

Macquarie University
**Macquarie University Central
Courtyard Precinct (MUCCP)
Redevelopment – State Significant
Development Application**
Waste Management Plan

Issue | 3 November 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 251278-00

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1 Introduction

This report supports a State Significant Development Application (SSDA) submitted to the Department of Planning and Environment (DP&E) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Macquarie University (MU) is seeking development consent for the first phase of the Macquarie University Central Courtyard Precinct (MUCCP) redevelopment. Under this application consent is sought for redevelopment of Building C10A, construction of two student accommodation buildings (Buildings R1 and R2) and redevelopment of the landscaped Central Courtyard.

1.1 Background

MU is a teaching and research institution of international, national and state significance. It is ranked among the top two per cent of universities in the world and holds a 5-star QS rating. MU is renowned for its innovative research and its commercial partnerships, with more than 100 leading companies located on Campus or in the surrounding Macquarie Park high-tech precinct.

MU was founded in 1964 and has since grown into a large research university with over 30,000 students and 3,000 staff. More than \$1 billion has recently been invested in MU facilities and infrastructure to ensure students and staff can thrive in an inspiring and technologically advanced learning environment.

In March 2014, MU adopted the ‘Macquarie University Campus Master Plan 2014’. The Master Plan builds on the approved MU Concept Plan 2009 and sets out the physical framework to accommodate the University’s predicted needs, while ensuring flexibility into the future and enhancing the existing qualities of the University’s Campus. Ongoing changes in teaching methodologies, new course opportunities, a desire to increase industry engagement and the potential for commercial opportunities on the Campus were all key considerations in the development of the Master Plan.

1.2 Site description

The MUCCP is situated in the centre of the University campus, within Precinct A. The MUCCP currently contains Buildings C9A and C10A (the Student Hub) which are subject to a separate demolition DA to City of Ryde Council, Buildings C8A, C7A and the landscaped Central Courtyard. The MUCCP is a key component of the University campus.

Figure 1 shows the location of the MUCCP within the context of the University campus.



Figure 1 Location of the site

1.3 Overview of the Proposed Development

In accordance with the Master Plan, MU has identified the opportunity to move student accommodation to the heart of the campus. The Master Plan also acknowledges the importance of the MUCCP, and the need to retain the Precinct as a key focus of the University's civic and administrative functions, with active edges for retail, and food and beverage uses.

MU is seeking to secure development consent for the first phase of the MUCCP redevelopment. Consent is sought for redevelopment of Building C10A (known as 1 Central Courtyard), construction of two student accommodation buildings (R1 and R2) and redevelopment of the landscaped Central Courtyard. The proposal comprises:

- Construction of a new, multi-storey Student Hub (1 Central Courtyard or 1CC) in place of existing Building C10A, with ancillary retail uses.
- Construction of two student accommodation buildings (Buildings R1 – 2) to provide approximately 340 student beds and integrated academic uses.
- Redevelopment of the landscaped 1CC
- Construction of a shared basement including plant, loading and waste management facilities, end of trip facilities and accessible parking.

- Installation of a new substation.
- Installation of utilities and services to accommodate the proposed development.
- Upgrade of the western extent of Science Road to accommodate fire brigade access.
- Tree removal and landscaping.

The extent of the SSDA works is shown in Figure 2

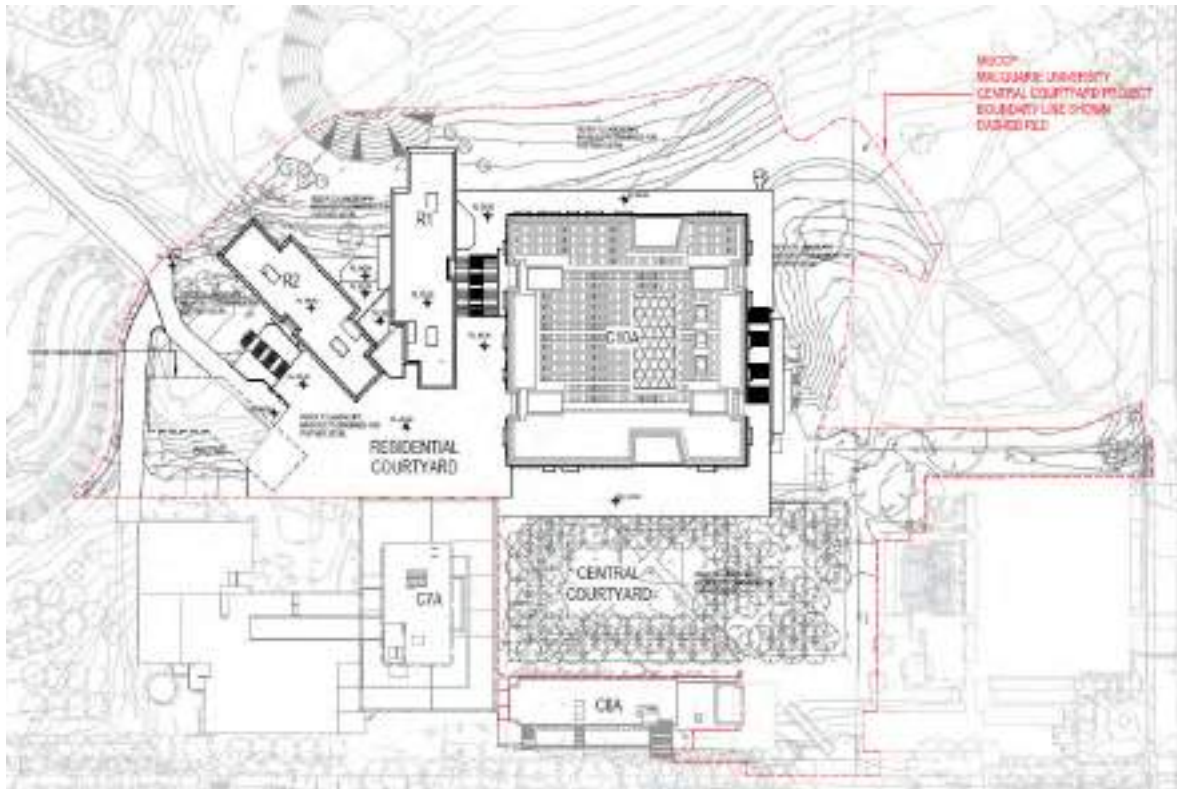


Figure 2 The boundary for the MUCCP SSDA

1.4 Purpose of this Waste Management Plan

This Waste Management Plan (WMP) specifically addresses the requirements outlined in point 13 of the Plans and Documents section of the Secretary's Environmental Assessment Requirements (SSD 8755) dated 13 October 2017, which reads:

Key Issues

SEARS No 13 (Waste)

Identify, quantify and classify the likely waste streams to be generated during construction and operation and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.

Addressed in Section 5 and Section 6

Identify appropriate servicing arrangements (including but not limited to, waste management, loading zones, mechanical plant) for the site.

Addressed in Section 7.2 and Section 9

2 Green Star Equivalence

The MUCCP development is targeting waste and sustainability goals that are equivalent to those for Green Star submission. This WMP is compliant with all Green Star requirements for Credit 8A – Operational Waste, and Credit 22B – Construction and Demolition Waste, even though it may ultimately not be submitted for accreditation. Table 1 details the requirements of both Green Star credits.

Table 1 Performance Pathway: Specialist Plan Green Star credit overview

Credit 8A	Criteria	Requirements
Performance Pathway: Specialist Plan	1 point is available where a waste professional specialist prepares and implements an Operational Waste Management Plan (OWMP) for the project in accordance with best practice approaches and this is reflected in the building's design.	- Identify the site boundary, the waste streams relevant to the project, and the individual roles responsible for delivering and reviewing the OWMP; - Set diversion from landfill targets and/or targets for reducing total materials generation (general waste materials and recyclable/reusable materials), as well as monitoring and measurement procedures for waste and recycling streams by weight. - Outline methods for encouraging the separation of waste streams, such as bins, storage areas or recycling facilities in public areas as required. - Identify storage areas for all waste streams and outline best practice safety and access requirements for their collection. - Identify safe methods for vehicle access and transfer of waste; and - Incorporate a review process to assess the success of the OWMP and make improvements, based on operational experience.
Credit 22B	Criteria	Requirements
Construction and Demolition Waste	1 point is available where construction waste going to landfill is reduced by diverting a significant amount of waste from going to landfill as a proportion of waste generated.	Waste shall be reported in kilograms of waste per square metre of GFA, as well as in percentage.

- To calculate the amount of waste diverted from landfill, the project is required to report the total amount of waste generated (kg/m3), and the total amount of waste diverted from landfill (kg/m3), and report on the proportion diverted as a percentage.

3 Legislation, policy and guidelines

3.1 NSW state legislation and policy

3.1.1 The Protection of the Environment Operations Act, 1997

The *Protection of the Environment Operations Act* 1997 covers the requirements for waste generators in terms of storage and correct disposal of waste. The Act establishes the waste generator as having responsibility for the correct management of waste, including final disposal.

3.1.2 Waste Avoidance and Resource Recovery Strategy 2014– 2021

The NSW Waste and Resource Recovery Strategy 2014-2021 was released in December 2014. Again supported by a further \$337m Waste Less, Recycle More investment initiative for 2017-2021, in addition to the already invested \$455m, the strategy sets clear directions for a range of priority areas and aligns with the NSW Governments waste reforms. The Strategy sets clear targets for avoiding and reducing waste generation and increasing recycling rates. The recycling targets set are:

- 70% for municipal solid waste by 2021-22
- 70% for commercial and industrial waste 2021-22
- 80% for construction and demolition waste 2021-22

In addition there is an overarching target of increasing waste diverted from landfill to 75%.

3.1.3 Waste Avoidance and Resource Recovery Act 2001

Due to concerns about waste management practices and increasing volumes of waste, the NSW government introduced the *Waste Avoidance and Resource Recovery Act* 2001, superseding the Waste Minimisation and Management Act 1995 following its five year review.

The object of the *Waste Avoidance and Resource Recovery Act* is to encourage the most efficient use of resources, to reduce environmental harm, and to provide for the continual reduction in waste generation in line with the principles of ecologically sustainable development (ESD).

The WMP is a requirement for a new development in NSW and is written with reference to the *NSW Waste Avoidance and Resource Recovery Strategy 2014-21*, made under the Act.

The following hierarchy for managing waste, from most desirable to least desirable, meets the objects of the Act:

- Avoid unnecessary resource consumption;
- Recover resources (including reuse, reprocessing, recycling and energy recovery); and
- Dispose (as a last resort).

3.1.4 The NSW Waste Reduction and Purchasing Policy 2007 (WRAPP)

The *NSW Waste Reduction and Purchasing Policy* (WRAPP) requires all state government agencies and state owned corporations to develop and implement a WRAPP plan to reduce waste in four scheduled waste sources:

- Paper products;
- Office equipment and components;
- Vegetation material; and
- Construction and demolition materials.

WRAPP is not directly applicable to the project, but has been used as a guiding document for waste initiatives.

3.2 Local Government requirements

3.2.1 City of Ryde Council's *Development Control Plan*

The Council of the City of Ryde's *Development Control Plan* (DCP) was developed in 2014 to provide effective waste planning and management that benefits the builder/developer, and to comply with legislation such as the *Protection of the Environment Operation Act 1997*, the *Environmental Planning and Assessment Act 1979*, and the *Waste Avoidance and Resource Recovery Act 2001*.

Part 7.2 of the City of Ryde (CoR) DCP includes the objectives and requirements in relation to waste minimisation and management for DAs within the City of Ryde. All DAs to which Part 7.2 applies must be accompanied by a Site Waste Minimisation and Management Plan (SWMMP), as well as location and design details of waste storage facilities on the site of the proposed development.

The specific sections in Part 7.2 which pertain to the proposed development include:

- Section 2.2 aims and objectives for all developments;
- Section 2.3 all developments;
- Section 2.4 demolition and construction;
- Section 2.7 residential flat buildings of 4 storeys or more;
- Section 2.8 commercial and retail; and
- Section 2.9 mixed use developments

The key objectives of Council's DCP are as follows:

Waste minimisation

1. To minimise resource requirements and construction waste through reuse and recycling and the efficient selection and use of resources.
2. To minimise demolition waste by promoting adaptability in building design and focussing upon end of life deconstruction.
3. To encourage building designs, construction and demolition techniques which minimise waste generation
4. To maximise reuse and recycling of household waste and industrial/commercial waste.
5. To assist in achieving Federal and State Government waste minimisation targets in accordance with regional waste plans.
6. To minimise the overall environmental impacts of waste and foster the principles of ecologically sustainable development (ESD)

Waste management

1. To assist applicants in planning for sustainable waste management, through the preparation of a site waste minimisation and management plan.
2. To assist applicants to develop systems for waste management that ensure waste is transported and disposed of in a lawful manner.
3. To require source separation, design and location standards which complement waste collection and management services offered by the relevant service providers.
4. To provide guidance in regards to space, storage, amenity and management of waste management facilities.
5. To ensure waste management systems are easy to use and access.
6. To minimise risks associated with waste management at all stages of development.

4 Targets, monitoring and measurement

High quality waste data improves the overall level of accuracy, transparency and confidence in waste data. It enables meaningful and accurate comparisons and benchmarking to be conducted both within portfolios and between waste contractors.

Good waste data informs strategic resource planning and provides insight into equipment/operational efficiency as well as ensuring accuracy of invoicing and fees. MU can achieve greater resource recovery by accurately measuring current and future waste performance.

4.1 Waste targets

R1-2 and ICC are aiming to deliver an exemplary sustainability standard and consequently waste related targets will be set to ‘push the envelope’ in the context of the Ryde campus. R1-2 and ICC will adopt MUCCPs proposed landfill diversion target¹ of 70%, as stated in the Macquarie University Sustainability Strategy².

This target will be calculated as follows:

$$\frac{\text{total waste (kg)} - \text{landfill waste (kg)}}{\text{total waste (kg)}} \times 100\%$$

4.2 Monitoring and measurement

Data pertaining to R1-2 and ICC’s waste generation will be collected, collated and recorded by the waste service provider to ensure best practice monitoring procedures. This will help MU to measure their progress towards achieving their waste targets.

4.2.1 Operations

The waste service provider for R1-2 and ICC must adhere to this WMP and comply with minimum operational safety standards.

The waste service provider must be able to attribute a mass to each bin collected, which must be measured according to the individual waste stream with evidence regarding the integrity of any scales/meters used. Masses must be recorded in an agreed format and forwarded on to the preferred contact for R1-2 and ICC at the close of each invoicing period.

Where the waste service provider observes contamination in a recycling bin, that bin must be weighed and added to the operational waste management report as a

¹ A landfill diversion target is more appropriate at the building level. A waste reduction target per student would be more appropriate at the campus level.

² Macquarie University Sustainability Strategy 2014, Section 8.12 Waste

‘contamination incident’. The contents in the contaminated bin must then be disposed of as general waste and the incident reported to the preferred contact for R1-2 and 1CC.

The waste service provider must supply equipment (bins, signage/stickers etc.) colour-coded in accordance with the Australian Standard 4123 and approved by the preferred contact for R1-2 and 1CC.

The waste service provider (in conjunction with MU) must ensure that collecting services are done periodically and only when necessary to ensure the bins are not greater than three quarters full, and to maintain a hygienic and odour free environment.

4.2.2 Contamination audit

A site specific contamination audit of each recycling stream is recommended annually. This audit is conducted internally and will be overseen by an independent and competent person.

For two consecutive collections, the contents of the sample should be audited to determine the level of “non-acceptable” items. The sample will consist of all bins normally presented for collection and non-acceptable items must be as advised by the receiving facility.

Contamination rate is determined as the total mass of ‘non-acceptable’ items expressed as a percentage of the total mass of all bins in the sample.

Where contamination is deemed unacceptable, the preferred contact for R1-2 and 1CC should seek to address this issue (e.g. through educational or other means).

4.2.3 Reporting

The waste service provider is to issue periodic operational waste management reports (e.g. on a monthly or quarterly basis) to the preferred contact for R1-2 and 1CC, including:

- A list quantifying the amount and types of waste generated by R1-2 and 1CC.
- A list of contamination incidents including the masses of contaminated bins.
- Records and evidence to substantiate data contained within reports to the nominated reporting standard.

4.3 Review of WMP

The waste service provider and cleaning contractor will annually review the WMP with the preferred contact for R1-2 and 1CC as well as any other relevant parties from MU to determine enhancements, sustainability initiatives and other waste management initiatives.

5 Construction waste

5.1 Waste streams

Construction works for this development are to take place with consideration of the project's Green Star Credit 22B equivalent objectives, particularly in regards to use of recycled building materials and recycling of construction waste streams. The primary goal for waste management in the construction phase is to ensure the highest possible proportion of waste is recycled or reused. The diversion from landfill target rate for construction waste will be 90% or higher.

An overview of the major waste streams resulting from construction is provided in Figure 3. Waste streams which are generally predicted to generate the greatest volume are highlighted in pink.

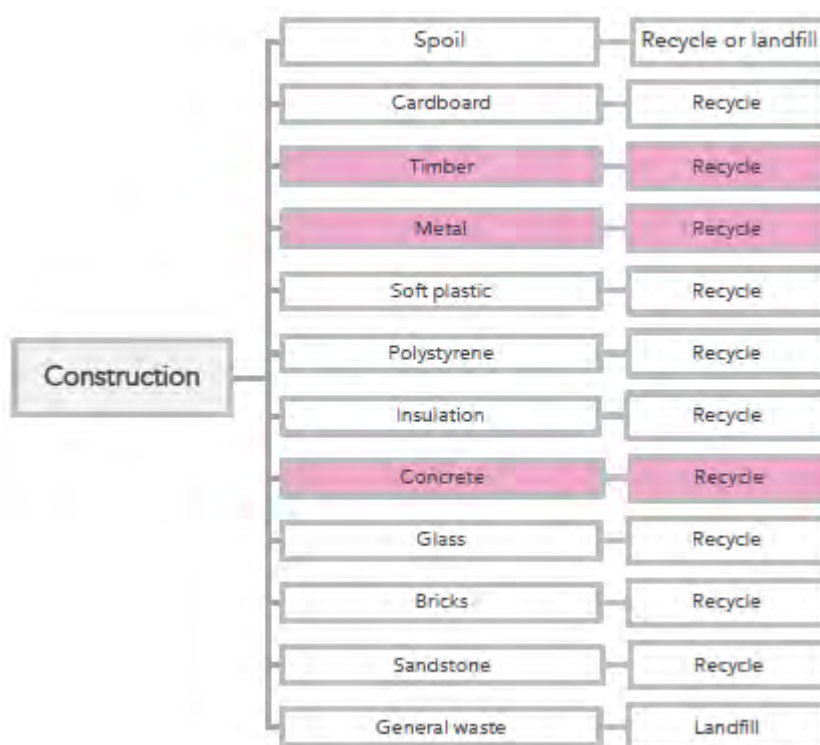


Figure 3 Overview of expected construction waste streams

5.2 Waste generation estimates

The City of Ryde and the City of Sydney do not currently provide any waste generation rates for construction waste volumes. Due to this lack of existing data, construction waste generated onsite for ICC, R1 – 2, and the Central Courtyard has been estimated below using Western Australia Local Government Association Construction Waste Management Guidelines (WALGA Guidelines). This is considered the most relevant and accurate Australian-based construction waste estimation tool.

It should be noted that WALGA Guidelines do not have construction waste categories for glass or landscaping. Waste as an approximate percentage of the total materials has been estimated conservatively for these two categories.

The estimated volumes of construction waste in Table 2 have been calculated using estimated volumes of construction materials provided by WT Partnerships on 19/10/2017. These estimated volumes will need review and approval by the appointed Principal Construction Manager, and it must be emphasised that the actual volume of construction waste generated onsite may vary considerably from these estimates below.

At this early stage of the project, it is very difficult to estimate the exact volume of construction waste that may be generated. This information is being developed by the Construction Consultant and more detailed and accurate estimations may be included at a further project stage.

Table 2 Estimation of construction waste generation

Element	Dominant material	Approximate volume of construction materials ordered (m ³)	Waste as an approximate percentage of the total materials ordered	Approximate volume of construction waste generated (m ³)
Substructure	Concrete	3,268	3-5%	98-163
Columns		1,237		37-62
Upper floors	Timber	5,483	5-7%	274-384
Staircases		189		9-13
Roof	Bricks	1,046	5-10%	52-105
External walls, windows & doors		1,776		89-178
Internal walls	Glass	7,668	2-20%	153-1,534
Internal doors		182		4-36
Wall finishes	Plasterboard	418	5-20%	21-84
Services and landscaping	TBC	7,183	2-20%	144-1,437
Total				881-3,996 m ³

A detailed breakdown of the volume of materials provided by WT Partnerships can be found in Appendix A.

5.3 Construction waste management

Waste generation and management during the construction phase will be the responsibility of the Principal Contractor and is to be handled in accordance with the approved Construction Waste Management Plan (CWMP) as it relates to materials procurement, handling, storage, and use. Waste generated during construction and demolition will be reused and recycled as a priority, and only disposed to landfill when unavoidable.

During construction, suitable areas on site (or off site, if necessary), will be allocated which provide adequate space and access for:

- Separated storage of building materials,
- Separated storage of construction waste,
- Separated sorting of construction waste, and
- Removal of construction waste for recycling, re-use or landfill.

Waste that is unable to be reused or recycled will be disposed of offsite at an EPA-approved waste management facility following classification. Details of waste types, volumes and destinations will be recorded in recording and tracking schedules. Prior to transporting waste materials to offsite facilities, it will be verified that the transporter and facility is licensed to handle the material it is designated to carry.

Construction waste tracking sheets are to be completed by all contractors, as provided in Appendix B.

6 Operational waste

6.1 Waste generation

Waste volumes for the proposed developments have been estimated in order to determine waste storage and collection requirements. Waste generation is calculated from the appropriate waste generation rate and the total floor area, according to the intended occupancy type.

6.1.1 1CC

Waste generation estimates for 1CC are based on the area schedule (issued by Architectus, dated 24 August 2017), and the waste generation rates provided in Schedule 3, Part 7.2 of Council's DCP. The applicable rates are shown below in Table 3.

Table 3: Applicable waste and recycling generation rates

Building space use	Area Schedule	Applicable waste generation type	General waste generation rate (including food organics)	Total co-mingled recycling generation rate (including paper/card)
Formal & informal teaching and learning / offices	9,612 m ²	Offices	10 L / 100 m ² / day	10 L / 100 m ² / day
Function room / BOH / showcase / lobby / foyer / terraces	4,876 m ²	Showroom	40 L / 100 m ² / day	10 L / 100 m ² / day
Food and beverage retail / dining space / kiosk /	848 m ²	Restaurant, café	667 L / 100 m ² / day	133 L / 100 m ² / day
Student bar / bar terrace	532 m ²	Shop greater than 100m ² area	50 L / 100 m ² / day	50 L / 100 m ² / day
Commercial kitchen	281 m ²	Restaurant, café	667 L / 100 m ² / day	133 L / 100 m ² / day

The storage, circulation, loading, plant, stage, riser, cleaning, and service areas of the buildings have been assumed to not generate any waste.

The detailed area schedule has been provided in Appendix C.

6.1.2 R1 – 2

Waste generation estimates for R1 – 2 are based on a combination of the number of beds provided in each tower, the SSDA Frozen Set area schedule (dated 26 September 2017), and the relevant waste generation rates provided in Schedule 3, Part 7.2 of Council's DCP. The applicable rates are shown below in Table 4.

Table 4: Applicable waste and recycling generation rates

Building space use	Applicable waste generation type	General waste generation rate (including food organics)	Total co-mingled recycling generation rate (including paper/card)
Residential	Apartment dwellings	120 L / apartment / week	60 L / apartment / week
Shared kitchen and dining	Café	667 L / 100 m ² / day	133 L / 100 m ² / day
Student lounge / common areas	Offices	10 L / 100 m ² / day	10 L / 100 m ² / day

Outdoor courtyard / rooftop terrace / garden spaces	Public realm	1 x receptacle / 30 m	1 x receptacle / 30 m
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6.2 Operational waste streams

The waste streams which will be generated during operation of the proposed development are identified below in Table 5.

Table 5: Operational waste streams

Source	Waste Stream
ICC	General waste Co-mingled recycling Paper and card recycling Secure documents Food organics (optional, depends on tenancy and capacity of contractor) Cooking oil (optional, depends on tenancy) Hard / bulky waste / E-waste / batteries / printer cartridges Sanitary waste
R1 – R2 Shared Spaces	General waste Co-mingled recycling Food organics (optional, depends on tenancy and capacity of contractor) Cooking oil (optional, depends on tenancy) Hard / bulky waste / E-waste / batteries / printer cartridges
R1 – R2 Apartments	General waste Co-mingled recycling Hard / bulky waste / E-waste / batteries / printer cartridges
Central Courtyard	General waste Co-mingled recycling Food organics (optional, depends on tenancy and capacity of contractor)

It is recommended that bin stations comprising of the streams likely to generate the highest volume are located in central, accessible locations.

A separate cage for all hard / bulky waste and e-waste will be allocated **within the central waste and recycling storage room**, but receptacles for hard / bulky waste will not be provided in public areas.

Each apartment will have two separate bins, general waste and co-mingled recycling. If students opt in, they may receive a third bin for food scraps in their apartment (*TBC by MU*).

6.3 Waste generation estimates

6.3.1 1CC

Indicative estimates of daily waste generation for 1CC are summarised below in Table 6, based on the 50% design area schedule (issued by Architectus, dated 24 August 2017), CoR waste generation rates and professional experience.

Please note that waste estimates have not been provided for other waste streams (e.g. sanitary waste etc.) due to their anticipated small volumes and a lack of metrics available.

The recommended area requirements for 1CC central waste and recycling storage is outlined in Table 7.

Table 6 Estimated waste generation volumes

Source	Waste and recycling volumes (L/day)			
	General waste	Co-mingled recycling	Paper and card recycling ³	Food organics ⁴
Offices / classrooms / lobby / Function room	1,420	435	1,014	29
Café / food and beverage areas / bar / commercial kitchen	4,820	872	908	3,036
Total	6,240	1,307	1,922	3,065

³ Assuming that 51% of total recycling comprises paper/card for Cafes, and 70% of total recycling comprises paper/card for offices (based on data from: Encycle (2013) A Study into commercial & industrial (C&I) waste and recycling in Australia by industry division)

⁴ Assuming that 70% of general waste comprises organic waste for cafes with a 80% capture rate, and 4% of general waste comprises organics with a 50% capture rate (based on data from: Encycle (2013) A Study into commercial & industrial (C&I) waste and recycling in Australia by industry division)

Table 7 Recommended area requirements for 1CC central waste and recycling store

Component	Waste stream	Bin Requirements	Area m ²
General waste storage	General waste	8 x 240L general waste receptacles (Shared Spaces) 11 x 660L general waste receptacles (1CC) 20 x 240L general waste receptacles (Central Courtyard) 1 x 660L general waste receptacle (R1 – 2 & 1CC garden bins)	48 m ²
Recycling storage	Co-mingled	14 x 240L recycling receptacles (Shared Spaces) 13 x 660L recycling receptacles (1CC) 20 x 240L recycling receptacles (Central Courtyard) 1 x 660L general waste receptacle (R1 – 2 & 1CC garden bins)	51 m ²
	Paper/card	17 x 240L recycling receptacles (Shared spaces) 15 x 660L recycling receptacles (1CC)	
	Food and garden organics	3 x 240L recycling receptacles (Shared Spaces) 13 x 240L recycling receptacles (1CC)	
Hard waste storage	Bulky items / e-waste	Caged section	12 m ²
Provision for Function Room overflow	Any waste stream	As needed basis	20 m ²
Bin wash down	All waste streams		2
Total			133 m²

A bin scaling factor of 1.5 has been applied to account for compliance in receptacle manoeuvrability and accessibility. As outlined in Figure 4, the 1CC central waste and recycling store currently provides **190m²**, and is adequate for storing all waste generated by 1CC, the ‘Shared Spaces’ in R1 – 2, the Central courtyard, and any overflow of waste and recycling generated by R1 – 2.

6.3.2 R1 – 2

Indicative estimates of daily waste generation for R1 – 2 are summarised below in Table 8, based on the SSDA Frozen Set area schedule (dated 26 September 2017) and CoR waste generation rates for commercial and residential waste. Please note that sanitary waste is included in the general waste stream volume for each apartment.

R1 – 2 outdoor bin stations have been calculated as 10 x 60L receptacles per stream throughout the R1 – 2 and 1CC garden areas, which has been confirmed by Aspect Landscape Architects. Smaller bins have been placed in the residential gardens more frequently due to the increased number of eating areas.

Table 8 Estimated waste generation volumes

Source	Waste and recycling volumes (L/day)		
	General waste	Co-mingled recycling	Food organics
Residential	2,589	1,294	-
Shared kitchen / dining	930	142	517
Student lounge / common areas	119	119	-
Outdoor courtyard / rooftop terrace / garden spaces	600	600	-
Total	4,006	4,562	401

It should be noted that food and organic waste bins will be available in the shared dining and food preparation areas. It is proposed that bins may be provided to student apartments, however this is to be confirmed by MU.

The recommended area requirements for R1 – 2 central waste and recycling storage is outlined in Table 9.

Table 9 Recommended area requirements for R1 – 2 central waste and recycling storage

Component	Waste stream	Bin Requirements		Area required		Area provided	
		R1	R2	R1	R2	R1	R2
General waste storage	General waste	1 x Compactor containing 2 x 660L receptacles	1 x Compactor containing 2 x 660L receptacles	15	15	29	40
Recycling storage	Co-mingled	7 x 660L recycling receptacles					
Hard waste storage	Bulky items	Caged section		26		47	
	E-waste	Small receptacle					
Total				51m²		116m²	

A bin scaling factor of 1.5 has been applied to account for compliance in receptacle manoeuvrability and accessibility. As outlined in Figure 5, the R1 – 2

waste and recycling store rooms allow a total area of **116m²**, which is adequate for storing all waste and recycling generated by the R1 – 2 apartments.

6.3.3 Central Courtyard

There are currently no existing guidelines pertaining to the provision of bins in public areas. Consultation with Council's peak body Local Government NSW confirmed there were no requirements to adhere to. It is recommended that bin stations are located every 30 metres as a benchmark footfall. A public realm bin station should comprise of 1 x general waste receptacle, and 1 x co-mingled recycling receptacle.

Based on this recommendation from Local Government NSW, it is anticipated the structure outlined in Table 10 will be adequate.

Table 10 Summary of estimated Central Courtyard waste generation

Stream	Volume per receptacle	Number of receptacles
General waste	240L	9
Co-mingled recycling	240L	9

It should be noted that the estimated waste volumes outlined in Table 10 are estimations based on a recommendation alone, and not on actual MU public waste generation data. Actual waste volumes generated in the Central Courtyard may vary.

It is often difficult to monitor the volume of public realm waste being generated, which makes it difficult to estimate the number of receptacles required in public realms. Additionally, it is often difficult for facilities management to schedule collection of public realm bins without knowing how often they are at capacity.

Smart Bins compact up to four times the volume of the bin, and notify facilities management when they are 80% full. It is recommended that Smart Bins are utilised in the Central Courtyard, to maximise the efficiency of facilities management, and to accurately collect data pertaining to the capacity and frequency of each bin throughout the day.

A location map of all public bins is located in Appendix D.

7 Operational waste management system

7.1 Existing practices

Macquarie University's current sustainability policy states the need to embed effective waste management practices to encourage the MU community to avoid, reduce, reuse and recycle. The current diversion from landfill target is 70% according to the Macquarie University Sustainability Strategy 2014.

The waste streams being separated on campus at present are as follows:

- General waste
- Paper / cardboard
- Co-mingled recycling
- Secure documents
- E-waste
- Printer cartridges
- Sanitary waste
- Cooking oil

At present, there is medium to high contamination of bins around campus based on observation and feedback from facilities management. There will need to be tighter parameters between commercial/retail tenancies and facilities management regarding waste and recycling.

There is a need for updated contracts to include changes to commercial/retail waste generation and whether or not the current capacity of the waste management system can support any changes.

7.2 Overview of waste management system

The proposed Waste Management System (WMS) is summarised in Table 11. This summary identifies the reticulation from the point of disposal to the central waste room and collection point.

In addition, the responsibilities associated with waste management are outlined below. All contracts with building managers, tenants and cleaners should clearly outline the waste management and collection system for allocating waste management responsibilities.

Table 11 Proposed operational waste management system

Space use	Local disposal	Transfer to waste storage room	Transfer to Central waste room(s)	Transfer to collection point	Collection point
ICC					
Office / teaching and learning / foyer / BoH	Bin stations as needed in shared spaces	Cleaners / facilities management to transfer to central waste store in ICC Basement 2 using trolleys.		Nominated cleaning staff / facilities management transfer waste receptacles from ICC central waste and recycling room to the loading zone.	Waste contractors collect waste from loading zone in waste collection vehicles. Loading zone is located on Basement Level 2, accessed via the driveway entrance.
Food and beverage retail	Bin stations as needed in shared spaces				
Central Courtyard					
Public realm	Bins / receptacles as needed in public spaces	Building management / grounds keeper to transfer to central waste store in ICC Basement 2 using automated grounds vehicles.			
R1 – 2					
Apartments	One general waste bin and one co-mingled recycling bin in each apartment	Students to take all general waste to the chute room located on each floor and drop down the chute. Students to take all recycling to recycling store in R1 – 2 Basement 1.	General waste and recycling bins from storage rooms in R1 – 2 Basement 1 are transferred to loading dock on ICC Basement Level 2 by facilities management.	Nominated cleaning staff/building management transfer waste receptacles from R1 – 2 central waste and recycling rooms on Basement Level 1 to the loading dock.	
Shared student spaces (dining, music, lounge)	Bins as needed in shared spaces	Cleaners / facilities management to transfer general waste and recyclables to central waste store in ICC Basement 2 using trolleys.		Nominated cleaning staff / facilities management transfer waste receptacles from ICC central waste and recycling room to the loading zone.	
Function Room	Bins as needed in Function Room during event				

It is anticipated that general waste, co-mingled recycling, paper/cardboard, and food organics will be collected routinely every day. All hard / bulky waste, e-waste, batteries, secure documents, sanitary waste, and printer cartridges will be collected on an 'as needed' basis. Local storage

Students and staff in ICC will dispose of their waste and recycling (including food organics) in centralised bin stations located in common areas within the

building. Retail operators will dispose of their waste in appropriate receptacles within their tenancy prior to transfer to the central waste storage room. All medical / hazardous and sanitary waste generated in 1CC will be disposed of into the appropriate receptacles provided by a qualified waste service provider.

Students and staff in the Central Courtyard will dispose of their waste and recycling in bin stations (including food organics) located evenly around the public realm. Proposed public bin station locations can be found in Appendix D.

Students residing in R1 – 2 will be dispose of their general waste in 60L receptacles stored within their apartments. It will be the responsibility of the students to transfer this waste to the central chute room on their floor to dispose of the waste. All recyclables will be disposed of in 60L receptacles stored within their apartments. It will be the responsibility of the students to transfer these recyclables to the R1 – 2 central recycling store room on Basement 1.

7.2.1 Central storage

Detailed architectural layouts of all central waste and recycling storage rooms can be found in Appendix E.

7.2.2 1CC

The central waste and recycling storage room for 1CC will be located on Basement Level Lower, as showed below in Figure 4.

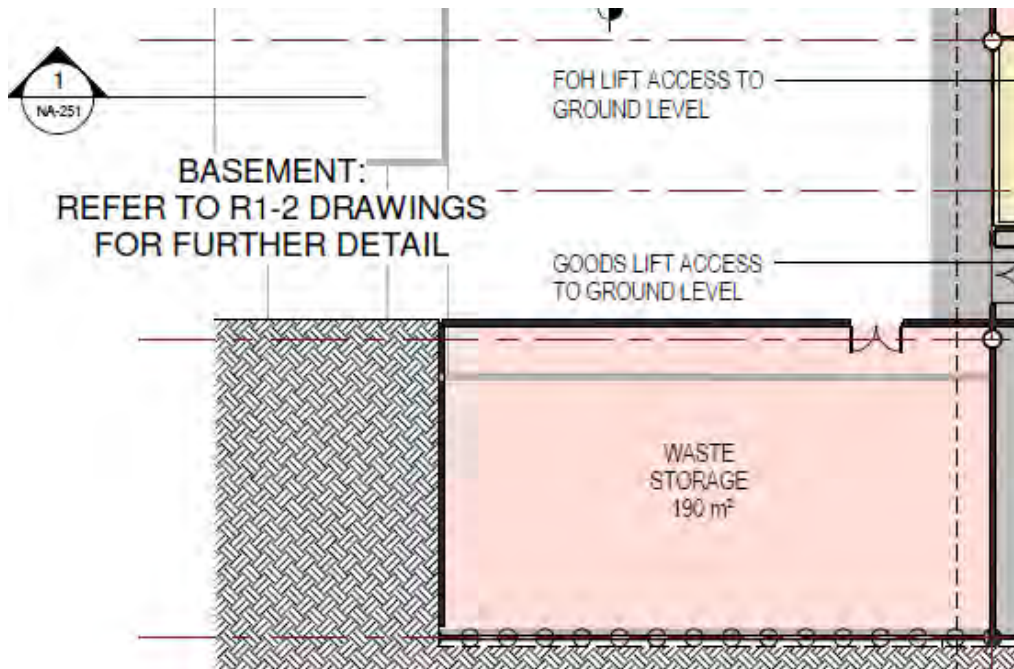


Figure 4 1CC Central waste and recycling storage room

This storage room will accommodate all waste generated by 1CC, the ‘Shared Spaces’ in R1 – 2 and the Central courtyard, and will cater to any overflow of waste and recycling generated by R1 – 2.

In the context of R1 – 2, the ‘Shared Spaces’ account for the following:

- Student Lounge
- Shared Kitchen
- Shared Dining
- Music Room
- Lobby

7.2.3 R1 – 2

The central waste and recycling storage rooms for R1 – 2 will be located on Basement 1, as showed below in Figure 5.

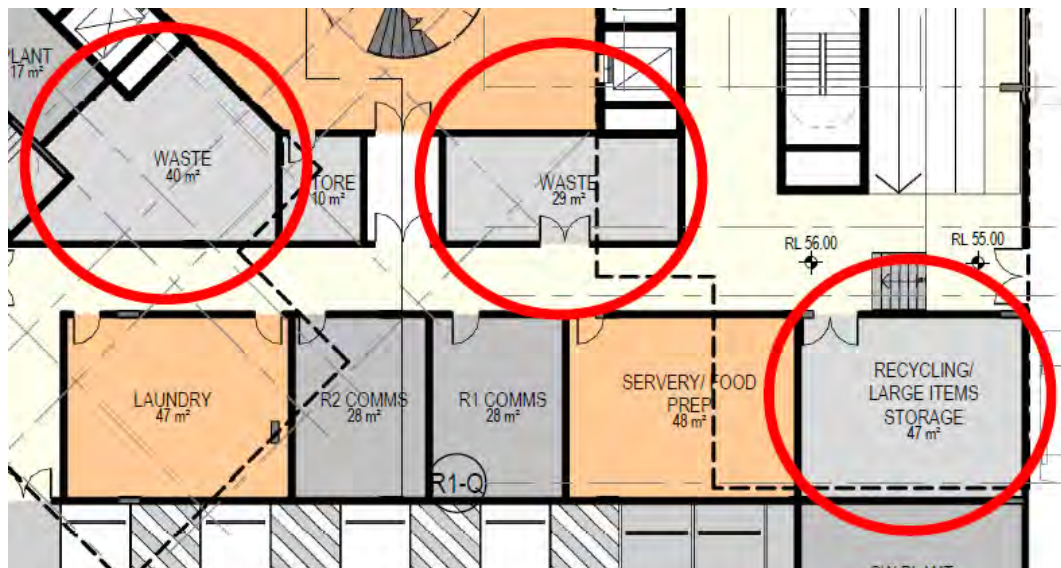


Figure 5 R1 – 2 central waste and recycling storage rooms on Basement 1.

These storage rooms will accommodate all waste and recycling generated by the *apartments* in R1 – 2 and the Function room. Any overflow of waste and recycling generated by large events in the Function room may be transferred to the 1CC central waste and recycling store room on Basement Lower Level, where adequate space has been provided to account for these events.

7.2.4 Chute design

The waste management system allows for one general waste chute in R1 and one general waste chute in R2. As it stands, it is possible to have an additional co-mingled chute for recyclables, or a single chute that interchanges between general waste and recycling. Recyclables in a chute may pose some noise issues and the materials used to isolate the chute from its structure *will need to be confirmed by the architect*. However, it should be noted that noise will be greatly reduced by the waste room sitting below ground level, with the concrete slab absorbing a lot of the resonating acoustics.

Another option is to have one recyclables chute only on each level, and have the students transfer the general waste downstairs manually. This may encourage

higher recycling rates but conversely could cause contamination issues and *will need to be confirmed by MU*.

It is recommended that a carousel system with a compactor is utilised in the R1 & 2 waste storage rooms to capture all waste dropped down from the apartment levels. All refuse chutes and hoppers will be compliant with the Building Code of Australia 2014 and the British Standard 1703:2005.

The minimum ventilation requirements are 100 L/s min in a garbage room. Maintenance occurs via the hoppers on each level. If there is more than 3 levels without a hopper, access panels may be put at one of those levels. Maintenance is minimised if education / signage is clear and effective.

The location of chute rooms for each level have been circled on pages 4 – 9 of Appendix E. The requirements for chute design have been taken from Council's DCP and are outlined in Table 13.

8 Waste storage design

8.1 Signage

Signage will be provided in all waste disposal, storage and collection areas demonstrating how to use the waste management system, including what materials are acceptable in each recycling bins. All waste streams will be stored in clearly labelled, colour coded bins as appropriate to ensure that waste streams are not inadvertently mixed.

The standard colours of each bin are outlined in Table 12 as stated on CoR Council website. These measures are necessary in order to encourage the appropriate separation of waste streams and the recovery of resources.

Table 12 Standard bin colours

Bin	Colour
General waste	Red lid and dark green body
Co-mingled recycling	Yellow lid and dark green body
Paper / card recycling	Blue lid and blue body
Food organics	Maroon lid and dark green body
Garden organics	Light green lid and dark green body

In addition, clear Occupational Health and Safety (OHS) signage must be provided as appropriate. In particular, appropriate OHS must be provided within each waste and recycling room.

8.2 General waste facilities design

The following design aspects in Table 13 are considered the safest and most hygienic in waste storage room design. All design provisions have been adopted from Part 7.2 of Council's DCP.

Table 13 Waste storage room design details

Design Provision	
Residential Bin Storage Area	The bin storage area must be of adequate dimensions to comfortably accommodate the required number of bins. A space at least 700mm wide x 750mm deep must be provided for each bin. The layout of the bin storage area must allow easy unobstructed access to all bins (stacked bin arrangements are not acceptable) and allow the bins to be easily removed for servicing purposes. To permit easy access for servicing all passageways must be at least 1 metre wide. The floor of the bin storage area must be constructed of concrete. The walls of the bin storage area must be constructed of brickwork at least 1100mm high and be designed to screen the bins from the street. The entry to the bin storage area must not include any gates. Landscaping must be provided to minimise the impact of the bin storage area on the streetscape.
Waste and recycling storage rooms	The waste and recycling storage room must be of adequate dimensions to comfortably accommodate the required number of waste and recycling bins. The layout of the waste and recycling storage room must allow easy unobstructed access to all bins (stacked bin arrangements are not acceptable) and allow the bins to be easily removed for servicing purposes. Where building occupants are required to take their waste to the waste and recycling storage room, the garbage bins should be located closest to the access door to minimise the risk of the recycling bins being contaminated. The floor of the waste and recycling storage room must be constructed of concrete finished to a smooth even surface and coved at the intersections with the walls. Where garbage or putrescible waste is to be stored, the floor must be graded to a floor waste connected to the sewerage system. The floor waste must be fitted with an in-floor dry basket arrestor approved by Sydney Water Corporation. Where garbage or putrescible waste is to be stored, a tap with a hose connection must be provided in or adjacent to the waste and recycling storage area to facilitate cleaning. The walls of the waste and recycling storage room must be constructed of brickwork, concrete block work or similar solid material with the internal wall surfaces cement rendered to a smooth even surface. The ceiling of the waste and recycling storage room must be constructed of a rigid smooth faced non-absorbent material. The ceiling must be of a minimum height that enables access for cleaning and enables the lids of bins to be fully opened. The internal walls and ceiling of the waste and recycling storage room must be painted with a light coloured washable paint. The waste and recycling storage room must be provided with a close fitting self-closing door that is able to be opened from inside the room without the use of a key. The doors of the waste and recycling storage room must be finished with a smooth faced impervious material that is capable of being easily cleaned. The waste and recycling storage room must be provided with permanent natural ventilation direct to the outside air or a system of mechanical exhaust ventilation. The waste and recycling storage room must be provided with artificial lighting controllable by switches outside and inside the room. Sensor lights may be used in this regard.

	Clear signage must be displayed in the waste and recycling storage room describing how to use the waste facilities correctly.
Garbage chutes	Garbage chutes are only suitable to transfer garbage, and not suitable to transfer recyclables for a range of safety reasons, including potential fire hazard. Garbage chutes must be designed and constructed in accordance with the following requirements: The chute must be cylindrical in shape with a diameter of at least 500mm; The chute must be constructed of non-corrosive metal or other suitable smooth impervious material; The chute must be vertical with no bends, off-sets or restrictions and all internal joints and seams finished to a smooth even surface to allow the free flow of garbage through the chute; Chutes should not open onto any habitable or public space. The service openings for depositing garbage into the chute must be located in a dedicated service room/compartments (refer guidelines below); The service openings must be fitted with a charging device between one (1) metre and one and a half (1.5) metres above floor level and have a cross-sectional area not more than half that of the garbage chute; The charging devices must be self-closing and designed to permit free flow of garbage into the chute; The chute branches from the charging devices must not exceed one (1) metre in length and must be angled to allow the free flow of garbage into the chute; The chute must terminate in the waste and recycling storage room and discharge the garbage directly into a waste container or garbage compactor in such a way that no spillage occurs; A suitable cut-off device must be provided at or near the base of the chute to effectively close off the chute while the waste containers are being serviced or the compaction equipment is being maintained; The chute, charging devices and service openings must be capable of being easily cleaned; The chute must be ventilated so that air does not flow from the chute through any service opening and the flow of air through the chute does not impede the downward movement of garbage; and The vent at the top of the chute must extend above the roof level and be fitted a weather-proof cowl and wire mesh screen to prevent the entry of rainwater and birds.

8.3 Amenity

The management systems and constructed elements of this development will be designed and installed so as to enhance outcomes for building amenity. Any potential for noise and odour to arise will be minimised. Specifically:

- **Visual aspects:** Any facet of the waste management system that is visible from outside the building must be in keeping with the dominant design of the remainder of the development.
- **Noise:** The potential for noise must be minimised. Significant noise-generating waste management equipment will not be utilised in this development. However, Council may require waste storage to be refrigerated if sufficiently large quantities of food waste are generated on site and waste

removal from this site is difficult due to location or long trading hours. Production of offensive noise will be avoided.

- **Odour:** The potential for odour must be minimised. Any putrescible waste awaiting collection will be stored in a Council approved container with permanently tight fitting lids and smooth, washable internal surfaces. All waste storage areas will be fitted with mechanical vertical ventilation systems. Adequate mechanical ventilation and regular collection of waste will eliminate the risk of odour to building inhabitants and neighbours.

9 Waste collection

9.1 Location and access

The location for collecting all waste and recycling will be located on Basement Level Lower. This position is convenient for staff and facilities management. Prior to collection, nominated staff/building management will move waste and recycling receptacles from the central waste storage room to the loading zone, where they will await collection.

Collection vehicles will be able to access the loading zone by driving into the basement loading zone from basement driveway just south of R2. The access point has been illustrated by the Transport Consultant and can be found in Appendix F. The waste receptacles will not be located more than 20 metres from the loading zone.

The nominated collection point where the waste loading operations occur will be on a level surface away from slopes or vehicle ramps. In addition to this, the path where the waste contractor will transport the bins from the central waste storage room to the collection vehicle will be free of steps, kerbs and other uneven surfaces. The maximum distance for the waste contractor to transport mobile garbage bins larger than 660L is 20 metres.

9.2 Collection vehicles

The route for waste contractor access to the internal loading zone is via the driveway, can be accessed from the basement driveway south of R2.

The loading zone in the basement should cater for the size of the waste service provider collection vehicles. Access driveways and service areas for waste collection vehicles must be designed in accordance with Australian Standard AS 2890.2-2002 Parking Facilities – Part 2: Off-street commercial vehicle facilities, as stated in Council's DCP. Standard materials recovery vehicle dimensions have been included in Table 14 below.

Table 14 Rear loading collection vehicle for MGBs

Vehicle Specification	Measurement
Length overall	9.54 m
Width overall	2.6 m
Operational height	4 m
Travel height	3.8 m
Weight (payload)	26 tonnes
Turning circle	18.0 m

As noted on drawings provided by Architectus, the clearance height for the basement where all waste and recycling will be collected is currently 6 metres high. This is illustrated in Appendix G.

9.3 Frequency

Waste collection services for each waste stream are yet to be confirmed. Written evidence will be provided and held on site at all times of the contractor's valid and current licence for waste and recycling collection and disposal.

Collection frequency assumptions are as follows:

- Collection of general waste, co-mingled recycling, paper/cardboard recycling, and food and garden organics is to occur 5 x per week (every working day).
- Collection of other waste streams (e.g. hard / bulky waste, e-waste, cooking oil etc.) would be less frequent, and arranged as required.

Collection frequency of hazardous waste and sanitary waste will be at the discretion of the separate waste service providers collecting and treating these waste streams, and can be arranged with facilities management as required.

Note: Waste collection frequencies can be adjusted once the building is in operation and actual waste generation rates can be observed.

10 Waste initiatives

To encourage and improve correct segregation of all waste streams, it is recommended that Macquarie University host regular seminars to inform and motivate staff and students about waste management onsite and the importance this has on a local, national and global level. Student involvement will be invaluable in driving sustainable waste management onsite and can even extend to research, data analysis, and procurement.

To reduce paper waste, printing facilities can be limited to one central location on each floor. Creating digital spaces which enable advanced technology, such as communal screens for sharing information and viewing documents, will also reduce paper waste from printing activities.

10.1 Best practice separation

10.1.1 Co-mingled & paper / cardboard

The addition of co-mingled and paper / cardboard recycling bins in teaching and learning spaces would be a new addition to current waste management practices that would further increase the volume of recyclables being separated and diverted from landfill.

Arup recommends clear signage and colour coding on the bins in these areas to help educate and support correct segregation. In addition to this, bold and informative posters in the main learning spaces that illustrate correct recycling practices will increase the volume of recyclables being diverted from the general waste bins.

10.1.2 Food organics

In order for MU to achieve its waste targets as required by Green Star, and to encourage best practice waste management, Arup recommends implementing a food organics treatment unit. The benefits of organic recycling include:

- Increased diversion of waste from landfill, therefore achieving diversion targets and reducing high costs associated with sending waste to landfill. Recycling bins are a third of the cost of landfill bins. It is financially illogical not to separate recyclables from general waste stream.
- Bi-product can be used as a concentrated compost on university grounds, local community groups, or to sell to students and staff.
- MBG and skip bin collection frequency and cost reduced, in addition to the carbon emissions reduced by decreasing the transport requirements.
- Reduction of carbon footprint from less waste generating emissions in landfill and the reduction in collection vehicle transport.
- A change in wasteful culture to assist tenants of the LC building become environmentally responsible and to claim ownership of their individual waste practices.

An organics treatment unit can support student development by engaging a student project officer to manage the organics treatment system including liaising with retail / food and beverage staff, collecting and collating data relating to inputs and outputs of the system, managing the relationship with the organics collection provider, and identifying research projects related to the system.

An allowance has been made in the ICC central storage room for the potential future inclusion of an organic waste treatment unit.

10.2 Waste education

Waste education will be integral for MU to achieve its waste targets. MU should promote waste as a resource to be captured, rather than rubbish being sent to landfill. To do this, Arup recommends the following waste education strategies:

- Include waste education as part of MU staff development and broader educational visions.
- Expand public place recycling and accelerate awareness programs for staff, students and commercial / retail tenants.
- Bold signage in all common areas that clearly illustrate correct recycling practices.
- Interactive displays at MU open days to educate staff, students, commercial / retail tenants and visitors about the importance of waste minimisation in MU.
- Sustainable procurement workshop with suppliers to review current procurement practices and whether or not the need for some products can be reduced.

10.3 Sustainable procurement

Arup recommends a sustainable procurement policy be developed for MU to apply to facilities management, building management, and commercial / retail operators for all future procurement.

Purchasing items that minimise packaging / material content, containing recycled materials, avoiding plastic where possible, and seeking out environmentally conscious suppliers thereby minimising the downstream environmental impacts caused by wasteful consumption.

This could include the use of reusable cutlery / crockery, which could be branded with logos and / or waste related messages (see example in Figure 6).



Figure 6 Plate with message asking user to return to plate clearing area (left) and plate clearing area (right)

A detailed sustainable procurement policy will increase awareness for the consumption of resources by all building occupants, and will set the framework for clear responsibilities and effective reporting.

Appendix A

Construction Material Volumes

STAGE 05A - CENTRAL COURTYARD LEARNING & TEACHING CENTRE (C10A) - ELEMENTAL ESTIMATE

ELEMENT	M3
SUBSTRUCTURE	1,738
COLUMNS	482
UPPER FLOORS	7,202
STAIRCASES	88
ROOF	341
EXTERNAL WALLS, WINDOWS & DOORS	515
INTERNAL WALLS	3,765
INTERNAL DOORS	109
WALL FINISHES	418
SERVICES AND LANDSCAPING	1,466
TOTAL	16,124

NB// Excludes:-

FF&E

Excavation and demolition

Soft landscaping

Check:

Approx: 87 week programme x 1no 10m3 bin/week = 870m3

STAGE 5b - RESIDENTIAL ACCOMMODATION (R01 & R02) - ELEMENTAL ESTIMATE

ELEMENT	M3
SUBSTRUCTURE	1,548
COLUMNS	755
UPPER FLOORS	5,483
STAIRCASES	101
ROOF	705
EXTERNAL WALLS, WINDOWS & DOORS	1,261
INTERNAL WALLS	3,903
INTERNAL DOORS	73
SERVICES AND LANDSCAPING	1,383
TOTAL	15,212

NB// Excludes:-

FF&E

Excavation and demolition

Soft landscaping

Check:

Approx: 87 week programme x 1no 10m3 bin/week = 870m3

STAGE 5b - RESIDENTIAL ACCOMMODATION (R01 & R02) - ELEMENTAL ESTIMATE

ELEMENT	M3
HARD LANDSCAPING	3,769
SERVICES	565
TOTAL	4,334

NB// Excludes:-

FF&E

Excavation and demolition

Soft landscaping

Check:

Approx: 8 week programme x 1no 10m3 bin/week = 80m3

Appendix B

Example Construction Tracking Sheet

Details of waste management – construction phase

MATERIALS ON-SITE			DESTINATION		
Type of materials	Est. Vol. (m ³)	Est. Wt. (t)	REUSE AND RECYCLING	DISPOSAL	
			ON-SITE - specify proposed reuse or on-site recycling methods	OFF-SITE - specify contractor and recycling outlet	- specify contractor and landfill site
Excavated Materials					
Garden Organics					
Bricks					
Tiles					
Concrete					
Timber – please specify					
Plasterboard					
Metals					
Other waste eg. ceramic tiles, paints, PVC tubing, cardboard, fittings					

Appendix C

1CC Area Schedule

ROOM SCHEDULE - C10A

24/08/2017

Occupant	Name	Area	Room Number	L&T Modality
C10A - BASEMENT				
BOH	CIRCULATION	176.57		
BOH	CIRCULATION	132.20		
BOH	CLEANER	76.61		
CIRCULATION	LOBBY	26.45		
CIRCULATION	LOBBY	97.70		
CIRCULATION	CIRCULATION	116.29		
FOOD & BEVERAGE - BOH	F&B STORE	185.32		
FOOD & BEVERAGE - BOH	WASTE STORAGE	211.15		
FOOD & BEVERAGE - BOH	SANITARY FACILITIES	58.07		
FOOD & BEVERAGE - FOH	STUDENT BAR	375.33		
GRADUATION HALL	GRADUATION HALL	767.56		
GRADUATION HALL - BOH	COMMERCIAL KITCHEN	280.53		
GRADUATION HALL - BOH	FURNITURE STORE	100.04		
GRADUATION HALL - BOH	FUNCTION OFFICE	26.20		
GRADUATION HALL - BOH	SANITARY FACILITIES	57.82		
GRADUATION HALL - BOH	BACK OF STAGE	108.55		
GRADUATION HALL - BOH	KITCHEN STORE	58.76		
GRADUATION HALL - FOH	PRE-FUNCTION	747.18		
GRADUATION HALL - FOH	CLOAKROOM	77.72		
GRADUATION HALL STAGE	GRADUATION HALL STAGE	141.01		
PLANT - COMMS	PLANT (COMMS.)	34.24		
PLANT - COMMS	PLANT (COMMS.)	31.96		
PLANT - ELECTRICAL	PLANT (ELEC.)	3.24		
PLANT - ELECTRICAL	PLANT (ELEC.)	73.20		
PLANT - ELECTRICAL	PLANT (ELEC.)	31.35		
PLANT - ELECTRICAL	PLANT (ELEC.)	1.06		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	15.73		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	FHR	0.58		
PLANT - HYDRAULIC	FHR	0.41		
PLANT - HYDRAULIC	FHR	0.37		
PLANT - HYDRAULIC	FHR	0.36		
PLANT - HYDRAULIC	FHR	0.27		
PLANT - HYDRAULIC	FHR	0.56		
PLANT - HYDRAULIC	FHR	0.58		
PLANT - HYDRAULIC	FHR	0.58		
PLANT - HYDRAULIC	FHR	0.54		
PLANT - MECHANICAL	PLANT (MECH.)	292.73		
STORAGE	DOOR STORE	6.04		
STORAGE	STORE	33.62		
TERRACE	STUDENT BAR TERRACE	156.51		

ROOM SCHEDULE - C10A

24/08/2017

Occupant	Name	Area	Room Number	L&T Modality
C10A - BASEMENT MEZZANINE				
BOH	CIRCULATION	140.47		
BOH	CLEANER	7.22		
CIRCULATION	CIRCULATION	77.78		
CIRCULATION	CIRCULATION	10.65		
GRADUATION HALL - BOH	STAGE GALLERY	12.27		
GRADUATION HALL - BOH	A/V ROOM	11.64		
GRADUATION HALL - BOH	GREEN ROOM	10.87		
GRADUATION HALL - BOH	SANITARY FACILITIES	5.98		
PLANT - COMMS	PLANT (COMMS.)	15.54		
PLANT - FIRE	PLANT (FIRE)	37.68		
PLANT - MECHANICAL	PLANT (MECH.)	3.89		
PLANT - MECHANICAL	PLANT (MECH.)	9.43		
BOH	CIRCULATION	10.26		
BOH	PLANT	1.68		
BOH	CIRCULATION	18.48		
CIRCULATION	LOBBY	87.35		
GRADUATION HALL - BOH	SANITARY FACILITIES	41.76		
GRADUATION HALL - BOH	GRADUATION OFFICE	262.11		
GRADUATION HALL - BOH	GRADUATION STORE	106.26		
GRADUATION HALL - BOH	A/V ROOM	71.68		
PLANT - ELECTRICAL	PLANT (ELEC.)	3.24		
PLANT - ELECTRICAL	PLANT (ELEC.)	1.06		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	FHR	0.58		
PLANT - HYDRAULIC	FHR	0.36		
PLANT - MECHANICAL	PLANT (MECH.)	423.80		
PLANT - MECHANICAL	PLANT (MECH.)	10.50		

ROOM SCHEDULE - C10A

24/08/2017

Occupant	Name	Area	Room Number	L&T Modality
C10A - GROUND LEVEL				
BOH	CIRCULATION	18.48		
BOH	CIRCULATION	37.56		
BOH	CLEANER	8.40		
CIRCULATION	CIRCULATION FOH	5.09		
FOOD & BEVERAGE - BOH	SANITARY FACILITIES	57.45		
FOOD & BEVERAGE - BOH	SANITARY FACILITIES	31.75		
FOOD & BEVERAGE - BOH	SANITARY FACILITIES	10.64		
FOOD & BEVERAGE - BOH	SANITARY FACILITIES	10.64		
FOOD & BEVERAGE - FOH	R10	37.66		
FOOD & BEVERAGE - FOH	R05	86.08		
FOOD & BEVERAGE - FOH	R03	59.91		
FOOD & BEVERAGE - FOH	R04	62.55		
FOOD & BEVERAGE - FOH	R09	70.67		
FOOD & BEVERAGE - FOH	R01	76.91		
FOOD & BEVERAGE - FOH	R08	48.34		
FOOD & BEVERAGE - FOH	R06	80.25		
FOOD & BEVERAGE - FOH	R11	63.11		
FOOD & BEVERAGE - FOH	R12	60.90		
FOOD & BEVERAGE - FOH	R02	68.86		
FOOD & BEVERAGE - FOH	R07	81.53		
FOOD & BEVERAGE - FOH	K01	14.52		
FOOD & BEVERAGE - FOH	K02	14.52		
GRADUATION HALL - BOH	ROBE STORE	12.01		
LEARNING & TEACHING - FORMAL	SHOWCASE SPACE	65.97	LG.01	MULTI-MODE
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	1,463.50		
PLANT - COMMS	PLANT (COMMS.)	10.50		
PLANT - ELECTRICAL	PLANT (ELEC.)	1.06		
PLANT - ELECTRICAL	PLANT (ELEC.)	3.24		
PLANT - ELECTRICAL	PLANT (ELEC.)	1.19		
PLANT - FIRE	PLANT (FIRE)	1.73		
PLANT - HYDRAULIC	FHR	0.44		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	FHR	1.44		
PLANT - HYDRAULIC	PLANT (HYDR.)	1.49		
PLANT - HYDRAULIC	FHR	0.56		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	FHR	0.44		
PLANT - MECHANICAL	PLANT (MECH.)	5.89		
PLANT - MECHANICAL	PLANT (MECH.)	3.89		
STORAGE	GRADUATION STORE	9.84		
STORAGE	SHOWCASE SPACE STORAGE	30.77		
TERRACE	TERRACE	2,454.72		

ROOM SCHEDULE - C10A

24/08/2017

Occupant	Name	Area	Room Number	L&T Modality
C10A - GROUND MEZZANINE				
BOH	RISER	462.32		
BOH	RISER	150.52		
BOH	PLANT	17.16		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - MECHANICAL	RISER	20.20		
PLANT - MECHANICAL	RISER	18.48		
PLANT - MECHANICAL	RISER	10.50		
PLANT - MECHANICAL	RISER	3.89		
PLANT - MECHANICAL	RISER	3.24		
C10A - LEVEL 01				
BOH	SANITARY FACILITIES	89.76		
BOH	CIRCULATION	10.47		
BOH	CLEANER	8.40		
FOOD & BEVERAGE - FOH	COFFEE KIOSK	11.34		
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 90 STUDENTS	223.84	L1.14	MULTI-MODE
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 30 STUDENTS	73.83	L1.11B	PROJECT
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 60 STUDENTS	149.62	L1.07	PROJECT
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 90 STUDENTS	239.21	L1.12	MULTI-MODE
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 90 STUDENTS	221.51	L1.09	COLLABORATION
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 90 STUDENTS	221.35	L1.03	WORKPLACE
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 30 STUDENTS	73.83	L1.04B	COLLABORATION
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 60 STUDENTS	149.94	L1.05	COLLABORATION
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 60 STUDENTS	150.72	L1.06	COLLABORATION
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 30 STUDENTS	92.02	L1.04A	PROJECT
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 30 STUDENTS	92.02	L1.11A	COLLABORATION
LEARNING & TEACHING - FORMAL	MAKER SPACE	72.15	L1.10	MAKER SPACE
LEARNING & TEACHING - FORMAL	SHOWCASE SPACE	6.16		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	2,207.77		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.53		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.44		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.44		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.44		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.44		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.45		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.54		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.44		
PLANT - COMMS	PLANT (COMMS.)	10.50		
PLANT - COMMS	PLANT (COMMS.)	10.50		
PLANT - ELECTRICAL	PLANT (ELEC.)	1.45		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.60		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - MECHANICAL	PLANT (MECH.)	20.20		
PLANT - MECHANICAL	PLANT (MECH.)	18.28		
PLANT - MECHANICAL	PLANT (MECH.)	20.22		
PLANT - MECHANICAL	PLANT (MECH.)	9.23		
PLANT - MECHANICAL	PLANT (MECH.)	10.50		
TERRACE	TERRACE	105.23		
TERRACE	TERRACE	161.46		

ROOM SCHEDULE - C10A

24/08/2017

Occupant	Name	Area	Room Number	L&T Modality
C10A - LEVEL 02				
BOH	SANITARY FACILITIES	89.76		
BOH	CIRCULATION	10.47		
BOH	CLEANER	8.40		
FOOD & BEVERAGE - FOH	COFFEE KIOSK	11.34		
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 90 STUDENTS	225.38	L2.09	WORKPLACE
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 60 STUDENTS	149.94	L2.05	FLEXIBLE
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 30 STUDENTS	73.83	L2.01B	FLEXIBLE
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 30 STUDENTS	73.83	L2.08B	PROJECT
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 60 STUDENTS	149.89	L2.14	COLLABORATION
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 60 STUDENTS	149.94	L2.12	COLLABORATION
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 90 STUDENTS	227.34	L2.03	COLLABORATION
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 60 STUDENTS	149.94	L2.07	COLLABORATION
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 30 STUDENTS	92.02	L2.01A	COLLABORATION
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 30 STUDENTS	91.11	L2.08A	LOUNGE
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 60 STUDENTS	150.72	L2.13	LOUNGE
LEARNING & TEACHING - FORMAL	L&T - FORMAL - 60 STUDENTS	150.72	L2.06	FLEXIBLE
LEARNING & TEACHING - FORMAL	MAKER SPACE	72.15	L2.02	MAKER SPACE
LEARNING & TEACHING - FORMAL	SHOWCASE SPACE	6.16		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	2,143.11		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.53		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.53		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.44		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.53		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.53		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.53		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.53		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.44		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.53		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.44		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	7.53		
LEARNING & TEACHING - INFORMAL	L&T - INFORMAL	5.44		
PLANT - COMMS	PLANT (COMMS.)	10.50		
PLANT - COMMS	PLANT (COMMS.)	10.50		
PLANT - ELECTRICAL	PLANT (ELEC.)	1.45		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.60		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - MECHANICAL	PLANT (MECH.)	9.23		
PLANT - MECHANICAL	PLANT (MECH.)	20.20		
PLANT - MECHANICAL	PLANT (MECH.)	10.50		
PLANT - MECHANICAL	PLANT (MECH.)	18.28		
PLANT - MECHANICAL	PLANT (MECH.)	20.22		
TERRACE	TERRACE	30.30		
TERRACE	TERRACE	122.03		

ROOM SCHEDULE - C10A

24/08/2017

Occupant	Name	Area	Room Number	L&T Modality
C10A - LEVEL 03				
BOH	PLANT	1,711.83		
BOH	CIRCULATION	10.47		
BOH	CIRCULATION	9.23		
BOH	CIRCULATION	9.23		
PLANT - COMMS	PLANT (COMMS.)	10.50		
PLANT - COMMS	PLANT (COMMS.)	10.50		
PLANT - ELECTRICAL	PLANT (ELEC.)	1.45		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.60		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - HYDRAULIC	PLANT (HYDR.)	0.49		
PLANT - MECHANICAL	PLANT (MECH.)	9.23		
PLANT - MECHANICAL	PLANT (MECH.)	20.20		
PLANT - MECHANICAL	PLANT (MECH.)	10.50		
PLANT - MECHANICAL	PLANT (MECH.)	8.55		
PLANT - MECHANICAL	PLANT (MECH.)	10.50		
		22,360.64		

Appendix D

Public Realm Bin Station Locations



STATUS

FOR INFORMATION

NOTES

Check all dimensions and site conditions prior to commencement of any work, the purchasing or ordering of any materials, fitting, plant services or equipment and the fabrication of any components.

Do not scale drawings - refer to figured dimensions only. Any discrepancies shall immediately be referred to the landscape architect for clarification.

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WARNING

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Services shown on this drawing are approximate only. The exact location is to be confirmed on site by contractor prior to commencement of work.

REV	DATE	AMENDMENTS
A	09/03/2017	FOR COSTING
B	16/03/2017	FOR INFORMATION
C	31/08/2017	FOR INFORMATION
D	12/09/2017	FOR INFORMATION
E	13/09/2017	FOR INFORMATION
F	14/09/2017	FOR INFORMATION

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CLIENT

Macquarie University
Sydney
NSW 2019

PROJECT

Macquarie University
Central Courtyard Precinct

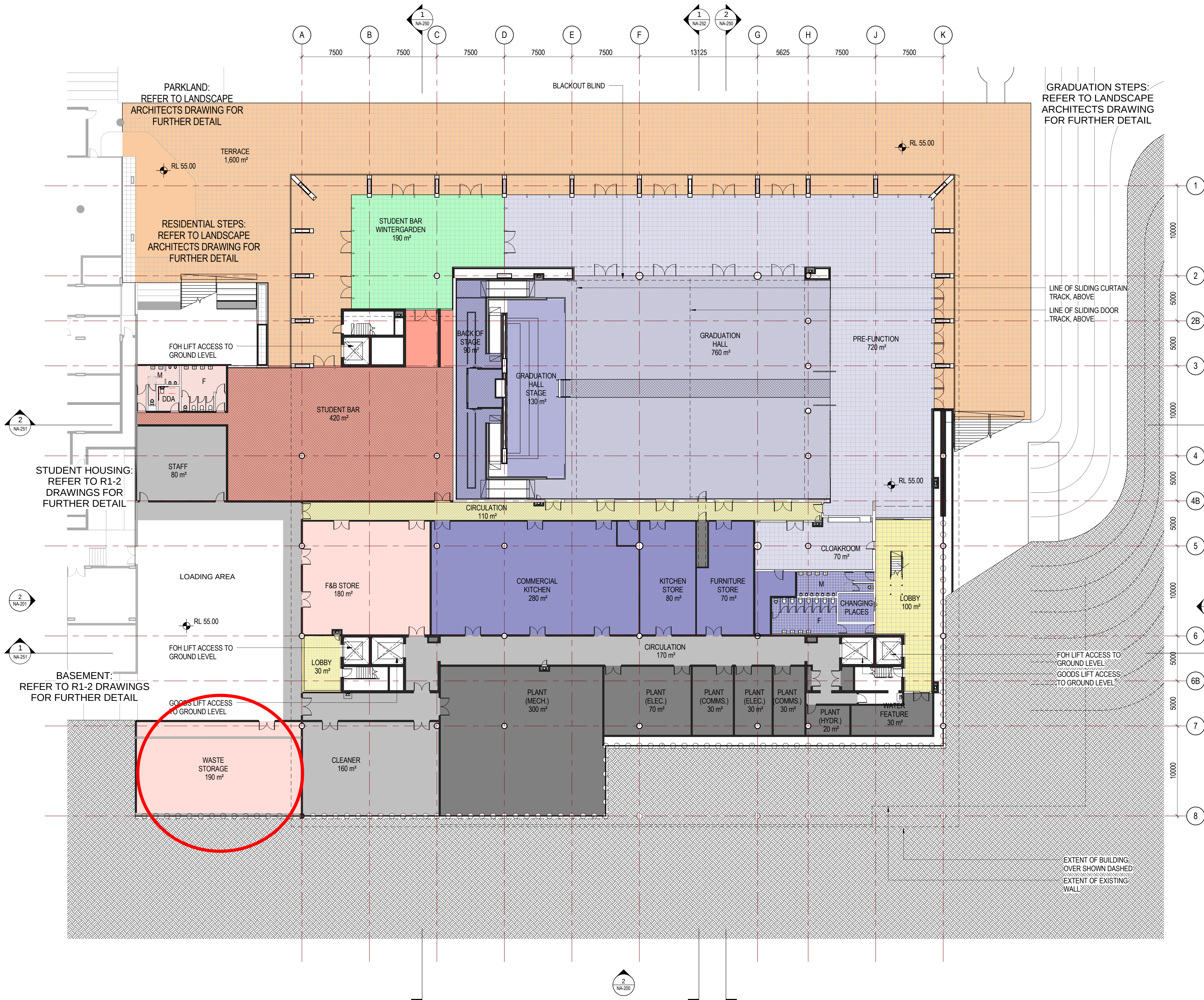
DRAWING

MCCP Site Plan
PRELIMINARY SSDA BOUNDARY

DRAWN	CHECKED	SCALE @ A1
MD	NB CW	1:500
DRAWING NO.	REVISION	
ALL-MCCP-LA-SSDA-NA	F	

Appendix E

Architectural Drawings



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issue	amendment	date
A	ISSUED FOR SSDA	29.09.2017

LEGEND

- BOH
- CIRCULATION
- FOOD & BEVERAGE - BOH
- FOOD & BEVERAGE - FOH
- GRADUATION HALL
- GRADUATION HALL - BOH
- GRADUATION HALL - FOH
- GRADUATION HALL STAGE
- PLANT - COMMS
- PLANT - ELECTRICAL
- PLANT - HYDRAULIC
- PLANT - MECHANICAL
- SHARED SEATING
- STORAGE
- TERRACE

consultant

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client

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scale bar

1:200 @ A1
1:400 @ A3

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project

**MUCCP - Stage 05A:
Central Courtyard Learning &
Teaching Centre**

drawing

DA Plan - Basement Level Lower

scale 1 : 200@A1 project no 140423.00

drawing no. **S5a-1 CC-AR-DA-B1-100**

checked TM issue

drawn JS

A

27/09/2017 2:55:43 PM



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issue	amendment	date
A	ISSUED FOR SSDA	29/09/2017

LEGEND

	BASEMENT
	PLANT
	BOH
	Circulation
	Residential Amenities
	Public Amenities

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MACQUARIE UNIVERSITY
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scale bar
0 2 4 6 8 10 m

North Arrow

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Sydney Melbourne Adelaide Auckland Christchurch Brisbane Shanghai

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project

MUCCP - Student Accommodation R1&R2

drawing

Plan - Basement 1

drawing no.

S5b-1_CC-AR-DA-B1- 100

scale

1 : 200@A1

drawn

KW/RIC

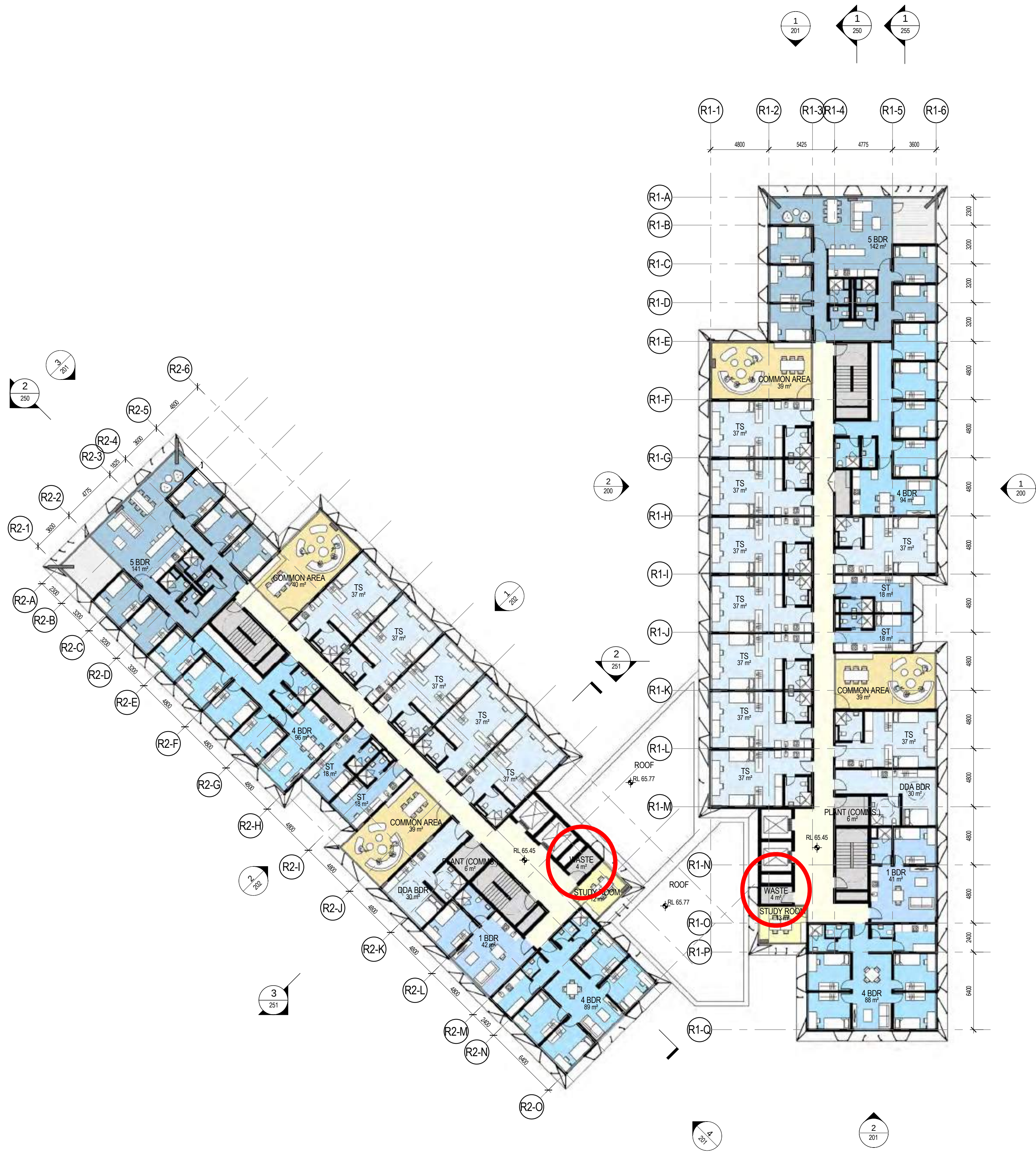
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RIC

project no

140423.00

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issue	amendment	date
A	ISSUED FOR SSDA	29/09/2017

LEGEND

- Residential - Studio
- Residential - DDA
- Residential - Twin Share
- BOH
- Circulation
- Residential - 1 Bed
- CommonArea
- StudyRoom
- Residential - 4 Bed A
- Residential - 4 Bed B
- Residential - 5 Bed

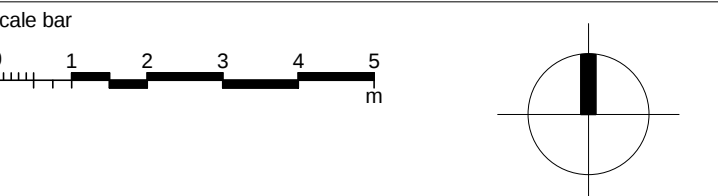
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project

**MUCCP - Student
Accommodation R1&R2**

drawing

Plan - Level 1

drawing no.

S5b-1_CC-AR-DA-L1- 103

scale

1 : 200@A1

drawn

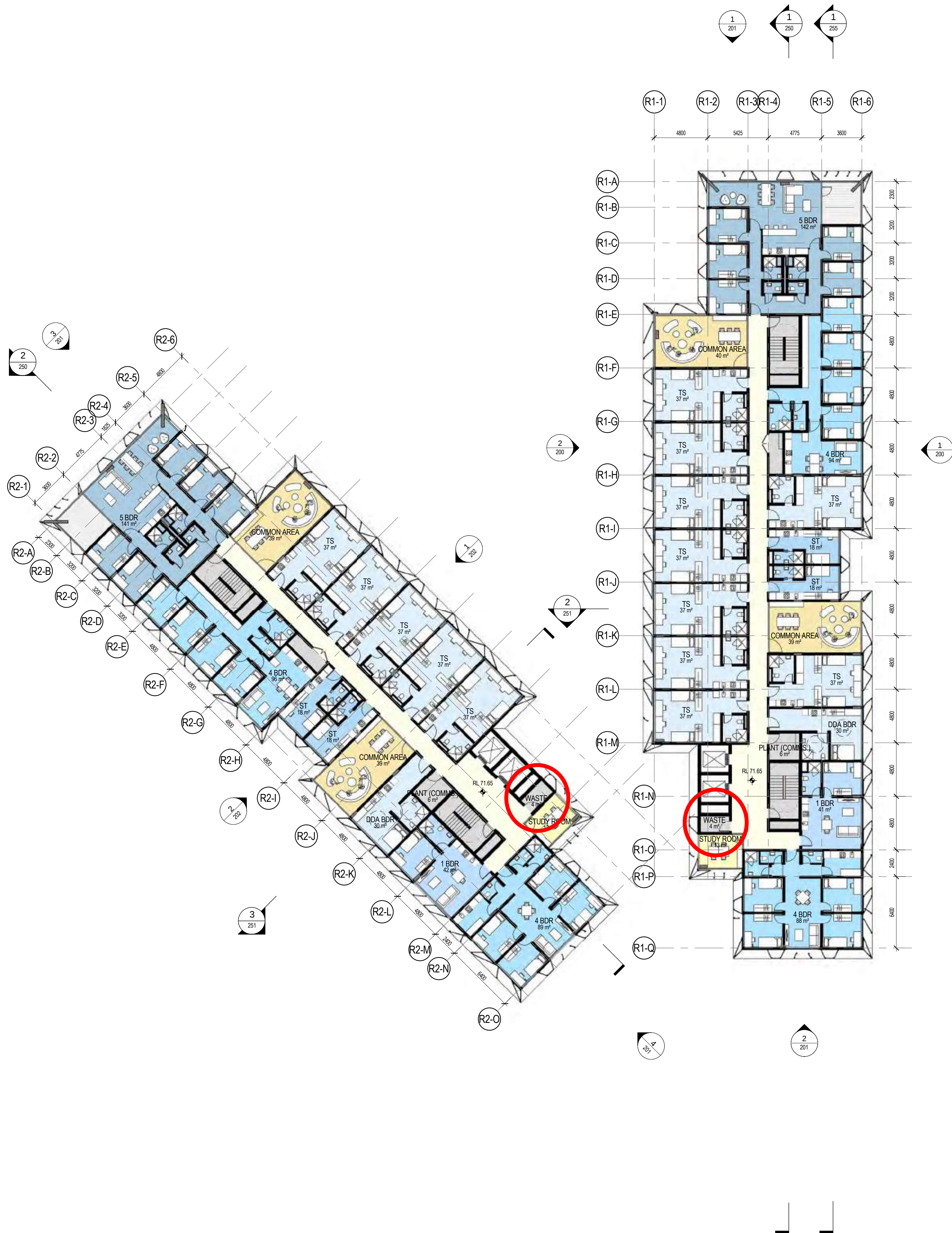
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checked

RIC

project no.

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issue	amendment	date
A	ISSUED FOR SSDA	29/09/2017

LEGEND

- Residential - Studio
- Residential - DDA
- Residential - Twin Share
- BOH
- Circulation
- Residential - 1 Bed
- CommonArea
- StudyRoom
- Residential - 4 Bed A
- Residential - 4 Bed B
- Residential - 5 Bed

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scale bar

0 2 4 6 8 10
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ONE CENTRL
COURTYARD
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**MUCCP - Student
Accommodation R1&R2**

drawing

Plan - Level 3

drawing no.

S5b-1_CC-AR-DA-L3- 105

scale

1 : 200@A1

drawn

KW/RIC

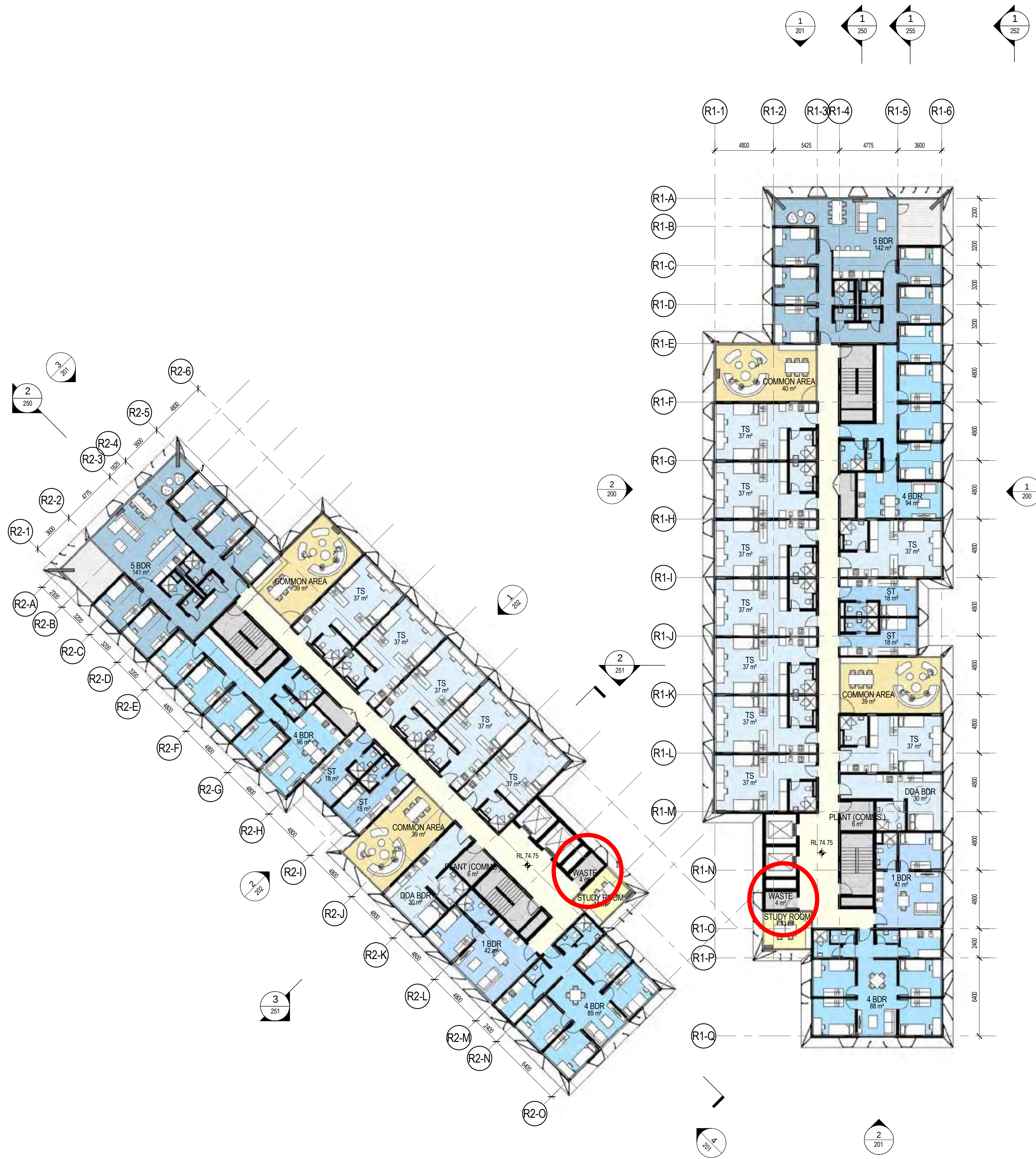
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Certified

issue	amendment	date
A	ISSUED FOR SSDA	29/09/2017

LEGEND

- Residential - Studio
- Residential - DDA
- Residential - Twin Share
- BOH
- Circulation
- Residential - 1 Bed
- CommonArea
- StudyRoom
- Residential - 4 Bed A
- Residential - 4 Bed B
- Residential - 5 Bed

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project

**MUCCP - Student
Accommodation R1&R2**

drawing

Plan - Level 4

drawing no.

S5b-1_CC-AR-DA-L4- 106

scale

1 : 200@A1

drawn

KW/RIC

checked

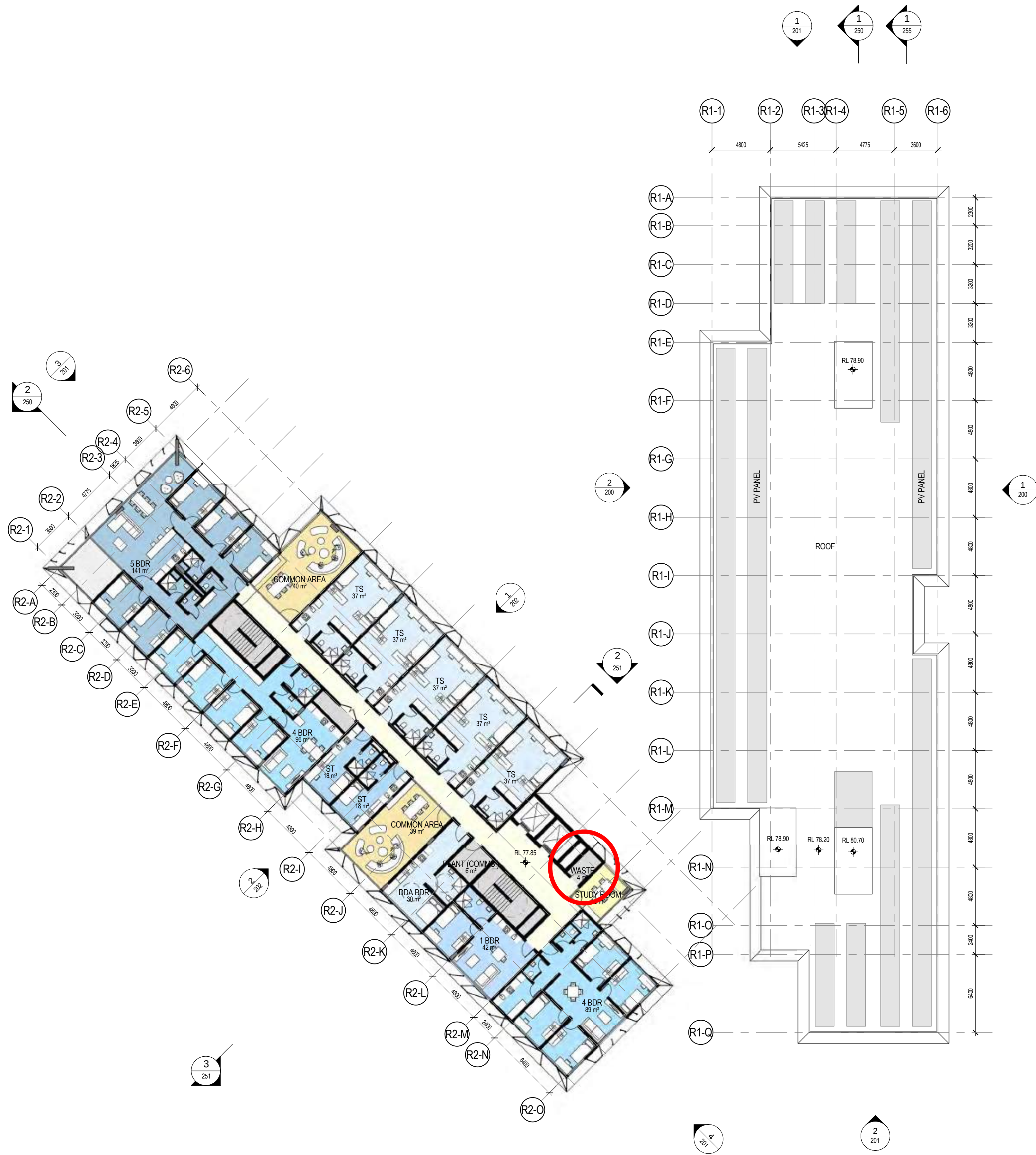
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2015
Certified

issue	amendment	date
A	ISSUED FOR SSDA	29/09/2017

LEGEND

- Residential - Studio
- Residential - DDA
- Residential - Twin Share
- BOH
- Circulation
- Residential - 1 Bed
- CommonArea
- StudyRoom
- Residential - 4 Bed A
- Residential - 4 Bed B
- Residential - 5 Bed

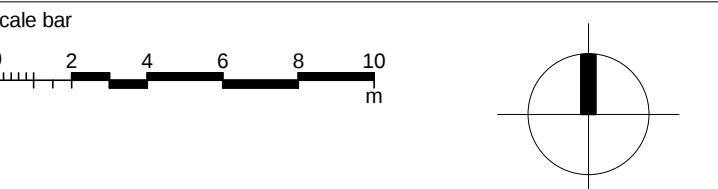
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ABN 90 131 245 684

project

**MUCCP - Student
Accommodation R1&R2**

drawing

Plan - Level 5

drawing no.

S5b-1_CC-AR-DA-L5- 107

scale

1 : 200@A1

drawn

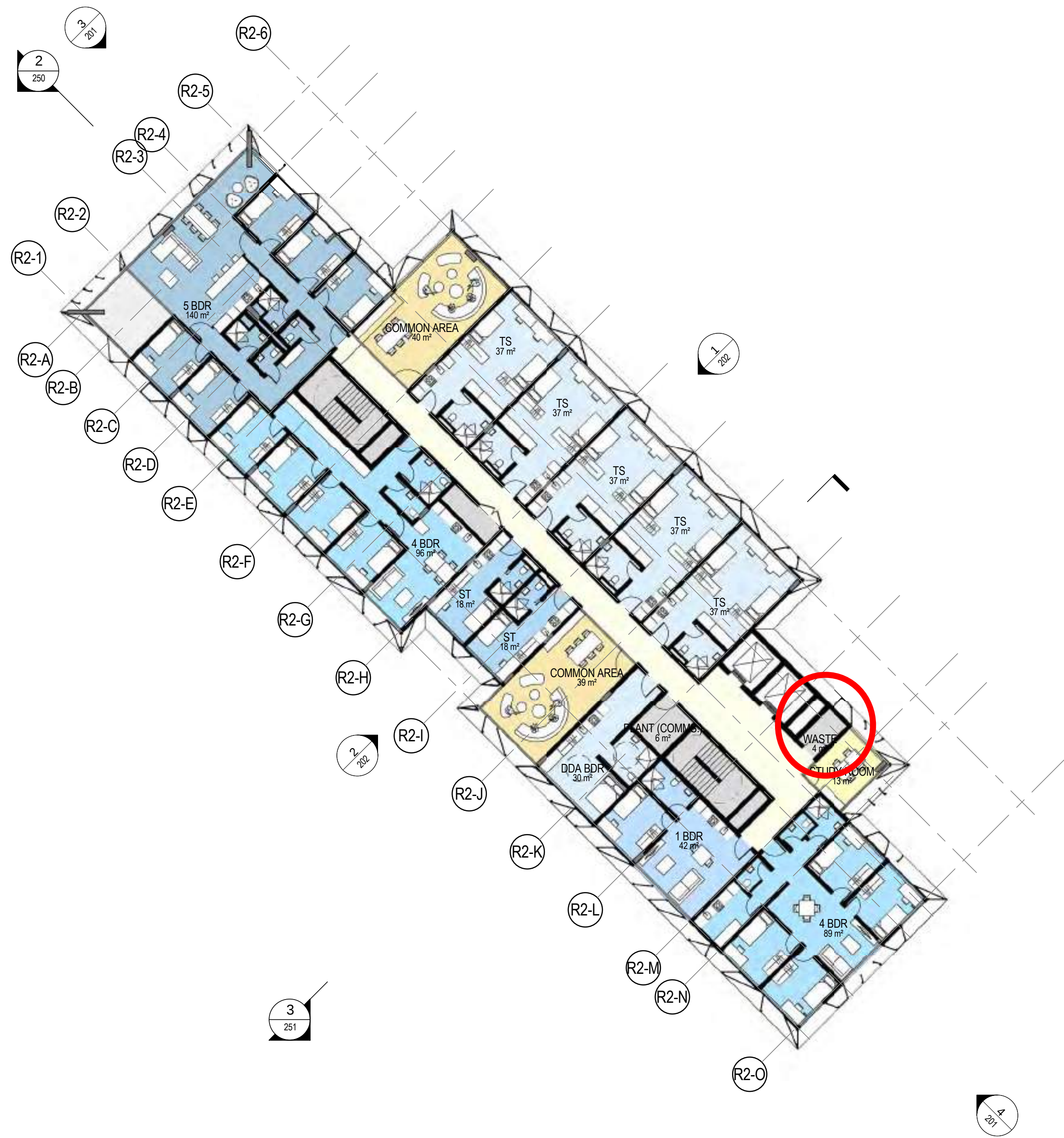
KW/RIC

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RIC

project no.

140423.00



ONE CENTRAL
COURTYARD
SHOWN DASHED

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Do not scale drawings.
Verify all dimensions on site



issue	amendment	date
A	ISSUED FOR SSDA	29/09/2017

LEGEND

- Residential - Studio
- Residential - DDA
- Residential - Twin Share
- BOH
- Circulation
- Residential - 1 Bed
- CommonArea
- StudyRoom
- Residential - 4 Bed A
- Residential - 4 Bed B
- Residential - 5 Bed

consultant

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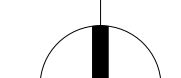
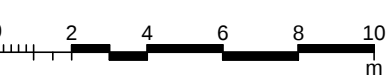
client

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project

**MUCCP - Student
Accommodation R1&R2**

drawing

Plan - Level 6

drawing no.

S5b-1_CC-AR-DA-L6- 108

scale

1:200@A1

drawn

KW/RIC

checked

RIC

issue

project no

140423.00

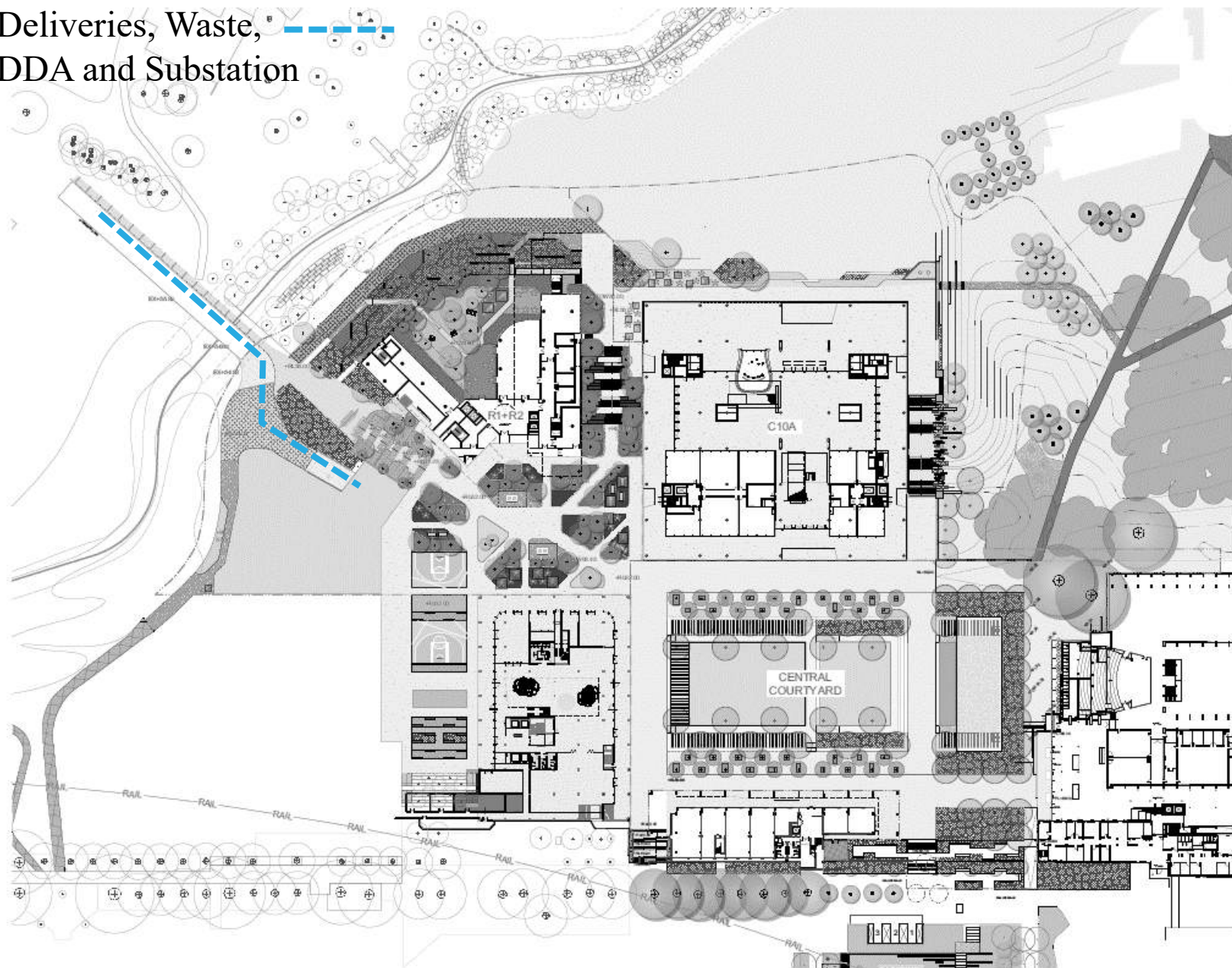
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Appendix F

Collection Vehicle Access Point

Deliveries, Waste, DDA and Substation



10/0000

FOR INFORMATION

Check all dimensions and site conditions prior to any construction of any work, and the client is responsible for any and all costs incurred. If any work is carried out, the client is responsible for any and all costs incurred.

Do not make any changes to the site conditions without the written consent of the client. Any changes to the site conditions without the written consent of the client are at the client's risk.

The drawings are not to be used for any purpose other than that for which they were prepared.

BEFORE YOU DIG

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NO.	DATE	DESCRIPTION
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20	10/0000	FOR CONSTRUCTION

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NSW 2019

PROJECT
Macquarie University
Central Courtyard Precinct

MCCP Site Plan
PRELIMINARY SSDA BOUNDARY

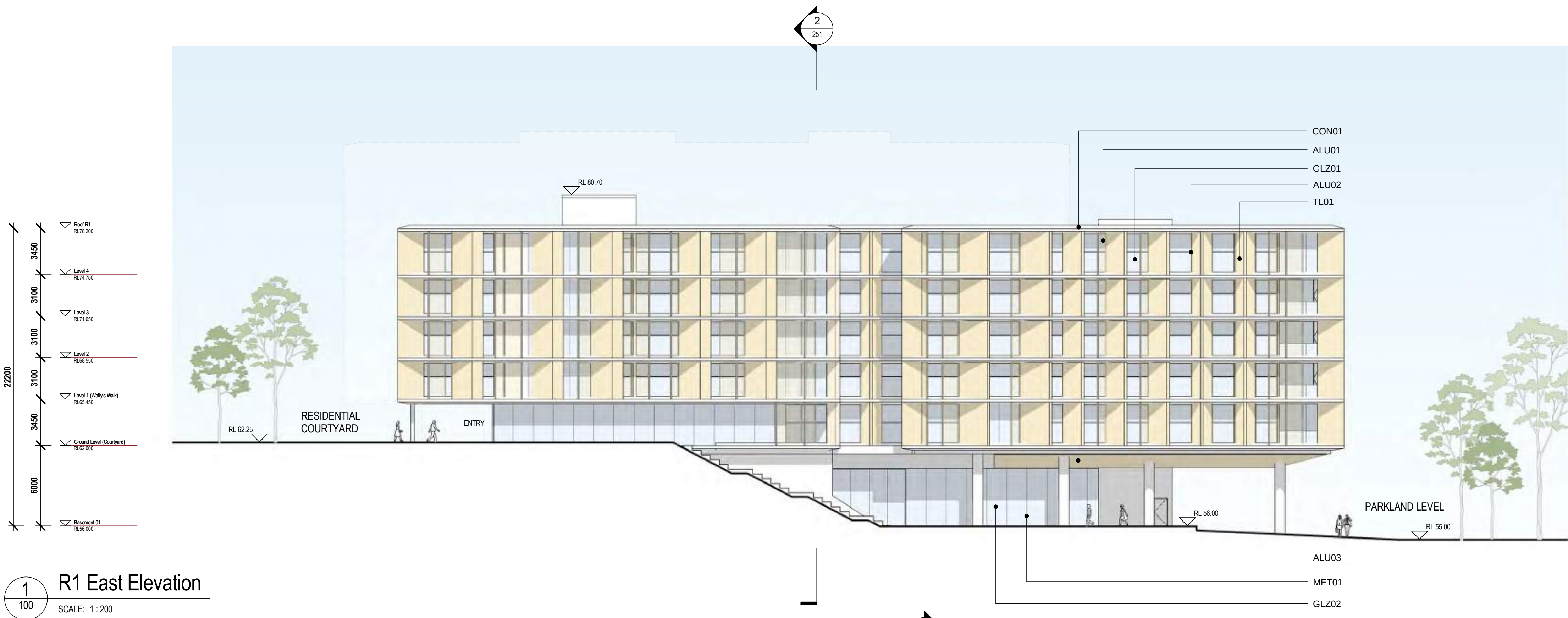
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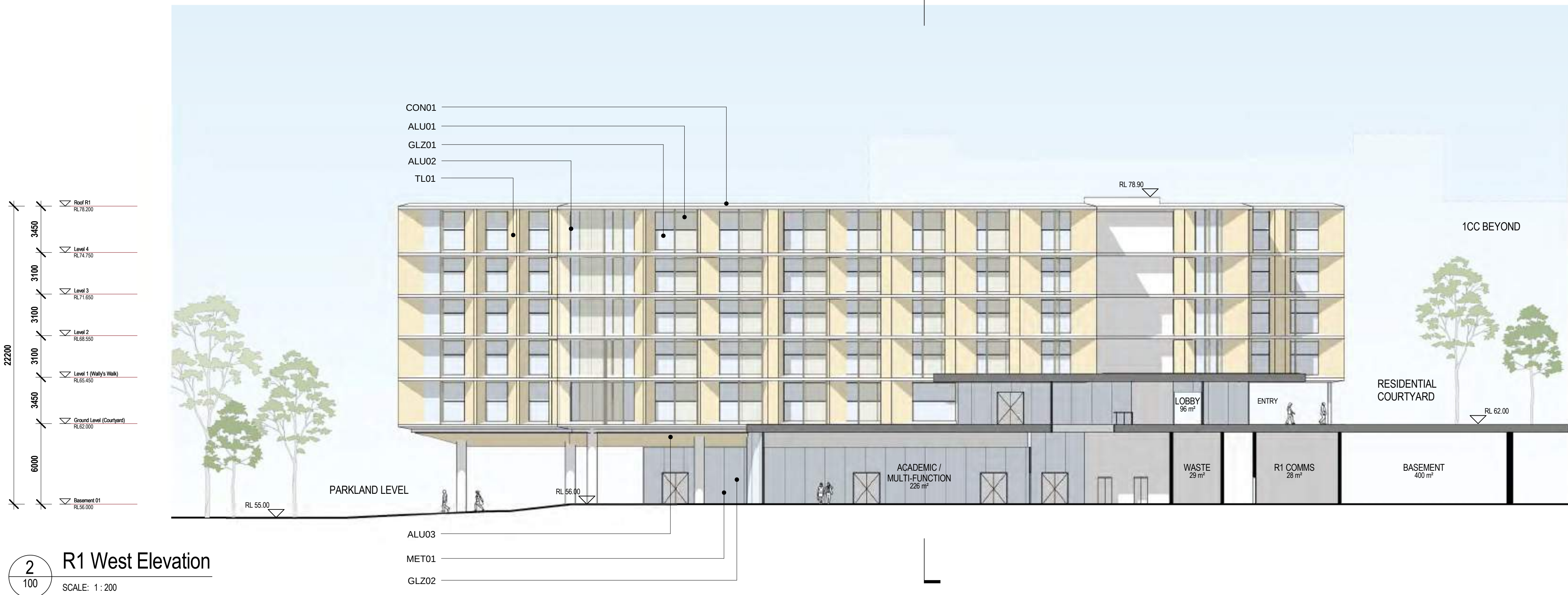
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Appendix G

Basement Height



1 R1 East Elevation
SCALE: 1:200



2 R1 West Elevation
SCALE: 1:200

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Do not scale drawings. Verify all dimensions on site.

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issue	amendment	date
A	ISSUED FOR SSDA	29/09/2017

- MATERIAL LEGEND
- ALU01 PERFORATED ALUMINIUM
 - ALU02 DARK BRONZE ALUMINIUM
 - ALU03 COMPOSITE PANEL
 - CON01 PRECAST CONCRETE
 - GLZ01 CLEAR GLASS, ALUMINIUM FRAME (ALU02)
 - GLZ02 CLEAR GLASS, STEEL FRAME (MET01)
 - MET01 CHARCOAL STEEL
 - TL 01 CERAMIC / MASONRY COMPOSITE PANEL

consultant

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ABN 90 131 245 684

project

MUCCP - Student
Accommodation R1&R2

drawing

Elevations - R1 East/ West

drawing no.

S5b-1_CC-AR-DA-NA- 200

scale

1: 200@A1

drawn

KW/RIC

checked

RIC

project no

140423.00

ISSUE

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