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REPORT TO
MACQUARIE UNIVERSITY PROPERTY

ON
REMEDIATION ACTION PLAN (RAP)

FOR
PROPOSED NEW DEVELOPMENT

AT
**8-12 UNIVERSITY AVENUE,
MACQUARIE UNIVERSITY, MACQUARIE PARK, NSW**

Date: 28 January 2020
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Executive Summary

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To be completed following client review of draft report.



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Abbreviations

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Asbestos Fines/Fibrous Asbestos	AF/FA
Asbestos Containing Material	ACM
Australian Height Datum	AHD
Asbestos Management Plan	AMP
Acid Sulfate Soil	ASS
Benzene, Toluene, Ethylbenzene, Xylene	BTEX
Conceptual Site Model	CSM
Development Application	DA
Data Quality Indicator	DQI
Data Quality Objective	DQO
Environmental Investigation Services	EIS
Ecological Screening Level	ESL
Environmental Management Plan	EMP
Excavated Natural Material	ENM
Environment Protection Authority	EPA
Environmental Site Assessment	ESA
JK Environments	JKE
JK Geotechnics	JKG
Map Grid of Australia	MGA
National Association of Testing Authorities	NATA
National Environmental Protection Measure	NEPM
Organochlorine Pesticides	OCP
Organophosphate Pesticides	OPP
Polycyclic Aromatic Hydrocarbons	PAH
Potential ASS	PASS
Polychlorinated Biphenyls	PCBs
Photo-ionisation Detector	PID
Protection of the Environment Operations	POEO
Practical Quantitation Limit	PQL
Quality Assurance	QA
Quality Control	QC
Remediation Action Plan	RAP
Secretary's Environmental Assessment Requirements	SEARs
State Environmental Planning Policy	SEPP
State Significant Development	SSD
Source, Pathway, Receptor	SPR
Total Recoverable Hydrocarbons	TRH
Virgin Excavated Natural Material	VENM
Work Health and Safety	WHS
Units	
Litres	L
Metres BGL	mBGL
Metres	m
Milligrams per Kilogram	mg/kg
Milligrams per Litre	mg/L
Parts Per Million	ppm
Percentage	%
Percentage weight for weight	%w/w

1 INTRODUCTION

Macquarie University Property ('the client') commissioned JK Environments (JKE) to prepare a Remediation Action Plan (RAP) for the proposed new development at 8-12 University Avenue, Macquarie University, NSW. The site location is shown on Figure 1 and the RAP applies to the nominated development area shown on Figure 2 (referred to herein as "the site").

The RAP is required to support the State Significant Development Application (SSD 9313) for submission to the Department of Planning and Environment. This report has been prepared for the Early Works and Main Works Planning Applications. We understand that the exhibition period for the Environmental Impact Statement associated with the SSD proposal is complete. A submission response was received from the NSW EPA recommending that an independent contaminated site auditor complete an audit of the project. On this basis, it has been assumed that a statutory contaminated site audit will be required.

Environmental Investigation Services (EIS) re-branded to JK Environments in mid-2019 and will continue to function as the environmental division of JK Group alongside JK Geotechnics (JKG) and JK Drilling. JKE (as EIS) has previously prepared a number of documents in relation to the proposed development at the site. A summary of relevant information is included in Section 2 and a selection of key documents are referenced throughout the RAP.

Previous investigations at the site did not identify significant, widespread contamination impacts in soil or groundwater. Asbestos was identified in soil at one location and this is the current focus of the RAP. However, the RAP also provides a framework for a supplementary intrusive investigation to better characterise the site (once adequate site access becomes available), confirm the extent of remediation, and to optimise the waste classification for the soils to be excavated and disposed off-site during the development works.

1.1 Proposed Development Details

The proposed development includes the demolition of the existing buildings on site and significant excavation works for a new development which will include the construction of a new multi-storey building containing retail, office space, laboratories and minor infrastructure associated with the building. The development layout forms the base of the attached Figure 3.

Early Works will involve:

- Site establishment and protection of adjoining property where required;
- Protection, diversion and/or temporary establishment of services and infrastructure as required;
- Erection of perimeter fencing, hoarding, gantry, scaffolding and site accommodation;
- Establishment of temporary access and pedestrian arrangements;
- Tree removal; and
- Demolition of Buildings/Carparks C2, C3, E1, Security Building C1a, decommissioning of an electrical sub-station and capping/augmentation of redundant services.

Main Works will involve:

- Site establishment and protection of adjoining property where required;
- Protection, diversion and/or temporary establishment of services and infrastructure as required;
- Erection of perimeter fencing, hoarding, gantry, scaffolding and site accommodation;
- Establishment of temporary access and pedestrian arrangements;
- Remediation of contaminated fill material on site;
- Construction of a combined three-level basement encompassing the whole of 8-12 University Avenue to provide basement parking and access to the existing services tunnel;
- Two A-Grade office buildings of approximately 50,000m² of Gross Floor Area including labs, collaborative spaces and areas for innovation;
- Buildings ranging from 6-7 stories accommodating a target 5-Star Green Star Design and As-Built v1.1 development rating and target 5 Star NABERS Base Building and Whole Building Energy Rating;
- A central pedestrian through-site link connecting the site to the broader University Campus; and
- Buildings incorporating flexible plates, central atrium, lift lobby and amenities supported by a high-quality public domain.

1.2 Remedial Goal, Aims and Objectives

The goal of the remediation is to reduce the risks associated with site contamination to an acceptable level and render the site suitable for the proposed development.

The primary aim of the remediation is to remediate the asbestos contamination identified during the previous JKE investigation so that risks (associated with asbestos exposure) to construction workers, future site occupants/users and adjacent land users during the construction process are appropriately managed and remain low and acceptable. The objectives of this RAP are to:

- Provide a supplementary investigation framework to be implemented prior to the commencement of remediation/excavation works;
- Provide a rationale to support the extent of the proposed remediation and the remedial approach based on the current investigation data;
- Document a methodology that is to be implemented to remediate the asbestos contamination/impacts and validate the site;
- Document a strategy that can be implemented in the event of uncovering any unexpected, contamination-related finds; and
- Provide a validation plan that is to be implemented to demonstrate that the remediation is successful.

1.3 Scope of Work

The RAP was prepared generally in accordance with a JKE proposal (Ref: EP48501PLRev1) of 16 October 2019 and written acceptance from the client dated 28 November 2019. The scope of work included the following:

- Review of the previous reports prepared by JKE and JKG;
- Review of the proposed development details;
- Review and update of the Conceptual Site Model (CSM);
- Preparation of a draft report for review; and

- Preparation of a final report after addressing client review comments.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)¹, other guidelines made under or with regards to the Contaminated Land Management Act (1997)² and State Environmental Planning Policy No.55 – Remediation of Land (1998)³.

¹ National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)*. (referred to as NEPM 2013)

² Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

³ *State Environmental Planning Policy No. 55 – Remediation of Land 1998* (NSW) (referred to as SEPP55)

2 SITE INFORMATION

2.1 Background

2.1.1 Preliminary Desktop Environmental Site Assessment

JKE (as EIS) previously prepared a report titled 'Preliminary Desktop Environmental Site Assessment for Proposed New Development at 8 & 10 University Avenue, Macquarie University, NSW' (Ref: E29775Krpt-DRAFT, dated 5 October 2016)⁴. The assessment included a review of relevant site history information, site walkover inspection and preparation of a draft report presenting the results of the assessment.

Various potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC) were identified. A summary of this information is included in the following table:

Table 2-1: Potential Contamination Sources/AEC and Contaminants of Potential Concern

Source/AEC	CoPC
<u>Fill material</u> - The site appears to have been historically filled to achieve the existing levels. The fill may have been imported from various sources and could be contaminated.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos
<u>Electrical Substation</u> – The substation area may have been impacted by leaking oils or leaching of metals from the associated infrastructure. The extent of impact would be expected to be limited to the substation footprint and immediate surrounds.	Heavy metals, TRH and PCBs
<u>Historical Land Use</u> – The site has been used for various agricultural purposes prior to 1965. The use of pesticides during this period could have resulted in potential contamination. Fuel may have been stored on-site. One owner's occupation was listed as French polisher. If this trade was practiced on the premises it may have resulted in spills of lacquers and polishes.	Heavy metals, OCPs, OPPs, TRH/BTEX and VOCs
<u>Hazardous Building Material</u> – The aerial photographs indicate that former buildings at the site were demolished prior to 1965. The use of hazardous building material in the former buildings could have resulted in potential contamination. Existing buildings and structures on site were constructed prior to 1970 and may also contain hazardous building materials.	Asbestos, lead and PCBs

⁴ Referred to as JKE 2016 Report

The JKE 2016 report recommended that a Stage 2 (detailed) site investigation be undertaken along with a hazardous building materials assessment. It was acknowledged that the Stage 2 investigation would not include sampling beneath the substation and that this would be a data gap that would need to be addressed as part of the substation decommissioning.

2.1.2 Hazardous Building Materials Assessment

JKE (as EIS) previously prepared a report titled 'Hazardous Building Materials Assessment for Proposed New Development at 8-12 University Avenue, Macquarie University, NSW' (Ref: E29775Krpt-HAZ-rev2, dated 10 April 2017)⁵. The assessment identified asbestos containing materials within the Electrical Substation Building and associated plant equipment. Synthetic Mineral Fibre (SMF) materials and potential PCB- containing light fittings were also identified within the substation building and car parks. It was recommended that these materials are removed appropriately prior to the commencement of demolition works.

2.1.3 Stage 2 Environmental Site Assessment

JKE (as EIS) previously prepared a report titled 'Stage 2 Environmental Site Assessment for Proposed New Development at 8-12 University Avenue, Macquarie University, NSW' (Ref: E29775Krpt-Final-rev3, dated 2 June 2017)⁶. The assessment involved soil sampling from 22 boreholes (BH1 to BH22) and groundwater sampling from three monitoring wells. The boreholes typically encountered fill soil at the surface or beneath pavement to depths of between 0.18m to 1.5m, comprising silty sand or gravel overlying natural clayey soils and siltstone or sandstone bedrock.

A selection of soil samples were analysed for the CoPC summarised in Table 2-1 above and the results were compared to the NEPM (2013) Tier 1 site assessment criteria (SAC) for commercial/industrial land use (land use D). Contaminant concentrations were reported to be below the adopted SAC, however matted material containing asbestos was identified in the soil matrix from BH2 (0-0.1m). The material was identified by the laboratory as loose and degraded material; hence the material was assessed to be 'friable' based on laboratory information.

A selection of soil and bedrock sample were analysed for soil salinity parameters. The laboratory results indicated that the site is not impacted by dryland salinity. With the exception of one "moderately saline" value all of the results were non-saline. A Salinity Management Plan was not considered to be necessary for the proposed development.

Minor detections of some heavy metals were encountered in groundwater. However, these were not attributed to contamination from on-site or nearby off-site contaminating activities.

The report recommended preparation of an Asbestos Management Plan (AMP) and provided high-level recommendations in relation to remediation/validation. Due to the occurrence of asbestos at one location

⁵ Referred to as JKE Hazmat Report

⁶ Referred to as JKE 2017 Report

and the limitations associated with assessing asbestos via sampling from boreholes, the report specified a waste classification for the fill of 'General Solid Waste (non-putrescible) containing asbestos'.

It is noted that the site area applicable to the JKE 2017 report (and the associated reports and letters discussed herein) has been altered slightly for the purpose of the RAP.

2.1.4 Addendum Letter 1, October 2018

JKE (as EIS) previously prepared an addendum letter (Ref: E29775Klet, dated 10 October 2018)⁷ to the JKE 2017 report, at the request of the project manager, Cadence Australia. The letter was to outline the potential, if required, for any additional sampling to be conducted during the earthworks phase of the development. The letter indicated the following:

- During earthworks it should be possible to undertake additional sampling and analysis;
- The data from this additional analysis could potentially be used to revise the waste classification of the fill material on site; and
- Any revision of the waste classification will be dependent on the results of the additional sampling and analysis.

2.1.5 Addendum Letter 2, November 2018

JKE (as EIS) previously prepared a second addendum letter (Ref: E29775Klet2, dated 15 November 2018)⁸ to the JKE 2017 report, at the request of the client. The letter was to review and discuss the requirements of the Secretary's Environmental Assessment Requirements (SEARs) which was to: *"Address the statutory provisions contained in all relevant environmental planning instruments, including the Draft Remediation of Land SEPP"*. The addendum letter also provided guidance on how the new Draft SEPP would impact the conclusions of the JKE 2017 Report.

The letter outlined the key changes to the Draft SEPP were the triggers for Category 1 and Category 2 remediation works, including:

- Excavation, and removal from site, of contaminated soil, where the volume of soil to be excavated exceeds 3,000 cubic metres (m³), or where the area of excavation exceeds 3,000 square metres (m²);
- Removal from site of stockpiled contaminated soil, or other waste materials including asbestos waste, where the volume of soil and/or material exceeds 3,000m³;
- In-situ and ex-situ remediation of contaminated soil on site; and
- Remediation where a long-term Environmental Management Plan (EMP) is or will be required.

The JKE Addendum Letter 2 concluded that as the result of the above, the remediation at the site may be classed as Category 1. This was to be confirmed by the client's planning consultant.

⁷ Referred to as JKE Addendum Letter 1

⁸ Referred to as JKE Addendum Letter 2

2.2 Site Identification

Table 2-2: Site Identification

Lot & Deposited Plan:	Part of Lot 191 in DP1157041
Current Land Use:	University
Proposed Land Use:	University Mixed Use (university/commercial)
Local Government Authority:	Ryde City Council
Current Zoning:	B4 – Mixed Use
Site Area (m²):	Approximately 15,000m ² (up to 20,000m ² including public domain works)
Geographical Location (decimal degrees) (approx.):	Latitude: -33.776491 Longitude: 151.113545
Site Location Plan:	Figure 1
Sample Location Plan (samples from JKE 2017):	Figure 2
Remediation Plan	Figure 3
Site Location & Regional Setting:	The site is located within Macquarie University. The site is bound by Macquarie University Avenue to the south, and is located approximately 50m north-east of Kikkiya Creek and approximately 470m to the south of Mars Creek.
Topography:	The site is situated in a gently undulating area of Macquarie Park. The site itself has a very gradual slope of approximately 2° towards the south-east.
Geology & Hydrogeology:	Regional geological information reviewed for the JKE 2016 report indicated that the site is underlain by Hawkesbury Sandstone, which typically consists of medium to coarse grained quartz sandstone with minor shale and laminite lenses. Information reviewed in preparation of the JKE 2016 Report indicated that there were three registered groundwater bores in the vicinity of the site. All of these were registered for monitoring purposes.
Acid Sulfate Soil:	The site is not located in an acid sulfate soil (ASS) risk area according to the risk maps prepared by the Department of Land and Water Conservation.

2.3 Site Inspection

A walkover inspection of the site was undertaken as part of the JKE 2016 assessment. At the time of the inspection (October 2016), the eastern section of the site was occupied by three multi storey car parks (C2, C3 and C4) and the security and substation building was located along Macquarie Drive towards the NW corner of the site. Minor areas of exposed soil were identified in the central section of the site, west of the

car parks and beneath the connecting ramps of C3 and C4. Kikkiya Creek was identified a potentially sensitive environment, located approximately 50m to the south-east of the site.

2.4 Summary of Site History

A summary of the historical land uses and activities is presented in the table below. The information presented in the table is based on a weight of evidence assessment of the site history documentation.

Table 2-3: Summary of Historical Land Uses

Year(s)	Potential Land Use / Activities
1896 to 1965	Farming / Agriculture - The historical land titles indicate the site has been used as orchards, market gardens and poultry farms between 1896 and 1965. One land owner's occupation was listed as French polisher however there is no further indication of whether this trade was practiced on the premises. The 1943 aerial photograph indicated that the site had been cleared of most trees and was occupied by what appeared to be an orchard and/or market gardens, with associated buildings. The only structure on site that was visible in the historical aerial photographs was a shed-type structure on the northern boundary (towards the north-western corner of the site). This structure was visible in the photographs from 1943 to 1965.
1965 to present	Commercial / Education (Macquarie University) - The historical land titles indicate the site was purchased by Macquarie University in 1965. The 1970 aerial photograph indicated that the shed-type structure on the northern boundary had been demolished and the site was occupied by the substation building in the north-west corner of the site. A car park was visible in the north-eastern section of the site (based on the previous site boundary defined in the JKE 2016/2017 reports).

3 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) collected and assessed by JKE. Reference should also be made to the figures attached in the appendices.

3.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are presented in the following table:

Table 3-1: Known and Potential Sources of Contamination

Contamination Source	Contaminants of Concern
Known (AEC1) – Friable asbestos in fill in BH2 (see Figure 3) The matted asbestos material was identified within the fill material in one sample collected from BH2 (0-0.1m). The material could be associated with contaminated fill material historically imported onto the site, or associated with demolition of former structures in the site vicinity. The demolition of nearby structures could have resulted in asbestos being mixed with soil used in earthworks to create the site levels. Suspected – Co-located, bonded/non-friable ACM in soils across the site The previous investigation was completed via sampling from boreholes which provides a limited visual assessment of the soil. On this basis there is a potential for asbestos to be identified in soil elsewhere on site. The asbestos could be associated with fill or potentially historical infrastructure such as asbestos cement pipes used for irrigation and drainage.	Asbestos (in the form of asbestos fines/fibrous asbestos [AF/FA]) CoPC: co-located bonded/non-friable ACM
Potential (AEC2) – Electrical substation (see Figure 3) The substation area may have been impacted by leaking oils or leaching of metals from the associated infrastructure. The extent of impact would be expected to be limited to the substation footprint and immediate surrounds. Sampling from beneath the substation building was not undertaken as part of the JKE2017 investigation.	CoPC: heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc), TRHs and PCBs

3.2 Mechanism for Contamination, Affected media, Receptors and Exposure Pathways

Following an additional review of aerial photographs, it appeared that the site was mostly used as agricultural land, with only one small structure on northern boundary visible in the 1943-1965 photographs. There was visual evidence of ploughing furrows and earthworks/mechanical disturbance during this time which presumably turned over and churned the soil in these areas. From this information, the most likely mechanisms for asbestos contamination includes 'top-down' impacts associated with importation of fill and/or the churning/disturbance of the native soils after the demolition of structures. Mechanisms for contamination in the substation area may also be 'top-down' or potentially sub-surface release from buried electrical infrastructure.

The affected medium for the purpose of remediation includes soil, however it is noted that asbestos fibres need to mobilise into air before people can be exposed via inhalation of airborne asbestos fibres.

Human receptors include construction workers and site users (adults in the current/future setting) and those using the surrounding areas (again, including adults in the current/future setting). Plants and terrestrial ecology are considered to be environmental/ecological receptors applicable along the northern part of the site where soil is to be retained north of the proposed basement excavation.

3.3 Assessment of Data Gaps

The primary data gap is considered to be the soil beneath the electrical substation and security building located in the north-west portion of the site. This data gap will be addressed via the completion of the further investigation when the buildings and other substation infrastructure has been demolished/decommissioned.

A secondary data gap is considered to be the absence of bulk asbestos sampling due to the previous need to investigate the site using boreholes to minimise disturbance. The use of boreholes during the initial investigation phase of the project could not facilitate bulk asbestos quantification sampling and this will be compensated for via additional test pitting and sampling after demolition.

The requirements for the investigations specified above have been outlined as a *Supplementary Intrusive Investigation* in Section 4 of this RAP.

4 SUPPLEMENTARY INTRUSIVE INVESTIGATION

Prior to commencement of remediation, a supplementary intrusive investigation is required for AEC1, AEC2 and the remainder of the site when adequate access is available. It is recommended that the investigations occur as early as possible after demolition so that any changes to the remedial approach or extent can be factored into the overall program for the project.

The primary objective of the supplementary investigation is to characterise the nature and extent of the contamination (actual, potential and suspected) in order to better define the remedial extent. A secondary objective is to confirm the waste classification for fill/soil and bedrock being excavated to construct the basement.

A detailed Sampling, Analysis and Quality Plan (SAQP) is to be provided prior to commencement of the supplementary intrusive investigation, with reference to Schedule B2 of the NEPM (2013). The SAQP is to be approved by the client and the nominated site auditor prior to commencement of investigation. An outline of the sampling plan required for the supplementary intrusive investigation is provided below:

4.1 AEC1 – Friable Asbestos in Fill in the vicinity of BH2

- The investigation area is to be delineated by using the nearest borehole locations (BH22 and BH19) where no asbestos was located as the northern and eastern boundaries (as shown in Figure 3). This area is estimated to cover approximately 1,300m²;
- The investigation is to involve the excavation and sampling from 14 test pits placed on a grid-based pattern with a spacing of approximately 9.5m between sampling points; and
- The investigation is to include bulk sampling/screening for asbestos quantification at each sample location in accordance with the NEPM (2013) methods and those described in the Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009)⁹. Collection of 500mL soil samples for friable asbestos in soil (AF/FA) analysis is also required from each observed fill profile.

4.2 AEC2 – Electrical Substation

- The area is to be defined as capture the footprint of the substation building and associated equipment (as shown in Figure 3), which covers an area of approximately 1,000m²;
- The investigation is to involve the excavation and sampling from six test pits placed on a grid-based pattern with a spacing of approximately 13m between sampling points;
- The investigation is to include allowance for additional sampling points from within the substation footprint to target any potential point sources of contamination (i.e. beneath transformers or electrical equipment);
- The investigation is to include bulk sampling/screening for asbestos quantification at each sample location as noted in Section 4.1. Collection of 500mL soil samples for AF/FA analysis is to occur.

⁹ Western Australian (WA) Department of Health (DoH), (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia. (referred to as WA DoH 2009)

However, this analysis will not be undertaken if the sampling from within the AEC1 zone confirms the area of asbestos (AF/FA) contamination is confined to this area; and

- The samples are to be collected from all fill profiles and from the underlying natural soil within the first 0.5-1m contact and analysed for heavy metals, TRH and PCBs. Additional sampling and analysis at depth may be required if field indicators such as odours and/or staining is identified in any of the test pits.

4.3 Remainder of the Site

- The remainder of the site outside the defined AEC1 and AEC2 zones is to be investigated for the presence of asbestos. The remainder of the site covers an area of approximately 12,700m²;
- The investigation is to involve the excavation and sampling from 22 test pits placed on a grid-based pattern with a spacing of approximately 24m between sampling points; and
- The investigation is to include bulk sampling/screening for asbestos quantification at each sample location as noted in Section 4.1. Collection of 500mL soil samples for AF/FA analysis is to occur. However, this analysis will not be undertaken if the sampling from within the AEC1 zone appropriately defines the area of asbestos contamination.

4.4 Reporting Requirements

The results of the supplementary intrusive investigation are to be reported in a stand-alone document. The report should also include clarification of the waste classification across the site based on the delineation (or otherwise) of the asbestos in soil.

The supplementary intrusive investigation is to be undertaken by the site validation consultant. The results of the supplementary intrusive investigation should be evaluated and the validation consultant should advise whether the remedial actions outlined in this report are adequate and/or whether an addendum RAP needs to be prepared.

5 REMEDIATION EXTENT

The final remediation extent is to be confirmed based on two primary information inputs:

- The outcome of the supplementary intrusive investigation (refer to Section 4); and
- The identification of any unexpected finds throughout the excavation works.

A discussion of the anticipated extent of remediation based on the current data is provided below. Reference should also be made to the attached Figure 3.

Table 5-1: Remediation Extent

AEC	Extent (based on current data)
AEC1 Fill material (friable asbestos)	Based on the existing data, the horizontal extent of the AEC1 remediation area is approximately 1,300m. The extent has been delineated by the southern and western site boundaries, and to the north and east by BH22 and BH19 respectively (where asbestos was not identified previously). The vertical extent of remediation in AEC1 is to the base of the fill soil which is 0.5m at the BH2 location where the asbestos was identified. The fill depths towards the northern and eastern AEC1 remediation area boundaries are uncertain as the boreholes in these areas refused within the fill at 0.2-0.3m. However, it would be reasonable to assume that the fill across the remediation area would be in the order of 0.5m deep. Slightly deeper fill may be present towards the batters adjacent to the roadway at the southern end of the remediation area. An outline of remediation requirements to address this AEC is included in Section 7.
AEC2 Electrical substation	Remediation not currently required.

6 REMEDIATION OPTIONS

6.1 Soil Remediation

The NSW EPA follows the hierarchy set out in NEPM 2013 for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

1. On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated material so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;

Or if the above are not practicable:

3. Consolidation and isolation of the soil by on-site containment within a properly designed barrier; and
4. Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material; or
5. Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

For simplicity herein, the above hierarchy are respectively referred to as Option 1, Option 2, Option 3 etc.

In addition to the above, important considerations in assessing the acceptability of an asbestos remediation proposal (NEPM 2013) includes:

- Minimisation of public risk;
- Minimisation of contaminated soil disturbance; and
- Minimisation of contaminated material/soil moved to landfill.

The Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)¹⁰ provides the following additional requirements to be taken into consideration:

- Remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed; and
- Where there are large quantities of soil with low levels of contamination, alternative strategies should be considered or developed.

¹⁰ NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

6.2 Consideration of Remediation Options

The table below discusses a range of remediation options:

Table 6-1: Consideration of Remediation Options

Option	Discussion	Applicability
<u>Option 1</u> On-site treatment of contaminated soil	On-site treatment can provide a mechanism to reuse the processed material and, in some instances, avoid the need for large scale earthworks. Treatment options are contaminant-specific and can include bio-remediation, soil washing, air sparging and soil vapour extraction, thermal desorption and physical removal of bonded ACM fragments. Depending on the treatment option, licenses may be necessary for specific individual waste streams due to the potential for air pollution and the formation of harmful by-products during incineration processes. Licences for re-use of treated material/waste may also be required.	Not applicable for the contaminant of concern and form of asbestos in AEC1.
<u>Option 2</u> Off-site treatment of contaminated soil	Contaminated soils are excavated, transported to an approved/ licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility. This option is also contaminant-specific. The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed development works under the waste and resource recovery regulatory framework.	Not applicable for the contaminant of concern and form of asbestos in AEC1.
<u>Option 3</u> Consolidation and isolation of impacted soil by cap and containment	This would include the placement of an appropriate barrier over the contaminated material to reduce the potential for future disturbance and therefore health risk to future site users. This action may also reduce the transport of contamination via surface water movement and dust generation. The capping and/or containment must be appropriate for the specific contaminants of concern. An ongoing EMP would be required and the EMP would need to be publicly notified and made to be legally enforceable (e.g. via listings in the Section 10.7 planning certificate and on the land title).	Not applicable for AEC1 as the area is within the proposed basement footprint, which will require excavation and off-site disposal of all fill in order to construct the basement. Capping is a potential option that could be considered for the contaminant of concern in areas where fill soil is being retained, in the event that contamination is found to extend outside the basement footprint (e.g. north of the basement).

Option	Discussion	Applicability
Option 4 Removal of contaminated material to an appropriate facility and reinstatement with clean material (where necessary)	Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to a licensed landfill. The material would have to meet the requirements for landfill disposal. Landfill gate fees (which may be significant) would apply in addition to transport costs.	Applicable for AEC1 and the preferred option for remediation considering the extent of excavation for the proposed development works.
Option 5 Implementation of management strategy	Contaminated soils would be managed in such a way to reduce risks to the receptors and monitor the conditions over time so that there is an on-going minimisation of risk. This may occur via the implementation of monitoring programs, potentially also involving capping systems.	Not applicable at this stage.

6.3 Rationale for the Preferred Option for Remediation

The preferred remediation option for the site includes excavation and off-site disposal of fill in AEC1 to a licensed facility (Option 4). Remediation would occur down to the top of the underlying natural soil profile in the area of remediation. We note that removal of all fill will also occur within the entire basement footprint which provides scope for some extension of the remediation area if required.

This option aligns with the remediation hierarchy and is considered to be appropriate on the basis that excavation and off-site disposal is the only option for fill in the basement footprint, which will be excavated for the construction of three basement levels.

6.4 Soil Disposal – Preliminary Volume Analysis

From the data available, and assuming the remediation occurs to the full extent of the AEC1 area as described in Section 5, JKE estimate that the following soil volume/tonnage will be disposed off-site as part of the remediation of AEC1:

- Assumed fill depth (considering data from BH2, BH19 and BH22) of 0.5m;
- Approximate area of 1,300m²;
- Volume of 650m³ based on 0.5 x 1,300; and
- Approximate tonnage of 975 tonnes (assuming 1.5 tonnes per 1m³ of in-situ fill).

The above quantities are ballpark estimates only and should be confirmed by a quantity surveyor and remediation contractor prior to commencement. Additional fill/waste volume analysis should be undertaken following completion of the supplementary intrusive investigation, once the waste classifications are confirmed.

7 REMEDIATION DETAILS

7.1 Roles and Responsibilities

Table 7-1: Roles and Responsibilities

Role	Responsibility
Client/Developer	Macquarie University Property. The client is required to appoint the project team for the remediation and must provide all investigation reports including this RAP to the project manager, remediation contractor, consent authority and any other relevant parties involved in the project. The client is to arrange the boundary survey of the site as described in Section 7.3.
Project Manager	To be appointed. The project manager is required to review all documents prepared for the project and manage the implementation of the procedures outlined in this RAP. The project manager is to take reasonable steps so that the remediation contractor and others have understood the RAP and will implement it in its totality. The project manager will review the RAP and other documents and will update the parties involved of any changes to the development or remediation sequence (in consultation with the validation consultant). Further details are outlined in the sections below. The project manager is also to assist with maintaining adequate waste tracking records for the project to facilitate the validation consultant's and site auditor's assessment of such documentation in accordance with Sections 4.3.7 and 4.3.9 of the Site Auditor Guidelines 2017.
Remediation Contractor	To be appointed. The remediation contractor is required to review all documents prepared for the project, apply for any relevant removal licences or permits and implement the remediation requirements outlined in this RAP. The remediation contractor is required to collect all necessary documentation associated with the remediation activities and forward this documentation onto the client and project manager as they become available. Further details are outlined in the sections below.
Validation Consultant	JKE – subject to formal engagement The validation consultant¹¹ provides consulting advice and validation services in relation to the remediation. The validation is required to review any deviation to this RAP or in the event of unexpected finds if and when encountered during the site work. The validation consultant is to have a licensed Asbestos Assessor on staff to provide surface clearance inspections and certificates for the project (as required). The validation consultant is to prepare the AMP prior to the commencement of remediation work and is also required to liaise with the client, project manager and

¹¹ The consultant must be a certified practitioner (specialising in site contamination), under one of the NSW EPA endorsed certification schemes

Role	Responsibility
	remediation contractor on all matters pertaining to the site contamination, remediation and validation.
Site Auditor	To be appointed. The appointed site auditor is to review the project information and the reports prepared by the validation consultant as the project proceeds, and to provide a Site Audit Report (SAR) and Site Audit Statement (SAS) on completion of the project.

7.2 Sequence of Works

JKE anticipate the following sequence of work for the project (in the context of the remediation):

1. Demolition of existing buildings and structures and removal of demolition waste from site;
2. Completion of the supplementary intrusive investigation and additional reporting requirements;
3. Completion of the remediation and validation works; and
4. Implementation of Unexpected Finds Protocol and validation of all imported materials until the finalisation of the site validation report.

7.3 Pre-commencement

The project team is to have a pre-commencement meeting to discuss the sequence of remediation, and the remediation and validation tasks. The site management plan for remediation works (see Section 10) should be reviewed by the project manager and remediation contractor, and appropriate steps are to be taken to ensure the adequate implementation of the plan.

The extent of the site area for the purpose of remediation/validation and the site audit is to be confirmed, and a survey is to be prepared by the client's nominated subcontractor that clearly delineates the site. The survey is to include boundary and corner coordinates for the site.

Prior to commencement of work, an AMP is to be prepared by the validation consultant for the remediation works. The AMP is to be implemented by the remediation contractor (and their nominated subcontractors where relevant) throughout the subsequent steps. The AMP is to outline the specific requirements the removal contractor to prepare an asbestos removal control plan, for work health and safety (WHS), personal protective equipment (PPE), licencing requirements for asbestos removal work, air monitoring requirements, waste tracking and waste documentation requirements.

7.4 Step 1 – Demolition of Buildings

On completion of the removal of all of the hazardous building material, the existing buildings and structures should be demolished. The electrical substation and the associated infrastructure are to be decommissioned and demolished to meet the project requirements. The demolition waste is to be disposed off-site to appropriately licenced facilities. Hazardous materials are to be adequately managed and tracked in accordance with the relevant codes of practice, standards and regulations.

7.5 Step 2 – Completion of the Supplementary Intrusive Investigation and Reporting

The supplementary intrusive investigation is to be completed in accordance with the SAQP to be prepared as outlined in Section 4 of this RAP. The SAQP is to be approved by the client and nominated Site Auditor prior to commencement of the investigation. Where required, a revised or addendum RAP is also to be prepared by the validation consultant, then approved by the client and appointed site auditor (and consent authority, if required).

7.6 Step 3 - Remediation of AEC1 (Friable Asbestos in Fill)

The remediation details for AEC1 are provided in the following table (based on the current extent of remediation and preferred remediation option). The detailed validation plan relevant to this aspect of the remediation is provided in Section 8.

Table 7-2: Remediation Details

Step	Primary Role/Responsibility	Procedure
1.	Remediation contractor	<u>Site Establishment and Management Controls:</u> The remediation contractor (and its nominated subcontractor) is to make provisions to address the requirements under the AMP and establish on-site.
2.	Remediation contractor/client	<u>Excavation/stability requirements:</u> The project geotechnical engineer is to provide advice in relation to battering and/or shoring associated with the remediation work and this advice is to be implemented by the remediation contractor.
3.	Remediation contractor	<u>Mark-out of remediation area:</u> The remediation contractor is to mark out the remediation area using star pickets and flagged bunting. The area should be easily identifiable and can be marked out approximately using the scaled image attached as Figure 3. This should be cross-checked with the survey so that remediation occurs up to the site boundaries where applicable.
4.	Remediation contractor	<u>Excavation of asbestos-contaminated fill:</u> All fill is to be excavated from the remediation area to the full extent of remediation. The excavated material is to be loaded directly into trucks for disposal to landfill. All works are to be completed in accordance with the AMP.
5.	Validation consultant	<u>Validation and surface clearance inspections/certificates:</u> The base and walls of the remedial excavation are to be validated in accordance with Section 8. The validation consultant's nominated licenced Asbestos Assessor is to undertake a surface clearance inspection of the base and walls of the remediation area. Subject to a successful clearance inspection and subject to acceptable validation results, a clearance certificate is to be provided. In the event of surface clearance or validation failure, additional excavation is to be undertaken to 'chase-out' the impacted material in consultation with the validation consultant. The clearance inspection/validation sampling is then to be repeated as noted above.
6.	Remediation contractor/	<u>Backfilling of remedial excavations:</u> Backfilling of the remedial excavation is not expected to be required as the current remediation area falls within the proposed basement excavation. If backfilling is

Step	Primary Role/ Responsibility	Procedure
	validation consultant	required, this is to be undertaken using clean, sit-won material, or using clean/validated imported material. The backfill should be adequately compacted to meet the relevant engineering requirements for the project.

7.7 Step 4 – Implementation of Unexpected Finds Protocol & Validation of Imported Materials

The unexpected finds protocol is to be implemented for all remaining works, as outlined in Section 9.1. All imported materials are to be validated in accordance with Section 8.

7.8 Remediation Documentation

The remediation contractor must retain all documentation associated with the remediation, including but not limited to:

- Soil/waste disposal dockets;
- Asbestos management documentation, including all relevant notifications and monitoring reports (additional details in this regard are to be outlined in the AMP);
- Imported materials information;
- Photographs of remediation works; and
- Waste tracking documentation.

Copies of the above documentation must be forwarded to the validation consultant on completion of the remediation for inclusion in the final validation report.

Appropriate waste tracking records are to be maintained by the remediation contractor and the project manager throughout the project to facilitate the validation consultant's assessment of this documentation within the validation report, and the site auditor's review with regards to Sections 4.3.7 and 4.3.9 of the Site Auditor Guidelines 2017.

7.9 Soil Disposal - Volume and Disposal Analysis

A soil volume analysis should be undertaken on completion of the works and reconciled with the quantities shown on the soil disposal dockets and the estimate provided in Section 6.4. A review of the disposal facility's licence issued under the Protection of the Environment Operations (POEO) Act (1997)¹² should also be undertaken to assess whether each facility is appropriately licensed to receive the waste.

¹² NSW Government, (1997)). *Protection of Environment Operations Act*. (referred to as POEO Act 1997)

8 VALIDATION PLAN

Validation is necessary to demonstrate that remedial measures described in this RAP have been successful and that the site is suitable for the intended land use. The sampling program for the validation is outlined in Section 8.1. This is the minimum requirement based on the remedial strategies provided. Additional validation sampling may be required based on observations made during remediation.

8.1 Validation Sampling and Documentation

The table below outlines the validation requirements for the site.

Table 8-1: Validation Requirements

Aspect	Sampling	Analysis	Observations and Documentation
Fill Removal (AEC1 defined area)			
Base of excavation after fill removal is complete	One sample for 100m ² (10m by 10m grid). Samples are to be collected from the surface 0-0.05mBGL.	Asbestos (500ml NEPM 2013 analysis).	AMP to be prepared by the validation consultant.
Walls of excavation after fill removal is complete	One sample per 5 lineal metres along each wall, collected from each fill profile. Assuming the walls do not include adjoining areas of pavement in the upper section of the wall, it is expected that a sample would be obtained from the depth interval of 0-0.1m down the side of the wall, then from each subsequent fill profile (or at a minimum frequency of one sample per 1 vertical metre in fill if there are no distinct changes in profile).		Observations, soil type at validation locations, and dimensions of area to be recorded.
			Laboratory results.
			Photographs to be taken.
			Disposal dockets to be retained.
			Asbestos air monitoring results to be reviewed.
			Asbestos surface clearance certificate (for excavation base and walls) to be issued upon completion.
Imported Materials – relevant to all site works			
Imported VENM backfill (if required)	Minimum of three samples per source	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH, BTEX PAHs, OCP/OPPs, PCBs and asbestos. Additional analysis may be required depending on site history.	VENM documentation/ report required (should include source site history to demonstrate analytes are appropriate). Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation.
			Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing

Aspect	Sampling	Analysis	Observations and Documentation
			documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the validation assessment criteria (VAC).
Imported engineering materials such as recycled aggregate, road base etc or Excavated Natural Material (ENM)	One sample per 100m³ of material. Minimum of three samples per source/material type where total quantity is <100m³. Additional testing may be required for ENM to meet the specification within the ENM Order.	Heavy metals (as above), TRHs, BTEX, PAHs, pesticides, PCBs and asbestos (500ml NEPM 2013 analysis). Additional testing may be required for ENM (e.g. foreign materials, pH and electrical conductivity) depending on available documentation.	Documentation required to confirm material has been classified with reference to a relevant Resource Recovery Order/Exemption. Review of the facility's Environment Protection Licence (EPL). Material is to be inspected by the validation consultant upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Dockets for imported material to be provided. Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
Imported engineering materials comprising only natural quarried products such as the rock	At the validation consultant's discretion based on robustness of supplier documentation.	At the validation consultant's discretion based on robustness of supplier documentation.	Documentation to be provided from the supplier confirming the material is a product comprising only VENM (i.e. natural quarried product).

Aspect	Sampling	Analysis	Observations and Documentation
armour and rock underlay			
Imported landscaping materials	One sample per 100m ³ of material. Minimum of three samples per source/material type where total quantity is <100m ³ .	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRHs, BTEX, PAHs, pesticides, PCBs and asbestos	Documentation required to confirm material has been produced under an appropriate standard. Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Dockets for imported material to be provided. Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.

8.2 Validation Assessment Criteria and Data Assessment

The VAC to be adopted for the validation assessment are outlined in the table below:

Table 8-2: VAC

Validation Aspect	Criteria
AEC1	Asbestos analysis results for AF/FA to be <0.001%w/w (base and wall samples). Confirmation that excavation base and walls are free of visible asbestos/ACM, to be documented in asbestos clearance certificate.
Waste classification (soil disposal)	In accordance with the procedures and criteria outlined in the NSW EPA Waste Classification Guidelines - Part 1: Classifying Waste (2014) ¹³ and any other exemptions/approvals as required.

¹³ NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste*. (referred to as Waste Classification Guidelines 2014)

Validation Aspect	Criteria
Imported materials	Material imported as general fill must only be VENM or ENM. Results for VENM and other imported materials will need to be consistent with expectations for those materials. For VENM, it is expected that: - Heavy metal concentrations are to be less than the most conservative Added Contaminant Limit (ACL) concentrations for an urban residential and public open space exposure setting presented in Schedule B1 of the NEPM 2013; and - Organic compounds are to be less than the laboratory Practical Quantitation Limits (PQLs) and asbestos is to be absent. Recycled materials are to meet the criteria of the relevant exemption/order under which they are produced. From a validation perspective, analysis results are also to be assessed against the NEPM land use type D (commercial/industrial) criteria to confirm there is no human-health risk in the context of the proposed land use. Landscaping materials will be initially assessed against the same criteria as for VENM. In the event of validation failure (which is likely for organics such as PAHs and TRHs), a risk-based assessment approach could be adopted (similar to that described above for engineering materials), subject to the validation consultant consulting with the site auditor. Aesthetics: soils to be free of staining and odours.

Data should initially be assessed as above or below the VAC. Statistical analysis may be applied if deemed appropriate by the consultant and undertaken in accordance with the NEPM (2013).

8.3 Validation Report

As part of the validation process, a validation report will be prepared for the site by the validation consultant. The report will outline the remediation work undertaken and any deviations to the remediation strategy. The report will summarise the results of the validation assessment and will be prepared in accordance with the NSW OEH Guidelines for Consultants Reporting on Contaminated Sites (2011), or the relevant guidelines applicable at the time of remediation (noting that the Consultants Reporting Guidelines are currently being revised and are out for public consultation).

8.4 Data Quality

Appropriate QA/QC samples should be obtained during the validation (where applicable) and analysed for the same suite of contaminants as the primary samples. As a minimum, QA/QC sampling should include duplicates (5% inter-laboratory and 5% intra-laboratory), trip spikes and trip blanks. Rinsate samples should be obtained if re-usable sampling equipment is utilised.

Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) should be clearly outlined and assessed as part of the validation process. A framework for the DQO and DQI process is outlined below and should be reflected in the validation report.

DQOs should be established for the validation with regards to the seven-step process outlined NEPM (2013). The seven steps include the following:

- State the problem;
- Identify the decisions/goal of the study;
- Identify information inputs;
- Define the study boundary;
- Develop the analytical approach/decision rule;
- Specify the performance/acceptance criteria; and
- Optimise the design for obtaining the data.

DQIs are to be assessed based on field and laboratory considerations for precision, accuracy, representativeness, completeness and comparability.

9 CONTINGENCY PLAN

A review of the proposed remediation works has indicated that the greatest risk that may affect the success of the remediation is an unexpected find. A contingency plan for unexpected finds is outlined below, in conjunction with a selection of other contingencies that may apply to this project.

9.1 Unexpected Finds

Residual hazards that may exist at the site would generally be expected to be detectable through visual or olfactory means. At this site, these types of hazards may include: asbestos outside of the nominated remediation area; underground tanks; and odorous or stained hydrocarbon impacted soils. The procedure to be followed in the event of an unexpected find is presented below:

- In the event of an unexpected find, all work in the immediate vicinity should cease and the remediation contractor should contact the validation consultant and the project manager;
- Temporary barricades should be erected to isolate the area from access to workers;
- The validation consultant is to attend the site, adequately characterise the contamination and provide advice in relation to remediation. In the event that remediation differs from that outlined in this RAP, an addendum RAP or Remedial Works Plan (RWP) must be prepared in consultation with the project stakeholders and (where required) submitted to the consent authority; and
- Contamination should be remediated and validated in accordance with the advice provided, and the results should be included in the validation report.

9.2 Soil Validation Failure

In the event of a soil validation failure, the excavation should be extended in the direction of the failure (in consultation with the validation consultant) and the area re-validated. The client/project manager is to be advised in the event this is to occur, prior to commencement of further excavation and off-site disposal of additional material.

9.3 Importation Failure for VENM or other Imported Materials

Where material to be imported onto the site does not meet the importation VAC detailed in Section 8, the only option is to not accept the material. Alternative material must be sourced that meets the importation requirements.

9.4 Additional Soil Contamination

Due to the extent of the basement excavation, the identification of additional soil contamination would most likely be addressed by default if the contamination falls within the basement footprint. In the event of an unexpected find or if additional contamination occurs in the northern part of the site, outside the basement footprint, an alternative strategy will need to be developed. This could include the construction of a containment cell for contaminated material, or in-situ capping. In the event that these contingency actions are required, a RWP is to be prepared by the validation consultant and approved by the client and site



auditor. We would expect that an amendment to the development consent would be required in this instance, however this should be confirmed by the client's planner should the situation arise.

10 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. The client should make reference to the development consent for specific site management requirements for the overall development of the site.

10.1 Asbestos Management Plan

Prior to the commencement of any soil disturbance in the remediation areas, an AMP is to be prepared by the validation consultant to document the asbestos-related management requirements for the remediation as noted in Section 7.3.

10.2 Interim Site Management

No interim site management measures are considered necessary at this stage, provided that the sub-surface fill soils in AEC1 remain undisturbed and the grass cover in the area is adequately maintained.

10.3 Project Contacts

Emergency procedures and contact telephone numbers should be displayed in a prominent position at the site entrance gate and within the main site working areas. The contact details of key project personnel are summarised in the following table (this should be updated when further details are known):

Table 10-1: Project Contacts

Role	Company	Contact Details
Project Manager	To be appointed	-
Remediation Contractor	To be appointed	-
Site Auditor	To be appointed	-
Environmental Consultant	JKE (at the time of the RAP preparation)	JK Environments (02) 9888 5000
Certifier	To be appointed	-
NSW EPA	Pollution Line	131 555
Emergency Services	Ambulance, Police, Fire	000

10.4 Security

Appropriate fencing should be installed as required to secure the remediation areas. Warning signs should be erected, which outline the personal PPE required for remediation work. All excavations should be clearly marked and secured to reduce the risk to site personnel from injury by falling into open excavations.

10.5 Timing and Sequencing of Remediation Works

In general, all remedial works should be completed prior to the commencement of any building works and in accordance with the SSD approval. In the event that unexpected delays occur mid-way through remediation, builder's plastic (or similar) should be used to cover the remediation areas in order to reduce the dust generation, surface water run-off and/or exposure to receptors.

10.6 Site Soil and Water Management Plan

The contractor should prepare a detailed soil and water management plan prior to the commencement of site works. Silt fences should be used to control the surface water runoff at all appropriate locations of the site. Reference should be made to the consent conditions for further details.

All stockpiled materials should be placed within an erosion containment boundary with silt fences and sandbags employed to limit sediment movement. The containment area should be located away from drainage lines, gutters, stormwater pits and inlets and the site boundary. No liquid waste or runoff should be discharged to the stormwater or sewerage system without the approval of the appropriate authorities.

10.7 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)¹⁴ should be adopted. Other measures specified in the consent conditions should also be complied with. Noise producing machinery and equipment should only be operated between the hours approved by the consent authority (refer to consent documents).

All practicable measures should be taken to reduce the generation of noise and vibration to within acceptable limits. In the event that short-term noisy operations are necessary, and where these are likely to affect nearby land users, notifications should be provided to the relevant authorities and the land users by the project manager, specifying the expected duration of the noisy works.

10.8 Dust Control Plan

All practicable measures should be taken to reduce dust emanating from the site. Factors that contribute to dust production are:

- Wind over a cleared surface;
- Wind over stockpiled material; and

¹⁴ Australian Standard, (2002). *AS2460: Acoustics - Measurement of the Reverberation Time in Rooms*.

- Movement of machinery in unpaved areas.

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Visible dust should not be present at the site boundary. Measures to minimise the potential for dust generation include:

- Use of water sprays on unsealed or exposed soil surfaces;
- Covering of stockpiled materials and excavation faces (particularly during periods of site inactivity and/or during windy conditions) or alternatively the erection of hessian fences around stockpiled soil or large exposed areas of soil;
- Establishment of dust screens consisting of a 2m high shade cloth or similar material secured to a chain wire fence (particularly along the north-western site boundary);
- Maintenance of dust control measures to keep the facilities in good operating condition;
- Stopping work during strong winds;
- Loading or unloading of dry soil as close as possible to stockpiles to prevent spreading of loose material around the development area; and
- The expanse of cleared land should be kept to a minimum to achieve a clean and economical working environment.

If stockpiles are to remain on-site or soil remains exposed, dust monitoring should be undertaken at the site. If excessive dust is generated all site activities should cease until either wind conditions are more acceptable or a revised method of excavation/remediation is developed.

Dust is also produced during the transfer of material to and from the site. All material should be covered during transport and should be properly disposed of on delivery. No material is to be left in an exposed, un-monitored condition.

All equipment and machinery should be brushed or washed down before leaving the site to limit dust and sediment movement off-site. Additional decontamination procedures are to be outlined in the AMP. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the Waste Classification Guidelines.

10.9 Air Monitoring

Asbestos air monitoring is to occur for the duration of remediation works. Air monitoring must only be carried out by personnel registered and accredited by NATA (National Association of Testing Authorities). Filter analysis must only be carried out within a NATA certified laboratory. The monitoring results must conform to the requirements of the NOHSC Guidance note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003 (2005)].

The monitoring program will be used to assess whether the control procedures being applied are satisfactory and that criteria for airborne asbestos fibre levels are not being exceeded. The following levels will be used as action criteria during the air monitoring:

- <0.01 Fibres/ml: Work procedures deemed to be successful;

- 0.01 to 0.02 Fibres/ml: Inspection of the site and review of procedures; and
- >0.02 Fibres/ml: Stop work, inspection of the site, review of procedures, clean-up, rectification works where required and notify the relevant regulator.

10.10 Odour Control Plan

All activities undertaken at the site should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and any odours arising from the works or stockpiled material should be controlled. Odorous conditions are not expected to be generated during the known remedial activities, however, potential control measures to be implemented may include:

- Maintenance of construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the POEO Act;
- Demolition materials and other combustible waste should not be burnt on site;
- The spraying of a suitable proprietary product to suppress any odours that may be generated by excavated materials; and
- Use of protective covers (e.g. tarpaulins or builder's plastic).

All practicable measures should be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

The following odour management plan should be implemented to limit the exposure of site personnel and surrounding residents to unpleasant odours:

- Excavation and stockpiling of material should be scheduled during periods with low winds if possible;
- A suitable proprietary product could be sprayed on material during excavation and following stockpiling to reduce odours;
- All complaints from workers and neighbours should be logged and a response provided. Work should be rescheduled as necessary to minimise odour problems;
- The site foreman should consider the following odour control measures:
 - reduce the exposed surface of the odorous materials;
 - time excavation activities to reduce off-site nuisance (particularly during strong winds); and
 - cover exposed excavation faces overnight or during periods of low excavation activity.
- If continued complaints are received, alternative odour management strategies should be considered and implemented.

10.11 Work Health and Safety Plan

A site specific WHS plan should be prepared by the contractor for all work to be undertaken at the site. The WHS plan should meet all the requirements outlined in relevant guidelines and regulations.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers and steel cap boots. The additional asbestos-related PPE is to be worn for asbestos-related works, to be specified in the AMP.

Washroom and lunchroom facilities should also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

10.12 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site. This should, as a minimum, include measures to recycle and re-use natural excavated material wherever possible.

10.13 Incident Management Contingency

The validation consultant engaged to undertake the validation assessment should be contacted if any unexpected conditions are encountered at the site. This should enable the scope of remedial/validation works to be adjusted as required. Similarly, if any incident occurs at the site, the validation consultant should be advised to assess potential impacts on contamination conditions and the remediation/validation timetable.

10.14 Hours of Operation

Hours of operation should be between those approved by the consent authority under the development approval process. Reference should also be made to any specific conditions imposed by other consent authority/regulatory bodies.

11 CONCLUSION

JKE are of the opinion that the site can be made suitable for the proposed development provided this RAP is implemented accordingly. A site validation report is to be prepared on completion of remediation activities confirming the outcome of the remediation and validation.

11.1 Remediation Category

Site remediation can fall under the following two categories outlined in SEPP55:

Table 11-1: Remediation Category

Category	Details
Category 1	Category 1 remediation works are those undertaken in the following areas specified under Clause 9 of SEPP55: • A designated development; • Carried out on land declared to be a critical habitat; • Development for which another SEPP or REP requires a development consent; or • Carried out in an area or zone classified as: ➢ Coastal Protection; ➢ Conservation or heritage conservation; ➢ Habitat protection, or habitat or wildlife corridor; ➢ Environmental protection; ➢ Escarpment, escarpment protection or preservation; ➢ Floodway or wetland; ➢ Nature reserve, scenic area or scenic protection; etc. • Work that is not carried out in accordance with the site management provisions contained in the consent authority Development Control Plan (DCP)/Local Environmental Plan (LEP) etc. Approval is required from the consent authority for Category 1 remediation work. The RAP needs to be assessed as part of the development consent. Category 1 remediation work is identified as advertised development work unless the remediation work is a designated development or a state significant development (Clause 13 of SEPP55).
Category 2	Remediation works which do not fall under the above category are classed as Category 2. Development consent is not required for Category 2 remediation works; however, the consent authority should be given 30 days' notice prior to commencement of works.

Considering the above, JKE have assessed that the remediation falls within Category 1 as the site is mapped as Heritage Item No.10 under Ryde LEP 2014. This has been outlined in the Response to Submissions letter issued by the NSW Department of Planning and Environment, dated 4 March 2019. This should be confirmed by an expert planner.

11.2 Regulatory Requirements

The regulatory requirements applicable for the site are outlined in the following table:

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Table 11-2: Regulatory Requirement

Guideline / Legislation	Applicability
Duty to Report Contamination (2015)¹⁵	At this stage, JKE consider that there is no requirement to notify the NSW EPA of the site contamination. This requirement should be reassessed as part of the validation process and following review of the asbestos air monitoring results.
POEO Act 1997	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner. Appropriate waste tracking is required for all waste that is disposed off-site. Activities should be carried out in a manner which does not result in the pollution of waters.
POEO (Waste) Regulation 2014	Part 7 of the POEO Waste Regulation set outs the requirements for the transportation and management of asbestos waste and Clause 79 of the POEO Waste Regulation requires waste transporters to provide information to the NSW EPA regarding the movement of any load in NSW of more than 10 square meters of asbestos sheeting, or 100 kilograms of asbestos waste. To fulfil these legal obligations, asbestos waste transporters must use WasteLocate. Clause 78 of the POEO Waste Regulation requires that a person who transport asbestos waste must ensure that: - Any part of any vehicle in which the person transports the waste is covered, and leak-proof, during the transportation; and - If the waste consists of bonded asbestos material—it is securely packaged during the transportation; and - If the waste consists of friable asbestos material—it is kept in a sealed container during transportation; and - If the waste consists of asbestos-contaminated soils—it is wetted down.
Protection of the Environment Operations Amendment (Asbestos Waste) Act 2018	Lawful disposal of asbestos waste is required under the POEO (Asbestos Waste) Act 2018 and POEO (Waste) Regulation. Re-use or recycling of asbestos waste is prohibited under Clause 144AAB of the Act.
Water Management Act 2000	The development (and therefore the remediation) may require controlled activity approval due to the proposed removal of trees and vegetation and the sites' proximity to Kikkiya Creek. This requirement should be assessed and confirmed by the relevant authorities.
Code of Practice How to manage and control asbestos in the workplace (2019)¹⁶	Sites with asbestos become a 'workplace' when work is carried out there and require a register and asbestos management plan. Appropriate SafeWork NSW notification will be required for asbestos removal works or handling. Contractors are also required to be appropriately licensed for the asbestos works undertaken (i.e. Class A for the friable asbestos works for this project).

¹⁵ NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under the Contamination Land Management Act 1997*. (referred to as Duty to Report Contamination 2015)

¹⁶ SafeWork NSW, (2019). *Code of Practice – How to Manage and Control Asbestos in the Workplace*.

12 LIMITATIONS

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The report limitations are outlined below:

- JKE accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the JKE proposal; and terms of contract between JKE and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, JKE has not undertaken any verification process, except where specifically stated in the report;
- JKE has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- JKE accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- JKE have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. JKE should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Important Information about This Report

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These notes have been prepared by JKE to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors

This report has been prepared in response to specific project requirements as stated in the JKE proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

JKE/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by JKE to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions

Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data

Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Assessment Limitations

Although information provided by a site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Assessments by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

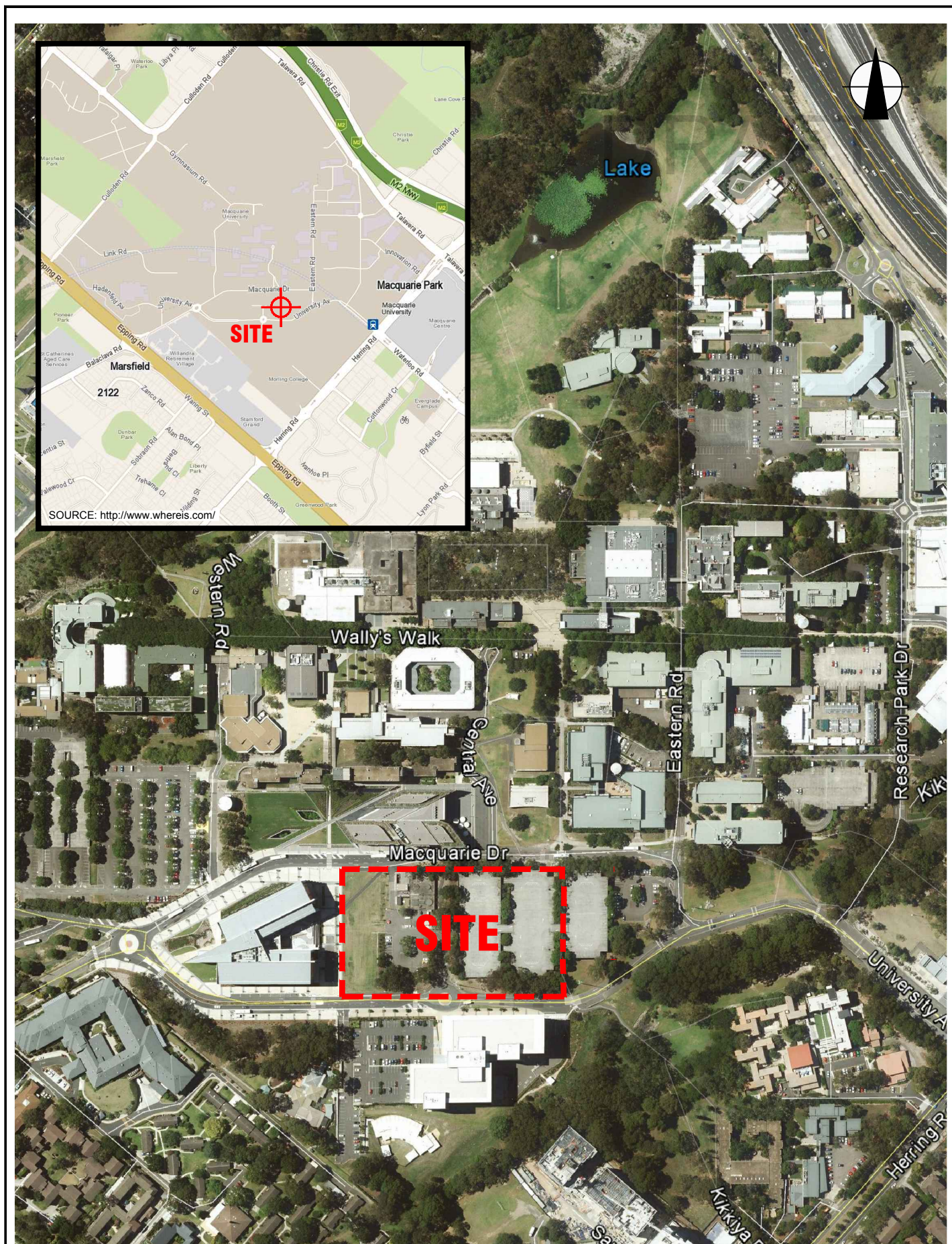
Read Responsibility Clauses Closely

Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.



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REPORT FIGURES



AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

Notes: Reference should be made to the report text for a full understanding of this plan.

Title:

SITE LOCATION PLAN

Location:

8-12 UNIVERSITY AVENUE
MACQUARIE PARK, NSW

Report No:

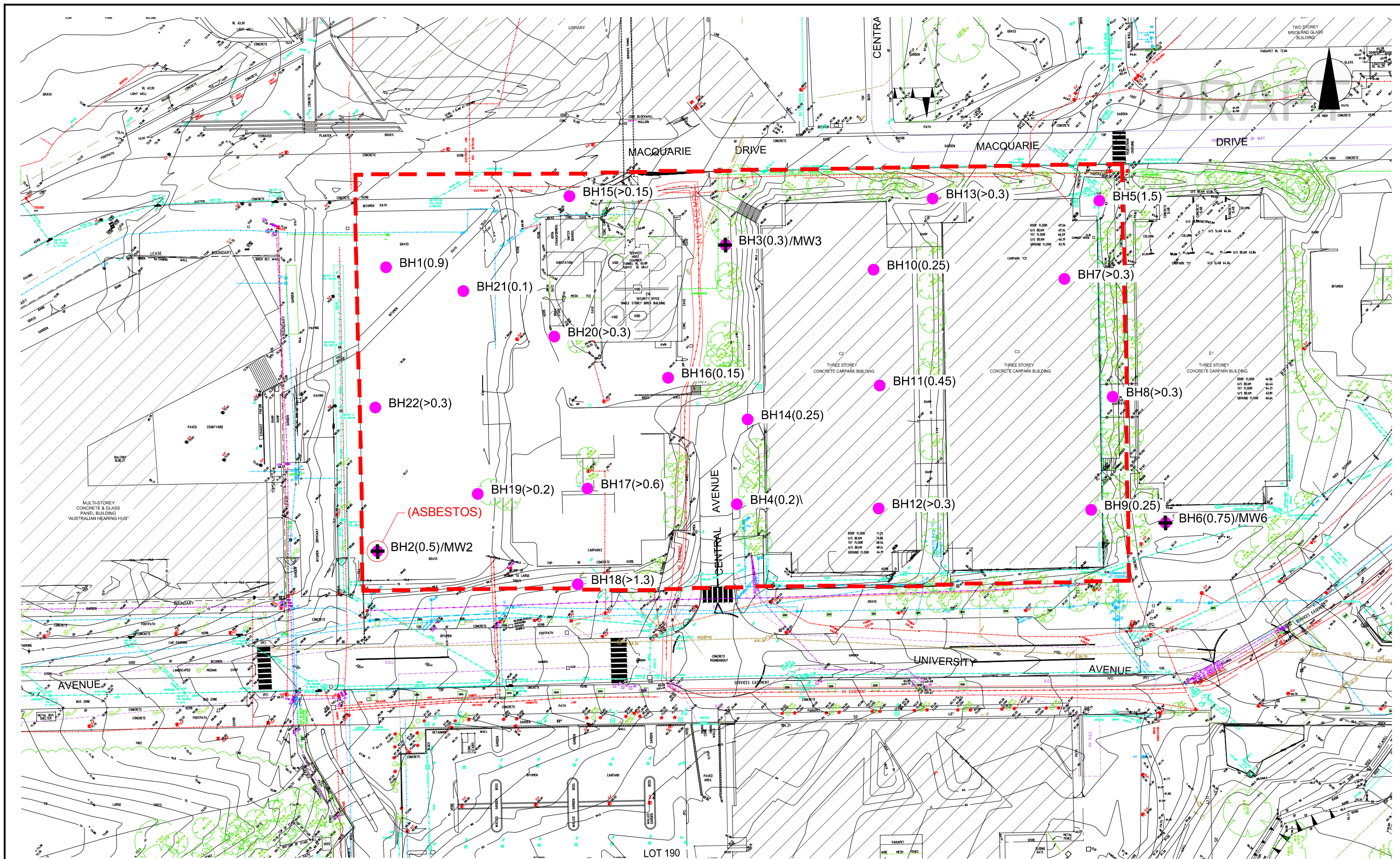
E29775PL

Figure No:

1

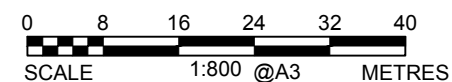
JK ENVIRONMENTS





LEGEND

- APPROXIMATE SITE BOUNDARY
- BH (Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- MW2 GROUNDWATER MONITORING WELL LOCATION AND NUMBER

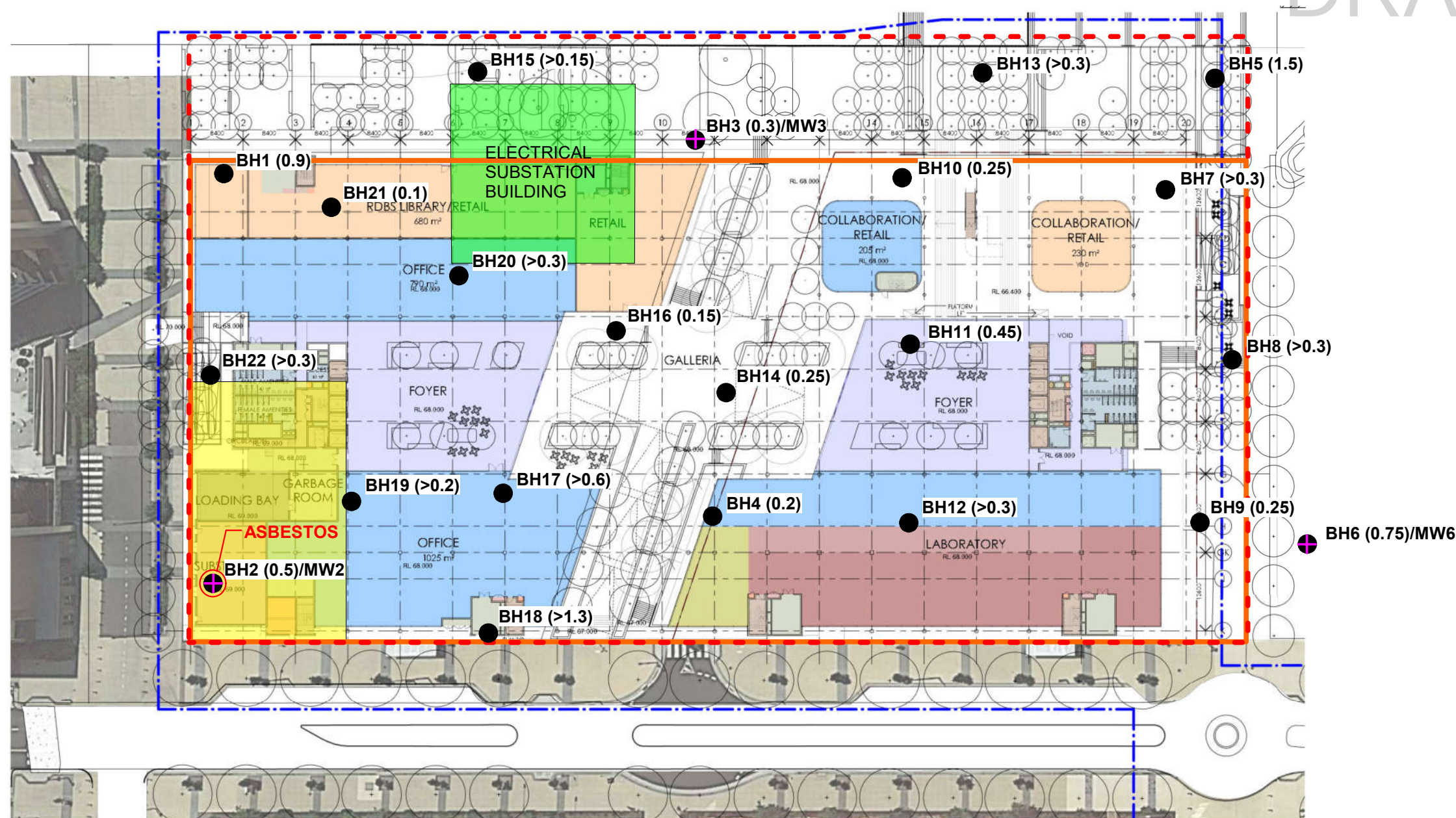


This plan should be read in conjunction with the JKE report.

Title:		SAMPLE LOCATION PLAN	
Location:		8-12 UNIVERSITY AVENUE MACQUARIE PARK, NSW	
Report No:		E29775PL	Figure No: 2
JK ENVIRONMENTS			



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Appendix A: Proposed Development Plans



CONTEXT PLAN 1:2000

ARCHITECTURAL DESIGN DA DRAWINGS

DA00.01	COVER SHEET	J
DA00.02	DEVELOPMENT SCHEDULES - GFA	J
DA00.02.1	DEVELOPMENT SCHEDULES - NLA	A
DA01.01	SITE PLAN	J
DA01.02	SITE & CONTEXT	H
DA02.01	BASEMENT 3 PLAN	J
DA02.02	LOWER GROUND AND BASEMENT 2	J
DA02.03	THE COMMON AND BASEMENT 1	J
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DA02.05	MEZZANINE FLOOR PLAN	J
DA02.06	LEVEL 1 FLOOR PLAN	J
DA02.06.1	LEVEL 2 FLOOR PLAN	A
DA02.06.2	LEVEL 3 FLOOR PLAN	A
DA02.07	LEVEL 4 FLOOR PLAN	J
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DA02.10	LEVEL 7 / PLANT ROOM FLOOR PLAN	J
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DA03.01	SECTIONS	J
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DA03.03	NORTH AND WEST ELEVATIONS	J
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DA04.01	SHADOW STUDY DIAGRAMS WINTER SOLSTICE	H
DA04.02	SHADOW STUDY DIAGRAMS SUMMER SOLSTICE	H
DA04.03	SHADOW STUDY DIAGRAMS SPRING/AUTUMN EQUINOX	H
DA11.12	STAIR & LIFT CORE (BUILDING 12) PLANS	J
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ARCHITECTURAL DESIGN (SSD) DA DRAWINGS

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Issued For SSD Approval 2.11.2018



MACQUARIE
University

GFA SCHEDULE TOTAL - BUILDING E02

Ground Level	
ACCESS	10 m²
AIR LOCK	5 m²
CIRCULATION	25 m²
FEMALE AMENITIES	40 m²
FOYER	255 m²
LIFT LOBBY	35 m²
MALE AMENITIES	40 m²
UNIVERSITY OFFICE	2465 m²
UNIVERSITY OFFICE/RETAIL	385 m²
	3260 m²

Level 1	
ACCESS	10 m²
AIR LOCK	10 m²
CIRCULATION	30 m²
FEMALE AMENITIES	40 m²
LIFT LOBBY	225 m²
MALE AMENITIES	40 m²
UNIVERSITY OFFICE	3790 m²
	4140 m²

Level 2	
ACCESS	10 m²
AIR LOCK	10 m²
FEMALE AMENITIES	40 m²
LIFT LOBBY	140 m²
MALE AMENITIES	40 m²
UNIVERSITY OFFICE	3790 m²
	4030 m²

Level 3	
ACCESS	10 m²
AIR LOCK	10 m²
FEMALE AMENITIES	40 m²
LIFT LOBBY	140 m²
MALE AMENITIES	40 m²
OFFICE	3790 m²
	4030 m²

Level 4	
ACCESS	10 m²
AIR LOCK	10 m²
FEMALE AMENITIES	40 m²
LIFT LOBBY	140 m²
MALE AMENITIES	40 m²
OFFICE	3790 m²
	4030 m²

Level 5	
ACCESS	10 m²
AIR LOCK	10 m²
FEMALE AMENITIES	40 m²
LIFT LOBBY	140 m²
MALE AMENITIES	40 m²
OFFICE	3790 m²
	4030 m²

Level 6	
ACCESS	10 m²
AIR LOCK	10 m²
FEMALE AMENITIES	40 m²
LIFT LOBBY	140 m²
MALE AMENITIES	40 m²
OFFICE	3790 m²
	4030 m²

GFA TOTAL - BUILDING E02 27535 m²

GFA SCHEDULE TOTAL - BUILDING E03

Basement 2	
BIKE HUB	115 m²
	115 m²

Basement 1	
BIKE HUB MEZZANINE	75 m²
RETAIL	155 m²
	230 m²

Ground Level	
ACCESS	10 m²
AIR LOCK	15 m²
CIRCULATION	80 m²
COLLABORATION/ RETAIL	455 m²
FEMALE AMENITIES	35 m²
FOYER	285 m²
LIFT LOBBY	35 m²
MALE AMENITIES	35 m²
UNIVERSITY LABORATORY/OFFICE	1880 m²
	2830 m²

Mezzanine	
ACCESS	10 m²
FEMALE AMENITIES	15 m²
LIFT LOBBY	70 m²
MALE AMENITIES	15 m²
STORE	45 m²
UNIVERSITY COLLABORATION	600 m²
	755 m²

Level 1	
ACCESS	10 m²
AIR LOCK	10 m²
CIRCULATION	30 m²
FEMALE AMENITIES	35 m²
LIFT LOBBY	215 m²
MALE AMENITIES	35 m²
UNIVERSITY COLLABORATION	1365 m²
UNIVERSITY LABORATORY/OFFICE	2090 m²
	3790 m²

Level 2	
ACCESS	10 m²
AIR LOCK	10 m²
CIRCULATION	30 m²
FEMALE AMENITIES	35 m²
LIFT LOBBY	110 m²
MALE AMENITIES	35 m²
UNIVERSITY COLLABORATION	1360 m²
UNIVERSITY LABORATORY/OFFICE	2090 m²
	3675 m²

Level 3	
ACCESS	10 m²
AIR LOCK	10 m²
CIRCULATION	30 m²
FEMALE AMENITIES	35 m²
LABORATORY/OFFICE	2090 m²
LIFT LOBBY	110 m²
MALE AMENITIES	35 m²
UNIVERSITY COLLABORATION	1360 m²
	3675 m²

Level 4	
ACCESS	10 m²
AIR LOCK	10 m²
CIRCULATION	30 m²
FEMALE AMENITIES	35 m²
LABORATORY/OFFICE	2090 m²
LIFT LOBBY	110 m²
MALE AMENITIES	35 m²
UNIVERSITY COLLABORATION	1250 m²
	3565 m²

Level 5	
ACCESS	10 m²
AIR LOCK	10 m²
CIRCULATION	30 m²
FEMALE AMENITIES	35 m²
LABORATORY/OFFICE	2090 m²
LIFT LOBBY	115 m²
MALE AMENITIES	35 m²
UNIVERSITY COLLABORATION	955 m²
	3275 m²

GFA TOTAL - BUILDING E03 21905 m²

GFA SCHEDULE TOTAL - NON-UNIVERSITY

Basement 2	
BIKE HUB	115 m²
	115 m²

Basement 1	
BIKE HUB MEZZANINE	75 m²
RETAIL	155 m²
	230 m²

Ground Level	
COLLABORATION/ RETAIL	455 m²
FOYER	75 m²
	530 m²

Level 3	
ACCESS	20 m²
AIR LOCK	15 m²
CIRCULATION	15 m²
FEMALE AMENITIES	75 m²
LABORATORY/OFFICE	2090 m²
LIFT LOBBY	200 m²
MALE AMENITIES	40 m²
OFFICE	3790 m²
	6240 m²

Level 4	
ACCESS	20 m²
AIR LOCK	15 m²
CIRCULATION	15 m²
FEMALE AMENITIES	75 m²
LABORATORY/OFFICE	2090 m²
LIFT LOBBY	200 m²
MALE AMENITIES	40 m²
OFFICE	3790 m²
	6240 m²

Level 5	
ACCESS	20 m²
AIR LOCK	15 m²
CIRCULATION	15 m²
FEMALE AMENITIES	75 m²
LABORATORY/OFFICE	2090 m²
LIFT LOBBY	200 m²
MALE AMENITIES	40 m²
OFFICE	3790 m²
	6240 m²

Level 6	
ACCESS	10 m²
AIR LOCK	10 m²
FEMALE AMENITIES	40 m²
LIFT LOBBY	140 m²
MALE AMENITIES	40 m²
OFFICE	3790 m²
	4030 m²

GFA TOTAL - NON UNIVERSITY 23620 m²

GFA SCHEDULE TOTAL - UNIVERSITY

Ground Level	
ACCESS	20 m²
AIR LOCK	20 m²
CIRCULATION	105 m²
FEMALE AMENITIES	75 m²
FOYER	465 m²
LIFT LOBBY	70 m²
MALE AMENITIES	70 m²
UNIVERSITY LABORATORY/OFFICE	1880 m²
UNIVERSITY OFFICE	2465 m²
UNIVERSITY OFFICE/RETAIL	385 m²
	5555 m²

Mezzanine	
ACCESS	10 m²
FEMALE AMENITIES	15 m²
LIFT LOBBY	70 m²
MALE AMENITIES	15 m²
STORE	45 m²
UNIVERSITY COLLABORATION	600 m²
	755 m²

Level 1	
ACCESS	20 m²
AIR LOCK	20 m²
CIRCULATION	60 m²
FEMALE AMENITIES	75 m²
LIFT LOBBY	440 m²
MALE AMENITIES	70 m²
UNIVERSITY COLLABORATION	1365 m²
UNIVERSITY LABORATORY/OFFICE	2090 m²
UNIVERSITY OFFICE	3790 m²
	7930 m²

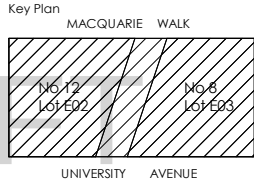
Level 2	
ACCESS	20 m²
AIR LOCK	20 m²
CIRCULATION	30 m²
FEMALE AMENITIES	75 m²
LIFT LOBBY	250 m²
MALE AMENITIES	70 m²
UNIVERSITY COLLABORATION	1360 m²
UNIVERSITY LABORATORY/OFFICE	2090 m²
UNIVERSITY OFFICE	3790 m²
	7705 m²

Level 3	
AIR LOCK	5 m²
CIRCULATION	15 m²
LIFT LOBBY	50 m²
MALE AMENITIES	35 m²
UNIVERSITY COLLABORATION	1360 m²
	1465 m²

Level 4	
AIR LOCK	5 m²
CIRCULATION	15 m²
LIFT LOBBY	50 m²
MALE AMENITIES	35 m²
UNIVERSITY COLLABORATION	1250 m²
	1355 m²

Level 5	
AIR LOCK	5 m²
CIRCULATION	15 m²
LIFT LOBBY	55 m²
MALE AMENITIES	35 m²
UNIVERSITY COLLABORATION	955 m²
	1065 m²

GFA TOTAL - UNIVERSITY 25825 m²



NOTE:
INDIVIDUAL SCHEDULE AREAS VALUES ARE
ROUNDED VALUES, ROUNDED TO THE NEAREST
5m².
SCHEDULE TOTAL AREAS ARE A ROUNDED TOTAL
BASED ON THE NON-ROUNDED INDIVIDUAL
VALUES, THEREFORE MAY NOT BE A TOTAL OF THE
INDIVIDUAL ROUNDED VALUES.

GFA SCHEDULE TOTAL DOES NOT INCLUDE:
-ANCILLARY
-BOH CIRCULATION
-END OF TRIP FACILITIES
-PARKING
-ELECTRICAL, FIRE, HYDRAULIC & MECHANICAL
SERVICES
-VERTICAL CIRCULATION
-VOID

J	Issued For SSD Approval	SJ	2.11.2018
I	Issue for approval	SJ	31.01.2018
H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	Chk.	Date

DO NOT SCALE from this drawing. Use given dimensions only.
Check all dimensions on the job prior to commencement of shop
drawings or fabrication. Any discrepancies are to be referred to the
Architect/Engineer/Designer prior to commencement of work



Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
DEVELOPMENT SCHEDULES - GFA

Drawing No.
KFS-812UA-AR-DWG-DA00.02

Scales 1 : 250 @ A1

Drawn

Checked

Revision

J

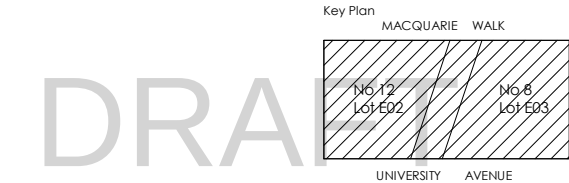
Project No.

6508

2/11/2018 10:23:24 AM - Plot Date

NLA SCHEDULE TOTAL - BUILDING E02	
Ground Level	
UNIVERSITY OFFICE	2465 m²
UNIVERSITY OFFICE/RETAIL	385 m²
	2855 m²
Level 1	
UNIVERSITY OFFICE	3790 m²
	3790 m²
Level 2	
UNIVERSITY OFFICE	3790 m²
	3790 m²
Level 3	
OFFICE	3790 m²
	3790 m²
Level 4	
OFFICE	3790 m²
	3790 m²
Level 5	
OFFICE	3790 m²
	3790 m²
Level 6	
OFFICE	3790 m²
	3790 m²
NLA TOTAL - BUILDING E02	25595 m²

NLA SCHEDULE TOTAL - BUILDING E03	
E03	
Basement 2	
BIKE HUB	115 m²
	115 m²
Basement 1	
BIKE HUB MEZZANINE	75 m²
RETAIL	155 m²
	230 m²
	340 m²
E03 North	
Ground Level	
COLLABORATION/ RETAIL	455 m²
	455 m²
Mezzanine	
STORE	45 m²
UNIVERSITY	600 m²
COLLABORATION	
	650 m²
Level 1	
UNIVERSITY	1365 m²
COLLABORATION	
	1365 m²
Level 2	
UNIVERSITY	1360 m²
COLLABORATION	
	1360 m²
Level 3	
UNIVERSITY	1360 m²
COLLABORATION	
	1360 m²
Level 4	
UNIVERSITY	1250 m²
COLLABORATION	
	1250 m²
Level 5	
UNIVERSITY	955 m²
COLLABORATION	
	955 m²
	7400 m²
E03 South	
Ground Level	
UNIVERSITY	1880 m²
LABORATORY/OFFICE	
	1880 m²
Level 1	
UNIVERSITY	2090 m²
LABORATORY/OFFICE	
	2090 m²
Level 2	
UNIVERSITY	2090 m²
LABORATORY/OFFICE	
	2090 m²
Level 3	
LABORATORY/OFFICE	2090 m²
	2090 m²
Level 4	
LABORATORY/OFFICE	2090 m²
	2090 m²
Level 5	
LABORATORY/OFFICE	2090 m²
	2090 m²
	12335 m²
NLA TOTAL - BUILDING E03	20075 m²



NOTE:

INDIVIDUAL SCHEDULE AREAS VALUES ARE
ROUNDED VALUES, ROUNDED TO THE NEAREST
5m².

SCHEDULE TOTAL AREAS ARE A ROUNDED TOTAL
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VALUES, THEREFORE MAY NOT BE A TOTAL OF THE
INDIVIDUAL ROUNDED VALUES.

GFA SCHEDULE TOTAL DOES NOT INCLUDE:

- ANCILLARY
- BOH CIRCULATION
- END OF TRIP FACILITIES
- PARKING
- ELECTRICAL, FIRE, HYDRAULIC & MECHANICAL
SERVICES
- VERTICAL CIRCULATION
- VOID

A	Issued For SSD Approval	SJ	2.11.2018
Rev.	Revision Description	Chk.	Date
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Project

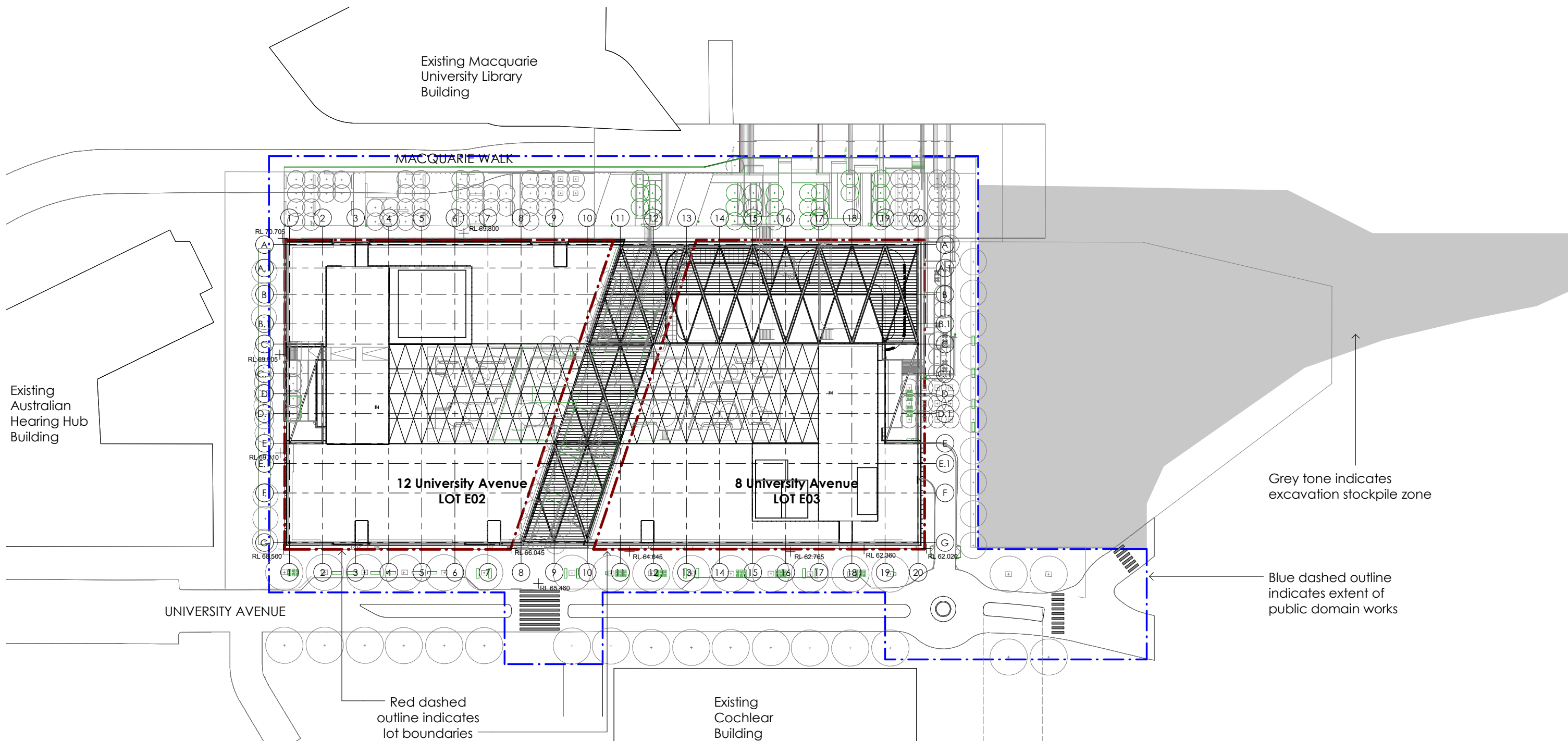
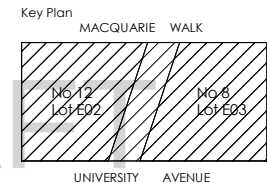
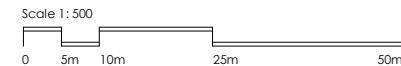
8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
DEVELOPMENT SCHEDULES - NLA

Drawing No.
KFS-812UA-AR-DWG-DA00.02.1

Scales Drawn Author Checked Checker

Revision
A
Project No.
6508



J	Issued For SSD Approval	SJ	2.11.2018
I	Issue for approval	SJ	31.01.2018
H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	Chk.	Date

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Client



MACQUARIE
University

Project Manager

CADENCE
AUSTRALIA

Architects

KANNFINCH | SISSONS

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ACN 139 614 798 Tel +61 2 9299 4111 www.kannfinch.com
Nominated Architect: Stephen Jamison NSW ARB Reg No 5108

Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
SITE PLAN

Drawing No.
KFS-812UA-AR-DWG-DA01.01

Scales 1:500 @ A1

Drawn SG

Checked

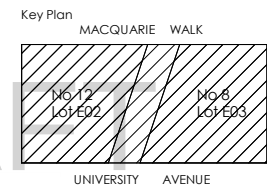
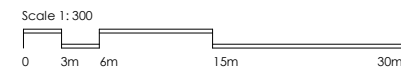
Revision

J

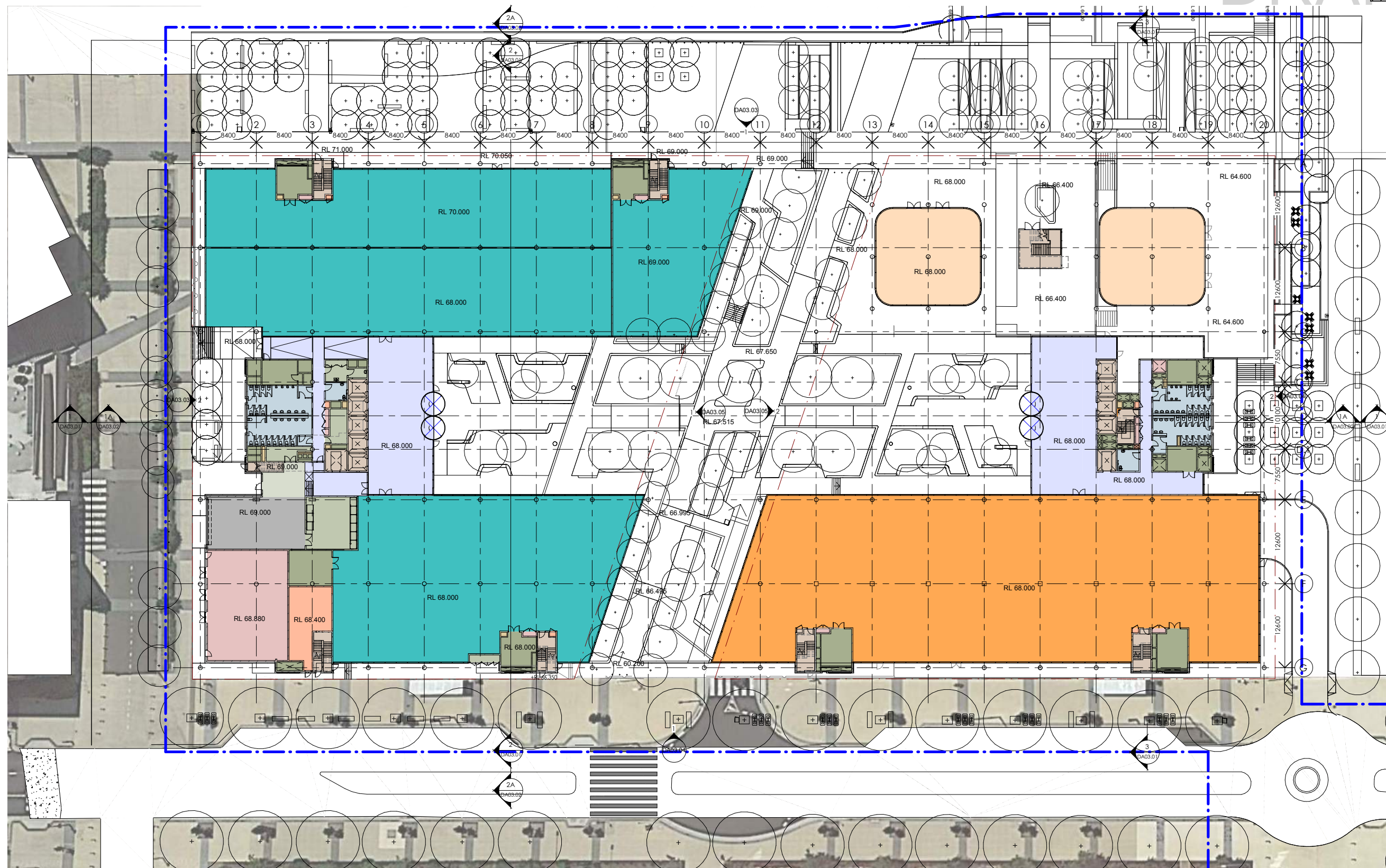
Project No.

6508

2/11/2018 10:23:43 AM - Plot Date



DRAWING



H	Issued For SSD Approval	SJ	2.11.2018
G	Issue for approval	SJ	31.01.2018
F	Issue For Approval	SJ	22.11.2017
E	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	CHK.	Date

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Client



MACQUARIE
University

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CADENCE
AUSTRALIA

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Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing

SITE & CONTEXT

Drawing No.
KFS-812UA-AR-DWG-DA01.02

Scales 1 : 300 @ A1

Drawn

Checked

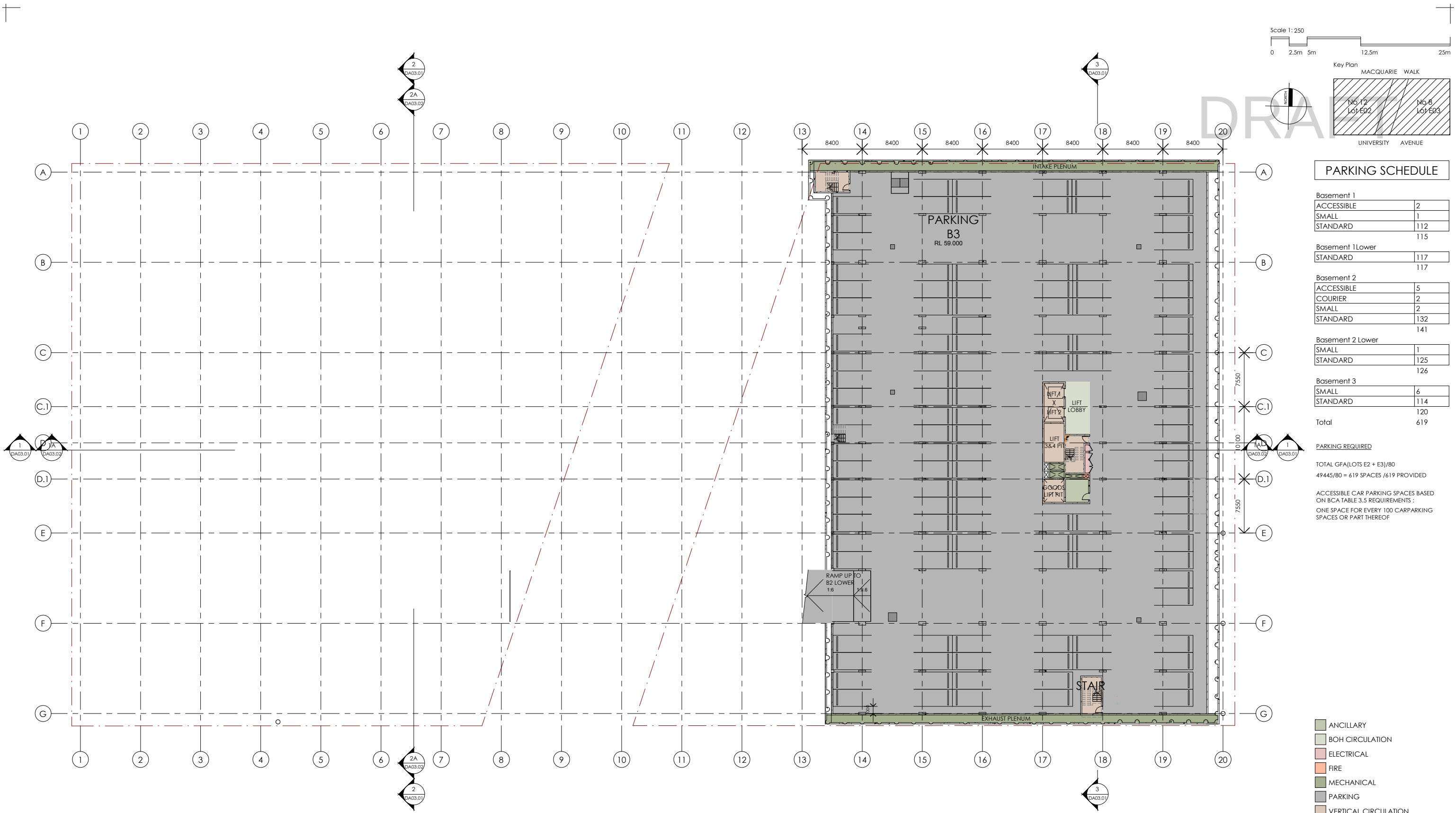
Revision

H

Project No.

6508

2/11/2018 10:56:33 AM - Plot Date



PARKING SCHEDULE

Basement 1	
ACCESSIBLE	2
SMALL	1
STANDARD	112
	115
Basement 1 Lower	
STANDARD	117
	117
Basement 2	
ACCESSIBLE	5
COURIER	2
SMALL	2
STANDARD	132
	141
Basement 2 Lower	
SMALL	1
STANDARD	125
	126
Basement 3	
SMALL	6
STANDARD	114
	120
Total	619

PARKING REQUIRED

TOTAL GFA(LOTS E2 + E3)/80

49445/80 = 619 SPACES /619 PROVIDED

ACCESSIBLE CAR PARKING SPACES BASED ON BCA TABLE 3.5 REQUIREMENTS : ONE SPACE FOR EVERY 100 CARPARKING SPACES OR PART THEREOF

- ANCILLARY
- BOH CIRCULATION
- ELECTRICAL
- FIRE
- MECHANICAL
- PARKING
- VERTICAL CIRCULATION

J	Issued For SSD Approval	SJ	2.11.2018
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H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	CHK.	Date

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Consultant

Project

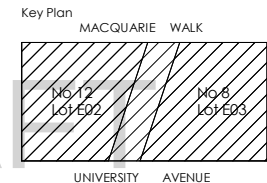
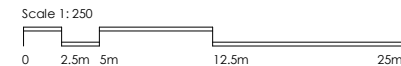
8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
BASEMENT 3 PLAN

Drawing No.
KFS-812UA-AR-DWG-DA02.01

Revision
J

2/11/2018 10:23:57 AM: Plot Date



PARKING SCHEDULE

Basement 1	
ACCESSIBLE	2
SMALL	1
STANDARD	112
115	
Basement 1 Lower	
STANDARD	117
117	
Basement 2	
ACCESSIBLE	5
COURIER	2
SMALL	2
STANDARD	132
141	
Basement 2 Lower	
SMALL	1
STANDARD	125
126	
Basement 3	
SMALL	6
STANDARD	114
120	
Total	
619	

PARKING REQUIRED

TOTAL GFA(LOTS E2 + E3)/80
49445/80 = 619 SPACES /619 PROVIDED

ACCESSIBLE CAR PARKING SPACES BASED ON BCA TABLE 3.5 REQUIREMENTS:
ONE SPACE FOR EVERY 100 CARPARKING SPACES OR PART THEREOF

- ANCILLARY
- BOH CIRCULATION
- ELECTRICAL
- END OF TRIP FACILITIES
- FIRE
- HYDRAULIC
- MECHANICAL
- PARKING
- RETAIL
- VERTICAL CIRCULATION

J	Issued For SSD Approval	SJ	2.11.2018
I	Issue for approval	SJ	31.01.2018
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G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	CHK.	Date

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Client



MACQUARIE
University

Project Manager

CADENCE
AUSTRALIA

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Nominated Architect: Stephen Jamison NSW ARB Reg No 5108

Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing

LOWER GROUND AND BASEMENT 2

Drawing No.
KFS-812UA-AR-DWG-DA02.02

Scales 1:250 @ A1

Drawn SG

Checked

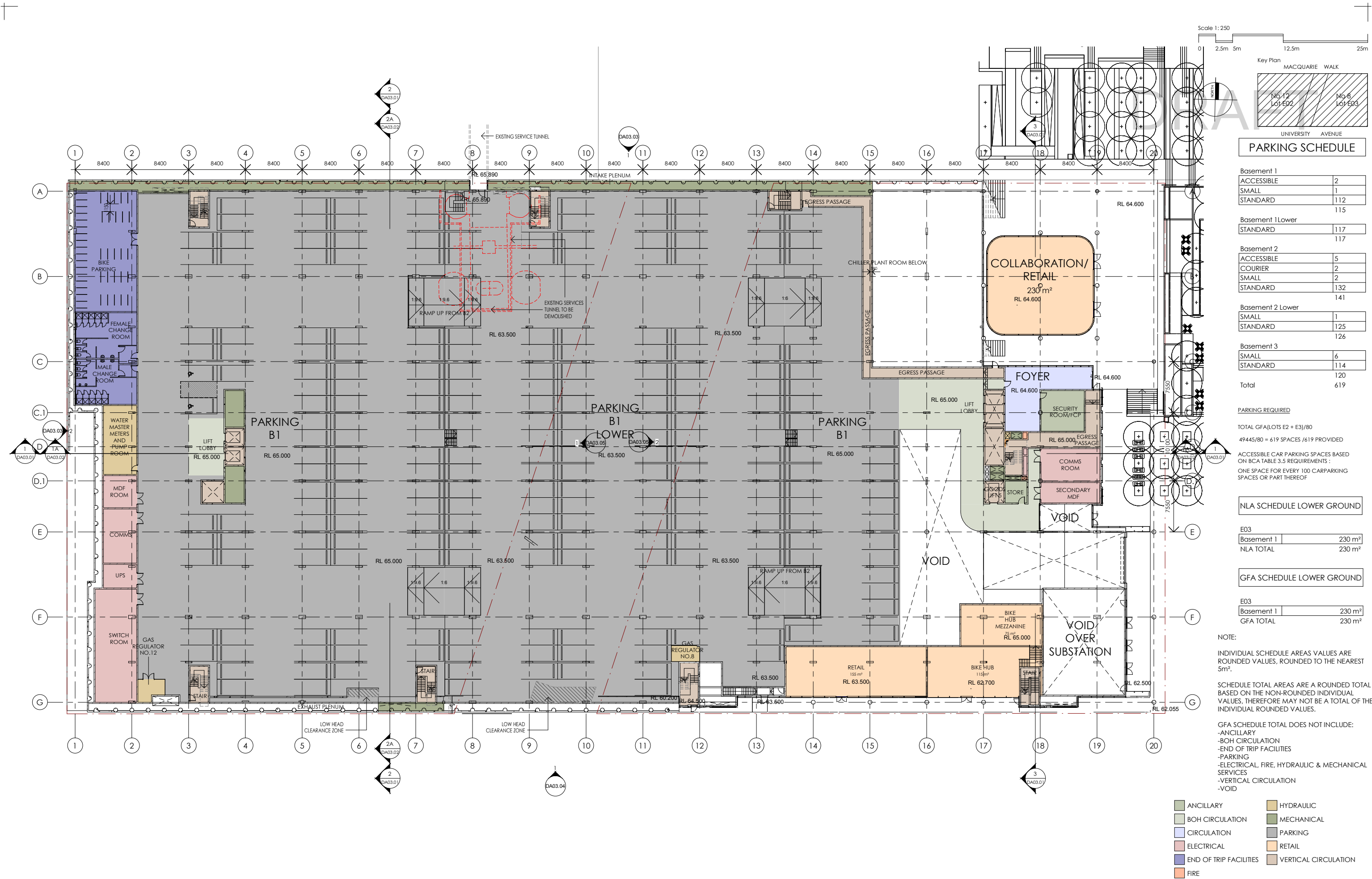
Revision

J

Project No.

6508

2/11/2018 10:56:36 AM - Plot Date



J	Issued For SSD Approval	SJ	2.11.2018
I	Issue for approval	SJ	31.01.2018
H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	CHK.	Date

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Consultant

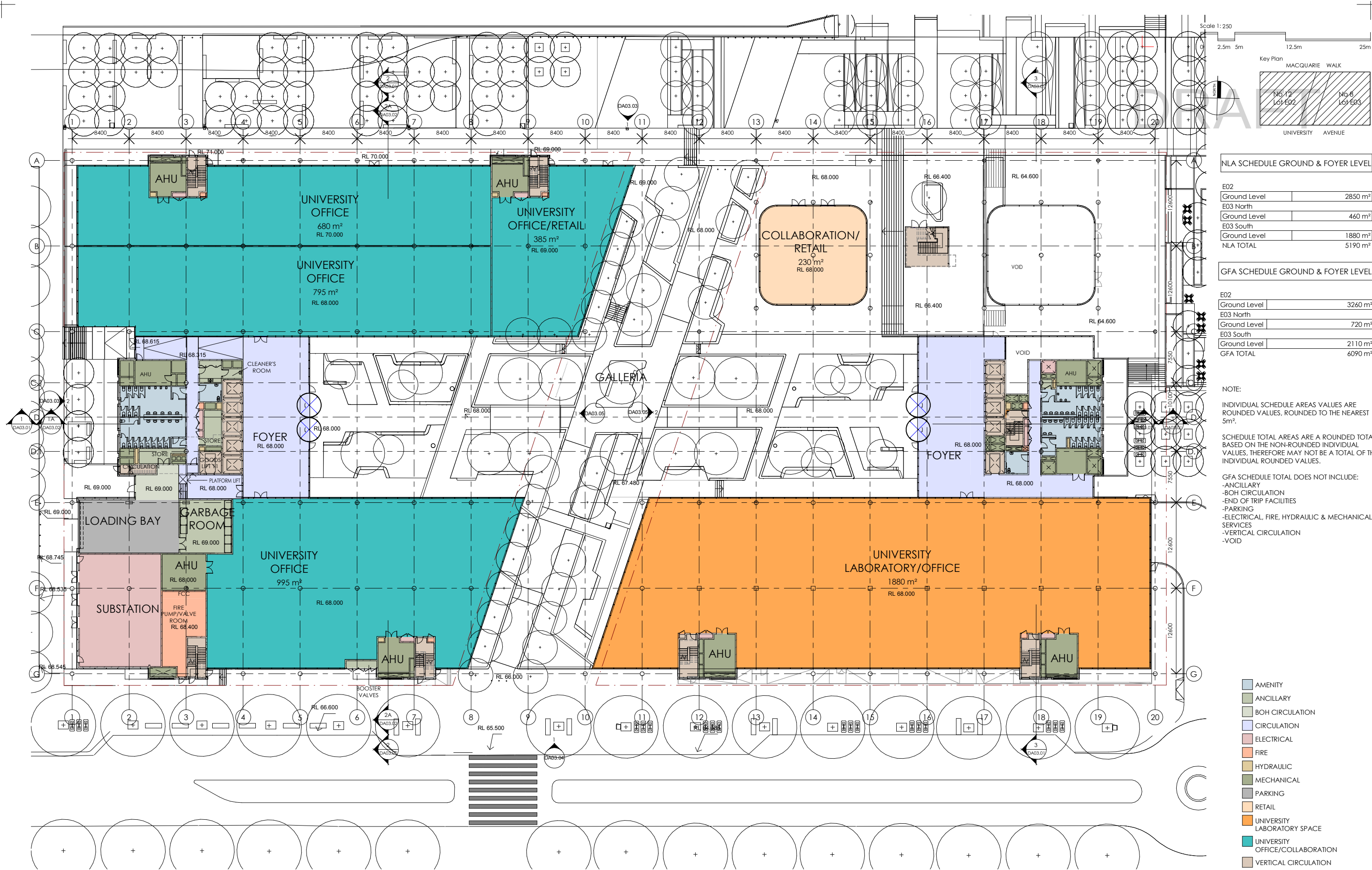
Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
THE COMMON AND BASEMENT 1

Drawing No.
KFS-812UA-AR-DWG-DA02.03

Revision
J
Project No.
6508
Scales 1 : 250 @ A1 Drawn: SG Checked: 2/11/2018 10:56:39 AM: Plot Date



NLA SCHEDULE GROUND & FOYER LEVEL

E02	
Ground Level	2850 m ²
E03 North	
Ground Level	460 m ²
E03 South	
Ground Level	1880 m ²
NLA TOTAL	5190 m ²

GFA SCHEDULE GROUND & FOYER LEVEL

E02	
Ground Level	3260 m ²
E03 North	
Ground Level	720 m ²
E03 South	
Ground Level	2110 m ²
GFA TOTAL	6090 m ²

NOTE:
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-BOH CIRCULATION
-END OF TRIP FACILITIES
-PARKING
-ELECTRICAL, FIRE, HYDRAULIC & MECHANICAL
SERVICES
-VERTICAL CIRCULATION
-VOID

J	Issued For SSD Approval	SJ	2.11.2018
I	Issue for approval	SJ	31.01.2018
H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	CHK.	Date

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Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
GROUND AND UPPER GROUND FLOOR PLAN

Drawing No.
KFS-812UA-AR-DWG-DA02.04

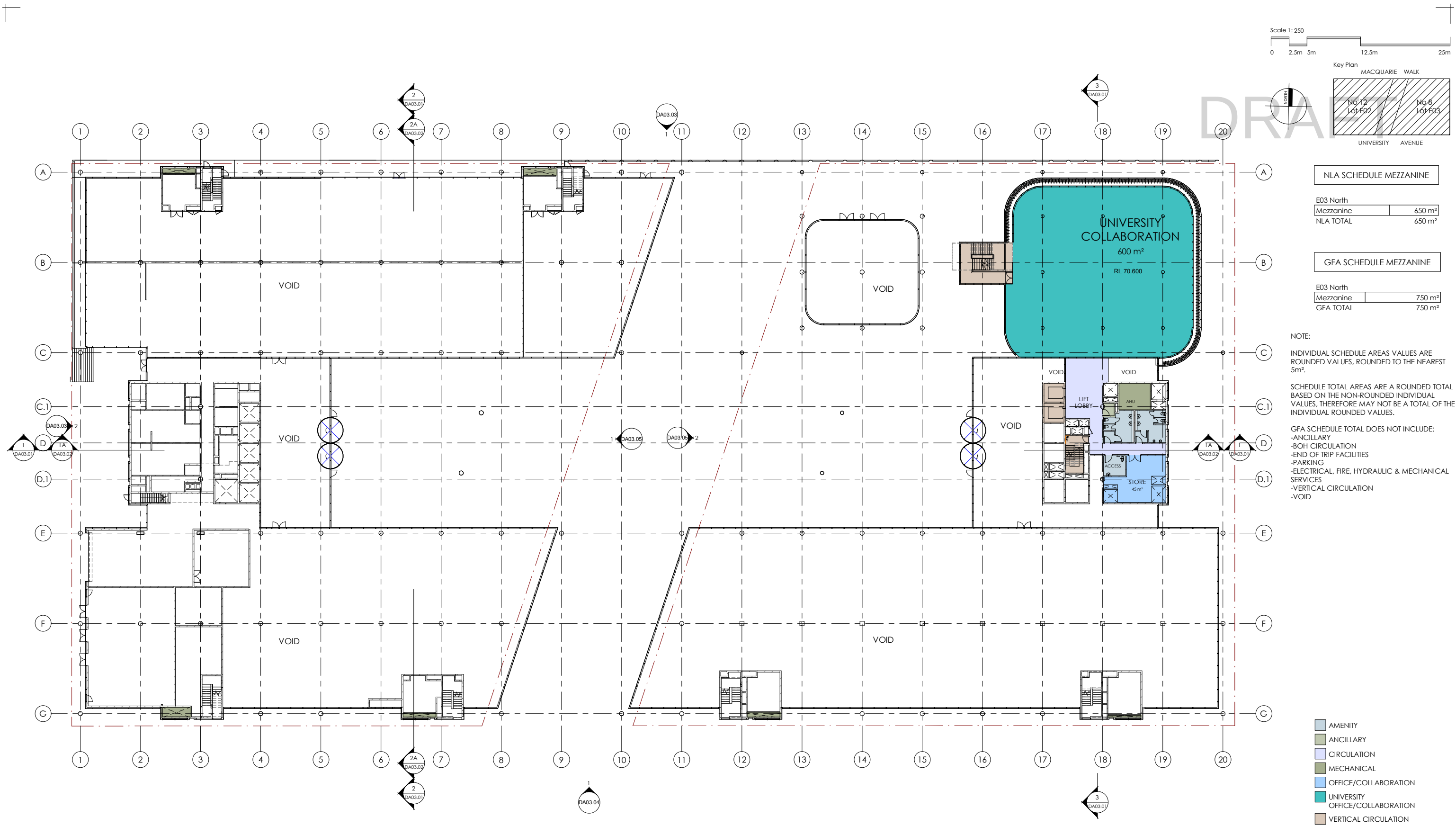
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Drawn: SG

Checked:

Revision
J
6508

2/11/2018 10:56:44 AM - Plot Date



J	Issued For SSD Approval	SJ	2.11.2018
I	Issue for approval	SJ	31.01.2018
H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	CHK.	Date

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Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
MEZZANINE FLOOR PLAN

Drawing No.
KFS-812UA-AR-DWG-DA02.05

Scales 1 : 250 @ A1

Drawn

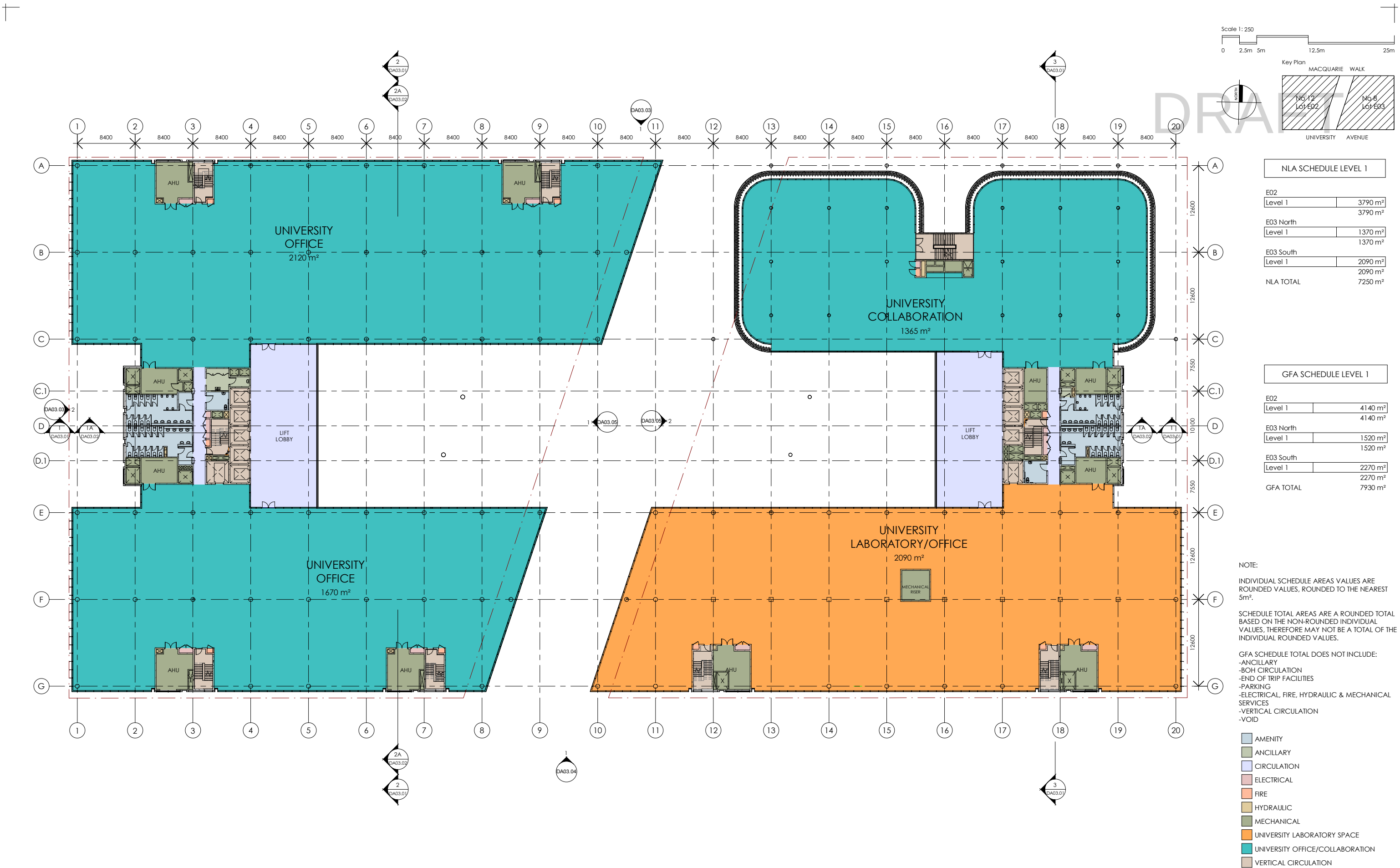
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Revision

J

6508

2/11/2018 10:56:48 AM - Plot Date



J	Issued For SSD Approval	SJ	2.11.2018
I	Issue for approval	SJ	31.01.2018
H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	CHK.	Date

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Client



MACQUARIE
University

Project Manager



Architects

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Nominated Architect: Stephen Jamison NSW ARB Reg No 5108

Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
LEVEL 1 FLOOR PLAN

Drawing No.
KFS-812UA-AR-DWG-DA02.06

Scales 1 : 250 @ A1

Drawn: SG

Checked:

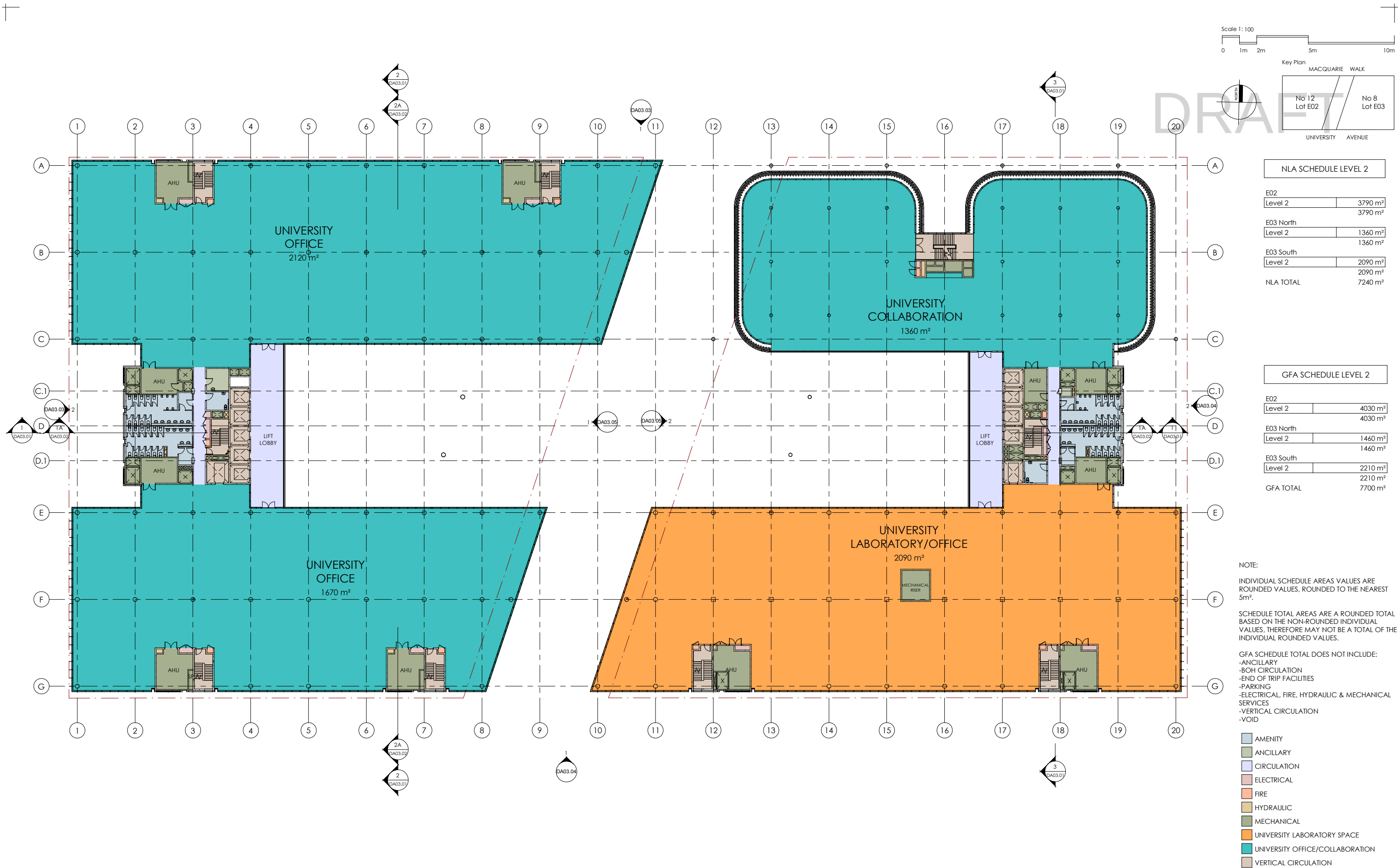
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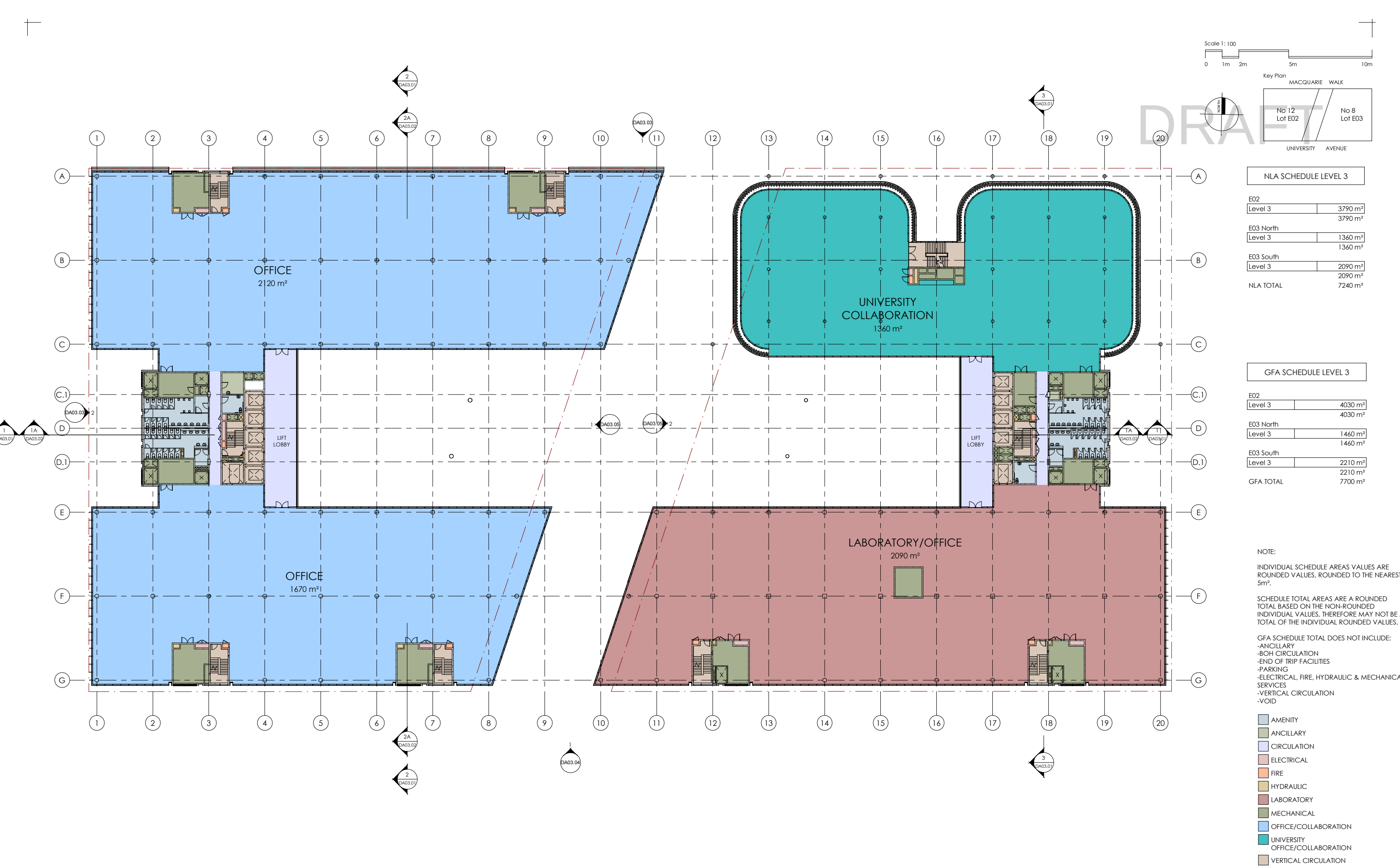
J

Project No.

6508

2/11/2018 10:24:40 AM: Plot Date





NLA SCHEDULE LEVEL 3

E02	
Level 3	3790 m²
	3790 m²
E03 North	
Level 3	1360 m²
	1360 m²
E03 South	
Level 3	2090 m²
	2090 m²
NLA TOTAL	7240 m²

GFA SCHEDULE LEVEL 3

E02	
Level 3	4030 m²
	4030 m²
E03 North	
Level 3	1460 m²
	1460 m²
E03 South	
Level 3	2210 m²
	2210 m²
GFA TOTAL	7700 m²

NOTE:

INDIVIDUAL SCHEDULE AREAS VALUES ARE ROUNDED VALUES, ROUNDED TO THE NEAREST 5m².

SCHEDULE TOTAL AREAS ARE A ROUNDED TOTAL BASED ON THE NON-ROUNDED INDIVIDUAL VALUES, THEREFORE MAY NOT BE TOTAL OF THE INDIVIDUAL ROUNDED VALUES.

GFA SCHEDULE TOTAL DOES NOT INCLUDE:

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- BOH CIRCULATION
- END OF TRIP FACILITIES
- PARKING
- ELECTRICAL, FIRE, HYDRAULIC & MECHANICAL SERVICES
- VERTICAL CIRCULATION
- VOID

- AMENITY
- ANCILLARY
- CIRCULATION
- ELECTRICAL
- FIRE
- HYDRAULIC
- LABORATORY
- MECHANICAL
- OFFICE/COLLABORATION
- UNIVERSITY OFFICE/COLLABORATION
- VERTICAL CIRCULATION

Rev.	Issued For SSD Approval	SJ	2.11.2018
	Revision Description	CHK.	Date

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Nominated Architect: Stephen Jamison NSW ARB Reg No 5108

Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
LEVEL 3 FLOOR PLAN

Drawing No.
KFS-812UA-AR-DWG-DA02.06.2

Scales 1 : 250 @ A1

Drawn Author

Checked Checker

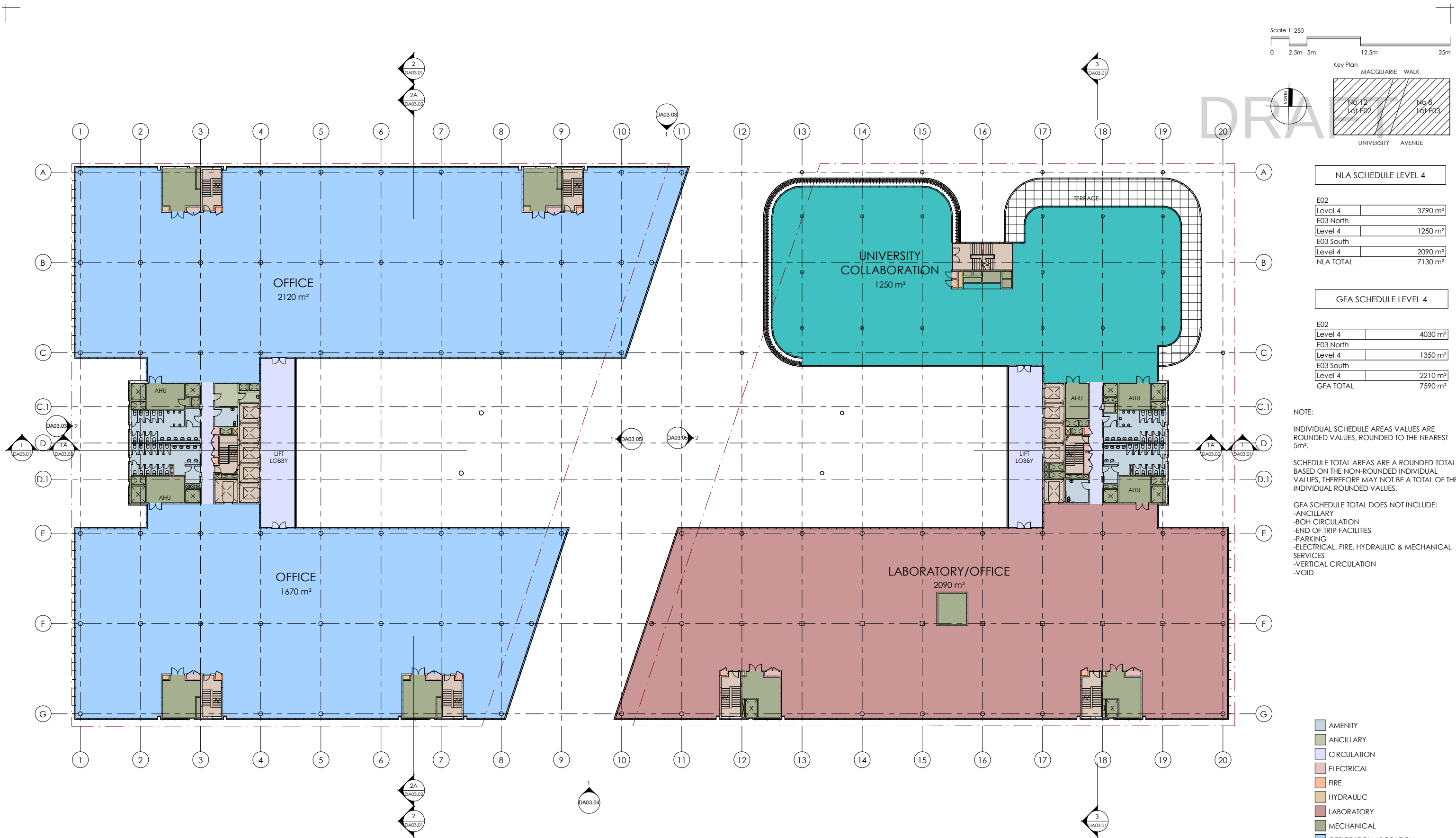
Revision

A

Project No.

6508

2/11/2018 10:25:01 AM: Plot Date



NLA SCHEDULE LEVEL 4

E02	
Level 4	3790 m²
E03 North	
Level 4	1250 m²
E03 South	
Level 4	2090 m²
NLA TOTAL	7130 m²

GFA SCHEDULE LEVEL 4

E02	
Level 4	4030 m²
E03 North	
Level 4	1350 m²
E03 South	
Level 4	2210 m²
GFA TOTAL	7590 m²

NOTE:

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- END OF TRIP FACILITIES
- PARKING
- ELECTRICAL, FIRE, HYDRAULIC & MECHANICAL SERVICES
- VERTICAL CIRCULATION
- VOID

- AMENITY
- ANCILLARY
- CIRCULATION
- ELECTRICAL
- FIRE
- HYDRAULIC
- LABORATORY
- MECHANICAL
- OFFICE/COLLABORATION
- UNIVERSITY OFFICE/COLLABORATION
- VERTICAL CIRCULATION

J	Issued For SSD Approval	SJ	2.11.2018
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H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	CHK.	Date

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Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
LEVEL 4 FLOOR PLAN

Drawing No.
KFS-812UA-AR-DWG-DA02.07

Scales 1 : 250 @ A1

Drawn

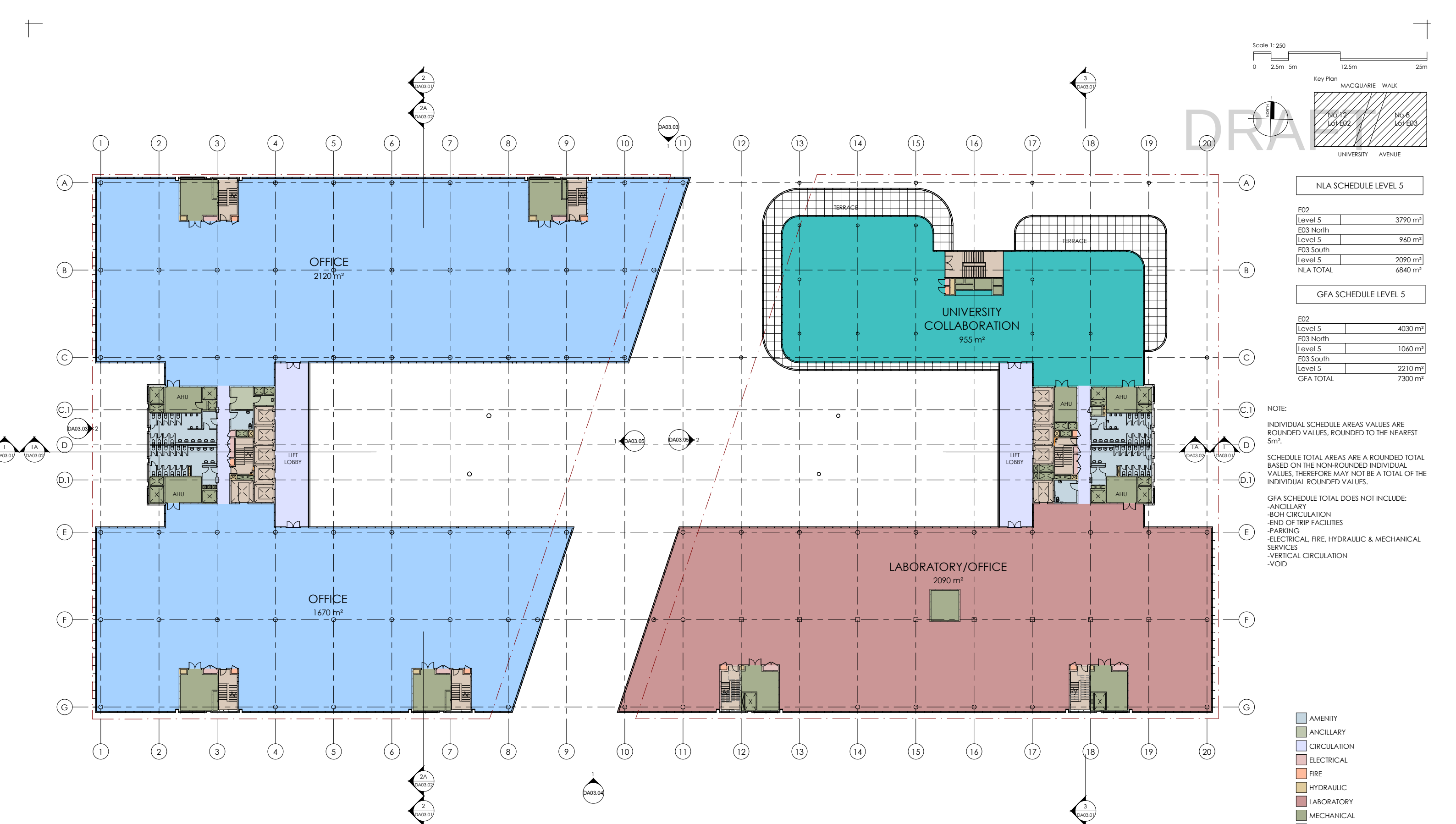
Checked

Revision

J

6508

2/11/2018 10:56:52 AM : Plot Date



NLA SCHEDULE LEVEL 5

E02	
Level 5	3790 m²
E03 North	
Level 5	960 m²
E03 South	
Level 5	2090 m²
NLA TOTAL	6840 m²

GFA SCHEDULE LEVEL 5

E02	
Level 5	4030 m²
E03 North	
Level 5	1060 m²
E03 South	
Level 5	2210 m²
GFA TOTAL	7300 m²

NOTE:

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- END OF TRIP FACILITIES
- PARKING
- ELECTRICAL, FIRE, HYDRAULIC & MECHANICAL SERVICES
- VERTICAL CIRCULATION
- VOID

J	Issued For SSD Approval	SJ	2.11.2018
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Rev.	Revision Description	CHK.	Date

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Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
LEVEL 5 FLOOR PLAN

Drawing No.
KFS-812UA-AR-DWG-DA02.08

Scales 1 : 250 @ A1

Drawn

Checked

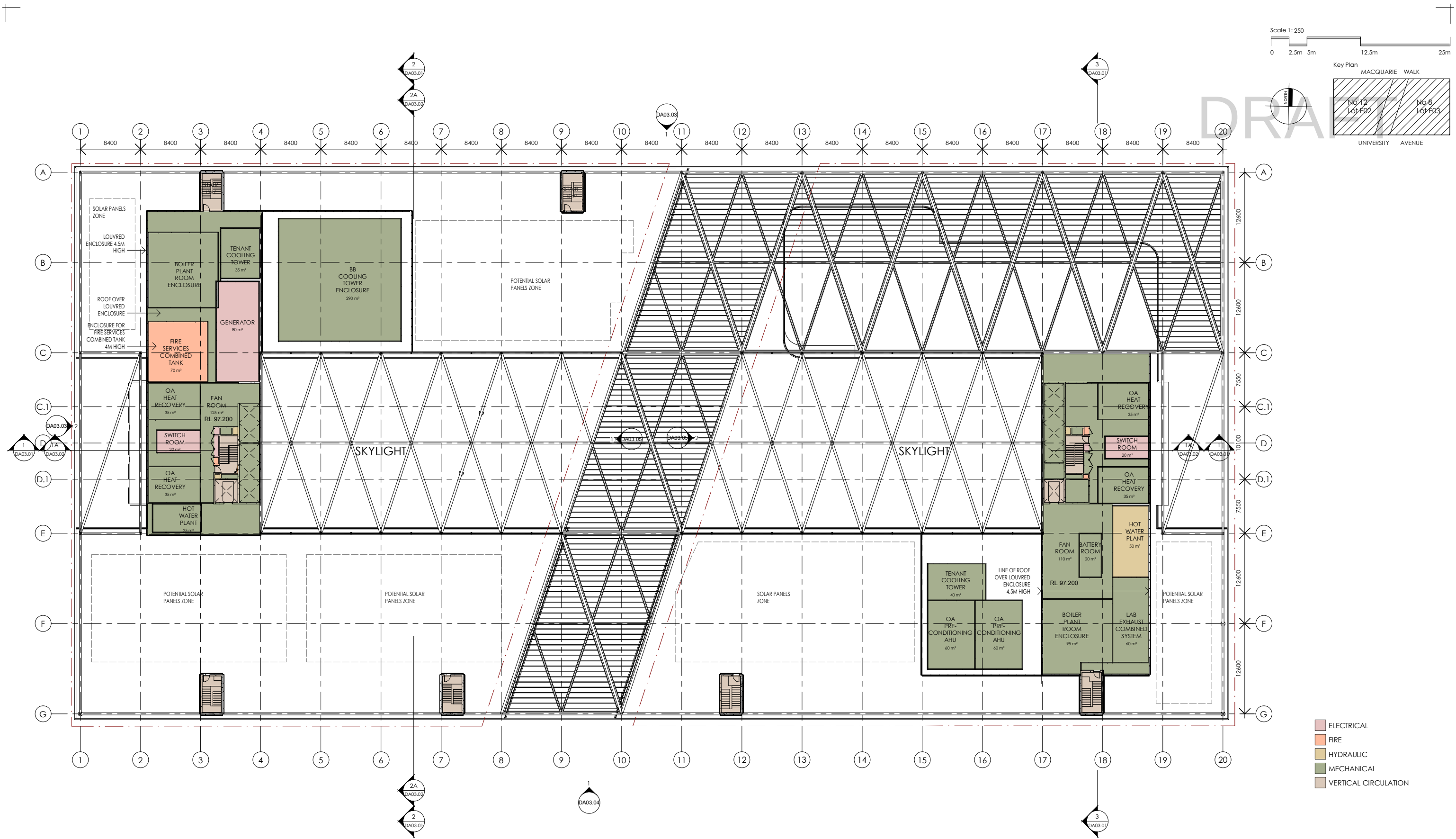
Revision

J

Project No.

6508

2/11/2018 10:25:22 AM - Plot Date



J	Issued For SSD Approval	SJ	2.11.2018
I	Issue for approval	SJ	31.01.2018
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Nominated Architect: Stephen Jamison NSW ARB Reg No 5108

Consultant

Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing

LEVEL 7 / PLANT ROOM FLOOR PLAN

Drawing No.

KFS-812UA-AR-DWG-DA02.10

Scales 1 : 250 @ A1

Drawn: SG

Checked:

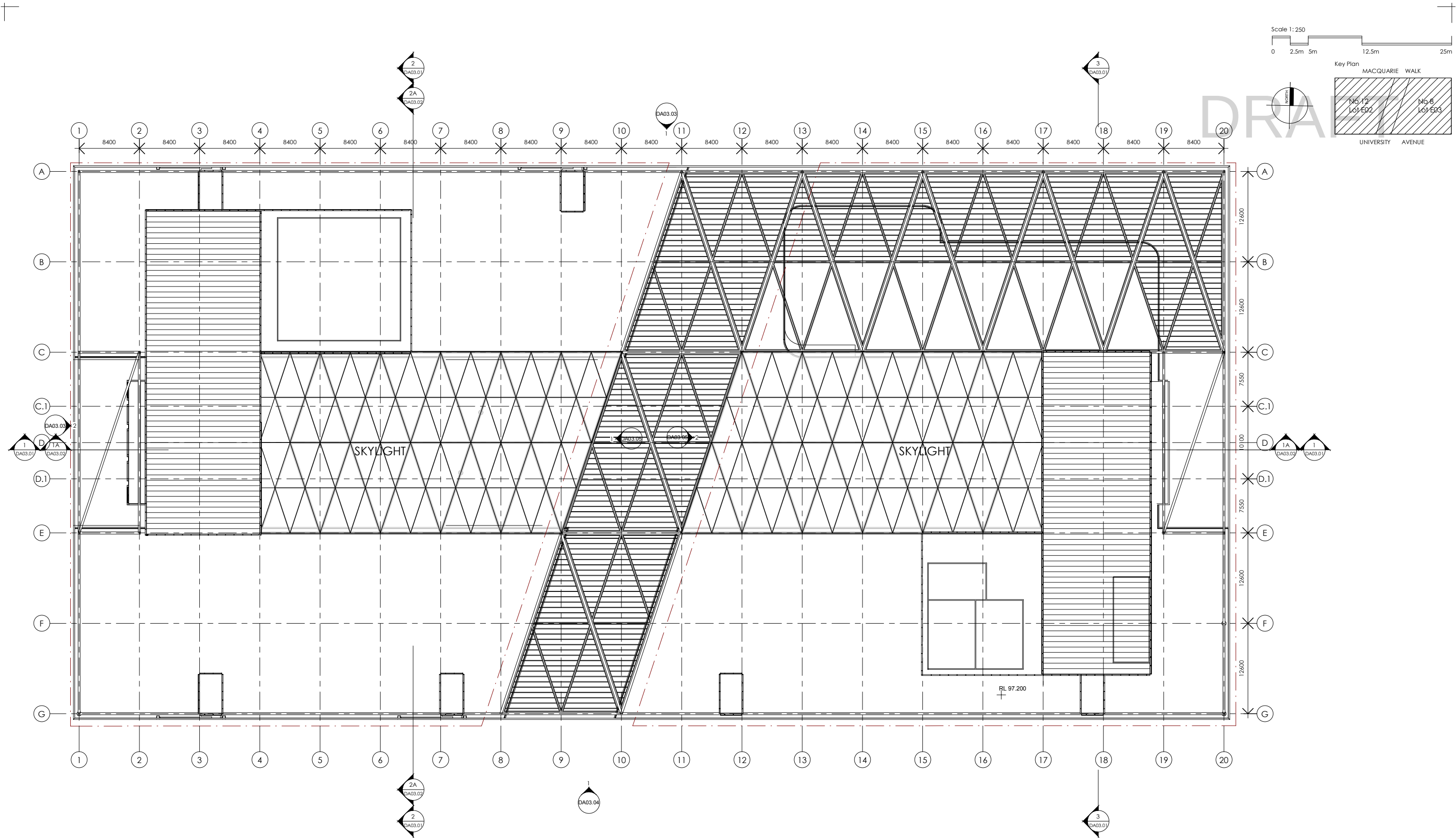
Revision

J

Project No.

6508

2/11/2018 10:25:40 AM - Plot Date



J	Issued For SSD Approval	SJ	2.11.2018
I	Issue for approval	SJ	31.01.2018
H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	Chk.	Date

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Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing No.
LEVEL 8 / ROOF PLAN

Drawing No.
KFS-812UA-AR-DWG-DA02.11

Scales 1 : 250 @ A1

Drawn

Checked

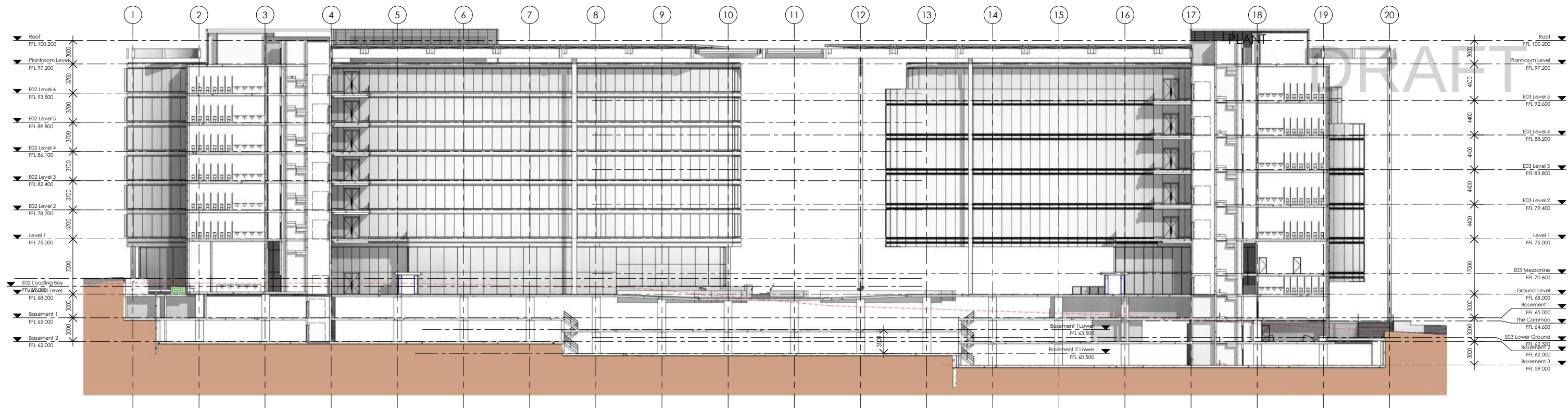
Revision

J

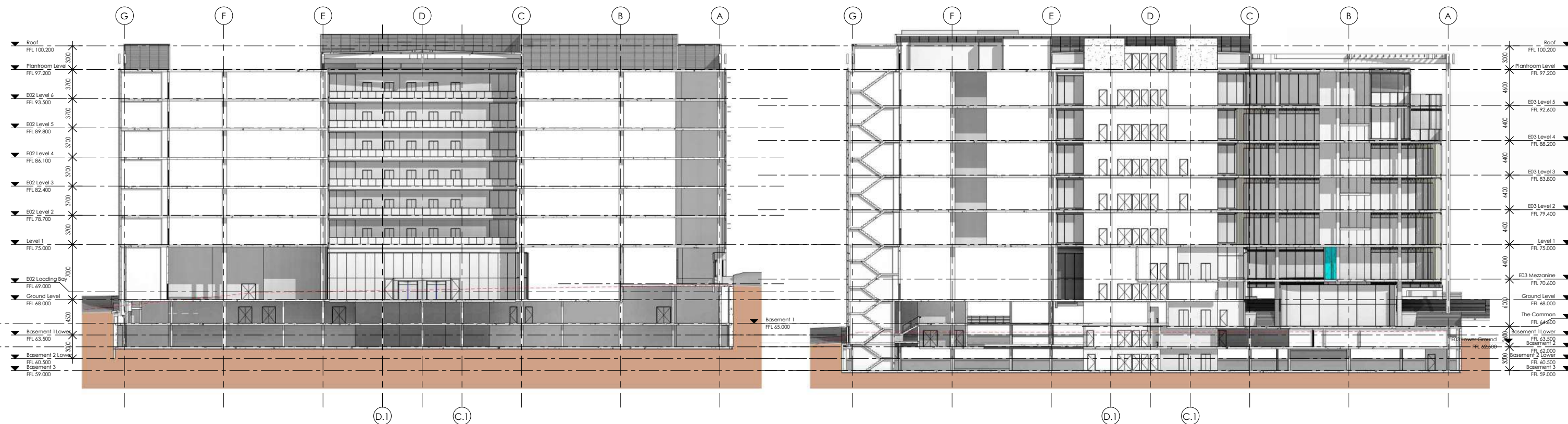
Project No.

6508

2/11/2018 10:56:59 AM - Plot Date



1 EAST WEST SECTION



2 NORTH SOUTH SECTION E02

3 NORTH SOUTH SECTION E03

J	Issued For SSD Approval	SJ	2.11.2018
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Client



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Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
SECTIONS

Drawing No.
KFS-812UA-AR-DWG-DA03.01

Scales 1:250 @ A1

Drawn SG

Checked

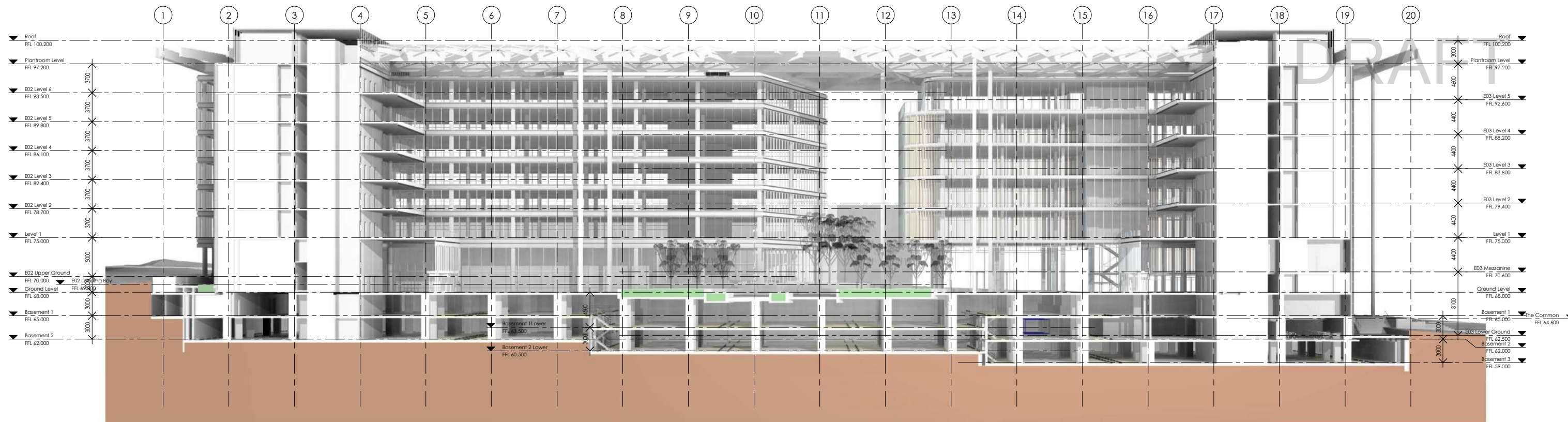
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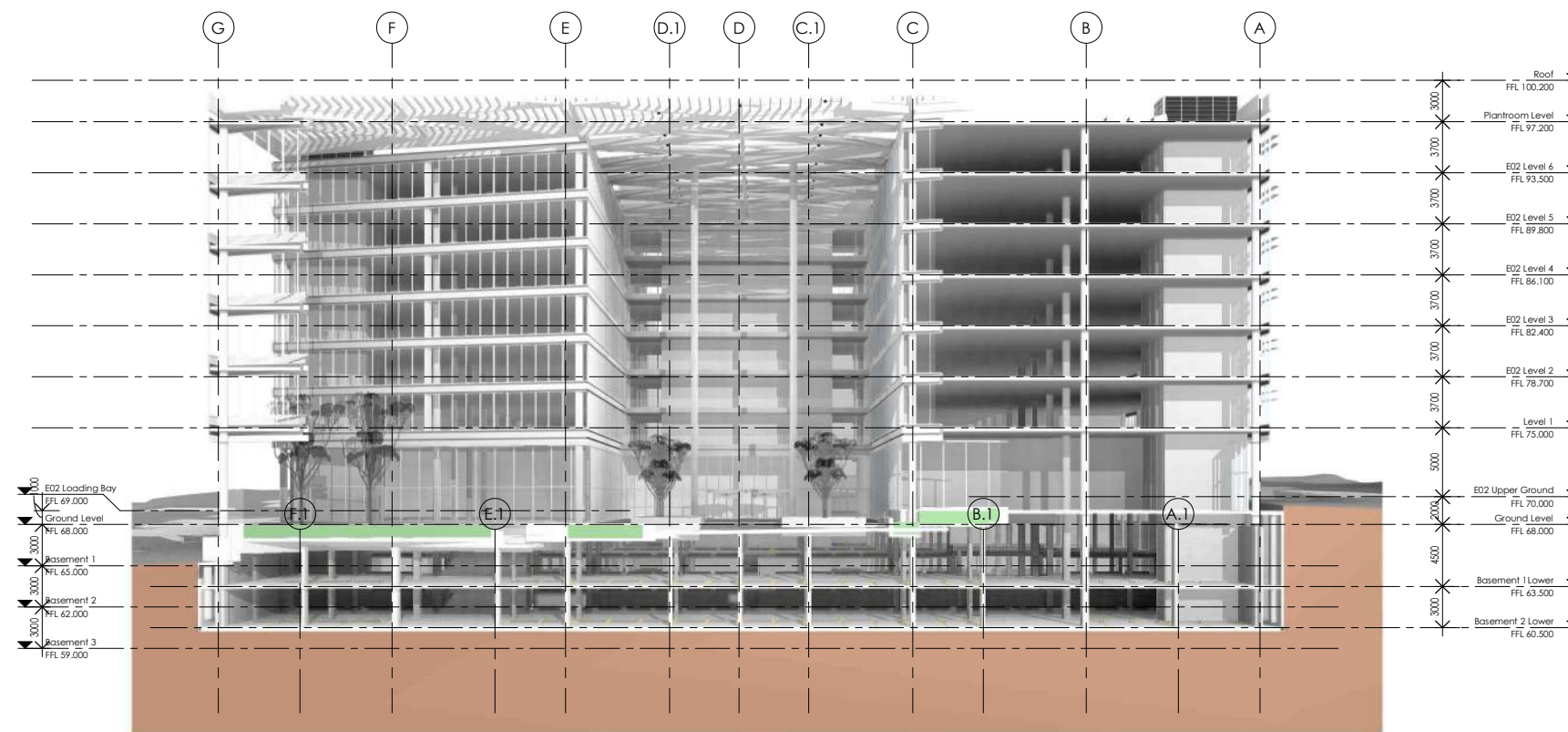
Project No.

6508

2/11/2018 10:27:13 AM - Plot Date



1 EAST WEST PERSPECTIVE SECTION



2 NORTH SOUTH PERSPECTIVE SECTION

J	Issued For SSD Approval	SJ	2.11.2018
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Client



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8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
PERSPECTIVE SECTIONS

Drawing No.
KFS-812UA-AR-DWG-DA03.02

Scales 1: 250 @ A1

Drawn

Checked

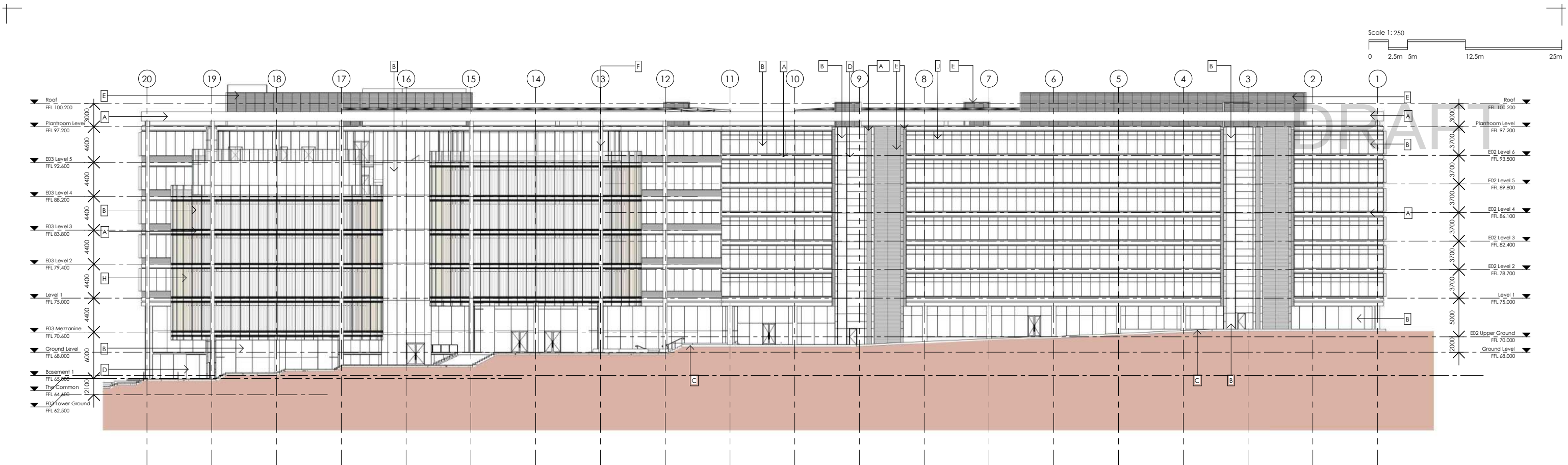
Revision

J

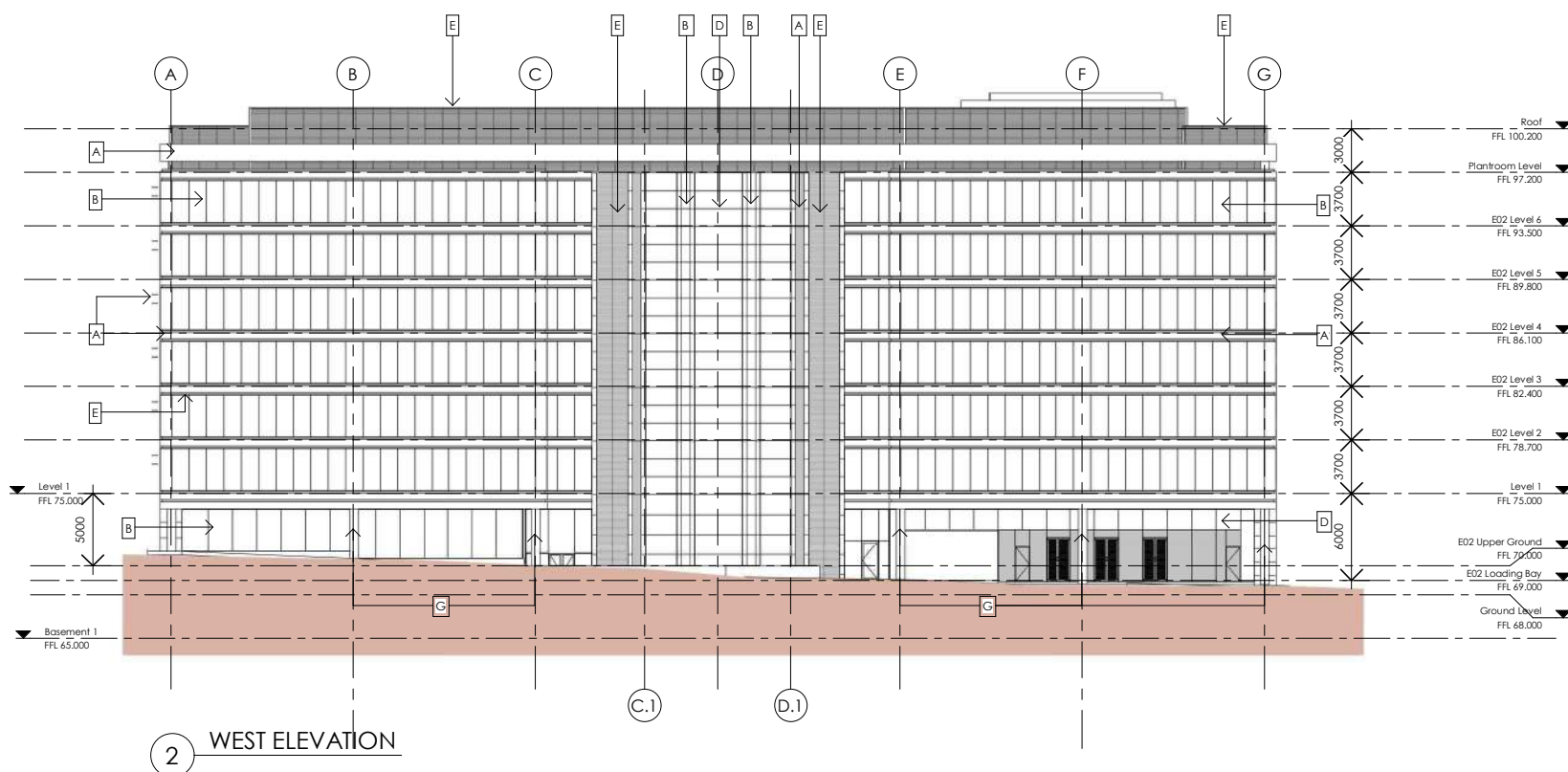
Project No.

6508

2/11/2018 10:28:55 AM - Plot Date



1 NORTH ELEVATION



2 WEST ELEVATION

LEGEND

- A PRE-FINISHED COMPOSITE ALUMINIUM PANEL
- B PRE-FINISHED ALUMINIUM FRAMED GLASS CURTAIN WALL
- C SELECTED CONCRETE/STONE PAVING
- D PRE-FINISHED FIBRE CEMENT CLADDING
- E PRE-FINISHED ALUMINIUM LOUVRE / SPANDREL PANEL
- F PAINTED STEEL BEAM / COLUMN
- G OFF FORM CONCRETE COLUMN
- H DOUBLE SKIN GLASS FACADE WITH INTEGRAL SUN SHADE LOUVRES
- J PRE-FINISHED ALUMINIUM HORIZONTAL SUNSHADES

J	Issued For SSD Approval	SJ	2.11.2018
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8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing

NORTH AND WEST ELEVATIONS

Drawing No.
KFS-812UA-AR-DWG-DA03.03

Scales 1 : 250 @ A1

Drawn

Checked

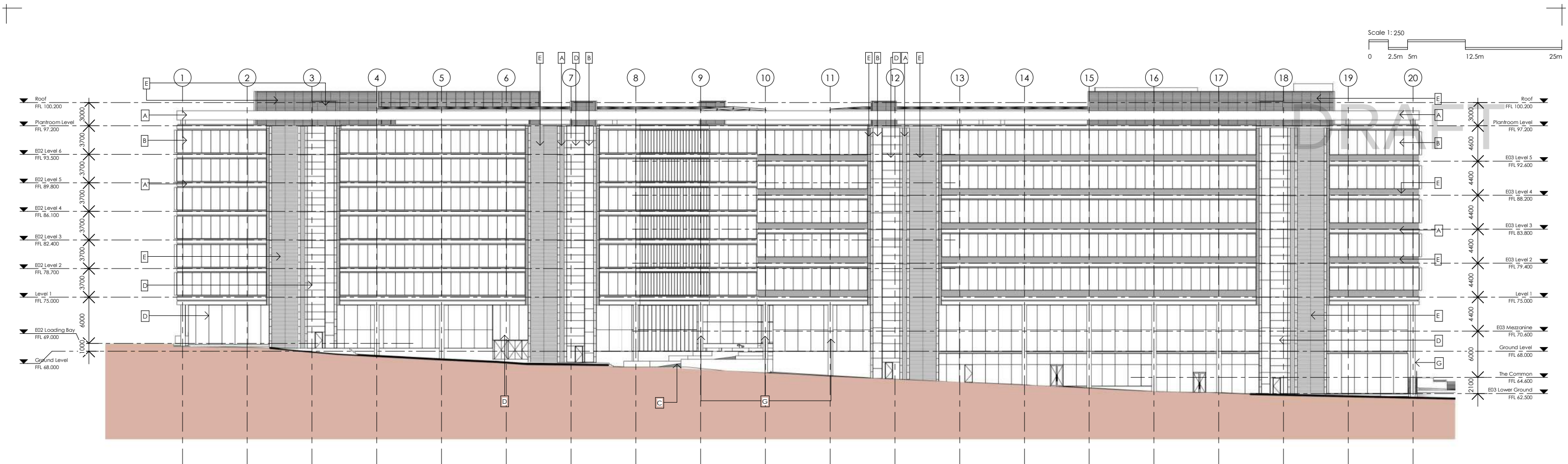
Revision

J

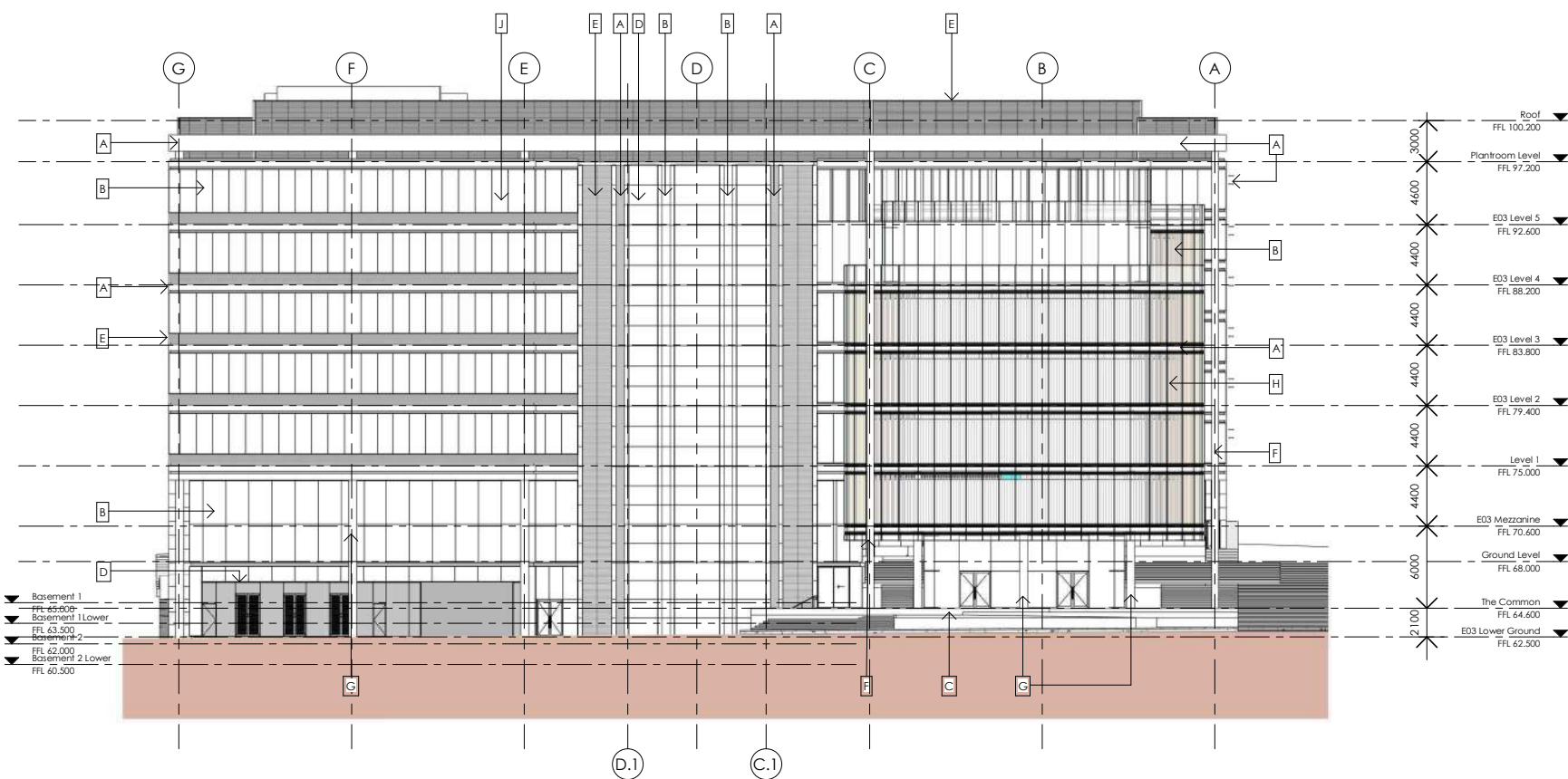
Project No.

6508

2/11/2018 10:30:25 AM - Plot Date



1 SOUTH ELEVATION



2 EAST ELEVATION

LEGEND

- A PRE-FINISHED COMPOSITE ALUMINIUM PANEL
- B PRE-FINISHED ALUMINIUM FRAMED GLASS CURTAIN WALL
- C SELECTED CONCRETE/STONE PAVING
- D PRE-FINISHED FIBRE CEMENT CLADDING
- E PRE-FINISHED ALUMINIUM LOUVRE / SPANDREL PANEL
- F PAINTED STEEL BEAM / COLUMN
- G OFF FORM CONCRETE COLUMN
- H DOUBLE SKIN GLASS FACADE WITH INTEGRAL SUN SHADE LOUVRES
- J PRE-FINISHED ALUMINIUM HORIZONTAL SUNSHADES

J	Issued For SSD Approval	SJ	2.11.2018
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8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing

SOUTH AND EAST ELEVATIONS

Drawing No.

KFS-812UA-AR-DWG-DA03.04

Scales 1 : 250 @ A1

Drawn

Checked

Revision

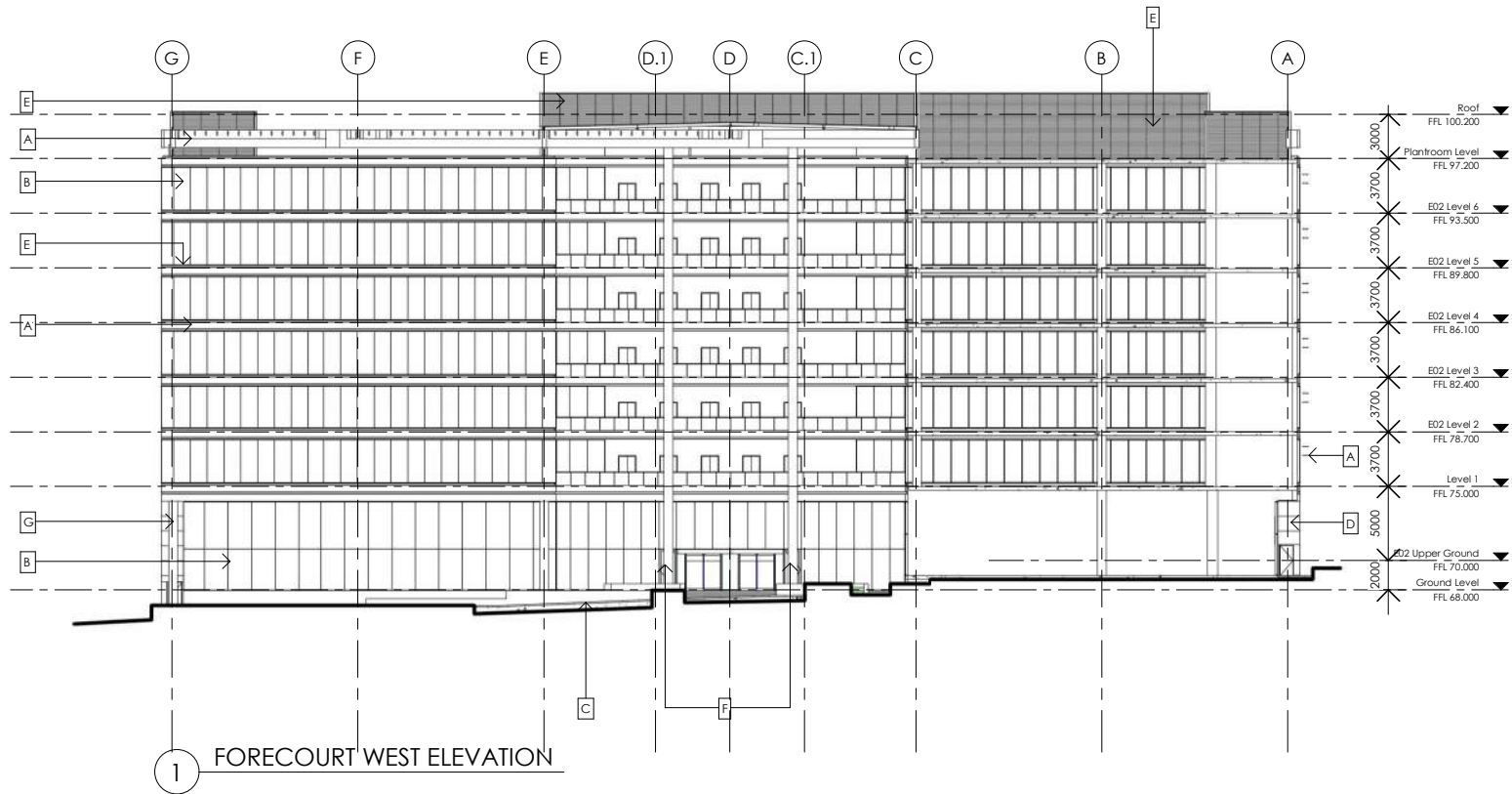
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Project No.

6508

2/11/2018 10:31:53 AM: Plot Date

DRAFT



LEGEND

- A PRE-FINISHED COMPOSITE ALUMINIUM PANEL
- B PRE-FINISHED ALUMINIUM FRAMED GLASS CURTAIN WALL
- C SELECTED CONCRETE/STONE PAVING
- D PRE-FINISHED FIBRE CEMENT CLADDING
- E PRE-FINISHED ALUMINIUM LOUVRE / SPANDREL PANEL
- F PAINTED STEEL BEAM / COLUMN
- G OFF FORM CONCRETE COLUMN
- H DOUBLE SKIN GLASS FACADE WITH INTEGRAL SUN SHADE LOUVRES
- J PRE-FINISHED ALUMINIUM HORIZONTAL SUNSHADES

J	Issued For SSD Approval	SJ	2.11.2018
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Rev.	Revision Description	CHK.	Date

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Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing

EAST AND WEST FORECOURT ELEVATIONS

Drawing No.

KFS-812UA-AR-DWG-DA03.05

Scales 1 : 250 @ A1

Drawn

Checked

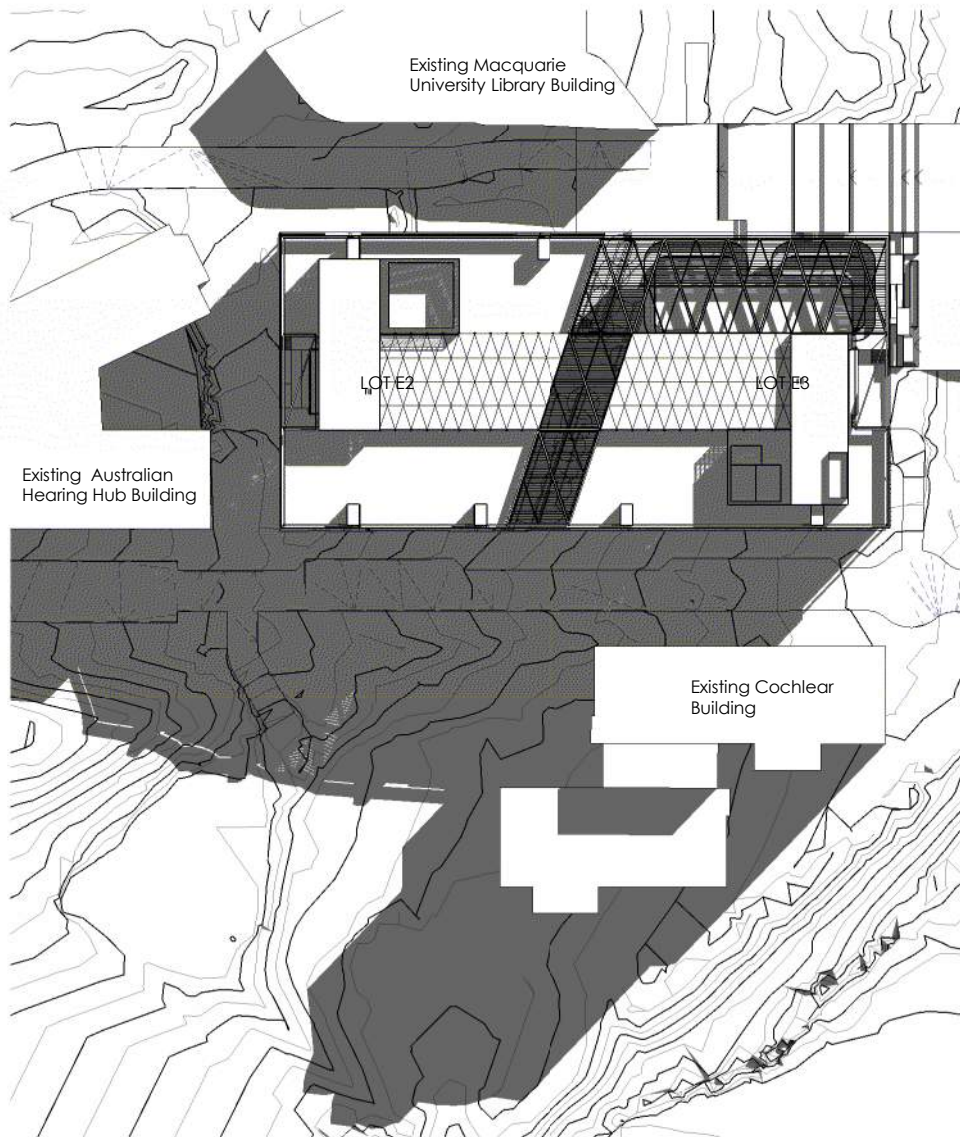
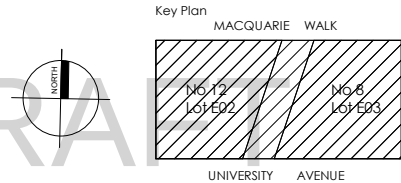
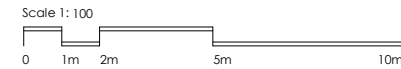
Revision

J

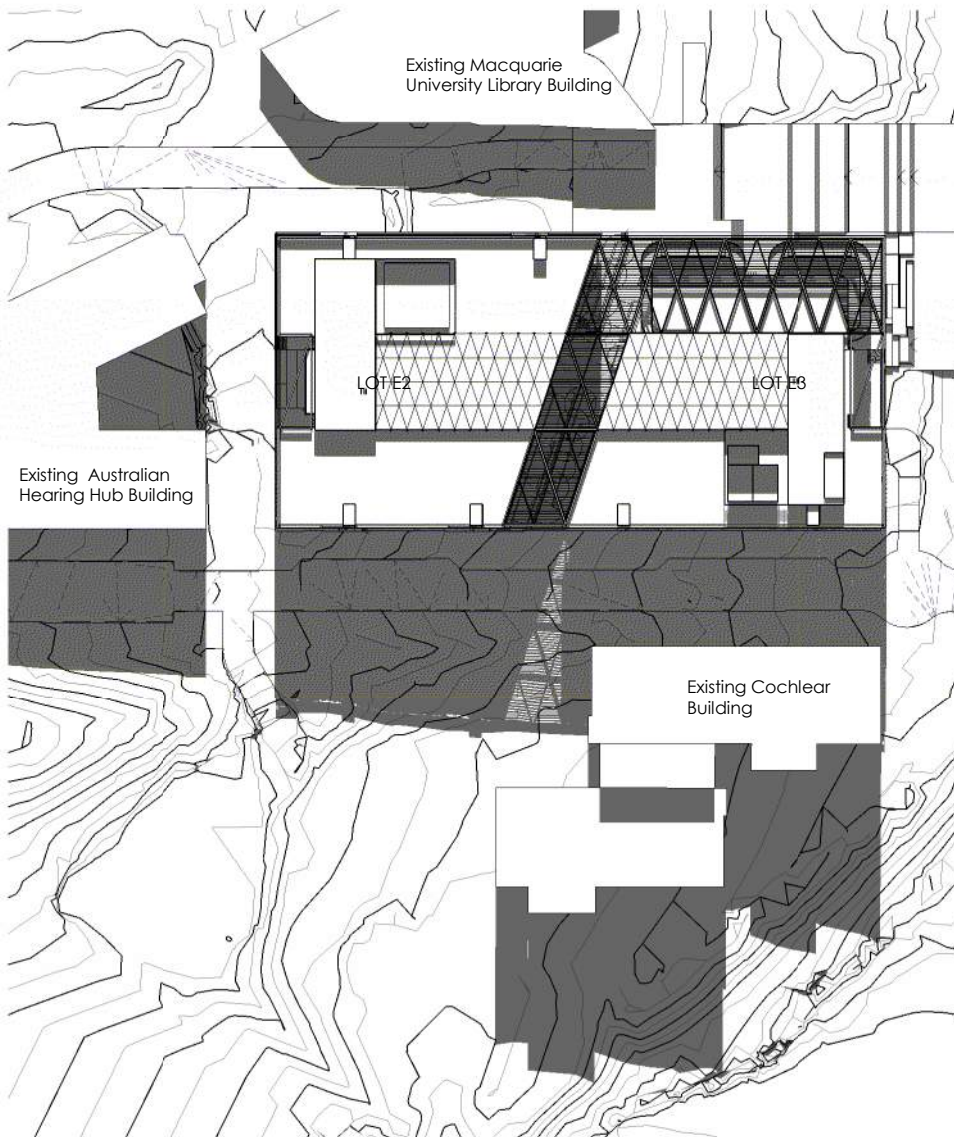
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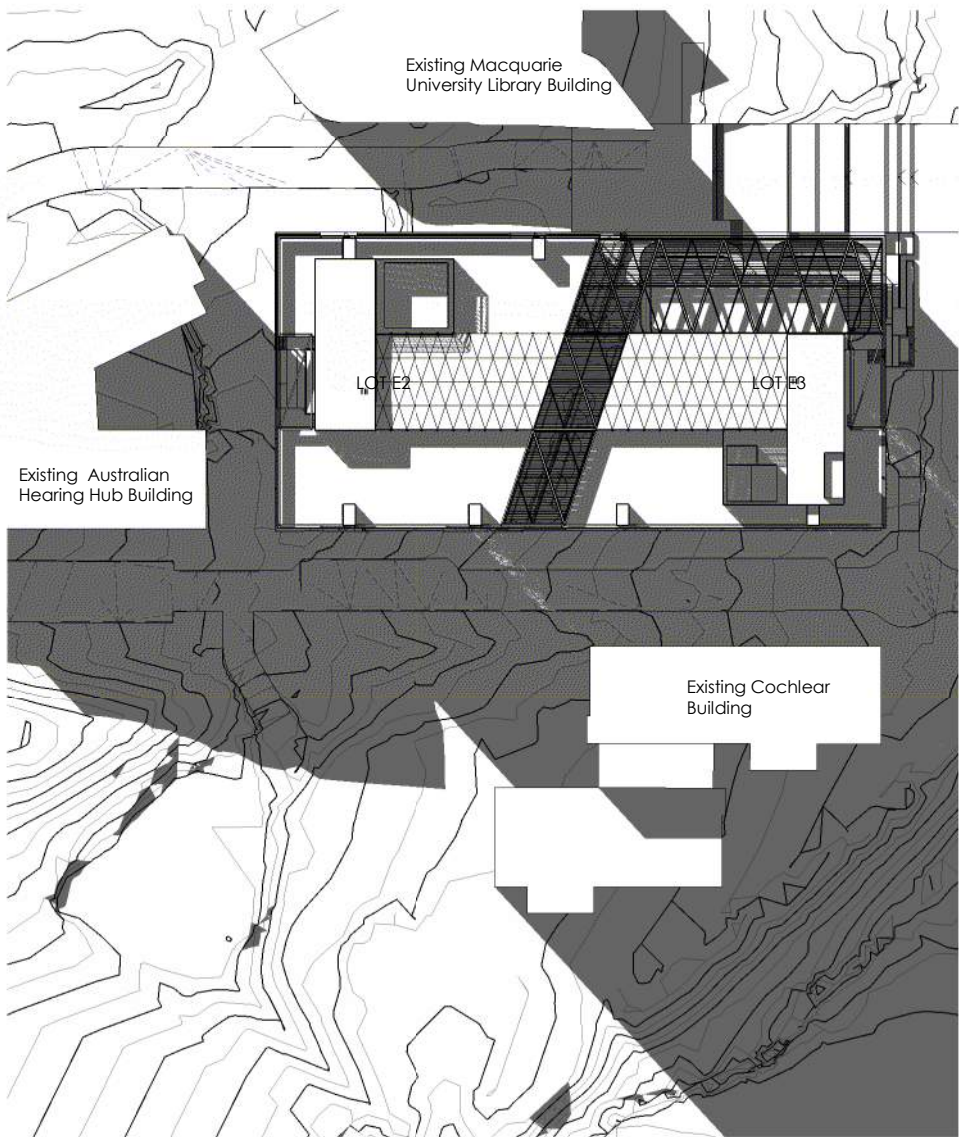
2/11/2018 10:32:31 AM - Plot Date



SHADOW 9AM WINTER SOLSTICE



SHADOW 12PM WINTER SOLSTICE



SHADOW 3PM WINTER SOLSTICE

H	Issued For SSD Approval	SJ	2.11.2018
G	Issue for approval	SJ	31.01.2018
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E	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	Chk.	Date

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Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
SHADOW STUDY DIAGRAMS WINTER SOLSTICE

Drawing No.
KFS-812UA-AR-DWG-DA04.01

Scales 1 : 1000 @ A1

Drawn

Checked

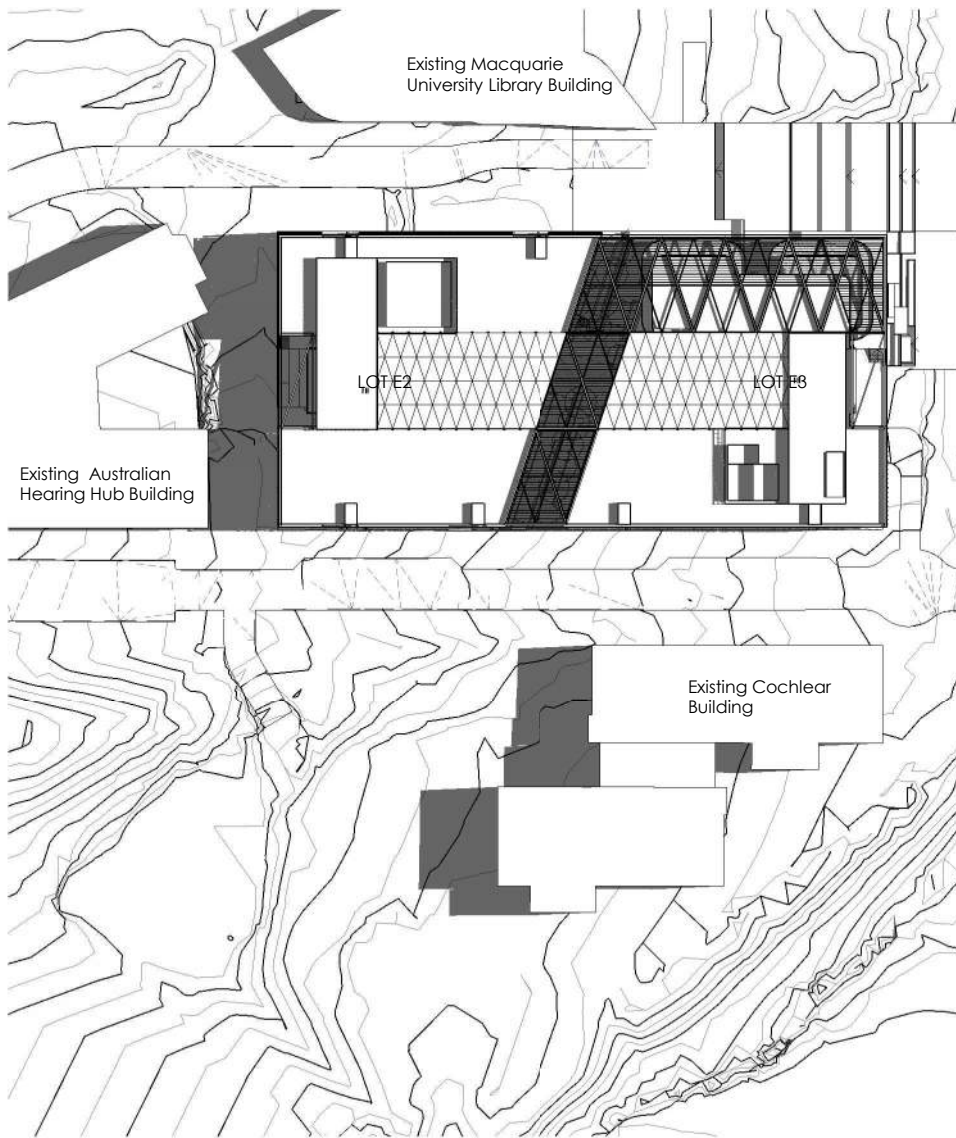
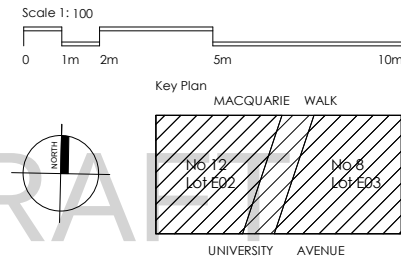
Revision

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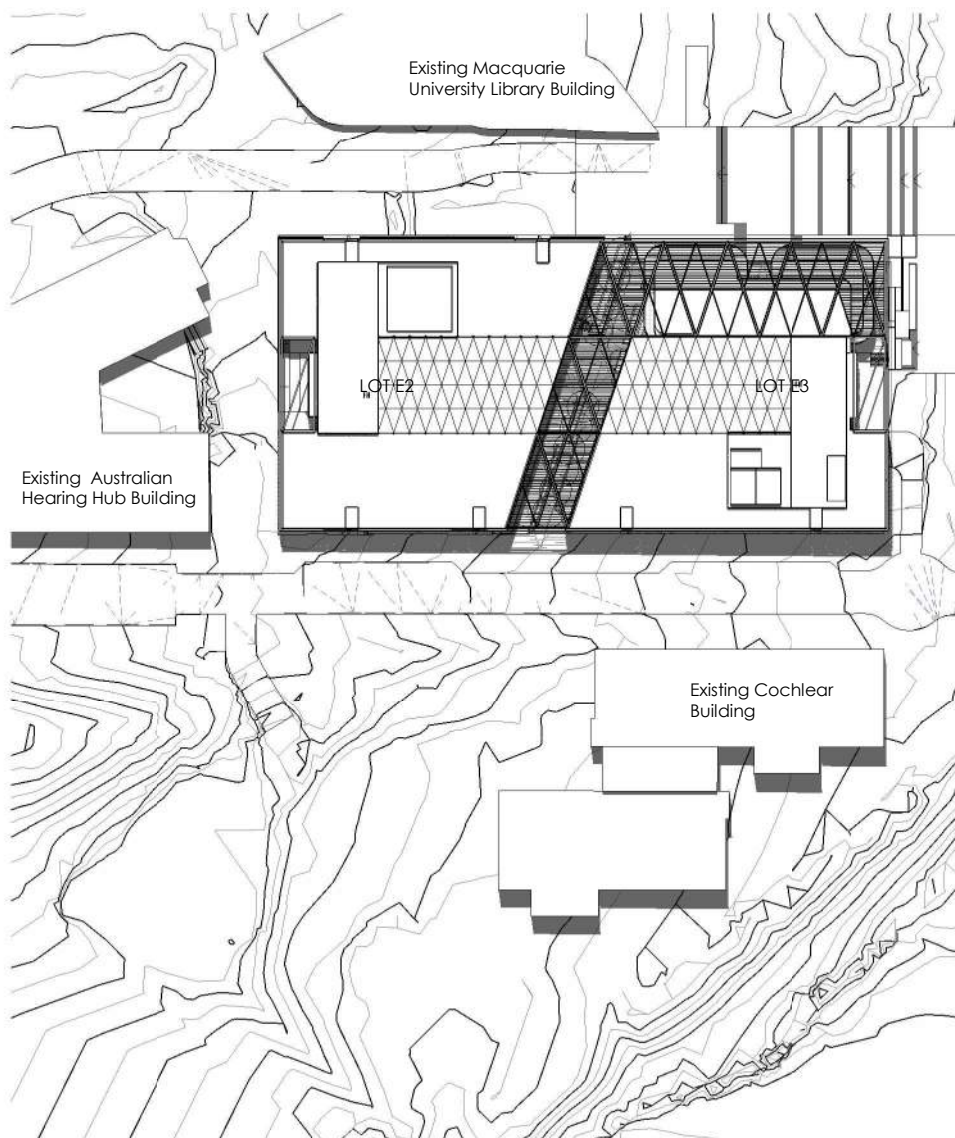
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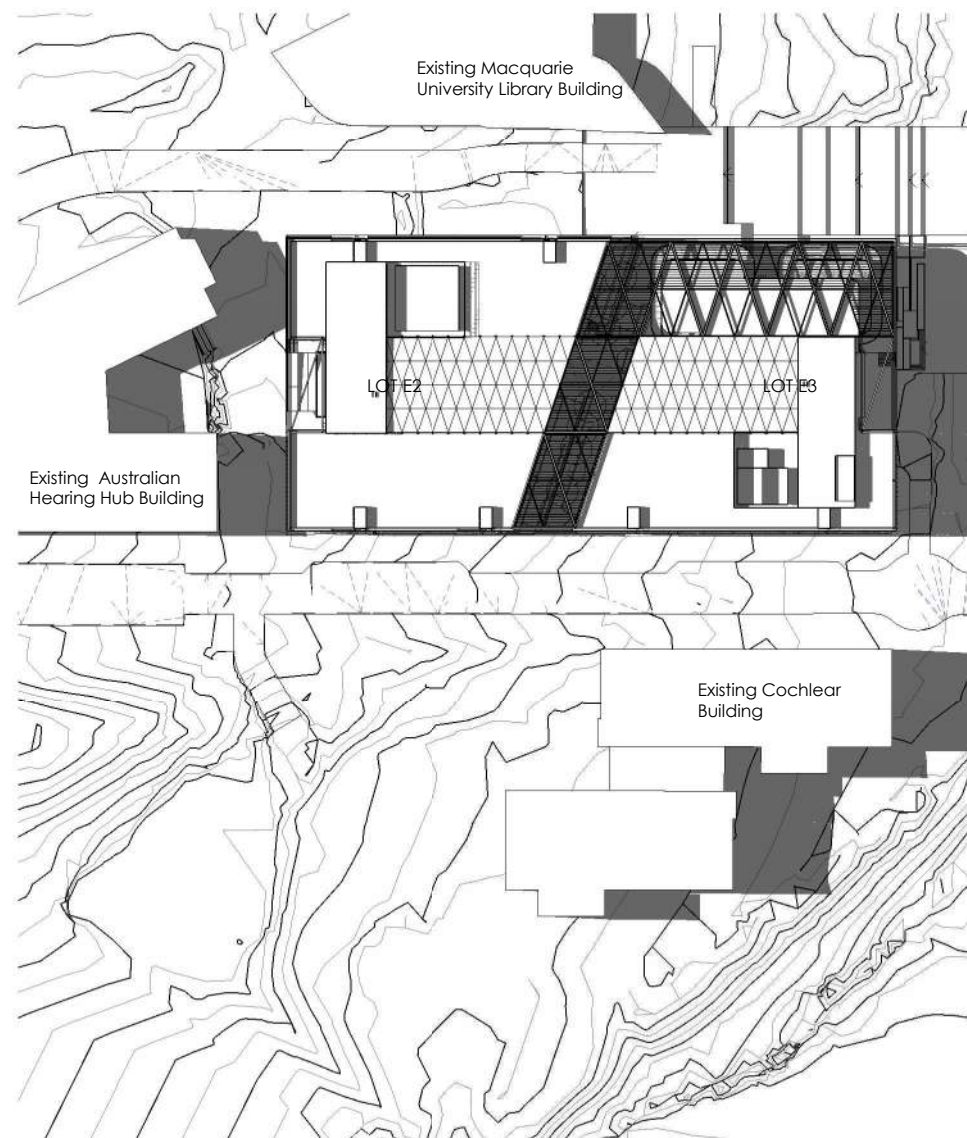
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SHADOW 9AM SUMMER SOLSTICE



SHADOW 12PM SUMMER SOLSTICE



SHADOW 3PM SUMMER SOLSTICE

H	Issued For SSD Approval	SJ	2.11.2018
G	Issue for approval	SJ	31.01.2018
F	Issue For Approval	SJ	22.11.2017
E	Issue For Approval	SJ	21.11.2017
Rev.	Revision Description	CHK.	Date

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Nominated Architect: Stephen Jamison NSW ARB Reg No 5108

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8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
SHADOW STUDY DIAGRAMS SUMMER SOLSTICE

Drawing No.
KFS-812UA-AR-DWG-DA04.02

Scales 1 : 1000 @ A1

Drawn SG

Checked

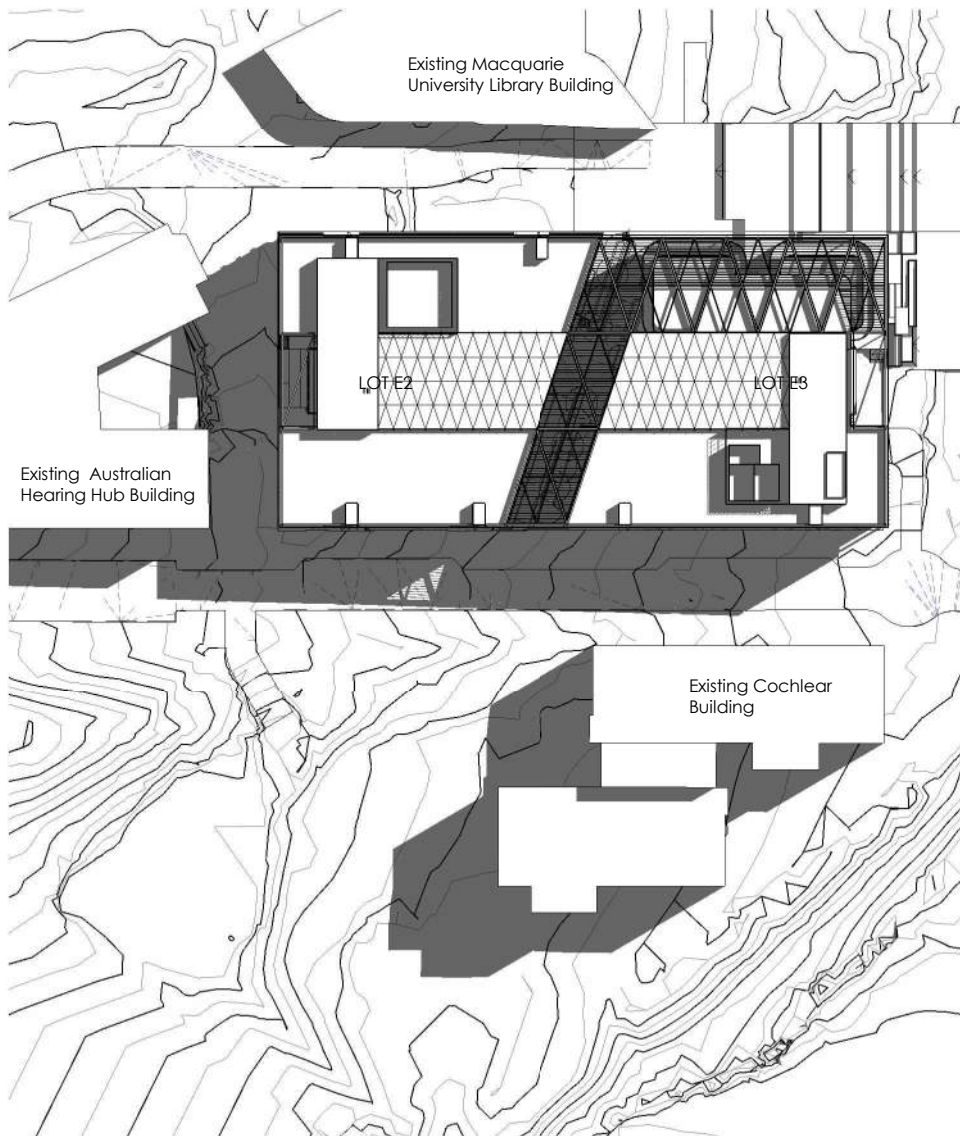
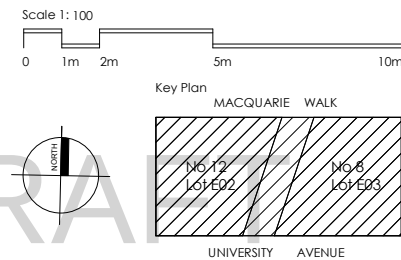
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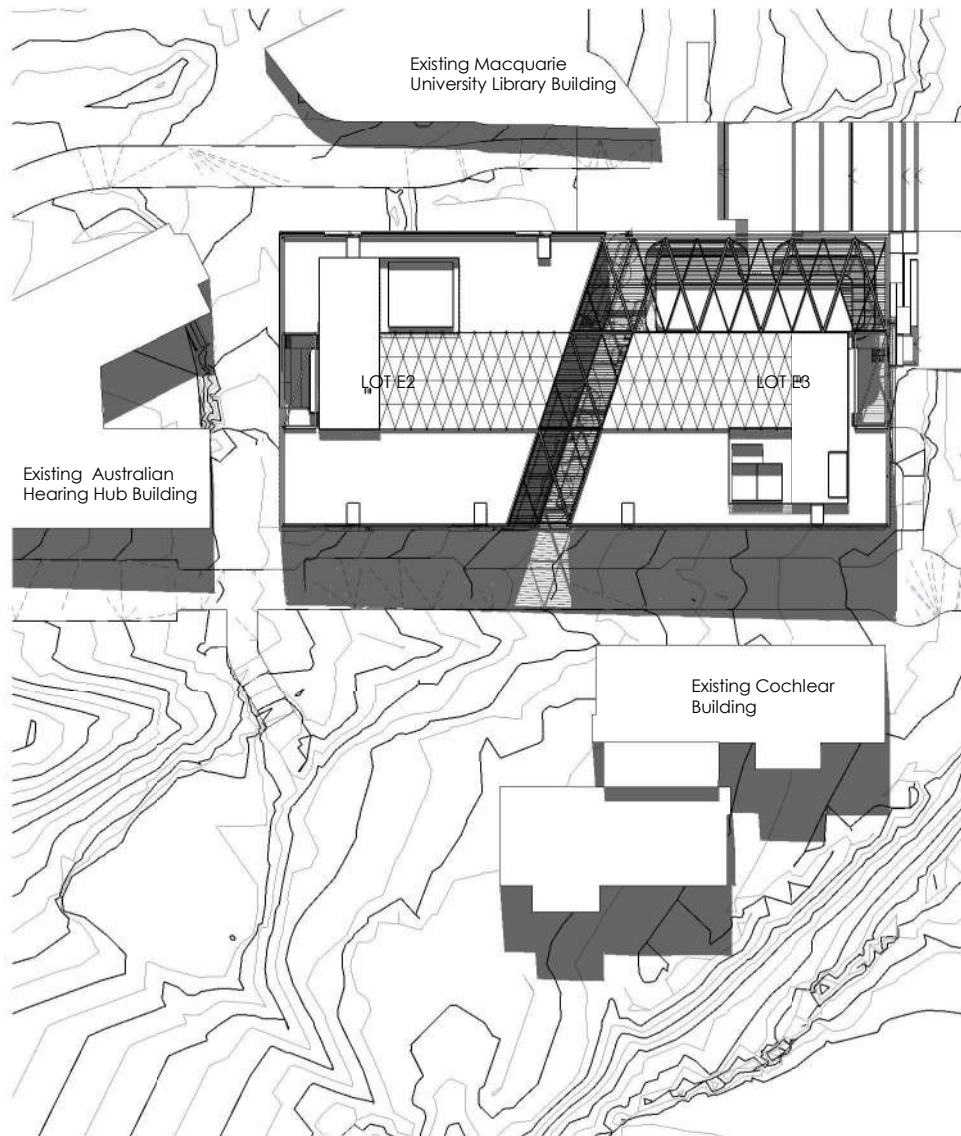
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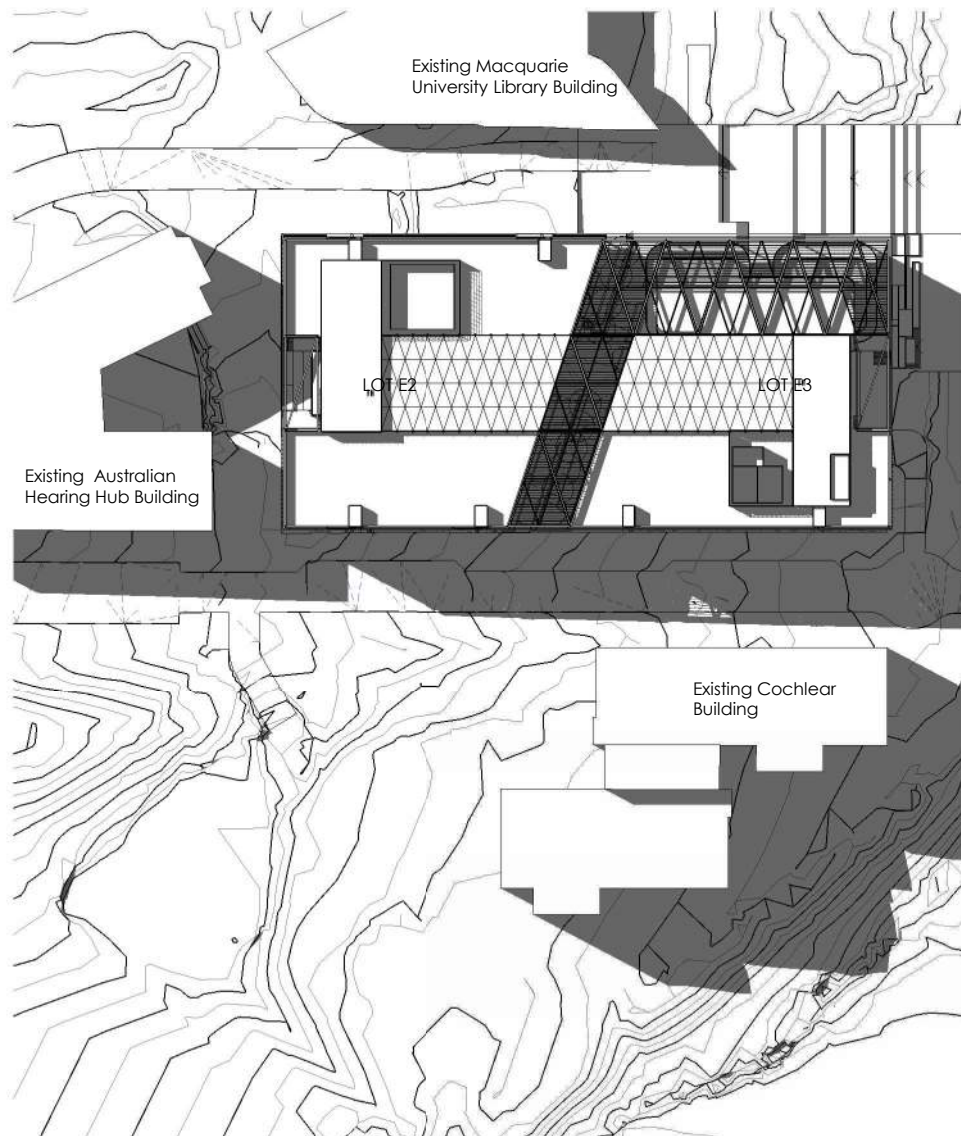
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SHADOW 9AM SPRING/AUTUMN EQUINOX



SHADOW 12PM SPRING/AUTUMN EQUINOX



SHADOW 3PM SPRING/AUTUMN EQUINOX

H	Issued For SSD Approval	SJ	2.11.2018
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Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing
SHADOW STUDY DIAGRAMS SPRING/AUTUMN
EQUINOX

Drawing No.
KFS-812UA-AR-DWG-DA04.03

Scales 1 : 1000 @ A1

Drawn

Checked

Revision

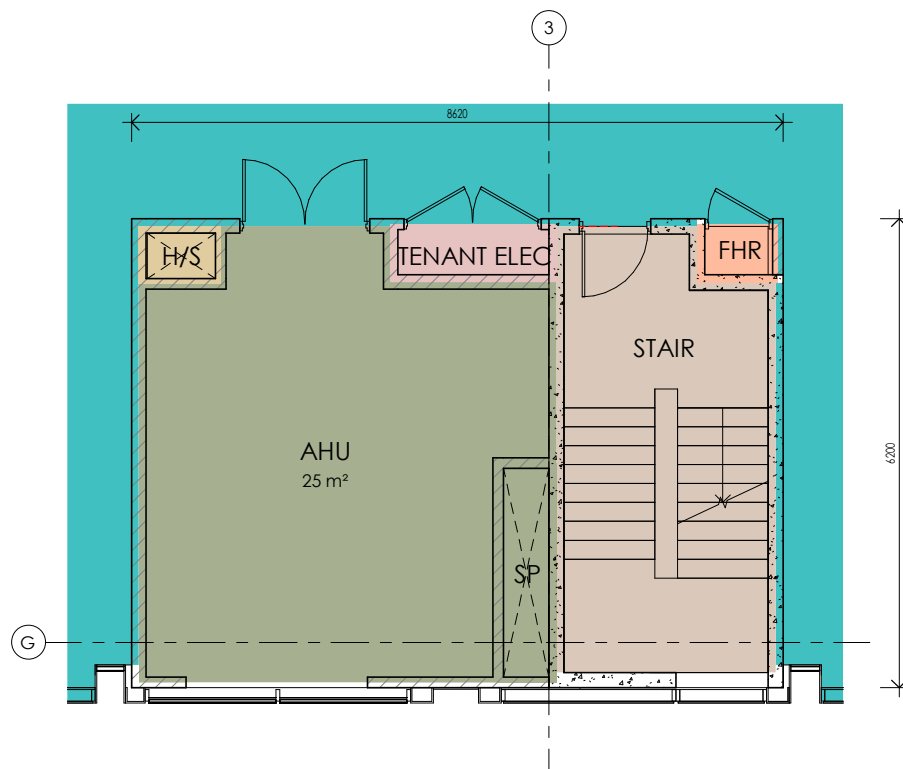
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Project No.

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2/11/2018 10:37:38 AM - Plot Date

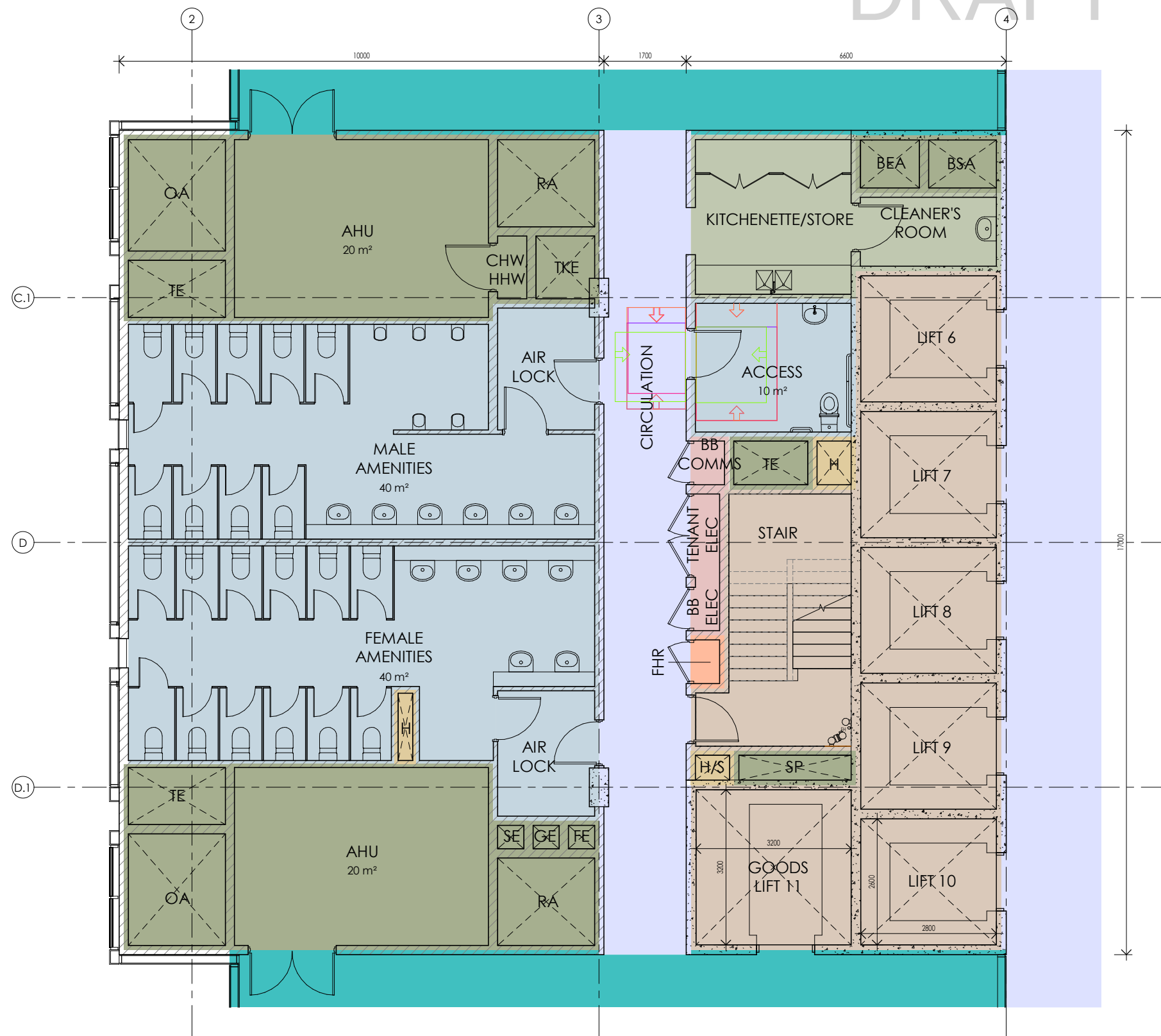
DRAFT



1 TYPICAL STAIR POD BUILDING 12

ABBREVIATIONS

AHU	AIR HANDLING UNIT
BB	BASE BUILDING
BEA	BASEMENT EXHAUST AIR
BSA	BASEMENT SUPPLY AIR
CHW, HHW	CHILLED/HOT WATER RISER
COMMS	COMMUNICATIONS CUPBOARD
ELEC	ELECTRICAL CUPBOARD
FE	FIRE PUMP EXHAUST
FHR	FIRE HOSE REEL
GE	GARBAGE ROOM EXHAUST
H	HYDRAULIC RISER
H/S	SYPHONIC DUCT/HYDRAULIC RISER
MDF	MAIN DISTRIBUTION FRAME
OA	OUTSIDE AIR RISER
RA	RELIEF AIR RISER
SE	STORE ROOM EXHAUST
SP	STAIR PRESSURISATION RISER
TE	TOILET EXHAUST RISER
TKE	TENANT KITCHEN EXHAUST RISER
TOA	TENANT OUTSIDE RISER



2 TYPICAL LIFT CORE BUILDING 12

J	Issued For SSD Approval	SJ	2.11.2018
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H	Issue For Approval	SJ	22.11.2017
G	Issue For Approval	SJ	21.11.2017
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Nominated Architect: Stephen Jamison NSW ARB Reg No 5108

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Project

8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing

STAIR & LIFT CORE (BUILDING 12) PLANS

Drawing No.

KFS-812UA-AR-DWG-DA11.12

Scales 1:50 @ A1

Drawn

Checked

Revision

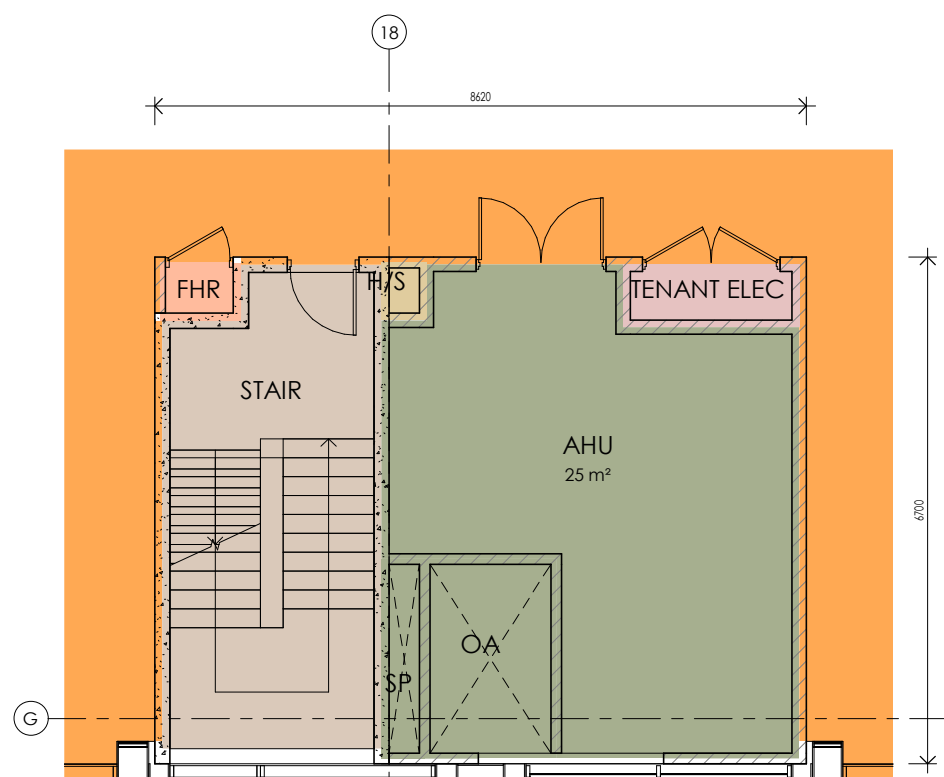
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Project No.

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2/11/2018 10:37:42 AM: Plot Date

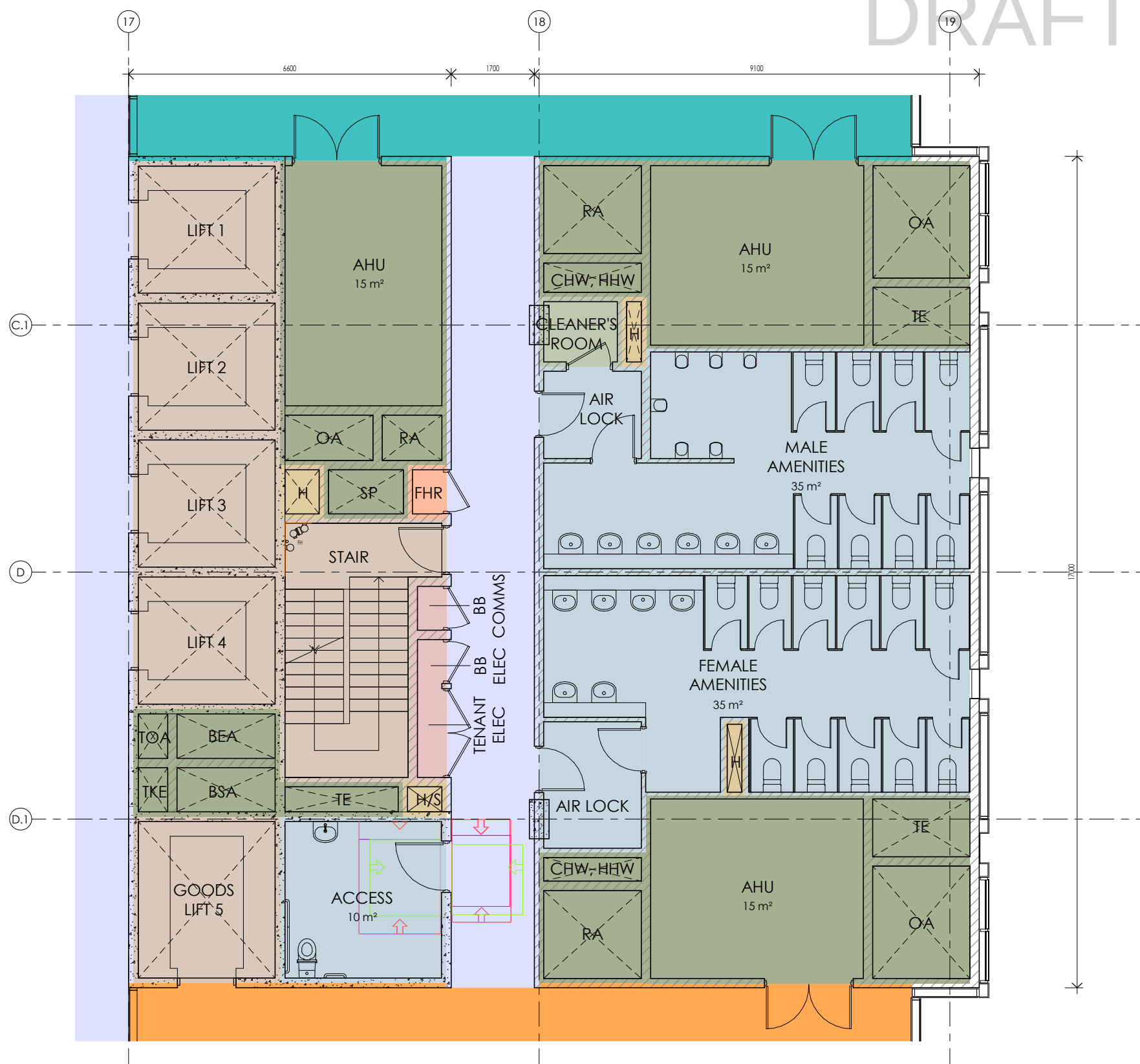
DRAFT



1 TYPICAL STAIR POD BUILDING 8

ABBREVIATIONS

AHU	AIR HANDLING UNIT
BB	BASE BUILDING
BEA	BASEMENT EXHAUST AIR
BSA	BASEMENT SUPPLY AIR
CHW, HHW	CHILLED/HOT WATER RISER
COMMS	COMMUNICATIONS CUPBOARD
ELEC	ELECTRICAL CUPBOARD
FE	FIRE PUMP EXHAUST
FHR	FIRE HOSE REEL
GE	GARBAGE ROOM EXHAUST
H	HYDRAULIC RISER
H/S	SYPHONIC DUCT/HYDRAULIC RISER
MDF	MAIN DISTRIBUTION FRAME
OA	OUTSIDE AIR RISER
RA	RELIEF AIR RISER
SE	STORE ROOM EXHAUST
SP	STAIR PRESSURISATION RISER
TE	TOILET EXHAUST RISER
TKE	TENANT KITCHEN EXHAUST RISER
TOA	TENANT OUTSIDE RISER



3 TYPICAL LIFT CORE BUILDING 8

G	Issued For SSD Approval	SJ	2.11.2018
F	Issue for approval	SJ	31.01.2018
E	Issue For Approval	SJ	22.11.2017
D	Issue For Approval	SJ	21.11.2017
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8 - 12 UNIVERSITY AVENUE
MACQUARIE UNIVERSITY

Drawing

STAIR & LIFT CORE (BUILDING 8) PLANS

Drawing No.

KFS-812UA-AR-DWG-DA11.13

Scales 1:50 @ A1

Drawn

Checked

Revision

G

Project No.

6508

2/11/2018 10:37:46 AM - Plot Date