



REPORT TO  
**HEALTH INFRASTRUCTURE**

ON  
**PRELIMINARY GEOTECHNICAL INVESTIGATION**

FOR  
**PROPOSED DPHI SITE DEVELOPMENT**

AT  
**COMMERCIAL ROAD, ROUSE HILL, NSW**

Date: 18 September 2025

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### ATTACHMENTS

STS Table A: Moisture Content, Atterberg Limits & Linear Shrinkage Test Report

STS Table B1: Four Day Soaked California Bearing Ratio Test Report

Envirolab Services Certificate of Analysis No. 387558

Borehole Logs 201 to 204 Inclusive

Figure 1: Site Location Plan

Figure 2: Borehole Location Plan

Report Explanation Notes

Appendix A: JK Environments Test Pit Location Plan & Relevant Test Pit Logs



## 1 INTRODUCTION

This report presents the results of a preliminary geotechnical investigation for the proposed development of the DPHI site at the corner of Commercial and Windsor Roads, Rouse Hill, NSW. The location of the site is shown in Figure 1. The investigation was commissioned by Health Infrastructure (Contract No. HI25251) in consultation with the project manager, Turner and Townsend.

We understand the DPHI site will be utilised as the temporary works area during construction on the Main Hospital site to the east. Whilst no details are currently available, the temporary works is expected to comprise access roads, site sheds, amenities, material storage, etc. Furthermore, it is understood that following completion of the Main Hospital construction works, the DPHI site will likely be redeveloped, however no proposed development details are currently available. Notwithstanding, this report has been prepared on the basis that both the temporary works and any future re-development of the DPHI site will be at/or close to existing grade, requiring minimal cut and fill earthworks, say less than 1m. Furthermore, we expect structural loads to be low to moderate for the temporary and permanent structures.

The purpose of this preliminary investigation was to obtain geotechnical information on the subsurface conditions at the nominated borehole locations, and to use this as a basis for providing comments and recommendations on site preparation, retention, footings, floor slabs, subgrade preparation, engineered fill and pavements.

## 2 INVESTIGATION PROCEDURE

The fieldwork for the investigation was carried out on 28 July 2025 and comprised four boreholes drilled with our truck mounted JK400 drilling rig. The boreholes were drilled to refusal depths ranging from 1.8m to 2.2m below existing surface levels using spiral auger techniques and a Tungsten Carbide ('TC') bit. Refusal occurred on high strength bedrock.

The strength of the subsurface soils was assessed from Standard Penetration Test (SPT) 'N' values augmented by hand penetrometer tests on the SPT split tube samples. The strength of the bedrock was assessed by observation of the auger penetration resistance using a 'TC' drill bit, together with examination of the recovered rock cuttings, and from correlations with subsequent moisture content test results on recovered rock chips. It should be noted that strengths assessed in this way are approximate and variances of one strength order should not be unexpected.

Selected samples were returned to Soil Test Services Pty Ltd (STS) and Envirolab Services Pty Ltd, both NATA accredited laboratories. STS tested soil and rock chip samples to determine moisture contents, Atterberg limits, linear shrinkages and four day soaked CBR values, as shown in STS Tables A and B1. Envirolab Services tested soil samples to determine pH, sulphate content, chloride content and resistivity, as shown in their Certificate of Analysis 387558.



Groundwater observations were made during and on completion of auger drilling. Groundwater monitoring wells were installed in BH201, BH203 and BH204 to allow further longer term groundwater monitoring to be carried out. Well construction details are provided on the borehole logs. Readings were taken within these wells during a subsequent visit by JK Environments (JKE) on 4 August 2025.

The fieldwork was completed in the full-time presence of our geotechnical engineer who set out the borehole locations, nominated the testing and sampling, and prepared the attached borehole logs. The borehole locations are shown on the attached Figure 2. The locations were measured using a differential GPS unit to provide surface levels and coordinates, which are shown on the borehole logs. The datum of the levels is the Australian Height Datum (AHD). For more details of the investigation procedures and their limitations, reference should be made to the attached Report Explanation Notes.

### **3 RESULTS OF INVESTIGATION**

#### **3.1 Site History**

From a review of available historical aerial imagery on the NSW Government Historical Imagery database, it appears that the site comprised farmland up until sometime in 1978, where then it appears to become a golf course. At some time between 2005 and 2013, the golf course is decommissioned and the area becomes grassland which appears to be similar to the current site conditions. During this period, an on-grade car park was constructed to the south-east of the subject site, at the location of the current T-Way bus parking area.

#### **3.2 Site Description**

The site is located in gently undulating topography with a general north-easterly slope down towards Caddies Creek. The site itself appears to be on the upper hillside generally sloping down to the north-east between 1° and 3°.

Commercial Road and Windsor Road bound the site to the north-west and south-west, respectively, and these roads comprise asphaltic concrete (AC) pavements that generally appear in moderate to good condition with occasional small diameter depressions and minor longitudinal cracking observed. The site is bound to the south-east by a T-Way bus parking area, comprising an on-grade concrete pavement. The site is bound to the north-east by the Main Hospital site which is delineated by temporary fencing and comprises grassland with sporadic small to large trees.

The site itself comprises a vacant lot that is grassed, dirt or AC paved. Small to large trees are present along the north-western and south-western perimeters of the subject site. Access to the site is via a gate within the temporary fence that abuts the Main Hospital site.

### **3.3 Subsurface Conditions**

The Penrith 1:100,000 Geological Series Sheet 9030 indicates that the site is mapped to be located within the Ashfield Shale geological unit, but is also about 350m south-west from the boundary with the Hawkesbury Sandstone. This profile does not account for any filling or in-situ weathering that has occurred at the site.

In summary, the boreholes encountered a shallow cover of pavements and fill overlying either residual silty clay or weathered siltstone bedrock which was initially and typically of very low to low strength, but quickly improved to medium to high strength. Further comments on the subsurface conditions encountered are provided below. Reference should be made to the borehole logs for detailed descriptions of the subsurface conditions encountered at each borehole location.

#### ***Pavement and Fill***

A deep lift AC pavement approximately 300mm thick was encountered at the surface in BH202. Fill was then encountered in all boreholes below the pavement in BH202 and from the surface in BH201, BH203 and BH204. The fill extended to depths ranging from approximately 0.3m to 0.5m below existing surface levels. The fill typically comprised silty gravelly sandy fill consisting of a mixture of sandstone, igneous and ironstone gravels. The exception was in BH201 where silty clay fill was encountered but contained trace amounts of gravels. Due to the shallow depth of the fill, testing of the fill was not carried out, however the fill was inferred to be moderately to well compacted based on resistance during drilling and our site observations.

#### ***Residual Silty Clay***

Residual silty clay was encountered in all boreholes except BH202 where the fill directly overlaid the underlying siltstone bedrock. The residual clays were assessed to be of medium plasticity and of hard strength. The moisture content of the clay was typically close to the plastic limit.

#### ***Weathered Bedrock***

Weathered siltstone bedrock was encountered in all boreholes at depths ranging from 0.5m to 1.3m below existing surface levels. The level of the surface of the rock ranged from RL54.6m to RL57.3m and typically graded down towards the south-east. Generally, the upper bedrock comprised distinctly weathered bedrock of very low to low strength, although in BH203 a thin band of extremely weathered siltstone was initially encountered. We note that extremely weathered siltstone will remould to a material with soil like properties. At depths between 0.8m and 1.8 below existing surface levels, medium to high strength bedrock was encountered and it extended to the borehole refusal depths.

#### ***Groundwater***

The boreholes did not encounter groundwater during auger drilling and were dry on completion. JKE returned to site on 4 August 2025 and the following table summarises the measurements made within the groundwater monitoring wells.

Well	Approximate Surface RL (AHD)	Measured Groundwater Levels			
		28 July 2025		4 August 2025	
		Depth (m)	Approx. RL (mAHD)	Depth (m)	Approx. RL (AHD)
BH201	58.60	Dry	-	0.6	58.0
BH203	56.81	Dry	-	Dry	-
BH204	55.40	Dry	-	Dry	-

### 3.4 Laboratory Test Results

Based on the Atterberg limits and linear shrinkage test results, the residual clays appear to be of medium plasticity and these would have a moderate potential for shrink-swell movements with changes in moisture content. The moisture content test results on samples of the weathered rock recovered from the augered portions of the boreholes showed reasonably good correlation with our field assessment of rock strengths. Reference should be made to the attached STS Table A for further details.

The four day soaked CBR tests on samples of the residual clay from BH201, BH2023 and BH204, surcharged with a 9kg surcharge and compacted to 98% of their Standard Maximum Dry Density (SMDD), returned CBR values of 6%, 3.5% and 11% respectively. We suspect the higher values in BH201 and BH204 may be affected by the presence of ironstone gravel within the material which may have artificially increased the CBR value. Reference should be made to the attached STS Table B1 for further details.

The following table summarises the soil chemistry test results from Envirolab Services. Reference should be made to the attached Certificate of Analysis No. 387558 for further details.

Location	Depth (m)	Soil Type	pH	Chloride mg/kg	Sulphate mg/kg	Resistivity ohm.cm
BH201	0.2-0.4	FILL: Silty Clay	6.5	<10	150	4,800
BH202	0.8-1.2	SILTSTONE	5.8	<10	27	22,000
BH203	0.5-0.65	RESIDUAL Silty CLAY	4.5	36	340	3,800

## 4 PRELIMINARY COMMENTS AND RECOMMENDATIONS

At the time of preparing this report, the proposed temporary and permanent works are unknown and therefore we have made assumptions as detailed in Section 1 above. As such, the following comments and recommendations should be considered of a general nature only and must be reviewed once design/work progresses and further details are known.

### 4.1 Excavation Conditions

Prior to any excavation commencing we recommend that reference be made to the NSW Government “Code of Practice Excavation Work” dated January 2020 or the most recent version at the time of works commencing.

We expect excavations in the order of about 1m or less may be required to achieve proposed finished surface levels. Such excavations are expected to encounter pavements, fill, residual silty clays and weathered siltstone bedrock of very low to low strength, although a limited depth of medium to high strength bedrock may also be encountered including iron indurated bands. Excavation of the soils and extremely weathered siltstone will be achievable using conventional excavation equipment, such as the buckets of hydraulic excavators.

Excavation of siltstone bedrock of low strength or higher will represent ‘hard rock’ excavation conditions and will require the use of rock excavation equipment, such as hydraulic rock hammers, rotary grinders, ripping hooks and rock saws. The excavation contractor should be made aware of this by being supplied with all geotechnical information, particularly the borehole logs and rock strength test results. Low productivity and increased equipment wear should be expected due to the rock strength.

### 4.2 Earthworks, Filling and Subgrade Preparation

The existing fill is uncontrolled and is not considered suitable to support footings or floor slabs. However, from a geotechnical perspective, the existing fill appears to be suitable to be re-used as engineered fill, as discussed further in Section 4.3 below. With that being said, given the existing trees and vegetation around the site perimeter, we expect portions of the upper fill may be unsuitable for re-use as engineered fill given it may have a high organic matter content. Whilst not suitable for re-use as engineered fill, it may be stockpiled separately and re-used for landscaping purposes if required or desirable. Any fill to be removed from site should be appropriately classified for disposal prior to removal from site.

Given the relatively shallow fill, ground floor infill slabs uniformly supported on the residual clays or bedrock may be feasible provided they can be designed to accommodate the structural loads, the potential shrink-swell movements, and provided any fill is placed as engineered fill in accordance with our recommendations in Section 4.3 below. Where not considered practical, the slabs should be designed as fully suspended floor slabs. Based on the investigation, the fill and residual clays are moderately reactive with expected shrink-swell movements in the order of that defined by a Class ‘M’ site in accordance with AS2870-2011. If existing clayey soils are re-used as engineered fill, then this will also increase the shrink-swell potential of the

soils, as well as the presence of existing/proposed trees. Regardless, once the cut and fill earthworks are known, further advice must be provided on the shrink-swell potential of the site.

In addition to the potential shrink-swell movements, there is potential for differential movements to occur should the infill slabs span over variable materials, (i.e. engineered fill, residual clay and siltstone bedrock). If the infill slab will directly overlie bedrock, it should be underlain by a granular separation layer of at least 100mm thickness. Once further slab design details are known, we recommend the potential impact of the reactivity of the clayey soils and differential founding conditions are reviewed and discussed further.

Where a fully suspended infill floor slab is adopted, no particular subgrade preparation would be required, but any vegetation, root affected soils or deleterious fill material should be stripped. Fill may then be placed as 'form fill' with only nominal compaction and without the need for density testing of the fill during placement. Void formers below the suspended slab of at least 50mm thickness (subject to provision of further earthworks advice) would be required to account for the potential shrink-swell reactivity of the underlying clayey soils.

If excavation and replacement of the fill is practical or for preparation of pavement subgrades external to the building, the following subgrade preparation measures should be followed:

- Strip all vegetation, root affected soils or any deleterious fill material exposed.
- Where excavation and replacement of the fill is practical below the building, remove all existing fill to expose the residual soils.
- Proof roll the exposed subgrade with at least 6 passes of a minimum 12 tonne dead weight, smooth drum (non vibrating) roller. The final pass of the proof rolling should be carried out in the presence of a geotechnical engineer to detect any weak subgrade areas.
- Any weak subgrade areas detected during proof rolling should be locally excavated to a sound base and the excavated material replaced with controlled, engineered fill, or as directed by the geotechnical engineer during the proof rolling inspection.
- Within pavement areas, if the unsuitable fill extends to significant depth the use of a bridging layer may be required to avoid excessive excavation. The bridging layer would need to be designed at the time, but we expect it would comprise good quality granular fill with geotextile layers of at least 0.5m to 0.6m thick.
- Following treatment of any weak layers, engineered fill should be placed as required in thin horizontal layers to the design levels.

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

### 4.3 Engineered Fill and Compaction Control

Engineered fill should preferably comprise well graded granular materials, such as crushed sandstone, free of deleterious substances and having a maximum particle size not exceeding 75mm. As discussed above, from a geotechnical perspective, the existing fill generally appears suitable for re-use as engineered fill, although the upper soils in parts of the site may contain too much organic content, such as roots, resulting in the soils no longer being suitable. However, these upper soils may be stockpiled separately and re-used for landscaping purposes.

Such fill should be compacted in horizontal layers of not greater than 300mm loose thickness, to a density of at least 98% of Standard Maximum Dry Density (SMDD) and to within  $\pm 2\%$  of the Standard Optimum Moisture Content (SOMC). If general site filling is required that will not be below permanent structures, then a reduced density of at least 95% SMDD may be adopted. For backfilling confined excavations such as service trenches, a similar compaction to engineered fill should be adhered to, but if light compaction equipment is used then the layer thickness should be limited to 100mm loose thickness.

Density tests should be regularly carried out on the fill to confirm the above specifications are achieved. The frequency of density testing should be at least one test per layer per 500m<sup>2</sup> or three tests per visit, whichever requires the most tests. Preferably the geotechnical testing authority should be engaged directly on behalf of the client and not by the earthworks subcontractor. If engineered fill is to be used to support pavements and/or floor slabs, then we recommend the earthworks are carried out under Level 1 supervision and testing in accordance with AS3798-2007. Otherwise, for general filling outside these areas, Level 2 sampling and testing should suffice. Depending on the extent of the proposed earthworks, consideration may be given to the preparation of a Bulk Earthworks Specification to ensure the earthworks are undertaken to a high quality.

### 4.4 Retention

We expect the only low height retaining walls or batters may be required for the site. Should space allow, the use of temporary batters appears feasible to allow construction of permanent retaining walls at the base of the batters. If this is not the case or preferred, then retention systems may need to be installed prior to the start of excavation and additional advice on such walls should be obtained once the extent of any such walls are known.

Temporary batters through the soils and all weathered siltstone up to and including very low strength should be no steeper than 1 Vertical in 1 Horizontal (1V:1H). Where batter heights exceed 3m, further advice should be sought from the geotechnical engineers. However typically a 2m wide bench at about mid height of the batter slope should be allowed. Such batters should remain stable in the short term provided all surcharge loads, including construction loads, are kept well clear of the crest of the batters.

Permanent batters through the soils and all weathered siltstone up to and including very low strength should be no steeper than 1V:2H, but flatter batters of the order of 1V:3H may be preferred to allow access for maintenance of vegetation. All permanent batters should be covered with topsoil and planted with a deep

rooted runner grass, or other suitable coverings, to reduce erosion. All stormwater runoff should be directed away from all temporary and permanent batters to also reduce erosion.

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

Permanent retaining walls supporting no more than about 3m may be designed as cantilevered walls. The major consideration in the selection of lateral earth pressures for the design of retaining walls is the need to limit deformations occurring outside the excavation. The following characteristic earth pressure coefficients and subsoil parameters may be adopted for the static design of the proposed basement walls:

- Cantilevered walls should be designed based on a triangular earth pressure distribution. Where the resulting ground movements are of little concern, design may be based on an active earth pressure coefficient,  $K_a$ , of 0.33.
- Where movements are to be reduced, or where walls are restrained from movement by other structural elements in front of the wall, an 'at rest' earth pressure coefficient,  $K_0$ , of 0.6 should be used for the design of cantilevered walls.
- A bulk unit weight of  $20\text{kN/m}^3$  should be adopted for the soils and bedrock up to very low strength. For bedrock of low strength or better, a bulk unit weight of  $24\text{kN/m}^3$  should be adopted.
- For cantilevered walls, the passive toe resistance may be estimated using a triangular lateral earth pressure distribution and a passive earth pressure coefficient ( $K_p$ ) of 3.0 but with a factor of safety of at least 2 to reduce movements. Lateral resistance should be calculated below a nominal 0.3m below the excavation level to allow for disturbance during construction. All other localised excavations in front of the wall (such as for buried services, lift overrun pits, etc) should also be taken into account in the wall design.
- All surcharge loads affecting the walls (e.g. due to traffic, construction, adjacent high level footings, etc) must be taken into account in the wall design using the earth pressure coefficients given above.

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

## 4.5 Groundwater

Based on the groundwater levels measured, we generally do not expect groundwater to be encountered, although should excavations extend into the bedrock, seepage along the soil-rock interface should be expected during and after rainfall periods. The groundwater encountered at 0.6m depth on 4 August 2025 within the monitoring well at BH201 is inferred to likely be trapped/perched water within the fill profile and is not expected to be the 'true' groundwater level, particularly given the other monitoring wells were dry. Regardless, for the expected seepage flows, we expect conventional gravity or sump and pump drainage methods will be suitable.

## 4.6 Footings

### 4.6.1 Footings on Bedrock

Our preference is for all new buildings to be uniformly founded on the siltstone bedrock, using a combination of pad/strip footings and/or short bored piles. The following criteria are recommended for design and construction of these footings:

1. Strip/pad footings or bored piles may be proportioned for an Allowable End Bearing Pressure (AEBP) of 1,000kPa when founded with a nominal socket of 0.3m into siltstone of at least low strength.
2. An allowable shaft adhesion (ASA) equivalent to 10% of the above ABP values may be adopted for design of pier sockets, in compression, through the siltstone. For uplift or tension, the aforementioned ASA value should be halved. The shaft adhesion values are recommended on condition that cleanliness and roughness of pile sockets and bases are achieved and only that portion of the socket below the nominal 0.3m socket is utilised. Shaft adhesion through the soils should be ignored.
3. For piles socketed into the siltstone bedrock of medium to high strength, large capacity drilling rigs with rock augers or coring buckets may have to be used.
4. All loose or softened debris should be cleaned from the base of all pad or strip footings and bored piers prior to concreting. All footings should be poured immediately after excavation/drilling, removal of water, cleaning and inspection.
5. At least the initial stages of footing excavation or drilling should be inspected by a geotechnical to confirm that a suitable founding stratum is being achieved.

Higher bearing pressures on the medium to high strength siltstone bedrock are expected to be feasible, however further detailed investigations including cored boreholes would be required.

#### 4.6.2 Shallow Footings on Residual Clay

Shallow pad and strip footings or the external and internal beams of stiffened raft slabs may be founded in the residual silty clay. However, the designer should be aware that rock is relatively shallow (0.5m to 1.5m) and embedding the footings to achieve the required depth for say Class 'M' movements together with any cut/fill earthworks on the site, may result in some footing excavations encountering bedrock while others are founded on residual soils or engineered fill. This is problematic as it would give rise to significant differential movement across the building. We therefore re-iterate our preference for footings to be founded uniformly on the bedrock. If shallow footings on clays are to be used, the building must be well articulated. Stiffened rafts, strip or pad footings may be designed for a bearing pressure no higher than 150kPa when bearing on silty clays of at least very stiff strength. Subgrade preparation recommendations below stiffened raft slabs are as discussed in Sections 4.2 above.

The designer should also note that should there be trees within the footprint of the proposed buildings, or within a distance equivalent to the height of any adjoining fully grown tree from the building, that these will affect the performance of footings on clay soils. A potential 'abnormal moisture condition' may exist where the trees are to be removed/planted and consideration must be given to this in the design.

If stiffened raft slabs or footing beams are adopted and are supported on piles to rock, then we recommend the use of void formers of at least 50mm thickness below the slab to reduce the risk of swelling soils adversely affecting the slab or beam. Alternatively, the structural column loads may be supported on piles socketed into bedrock and then a 'floating' on-grade infill slab constructed between the columns, which would avoid the need for void formers given the slab would be designed for the shrink-swell movements.

At least the initial stages of footing excavation should be inspected by a geotechnical engineer to ascertain that the recommended founding material has been reached and to check initial assumptions about foundation conditions and possible variations that may occur between borehole locations. The need for further inspections can be assessed following the initial visit.

#### 4.7 Soil Aggression

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

#### 4.8 Earthquake Design Classification

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 B<sub>e</sub> – Rock site.

## 4.9 Pavements

We expect new access roads connecting from Commercial Road and the proposed Main Hospital may be required. Any pavement subgrade should be prepared as recommended in Sections 4.2 and 4.3 above.

The CBR testing of samples returned CBR values of 3.5% to 11%. Notwithstanding, we recommend that once the extent and level of any pavements are known that further advice is provided, and potentially additional CBR testing to assess the appropriate design parameters. If granular fill is used to raise site levels, then higher CBR values may be appropriate for such material.

Based on the limited testing carried out to date, we consider that preliminary design of the pavement thickness may be based on a soaked CBR of 3.5%, or a modulus of subgrade reaction of 35kPa/mm (750mm plate).

Should bedrock be exposed, one of the main issues is that a rock subgrade provides poor drainage. The bedrock is effectively impermeable and water can pond on the surface becoming trapped in the subbase/base layers, having an adverse effect on pavement performance. As recommended by the Transport for NSW (TfNSW) guidelines, the upper say 30mm of the bedrock should be ripped and recompacted to reduce such risks.

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

Concrete pavements should have a subbase layer of at least 100mm thickness of crushed rock to TfNSW QA specification 3051 (2020) unbound base material (or similar good quality and durable fine crushed rock), which is compacted to at least 100% of SMDD. Concrete pavements should be designed with effective shear transmission at all joints by way of either doweled or keyed joints.

## 4.10 Salinity

The site is located in an area where soil and groundwater salinity may occur. Salinity can affect the longevity and appearance of structures as well as causing adverse horticultural and hydrogeological effects. The local council has guidelines relating to salinity issues which should be checked for relevance to this project. Furthermore, reference should be made to the Surface and Groundwater Impact Assessment report prepared by JK Environments, Ref: E37757Brpt2-SGIA-DPHI, which contains further information with respects to salinity and provides further details.

#### 4.11 Sydney Water Assets

We noted the presence of a Sydney Water DN600 DICL recycled water pipe that appears to exist along the south-western side of the subject site, as shown in Plate 1 below. Should any of the proposed works occur within close vicinity to the asset, then 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). This can even include construction of new roads and movement of construction vehicles. Reference should be made to the Sydney Water Technical Guideline, Building Over and Adjacent (BOA) to Pipe Assets, for further advice in this regard.



Plate 1 – Excerpt from Sydney Water BYDA map

The purpose of the SEA is to assess the potential impact of temporary works and permanent structures. 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.

#### **4.12 Further Geotechnical Input**

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

- If higher footing bearing pressures are required drilling of cored boreholes;
- Sydney Water Specialist Engineering Assessment, if required;
- Footing inspections;
- Proof roll inspections;
- Density tests.
- Further soaked CBR testing, if required.

### **5 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.



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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.

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

<b>Client:</b>	JK Geotechnics	<b>Report No.:</b>	37756LF - A
<b>Project:</b>	HI25251 Detailed Site Investigation	<b>Report Date:</b>	12/08/2025
<b>Location:</b>	Rouse Hill Hospital, Commercial Road, Rouse Hill, NSW	<b>Page 1 of 1</b>	

AS 1289	TEST METHOD	2.1.1	3.1.2	3.2.1	3.3.1	3.4.1
BOREHOLE NUMBER	DEPTH m	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	LINEAR SHRINKAGE
		%	%	%	%	%
201	0.50 - 0.95	18.5	47	19	28	12.0
201	1.50 - 1.60	5.7	-	-	-	-
202	1.50 - 1.80	5.1	-	-	-	-
203	1.30 - 1.50	6.2	-	-	-	-
203	1.80 - 2.00	4.6	-	-	-	-
204	0.50 - 0.80	20.1	48	18	30	12.0
204	1.30 - 1.50	6.2	-	-	-	-

**Notes:**

- The test sample for liquid and plastic limit was air-dried & dry-sieved
- The linear shrinkage mould was 125mm
- Refer to appropriate notes for soil descriptions
- Date of receipt of sample and date tested: 01/08/2025 & 07/08/2025.
- Sampled and supplied by client. Samples tested as received.

**TABLE B1**  
**FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT**

<b>Client:</b>	JK Geotechnics	<b>Report No.:</b>	37756LF - B1
<b>Project:</b>	Proposed DPHI Site Development	<b>Report Date:</b>	27/08/2025
<b>Location:</b>	Commercial Road, Rouse Hill, NSW	<b>Page 1 of 1</b>	

BOREHOLE NUMBER	BH 201	BH 203	BH 204
DEPTH (m)	0.50 - 1.00	0.50 - 1.00	0.30 - 0.80
Surcharge (kg)	9.0	9.0	9.0
Maximum Dry Density (t/m <sup>3</sup> )	1.61 STD	1.63 STD	1.80 STD
Optimum Moisture Content (%)	22.8	22.8	16.1
Moulded Dry Density (t/m <sup>3</sup> )	1.57	1.60	1.76
Sample Density Ratio (%)	98	98	98
Sample Moisture Ratio (%)	101	100	101
Moisture Contents			
Insitu (%)	22.0	22.2	16.8
Moulded (%)	23.0	22.8	16.3
After soaking and			
After Test, Top 30mm(%)	26.8	28.6	20.0
Remaining Depth (%)	25.1	23.2	19.1
Material Retained on 19mm Sieve (%)	2*	0	1*
Swell (%)	0.5	0.5	0.5
<b>C.B.R. value:</b>	<b>@2.5mm penetration</b>	<b>6</b>	<b>3.5</b>
		<b>11</b>	

- 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 and date tested: 31/07/2025 & 08-11/08/2025.
  - \* Denotes not used in test sample.

## CERTIFICATE OF ANALYSIS 387558

### Client Details

<b>Client</b>	JK Geotechnics
<b>Attention</b>	Salvatore Wedde
<b>Address</b>	PO Box 976, North Ryde BC, NSW, 1670

### Sample Details

<b>Your Reference</b>	<b>37756LF, HI25251 Rouse Hill Hospital, Rouse Hill</b>
<b>Number of Samples</b>	3 Soil
<b>Date samples received</b>	04/08/2025
<b>Date completed instructions received</b>	04/08/2025

### Analysis Details

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

Samples were analysed as received from the client unless as indicated below in the method summaries. 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.

### Report Details

<b>Date results requested by</b>	11/08/2025
<b>Date of Issue</b>	08/08/2025
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. <b>Tests not covered by NATA are denoted with *</b>	

**Results Approved By**  
 Jenny He, Inorganic Team Leader

**Authorised By**  
 Nancy Zhang, Laboratory Manager

Misc Inorg - Soil				
Our Reference		387558-1	387558-2	387558-3
Your Reference	UNITS	201	202	203
Depth		0.2-0.4	0.8-1.2	0.5-0.65
Date Sampled		28/07/2025	28/07/2025	28/07/2025
Type of sample		Soil	Soil	Soil
Date prepared	-	04/08/2025	04/08/2025	04/08/2025
Date analysed	-	06/08/2025	06/08/2025	06/08/2025
pH 1:5 soil:water	pH Units	6.5	5.8	4.5
Sulphate, SO4 1:5 soil:water	mg/kg	150	27	340
Chloride, Cl 1:5 soil:water	mg/kg	<10	<10	36
Resistivity in soil*	ohm m	48	220	38

Method ID	Methodology Summary
<b>Inorg-001</b>	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
<b>Inorg-002</b>	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.
<b>Inorg-081</b>	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.

Client Reference: 37756LF, HI25251 Rouse Hill Hospital, Rouse Hill

QUALITY CONTROL: Misc Inorg - Soil				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			04/08/2025	[NT]	[NT]	[NT]	[NT]	04/08/2025	[NT]
Date analysed	-			06/08/2025	[NT]	[NT]	[NT]	[NT]	06/08/2025	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	99	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	91	[NT]
Resistivity in soil*	ohm m	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

**Result Definitions**

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

**Quality Control Definitions**

<b>Blank</b>	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.
<b>Duplicate</b>	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.
<b>Matrix Spike</b>	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.
<b>LCS (Laboratory Control Sample)</b>	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.
<b>Surrogate Spike</b>	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.

## 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.

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

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.

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.

For Dust Deposit Gauge (DDG) analysis the sampling, sampling period and funnel exposure area do not fall under Envirolab's NATA accreditation (unless the Newcastle laboratory where responsible for the sampling), hence the annotation on the DDG units of reporting.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

## BOREHOLE LOG

**Client:** HEALTH INFRASTRUCTURE  
**Project:** PROPOSED ROUSE HILL HOSPITAL  
**Location:** COMMERCIAL ROAD, ROUSE HILL, NSW

**Job No.:** 37756LF      **Method:** SPIRAL AUGER      **R.L. Surface:** 58.60 m  
**Date:** 28/7/25      **Datum:** AHD  
**Plant Type:** JK400      **Logged/Checked By:** S.W./O.F.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	ES	U50	DB	DS										
DRY ON COMPLETION										FILL: Silty clay, medium plasticity, brown, trace of fine to medium grained igneous, sandstone and ironstone gravel.	w-PL			GRASS COVER
					N = 16 9,8,8	58			CI	Silty CLAY: medium plasticity, red brown, trace of fine to medium grained ironstone gravel.	w-PL	Hd	>600 >600 >600	RESIDUAL
						1			-	SILTSTONE: dark grey and brown.	DW	L		ASHFIELD SHALE
						57				END OF BOREHOLE AT 1.80 m		M		LOW 'TC' BIT RESISTANCE MODERATE RESISTANCE HIGH RESISTANCE 'TC' BIT REFUSAL ON HIGH STRENGTH BEDROCK
						2								GROUNDWATER MONITORING WELL INSTALLED TO 1.8m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 0.5m TO 1.8m. CASING 0.75m ABOVE SURFACE TO 0.5m DEPTH. 2mm SAND FILTER PACK 0.3m TO 1.8m. BENTONITE SEAL 0.1m TO 0.3m. CONCRETED AT SURFACE.
						3								
						55								
						54								
						53								
						52								

JK 9.02.4.LB.GLB Log JK AUGERHOLE - MASTER 37756LF ROUSEHILL.CPJ <DrawingFile> 27/08/2025 11:18 10.01.00.01 Dajgel Lab and In Situ Tool - DGD\Lab\JK 9.02.4.2019-05-31.Pjt\JK 9.01.0.2018-05-20

## BOREHOLE LOG

<b>Client:</b> HEALTH INFRASTRUCTURE		
<b>Project:</b> PROPOSED ROUSE HILL HOSPITAL		
<b>Location:</b> COMMERCIAL ROAD, ROUSE HILL, NSW		
<b>Job No.:</b> 37756LF	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> 56.95 m
<b>Date:</b> 28/7/25	<b>Datum:</b> AHD	
<b>Plant Type:</b> JK400	<b>Logged/Checked By:</b> S.W./O.F.	


Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	ES	U50	DB	DS										
DRY ON COMPLETION					N=SPT 18/ 150mm REFUSAL					ASPHALTIC CONCRETE: 300mm.t				
									-	FILL: Silty gravelly sand, fine to coarse grained, yellow brown, fine to coarse grained sandstone gravel, trace of clay.	M			
							56	1		-	SILTSTONE: grey and brown.	DW	VL	
												M		MODERATE 'TC' BIT RESISTANCE
						55	2			END OF BOREHOLE AT 1.80 m				'TC' BIT REFUSAL ON HIGH STRENGTH BEDROCK
						54	3							
						53	4							
						52	5							
						51	6							
						50								

JK 9.02.4.LB.GLB Log JK AUGERHOLE - MASTER 37756LF ROUSEHILL.CPJ <DrawingFiles> 27/08/2025 11:18 10.01.00.01 Dajgel Lab and In Situ Tool - DGD Lib JK 9.02.4.2019-05-31 Proj JK 9.01.0.2018-05-20

## BOREHOLE LOG

**Client:** HEALTH INFRASTRUCTURE  
**Project:** PROPOSED ROUSE HILL HOSPITAL  
**Location:** COMMERCIAL ROAD, ROUSE HILL, NSW

**Job No.:** 37756LF      **Method:** SPIRAL AUGER      **R.L. Surface:** 56.81 m  
**Date:** 28/7/25      **Datum:** AHD  
**Plant Type:** JK400      **Logged/Checked By:** S.W./O.F.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks					
	ES	U50	DB	DS															
DRY ON COMPLETION					N = 24 7, 11, 13	56	1		CI	FILL: Silty gravelly sand, fine to coarse grained, yellow brown, fine to coarse grained sandstone gravel, trace of clay.	M			GRASS COVER					
															w-PL	Hd		RESIDUAL	
																	540 520 >600	ASHFIELD SHALE	
																XW	Hd		
																DW	VL		VERY LOW 'TC' BIT RESISTANCE
																	L - M		LOW TO MODERATE RESISTANCE
						55	2			SILTSTONE: dark grey.	SW	M - H		MODERATE TO HIGH RESISTANCE					
						54	3			END OF BOREHOLE AT 2.20 m				'TC' BIT REFUSAL ON HIGH STRENGTH BEDROCK					
						53	4							GROUNDWATER MONITORING WELL INSTALLED TO 2.2m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 0.7m TO 2.2m. CASING 1.1m ABOVE SURFACE TO 0.7m DEPTH. 2mm SAND FILTER PACK 0.5m TO 2.2m. BENTONITE SEAL 0.1m TO 0.5m. CONCRETED AT SURFACE.					
						52	5												
						51	6												
						50													

JK 9.024.LB.GLB\_Log\_JK\_AUGERHOLE\_MASTER\_37756LF\_ROUSEHILL.CPJ <DrawingFile> 27/08/2025 11:18 10.01.00.01 Dajgel Lab and In Situ Tool - DGD Lib JK 9.024.2019-05-31 Proj JK 9.01.0.2018-05-20

## BOREHOLE LOG

**Client:** HEALTH INFRASTRUCTURE  
**Project:** PROPOSED ROUSE HILL HOSPITAL  
**Location:** COMMERCIAL ROAD, ROUSE HILL, NSW

**Job No.:** 37756LF      **Method:** SPIRAL AUGER      **R.L. Surface:** 55.40 m  
**Date:** 28/7/25      **Datum:** AHD  
**Plant Type:** JK400      **Logged/Checked By:** S.W./O.F.

Groundwater Record	SAMPLES				Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
	ES	U50	DB	DS										
DRY ON COMPLETION					N = 21 10,9,12	55		CI	FILL: Silty gravelly sand, fine to medium grained, brown, fine to coarse grained igneous gravel, trace of asphaltic concrete and concrete fragments. Silty CLAY: medium plasticity, red brown and light grey, trace of fine to medium grained ironstone gravel.	D			RESIDUAL	
						1		-	SILTSTONE: grey and orange brown, with extremely weathered bands.	DW	VL	550 580 >600	ASHFIELD SHALE VERY LOW 'TC' BIT RESISTANCE	
						54			SILTSTONE: dark grey.		L		LOW TO MODERATE RESISTANCE	
											M - H		MODERATE TO HIGH RESISTANCE	
							2			END OF BOREHOLE AT 2.00 m				'TC' BIT REFUSAL ON HIGH STRENGTH BEDROCK
						53							GROUNDWATER MONITORING WELL INSTALLED TO 2.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 0.0m TO 2.0m. CASING 0.8m ABOVE SURFACE TO 0.0m DEPTH. 2mm SAND FILTER PACK 0.2m TO 2.0m. BENTONITE SEAL 0.0m TO 0.2m. CONCRETED AT SURFACE.	
						52								
						51								
						50								
						49								

JK 9.02.4.LB.GLB Log JK AUGERHOLE - MASTER 37756LF ROUSEHILL.CPJ <DrawingFile> 27/08/2025 11:18 10.01.00.01 Dajgel Lab and In Situ Tool - DGD\Lab JK 9.02.4.2019-05-31 Proj JK 9.01.0.2018-05-20



SOURCE: <http://www.wherere.com/>

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

Title:	<b>SITE LOCATION PLAN</b>	
Location:	CNR WINDSOR AND COMMERCIAL ROAD, ROUSE HILL, NSW	
Report No:	37756LF	Figure No: 1

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

**JKGeotechnics**



PLOT DATE: 6/08/2025 11:18:33 AM DWG FILE: \\8F\GEO\TECHNICAL\JOBS\3700\37756LF\ROUSE HILL\CAD\37756LF.DWG

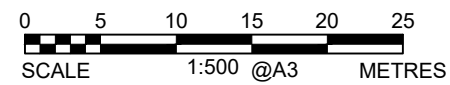


PLOT DATE: 27/08/2025 2:29:51 PM DWG FILE: J:\B\F GEOTECHNICAL JOBS\37000\37756LF ROUSE HILL\CAD\37756LF.DWG

**LEGEND**

● BOREHOLE

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM



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

Title:

**BOREHOLE LOCATION PLAN**

Location:

CNR WINDSOR AND COMMERCIAL ROAD,  
ROUSE HILL, NSW

Report No:

37756LF

Figure No:

2b

**JKGeotechnics**



# 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<sub>c</sub>' 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 ( $K_0$ ), over-consolidation ratio (OCR), undrained shear strength ( $C_u$ ), friction angle ( $\phi$ ), coefficient of consolidation ( $C_h$ ), coefficient of permeability ( $K_h$ ), unit weight ( $\gamma$ ), 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 ( $G_0$ ).

**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  $6^\circ$  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	

### Laboratory Classification Criteria

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

$$C_u = \frac{D_{60}}{D_{10}} \quad \text{and} \quad C_c = \frac{(D_{30})^2}{D_{10} D_{60}}$$

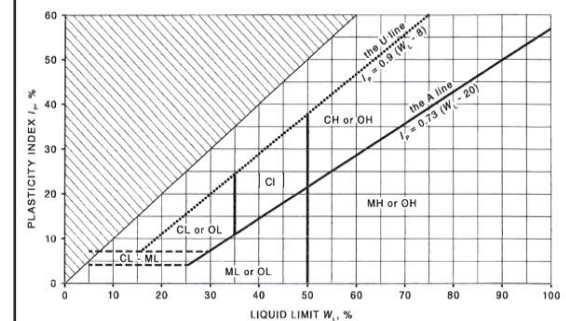
Where  $D_{10}$ ,  $D_{30}$  and  $D_{60}$  are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

### NOTES:




- 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.
- 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.
- Clay soils with liquid limits  $> 35\%$  and  $\leq 50\%$  may be classified as being of medium plasticity.
- The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Major Divisions		Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification
				Dry Strength	Dilatancy	Toughness	
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	–	–	–	–

**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 <sub>c</sub> =	5	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.	
		7		
		3R		
VNS = 25 PID = 100	Vane shear reading in kPa of undrained shear strength. Photoionisation detector reading in ppm (soil sample headspace test).			
Moisture Condition (Fine Grained Soils)	w > PL	Moisture content estimated to be greater than plastic limit.		
	w ≈ PL	Moisture content estimated to be approximately equal to plastic limit.		
(Coarse Grained Soils)	w < PL	Moisture content estimated to be less than plastic limit.		
	w ≈ LL	Moisture content estimated to be near liquid limit.		
	w > LL	Moisture content estimated to be wet of liquid limit.		
	D	DRY – runs freely through fingers.		
	M	MOIST – does not run freely but no 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)		<b>Density Index (I<sub>D</sub>) Range (%)</b>		
	VL	VERY LOOSE	≤ 15	<b>SPT 'N' Value Range (Blows/300mm)</b>
	L	LOOSE	> 15 and ≤ 35	0 – 4
	MD	MEDIUM DENSE	> 35 and ≤ 65	4 – 10
	D	DENSE	> 65 and ≤ 85	10 – 30
	VD	VERY DENSE	> 85	30 – 50
	( )	Bracketed symbol indicates estimated density based on ease of drilling or other assessment.		> 50
Hand Penetrometer Readings	300	Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.		
	250			



Log Column	Symbol	Definition
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Twin pronged tungsten carbide bit.
	T <sub>60</sub>	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	HW	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		
Distinctly Weathered (Note 1)		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			
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 $I_{s(50)}$ (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.



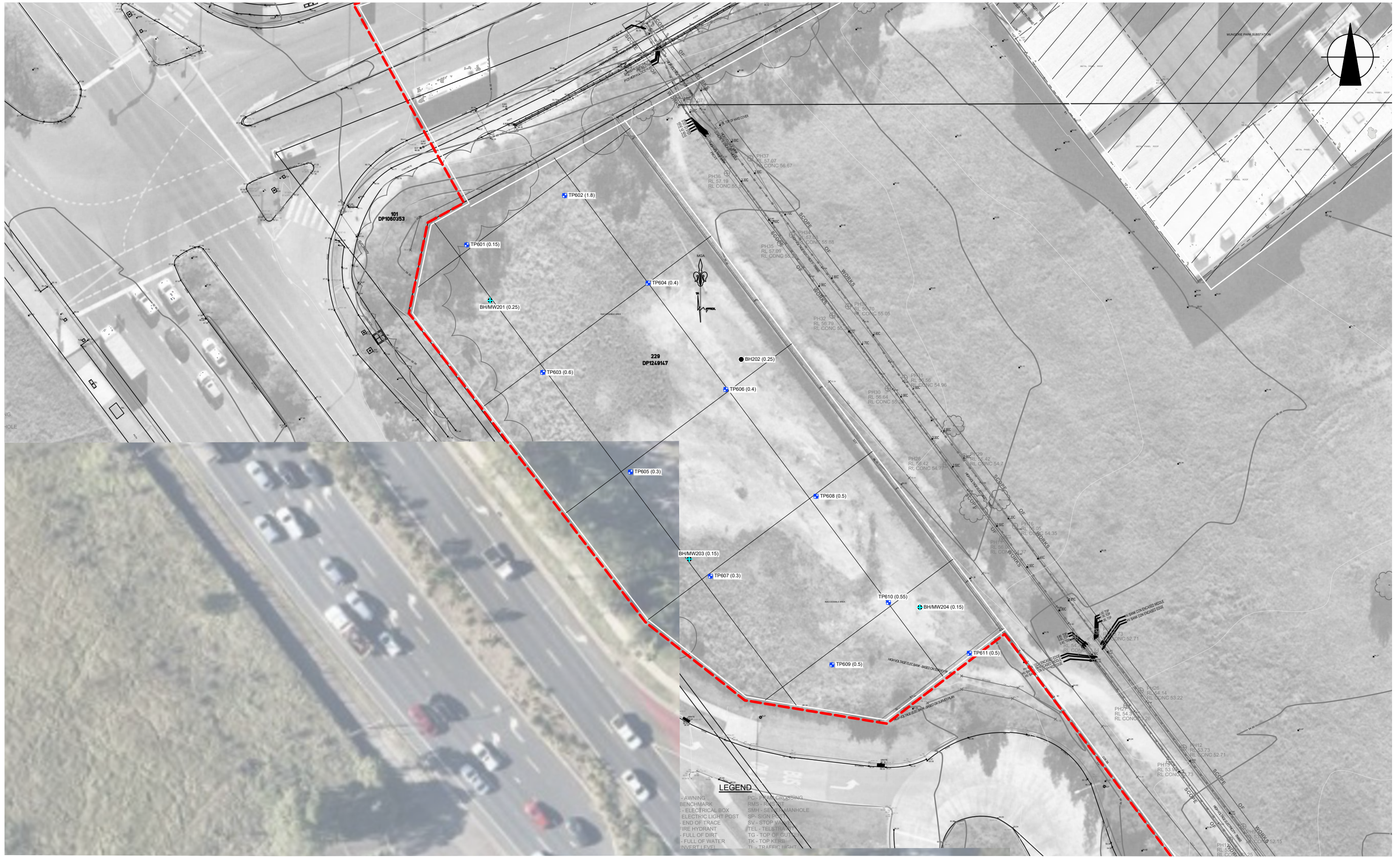
## Abbreviations Used in Defect Description

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

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**LEGEND**  
 - AWNING  
 - BENCHMARK  
 - ELECTRICAL BOX  
 - ELECTRIC LIGHT POST  
 - END OF TRACE  
 - FIRE HYDRANT  
 - FULL OF DIRT  
 - FULL OF WATER  
 - INVERT LEVEL  
 - PO - ROAD CROSSING  
 - RMS - RAIN PIT  
 - SMH - SEWER MANHOLE  
 - SP - SIGN POST  
 - SV - STOP SIGN  
 - TEL - TELEPHONE  
 - TG - TOP OF GUTTER  
 - TK - TOP KERB  
 - TL - TRAFFIC LIGHT

	APPROXIMATE SITE BOUNDARY
	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
	TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

SCALE 1:500 @A3 METRES

This plan should be read in conjunction with the Environmental report.

<b>Title: SAMPLE LOCATION PLAN</b>	
<b>DPHI SITE</b>	
Location: CNR WINDSOR AND COMMERCIAL ROAD, ROUSE HILL, NSW	
Project No: E37757B	Figure No: 2b
<b>JKEnvironments</b>	



PLOT DATE: 27/08/2025 11:17:35 AM DWG FILE: K:\5C EIS JOBS\37000\37757B ROUSE HILL HOSPITAL\CAD\E37757B.DWG

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP601**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NSW HEALTH INFRASTRUCTURE
<b>Project:</b>	DETAILED SITE INVESTIGATION
<b>Location:</b>	CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

<b>Job No.:</b> E37757B	<b>Method:</b> TEST PIT	<b>R.L. Surface:</b> 58.57m
<b>Date:</b> 21/7/25		<b>Datum:</b> AHD
<b>Plant Type:</b> JKX	<b>Logged/Checked by:</b> V.R./V.B.	

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS	DB									
DRY ON COMPLETION							0		CI-CH	FILL: Silty clay, medium plasticity, dark brown, with root fibres, trace of ironstone gravel, plastic and concrete fragments. FILL: Silty clay, medium to high plasticity, light grey and light brown, with ironstone and igneous gravel, trace of plastic fragments. Silty CLAY: medium to high plasticity, red brown mottled light grey, trace of ironstone gravel.	w<PL			GRASS COVER
							0.5				w<PL			SCREEN: 10.20kg 0-0.1m, NO FCF INSUFFICIENT RETURN FOR BULK SCREEN RESIDUAL
							1			END OF TEST PIT AT 0.8m				
							1.5							
							2							
							2.5							
							3							
							3.5							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP602**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NSW HEALTH INFRASTRUCTURE
<b>Project:</b>	DETAILED SITE INVESTIGATION
<b>Location:</b>	CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

<b>Job No.:</b> E37757B	<b>Method:</b> TEST PIT	<b>R.L. Surface:</b> 58.29m
<b>Date:</b> 22/7/25	<b>Logged/Checked by:</b> V.R./V.B.	<b>Datum:</b> AHD
<b>Plant Type:</b> JKX		

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks	
	ES	ASS	ASB	PFAS										DB
DRY ON COMPLETION						0			FILL: Silty clay, medium plasticity, brown, with root fibres, trace of ironstone and igneous gravel.	w<PL			GRASS COVER	
						0.5		FILL: Sandy clay, medium plasticity, light brown, with igneous and ironstone gravel, trace of concrete fragments and slag.	w≈PL				SCREEN: 10.10kg 0-0.1m, NO FCF	
						1.0		FILL: Silty clay, medium plasticity, brown, with igneous and ironstone gravel, trace of asphaltic concrete, plastic, metal and concrete fragments, and geofabric.					SCREEN: 10.40kg 0.1-0.4m, NO FCF	
						1.5								SCREEN: 11.40kg 0.4-0.9m, NO FCF
						2.0			CI	Silty CLAY: medium plasticity, light grey mottled orange brown, with siltstone and ironstone gravel, and root fibres.	w<PL			SCREEN: 10.40kg 0.9-1.4m, NO FCF
					2.1				Extremely Weathered siltstone: silty CLAY, low to medium plasticity, light grey and red brown, with siltstone and ironstone gravel.	XW				
					2.5				END OF TEST PIT AT 2.1m					
					3.0									
					3.5									

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP603**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b> NSW HEALTH INFRASTRUCTURE		<b>Project:</b> DETAILED SITE INVESTIGATION		<b>Location:</b> CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW									
<b>Job No.:</b> E37757B		<b>Method:</b> TEST PIT		<b>R.L. Surface:</b> 58.22m									
<b>Date:</b> 21/7/25		<b>Logged/Checked by:</b> V.R./V.B.		<b>Datum:</b> AHD									
<b>Plant Type:</b> JKX													
Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS									
DRY ON COMPLETION						0			FILL: Silty clayey sand, fine to medium grained, brown, with igneous and ironstone gravel, and root fibres, trace of plastic fragments.	D			GRASS COVER
						0.5			FILL: Gravelly sand, fine to medium grained, brown, with ironstone, igneous and sandstone gravel, trace of slag and root fibres.				SCREEN: 10.15kg 0-0.1m, NO FCF SCREEN: 11.65kg 0.1-0.3m, NO FCF SCREEN: 12.95kg 0.3-0.6m, NO FCF
						1		CI-CH	as above, but yellow brown, with ironstone, igneous and sandstone gravel, trace of plastic fragments. Silty CLAY: medium to high plasticity, red brown mottled light grey, trace of ironstone gravel and root fibres.	w<PL			RESIDUAL
						1			END OF TEST PIT AT 1.0m				
						1.5							
						2							
						2.5							
						3							
						3.5							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP604**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NSW HEALTH INFRASTRUCTURE
<b>Project:</b>	DETAILED SITE INVESTIGATION
<b>Location:</b>	CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

<b>Job No.:</b> E37757B	<b>Method:</b> TEST PIT	<b>R.L. Surface:</b> 57.43m
<b>Date:</b> 22/7/25	<b>Datum:</b> AHD	
<b>Plant Type:</b> JKX	<b>Logged/Checked by:</b> V.R./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS									
DRY ON COMPLETION						0			FILL: Silty clay, medium plasticity, light brown, with ironstone and igneous gravel, slag and root fibres, trace of plastic and concrete fragments.	w<PL			GRASS COVER / ASPHALTIC CONCRETE
						0.5		CI-CH	FILL: Asphaltic concrete and concrete, with ironstone and igneous gravel, and slag. Silty CLAY: medium to high plasticity, red brown mottled light grey, trace of ironstone gravel.	w<PL			SCREEN: 10.55kg 0-0.1m, NO FCF
													SCREEN: 10.30kg 0.1-0.2m, NO FCF
													INSUFFICIENT RETURN FOR BULK SCREEN RESIDUAL
						1			END OF TEST PIT AT 1.0m				
						1.5							
						2							
						2.5							
						3							
						3.5							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP605**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NSW HEALTH INFRASTRUCTURE
<b>Project:</b>	DETAILED SITE INVESTIGATION
<b>Location:</b>	CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

<b>Job No.:</b> E37757B	<b>Method:</b> TEST PIT	<b>R.L. Surface:</b> 57.31m
<b>Date:</b> 22/7/25		<b>Datum:</b> AHD
<b>Plant Type:</b> JKX	<b>Logged/Checked by:</b> V.R./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS									
DRY ON COMPLETION						0			FILL: Silty gravelly sand, medium to coarse grained, light brown and yellow brown, with igneous and ironstone gravel, and concrete fragments, trace of terracotta tile and ceramic fragments.	D			ASPHALTIC CONCRETE / ROAD BASE COVER
						0.5		CI-CH	as above, but with ironstone and sandstone gravel, trace of igneous gravel. Silty CLAY: medium to high plasticity, red brown mottled light grey, trace of ironstone gravel.	w<PL			SCREEN: 11.85kg 0-0.1m, NO FCF SCREEN: 10.40kg 0.1-0.3m, NO FCF RESIDUAL
						1			END OF TEST PIT AT 0.9m				
						1.5							
						2							
						2.5							
						3							
						3.5							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP606**

1/1

Environmental logs are not to be used for geotechnical purposes

SDUP601: 0-0.1m

**Client:** NSW HEALTH INFRASTRUCTURE  
**Project:** DETAILED SITE INVESTIGATION  
**Location:** CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

**Job No.:** E37757B      **Method:** TEST PIT      **R.L. Surface:** 56.93m  
**Date:** 21/7/25      **Datum:** AHD  
**Plant Type:** JKX      **Logged/Checked by:** V.R./V.B.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS									
DRY ON COMPLETION						0			FILL: Silty gravelly sand, fine to medium grained, light brown, with igneous and ironstone gravel, trace of glass and metal fragments.	D			ASPHALTIC CONCRETE / ROAD BASE COVER
						0.5		CI-CH	FILL: Sandy gravel, coarse grained, igneous, dark brown, fine to medium grained sand.	w<PL			SCREEN: 12.95kg 0-0.1m, NO FCF BALLAST
								-	FILL: Sand, fine to coarse grained, yellow brown, trace of sandstone gravel.	XW			SCREEN: 12.05kg 0.2-0.35m, NO FCF INSUFFICIENT RETURN FOR BULK SCREEN
									Silty CLAY: medium to high plasticity, red brown mottled grey, with fine to medium grained sand, trace of ironstone gravel. Extremely Weathered siltstone: silty CLAY, low to medium plasticity, light grey and red brown, trace of ash. END OF TEST PIT AT 0.9m				RESIDUAL
						1							
						1.5							
						2							
						2.5							
						3							
						3.5							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP607**

1/1

Environmental logs are not to be used for geotechnical purposes

SDUP604: 0-0.1m

<b>Client:</b>	NSW HEALTH INFRASTRUCTURE
<b>Project:</b>	DETAILED SITE INVESTIGATION
<b>Location:</b>	CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

<b>Job No.:</b> E37757B	<b>Method:</b> TEST PIT	<b>R.L. Surface:</b> 56.59m
<b>Date:</b> 21/7/25		<b>Datum:</b> AHD
<b>Plant Type:</b> JKX	<b>Logged/Checked by:</b> V.R./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS									
DRY ON COMPLETION						0			FILL: Silty clay, medium plasticity, brown, with igneous and ironstone gravel, and root fibres.	w<PL			GRASS COVER
						0.5		CI-CH	FILL: Sand, fine to medium grained, yellow brown. Silty CLAY: medium to high plasticity, red brown, trace of ironstone and siltstone gravel.	D w<PL			SCREEN: 10.25kg 0-0.1m, NO FCF SCREEN: 11.30kg 0.15-0.3m, NO FCF RESIDUAL
						1			END OF TEST PIT AT 0.8m				
						1.5							
						2							
						2.5							
						3							
						3.5							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP608**

1/1

Environmental logs are not to be used for geotechnical purposes

SDUP602: 0-0.1m

<b>Client:</b>	NSW HEALTH INFRASTRUCTURE
<b>Project:</b>	DETAILED SITE INVESTIGATION
<b>Location:</b>	CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

<b>Job No.:</b> E37757B	<b>Method:</b> TEST PIT	<b>R.L. Surface:</b> 56.21m
<b>Date:</b> 21/7/25		<b>Datum:</b> AHD
<b>Plant Type:</b> JKX	<b>Logged/Checked by:</b> V.R./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS									
DRY ON COMPLETION						0			FILL: Silty gravelly sand, fine to medium grained, light brown, with igneous and ironstone gravel, trace of ceramic and concrete fragments, and root fibres.	D			ASPHALTIC CONCRETE / ROAD BASE COVER
						0.5			FILL: Sandy gravel, fine to coarse grained, igneous, dark brown, with fine to medium grained sand.	XW			SCREEN: 10.55kg 0-0.1m, NO FCF
						1			FILL: Sand, fine to medium grained, yellow brown, trace of ironstone and sandstone gravel. Extremely Weathered siltstone: silty CLAY, low to medium plasticity, light grey mottled red brown, with ironstone gravel.				SCREEN: 12.70kg 0.2-0.4m, NO FCF SCREEN: 13.00kg 0.4-0.5m, NO FCF
						1			END OF TEST PIT AT 1.0m				
						1.5							
						2							
						2.5							
						3							
						3.5							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP609**

1/1

Environmental logs are not to be used for geotechnical purposes

SDUP603: 0.3-0.4m

**Client:** NSW HEALTH INFRASTRUCTURE  
**Project:** DETAILED SITE INVESTIGATION  
**Location:** CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

**Job No.:** E37757B      **Method:** TEST PIT      **R.L. Surface:** 55.76m  
**Date:** 21/7/25      **Datum:** AHD  
**Plant Type:** JKX      **Logged/Checked by:** V.R./V.B.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS									
DRY ON COMPLETION						0			FILL: Silty clayey sand, fine to medium grained, light brown, igneous and ironstone gravel, trace of sandstone gravel, roots and root fibres.	D			GRASS COVER SCREEN: 11.60kg 0-0.1m, NO FCF SCREEN: 10.10kg 0.2-0.5m, NO FCF
						0.5		CI-CH	FILL: Silty sandy clay, medium to high plasticity, brown, with fine to medium grained sand, and igneous and ironstone gravel. Silty CLAY: medium to high plasticity, red brown mottled light grey, trace of ironstone and siltstone gravel, and slag.	w<PL			
						1			END OF TEST PIT AT 0.8m				
						1.5							
						2							
						2.5							
						3							
						3.5							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP610**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NSW HEALTH INFRASTRUCTURE
<b>Project:</b>	DETAILED SITE INVESTIGATION
<b>Location:</b>	CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

<b>Job No.:</b> E37757B	<b>Method:</b> TEST PIT	<b>R.L. Surface:</b> 55.64m
<b>Date:</b> 21/7/25		<b>Datum:</b> AHD
<b>Plant Type:</b> JKX	<b>Logged/Checked by:</b> V.R./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS									
DRY ON COMPLETION						0			FILL: Silty gravelly sand, fine to medium grained, light brown, with igneous and ironstone gravel, and concrete fragments, trace of metal fragments and root fibres.	D			ASPHALTIC CONCRETE / ROAD BASE COVER
						0.5		CI-CH	FILL: Silty sandy clay, medium to high plasticity, brown, with fine to medium grained sand.	w<PL			SCREEN: 10.35kg 0-0.1m, NO FCF
						0.5			FILL: Sand, fine to medium grained, yellow brown, trace of sandstone gravel.	D			SCREEN: 10.10kg 0.2-0.5m, NO FCF
						0.5			Silty CLAY: medium to high plasticity, red brown, trace of ironstone gravel and root fibres.	w<PL			INSUFFICIENT RETURN FOR BULK SCREEN RESIDUAL
					1	1		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, light grey mottled red brown, trace of ironstone gravel.	XW			
					1	1			END OF TEST PIT AT 1.0m				
					1.5	1.5							
					2	2							
					2.5	2.5							
					3	3							
					3.5	3.5							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**TP611**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NSW HEALTH INFRASTRUCTURE
<b>Project:</b>	DETAILED SITE INVESTIGATION
<b>Location:</b>	CORNER OF WINDSOR ROAD AND COMMERCIAL ROAD, ROUSE HILL, NSW

<b>Job No.:</b> E37757B	<b>Method:</b> TEST PIT	<b>R.L. Surface:</b> 55.03m
<b>Date:</b> 21/7/25		<b>Datum:</b> AHD
<b>Plant Type:</b> JKX	<b>Logged/Checked by:</b> V.R./V.B.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	PFAS									
DRY ON COMPLETION						0			FILL: Silty gravelly sand, fine to medium grained, brown, with ironstone and igneous gravel, trace of metal, concrete and ceramic fragments and root fibres.	D			GRASS COVER / ASPHALTIC CONCRETE
						0.5		CI-CH	FILL: Sandy gravel, fine to coarse grained, dark brown, with igneous gravel and fine to medium grained sand, trace of concrete fragments and slag.	w<PL			SCREEN: 11.40kg 0-0.1m, NO FCF
						1			FILL: Sand, fine to coarse grained, yellow brown, trace of sandstone gravel.				SCREEN: 14.20kg 0.2-0.4m, NO FCF
						1			Silty CLAY: medium to high plasticity, red brown mottled light grey, trace of ironstone gravel and ash.				INSUFFICIENT RETURN FOR BULK SCREEN RESIDUAL
						1			END OF TEST PIT AT 1.0m				
						1.5							
						2							
						2.5							
						3							
						3.5							