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Dewatering Management Plan

Qantas Flight Training Centre

297 King Street and 65 Kent Road

Mascot NSW

Prepared for APP Pty Ltd

16 August 2019

Version 1

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Prepared for APP Pty Ltd

Reviewer & Approver:	**Lee Douglass** Principal Hydrogeologist (CEnvP SCP: 40974)	

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Executive Summary

Reditus Consulting Pty Ltd (Reditus) were commissioned by APP Pty Ltd to prepare a Dewatering Management Plan (DMP) for the proposed Qantas Flight Training Facility (QFTF) development located at 297 King St and 65 Kent Road, Mascot NSW (the site).

The DMP provides details on the hydrogeological setting, construction design, predictions of groundwater extraction volumes, and assessment of potential dewatering impacts. The DMP also provides management strategies to minimise adverse environmental impacts including environmental control procedures, monitoring program, performance criteria and compliance reporting requirements.

Four (4) main excavations are proposed to facilitate construction of the development, including a pool and three (3) lift shafts. These will be constructed as 'fully tanked', preventing any groundwater inflow or water outflow following completion of the construction works.

Of the four (4) excavations, the Eastern and the Western Carpark Lift Shafts were determined to extend below the groundwater table. These two excavations will require dewatering during the construction period. The Pool and Training Building Lift Shafts were determined not to extend below the groundwater table, therefore do not require dewatering.

Groundwater take estimates were predicted, incorporating both groundwater inflows and matrix removal through excavation. The groundwater inflow was predicted using a steady-state analytical method developed by Marinelli and Niccoli (2000). The following most likely groundwater take estimates were predicted during construction:

Dewatering Area	Predict Inflow Take (ML)	Predicted Matrix Take (ML)	Total Groundwater Take (ML)
Car Park Lift Shaft West	0.443	0.007	0.449
Car Park Lift Shaft East	0.791	0.014	0.805
		Total	**1.254**

Given that groundwater will be intercepted and require dewatering during construction of the two (2) car park lift shafts, the proposed development is considered to be an aquifer inference activity requiring assessment and authorisation (if required) from the WaterNSW under the Water Management Act 2000. As such, WaterNSW requires an application to be submitted for "Approval for Water Supply Works and/or Water Use" (previously known as a Temporary Dewatering Licence).

The purpose of this DMP is to facilitate an application for an "Approval for Water Supply Works and/or Water Use" (previously known as a Temporary Dewatering Licence)' to be submitted to WaterNSW under the Water Management Act 2000. Following assessment of the DMP, WaterNSW will determine if the groundwater take is considered significant enough to warrant approval and issue of a Water Access Licence (WAL) under the Water Management Act 2000. In most cases, WaterNSW will generally not require issue of a WAL for dewatering activities estimated be less than <3ML/yr.

Reditus note that if approval is granted, typically an application for a "new water access licence with a zero share component" will need to be completed and a suitable groundwater entitlement will also need to be obtained from the market to account for the groundwater take. This entitlement must be obtained from within the same groundwater source. This will typically need to be obtained within three months of granting of the Zero Access Licence.

To assist the WaterNSW assessment, the following required information required to support the "Approval for Water Supply Works and/or Water Use" application is listed in the table below.

Checklist Item	Required Information Description	DMP Findings	Relevant Page No:
5.1	Current groundwater levels, preferably based on at least three repeat measurements from at least three monitoring bores and should be used to develop a watertable map for the site and its near environs, be accompanied by an interpretation of the groundwater flow direction from these data, and an assessment of the likely level to which groundwater might naturally rise during the life of the building.	Onsite groundwater elevations have been obtained from 15 onsite monitoring wells and 24 CTP boreholes, on multiple occasions between 7 and 24 January 2019. Groundwater flow direction was inferred to be towards the east, towards Alexandra Canal. Standing groundwater levels measured from monitoring wells ranged between RL 1.31m and RL 3.18m. Levels measured from CTP boreholes ranged between RL 1.4m and RL 3.8m below ground level. The following groundwater levels were reported in the areas of the proposed excavations: • Pool: RL 2.06m to RL 2.4m • Training Building Lift: RL 2.1m to RL 3.18m • **Car Park Lift West:** RL 2.2m to RL 2.5m • **Car Park Lift East:** RL 2.24m to RL 3.05m It is the professional experience of Reditus that the groundwater levels in alluvial and aeolian aquifers in the Sydney region (such as the BSA) can vary naturally by ±1m or more during prolonged periods of dry or wet weather.	Pg. 11-15 Section 4.
5.2	Predictions of total volume of groundwater to be extracted at the property – the method of calculation and the basis for parameter estimates and any assumptions used to derive the volume are to be clearly documented.	An analytical steady state model was used to predict groundwater extraction volumes, including both that contained in the excavation matrix and inflow during construction. The total groundwater take volume over the excavation and construction period was predicted to be **1.254 ML**. This includes the matrix volume of groundwater and inflow during construction. No ongoing inflows are predicted as the pool and lift shafts will be "fully tanked". No other underground structures are proposed.	Pg. 18-27 Section 5.
5.3	Predicted duration of dewatering at the property, noting that temporary dewatering licences are generally issued for no more than 12 months.	The duration of temporary dewatering during construction is expected to be less than 1 month.	Pg. 7-8
5.4	Details of how dewatering volumes are to be measured, e.g. by calibrated flow meter or other suitable method, and of the maximum depth of the proposed dewatering system.	Groundwater extraction volumes are to be measured using a calibrated flow meter (inline Magflow meter). The two (2) excavation areas proposed to be dewatered are to the following depths: • **Car Park Lift West:** RL 1.630m (0.87m below groundwater table) • **Car Park Lift East:** RL 1.630m (1.42m below groundwater table)	Pg. 6 & 54
5.5	Details of any predicted impacts or particular issues, e.g. proximity of groundwater dependent ecosystems springs; or water supply losses by neighbouring groundwater user's, potential subsidence impacts on nearby structures or infrastructure.	The closest GDE is located approximately 1.5km southeast (Botany Wetlands), which is hydraulically cross-gradient from the site. The closest water supply works bore (GW027248) was located approximately 220m to the north of the site. Given the predicted drawdown at 60m from the excavation boundary is <0.1m (temporary only), the dewatering works are unlikely to cause a detrimental impact GDEs or water supply works. Groundwater drawdown of <1m is predicted within 2.5m from the site boundary. A temporary drop in the water table of 1m or less is considered unlikely to result in off-site geotechnical settlement impacts. A drawdown monitoring program and contingency recommendation are provided.	Pg. 10-11, 16-17, 34-35

5.6	Details of monitoring proposed during the dewatering program. These should be designed to inform and facilitate the protection of any identified potential impacts.	The requirements for monitoring, management and compliance reporting of potential impacts (including drawdown/settlement, noise, vibration and odour) are detailed in Section 11 of this DMP.	Pg. 54-58
5.7	Details of ambient groundwater quality conditions beneath the property and of any proposed treatment to be applied to pumped water prior to disposal – at a minimum, treatment must be undertaken to remove contaminants, manage pH, reduce suspended solids and turbidity to acceptable levels and ensure that dissolved oxygen levels are compatible with ambient quality requirements in receiving waters. Groundwater cannot be reinjected into an aquifer without the specific approval of, and licensing by, WaterNSW.	Groundwater sampling has been completed on the site (Section 4.2.3). The most recent groundwater sampling and laboratory data from MW01 and MW02 (located within the car park development area) reported concentrations potential contaminants of concern below the adopted ANZG (2018) 95% marine water quality guidelines, with the exception of the following: • Arsenic of 27ug/L • Zinc of 1.18mg/L Reditus note that PFOS was detected at 0.03ug/L, which above the laboratory limit of reporting but below the NEMP 2018 Interim marine guideline of 0.13ug/L. Based on the above concentrations, water treatment will be required. A small commercial grade reverse osmosis (RO) treatment system is recommended to achieve stormwater discharge criteria or onsite reuse. Water treatment (Section 10.3) and water quality objectives (Section 8) are provided in the DMP. Groundwater re-injection is not currently proposed, however, is recommended as a contingency should offsite drawdown approach specified limits or required under an Acid Sulfate Soil Management Plan.	Pg. 15-16, 51-53
5.8	Details of how reporting will occur during and following the dewatering program, to confirm that predicted quantities and quality objectives were met; and that upon completion, the surrounding groundwater levels have recovered.	Weekly dewatering reports summarising water level monitoring are recommended. A "Completion Report" detailing the volume of water taken and groundwater condition post dewatering activities, will be provided to the WaterNSW.	Pg. 60
5.9	Description of the method of dewatering and related construction including any proposal to use temporary piling or support walls and the relative depths thereof.	The proposed construction of the pool and lift shafts will be "fully tanked" and water tight, preventing any ongoing groundwater take. It is anticipated that dewatering will commence following the competition of sheet pile walls (or equivalent temporary sheet walls) around the excavation perimeter. Groundwater is proposed to be extracted using a series of spearpoints installed around the perimeter of the excavation, to approximately 0.5m below the depth of the proposed excavation of RL1.630m. Each of the spearpoints will be connected to a header main around the site perimeter, with water extracted via a vacuum pump to ensure a groundwater head at RL 1.630m.	Pg. 6-10

1. Introduction

Reditus Consulting Pty Lty (Reditus) were commissioned by APP Pty Ltd to prepare a Dewatering Management Plan (DMP) for the proposed Qantas Flight Training Facility (QFTF) development located at 297 King St and 65 Kent Road, Mascot NSW (the site). The proposed development involves the construction of the following:

- 297 King Street Mascot (Lot 4 DP234489):
  - Flight Training Centre (FTC) Building, including four (4) levels of commercial space, a Hall Room and Pool.
  - The major below ground excavations include the Pool and one Lift Shaft within the FTC Building.
- 65 Kent Road Mascot (Lot 133 DP659434 & Lot B DP164829):
  - Above ground Car Park of 12 levels.
  - The major below ground excavations include two (2) Lift Shafts, identified as the Eastern Lift Shaft and the Western Lift Shaft.

Figure 1, **Appendix A**, identifies the site location and surrounding features, and Figure 2, **Appendix A** details the proposed development site layout. The site details are summarised in Table 1-1 below.

Table 1-1: Site Identification Details

Site Characteristics	Details
Street Address	297 King St and 65 Kent Road, Mascot NSW
Lot & Deposited Plan	▪ Lot 133 DP 659434; ▪ Lot B DP 164829; ▪ Lot 1 DP 202747; ▪ Lot 4 DP 234489; and ▪ Lots 2-5 DP 234489
LGA	Bayside Council
Zoning	IN1 – General Industrial under the Botany Bay Local Environmental Plan 2013
Site Coordinates to the approximate centre of the site (GDA94-MGA55)	Easting: 332273 Northing: 6244521
Site Area	Total: 5.417 ha Development Footprint: 2.807 ha
Excavation Areas	Pool: 200m^2 Training Building Lift Shaft: 21m^2 Car Park Lift Shaft West: 30.7m^2 Car Park Lift Shaft East: 40m^2

Four (4) main excavations are proposed to facilitate construction of the development, including a pool and three (3) lift shafts. These will be constructed as 'fully tanked', preventing any groundwater inflow or water outflow following completion of the construction works.

Of the four (4) excavations, the Eastern and the Western Carpark Lift Shafts were determined to extend below the groundwater table. These two excavations will require dewatering during the construction period. The Pool and Training Building Lift Shafts were determined not to extend below the groundwater table, therefore do not require dewatering for construction.

Given that groundwater will be intercepted and dewatered during construction, the proposed development is considered to be an aquifer inference activity requiring authorisation from the WaterNSW under the Water Management Act 2000.

Reditus notes that the WaterNSW requires an application to be submitted for all dewatering activities, including those estimated be less than <3ML/yr (which was a former threshold for application requirement up to Dec 2015). Following WaterNSW's review and assessment of the application, a Temporary Dewatering Licence or Water Access Licence (WAL) will not generally required if the total groundwater take is <3ML/year.

In order to submit an application for "Approval for Water Supply Works and/or Water Use" (previously known as a Temporary Dewatering Licence), mandatory information is required to be provided to the WaterNSW for assessment in the form of a Dewatering Management Plan (DMP), including those estimated be less than <3ML/yr. This mandatory information has been summarised within the WaterNSW "Mandatory Assessment Requirements for Groundwater Approval (Dewatering)" checklist, which is summarised in the executive summary of this DMP.

Reditus note that if approval is granted and a WAL issued, typically an application for a "new water access licence with a zero share component" will need to be completed and a suitable groundwater entitlement will also need to be obtained from the market to account for the groundwater take. This entitlement must be obtained from within the same groundwater source. This will typically need to be obtained within three months of granting of the Zero Access Licence.

1.1. Objectives

Dewatering activities have the potential to impact the surrounding environment, primarily associated with:

- Potential settlement issues as a result of groundwater drawdown outside the site.
- Potential groundwater drawdown impacts on surrounding water supply works (e.g. domestic bores) or environmental groundwater uses.
- Potential issues with groundwater drawdown in acid sulfate soil environments.
- Potential mobilisation and migration of contamination from offsite sources.

The primary objectives of the DMP are to:

- Provide details on the hydrogeological setting of the site and a summary of key environmental factors relevant to dewatering with specific focus on water quality at the site;
- Provide details of the proposed development layout, construction design and dewatering methods;
- Predict dewatering extraction volumes required for the development works during construction;
- Determine the potential impacts of the dewatering activity to groundwater dependent ecosystems (GDEs), springs, water supply works and potential for subsidence impacts on nearby structures or infrastructure;
- Provide management strategies to minimise adverse environmental impacts; and
- Establish environmental control procedures, monitoring program, performance criteria and compliance reporting to assess the potential impacts of extracted groundwater on the receiving environment and the effectiveness of implemented controls.

1.2. Scope of Works

To meet the above objectives, the following scope of work was undertaken:

- A desktop site assessment, including review of previous reports where available;
- A review of relevant policy, regulations and guidelines;
- Review of construction proposal details relevant to dewatering and proposed dewatering methodology;
- Development of groundwater elevation contour plan, interpretation of groundwater flow direction and assessment of the likely level fluctuations during the life of the building;
- Develop conceptual flow model to replicate the proposed excavation activity. This will be a steady state model and will predict groundwater inflow volumes at the proposed basement excavation level during excavation:
  - Completion of analytical equations to derive groundwater extraction volumes using a range of representative aquifer parameters from published literature values and site specific data; and
  - Estimate volume of groundwater required to be removed during the dewatering process and assess the likely impacts of the dewatering activities on other groundwater users.
- Specify the discharge water quality criteria, anticipated treatment requirements, sampling frequency and compliance reporting requirements; and
- Preparation of this Dewatering Management Plan.

1.3. Roles and Responsibilities

The Principal Contractor will be responsible for implementing the appropriate management of dewatered groundwater as detailed in this document. It must be noted that the DMP is not inclusive of all conditions of consent in relation to dewatering and groundwater management, and that the Principal Contractor is responsible for making itself aware of, and complying with, all relevant conditions of the permits, licenses and approvals referred to in Section 6.

1.4. Limitations

A detailed statement of limitations for this report is provided in Section 14.

This report is based on the Scope of Work outlined in Section 1.2. Reditus prepared this report in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession.

This report relates only to the objectives stated and does not relate to any other work undertaken for the Client (APP Pty Ltd). It is a report based on the information reported in previous environmental assessments by others, and data made available to Reditus. These conditions stated in this report may change with time and space.

All conclusions regarding the property area are the professional opinions of Reditus, subject to the qualifications in the report. Whilst normal assessments of data reliability have been made, Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project. The client acknowledges that this report is for the exclusive use of the client.

2. Document Review

The following documents specific to the site were provided to Reditus for preparation of this DMP:

- Noxongiffen (29 May 2019) Qantas Group Flight Training Centre & Carpark – Preliminary Architectural Drawings;
- Arcadis (7 June 2019) Environmental Site Assessment, Qantas Flight Training Centre and Carpark, 297 King Street Mascot NSW (ref: 10026436RP01);
- Douglas Partners (8 February 2019) Report on Geotechnical Investigation Proposed Flight Training Centre (ref: 85777.15 R.001);
- Norman Disney & Young (20 May 2019) Qantas Group Flight Training Centre – Hydraulic Services Plans;
- Enstruct Group (20 May 2019) Qantas Group Flight training Centre – Structural, Stormwater & Pile Plans; and
- Land Partners (5 June 2019) Detail Survey of Qantas Catering Facility Carpark Area (ref: SY074560.00; rev: F)

3. Proposed Development

3.1. Development Details

Based on the supplied drawings, the proposed development involves the construction of the following:

- 297 King Street Mascot (Lot 4 DP234489):
  - Flight Training Centre (FTC) Building, including four (4) levels of commercial space, a Hall Room and Pool.
  - The major below ground excavations include the Pool and one Lift Shaft within the FTC Building.
- 65 Kent Road Mascot (Lot 133 DP659434 & Lot B DP164829):
  - Above ground Car Park of 12 levels.
  - The major below ground excavations include two (2) Lift Shafts, identified as the Eastern Lift Shaft and the Western Lift Shaft.

Four (4) main excavations are proposed to facilitate construction of the development, including a pool and three (3) lift shafts. These will be constructed as 'fully tanked', preventing any groundwater inflow or water outflow following completion of the construction works. Some minor localised footing excavation and capping beam excavation will be required, however, it is not expected to intercept groundwater.

Of the four (4) excavations, the Eastern and the Western Carpark Lift Shafts were determined to extend below the groundwater table. These two excavations will require dewatering during the construction period. The Pool and Training Building Lift Shafts were determined not to extend below the groundwater table, therefore do not require dewatering for construction.

In order to provide a stable working surface and to allow localised deeper excavations, any water table will need to be lowered by a minimum of 0.25m below the bulk excavation level (BEL).

The surface elevations, finished floor levels (FFL) and BEL are provided in Table 3-1 below.

Table 3-1: Summary of Proposed Excavation Parameters

Descriptions	Pool	Training Building Lift Shaft	Carpark Lift Shaft West	Carpark Lift Shaft East
Excavation Footprint Area (m2)	20	21	30.7	40
Site Surface Elevation (RLm AHD)	5.7	5.7	5.83	5.83
Basement Finished Floor Level (RLm AHD)	3.5	3.5	2.49	2.49
Estimated Bulk Excavation Level (RLm AHD)	3.2	3.2	1.63	1.63

The proposed excavation footprint is provided in Figure 2, **Appendix A**. Copies of the architectural drawings are provided in **Appendix B**.

3.2. Construction Methodology

The proposed construction is of a "fully tanked" water tight structure (including the pool and lift shafts).

The excavation are likely to be shored using 4mm steel sheet piles around the excavation perimeter (or equivalent sheet shoring), extending approximately 2.0m below the BEL. While the shoring will also serve to minimise the ingress of groundwater it does not necessarily provide a 'water tight excavation', as water entry will still occurs though sheet joints and the excavation base.

Dewatering is proposed to commence following the competition of shoring walls. Groundwater is proposed to be extracted using a series of spearpoints around the permitter of the excavation.

Each of the spearpoints will be connected to a header main around the site perimeter. The header line is then connected to a settlement tank and treatment system prior to proposed dewatering. Reinjection is currently not proposed.

From an environmental perspective, the proposed tanked construction method is strongly recommended as it is effective in:

- Mitigating the risk of environmental impacts associated with drawdown of the water table, and the potential settlement of unconsolidated soils;
- Reducing the volume of extracted groundwater to be discharged (typically) off-site, which often requires treatment and has the potential to adversely impact the receiving environment.

Irrespective of the method, the dewatering depth shall be minimised to the extent practicable to reduce the volume of water to be extracted and to limit groundwater drawdown.

Dewatering is likely to be required to operate 24 hours a day / seven days a week to maintain the water table at operational levels during the construction works.

3.3. Dewatering Extraction Rate and Duration

The uncertainty around the final dewatering methods prevent absolute quantitative assessment of the pumping rates and project volumes. The many variables involved in dewatering make predicting flow rates problematic. These variables include variations in recharge rates, effects of varying geology on hydraulic conductivity and soil porosity, and natural and built hydraulic barriers and recharge zones (including Alexandria Canal, Mill Stream, Lachlan Ponds and Botany Bay).

The approximate duration to complete the necessary excavation works and tanked construction is 2 weeks for each excavation area and construction component.

Dewatering is likely to be required continuously until the lift shafts are constructed and watertight and there is sufficient built loading to neutralise hydrostatic pressure. To minimise interruptions to the project and unnecessary expenditure, it is recommended that extraction pumps that can cater for low to high flow rates rather

than mobilising multiple pumps that may not be required if lower flows are encountered.

The predicted dewatering extraction rate is provided in Section 5 below. In summary, the steady-state groundwater extraction rate is predicted to be approximately 1L/s (totalling 1.23ML over the construction period).

3.4. Discharge Methods

3.4.1. Option 1 – Discharge to Stormwater

Approval shall be obtained from Bayside Council (Council) to direct dewatered and treated groundwater to the stormwater network. Dewatered groundwater is expected to be directed to the stormwater drain entry point along King Street, located directly in front of the site. Direct connection to stormwater is a preferred option however the presence of underground stormwater channels for direct connection adjacent to the site is unknown.

Treatment of extracted groundwater will be required during the proposed dewatering program to improve the water quality and minimise potential impacts to the receiving waters relevant details are provided in Section 10. The water quality of the extracted groundwater shall be assessed prior to discharge to the stormwater network, and then weekly thereafter during its release to monitor the waters suitability for continuous discharge. This monitoring will guide the initial type and level of treatment required to minimise environmental risks associated with the waters release, and reassessment of the treatment measures during the dewatering program.

3.4.2. Option 2 – Onsite Reuse

Alternatively, treated groundwater may potentially be used for onsite construction purposes (i.e. dust suppression, washing) following treatment. Treatment of extracted groundwater will be required to improve the water quality and minimise potential impacts to the potential receptors. The water quality of the extracted groundwater shall be assessed prior to reuse. This monitoring will guide the initial type and level of treatment required to minimise environmental risks associated with the waters release, and reassessment of the treatment measures during the dewatering program.

3.4.3. Option 3 – Reinjection

Reinjection of groundwater may be required to control drawdown effects, to mitigate potential Acid Sulfate Soil generation effects and/or settlement effects.

Treatment of extracted groundwater will be required to improve the water quality and minimise potential impacts to the potential receptors prior to re-injection.

4. Site Characterisation

Previous geotechnical and environmental investigations have been completed at the site which provide an understanding of the site geology and hydrogeology. A summary of the geological and hydrogeological setting is provided in Sections 4.1 and 4.2 below.

4.1. Summary of Geological Setting

The site is situated on Quaternary estuarine deposits comprising silty to peaty quartz sand, silt and clay. The site is underlain by Botany Sand which is known to be highly permeable to groundwater.

Review of the Sydney Geological Map Sheet 9130, 1:100 000 Edition 1, 1983 (Dept of Mineral Resources, 1983) indicated that the Site is underlain by Quaternary aged dune deposits of the Botany Sands. These typically comprise medium to fine grained 'marine' sand with podzols.

The thickness of the sediments ranges from approximately 10m around the perimeter of the basin to greater than about 60 m in parts. The thickness of sediments in the area of the site is estimated to be of the order of 20 to 30m.

Typically the Botany Sand formation overlies the Hawkesbury Sandstone, which comprises medium to coarse grained quartz sandstone, very minor shale and laminite lenses.

The Soil Conservation Service of NSW Sydney 1:100,000 Soil Landscapes Series Sheet 9130 ('SCS, 9130') indicates that the Aeolian landscape at the site likely comprises the Tuggerah soil landscape. The Tuggerah landscape typically comprises gently undulating to coastal dune fields, with slope gradients between 1-10%, with deep podsols on dunes and podsol/humus intergrades on swales. These soils are noted to present a wind erosion hazard, salinity, strongly acidic, localised water logging and generally non-cohesive soils.

4.1.1. Site Specific Geology

Arcadis (2019) described the site as fill material varied in thickness. The depth of fill across the site ranged from 1.20m to 3.5m in depth and generally consisted of the following layers:

- Asphalt or concrete hardstand surface;
- Road base consisting of sandy gravels, high compaction, poorly sorted and dry;
- Reworked silty sand, light brown to grey, coarse grained, poorly sorted, some angular gravels. Foreign inclusions including glass fragments, scrap metal, brick fragments, terracotta fragments, woodchips, were evident at some locations; and
- Isolated ash layers were observed in the southernmost carpark in the northeast and northwest corners.

The natural material consisted of silty Sand, silty Clay, clayey Sand, sandy Silt and peat. Generally described as light grey to brown colour.

4.1.2. Acid Sulfate Soils

Acid sulfate soils (ASS) occur predominantly on coastal land with elevations generally below 5m Australian Height Datum (AHD). These soils also occur further inland in saline seepage areas, rivers, lake beds and irrigation channels. Where present, draw-down of the local water table can expose ASS to oxidising conditions creating acidity and mobilising metals at potentially harmful concentrations.

Review of the Botany Bay Acid Sulfate Soil Risk Map (Murphy, 1997) shows the site to be located in an area of X4 disturbed terrain. A review of the Atlas of Australia Acid Sulfate Soils (ASS) map shows the site is situated in a Class B category with a low probability of occurrence (60-70% chance of occurrence) with occurrence across the site.

The Botany Bay Local Environmental Plan 2013 indicated that the site is located in a Soil Class 2 Acid Sulfate Soils area. The description of a Soil Class 2 area is 'works below natural ground surface present an environmental risk and works likely to lower the water table present an environmental risk'.

An ASS investigation was completed by Arcadis (2019) and was summarised as follows:

- 48 samples were analysed and 37 were classified as PASS;
- PASS was generally identified near the fill/natural horizon and likely to be present within undisturbed natural layers of soil;
- ASS was not identified, however, excavation or disturbance of the soils where PAA was identified is likely to encounter ASS; and
- Recommendation for an ASSMP to be developed for the site.

Excavations >1.0m below ground level were determined to potentially encounter PASS. Under Section 6.10 of the LEP, an acid sulfate soil management plan (ASSMP) will be required for these works

4.2. Summary of Hydrogeological Setting

The site is located within the southern portion of the Botany Sand Beds (BSB) and associated Botany Sand Aquifer (BSA) (DLWC 2000). There are two main systems operating within the BSB: the shallow unconfined to semi-confined groundwater system within the shallow unconsolidated Quaternary sediments of the BSB and the deeper, confined groundwater system of the Triassic rock formation (Hawkesbury Sandstone) underlying the BSB.

Groundwater immediately underlying the site is anticipated to occur within sand and/or silty sand sediments in the vicinity of the site. Localised layers of low permeability (e.g. clay, peat and layers of localised iron-cemented sand) may act local confining layers. The aquifer is bounded by thick clay deposits in the west, and numerous rock outcrops in the east. Unconsolidated sediments include significant

sand deposits, coffee rock and peat, and are increasingly silty and clayey in the western part of the basin. Paleochannels within these sediments are important groundwater flow conduits, however, depth and channel morphology in some areas are subject to some uncertainty. The inflows, outflows and storage of the BSB define the water balance. Recharge is predominantly through rainfall infiltration.

The maximum aquifer depth is commonly reported as 80 m, with detailed work by Woodward Clyde (1996)[1] indicating the actual paleochannel depth near Botany Bay is approximately 65 m. The thickness of sediments in the area of the site is estimated to be of the order of 20 to 30m.

Based on Reditus' experience of the natural groundwater dynamics in the Botany Sands, the natural variation in groundwater levels varies rapidly in response to climatic conditions and fluctuations of up to 1m are common. Accordingly, a temporary drop in the water table of 1m or less is considered unlikely to result in off-site geotechnical impacts.

It is noted that the BSA is designated as Groundwater Management Area (GMA) by the NSW Office of Water (currently identified as NSW DoPIE-Water). A temporary water restrictions order for the Botany Sands groundwater source has been gazetted (2018) under the Waste Management Act 2000. The taking of water from the water source specified in Schedule 1 is prohibited as specified in Schedules 2 and 3 of the Order.

The site is located within Area 2 of the gazetted prohibition areas. Under Schedule 3, the taking of water from those parts of the Botany Sands Groundwater Source within Area 2 is prohibited for any of the following purposes:

a) human consumption;

b) consumption by animals;

c) domestic purposes;

d) any other purpose

The prohibition (d) does not apply to the taking of water for remediation, temporary construction dewatering, testing or monitoring purposes.

4.2.1. Site Groundwater Elevations and Inferred Flow Direction

A total of 15 groundwater monitoring wells have been installed and monitored across the site. In addition, 24 Cone Penetrometer Test (CPT) have been completed which have interpreted groundwater water table levels. Locations are provided on Figures 3 & 4, **Appendix A**.

Groundwater monitoring and level measurements have been collected on multiple occasions, between 7 and 24 January 2019.

[1] Woodward-Clyde, 1996, ICI Botany Groundwater Stage 2 Survey. Contract S2/C3 Water / Soil Phase 2. Final Report 3390R1-D for ICI Engineering Australia Pty Ltd. August 1996.

A summary of groundwater monitoring wells, CPTs, standing groundwater levels and measurement dates are provided in Table 4-1 below.

Table 4-1: Summary of Standing Groundwater Measurements

Monitoring Well / CPT Hole	Measurement Date	Standing Water Level (mbgl)	Standing Water Level (RLm AHD)
MW01	8/01/19	0.975	3.05
MW02	8/01/19	1.418	2.23
MW03	8/01/19	3.497	1.31
MW04	8/01/19	2.244	2.61
MW05	8/01/19	3.553	2.06
MW06	8/01/19	1.896	3.18
MW07	8/01/19	3.340	2.30
MW1	8/01/19	2.55	-
MW2	8/01/19	2.390	-
MW3	8/01/19	2.341	-
MW4	8/01/19	2.375	-
BH1	24/1/19	3.3	2.31
BH6	24/1/19	3.2	1.64
BH8	24/1/19	2.5	2.44
BH12	24/1/19	1.2	2.83
CPT101	7/01/19	3.2	2.4
CPT102	10/01/19	-	-
CPT103	7/01/19	3.0	2.2
CPT104	7/01/19	2.9	2.1
CPT105	8/01/19	2.4	2.5
CPT106	9/01/19	3.4	1.4
CPT107	11/01/19	-	-
CPT108	24/01/19	2.4	2.5
CPT109	9/01/19	-	-
CPT110	9/01/19	1.0	3.0
CPT111	10/01/19	-	-
CPT112	11/01/19	1.0	3.0
CPT113	8/01/19	2.6	2.7
CPT114	11/01/19	2.7	2.4
CPT115	10/01/19	3.5	1.6
CPT116	7/01/19	3.0	2.0
CPT117	8/01/19	2.7	2.2
CPT118	14/01/19	1.2	3.8
CPT119	8/01/19	-	-
CPT120	9/01/19	1.1	2.5
CPT121	9/01/19	1.6	2.2
CPT122	10/01/19	0.7	2.9
CPT123	10/01/19	0.9	3.0
CPT124	21/01/19	1.0	2.7

Groundwater elevation contours and inferred flow direction have been previously reported flowing in easterly direction towards Alexandria Canal and Botany Bay (Arcadis 2019). Copies of the groundwater elevation contours and inferred flow direction is presented in Figure 5, **Appendix A**.

4.2.2. Excavation Area Specific Groundwater Level Conditions

The following sections provide groundwater elevation details within the general region of the four (4) proposed excavation areas.

4.2.2.1. Pool Excavation

The proposed pool excavation and construction is proposed in the southwestern section of the site. The groundwater conditions in this area are represented by the wells and CPTs listed in Table 4-2 below

Table 4-2: Representative Groundwater Levels at the Pool Excavation

Monitoring Well / CPT Hole	Measurement Date	Standing Water Level (mbgl)	Standing Water Level (RLm AHD)
MW05	8/01/19	3.553	2.06
MW07	8/01/19	3.340	2.30
BH1	24/1/19	3.3	2.31
CPT101	7/01/19	3.2	2.4
		Base of Pool Excavation	**3.20**

Based on the above groundwater level measurements, the base of the pool excavation is approximately 0.8m above the maximum groundwater level reported in the area.

As such, groundwater is unlikely to be encountered during excavation of the pool and will therefore not require dewatering for construction.

4.2.2.1. Training Building Lift Shaft

The proposed Training Building Lift Shaft excavation and construction is proposed in the southwestern section of the site. The groundwater conditions in this area are represented by the wells and CPTs listed in Table 4-2 below.

Table 4-3: Representative Groundwater Levels at the Training Building Lift Shaft Excavation

Monitoring Well / CPT Hole	Measurement Date	Standing Water Level (mbgl)	Standing Water Level (RLm AHD)
MW04	8/01/19	2.244	2.61
MW06	8/01/19	1.896	3.18
BH8	24/1/19	2.5	2.44
CPT104	7/01/19	2.9	2.1
CPT105	8/01/19	2.4	2.5
CPT108	24/01/19	2.4	2.5
CPT117	8/01/19	2.7	2.2
Base of Training Building Lift Shaft Excavation			**3.20**

Based on the above groundwater level measurements, the base of the Training Building Lift Shaft excavation is approximately 0.02m above the maximum groundwater level reported in the area (noting that MW06 is located 30m upgradient from the proposed lift shaft excavation area). CPT104 is the closest borehole to the Training Building Lift Shaft, which suggests that the groundwater is most likely going to be 1.1m below the base of the excavation

As such, groundwater is unlikely to be encountered during excavation of the pool and will therefore not require dewatering for construction.

4.2.2.1. Carpark Lift Shaft West

The proposed Carpark Lift Shaft West excavation and construction is proposed in the southwestern section of the site. The groundwater conditions in this area are represented by the wells and CPTs listed in Table 4-4 below.

Table 4-4: Representative Groundwater Levels at the Carpark Lift Shaft West Excavation

Monitoring Well / CPT Hole	Measurement Date	Standing Water Level (mbgl)	Standing Water Level (RLm AHD)
MW02	8/01/19	1.418	2.23
CPT120	9/01/19	1.1	2.5
CPT121	9/01/19	1.6	2.2
Base of Carpark Lift Shaft West Excavation			**1.63**

Based on the above groundwater level measurements, the base of the Carpark Lift Shaft West excavation is approximately 0.87m below the maximum groundwater level reported in the area.

As such, groundwater will be encountered during excavation of the Carpark Lift Shaft West and will therefore require dewatering for construction.

4.2.2.1. Carpark Lift Shaft East

The proposed Carpark Lift Shaft East excavation and construction is proposed in the southwestern section of the site. The groundwater conditions in this area are represented by the wells and CPTs listed in Table 4-5 below.

Table 4-5: Representative Groundwater Levels at the Carpark Lift Shaft East Excavation

Monitoring Well / CPT Hole	Measurement Date	Standing Water Level (mbgl)	Standing Water Level (RLm AHD)
MW01	8/01/19	0.975	3.05
MW02	8/01/19	1.418	2.23
CPT110	9/01/19	1.0	3.0
CPT120	9/01/19	1.1	2.5
	Base of Carpark Lift Shaft East Excavation		**1.63**

Based on the above groundwater level measurements, the base of the Carpark Lift Shaft East excavation is approximately 1.37m below the maximum groundwater level reported in the area.

As such, groundwater will be encountered during excavation of the Carpark Lift Shaft East and will therefore require dewatering for construction.

4.2.3. Groundwater Quality Sampling Results

Collection and analysis of groundwater samples from 11 onsite monitoring wells has been completed by Arcadis (2019). The locations of groundwater monitoring wells are presented in Figure 3 & 4, **Appendix A**. Copies of the result summary tables are provided in **Appendix C**.

Based on the above proposed excavation areas which intercept groundwater, only samples from groundwater monitoring wells MW01 & MW02 are considered representative of the groundwater to be extracted.

Groundwater physicochemical measurements (including pH, dissolved oxygen (DO), electrical conductivity (EC), oxidative reduction potential (ORP) and temperature were reported during purging of monitoring wells during the most recent 2019 sampling event. A summary of the physicochemical measurements for MW01 and MW02 are provided in Table 4-6 below.

Table 4-6: Groundwater Physicochemical Results

Monitoring Well	Date	pH	DO	EC	TDS	ORP*
			mg/L	µS/cm	mg/L	mV
MW01	24/01/2019	6.7	0.06	459.5	308	195.7
MW02	24/01/2019	6.1	0	337.8	226	27.8

All samples collected from onsite monitoring wells (MW01 and MW02) during 2019 reported concentrations of TRH, BTEX, PAHs, PCBs, OCPs, VOCs and Phenols below the laboratory limit of reporting.

Concentrations of heavy metals were reported below the ANZECC (2000) 95% Marine Water Quality Guidelines with the exception of the following:

- Arsenic of 27ug/L
- Zin of 1,1180ug/L

Concentrations of PFAS were reported below the NEMP 2018 95% interim marine water quality guidelines. Reditus note that PFOS was detected above the laboratory limit of reporting, at 0.03ug/L in both MW01 and MW02. This concentration is below the NEMP 2018 95% interim marine water quality guideline of 0.13ug/L.

4.2.4. Registered Groundwater Bore Search

A search of the Australian Government Bureau of Meteorology – Australian Groundwater Explorer was completed by Arcadis. A total of 132 registered groundwater bores were identified within 1km of the site, of which 13 were for water supply purposes (including commercial/industrial and water supply) and the remainder used for either monitoring, exploration or 'other' purposes.

The closest water supply works bore (GW027248) was located approximately 220m to the north of the site. The depths of the registered water supply groundwater bores ranged between 3m and 14.9m below ground level (bgl).

4.2.5. Groundwater Dependant Ecosystems (GDE) Search

Groundwater dependent ecosystems (GDEs) are a diverse and important component of biological diversity. The term GDE takes into account ecosystems that use groundwater as part of their survival strategies. GDEs can potentially include wetlands, vegetation, mound springs, river base flows, cave ecosystems, playa lakes and saline discharges, springs, mangroves, river pools, billabongs and hanging swamps and near-shore marine ecosystems.

The groundwater dependence of ecosystems can range from complete to partial reliance on groundwater, such as might occur during droughts. The degree and nature of groundwater dependence will influence the extent to which they are affected by changes to the groundwater system, both in quality and quantity.

Many land and water use activities within a catchment can affect groundwater dependent ecosystem function and viability. It is important to manage these land and water use activities within a regulatory and licensing framework. Risk assessment guidelines for groundwater dependent ecosystems have been developed to operate within the regulatory and licensing framework provided by the Water Management Act 2000 and Water Sharing Plans (WSPs). The guidelines are based on an assessment of various ecological and risk factors that are important to decisions on allowing a proposed activity or development.

Water Sharing Plans (WSPs) have been developed for groundwater systems in NSW to preserve water resources by establishing rules for sharing water between different types of water uses. The site is located within the following WSP:

- Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (2011) – Botany Sands Groundwater Source.

Based on a review of the WSP, there are two (2) high priority Groundwater Dependent Ecosystems (GDEs) within the Botany Groundwater source including:

- Botany Wetlands (Estuarine Wetland - located on the northern shore of Botany Bay from Gardeners Road Mascot to the bay; including Lachlan swamps, Mill Pond, Mill Stream and Engine Pond); and
- Lachlan Swamps (Floodplain Wetland - Mill Pond, Mill Stream and Engine Pond).

These GDEs are located approximately 1.5km to the southeast, which is hydraulically cross-gradient / up-gradient of the site (as the local inferred groundwater flow direction at the site was towards the west).

Furthermore, a review of The National Atlas of Groundwater Dependent Ecosystems (Commonwealth of Australia Bureau of Meteorology, 2017) indicated that there may be several potential GDEs between within 1-2km of the site along Mill Stream including:

- Eastern Suburbs Banksia Scrub; and
- Estuarine Fringe Forest (included in above high priority GDEs as Botany Wetlands).

5. Groundwater Take and Drawdown Estimates

5.1. Summary of Geology and Hydrogeology

The generalised subsurface profile was comprised of fill to an approximate depth of 1.2-3.5m bgl, overlying Botany Sand Beds.

Standing groundwater levels measured onsite at the Eastern and Western Carpark Lift Shafts were reported to range between RL 2.23m AHD and RL 3.05mAHD.

For conservatism, the maximum onsite groundwater elevations of RL 2.5mAHD (Western Lift Shaft) and RL 3.05mAHD (Eastern Lift Shaft) were used in the prediction of groundwater take. These values were adopted in the analytical model to predict groundwater take and extent of groundwater drawdown.

Based on a proposed Target Dewatering Level (TDL) of RL 1.38mAHD and a maximum standing water level of RL 2.5mAHD (Western Lift Shaft) and RL 3.05mAHD (Eastern Lift Shaft), there was up to 0.87m (Western Lift Shaft) and 1.42 (Eastern Lift Shaft) of groundwater requiring to be dewatered to ensure that the excavation surfaces are workable.

5.2. Conceptual Flow Model

A conceptual model is a description of the site, site works and groundwater systems presented both as text and graphically. This description is then approximated using an analytical solution to allow prediction of groundwater behaviour.

The groundwater extraction estimate comprises two key components to be considered:

1. The component of groundwater present within the aquifer matrix, which will be removed as part of the excavation process (pore water); and
2. The component of inflow into the excavation from the surrounding aquifer (walls and base) during the dewatering activity.

The conceptual flow model developed for this assessment was a "steady state" model – a snapshot in time representing average conditions. This snapshot was completed based on conservative assumptions of the excavation depth and proposed shoring wall designs, which estimate the greatest groundwater inflow. Note that more detailed analysis can be provided through a three dimensional flow model (beyond the scope of the current assessment).

To estimate the groundwater extracted present within the aquifer matrix, which will be removed as part of the excavation process, the porosity of the matrix is multiplied by the saturated excavation volume.

The saturated excavation volume was calculated by determining the difference between the conservative standing groundwater level and the BEL, multiplied by the approximate excavation area.

To estimate the groundwater inflow volumes, Reditus used the Marinelli and Niccoli (2000)[2] steady-state analytical solution. This solution provides a convenient means for estimating groundwater inflows into excavations, and is considered applicable to use as a conservative assessment for the ongoing groundwater seepage into the proposed drained basement design.

The analytical method of Marinelli and Niccoli (2000) requires a simplification of the hydrogeological environment and was used to provide a broad range of potential drawdown and groundwater inflow. The equations calculate groundwater inflow from the aquifer based on the conceptual model.

The conceptual flow model was approximated by analytical models, which are divided into two zones separated by a conceptual no-flow boundary where horizontal flow will occur level with the excavation base:

- **Zone 1** – exists above the base of the excavation and represents lateral flow to the excavation via the surrounding walls.
- **Zone 2** – extends from the bottom of the excavation downward and considers vertical upward groundwater inflow to the excavation bottom into the void.

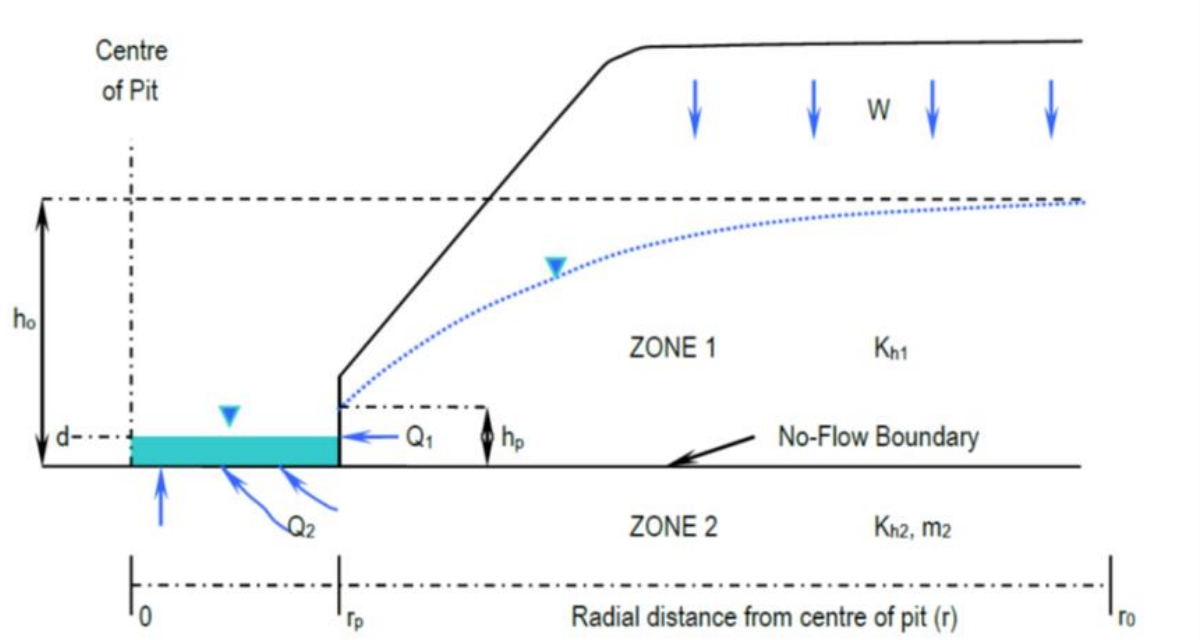


Figure 1: Conceptual Model of Analytical Solution

The analytical solution for Zone 1 considered steady state, unconfined, horizontal radial flow, with uniformly distributed recharge at the water table. This represents the volume of water laterally flowing into the excavation from behind the sheet pile

[2] Marinelli, F, and Niccoli, W.L. (2000) *Simple analytical equations for estimating ground water inflow to a mine pit*: Groundwater, v. 38, no.2, p. 311-314

walls. Whilst the sheet piles may inhibit lateral groundwater inflow to some degree, they are not considered sufficiently impermeable to ignore the inflow from this zone.

The analytical solution for Zone 2 is based on steady-state flow to one side of a circular disk sink of constant and uniform drawdown. The circular disk sink represents the volume of water needing to be removed to dewater the site to the target dewatering level of RL 1.38m.

For the development of the conceptual flow model for the proposed excavation, the circular disk sink was assumed to encompass the approximate area of the excavation footprint. The total excavation is approximated as a single large well and as such the circular disk sink was assigned a radius of based on the footprint of the proposed excavation.

Monthly rainfall data was obtained from the Australian Government Bureau of Meteorology (Station 66037: Sydney Airport AMO NSW), from a weather station approximately <1km from the site. The data set from Sydney Airport AMO weather station extends back to 1929, which provided 90 years of rainfall data encompassing longer term climatic trends. The mean annual rainfall (based on monthly observations) from a period between 1929 and 2019 was 1081.1mm. This converted to an assumed average daily rainfall of 0.00296m/day.

5.3. Summary of Aquifer Parameters

The hydraulic conductivity of the Botany Sands varies depending on the grain size and degree of sorting, but is generally high and has been measured at over 50 m/day in parts of the aquifer. In the absence of site specific test data, a default "most likely" value of 5 m/day has been assumed. This is anticipated to be a conservative realistic value and Reditus' experience in the area has identified hydraulic conductivity values of 1 – 10 m/day.

For the purposes of the dewatering assessment, the Botany Sands Aquifer was assumed to be anisotropic, with the horizontal permeability greater than the vertical permeability due to the grain shape and orientation of the aeolian sand particles. Vertical hydraulic conductivity (Kz) was assumed to be one tenth of the lateral hydraulic conductivity throughout the model (a reasonable assumption as vertical hydraulic conductivity in alluvial environments is commonly around 0.1 times the lateral conductivity).

Site specific porosity values were not measured. As such, representative porosity values were adopted from literature sources. A porosity value 0.25 was assumed for the Aeolian Sand.

5.4. Analytical Model Equations

All analytical models include some degree of uncertainty in their predictions as they are, by necessity, simplifications of complex real world systems. Whilst every effort is made to ensure that the primary model reflects the best understanding of site conditions, and therefore the "most likely" case, this cannot be guaranteed and any model result presented as a single number should be viewed with a degree of caution.

Factors which affect the dewatering rate, groundwater take and extent of drawdown within the steady state model include the hydraulic conductivity, thickness of saturated water bearing zone, excavation depth, porosity and recharge. It is considered impractical to determine these factors by pumping tests and further analytical assessment, based on the relatively small scale of the development (two lift shaft excavations) and the likely relatively low risk of impact to groundwater in the shallow water bearing zone. Typical representative values were used in the model. Assessment of the range of typical values and their effects on the model predictions were made to allow sound management decisions using best case, worst case and most likely scenarios.

5.4.1. Groundwater Take Volume within the Excavation Matrix

The following equation was utilised to estimate the groundwater volume present in the aquifer matrix directly removed through excavation:

$$V = \emptyset \times m \quad (1)$$

$$m = (H_0 - BEL) \times A \quad (2)$$

where:

V = groundwater volume present in the aquifer matrix directly removed through excavation (m^3).

ϕ = matrix porosity

m = volume of saturated aquifer matrix to be excavated

H_0 = initial water table elevation (RLm)

BEL = basement excavation level (RLm)

A = area of excavation

5.4.2. Groundwater Inflow Take Volume Estimate

The steady state inflow rate into the disk sink is given by the following equations[2]:

Zone 1:

$$Q_1 = W\pi\left(r_o^2 - r_p^2\right) \quad (3)$$

$$h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}}\left[r_0^2 ln\left(\frac{r_o}{r_p}\right) - \frac{\left(r_0^2 - r_p^2\right)}{2}\right]} \quad (4)$$

Zone 2:

$$Q_2 = 4r_p\left(\frac{K_{h2}}{m_2}\right)(h_0 - d) \quad (5)$$

$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}} \quad (6)$$

where:

Q = groundwater flux (m^3/day)

K_{h1} = horizontal hydraulic conductivity (m/day) at Zone 1

K_{h2} = horizontal hydraulic conductivity (m/day) at Zone 2

K_{v2} = vertical hydraulic conductivity (m/day) at Zone 2

m_2 = vertical hydraulic conductivity anisotropy parameter

d = depth of water (above target dewatering level) within final excavation (m) *(assumed to be 0 at final excavation depth)*

r_p = radius from centre of excavation (circular disk sink) (m)

r_o = drawdown radius from centre of excavation (iterative calculation)

h_0 = initial saturated thickness above base of excavation (m)

h_p = saturated thickness above the base of excavation at the excavation wall (r_p), which is assumed 0m

W = rainfall recharge rate (assumed % of the mean daily rainfall)

5.4.3. Groundwater Drawdown Extent

The following equations were used to calculated the groundwater drawdown resulting from the groundwater take into the excavation[2]:

$$H_{1(r)} = H_0 - h_0 + \sqrt{h_p^2 + \frac{W}{K_{h1}}\left[r_o^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2}\right]} \quad (7)$$

where:

$H_{1(r)}$ = hydraulic head elevation (m) at a radial distance (r) from excavation centre

H_0 = initial groundwater elevation (mRL)

h_0 = initial saturated thickness above base of excavation (m)

r = radial distance from excavation centre (m)

z = vertical depth below the excavation bottom (assumed to be 0m)

W = rainfall recharge rate (assumed % of the mean daily rainfall)

K_{h1} = horizontal hydraulic conductivity (m/day) at Zone 1

5.5. Analytical Assumptions and Input Parameters

5.5.1. Assumptions

The analytical solution was based on the following assumptions, after Marinelli and Niccoli (2000):

- Steady state, unconfined, horizontal radial flow, with uniformly distributed recharge at the water table.
- The excavation walls are approximated as a circular cylinder.
- Groundwater flow is horizontal. The Dupuit-Forchheimer approximation (McWhorter and Sunada 1977) is used to account for changes in saturated thickness due to depression of the water table.
- The static (pre-excavation) water table is approximately horizontal.
- Uniform distributed recharge occurs across the site as a result of surface infiltration. All recharge within the radius of influence (cone of depression) of the pit assumed to be captured by the excavation.
- Groundwater flow toward the pit is axially symmetric.
- Hydraulic head is initially uniform (hydrostatic) throughout Zone 2. Initial head is equal to the elevation of the initial water table in Zone 1.
- The disk sink has a constant hydraulic head equal to the elevation of the "pit lake water surface". If the pit is completely dewatered, the disk sink head is equal to the elevation of the pit bottom – in this case the target dewatering level.
- Flow to the disk sink is three dimensional and axially symmetric.
- Materials within Zone 2 are anisotropic, and the principal coordinate directions for hydraulic conductivity are horizontal and vertical.

5.5.2. Parameters

The parameters used to estimate the groundwater removal (excavation and inflow) within the analytical solution are provided in Table 5-1 below.

Table 5-1: Groundwater Analytical Model Input Parameters

Parameter	Unit	Best Case	Most Likely	Worst Case
Excavation Matrix Storage				
Effective Porosity (ϕ)	-	0.20	0.25	0.30
Bulk Excavation Level (BEL)	RL m	1.63	1.63	1.63

A	m^2	30.72 (West) 40 (East)	30.72 (West) 40 (East)	30.72 (West) 40 (East)
Zone 1				
r_p	m	3.13 (West) 3.57 (East)	3.13 (West) 3.57 (East)	3.13 (West) 3.57 (East)
r_o	m	44.36 (West) 63 (East)	86.58 (West) 124.2 (East)	116.52 (West) 167.6 (East)
W	m/day	$2.96x10^{-4}$ (10% of average annual rainfall)	$2.96x10^{-4}$ (10% of average annual rainfall)	$2.96x10^{-4}$ (10% of average annual rainfall)
h_0^*	m	1.12 (West) 1.67 (East)	1.12 (West) 1.67 (East)	1.12 (West) 1.67 (East)
h_p^{**}	m	0	0	0
K_{h1}	m/day	1	5	10
Zone 2				
K_{h2}	m/day	1	5	10
K_{v2}	m/day	0.1	0.5	1
d	RL m	0	0	0

5.6. Summary of Model Results

5.6.1. Estimate of Groundwater Volume Removed within Excavations

The groundwater matrix removal was estimated using equation 1 and equation 2, with predictions provided in Table 5-2 below.

Table 5-2: Prediction of Groundwater Volume Removed within the Excavation Matrix

Groundwater Volume Removed (ML)	Best Case	Most Likely	Worst Case
Western Carpark Lift Shaft	0.005	**0.007**	0.008
Eastern Carpark Lift Shaft	0.011	**0.014**	0.017

5.6.2. Prediction of Groundwater Inflow During Construction Period

The groundwater inflow was estimated using equation 3, 4, 5 & 6, with predictions provided in Table 5-3 below assuming a 0.5 month dewatering program.

Table 5-3: Prediction of Groundwater Inflows over the Construction Dewatering Period

Groundwater Inflow	Best Case	Most Likely	Worst Case
Western Carpark Lift Shaft Zone 1 (ML)	0.03	**0.11**	0.19
Western Carpark Lift Shaft Zone 2 (ML)	0.07	**0.34**	0.67
Eastern Carpark Lift Shaft Zone 1 (ML)	0.06	**0.22**	0.4
Eastern Carpark Lift Shaft Zone 2 (ML)	0.11	**0.57**	1.15
Total (ML)	0.27	**1.24**	2.41

5.6.3. Summary of 'Most Likely' Total Predicted Groundwater Take

Based on the anticipated 0.5 month dewatering program (including both the initial matrix storage removed via excavation, and the groundwater inflow) the following total groundwater extraction volumes were predicted as presented in Table 5-4 below:

Table 5-4: Most Likely Predicted Groundwater Take

Dewatering Area	Predict Inflow Take (ML)	Predicted Matrix Take (ML)	Total Groundwater Take (ML)
Car Park Lift Shaft West	0.443	0.007	0.449
Car Park Lift Shaft East	0.791	0.014	0.805
		Total	**1.254**

5.6.4. Prediction of Drawdown Distance

As part of the dewatering assessment, the extent of groundwater drawdown was estimated at regular distance intervals from the edge of the circular disk sink (approximate excavation edge) and at the nearest neighbouring building (approximately 10m from the proposed excavation perimeter). The estimated drawdown with distance has been provided in Table 5-5 below.

Table 5-5: Prediction of Drawdown Outside of Excavation during Dewatering

Distance from Excavation Boundary (m)	Prediction of Groundwater Drawdown (m) Car Park Lift Shaft West	Prediction of Groundwater Drawdown (m) Car Park Lift Shaft East
1	0.77	1.20
2.5	0.61	0.97
5	0.47	0.78
10	0.32	0.57
25	0.14	0.30
50	<0.1	0.12
60	<0.1	<0.1

It is the professional experience of Reditus that the groundwater levels in alluvial and aeolian aquifers in the Sydney region (such as the BSA) can vary naturally by ±1m or more during prolonged periods of dry or wet weather. Accordingly, a temporary drop in the water table of 1m or less is considered unlikely to result in off-site geotechnical settlement impacts. As a guide, for a 2m lowering if the groundwater level, settlements of less than 10mm are expected, depending on the thickness and composition of the underlying soils.

There is potential that drawdown outside the site may be sufficient to induce settlement in overlying buildings unless an appropriate DMP is implemented. A suitability qualified geotechnical consultant will be required to determine the potential settlement impacts caused by the potential drawdown as a result of the proposed dewatering activities. Detailed geotechnical considerations are beyond the scope of this assessment.

If drawdown approaching 1.0m is identified in the monitoring points outside the excavation or shoring walls, consideration should be given to control of the off-site water table depression. This is likely to have in implication on the costs of the project but is recommended in order to reduce the risk of damage to adjacent buildings and roadways (refer to Section 9 and10).

The closest high priority GDE (Botany Wetlands) is located 1.5km southeast, which is hydraulically cross-gradient from the site. Given the predicted drawdown at 60m from the excavation boundary is <0.1m (temporary only), the dewatering works are unlikely to cause a detrimental impact to these receptors as it's within levels of natural fluctuations.

The closest registered groundwater supply bore (GW027248) was located 220m to the north of the site. Given the predicted drawdown at 60m from the site boundary is <0.1m (temporary only), the dewatering works are unlikely to cause a detrimental impact to registered water supplies.

Whilst every effort has been made to make accurate predictions in the dewatering volumes and off-site effects, it is strongly recommended that water levels be monitored regularly in the dewatered area and in surrounding properties (refer to Section 10 and 11) to ensure that local variations in hydraulic properties in the aquifer do not result in unacceptable groundwater table depression.

6. Legislation, Regulation and Relevant Endorsed Guidelines

To facilitate the temporary construction dewatering, in relation to impacts of groundwater resources and the surrounding environment, the following statutory requirements need to be achieved to address the WaterNSW / NRAR regulations.

The majority of NSW groundwater is covered by statutory water sharing plans (WSP) and the NSW Aquifer Interference Policy (AIP).

Given that groundwater will be incepted and dewatered during construction, the proposed development is considered to be an aquifer inference activity requiring authorisation from WaterNSW under the Water Management Act 2000.

6.1. Environmental Planning and Assessment Act 1979

Conditions of consent in relation to dewatering are likely to be prescribed by the Council in the Development Consent and NSW DoPIE for the works issued under the Environmental Planning and Assessment Act (1979). A copy of the approval must be kept on location at all times.

6.2. Protection of the Environment Operations (POEO) Act 1997

The POEO Act 1997 and its associated schedules and regulations are directly relevant to dewatering operations. In particular, the Act includes requirements prohibiting the pollution of waters, preventing or minimising air and noise pollution, regarding maintenance and operation plant in a proper and efficient condition/manner, and for minimising and managing wastes.

The Act also requires notification to the NSW Environmental Protection Authority (EPA), when a pollution incident occurs that causes or threatens material harm to the environment.

6.3. Bayside Council – Dewatering Discharge Approval / Permit

Council typically requires that the Principal Contractor must provide a copy of the DMP to Council prior to commencing discharge of groundwater from site. Council are required to provide 'written approval' (usually in the form of a permit) as part of "Application for approval for water supply works, and/or water use" with the WaterNSW prior to discharge of the treated groundwater to the stormwater network.

There are typically several conditions within the Development Application (DA) consent conditions for the site which also must be achieved prior to discharge of the treated groundwater to the stormwater network.

6.4. Water Act 1912 and Water Management Act 2000

Temporary dewatering for construction purposes is classified as an aquifer interference activity under the NSW Aquifer Interference Policy 2012. WaterNSW and NRAR (formerly known as NSW Office of Water) enforces the provisions of the Water Management Act 2000 (WMA) which includes regulation of all aquifer interference activities.

While minor aquifer interference activities works are generally exempt from the full extent of the WMA, an application for "Approval for Water Supply Works and/or Water Use" (previously known as a Temporary Dewatering Licence) is required, regardless if the total volume of groundwater extracted is expected to exceed <3 ML per year. A Water Access License (WAL), or written approval from WaterNSW/NRAR if no licence is required, must be obtained prior to commencement.

The following information must be provided in support of the "Approval for Water Supply Works and/or Water Use" application:

- A copy of a valid planning consent for the project;
- A copy of the written authorisation for the disposal of the extracted groundwater;
- A report, or group of reports, which clearly and concisely set out:
  - Current groundwater levels, preferably based on at least three repeat measurements from at least three monitoring bores predictions of total volume of groundwater to be extracted at the property - the method of calculation and the basis for parameter estimates and any assumptions used to derive the volume are to be clearly documented
  - Predicted duration of dewatering at the property, noting that temporary dewatering licences are generally issued for no more than 12 months
  - Details of how dewatering volumes are to be measured, and of the maximum depth of the proposed dewatering system
  - Details of any predicted impacts or particular issues, for e.g. proximity of groundwater dependent ecosystems or water supply losses by neighbouring groundwater users
  - Details of any monitoring proposed during the dewatering program
  - Details of ambient groundwater quality conditions and of any proposed treatment to be applied to pumped water prior to disposal
  - Details of how reporting will occur during and following the dewatering program, to confirm that predicted quantities and quality objectives were met.

Further information on the aquifer interference policy and licencing requirements are available from the WaterNSW website.

Reditus note that if/once approval has been provided, an application for a "new water access licence with a zero share component" may be required to be completed and a suitable groundwater entitlement may also need to be obtained from the market to account for the groundwater take within the same groundwater

source (in this case, Sydney Basin Central Groundwater Source – Botany Sands). This will need to be obtained within three months of granting of the Zero Access Licence.

6.4.1. Water Sharing Plans (WSPs)

WSPs are being progressively developed for rivers and groundwater systems across NSW following the introduction of the Water Management Act 2000. WSPs made under the WMA are being prepared as Minister's plans under Section 50 of the Act. These plans protect the health of our rivers and groundwater while also providing water users with perpetual access licences, equitable conditions, and increased opportunities to trade water through separation of land and water.

WSPs provide a legislative basis for sharing water between the environment and consumptive purposes. Under the WMA, a plan for the sharing of water must protect each water source and its dependent ecosystems and must protect basic landholder rights.

The Project Site is located within the following WSP:

- Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (2011) – Botany Sands Groundwater Source

6.4.1.1. Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (2011) – Botany Sands Groundwater Source

The Botany Sands Groundwater Source consists of the aeolian sand deposits that envelope Botany Bay and covers an area of 91.12 km^2. The groundwater is mostly low in salinity and high-yielding, and has been an important source of water supply for Sydney's industry and community for over 100 years.

The NSW Government has been actively managing the extraction of groundwater in the Botany area. In August 2003, an embargo under section 113A of the WA 1912 was made in the northern part of the aquifer because available water was depleted by plumes of contamination. This embargo prevented any new applications to extract groundwater being made. In August 2006 an order prohibiting the use of existing domestic bores was made for four zones within the northern Botany Sands Aquifer under Section 323 of the WMA 2000 (now section 324). The ban on domestic use was made in the interest of public health and the zones were based on current and historical land use activity and therefore the potential for contamination.

In June 2007 the remaining parts of the Botany Sands Groundwater Source were embargoed under the WA 1912 to prevent any additional commercial extraction. The aquifer is still used mainly for industrial purposes, along with domestic use in residential areas outside the restricted areas. Reditus notes that the embargo does not apply for licences of works for the dewatering of construction sites.

In 2018, temporary water restrictions Order for the Botany Sands groundwater source has been gazetted (2018) under the Waste Management Act 2000, repealing the 2006/2007 embargo. The taking of water from the water source specified in Schedule 1 is prohibited as specified in Schedules 2 and 3 of the Order.

The site is located within Area 2 of the gazetted prohibition areas. Under Schedule 3, the taking of water from those parts of the Botany Sands Groundwater Source within Area 2 is prohibited for any of the following purposes:

a) human consumption;

b) consumption by animals;

c) domestic purposes;

d) any other purpose

The prohibition (d) does not apply to the taking of water for remediation, temporary construction dewatering, testing or monitoring purposes.

Based on a review of the WSP, there are two (2) high priority Groundwater Dependent Ecosystems (GDEs) within the Botany Groundwater source including:

- Botany Wetlands (Estuarine Wetland - located on the northern shore of Botany Bay from Gardeners Road Mascot to the bay; including Lachlan swamps, Mill Pond, Mill Stream and Engine Pond)
- Lachlan Swamps (Floodplain Wetland - Mill Pond, Mill Stream and Engine Pond)

These GDEs are located approximately 1.5m to the southeast, which is hydraulically cross-gradient of the site (as the local inferred groundwater flow direction at the site was towards the southwest).

6.5. NSW Aquifer Interference Policy 2012

The purpose of the NSW Aquifer Interference Policy 2012 is to explain the role and requirements of the Minister administering the WMA in the water licensing and assessment processes for aquifer interference activities under the WMA and other relevant legislative frameworks. The NSW Aquifer Interference Policy 2012:

1. clarifies the requirements for obtaining water licences for aquifer interference activities under NSW water legislation; and
2. establishes and objectively defines considerations in assessing and providing advice on whether more than minimal impacts might occur to a key water-dependent asset.

The proposed development will result in aquifer interference under the NSW Aquifer Interference Policy (2012) as groundwater will be removed from at least one aquifer. Accordingly, groundwater licensing may be required.

6.5.1. Licensing of Water Taken Through Aquifer Interference

A water licence is required under the WMA (unless an exemption applies or water is being taken under a basic landholder right) where any act by a person carrying out an aquifer interference activity causes:

- the removal of water from a water source; or
- the movement of water from one part of an aquifer to another part of an aquifer; or

- the movement of water from one water source to another water source, such as:
  - from an aquifer to an adjacent aquifer; or
  - from an aquifer to a river/lake; or
  - from a river/lake to an aquifer.

A licence for the removal of water from a water source may be required for the development.

6.6. Relevant National and NSW EPA Endorsed Guidelines

Approval for the disposal of groundwater to stormwater will be regulated by Council.

The adopted water quality guidelines for discharge waters are the:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018);
- ANZECC/ARMCANZ (2000) Default Trigger Values (TVs) for Physical and Chemical Stressors (used in the absence of ANZG 2018); and
- Guidelines for Managing Risks in recreational Water (NHMRC 2008) / Drinking Water Criteria (NHMRC 2017).

Use of the 95% protection level (for the ANZG 2018 Guidelines) is based on an assumption that the surrounding watercourses are moderately disturbed ecosystems (as receiving road and stormwater runoff from adjacent highly urbanised environment). In the absence of ANZG (2018) DGVs, the ANZECC (2000) trigger values (TVs) were adopted.

It is noted that the ANZG (2018) are currently pending adoption by Federal and State agencies. It is also noted that the ANZG(2018) DGVs are currently consistent with the ANZECC (2000) TVs. Additional and/or revised DGVs will be incorporated into the ANZG (2018) over time as new guidelines values have been established.

This DMP will need to be revised in there is any material change once the ANZG (2018) have been approved by relevant Federal and State authorities, and/or if changes to the DGVs occur. If this change occurs during the current proposed dewatering period, this is to be reflected in a revised DMP.

There are currently no endorsed water quality guideline values in NSW for secondary contact which may occur during recreational activities. Reditus notes that the health-based drinking water guidelines criteria (NHMRC 2017) were derived based on the long-term consumption of 2L/day of the water. Incidental ingestion of water from Alexandra Canal & Botany Bay (which are saline) during recreational activities unlikely to exceed more than 50mL/day, which is equivalent to approximately two mouthfuls of water. For conservatism, the greater of the health-based drinking water criteria or the aesthetic criteria (NHMRC 2017) multiplied by ten (10) has been chosen to address the secondary contact recreational uses of water. This factor of ten (10) is considered conservative as it is equivalent to long-term ingestion of 200mL/day of water.

7. Groundwater Impact Assessment

7.1. Minimal Impact Considerations

The WMA 2000 includes the concept of ensuring "no more than minimal harm" for both the granting of water access licences and the granting of aquifer interference approvals.

The Aquifer Interference Policy includes a set of minimal impact considerations for assessing the impacts of all aquifer interference activities, including those regulated under the WMA 2000, the Water Act 1912 and those decided under other legislation.

Aquifer interference approvals are not to be granted unless the Minister is satisfied that adequate arrangements are in force to ensure that no more than minimal harm will be done to any water source, or its dependent ecosystems, as a consequence of its being interfered with in the course of the activities to which the approval relates.

Whilst aquifer interference approvals are not required to be granted, the minimal harm test under the WMA is not activated for the assessment of impacts. Therefore, this Policy establishes and objectively defines minimal impact considerations as they relate to water-dependent assets and these considerations will be used as the basis for providing advice to the Minister.

All NSW groundwater sources have been categorised as being either highly productive or less productive, based on the general character of the water source meeting or not meeting the criteria of 1500 mg/L total dissolved solids and a bore yield rate of greater than 5 L/s. This categorisation applies to a whole groundwater source as it is defined in a water sharing plan, not to the specific groundwater conditions at a particular location. The minimal impact considerations for the highly productive groundwater sources are different to those for the less productive groundwater sources.

Thresholds for minimal impact considerations have been developed for each groundwater source in NSW. Within the WMA, Table 1 – Minimal Impact Considerations for Aquifer Interference Activities are categorised into type of groundwater sources and are presented in Table 7-1 below. The thresholds relate to impacts on groundwater table and pressure, and to groundwater and surface water quality.

Table 7-1: Highly and Less Productive Groundwater Source Types

Highly Productive	Less Productive
▪ Alluvial; ▪ Coastal Sands; ▪ Porous Rock; – Great Artesian Basin - Eastern Recharge and Southern Recharge; – Great Artesian Basin – Surat, Warrego and Central; – other porous rock; and ▪ Fractured Rock.	▪ Alluvial; ▪ Porous Rock; and ▪ Fractured Rock.

The proposed development is considered to be located in a Highly Productive groundwater source based on the coastal sands of the Botany Sands Aquifer, non-saline (<1500mg/L) and known yields of greater than 5L/s. An assessment of the 'Minimal Impact Considerations' is provided in Table 7-2 below.

Table 7-2: Minimal Impact Considerations under the Aquifer Interference Policy

Aquifer	Coastal Sands (Botany Sands Groundwater Source)
Category	Highly Productive
Level 1 Minimal Impact Consideration	**Assessment**
Water Table Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan. A maximum of a 2m decline cumulatively at any water supply work.	The closest GDE is located 1.5m southeast, which is hydraulically cross-gradient from the site. The closest water supply works bore (GW027248) was located approximately 220m to the northwest of the site. **Given the predicted drawdown at 60m from the excavation boundary is <0.1m (temporary only), the dewatering works are unlikely to cause a detrimental impact to these receptors as it's <10% of natural fluctuations.** **Based on the above, the proposed dewatering works will not result in water table decline of more than 2m at any water supply work.**

Water Pressure A cumulative pressure head decline of not more than a 2 metre decline, at any water supply work.	The closest water supply works bore (GW027248) was located approximately 220m to the northwest of the site. **Given the predicted drawdown at 60m from the excavation boundary is <0.1m (temporary only), the proposed dewatering works will not result in water table decline of more than 2m at any water supply work.**
Water Quality Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 metres from the activity.	**The proposed development and tanked design is not expected to change the groundwater quality.**

Based on the above assessment, the temporary dewatering activities are considered to be of Minimal Impact under the NSW DPI (2012) AIP and WMA 2000.

7.2. WSP Rules for Water Access Approval

A summary of the water sharing rules for granting of access licences (as detailed within the WSP – Botany Sands Groundwater Source), compared against the results of the above assessment, are presented Table 7-3 below. Reditus note that the following rules are used as a guide only and actual licence conditions are granted at the discretion of the NSW DPI Water.

Table 7-3: Summary of Water Access Rules and Findings of Assessment

Relevant WSP Rule	Assessment
Granting of access licences may be considered for the following: ▪ Commercial access licences under a controlled allocation order made in relation to any unassigned water in this water source.	The dewatering works during development may be considered as under a Commercial access licence conditions.
To minimise interference between neighbouring water supply works, no water supply works to be granted or amended within the following distances of existing bores: ▪ 200m from an aquifer access licence bore on another landholding, or ▪ 50m from a basic landholder rights bore on another landholding, or ▪ 50m from a property boundary (unless written consent from neighbour), or	The closest registered bore is located over 220m from the site. Written consent may be required from neighbouring properties as the dewatering will occur adjoining the site boundary.

▪ 300m from a local or major water utility bore, or ▪ 200m from a NSW Office of Water monitoring bore (unless written consent from NSW Office of Water). *The plan lists circumstances in which these distance rules may be varied and exemptions from these rules.*	
To protect bores located near contamination, no water supply works are to be granted or amended within: ▪ 250m of contamination as identified within the plan, or ▪ 250m to 500m of contamination as identified within the plan unless no drawdown of water will occur within 250m of the contamination source, ▪ a distance greater than 500m of contamination as identified within the plan if necessary to protect the water source, the environment or public health and safety. *The plan lists circumstances in which these distance rules may be varied and exemptions from these rules.*	Based on the modelled groundwater conditions, with <0.1m drawdown within 60m from the site boundary, the temporary dewatering works is unlikely to have significant influence at this location.
To protect bores located near sensitive environmental areas, no water supply works to be granted or amended within the following distances of high priority Groundwater Dependent Ecosystems (GDEs) (non Karst) as identified within the plan: ▪ 100m for bores used solely for extracting basic landholder rights, or ▪ 200m for bores used for all other access licences. No water supply works to be granted or amended within the following distances from these identified features: ▪ 500m of high priority karst environment GDEs, or ▪ a distance greater than 500m of a high priority karst environment GDE if the Minister is satisfied that the work is likely to cause drawdown at the perimeter of the high priority karst GDE, or ▪ 40m of a river or stream or lagoon (3rd order or above), ▪ 40m of a 1st or 2nd order stream, unless drilled into underlying parent material and slotted intervals commence deeper than 30m (30m	Based on a review of the WSP, there are no high priority Groundwater Dependent Ecosystems (GDEs) within 1.5km of the site (including springs, geothermal springs, wetlands and karst). The site is located approximately 1.5m from Mill Stream.

may be amended if demonstrate minimal impact on base flows in the stream), or ▪ 100m from the top of an escarpment. *The plan lists circumstances in which these distance rules may be varied and exemptions from these rules.*	
To protect groundwater dependent culturally significant sites, no water supply works to be granted or amended within the following distances of groundwater dependent cultural significant sites as identified within the plan: ▪ 100m for bores used for extracting for basic landholder rights, or ▪ 200m for bores used for all other aquifer access licences *The plan lists circumstances in which these distance rules may be varied and exemptions from these rules.*	Based on a review of the WSP, there are no groundwater dependent cultural significant sites within 200m of the site associated dewatering works.
Available Water Determinations (AWDs): ▪ 100% stock and domestic, local and major utilities and specific purpose access licences ▪ 1ML/unit of share aquifer access licences *AWD for aquifer access licences may be reduced in response to a growth in use.*	Reditus recommends that a water access licence may be required to allow the abstraction of 1.25ML/yr (may vary depending on actual measured volumes after installation of flow meters) of groundwater from the Greater Metropolitan Region Groundwater Sources – Botany Sands Groundwater Source
Trading Rules ▪ INTO groundwater source: Not permitted ▪ WITHIN groundwater source: Permitted subject to local impact assessment ▪ Conversion to another category of access licence: Not permitted.	

Based on the above, the proposed dewatering works complies with the general rules for granting of a water access licence under the WSP for the Greater Metropolitan Region Groundwater Sources – Botany Sands Groundwater Source.

8. Draft Water Quality Objectives

8.1. Receiving Environment

The site is situated within a mixed commercial/industrial and residential area. The extracted groundwater will be treated and discharged to the stormwater network via connection to an approved location by Council (dewatering contractor to confirm exact location).

The receiving waters of the stormwater network are understood to be Alexandria Canal and Botany Bay, located to the west of the site.

The Alexandria Canal and Botany Bay is considered a moderately disturbed ecosystem, which receives water from a highly urbanised environment, including multiple waste streams. Use of the 95% protection level for ecological receptors has been adopted on this basis.

8.2. Adopted Discharge Water Quality Guidelines

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) provide detailed approaches and advice on identifying appropriate guideline values for the protection of environmental receptors. These guideline values help to ensure that agreed community values and their management goals are protected.

The ANZG (2018) have been recently endorsed by the NSW EPA, which supersede the previous ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Applying the ANZECC (2000) guidelines to the range of community values relied largely on a single line of evidence (chemical assessment) to determine whether or not a guideline value was exceeded. The ANZG (2018) Water Quality Guidelines improve confidence in our assessments by:

- introducing a systematic approach to assessing a number of lines of evidence along the pressure–stressor–ecosystem receptors pathway
- promoting decisions on the basis of the integrated weight of evidence.

For the protection of aquatic ecosystems, locally derived guideline values are most appropriate. In the absence of locally derived guideline values or other jurisdictionally-legislated requirements (as in this case), the ANZG (2018) provide default guideline values (DGVs) for assessing the impacts of physio-chemical parameters and potential toxicants on aquatic ecosystems, as well as advice on tailoring DGVs to suit the local region. Where DGVs are not available within the ANZG (2018), the ANZECC (2000) guidelines trigger values (TVs) are adopted

It is specifically noted in the ANZG (2018) guidelines that "the Water Quality Guidelines are not intended to directly apply to contaminant concentrations in industrial discharges or stormwater quality (unless stormwater systems are regarded as having relevant community value)".

The ANZG (2018) provides guidance on assessing a waste discharge. The ANZG (2018) Water Quality Management Framework and associated monitoring data can be used to assess compliance or potential impacts of a waste discharge on water

quality. Assessing a waste discharge in this way aims to ensure that it complies with the conditions of approval and is not causing environmental harm. The Water Quality Management Framework provides a step-by-step approach to protect the community values of waterways.

8.2.1. Water Quality Management Framework

The Water Quality Management Frameworks has the following steps which are adopted as part of this CEMP:

- **Step 1: Examine current understanding**
  - Use current understanding to develop or refine a conceptual model of key waterway processes and how the waste discharge could affect local waterways.
  - Site-specific information on the operation and receiving environment (e.g. current water quality and temporal and spatial release characteristics of the discharge, mixing zones and regulatory compliance points, water quality and ecology of the receiving environment).
  - As further monitoring data become available, update and refine the current understanding.
- **Step 2: Define community values and management goals**
  - Establish or refine community values and more specific management goals (including level of protection) for the relevant waterways at stakeholder involvement workshops.
  - The relevant values adopted are the 95% protection level of marine ecosystems and recreational use.
- **Step 3: Define relevant indicators**
  - Select indicators for relevant pressures identified for the system, the associated stressors and the anticipated ecosystem receptors.
  - Based on previous groundwater quality information, the analytical suite detailed in Section 4.2.3 has been adopted as primary indicators. Other indicators include visual inspection at the discharge point of the stormwater into Alexandria Canal for any signs of potential adverse effects (e.g. turbidity, increased algae presence, discolouration).
- **Step 4: Determine water quality guideline values**
  - Determine the water quality guideline values for each of the relevant the biological, chemical and physical indicators required to provide the desired level of protection for the management goals of relevant waterways.
  - The DMP adopts the ANZG (2018) DGVs and the ANZECC (2000) TVs in the absence of DGVs. Results of monitoring data from the stormwater drain and Alexandria Canal will also be used for the assessment to determine if adverse environmental impact are occurring from temporary groundwater discharge.

- **Step 5: Define draft water quality objectives**
  - Use the guideline values or narrative statements chosen for each selected indicator as draft water quality objectives to ensure the protection of all identified community values and their management goals.
- **Step 6: Assess if draft water quality objectives are met**
  - Use measurements from monitoring of each relevant indicator to assess whether current water quality meets the draft water quality objectives.
  - This includes comparison of the water quality monitoring data for each relevant indicator with the water quality objectives, together with the evidence from any additional lines of evidence (such as results from at the edge of the mixing zone).
  - The weight-of-evidence process evaluates results from multiple lines of evidence across the pressures, stressors and ecosystem receptors relevant to the waste discharge. It is the key process by which the protection of community values is assessed. Multiple potential outcomes are possible from a weight-of-evidence evaluation. The resulting evaluation of water quality results will be used to determine if adverse trends are evident as a result of the temporary discharge of groundwater to stormwater.
  - If the Water Quality Objectives are met, then management should focus on maintaining discharge quality. If Water Quality Objectives are not met and potential adverse trends are evident, the following options will be considered:
    - formulate, assess and prioritise management strategies to improve existing water quality associated with the waste discharge (Steps 8 to 10), and/or
    - reassess the appropriateness of the water quality guideline values (Step 7), and/or
    - consider selection of additional or alternative indicators or lines of evidence (Step 7).
- **Step 7: Consider additional indicators or refine water quality objectives**
  - Assess the need to revise or add to the lines of evidence or indicators and the water quality guideline values.
- **Step 8: Consider alternative management strategies**
  - Evaluate the effectiveness of current management strategies to address the identified water quality issues and recommend possible improvements. Improved or alternative management strategies are formulated, assessed and prioritised.
- **Step 9: Assess if water quality objectives are achievable**
  - Use information gained from Steps 6 to 8 to assess whether the water quality objectives are achievable.
- **Step 10: Implement agreed management strategy**

– Document and implement agreed management strategies, including, in some cases, a suitable and agreed adaptive management framework.

This DMP details the current management strategy to be implemented.

8.2.2. ANZG (2018) Physical and Chemical Stressor Details

As noted above, there are two types of physical and chemical stressors that directly affect aquatic ecosystems that can be distinguished: those that are directly toxic to biota, and those that, while not directly toxic, can result in adverse changes to the ecosystem (e.g. algae blooms). In the absence of site specific guideline values, the following DGVs were adopted as water quality assessment criteria in order to assess this situation:

- **ANZECC (2000)**[1] Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems in Estuaries. These trigger values do not represent direct toxicity to biota, but can potentially result in non-toxic impacts to the ecosystem. ANZG (2018) do not currently provide DGV for physical and chemical stressors, therefore the ANZECC (2000) trigger values have been adopted; and
- **ANZG (2018) DGVs & ANZECC (2000)**[2] Australian and New Zealand Guidelines for Water Quality. Trigger values for Marine Water under the 95% protection levels. These trigger values represent toxicity to biota.

The adopted DGV criteria are protective of receptors at the point of exposure (i.e. stormwater drain and Alexandria Canal), and are overly conservative for the assessment of direct discharge water quality in areas where ecological receptors are not present (i.e. Site discharge into Stormwater drains). On this basis, the Alexandria Canal waters are considered the only receiving environment requiring protection. Reditus notes that the use of the DGVs is conservative and may not represent the Alexandria Canal and Botany Bay local system.

Since the publication of ANZECC (2000), an Errata document has been issued which details that Nitrate values in Table 3.4.1 (page 3.4-5) are deleted and replaced with "Under Review" (http://www.agriculture.gov.au/SiteCollectionDocuments/water/nwqms-guidelines-4-vol1-errata.pdf). Furthermore, Nitrate guidelines values in ANZECC 2000 have been reviewed and recalculated (http://www.mfe.govt.nz/publications/fresh-water/anzecc-nitrate-correction-sep02). The recalculated trigger values for 95% level of protection was 31.9mg/L for Nitrate and 7.2mg/L for Nitrate-N.

It is important to note that the Draft Water Quality Objectives (WQO) listed below are specific to aquatic ecosystems only and are not intended as discharge water quality criteria. The adopted guidelines contain information on the comparison of test data with guideline DGVs & TVs. It emphasises that exceedances of the DGVs and TVs are an early warning mechanism to alert managers of a potential problem and are not intended to be an instrument to assess compliance and should not be used in this capacity.

The guidelines recognise that the environmental values and unique conditions of a site and specific behaviour of contaminants in different environments are important considerations when applying the guidelines. Factors relevant to assessing point

source discharges include the flow rote of the discharge, receiving water flows and/or intensity of tidal exchange, and the levels of risk that vary from acute to chronic exposure.

Mixing zones are a tool for responsible management of the environment. As detailed within the ANZG (2018), mixing zone are described as an explicitly defined area around an effluent discharge where some, or all, water quality objectives may not be met. It is a generally accepted practice to apply the concept of a mixing zone for waste water discharges (such as stormwater). As a consequence, some community values of the water body may not be protected. The responsibility lies with the discharger to minimise this impact by keeping the mixing zone as small as practicable. They are designed to limit the impact to the environment that would otherwise occur if discharges were allowed to flow unchecked into waterways.

Critical to assessing the impact of an effluent discharge on beneficial uses and values is understanding the dilution and dispersion of the effluent. For discharges to marine environments, characteristics such as tidal and current movements, density and temperature differences, depth of water and rate of flow need to be considered to assess the dilution capabilities of the waterbody under various scenarios.

8.2.3. Recreational Water Quality (NHMRC 2012 & 2017)

The greater of the health based drinking water criteria (NHMRC 2012) multiplied by ten or the aesthetic criteria have been chosen to address the secondary contact recreational uses of water.

8.3. Draft Water Quality Objectives - DGVs

A summary of the discharge water quality criteria is provided in below for the water quality parameters and chemical of concern, which have been selected on the basis of site operational history, regional setting and site groundwater quality.

It is important to note that the Water Quality Objectives (WQO) listed in below are specific to aquatic ecosystems only and are not intended as discharge water quality criteria. The ANZG (2018) framework emphasises that comparison of test data with guideline DGVs that 'exceedances of the DGVs are an "early warning" mechanism to alert managers of a potential problem and are not intended to be an instrument to assess "compliance", and should not be used in this capacity.

ANZG (2018) recognises that the environmental values and unique conditions of a site and specific behaviour of contaminants in different environments are important considerations when applying the guidelines. Factors relevant to assessing point source discharges include the flow rote of the discharge, receiving water flows and/or intensity of tidal exchange, and the levels of risk that vary from acute to chronic exposure.

Table 8-1: Water Quality Objectives - DGVs

Analyte Group	Analyte	ANZG (2018) Marine Water Quality Guidelines (µg/L)	Recreational Water Quality Criteria.
BTEX	Benzene	500	1,000
	Ethylbenzene	5	3,000
	Toluene	180	8,000
	Xylene (m)	75	6,000
	Xylene (p)	200	
	Xylene (o)	350	
Heavy Metals	Arsenic	24	50
	Cadmium	0.7	5
	Chromium	27.4	50
	Copper	1.3	1,000
	Nickel	7	200
	Lead	4.4	50
	Zinc	15	5,000
	Mercury	0.1	10
PAHs	Phenanthrene	0.6	-
	Anthracene	0.1	-
	Flouranthane	1	-
	Benzo(a)Pyrene	0.1	0.1
	Naphthalene	70	-
Pesticides	Atrazine	13	200
	Carbofuran	0.06	100
	Chlorodane	0.03	20
	Chlorpyrifos	0.009	100
	2,4-D	280	300
	DDT	0.006	90
	Diazinon	0.01	40
	Dimethoate	0.15	70
	Diquat	1.4	70
	Endosulfan	0.005	200
	Endrin	0.04	-
	Fenitrothion	0.2	70
	Glyphosate	370	1,000
	Heptachlor	0.01	-
	Lindane	0.2	100
	Malathion	0.05	700
	Methomyl	3.5	200
	Molinate	3.4	40
	Parathion	0.004	200
	Simazine	3.2	200
	2,4,5-T	36	1,000
	Tebuthiuron	2.2	-
	Temephos	0.05	4,000
	Thibencarb	2.8	400

	Thiram	0.01	70
	Toxafene	0.1	-
	Trifluralin	2.6	900
PCBs	Aroclor 1242	0.3	-
	Aroclor 1254	0.01	-
VOCs	1,1-DCA	90	-
	1,2-DCA	1,900	30
	1,1,1-TCA	270	-
	1,1,2-TCA	1,900	-
	1,1,2,2-TCA	400	-
	PCA	80	-
	DCM	4,000	40
	Chloroform	370	30
	Carbon Tetrachloride	240	30
	Vinyl Chloride	100	3
	DCE	700	600
	TCE	330	-
	PCE	70	500
	CB	55	100
	1,2-DCB	160	10
	1,3-DCB	260	200
	1,4-DCB	60	3
	1,2,3-TCB	3	50
	1,2,4-TCB	20	
	1,3,4-TCB	8	
	1,2,3,4-PCB	2	-
	1,2,3,5-PCB	3	-
	1,2,4,5-PCB	5	-
	PCB	1.5	-
Total Petroleum Hydrocarbons	TPH/TRH	2 (mg/L) [a]	-
Total Nitrogen	Total Nitrogen	300 [b]	-
Nitrate	Nitrate	7200 [c]	500,000
Total Phosphorus	Total Phosphorus	30 [b]	-
Ammonia	Ammonia	910 (pH dependant)	5,000
pH	pH	7.0-8.5 [b]	6.5-8.5
Total Suspended Solids	TSS	50,000	-
Turbidity	Turbidity	10 NTU	5 NTU
Temperature	Temperature	15-30˚C	-
Sheens/Odours	Sheens/Odours	No Observable Sheen or Odour	-
PFAS	PFOS	0.13[d]	0.7[d]
	PFOA	220[d]	5.6[d]

a - Recommended water quality criteria (NSW EPA).

b - ANZECC (2000) Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems for Estuaries (Table 3.3.2 Chapter 3 Aquatic Ecosystems).

c - Errata document has been issued which details that Nitrate values in Table 3.4.1 (page 3.4-5) are deleted and replaced with "Under Review" (http://www.agriculture.gov.au/SiteCollectionDocuments/water/nwqms-guidelines-4-vol1-errata.pdf). The Nitrate guidelines values in ANZECC 2000 have been reviewed and recalculated (http://www.mfe.govt.nz/publications/fresh-water/anzecc-nitrate-correction-sep02). With values for 95% level of protection reported at 31.9mg/L for Nitrate and 7.2mg/L for Nitrate-N.

d – NEMP (2018) PFAS National Environmental Management Plan

Analytes such as Total Suspended Solids (TSS) and other easily observable aspects from the dewatering process will need to monitored closely as adverse public interest in this site is a foreseeable possibility

- Total suspended solids (TSS) < 50 mg/L
- No observable sheen or odour
- Turbidity < 10 NTU
- Temperature < 30˚C

9. Potential Dewatering Impacts

Dewatering operations have the potential to impact receptors and the surrounding environment if not managed appropriately. This section outlines key areas of concern with respect to dewatering and potential environmental impacts.

Procedures for the management of potential environmental impacts are detailed in Section 10.

9.1. Receiving Water Quality

Typically, large volume and/or well flushed water bodies have a capacity to buffer the discharge of potential contaminants depending on the flow rate and duration of discharge. While the receiving waters are subject to the influences of an urbanised catchment, dewatering activities must not contribute to or cause significant decreases in receiving waters quality. Potential impacts associated with releasing dewatered groundwater to receiving waters (via the stormwater network) are summarised below.

9.1.1. Physicochemical Parameters

Changes to natural pH levels in a receiving waterway can be directly or indirectly detrimental to aquatic biota as particular species can be intolerant to specific conditions caused by dewatering processes.

Acidifying the receiving waters can cause metals bound to sediment and organic matter to be liberated, increasing toxicity and enhancing the bioavailability of background metals. Oxidation of dissolved metals can also strip oxygen from the receiving waters resulting in fish kills, however this is less likely in medium to high flow systems such as Botany Bay.

Turbidity and suspended solids impact on a receiving environment include siltation, reduction of the euphotic zone affecting photosynthetic organisms by limiting light transmission through the water column this has a flow on effect as the food chain is disrupted affecting benthic organisms and higher level organisms.

9.1.2. Nutrients

Streams/rivers, canals and coastal lakes environments have the ability to assimilate and export nutrients (such as nitrogen and phosphorus) through a variety of pathways including flushing, bacterial conversion and permanent accumulation in sediments. Under favourable conditions these cycles can help buffer the receiving environment from potentially deleterious effects of nutrient loading. These effects can include eutrophication, potentially toxic algal blooms, increased oxygen demand and ammonia toxicity.

While the buffering ability of the receiving environment should not be relied upon as a management strategy, the efficiency of a particular water body to process nutrients is an important consideration in assessing the potential impacts of eutrophication of a water body.

9.1.3. Heavy Metals

High concentrations of potentially harmful metals may be encountered in the groundwater depending on geology and historical uses of the site (and surrounding properties).

Whilst metals and associated compounds occur naturally in the environment and are essential for many organisms, the potential toxicity of metals to aquatic biota generally increases with concentration, particularly when in dissolved form. Furthermore, concentrations of dissolved metals may fluctuate throughout dewatering as water is drawn in from surrounding environments.

Metal toxicity also varies between different species of a particular metal, the physical and chemical characteristics of the receiving environment, and biological receptors. Thus, the size, tidal/mixing/flushing regime, and background concentrations of metals in the receiving waterway must be taken into account when assessing compliance.

Importantly, the total load and duration of metals discharged also needs to be considered when assessing potential chronic effects of metals on biota, though this is less crucial in deeper water with strong tidal interaction where the risk of accumulation is minimised.

9.1.4. Petroleum Hydrocarbons and Chlorinated Solvents

The site has been used for commercial/industrial purposes, with known use and storage of petroleum hydrocarbons. Research indicates that petroleum hydrocarbons toxicity is highly variable, as they contain many hydrocarbon chain compounds. Generally, petroleum hydrocarbon based compounds can naturally biodegrade given the right conditions and generally degrade to lesser toxic substances.

The chemical degradation products of the potential VOC contaminants in groundwater, specifically chlorinated hydrocarbons including tetrachloroethene (PCE) and degradation daughter products trichloroethene (TCE), dichloroethene (DCE) and vinyl chloride (VC) can be of greater ecological and human health risk than the parent compounds and are therefore are considered to be significant.

Concentrations of TPH were previous reported in several groundwater samples in other areas of the site, however, the most recent sampling results from wells MW01 and MW02 near the excavations were reported below the laboratory limit of reporting (LOR).

TRH and VOC compounds may require treatment prior to discharge, which can be achieved via several methods. The treatment system may consist of a single remediation method, such as air stripping or filtered through activated carbon (sorption) to remediate the water to a suitable standard for disposal or re-injection.

9.1.5. Other Contaminants

Other hydrocarbon contamination (PAHs and Phenols) and other common anthropogenic contaminants (PFAS, OCPs, OPPs and PCBs) have not been

identified exceeding the adopted ecological criteria within the localised groundwater.

Whilst these contaminants are not expected to be present at elevated concentrations during the dewatering process (based on the most recent groundwater quality data), historical use of pesticides and other chemicals are known in the surrounding area. As such, monitoring of these compounds (as identified in previous environmental investigations) is strongly recommended.

9.2. Settlement of Unconsolidated Soils

Dewatering has the potential to induce settlement in loose sands and soft sediments, possibly compromising the structural integrity of surrounding structures. This is likely to be lessor of an issue with water bearing rock aquifers.

There is potential that drawdown outside the site may be sufficient to induce settlement in overlying buildings unless an appropriate DMP is implemented. A suitability qualified geotechnical consultant will be required to determine the potential settlement impacts caused by the potential drawdown because of the proposed dewatering activities. Detailed geotechnical considerations are beyond the scope of this assessment.

A suitably qualified engineer is required to determine the risk of settlement, potential impacts on the integrity of adjacent structures (i.e. buildings, roads, pipelines, etc.), and appropriate management measures.

9.3. Acid Sulfate Soils

Acid sulfate soils (ASS) occur predominantly on coastal land with elevations generally below 5m Australian Height Datum (AHD). These soils also occur further inland in saline seepage areas, rivers, lake beds and irrigation channels. Where present, draw-down of the local water table can expose ASS to oxidising conditions creating acidity and mobilising metals at potentially harmful concentrations.

The Botany Bay Local Environmental Plan 2013 indicated that the site is located in a Soil Class 2 Acid Sulfate Soils area. The description of a Soil Class 2 area is 'works below natural ground surface present an environmental risk and works likely to lower the water table present an environmental risk'.

An ASS investigation was completed by Arcadis (2019) and was summarised as follows:

- 48 samples were analysed and 37 were classified as PASS;
- PASS was generally identified near the fill/natural horizon and likely to be present within undisturbed natural layers of soil;
- ASS was not identified, however, excavation or disturbance of the soils where PAA was identified is likely to encounter ASS; and
- Recommendation for an ASSMP to be developed for the site.

Excavations >1.0m below ground level were determined to potentially encounter PASS. Under Section 6.10 of the LEP, an acid sulfate soil management plan (ASSMP) will be required for these works. Management and monitoring during dewatering

works must be implemented to ensure no adverse impacts occur (either on or offsite) due to potential dewatering of potential ASS.

9.4. Impact to Water Supply Works and GDEs

As detailed in Section 7 above, the temporary dewatering works will not adversely impact on any water supply works, high priority GDEs, and is not expected to result in a change to water quality.

Based on the above assessment, the temporary dewatering and ongoing drained basement activities are considered to be of Minimal Impact under the NSW DPI (2012) AIP and WMA 2000.

9.5. Noise, Vibration and Odour

Noise and vibrations are generated by pumps, generators and treatment systems which typically operate 24 hours a day during dewatering operations. Offensive odours, such as hydrogen sulphide can also be liberated through excavation of sand and or soils with high organic content. Other odours from volatile organic compounds can occur from sites contaminated with petroleum hydrocarbons or solvents. It is also common for diesel fumes to emanate from dewatering pumps and generators where electric systems cannot be used.

Noise, vibrations and odour have the potential to cause a public nuisance, particularly in dense residential areas such as the is site, and may also impact on the natural movements or behaviour of wildlife.

10. Management of Potential Impacts

10.1. Drawdown

The depth of groundwater extraction infrastructure and the rate of extraction shall be limited to the minimum requirements set in the hydrogeological model to achieve the lowering of groundwater within the site to undertake construction works.

Dewatering shall be managed in consultation with a suitably qualified geotechnical engineer to ensure the structural integrity as built structures is not compromised.

Whilst effort has been made to make accurate predictions in the dewatering volumes and off-site effects, it is strongly recommended that water levels be monitored regularly in the dewatered area and in surrounding properties to ensure that local variations in hydraulic properties in the sands and clays do not result in unacceptable groundwater table depression or mounding.

Monitoring of groundwater levels outside the basement wall at a minimum of three locations is recommended on a daily basis (refer to Section 11). If drawdown approaching 1.0m is identified in the monitoring points outside the shoring wall or near existing buildings, consideration should be given to control of the off-site water table depression. This is likely to have in implication on the costs of the project but may be recommended in order to reduce the risk of damage to adjacent buildings and roadways. Control methods may include:

- Altering the proposed excavation shoring walls so that they are less permeable (e.g. extending the sheet piles into deeper less permeable strata such as clay or rock), minimising the volume and flow of groundwater into the excavation. This is a viable contingency option unless subsurface conditions differ from those identified in the geotechnical assessment.
- Reinjection of extracted water along the site boundary. This may require some injection points to be outside the site boundary, and may require a variation to the dewatering licence obtained from WaterNSW. Injection water quality would be required to be meet NSW EPA endorsed guideline criteria.

10.2. Discharge of Groundwater

Groundwater discharge shall be controlled in a manner which does not create a flooding hazard. During extreme rainfall/storm/tide events the local stormwater drainage system can become full or flooded. If combined stormwater and dewatering flows exceed the capacity of the stormwater drainage system, discharge shall be reduced or, if necessary, stopped until stormwater flows, and / or tidal inundation subsides. Routine inspections at the stormwater inlet will need to be conducted by the Site Manager or on appropriate delegate during storm events and greater than overage tides.

The flowing sections may be required during the dewatering process if deemed necessary by the licencing provider and Council.

10.2.1. Water Quality Testing Prior to Discharge

Prior to discharge of extracted groundwater, the groundwater is understood to be recirculated back into the open excavation/ or temporary onsite water storage to allow clearing of sediment from the dewatering system and allow water quality to stablised. Once conditions have stabilised, initial batch testing of extracted water will be completed and compared against the WQO listed in Table 8-1 above.

The treated groundwater will be tested for analytes specified in Section 11, following receipt of the test results, the Environmental Manager/Consultant, in consultation with Council (where required), shall determine the suitability for discharge to the stormwater network. Compliance with the WQO set out in Table 8-1 is required prior to discharge. Additional components to the water treatment process may be required if initial batch testing results do not meet the WQO.

Reditus note that the period between collecting the pre-start samples and discharging from site can exceed one week (more if test results are not favourable and retesting is required) and that this should be accounted for in the construction program.

10.3. Water Treatment – Reverse Osmosis Unit

The extracted groundwater will require treatment prior to discharge to stormwater, primarily due to the elevated concentrations of zinc (1.18mg/L) and arsenic (27ug/L). There are also reportable concentrations of PFAS compounds (as PFOS), whilst below relevant NEMP (2018) criteria, may require treatment from a precautionary perspective to non-detectable levels.

Traditional methods for the removal of dissolved zinc in water is via flocculation, pH correction and Direct Air Flotation (DAF). Given the relatively small scale of the groundwater extraction and short period, the capital costs and setup requirements for a DAF unit are considered prohibitive. Reditus also note that PFAS components would not be treated using this technology.

Furthermore, the waters may contain nutrients (nitrogen and phosphorus compounds) requiring treatment. There is currently no proven and cost-effective method for the removal of nutrients with the available retention times and available space on construction sites. However, medium to high flow conditions and natural aquatic processes in Alexandria Canal receiving waters are likely to mitigate possible impacts of nutrient loading.

If assessment of monitoring results indicate that unacceptable adverse environmental impacts are occurring at the receiving water beyond the mixing zone due to nutrient loading, water treatment should be completed using Reverse Osmosis (RO).

RO is a water purification technology that uses a semipermeable membrane to remove ions, molecules, and larger particles from water. The membrane is designed to allow only water to pass through while preventing the passage of solutes (such as potential groundwater contaminants). RO is proven technology capable of achieving the proposed water quality objectives DGVs.

Small portable commercial RO units are readily available and would suit this project dewatering demands.

Primary treatment through a settlement tank and sand filter is recommended, prior to RO treatment.

10.3.1. Dosing pH Buffer and Flocculant Alternative

The following treatment methods may be considered where required (treatment devices may be removed from site where consistent water quality results indicate devices are no longer necessary):

- Dosing with a buffering agent to achieve the target pH for the respective receiving environment and maximum metal precipitation/flocculation.
- Retention in a settlement tank(s), incorporating a silt separator (preferably a plate separator design).

The proposed method of pH treatment, and most effective, is an automated dosing system with retention of the treated water to allow for pH stabilisation, metal precipitation and settlement of solids. Maintaining the pH 7.0-8.5 units will minimise the potential for direct pH impacts on the receiving environment and promote conversion of dissolved metals into total form and subsequent settlement/flocculation.

Sufficient area shall be allocated for settlement tanks to increase the retention time of the water and provide an opportunity for the settlement of floc and/or suspended material.

Where the above procedures prove ineffective at decreasing concentrations of dissolved and/or total metals to appropriate levels, the inclusion of the following procedures in the treatment train are recommended:

- Dosing with a pre-treatment agent to promote chemical oxidation.
- Dosing with a flocculation agent.
- Air-stripping unit or Granulated Activated Carbon (GAC) unit to target any dissolved phase TPH/VOC contamination.

The role of the air strippers is to volatilise dissolved volatile contaminants, removing them from the groundwater influent stream. The vapour phase contaminants are captured and diverted through external GAC hoppers where they are sorbed. Treated groundwater influent then undergoes tertiary polishing treatment to remove any remaining dissolved phase hydrocarbons and reduce background heavy metals through particulate filtration. This is achieved via filtration of the groundwater influent through GAC and ion exchanging media filtration vessels via the process of adsorption and ion exchange.

Initial monitoring of discharge water quality shall provide the information required to optimise the water treatment regime.

Any addition of chemical agents must be managed by a suitably qualified environmental scientist and the chemicals approved for use by the NSW EPA. Intensive monitoring of treatment agent dose rates and discharge water quality must be untaken to optimise the water treatment regime specific to the site.

10.3.2. Maintenance of Water Treatment System

Routine maintenance of the treatment equipment will be required to ensure optimum performance. The discharge pipeline and any protective structures, such as driveway ramps/culverts, must be checked for leaks and damage on a regular basis. Retention structures must also be inspected regularly to ensure adequate performance and structural integrity.

Chemical treatment and settlement is likely to result in the retention of organic and/or inorganic material. Removal of the accumulated material will be required periodically to avoid re-suspension of accumulated sediment and reduction of treatment system capacity. Strategies to limit the volume of waste to be removed should be developed in consultation with the project environmental consultant.

10.4. Noise and Vibration

The following methods shall be employed to reduce noise emissions resulting from dewatering operations:

- Preference shall be given to electric powered dewatering pumps over diesel / fuel powered equipment (due to the sound generated being lower with electric pumps). The proposed pumps are noted to be electrical vacuum header pump.
- Installation and maintenance of high efficiency mufflers for all noise generating plant.
- Pump equipment and generators shall be located away from site boundaries where possible, with consideration to adjoining residences, Installation of acoustically baffled enclosures around and generators and pump is recommended to minimise noise issues or complaints.

10.5. Odour

Routine odour monitoring should be undertaken to identify offensive odours and avoid potential impacts on adjacent site users. Control measures, such as deodorants or passing the discharge through a carbon filter tank, shall be adopted in the event odours are considered unacceptable levels at the site boundary. Where odour controls prove ineffective, activities that cause an offensive odour shall cease until odour emissions are resolved.

11. Monitoring Program

Monitoring of the discharge water will be completed for the estimated 0.5-1 month duration of the dewatering activities in accordance with the monitoring schedules below. All monitoring of water quality will be completed by a suitably qualified person, using calibrated equipment to collect samples that are representative of the discharge.

Specifications set out in the dewatering and discharge licence will outline the specific frequency of assessment, an interim sampling and monitoring program is outlined below.

11.1. Monitoring Frequency and Analysis

Daily field monitoring of the following parameters from the inlet and outlet sides of the treatment system.

- pH
- Turbidity

Daily water samples will be collected from the dewatering discharge point and receiving water during the active dewatering for the first week of dewatering activities. Physico-chemical parameters will be measured using a calibrated water quality meter for the following parameters:

- pH
- Electrical conductivity(EC)
- Dissolved oxygen (DO);
- Redox Potential (mV)
- Temperature (˚C)
- Turbidity

Water samples collected will be submitted for analysis to a NATA accredited laboratory for the following analytes:

- Total suspended solids (TSS);
- Nutrients (Ammonia, nitrates, total nitrogen and total phosphorous);
- Dissolved Metals (including arsenic, cadmium, chromium, copper, iron, lead, nickel, mercury and zinc)
- TRH, BTEX and PAHS;
- OPPS, OCPS and PCBs;
- VOCs;
- PFAS

Should laboratory results indicate discharge water consistent compliance with the WQO during the initial month of dewatering activities, the frequency of water sample collection for laboratory analysis may be reduced to weekly events.

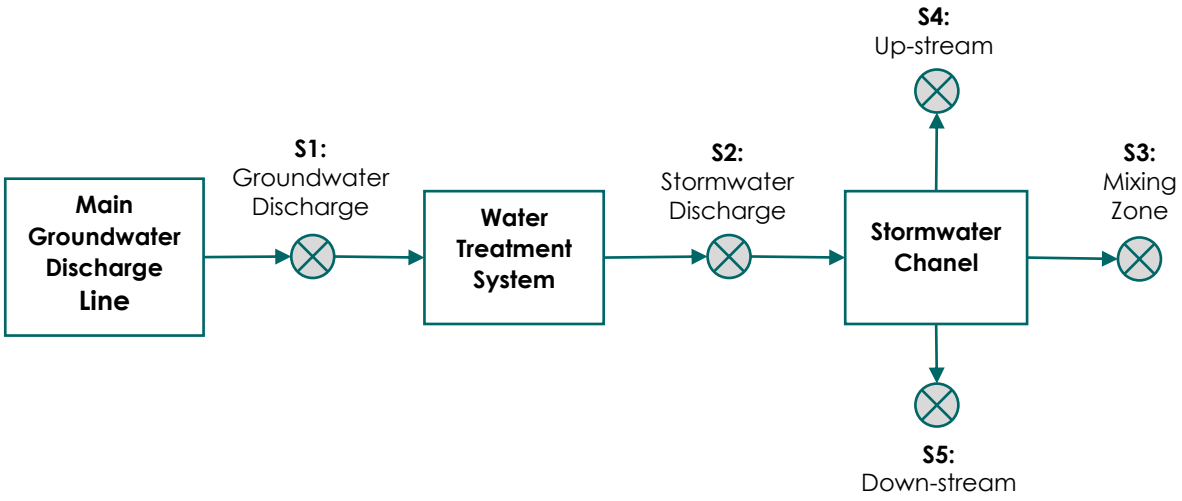
Water sampling frequency, required analysis, parameter monitoring and locations are summarised in Table 11-1 below. Should unexpected exceedances of the receiving WQO occur in the discharge samples, an increase in the sampling frequency and/or number of monitoring locations should be completed as part of further investigations.

Table 11-1: Monitoring Program for Stormwater Discharge

Parameter	Location	Frequency
Visual sheens, oil and grease and hydrocarbon odours	Discharge	Daily
pH	Discharge	Daily
	Receiving Waters	Daily
Electrical Conductivity	Discharge	Daily
	Receiving Waters	
Dissolved Oxygen	Discharge	Daily
	Receiving Waters	
Turbidity	Discharge	Daily
	Receiving Waters	
Total Suspended Solids	Discharge	Daily
	Receiving Waters	
Ammonia, Nitrate, Total Nitrogen & Total Phosphorus	Discharge	Daily
	Receiving Waters	
Dissolved Heavy Metals	Discharge	Daily
	Receiving Waters	
OPPs, OCPs and PCBs	Discharge	Daily
	Receiving Waters	
TRH, BTEX, PAHs and VOCs	Discharge	Daily
	Receiving Waters	
PFAS	Discharge	Daily
	Receiving Waters	

11.2. Monitoring Locations

Water quality samples will be collected from the following locations as presented in the flow chart below.



The following descriptions of the sampling locations are provided below:

- **S1: Untreated Groundwater:**
  - A sample of the groundwater discharge prior to water treatment.
- **S2: Treated Water (Stormwater Discharge):**
  - A sample of the treated water prior to its discharge into the Parramatta River.
- **S3: Stormwater – Mixing Zone:**
  - A sample of the receiving waters at the mixing zone boundary.
- **S4: Stormwater – Up-stream:**
  - A sample of the receiving waters at a location approximately 100m up-stream from the stormwater discharge point.
- **S5: Stormwater – Down-stream:**
  - A sample of the receiving waters at a location approximately 100m down-stream from the stormwater discharge point.

Should analytical results of the treated waters indicate consistent water quality below the DGVs, sampling of the Stormwater Chanel (points S3, S4 & S5) may not be required.

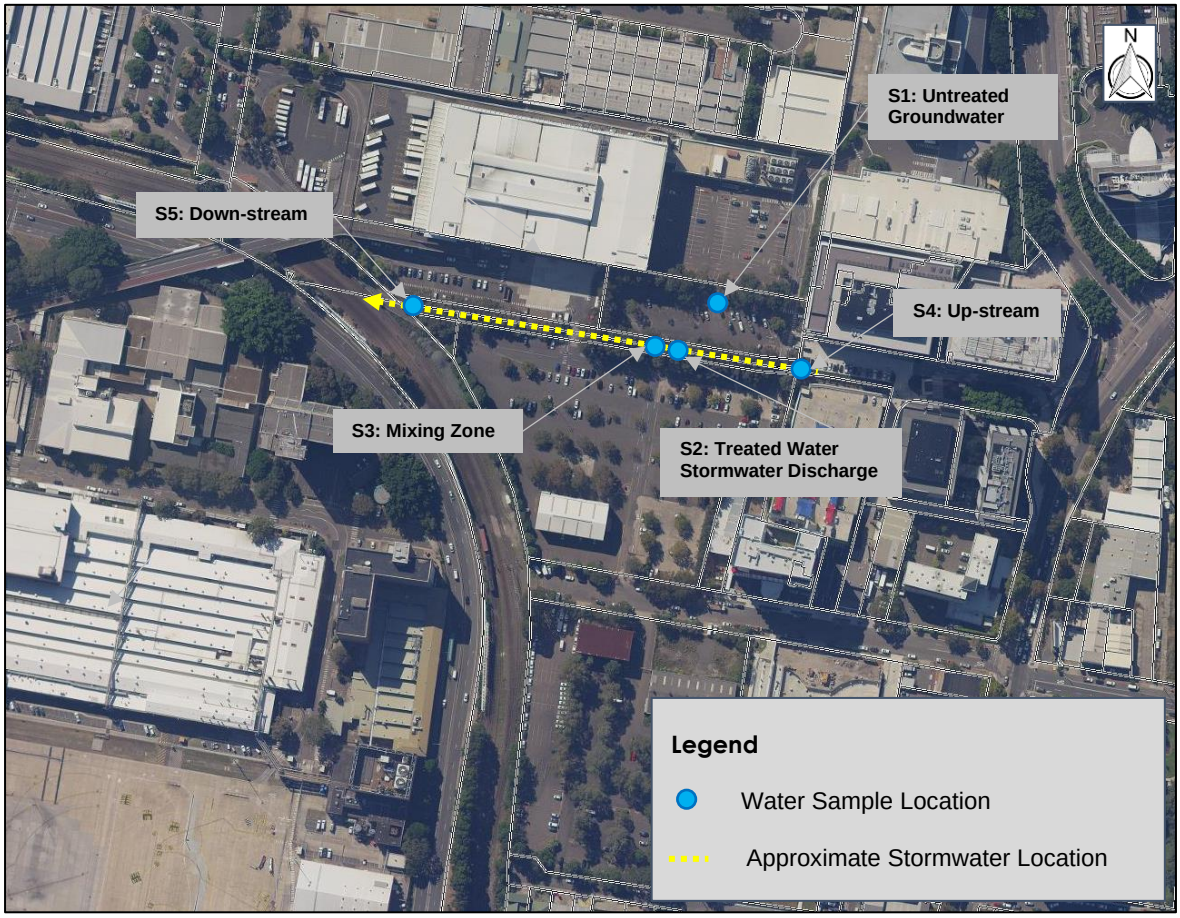


Figure 2: Proposed Monitoring Locations

11.3. Water Sample Collection

Discharge and receiving waters will be analysed in the field using a calibrated water quality meter to assess the EC, DO, pH, ORP and Temperature.

Water samples will be taken directly from the discharge line sample ports or using a surface water grab sampler for the remaining analytes mentioned in Section 11.1 above.

Samples are to be placed directly into appropriately preserved, laboratory supplied sampling containers, labelled with the project identification, sample name/location, sample date and who collected the sample. Samples for dissolved heavy metal analysis shall be field filtered using 0.45um disposable filters.

Once samples are obtained, they are to be stored and transported in an ice cooled Esky to the laboratory under a chain-of-custody (CoC).

11.4. Monitoring of Discharge Flow Rate and Groundwater Drawdown

Discharge flow rates, groundwater levels and groundwater pH outside the excavation shall be monitored in accordance with Table 11-2 below.

Table 11-2: Monitoring Programme for Discharge Flow Rates and Groundwater Levels

Parameter	Location	Frequency
Discharge Rates and Volumes	Calibrated flow meter (eg. inline Magflow meter) on discharge pipeline	Daily
Groundwater Level	From 3 groundwater monitoring wells located outside the excavation.	Daily during the dewatering and for a minimum of two months following the cessation of pumping.
Groundwater pH	From 3 groundwater monitoring wells located outside the excavation.	Daily during the dewatering and for a minimum of two months following the cessation of pumping.

Given the potential for acid sulfate soils to be dewatered at both onsite and offsite locations, at a minimum daily monitoring of offsite groundwater pH is required. Additional monitoring requirements may be required and should be specified in a standalone Acid Sulfate Soil Management Plan (to be prepared in accordance with ASSMAC (August 1998) guidelines series.

11.5. Contingencies

If drawdown approaching 1.0m is identified in the monitoring points outside the shoring wall, and/or if groundwater pH observed to be decreasing or has become more acidic than 'pre-dewatering' baseline conditions, consideration should be given to control of the off-site water table depression. This is likely to have in implication on the costs of the project but is recommended in order to reduce the risk of damage to adjacent buildings and roadways. Control methods may include:

- Extending the shoring walls to a greater depth and ideally keying them into a continuous low permeability soil horizon (e.g. clay). This is a viable contingency option unless subsurface conditions differ from those identified in the geotechnical assessment.
- Reinjection of extracted water along the site boundary. This may require some injection points to be outside the site boundary, and may require a variation to the dewatering licence obtained from the WaterNSW / NRAR.

If groundwater control is not viable for the management of ASS, injection of an acid neutralising agent such as calcium

If unexpected monitoring results indicate that the quality of the receiving water has changed (as a direct result of the dewatering activities), modification of management practices must be implemented, including up-scaling of the treatment measures.

Implementation/adjustment of physical and/or treatment processes and/or installation of larger retention structures should be completed as an initial procedure to mitigate unacceptable levels of chemical contaminants (e.g. dissolved heavy metals, petroleum hydrocarbons, VOCs or pesticides). Where increased dissolved oxygen of the discharge waters is required, an aerator should be installed within the treatment line.

Where implemented contingencies prove ineffective at mitigating risks to the receiving water way, ceasing dewatering may be the only options until such time that other management techniques can be applied. To avoid potential damage to the constructed basement in such a situation, consideration should be given to obtaining a permit to discharge to sewer with Sydney Water.

12. Records and Reporting

The Principal Contractor shall maintain a record of all water quality and groundwater level monitoring, along with details of corrective and preventative actions implemented in relation to the dewatering activity. The following reports shall be prepared:

- A weekly (interim) report issued upon receipt of laboratory analysis results that identifies potential compliance issues or water quality impacts that require immediate action, and other recommended preventive/corrective actions
- A monthly dewatering report summarising the water quality data and management strategies implemented during the entire works. The report shall include a summary of discharge and receiving waters quality results, a statistical appraisal of the data, control charts showing quality results, a compliance assessment, indications of potential environmental harm, and comments and/or corrective actions implemented during the works.

The following information must be maintained and may be required to be submitted to WaterNSW / NRAR on completion of dewatering as part of "Completion Report":

- Volume of groundwater pumped, the volume discharged offsite (and/or reinjected if applicable), the discharge / reinjection rate and the duration of pumping;
- Groundwater level monitoring data;
- All water quality monitoring data including results of pre-release water quality testing, within six months of completion of dewatering; and
- Location and construction of groundwater extraction works that are abandoned after dewatering has ceased.

A Water Access Licence (WAL) and Works Approval may be issued for the dewatering works. The WAL should be obtained to cover the predicted volume of groundwater to be abstracted from the Greater Metropolitan Region Groundwater Sources – Botany Sands Groundwater Source. Should volumes measured during construction dewatering exceed the predicted volumes, additional WAL should be obtained to ensure all groundwater take is accounted for.

13. References

ANZECC/ARMCANZ. 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Qualify, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand;

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NEPM. 2013. National Environment Protection Measure, Schedule B (1) investigation levels for soil and groundwater;

NSW government Office of Environment and Heritage, Acid Sulphate Risk Maps 2015 http://www.environment.nsw.gov.au/acidsulfatesoil/riskmaps.htm

14. Limitations

The report or document does not purport to provide legal advice and any conclusions or recommendations made should not be relied upon as a substitute for such advice.

The report does not constitute a recommendation by Reditus for the client (APP Pty Ltd) or any other party to engage in any commercial or financial transaction and any decision by the client or other party to engage in such activities is strictly a matter for the client.

The report relies upon data, surveys, measurements and results taken at or under the site at particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the client. Furthermore, the report has been prepared solely for use by the client and Reditus accepts no responsibility for its use by other parties. The client agrees that Reditus' report or associated correspondence will not be used or reproduced in full or in part for promotional purposes and cannot be used or relied upon by any other individual, party, group or company in any prospectus or offering. Any individual, party, group or company seeking to rely this report cannot do so and should seek their own independent advice.

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Additionally, unless otherwise stated Reditus did not conduct soil, air or wastewater analyses including asbestos or perform contaminated sampling of any kind. Nor did Reditus investigate any waste material from the property that may have been disposed off the site, or undertake and assessment or review of related site waste management practices.

The results of this assessment are based upon (if undertaken as part of the scope work) a site inspection conducted by Reditus personnel and/or information from interviews with people who have knowledge of site conditions and/or information provided by regulatory agencies. All conclusions and recommendations regarding the property are the professional opinions of the Reditus personnel involved with the project, subject to the qualifications made above.

While normal assessments of data reliability have been made, Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project/assessment.

Reditus is not engaged in environmental auditing and/or reporting of any kind for the purpose of advertising sales promoting, or endorsement of any client's interests,

including raising investment capital, recommending investment decisions, or other publicity purposes. Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project.

Information relating to soil, groundwater, waste, air or other matrix conditions in this document is considered to be accurate at the date of issue. Surface, subsurface and atmospheric conditions can vary across a particular site or region, which cannot be wholly defined by investigation. As a result, it is unlikely that the results and estimations presented in this report will represent the extremes of conditions within the site that may exist. Subsurface conditions including contaminant concentrations can change in a limited period of time and typically have a high level of spatial heterogeneity.

From a technical perspective, there is a high degree of uncertainty associated with the assessment of subsurface, aquatic and atmospheric environments. They are prone to be heterogeneous, complex environments, in which small subsurface features or changes in geologic conditions or other environmental anomalies can have substantial impact on water, air and chemical movement.

Major uncertainties can also occur with source characterisation, assessment of chemical fate and transport in the environment, assessment of exposure risks and health effects, and remedial action performance. These factors make uncertainty an inherent feature of potentially impacted sites. Technical uncertainties are characteristically several orders of magnitude greater at impacted sites than for other kinds of projects.

In relation the conduct of Asbestos inspections or the preparation of hazardous materials reports Reditus has conducted inspections and the identification of hazardous material within the constraints presented by the property. Whist efforts are made to access areas not normally accessed during normal use of the site to identify the presence of asbestos or other hazardous material, unless explicitly tested no guarantee can be provided that such material is or is not present.

Reditus' professional opinions are based upon its professional judgment, experience, and training. These opinions are also based upon data derived from the limited testing and analysis described in this report or reports reviewed. It is possible that additional testing and analysis might produce different results and/or different opinions or other opinions. Reditus has limited its investigation(s) to the scope agreed upon with its client. Reditus believes that its opinions are reasonably supported by the testing and analysis that has been undertaken (if any), and that those opinions have been developed according to the professional standard of care for the environmental consulting profession in this area at this time. Other opinions and interpretations may be possible. That standard of care may change and new methods and practices of exploration, testing and analysis may develop in the future, which might produce different results.

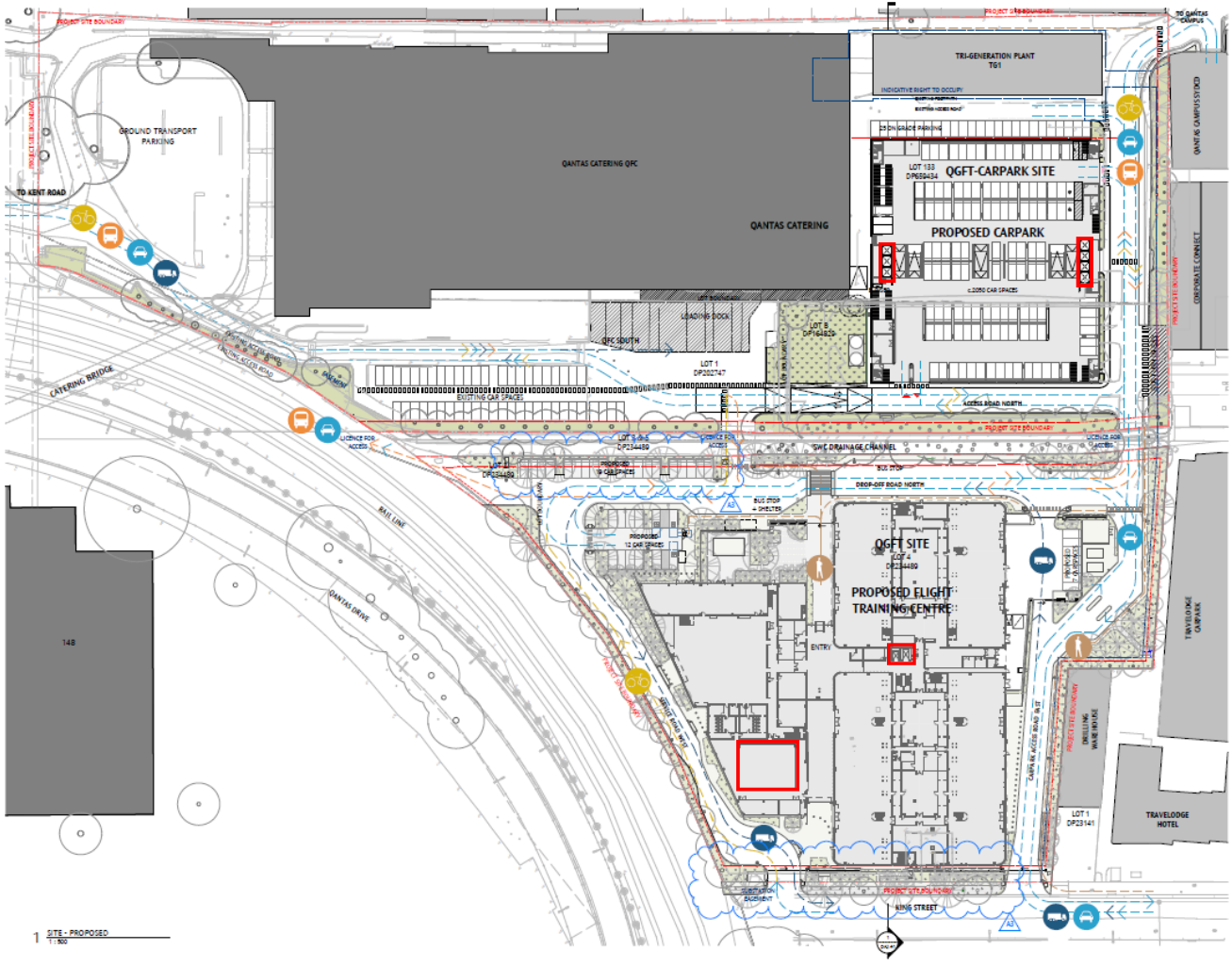
Appendix A - Figures

Legend

REDITUS

Project Number	19130
Project Name	Dewatering Management Plan
Site location	297 King St & 65 Kent Rd, Mascot NSW

Figure 1
Site Location



Legend

Excavation Areas

REDITUS

Project Number	19130
Project Name	Dewatering Management Plan
Site location	297 King St & 65 Kent Rd, Mascot NSW

Figure 2

Site Layout

Legend

- Site Boundary
- Soil Bores
- Monitoring Wells
- Existing Monitoring Wells (ES, 2013)

REDITUS

Project Number	19130
Project Name	Dewatering Management Plan
Site location	297 King St & 65 Kent Rd, Mascot NSW

Figure 3

Arcadis Groundwater Monitoring Well Locations

Legend

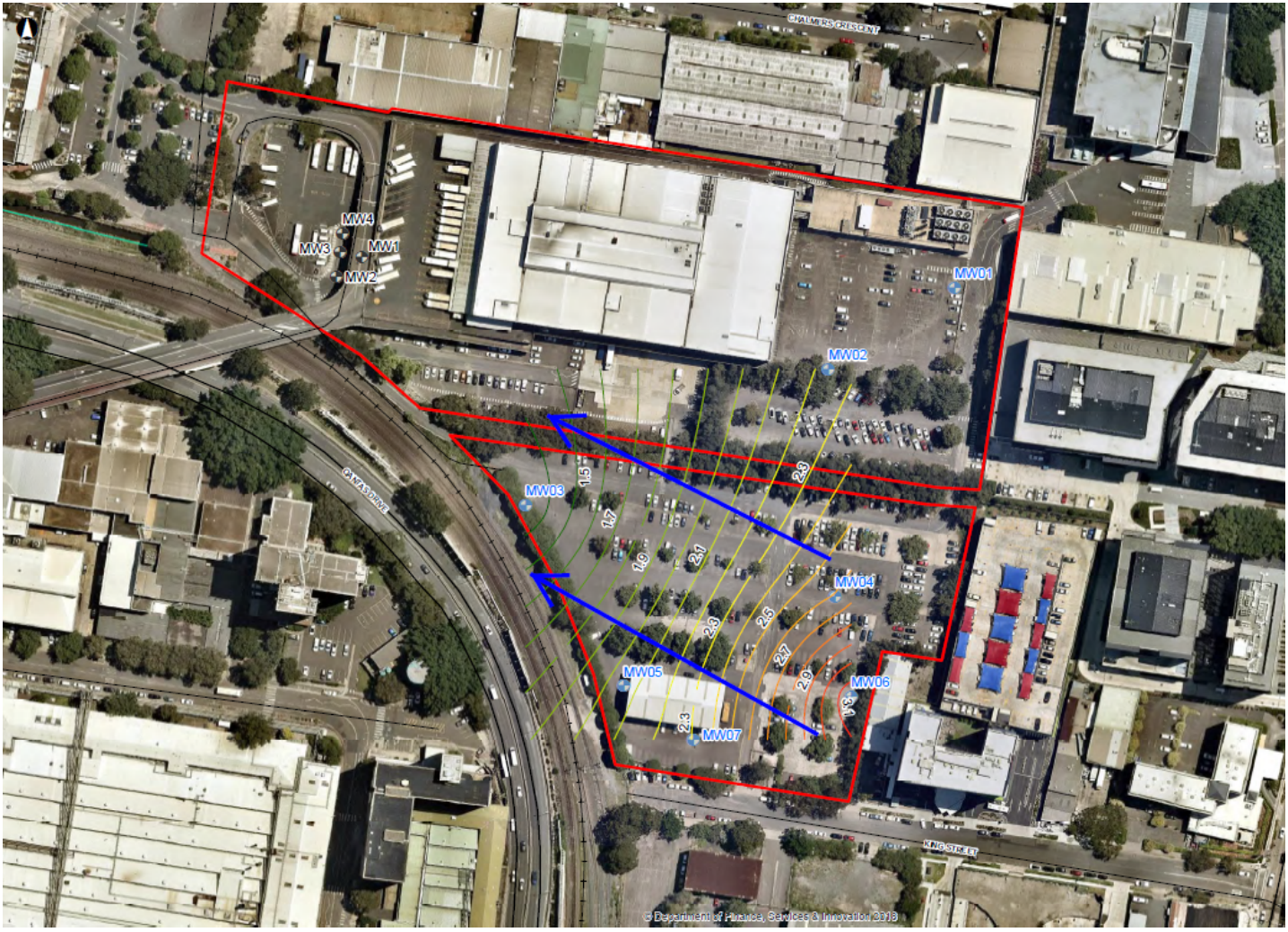
- Test Bore Location
- Cone Penetration Test Location
- W Monitoring well location

REDITUS

Project Number	19130
Project Name	Dewatering Management Plan
Site location	297 King St & 65 Kent Rd, Mascot NSW

Figure 4

DP Groundwater Monitoring Well Locations



Legend

- Monitoring Wells
- Existing Monitoring Wells (ES, 2013)

Height (AHD)

- 1.5
- 2
- 2.5
- 3

N

REDITUS

Project Number	19130
Project Name	Dewatering Management Plan
Site location	297 King St & 65 Kent Rd, Mascot NSW

Figure 5
Groundwater Elevation Contours

Appendix B – Development Application Drawings

QANTAS GROUP FLIGHT TRAINING CENTRE & CARPARK

297 KING STREET, MASCOT

LOT 2 DP 234489
LOT 4 DP 234489
LOT 1 DP 202747
LOT B DP 164829
LOT 133 DP 659434

REV	REASON FOR ISSUE	DATE
A2	SSD APPLICATION	2019.05.29

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277 | T 61 3 9650 5889 | melbourne@noxongiffen.com

| ABN 54 109 252 360 | www.noxongiffen.com

1.0 LOCATION PLAN

2.0 SYMBOLS

GRIDLINE

PARTITION TYPE

FLOOR HEIGHT

CEILING HEIGHT

SPOT LEVEL
EXIST
PROPOSED

DOOR NUMBER

WINDOW NUMBER

ELEVATION REFERNECE

SECTION REFERENCE

INTERNAL ELEVATION REFERENCE

ROOM NAME

DETAIL REFERENCE

NEW WALL

EXISTING WALL
- TO BE DEMOLISHED

3.0 ABBREVIATIONS

ADJ	ADJACENT
AL	ALUMINIUM
AP	ACCESS PANEL
ARTC	AUSTRALIAN RAIL TRACK CORPORATION
ATO	AS TURNS OUT
BTW	BETWEEN
BLK	BLOCKWORK
BWK	BRICKWORK
CL	CENTRELINE
CJ	CONTROL JOINT
COL	COLUMN
CONC	CONCRETE
COS	CHECK ON SITE
CPT	CARPET
DIA	DIAMETER
DL	DOWNLIGHT
DP	DOWNPIPE
DPM	DAMP PROOF MEMBRANE
EDB	ELECTRICAL DISTRIBUTION BOARD
EJ	EXPANSION JOINT
ELEC	ELECTRICAL
EQ	EQUAL
EQUIP	EQUIPMENT
EXH	EXHAUST
EXIST	EXISTING
[E]	EXISTING
FL	FLOOR
FCL	FINISHED CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FE	FIRE EXTINGUISHER
FHR	FIRE HOSE REEL
FW	FLOOR WASTE
GL	GLAZING
GPO	GENERAL PURPOSE OUTLET
HWD	HARDWOOD
HWR	HARDWARE
INS	INSULATION
LV	LEVEL
MECH	MECH
MJ	MOVEMENT JOINT
MS	MILD STEEL
NOM	NOMINAL
NTS	NOT TO SCALE
OA	OVERALL
PT	PAINT
QGFT	QANTAS GROUP FLIGHT TRAINING CENTRE
RAD	RADIUS
RV	RIDGE VENT
SIM	SIMILAR
SS	STAINLESS STEEL
SWC	SYDNEY WATER CORPORATION
TBC	TO BE CONFIRMED
TEL	TELEPHONE
TIM	TIMBER
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
U/S	UNDERSIDE
VP	VENT PIPE

4.0 SCHEDULES

M MATERIALS

M-FL FLOOR FINISHES

M-FL-PA	PAVING

M-WA WALL FINISHES

M-WA-BL	BLOCKWORK	
FINISH	ANTI GRAFFITI	
COLOUR	-/G	GREY
M-WA-CFC	COMPRESSED FIBRE CEMENT SHEET	
FINISH	-/G	GREY
M-WA-CO	CONCRETE	
FINISH	ANTI GRAFFITI	
COLOUR	-/G	GREY
M-WA-CP	PRECAST CONCRETE	
FINISH	ANTI GRAFFITI	
COLOUR	-/G	GREY
	-/C	COLOURED
M-WA-CW	CHAINWIRE MESH	
FINISH	-/G	GALVANISED
M-WA-MD	METAL DECK CLADDING	
FINISH	COLORBOND	
COLOUR	-/L	LIGHT
	-/M	MEDIUM

M-RF ROOFING

M-RF-DP	DOWNPIPE
M-RF-GU	GUTTER
M-RF-MD	METAL DECK
FINISH	COLORBOND
COLOUR	-/M MEDIUM

C CONSTRUCTION

C-ST STRUCTURE

C-ST-CO	STRUCTURAL CONCRETE
FINISH	ANTI GRAFFITI
C-ST-ST	STRUCTURAL STEEL
FINISH	-/G GALVANISED

C-DO DOORS

C-DO	FLUSH DOOR	
COLOUR	DARK	
C-DO-AL	ALUMINIUM FRAMED GLAZED DOOR	
FRAME	-/D	DARK
C-DO-RS	ROLLER SHUTTER	

C-WI WINDOWS

C-WI-AL	ALUMINIUM FRAMED GLAZED WINDOW	
FRAME	-/D	DARK
C-WI-RF	GLAZED ROOFLIGHT	

C-MW METALWORKS

C-MW-CP	CANOPY	
COLOUR	DARK	
C-MW-FN	FENCING, BALUSTRADE	
-/R	RODS	
COLOUR	DARK	
C-MW-LV	LOUVRES, VERTICAL	
COLOUR	-/L	LIGHT
	-/M	MEDIUM
C-MW-LH	LOUVRES, HORIZONTAL	
COLOUR	-/D	DARK
	-/G	GALVANISED
	-/M	MEDIUM
C-MW-PR	PROTECTION	
-/CB	CRASH BARRIER	
FINISH	GALVANISED	

F FITOUT

F-SN SIGNAGE

F-SN	REFER DETAILS

L LANDSCAPE & EXTERNAL WORKS

REFER ALSO CIVIL & LANDSCAPE DOCUMENTATION.

L-FI FITTINGS

L-FI-BO	BOLLARDS
L-FI-BG	BOOM GATES
L-FI-HR	HANDRAIL

L-FN FENCING

L-FN-PS	PALISADE FENCING, WITH GATES AS SHOWN
FINISH	REFER LANDSCAPE ARCHITECTS DOCUMENTATION
HEIGHT	2400H, UNO

L-PA PAVEMENT

L-PA	PAVEMENT	
L-PA-CO	CONCRETE	
	-/D	DRIVEWAY CROSSING
	-/F	FOOTPATH
L-PA-LM	LINE MARKINGS	
	PAVEMENT MARKING PAINT	
-/A	ACCESSIBLE PARKING WITH LINE MARKINGS TO AS 2890.1	
L-PA-KB	KERB TO CIVIL ENGINEER'S DESIGN	
-/R	KERB RAMP TO AS1428.1	

L-PL PLANTING

L-PL-PL	PLANTING
L-PL-SS	TENSIONED MESH SYSTEM WITH PLANTING
FINISH	STAINLESS STEEL

L-WA WALLS

L-WA-BL	BLOCKWORK WALL
FINISH	RENDER
HEIGHT	2400H
L-WA-RW	RETAINING WALL REFER CIVIL ENGINEERS DOCUMENTATION

S SERVICES

REFER ALSO SERVICES & CIVIL DOCUMENTATION.

S-EL ELECTRICAL

S-EL-SS	SUBSTATION KIOSK

S-FI FIRE

S-FI-BT	BREAK TANK
COLOUR	DARK
S-FI-HB	HYDRANT BOOSTER
S-FI-HY	HYDRANT
S-FI-PE	FIRE PUMP ENCLOSURE

S-HY HYDRAULIC

S-HY-GA	GREASE ARRESTOR
S-HY-WM	WATER METER
S-HY-WT	WATER TANK
COLOUR	DARK

S-LI LIGHTING

S-LI-EX	EXTERNAL LIGHT

REV	REASON FOR ISSUE	DATE
A1	SSD APPLICATION	2019.04.11

PRELIMINARY
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noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277 | T 61 3 9650 5889 | melbourne@noxongiffen.com
ABN 54 109 252 360 | www.noxongiffen.com

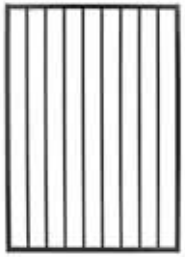
QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

LEGEND AND NOTES
NOTES & SCHEDULES

A1
NGA-S1822-DWG-DA1.02

FLIGHT TRAINING CENTRE

CAR PARK



C-MW-FN/R

LEGEND - MATERIALS

REF.	DESCRIPTION	COLOUR
M-WA-BL/G	BLOCKWORK	GREY
M-WA-CFC	COMPRESSED FIBRE CEMENT	GRAY
M-WA-CO/G	CONCRETE	GRAY
M-WA-CP/G	PRECAST CONCRETE	GRAY
M-WA-CP/C	PRECAST CONCRETE	COLOURED (RED)
M-WA-CW/G	CHAINWIRE MESH	GALVANISED
M-WA-MD/L	METAL DECK CLADDING	LIGHT
M-RF-MD/M	METAL DECK ROOFING	MEDIUM
C-MW-FN/R	FENCING, METAL RODS	DARK
C-MW-LV/L	METAL WORKS, LOUVRES	LIGHT
C-MW-LH/D	METAL WORKS, LOUVRES	DARK
C-MW-LH/G	METAL WORKS, LOUVRES	GALVANISED
C-MW-LH/M	METAL WORKS, LOUVRES	MEDIUM
C-MW-PR/CB	CRASH BARRIER	GALVANISED
C-ST-ST/G	STRUCTURAL STEEL	GALVANISED
C-WI-AL/D	ALUMINIUM FRAMED WINDOW SYSTEM	DARK
L-PL-SS	PLANTING, TENSIONSED MESH	STAINLESS STEEL
L-WA-BL/R	LANDSCAPE BLOCKWORK WALL	RENDERED

REV	REASON FOR ISSUE	DATE
A1	SSD APPLICATION	2019.04.11

PRELIMINARY
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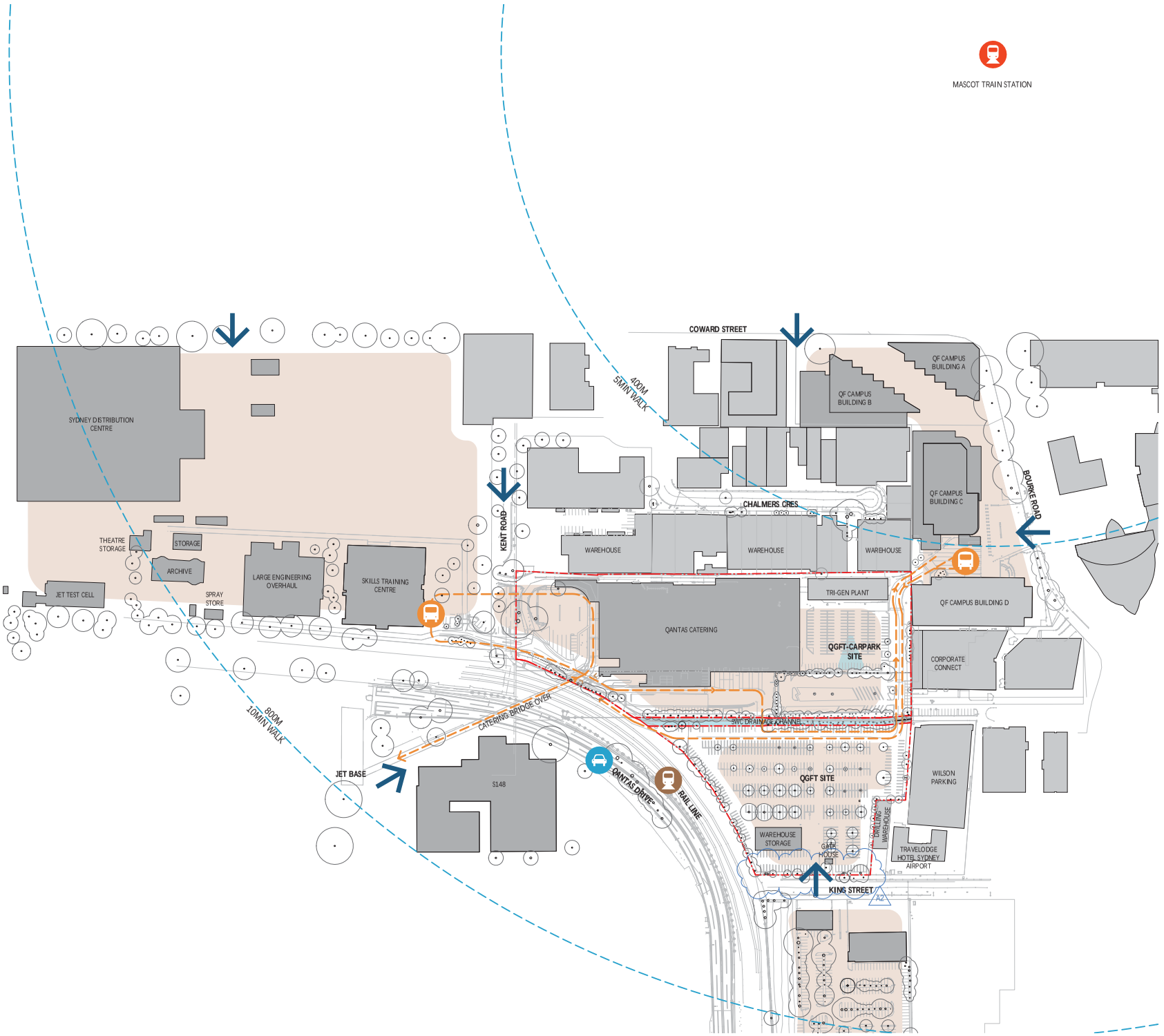
noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277 | T 61 3 9650 5889 | melbourne@noxongiffen.com
| ABN 54 109 252 360 | www.noxongiffen.com

QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

QGFT MATERIALS & FINISHES
NOTES & SCHEDULES

A1
NGA-S1822-DWG-DA1.10



GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

LEGEND - LOCALITY

SITE

- QANTAS CAMPUS & FREEHOLD LAND

TRANSPORT

- QF BUS STOPS & ROUTE
- TRAIN - FREIGHT
- TRAIN - PUBLIC
- ROAD - GATEWAY
- PEDESTRIAN - WALKING DISTANCE FROM MASCOT

ACCESS

- ACCESS TO QF CAMPUS

ENVIRONMENT

- EXISTING TREES

A2 - *KING ST. TREES AMENDED*

REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

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Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
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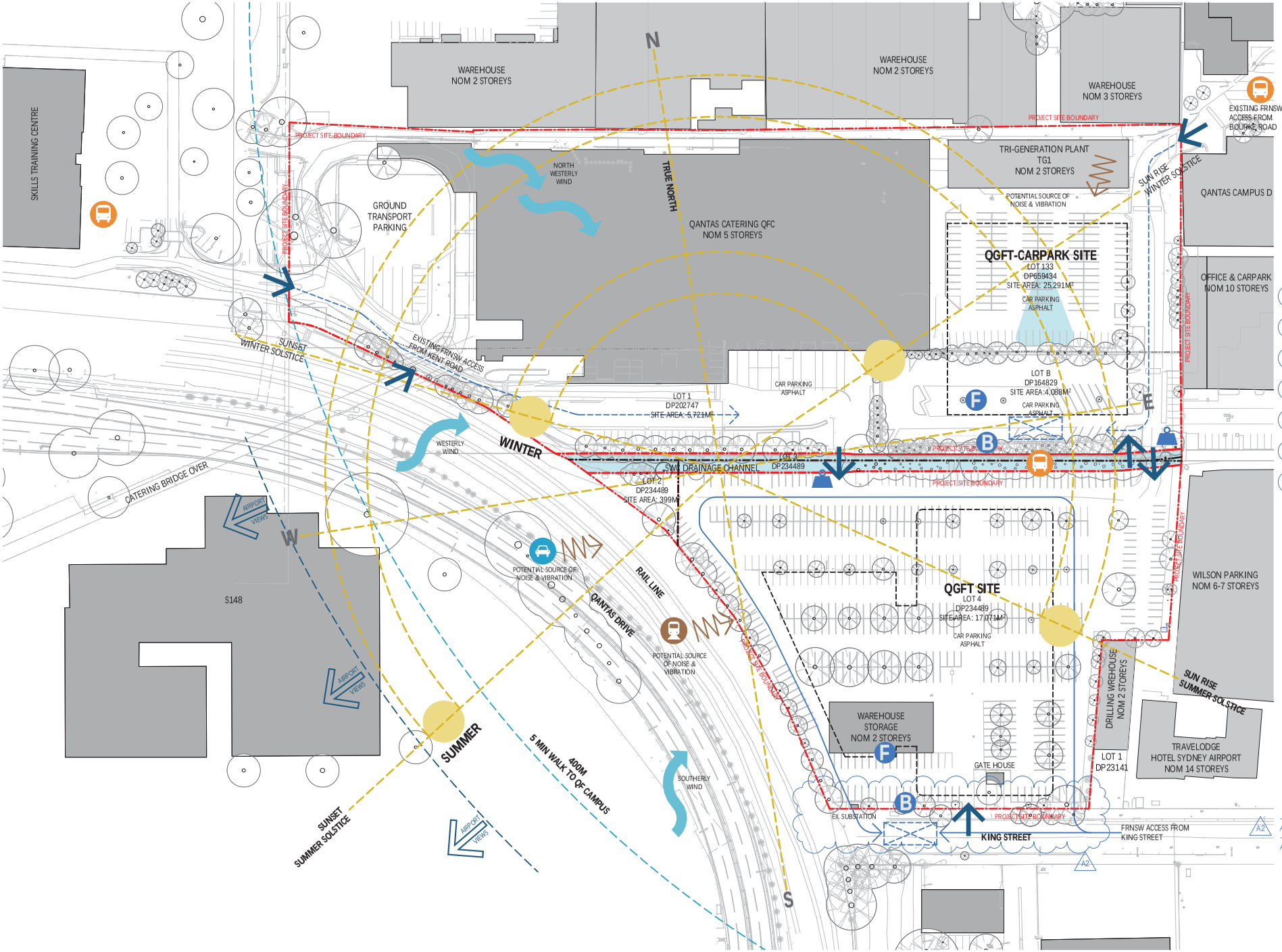
QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:1500@A1, 50%@A3

PLAN - LOCALITY ANALYSIS
SITE

A2
NGA-S1822-DWG-DA2.01



GENERAL NOTES

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LEGEND - SITE ANALYSIS

ENVIRONMENT

- WIND
- NOISE & VIBRATION

TRANSPORT

- QANTAS BUS STOPS
- WALKING DISTANCE FROM QF CAMPUS

ACCESS

- SITE ACCESS
- WEIGHT LIMIT TO SWC OWNED BRIDGES
- FRNSW ACCESS - PROPOSED
- FRNSW ACCESS - EXISTING
- INDICATIVE FRNSW HARDSTAND
- B BOOSTER ASSEMBLY
- F FIP

ENVIRONMENT

- EXISTING TREES
- WATER

VIEWS

- AIRPORT VIEWS

- KINGSTREET TREES AMENDED
- FRNSW ACCESS ADDED

REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
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| ABN 54 109 252 360 | www.noxongiffen.com

QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:650@A1, 50%@A3

PLAN - SITE ANALYSIS
SITE

A2
NGA-S1822-DWG-DA2.02

GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

AREA - QGFT - SITE	**17470 m²**
LOT 4 DP234489	17071 m²
LOT 2 DP234489	399 m²
FSR - QGFT	**1 : 0.86**

AREA TYPES

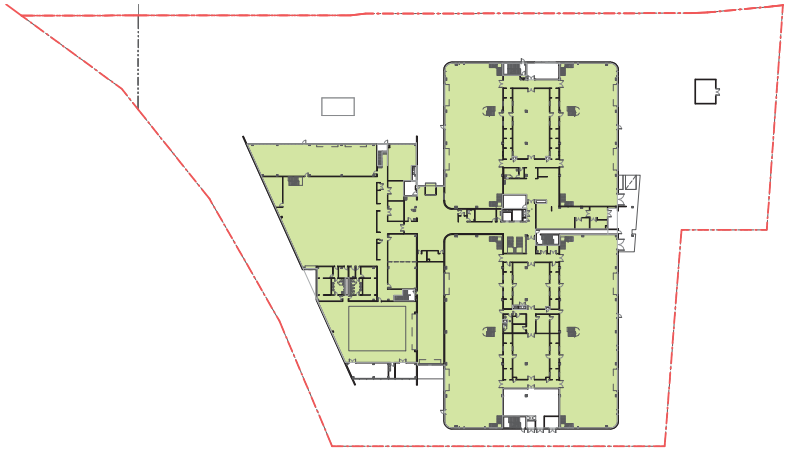
- 5 OFFICE
- 9 ASSEMBLY BUILDING

AREA - QGFT - GROSS FLOOR

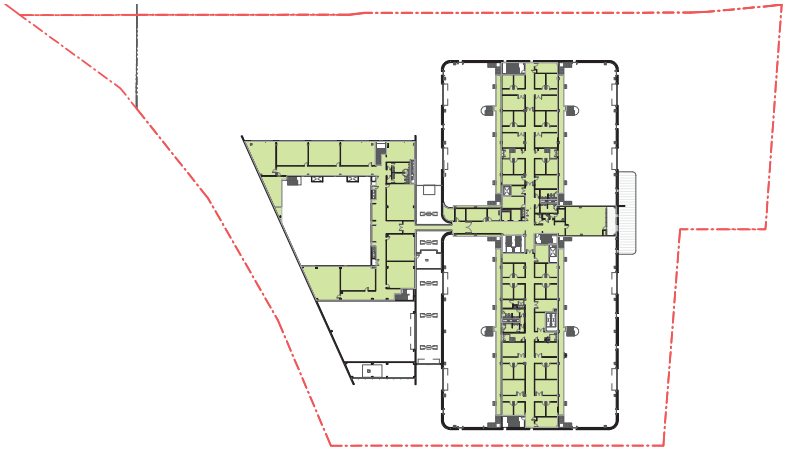
NAME	LEVEL	AREA
5 OFFICE	FFL-L03	3166 m²
TOTAL 5 OFFICE AREA		3166 m²
9 ASSEMBLY	FFL-L00	6988 m²
9 ASSEMBLY	FFL-L01	3039 m²
9 ASSEMBLY	FFL-L02	1723 m²
9 ASSEMBLY	FFL-L03	135 m²
TOTAL 9 ASSEMBLY AREA		11884 m²

AREA - QGFT - TOTAL GROSS FLOOR

LEVEL	AREA m²
FFL-L00	6988 m²
FFL-L01	3039 m²
FFL-L02	1723 m²
FFL-L03	3301 m²
TOTAL AREA	15051 m²



00 L-00 1 : 750



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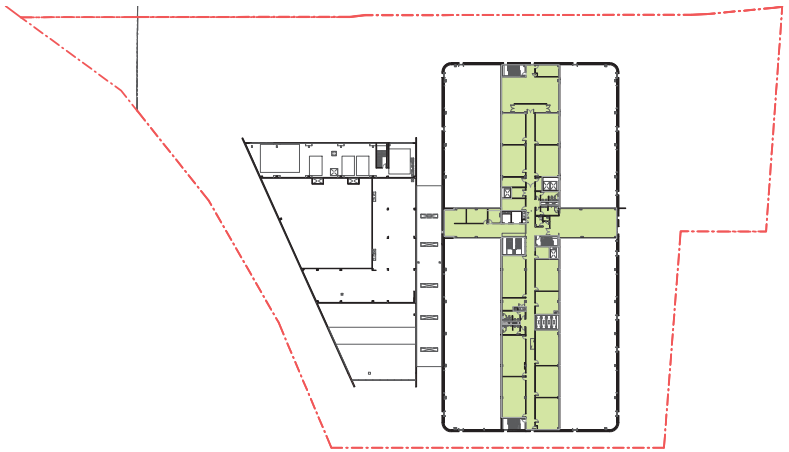

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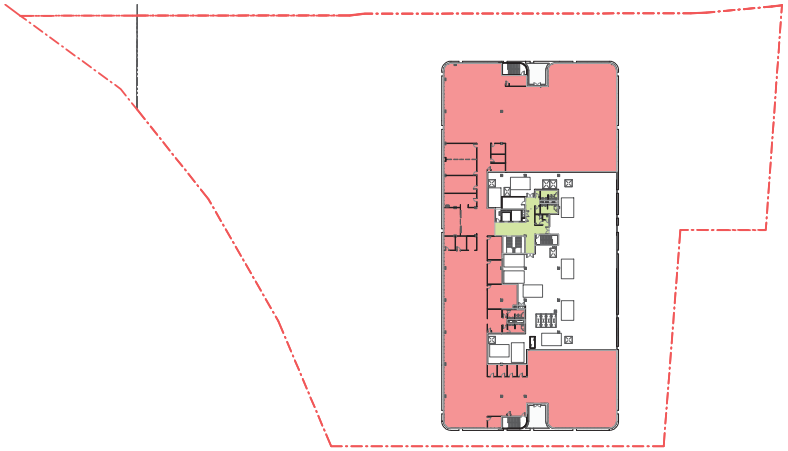

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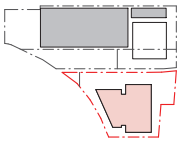

REV	REASON FOR ISSUE	DATE
A2	SSD APPLICATION	2019.04.17

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277 | T 61 3 9650 5889 | melbourne@noxongiffen.com
| ABN 54 109 252 360 | www.noxongiffen.com

QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

7.5 15 37.5

1:750@A1, 50%@A3

PLAN - GFA - QGFT
SITE

A2
NGA-S1822-DWG-DA2.15

AREA - QGFT - CARPARK - GROSS FLOOR

NAME	LEVEL	AREA
5 OFFICE	GROUND LEVEL	577 m²
5 OFFICE	LEVEL - 02	2504 m²
5 OFFICE	LEVEL - 03	208 m²
5 OFFICE	LEVEL - 04	54 m²
		3343 m²
7B STORAGE	GROUND LEVEL	428 m²
7B STORAGE	LEVEL - 02	231 m²
7B STORAGE	LEVEL - 03	266 m²
7B STORAGE	LEVEL - 04	70 m²
		996 m²
8 PRODUCTION	LEVEL - 03	8357 m²
8 PRODUCTION	LEVEL - 04	8079 m²
		16435 m²
8 WORKSHOP	GROUND LEVEL	1247 m²
		1247 m²
TOTAL GFA		22021 m²

GENERAL NOTES

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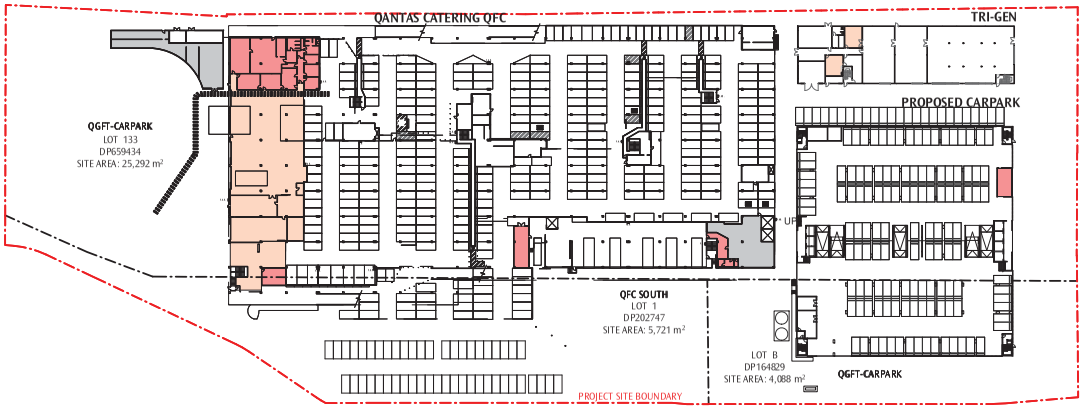
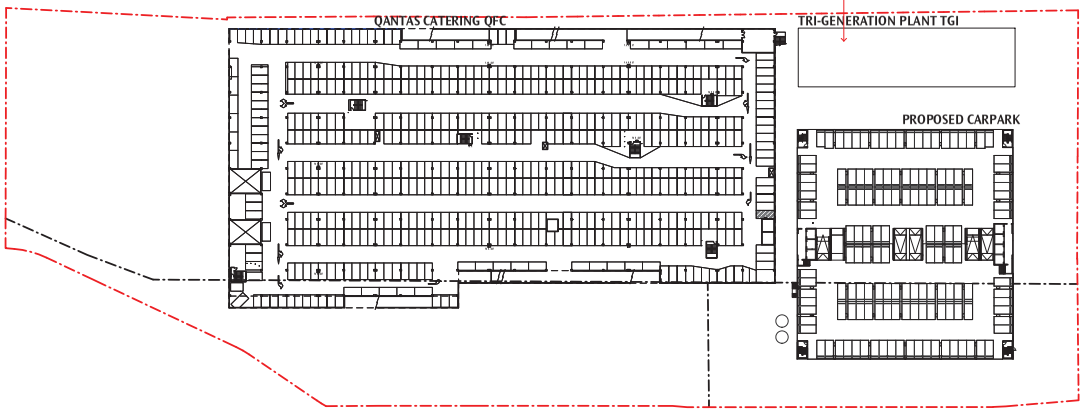
- 5 OFFICE
- 7B STORAGE
- 8 PRODUCTION
- 8 WORKSHOP

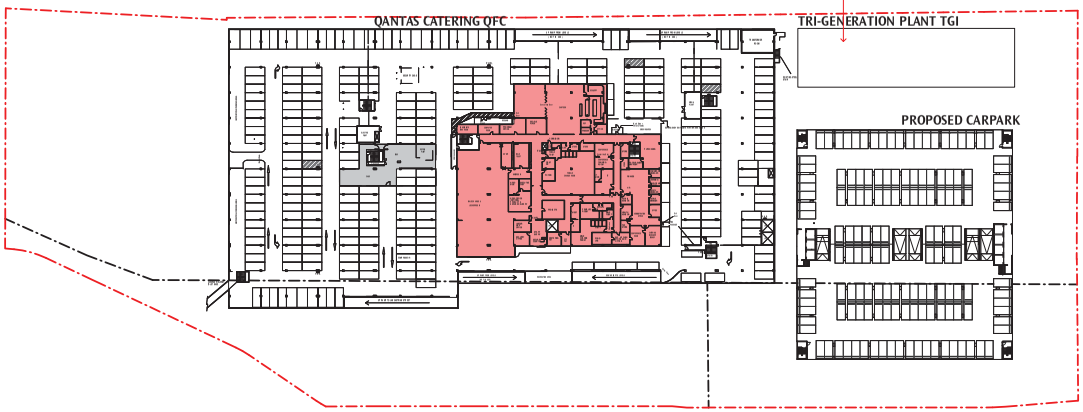
QGFT - CARPARK	**35101m²**
LOT B DP164829	4088 m²
LOT 1 DP202747	5721 m²
LOT 133 DP659434	25292 m²
FSR - QGFT -CARPARK	**1 : 0.63**



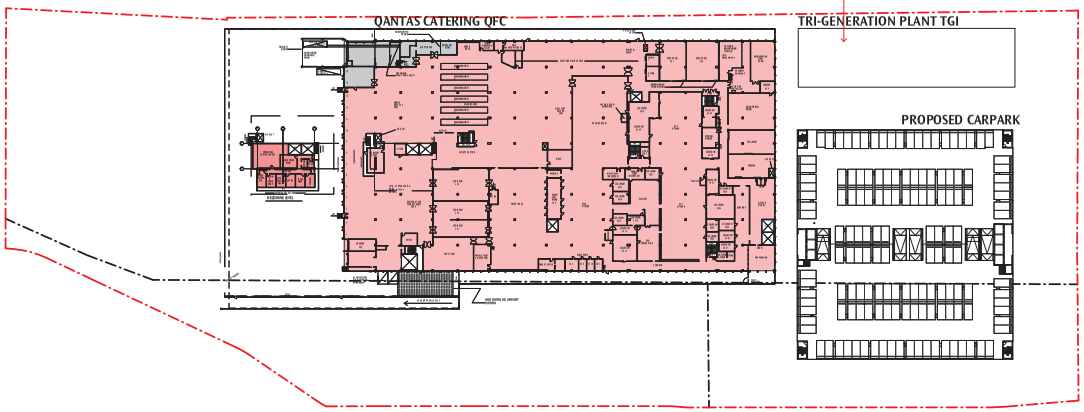
G GROUND LEVEL
1 : 800



1 LEVEL - 01
1 : 800



2 LEVEL - 02
1 : 800



3 LEVEL - 03
1 : 800

REV	REASON FOR ISSUE	DATE
A2	SSDA PPLICATION	19.04.17
A1	SSDA PPLICATION	19.04.11

PRELIMINARY
NOT FOR CONSTRUCTION

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| ABN 54 109 252 360 | www.noxongiffen.com

QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:800@A1, 50%@A3

PLAN - GFA CARPARK

A2
NGA-1822-DWG-DA2.16

AREA - QGFT - CARPARK - GROSS FLOOR

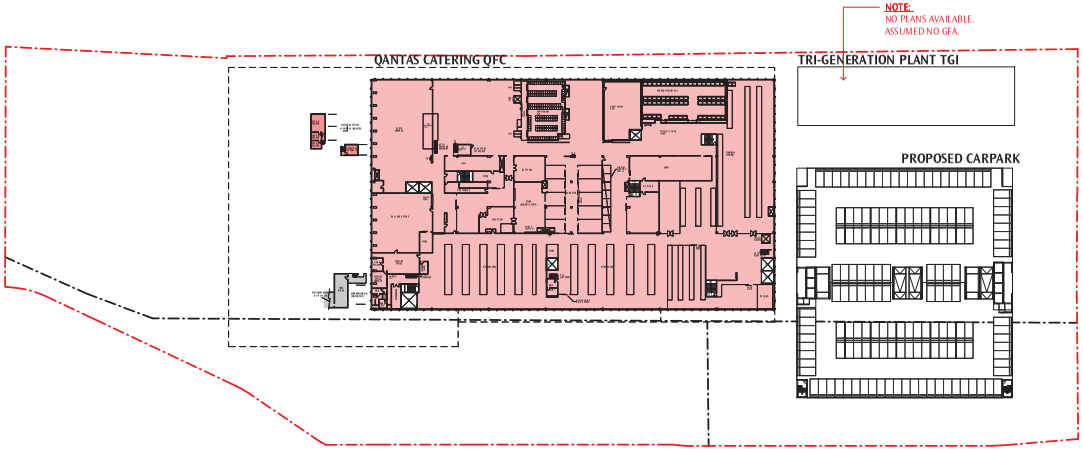
NAME	LEVEL	AREA
5 OFFICE	GROUND LEVEL	577 m²
5 OFFICE	LEVEL - 02	2504 m²
5 OFFICE	LEVEL - 03	208 m²
5 OFFICE	LEVEL - 04	54 m²
		3343 m²
7B STORAGE	GROUND LEVEL	428 m²
7B STORAGE	LEVEL - 02	231 m²
7B STORAGE	LEVEL - 03	266 m²
7B STORAGE	LEVEL - 04	70 m²
		996 m²
8 PRODUCTION	LEVEL - 03	8357 m²
8 PRODUCTION	LEVEL - 04	8079 m²
		16435 m²
8 WORKSHOP	GROUND LEVEL	1247 m²
		1247 m²
TOTAL GFA		22021 m²

GENERAL NOTES

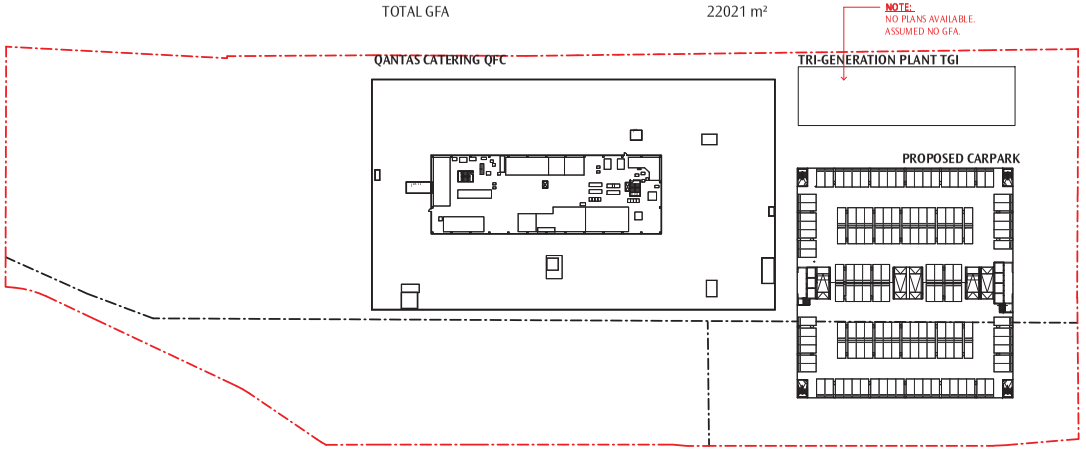
DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

- 5 OFFICE
- 7B STORAGE
- 8 PRODUCTION
- 8 WORKSHOP

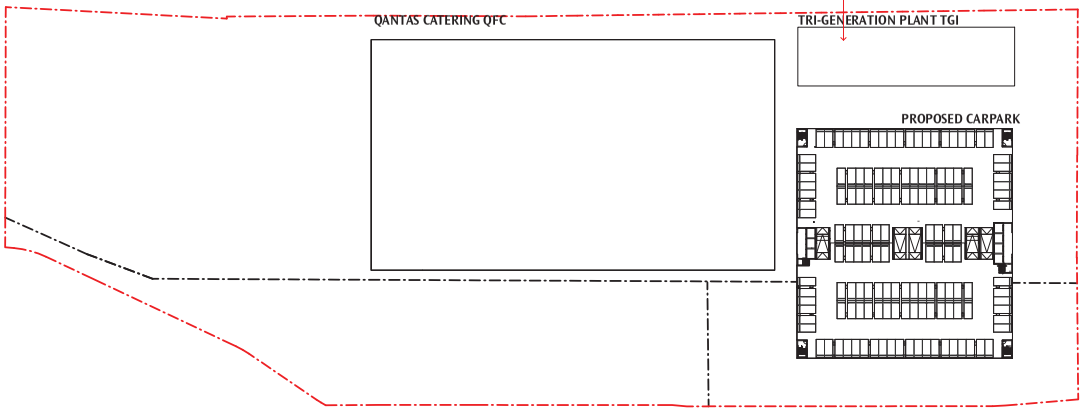
QGFT - CARPARK	**35101m²**
LOT B DP164829	4088 m²
LOT 1 DP202747	5721 m²
LOT 133 DP659434	25292 m²
FSR - QGFT -CARPARK	**1 : 0.63**



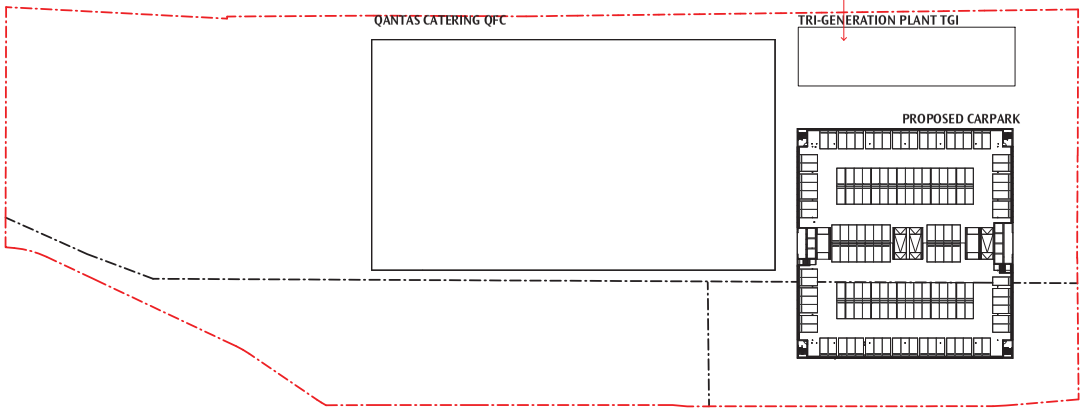
4 LEVEL - 04
1 : 800



5 LEVEL - 05
1 : 800



6 LEVEL - 06, 07, 08, 09, 10, 11, 12
1 : 800



13 LEVEL - 13
1 : 800

REV	REASON FOR ISSUE	DATE
A2	SSDA PPLICATION	19.04.17
A1	SSDA PPLICATION	19.04.11

PRELIMINARY
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noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277

| T 61 2 9262 9066 | sydney@noxongiffen.com
| T 61 3 9650 5889 | melbourne@noxongiffen.com
| ABN 54 109 252 360 | www.noxongiffen.com

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297 KING STREET MASCOT

0 8 16 40

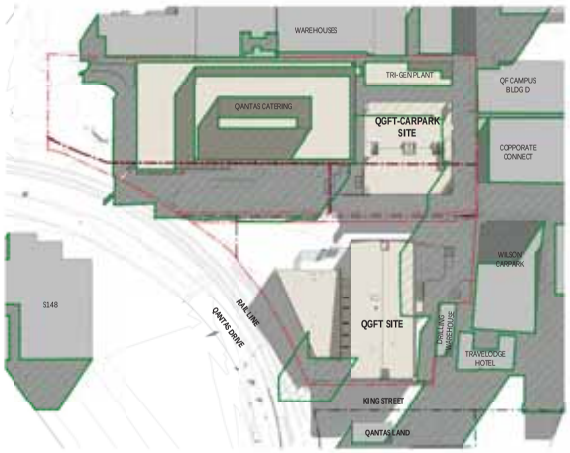
1:800@A1, 50%@A3

PLAN - GFA
CAR PARK

A2
NGA-1822-DWG-DA2.17

GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



01 PROPOSED - STAGE 1 - 21 JUN 9AM
1 : 2000

02 PROPOSED - STAGE 1 - 21 JUN 12PM
1 : 2000

03 PROPOSED - STAGE 1 - 21 JUN 3PM
1 : 2000

LEGEND - SHADOWS

EXISTING

PROPOSED

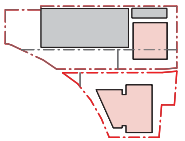
SHADOW DIAGRAMS EXCLUDE EXISTING AND PROPOSED TREES AND FENCING

04 PROPOSED - STAGE 1 - 21 DEC 9AM
1 : 2000

05 PROPOSED - STAGE 1 - 21 DEC 12PM
1 : 2000

06 PROPOSED - STAGE 1 - 21 DEC 3PM
1 : 2000

A2 *-VIEWS EXTENDED SOUTH OF KING ST.*



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
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noxongiffen
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297 KING STREET MASCOT

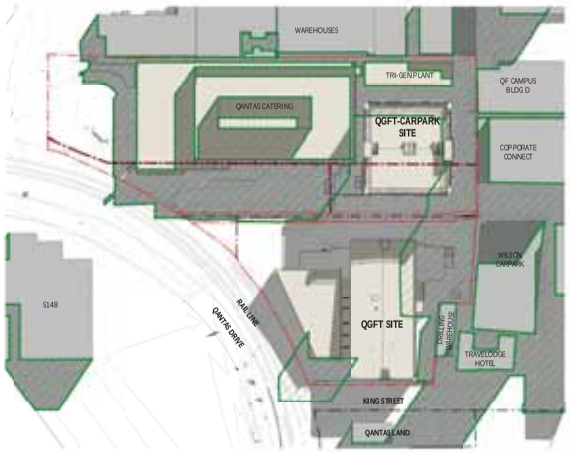
PLAN - PROPOSED SHADOWS STAGE 1
SITE

1:2000@A1, 50%@A3

A2
NGA-S1822-DWG-DA2.20

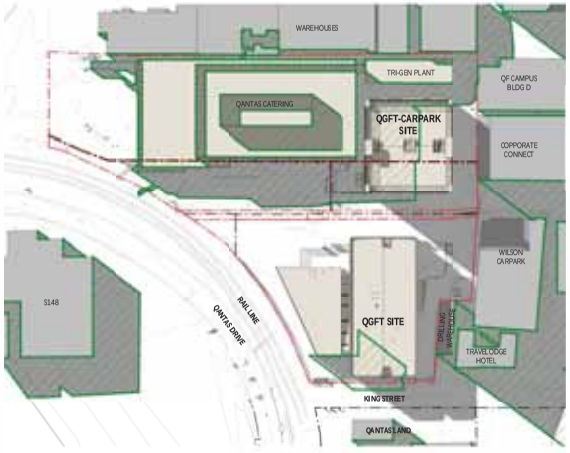
GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



01 PROPOSED - STAGE 2 - 21 JUN 9AM
1 : 2000

02 PROPOSED - STAGE 2 - 21 JUN 12PM
1 : 2000



03 PROPOSED - STAGE 2 - 21 JUN 3PM
1 : 2000

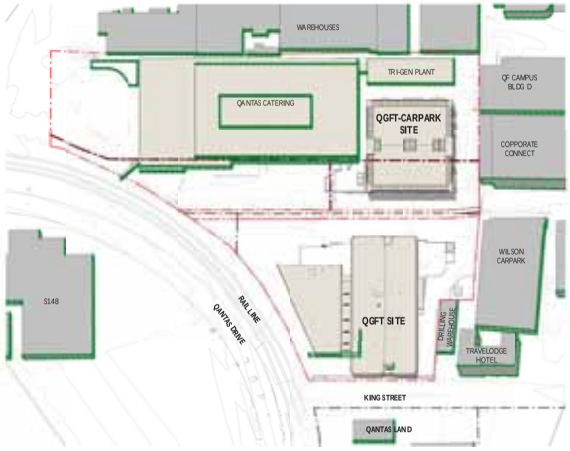
LEGEND - SHADOWS

EXISTING

PROPOSED

SHADOW DIAGRAMS EXCLUDE EXISTING AND PROPOSED TREES AND FENCING

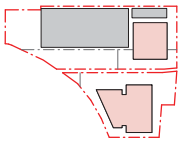
04 PROPOSED - STAGE 2 - 21 DEC 9AM
1 : 2000



05 PROPOSED - STAGE 2 - 21 DEC 12PM
1 : 2000

06 PROPOSED - STAGE 2 - 21 DEC 3PM
1 : 2000

A2 *-VIEWS EXTENDED SOUTH OF KING ST.*



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
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noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
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| ABN 54 109 252 360 | www.noxongiffen.com

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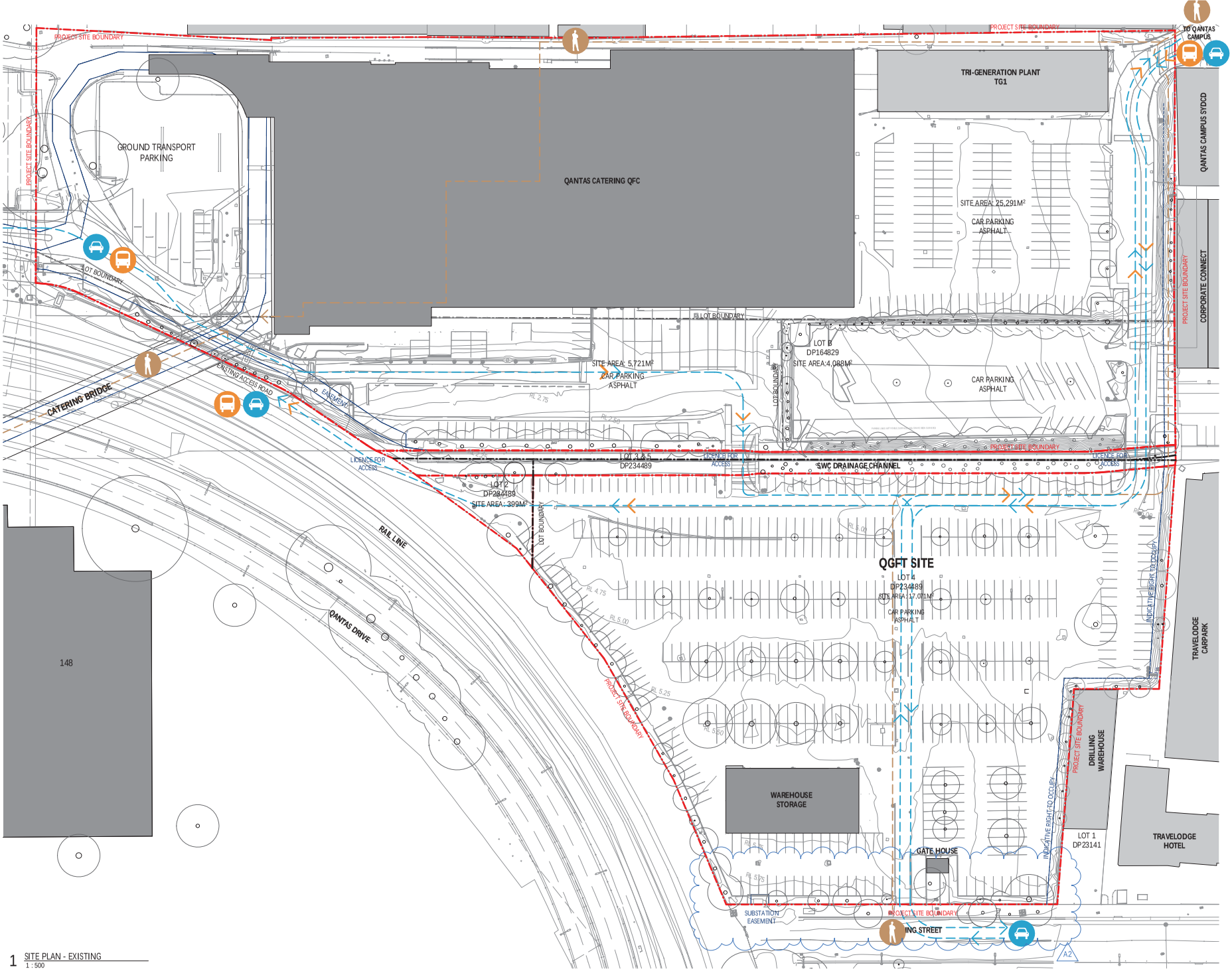
297 KING STREET MASCOT

PLAN - PROPOSED SHADOWS STAGE 2
SITE
1:2000@A1, 50%@A3

A2
NGA-S1822-DWG-DA2.21



1 SITE PLAN - EXISTING
1 : 500

GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

LEGEND - EXISTING SITE

ACCESS

- QANTAS BUS
- CAR
- PEDESTRIAN

TREES

- EXISTING

EXISTING PARKING SUMMARY

QGFT SITE	570
QGFT CARPARK SITE	230
TOTAL	**800**

REFER TRAFFIC ENGINEER'S REPORT

A2 - KING ST. TREES AMENDED -GRAPHICS SIMPLFIED FOR CLARITY

REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
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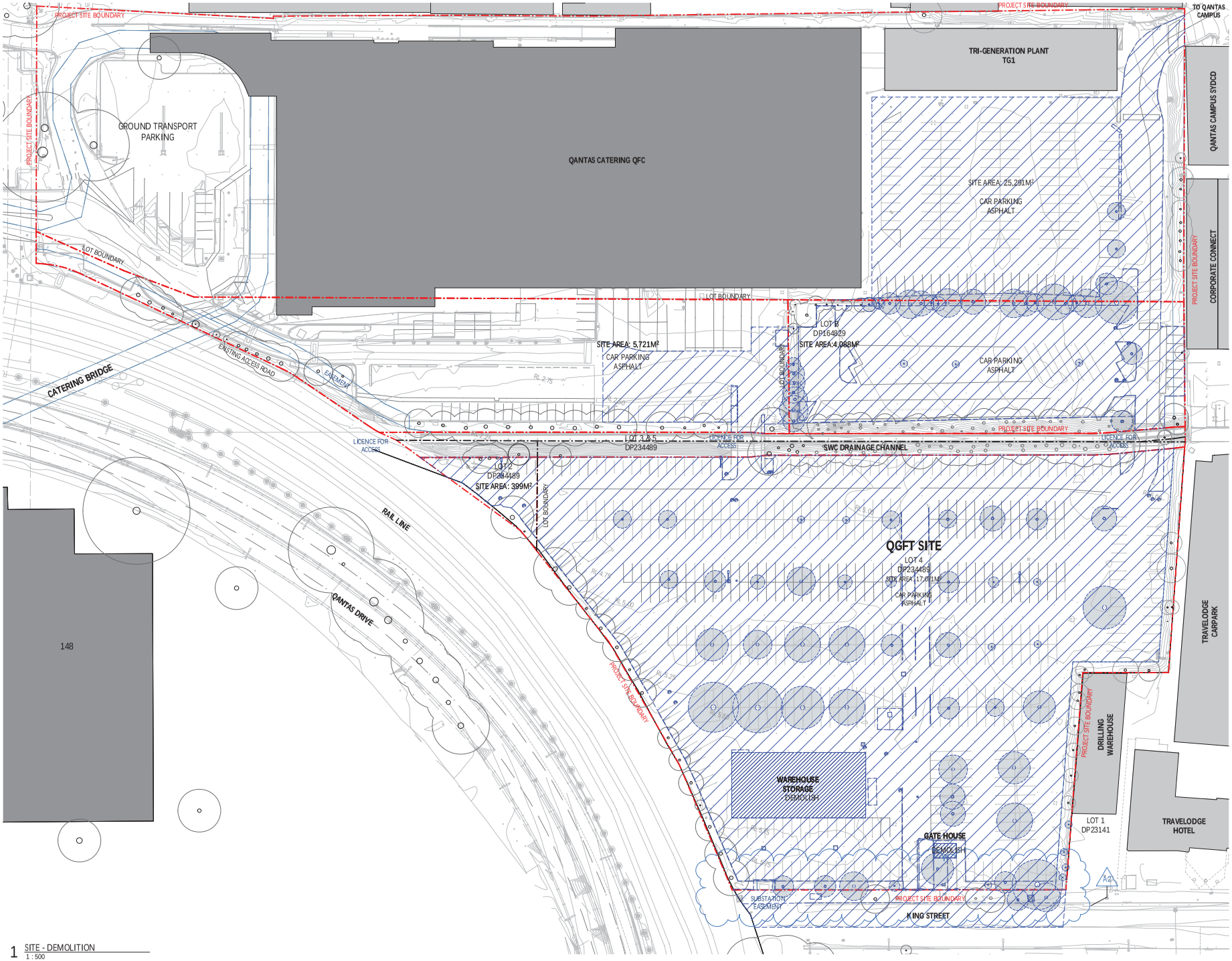
297 KING STREET MASCOT

1:500@A1, 50%@A3

PLAN - EXISTING SITE

A2
NGA-S1822-DWG-DA2.30



1 SITE - DEMOLITION
1 : 500

GENERAL NOTES
DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

LEGEND - DEMOLITION

SITE

- DEMOLISH BUILDING
- DEMOLISH HARDSTAND & SITE IMPROVEMENTS, INDICATIVE EXTENT. REFER CIVIL ENGINEERS DOCUMENTAITON

TREES

- EXISTING, RETAINED
- DEMOLISH REFER LANDSCAPE ARCHITECTS DOCUMENTATION

EXISTING PARKING SUMMARY

QGFT SITE	570
QGFT CARPARK SITE	230
TOTAL	**800**

REFER TRAFFIC ENGINEER'S REPORT

A2 - KINGSTREET TREES AMENDED

REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

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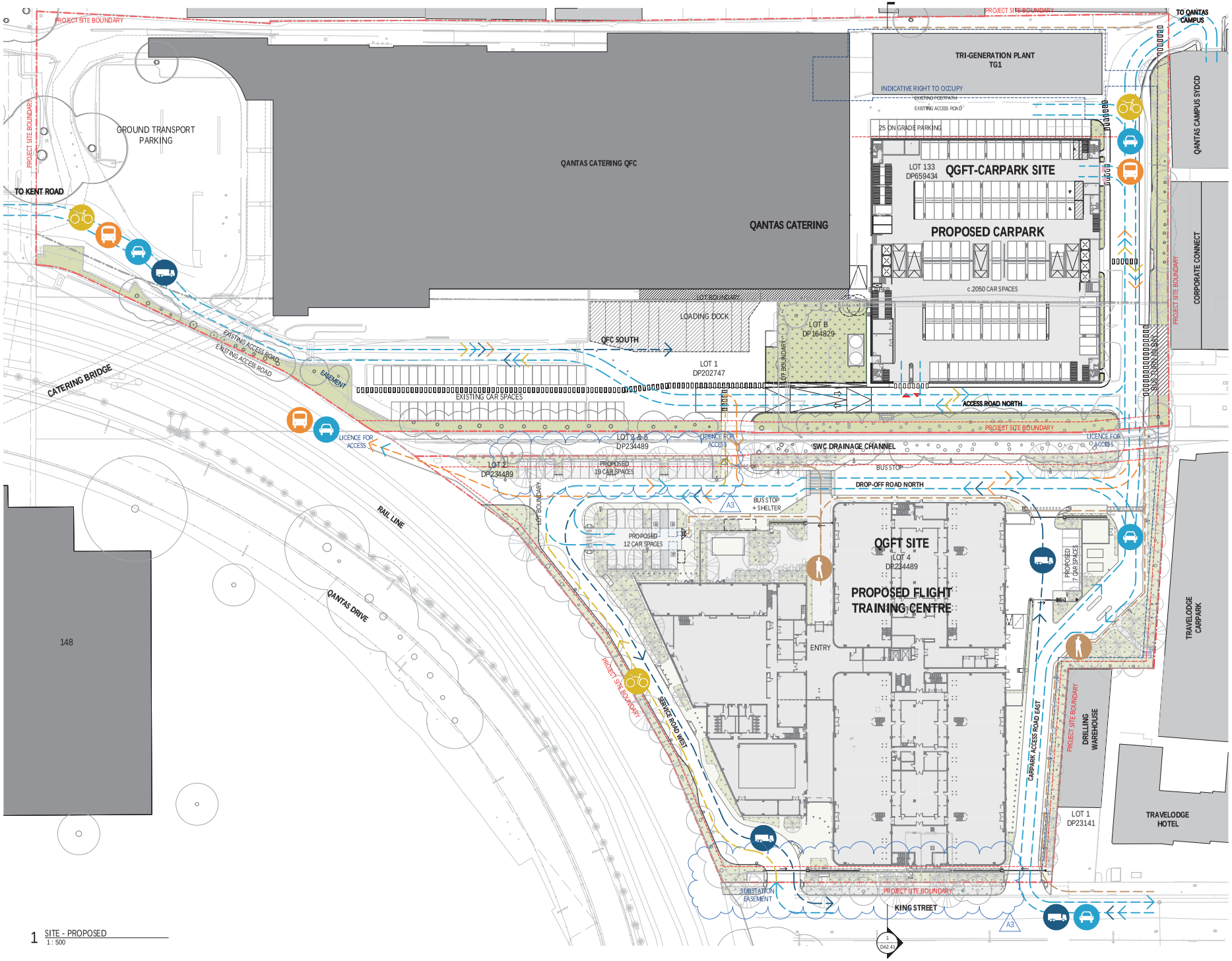
297 KING STREET MASCOT

1:500@A1, 50%@A3

PLAN - DEMOLITION
SITE

A2
NGA-S1822-DWG-DA2.31



1 SITE - PROPOSED
1 : 500

GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

LEGEND

PROPOSED ACCESS

- SERVICE VEHICLE
- QANTAS BUS
- CAR
- PEDESTRIAN
- BICYCLE

LANDSCAPE

- EXISTING
- PROPOSED

TREES

- EXISTING
- DEMOLISH
- PROPOSED

A3 - KING ST. TREES AMENDED
-LANDSCAPE AREAS/TREES ADDED
-CAR SPACE DELETED
-ACCESS DIAGRAM GRAPHICS SIMPLIFIED

PROPOSED PARKING SUMMARY

QGFT SITE	38
QGFT-CARPARK SITE	2059
TOTAL:	2097

REV	REASON FOR ISSUE	DATE
A3	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724
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| ABN 54 109 252 360 | www.noxongiffen.com

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:500@A1, 50%@A3

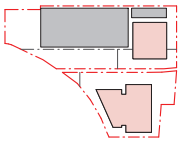
PLAN - PROPOSED
SITE

A3
NGA-S1822-DWG-DA2.40

GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

1 SECTION E - SITE SECTION
1 : 500



REV	REASON FOR ISSUE	DATE
A1	SSD APPLICATION	2019.04.11

PRELIMINARY
NOT FOR CONSTRUCTION

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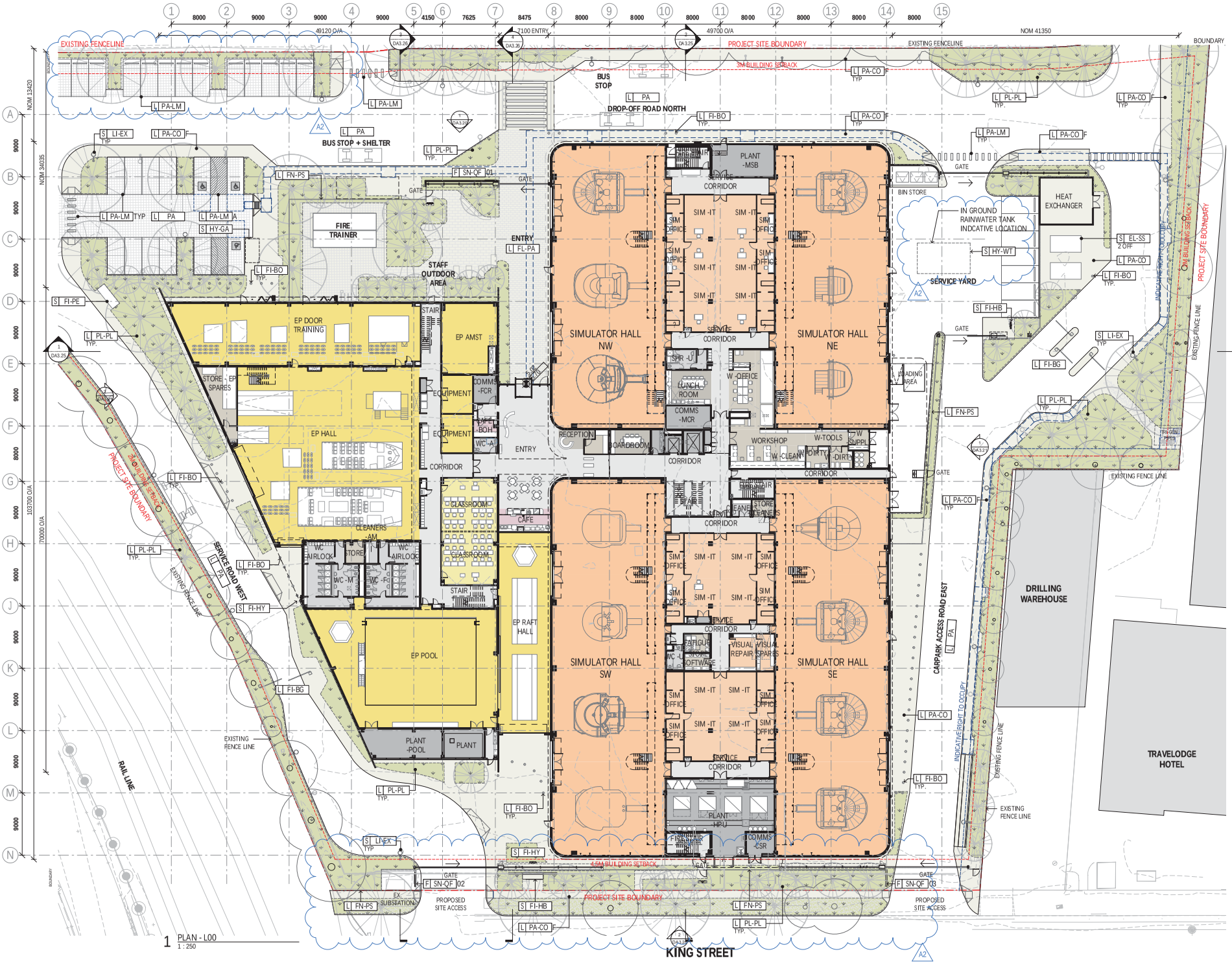
297 KING STREET MASCOT

1:500@A1, 50%@A3

SECTION
SITE

A1
NGA-S1822-DWG-DA2.41



1 PLAN - L00
1 : 250

GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

LEGEND

LANDSCAPE

- EXISTING
- PROPOSED

TREES

- EXISTING
- PROPOSED

A2 - KING ST. TREES AMENDED
-LANDSCAPE AREAS/TREES ADDED
-CAR SPACE DELETED
-RAINWATER TANK ADDED

REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

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Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
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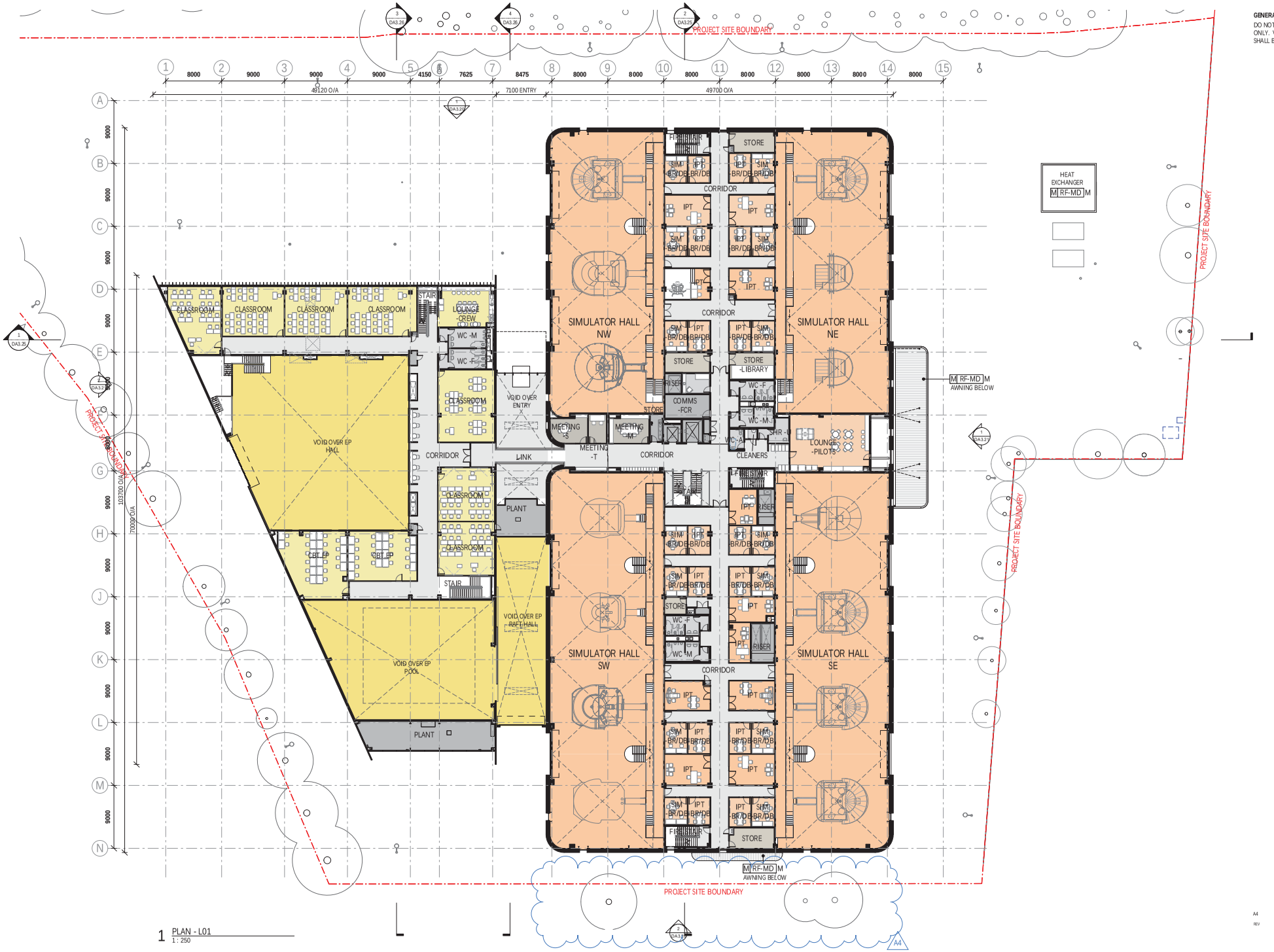
297 KING STREET MASCOT

1:250@A1, 50%@A3

PLAN - SITE & GROUND FLOOR
QGFT - GENERAL ARRANGEMENT

A2
NGA-S1822-DWG-DA3.01



1 PLAN - L01
1 : 250

GENERAL NOTES
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REV	REASON FOR ISSUE	DATE
A4	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277 | T 61 3 9650 5889 | melbourne@noxongiffen.com
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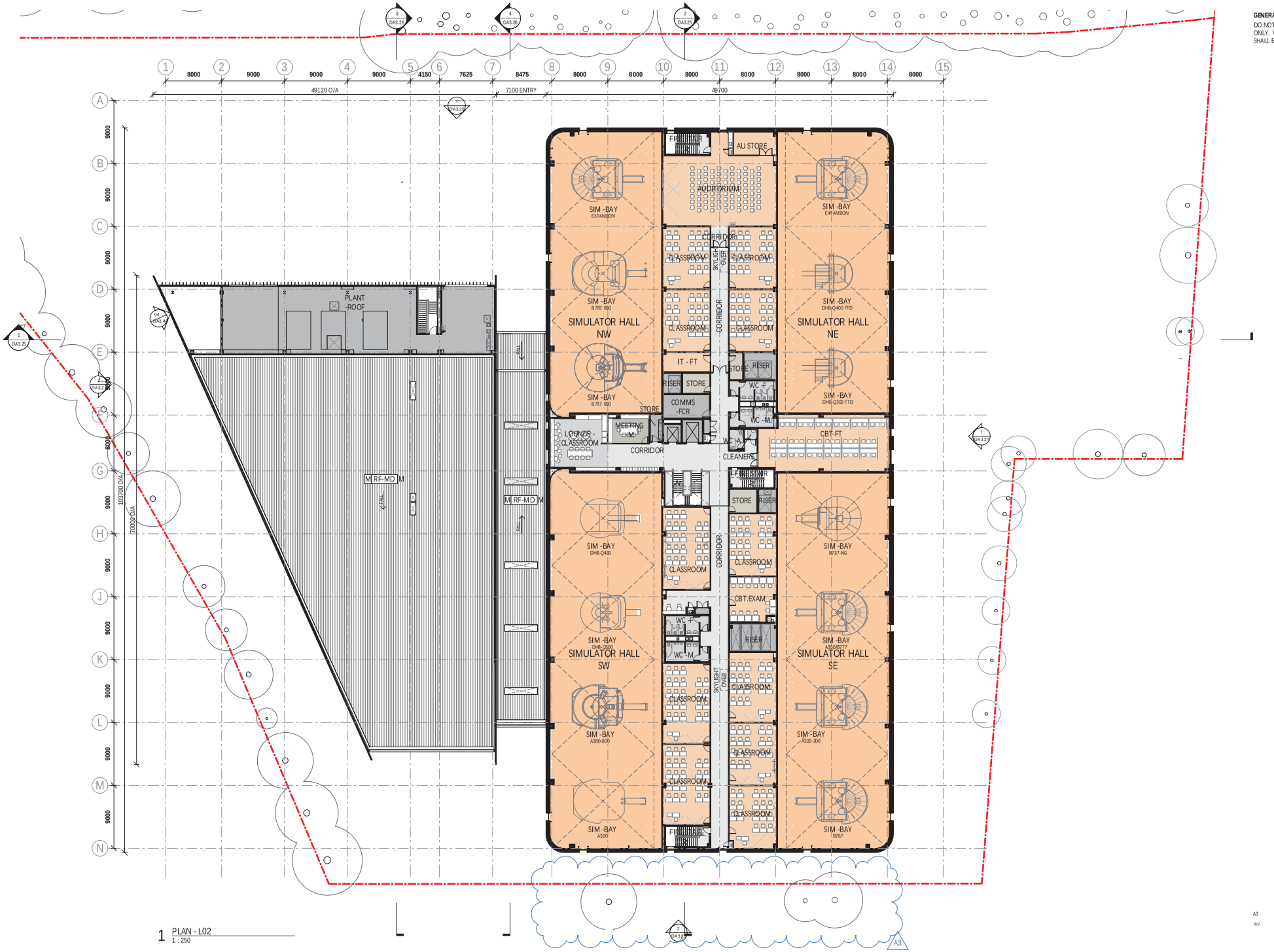
297 KING STREET MASCOT

1:250@A1, 50%@A3

PLAN - LEVEL 1
QGFT - GENERAL ARRANGEMENT

A4
NGA-S1822-DWG-DA3.02



1 PLAN - L02
1 : 250

GENERAL NOTES
DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

A3 - KING ST. TREES AMENDED

REV	REASON FOR ISSUE	DATE
A3	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
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Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
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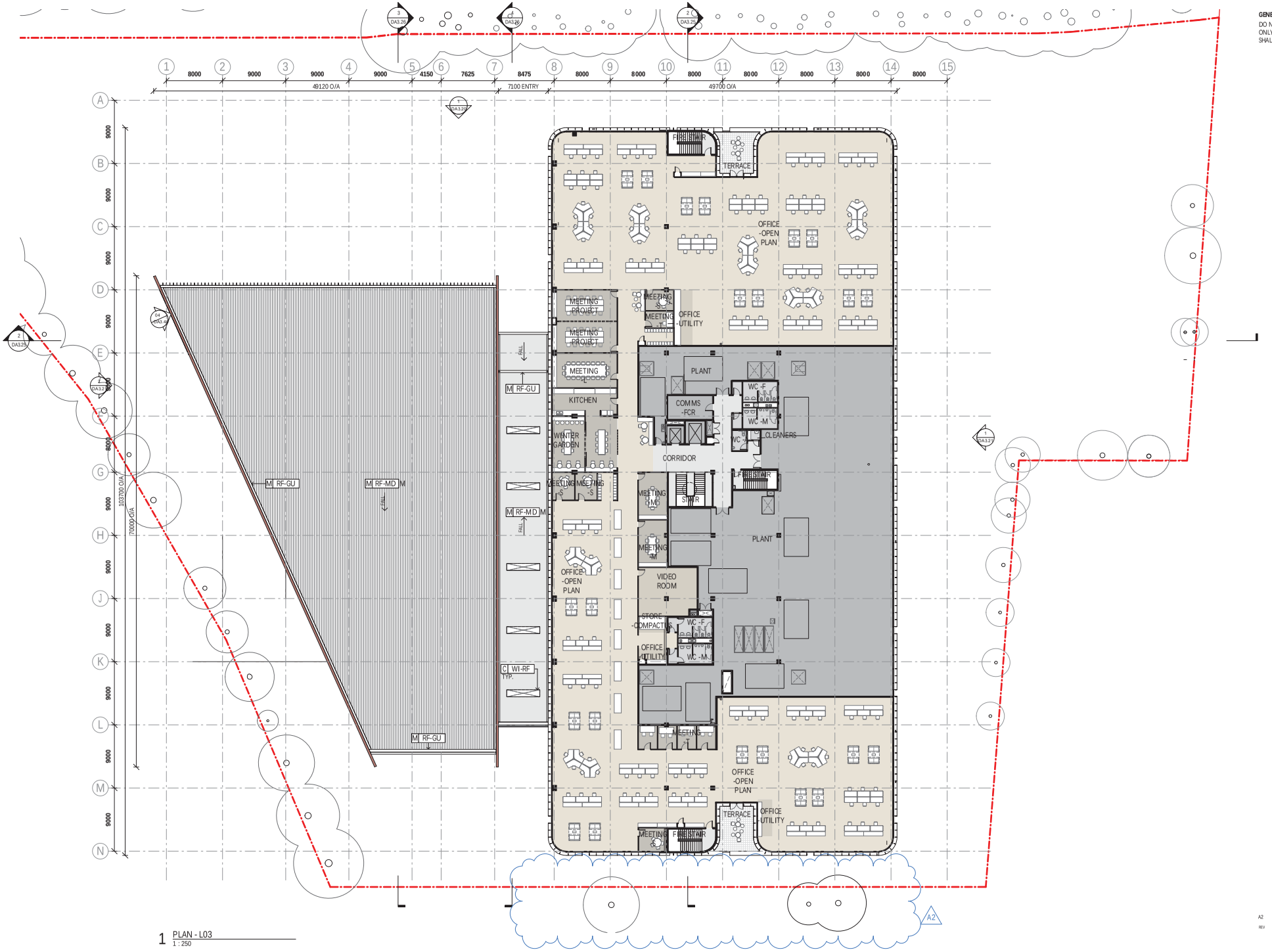
297 KING STREET MASCOT

1:250@A1, 50%@A3

PLAN - LEVEL 2
QGFT - GENERAL ARRANGEMENT

A3
NGA-S1822-DWG-DA3.03



1 PLAN - L03
1 : 250

GENERAL NOTES

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REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

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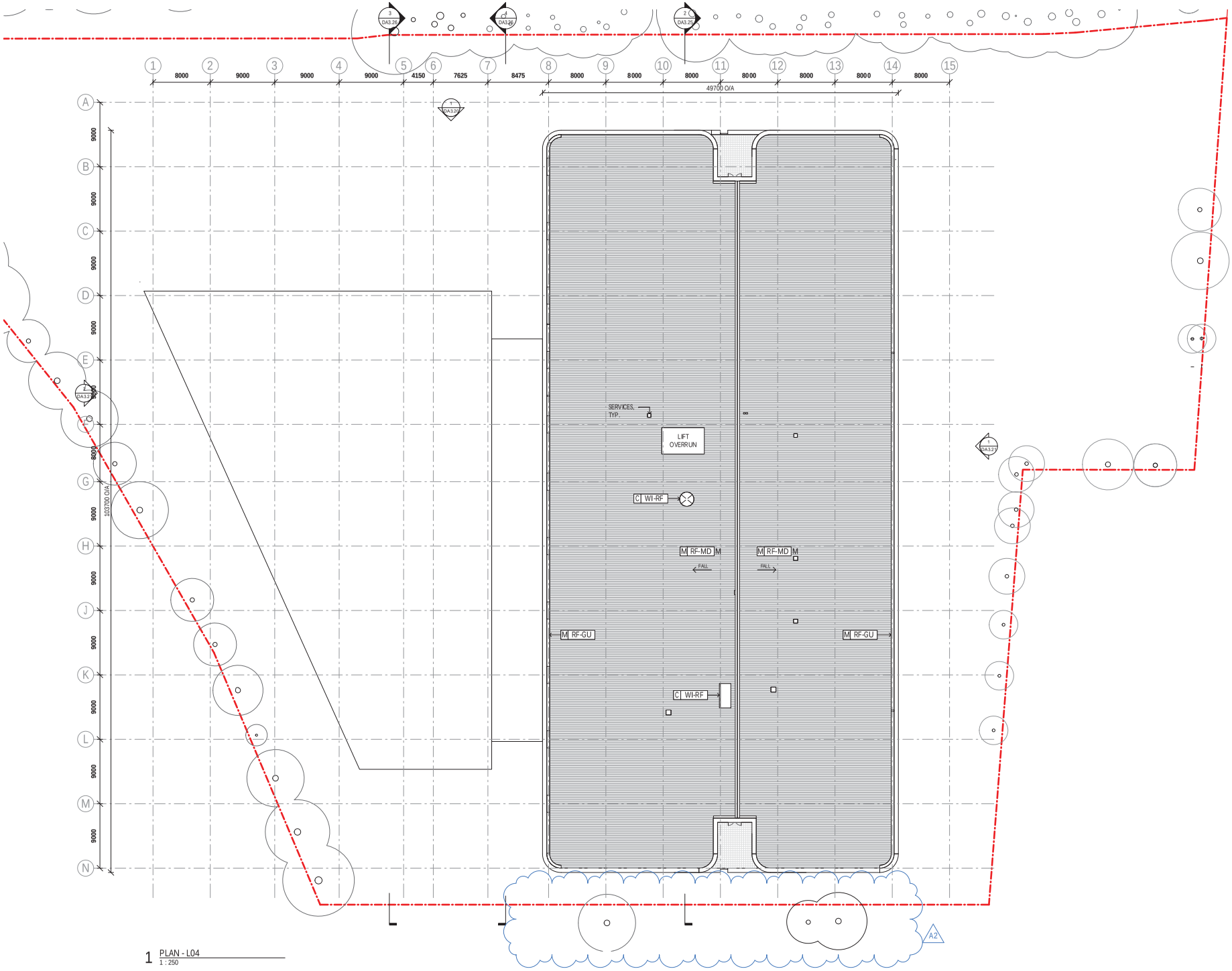
297 KING STREET MASCOT

1:250@A1, 50%@A3

PLAN - LEVEL 3
QGFT - GENERAL ARRANGEMENT

A2
NGA-S1822-DWG-DA3.04



1 PLAN - L04
1 : 250

GENERAL NOTES

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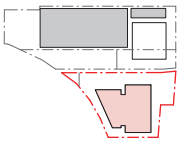
A2 -KING ST.TREES AMENDED



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

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QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

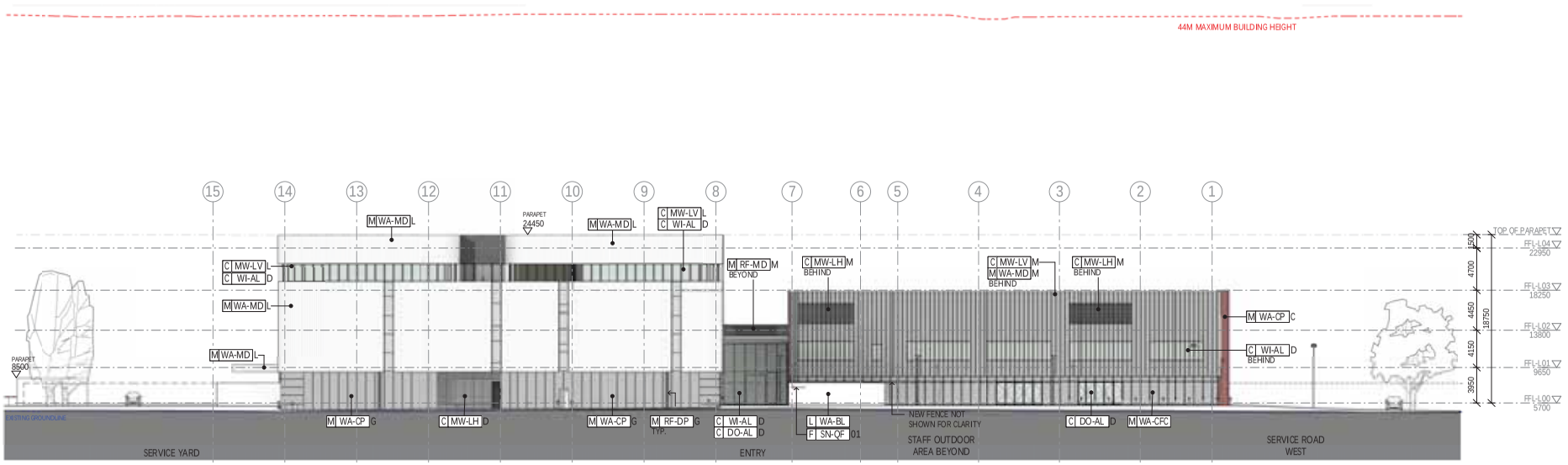
1:250@A1, 50%@A3

PLAN - ROOF
QGFT - GENERAL ARRANGEMENT

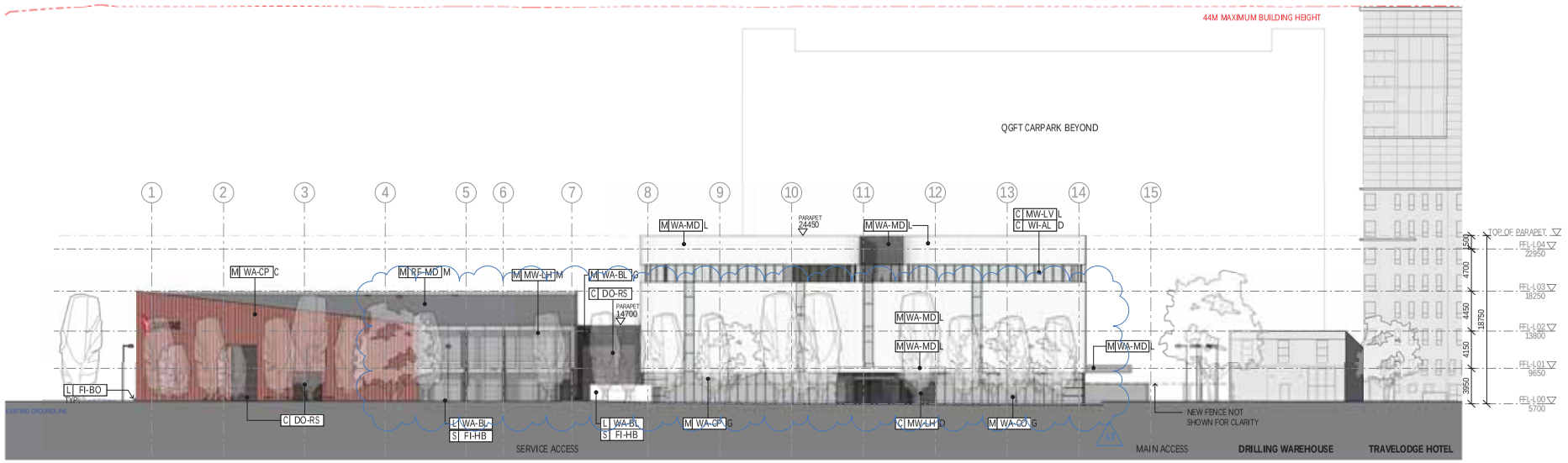
A2
NGA-S1822-DWG-DA3.10

GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



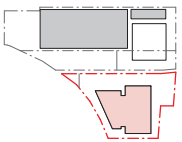
1 ELEVATION - NORTH
1 : 250



2 ELEVATION - SOUTH
1 : 250

EXISTING BOUNDARY FENCELINE NOT SHOWN FOR CLARITY

A3 - KING ST. TREES AMENDED



REV	REASON FOR ISSUE	DATE
A3	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
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| ABN 54 109 252 360 | www.noxongiffen.com

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QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

2.5 5 12.5

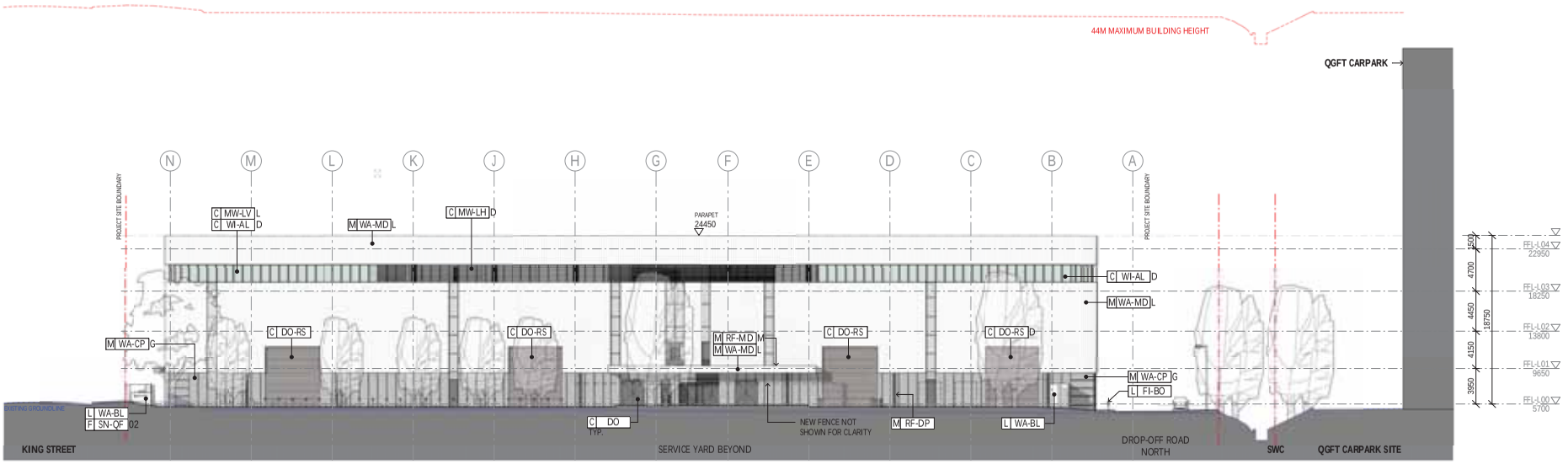
1:250@A1, 50%@A3

ELEVATIONS - NORTH & SOUTH
QGFT - GENERAL ARRANGEMENT

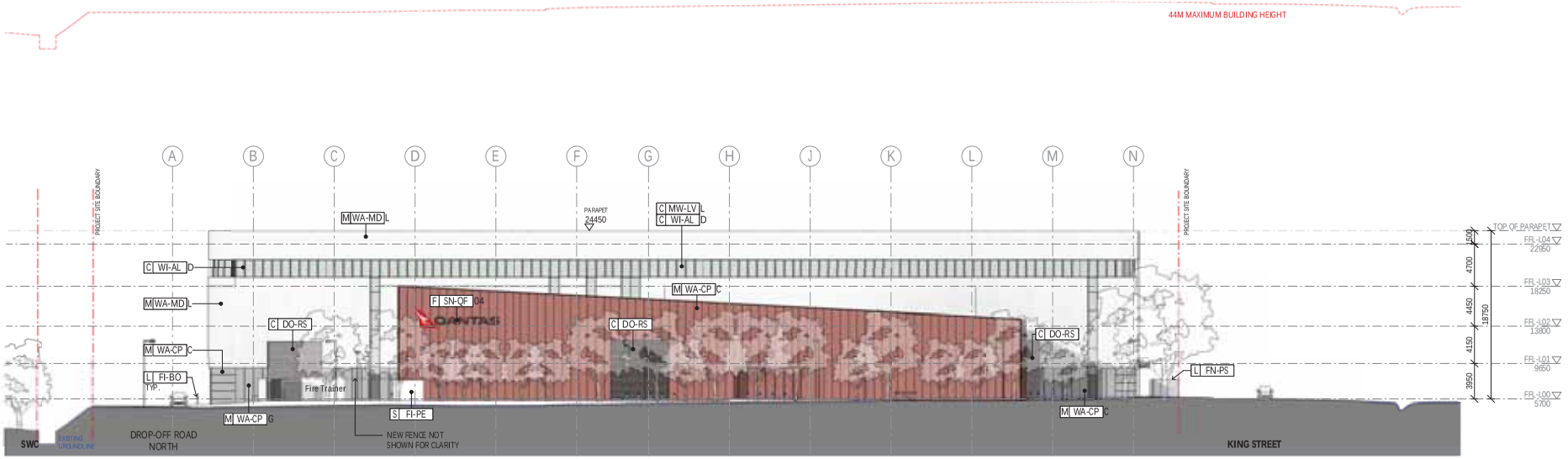
A3
NGA-S1822-DWG-DA3.20

GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



1 ELEVATION - EAST
1 : 250
EXISTING BOUNDARY FENCELINE NOT SHOWN FOR CLARITY



2 ELEVATION - WEST
1 : 250
EXISTING BOUNDARY FENCELINE NOT SHOWN FOR CLARITY

REV	REASON FOR ISSUE	DATE
A2	SSD APPLICATION	2019.05.29

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277 | T 61 3 9650 5889 | melbourne@noxongiffen.com

| ABN 54 109 252 360 | www.noxongiffen.com

QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:250@A1, 50%@A3

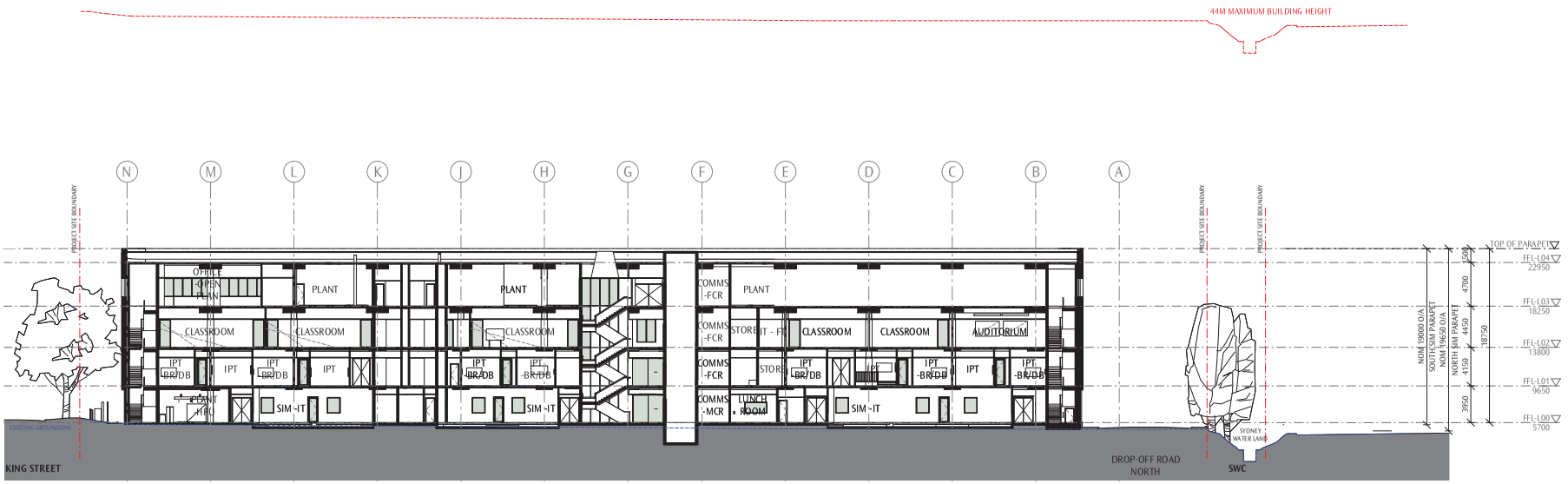
ELEVATIONS - EAST & WEST
QGFT - GENERAL ARRANGEMENT

A2
NGA-S1822-DWG-DA3.21

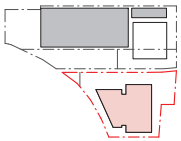
GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

1 SECTION A
1 : 250



2 SECTION B
1 : 250



A1	SSD APPLICATION	2019.04.11
REV	REASON FOR ISSUE	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277 | T 61 3 9650 5889 | melbourne@noxongiffen.com
ABN 54 109 252 360 | www.noxongiffen.com

QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

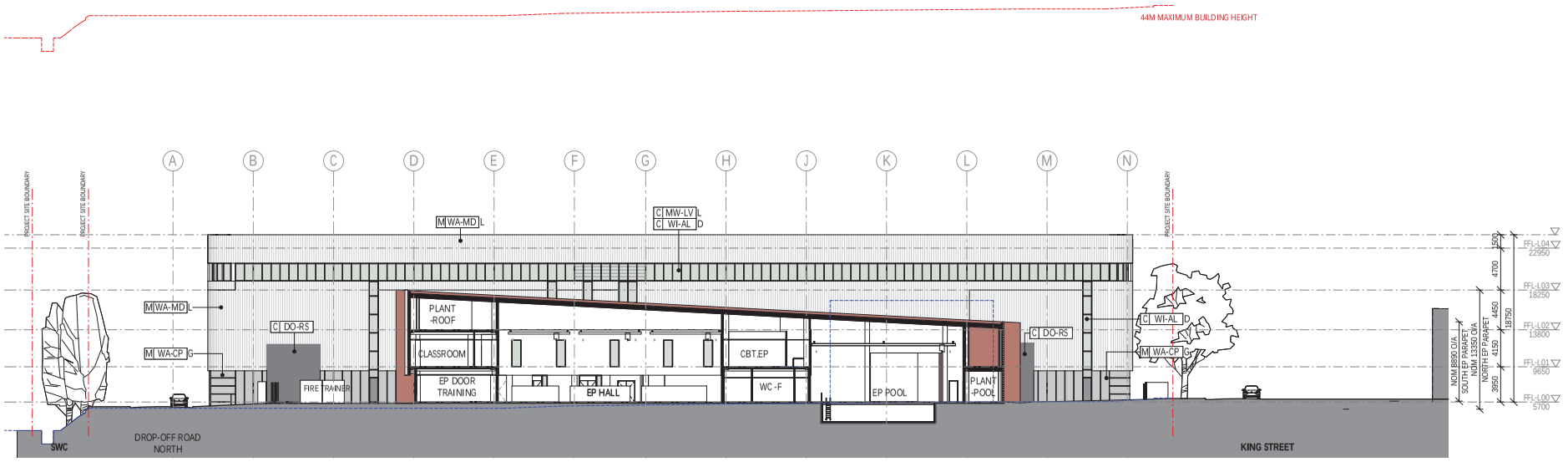
1:250@A1, 50%@A3

SECTIONS
QGFT - GENERAL ARRANGEMENT

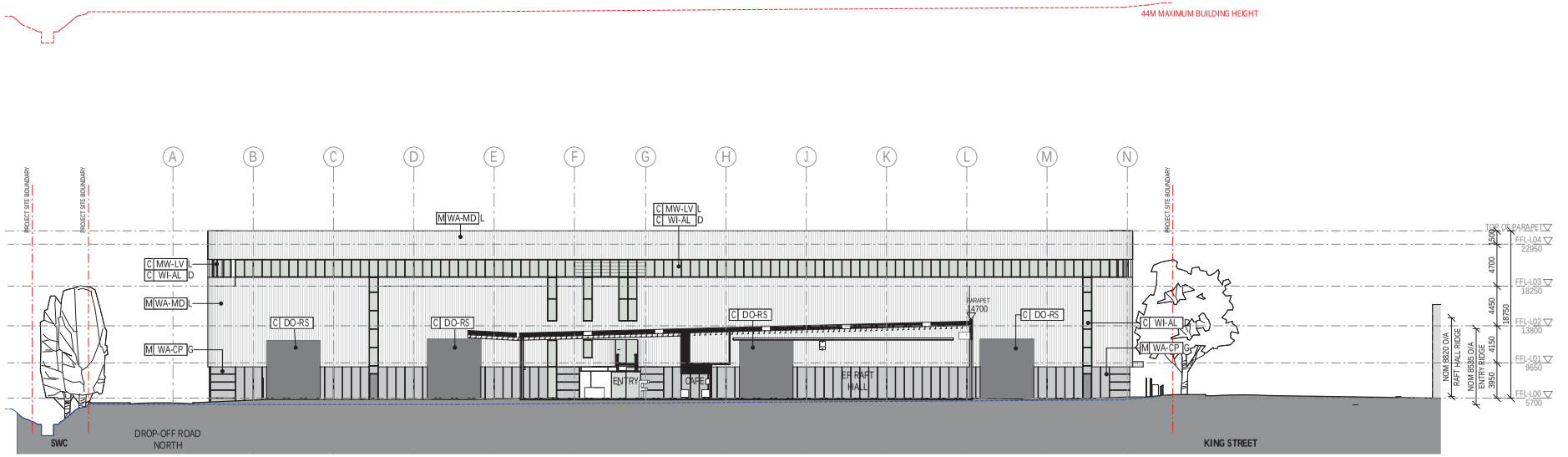
A1
NGA-S1822-DWG-DA3.25

GENERAL NOTES

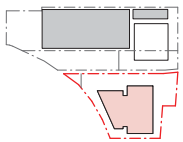
DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



3 SECTION C
1 : 250



4 SECTION D
1 : 250



REV	REASON FOR ISSUE	DATE
A2	SSD APPLICATION	2019.05.29

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
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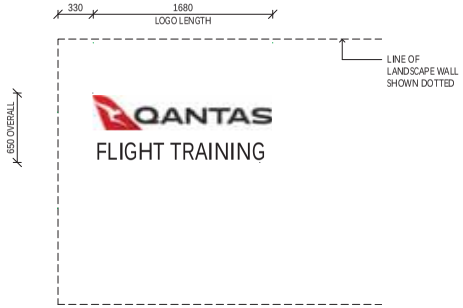
QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:250@A1, 50%@A3

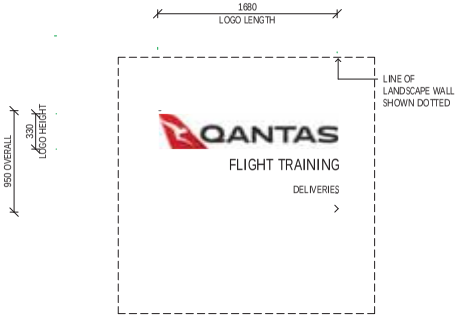
SECTIONS
QGFT - GENERAL ARRANGEMENT

A2
NGA-S1822-DWG-DA3.26



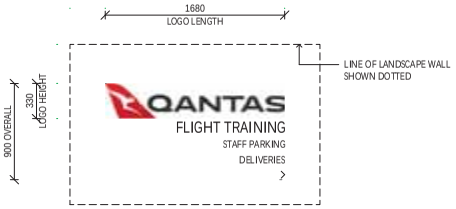
01 DETAIL ELEVATION - F-SN-QF/01 - NORTH ROAD
1 : 25

EXTERNAL BUILDING IDENTIFICATION SIGN
- EXTERNAL ILLUMINATION



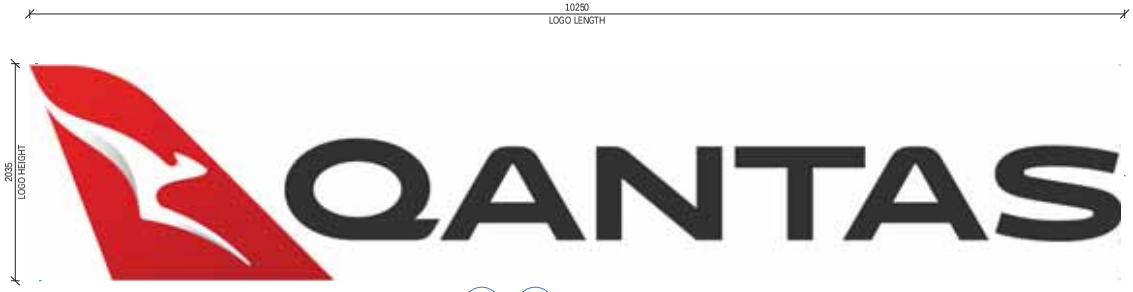
02 DETAIL ELEVATION - F-SN-QF/02 - KING STREET
1 : 25

EXTERNAL WAYFINDING SIGN
- EXTERNAL ILLUMINATION



03 DETAIL ELEVATION - F-SN-QF/03 - KING STREET
1 : 25

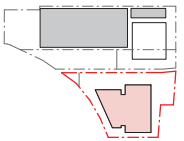
EXTERNAL WAYFINDING SIGN
- EXTERNAL ILLUMINATION



04 DETAIL ELEVATION - SI-SN-QF/04 - QGFT FACADE WEST, CARPARK FACADE SOUTH & WEST
1 : 25

EXTERNAL IDENTITY SIGN
- INTERNAL ILLUMINATION

A3 - CARPARK SIGNAGE DIRECTION AMENDED



REV	REASON FOR ISSUE	DATE
A3	SSD RESPONSE TO SUBMISSIONS	2019.07.30

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
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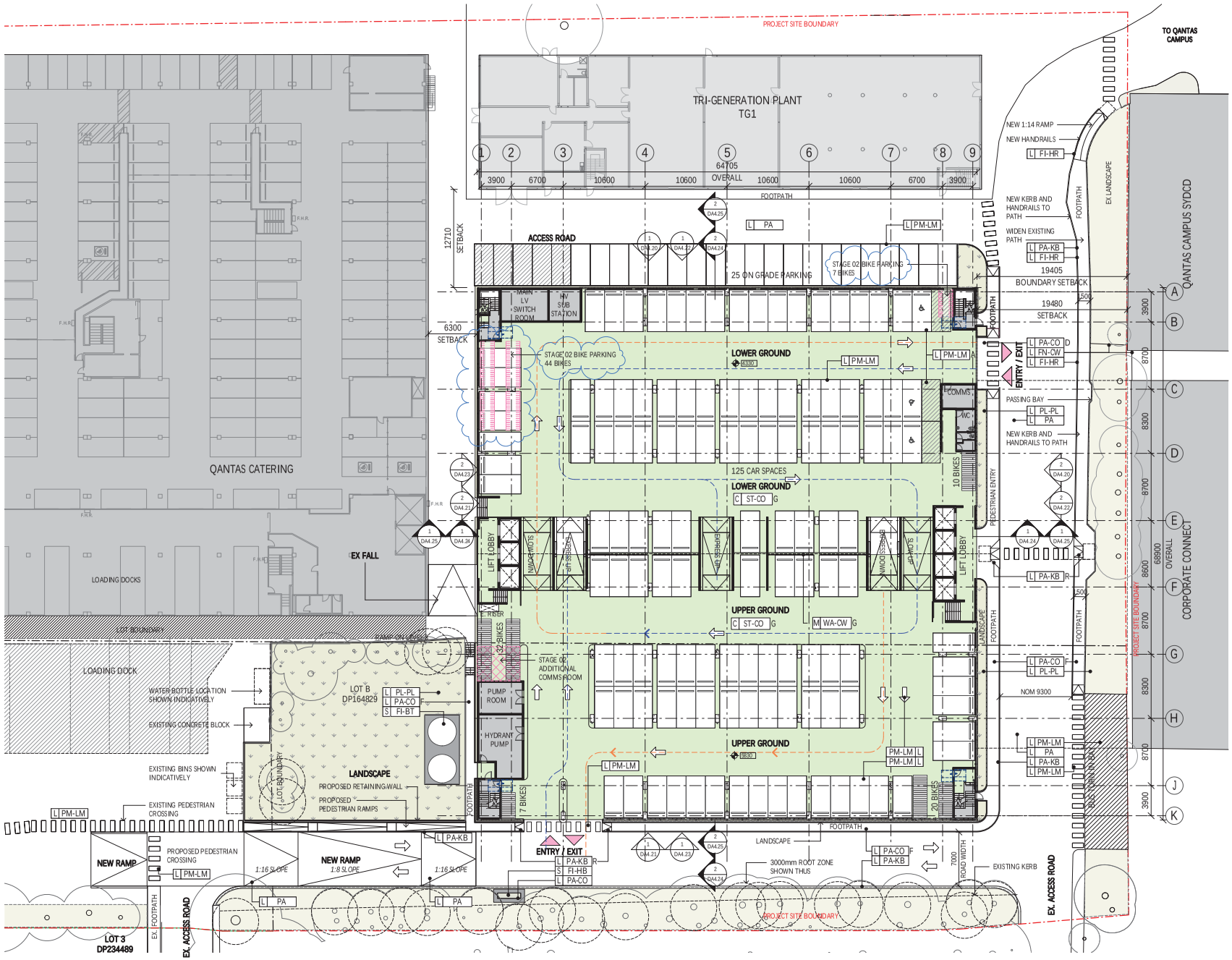
| ABN 54 109 252 360 | www.noxongiffen.com

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:25@A1, 50%@A3

SIGNAGE
QGFT - DETAILS

A3
NGA-S1822-DWG-DA3.40



GENERAL NOTES

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LANDSCAPE

- EXISTING
- PROPOSED

TREES

- EXISTING
- DEMOLISH
- PROPOSED

NUMBER OF CARPARKS & AREA STAGE 01

Level	Floor Area	On Grade Parking	Incremental Car Spaces	Cumulative Car Space
GROUND LEVEL	4292 m²	25	125	150
LEVEL - 01	4304 m²	0	145	295
LEVEL - 02	4304 m²	0	147	442
LEVEL - 03	4304 m²	0	147	589
LEVEL - 04	4304 m²	0	159	748

TOTAL AREA:
LEVELS IN 21508 m²
TOTAL: 5

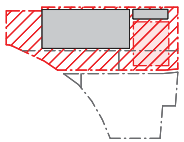
NUMBER OF CARPARKS & AREA STAGE 02

Level	Floor Area	On Grade Parking	Incremental Car Spaces	Cumulative Car Space
GROUND LEVEL	4292 m²	25	121	146
LEVEL - 01	4304 m²	0	145	291
LEVEL - 02	4304 m²	0	147	438
LEVEL - 03	4304 m²	0	147	585
LEVEL - 04	4304 m²	0	147	732
LEVEL - 05	4304 m²	0	147	879
LEVEL - 06	4304 m²	0	147	1026
LEVEL - 07	4304 m²	0	147	1173
LEVEL - 08	4304 m²	0	147	1320
LEVEL - 09	4304 m²	0	147	1467
LEVEL - 10	4304 m²	0	147	1614
LEVEL - 11	4304 m²	0	147	1761
LEVEL - 12	4304 m²	0	147	1908
LEVEL - 13	4304 m²	0	151	2059

TOTAL AREA:
LEVELS IN 60244 m²
TOTAL: 14

BIKE PARKING

STAGE 01	69
STAGE 02	120



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.04.11

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277

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| ABN 54 109 252 360 | www.noxongiffen.com

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

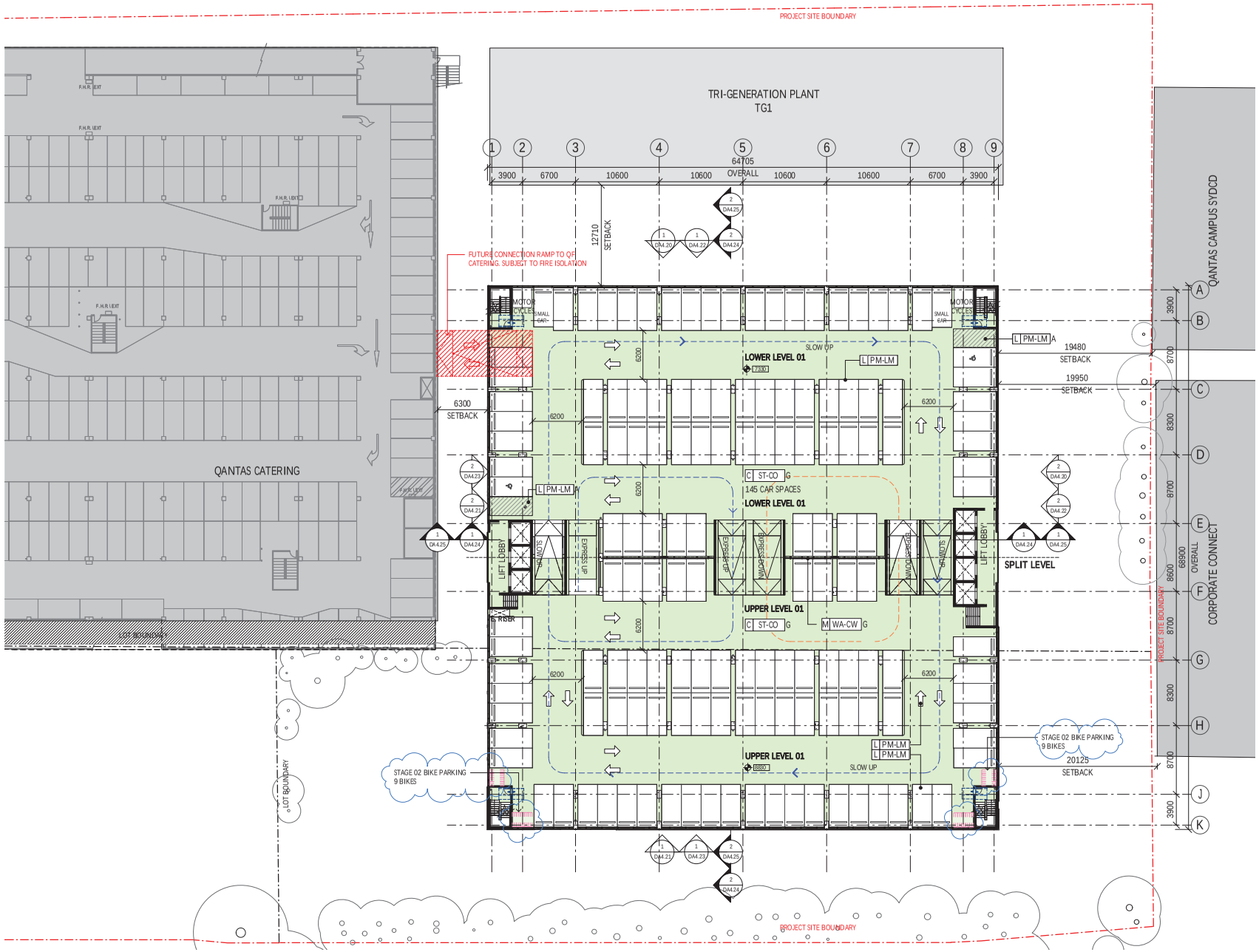
1:250@A1, 50%@A3

PLAN - SITE & GROUND FLOOR
QGFT - C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.01

GENERAL NOTES

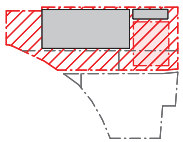
DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



NUMBER OF CARPARKS & AREA STAGE 01				
Level	Floor Area	On Grade Parking	Incremental Car Spaces	Cumulative Car Space
GROUND LEVEL	4292 m²	25	125	150
LEVEL - 01	4304 m²	0	145	295
LEVEL - 02	4304 m²	0	147	442
LEVEL - 03	4304 m²	0	147	589
LEVEL - 04	4304 m²	0	159	748
TOTAL AREA: LEVELS IN TOTAL: 5	21508 m²			

NUMBER OF CARPARKS & AREA STAGE 02				
Level	Floor Area	On Grade Parking	Incremental Car Spaces	Cumulative Car Space
GROUND LEVEL	4292 m²	25	121	146
LEVEL - 01	4304 m²	0	145	291
LEVEL - 02	4304 m²	0	147	438
LEVEL - 03	4304 m²	0	147	585
LEVEL - 04	4304 m²	0	147	732
LEVEL - 05	4304 m²	0	147	879
LEVEL - 06	4304 m²	0	147	1026
LEVEL - 07	4304 m²	0	147	1173
LEVEL - 08	4304 m²	0	147	1320
LEVEL - 09	4304 m²	0	147	1467
LEVEL - 10	4304 m²	0	147	1614
LEVEL - 11	4304 m²	0	147	1761
LEVEL - 12	4304 m²	0	147	1908
LEVEL - 13	4304 m²	0	151	2059
TOTAL AREA: LEVELS IN TOTAL: 14	60244 m²			

BIKE PARKING	
STAGE 01	69
STAGE 02	120



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.04.11

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724 | T 61 2 9262 9066 | sydney@noxongiffen.com
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ABN 54 109 252 360 | www.noxongiffen.com

QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

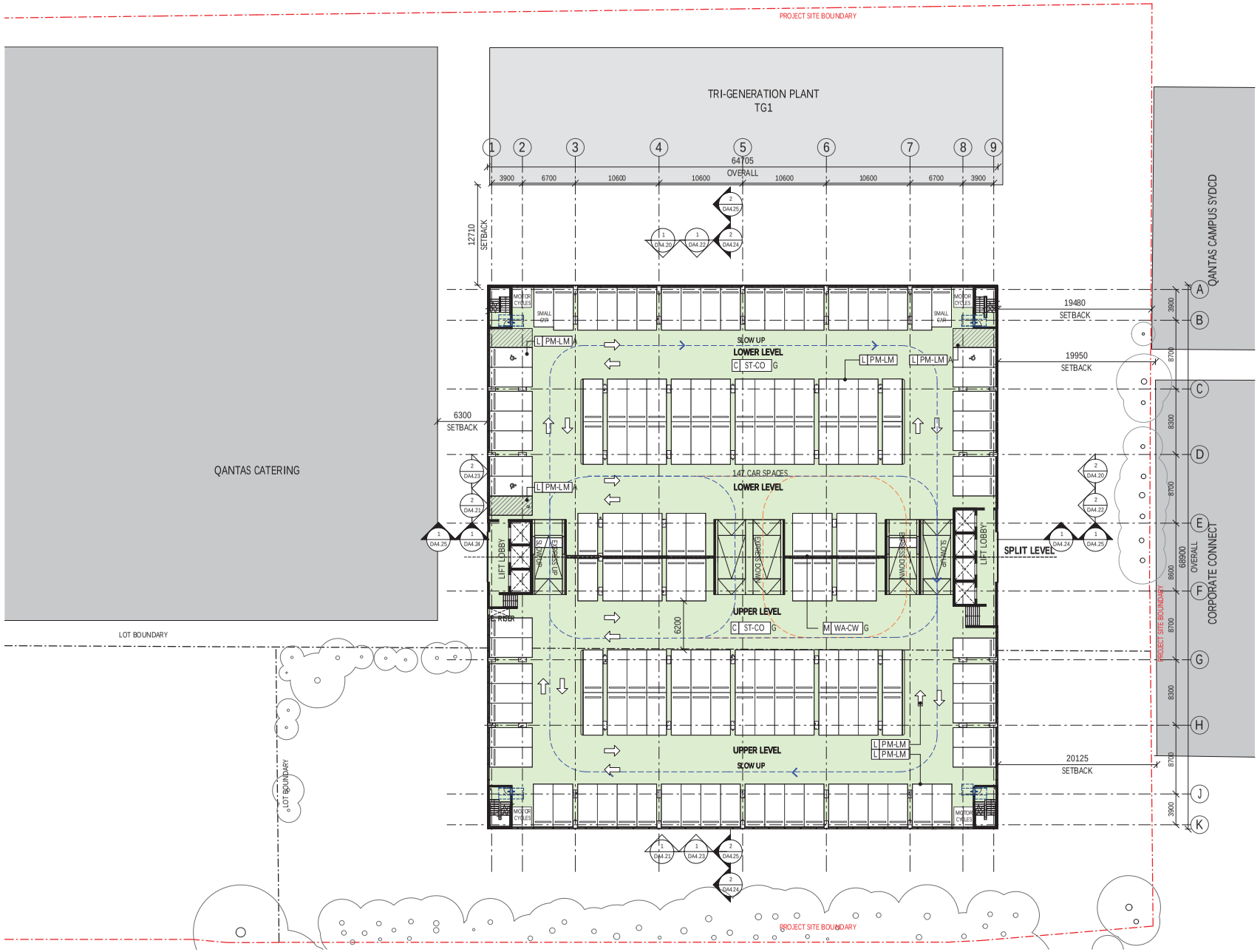
1:250@A1, 50%@A3

PLAN - FIRST FLOOR
QGFT - C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.02

GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



NUMBER OF CARPARKS & AREA STAGE 01

Level	Floor Area	On Grade Parking	Incremental Car Spaces	Cumulative Car Space
GROUND LEVEL	4292 m²	25	125	150
LEVEL - 01	4304 m²	0	145	295
LEVEL - 02	4304 m²	0	147	442
LEVEL - 03	4304 m²	0	147	589
LEVEL - 04	4304 m²	0	159	748

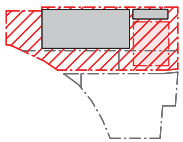
TOTAL AREA:
LEVELS IN 21508 m²
TOTAL: 5

NUMBER OF CARPARKS & AREA STAGE 02

Level	Floor Area	On Grade Parking	Incremental Car Spaces	Cumulative Car Space
GROUND LEVEL	4292 m²	25	121	146
LEVEL - 01	4304 m²	0	145	291
LEVEL - 02	4304 m²	0	147	438
LEVEL - 03	4304 m²	0	147	585
LEVEL - 04	4304 m²	0	147	732
LEVEL - 05	4304 m²	0	147	879
LEVEL - 06	4304 m²	0	147	1026
LEVEL - 07	4304 m²	0	147	1173
LEVEL - 08	4304 m²	0	147	1320
LEVEL - 09	4304 m²	0	147	1467
LEVEL - 10	4304 m²	0	147	1614
LEVEL - 11	4304 m²	0	147	1761
LEVEL - 12	4304 m²	0	147	1908
LEVEL - 13	4304 m²	0	151	2059

TOTAL AREA:
LEVELS IN 60244 m²
TOTAL: 14

BIKE PARKING	
STAGE 01	69
STAGE 02	120



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.04.11

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
Sydney - Nominated Architect Darren Giffen ARB NSW 6724
Melbourne - Nominated Architect Justin Noxon ARB VIC 16277

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| T 61 3 9650 5889 | melbourne@noxongiffen.com
| ABN 54 109 252 360 | www.noxongiffen.com

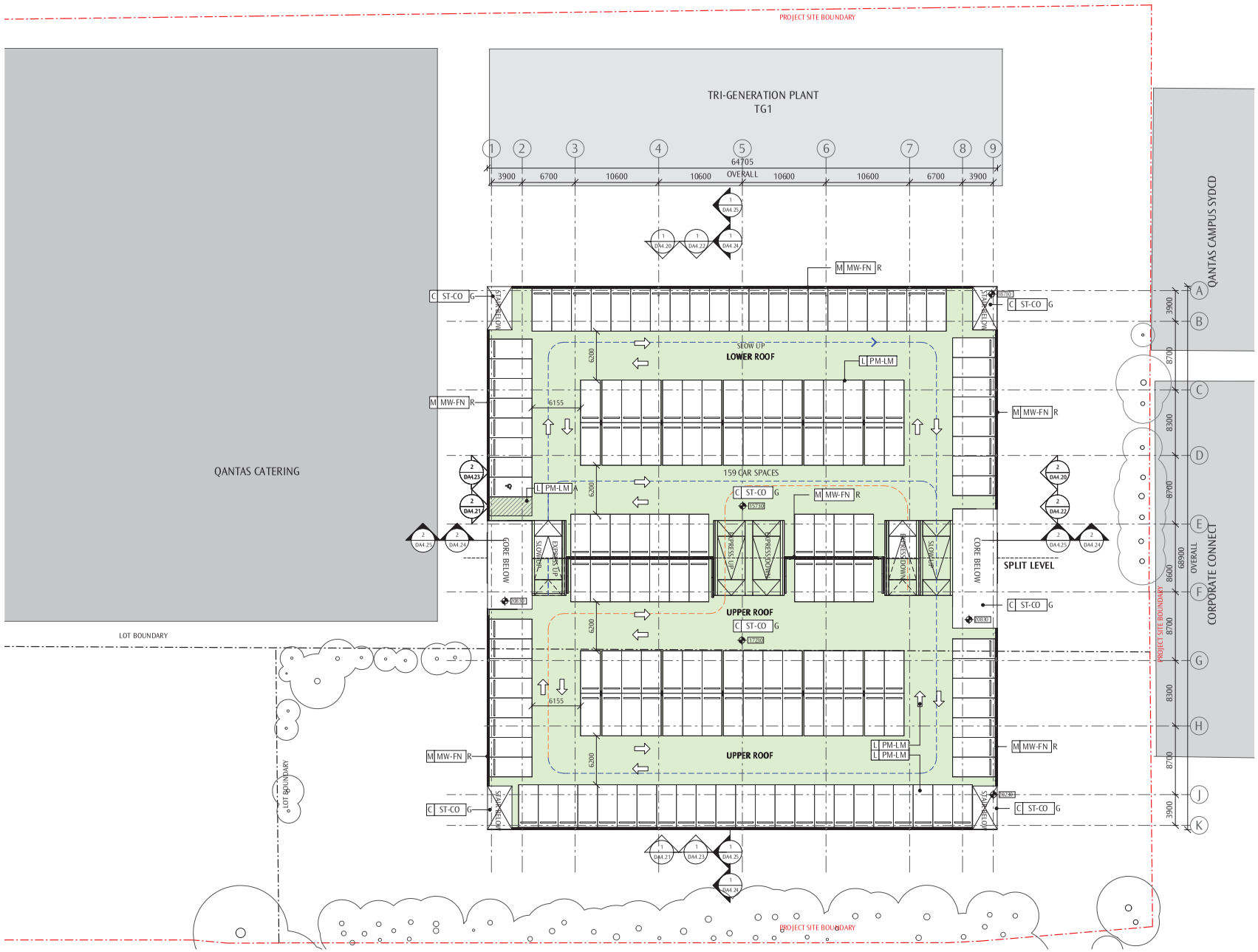
QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:250@A1, 50%@A3

TYPICAL FLOOR
QGFT - C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.03



GENERAL NOTES

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LANDSCAPE

EXISTING

PROPOSED

TREES

EXISTING

DEMOLISH

PROPOSED

NUMBER OF CARPARKS & AREA STAGE 01				
Level	Floor Area	On Grade Parking	Incremental Car Spaces	Cumulative Car Space
GROUND LEVEL	4292 m²	25	125	150
LEVEL - 01	4304 m²	0	145	295
LEVEL - 02	4304 m²	0	147	442
LEVEL - 03	4304 m²	0	147	589
LEVEL - 04	4304 m²	0	159	748

TOTAL AREA:
LEVELS IN 21508 m²
TOTAL: 5

REV	REASON FOR ISSUE	DATE
A1	SSDA APPLICATION	19.04.11

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
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QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

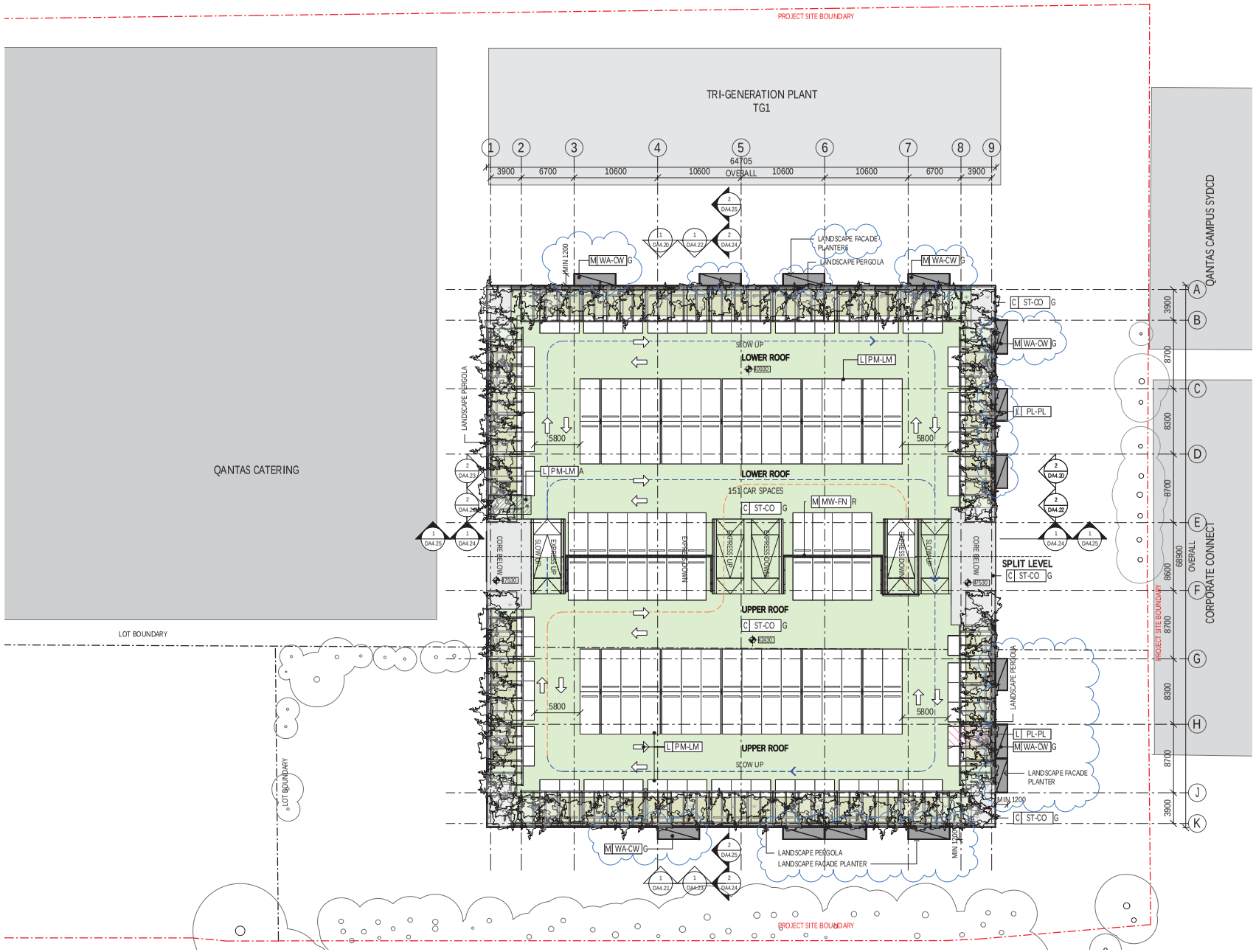
1:250@A1, 50%@A3

ROOF STAGE 01
QGFT - C - GENERAL ARRANGEMENT

A1
NGA-1822-DWG-DA4.10

GENERAL NOTES

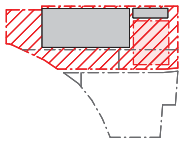
DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



NUMBER OF CARPARKS & AREA STAGE 02				
Level	Floor Area	On Grade Parking	Incremental Car Spaces	Cumulative Car Space
GROUND LEVEL	4292 m²	25	121	146
LEVEL - 01	4304 m²	0	145	291
LEVEL - 02	4304 m²	0	147	438
LEVEL - 03	4304 m²	0	147	585
LEVEL - 04	4304 m²	0	147	732
LEVEL - 05	4304 m²	0	147	879
LEVEL - 06	4304 m²	0	147	1026
LEVEL - 07	4304 m²	0	147	1173
LEVEL - 08	4304 m²	0	147	1320
LEVEL - 09	4304 m²	0	147	1467
LEVEL - 10	4304 m²	0	147	1614
LEVEL - 11	4304 m²	0	147	1761
LEVEL - 12	4304 m²	0	147	1908
LEVEL - 13	4304 m²	0	151	2059

TOTAL AREA:
LEVELS IN TOTAL: 14 — 60244 m²

BIKE PARKING	
STAGE 01	69
STAGE 02	120



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.04.11

PRELIMINARY
NOT FOR CONSTRUCTION

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QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:250@A1, 50%@A3

ROOF STAGE 02
QGFT - C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.11

GENERAL NOTES

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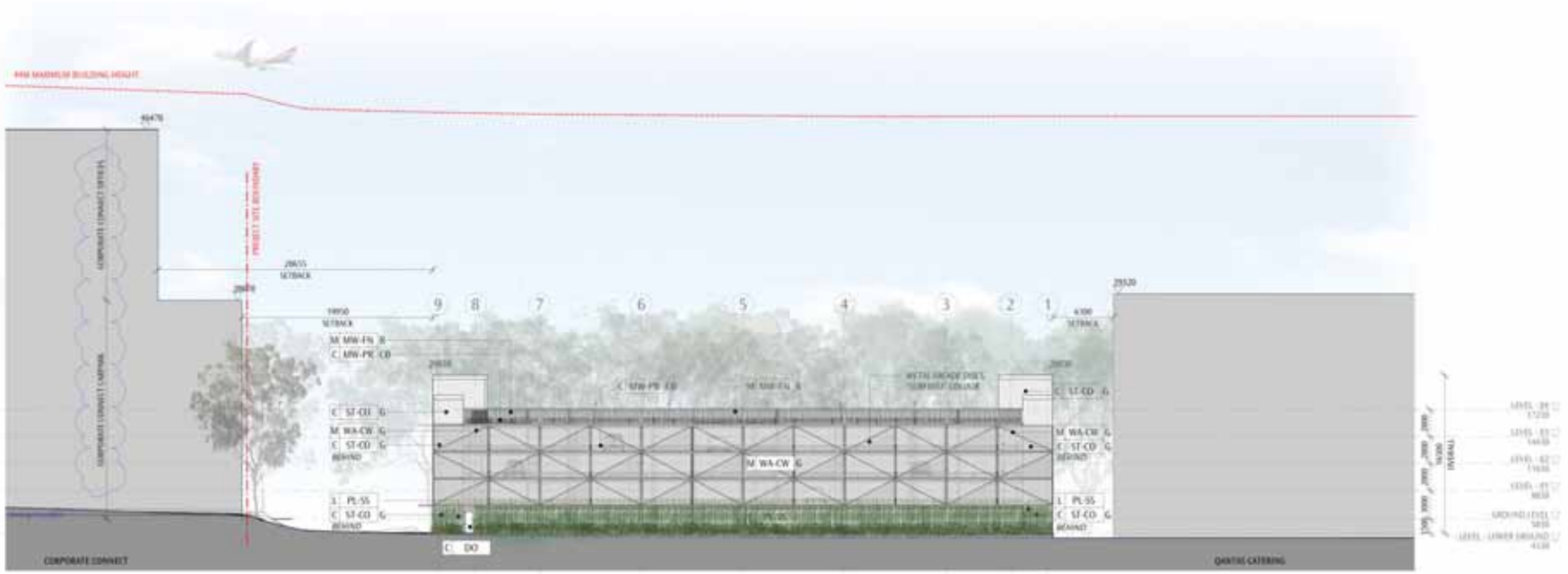
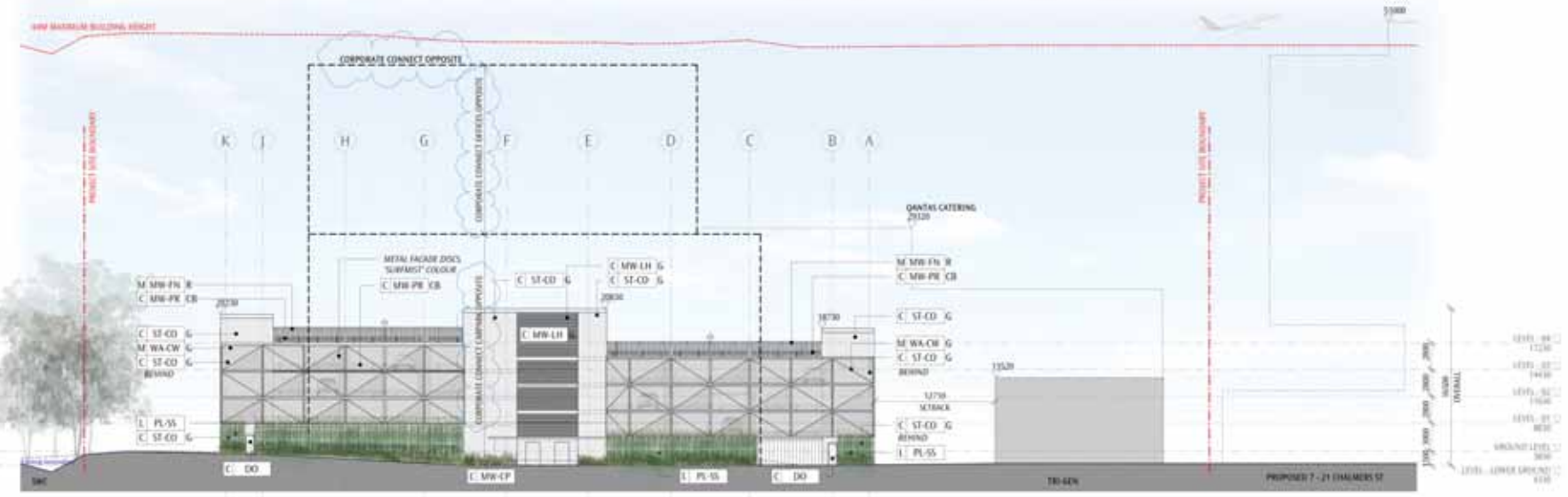
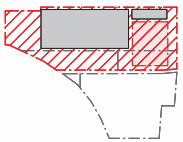


1 NORTH ELEVATION STAGE 01
1 : 250



2 EAST ELEVATION STAGE 01
1 : 250



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.05.24

PRELIMINARY
NOT FOR CONSTRUCTION

noxongiffen
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| ABN 54 109 252 360 | www.noxongiffen.com

QANTAS

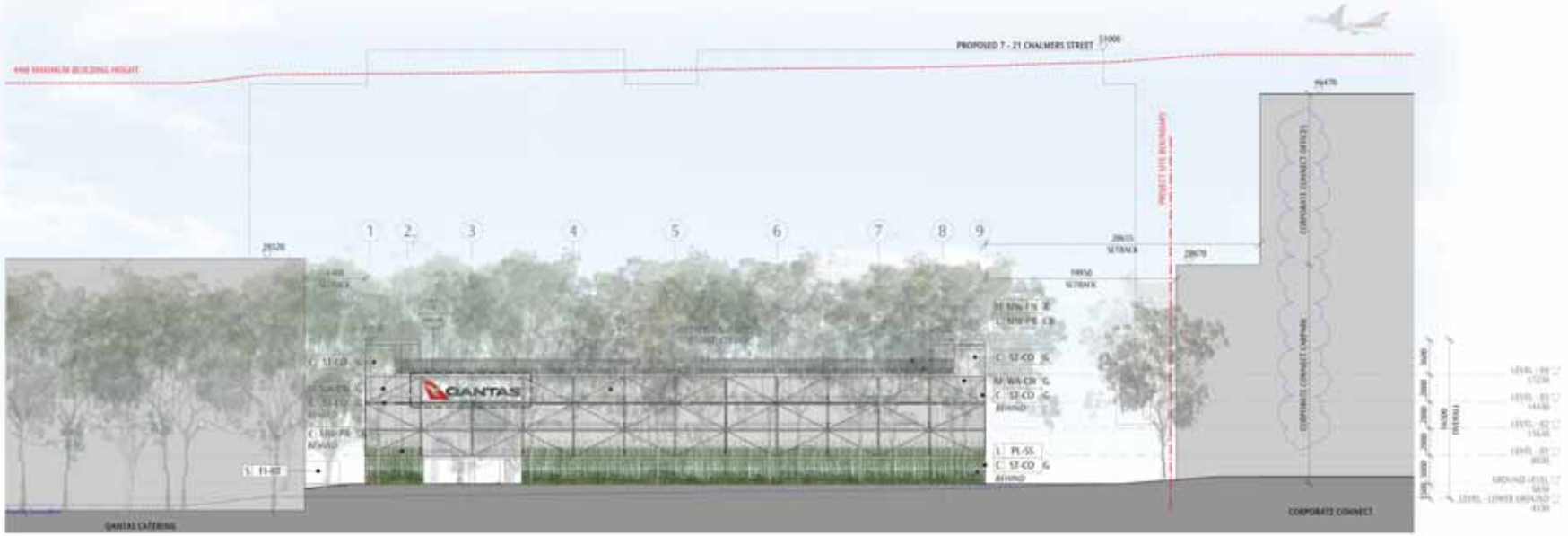
QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:250@A1, 50%@A3

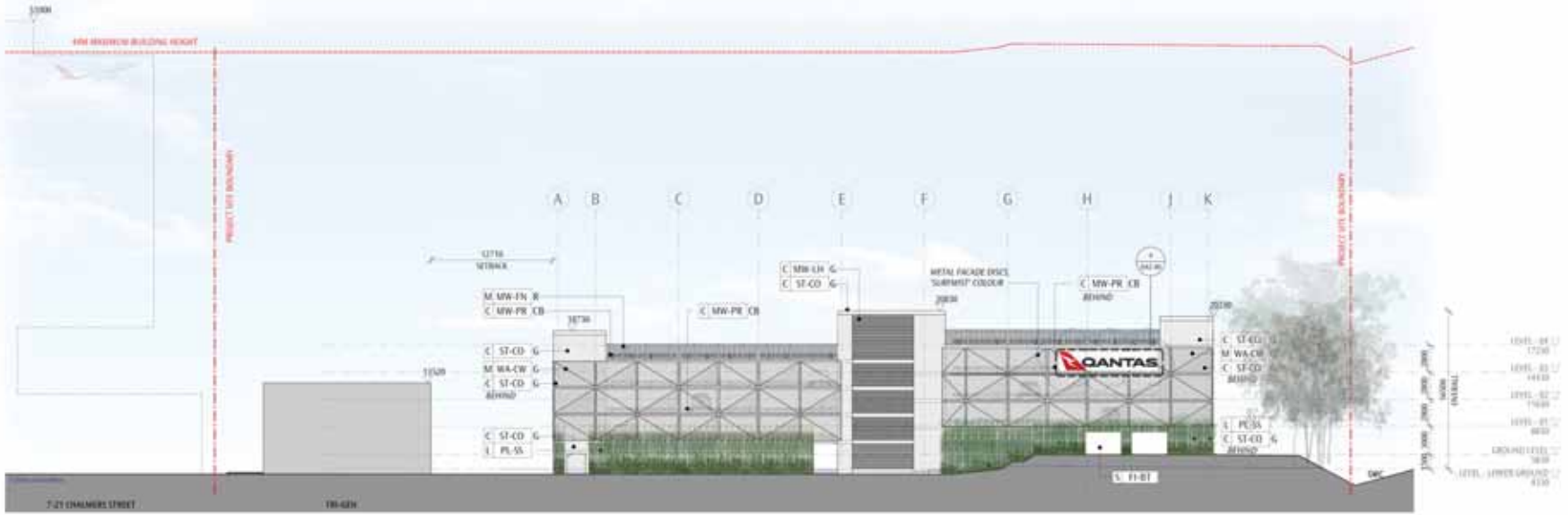
ELEVATIONS STAGE 01
QGFT-C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.20

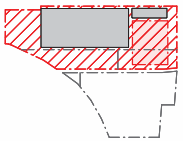
GENERAL NOTES
DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



1 SOUTH ELEVATION STAGE 01
1 : 250



2 WEST ELEVATION STAGE 01
1 : 250



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.05.24

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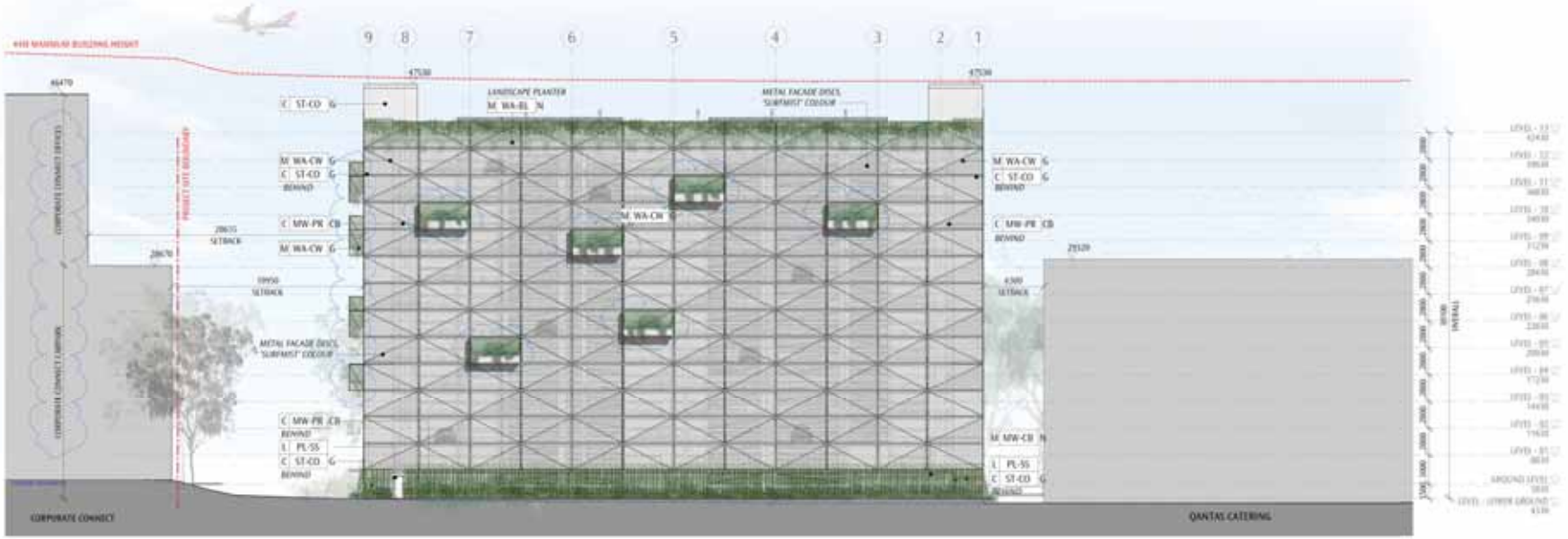
QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:250@A1, 50%@A3

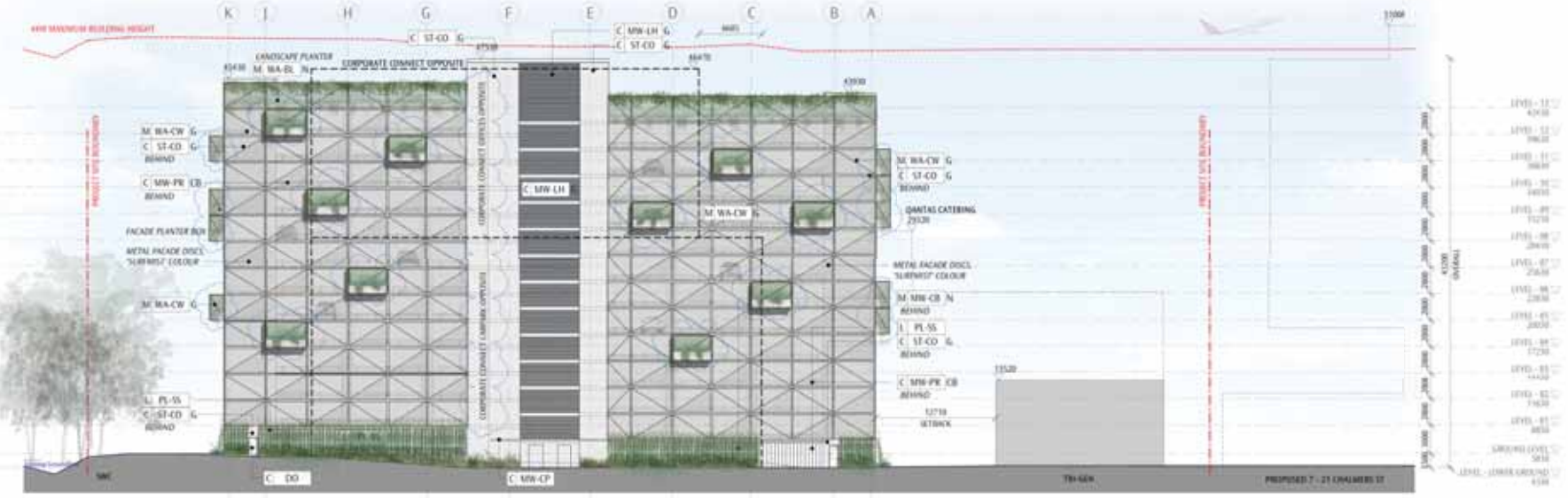
ELEVATIONS STAGE 01
QGFT-C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.21

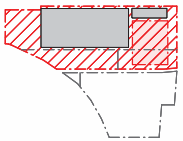
GENERAL NOTES
DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



1 NORTH ELEVATION
1 : 250



2 EAST ELEVATION
1 : 250



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.05.24

PRELIMINARY
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QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

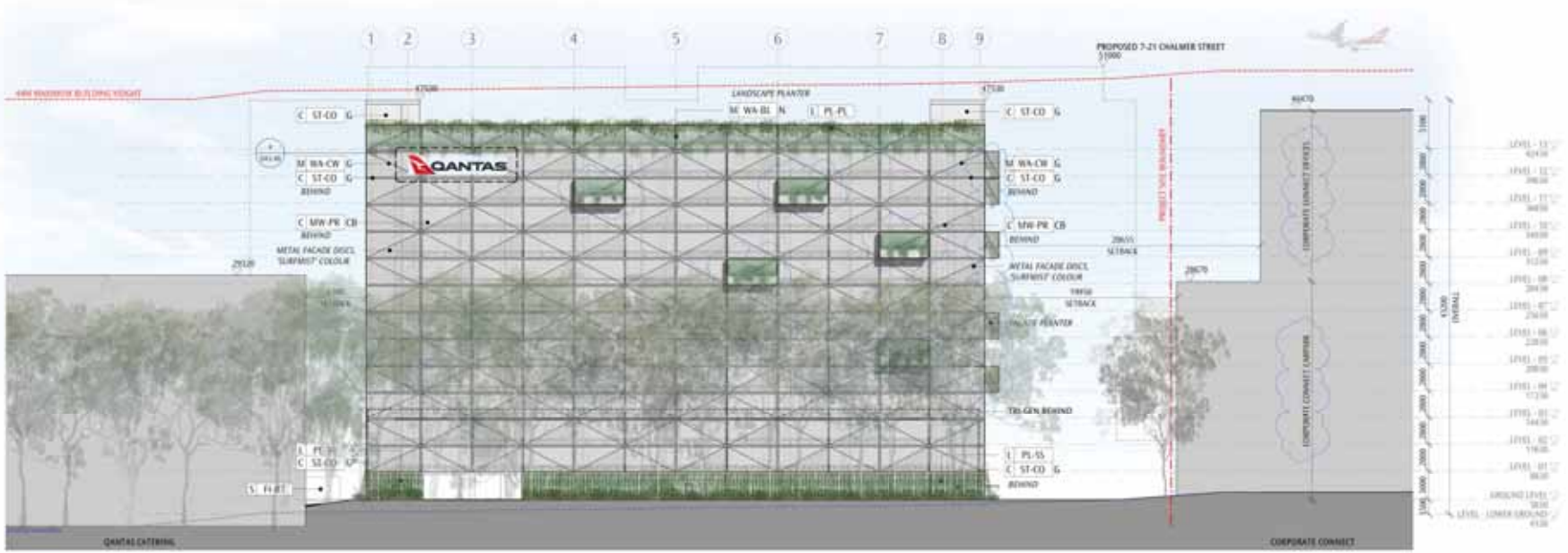
1:250@A1, 50%@A3

ELEVATIONS STAGE 02
QGFT-C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.22

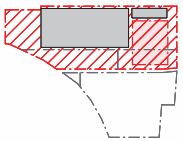
GENERAL NOTES

DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.



1 SOUTH ELEVATION
1 : 250

2 WEST ELEVATION
1 : 250



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.05.24

PRELIMINARY
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QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

1:250@A1, 50%@A3

ELEVATIONS STAGE 02
QGFT-C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.23

GENERAL NOTES

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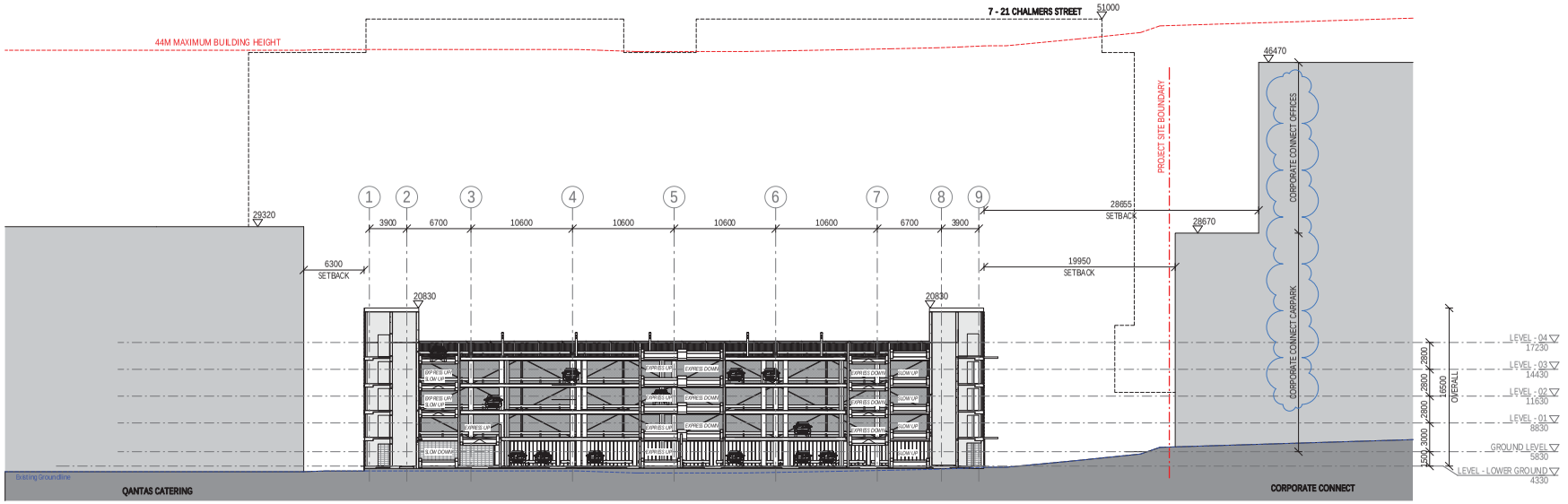
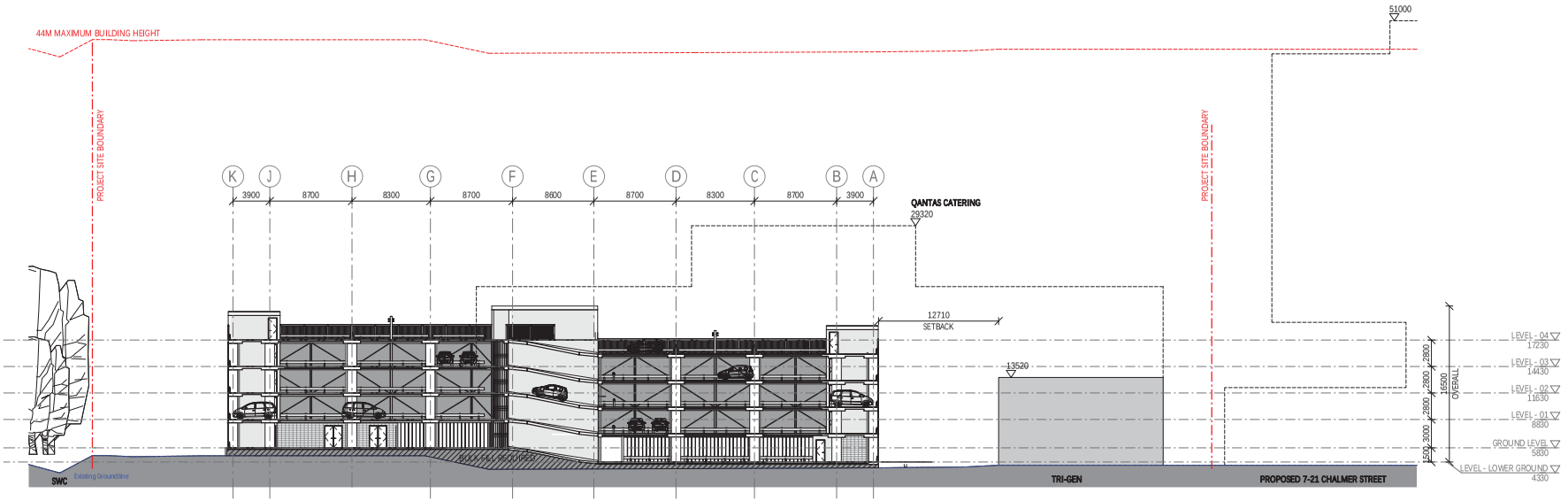
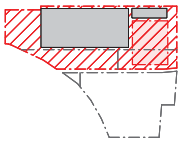


1 SECTION B - STAGE 01
1 : 250



2 SECTION A - STAGE 01
1 : 250



REV	REASON FOR ISSUE	DATE
A2	SSD RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.05.24

PRELIMINARY
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297 KING STREET MASCOT

1:250@A1, 50%@A3

SECTIONS - STAGE 01
QGFT-C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.24

GENERAL NOTES

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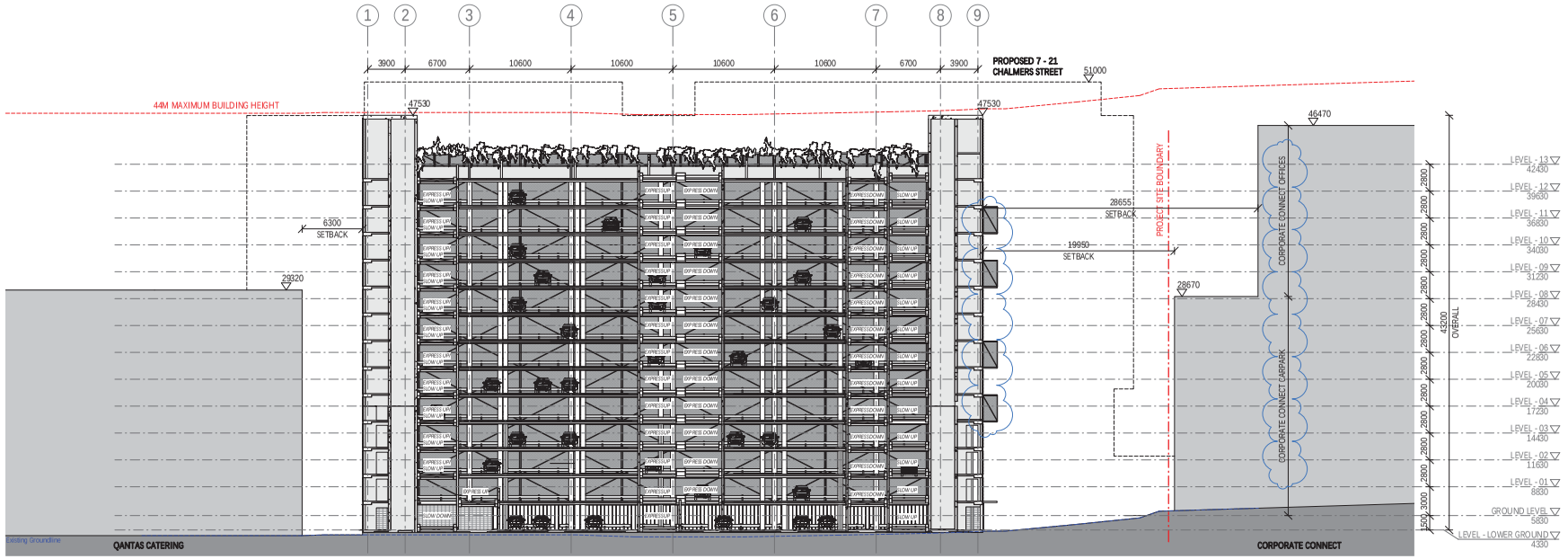
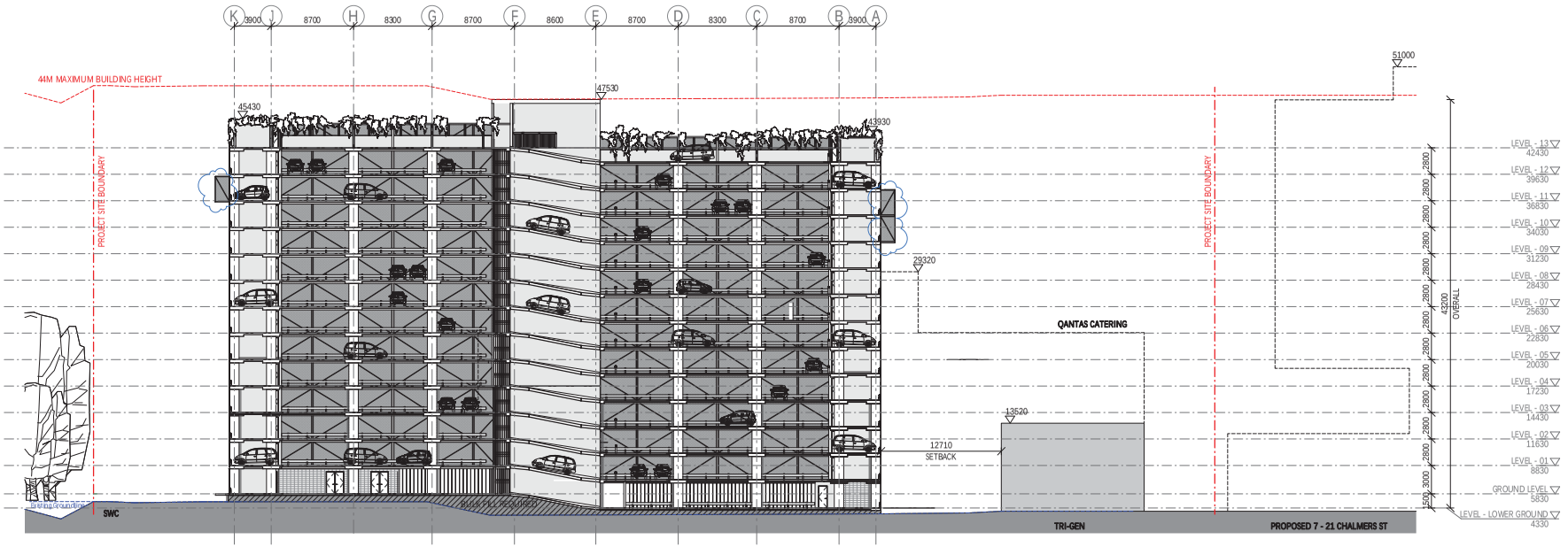
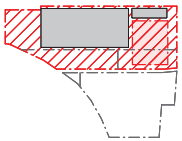


1 SECTION B
1 : 250



2 SECTION A
1 : 250



REV	REASON FOR ISSUE	DATE
A2	RESPONSE TO SUBMISSIONS	19.07.30
A1	SSD APPLICATION	19.05.24

PRELIMINARY
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297 KING STREET MASCOT

1:250@A1, 50%@A3

SECTIONS STAGE 02
QGFT-C - GENERAL ARRANGEMENT

A2
NGA-1822-DWG-DA4.25

REV	REASON FOR ISSUE	DATE
A3	SSD APPLICATION	2019.05.29

PRELIMINARY
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297 KING STREET MASCOT

SOUTH - KING STREET
ARTISTS IMPRESSIONS

A3
NGA-S1822-DWG-DA5.01

REV	REASON FOR ISSUE	DATE
A3	SSD APPLICATION	2019.05.29

PRELIMINARY
NOT FOR CONSTRUCTION

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QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

NORTH
ARTISTS IMPRESSIONS

A3
NGA-S1822-DWG-DA5.02

PRELIMINARY
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QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT |

WEST - QANTAS DRIVE |
ARTISTS IMPRESSIONS |

A2
NGA-S1822-DWG-DA5.03

REV	REASON FOR ISSUE	DATE
A1	SSD APPLICATION	2019.05.29

PRELIMINARY
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QANTAS

QANTAS GROUP FLIGHT TRAINING CENTRE
297 KING STREET MASCOT

CARPARK
ARTISTS IMPRESSIONS

A1
NGA-S1822-DWG-DA5.04

Appendix C – Summary of Groundwater Analytical Results

10026439
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297 King St, Mascot NSW 2020

			PAH/Phenols	SVOCs																Inorganics	PFOS/PFOA																									
			Acetophenone	2-(acetylamino) fluorene	3,3-Dichlorobenzidine	4-(dimethylamino) azobenzene	4-bromophenyl phenyl ether	4-chlorophenyl phenyl ether	4-Nitroquinoline-N-oxide	Azobenzene	Bis(2-chloroethoxy) methane	Bis(2-chloroethyl)ether	Dibenzofuran	Hexachloropropene	Methapyrilene	N-nitrosomorpholine	N-nitrosopiperidine	N-nitrosopyrrolidine	Phenacetin	Ammonia as N	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	N-Methylperfluorooctanesulfonamidoethanol (N-MeFOSE)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	Perfluorodecanesulfonic acid (PFDS)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorobutane sulfonic acid (PFBS)	Perfluorododecanoic acid (PFDoDA)	Perfluoroheptanoic acid (PFHpA)	Perfluorononanoic acid (PFNA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.02	0.05	0.05	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.05	0.02
ANZG (2018) Marine water 95% toxicant DGVs																				0.91																										
PFAS NEMP 2018 Table 5 Interim marine 95%																																	0.13	220												
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand																																													
2-4m																																													
4-8m																																													
>8m																																													
NEPM 2013 Table 1C GILs, Marine Waters																				0.91																										
Field_ID	**Sampled_Date_Time**	**Lab_Report_Number**																																											
MW01	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	0.03	<0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02
MW02	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	0.43	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	0.03	<0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02
MW03	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	3.27	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02
MW04	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	0.95	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02
MW05	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02
MW06	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02
MW07	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02
MW1	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	6.6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.02	<0.05	<0.02
MW2	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	3.9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	0.07	<0.02	<0.02	<0.05	<0.02
MW3	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	3.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	0.02	0.01	<0.02	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	0.08	<0.02	<0.02	<0.05	<0.02
MW4	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.02	0.03	0.01	0.05	<0.02	0.03	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.05	<0.02

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297 King St, Mascot NSW 2020

						Metals								TPH					TRH							BTEX							MAH									PAH											
		Perfluoroundecanoic acid (PFUnDA)	Sum of PFHxS and PFOS	Sum of PFAS	Sum of PFAS (WA DER List)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)	C6-C9	C10-C14	C15-C28	C29-C36	C10-C36 (Sum of total)	C6-C10	>C6-C10 less BTEX (F1)	C10-C16	>C10-C16 less Naphthalene (F2)	C16-C34	C34-C40	>C10 - C40 (Sum of total)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	Styrene	tert-butylbenzene	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	7,12-dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(e) pyrene	Benzo(a)pyrene TEQ calc (Zero)	Benzo(g,h,i)perylene	Benzo(b+j+k)fluoranthene
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		0.02	0.01	0.01	0.01	1	0.1	1	1	1	0.1	1	5	20	50	100	50	50	20	20	100	100	100	100	100	1	2	2	2	2	2	1	5	5	5	5	5	5	5	5	5	2	2	2	2	2	2	2	2	2	2	4
ANZG (2018) Marine water 95% toxicant DGVs							5.5	4.4	1.3	4.4	0.4	70	15													700																												
PFAS NEMP 2018 Table 5 Interim marine 95%																																																				
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Ir																																																				
2-4m																				6000		NL				5000	NL	NL			NL																						
4-8m																				6000		NL				5000	NL	NL			NL																						
>8m																				7000		NL				5000	NL	NL			NL																						
NEPM 2013 Table 1C GILs, Marine Waters						13	0.7	4.4	1.3	4.4	0.1	7	15													500																												
Field_ID	**Sampled_Date_Time**	**Lab_Report_Number**																																																
MW01	08-Jan-19	ES1900690	<0.02	0.03	0.03	0.03	<1	<0.1	<1	<1	<1	<0.1	5	1180	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW02	08-Jan-19	ES1900690	<0.02	0.03	0.03	0.03	27	<0.1	<1	<1	<1	<0.1	2	20	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW03	08-Jan-19	ES1900690	<0.02	<0.01	<0.01	<0.01	1	<0.1	<1	<1	<1	<0.1	2	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW04	08-Jan-19	ES1900690	<0.02	0.02	0.02	0.02	8	<0.1	<1	<1	<1	<0.1	1	23	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW05	08-Jan-19	ES1900690	<0.02	<0.01	<0.01	<0.01	4	0.7	<1	1	1	<0.1	2	1550	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW06	08-Jan-19	ES1900690	<0.02	<0.01	<0.01	<0.01	<1	<0.1	<1	4	<1	<0.1	<1	304	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW07	08-Jan-19	ES1900690	<0.02	<0.01	<0.01	<0.01	<1	<0.1	<1	<1	<1	<0.1	<1	1660	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW1	19-Feb-19	ES1905103	<0.02	<0.01	0.04	<0.01	<1	<0.1	<1	<1	<1	<0.1	<1	<5	<20	270	860	<50	1130	<20	<20	500	500	620	<100	1120	<1	<2	<2	<2	<2	<2	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW2	19-Feb-19	ES1905103	<0.02	<0.01	0.07	<0.01	<1	<0.1	1	<1	<1	<0.1	<1	6	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	1	<2	<2	<2	<2	<2	1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW3	19-Feb-19	ES1905103	<0.02	0.02	0.11	0.03	<1	<0.1	1	1	2	<0.1	2	10	<20	<50	140	<50	140	<20	<20	<100	110	<100	110	<1	<2	<2	<2	<2	<2	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4
MW4	19-Feb-19	ES1905103	<0.02	0.08	0.15	0.15	4	<0.1	3	<1	<1	<0.1	2	<5	60	<50	<100	<50	<50	60	60	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<5	10	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4

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			Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			2	2	2	2	2	2	2	2	2
ANZG (2018) Marine water 95% toxicant DGVs								70			
PFAS NEMP 2018 Table 5 Interim marine 95%											
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Ir											
2-4m								NL			
4-8m								NL			
>8m								NL			
NEPM 2013 Table 1C GILs, Marine Waters								50			
Field_ID	**Sampled_Date_Time**	**Lab_Report_Number**									
MW01	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW02	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW03	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW04	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW05	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW06	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW07	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW1	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW2	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW3	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW4	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<2

			Phenols											
			2,4,5-trichlorophenol	2,4,6-trichlorophenol	2,4-dichlorophenol	2,4-dimethylphenol	2,6-dichlorophenol	2-chlorophenol	2-nitrophenol	2-methylphenol	3&4-Methylphenol (m&p-cresol)	4-chloro-3-methylphenol	Pentachlorophenol	Phenol
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			2	2	2	2	2	2	2	2	4	2	4	2
ANZG (2018) Marine water 95% toxicant DGVs													22	400
PFAS NEMP 2018 Table 5 Interim marine 95%														
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Ir														
2-4m														
4-8m														
>8m														
NEPM 2013 Table 1C GILs, Marine Waters													11	400
Field_ID	**Sampled_Date_Time**	**Lab_Report_Number**												
MW01	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW02	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW03	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW04	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW05	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW06	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW07	08-Jan-19	ES1900690	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW1	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW2	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW3	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2
MW4	19-Feb-19	ES1905103	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<4	<2

			Chlorinated Hydrocarbons																																
			1,1,2,2-tetrachloroethane	1,1,1,2-tetrachloroethane	1,1,2-trichloroethane	1,1,1-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,1-dichloropropene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Hexachlorocyclopentadiene	Hexachloroethane	Hexachlorobutadiene	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Vinyl chloride	a-BHC	Aldrin
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	50	5	50	5	5	5	10	2	2	5	5	5	5	50	2	2
ANZG (2018) Marine water 95% toxicant DGVs					1900																														
PFAS NEMP 2018 Table 5 Interim marine 95%																																			
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Ir																																			
2-4m																																			
4-8m																																			
>8m																																			
NEPM 2013 Table 1C GILs, Marine Waters					1900																														
Field_ID	**Sampled_Date_Time**	**Lab_Report_Number**																																	
MW01	08-Jan-19	ES1900690	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW02	08-Jan-19	ES1900690	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW03	08-Jan-19	ES1900690	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	18	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW04	08-Jan-19	ES1900690	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW05	08-Jan-19	ES1900690	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW06	08-Jan-19	ES1900690	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW07	08-Jan-19	ES1900690	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW1	19-Feb-19	ES1905103	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW2	19-Feb-19	ES1905103	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW3	19-Feb-19	ES1905103	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2
MW4	19-Feb-19	ES1905103	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<10	<2	<2	<5	<5	<5	<5	<50	<2	<2

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			Organochlorine Pesticides															Organophosphorous Pesticides											Pesticides		Herbicides	Halogenated Hydrocarbons								Halogenated Benzenes											Explosives			
			Dieldrin	**Aldrin + Dieldrin**	**b-BHC**	**d-BHC**	**DDD**	**4,4-DDE**	**DDT**	**DDT+DDE+DDD**	**Endosulfan I**	**Endosulfan II**	**Endosulfan sulphate**	**Endrin**	**g-BHC (Lindane)**	**Heptachlor**	**Heptachlor epoxide**	**Chlorfenvinphos**	**Chlorpyrifos**	**Chlorpyrifos-methyl**	**Diazinon**	**Dichlorvos**	**Dimethoate**	**Ethion**	**Fenthion**	**Malathion**	**Pirimphos-ethyl**	**Prothiofos**	**Chlorobenzilate**	**Carbazole**	**Pronamide**	**1,2-dibromoethane**	**cis-1,4-Dichloro-2-butene**	**trans-1,4-Dichloro-2-butene**	**Pentachloroethane**	**Bromomethane**	**Dichlorodifluoromethane**	**Iodomethane**	**Trichlorofluoromethane**	**1,2,3-trichlorobenzene**	**1,2,4-trichlorobenzene**	**1,2-dichlorobenzene**	**1,3-dichlorobenzene**	**1,4-dichlorobenzene**	**2-chlorotoluene**	**4-chlorotoluene**	**Bromobenzene**	**Chlorobenzene**	**Hexachlorobenzene**	**Pentachlorobenzene**	**1,3,5-Trinitrobenzene**	**2,4-Dinitrotoluene**	**2,6-dinitrotoluene**	**Nitrobenzene**
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L
EQL			2	4	2	2	2	2	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	5	5	5	5	50	50	5	50	5	2	2	2	2	5	5	5	5	4	2	0.002	4	4	2
ANZG (2018) Marine water 95% toxicant DGVs														0.008					0.009																						80													
PFAS NEMP 2018 Table 5 Interim marine 95%																																																						
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Ir																																																						
2-4m																																																						
4-8m																																																						
>8m																																																						
NEPM 2013 Table 1C GILs, Marine Waters														0.004					0.009																						20													
Field_ID	**Sampled_Date_Time**	**Lab_Report_Number**																																																				
MW01	08-Jan-19	ES1900690	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW02	08-Jan-19	ES1900690	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW03	08-Jan-19	ES1900690	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW04	08-Jan-19	ES1900690	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW05	08-Jan-19	ES1900690	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW06	08-Jan-19	ES1900690	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW07	08-Jan-19	ES1900690	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW1	19-Feb-19	ES1905103	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW2	19-Feb-19	ES1905103	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW3	19-Feb-19	ES1905103	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2
MW4	19-Feb-19	ES1905103	<2	<4	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	<50	<50	<5	<50	<5	<2	<2	<2	<2	<5	<5	<5	<5	<4	<2	<0.002	<4	<4	<2

10026439
Qantas Flight Training Centre and Carpark
297 King St, Mascot NSW 2020

			Phthalates						Amino Aliphatics				Amino Aromatics		Anilines						Nitroaromatics			Solvents						
			Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Diethylphthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	N-nitrosodiethylamine	N-nitrosodi-n-butylamine	N-nitrosodi-n-propylamine	N-Nitrosomethylethylamine	1-naphthylamine	N-Nitrosodiphenyl & Diphenylamine	2-nitroaniline	3-nitroaniline	4-chloroaniline	4-nitroaniline	2-methyl-5-nitroaniline	Aniline	2-Picoline	4-aminobiphenyl	Pentachloronitrobenzene	Methyl Ethyl Ketone	2-hexanone (MBK)	4-Methyl-2-pentanone	Carbon disulfide	Isophorone	Vinyl acetate
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			10	2	2	2	2	2	2	2	2	2	2	4	4	4	2	2	2	2	2	2	2	50	50	50	5	2	50
ANZG (2018) Marine water 95% toxicant DGVs																													
PFAS NEMP 2018 Table 5 Interim marine 95%																													
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Ir																													
2-4m																													
4-8m																													
>8m																													
NEPM 2013 Table 1C GILs, Marine Waters																													
Field_ID	**Sampled_Date_Time**	**Lab_Report_Number**																											
MW01	08-Jan-19	ES1900690	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW02	08-Jan-19	ES1900690	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW03	08-Jan-19	ES1900690	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW04	08-Jan-19	ES1900690	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW05	08-Jan-19	ES1900690	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW06	08-Jan-19	ES1900690	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW07	08-Jan-19	ES1900690	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW1	19-Feb-19	ES1905103	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW2	19-Feb-19	ES1905103	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW3	19-Feb-19	ES1905103	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50
MW4	19-Feb-19	ES1905103	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<50	<50	<50	<5	<2	<50

Appendix D – Groundwater Monitoring Well Construction Logs

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.61 AHD
EASTING: 332213
NORTHING: 6244341
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 85777.15
DATE: 15/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
5	0.05	ASPHALTIC CONCRETE: 50mm thick							A			
	0.4	FILLING: dark brown, gravelly, fine to medium sand filling, damp							A			
		SAND: medium dense, pale brown, fine to medium sand, damp							A			
1												
	1.6	SAND: dense, brown, fine to medium sand, moist							S			5,14,19 N = 33
2												
3	3.0	SAND: medium dense, pale brown fine to medium sand, wet							S			5,7,11 N = 18
4												
1									S			5,7,13 N = 20
5												
0												
6												
-1	7.0	SAND: dense to very dense, pale brown sand with some dark brown peaty layers										
-2												
8												
-3												
9												
-4												

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 9.0m, HQ to 28.0m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.0m, NMLC-coring to 31.08m

WATER OBSERVATIONS: Free ground water observed at 3.3m on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT101

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.61 AHD
EASTING: 332213
NORTHING: 6244341
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 85777.15
DATE: 15/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-5	11	SAND: dense to very dense, pale brown sand with some dark brown peaty layers *(continued)*										
-6	12											
-7	13											
-8	14											
-9	15	15.0 CLAY: stiff to very stiff clay with some sandy layers										
-10	16											
-11	17											
-12	18											
-13	19											
-14												

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 9.0m, HQ to 28.0m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.0m, NMLC-coring to 31.08m

WATER OBSERVATIONS: Free ground water observed at 3.3m on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT101

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.61 AHD
EASTING: 332213
NORTHING: 6244341
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 85777.15
DATE: 15/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-15	21	CLAY: stiff to very stiff clay with some sandy layers *(continued)*										
-16	22											
-17	23	hard below 23m										
-18	24											
-19	25											
-20	26											
-21	27											
-22	28	28.0 LAMINITE: extremely and very low to low strength, highly weathered, fractured and slightly fractured, grey-brown laminite with approximately 20% fine sandstone laminations						28.15-28.29m: Ds, fe 28.30-28.33m: Cs 28.44m: Ds				
-23		28.85						28.61m: B 0°, pl, cly 9mm, fe				PL(A) = 0.23
	29	LAMINITE: very low to low strength, highly then slightly weathered, slightly fractured, pale grey to grey laminite with approximately 40% fine sandstone laminations						28.72-28.73m: Ds, fe 28.86m: J 30°, pl, cly 5mm, fe 28.93m: B 0°, pl, cly 5mm, fe 29.08m: B 5°, pl, cly vn 29.40-29.41m: Cs 29.65m: J 45°, pl, ro,	C	100	30	PL(A) = 0.91
-24	29.3											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 9.0m, HQ to 28.0m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.0m, NMLC-coring to 31.08m

WATER OBSERVATIONS: Free ground water observed at 3.3m on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT101

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.61 AHD
EASTING: 332213
NORTHING: 6244341
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 85777.15
DATE: 15/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-25	31	LAMINITE: medium strength with several extremely low strength bands, slightly weathered, slightly fractured, pale grey to grey laminite with approximately 25% fine sandstone laminations and some clay bands *(continued)*						cln 29.81m: J 60°, ir, ro, cln 30.02-30.04m: Cs 30.14-30.15m: Cs 30.52-30.53m: Cs 30.67m: J 45°, pl, ro, cln 30.84-30.85m: Cs 31.06-31.08m: Cs 31.14m: B 5°, pl, cly 8mm 31.23-31.35m: J 30°-70°, st, cly 5mm 31.35m: B 0°, pl, cly 5mm 31.52m: B 0°, pl, cly 7mm 31.55-31.56m: Cs 31.91m: J 45°, pl, cly 3mm 32.3m: B 0°, pl, cly 4mm 32.47m: B 10°, pl, cly 2mm 32.62m: J 40°, pl, cln 33.27-33.28m: fg, 5mm 33.66m: J 70°-90°, cu, cln, ro 33.77m: J 0°-45°, cu, cln, ro 33.89m: J (x2) 45°, pl, partially he				PL(A) = 0.9
-26	31.08	LAMINITE: high then medium strength, slightly weathered then fresh, slightly fractured, pale grey to grey laminite with approximately 20% fine sandstone laminations							C	100	88	PL(A) = 2
-27	32											PL(A) = 0.85
-28	33								C	100	91	PL(A) = 0.9
-29	34	Bore discontinued at 34.0m										
-30	34.0											
-31	35											
-32	36											
-33	37											
-34	38											
	39											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 9.0m, HQ to 28.0m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.0m, NMLC-coring to 31.08m

WATER OBSERVATIONS: Free ground water observed at 3.3m on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT101

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 1 PROJECT: MASCOT JANUARY 2019

28.00 – 32.00m

BORE: 1 PROJECT: MASCOT JANUARY 2019

32.00 – 34.00m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.08 AHD
EASTING: 332258
NORTHING: 6244337
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 85777.15
DATE: 14/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
5	0.15	CONCRETE PAVEMENT: 25mm aggregate, 8mm dia steel reinforcement							A			
		FILLING: dark brown sand filling with some gravel, damp							A			
									B			
4	0.9 1	SAND: medium dense to dense, pale brown and dark brown, fine to medium sand with trace silt, damp							A			
									B			
3	2								S			8,11,19 N = 30
2	3								S			4,7,9 N = 16
1	4											
0	5	4.7m: dark brown clay band with rootlets							S			3,6,6 N = 12
-1	6											
-2	7											
-3	8	Some peaty layers between 8.5m and 11.5m										
-4	9											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 23.2m

TYPE OF BORING: Diacore to 0.15m, solid flight auger to 5.5m, Rotary wash-bore to 23.25m, NMLC-coring to 32.25m

WATER OBSERVATIONS: Free ground water observed at 2.1m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT102

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.08 AHD
EASTING: 332258
NORTHING: 6244337
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 85777.15
DATE: 14/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-5	11	SAND: medium dense to dense, pale brown and dark brown, fine to medium sand with trace silt, damp *(continued)*										
-6	12											
-7	13											
-8	14											
-9	14.0	SILTY CLAY: stiff to very stiff, dark brown silty clay, low to medium plasticity										
-10	15											
-11	16	grey below 15.7m										
-12	17											
-13	18											
-14	19											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 23.2m

TYPE OF BORING: Diacore to 0.15m, solid flight auger to 5.5m, Rotary wash-bore to 23.25m, NMLC-coring to 32.25m

WATER OBSERVATIONS: Free ground water observed at 2.1m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT102

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.08 AHD
EASTING: 332258
NORTHING: 6244337
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 85777.15
DATE: 14/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-16	21	SILTY CLAY: stiff to very stiff, dark brown silty clay, low to medium plasticity *(continued)*										
-17	22											
-18	23	hard below 22.8m										
	23.25	SILTY CLAY: very stiff to hard silty clay, with medium to high strength ironstone bands and ironstone gravel							C	100	0	pp = 200 pp = 270
-19	24											
-20	24.9 25	SILTSTONE: extremely low and very low strength, extremely and highly weathered, pale grey-brown siltstone							C	100	0	pp = 600 pp = 700
-21	26							25.56m: B 0°, cly 3mm, pl, fe 25.75m: B 0°, pl, cly 9mm, fe				
-22	26.3 27	LAMINITE: very low strength, highly weathered, slightly fractured, grey-brown laminite with approximately 20% fine sandstone laminations						26.46m: B 0°, pl, cly 5mm 26.67-26.78m: Ds, fe 26.78-26.92m: Ds, fe 27.10-27.50m: fg 10mm	C	100	0	PL(A) = 0.11
-23	27.5 28	LAMINITE: low to medium strength with numerous extremely low strength bands, slightly weathered, fractured, pale grey and grey laminite with approximately 25% fine sandstone laminations						27.80-27.86m: J 60°, ir, ro, cln 28.05-28.06m: Cs 28.10-28.16m: J 60°-90°, ir, ro, cln, partially he 28.19-28.25m: J 65°, pl, ro, cln 28.30-28.34m: J 60°, pl, cly 5mm	C	100	57	PL(A) = 0.75 PL(A) = 0.91
-24	29							28.55-28.57m: Ds 28.67-28.74m: J 60°-90°, st, cln 28.83-28.87m: J 70°, pl, cly 28.87-28.91m: Ds	C	100	20	PL(A) = 0.81
	30.0											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 23.2m

TYPE OF BORING: Diacore to 0.15m, solid flight auger to 5.5m, Rotary wash-bore to 23.25m, NMLC-coring to 32.25m

WATER OBSERVATIONS: Free ground water observed at 2.1m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT102

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.08 AHD
EASTING: 332258
NORTHING: 6244337
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 85777.15
DATE: 14/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
-25		LAMINITE: medium to high strength, fresh, slightly fractured, pale grey and grey laminite with approximately 20% fine sandstone laminations						28.91-28.98m: J 70°, pl, cly vn 28.95-29.04m: Ds 28.97-28.48m: Cs 29.00-29.08m: fg 10mm 29.12m: J 60°, pl, cln 29.14-29.20m: fg, 10-20mm 29.23-29.33m: Ds 29.52-29.54m: Cs 29.59-31.02m: J (x5) 45°-85°, cly vn, ir 31.62-31.70m: J (x2), pl, ro, partially he				PL(A) = 1.1
-26	31								C	100	96	
-27	32											PL(A) = 1.2
	32.25	Bore discontinued at 32.25m						32.13m: J 45°, pl, ro, cln				PL(A) = 1.2
-28	33											
-29	34											
-30	35											
-31	36											
-32	37											
-33	38											
-34	39											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 23.2m

TYPE OF BORING: Diacore to 0.15m, solid flight auger to 5.5m, Rotary wash-bore to 23.25m, NMLC-coring to 32.25m

WATER OBSERVATIONS: Free ground water observed at 2.1m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT102

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 2 PROJECT: MASCOT JANUARY 2019

23.25 – 28.00m

BORE: 2 PROJECT: MASCOT JANUARY 2019

28.00 – 32.25m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.19 AHD
EASTING: 332158
NORTHING: 6244401
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 85777.15
DATE: 15/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
5	0.03	ASPHALTIC CONCRETE: 30mm							A			
		FILLING: dark brown gravelly sand and gravelly clayey sand filling, with some clay and silt, damp							A			
									B			
4	1								A			
									B			
									S			5,7,4 N = 11
3	2											
	2.3	SANDY CLAY: soft dark brown sandy clay with some silt, saturated										
2	3								S			0,0,2 N = 2
	3.4	SAND: medium dense to dense, pale brown fine to medium sand, with some peaty layers										
1	4											
									S			5,12,12 N = 24
0	5											
-1	6											
-2	7											
-3	8											
-4	9											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.65m, HQ to 28.0m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.95m, NMLC-coring to 35.43m

WATER OBSERVATIONS: Free ground water observed at 3.2m

REMARKS: Soil descriptions and strengths at depth based on CPT103

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.19 AHD
EASTING: 332158
NORTHING: 6244401
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 85777.15
DATE: 15/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-5	11	SAND: medium dense to dense, pale brown fine to medium sand, with some peaty layers *(continued)*										
-6	12											
-7	13											
-8	14											
-9	14.4	SILTY CLAY: stiff to very stiff, light grey, silty clay										
-10	15											
-11	16											
-12	17											
-13	18											
-14	19											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.65m, HQ to 28.0m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.95m, NMLC-coring to 35.43m

WATER OBSERVATIONS: Free ground water observed at 3.2m

REMARKS: Soil descriptions and strengths at depth based on CPT103

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.19 AHD
EASTING: 332158
NORTHING: 6244401
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 85777.15
DATE: 15/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-15		SILTY CLAY: stiff to very stiff, light grey, silty clay *(continued)*										
-16	21											
-17	22											
-18	23											
-19	24	hard below 24m										
-20	25											
-21	26											
-22	27											
-23	28											
	28.45	SILTY CLAY: very stiff, red-brown and grey silty clay with some medium to high strength ironstone bands and gravel, high plasticity						28.45m: CORE LOSS: 500mm				
-24	28.95 / 29								C	55	0	pp = 300 PL(A) = 0.65
	29.55								C	100	0	

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.65m, HQ to 28.0m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.95m, NMLC-coring to 35.43m

WATER OBSERVATIONS: Free ground water observed at 3.2m

REMARKS: Soil descriptions and strengths at depth based on CPT103

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.19 AHD
EASTING: 332158
NORTHING: 6244401
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 85777.15
DATE: 15/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-25		SILTSTONE: extremely then very low strength, extremely then highly weathered, pale grey-brown to grey-brown siltstone *(continued)*	EW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00	30.64m: B 10°-20°, ir,cly 5mm, fe 30.75-30.99m: B (x4) 0°, pl, cly (1-5mm), fe	C	100	0	
-26	31							31.33-31.34m: Cs 31.36m: B 0°, pl, cly 8mm 31.41-31.52m: Cs 31.62-31.64m: Ds 31.83-31.90m: J (x3) 80°-90°, ir, cly vn, practically healed 32.39m: B 0°, pl, cly vn, fe 32.65-32.69m: fg 32.76m: J 60°, pl, ly vn	C	100	50	PL(A) = 0.74 PL(A) = 0.94
-27	31.75 32	LAMINITE: medium strength, slightly weathered then fresh, slightly fractured, pale grey and grey laminite with approximately 20% fine sandstone laminations										
-28	33 33.0	LAMINITE: high strength, fresh, slightly fractured pale grey and grey laminite with approximately 20% fine sandstone laminations						33.16-33.25m: J 50°, pl, ro, cln 33.41m: B 0°, pl, cly 4mm 33.54m: B 0°, pl, cly 5mm 33.55m: J (x3) 60°, pl, cly vn 33.72-33.99m: J 60°, pl, cln 34.21m: J 30°, un, cln, sm 34.68-34.85m: Sz, fg, 1-10mm 34.95m: J 95°, pl, ro, cln 35.05m: J 45°, ro, cln 35.16-35.26m: J (45°-60°), st, cln				PL(A) = 1.5
-29	34	34.40-34.85m: increase in bedding angle to 40° 34.70-34.85m: shear zone							C	100	87	PL(A) = 2.4 PL(A) = 2.8
-30	35 35.43	Bore discontinued at 35.43m										
-31	36											
-32	37											
-33	38											
-34	39											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.65m, HQ to 28.0m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.95m, NMLC-coring to 35.43m

WATER OBSERVATIONS: Free ground water observed at 3.2m

REMARKS: Soil descriptions and strengths at depth based on CPT103

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 3 PROJECT: MASCOT JANUARY 2019

28.45 – 33.00m

BORE: 3 PROJECT: MASCOT JANUARY 2019

33.00 – 35.43m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.06 AHD
EASTING: 332223
NORTHING: 6244388
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 85777.15
DATE: 14/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
5	0.04	ASPHALTIC CONCRETE							A			
	0.3	FILLING: dark brown, fine to medium gravelly sand filling, damp							A			
		FILLING: pale brown, fine to medium sand filling, moist										
4	1	0.9m: dark brown gravel, plastic fragments							A			
									S			2,3,4 N = 7
3	2											
	2.5	SAND: medium dense to dense, brown, fine to medium sand, moist										
2	3								S			13,24,24 N = 48
1	4											
									S			5,10,12 N = 22
0	5											
-1	6											
-2	7											
-3	8	several peaty layers between 8.5m and 11.5m										
-4	9											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 5.5m, HQ to 34.92m

TYPE OF BORING: Solid flight auger to 5.5m, Rotary wash-bore to 26.6m, NMLC-coring to 34.92m

WATER OBSERVATIONS: Free ground water observed at 2.7m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT104

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.06 AHD
EASTING: 332223
NORTHING: 6244388
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 85777.15
DATE: 14/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-5		SAND: medium dense to dense, brown, fine to medium sand, moist *(continued)*										
-6	11											
-7	12											
-8	13											
-9	14											
	14.5	CLAY: stiff to very stiff clay										
-10	15											
-11	16											
-12	17											
-13	18											
-14	19											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 5.5m, HQ to 34.92m

TYPE OF BORING: Solid flight auger to 5.5m, Rotary wash-bore to 26.6m, NMLC-coring to 34.92m

WATER OBSERVATIONS: Free ground water observed at 2.7m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT104

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.06 AHD
EASTING: 332223
NORTHING: 6244388
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 85777.15
DATE: 14/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-15		CLAY: stiff to very stiff clay *(continued)*										
-16	21											
-17	22	hard below 22m										
-18	23											
-19	24											
-20	25											
-21	26											
	26.6							26.6m: CORE LOSS: 150mm				pp = 470
	26.75	SILTY CLAY: hard, grey and brown silty clay with medium to high strength ironstone bands and gravel, high plasticity										
-22	27											pp = 600
-23	28								C	95	4	
												pp = 570
	28.8	SILTSTONE: extremely low strength, extremely weathered, grey-brown siltstone						28.80-28.84m: Ds 28.94m: B 0°, pl, cly vn, fe 29.08-29.10m: Cs, fe 29.22m: B 0°, pl, cly 5mm, fe 29.22-29.35m: Ds 29.38m: J 0°&80°, st,				
-24	29											
	29.35											
	29.55								C	98	49	PL(A) = 0.29

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 5.5m, HQ to 34.92m

TYPE OF BORING: Solid flight auger to 5.5m, Rotary wash-bore to 26.6m, NMLC-coring to 34.92m

WATER OBSERVATIONS: Free ground water observed at 2.7m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT104

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 5.06 AHD
EASTING: 332223
NORTHING: 6244388
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 85777.15
DATE: 14/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-25	30.3	LAMINITE: very low to low strength, highly then slightly weathered, slightly fractured, pale grey and grey laminite with approximately 20% fine sandstone laminations *(continued)*						cly vn, fe 29.5m: CORE LOSS: 50mm 29.86-29.94m: J 80°, pl, cly vn 30.71-30.72m: Cs				PL(A) = 0.49
-26	31	LAMINITE: low to medium strength, fresh, slightly fractured, pale grey and grey laminite with approximately 20% fine sandstone laminations							C	98	49	PL(A) = 0.85
-27	32							31.66-31.76m: J (x11) 60°-85°, pl, cln 31.94m: J 90°, cu, cln 32.08m: J 70°, pl, cln				PL(A) = 0.9
	32.5	LAMINITE: medium to high strength, fresh, slightly fractured, grey laminite with approximately 20% fine sandstone laminations						32.33m: J 35°, pl, ro, cln 32.53m: J (x2) 30°-45°, pl, ro, cln 32.72m: J 30°, pl, ro, cln 32.96m: J 35°, pl, ro, cln 33.04m: J 50°, pl, ro, cln 33.63m: J 45°, pl, ro, cln				
-28	33								C	100	87	PL(A) = 1.4
-29	34							34.30-34.49m: J 65°, pl, ro, cln				PL(A) = 2.1
-30	34.92 35	Bore discontinued at 34.92m						34.87m: J 60°, pl, ro, cln				
-31	36											
-32	37											
-33	38											
-34	39											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 5.5m, HQ to 34.92m

TYPE OF BORING: Solid flight auger to 5.5m, Rotary wash-bore to 26.6m, NMLC-coring to 34.92m

WATER OBSERVATIONS: Free ground water observed at 2.7m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT104

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 4 PROJECT: MASCOT JANUARY 2019

26.60 – 31.00m

BORE: 4 PROJECT: MASCOT JANUARY 2019

31.00 – 32.92m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.94 AHD
EASTING: 332262
NORTHING: 6244382
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 85777.15
DATE: 17/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.04	ASPHALTIC CONCRETE										
		FILLING: dark brown gravelly sand filling with some clay, damp							A			
	0.7	SAND: loose to medium dense, pale brown, fine to medium sand with some peaty and clayey bands							A			
	1								A			
	2								S			6,10,14 N = 24
	3								S			7,10,21 N = 31
	4											
	5								S			1,0,3 N = 3
	6	Mostly medium dense to dense below 6m										
	7											
	8											
	9											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 6m, HQ to 30.45m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 30.5m, NMLC-coring to 35.5m

WATER OBSERVATIONS: Free ground water observed at 1.9m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT105

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.94 AHD
EASTING: 332262
NORTHING: 6244382
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 85777.15
DATE: 17/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-6	11	SAND: loose to medium dense, pale brown, fine to medium sand with some peaty and clayey bands *(continued)*										
-7	12											
-8	13											
-9	14											
	14.2	CLAY: stiff to very stiff clay and sandy clay										
-10	15											
-11	16											
-12	17											
-13	18											
-14	19											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 6m, HQ to 30.45m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 30.5m, NMLC-coring to 35.5m

WATER OBSERVATIONS: Free ground water observed at 1.9m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT105

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.94 AHD
EASTING: 332262
NORTHING: 6244382
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 85777.15
DATE: 17/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-16	21	CLAY: stiff to very stiff clay and sandy clay *(continued)*										
-17	22											
-18	23	hard below 23m										
-19	24											
-20	25											
-21	26											
-22	27											
-23	28											
-24	29											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 6m, HQ to 30.45m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 30.5m, NMLC-coring to 35.5m

WATER OBSERVATIONS: Free ground water observed at 1.9m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT105

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.94 AHD
EASTING: 332262
NORTHING: 6244382
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 85777.15
DATE: 17/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		CLAY: stiff to very stiff clay and sandy clay *(continued)*										
	30.5	LAMINITE: medium to high strength, fresh, slightly fractured and unbroken, pale grey and grey laminite with approximately 20% fine sandstone laminations						30.50-30.53m: Ds 30.99m: J 50°, pl, ro, cln 31.48-31.60m: J (x5) 45°-70°, pl & cu, ro, cly vn 32.64m: B 0°, pl, cly 2mm 32.74m: B 0°, pl, cly 4mm 33.58m: J 60°, ir, ro, cln 33.9m: J (45°&0°), st, ro, cln 34.62m: J 80°, pl, ro, ti 35.08m: J 60°, pl, sm, cly vn	C	100	85	PL(A) = 1.3 PL(A) = 1.1 PL(A) = 1.3 PL(A) = 1.1
	34.0	SILTSTONE: high strength, fresh, slightly fractured and unbroken, grey siltstone, with a trace of fine sandstone laminations							C	100	96	PL(A) = 1.2 PL(A) = 1.5
	35.5	Bore discontinued at 35.5m										

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 6m, HQ to 30.45m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 30.5m, NMLC-coring to 35.5m

WATER OBSERVATIONS: Free ground water observed at 1.9m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT105

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 5 PROJECT: MASCOT JANUARY 2019

30.50 – 34.00m

BORE: 5 PROJECT: MASCOT JANUARY 2019

34.00 – 35.45m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.84 AHD
EASTING: 332160
NORTHING: 6244443
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 85777.15
DATE: 23/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
4	0.04	ASPHALTIC CONCRETE: 40mm thick							A			
		FILLING: brown, gravelly sand filling with some clay, damp							A			Bulk samples taken from 0.1-1.2m and 1.2-1.5m
1									A			
	1.2	FILLING: poorly compacted, grey sandy clay filling with some gravel, damp							A			
3									S			1,1,1 N = 2
2	2.5	SILTY SANDY CLAY: very soft, dark grey silty sandy clay with a trace of rootlets, moist										
2									S			0,0,0 N = 0
1	4.0	SAND: medium dense to dense, pale brown, fine to medium sand, saturated with some peaty and clayey bands										
4									S			9,5,10 N = 15
0	5											
-1	6											
-2	7											
-3	8											
-4	9											
-5												

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 27.25m

TYPE OF BORING: Solid flight auger to 5.60m, Rotary wash-bore to 29.35m, NMLC-coring to 35.33m

WATER OBSERVATIONS: Free groundwater observed at 3.2m on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT106

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.84 AHD
EASTING: 332160
NORTHING: 6244443
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 85777.15
DATE: 23/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-6	11	SAND: medium dense to dense, pale brown, fine to medium sand, saturated with some peaty and clayey bands *(continued)*										
-7	12											
-8	13											
-9	14											
	14.3	CLAY: stiff to very stiff, light grey clay										
-10	15											
-11	16											
-12	17											
-13	18											
-14	19											
-15												

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 27.25m

TYPE OF BORING: Solid flight auger to 5.60m, Rotary wash-bore to 29.35m, NMLC-coring to 35.33m

WATER OBSERVATIONS: Free groundwater observed at 3.2m on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT106

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.84 AHD
EASTING: 332160
NORTHING: 6244443
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 85777.15
DATE: 23/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-16	21	CLAY: stiff to very stiff, light grey clay *(continued)*										
-17	22											
-18	23											
	23.0	CLAY: very stiff to hard, brown and red-brown clay with some ironstone										
-19	24											
-20	25											
-21	26											
-22	27											
-23	28											
-24	29											
	29.55							29.73m: J60°, ir, cly 2mm, fe stn	C	100	0	
-25												

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 27.25m

TYPE OF BORING: Solid flight auger to 5.60m, Rotary wash-bore to 29.35m, NMLC-coring to 35.33m

WATER OBSERVATIONS: Free groundwater observed at 3.2m on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT106

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.84 AHD
EASTING: 332160
NORTHING: 6244443
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 85777.15
DATE: 23/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
-26	30.58	LAMINITE: extremely low then very low to low strength, extremely to highly weathered, pale grey-brown laminite *(continued)*						29.79-29.82m: B(x4), 0°, pl, cly vn, fe 29.89m: J(x2), 60°, pl, cly vn, fe	C	100	0	
-26	31	LAMINITE: high strength, fresh, slightly fractured and unbroken, pale grey to grey laminite with approximately 20% fine grained sandstone laminations 31.00-31.20m: fractured						29.93m: B0°, pl, cly 3mm, fe 30.15m: B10°, pl, cly 5mm, fe 30.23m: B10°, pl, cly vn, fe	C	100	29	PL(A) = 1.3
-27	32							30.3m: B0°, pl, cly 8mm, fe 30.44-30.48m: Cs, 40mm 30.52-30.53m: Cs, 10mm, fe 30.56m: J60-90°, cu, cly vn, fe 30.57-30.58m: Cs, 10mm, fe 30.66m: B5°, pl, cly 5mm, fe 30.72m: J30° & 70°, st, ro, cln 30.87m: J60°, ir, cly vn 30.93m: J60°, ir, cly vn 31.04-31.15m: J60°, ir, cly vn	C	100	100	PL(A) = 1.3 PL(A) = 2.1
-28	33											
-29	34							31.15m: J60°, ir, cly vn 31.25m: J80°, ir, ti 31.34m: J65°, pl, sm, cln 33.25-33.40m: J65°, pl, ro, cln	C	100	100	PL(A) = 1.8 PL(A) = 1.6
-30	35											
-30	35.33	Bore discontinued at 35.33m										PL(A) = 1.4
-31	36											
-32	37											
-33	38											
-34	39											
-35												

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 27.25m

TYPE OF BORING: Solid flight auger to 5.60m, Rotary wash-bore to 29.35m, NMLC-coring to 35.33m

WATER OBSERVATIONS: Free groundwater observed at 3.2m on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT106

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 6 PROJECT: MASCOT JANUARY 2019

29.55 – 34.00m

BORE: 6 PROJECT: MASCOT JANUARY 2019

34.00 – 35.33m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.90 AHD
EASTING: 332220
NORTHING: 6244433
DIP/AZIMUTH: 90°/--

BORE No: BH7
PROJECT No: 85777.15
DATE: 18/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
4.85	0.05	APSHALTIC CONCRETE: 50mm thick							A			
4.8	0.1	FILLING: dark brown gravelly sand filling (roadbase)							A			
		FILLING: dark brown clayey sand filling with some gravel, damp							A			
3.9	1								S			1,1,2 N = 3
		1.6m: becoming soft, sandy clay with trace gravel										
2.2	2.7	SANDY SILTY CLAY: soft, dark brown sandy silty clay, wet										
1.75	3.15	SAND: mostly medium dense to dense, pale brown, fine to medium sand with some clayey and peaty layers							S			4,4,6 N = 10
									S			3,5,7 N = 12

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 6.5m, HQ to 28.05m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.5m, NMLC-coring to 34.45m

WATER OBSERVATIONS: Free ground water observed at 2.8m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT107

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.90 AHD
EASTING: 332220
NORTHING: 6244433
DIP/AZIMUTH: 90°/--

BORE No: BH7
PROJECT No: 85777.15
DATE: 18/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-6	11	SAND: mostly medium dense to dense, pale brown, fine to medium sand with some clayey and peaty layers *(continued)*										
-7	12											
-8	13											
-9	14											
	14.3	CLAY: stiff to hard clay										
-10	15											
-11	16											
-12	17											
-13	18											
-14	19											
-15												

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 6.5m, HQ to 28.05m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.5m, NMLC-coring to 34.45m

WATER OBSERVATIONS: Free ground water observed at 2.8m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT107

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.90 AHD
EASTING: 332220
NORTHING: 6244433
DIP/AZIMUTH: 90°/--

BORE No: BH7
PROJECT No: 85777.15
DATE: 18/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-16	21	CLAY: stiff to hard clay *(continued)*										
-17	22											
-18	23	hard below 23m										
-19	24											
-20	25											
-21	26											
-22	27											
-23	28											
	28.5											
-24	28.6	SILTY CLAY: very stiff to hard, grey and brown silty clay with medium to high strength ironstone bands and gravel						28.5m: CORE LOSS: 100mm	C	97	40	pp = 360 pp = 370 pp = 230
	29											
	29.1	LAMINITE: extremely low strength, extremely weathered, pale grey-brown laminite						29.10-29.12m: Cs, fe 29.25m: B 0°, pl, cly 9mm				
-25	29.9											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 6.5m, HQ to 28.05m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.5m, NMLC-coring to 34.45m

WATER OBSERVATIONS: Free ground water observed at 2.8m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT107

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.90 AHD
EASTING: 332220
NORTHING: 6244433
DIP/AZIMUTH: 90°/--

BORE No: BH7
PROJECT No: 85777.15
DATE: 18/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-26	30.4	LAMINITE: extremely low to very low strength, highly weathered, slightly fractured, grey laminite *(continued)*						30.05-30.23m: Ds 30.24m: J 70°, pl, he 30.33-30.36m: Ds 30.38-30.92m: J (x2) 45°, pl, ro, cln	C	97	40	PL(A) = 0.87
		LAMINITE: medium then high strength, fresh, slightly fractured, pale grey and grey laminite with approximately 20% fine sandstone laminations						31.27m: J 45°, pl, ro, cly vn 31.48-31.77m: J (x5) 60°-80°, pl&ir, cly vn				PL(A) = 1
-27	31											
	32							32.12-32.26m: J 85°, un, ro, cln 32.26-32.47m: J 60°, pl, ro, cln	C	100	83	PL(A) = 1.7
-28	33							33.12m: J 70°-90°, st, ro, cln 33.28m: J 35°, pl, ro, cln 33.55m: J 70°-90°, st, ro, cln				PL(A) = 1.8
-29	34									100	92	PL(A) = 1.2
	34.45	Bore discontinued at 34.45m										
-30	35											
-31	36											
-32	37											
-33	38											
-34	39											
-35												

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 6.5m, HQ to 28.05m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 28.5m, NMLC-coring to 34.45m

WATER OBSERVATIONS: Free ground water observed at 2.8m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT107

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 7 PROJECT: MASCOT JANUARY 2019

28.50 – 33.00m

BORE: 7 PROJECT: MASCOT JANUARY 2019

33.00 – 34.45m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.94 AHD
EASTING: 332275
NORTHING: 6244413
DIP/AZIMUTH: 90°/--

BORE No: BH8
PROJECT No: 85777.15
DATE: 22/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.05	ASPHALTIC CONCRETE										
	0.4	CONCRETE SLAB: 20mm aggregate, metal plates up to 10mm thick							A			
		FILLING: brown and dark brown, fine to medium sand and sandy clay filling with a trace of gravel							B			
	0.9	SILTY SAND: loose, dark grey silty fine to medium sand with some clay, damp							A			
	1.5	SAND: mostly medium dense, brown, fine to medium sand with some clayey lenses and peaty sands							B			
									S			1,3,3 N = 6
									B			
									S			3,5,6 N = 11
									S			2,7,11 N = 18

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 9.0m, HQ to 28.25m

TYPE OF BORING: Diacore to 0.4m, solid flight auger to 5.0m, Rotary wash-bore to 28.25m, NMLC-coring to 32.23m

WATER OBSERVATIONS: Free ground water observed at 2.48 on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT108

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.94 AHD
EASTING: 332275
NORTHING: 6244413
DIP/AZIMUTH: 90°/--

BORE No: BH8
PROJECT No: 85777.15
DATE: 22/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-6	11	SAND: mostly medium dense, brown, fine to medium sand with some clayey lenses and peaty sands *(continued)*										
-7	12											
-8	13											
-9	14											
	14.2	CLAY: stiff to very stiff, light grey clay										
-10	15											
-11	16											
-12	17											
-13	18											
-14	19	19m: ironstone band										

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 9.0m, HQ to 28.25m

TYPE OF BORING: Diacore to 0.4m, solid flight auger to 5.0m, Rotary wash-bore to 28.25m, NMLC-coring to 32.23m

WATER OBSERVATIONS: Free ground water observed at 2.48 on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT108

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.94 AHD
EASTING: 332275
NORTHING: 6244413
DIP/AZIMUTH: 90°/--

BORE No: BH8
PROJECT No: 85777.15
DATE: 22/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-16	21	CLAY: stiff to very stiff, light grey clay *(continued)* 20.5m: ironstone band										
-17	22											
-18	23	very stiff to hard below 23m										
-19	24											
-20	25	24.5m: ironstone band										
-21	26											
-22	27											
-23	28											
-24	28.25 29	SILTSTONE: extremely to very low strength, extremely to highly weathered, slightly fractured, pale grey-brown and red-brown siltstone with medium strength iron-cemented bands						28.73m: B 0°, pl, cly vn, fe 28.8m: B 0°-20°, cu, cly vn, fe 29.36-29.46m: J 60°, pl, cly vn, fe	C	100	0	
	29.58 29.8							29.5m: CORE LOSS: 80mm	C	94	10	PL(A) = 0.21

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 9.0m, HQ to 28.25m

TYPE OF BORING: Diacore to 0.4m, solid flight auger to 5.0m, Rotary wash-bore to 28.25m, NMLC-coring to 32.23m

WATER OBSERVATIONS: Free ground water observed at 2.48 on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT108

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.94 AHD
EASTING: 332275
NORTHING: 6244413
DIP/AZIMUTH: 90°/--

BORE No: BH8
PROJECT No: 85777.15
DATE: 22/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
26	31	LAMINITE: low then medum strength, slightly weathered, fractured and slightly fractured pale grey and grey laminite with approximately 20 % fine sandstone laminations *(continued)*						29.62-29.65m: Cs, fe 29.68m: J 80°-90°, ir, cly vn, fe 29.70-29.73m: Cs, fe 29.78-29.85m: B (x3) 0°-10°, pl, cly 5-9mm, fe 30.1m: B 0°, pl, cly 9mm 30.14m: J 45°, pl, cly vn 30.18m: B 0°, pl, cly 8mm 30.27m: J 35°, cu, ro, cln 30.32-30.55m: J (x4) 45°, pl,cly vn 30.57-30.70m: J (45°-70°, ir, cly vn 30.83m: CORE LOSS: 170mm 31.12-31.25m: J (x4) 45°, pl, cly vn, partially he 31.82-31.83m: J (x13) 40°-60°, pl, ro, cly vn 31.88m: B 15°, pl, cly 5mm 32.64m: J 45°, pl, he 33.22m: J 40°, ir, cly vn 33.47m: J 80°-90°, cu, partially he 33.56m: J 60°, pl, ro, cln 33.57-33.73m: J 60°, pl, cly vn 33.85m: J 40°, pl, ro, cln 33.88m: J 60°, pl, ro, cln 34.04m: J 60°-90°, ir, ro, cln 34.07m: J 30°-45°, st, ro, cln 34.5m: J (x2) 60°, pl, cly vn 35.12m: J 60°, pl, cly vn	C	94	10	PL(A) = 0.73
27	31.0											
	32	LAMINITE: medium and high strength, fresh, fractured and slightly fractured, pale grey and grey laminite with approximately 20% fine sandstone laminations							C	88	29	PL(A) = 1.4
28	32.35	SILTSTONE: medium and high strength, fresh, slightly fractured grey siltstone with approximately 5% fine sandstone laminations							C	100	78	PL(A) = 0.39 PL(A) = 1.1 PL(A) = 0.72
29	33											
30	34											
	35											
31	35.23	Bore discontinued at 35.23m										PL(A) = 0.86
	36											
32	37											
33	38											
34	39											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 9.0m, HQ to 28.25m

TYPE OF BORING: Diacore to 0.4m, solid flight auger to 5.0m, Rotary wash-bore to 28.25m, NMLC-coring to 32.23m

WATER OBSERVATIONS: Free ground water observed at 2.48 on 24 Jan 2019

REMARKS: Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT108

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 8 PROJECT: MASCOT JANUARY 2019

28.25 – 33.00m

BORE: 8 PROJECT: MASCOT JANUARY 2019

33.00 – 35.23m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.81 AHD
EASTING: 332240
NORTHING: 6244500
DIP/AZIMUTH: 90°/--

BORE No: BH9
PROJECT No: 85777.15
DATE: 16/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
3	0.03	ASPHALTIC CONCRETE: 30mm thick							A			
	0.6	FILLING: brown, sandy clay and sand filling with some sandstone gravel, damp							A			
2	1	SAND: medium dense, pale brown, fine to medium sand, moist							A			
1	1.5	CLAYEY SAND: soft, dark brown clayey sand, saturated							S			0,1,4 N = 5
	1.8	SAND: loose to medium dense, pale brown fine sand with some clayey or peaty layers										
0	3								S			3,6,9 N = 15
-1	4											
-2	5								S			4,6,7 N = 13
-3	6	mostly medium dense to very dense below 6m										
-4	7											
-5	8											
-6	9											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 10.5m, HQ to 29.5m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 29.5m, NMLC-coring to 34.62m

WATER OBSERVATIONS: Free ground water observed at 1.4m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT109

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.81 AHD
EASTING: 332240
NORTHING: 6244500
DIP/AZIMUTH: 90°/--

BORE No: BH9
PROJECT No: 85777.15
DATE: 16/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-7	11	SAND: loose to medium dense, pale brown fine sand with some clayey or peaty layers *(continued)*										
-8	12											
-9	13											
	13.1	CLAY: firm to very stiff clay										
-10	14											
-11	15											
-12	16											
-13	17	very stiff to hard below 17m										
-14	18											
-15	19											
-16												

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 10.5m, HQ to 29.5m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 29.5m, NMLC-coring to 34.62m

WATER OBSERVATIONS: Free ground water observed at 1.4m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT109

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.81 AHD
EASTING: 332240
NORTHING: 6244500
DIP/AZIMUTH: 90°/--

BORE No: BH9
PROJECT No: 85777.15
DATE: 16/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-17	21	CLAY: firm to very stiff clay *(continued)*										
-18	22											
-19	23											
-20	24											
-21	25											
-22	26											
-23	27											
-24	28											
-25	29											
-26	29.5	LAMINITE: very low and low strength,slightly weathered, fractured and slightly fractured,						29.57m: B 0°, pl, cly 5mm 29.62m: B 0°, pl, cly	C	100	93	PL(A) = 0.14
	29.9											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 10.5m, HQ to 29.5m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 29.5m, NMLC-coring to 34.62m

WATER OBSERVATIONS: Free ground water observed at 1.4m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT109

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.81 AHD
EASTING: 332240
NORTHING: 6244500
DIP/AZIMUTH: 90°/--

BORE No: BH9
PROJECT No: 85777.15
DATE: 16/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-27	31	grey laminite with approximately 20% fine sandstone laminations LAMINITE: medium then medium to high strength, fresh, slightly fractured and unbroken, pale grey and grey laminite with approximately 25% fine sandstone laminations *(continued)*						5mm 29.74m: B 0°, pl, cly 8mm 29.95m: J 45°, ti 30.04-30.16m: J (x2) 45°&70°, pl, ro, cln	C	100	93	PL(A) = 0.93 PL(A) = 0.86
-28	32							31.58-31.68m: J 60°, pl, ro, cln 31.70-31.83m: J 60°, pl, ro, cln, partially he 31.80-31.95m: J 60°, pl, he 32.22m: B 0°, pl, cly, 9mm 32.35-32.45m: J 45°-70°, pl, ir, ro, cln				PL(A) = 1.1
-29	33 33.0	32.45-32.92m: fractured SILTSTONE: medium to high strength, slightly fractured, grey siltstone with approximately 10% fine sandstone laminations						33.12m: B 0°, pl, cly 5mm 33.121m: J 60°, pl, ro, cln 33.29m: B 0°, pl, cly 2mm 33.32m: J 30°, pl, ro, cln 33.35m: J 90°, st, ro, cln	C	100	66	PL(A) = 0.66
-30	34											PL(A) = 1
-31	34.62	Bore discontinued at 34.62m										
-32	35											
-33	36											
-34	37											
-35	38											
-36	39											

RIG: Scout 4 **DRILLER:** Rhett K-E **LOGGED:** RB/SI **CASING:** HW to 10.5m, HQ to 29.5m

TYPE OF BORING: Solid flight auger to 5.0m, Rotary wash-bore to 29.5m, NMLC-coring to 34.62m

WATER OBSERVATIONS: Free ground water observed at 1.4m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT109

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 9 PROJECT: MASCOT JANUARY 2019

29.5 – 33.00m

BORE: 9 PROJECT: MASCOT JANUARY 2019

33.00 – 34.62m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.98 AHD
EASTING: 332297
NORTHING: 6244497
DIP/AZIMUTH: 90°/--

BORE No: BH10
PROJECT No: 85777.15
DATE: 16/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.03	ASPHALTIC CONCRETE							A			
	0.3	FILLING: dark brown, clayey sand filling with some sandstone gravel, moist							A			
3	1	SAND: loose to medium dense, pale brown, fine to medium sand, moist							A			
		1.5-1.95m: very soft, dark brown sandy silty clay band							S			1,0,1 N = 1
2	2											
1	3								S			4,5,9 N = 14
0	4											
-1	5								S			4,6,3 N = 9
	5.5	SAND: medium dense to very dense, fine to medium sand with some clayey or peaty bands										
-2	6											
-3	7											
-4	8											
-5	9											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.55m, HQ to 26.9m

TYPE OF BORING: Solid flight auger to 5.55m, Rotary wash-bore to 26.9m, NMLC-coring to 33.75m

WATER OBSERVATIONS: Free ground water observed at 0.85m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT110

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.98 AHD
EASTING: 332297
NORTHING: 6244497
DIP/AZIMUTH: 90°/--

BORE No: BH10
PROJECT No: 85777.15
DATE: 16/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-7	11	SAND: medium dense to very dense, fine to medium sand with some clayey or peaty bands *(continued)*										
-8	12											
	12.8											
-9	13	CLAY: stiff to hard, red and brown clay and silty clay with some ironstone bands										
-10	14											
-11	15											
-12	16											
-13	17											
-14	18											
-15	19											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.55m, HQ to 26.9m

TYPE OF BORING: Solid flight auger to 5.55m, Rotary wash-bore to 26.9m, NMLC-coring to 33.75m

WATER OBSERVATIONS: Free ground water observed at 0.85m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT110

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.98 AHD
EASTING: 332297
NORTHING: 6244497
DIP/AZIMUTH: 90°/--

BORE No: BH10
PROJECT No: 85777.15
DATE: 16/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-17	21	CLAY: stiff to hard, red and brown clay and silty clay with some ironstone bands *(continued)* very stiff to hard below 20.9m										
-18	22											
-19	23											
-20	24											
-21	25											
-22	26											
-23	26.9 27	LAMINITE: very low strength, highly weathered, pale grey to grey laminite with approximately 30% fine sandstone laminations						27.19m: B 0°, pl, cly 8mm 27.67-27.69m: Cs 27.93m: B 0°, pl, cly 5mm				PL(A) = 0.09
-24	28								C	100	46	
	28.3	LAMINITE: medium strength with some extremely low strength bands, slightly weathered, fractured and slightly fractured, pale grey and grey laminite with approximately 20% fine sandstone laminations						28.36m: J 5°-70°, st, cly 6mm 28.48-28.70m: J 70°, pl, ro, ti 28.73-29.10m: J 85°-90°, pl, ro, cln 28.95m: J 45°, pl, sm 29.09-29.11m: Cs 29.18-29.30m: Cs 29.30-29.36m: fr, 110mm 29.43-29.51m: J (x7)				PL(A) = 0.31 PL(A) = 0.62
-25	29											
	29.6								C	100	66	PL(A) = 1.2

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.55m, HQ to 26.9m

TYPE OF BORING: Solid flight auger to 5.55m, Rotary wash-bore to 26.9m, NMLC-coring to 33.75m

WATER OBSERVATIONS: Free ground water observed at 0.85m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT110

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.98 AHD
EASTING: 332297
NORTHING: 6244497
DIP/AZIMUTH: 90°/--

BORE No: BH10
PROJECT No: 85777.15
DATE: 16/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-27	31	LAMINITE: high strength, fresh, slightly fractured, pale grey to grey laminite with approximately 20% fine grained sandstone *(continued)*						55°, pl, cly vn 29.51m: B 0°, pl, cly 3mm 29.54m: J 55°, pl, ro, cln 29.63m: B 0°, pl, cly 7mm 29.69-29.75m: J 60°, pl, ro, cln 30m: J 45°, pl, ro, cln 30.07m: J 45°, pl, ro, cln 30.39m: J 45°, pl, ro, cln 30.49m: J 50°, pl, ro, cln 30.94m: J 70°, ir, ro 31m: J 50°, pl, ro, cln 31.07-31.20m: J (x2) 60°, pl, ro, cln 31.82m: B 5°, pl, cly 2mm 31.96m: J 55°, pl, ro, cln 32.48m: J 60°, pl, ro, cln 32.54-32.64m: J 60°, pl, ro, cln 32.82m: J 60°, pl, he 33.03m: J 70°, pl, partially he 33.06-33.16m: J 60°, pl, cln, sm 33.5m: J 45°, pl, he 33.64-33.68: J (x2) 60°, pl, ro, cln	C	100	66	PL(A) = 1
-28	32								C	100	90	PL(A) = 1.8 PL(A) = 1.9 PL(A) = 1.5
	32.1	SILTSTONE: high strength, fresh, slightly fractured, grey siltstone with a trace of fine sandstone laminations										
-29	33											
	33.75	Bore discontinued at 33.75m										
-30	34											
-31	35											
-32	36											
-33	37											
-34	38											
-35	39											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.55m, HQ to 26.9m

TYPE OF BORING: Solid flight auger to 5.55m, Rotary wash-bore to 26.9m, NMLC-coring to 33.75m

WATER OBSERVATIONS: Free ground water observed at 0.85m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT110

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 10 PROJECT: MASCOT JANUARY 2019

26.9 – 31.0m

BORE: 10 PROJECT: MASCOT JANUARY 2019

31.00 – 33.75m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.79 AHD
EASTING: 332247
NORTHING: 6244540
DIP/AZIMUTH: 90°/--

BORE No: BH11
PROJECT No: 85777.15
DATE: 18/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.02	ASPHALTIC CONCRETE							A			
	0.35	FILLING: dark brown, gravelly sand and clayey sand filling							A			
	0.6	SAND: pale brown, fine to meidum sand, moist							A			
	1.2	SANDY SILTY CLAY: firm, dark brown sandy silty clay with some rootlets							A			
		SAND: medium dense to dense, pale brown, fine to medium sand with some clayey and peaty layers							S			1,3,5 N = 8
									S			4,6,7 N = 13
									S			4,9,12 N = 21

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 27.8m

TYPE OF BORING: Solid flight auger to 5.50m, Rotary wash-bore to 27.80m, NMLC-coring to 33.82m

WATER OBSERVATIONS: Free groundwater observed at 1.2m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT111

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.79 AHD
EASTING: 332247
NORTHING: 6244540
DIP/AZIMUTH: 90°/--

BORE No: BH11
PROJECT No: 85777.15
DATE: 18/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-7	11	SAND: medium dense to dense, pale brown, fine to medium sand with some clayey and peaty layers *(continued)*										
-8	12											
-9	13											
	13.3	CLAY: stiff to very stiff clay										
-10	14											
-11	15											
-12	16											
-13	17											
-14	18											
-15	19											
-16												

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 27.8m

TYPE OF BORING: Solid flight auger to 5.50m, Rotary wash-bore to 27.80m, NMLC-coring to 33.82m

WATER OBSERVATIONS: Free groundwater observed at 1.2m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT111

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.79 AHD
EASTING: 332247
NORTHING: 6244540
DIP/AZIMUTH: 90°/--

BORE No: BH11
PROJECT No: 85777.15
DATE: 18/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-17	21	CLAY: stiff to very stiff clay *(continued)* hard below 20m										
-18	22											
-19	23											
-20	24											
-21	25											
-22	26											
-23	27											
-24	27.8	LAMINITE: very low and very low to low strength, highly weathered, fractured and slightly fractured, pale grey and grey laminite with approximately 25% fine sandstone laminations						27.92m: J5° & 75°, st, cly 9mm 27.96-28.08m: J80-90°, ir, cly vn 28.11m: J70°, pl, partially he 28.28-28.29m: Cs, 10mm 28.39-28.44m: fg, 10mm 28.56-28.66m: J70°, ir, ro, cln 28.73-28.84m; J65-80°, ir, cly vn 28.9m: J80°, ir, cly vn	C	100	0	PL(A) = 0.1
-25	29								C	100	49	PL(A) = 0.18
-26	29.1	LAMINITE: medium strength with several very low strength bands, extremely and slightly weathered, pale grey and grey laminite with approximately 25% fine sandstone laminations										PL(A) = 0.42

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 27.8m

TYPE OF BORING: Solid flight auger to 5.50m, Rotary wash-bore to 27.80m, NMLC-coring to 33.82m

WATER OBSERVATIONS: Free groundwater observed at 1.2m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT111

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 3.79 AHD
EASTING: 332247
NORTHING: 6244540
DIP/AZIMUTH: 90°/--

BORE No: BH11
PROJECT No: 85777.15
DATE: 18/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-27	31	LAMINITE: medium strength with several very low strength bands, extremely and slightly weathered, pale grey and grey laminite with approximately 25% fine sandstone laminations *(continued)*						29.2m: B10°, pl, cly 5mm 29.26-29.28m: Ds, 20mm 29.44m: B10°, pl, cly 5mm	C	100	49	PL(A) = 0.42
	31.0	LAMINITE: medium to high and high strength, fresh, slightly fractured, pale grey and grey laminite with approximately 20% fine sandstone laminations						29.57m: J45°, pl, ro, cln 29.64-29.66m: Ds, 20mm 29.89-29.96m: Ds, 70mm 29.97-30.11m: J60-90°, ir, cly vn 30.12-30.21m: Ds, 90mm 30.24m: J30°, cu, ti 3027-30.73m; J(x5), 45°, pl, ro, cly vn 30.99m: J45°, pl, cly vn 31.05m: J45°, pl, he 31.77m: J45°, pl, ro, cln 31.85m: J45°, pl, partially he 32.22m: J60-70°, cu, ro, cln 32.34m: J45°, pl, sm, cly vn 33.05m: J45°, ir, ro, cln 33.34-33.57m: J(x3), 45°, pl, sm, cln	C	100	74	PL(A) = 1.8 PL(A) = 0.98 PL(A) = 1.3
-28	32											
-29	33											
-30	33.82	Bore discontinued at 33.82m										
	34											
-31	35											
-32	36											
-33	37											
-34	38											
-35	39											
-36												

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 27.8m

TYPE OF BORING: Solid flight auger to 5.50m, Rotary wash-bore to 27.80m, NMLC-coring to 33.82m

WATER OBSERVATIONS: Free groundwater observed at 1.2m (measured off SPT rod)

REMARKS: Soil descriptions and strengths at depth based on CPT111

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 11 PROJECT: MASCOT JANUARY 2019

27.80 – 32.00m

BORE: 11 PROJECT: MASCOT JANUARY 2019

32.00 – 33.82m

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.03 AHD
EASTING: 332299
NORTHING: 6244531
DIP/AZIMUTH: 90°/--

BORE No: BH12
PROJECT No: 85777.15
DATE: 21/1/2019
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
4	0.04	ASPHALTIC CONCRETE							A			
	0.45	FILLING: brown and dark brown, gravelly sand and clayey sand filling							A			
3	1	SAND: loose to medium dense, pale brown fine to medium grained sand, moist							A			
	1.7	SILTY SANDY CLAY: soft, dark brown silty sandy clay							S			2,1,2 N = 3
2	2											
	2.0	SAND: loose to medium dense, pale brown, fine to medium sand, saturated										
1	3								S			4,2,1 N = 3
0	4											
-1	5								S			0,4,6 N = 10
	5.8	SAND: medium dense to dense, pale brown, fine to medium sand with some clayey and peaty layers										
-2	6											
-3	7											
-4	8											
-5	9											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 24.1m

TYPE OF BORING: Solid flight auger to 5.5m, Rotary wash-bore to 24.1m, NMLC-coring to 31.95m

WATER OBSERVATIONS: Free ground water observed at 1.2m on 24 Jan 2019

REMARKS: Excess core (0.38m) was recovered during 27.04 - 29.35m run. Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT112

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.03 AHD
EASTING: 332299
NORTHING: 6244531
DIP/AZIMUTH: 90°/--

BORE No: BH12
PROJECT No: 85777.15
DATE: 21/1/2019
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-6		SAND: medium dense to dense, pale brown, fine to medium sand with some clayey and peaty layers *(continued)*										
-7	11											
-8	12											
-9	13											
	13.3	CLAY: stiff to very stiff, light grey and brown clay										
-10	14											
-11	15											
-12	16											
-13	17	stiff to hard below 17m										
-14	18											
-15	19											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 24.1m

TYPE OF BORING: Solid flight auger to 5.5m, Rotary wash-bore to 24.1m, NMLC-coring to 31.95m

WATER OBSERVATIONS: Free ground water observed at 1.2m on 24 Jan 2019

REMARKS: Excess core (0.38m) was recovered during 27.04 - 29.35m run. Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT112

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.03 AHD
EASTING: 332299
NORTHING: 6244531
DIP/AZIMUTH: 90°/--

BORE No: BH12
PROJECT No: 85777.15
DATE: 21/1/2019
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
-16		CLAY: stiff to very stiff, light grey and brown clay *(continued)*										
-17	21											
-18	22											
-19	23											
-20	24											
	24.1	SILTSTONE: very low strength, highly weathered, slightly fractured, grey siltstone						24.74m: B 0°, pl, cly 9mm, fe 24.85m: B 15°, ir, fe, cly 9mm 25.1m: J 45°, pl, cly vn, fe 25.46m: B 10°, pl, cly 2mm, fe	C	100	0	PL(A) = 0.08
-21	25											
-22	26							26.30-26.31m: Ds	C	100	15	PL(A) = 0.1
	26.8	LAMINITE: low then medium strength with several extremely low strength bands, slightly weathered, slightly fractured grey laminite										PL(A) = 0.14
-23	27							27.07-27.08m: Cs 27.16-27.18m: Cs 27.22-27.23m: Cs 27.31-27.32m: Cs 27.40-27.65m: J 75°-90°, ir, ro, cln, partially he 27.55-27.58m: Cs 27.73-27.85m: B (x3) 0°-5°, pl, cly 7-9mm 27.95m: J 45°, pl, ro, cln 28.19-28.69m: B (x8) 0°-10°, pl, cly 5-9mm 28.74m: J 30°&45°, st, ro, cln 29.03-29.36m: B (x4) 0°-5°, pl, cly 3-6mm	C	100	33	PL(A) = 0.27
-24	28											PL(A) = 0.95
	28.0	LAMINITE: medium to high strength, slightly weathered, slightly fractured grey laminite with approximately 30% fine sandstone laminations										PL(A) = 1.4
-25	29							29.7m: J 50°, pl, ro, cln 29.85m: J 40°, pl, cly vn	C	100	90	

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 24.1m

TYPE OF BORING: Solid flight auger to 5.5m, Rotary wash-bore to 24.1m, NMLC-coring to 31.95m

WATER OBSERVATIONS: Free ground water observed at 1.2m on 24 Jan 2019

REMARKS: Excess core (0.38m) was recovered during 27.04 - 29.35m run. Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT112

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Enstruct Group Pty Ltd
PROJECT: QANTAS Sydney Flight Training Centre
LOCATION: 295-297 King Street Mascot

SURFACE LEVEL: 4.03 AHD
EASTING: 332299
NORTHING: 6244531
DIP/AZIMUTH: 90°/--

BORE No: BH12
PROJECT No: 85777.15
DATE: 21/1/2019
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-26		LAMINITE: medium to high strength, slightly weathered, slightly fractured grey laminite with approximately 30% fine sandstone laminations *(continued)*						30.17-30.19m: B (x2) 30°, pl, cly 1-2mm 30.43m: J 70°, ir, ro, cln				PL(A) = 1.1
-27	31							30.87-30.98m: B (x3) 5°, pl, cly 1mm 31.10-31.94m: J (x6) 40°-50°,pl, ro, sm, cln&cly vn	C	100	90	
												PL(A) = 1.1
-28	32 31.95	Bore discontinued at 31.95m										
-29	33											
-30	34											
-31	35											
-32	36											
-33	37											
-34	38											
-35	39											

RIG: Explora 140 **DRILLER:** John S **LOGGED:** RB/SI **CASING:** HW to 5.6m, HQ to 24.1m

TYPE OF BORING: Solid flight auger to 5.5m, Rotary wash-bore to 24.1m, NMLC-coring to 31.95m

WATER OBSERVATIONS: Free ground water observed at 1.2m on 24 Jan 2019

REMARKS: Excess core (0.38m) was recovered during 27.04 - 29.35m run. Standpipe installed to 9.0m (screen 6.0-9.0m, gravel 5.0-9.0m, bentonite 4.0-5.0m backfill to GL with gatic cover). Soil descriptions and strengths at depth based on CPT112

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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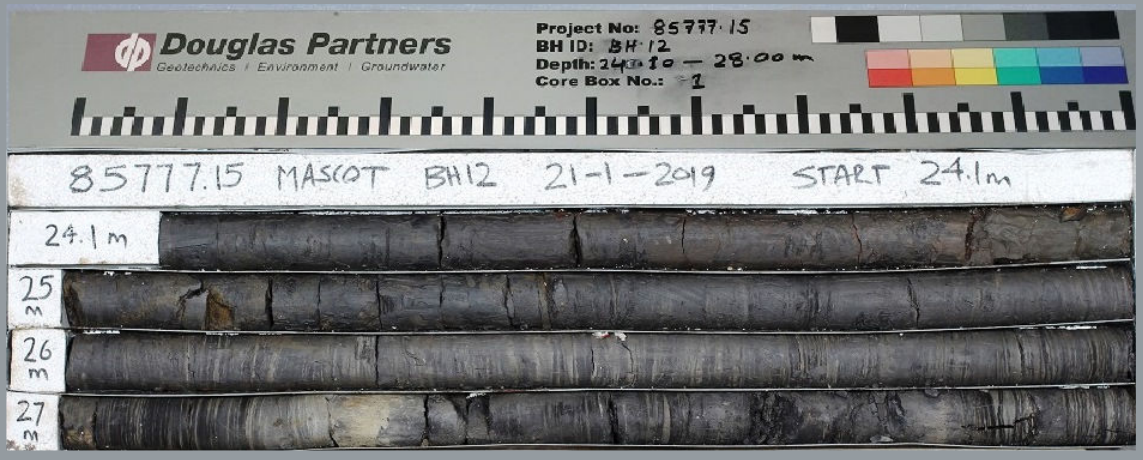
BORE: 12 PROJECT: MASCOT JANUARY 2019



24.10 – 28.00m

BORE: 12 PROJECT: MASCOT JANUARY 2019

28.00 – 31.95m

Appendix D

Cone Penetration Tests

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

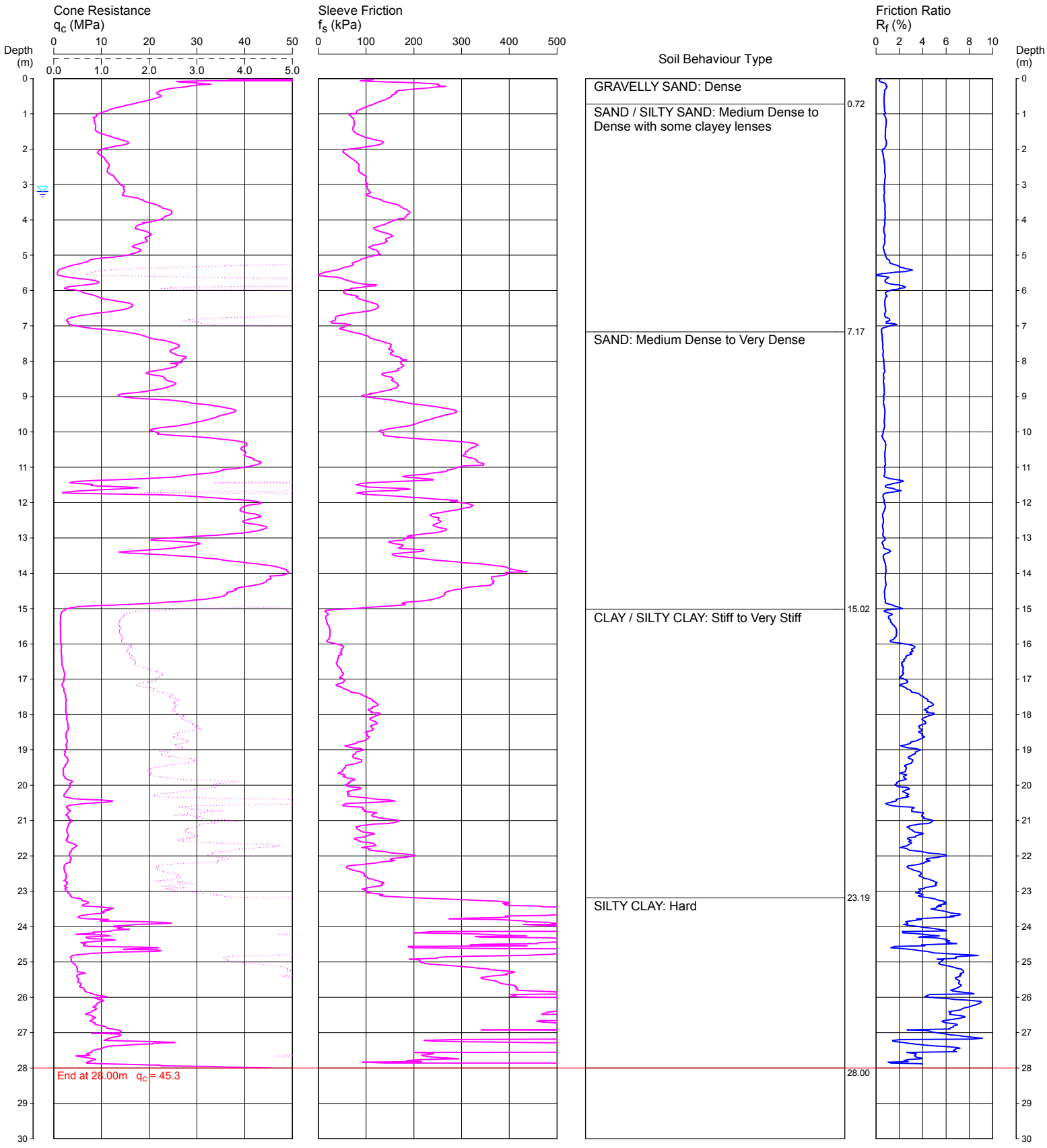
REDUCED LEVEL: 5.61

COORDINATES: 332213E 6244341N

CPT101

DATE 7/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE ROD BOWING.
GROUNDWATER OBSERVED AT 3.2 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 3.20m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT101.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

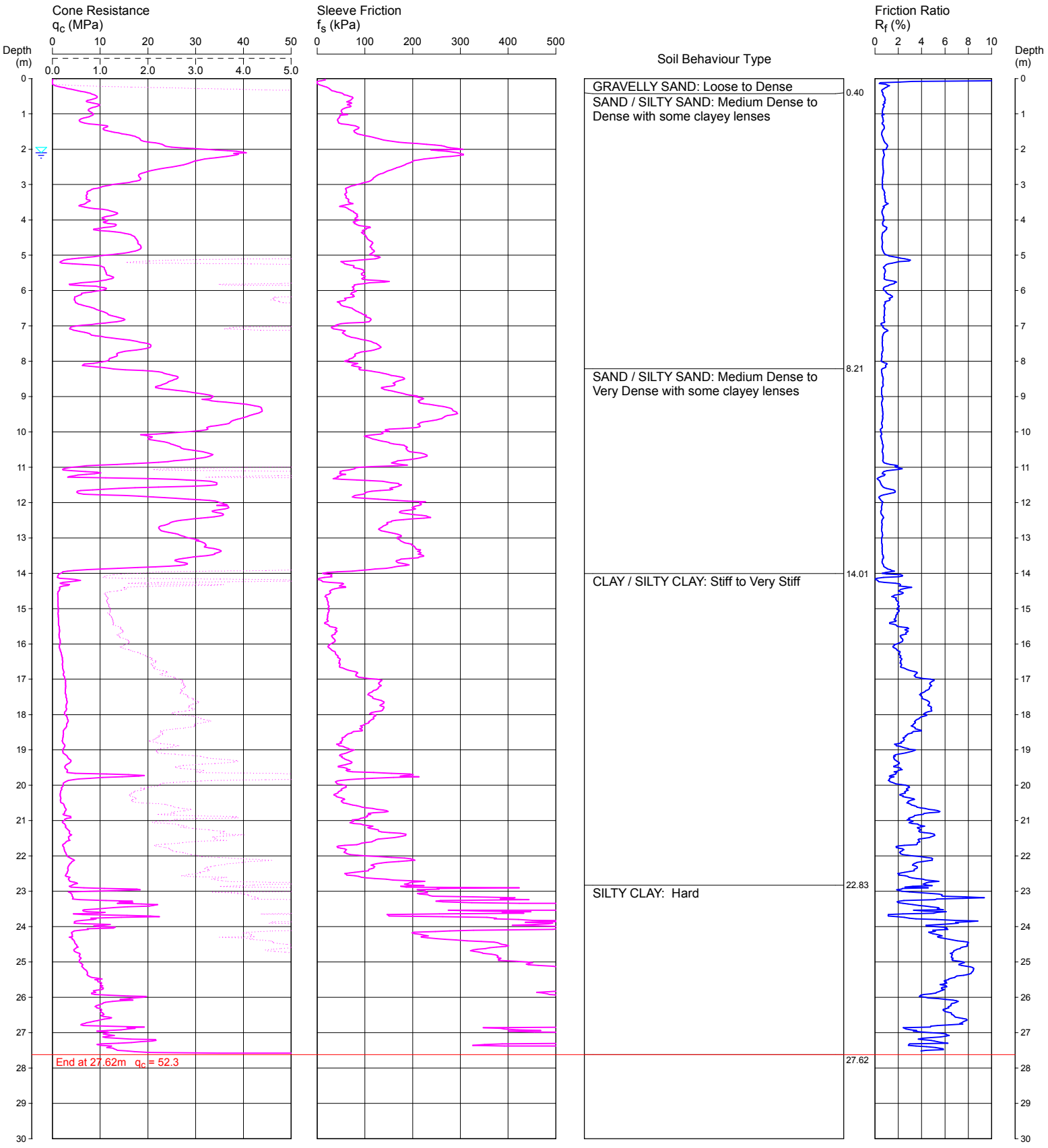
REDUCED LEVEL: 5.08

COORDINATES: 332258E 6244337N

CPT102

DATE 10/01/2019

PROJECT No: 85777.15



REMARKS: CONCRETE CORE TO 0.2 m DEPTH. TEST DISCONTINUED DUE TO CONE TIP REFUSAL. HOLE COLLAPSE AT 0.8 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 2.10m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT102.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

REDUCED LEVEL: 5.19

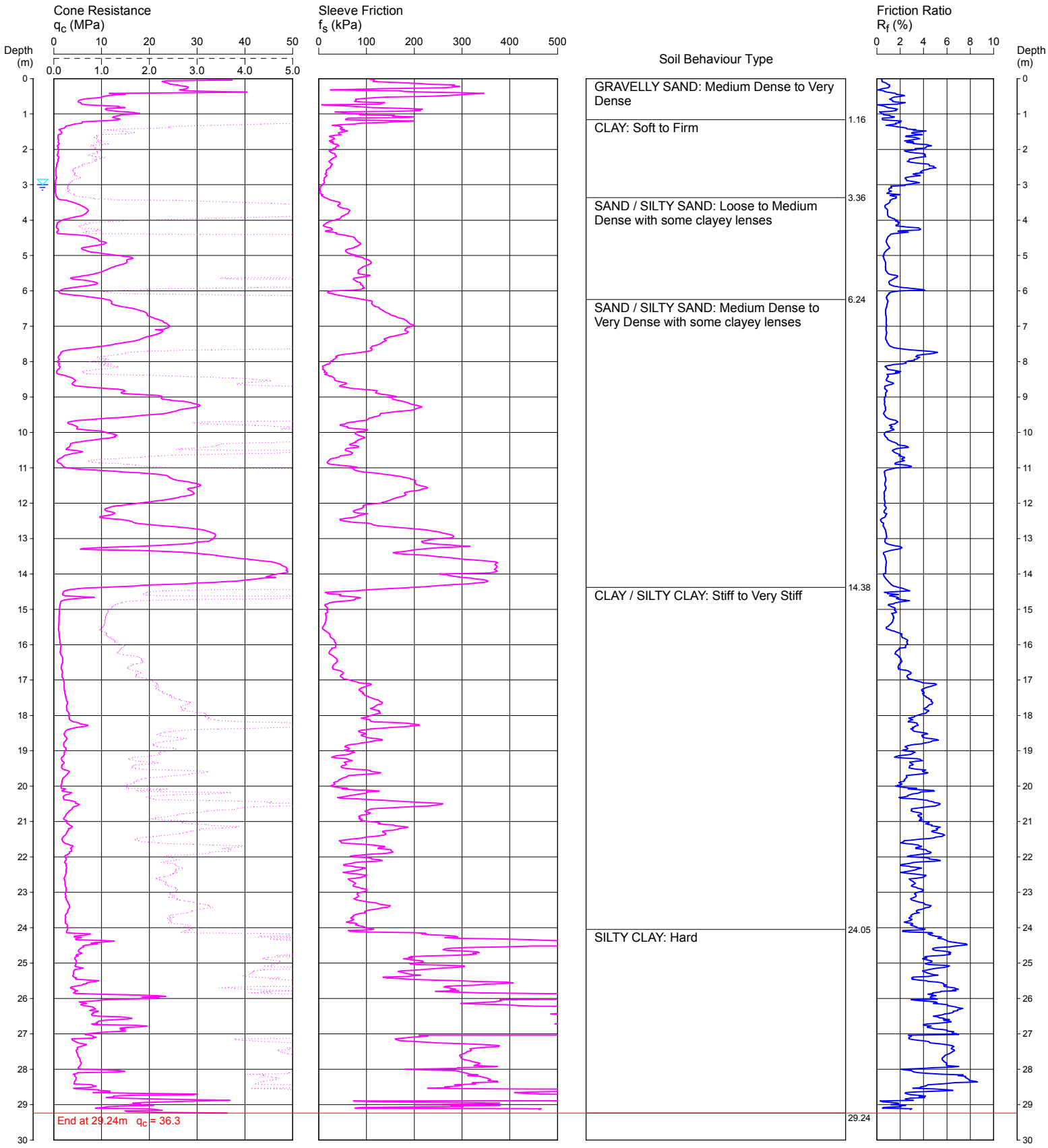
COORDINATES: 332158E 6244401N

CPT103

Page 1 of 1

DATE 7/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING. GROUNDWATER OBSERVED AT 3.0 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 3.00m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT103.CP5

Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

REDUCED LEVEL: 5.06

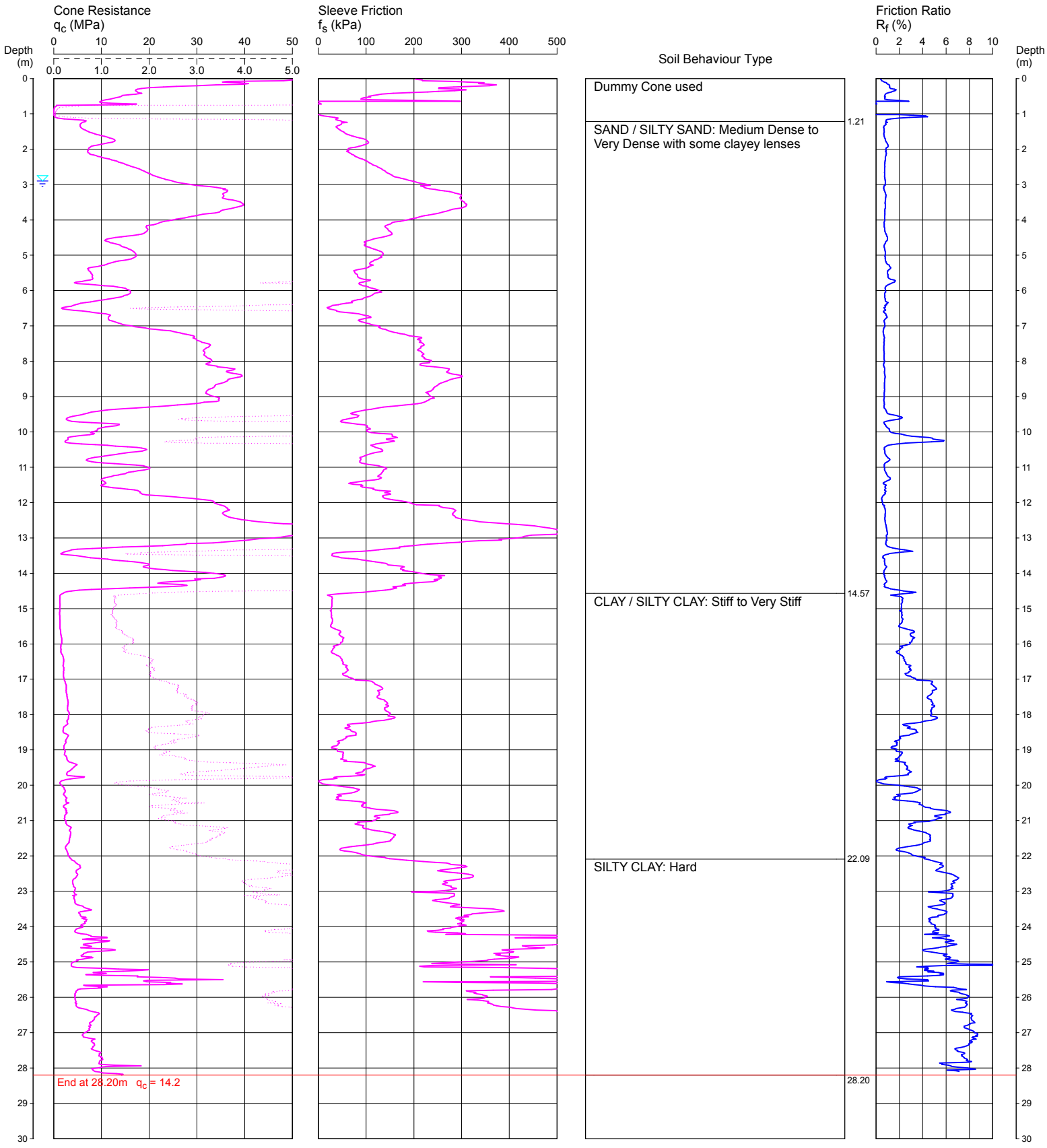
COORDINATES: 332223E 6244388N

CPT104

Page 1 of 1

DATE 7/01/2019

PROJECT No: 85777.15



REMARKS: DUMMY CONE FROM 0.74 TO 1.2 m TO PENETRATE FILLING.TEST DISCONTINUED DUE TO EXCESSIVE ROD BOWING. GROUNDWATER OBSERVED AT 2.9 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 2.90m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT104.CP5

Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

REDUCED LEVEL: 4.94

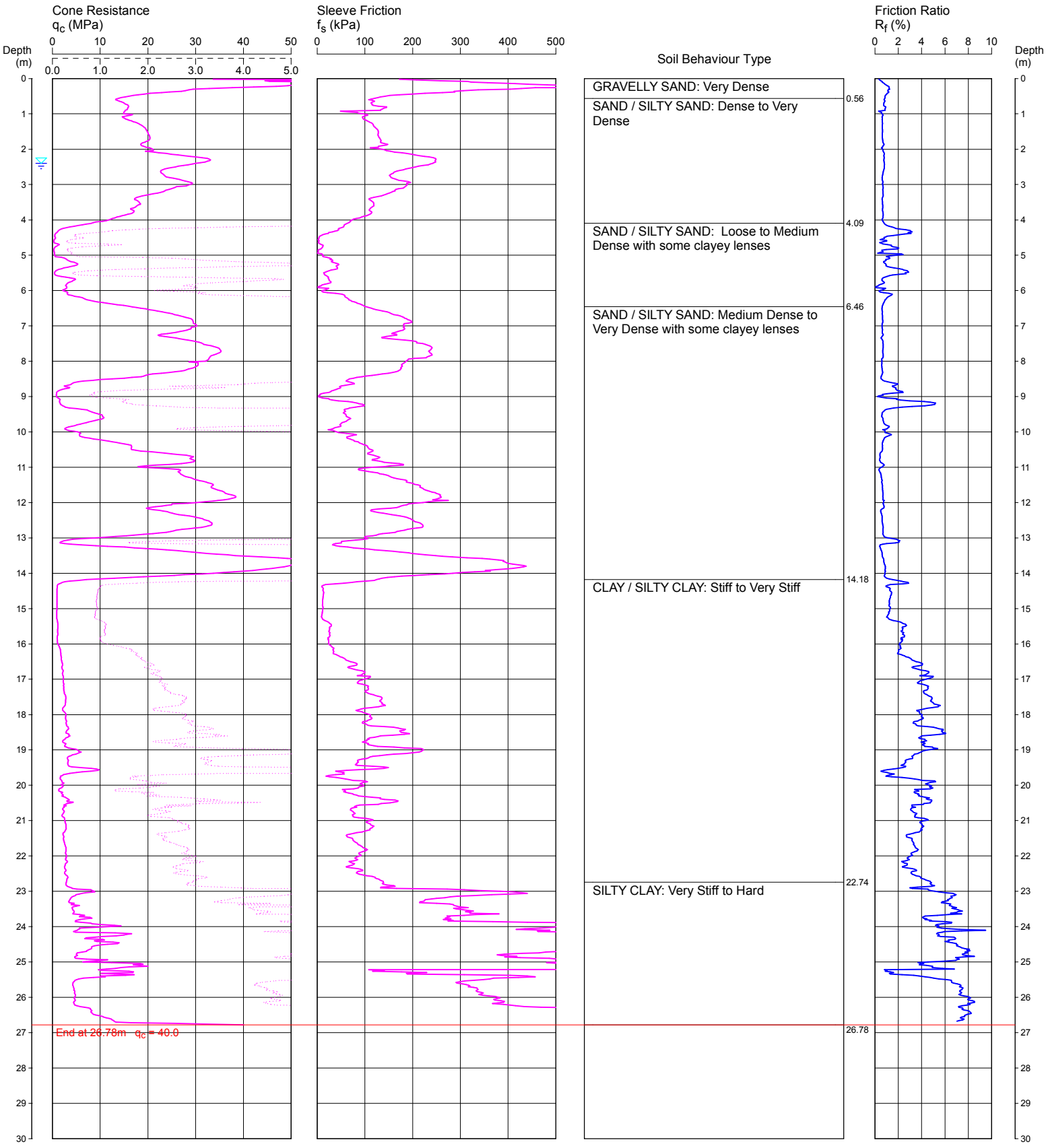
COORDINATES: 332262E 6244382N

CPT105

Page 1 of 1

DATE 8/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING.
GROUNDWATER OBSERVED AT 2.4 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 2.40m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT105.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
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CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

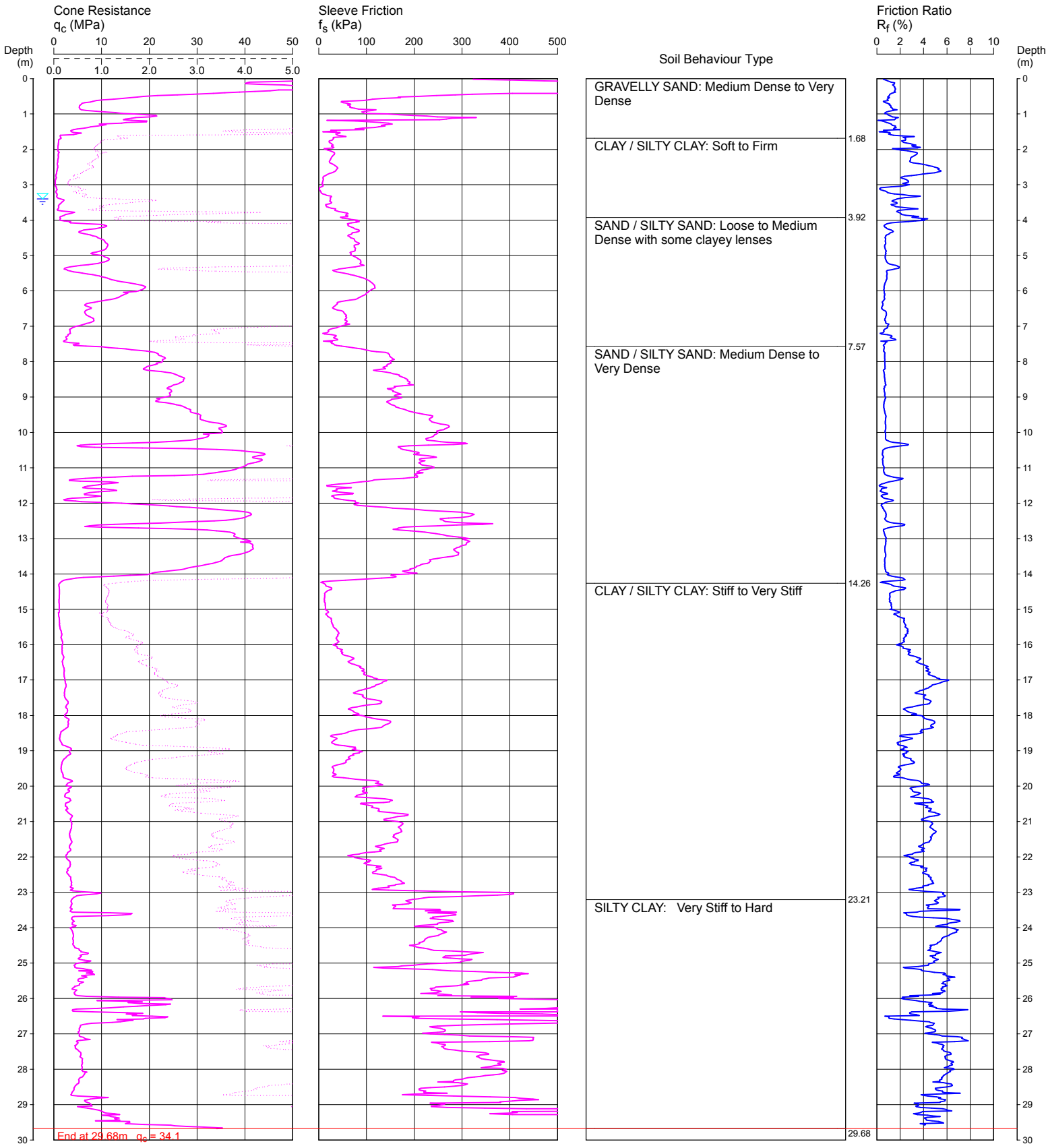
REDUCED LEVEL: 4.84

COORDINATES: 332160E 6244443N

CPT106

DATE 9/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING.
GROUNDWATER OBSERVED AT 3.4 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 3.40m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT106.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

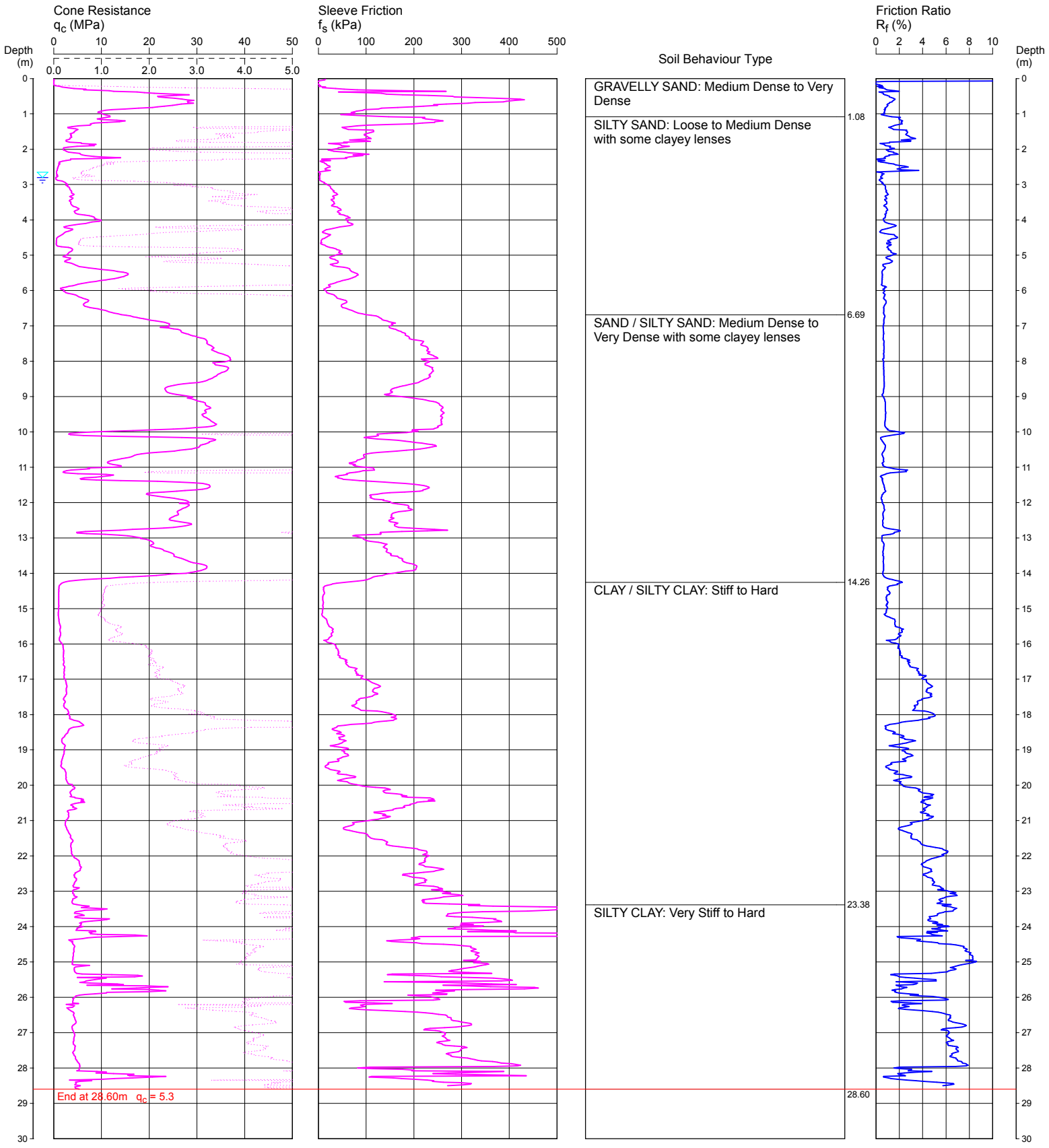
REDUCED LEVEL: 4.90

COORDINATES: 332220E 6244433N

CPT107

DATE 11/01/2019

PROJECT No: 85777.15



REMARKS: CONCRETE CORE TO 0.2 m DEPTH. TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING. HOLE COLLAPSE AT 0.5 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 2.80m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT107.CP5

Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

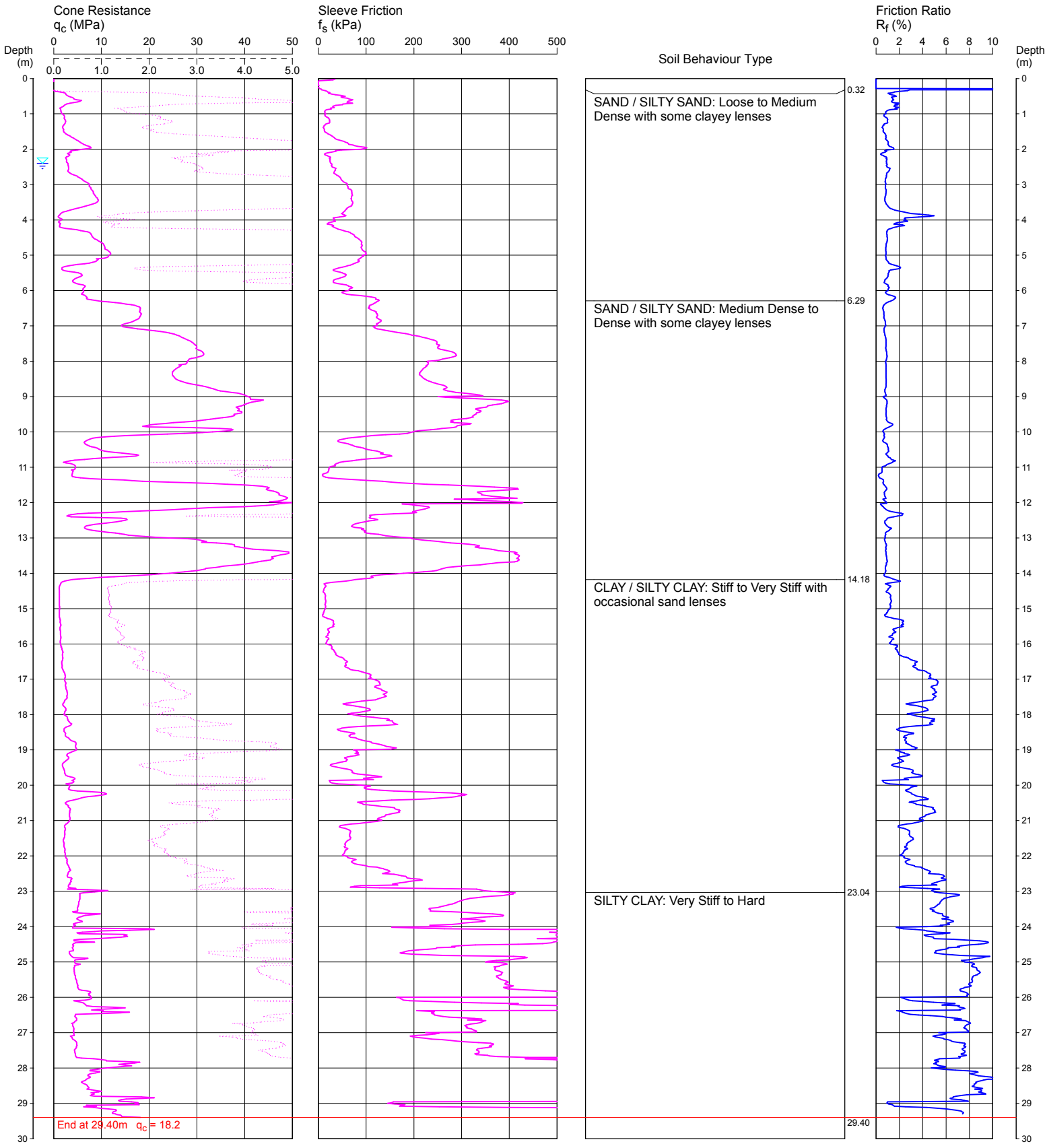
REDUCED LEVEL: 4.94

COORDINATES: 332275E 6244413N

CPT108

DATE 24/01/2019

PROJECT No: 85777.15



REMARKS: CONCRETE CORE TO 0.35 m DEPTH. TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING. GROUNDWATER OBSERVED AT 2.4 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 2.40m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT108.CP5

Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

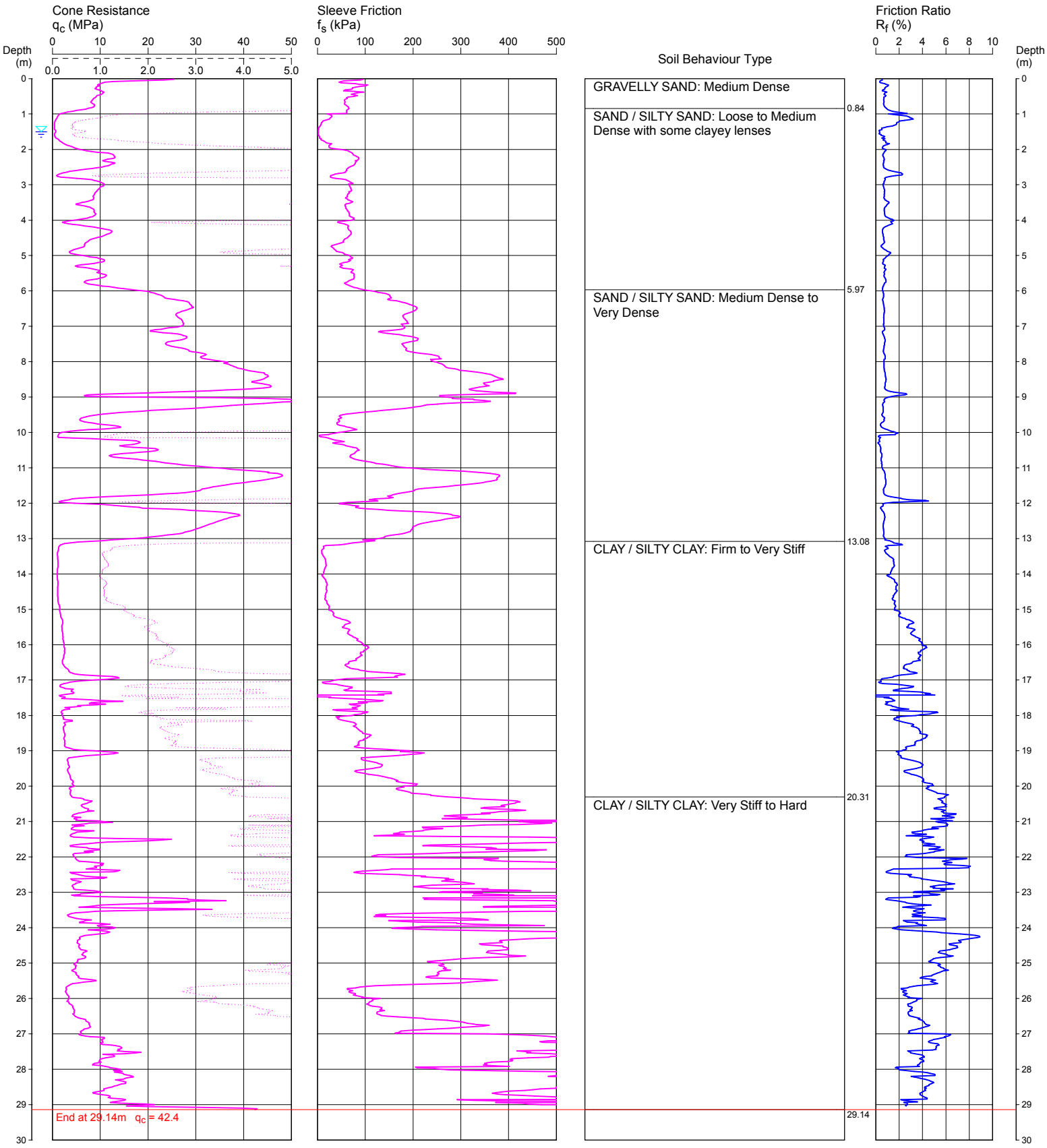
REDUCED LEVEL: 3.81

COORDINATES: 332240E 6244500N

CPT109

DATE 9/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING.
HOLE COLLAPSE AT 1.5 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 1.50m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT109.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

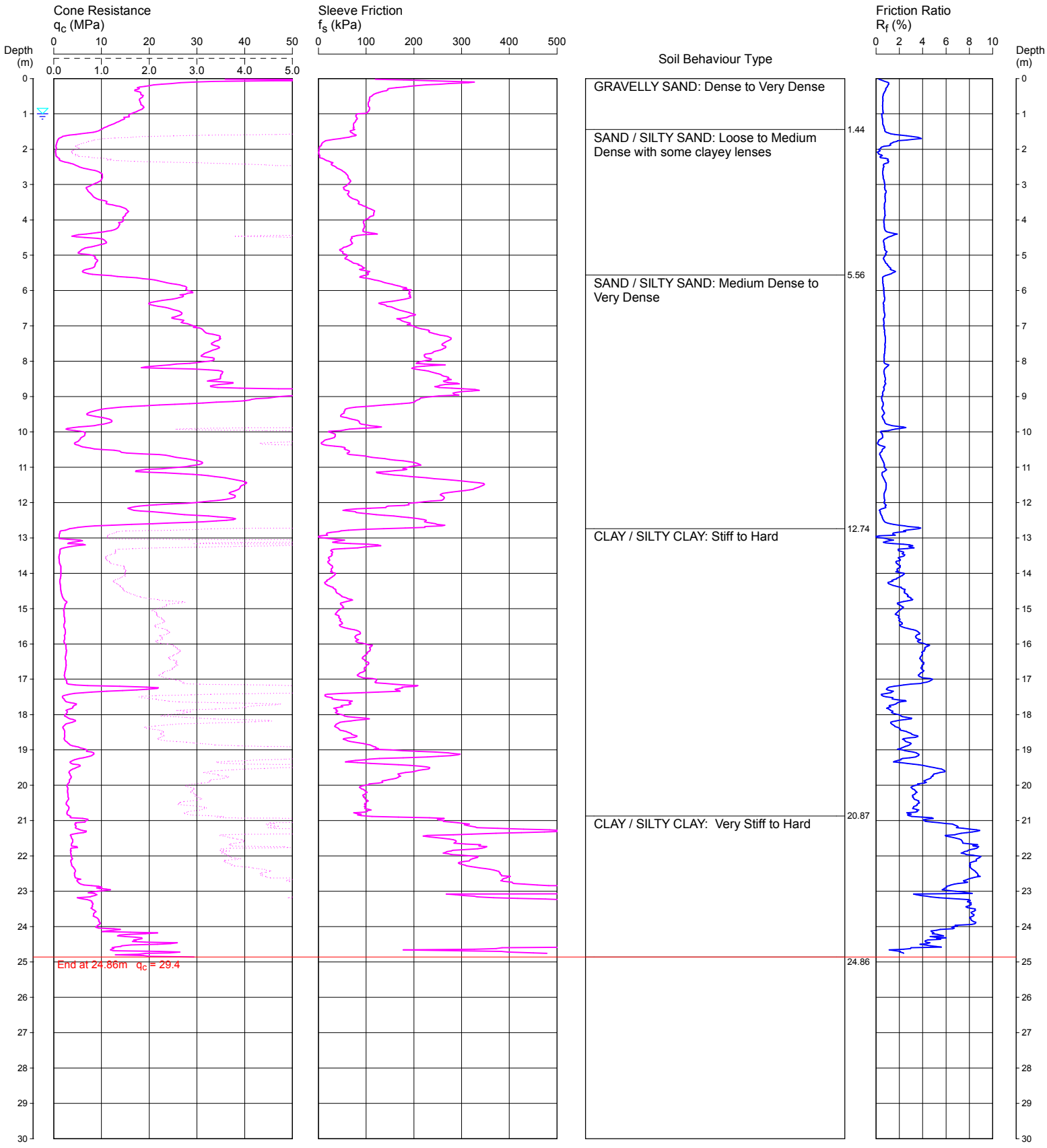
REDUCED LEVEL: 3.98

COORDINATES: 332297E 6244497N

CPT110

DATE 9/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING.
GROUNDWATER OBSERVED AT 1.0 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 1.00m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT110.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

REDUCED LEVEL: 3.79

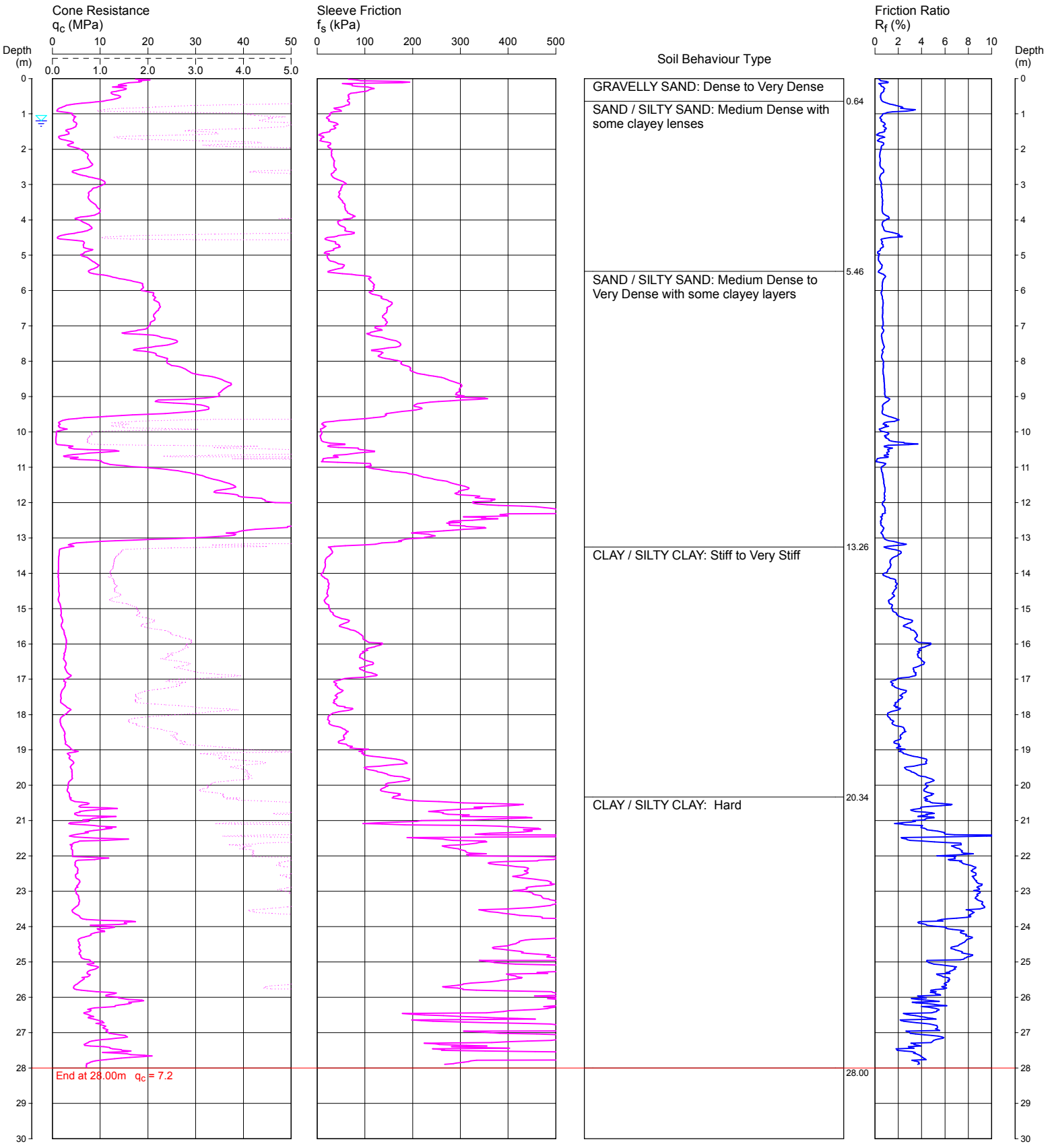
COORDINATES: 332247E 6244540N

CPT111

Page 1 of 1

DATE 10/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE ROD BOWING.
HOLE COLLAPSE AT 1.4 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 1.20m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT111.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

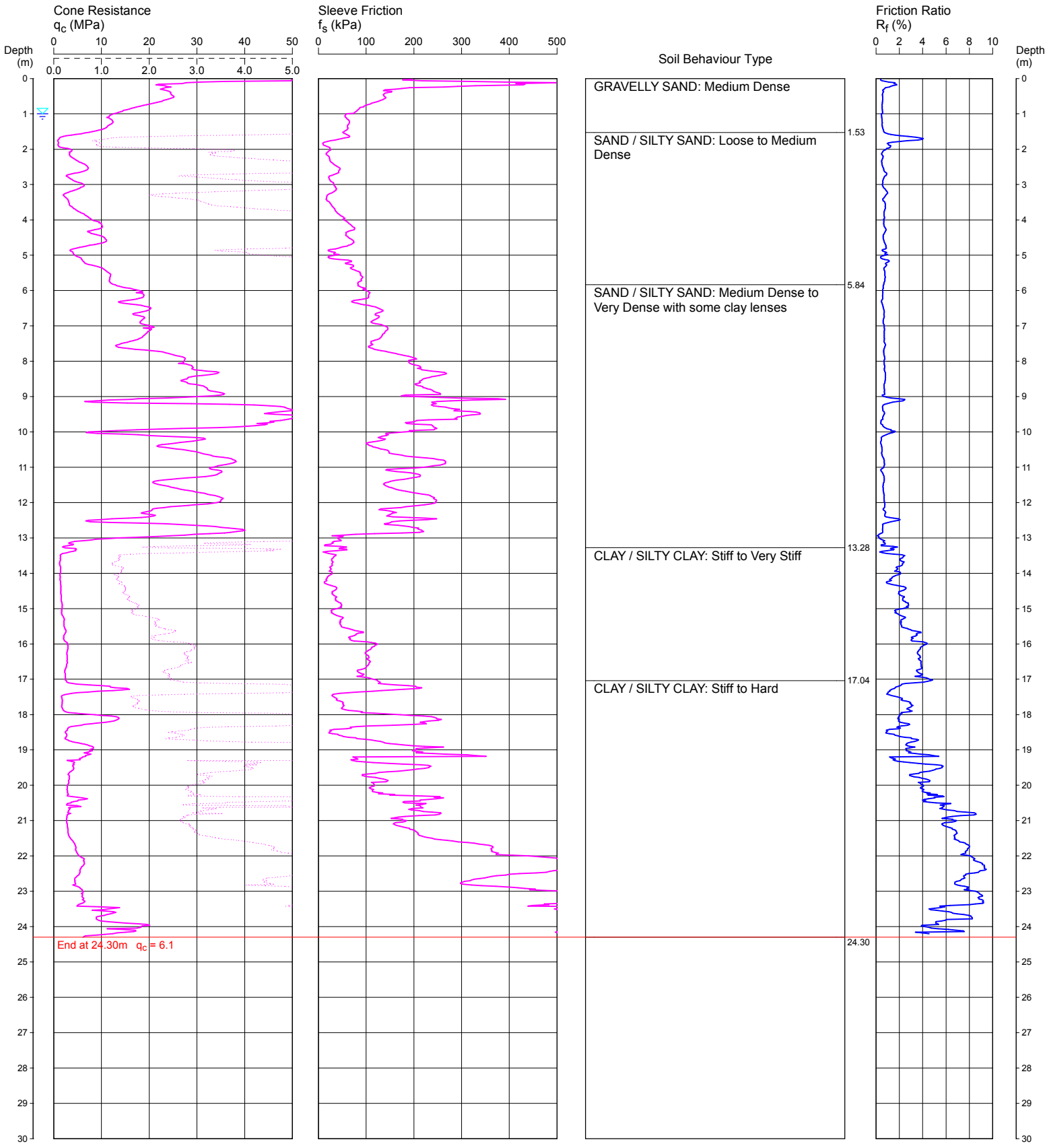
REDUCED LEVEL: 4.03

COORDINATES: 332299E 6244531N

CPT112

DATE 11/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING.
GROUNDWATER OBSERVED AT 1.0 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 1.00m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT112.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

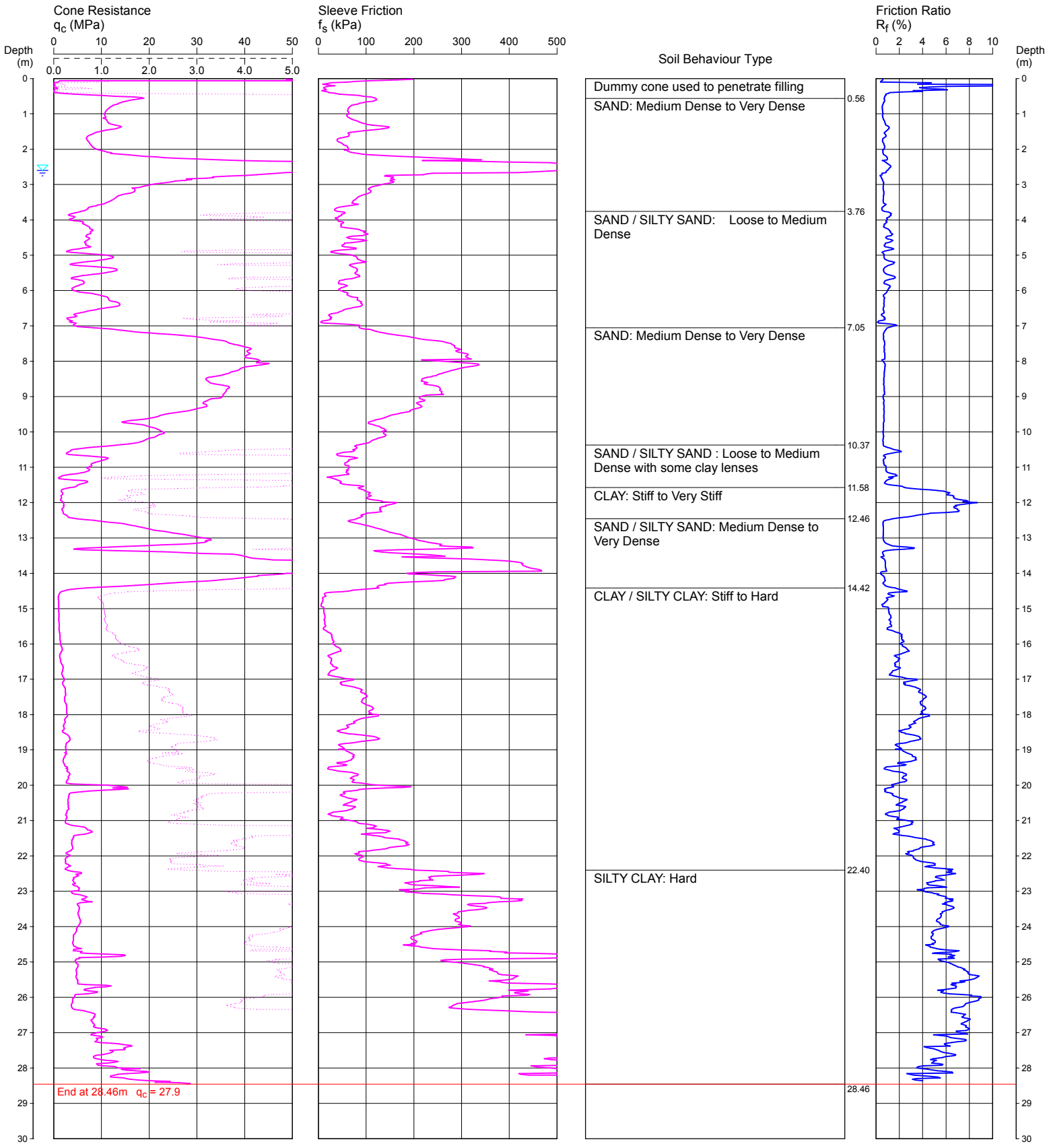
REDUCED LEVEL: 5.30

COORDINATES: 332219E 6244364N

CPT113

DATE 8/01/2019

PROJECT No: 85777.15



REMARKS: DUMMY CONE FROM 0.04 TO 0.5 m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO EXCESSIVE ROD BOWING. HOLE COLLAPSE AT 2.6 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 2.60m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT113.CP5

Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

REDUCED LEVEL: 5.07

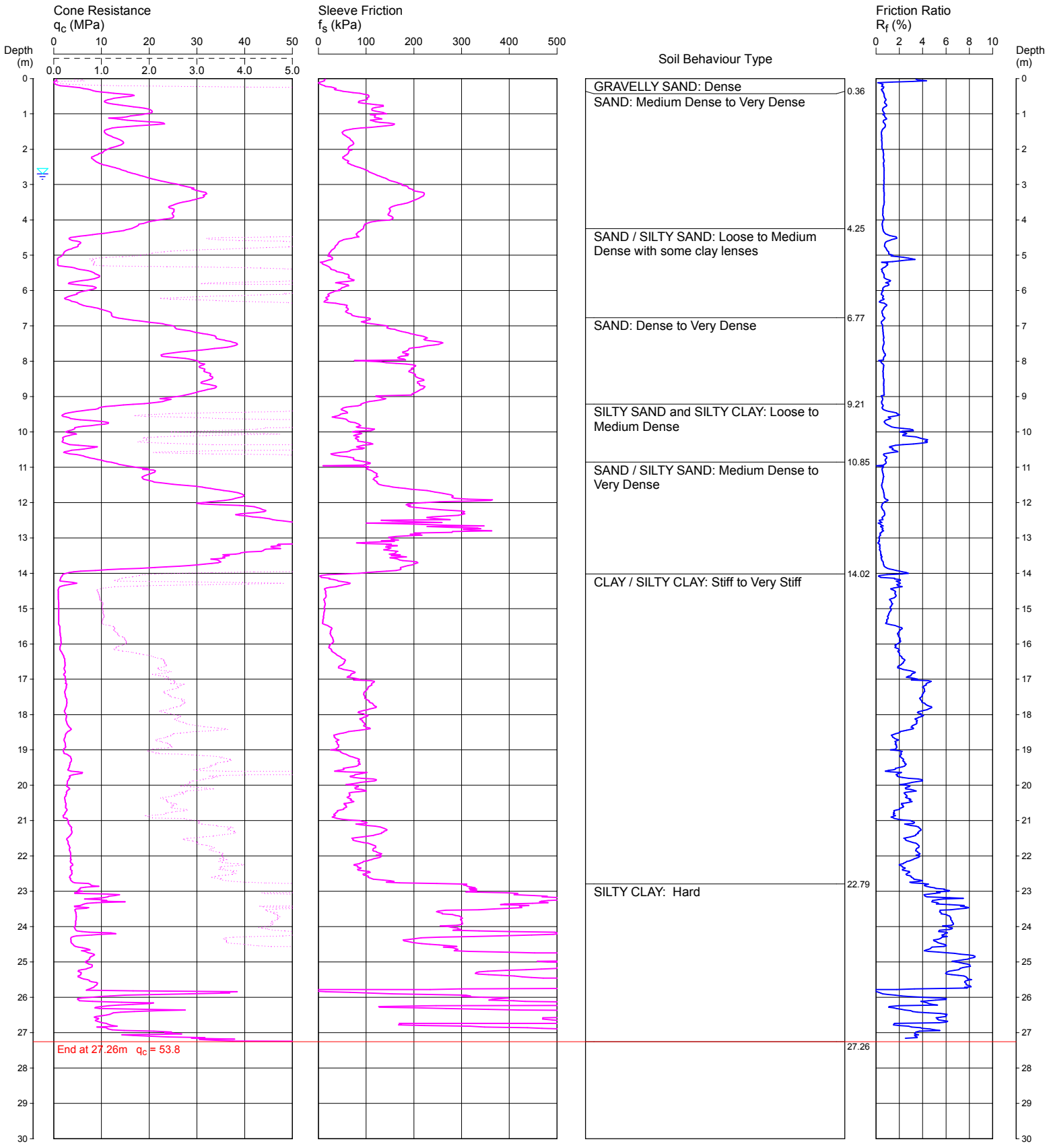
COORDINATES: 332262E 6244359N

CPT114

Page 1 of 1

DATE 11/01/2019

PROJECT No: 85777.15



REMARKS: CONCRETE CORE TO 0.13 m DEPTH. TEST DISCONTINUED DUE TO CONE TIP REFUSAL. GROUNDWATER OBSERVED AT 2.7 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 2.70m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT114.CP5

Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

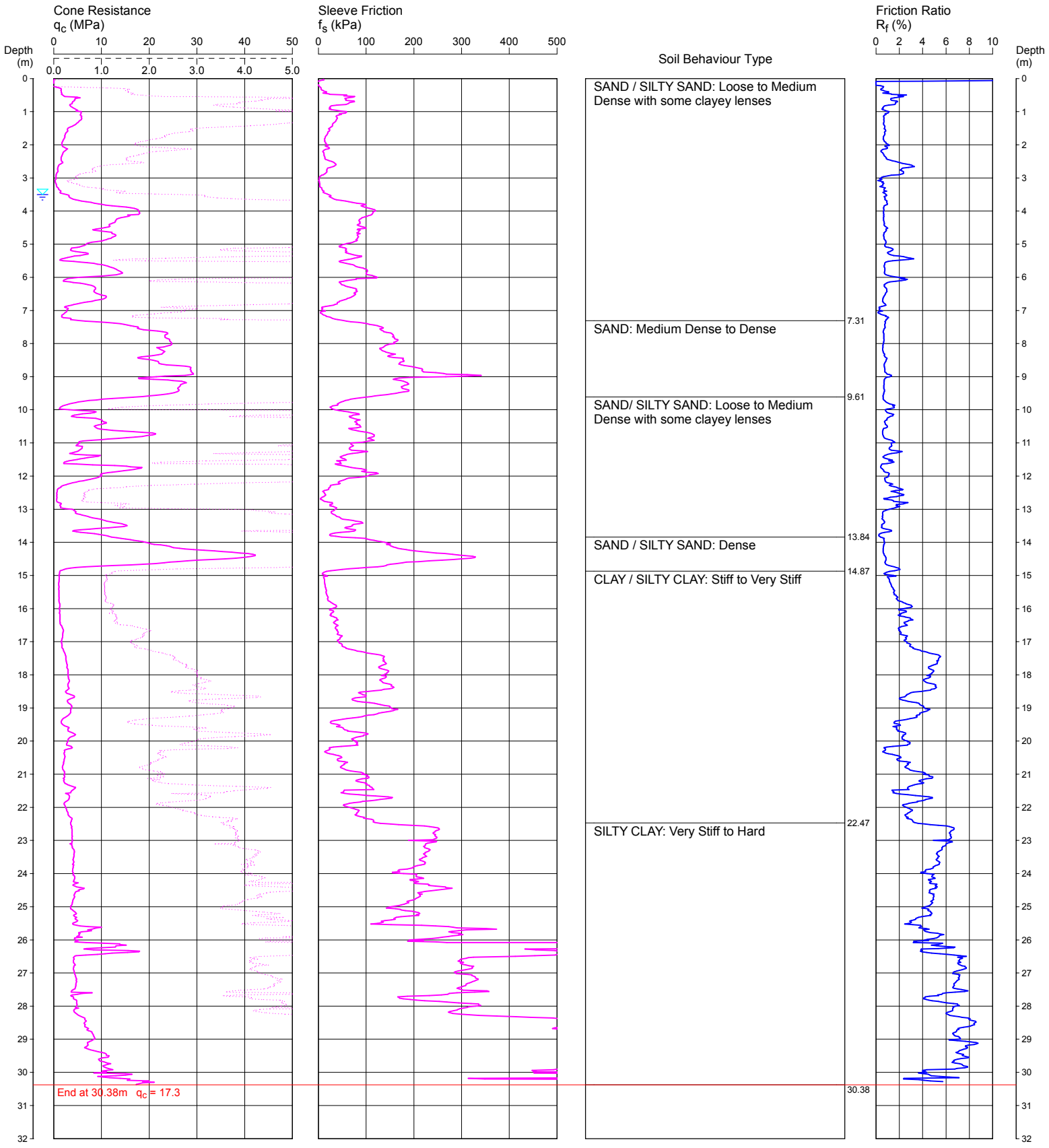
REDUCED LEVEL: 5.09

COORDINATES: 332198E 6244408N

CPT115

DATE 10/01/2019

PROJECT No: 85777.15



REMARKS: CONCRETE CORE TO 0.2 m DEPTH. TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING. GROUNDWATER OBSERVED AT 3.5 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 3.50m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT115.CP5

Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

REDUCED LEVEL: 5.02

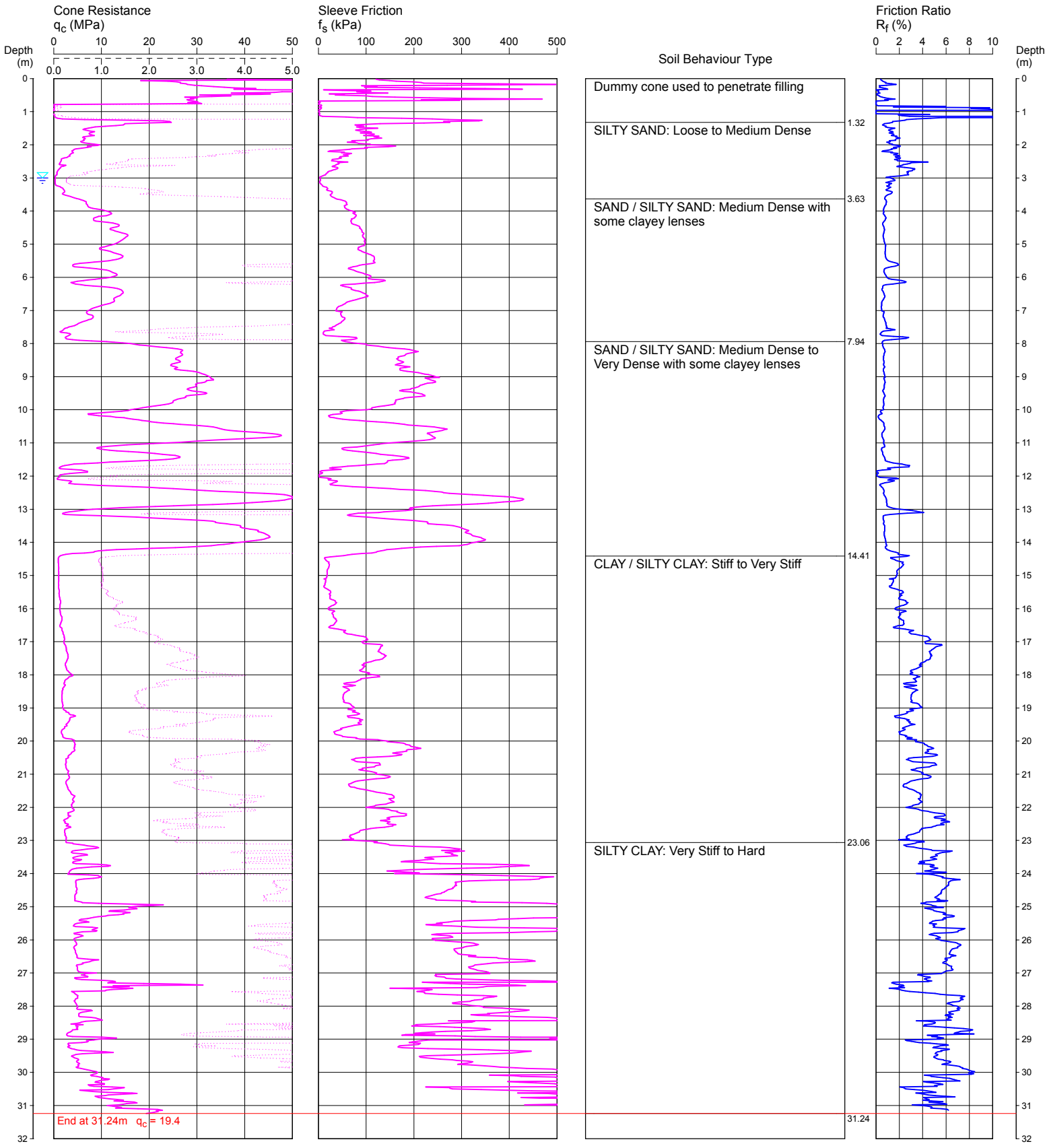
COORDINATES: 332161E 6244418N

CPT116

Page 1 of 1

DATE 7/01/2019

PROJECT No: 85777.15



REMARKS: DUMMY CONE FROM 0.76 TO 1.3 m TO PENETRATE FILLING. TEST DISCONTINUED DUE TO SLEEVE REFUSAL. HOLE COLLAPSE AT 3.0 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 3.00m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT116.CP5

Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

REDUCED LEVEL: 4.91

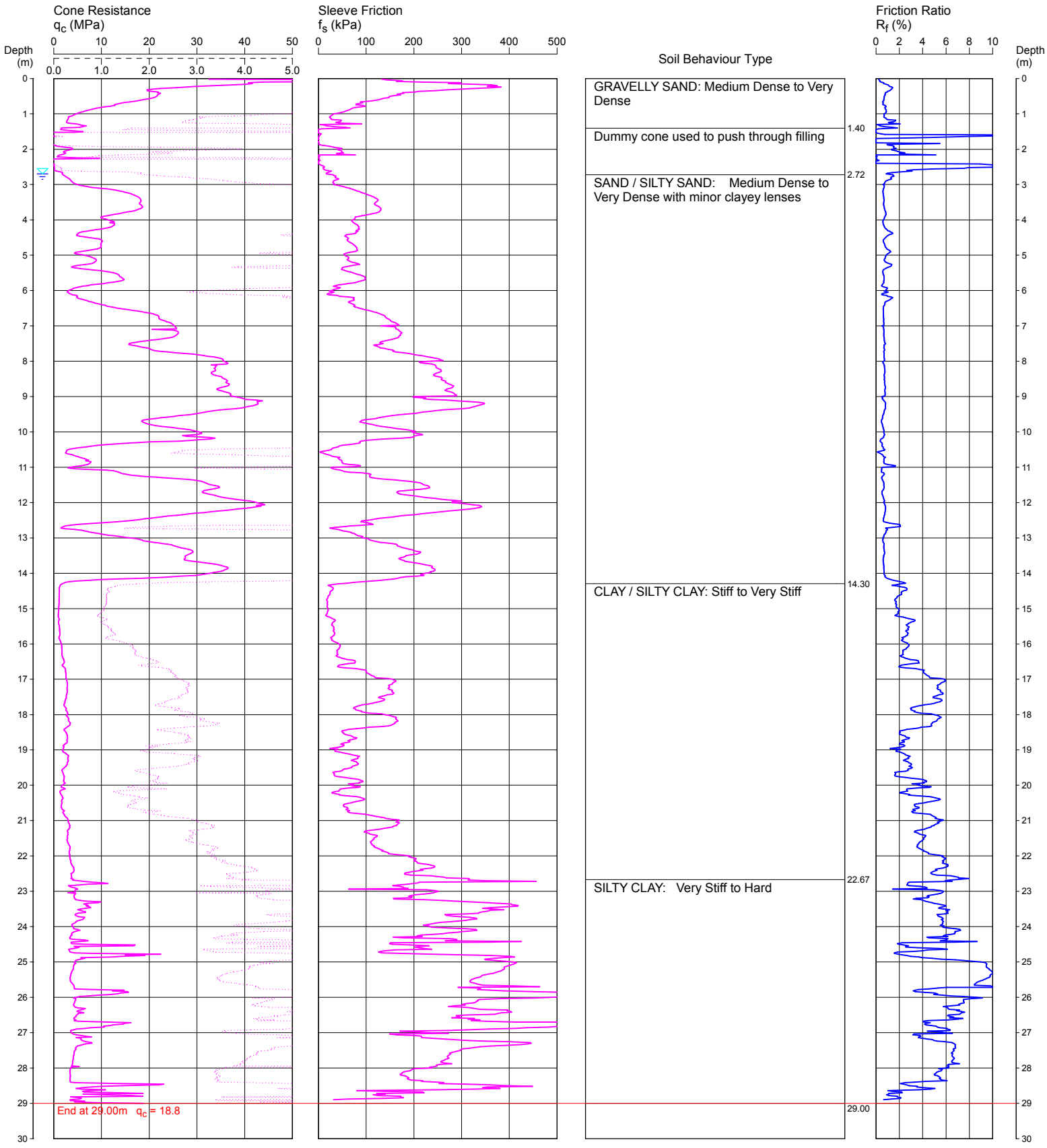
COORDINATES: 332225E 6244414N

CPT117

Page 1 of 1

DATE 8/01/2019

PROJECT No: 85777.15



REMARKS: DUMMY CONE FROM 1.52 TO 2.0 m AND 2.26 TO 2.7 m TO PENETRATE FILLING.TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING. GROUNDWATER OBSERVED AT 2.7 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 2.70m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT117.CP5

Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

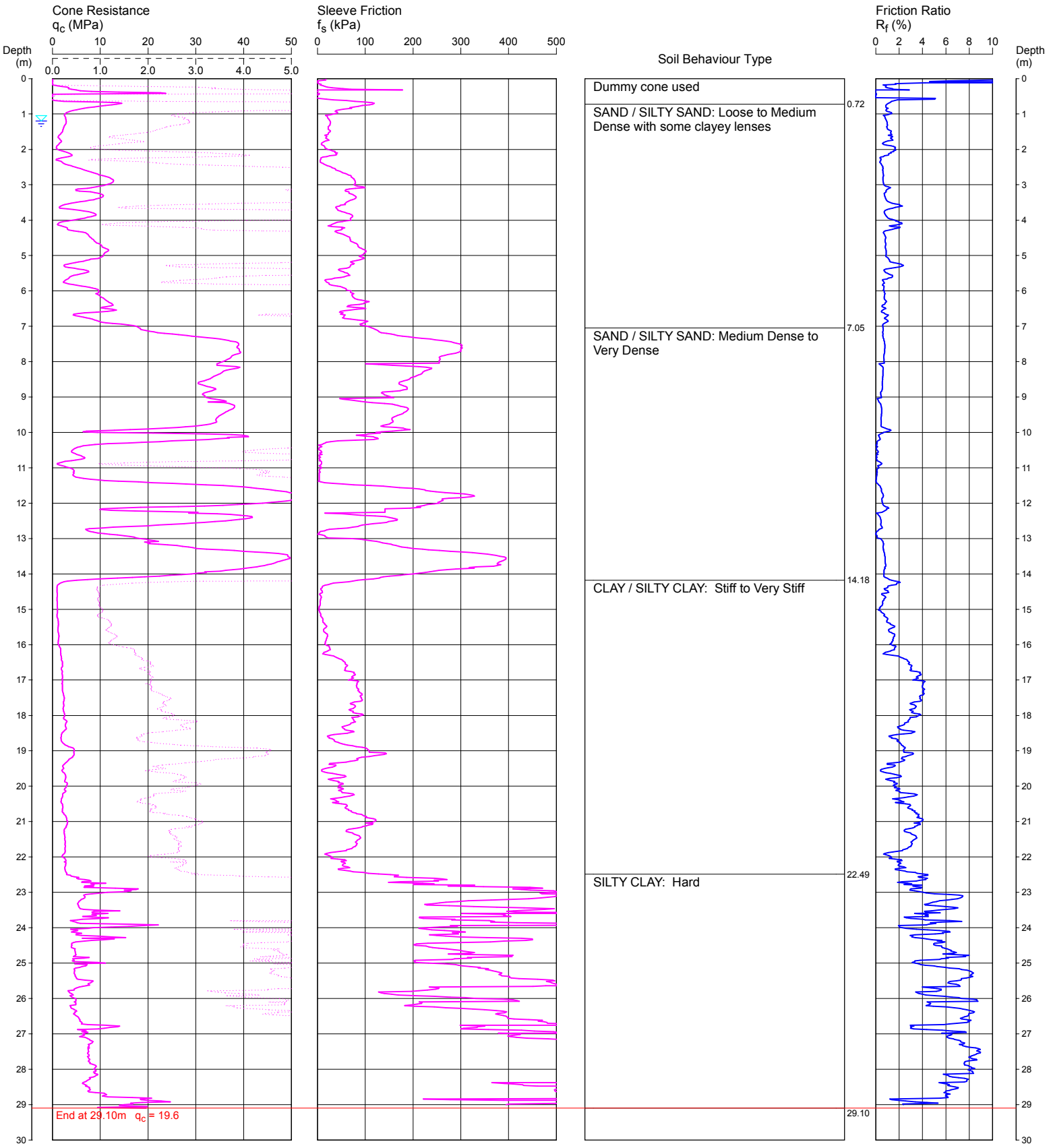
REDUCED LEVEL: 4.97

COORDINATES: 332274E 6244404N

CPT118

DATE 14/01/2019

PROJECT No: 85777.15



REMARKS: CONCRETE CORE TO 0.2 m DEPTH. DUMMY CONE FROM 0.42 TO 0.7 m DEPTH.
TEST DISCONTINUED DUE TO EXCESSIVE ROD BOWING. GROUNDWATER OBSERVED AT 1.2 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 1.20m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT118.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

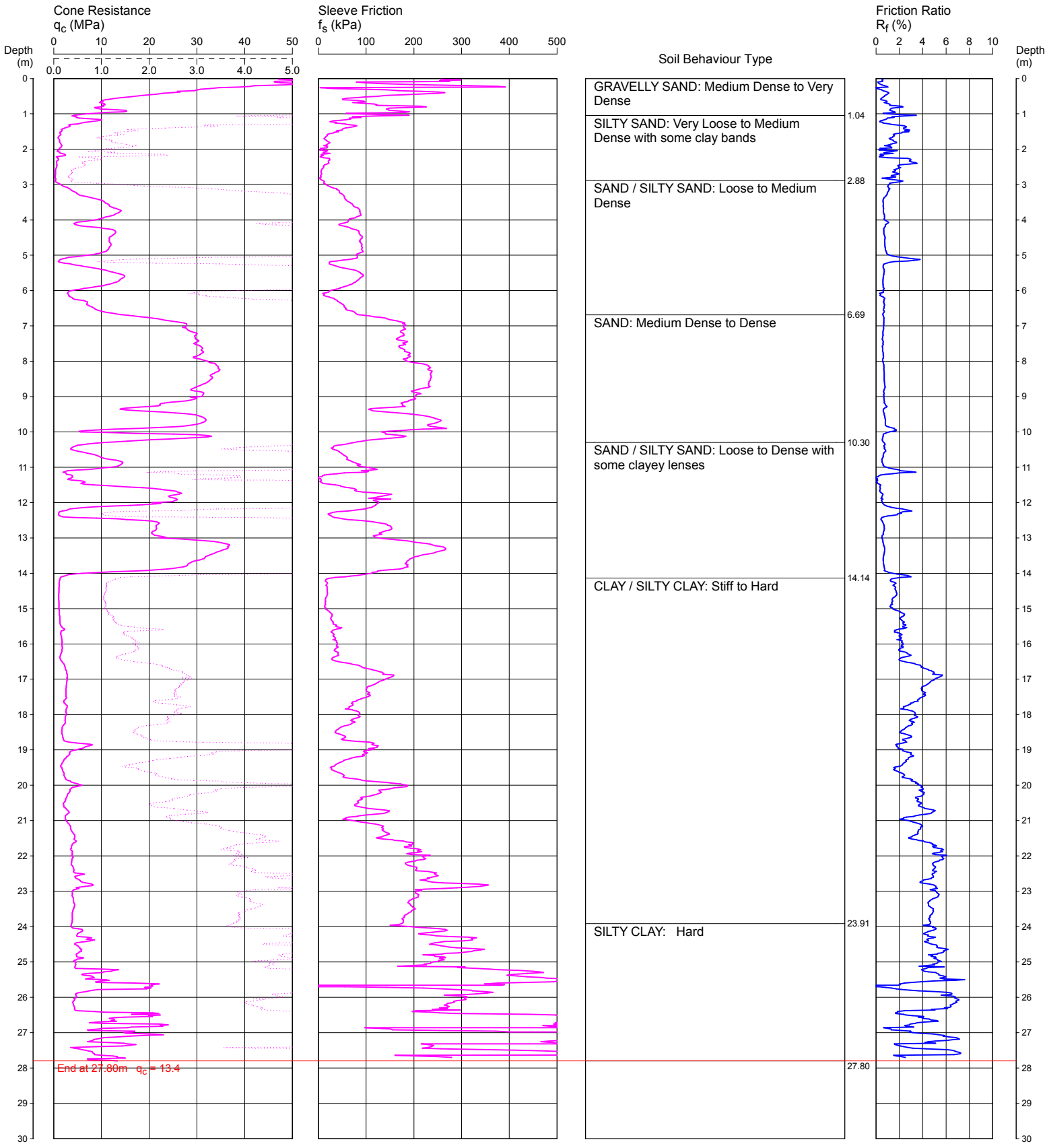
REDUCED LEVEL: 4.80

COORDINATES: 332200E 6244437N

CPT119

DATE 8/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING.
HOLE COLLAPSE AT 1.0 m AFTER WITHDRAWAL OF RODS.

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT119.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

REDUCED LEVEL: 3.57

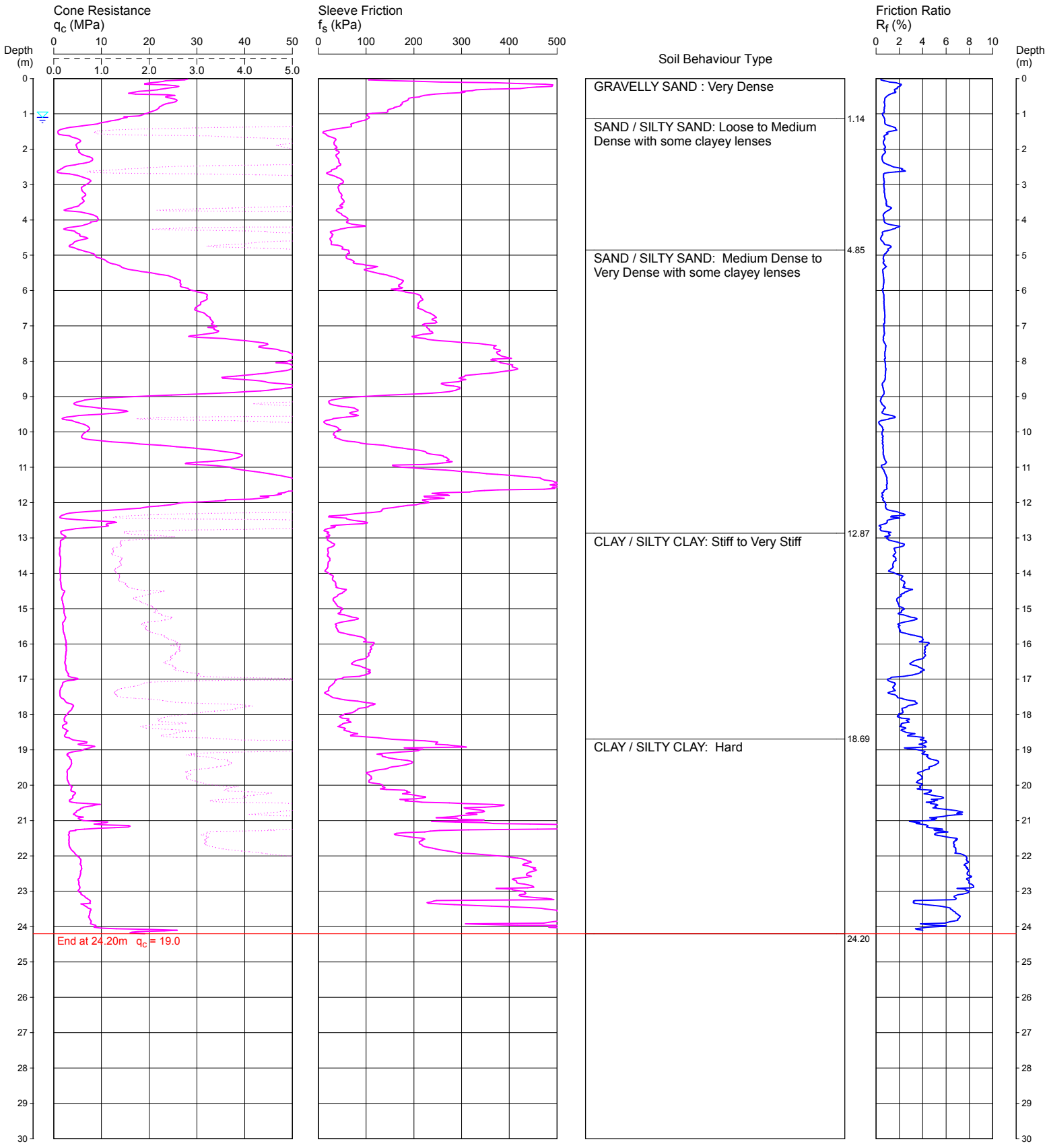
COORDINATES: 332279E 6244503N

CPT120

Page 1 of 1

DATE 9/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING.
GROUNDWATER OBSERVED AT 1.1 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 1.10m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT120.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

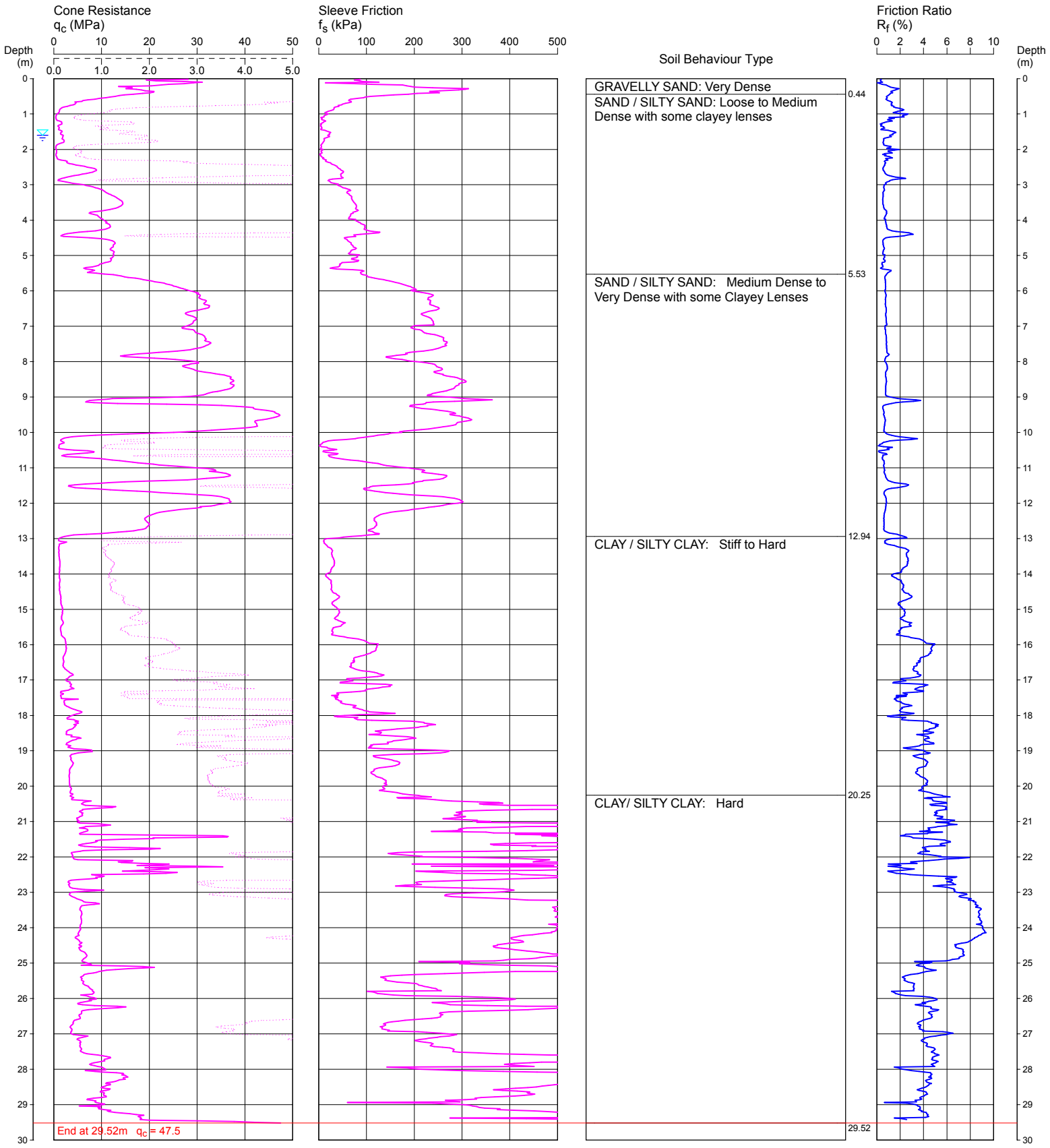
REDUCED LEVEL: 3.81

COORDINATES: 332245E 6244521N

CPT121

DATE 9/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE ROD BOWING.
GROUNDWATER OBSERVED AT 1.6 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 1.60m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT121.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

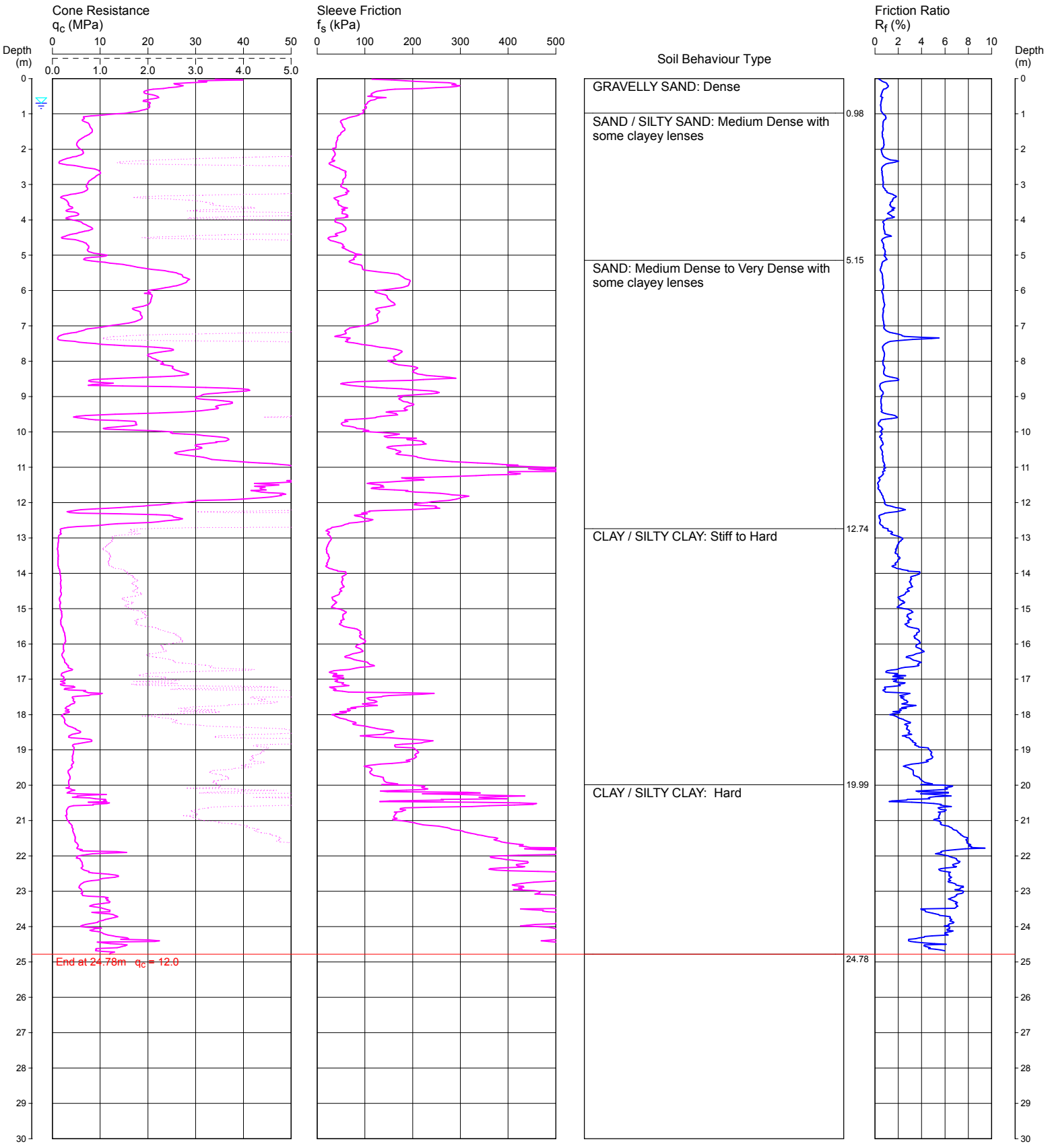
REDUCED LEVEL: 3.61

COORDINATES: 332279E 6244520N

CPT122

DATE 10/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE ROD BOWING.
GROUNDWATER OBSERVED AT 0.7 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 0.70m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT122.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

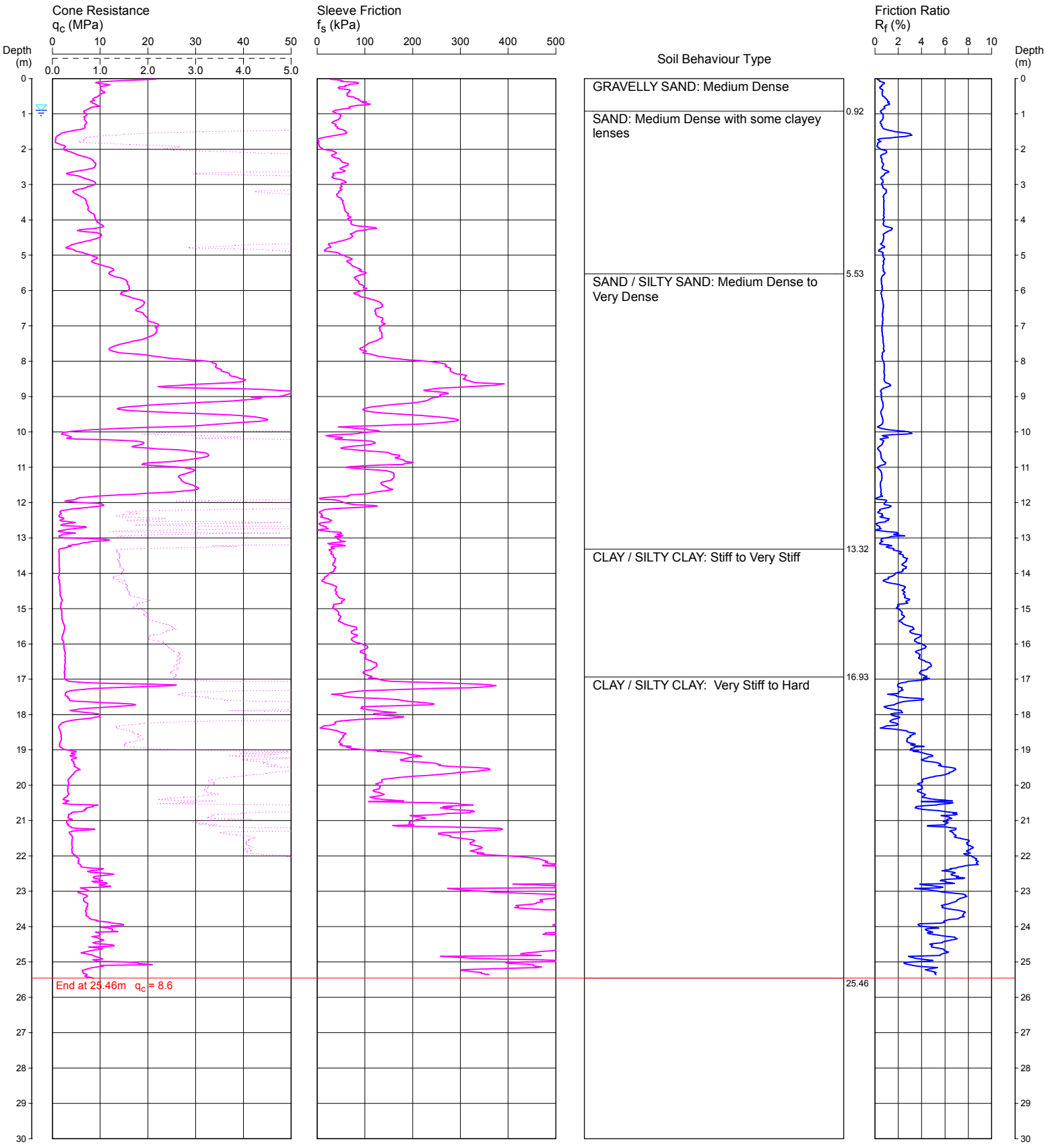
REDUCED LEVEL: 3.89

COORDINATES: 332293E 6244518N

CPT123

DATE 10/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE ROD BOWING.
GROUNDWATER OBSERVED AT 0.9 m AFTER WITHDRAWAL OF RODS.

Water depth after test: 0.90m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT123.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: ENSTRUCT GROUP PTY LTD

PROJECT: AIRPORT - QANTAS FLIGHT TRAINING CENTRE

LOCATION: 295 - 297 KING STREET, MASCOT

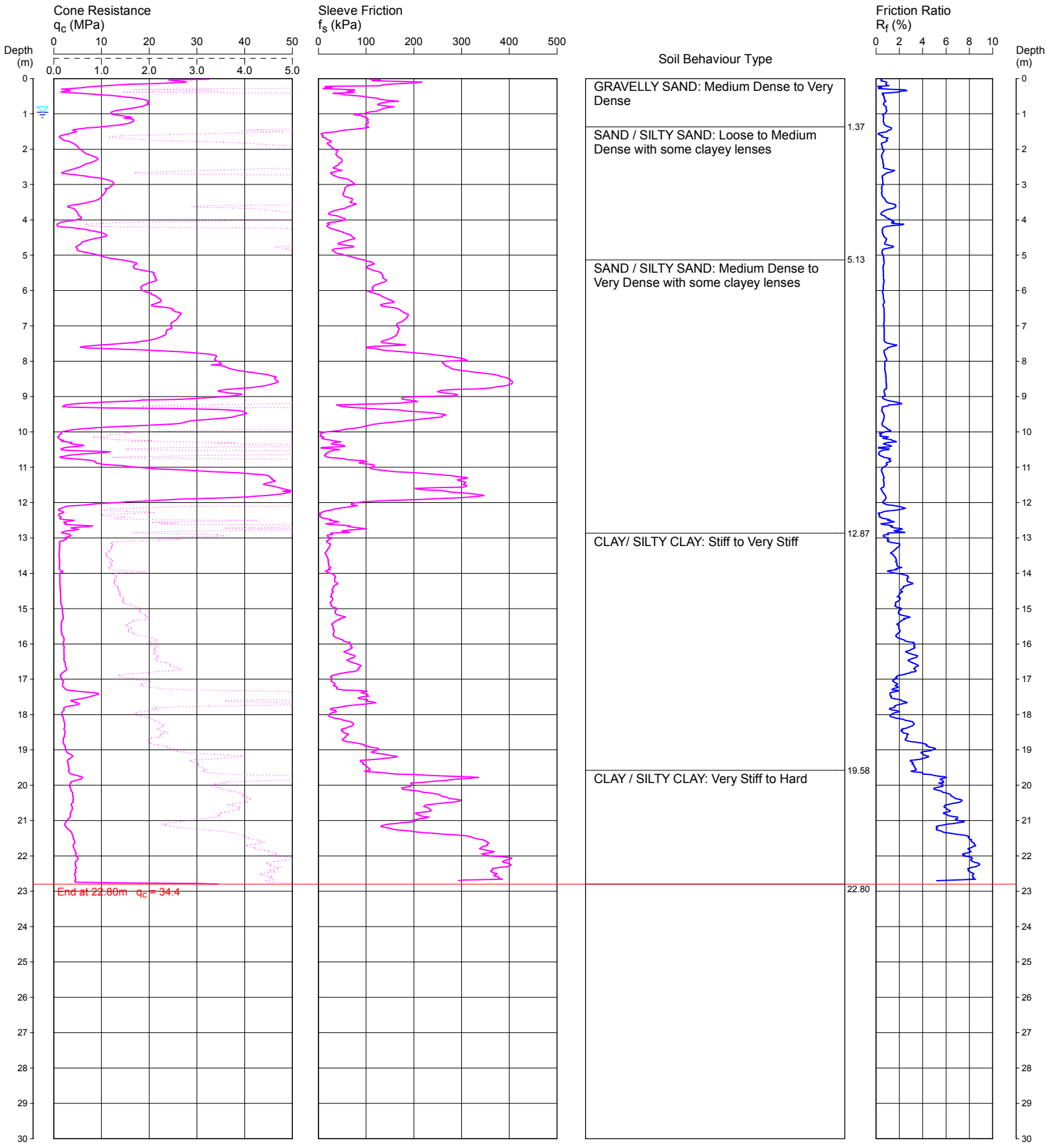
REDUCED LEVEL: 3.71

COORDINATES: 332269E 6244538N

CPT124

DATE 21/01/2019

PROJECT No: 85777.15



REMARKS: TEST DISCONTINUED DUE TO BENDING NEAR REFUSAL
GROUNDWATER MEASURED AT 0.95 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 0.95m depth (assumed)

File: P:\85777.15 - AIRPORT - QANTAS Flight Training Centre\4.0 Field Work\4.2 Testing\CPTs\CPT124.CP5
Cone ID: 181002 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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