70			
								0.40			
		49	13					1.0			
								0.80			
								1.2			
					LAMINITE: as below.		H			(13.89m) Be, 0°, P, S, Clay FILLED, 6 mm.t	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 9

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~62.3 m

Date: 4/12/23 TO 5/12/23 **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
90% RETURN		48	15		LAMINITE: Siltstone, dark grey, and Sandstone, fine to medium grained, light grey, bedded at 0-5°.	FR	H	2.6, 1.2, 2.7, 1.6, 4.4, 1.5, 2.5		(13.99m) CS, 0°, 15 mm.t (14.07m) Be, 0°, P, S, Clay FILLED, 7 mm.t (14.15m) XWS, 0°, 7 mm.t	Ashfield Shale
		47									
		46	16								
		45	17		END OF BOREHOLE AT 16.48 m						
		44	18								
		43	19								
		42	20								

JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 36466BF MACQUARIEPARK.GPJ <<DrawingFile>> 12/03/2024 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

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466BF
Borehole No: BH9
Depth: 7.15m to 16.00m
KODAK Gray Scale
KODAK Color Control Patches
36466BF BH9 START CORING AT 7.15m
7
8
9
10
11
12
13
14
15
JK Geotechnics


JKGeotechnics
Job No: 36466BF
Borehole No: BH9
Depth: 16.00m to 16.48m
KODAK Gray Scale
KODAK Color Control Patches
16
END OF BH9 AT 16.48m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 12

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~65.0 m

Date: 4/1/24 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** J.F./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										ASPHALTIC CONCRETE: 50mm.t				
									-	FILL: Gravelly sand, fine to medium grained, dark grey and brown, fine to medium grained sandstone, ironstone and igneous gravel, trace of clay nodules.	M			APPEARS MODERATELY COMPACTED
					N = 14 5,5,9	64	1							
										FILL: Silty clay, high plasticity, orange brown and dark grey, trace of fine to medium grained igneous and ironstone gravel.	w>PL		340 320 300	
					N = 11 5,4,7	63	2							
									-	Extremely Weathered siltstone: silty CLAY, high plasticity, grey and red brown, with iron indurated bands.	XW	Hd		ASHFIELD SHALE
					N > 21 9,9,12/ 100mm REFUSAL	62	3						>600 >600 >600	
										SILTSTONE: grey, with iron indurated bands.	DW	L		LOW 'TC' BIT RESISTANCE WITH MODERATE BANDS
						61	4							
										as above, but dark grey, with extremely weathered bands.				LOW RESISTANCE WITH VERY LOW BANDS
						60	5							
						59	6							

JKGeotechnics

BOREHOLE LOG

Borehole No. 12

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~65.0 m

Date: 4/1/24 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** J.F./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
									-	SILTSTONE: dark grey, with iron indurated and extremely weathered bands.	DW	L		
				■		57	8			SILTSTONE: dark grey, with iron indurated bands.				LOW RESISTANCE
				■		56	9							
				■		55	10					L - M		LOW TO MODERATE RESISTANCE
										REFER TO CORED BOREHOLE LOG				'TC' BIT REFUSAL
						54	11							
						53	12							
						52	13							

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 12 **3 / 4**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~65.0 m

Date: 4/1/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** J.F./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 10.32m						
98% RETURN		54	11		SILTSTONE: dark grey, with grey laminae, bedded at 0-5°.	SW	H	1.2, 0.50		(10.73m) Be, 5°, P, S, Clay Ct (10.78m) Cr, 0°, 50 mm.t (10.85m) J, 85°, P, S, Fe Vn (10.93m) Cr, 0°, 90 mm.t	Ashfield Shale
						FR		1.3		(11.38m) J, 70°, P, S, Cn	
								1.7		(11.74m) J, 60°, P, S, Cn	
		53	12					1.7		(12.12m) J, 40°, P, S, Cn (12.18m) J, 85°, P, S, Cn	
								2.1		(12.68m) J, 65°, P, S, Cn (12.81m) Cr, 0°, 10 mm.t (12.90m) J, 60°, P, S, Cn	
		52	13					2.0			
								2.3		(14.11m) J, 70°, P, S, Cn (14.20m) Be, 0°, P, S, Clay Ct	
		51	14					1.8		(14.51m) J, 25°, P, S, Clay Vn	
								1.0			
		50	15					1.3			
								0.90		(15.81m) CS, 0°, 50 mm.t (15.92m) Cr, 0°, 150 mm.t	
		49	16		LAMINITE: Siltstone, dark grey and grey, and Sandstone: fine to medium grained, light grey, bedded at 0-15°.	SW	M	0.90		(16.09m) J, 75°, P, R, Cn	
										(16.34m) Cr, 0°, 30 mm.t	
										(16.50m) Cr, 10°, 15 mm.t	
								1.1		(16.64m) Be, 15°, P, R, Clay Vn (16.64m) J, 90°, P, S, Cn	
										(16.85m) Be, 10°, P, R, Clay Ct	

JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 36466BF MACQUARIEPARK.GPJ <<DrawingFile>> 12/03/2024 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

CORED BOREHOLE LOG

Borehole No. 12 **4 / 4**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~65.0 m

Date: 4/1/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** J.F./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
					LAMINITE: Siltstone, dark grey and grey, and Sandstone: fine to medium grained, light grey, bedded at 0-15°.	SW	M	0.40			
					END OF BOREHOLE AT 17.20 m						
		47	18								
		46	19								
		45	20								
		44	21								
		43	22								
		42	23								

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466BF
Borehole No: BH12
Depth: 10.32m to 17.20m
KODAK Gray Scale
KODAK Color Control Patches
36466BF BH12 START CORING AT 10.32m
10
11
12
13
14
15
16
17
EOH AT 17.20m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 14

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~65.8 m

Date: 28/11/23 **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									-	ASPHALTIC CONCRETE: 18mm.t	D			
										FILL: Gravelly silty sand, fine to coarse grained, grey, fine to medium grained igneous gravel, trace of slag.				
									CL-Cl		w>PL	VSt		RESIDUAL
					N = 9 3,3,6					Gravelly silty CLAY: low to medium plasticity, grey, light grey and red brown, fine to medium grained siltstone and ironstone gravel.			250 290 350	
						65	1							
									-	Extremely Weathered siltstone: gravelly silty CLAY, high plasticity, light grey and red brown, with very low to low strength siltstone bands and ironstone bands.	XW	Hd		ASHFIELD SHALE VERY LOW 'TC' BIT RESISTANCE
						64	2							
									-	LAMINITE: Siltstone, light and dark grey, and Sandstone, fine grained, light grey, with dark grey sandstone laminae.	DW	L		BANDED LOW TO MODERATE RESISTANCE
										REFER TO CORED BOREHOLE LOG				
						63	3							
						62	4							
						61	5							
						60	6							
						59								

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 14 **2 / 3**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~65.8 m

Date: 28/11/23 **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)	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
					START CORING AT 2.55m						
85% RETURN		63	3		NO CORE 0.36m						
		62	4		Extremely Weathered siltstone: gravelly silty CLAY, low plasticity, light grey and grey, fine to medium grained siltstone and ironstone gravel.	XW	Hd				Ashfield Shale
		61	5		NO CORE 0.26m						
		60	6		SILTSTONE: dark grey, with light grey laminae, bedded at 0-10°.	SW	L	0.40	200	(4.83-5.83m) Bex multiple, 0 - 5°, P, R, Fe Sn, ~50mm spacing (4.83-5.83m) XWS, 0 - 5°, 10-15mm.t (5.40-5.90m) J x 6, 20 - 55°, P, R, Fe Sn	Ashfield Shale
		59	7					0.60		(5.83-7.00m) XWSx multiple, 0 - 5°, 10-50mm.t	
		58	8					0.20 0.40		(7.12-7.52m) XWS x 4, 0 - 5°, 10-30mm.t (7.00-8.18m) Bex multiple, 0 - 5°, P, R, Cn, or Fe, Sn	
							M	1.2		(7.70m) J, 85°, P, R, Fe Sn (7.88-8.03m) XWS x 2, 3°, 5-10mm.t (8.16-8.37m) XWS x 2, 0°, 2-5mm.t	
		57						0.80 0.80			

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 14 **3 / 3**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~65.8 m

Date: 28/11/23 **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		56	10		SILTSTONE: dark grey, with light grey laminae, bedded at 0-10°. *(continued)*	SW	M	0.80	600 200 60 20	(9.00m) J, 85°, P, R, Fe Sn (9.03m) XWS, 5°, 5 mm.t (9.05m) J, 70°, P, R, Fe Sn (8.18-10.00m) Bex multiple, 0 - 5°, P, R, Fe Sn	Ashfield Shale
								0.70		(9.47m) J, 60°, P, R, Fe Sn	
		55	11				M - H	0.50		(10.03m) Ji, 35°, P, R, Fe Sn (10.08-10.36m) Be x 3, 0 - 5°, P, R, Cn, or Fe, Sn	
								1.6		(10.56m) Be, 3°, P, R, Fe Sn, & J, IS, P, R, Fe, Sn	
		54	12					1.6		(11.00-12.00m) J x 2, 75 - 85°, P, R, Cn (11.42-11.92m) Cr x 3, 10°, 20-60mm.t	
										(12.24m) J, 60°, P, R, Cn (12.36m) Cr, 5°, 140 mm.t	
		53	13					1.0		(12.63m) J, 80°, P, R, Cn (12.90m) J, 80 - 90°, Un, R, Cn	
										(13.49m) Cr, 13°, 20 mm.t	
		52	14		as above, but with grey, fine grained sandstone bands, bedded at 0-5°.			0.80		(14.10m) J, 80°, P, R, Cn (14.18m) J, 80°, P, R, Cn	
								0.70			
		51	15					0.60		(14.75m) Be, 10°, Ir, R, Cn	
					END OF BOREHOLE AT 15.00 m					(15.00m) J, 35°, P, R, Cn	
		50							600 200 60 20		

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466BF
Borehole No: BH14
Depth: 2.55m to 11.00m
KODAK Gray Scale
KODAK Color Control Patches
36466BF BH14 START CORING AT 2.55m
2
NO CORE 0.36m
3
4
NO CORE 0.26m
5
6
7
8
9
10
JK Geotechnics


JKGeotechnics
Job No: 36466BF
Borehole No: BH14
Depth: 11.00 to 15.00m
KODAK Gray Scale
KODAK Color Control Patches
11
12
13
14
END OF BOREHOLE AT 15.00m

JKGeotechnics

BOREHOLE LOG

Borehole No. 18

1 / 3

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~68.0 m

Date: 27/11/23 **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									-	ASPHALTIC CONCRETE: 20mm.t	D			
									-	FILL: Gravelly silty sand, fine to coarse grained, grey, fine to medium grained igneous gravel, and slag.	XW	Hd		RESIDUAL
										Extremely Weathered siltstone: gravelly silty CLAY, low plasticity, red brown, fine to medium grained siltstone and ironstone gravel.	DW	L - M		ASHFIELD SHALE MODERATE 'V' BIT RESISTANCE BANDED WITH LOW RESISTANCE
						67	1			SILTSTONE: grey, with ironstone bands and fine grained sandstone bands.				
										REFER TO CORED BOREHOLE LOG				GROUNDWATER MONITORING WELL INSTALLED TO 13.1m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 1.1m TO 13.1m. CASING 0.1m TO 1.1m. 2mm SAND FILTER PACK 0.5m TO 13.1m. BENTONITE SEAL 0.1m TO 0.5m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						66	2							
						65	3							
						64	4							
						63	5							
						62	6							

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 18 **2 / 3**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~68.0 m

Date: 27/11/23 **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	DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
					START CORING AT 1.15m						
					NO CORE 0.40m						
		66	2		Extremely Weathered siltstone: gravelly silty CLAY, low plasticity, grey, fine to medium grained siltstone and ironstone gravel, with low to medium strength siltstone and ironstone bands.	XW	Hd	0.60 0.30 0.30			Ashfield Shale
		65	3		NO CORE 0.28m						
ON 30/11/23 85% RETURN ON 12/12/23		64	4		LAMINITE: Siltstone, grey, bedded with Sandstone, fine grained, bedded at 0-5°.	MW	L	0.30 0.30 0.50 0.20 0.30		(3.38m) J, 80°, Ir, Vr, Fe Sn (3.33-3.57m) Be x 10, 0°, P, Vr, Fe Sn (3.53m) J, 60°, P, Vr, Cn (3.57m) Be, 0°, C, R, Cn (3.61-3.66m) Be x 4, 0°, P, R, Cn (3.71m) Be x 3, 3°, P, Vr, Fe Sn (3.79-3.91m) Be x 3, 5°, P, R, Fe Sn (4.05m) J, 65°, P, Vr, Fe Sn (4.10m) Be x 3, 5°, P, R, Cn (4.18m) J, 85°, St, Vr, Fe Sn (4.20-4.45m) Be x 10, 3 - 5°, P, Vr, Fe Sn (4.52m) Be, 0°, C, Vr, XW FILLED, 3 mm.t (4.68-4.98m) Be x 5, P, Vr, Fe Sn (4.92-5.20m) XWS x 4, 0 - 3°, 3 mm.t (5.32m) XWS, 5°, 35 mm.t (5.41m) Be, 0°, P, Vr, Fe Sn (5.51m) Be, 0°, P, R, Fe Sn, & XW, FILLED 2mm.t (5.56m) Be, 0°, P, R, XW FILLED, 2 mm.t (5.62m) XWS, 2°, 7 mm.t (5.64m) J, 60°, St, Vr, XW FILLED, 5 mm.t (5.66m) Ji, 60°, St, Vr, Fe Sn (5.68m) Be x 2, 0°, P, R, Fe Sn (5.71-5.74m) Be x 3, 0°, P, Vr, Fe Sn (5.81m) Be, 0°, P, R, Fe Sn (5.88m) XWS, 3°, 10 mm.t (5.95m) J, 70°, P, R, Fe Sn (6.02m) Be, 5°, P, Vr, Fe Sn (6.05m) XWS, 10°, 5 mm.t (6.10m) XWS, 7°, 15 mm.t (6.18m) J, 20°, P, R, Fe Sn (6.22m) Be, 5°, P, R, Fe Sn (6.32m) J, 60°, P, Vr, Fe Sn (6.47m) J, 10°, P, R, Fe Sn (6.50m) Be, 10°, P, R, Fe Sn (6.67-6.70m) Be x 2, 20°, P, R, Fe Sn (6.78m) J, 60°, P, Vr, Fe Sn, & XW, FILLED 15mm.t (7.13m) Be, 0°, P, R, Fe Sn (7.20-7.30m) J x 2, 65°, P, R, Cn (7.39m) Be, 10°, P, R, Fe Sn (7.40m) Be, 10°, Ir, Vr, Cn (7.61m) J, 40°, P, Vr, Cn	Ashfield Shale
		62	6								
		61	7		SILTSTONE: grey, with fine grained sandstone laminae, bedded at 0-10°.	SW	M M - H	0.90 0.40 0.70 1.4			

JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 36466BF MACQUARIEPARK.GPJ <<DrawingFile>> 12/03/2024 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

CORED BOREHOLE LOG

Borehole No. 18 **3 / 3**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~68.0 m

Date: 27/11/23 **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		59	9		SILTSTONE: grey, with fine grained sandstone laminae, bedded at 0-10°. *(continued)*	SW	M - H	1.1, 1.0, 2.1		(8.15m) J, 80°, P, R, Cn (8.30m) J, 70°, P, R, XW FILLED, 4 mm.t (8.44m) J, 80°, P, R, Cn (8.56m) J, 60°, P, R, Cn (8.66m) J, 60°, C, Vr, XW FILLED, 3 mm.t (8.73m) J, 60°, P, R, Cn (8.78m) J, 70°, P, R, Cn (8.96m) J, 70°, P, R, Cn (9.07m) J, 45°, P, Vr, Cn (9.19m) J, 80°, St, Vr, Cn	Ashfield Shale
					NO CORE 0.12m						
		58	10		SILTSTONE: grey, with fine grained sandstone laminae, bedded at 0-10°.	SW	M	0.80, 0.70, 1.8, 0.90, 0.80, 0.50, 0.70, 0.90		(9.67m) J, 40°, P, R, Cn (9.77m) J, 75°, St, Vr, Cn (9.86-9.99m) J x 3, 45°, P, R, Cn (10.35m) J, 70°, P, R, Cn (10.86m) J, 50°, P, R, Cn (11.14m) J x 2, 75°, P, R, Cn (11.52m) J x 2, 60°, P, R, Cn (11.76m) Be, 0°, P, R, Sand FILLED, 1 mm.t (11.88m) J, 45°, C, R, Cn (11.97m) J, 80°, Ir, R, Cn (12.12m) J, 50°, P, R, Cn (12.70m) J, 10°, P, R, Cn (13.00m) J, 50°, P, R, Cn	Ashfield Shale
		57	11								
		56	12								
		55	13								
		54	14		END OF BOREHOLE AT 13.07 m						

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466BF
Borehole No: BH18
Depth: 1.15m to 10.00m
KODAK Gray Scale
KODAK Color Control Patches
36466BF BH18 START CORING AT 1.15m
1
NO CORE 400mm
2
3
NO CORE 028m
4
5
6
7
8
9
NO CORE 0.12m
JK Geotechnics


JKGeotechnics
Job No: 36466BF
Borehole No: BH18
Depth: 10.00m to 13.07m
KODAK Gray Scale
KODAK Color Control Patches
10
11
12
13
END OF BH18 AT 13.07m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 21

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~65.0 m

Date: 3/1/24 TO 4/1/24 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** Q.V./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									-	ASPHALTIC CONCRETE: 40mm.t FILL: Silty clay, low to medium plasticity, light grey, brown and red brown, with fine to medium grained sand and fine to medium grained igneous and ironstone gravel.	w<PL			APPEARS WELL COMPACTED
					N = 19 5,8,11									TOO FRIABLE FOR HP TESTING
						64	1							
					N = 11 5,5,6									TOO FRIABLE FOR HP TESTING
						63	2		CL-Cl	Silty CLAY: low to medium plasticity, light grey, orange brown and red brown, with fine to medium grained ironstone gravel.	w~PL	(Hd)		RESIDUAL
					N > 11 10,11/ 100mm REFUSAL	62	3		-	Extremely Weathered siltstone: silty CLAY, low plasticity, light grey and red brown, with fine to medium grained ironstone gravel.	XW	Hd	>600 >600	ASHFIELD SHALE
						61	4			SILTSTONE: grey, dark grey and red brown, with occasional extremely weathered and iron indurated bands.	DW	VL - L		VERY LOW TO LOW 'TC' BIT RESISTANCE
						60	5							
						59	6					L		LOW RESISTANCE

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BOREHOLE LOG

Borehole No. 21

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~65.0 m

Date: 3/1/24 TO 4/1/24 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** Q.V./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
				■					-	SILTSTONE: dark grey and grey.	DW	L - M		LOW TO MODERATE RESISTANCE
										REFER TO CORED BOREHOLE LOG				
						57	8							
						56	9							
						55	10							
						54	11							
						53	12							
						52	13							

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 21

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~65.0 m

Date: 3/1/24 TO 4/1/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** Q.V./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 7.59m						
0% RETURN		57	8		SILTSTONE: dark grey, with red brown bands and grey laminae, bedded at 0-5°.	HW	L - M	0.40, 0.20		(7.64m) Be, 5°, P, S, Clay Vn (7.69m) Cr, 0°, 15 mm.t (7.74m) Cr, 5°, 25 mm.t (7.79m) Be, 5°, P, S, Clay Ct (7.84m) Cr, 5°, 30 mm.t (7.87m) CS, 5°, 10 mm.t (7.89m) J, 60°, P, S, Cn (7.98m) J, 40°, Ir, S, Cn (8.05m) XWS, 0°, 10 mm.t (8.07m) Be, 0°, P, S, Fe Ct (8.12m) Be, 0°, P, S, Clay Vn (8.16m) Cr, 0°, 10 mm.t (8.25m) J, 25°, P, S, Clay Ct (8.39m) J, 70°, P, S, Clay Vn (8.60m) Cr, 0°, 430 mm.t	
							VL - L	0.50			
98% RETURN		56	9		SILTSTONE: dark grey, with grey laminae, bedded at 0-5°.	FR	M	0.50, 0.80		(8.88m) Cr, 5°, 25 mm.t (9.32m) J, 40°, P, S, Cn (9.49m) Cr, 0°, 10 mm.t (9.56m) Cr, 0°, 5 mm.t	
		55	10					0.90, 1.0			
							M - H			(10.17m) J, 30°, P, S, Cn	
		54	11					0.80	200	(10.51m) J x 2, 90°, P, S, Cn (10.62m) Cr, 0°, 15 mm.t (10.65m) J, 25°, P, S, Cn (10.82m) J, 40°, P, S, Cn (10.89m) J, 30°, P, S, Clay FILLED (10.98m) J, 25°, P, S, Cn	Ashfield Shale
								1.6		(11.15m) J, 10°, P, S, Cn (11.28m) J x 2, 90°, P, S, Cn (11.32m) Cr, 0°, 30 mm.t	
		53	12					1.1, 1.3			
								0.60		(12.48m) J, 25°, P, S, Cn (12.55m) J, 55°, P, S, Cn	
		52	13					1.0		(12.97m) Be, 0°, P, S, Clay Ct (13.12m) Cr, 0°, 15 mm.t	
								0.70		(13.42m) J, 40°, P, S, Cn (13.55m) Be, 5°, P, S, Clay Vn (13.63m) J, 15°, P, S, Cn	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 21

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~65.0 m

Date: 3/1/24 TO 4/1/24 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** Q.V./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
98% RETURN		50	15		SILTSTONE: dark grey, with grey laminae, bedded at 0-5°. *(continued)*	FR	M - H	0.80		(14.41m) Be, 0°, P, S, Clay Ct	Ashfield Shale
										(14.70m) Be, 0°, P, S, Clay Ct	
								0.80			
								1.0			
								1.6		(15.66m) J, 25°, Ir, S, Cn	
								0.60		(15.92m) CS, 0°, 30 mm.t	
		49	16		LAMINITE: Siltstone, dark grey and grey, and Sandstone, fine to medium grained, light grey, bedded at 0-10°.					(16.12m) Be, 0°, P, R, Cn	
										(16.24m) CS, 0°, 30 mm.t	
								0.70			
								1.2		(16.72m) J, 30°, P, R, Cn	
										(16.90m) Be, 5°, P, R, Clay Ct	
		48	17							(17.22m) Cr, 0°, 3 mm.t	
								0.40			
								1.5		(17.80m) Be, 5°, P, R, Clay Ct	
										(17.84m) Jh, 70°, C	
		47	18					0.80		(18.09m) CS, 0°, 4 mm.t	
					END OF BOREHOLE AT 18.09 m						
		46	19								
		45	20								

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466BF
Borehole No: BH21
Depth: 7.59m to 16.00m
KODAK Gray Scale
KODAK Color Control Patches
36466BF BH21 START CORING AT 7.59 m
7
8
9
10
11
12
13
14
15
JK Geotechnics


JKGeotechnics
Job No: 36466BF
Borehole No: BH21
Depth: 16.00m to 18.09m
KODAK Gray Scale
KODAK Color Control Patches
16
17
18
EOH AT 18.09m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 24

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~65.7 m

Date: 30/11/23 **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 3,4,5	65	1			FILL: Silty sand, fine to coarse grained, brown, with clay nodules, trace of fine grained ironstone, fine to medium grained sandstone gravel, slag, roots and root fibres.	M w~PL			GRASS COVER APPEARS MODERATELY COMPACTED
										FILL: Silty clay, medium plasticity, red brown, dark grey and light grey, trace of fine to medium grained ironstone, sandstone and siltstone gravel, ash and root fibres.				
					N > 25 8,13,12/ 100mm REFUSAL	64	2		CL-CI	Gravelly silty CLAY: low to medium plasticity, light grey and red brown, fine to medium grained siltstone and ironstone gravel.	w<PL	Hd	>600 >600	RESIDUAL
						63	3							
						62	4							
						61	5		-	Extremely Weathered siltstone: gravelly silty CLAY, low plasticity, grey, fine to medium grained siltstone and ironstone gravel.	XW	Hd		ASHFIELD SHALE BANDED VERY LOW 'TC' BIT RESISTANCE
						60	6							
						59				SILTSTONE: grey, with grey laminae and extremely weathered bands.	DW	VL - L		

JKGeotechnics

BOREHOLE LOG

Borehole No. 24

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~65.7 m

Date: 30/11/23 **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
										SILTSTONE: grey, with grey laminae and extremely weathered bands.	DW	VL - L		
										REFER TO CORED BOREHOLE LOG				
						58	8							
						57	9							
						56	10							
						55	11							
						54	12							
						53	13							
						52								

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 24 **3 / 3**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~65.7 m

Date: 30/11/23 **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 Specific / General	Formation
					START CORING AT 7.09m			VL -0.1, L -0.3, M -1, H -3, VH -10, EH	600, 200, 60, 20		
		58			Extremely Weathered siltstone: gravelly silty CLAY or silty clayey GRAVEL, fine to coarse grained siltstone gravel, dark grey, low plasticity, with fine to medium grained ironstone gravel.	XW	Hd				
			8		SILTSTONE: dark grey, with brown and grey laminae, bedded at 0-10°.	SW	VL - L	0.30		(8.03m) Be, 5°, P, R, Cn (8.09-8.11m) Be x 2, 3°, P, R, Fe Sn (8.13m) XWS, 3°, 11 mm.t (8.12-8.21m) Be x 5, 0 - 5°, P, R, Fe Sn (8.23-8.30m) Be x 6, 0 - 10°, P, R, Fe Sn (8.39m) Cr, 5°, 10 mm.t	
		57					L - M	0.20		(8.51m) J, 40°, Ir, Vr, Cn (8.60m) J x 2, 85°, St, Vr, Cn (8.71m) J, 25°, P, R, Cn	
			9							(8.86m) XWS, 20°, Cr, 150 mm.t (8.92m) J x 2, 50 - 85°, P, R, Cn	
		56				FR	M	0.90		(9.51m) J, 70°, P, R, Cn (9.58m) J, 70°, P, R, Cn (9.70m) Be, 10°, P, R, Cn (9.78m) J, 25°, P, R, Cn (9.86m) J, 30°, P, R, Cn	
ON 12/12/23			10					1.0			
								0.90			
		55						0.80		(10.64m) Ji, 70°, P, R, Cn	
			11							(11.22m) J, 55°, P, R, Cn	
								0.60		(11.40m) J, 50°, P, R, Cn (11.45m) J, 25°, P, R, Cn (11.48m) J, 20°, P, R, Cn	
		54						0.60			
			12							(11.98m) J x 2, 50°, P, R, Cn (12.02m) J, 50°, P, R, Cn (12.10m) J, 25°, P, R, Cn	
								0.80			
					END OF BOREHOLE AT 12.22 m						
		53									
			13								
		52									

Ashfield Shale

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466PN
Borehole No: BH24
Depth: 7.09m to 12.22m
KODAK Gray Scale
KODAK Color Control Patches
Blue
Cyan
Green
Yellow
Red
Magenta
White
3/Color
Black
36466BF BH24 START CORING AT 7.09m
7
8
9
10
11
12
END OF BH24 AT 12.22m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 26

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~65.4 m

Date: 30/11/23 **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						65				CONCRETE: 400mm.t				8mm DIA. REINFORCEMENT, 140mm TOP COVER
										CONCRETE: 280mm.t				NO REINFORCEMENT OBSERVED
				■			1		-	Extremely Weathered siltstone: gravelly silty CLAY, low plasticity, light grey and orange brown, fine to medium grained siltstone and ironstone gravel.	XW	Hd		ASHFIELD SHALE AFFECTED BY WATER INTRODUCED DURING DIATUBE CORING VERY LOW 'TC' BIT RESISTANCE
						64								
				■			2							
						63								
				■						SILTSTONE: grey, with extremely weathered bands.	DW	VL - L		LOW RESISTANCE BANDED WITH SOIL RESISTANCE
						62	3							
							4							
						61				REFER TO CORED BOREHOLE LOG				GROUNDWATER MONITORING WELL INSTALLED TO 14.2m CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 2.2m TO 14.2m. CASING 0.1m TO 2.2m. 2mm SAND FILTER PACK 1.5m TO 14.2m. BENTONITE SEAL 0.1m TO 1.5m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
							5							
						60								
							6							
						59								

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 26

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~65.4 m

Date: 30/11/23 **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 4.20m						
					NO CORE 0.15m						
		61	5		SILTSTONE: dark grey, with grey laminae, bedded at 0-10°, with extremely weathered bands bedded at 0-10°.	MW	VL			(4.35-5.42m) Be x multiple, 0 - 10°, P, R, Fe Sn (4.35-5.42m) XWS x multiple, 0 - 10°, 20-100mm.t	
		60			Extremely Weathered siltstone: gravelly silty CLAY, low plasticity, dark grey, fine to medium grained siltstone gravel.	XW	Hd				
		59	6		SILTSTONE: dark grey, with grey laminae, bedded at 0-10°.	SW	M	0.60		(6.08m) Be, 5°, P, R, Fe Sn (6.10m) J x 3, 15 - 20°, P, R, Fe Sn (6.12m) Be, 5°, P, R, Fe Sn (6.15m) Ji, 60°, P, R, Fe Sn (6.20m) J, 20°, P, R, Cn	
								0.80		(6.56m) J, 85°, St, R, Cn	
			7							(6.67m) Be, 0°, P, Vr, Fe Sn (6.73m) XWS, 5°, 6 mm.t (6.75m) XWS, 5°, 5 mm.t	
		58						0.80		(7.17m) J, 75°, P, R, Cn	
85% RETURN									200	(7.49m) J, 45°, P, R, Cn	
			8					0.90	60 20	(7.70m) Be, 8°, P, R, Cn (7.77m) J, 65°, P, R, Cn	
						FR	M - H	1.8		(8.02m) J, 30°, P, R, Cn (8.06m) Be, 5°, P, R, Cn	
		57								(8.49m) XWS, 10°, 6 mm.t (8.52m) J, 60°, P, R, Cn	
								1.0		(8.76m) J, 60°, P, R, Cn (8.81m) J, 25°, P, R, Cn (8.88m) J, 40°, P, R, Cn	
			9							(9.03m) J, 25°, P, R, Cn	
		56						0.70			
▽ ON 5/12/23								0.90		(9.55m) J, 15°, P, R, Cn	
										(9.67m) J, 20°, P, R, Cn (9.74m) J, 85°, C, R, Cn	
			10							(9.88m) J, 75°, P, R, Cn	
▽ ON 12/12/23								1.0			
		55								(10.38m) J, 45°, P, R, Cn	
								1.3	600 200 60 20		Ashfield Shale

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 26

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~65.4 m

Date: 30/11/23 **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
85% RETURN		54	12		SILTSTONE: dark grey, with grey laminae, bedded at 0-10°. *(continued)*	FR	M - H	0.80		(11.30m) Be, 10°, P, R, Cn (11.35m) XWS, 0°, 15 mm.t	
		53	13		SANDSTONE: fine to medium grained, grey, bedded at 0-10°, with dark grey siltstone laminae, bedded at 0-10°, and siltstone bands.		M	0.50 0.90 0.90 0.40		(12.30m) Be, 15°, Un, R, Cn (12.48m) Be, 10°, P, R, Cn (12.60m) J, 70°, St, R, Cn (13.30m) Be x 2, 5°, P, R, Cn (13.39m) Be, 5°, P, R, Cn (13.40m) Be, 5°, P, R, Cn (13.44m) Be, 10°, Ir, R, Cn (13.48m) Be, 5°, P, R, Cn (13.52m) Be, 5°, P, R, Cn (13.58m) J, 80°, P, R, Cn (13.61m) XWS, 0°, 15 mm.t (13.70m) XWS, 0°, 10 mm.t (13.77m) Be, 10°, P, R, Cn (13.80m) Be, 10°, P, R, Cn (13.99m) XWS, 0°, 10 mm.t	Hawkesbury Sandstone
		52	14		SANDSTONE: fine to medium grained, light grey, with dark grey laminae, bedded at 0-10°.		M - H	0.80 1.4			
		51	15		END OF BOREHOLE AT 14.20 m						
		50	16								
		49	17								
		48									

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466PN
Borehole No: BH26
Depth: 4.15m to 13.00m
KODAK Gray Scale
KODAK Color Control Patches
36466 BF BH26 START CORING AT 4.15m
4
NO CORE 0.15m
5
6
7
8
9
10
11
12
JK Geotechnics


JKGeotechnics
Job No: 36466PN
Borehole No: BH26
Depth: 13.00m to 14.20m
KODAK Gray Scale
KODAK Color Control Patches
13
14
END OF BH26 AT 14.20m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 27

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~63.0 m

Date: 4/12/23 **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										CONCRETE: 140mm.t				8mm DIA. REINFORCEMENT, 50mm TOP COVER
				■	N = 14 4,5,9	62	1		-	FILL: Gravelly silty sand, fine to coarse grained, brown, fine to medium grained igneous gravel, trace of plastic fragments.	M			
										FILL: Silty clay, medium plasticity, red brown and orange brown, trace of fine to medium grained sand, fine grained igneous and ironstone gravel, and root fibres.	w~PL		>600 >600 >600	APPEARS WELL COMPACTED
				■	N > 31 10,16,15/ 100mm REFUSAL	61	2		-	Extremely Weathered siltstone: silty CLAY, medium plasticity, light grey mottled red brown, with fine to medium grained siltstone and ironstone gravel, and root fibres.	XW	Hd	>600 >600 >600	ASHFIELD SHALE VERY LOW 'TC' BIT RESISTANCE
				■	N > 14 12,14/ 100mm REFUSAL	60	3							
						59	4			SILTSTONE: dark grey, with iron indurated bands and extremely weathered bands.	DW	EL - VL		BANDED LOW RESISTANCE
						58	5					VL - L		
				■		57	6			SILTSTONE: dark grey, with grey laminae.		L - M		LOW TO MODERATE RESISTANCE BANDED WITH VERY LOW RESISTANCE

REFER TO CORED BOREHOLE LOG

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 27

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~63.0 m

Date: 4/12/23 **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		55	8		SILTSTONE: dark grey, with iron indurated bands of low to medium strength and extremely weathered bands, bedded at 0-10°, with grey laminae, undulating at 5-10°. START CORING AT 7.00m	MW	EL - VL	0.10		(7.15m) Jh, 35°, P, Vr, Fe Sn	Ashfield Shale
										(7.42m) Jh, 70°, P, Vr, Fe Sn	
										(7.00-8.00m) XWS x 6, 5°, 5-50mm.t	
										(7.00-8.00m) Be x multiple, 0 - 5°, P, R, Fe Sn	
										(7.54m) Jh, 70°, P, Vr, Fe Sn	
										(7.61m) J, 75°, P, R, Fe Sn	
										(7.67m) Jh, 35°, P, Vr, Fe Sn	
								0.50			
					SILTSTONE: dark grey, with grey laminae, bedded at 0-10°.	SW	L - M	0.20		(8.14m) Ji x 3, 40 - 50°, P, R, Fe Sn	
										(8.08-8.25m) Be x 3, 0 - 5°, P, R, Fe Sn	
										(8.30m) Be, 10°, P, R, Fe Sn	
										(8.35m) Be, 8°, P, R, Fe Sn	
										(8.40m) J, 40°, P, R, Fe Sn	
										(8.49m) Ji, 80°, P, R, Fe Sn	
								0.50		(8.55m) XWS, 5°, 28 mm.t	
										(8.56-8.67m) Be x 2, 5 - 10°, P, R, Fe Sn	
										(8.69-8.83m) Be x 2, 10°, P, R, Fe Sn	
						SW	M - H			(8.87m) J, 80°, P, R, Cn	
		54	9					1.3		(9.02m) Cr, 0°, 30 mm.t	
										(9.23m) J, 50°, P, R, Cn	
										(9.50m) J, 75°, P, R, Cn	
						FR					
								0.70			
		53	10					0.60			
										(10.50m) J, 70°, P, R, Cn	
								0.80			
		52	11					1.2			
								1.0			
		51	12							(12.05m) J, 80°, P, R, Cn	
								1.2		(12.50m) J, 70°, P, R, Cn	
										(12.56m) J, 40°, P, R, Cn	
								0.80			
		50	13							(13.08m) J, 70°, P, R, Cn	
								0.60		(13.33m) J, 30°, P, R, Cn	
								1.0			
										(13.88m) J, 80°, P, R, Cn	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 27 **3 / 3**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~63.0 m

Date: 4/12/23 **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					SILTSTONE: dark grey, with grey laminae, bedded at 0-10°. *(continued)*	FR	M - H			(14.05m) Cr, 5°, 110 mm.t (14.22m) J, 50°, P, R, Cn (14.37m) J, 80°, Un, R, Cn	
					LAMINITE: Siltstone, dark grey, with Sandstone, fine grained, light grey, with fine to medium grained sandstone bands, and siltstone lenses, bedded at 0-10°.			0.30			
		48	15					1.4		(14.83m) J, 40°, P, Vr, Cn	
								0.80		(15.38m) XWS, 5°, 10 mm.t (15.44m) Be, 0°, P, R, Cn (15.51m) Be, 5°, Un, R, Cn (15.54m) Be, 5°, P, R, Cn	
							H	1.4			
		47	16					2.8		(15.86m) Be, 0°, P, R, Cn (15.91m) Be, 0°, P, R, Cn (15.92m) Be, 5°, P, R, Cn	
								2.6			
								2.7			
		46	17					1.0		(17.26m) J, 70°, P, Vr, Cn (17.38m) XWS, 0°, 16 mm.t	
								1.1	200 60 20		
								1.5		(17.68m) J, 60°, P, R, Cn	
		45	18		END OF BOREHOLE AT 17.84 m						
		44	19								
		43	20						600 200 60 20		

JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 36466BF MACQUARIEPARK.GPJ <<DrawingFile>> 12/03/2024 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
Job No: 36466BF
Borehole No: BH27
Depth: 7.00m to 16.00m
KODAK Gray Scale
KODAK Color Control Patches
36466BF BH27 START CORING AT 7.00m
7
8
9
10
11
12
13
14
15
JK Geotechnics


JKGeotechnics
Job No: 36466BF
Borehole No: BH27
Depth: 16.00m to 17.84m
KODAK Gray Scale
KODAK Color Control Patches
16
17
END OF BH27
AT 17.84m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 29

1 / 4

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~63.0 m

Date: 5/12/23 **Datum:** AHD

Plant Type: JK330 **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: Silty clayey sand, fine to medium grained, grey brown, trace of clay nodules.	D w<PL			GRASS COVER APPEARS MODERATELY COMPACTED
					N = 11 4,5,6	62	1			FILL: Silty clay, low plasticity, brown, grey and red brown, trace of fine grained siltstone and ironstone gravel, fine to medium grained sand, construction rubble, ash and root fibres.			500 >600	
					N = 18 3,8,10	61	2						>600 550	
					N = 12 2,6,6	60	3							
						59	4		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, light grey and red brown, with ironstone bands, trace of fine grained siltstone.	XW	Hd		BANDED LOW 'TC' BIT RESISTANCE ASHFIELD SHALE
						58	5							
						57	6			SILTSTONE: dark grey, with grey laminae, extremely weathered bands and iron indurated bands.	DW	VL - L		BANDED LOW TO MODERATE RESISTANCE

ON 6/12/23

JKGeotechnics

BOREHOLE LOG

Borehole No. 29

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~63.0 m

Date: 5/12/23 **Datum:** AHD

Plant Type: JK330 **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
									-	SILTSTONE: dark grey, with grey laminae, extremely weathered bands and iron indurated bands. *(continued)*	DW	VL - L		
												L		LOW TO MODERATE RESISTANCE
						55	8							
						54	9					L - M		MODERATE RESISTANCE
						53	10			REFER TO CORED BOREHOLE LOG				GROUNDWATER MONITORING WELL INSTALLED TO 19.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 5.5m TO 19.0m. CASING 0.1m TO 5.5m. 2mm SAND FILTER PACK 4.0m TO 19.0m. BENTONITE SEAL 0.1m TO 4.0m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						52	11							
						51	12							
						50	13							

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 29

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF | **Core Size:** NMLC | **R.L. Surface:** ~63.0 m

Date: 5/12/23 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK330 | **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 9.75m						
	90% RETURN	53	10		SILTSTONE: dark grey, with grey laminae, bedded at 0-10°.	FR	M - H	1.1		(9.80m) CS, 5°, 60 mm.t (9.92m) XWS, 3°, 20 mm.t	Ashfield Shale
										(10.10m) Be, 0°, C, R, Cn (10.17m) XWS, 0°, 30 mm.t (10.26m) Be, 0°, P, R, Fe Sn	
										(10.48m) XWS, 3°, 140 mm.t	
										(10.68m) Be, 5°, P, R, XW FILLED, 1 mm.t	
										(10.85m) Be, 3°, P, R, XW FILLED, 2 mm.t	
		52	11					1.6 2.4		(11.12m) XWS, 5°, 3 mm.t (11.14-11.30m) XWS x 5, 5°, 5-20mm.t	
								0.50		(11.35-11.82m) XWS x 4, 5°, 14-40mm.t	
								0.60		(11.91m) XWS, 0°, 45 mm.t	
		51	12							(12.09m) J, 75°, P, R, Cn	
								1.0		(12.38m) XWS, 3°, 60 mm.t	
										(12.68-12.79m) J x 2, 30 - 35°, P, R, Cn	
		50	13					0.90		(12.98-13.03m) XWS, 0 - 5°, 15-30mm.t	
	ON 12/12/23							1.1			
										(13.50m) Be, 0°, P, R, Cn (13.58m) XWS, 3°, 13 mm.t	
										(13.71m) J, 20°, Ir, Vr, Cn	
										(13.80m) J, 40°, P, R, Cn (13.80m) J, 20°, P, R, Cn	
		49	14					0.90			
								1.1		(14.42m) Be, 3°, P, R, Cn	
								0.70		(14.75m) J, 40°, P, R, Cn (14.83m) J, 25°, P, Vr, Cn (14.92m) XWS, 0°, 125 mm.t	
		48	15								
								0.70		(15.46m) XWS, 0°, 7 mm.t	
										(15.67m) XWS, 0°, 60 mm.t	
								0.80		(15.86m) J, 85°, P, R, Cn	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 29

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~63.0 m

Date: 5/12/23 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK330 **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
90% RETURN		46	17		SILTSTONE: dark grey, with grey laminae, bedded at 0-10°. *(continued)*	FR	M - H	1.0, 0.80, 1.1		(16.05m) Be, 0°, P, R, Cn	Ashfield Shale
		45	18		LAMINITE: Sandstone, fine to medium grained, light grey, interbedded with Siltstone, dark grey, bedded at 0-10°.		H	1.6, 2.0			Hawkesbury Sandstone
		44	19				H - VH	3.6, 3.6			
					END OF BOREHOLE AT 19.24 m						
		43	20								
		42	21								
		41	22								

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JKGeotechnics
Job No: 36466BF
Borehole No: BH29
Depth: 9.75m to 18.00m
KODAK Gray Scale
KODAK Color Control Patches
36466BF BH29 START CORING AT 9.75m
9
10
11
12
13
14
15
16
17
JK Geotechnics


JKGeotechnics
Job No: 36466BF
Borehole No: BH29
Depth: 18.00m to 19.04m
KODAK Gray Scale
KODAK Color Control Patches
18
19
END OF BH29 AT 19.04m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 33

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~66.0 m

Date: 28/11/23 **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									-	ASPHALTIC CONCRETE: 18mm.t	D			
									-	FILL: Gravelly silty sand, fine to medium grained, grey, fine to medium grained igneous gravel, and slag.	XW	Hd		ASHFIELD SHALE
										Extremely Weathered siltstone: gravelly silty CLAY, low plasticity, red brown and light grey, fine to medium grained siltstone and ironstone gravel.				VERY LOW 'V' BIT RESISTANCE
						65	1			as above, but grey.				
						64	2			Extremely Weathered siltstone: gravelly silty CLAY, low plasticity, grey, with ironstone bands and very low to low strength siltstone bands.				LOW RESISTANCE
						63	3							
										SILTSTONE: grey, with extremely weathered bands and ironstone bands.	DW	VL - L		BANDED LOW RESISTANCE
						62	4							
										REFER TO CORED BOREHOLE LOG				
						61	5							
						60	6							

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 33

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~66.0 m

Date: 28/11/23 **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 4.37m						
85% RETURN		61	5		SILTSTONE: dark grey, with light grey laminae, bedded at 0-10°, with clay seams and extremely weathered and iron indurated bands.	SW	L L - M	0.20 0.40 0.40		(4.40m) XWS, 3°, 30 mm.t (4.43m) CS, 3°, 25 mm.t (4.47m) XWS, 4°, 25 mm.t (4.51m) Be, 3°, P, Vr, XW FILLED, 2 mm.t (4.55m) Be, 5°, P, R, Cn (4.64m) Be x 2, 5°, P, Vr, Fe Sn (4.66m) CS, 5°, 30 mm.t (4.71m) CS, 5°, 10 mm.t (4.79-4.95m) Be x 3, 5°, P, Vr, Fe Sn (5.04-5.14m) Be x 2, 5°, P, Vr, Fe Sn (5.28-5.32m) Be x 2, 3°, P, R, Fe Sn (5.42m) Be, 3°, P, R, Fe Sn	
		60	6		SILTSTONE: dark grey, with light grey laminae, bedded at 0-10°.		M - H	1.5 0.70		(5.62-5.90m) Be x 3, 5°, P, R, Fe Sn (5.94-6.10m) Be x 2, 3°, P, R, Fe Sn	
						FR		1.2 0.80		(6.36m) XWS, 3°, 1 mm.t (6.42m) J, 75°, St, R, Fe Sn (6.52m) Be, 3°, P, R, Fe Sn (6.53m) XWS, 0°, 8 mm.t (6.63-6.65m) Be x 2, 5°, P, R, Cn	
		59	7					1.2		(7.07m) J, 85°, St, R, Cn (7.14-7.28m) Be x 2, 5°, P, R, Fe Sn (7.37m) J, 60°, P, R, Fe Sn	
								0.90	60 20	(7.52m) Be, 5°, P, R, XW FILLED, 3 mm.t (7.56m) Be, 5°, C, R, Cn (7.80m) XWS, 5°, 10 mm.t	
		58	8					1.1		(8.17m) J, 20°, P, R, Cn (8.32m) Be, 15°, P, R, Siltstone gravel FILLED, 2 mm.t	
		57	9					1.2 1.1		(9.04m) Ji, 35°, St, R, Cn (9.14m) Be, 0°, P, R, Clay Vn	
		56	10					0.70 1.1		(9.95m) J, 70°, P, R, Cn	
								1.9 0.90 0.80	200 60 20	(10.15m) J, 25°, P, R, Cn (10.20m) J x 2, 40 - 45°, C, R, Cn (10.30m) Ji, 30°, P, Vr, Cn (10.32m) J, 25°, P, R, Cn (10.47m) J, 20°, P, R, Cn (10.52m) J, 30°, C, R, Cn (10.90m) Be, 5°, P, R, XW gravel FILLED, 1 mm.t	Ashfield Shale

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 33 **3 / 3**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** NMLC **R.L. Surface:** ~66.0 m

Date: 28/11/23 **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					SILTSTONE: dark grey, with light grey laminae, bedded at 0-10°. *(continued)*	FR	M - H	0.50		(11.10m) J, 80°, P, R, Cn (11.14m) Be, 5°, C, R, Cn (11.31m) Be, 5°, C, R, Cn (11.53m) Be, 7°, P, Vr, Cn (11.60m) J, 85°, P, Vr, Cn	
		54	12		LAMINITE: Sandstone, fine to medium grained, light grey, with Siltstone, dark grey, bedded at 0-10° and undulating at 10°.			0.40 1.3		(11.80m) Be, 5°, Un, R, Cn (11.82m) XWS, 7°, 20 mm.t (12.52m) Be, 3°, P, R, Cn (12.66-12.98m) Be, 3°, P, R, Cn	Ashfield Shale
		53	13					0.40 0.40 0.60		(13.03-13.24m) Be x 4, 3 - 5°, P, R, Cn (13.30m) XWS, 5°, 7 mm.t (13.43m) J, 25°, P, R, Cn (13.52m) Be, 3°, P, R, Cn	
					END OF BOREHOLE AT 13.55 m						
		52	14								
		51	15								
		50	16								
		49	17								

POINT LOAD STRENGTH INDEX $I_s(50)$: VL -0.1, L -0.3, M -1, H -3, VH -10, EH

SPACING (mm): 600, 200, 60, 20

JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 36466BF MACQUARIEPARK.GPJ <<DrawingFile>> 12/03/2024 13:51 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
Job No: 36466BF
Borehole No: BH33
Depth: 4.37m to 13.00m
KODAK Gray Scale
KODAK Color Control Patches
36466BF BH33 START CORING AT 4.37m
4
5
6
7
8
9
10
11
12
JK Geotechnics


JKGeotechnics
Job No: 36466BF
Borehole No: BH33
Depth: 13.00m to 13.55m
KODAK Gray Scale
KODAK Color Control Patches
13
END OF BH33 AT 13.55m
JK Geotechnics

JKGeotechnics

BOREHOLE LOG

Borehole No. 201

1 / 1

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~62.5 m

Date: 8/10/24 **Datum:** AHD

Plant Type: JK205 **Logged/Checked By:** M.M./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										ASPHALTIC CONCRETE: 40mm.t				
									-	FILL: Silty sand, fine to medium grained, brown, trace of fine to medium grained igneous and sandstone gravel, and clay nodules.	D			
					N = 12 6,6,6	62.0	0.5			FILL: Sandy clay, low plasticity, brown, fine to medium grained sand, trace of fine to medium grained igneous and sandstone gravel.	w<PL		320 350 400	APPEARS WELL COMPACTED
						61.5	1.0							HIGH 'TC' BIT RESISTANCE
										END OF BOREHOLE AT 1.30 m				
						61.0	1.5							
						60.5	2.0							
						60.0	2.5							
						59.5	3.0							

JK 9.02.4 LIB GLB Log JK AUGERHOLE - MASTER 36466BF1 MACQUARIEPARK.GPJ <<DrawingFile>> 17/02/2025 16:57 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

JKGeotechnics

BOREHOLE LOG

Borehole No. 202

1 / 1

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~61.9 m

Date: 8/10/24 **Datum:** AHD

Plant Type: JK205 **Logged/Checked By:** M.M./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										ASPHALTIC CONCRETE: 40mm.t				
						61.5	0.5		-	FILL: Silty sand, fine to medium grained, brown, trace of igneous and sandstone gravel, trace of clay nodules.	D			APPEARS WELL COMPACTED
					N = 12 9,7,5	61.0	1.0			FILL: Sandy clay, low plasticity, brown, trace of fine to medium grained sand, fine to medium grained igneous, ironstone and sandstone gravel.	w~PL			
						60.5	1.5		CI	Silty CLAY: medium plasticity, brown, trace of ironstone gravel.	w~PL			RESIDUAL
						60.0	2.0			END OF BOREHOLE AT 1.50 m				
						59.5	2.5							
						59.0	3.0							
						58.5								

JKGeotechnics

BOREHOLE LOG

Borehole No. 203

1 / 1

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~62.6 m

Date: 8/10/24 **Datum:** AHD

Plant Type: JK205 **Logged/Checked By:** M.M./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						62.5	0.0		-	ASPHALTIC CONCRETE: 40mm.t FILL: Silty sand, fine to medium grained, brown, trace of fine to medium grained gravel.	D			
										FILL: Silty clay, low to medium plasticity, brown, trace of fine to medium grained ironstone gravel.	w~PL			
					N = 27 4,10,17	62.0	0.5		CH	Silty CLAY: high plasticity, brown and grey, mottled red brown, trace of fine to medium grained ironstone gravel.	w~PL	Hd	>600 >600 >600	RESIDUAL
						61.5	1.0							
						61.0	1.5			END OF BOREHOLE AT 1.50 m				
						60.5	2.0							
						60.0	2.5							
						59.5	3.0							

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BOREHOLE LOG

Borehole No. 204 1 / 1

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~65.8 m

Date: 8/10/24 **Datum:** AHD

Plant Type: JK205 **Logged/Checked By:** M.M./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						65.5	0.0		-	ASPHALTIC CONCRETE: 20mm.t FILL: Sand, fine to medium grained, brown and dark grey, trace of fine to medium grained igneous gravel.	D			
							0.5		CL-CI	Silty CLAY: low to medium plasticity, brown, trace of fine to medium grained ironstone gravel.	w~PL			
					N = 10 3,4,6	65.0	1.0		CH	Silty CLAY: high plasticity, grey and red brown, trace of fine to medium grained siltstone gravel.	w~PL	VSt	180 200 240	RESIDUAL
						64.5	1.5			END OF BOREHOLE AT 1.50 m				
						64.0	2.0							
						63.5	2.5							
						63.0	3.0							
						62.5								

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BOREHOLE LOG

Borehole No. 205 1 / 1

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~59.9 m

Date: 8/10/24 **Datum:** AHD

Plant Type: JK205 **Logged/Checked By:** M.M./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						59.5	0.5		-	ASPHALTIC CONCRETE: 25mm.t FILL: Silty clay, medium plasticity, brown, fine to medium grained ironstone gravel, and ash.	w>PL			
					N = 12 3,5,7	59.0	1.0			FILL: Silty clay, medium plasticity, brown, fine to medium grained ironstone and siltstone gravel, and ash.	w<PL			LOW TO MODERATE 'TC' BIT RESISTANCE
						58.5	1.5							MODERATE RESISTANCE
					N = 34 5,14,20				CH	Silty CLAY: high plasticity, grey and red brown, trace of fine to medium grained ironstone gravel.	w~PL	Hd	>600	RESIDUAL
						58.0	2.0		-	Extremely Weathered siltstone: silty gravelly CLAY, low to medium plasticity, grey, fine to medium grained siltstone gravel.	XW	Hd	>600 >600	ASHFIELD SHALE
										END OF BOREHOLE AT 2.00 m				
						57.5	2.5							
						57.0	3.0							
						56.5								

JKGeotechnics

BOREHOLE LOG

Borehole No. 206 1 / 1

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** ~56.3 m

Date: 8/10/24 **Datum:** AHD

Plant Type: JK205 **Logged/Checked By:** M.M./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						56.0	0.0		-	ASPHALTIC CONCRETE: 10mm.t FILL: Silty sand, fine to medium grained, brown and grey, trace of fine to medium grained igneous gravel.	D			APPEARS WELL COMPACTED
					N = 12 4,5,7	55.5	0.5			FILL: Silty clay, medium to high plasticity, brown and grey, trace of fine to medium grained igneous and ironstone gravel, trace of ash.	w>PL		350 320 380	
						55.0	1.0		CI-CH	Silty CLAY: medium to high plasticity, brown and grey, trace of fine to medium grained ironstone and siltstone gravel.	w>PL	VSt	320 350 290	RESIDUAL HP TESTING ON REMOULDED SAMPLE
					N = 14 3,5,9	54.5	1.5					Hd	>600 >600 >600	
						54.0	2.0			END OF BOREHOLE AT 2.00 m				
						53.5	2.5							
						53.0	3.0							

JKGeotechnics

BOREHOLE LOG

Borehole No. 301

1 / 7

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** 62.6 m

Date: 2/1/25 AND 28/1/25 **Datum:** AHD

Plant Type: JK309 **Logged/Checked By:** J.F/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: Silty clay, medium plasticity, dark grey brown, trace of root fibres.	w<PL			GRASS COVER
					N = 10 4,4,6	62	1			FILL: Silty clay, high plasticity, brown and red brown, trace of fine to medium grained ironstone gravel.				
					N = 10 5,5,5	61	2			as above, but trace of plastic fragments and root fibres.				
						60				FILL: Silty clay, high plasticity, dark grey.	w>PL			
					N = 8 3,3,5		3							
						59			CH	Silty CLAY: high plasticity, orange brown mottled red brown, trace of ash.	w>PL	Hd	560 440 500	RESIDUAL
							4		-	Extremely Weathered siltstone: silty CLAY, medium plasticity, light grey, with iron indurated bands.	XW	Hd		ASHFIELD SHALE
					N > 17 15,17/ 150mm REFUSAL	58	5						>600 >600 >600	
					N=SPT 8/ 50mm REFUSAL	57	6							
						56								

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BOREHOLE LOG

Borehole No. 301

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** 62.6 m

Date: 2/1/25 AND 28/1/25 **Datum:** AHD

Plant Type: JK309 **Logged/Checked By:** J.F/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
									-	SILTSTONE: as above	XW	Hd		
										SILTSTONE: dark grey, with extremely weathered bands.	DW	VL - L		VERY LOW TO LOW 'TC' BIT RESISTANCE
						55								
							8			SILTSTONE: dark grey, with iron indurated bands.		M		MODERATE RESISTANCE
						54								
										REFER TO CORED BOREHOLE LOG				
						53	9							
							10							
						52								
							11							
						51								
							12							
						50								
							13							
						49								

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 301

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF | **Core Size:** HQ | **R.L. Surface:** 62.6 m

Date: 2/1/25 AND 28/1/25 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK309 | **Bearing:** N/A | **Logged/Checked By:** J.F/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
		54			START CORING AT 8.69m						
98% RETURN		53	9		SILTSTONE: dark grey, with red brown bands and light grey laminae, bedded at 0-10°.	DW	M	0.50 0.30 0.20		(8.72m) Be, 0°, P, S, Fe Ct (8.74m) Jh, 25°, P (8.79m) Be, 0°, P, S, Fe Ct (8.83m) Be, 0°, P, S, Fe Ct (8.86m) Be, 10°, P, S, Fe Ct (8.90m) Be, 0°, P, S, Clay Ct (8.96m) Be x 3, 0 - 5°, P, S, Fe Ct (9.06m) Be, 0°, P, S, Fe Ct (9.07m) Be, 0°, P, S, Fe Ct (9.09m) Be, 0°, P, S, Fe Ct (9.12m) Be, 0°, P, S, Fe Ct (9.19m) XWS, 10°, 15 mm.t (9.21m) J, 85°, P, S, Cn (9.23m) XWS, 7°, 10 mm.t (9.27m) XWS, 10°, 8 mm.t (9.53m) Be, 10°, P, S, Fe Ct (9.68m) Be, 10°, P, S, Fe Ct (9.83m) J, 15°, P, S, Fe Ct (9.85m) J, 20°, P, S, Fe Ct (9.92m) Be, 0°, P, S, Fe Ct (10.00m) Be, 0°, P, S, Fe Ct (10.06m) Be, 0°, P, S, Fe Ct (10.15m) Be, 0°, P, S, Fe Ct (10.46m) Cr, 0°, 10 mm.t	Ashfield Shale
		52	10		SILTSTONE: dark grey, with light grey laminae, bedded at 0-5°.	SW	M - H	0.50 1.7		(10.92m) J x 2, 35°, P, S, Cn	
		51	11			FR		1.5	60 20	(11.29m) J, 40°, P, S, Cn (11.30m) J, 15°, P, S, Cn (11.31m) Jh, 15°, P, Cn (11.38m) J, 40°, P, S, Clay Ct (11.49m) J, 75°, C, S, Cn (11.64m) J, 25°, P, S, Fe Ct (11.69m) J, 30°, P, S, Cn (11.72m) J, 45°, P, S, Clay Vn (11.75m) Be, 0°, P, S, Clay Ct	
		50	12					2.0 1.4		(12.39m) J, 70°, P, S, Cn (12.53m) J, 30°, Un, S, Cn	
		49	13					1.1 1.0 0.90		(13.20m) J, 15°, P, S, Cn (13.27m) J, 30°, P, S, Cn (13.36m) J, 60°, C, S, Cn (13.56m) J, 15°, P, S, Cn	
		48	14					1.0		(13.67m) J, 45°, P, S, Cn (13.70m) J, 30°, P, S, Cn (13.74m) J, 25°, P, S, Cn (13.91m) J, 70°, P, S, Cn (14.15m) J, 45°, P, S, Cn	
								0.60		(14.32-14.50m) J x 8, 30°, P, S, Cn	
								0.90		(14.71m) J, 70°, C, S, Cn	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 301

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF | **Core Size:** HQ | **R.L. Surface:** 62.6 m

Date: 2/1/25 AND 28/1/25 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK309 | **Bearing:** N/A | **Logged/Checked By:** J.F/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)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
98% RETURN		47	16		SILTSTONE: dark grey, with light grey laminae, bedded at 0-5°. *(continued)*	FR	M - H	1.3			Ashfield Shale
		46					H	1.7			
								1.8			
								3.1			
		45	17		LAMINITE: Siltstone, dark grey, and Sandstone, fine grained, light grey, bedded at 0-10°.			2.8		(17.32m) Jh, 90°, P	
								1.9			
		44	18		SANDSTONE: fine to medium grained, light grey, with dark grey laminae, and occasional siltstone bands, bedded at 0-10°.			3.5		(17.99m) J, 85°, P, S, Cn	Hawkesbury Sandstone
								3.2			
		43	19					2.4			
								2.8			
		42	20					2.3			
								2.3			
		41	21					2.8			
								2.0			
								2.3			

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 301

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF | **Core Size:** HQ | **R.L. Surface:** 62.6 m

Date: 2/1/25 AND 28/1/25 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK309 | **Bearing:** N/A | **Logged/Checked By:** J.F/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
98% RETURN		40	23		SANDSTONE: fine to medium grained, light grey, with dark grey laminae, and occasional siltstone bands, bedded at 0-10°. *(continued)*	FR	H	2.3		(22.56m) J, 88°, P, S, Cn	Hawkesbury Sandstone
								1.8			
		39								(23.58m) J, 90°, P, S, Cn	
			24					2.4			
								2.5			
		38						2.5			
			25					2.2			
		37								(25.60m) J, 80°, P, S, Cn	
			26					1.6			
		36								(26.71m) Be, 0°, P, S, Clay Ct	
								1.4		(26.85m) Be, 5°, P, S, Fe Ct	
			27							(26.93m) Be, 0°, P, S, Fe Ct	
								2.1		(26.99m) J, 0°, P, S, Cn	
										(27.06m) Be, 0°, Ir, R, Fe Vn	
					NO CORE 0.17m						
0% RETURN		35			SANDSTONE: fine to medium grained, light grey, with grey and dark grey laminae, bedded at 0-20°.	FR	M - H	0.90			Hawkesbury Sandstone
			28					0.80		(27.91m) Be, 0°, P, S, Clay Vn	
								1.0		(28.02m) Be, 5°, P, S, Clay Vn	
		34						0.80		(28.87m) Be, 10°, P, S, Clay Vn	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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CORED BOREHOLE LOG

Borehole No. 301 **6 / 7**

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** HQ **R.L. Surface:** 62.6 m

Date: 2/1/25 AND 28/1/25 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK309 **Bearing:** N/A **Logged/Checked By:** J.F/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 $I_s(50)$	SPACING (mm)	DEFECT DETAILS DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
0% RETURN		33 30 32 31 31 30 32 33 29 34 28 35 27	30 31 32 33 34 35		SANDSTONE: fine to medium grained, light grey, with grey and dark grey laminae, bedded at 0-20°. *(continued)*	FR	M - H	1.3 1.3 0.80 0.70 0.80 1.0 0.90 1.0 1.1 1.1 1.1 0.90 0.80 0.90		(29.78m) Be, 0°, P, S, Clay Ct (29.87m) Be, 20°, P, S, Clay Vn (30.62m) Be, 5°, P, S, Clay Ct (30.65m) Be, 10°, P, S, Clay Vn (34.04m) Be, 10°, P, S, Cb Vn (35.72m) Be, 5°, P, S, Clay Vn	Hawkesbury Sandstone

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 301 **7 / 7**

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** HQ **R.L. Surface:** 62.6 m

Date: 2/1/25 AND 28/1/25 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK309 **Bearing:** N/A **Logged/Checked By:** J.F/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
0% RETURN		26	37		SANDSTONE: fine to medium grained, light grey, with grey and dark grey laminae, bedded at 0-20°. *(continued)*	FR	M - H	1.0 0.90		(36.16m) Be, 5°, P, S, Clay Vn	Hawkesbury Sandstone
		25					H	1.3 1.6		(37.91m) Be, 10°, P, R, Cb Vn	
		24	38					1.7		(38.30m) J, 90°, P, R, Clay Ct	
		23	39					1.8 1.6		(39.38m) J, 40°, Ir, R, Clay Ct	
		22	40					1.8 1.5		(40.03m) Be, 0°, P, S, Cb Vn	
		21	41		END OF BOREHOLE AT 40.20 m						
		20	42								

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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Job No:	36466BF
Borehole No:	BH301
Depth:	8.69m – 16.00m

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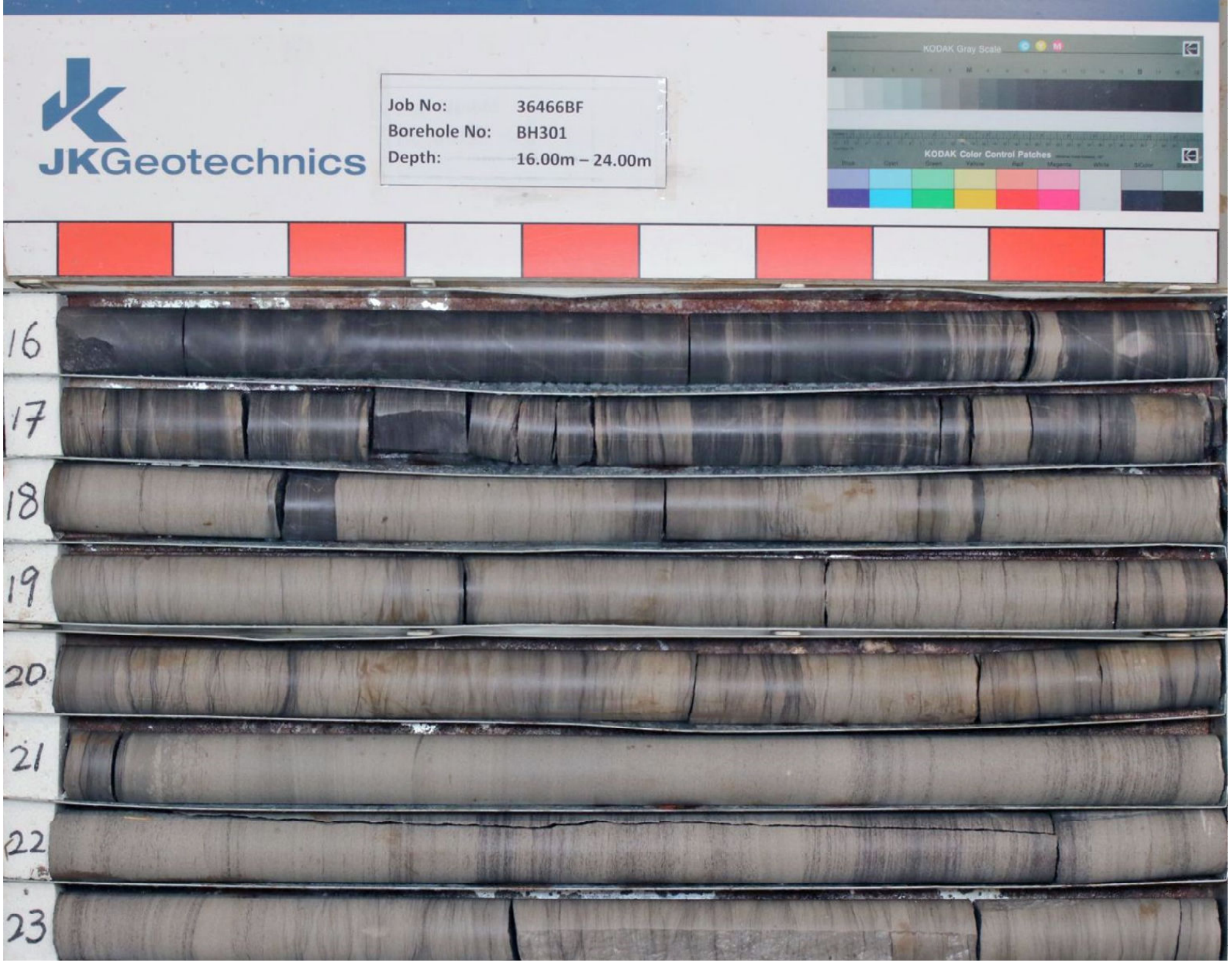
Job No:	36466BF
Borehole No:	BH301
Depth:	16.00m – 24.00m



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Job No:	36466BF
Borehole No:	BH301
Depth:	24.00m – 27.08m

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Job No:	36466BF
Borehole No:	BH301
Depth:	27.08m – 34.00m

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Job No:	36466BF
Borehole No:	BH301
Depth:	34.00m – 40.20m

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BOREHOLE LOG

Borehole No. 302

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** 57.8 m

Date: 2/1/25 TO 3/1/25 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** T.F./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									-	ASPHALTIC CONCRETE: 30mm.t	w>PL			SLIGHT HYDRO CARBON ODOUR
					N = 5 3,2,3	57	1			FILL: Gravelly clay, medium to high plasticity, grey and brown, fine to coarse grained igneous gravel, trace of fine to coarse grained ironstone gravel, ash and slag and root fibres.				
										as above, but light grey.				
					N = 6 2,2,4	56	2			FILL: Silty clay, low plasticity, dark grey, with fine to coarse grained igneous and ironstone gravel.				
									CH	Silty CLAY: high plasticity, orange brown, trace of fine to coarse grained ironstone gravel.	w>PL	VSt - Hd	400 410 340 350	RESIDUAL
										as above, but red brown and light grey.	w<PL			
					N = 21 5,6,15	55	3					Hd	450 >600 550	
									-	Extremely Weathered siltstone: silty CLAY, as below	XW	Hd		ASHFIELD SHALE
						54	4							BANDED 'TC' BIT RESISTANCE
					N = 35 13,13,22	53	5						>600 >600 >600	
						52	6							
					N = 23 8,11,12	51								

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BOREHOLE LOG

Borehole No. 302

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Method:** SPIRAL AUGER **R.L. Surface:** 57.8 m

Date: 2/1/25 TO 3/1/25 **Datum:** AHD

Plant Type: JK500 **Logged/Checked By:** T.F./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
						50	8		-	Extremely Weathered siltstone: silty CLAY, medium to high plasticity, with very low strength siltstone bands and iron indurated bands.	XW	Hd		
										SILTSTONE: dark grey, with iron indurated bands.	DW	L - M		LOW TO MODERATE RESISTANCE
						49	9			REFER TO CORED BOREHOLE LOG				
						48	10							
						47	11							
						46	12							
						45	13							
						44								

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 302

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** HQ **R.L. Surface:** 57.8 m

Date: 2/1/25 TO 3/1/25 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** T.F./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 8.60m						
100% RETURN		49	9		SILTSTONE: grey, with light grey laminae, bedded at 0-10°.	SW	M	0.30		(8.63m) Be, 0°, Ir, R, Fe Sn (8.73m) Be, 0°, Ir, R, Fe Sn (8.84m) J, 20°, Ir, R, Fe Sn	Ashfield Shale
		48	10		LAMINITE: Siltstone, grey, and Sandstone, fine to medium grained, with light grey laminae, bedded at 0-10°.		M - H	0.20 0.60 0.80		(9.02m) Be, 0°, Ir, R, Fe Sn (9.10m) Be, 0°, Ir, R, Fe Sn (9.14m) Ji, 75°, Ir, R, Fe Sn (9.22m) Be, 0°, Ir, R, Fe Sn (9.30m) XWS, 0°, 10 mm.t (10.05m) J, 60°, Ir, R, Fe Sn (10.19m) Be, 20°, Ir, R, Fe Sn	
		47	11					0.80 1.2		(10.82m) Be, 0°, Ir, R, Fe Sn (11.23m) XWS, 0°, 20 mm.t (11.28m) XWS, 0°, 10 mm.t (11.37m) XWS, 0°, 8 mm.t	
		46	12					0.80 0.40		(11.56m) XWS, 0°, 30 mm.t (11.73m) J, 80°, Ir, R, Cn (11.95m) XWS, 0°, 10 mm.t	
70% RETURN		45	13		SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 0-10°.	FR	H	1.3 2.3		(12.23m) CS, 0°, 10 mm.t (12.47m) Be, 0°, Ir, R, Fe Sn (12.61m) XWS, 0°, 15 mm.t (12.84m) CS, 0°, 10 mm.t (13.29m) XWS, 0°, 2 mm.t (13.38m) Be, 0°, Ir, R, Cn (13.50m) XWS, 10°, 2 mm.t	Hawkesbury Sandstone
		44	14					1.3 1.5		(13.84m) XWS, 5°, 2 mm.t	
		43			SANDSTONE: fine to medium grained, light grey, massive.			0.70		(14.72m) J, 60°, Ir, R, Cn	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 302

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF | **Core Size:** HQ | **R.L. Surface:** 57.8 m

Date: 2/1/25 TO 3/1/25 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** T.F./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
70% RETURN		42	16		SANDSTONE: fine to medium grained, light grey, massive. *(continued)*	FR	H	0.70	600 200 60 20	(15.09m) J, 10°, Ir, R, Cn (15.38m) XWS, 0°, 15 mm.t	Hawkesbury Sandstone
								1.5			
								1.5			
		41	17					1.3			
					SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 0-10°			1.0		(17.44m) J, 30°, Ir, R, Cn (17.49m) CS, 0°, 45 mm.t (17.61m) CS, 5°, 2 mm.t	
		40	18					2.0		(17.88m) Be, 0°, Ir, R, Cn	
								0.70		(18.28m) J, 25°, Ir, R, Cn	
		39	19					2.5			
								1.6			
		38	20					1.5			
					LAMINITE: Siltstone, grey, and Sandstone, fine to medium grained, light grey, bedded at 0-5°.			0.40		(20.20m) CS, 0°, 2 mm.t (20.35m) Be, 0°, Ir, R, Cn	
					SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 0-5°						
		37	21					2.1			
75% RETURN								1.0		(21.20m) Be, 0°, Ir, R, Cn	
		36						0.80			

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 302

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF | **Core Size:** HQ | **R.L. Surface:** 57.8 m

Date: 2/1/25 TO 3/1/25 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** T.F./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
75% RETURN		35	23		SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 0-5° *(continued)*	FR	H	0.60, 1.3, 0.50		(22.93m) CS, 0°, 13 mm.t; (23.16m) Ji, 50°, Ir, R, Cn; (23.20m) Be, 15°, Ir, R, Cn	Hawkesbury Sandstone
		34	24					0.60, 1.6		(23.60m) CS, 0°, 14 mm.t; (23.81m) Be, 5°, Ir, R, Cn; (23.92m) Be, 5°, Ir, R, Cn; (24.32m) J, 15°, Ir, R, Cn	
		33	25		LAMINITE: Siltstone, dark grey, and Sandstone, fine to medium grained, light grey laminae, bedded at 0-5°.			0.50, 0.80		(24.83m) Be, 0°, Ir, R, Cn	
		32	26		SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 0-15°.			1.1, 1.3		(25.50m) XWS, 0°, 20 mm.t	
		31	27					0.90, 1.5			
		30	28					0.90, 1.3			
		29						1.0			

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 302

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF | **Core Size:** HQ | **R.L. Surface:** 57.8 m

Date: 2/1/25 TO 3/1/25 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK500 | **Bearing:** N/A | **Logged/Checked By:** T.F./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
75% RETURN		28	30		SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 0-15°. *(continued)*	FR	H	1.0			Hawkesbury Sandstone
								0.90			
		27	31					1.1			
								1.6			
								1.4		(31.19m) Be, 0°, Ir, R, Cn	
		26	32					1.3			
								1.2		(32.21m) Be, 0°, P, R, Fe Cn	
		25	33					0.60			
								1.1			
		24	34					1.3			
								1.9			
		23	35					1.7			
								2.6			
		22						2.2			

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 302 **7 / 7**

Client: TTW (NSW) PTY LTD

Project: PROPOSED DATA CENTRE

Location: 34 WATERLOO ROAD, MACQUARIE PARK, NSW

Job No.: 36466BF **Core Size:** HQ **R.L. Surface:** 57.8 m

Date: 2/1/25 TO 3/1/25 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK500 **Bearing:** N/A **Logged/Checked By:** T.F./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
					SANDSTONE: fine to medium grained, light grey, with occasional grey laminae, bedded at 0-15°.	FR	H	1.6			
					END OF BOREHOLE AT 36.18 m						
		21	37								
		20	38								
		19	39								
		18	40								
		17	41								
		16	42								
		15									

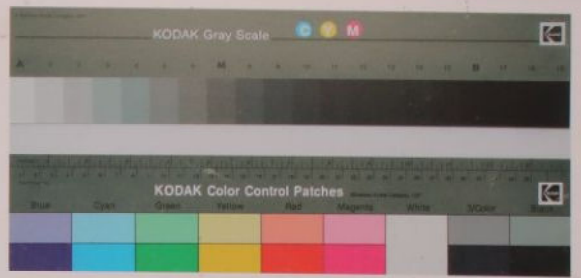
FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

Job No:	36466BF
Borehole No:	BH302
Depth:	8.60m – 15.00m

JKGeotechnics

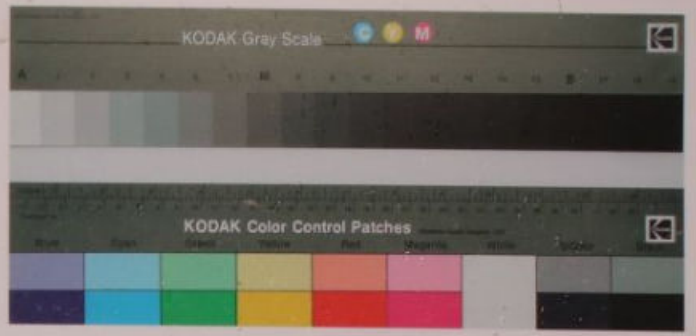
Job No:	36466BF
Borehole No:	BH302
Depth:	15.00m – 23.00m

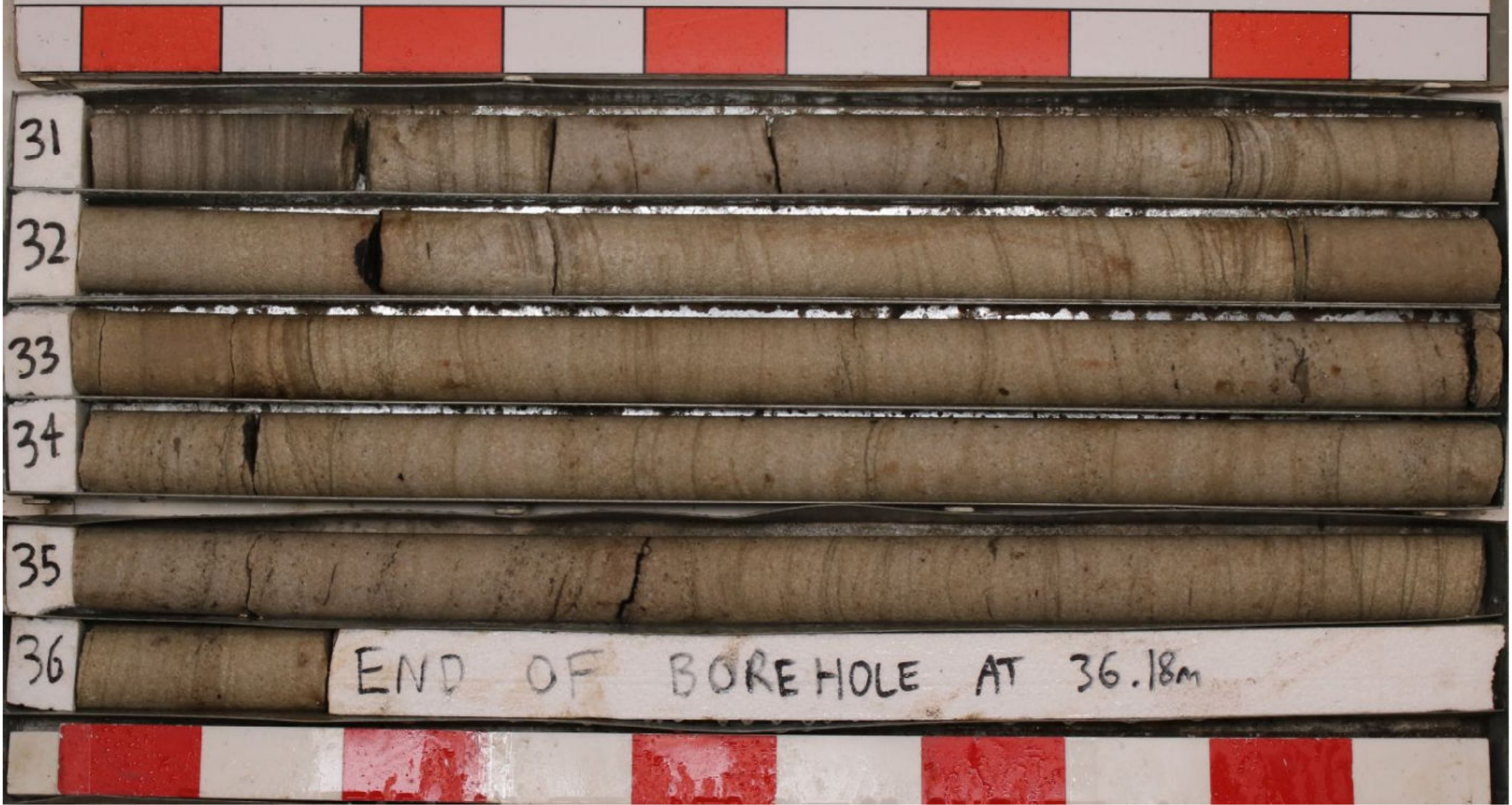



JKGeotechnics
Job No: 36466BF
Borehole No: BH302
Depth: 23.00m – 31.00m
KODAK Gray Scale
KODAK Color Control Patches
23
24
25
26
27
28
29
30

JKGeotechnics

Job No: 36466BF
Borehole No: BH302
Depth: 31.00m – 36.18m





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.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. Licence to use the documents may be revoked without notice if the Client is in breach of any obligation to make a payment to us.

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
Fine 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:

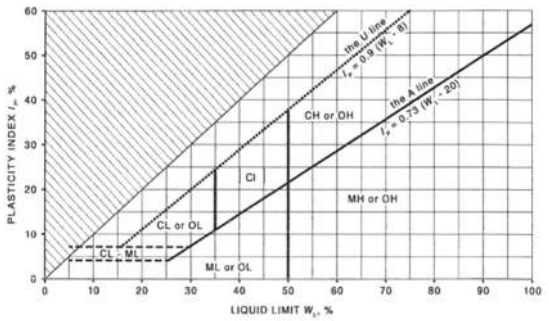
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

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.

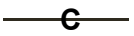
3 Clay soils with liquid limits > 35% and ≤ 50% may be classified as being of medium plasticity.

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	Sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
	ASB	Soil sample taken over depth indicated, for asbestos analysis.
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.
	SAL	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	Vane shear reading in kPa of undrained shear strength.
	PID = 100	Photoionisation detector reading in ppm (soil sample headspace test).
Moisture Condition (Fine Grained Soils)	w > PL	Moisture content estimated to be greater than plastic limit.
	$w \approx$ PL	Moisture content estimated to be approximately equal to plastic limit.
	w < PL	Moisture content estimated to be less than plastic limit.
	$w \approx$ LL	Moisture content estimated to be near liquid limit.
	w > LL	Moisture content estimated to be wet of liquid limit.
(Coarse Grained Soils)	D	DRY – runs freely through fingers.
	M	MOIST – does not run freely but no free water visible on soil surface.
	W	WET – free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS	VERY SOFT – unconfined compressive strength ≤ 25kPa.
	S	SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa.
	F	FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa.
	St	STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa.
	VSt	VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa.
	Hd	HARD – unconfined compressive strength > 400kPa.
	Fr	FRIABLE – strength not attainable, soil crumbles.
	( )	Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.
Density Index/ Relative Density (Cohesionless Soils)		**Density Index (I_D) Range (%)** / **SPT 'N' Value Range (Blows/300mm)**
	VL	VERY LOOSE – ≤ 15 – 0 – 4
	L	LOOSE – > 15 and ≤ 35 – 4 – 10
	MD	MEDIUM DENSE – > 35 and ≤ 65 – 10 – 30
	D	DENSE – > 65 and ≤ 85 – 30 – 50
	VD	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

APPENDIX A

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH1** 1/1

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 57.4m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 30mm.t	D			SCREEN: 5.80kg (<10L) 0.03-0.4m, NO FCF
										FILL: Silty gravelly sand, fine to medium grained, light brown, fine to medium grained igneous gravel.	M			SCREEN: 9.36kg (<10L) 0.4-1.0m, NO FCF
							1			FILL: Silty sand, fine to medium grained, grey, trace of sandstone cobbles, igneous gravel and metal fragments.	w<PL			SCREEN: 4.95kg (<10L) 1.0-1.7m, NO FCF
						N = 14 4,4,10				FILL: Silty clay, low to medium plasticity, brown, trace of igneous and sandstone gravel, and ash.				
									CI-CH	Silty CLAY: medium to high plasticity, grey and orange brown, trace of ironstone gravel.	w<PL			RESIDUAL
							2			END OF BOREHOLE AT 1.95m				
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH2 **1/1**

SDUP9: 0.5-0.95

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 57.4m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 20mm.t	D			SCREEN: 6.05kg (<10L) 0.02-0.5m, NO FCF
										FILL: Silty gravelly sand, light brown, fine to medium grained igneous gravel.				
						N = 18 13,9,9				FILL: Silty sandy clay, low plasticity, brown, fine to medium grained sand, trace of igneous and sandstone gravel, slag, metal fragments and ash.	w<PL			SCREEN: 7.45kg (<10L) 0.5-1.5m, FCF1
							1							
						N = 4 3,2,2								SCREEN: 1.45kg (<10L) 1.5-1.7m, NO FCF
									CI-CH	Silty CLAY: medium to high plasticity, yellow brown and orange brown, trace of ironstone gravel.	w≈PL			RESIDUAL
							2			END OF BOREHOLE AT 2.0m				
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH3** **1/1**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 56.3m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION						N = 4 1,2,2	0		-	ASPHALTIC CONCRETE: 10mm.t	M			INSUFFICIENT RETURN FOR BULK SCREEN
										FILL: Silty gravelly sand, fine to medium grained, brown, fine to medium grained igneous gravel, trace of ash.	w>PL			SCREEN: 4.45kg 0.1-1.1m, NO FCF
							1			FILL: Silty clay, medium to high plasticity, brown, trace of igneous and ironstone gravel, wood and ash.				SCREEN: 3.33kg 1.1-2.0m, NO FCF
						N = 4 1,2,2	2			END OF BOREHOLE AT 2.0m				
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH4** 1/1

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 58.1m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 20mm.t	M			SCREEN: 4.53kg (<10L)
										FILL: Silty gravelly sand, fine to medium grained, brown, fine to medium grained igneous gravel.	w<PL			0.02-0.3m, NO FCF
						N = 12 6,5,7				FILL: Silty clay, medium to high plasticity, brown and orange brown, trace of igneous and ironstone gravel, and ash.				SCREEN: 5.45kg (<10L) 0.3-1.3m, NO FCF
							1							SCREEN: 5.10kg (<10L) 1.3-1.6m, NO FCF
						N = 13 8,6,7			CI-CH	Silty CLAY: medium to high plasticity, orange brown mottled red brown, trace of ironstone gravel.	w<PL			RESIDUAL
							2			END OF BOREHOLE AT 2.0m				
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH6 **1/1**

SDUP8: 0.025-0.4

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 59.9m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 25mm.t	D			SCREEN: 3.75kg (<10L) 0.025-0.4m, NO FCF
										FILL: Silty gravelly sand, fine to medium grained, light brown, fine to medium grained igneous gravel.	w<PL			SCREEN: 10.02kg 0.4-1.2m, NO FCF
						N = 17 5,9,8	1			FILL: Silty clay, low to medium plasticity, brown, trace of sandstone and ironstone gravel, sand and ash.				
									CI-CH	Silty CLAY: medium to high plasticity, grey and orange brown, trace of ironstone gravel.	w<PL			RESIDUAL
						N > 8 12,8/ 50mm REFUSAL	2		-	Extremely Weathered siltstone: silty gravelly CLAY, low to medium plasticity, grey, fine to medium grained siltstone gravel.	XW			ASHFIELD SHALE
										END OF BOREHOLE AT 2.0m				
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH8 **1/1**

SDUP4: 0.03-0.4

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 61.9m

Date: 4/12/23 **Datum:** AHD

Plant Type: JK330 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 30mm.t	M			SCREEN: 5.50kg (<10L) 0.03-0.4m, NO FCF
										FILL: Silty sand, fine to medium grained, brown, trace of igneous gravel.	w≈PL			SCREEN: 5.93kg (<10L) 0.4-1.4m, NO FCF
						N = 13 7,5,8	1			FILL: Gravelly clay, low plasticity, brown, fine to medium grained, sub-angular igneous and ironstone gravel, trace of sand and ash.				
						N = 23 5,10,13	2		CI-CH	Silty CLAY: medium to high plasticity, yellow brown and orange brown, trace of ironstone gravel.	w<PL			RESIDUAL
							3		-	Extremely Weathered sandstone: silty CLAY, low to medium plasticity, orange brown.	XW			HAWKESBURY SANDSTONE
										SANDSTONE: orange brown.	DW			GROUNDWATER MONITORING WELL INSTALLED TO 5.6m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 2.6m TO 5.6m. CASING 0.03m TO 2.6m. 2mm SAND FILTER PACK 2.5m TO 5.6m. BENTONITE SEAL 2.0m TO 2.5m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
							4							
							5							
							6			END OF BOREHOLE AT 6.0m				
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH10** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 62.5m

Date: 4/12/23 **Datum:** AHD

Plant Type: JK330 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 40mm.t	M			SCREEN: 6.65kg (<10L) 0.04-0.45m, NO FCF
						N = 16 4,9,7				FILL: Silty gravelly sand, fine to medium grained, brown, fine to medium grained, sub-angular igneous gravel.	w≈PL			SCREEN: 7.15kg (<10L) 0.45-1.45m, NO FCF
							1			FILL: Sandy clay, low plasticity, brown, fine to medium grained sand, trace of sandstone gravel, tile fragments and slag.				
						N = 24 3,8,16								INSUFFICIENT RETURN FOR BULK SCREEN
							2		-	Extremely Weathered sandstone: silty CLAY, low to medium plasticity, orange brown.	XW			HAWKESBURY SANDSTONE
										END OF BOREHOLE AT 2.5m				
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH11** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 62.6m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 30mm.t	D			SCREEN: 2.50kg (<10L)
										FILL: Silty gravelly sand, fine to medium grained, light brown, fine to medium grained igneous gravel.	w<PL			0.03-0.3m, NO FCF
						N = 12 5,5,7				FILL: Silty clay, low to medium plasticity, brown, trace of sandstone and ironstone gravel, and ash.	w<PL			SCREEN: 8.95kg (<10L) 0.3-0.7m, NO FCF
							1		CI-CH	Silty CLAY: medium to high plasticity, grey and orange brown, trace of ironstone gravel.				RESIDUAL
						N > 8 15,8/ 50mm REFUSAL			-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, with distinctly weathered siltstone bands.	XW			ASHFIELD SHALE
							2			END OF BOREHOLE AT 1.7m				
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH13** 1/1

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 65.6m

Date: 4/12/23 **Datum:** AHD

Plant Type: JK330 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	ASS	ASB	PFAS	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 30mm.t	M			SCREEN: 3.95kg (<10L) 0.03-0.4m, NO FCF
										FILL: Silty sand, fine to medium grained, grey, trace of igneous gravel.	w≈PL			SCREEN: 9.9kg 0.3-1.3m, NO FCF
						N = 11 6,6,5				FILL: Silty gravelly clay, low to medium plasticity, brown, fine to medium grained, sub-angular igneous gravel, trace of slag.				
							1							SCREEN: 2.75kg (<10L) 1.3-1.7m, NO FCF
						N = 19 3,9,10			-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, yellow brown and orange brown, with distinctly weathered silstone bands, trace of ironstone bands.	XW			ASHFIELD SHALE
							2							
										END OF BOREHOLE AT 2.8m				
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH16** 1/1

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 66.2m

Date: 27/11/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■				0		-	ASPHALTIC CONCRETE: 10mm.t	D			INSUFFICIENT RETURN FOR BULK SCREEN ASHFIELD SHALE
	■		■						-	FILL: Sandy gravel, fine to medium grained, sub-angular igneous, brown, fine to medium grained sand.	XW			
	■		■				1			Extremely Weathered siltstone: silty CLAY, low to medium plasticity, brown, with distinctly weathered siltstone bands.				
	■		■							END OF BOREHOLE AT 1.5m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH17** **1/1**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 68.5m

Date: 27/11/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked by:** L.R./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION	■		■		■		0		-	ASPHALTIC CONCRETE: 50mm.t				SCREEN: 3.3kg (<10L)
										FILL: Sandy gravel, fine to medium grained, sub-angular igneous, brown,				0.05-0.4m, NO FCF
	■		■						-	fine to medium grained sand.	XW			ASHFIELD SHALE
	■		■				1			Extremely Weathered siltstone: silty CLAY, low to medium plasticity, brown, with distinctly weathered siltstone bands.				
										END OF BOREHOLE AT 1.5m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH19** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 64.6m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 20mm.t	D			SCREEN: 4.90kg (<10L) 0.02-0.4m, NO FCF
										FILL: Silty gravelly sand, fine to medium grained, light brown, fine to medium grained igneous gravel.	w<PL			SCREEN: 6.74kg (<10L) 0.4-1.4m, NO FCF
						N = 16 8,10,6	1			FILL: Silty clay, low to medium plasticity, brown and orange brown, trace of sandstone and igneous gravel, and ash.				
						N = 8 4,3,5	2							SCREEN: 6.30kg (<10L) 1.4-2.4m, NO FCF
														SCREEN: 4.10kg (<10L) 2.4-2.8m, NO FCF
						N > 11 7,11/ 50mm REFUSAL	3		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, light brown and grey.	XW			ASHFIELD SHALE
										END OF BOREHOLE AT 3.5m				
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH20** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 65.4m

Date: 4/12/23 **Datum:** AHD

Plant Type: JK330 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 20mm.t	M			SCREEN: 6.35kg 0.02-0.5m, NO FCF
						N = 14 6,7,7	1			FILL: Silty sand, fine to medium grained, grey, fine to medium grained, sub-angular igneous gravel.	w<PL			SCREEN: 11.40kg 0.5-1.5m, NO FCF
						N = 13 4,6,7	2			FILL: Silty clay, low to medium plasticity, orange brown, trace of igneous and sandstone gravel.				SCREEN: 6.75kg (<10L) 1.5-2.1m, NO FCF
									-	Extremely Weathered sandstone: silty CLAY, low to medium plasticity, yellow brown and orange brown, trace of sand.	XW			HAWKESBURY SANDSTONE
							3			END OF BOREHOLE AT 2.8m				
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH22 **1/1**

SDUP3: 0.1-0.15

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 64.2m

Date: 4/12/23 **Datum:** AHD

Plant Type: JK **Logged/Checked by:** L.R./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0		-	ASPHALTIC CONCRETE: 40mm.t	D			SCREEN: 3.47kg (<10L) 0.04-0.2m, NO FCF
										FILL: Gravelly sand, fine to coarse grained, grey brown, with fine to medium grained igneous gravel, trace of sandstone gravel, clay nodules, slag and glass fragments.	w<PL			SCREEN: 5.7kg (<10L) 0.2-0.6m, NO FCF
						N = 20 8,8,12			-	FILL: Silty clay, low plasticity, red brown, trace of igneous, ironstone and sandstone gravel, and clay nodules.	XW			ASHFIELD SHALE
							1			Extremely Weathered siltstone: silty CLAY, low to medium plasticity, light brown and grey, trace of ironstone bands.				
										END OF BOREHOLE AT 1.5m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH23 **1/1**

SDUP7: 0.02-0.3

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 65.6m

Date: 3/1/24 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION						N = 10 5,5,5	0		-	ASPHALTIC CONCRETE: 20mm.t	D			SCREEN: 3.15kg (<10L) 0.02-0.3m, NO FCF
										FILL: Silty gravelly sand, fine to medium grained, light brown, fine to medium grained igneous gravel.	D			SCREEN: 4.0kg (<10L) 0.3-1.0m, NO FCF
							1			FILL: Sand, fine to medium grained, yellow brown, trace of igneous gravel, metal and plastic fragments.				SCREEN: 11.30kg 1.0-1.4m, NO FCF
										END OF BOREHOLE AT 1.4m				TERMINATED DUE TO POSSIBLE SERVICE
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH25** 1/1

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 65.5m

Date: 4/12/23 **Datum:** AHD

Plant Type: JK330 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION	■		■				0			CONCRETE: 100mm.t				
	■		■						-	FILL: Silty clay, medium to high plasticity, brown, trace of igneous and ironstone gravel, sand and root fibres.	w>PL			SCREEN: 3.27kg (<10L) 0.1-0.3m, NO FCF
	■		■						CI-CH		w≈PL			RESIDUAL
						N > 26 5,16, 10/50mm REFUSAL				Silty CLAY: medium to high plasticity, yellow brown mottled orange brown.	XW			HAWKESBURY SANDSTONE
	■		■				1		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, yellow brown and orange brown, with distinctly weathered siltstone bands.				
										END OF BOREHOLE AT 1.3m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH28** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 63.7m

Date: 5/12/23 **Datum:** AHD

Plant Type: JK330 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0			FILL: Clayey sand, fine to medium grained, brown, trace of clay nodules.	M w<PL			GRASS COVER
						N = 12 5,5,7	1			FILL: Silty clay, low to medium plasticity, brown, trace of igneous and sandstone gravel, sand, glass fragments and ash.				SCREEN: 10.40kg 0-0.1m, NO FCF SCREEN: 2.55kg (<10L) 0.1-1.1m, NO FCF SCREEN: 6.18kg (<10L) 1.1-2.1m, NO FCF
						N = 18 6,9,9	2							SCREEN: 6.18kg (<10L) 2.1-3.0m, NO FCF
						N = 16 8,8,8	3		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled orange brown.	w≈PL			SCREEN: 3.20kg (<10L) 3.0-3.2m, NO FCF RESIDUAL
							4			END OF BOREHOLE AT 4.0m				
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH30** **1/1**

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** HAND AUGER **R.L. Surface:** ≈ 59.0m

Date: 5/12/23 **Datum:** AHD

Plant Type: - **Logged/Checked by:** L.R./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Gravelly sand, fine to medium grained, light brown, fine to medium grained, sub-angular ironstone gravel, trace of clay nodules, roots and root fibres.	D			SCREEN: 11.7kg 0-0.1m, NO FCF
										END OF BOREHOLE AT 0.1m				HAND AUGER REFUSAL
							1							
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH31** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 65.3m

Date: 4/12/23 **Datum:** AHD

Plant Type: JK330 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 30mm.t	M			SCREEN: 3.75kg (<10L)
									-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to medium grained, sub-angular igneous gravel.	XW			0.03-0.1m, NO FCF
							1			Extremely Weathered siltstone: silty CLAY, low to medium plasticity, yellow brown and orange brown, with distinctly weathered siltstone bands, trace of ironstone bands.				ASHFIELD SHALE
										END OF BOREHOLE AT 1.2m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH32** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 65.8m

Date: 5/12/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0		-	ASPHALTIC CONCRETE: 30mm.t	M			SCREEN: 4.0kg (<10L)
									-	FILL: Gravelly sand, fine to medium grained, grey, fine to medium grained, sub-angular igneous gravel.	XW			0.03-0.3m, NO FCF
										Extremely Weathered siltstone: silty gravelly CLAY, low to medium plasticity, grey and orange brown, trace of ironstone bands.				ASHFIELD SHALE
							1			as above, but grey.				
										END OF BOREHOLE AT 1.5m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH34** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 65.9m

Date: 5/12/23 **Datum:** AHD

Plant Type: JK500 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0		-	ASPHALTIC CONCRETE: 30mm.t	M			SCREEN: 3.95kg (<10L) 0.03-0.2m, NO FCF
									CI-CH	FILL: Gravelly sand, fine to medium grained, grey, fine to medium grained, sub-angular igneous gravel.	w<PL			RESIDUAL
						N > 24 6,14, 10/50mm REFUSAL			-	Silty CLAY: medium to high plasticity, grey, trace of ironstone gravel.	XW			ASHFIELD SHALE
							1			Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey.				
										END OF BOREHOLE AT 1.5m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH35** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: TTW

Project: PROPOSED S5 DATA CENTRE

Location: 269 LANE COVE ROAD, MACQUARIE PARK, NSW

Job No.: E36466PR **Method:** HAND AUGER **R.L. Surface:** ≈ 63.0m

Date: 5/1/24 **Datum:** AHD

Plant Type: - **Logged/Checked by:** L.R./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■				0			FILL: Silty clay, low to medium plasticity, dark brown, trace of fine to coarse grained sandstone gravel, and plastic fragments.	w<PL			GRASS COVER SCREEN: 10.3kg 0-0.15m, NO FCF
										END OF BOREHOLE AT 0.15m				
							1							
							2							
							3							
							4							
							5							
							6							
							7							