REPORT TO

BANKSTOWN AIRPORT PTY LTD

ON

GEOTECHNICAL INVESTIGATION

FOR

AVIATION HANGAR PROJECT

AT

BANKSTOWN AIRPORT, BANKSTOWN, NSW

Date: 20 June 2024

Ref: 35614BF2rptRev1

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1 INTRODUCTION

This report presents the results of a geotechnical investigation for the Aviation Hangar Project at Bankstown Airport, Bankstown, NSW. The location of the site is shown in Figure 1. The investigation was commissioned by Bankstown Airport Pty Ltd Services Order, Ref: SO 2022-28-02 dated 25 October 2023. The commission was on the basis of our fee proposal, Ref. P59184BF Rev1, dated 8 September 2023. This report has been revised to reflect the new project name (Aviation Hangar Project).

Based on the provided architectural drawings prepared by Crawford Architects (Project No. 22060, Dwg. A010^{RevC}, A018^{RevE} and A100^{RevC}, dated 29 November 2023) we understand that it is proposed to develop an area within Bankstown Airport by the construction of new hangars, taxiways and a central car park. The proposed ground floor levels vary from RL7.87m for the hanger to the north-west of the car park to RL8.40m for the hangers to the south-east. Based on existing site levels and assuming pavement/slab thickness of at least 0.3m, we expect very minor excavation, typically less than 0.3m, within the north-western portion of the site. However within the south-eastern portion of the site, we expect filling in the order of about 0.8mn will be required. We expect moderate structural loads for the proposed hangar structures.

The purpose of the investigation was to obtain geotechnical information on the subsurface conditions, and to use this as a basis for providing comments and recommendations on geotechnical aspects of the proposed development, such as earthworks and subgrade preparation, engineered fill footings, , and pavement design parameters.

This geotechnical investigation was carried out in conjunction with an environmental site assessment by out environmental division, JK Environments (JKE). Reference should be made to the separate report by JKE, Ref: E35614P2rpt, for the results of the environmental site assessment.

2 INVESTIGATION PROCEDURE

2.1 Previous Investigation

JK Geotechnics carried out an investigation late 2022 and early 2023 for the proposed pavement upgrade within the airport. The investigation comprised drilling of seventy (70) boreholes to maximum depths of 2m below existing surface levels to assess the existing pavements. A number of boreholes were drilled within and around the subject site for this investigation and these relevant borehole logs have been attached as Appendix B and the locations shown on Figure 2.

2.2 Current Investigation

The fieldwork for the current investigation was caried out on 16 and 17 November 2023 and comprised the drilling of eight boreholes (BH102, BH105, BH107, BH108, BH113, BH114, BH121, BH126) using our truck mounted JK500 drill rig. The boreholes were drilled to depths ranging from 4.95m to 7m below existing ground levels using spiral auger techniques and a Tungsten Carbide ('TC') drill bit.

Our environmental division, JKE, auger drilled an additional eighteen (18) boreholes to termination depths of 2m to collect environmental samples. These boreholes were not geotechnically logged and so have not been discussed further herein, but are included within Appendix A for information only, such as fill depths.

The estimated compaction of the fill and the strength of the natural clayey soils were assessed from Standard Penetration Test (SPT) 'N' values, augmented by hand penetrometer test results on cohesive samples recovered in the SPT split tube sampler. Groundwater observations were made during and on completion of auger drilling. In BH102, BH107, BH114, BH121 and BH126 Class 18 machine slotted PVC standpipes were installed and finished with a cast iron gatic cover to allow longer term groundwater monitoring to be completed. An environmental scientist from JKE returned to site on 24 November 2023 to measure the groundwater levels within the wells.

Selected soil samples were returned to NATA accredited laboratories (Soil Test Services Pty Ltd [STS] and Envirolab Services Pty Ltd) for moisture content, Atterberg limit, linear shrinkage, standard compaction, four day soaked CBR, soil pH, chloride content, sulphate content and resistivity testing. The test results are summarised in the attached STS Tables A and B and Envirolab Services Certificate of Analysis 338197.

Our geotechnical engineer was present full-time during the fieldwork to set out the borehole locations, nominate testing and sampling, and to prepare the attached borehole logs. The borehole locations, as shown on Figure 2, were set out by a differential GPS unit, which also provided the relative levels shown on the borehole logs. The survey datum 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 Description

Bankstown Airport is located within a relatively level floodplain on the eastern bank of the Georges River and hence grades down to the south-west towards the Georges River. Several canals and creeks extend from the Georges River and mostly onto the outer rim of the airport, with the exception of a canal located beyond the eastern edge of the runways in an approximate north-south alignment before turning under Nancy Leebold Drive.

The subject site is located centrally within the airport and is predominately grass covered within the north-western portion and covered by asphaltic concrete paved runways and taxiways within the south-eastern portion. The subject site is bounded by further pavements and taxiways, with buildings on the far side of the adjacent pavements to the north-east, north and north-west.

3.2 Subsurface Conditions

The 1:100,000 Geological Map of Penrith indicates the site to be underlain by Tertiary age alluvial soils, although the northern and eastern edges of the subject site are in close proximity to the Ashfield Shale geological boundary.

The boreholes disclosed a subsurface profile generally comprising silty sand and silty clay fill, covering natural alluvial soils. No bedrock was encountered. Groundwater was encountered at moderate depths. Reference should be made to the attached borehole logs for detailed descriptions of the subsurface conditions encountered at specific locations. A summary of the subsoil conditions, as encountered, is presented below:

Fill

All boreholes encountered fill to depths ranging from 0.4m (BH102) to 1.0m (BH114) below existing surface levels. The fill predominantly comprised silty clay with some silty clayey sand and silty sand fill initially encountered in BH105, BH121 and BH126. The fill contained various amounts of sand, fine to medium grained ironstone/igneous gravel, ash, slag and root fibres.

Natural Soils

Natural soils of alluvial and residual origins were encountered below the fill in all boreholes. The soils typically comprised silty clay of medium to high plasticity and with various moisture contents, although generally equal to or greater than the plastic limit. The strengths of the clays were typically very stiff to hard strength, however softened in some boreholes to stiff to very stiff strength at depths of 4.0m to 5.5m.

Groundwater

Groundwater seepage was encountered during drilling in BH107, BH121 and BH126 at depths of 3.1m, 6.2m and 6.2m, respectively. The remaining boreholes did not encountered seepage during drilling and were dry on completion.

The following table summarises the groundwater levels measured on 24 November 2023 within the monitoring wells.

Borehole	**24 November 2023**	
	Depth of Groundwater (m)	**RL (mAHD)**
BH102	3.2	4.6
BH107	2.1	4.1
BH114	2.7	5.7
BH121	4.6	3.8
BH126	6.5	2.7

3.3 Laboratory Test Results

The moisture content and Atterberg Limits test results confirmed our field classification of the site soils. The Atterberg Limits and linear shrinkage test results indicated the natural clays are generally of high plasticity, with the exception of BH126 where it was assessed to be of medium plasticity. The clayey soils have a high potential for shrink-swell reactivity with changes in moisture content.

The four day soaked CBR tests on samples of the high plasticity clay from BH105, BH108 and BH126 returned a CBR value of 1%, when compacted to 98% of their Standard Maximum Dry Density (SMDD) and surcharged with 4.5kg. During soaking, the samples from BH105, BH108 and BH126 swelled by 3.0%, 4.5% and 3.5%, respectively, further confirming the high reactive potential, and potential for softening upon wetting, of the clayey soils.

The results of the soil aggression testing are tabulated below:

Borehole	Depth (m)	Sample Type	pH	Sulphates SO_4 (mg/kg)	Chlorides CL (mg/kg)	Resistivity (ohm.cm)
BH102	4.6-4.95	Silty CLAY	8.7	240	750	1,300
BH108	1.6-1.95	Silty CLAY	4.6	380	720	1,500
BH121	1.5-1.8	Silty CLAY	5.3	330	1,100	1,100

4 COMMENTS AND RECOMMENDATIONS

4.1 Site Preparation and Excavation

Prior to any excavation commencing we recommend that reference be made to the latest version of NSW Government “Code of Practice Excavation Work”.

Initial site preparation should comprise removal of existing grass covered surface soils and/or root affected soils. We also assume at least partial removal of existing asphaltic concrete pavements.

Due to the difference in existing surface levels within the subject area, we expect that cut and fill earthworks will be required to achieve design surface levels. Based on existing site levels and assuming pavement/slab thickness of at least 0.3m, we expect very minor excavation, typically less than 0.3m, within the north-western portion of the site. However, within the south-eastern portion of the site, we expect filling in the order of about 0.8mn will be required.

Where excavations are required fill and natural soils will be encountered and these should be readily excavated using the buckets of conventional earthmoving equipment, such as the buckets of hydraulic excavators.

Following stripping, in areas where no excavation is required, any obvious deleterious or contaminated existing fill not disclosed by this investigation should be removed. These stripped materials should be taken offsite as they are not suitable for re-use as engineered fill. However, from a geotechnical perspective, the excavated natural clays may be re-used as engineered fill provided it is separately stockpiled. The surface soil and/or root affected soils may also be separately stockpiled and used for subsequent landscaping purpose, or appropriately disposed of, but would not be suitable for use as engineered fill. The depth of the root affected soils cannot be accurately determined from small diameter boreholes so if the depth of the root affected zone is critical, then we recommend test pits be excavated.

Fill was encountered within the boreholes and since we are unaware of any records of placement or compaction control of the fill it must be considered 'uncontrolled'. Such uncontrolled fill is not suitable to support footings or floor slabs so where the fill is not removed as part of stripping or bulk excavation it should be fully excavated from all building areas and replaced with controlled, engineered fill. Within pavement areas the fill may remain in place provided in performs adequately during proof rolling as recommended in Section 4.4 below.

Where excavations are carried out, temporary batter slopes of 1 Vertical (V) in 1 Horizontal (H) through the clay soils, and any limited thickness sandy materials are generally considered to be appropriate for excavations of not more than 3m in depth. Some instability of temporary sand batters, if present, may occur after rain periods and sand bagging may be required to stabilise the batter slopes at, and below, the level of any groundwater seepage. Permanent batters though clayey soils may be formed at no steeper than 1V:2H, although flatter batters at 1V:3H are preferred to allow access for maintenance. Appropriate erosion protection controls should also be allowed for, such as diversion of stormwater runoff from the batters and covering with topsoil and a deep rooted runner grass, or other suitable long term surface protection.

4.2 Footing Design

Due to the presence of uncontrolled fill of greater than 0.4m depth, the site classifies as Class 'P' in accordance with AS2870-2011 'Residential Slabs and Footings'. However, if the footings are designed to be founded on the natural clay soils, consideration must be given to the potential for reactive movements of the natural clays with changes in moisture content. In our opinion, any new footings must be designed on the assumption that shrink-swell movements of the clays similar to Class 'H1' type movements will occur.

It must be noted that new clayey fill will have a higher shrink-swell potential. Therefore, the potential shrink-swell movements must be reviewed once earthworks details are known to confirm whether the above assessment is accurate or whether higher shrink-swell movements similar to a Class 'H2' site will apply.

We note that in the strictest sense AS2870 does not apply to developments such as this, however it provides a useful guide for footing design on reactive clay sites. Reference may also be made to AS2870 for construction, performance criteria and maintenance precautions on reactive clay sites.

Based on the results of the investigation, we expect natural clay of at least very stiff strength or better to be present at relatively shallow depths. As such, we consider that high level footings founded within the natural clay or engineered fill would be suitable for the site. Piles would also be suitable for the site, founded within the natural clays, but the bearing pressure suitable for piles will be somewhat limited due to the lower strength layers encountered in the boreholes with depth. Piles could also be used where the existing uncontrolled fill is not replaced, with the adoption of fully suspended floor slabs.

Stiffened rafts, strip or pad footings may be designed based on an Allowable Bearing Pressure (ABP) of 150kPa when bearing on natural clays of at least very stiff strength or 100kPa when bearing on engineered fill, provided it is placed under Level 1 supervision as defined in AS3798-2007. Subgrade preparation and engineered fill recommendations below stiffened raft slabs are provided in Section 4.4 below.

Where piles are adopted, bored piers could be used, provided significant groundwater seepage is not encountered. This would require the piles to be poured shortly after drilling to limit such seepage. If bored piers are to be attempted, we recommend that trial piers be drilled to assess any issues with groundwater seepage. If the seepage is excessive then alternate piling techniques may be required, such as auger, grout injected (CFA) piles. For piles socketed either a minimum five times the pile diameter or 2m, whichever is greater, into the natural clay of at least stiff strength may be designed based upon an allowable end bearing pressure of 300kPa. Allowable shaft adhesions in compression and tension of 25kPa and 15kPa, respectively, may be adopted. Where piles are adopted, the effect of the shrink-swell potential of the soils must still be considered and we therefore recommend the use of void formers of at least 80mm thickness below the slab and beams to reduce the risk of swelling clays placing uplift pressures on the slabs. Further advice in this regard can be provided once details of the footing system and site earthworks (cut and fill) are known.

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.

Footings must be dry and free of any loose or water softened materials prior to pouring concrete. As the clayey soils are reactive and will deteriorate if exposed to moisture, if there is any delay in pouring footing then following geotechnical inspection, consideration should be given to protecting the base of the footing excavation with a blinding layer of concrete. If no blinding later is provided any water and/or water softened material must be removed prior to pouring the concrete.

4.3 Soil Aggression

In accordance with Tables 6.4.2(C) and 6.5.2(C) of AS2159-2009 '*Piling – Design and Installation*', the site is underlain by low permeability soils and therefore 'Soil Conditions B' are warranted. Based on the aggressivity testing, the natural clays have an exposure classification of 'Mild' for concrete piles when assessed in accordance with the criteria given in Table 6.4.2 (C). For steel piles and in accordance with Table 6.5.2 (C), the exposure classification for the soils tested is also 'Mild'.

4.4 Subgrade Preparation and Engineered Fill

Earthworks recommendations provided in this report should be complemented by reference to AS3798-2008 'Guidelines on Earthworks for Commercial and Residential Developments'.

4.4.1 Subgrade Preparation

If the floor slabs are proposed to be fully suspended on piled footings, then no particular subgrade preparation would be necessary other than stripping all root-affected or deleterious topsoil/fill. However, based on the reactivity of the clay soils, as discussed above, we recommend the use of void formers under the building floor slabs to separate the slab from the subgrade. Further advice in this regard can be provided once details of the footing system and site earthworks (cut and fill) are known.

Recommendations for subgrade preparation below stiffened raft slabs, slabs on ground and pavements are outlined below. Slab-on-ground (other than stiffened raft slabs) should also be constructed separate from the footings of the building (i.e. designed as 'floating').

1. All root affected or deleterious fill or topsoil must be removed. These stripped materials should be taken off site as they are not suitable for reuse as engineered fill. Where depressions result from stripping, they may be infilled with inert well-graded granular fill such as crushed sandstone, placed and compacted in layers as engineered fill.
2. Where existing uncontrolled fill is present in the proposed building areas, then the existing fill must be excavated to expose the natural subgrade. We recommend the excavation of the fill extend at least 1m beyond the building footprint. Within pavement areas the existing fill may remain in place, provided it performs adequately during proof rolling.
3. Following the above, the entire subgrade should be proof rolled with at least 8 passes of an at least 10 tonne roller tonne smooth drum roller to improve the surface compaction.
4. The final pass of proof rolling should be undertaken without vibration and in the presence of an experienced geotechnician or geotechnical engineer, to detect any unstable or soft subgrade areas.
5. Unstable subgrade detected during proof rolling should be locally excavated down to a sound base and the excavated material replaced with engineered fill or as advised by the geotechnical engineer during the proof rolling inspection. Any fill placed to raise site levels should also be engineered fill. From the borehole results we expect few, if any, unstable subgrade areas to occur provided good site drainage is maintained and the earthworks are carried out during good weather. The clays may be susceptible to softening where exposed to moisture as discussed in Section 4.4.3.

If dry conditions prevail at the time of construction the clay subgrade may become desiccated or have shrinkage cracks prior to pouring any concrete slabs. If this occurs then the subgrade must be watered and rolled until the cracks disappear. This should be completed immediately prior to pouring concrete.

4.4.2 Engineered Fill

Engineered fill should preferably comprise well graded granular materials, such as ripped rock or crushed sandstone, free of deleterious substances and having a maximum particle size not exceeding 75mm. Such fill should be compacted in horizontal layers of not greater than 200mm loose thickness, to a density of at least 98% of Standard Maximum Dry Density (SMDD). For backfilling confined excavations such as service trenches, a similar compaction to engineered fill should be adhered to, but if light compaction equipment is used then the layer thickness should be limited to 100mm loose thickness.

From a geotechnical perspective, the existing clayey fill and natural clays at the site may be acceptable for re-use as engineered fill on condition that the soils used are clean (i.e. free of organics and inclusions greater than 75mm size (or 40mm size, as necessary), and free of contaminants. These clayey soils should be compacted in maximum 200mm loose layers to a density strictly between 98% and 102% of SMDD and at moisture content within 2% of their Standard Optimum Moisture Content (SOMC). All clay fill should preferably be used in the lower fill layers. Consideration must also be made by the building designer of the greater reactive potential of new fills comprising reactive clays as opposed to existing clayey soils, as discussed in Section 4.2 above. Thus, the use of clay materials for engineered fill will entail more rigorous earthwork supervision and compaction control, time for possible moisture conditioning and hence, possibly a greater eventual cost for earthworks.

Density tests should be regularly carried out on engineered fill to confirm the above specifications are achieved. Density tests should be carried out at the frequencies outlined in AS3798 (Table 8.1) for the volume of fill involved. Within the proposed building footprint and particularly if the engineered fill will be supporting structural loads, then the fill must be placed under Level 1 inspection and testing, as defined in AS3798-2007. In areas where engineered fill will not be supporting structural loads a reduced Level 2 control of fill compaction may be adopted. Any areas of insufficient compaction will require reworking and retesting to confirm the required specification has been achieved. Preferably, the geotechnical inspection and testing authority (GITA) should be engaged directly on behalf of the client and not by the earthworks subcontractor.

4.4.3 Drainage During Construction

The subgrade will comprise clay soils. The clays may be found to be unstable if proper site drainage is not implemented during construction, as evident from the low CBR values measured. It is therefore important to provide good drainage in order to promote run-off and reduce ponding. Earthworks platforms should be graded to maintain cross-falls during construction. If the clays are exposed to periods of rainfall, softening may result and site trafficability will be poor. If softening occurs, the subgrade should be over-excavated to below the depth of moisture softening. The material removed should be replaced with engineered fill. Such work would likely cause delays to the earthworks program. Trafficability may be improved by the use of a sacrificial surface layer of crushed demolition rubble.

4.5 Pavement Design Parameters

Based on the nature of proposed structure, heavy traffic incurred by aircrafts and other vehicles is expected. Concrete pavements would undoubtedly be the best in areas where heavy vehicles manoeuvre and park, connected by flexible pavements that connect the proposed hanger structures to existing taxiways and runways. We recommend that reference also be made to AS2870 for drainage and vegetation precautions on reactive clay sites.

The silty clay subgrade has a low soaked CBR values of 1%. With these relatively poor subgrade values and conditions the following main pavement design options may be considered:

1. Design the pavements for a CBR value of 1% or an estimated subgrade reaction modulus (for concrete slabs or pavements) of 10kPa/mm (750mm diameter plate). The pavement sections where imported fill is used to raise site levels may be designed taking into account the thickness and soaked CBR value of the imported fill material.

OR

2. Provide an appropriate select fill layer as part of the overall pavement thickness. The select fill should be an inert well graded material, such as crushed sandstone, with a soaked CBR value of at least 10%.

OR

3. Stabilise the subgrade to a depth of 200mm to 300mm by the addition of lime. When thoroughly mixed and re-compacted to a minimum of 98% of SMDD, a reduction in reactivity along with substantial increase in strength will be achieved. As a guide, the addition of approximately 4% lime by dry weight of clay should result in a soaked CBR value of around 6% or an equivalent subgrade reaction modulus of 40kPa/mm. This should, however, be confirmed by laboratory testing. If lime stabilisation is undertaken, an experienced contractor with appropriate equipment should be engaged. We note that use of lime close to office areas or parked cars is generally not preferred unless an acceptable method of dust suppression can be adopted.

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

Careful attention to subsurface and surface drainage is required in view of the effect of moisture on the clay subgrade. The surface of the pavement and the subgrade should be sloped to shed water, and adequate subsurface drainage should be installed around the pavement to intercept and dispose of water flows. The drainage trenches should be excavated with a longitudinal fall to appropriate discharge points so as to reduce the risk of water ponding. The subsoil drainage should extend at least 0.3m below the subgrade levels.

4.6 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:

- Confirmation of site classification once structural design and earthworks are known.
- Inspection of footing excavations.
- Inspection of proof rolling of subgrade.
- Density tests of engineered fill and/or pavement construction materials.

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.

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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SOIL TEST SERVICES
ABN 43 002 145 173

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

Client: JK Geotechnics
Project: Skyfield Development (Proposed Hangar)
Location: Bankstown Airport, Bankstown, NSW

Report No.: 35614BF2 - A
Report Date: 29/11/2023
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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 %**
105	0.50 - 0.80	23.7	69	16	53	16.5*
107	0.75 - 0.95	24.9	70	20	50	16.5*
113	0.80 - 0.95	20.5	84	21	63	22.5*
126	1.50 - 1.80	16.8	43	14	29	12.5*

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: 21/11/2023.
- Sampled and supplied by client. Samples tested as received.
- * Denotes Linear Shrinkage curled.

NATA

NATA Accredited Laboratory Number:1327

Accredited for compliance with ISO/IEC 17025 - Testing.
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the items tested or sampled.

29/11/2023
Authorised Signature / Date
(D. Treweek)

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SOIL TEST SERVICES
ABN 43 002 145 173

TABLE B
SEVEN DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client:	JK Geotechnics	**Report No.:**	35614BF2 - B
Project:	Skyfield Development (Proposed Hangar)	**Report Date:**	30/11/2023
Location:	Bankstown Airport, Bankstown, NSW	**Page 1 of 1**	

BOREHOLE NUMBER	BH 105	BH 108	BH 126
DEPTH (m)	0.50 - 1.50	0.50 - 1.50	0.50 - 1.50
Surcharge (kg)	4.5	4.5	4.5
Maximum Dry Density (t/m^3)	1.64 STD	1.60 STD	1.63 STD
Optimum Moisture Content (%)	21.7	20.5	20.8
Moulded Dry Density (t/m^3)	1.61	1.56	1.60
Sample Density Ratio (%)	98	98	98
Sample Moisture Ratio (%)	99	102	99
Moisture Contents			
Insitu (%)	22.9	22.0	21.5
Moulded (%)	21.4	20.8	20.6
After soaking and After Test, Top 30mm(%)	33.2	36.6	33.4
Remaining Depth (%)	26.2	25.4	23.5
Material Retained on 19mm Sieve (%)	0	0	0
Swell (%)	3.0	4.5	3.5
C.B.R. value: @2.5mm penetration	1	1	1

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: 21/11/2023.

NATA
NATA Accredited Laboratory
Number:1327

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the items tested or sampled.

30/11/2023
Authorised Signature / Date
(D. Treweek)

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CERTIFICATE OF ANALYSIS 338197

Client Details

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

Sample Details

Your Reference	**35614BF2, Bankstown**
Number of Samples	3 Soil
Date samples received	20/11/2023
Date completed instructions received	20/11/2023

Analysis Details

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

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

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

Report Details

Date results requested by	27/11/2023
Date of Issue	27/11/2023

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Results Approved By
Diego Bigolin, Inorganics Supervisor

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil				
Our Reference		338197-1	338197-2	338197-3
Your Reference	UNITS	BH102	BH108	BH121
Depth		4.6-4.95	1.6-1.95	1.5-1.8
Date Sampled		16/11/2023	16/11/2023	17/11/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	22/11/2023	22/11/2023	22/11/2023
Date analysed	-	22/11/2023	22/11/2023	22/11/2023
pH 1:5 soil:water	pH Units	8.7	4.6	5.3
Chloride, Cl 1:5 soil:water	mg/kg	750	720	1,100
Sulphate, SO4 1:5 soil:water	mg/kg	240	380	330
Resistivity in soil*	ohm m	13	15	11

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

QUALITY CONTROL: Misc Inorg - Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			22/11/2023	[NT]	[NT]	[NT]	[NT]	22/11/2023	[NT]
Date analysed	-			22/11/2023	[NT]	[NT]	[NT]	[NT]	22/11/2023	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	105	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	106	[NT]
Resistivity in soil*	ohm m	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

SOURCE: http://www.whereis.com/

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

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

Title:

SITE LOCATION PLAN

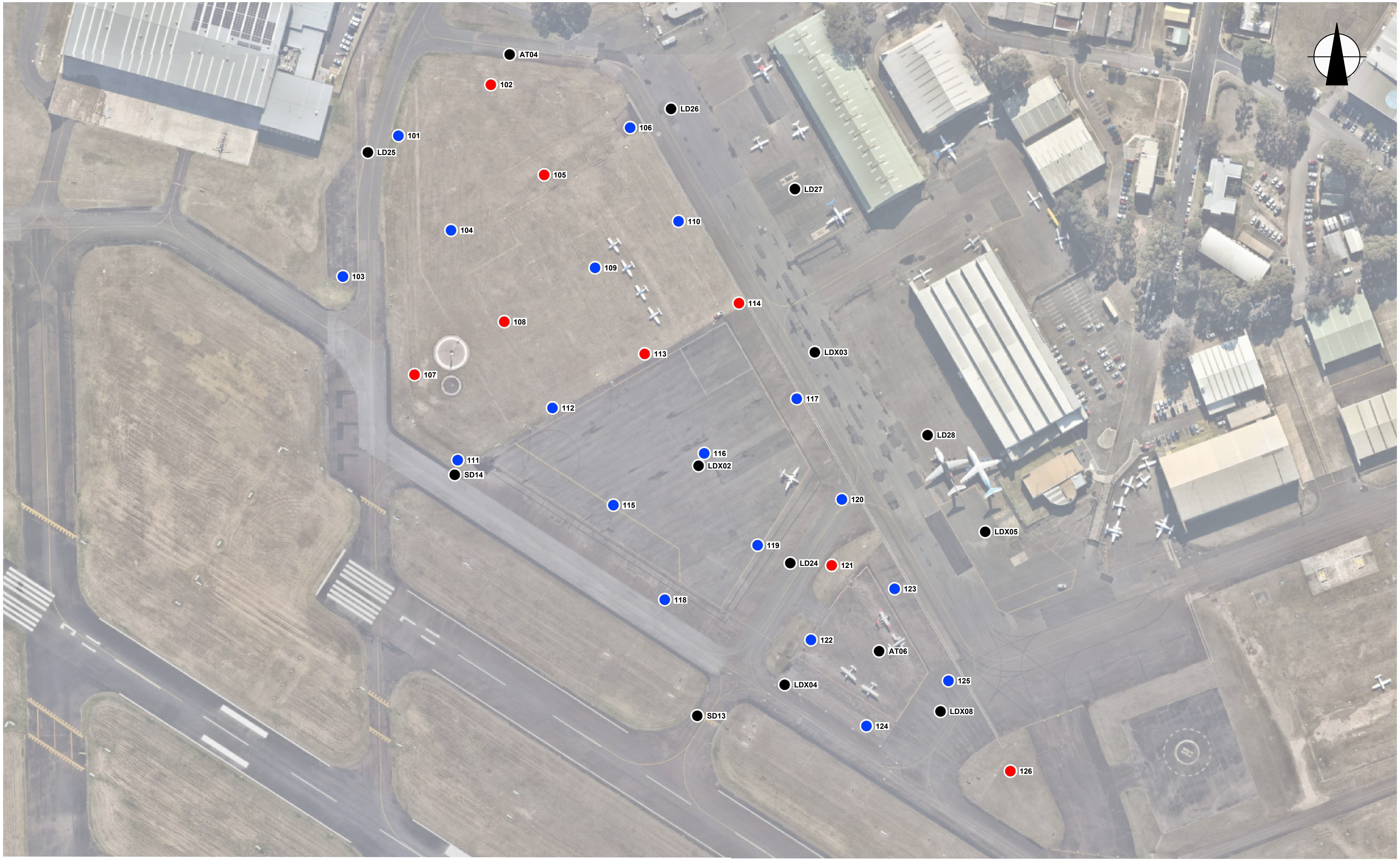
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Report No: 35614BF2

Figure No: 1

JKGeotechnics

PLOT DATE: 8/01/2024 10:39:46 AM DWG FILE: J:\6F GEOTECHNICAL JOBS\35000'S\35614BF BANKSTOWN\CAD\35614BF2.DWG



LEGEND

🔴 BOREHOLES FROM CURRENT INVESTIGATION (JKG)
🔵 BOREHOLES FROM CURRENT INVESTIGATION (JKE)
⚫ BOREHOLES FROM PREVIOUS INVESTIGATION

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 20 40 60 80 100
SCALE 1:2000 @A3 METRES

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

Title:
BOREHOLE LOCATION PLAN

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Report No: 35614BF2

Figure No: 2

JKGeotechnics

PLOT DATE: 8/01/2024 10:56:10 AM DWG FILE: J:\6F GEOTECHNICAL JOBS\35000'S\35614BF BANKSTOWN\CAD\35614BF2.DWG

BOREHOLE LOG

Borehole No.
102
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF2
Method: SPIRAL AUGER
R.L. Surface: 7.79m
Date: 16/11/23
Datum: AHD
Plant Type: JK500
Logged/Checked by: C.S.Y./O.F.

Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION		0		FILL: Silty clay, low plasticity, brown, trace of fine to medium grained sand, fine to medium grained igneous gravel, and root fibres.	w<PL			GRASS COVER
			CH	Silty CLAY: high plasticity, grey mottled red brown, trace of root fibres.	w>PL	VSt		ALLUVIAL
	N = 6 2,3,3							
							280 260 320	
		1				VSt-Hd		
	N = 13 3,5,8						410 350 550	
		2						
					w≈PL	Hd		
ON 24/11/23	N = 16 4,7,9	3					460 500 540	
				as above, but light grey mottled orange brown, with iron indurated bands.	w<PL			POSSIBLY RESIDUAL GROUNDWATER MONITORING WELL INSTALLED TO 7.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 7.0m TO 4.0m. CASING 4.0m TO 0.15m. 2mm SAND FILTER PACK 7.0m TO 3.5m. BENTONITE SEAL 3.5m TO 0.15m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
		4						
	N = 18 6,7,11						>600 >600 >600	
		5						
	N = 21 7,9,12	6					480 460 500	
					w≈PL			
					w>PL			
		7		END OF BOREHOLE AT 7.0m				

JKGeotechnics

BOREHOLE LOG

Borehole No.
105
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF2 **Method:** SPIRAL AUGER **R.L. Surface:** 7.59m
Date: 17/11/23 **Datum:** AHD
Plant Type: JK500 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES U50 DB DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clayey sand, fine to coarse grained, grey brown, trace of fine grained ironstone gravel, slag, ash and root fibres.	M w>PL			GRASS COVER
		N = 6 2,3,3			CH	FILL: Silty clay, medium plasticity, brown and orange brown, trace of fine grained ironstone gravel, ash and root fibres.	w≈PL	St-VSt	180 230 250	ALLUVIAL
			1			Silty CLAY: high plasticity, grey mottled red brown, trace of fine grained ironstone gravel, and root fibres.				
		N = 10 3,4,6				as above, but light grey mottled red brown.			320 350 280	
			2							
							w<PL	Hd		
		N = 20 7,8,12	3						480 580 >600	
			4		CI	Silty CLAY: medium plasticity, grey and orange brown, trace of fine grained sand, ash and root fibres.	w>PL	(St-VSt)		
		N = 16 3,7,9							180 160 210	
					CH	Silty CLAY: high plasticity, light grey, red brown and orange brown, trace of fine to medium grained ironstone gravel.		Hd	510 560 500	
			5			END OF BOREHOLE AT 4.95m				
			6							
			7							

JKGeotechnics

BOREHOLE LOG

Borehole No.
107
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF2 **Method:** SPIRAL AUGER **R.L. Surface:** 6.19m
Date: 16/11/23 **Datum:** AHD
Plant Type: JK500 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
		0		FILL: Silty clay, low plasticity, brown and red brown, trace of fine to medium grained ironstone gravel, and root fibres.	w≈PL		380 410	GRASS COVER APPEARS POORLY COMPACTED
	N = 6 2,2,4		CH	Silty CLAY: high plasticity, grey mottled orange brown, trace of fine grained ironstone gravel, ash and root fibres.	w>PL	VSt	250 280 260	ALLUVIAL
		1						
ON 24/11/23	N = 11 2,5,6						350 370 410	
		2		as above, but light grey.				
ON COMPLETION								
	N = 7 3,3,4	3					240 250 260	
			CI-CH	Silty CLAY: medium to high plasticity, light grey, red brown and orange brown, trace of fine to medium grained ironstone gravel.				
		4						
	N = 10 6,4,6					Hd	540 480 450	GROUNDWATER MONITORING WELL INSTALLED TO 6.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 6.0m TO 3.0m. CASING 3.0m TO 0.1m. 2mm SAND FILTER PACK 6.0m TO 2.5m. BENTONITE SEAL 2.5m TO 0.1m. COMPLETED WITH A CONCRETED GATIC COVER.
		5		as above, but with ironstone bands.				
	N = 24 8,14,10	6					350 380 450	
				END OF BOREHOLE AT 6.45m				
		7						

BOREHOLE LOG

Borehole No.
108
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF2 **Method:** SPIRAL AUGER **R.L. Surface:** 7.00m
Date: 16/11/23 **Datum:** AHD
Plant Type: JK500 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES U50 DB DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			0			FILL: Silty clay, low plasticity, brown, with fine to medium grained sand.				GRASS COVER
		N = 9 3,4,5			CH	Silty CLAY: high plasticity, light grey mottled red brown, trace of fine to medium grained ironstone gravel, ash and root fibres.	w≈PL			ALLUVIAL
			1				w>PL	VSt		
		N = 11 3,4,7	2						360 320 350	
							w≈PL		370 350	
		N = 17 5,6,11	3			as above, but red brown mottled light grey and orange brown.		VSt-Hd	580 >600 480	
			4							
		N = 20 5,8,12							>600 >600 >600	
			5			END OF BOREHOLE AT 4.95m				
			6							
			7							

JKGeotechnics

BOREHOLE LOG

Borehole No.
113
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF2
Method: SPIRAL AUGER
R.L. Surface: 7.59m
Date: 16/11/23
Datum: AHD
Plant Type: JK500
Logged/Checked by: C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty clay, low plasticity, brown, with fine grained sand, trace of fine to medium grained ironstone gravel, clay nodules and root fibres.	w<PL			GRASS COVER
					N = 13 4,5,8			CH	Silty CLAY: high plasticity, red brown mottled light grey and orange brown, trace of fine to medium grained ironstone gravel, ash and root fibres.	w≈PL	Hd	>600 >600 >600	ALLUVIAL
						1							
					N = 10 3,4,6						St- VSt	270 370 350	
						2							
												250 250 260	
					N = 14 4,5,9	3						360 280 520	
									as above, but light grey mottled orange brown.		VSt- Hd		
						4						400 500	
					N = 14 3,5,9							450 480 490	
						5			END OF BOREHOLE AT 4.95m				
						6							
						7							

JKGeotechnics

BOREHOLE LOG

Borehole No.
114
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF2
Method: SPIRAL AUGER
R.L. Surface: 8.38m
Date: 16/11/23
Datum: AHD
Plant Type: JK500
Logged/Checked by: C.S.Y./O.F.

Groundwater Record	SAMPLES				Field Tests	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						0			FILL: Silty clay, low plasticity, brown, with fine grained sand, trace of fine to medium grained ironstone gravel, clay nodules and root fibres.	w<PL			GRASS COVER
					N = 9 5,5,4				FILL: Silty clay, high plasticity, red brown and orange brown, trace of fine to medium grained ironstone gravel, and ash.			>600 >600	POSSIBLY NATURAL
						1		CH	Silty CLAY: high plasticity, grey mottled orange brown and red brown, trace of fine to medium grained ironstone gravel, and root fibres.	w>PL	VSt-Hd		ALLUVIAL
					N = 7 2,2,5							340 350 410	
						2							
												340 360 420	HP TESTING ON REMOULDED SAMPLE
▼ ON 24/11/23					N = 16 4,6,10	3					Hd	420 440 520	
									as above, but orange brown and light grey.		VSt	350 360	GROUNDWATER MONITORING WELL INSTALLED TO 7.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 7.0m TO 4.0m. CASING 4.0m TO 0.5m. 2mm SAND FILTER PACK 7.0m TO 3.5m. BENTONITE SEAL 3.5m TO 2.6m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						4							
					N = 13 3,6,7							280 320 300	
						5		CI	Silty CLAY: medium plasticity, light grey mottled orange brown.		VSt-Hd	280	
						6						380 380 420	
					N = 18 6,7,11								
						7			END OF BOREHOLE AT 7.0m				

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BOREHOLE LOG

Borehole No.
121
1/1

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF2 **Method:** SPIRAL AUGER **R.L. Surface:** 8.37m

Date: 17/11/23 **Datum:** AHD

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

Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
		0		FILL: Silty clayey sand, fine to coarse grained, brown, trace of fine grained ironstone gravel, slag and root fibres.	M w>PL			GRASS COVER
	N = 6 3,3,3		CI-CH	FILL: Silty clay, low to medium plasticity, grey and orange brown, trace of fine grained ironstone gravel, ash and root fibres.	w>PL	VSt-Hd	400 400 420	ALLUVIAL
		1		Silty CLAY: medium to high plasticity, grey mottled orange brown, trace of ash and root fibres.				
	N = 10 4,4,6						250 320 400	
		2						
				Silty CLAY: medium to high plasticity, light grey mottled red brown and orange brown, trace of fine to medium grained ironstone gravel.	w≈PL			
	N = 19 6,8,11	3					400 580 500	
		4						
ON 24/11/23 ▼			CL	Silty CLAY: low plasticity, light grey mottled orange brown, with fine to medium grained sand.	w>PL	St		GROUNDWATER MONITORING WELL INSTALLED TO 7.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 7.0m TO 4.0m. CASING 4.0m TO 0.15m. 2mm SAND FILTER PACK 7.0m TO 3.5m. BENTONITE SEAL 3.5m TO 2.0m. BACKFILLED WITH SAND AND CUTTINGS TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
▼ ON COMPLET- ION	N = 9 3,4,5						180 200 170	
		5						
▶	N = 11 3,5,6	6				VSt	250 200 300	
		7		END OF BOREHOLE AT 7.0m				

JKGeotechnics

BOREHOLE LOG

Borehole No.
126
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF2
Method: SPIRAL AUGER
R.L. Surface: 9.20m
Date: 17/11/23
Datum: AHD
Plant Type: JK500
Logged/Checked by: C.S.Y./O.F.

Groundwater Record	SAMPLES ES U50 DB DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
			0			FILL: Silty sand, fine to coarse grained, brown, trace of fine to medium grained ironstone gravel, and root fibres.	M w>PL			GRASS COVER REWORKED NATURAL
		N = 8 3,3,5			CI	FILL: Silty clay, low plasticity, grey brown, trace of fine to medium grained ironstone gravel.	w>PL	Hd	460 450 500	ALLUVIAL
			1			Silty CLAY: medium plasticity, grey mottled red brown, trace of fine grained ironstone gravel, ash and root fibres.				
		N = 12 4,5,7				as above, but light grey mottled orange brown.			320 440 500	
			2							
									420 430 450	POSSIBLY RESIDUAL
		N = 18 5,6,12	3						480 500 500	
			4							
		N = 21 5,8,13							470 >600 >600	GROUNDWATER MONITORING WELL INSTALLED TO 7.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 7.0m TO 4.0m. CASING 4.0m TO 0.15m. 2mm SAND FILTER PACK 7.0m TO 3.5m. BENTONITE SEAL 3.5m TO 2.0m. BACKFILLED WITH SAND AND CUTTINGS TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
ON 24/11/23 ▼			5							
					CL	Silty CLAY: low plasticity, light grey mottled orange brown, with fine to medium grained sand.	w>PL	St- VSt		
ON COMPLETION ▼ ▶		N = 11 5,4,7	6						180 230 250	
			7			END OF BOREHOLE AT 7.0m				

REPORT EXPLANATION NOTES

INTRODUCTION

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

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

DESCRIPTION AND CLASSIFICATION METHODS

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

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

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

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

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

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

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

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

SAMPLING

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

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

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

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

INVESTIGATION METHODS

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

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

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

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

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

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

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

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

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

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

The test results are reported in the following form:

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

  N = 13
  4, 6, 7

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

  N > 30
  15, 30/40mm

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

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

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

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

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

The information provided on the charts comprise:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

LOGS

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

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

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

GROUNDWATER

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

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

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

FILL

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

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

LABORATORY TESTING

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

ENGINEERING REPORTS

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

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

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

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

SITE ANOMALIES

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

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

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

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

REVIEW OF DESIGN

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

SITE INSPECTION

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

Requirements could range from:

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

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

iii) full time engineering presence on site.

SYMBOL LEGENDS

SOIL

- ▩ FILL
- ≋ TOPSOIL
- ▨ CLAY (CL, CI, CH)
- ▥ SILT (ML, MH)
- ░ SAND (SP, SW)
- ⁘ GRAVEL (GP, GW)
- ▨ SANDY CLAY (CL, CI, CH)
- ▨ SILTY CLAY (CL, CI, CH)
- ▨ CLAYEY SAND (SC)
- ▥ SILTY SAND (SM)
- ▨ GRAVELLY CLAY (CL, CI, CH)
- ▨ CLAYEY GRAVEL (GC)
- ▥ SANDY SILT (ML, MH)
- ⁂ PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK

- ⁘ CONGLOMERATE
- ░ SANDSTONE
- ▤ SHALE/MUDSTONE
- ▥ SILTSTONE
- ▤ CLAYSTONE
- ■ COAL
- ▥ LAMINITE
- ▦ LIMESTONE
- ≋ PHYLLITE, SCHIST
- ▤ TUFF
- ⁘ GRANITE, GABBRO
- ✚ DOLERITE, DIORITE
- ⋁ BASALT, ANDESITE
- ≋ QUARTZITE

OTHER MATERIALS

- ▦ BRICKS OR PAVERS
- ▵ CONCRETE
- ■ ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

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

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

Laboratory Classification Criteria

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

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

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

NOTES:

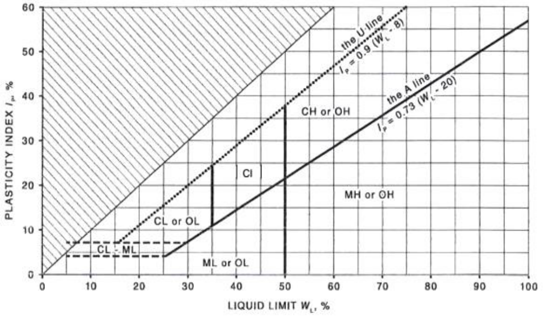
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

2 Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.

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

4 The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

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



LOG SYMBOLS

<table>
<tr><th>Log Column</th><th>Symbol</th><th colspan="3">Definition</th></tr>
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<tr><td></td><td>—C—</td><td colspan="3">Extent of borehole/test pit collapse shortly after drilling/excavation.</td></tr>
<tr><td></td><td>▶</td><td colspan="3">Groundwater seepage into borehole or test pit noted during drilling or excavation.</td></tr>
<tr><td>Samples</td><td>ES</td><td colspan="3">Sample taken over depth indicated, for environmental analysis.</td></tr>
<tr><td></td><td>U50</td><td colspan="3">Undisturbed 50mm diameter tube sample taken over depth indicated.</td></tr>
<tr><td></td><td>DB</td><td colspan="3">Bulk disturbed sample taken over depth indicated.</td></tr>
<tr><td></td><td>DS</td><td colspan="3">Small disturbed bag sample taken over depth indicated.</td></tr>
<tr><td></td><td>ASB</td><td colspan="3">Soil sample taken over depth indicated, for asbestos analysis.</td></tr>
<tr><td></td><td>ASS</td><td colspan="3">Soil sample taken over depth indicated, for acid sulfate soil analysis.</td></tr>
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<tr><td>Field Tests</td><td>N = 17
4, 7, 10</td><td colspan="3">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.</td></tr>
<tr><td></td><td>N_c = 5
7
3R</td><td colspan="3">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.</td></tr>
<tr><td></td><td>VNS = 25</td><td colspan="3">Vane shear reading in kPa of undrained shear strength.</td></tr>
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<tr><td>Moisture Condition
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<tr><td></td><td><i>w</i> ≈ PL</td><td colspan="3">Moisture content estimated to be approximately equal to plastic limit.</td></tr>
<tr><td></td><td><i>w</i> < PL</td><td colspan="3">Moisture content estimated to be less than plastic limit.</td></tr>
<tr><td></td><td><i>w</i> ≈ LL</td><td colspan="3">Moisture content estimated to be near liquid limit.</td></tr>
<tr><td></td><td><i>w</i> > LL</td><td colspan="3">Moisture content estimated to be wet of liquid limit.</td></tr>
<tr><td>(Coarse Grained Soils)</td><td>D</td><td colspan="3">DRY – runs freely through fingers.</td></tr>
<tr><td></td><td>M</td><td colspan="3">MOIST – does not run freely but no free water visible on soil surface.</td></tr>
<tr><td></td><td>W</td><td colspan="3">WET – free water visible on soil surface.</td></tr>
<tr><td>Strength (Consistency)
Cohesive Soils</td><td>VS</td><td colspan="3">VERY SOFT – unconfined compressive strength ≤ 25kPa.</td></tr>
<tr><td></td><td>S</td><td colspan="3">SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa.</td></tr>
<tr><td></td><td>F</td><td colspan="3">FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa.</td></tr>
<tr><td></td><td>St</td><td colspan="3">STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa.</td></tr>
<tr><td></td><td>VSt</td><td colspan="3">VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa.</td></tr>
<tr><td></td><td>Hd</td><td colspan="3">HARD – unconfined compressive strength > 400kPa.</td></tr>
<tr><td></td><td>Fr</td><td colspan="3">FRIABLE – strength not attainable, soil crumbles.</td></tr>
<tr><td></td><td>( )</td><td colspan="3">Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.</td></tr>
<tr><td>Density Index/
Relative Density
(Cohesionless Soils)</td><td></td><td></td><td>Density Index (I_D) Range (%)</td><td>SPT ‘N’ Value Range (Blows/300mm)</td></tr>
<tr><td></td><td>VL</td><td>VERY LOOSE</td><td>≤ 15</td><td>0 – 4</td></tr>
<tr><td></td><td>L</td><td>LOOSE</td><td>> 15 and ≤ 35</td><td>4 – 10</td></tr>
<tr><td></td><td>MD</td><td>MEDIUM DENSE</td><td>> 35 and ≤ 65</td><td>10 – 30</td></tr>
<tr><td></td><td>D</td><td>DENSE</td><td>> 65 and ≤ 85</td><td>30 – 50</td></tr>
<tr><td></td><td>VD</td><td>VERY DENSE</td><td>> 85</td><td>> 50</td></tr>
<tr><td></td><td>( )</td><td colspan="3">Bracketed symbol indicates estimated density based on ease of drilling or other assessment.</td></tr>
<tr><td>Hand Penetrometer Readings</td><td>300
250</td><td colspan="3">Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.</td></tr>
</table>

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

Classification of Material Weathering

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

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

Rock Material Strength Classification

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

Abbreviations Used in Defect Description

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

APPENDIX A

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH101
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 7.36m
Date: 15/11/23
Datum: AHD
Plant Type: EZIPROBE
Logged/Checked by: A.D./B.P.

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, low to medium plasticity, brown, trace of sand, igneous gravel, concrete fragments and root fibres.	w<PL			GRASS COVER
								▩						
	■		■	■				▩		as above, but grey.	w<PL			
							0.5	▩		FILL: Silty clay, medium to high plasticity, grey, orange and red brown, trace of root fibres.	w<PL			REWORKED NATURAL
	■		■	■				▩						
							1	▨	CI-CH	Silty CLAY: medium to high plasticity, grey mottled red, trace of root fibres.	w≈PL			ALLUVIAL
	■		■	■				▨						
							1.5	▨						
				■				▨						
							2			END OF BOREHOLE AT 2.0m				
							2.5							
							3							
							3.5							

ENVIRONMENTAL LOG

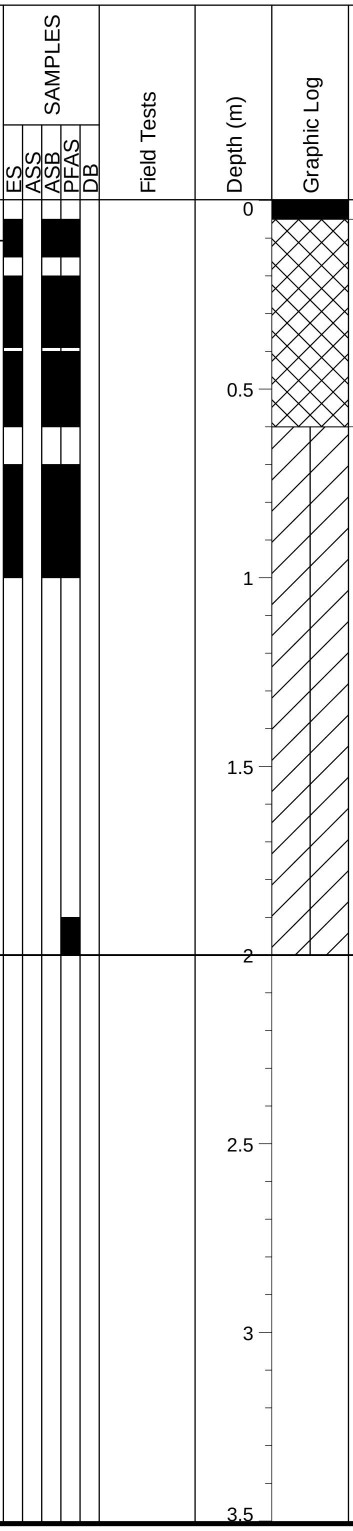
Log No.
BH103
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP112

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 6.79m
Date: 16/11/23
Datum: AHD
Plant Type: EZIPROBE
Logged/Checked by: A.D./B.P.



Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION		0		ASPHALT: 50mm.t				
			-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel, trace of asphalt fragments.	M			ROADBASE
					M			
		0.5		FILL: Clayey sand, fine to medium grained, light brown and grey, trace of igneous and sandstone gravel.	w≈PL			
			CI-CH	FILL: Silty clay, medium to high plasticity, brown and dark grey, trace of ash.	w≈PL			ALLUVIAL
				Silty CLAY: medium to high plasticity, grey mottled red and orange.				
		2		END OF BOREHOLE AT 2.0m				

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH104
1/1

SDUP101: 1.7-2.0

Client: BANKSTOWN AIRPORT PTY LTD

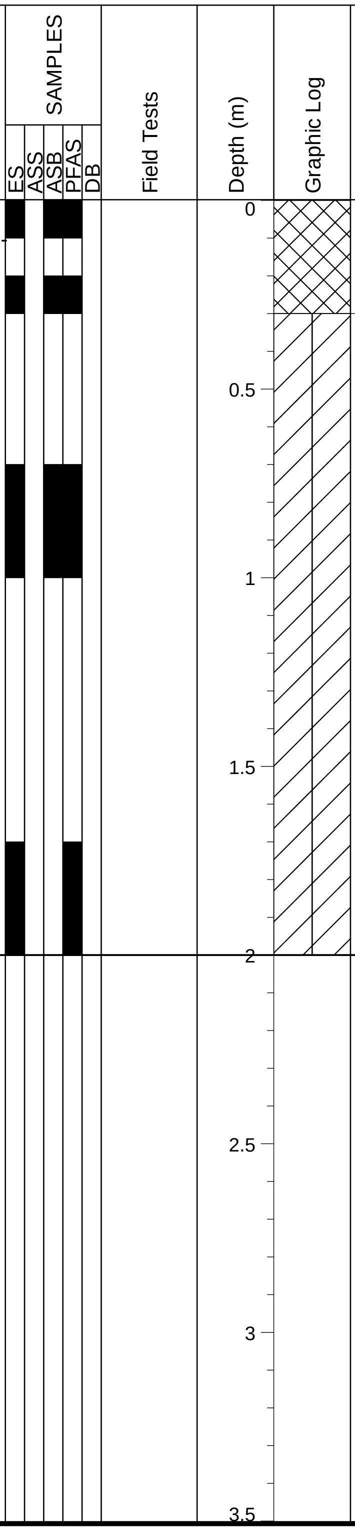
Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2 **Method:** PUSH TUBE **R.L. Surface:** 7.04m

Date: 15/11/23 **Datum:** AHD

Plant Type: EZIPROBE **Logged/Checked by:** A.D./B.P.



Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION		0		FILL: Silty clay, medium plasticity, brown, trace of igneous gravel and root fibres.	w<PL			GRASS COVER
				FILL: Silty clay, low to medium plasticity, light grey and brown, trace of ironstone gravel and root fibres.	w<PL			
			CI-CH	Silty CLAY: medium to high plasticity, light grey mottled red, trace of root fibres.	w≈PL			ALLUVIAL
		2		END OF BOREHOLE AT 2.0m				

JKEnvironments

ENVIRONMENTAL LOG

Log No.
BH106
1/1

Environmental logs are not to be used for geotechnical purposes

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2 **Method:** PUSH TUBE **R.L. Surface:** 8.38m

Date: 16/11/23 **Datum:** AHD

Plant Type: EZIPROBE **Logged/Checked by:** A.D./B.P.

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	■		ASPHALT: 100mm.t				
	■		■	■				▨	-	FILL: Silty clay, low to medium plasticity, brown, with fine to medium grained sand, trace of igneous gravel and asphalt fragments.	w<PL			
	■		■	■			0.5	▨		FILL: Silty clay, medium to high plasticity, brown and orange brown.	w≈PL			REWORKED NATURAL
	■		■	■ ■			1 1.5	▧	CI-CH	Silty CLAY: medium to high plasticity, grey mottled red and orange.	w≈PL			ALLUVIAL
							2 2.5 3 3.5			END OF BOREHOLE AT 2.0m				

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH109
1/1
SDUP102: 0-0.15

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 7.55m
Date: 15/11/23
Datum: AHD
Plant Type: EZIPROBE
Logged/Checked by: A.D./B.P.

Groundwater Record	Field Tests	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION		0		FILL: Silty clay, low to medium plasticity, brown, trace of sand and root fibres.	w<PL			GRASS COVER
				FILL: Silty clay, low to medium plasticity, grey and brown, trace of igneous gravel and root fibres.	w<PL			
		0.5		FILL: Silty clay, medium to high plasticity, grey, red and orange brown, trace of root fibres.	w<PL			REWORKED NATURAL
		1	CI-CH	Silty CLAY: medium to high plasticity, grey mottled red, trace of root fibres.	w≈PL			ALLUVIAL
		1.5						
		2		END OF BOREHOLE AT 2.0m				
		2.5						
		3						
		3.5						

SAMPLES: ES, ASS, ASB, PFAS, DB

Graphic Log

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ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH110
1/1

SDUP103: 0-0.1

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 8.25m

Date: 15/11/23
Datum: AHD

Plant Type: EZIPROBE
Logged/Checked by: A.D./B.P.

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, low to medium plasticity, brown, trace of sand and root fibres.	w<PL			GRASS COVER
	■		■	■			0.5	▩		FILL: Silty clay, medium to high plasticity, brown, grey and orange brown, trace of root fibres.	w<PL			REWORKED NATURAL
	■		■	■ ■			1 1.5	▨	CI-CH	Silty CLAY: medium to high plasticity, grey mottled orange, trace of sand and ironstone gravel.	w≈PL			ALLUVIAL
							2 2.5 3 3.5			END OF BOREHOLE AT 2.0m				

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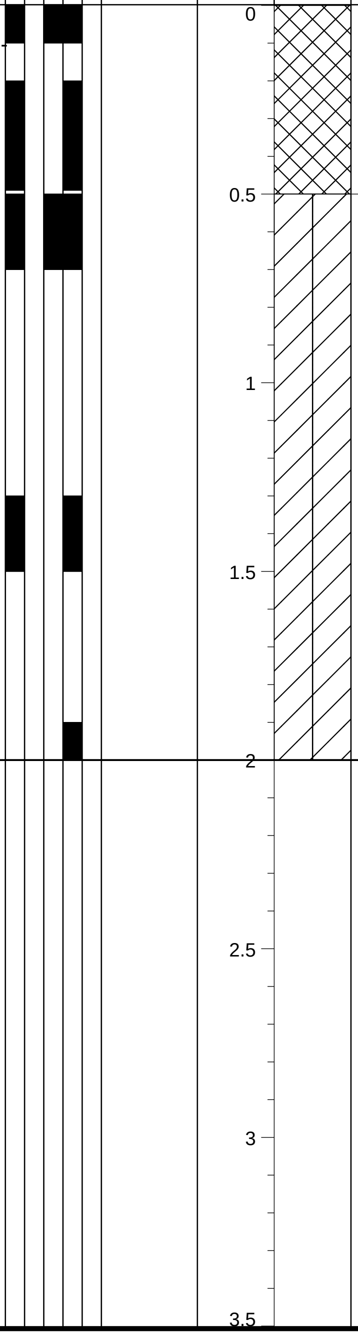
ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH111
1/1
SDUP105: 0-0.1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 6.63m
Date: 15/11/23
Datum: AHD
Plant Type: EZIPROBE
Logged/Checked by: A.D./B.P.



Groundwater Record	SAMPLES ES	ASS	ASB	PFAS	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, low to medium plasticity, brown, trace of root fibres.	w≈PL			GRASS COVER
										FILL: Silty clay, medium to high plasticity, brown and grey, trace of root fibres.	w≈PL			
							0.5		CI-CH	Silty CLAY: medium to high plasticity, grey mottled red and orange, trace of root fibres.	w≈PL			ALLUVIAL
							2			END OF BOREHOLE AT 2.0m				

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH112
1/1

SDUP104: 0-0.1

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2 **Method:** PUSH TUBE **R.L. Surface:** 6.90m

Date: 15/11/23 **Datum:** AHD

Plant Type: EZIPROBE **Logged/Checked by:** A.D./B.P.

Groundwater Record	SAMPLES ES	ASS	ASB	PFAS	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■	■			0	▩		FILL: Silty clay, low to medium plasticity, brown, trace of sand, ironstone gravel and root fibres.	w<PL			GRASS COVER
	■		■	■			0.5	▩		FILL: Silty clay, medium to high plasticity, brown, grey and orange brown, trace of root fibres.	w<PL			REWORKED NATURAL
	■		■	■ ■			1 1.5	▨	CI-CH	Silty CLAY: medium to high plasticity, grey mottled red and orange.	w≈PL			ALLUVIAL
							2 2.5 3 3.5			END OF BOREHOLE AT 2.0m				

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH115** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2 **Method:** PUSH TUBE **R.L. Surface:** 7.14m

Date: 16/11/23 **Datum:** AHD

Plant Type: EZIPROBE **Logged/Checked by:** A.D./B.P.

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	■		ASPHALT: 80mm.t				
	■		■	■				☒	-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel.	M			ROADBASE
	■		■	■			0.5	☒		FILL: Clayey sand, fine to medium grained, light brown and grey, trace of sandstone gravel.	M			
	■		■	■ ■			1 1.5	▨	CI-CH	Silty CLAY: medium to high plasticity, grey mottled red, trace of root fibres.	w≈PL			ALLUVIAL
							2 2.5 3 3.5			END OF BOREHOLE AT 2.0m				

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH116
1/1

SDUP111

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2 **Method:** PUSH TUBE **R.L. Surface:** 7.74m

Date: 16/11/23 **Datum:** AHD

Plant Type: EZIPROBE **Logged/Checked by:** A.D./B.P.

Groundwater Record	SAMPLES ES	ASS	ASB	PFAS	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			ASPHALT: 60mm.t				
									-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel, trace of asphalt fragments.	M			ROADBASE
										FILL: Clayey sand, fine to medium grained, light brown, red brown and grey, trace of sandstone gravel.	M			
							0.5							
									CI-CH	Silty CLAY: medium to high plasticity, grey motted red and brown.	w≈PL			ALLUVIAL
							1							
							1.5							
							2			END OF BOREHOLE AT 2.0m				
							2.5							
							3							
							3.5							

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ENVIRONMENTAL LOG

Log No. BH117 1/1

Environmental logs are not to be used for geotechnical purposes

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2 **Method:** PUSH TUBE **R.L. Surface:** 8.44m

Date: 16/11/23 **Datum:** AHD

Plant Type: EZIPROBE **Logged/Checked by:** A.D./B.P.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0	■		ASPHALT: 60mm.t				
	■		■	■					-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel.	M			ROADBASE
	■		■	■			0.5			FILL: Clayey sand, fine to medium grained, light brown and grey, trace of sandstone gravel.	M			
	■		■	■			1 1.5		CI-CH	Silty CLAY: medium to high plasticity, grey mottled red.	w≈PL			ALLUVIAL
				■										
							2 2.5 3 3.5			END OF BOREHOLE AT 2.0m				

ENVIRONMENTAL LOG

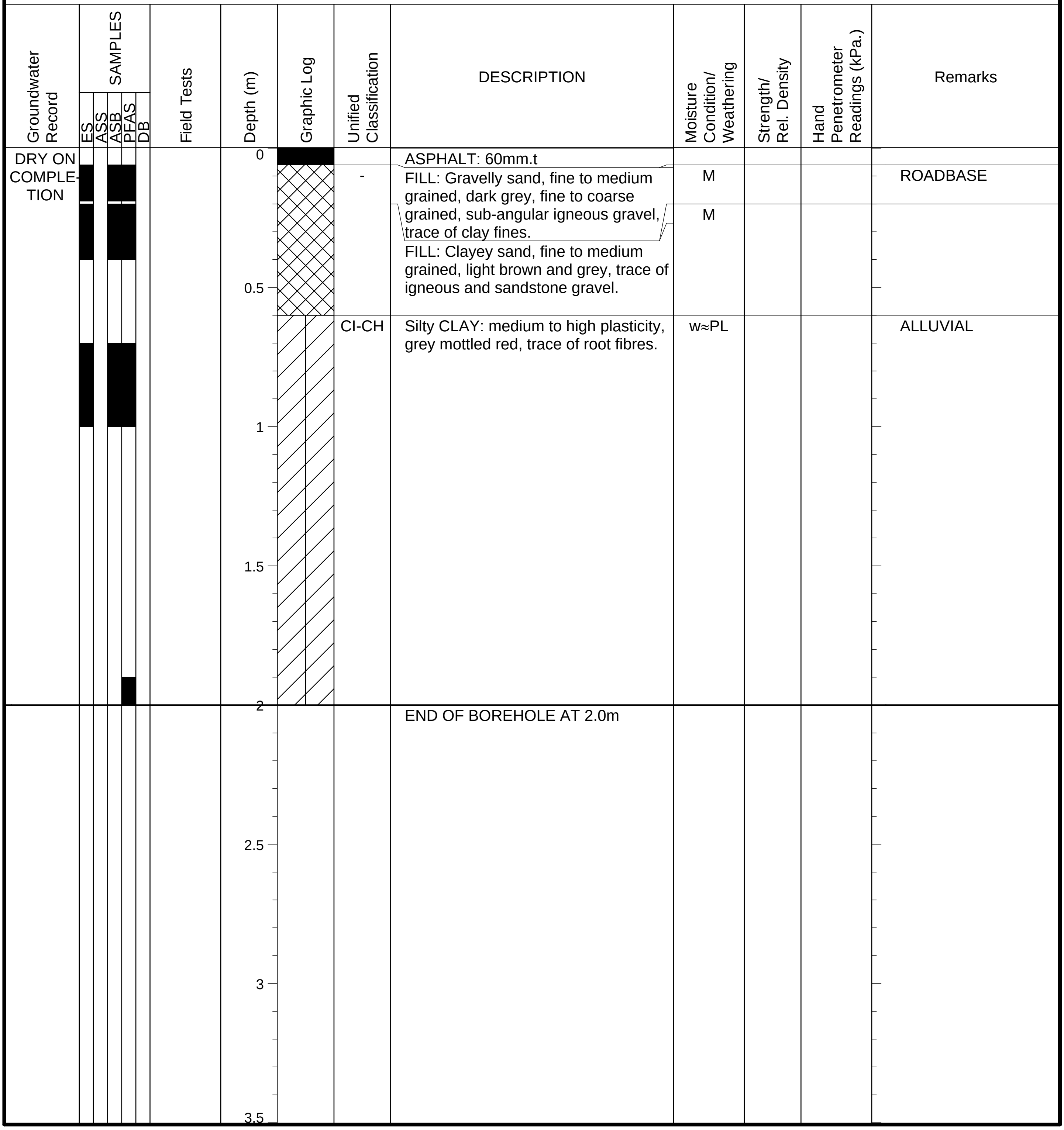
Log No.
BH118
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP113: 1.9-2.0

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 7.46m
Date: 17/11/23
Datum: AHD
Plant Type: EZIPROBE
Logged/Checked by: A.D./B.P.



Groundwater Record	Depth (m)	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Remarks
DRY ON COMPLETION	0		ASPHALT: 60mm.t		
		-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel, trace of clay fines.	M	ROADBASE
			FILL: Clayey sand, fine to medium grained, light brown and grey, trace of igneous and sandstone gravel.	M	
		CI-CH	Silty CLAY: medium to high plasticity, grey mottled red, trace of root fibres.	w≈PL	ALLUVIAL
	2		END OF BOREHOLE AT 2.0m		

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ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH119
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 7.89m
Date: 17/11/23
Datum: AHD
Plant Type: EZIPROBE
Logged/Checked by: A.D./B.P.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0	■		ASPHALT: 70mm.t				
	■		■					▨	-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel.	M			ROADBASE
	■		■				0.5	▨		FILL: Clayey sand, fine to medium grained, light brown and grey, trace of sandstone and igneous gravel.	M			
	■		■	■			1 1.5	▨	CI-CH	Silty CLAY: medium to high plasticity, grey mottled red and orange.	w≈PL			ALLUVIAL
							2 2.5 3 3.5			END OF BOREHOLE AT 2.0m				

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ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH120
1/1

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 8.55m
Date: 16-17/11/23
Datum: AHD
Plant Type: EZIPROBE
Logged/Checked by: A.D./B.P.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			ASPHALT: 100mm.t				
									-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel, trace of asphalt fragments.	W			ROADBASE
										FILL: Clayey sand, fine to medium grained, brown and orange brown, trace of sandstone gravel.	M			
							0.5							
									CI-CH	Silty CLAY: medium to high plasticity, grey mottled red and orange, trace of root fibres.	w≈PL			ALLUVIAL
							1							
							1.5							
							2							
										END OF BOREHOLE AT 2.1m				
							2.5							
							3							
							3.5							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH122
1/1

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 8.17m

Date: 17/11/23
Datum: AHD

Plant Type: EZIPROBE
Logged/Checked by: L.R./B.P.

Groundwater Record	SAMPLES ES	ASS	ASB	PFAS	DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■	■			0		-	ASPHALTIC CONCRETE: 10mm.t	D			ROADBASE
	■		■	■						FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel, trace of asphalt fragments.	D			
										as above, but grey.				
							0.5							
	■		■	■					CI-CH	Silty CLAY: medium to high plasticity, grey mottled red brown.	w≈PL			ALLUVIAL
							1							
							1.5							
				■										
							2			END OF BOREHOLE AT 2.0m				
							2.5							
							3							
							3.5							

ENVIRONMENTAL LOG

Log No.
BH123
1/1

Environmental logs are not to be used for geotechnical purposes

Client: BANKSTOWN AIRPORT PTY LTD
Project: AVIATION HANGAR PROJECT
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2
Method: PUSH TUBE
R.L. Surface: 8.63m
Date: 17/11/23
Datum: AHD
Plant Type: EZIPROBE
Logged/Checked by: A.D./B.P.

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	■		ASPHALT: 80mm.t				
	■		■					▩	-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel, trace of asphalt fragments.	M			
	■		■				0.5	▩		FILL: Clayey sand, fine to medium grained, light brown and grey, trace of sandstone gravel.	M			
	■		■				1 1.5	▨	CI-CH	Silty CLAY: medium to high plasticity, grey mottled red brown, trace of root fibres.	w≈PL			ALLUVIAL
							2 2.5 3 3.5			END OF BOREHOLE AT 2.0m				

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH124
1/1

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2 **Method:** PUSH TUBE **R.L. Surface:** 8.51m

Date: 17/11/23 **Datum:** AHD

Plant Type: EZIPROBE **Logged/Checked by:** A.D./B.P.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0	■		ASPHALT: 50mm.t				
	■		■	■				▩	-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel.	M			ROADBASE
	■		■	■			0.5	▩		FILL: Clayey sand, fine to medium grained, light brown and grey, trace of sandstone and igneous gravel.	M			
	■		■	■ ■			1 1.5	▨	CI-CH	Silty CLAY: medium to high plasticity, grey mottled orange, trace of root fibres.	w≈PL			ALLUVIAL
							2 2.5 3 3.5			END OF BOREHOLE AT 2.0m				

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ENVIRONMENTAL LOG

Log No.
BH125
1/1

Environmental logs are not to be used for geotechnical purposes

Client: BANKSTOWN AIRPORT PTY LTD

Project: AVIATION HANGAR PROJECT

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: E35614P2 **Method:** PUSH TUBE **R.L. Surface:** 8.95m

Date: 17/11/23 **Datum:** AHD

Plant Type: EZIPROBE **Logged/Checked by:** A.D./B.P.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			ASPHALT: 120mm.t				
	■		■	■					-	FILL: Gravelly sand, fine to medium grained, dark grey, fine to coarse grained, sub-angular igneous gravel.	M			ROADBASE
	■		■	■			0.5			FILL: Clayey sand, fine to medium grained, light brown and grey, trace of sandstone gravel.	M			
	■		■	■			1 1.5		CI-CH	Silty CLAY: medium to high plasticity, grey mottled red and orange.	w≈PL			ALLUVIAL
				■										
							2 2.5 3 3.5			END OF BOREHOLE AT 2.0m				

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APPENDIX B

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BOREHOLE LOG

Borehole No.
LDX02
1/1

Client: SYDNEY METRO AIRPORTS

Project: PROPOSED PAVEMENT UPGRADE

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF **Method:** SPIRAL AUGER **R.L. Surface:** 7.67m

Date: 1/12/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION				■		0			ASPHALTIC CONCRETE: 80mm.t				
			■	■	N = 14 6,9,5			-	FILL: Gravelly sand, fine to coarse grained, dark grey, fine to coarse grained igneous and sandstone gravel, with clay/ silt.	M			
			■			0.5			FILL: Gravelly sand, fine to coarse grained, brown, fine to coarse grained sandstone, ironstone and igneous gravel, trace of ash.	w>PL		250 280 280	
			■		N = 6 2,3,3				FILL: Silty clay, medium plasticity, grey mottled red brown, trace of root fibres, inter bedded with fine to coarse grained igneous gravel and fine to coarse grained sand.				
			■		N = 7 2,3,4	1		CH	Silty CLAY: high plasticity, light grey mottled red brown, trace of root fibres.	w≈PL	St	150 160 170	ALLUVIAL
						1.5							
									END OF LDX02 AT 1.7m				
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No.
LDX03
1/1

Client: SYDNEY METRO AIRPORTS
Project: PROPOSED PAVEMENT UPGRADE
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF
Method: SPIRAL AUGER
R.L. Surface: 8.62m
Date: 1/12/22
Datum: AHD
Plant Type: JK400
Logged/Checked by: C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			ASPHALTIC CONCRETE: 100mm.t				
					N = 12 8,4			-	FILL: Cemented gravelly sand, fine to coarse grained, brown, fine to coarse grained ironstone, sandstone and igneous gravel.	M			
									FILL: Sandy gravel, fine to coarse grained sandstone, ironstone and igneous, brown and grey, fine to coarse grained sand, trace of fine to medium grained asphaltic rubble.				
					N = 7 2,3,4	0.5			FILL: Silty clay, medium to high plasticity, grey mottled orange brown, with root fibres.	w>PL		140 210 220	POSSIBLY NATURAL
					N = 7 1,3,4	1		CH	Silty CLAY: high plasticity, light grey mottled red brown, with root fibres.	w≈PL	VSt	230 260 210	ALLUVIAL
						1.5							
						2			END OF LDX03 AT 2.0m				
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No.
LDX04
1/1

Client: SYDNEY METRO AIRPORTS

Project: PROPOSED PAVEMENT UPGRADE

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF **Method:** SPIRAL AUGER **R.L. Surface:** 8.22m

Date: 30/11/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0	■		ASPHALTIC CONCRETE: 70mm.t				
				■	N = 10 6,7,3		▨	-	FILL: Gravelly sand, fine to coarse grained, dark grey, fine to medium grained igneous and sandstone gravel, with clay/silt, trace of slag and brick fragments.	M			
				■	N = 4 2,2,2	0.5	▨		FILL: Clayey sand, fine to coarse grained, brown, low plasticity, with fine to medium grained sandstone and igneous gravel.	w>PL		160 190 200	
							▨		FILL: Silty clay, low to medium plasticity, grey mottled brown, trace of root fibres.				
				■	N = 8 2,3,5	1	▧	CH	Silty CLAY: high plasticity, light grey mottled red brown, trace of root fibres.	w≈PL	VSt	340 360 380	ALLUVIAL POSSIBLY RESIDUAL
						1.5			END OF LDX04 AT 1.5m				
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No.
LDX05
1/1

Client: SYDNEY METRO AIRPORTS
Project: PROPOSED PAVEMENT UPGRADE
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF **Method:** SPIRAL AUGER / DIATUBE **R.L. Surface:** 9.17m
Date: 23/2/23 **Datum:** AHD
Plant Type: JK400 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION				■		0	■		ASPHALTIC CONCRETE: 80mm.t				
			■		N > 4 9,4/150mm REFUSAL		▩	-	FILL: Sandy gravel, fine to coarse grained, igneous and ironstone gravel, brown and grey, fine to coarse grained sand, with fines.	M			DIATUBE DRILLED TO 150mm DEPTH
			■		N = 4 2,2,2	0.5	▩		FILL: Silty clay, medium plasticity, light grey, brown and red brown, trace of fine to medium grained sand, fine to medium grained ironstone gravel, ash and root fibres.	w>PL		180 200 210 250 200 220	POSSIBLY REWORKED NATURAL
			■		N = 9 2,4,5	1 1.5	▨	CH	Silty CLAY: high plasticity, light grey mottled red brown, brown and orange brown, trace of ash and root fibres.	w≈PL	VSt	290 330 300	ALLUVIAL POSSIBLY RESIDUAL
						2 2.5 3 3.5			END OF LDX05 AT 1.8m				

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BOREHOLE LOG

Borehole No.
LDX08
1/1

Client: SYDNEY METRO AIRPORTS

Project: PROPOSED PAVEMENT UPGRADE

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF **Method:** SPIRAL AUGER **R.L. Surface:** 8.89m

Date: 2/12/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLET-ION						0			ASPHALTIC CONCRETE: 100mm.t				
					N = 12 6,8,4			-	FILL: Gravelly sand, fine grained, grey, fine to coarse grained igneous gravel, with clay/silt.	M			
									FILL: Gravelly sand, fine to coarse grained, brown, fine to coarse grained sandstone, igneous and ironstone gravel, trace of clay nodules.	w>PL		230 360 370	
					N = 7 2,3,4*	0.5			FILL: Silty clay, high plasticity, grey mottled red brown, inter bedded with sandy gravel, grey, trace of root fibres.			220 200 210	
					N = 9 2,4,5	1 1.5		CH	Silty CLAY: high plasticity, light grey mottled red brown, trace of root fibres.	w≈PL	VSt	220 240 230	ALLUVIAL POSSIBLY RESIDUAL
						2 2.5 3 3.5			END OF LDX08 AT 1.8m				

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BOREHOLE LOG

Borehole No.
LD24
1/1
SDUP4: 0.07-0.2m

Client: SYDNEY METRO AIRPORTS
Project: PROPOSED PAVEMENT UPGRADE
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF **Method:** SPIRAL AUGER **R.L. Surface:** 8.20m
Date: 1/12/22 **Datum:** AHD
Plant Type: JK400 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0	■		ASPHALTIC CONCRETE: 70mm.t				
	■			■	N = 10 8,7,3		▨	-	FILL: Gravelly silty sand, fine to coarse grained, grey, fine to coarse grained sandstone, igneous and ironstone gravel.	M			
	■			■			▨		FILL: Gravelly sand, fine to coarse grained, brown, fine to coarse grained sandstone and ironstone gravel, trace of clay nodules.				
	■			■	N = 5 1,2,3	0.5	▨		FILL: Silty clay, high plasticity, grey mottled orange brown, trace of root fibres.	w≈PL		200 230 250	POSSIBLY REWORKED NATURAL
	■			■	N = 4 1,2,2	1	▧	CH	Silty CLAY: high plasticity, light grey mottled orange brown, trace of root fibres.	w≈PL	St	200 200 200	ALLUVIAL
						1.5			END OF LD24 AT 1.5m				
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No.
LD25
1/1

Client: SYDNEY METRO AIRPORTS

Project: PROPOSED PAVEMENT UPGRADE

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF
Method: SPIRAL AUGER
R.L. Surface: 7.56m

Date: 9/12/22
Datum: AHD

Plant Type: JK400
Logged/Checked by: C.S.Y./O.F.

Groundwater Record	SAMPLES ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION				■		0	■		ASPHALTIC CONCRETE: 100mm.t				
			■		N = SPT 11/75mm REFUSAL		▩	-	FILL: Sandy gravel, fine to coarse grained, igneous and sandstone, brown, fine to coarse grained sand, trace of brick, tile fragments, metal wire and clay/silt.	M			
			■		N = 3 6,1,2	0.5	▩		FILL: Silty clay, low plasticity, grey and brown, trace of fine to medium grained igneous gravel and root fibres.	w>PL		50 60 100	
			■		N = 6 2,2,4	1 1.5	▨	CH	Silty CLAY: high plasticity, light grey mottled red brown, trace of root fibres.	w≈PL	VSt	220 270 200	ALLUVIAL
						2 2.5 3 3.5			END OF LD25 AT 1.7m				

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BOREHOLE LOG

Borehole No.
LD26
1/1

SDUP5: 0.16-0.3m

Client: SYDNEY METRO AIRPORTS

Project: PROPOSED PAVEMENT UPGRADE

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF **Method:** SPIRAL AUGER **R.L. Surface:** 8.79m

Date: 1/12/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION				■		0	■		ASPHALTIC CONCRETE: 160mm.t				
	■		■	■	N = 7 5,5,2		▨	-	FILL: Sandy gravel, fine to coarse grained sandstone and igneous, brown, fine to coarse grained sand, with fines.	W*			*MOISTURE AFFECTED BY DIATUBING
	■		■		N = 5 SUNK,2,3	0.5	▨		FILL: Silty clay, medium to high plasticity, grey mottled orange brown, trace of fine to medium grained igneous gravel.	w>PL*			
	■		■		N = 10 2,4,6	1	▧	CI-CH	Silty CLAY: medium to high plasticity, light grey mottled red brown, trace of root fibres.	w≈PL	VSt	330 250 230	RESIDUAL
						1.5			END OF LD26 AT 1.5m				
						2							
						2.5							
						3							
						3.5							

BOREHOLE LOG

Borehole No.
LD27
1/1

Client: SYDNEY METRO AIRPORTS

Project: PROPOSED PAVEMENT UPGRADE

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF **Method:** SPIRAL AUGER **R.L. Surface:** 9.22m

Date: 22/2/23 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION				■		0			ASPHALTIC CONCRETE: 120mm.t				
			■		N = 7 6,4,3			-	FILL: Silty clayey sand, fine to medium grained, brown, fine to medium grained sand, trace of fine to medium grained ironstone and sandstone gravel, and ash.	M		350 380 300	
			■		N = 7 2,3,4	0.5			FILL: Silty clay, medium plasticity, dark grey, red brown and brown, trace of fine to medium grained sand, fine to coarse grained ironstone and sandstone gravel, and ash.	w>PL			
			■					CI-CH	Silty CLAY: medium to high plasticity, red brown mottled grey, trace of fine to medium grained sand, fine to medium grained sandstone gravel, ah and root fibres.	w≈PL	VSt	300 360 480	ALLUVIAL
			■		N = 9 3,4,5	1 1.5			Silty CLAY: medium to high plasticity, light grey mottled red brown and orange brown, trace of root fibres.			270 370 350	POSSIBLY RESIDUAL
						2 2.5 3 3.5			END OF LD27 AT 1.8m				

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BOREHOLE LOG

Borehole No.
LD28
1/1

Client: SYDNEY METRO AIRPORTS
Project: PROPOSED PAVEMENT UPGRADE
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF
Method: SPIRAL AUGER
R.L. Surface: 8.96m
Date: 2/12/22
Datum: AHD
Plant Type: JK400
Logged/Checked by: C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION				■		0	■		ASPHALTIC CONCRETE: 40mm.t				
			■		N = 16 9,7		▩	-	FILL: Cemented gravelly sand, fine to medium grained sand, brown, fine to coarse grained igneous gravel.	M			
			■				▩		FILL: Silty sand, fine to medium grained, grey, low plasticity, with fine to medium grained igneous gravel.				
			■		N = 4 2,2,2	0.5 1	▩		FILL: Silty clay, high plasticity, grey mottled red brown, trace of fine to coarse grained sand, fine to medium grained sandstone and ironstone gravel, brick fragments and root fibres.	w>PL		170 180 210	
			■		N = 8 2,3,5	1.5	▨	CH	Silty CLAY: high plasticity, light grey mottled red brown, trace of root fibres.	w≈PL	VSt	220 280 280	ALLUVIAL POSSIBLY FILL
						2 2.5 3 3.5			END OF LD28 AT 1.7m				

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BOREHOLE LOG

Borehole No.
SD13
1/1

Client: SYDNEY METRO AIRPORTS

Project: PROPOSED PAVEMENT UPGRADE

Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF **Method:** SPIRAL AUGER **R.L. Surface:** 7.77m

Date: 19/12/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			ASPHALTIC CONCRETE: 60mm.t				
					N = 8 8,5,3			-	FILL: Gravelly sand, fine to coarse grained, grey fine to coarse grained, igneous, ironstone and sandstone gravel, trace of fine to coarse grained sand.	W			
					N = 6 2,3,3	0.5			FILL: Silty clay, medium to high plasticity, grey mottled light grey, trace of ash.	w>PL		150 250 200	
								CH	Silty CLAY: high plasticity, light grey mottled red brown, trace of ash and root fibres, inter bedded with dark grey medium plasticity silty clay.	w≈PL	St-VSt	170 170 120 210 150 190	ALLUVIAL
					N = 1 2,5,6	1					VSt-Hd	390 410 300	
						1.5			END OF SD13 AT 1.45m				
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No.
SD14
1/1

Client: SYDNEY METRO AIRPORTS
Project: PROPOSED PAVEMENT UPGRADE
Location: BANKSTOWN AIRPORT, BANKSTOWN, NSW

Job No.: 35614BF **Method:** SPIRAL AUGER **R.L. Surface:** 6.81m
Date: 30/11/22 **Datum:** AHD
Plant Type: JK400 **Logged/Checked by:** C.S.Y./O.F.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0	■		ASPHALTIC CONCRETE: 80mm.t				
			■	■	N = 14 6,10,4		▨	-	FILL: Gravelly sand, fine to medium grained, grey, fine to medium grained igneous, sandstone and ironstone gravel.	M			
			■	■		0.5	▨		FILL: Silty clay, low to medium plasticity, grey mottled brown, trace of root fibres.	w>PL		180 160 110	
			■		N = 5 1,2,3 N = 5 1,2,3	1	▧	CH	Silty CLAY: high plasticity, light grey mottled red brown and orange brown, trace of root fibres.	w>PL	St- VSt	210 230 180	ALLUVIAL POSSIBLY RESIDUAL
						1.5			END OF SD14 AT 1.5m				
						2 2.5 3 3.5							