POWERHOUSE PARRAMATTA
ENVIRONMENTAL IMPACT STATEMENT

APPENDIX BB
OPERATIONAL WASTE MANAGEMENT PLAN

Arup

NSW GOVERNMENT

Infrastructure NSW

Powerhouse Precinct Parramatta

Powerhouse SSDA report – Operational Waste Management Plan

PMH-ARP-REP-WS-0003

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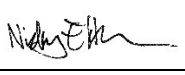
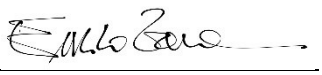
		Signature			
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Contents

1 Introduction

This report supports a State Significant Development (SSD) Development Application (DA) for the development of the Powerhouse Parramatta at 34-54 & 30B Phillip Street and 338 Church Street, Parramatta. The Powerhouse Parramatta is a museum (information and education facility) that has a capital investment value in excess of $30 million and as such the DA is submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Infrastructure NSW is the proponent of the DA.

2 Background

The Powerhouse is Australia's contemporary museum for excellence and innovation in applied arts and sciences. The museum was established in 1879 in the Garden Palace which emerged from a history of 19th Century grand exhibition halls, including the Grand Palais. It currently encompasses the Powerhouse in Ultimo, Sydney Observatory in The Rocks and the Museums Discovery Centre in Castle Hill. The Powerhouse has occupied the Ultimo site since 1988.

Parramatta, in the heart of Western Sydney, is entering a period of rapid growth. It was identified in 2014's *A Plan for Growing Sydney* as the metropolis' emerging second Central Business District, with the provision of supporting social and cultural infrastructure regarded as integral to its success. The strategic importance of Parramatta as an economic and social capital for Sydney has been subsequently reinforced and further emphasised through its designation as the metropolitan centre of the Central City under the *Greater Sydney Region Plan*.

Powerhouse Parramatta will be the first State cultural institution to be located in Western Sydney – the geographical heart of Sydney. In December 2019, the Government announced the winning design, by Moreau Kusunoki and Genton, for the Powerhouse Parramatta from an international design competition.

Powerhouse Parramatta will establish a new paradigm for museums through the creation of an institution that is innately flexible. It will become a national and international destination renowned for its distinctive programs driven by original research and inspired by its expansive collections. It will be a place of collaboration, a mirror of its communities forever embedded in the contemporary identity of Greater Sydney and NSW.

3 Site Description

The site is located at the northern edge of the Parramatta CBD on the southern bank of the Parramatta River. It occupies an area of approximately 2.5 hectares and has extensive frontages to Phillip Street, Wilde Avenue and the Parramatta

River. A small portion of the site extends along the foreshore of the Parramatta River to the west, close to the Lennox Street Bridge on Church Street. The site boundary is identified in Figure 1 and Figure 1. The site excludes the GE Office Building at 32 Phillip Street.

The site is currently occupied by a number of buildings and structures, including:

- Riverbank Car Park – a four-level public car park;
- Willow Grove – a two-storey villa of Victorian Italianate style constructed in the 1870s
- St George's Terrace – a two-storey terrace of seven houses fronting Phillip Street constructed in the 1880s
- 36 Phillip Street – a two-storey building comprising retail and business premises;
- 40 Phillip Street – a two-storey building comprising retail and business premises; and
- 42 Phillip Street – a substation building set back from the street

The immediate context of the site comprises a range of land uses including office premises, retail premises, hotel, serviced apartments and residential apartments. To the north is the Parramatta River and open space corridor, beyond which are predominately residential uses. The Riverside Theatre is located to the north-west across the Parramatta River.

Figure 1 - Aerial photograph of the site and its context

Source: Mark Merton Photography

Figure 2 - Site boundary, key existing features, and immediate local context

Source: Ethos Urban

4 Overview of Proposed Development

The Powerhouse was established in 1879, and Powerhouse Parramatta will radically return to its origins through the creation of seven presentation spaces of extraordinary scale that will enable the delivery of an ambitious and constantly changing program that provides new levels of access to Powerhouse Collection. The Powerhouse will set a new international benchmark in experiential learning through the creation of an immensely scaled 360-degree digital space, unique to Australia.

Powerhouse Parramatta will reflect the communities and cultures of one of Australia's fastest growing regions. It will hold First Nations culture at its core and set a new national benchmark in culturally diverse programming. The Powerhouse will be highly connected through multiple transport links,and integrate into the fine grain of the city.

Powerhouse Parramatta will be an active working precinct and include the Powerlab, which will enable researchers, scientists, artists and students from across regional NSW, Australia and around the world to collaborate and

participate in Powerhouse programs. The Powerlab will feature digital studios to support music and screen industries alongside co-working spaces, life-long learning and community spaces. Integrated into the Powerlab will be a research kitchen and library that will support a NSW industry development program including archives and oral histories.

This application will deliver a new cultural institution for Parramatta in the heart of Sydney's Central City. The SSD DA seeks consent for the delivery of the Powerhouse Paramatta as a single stage, comprising:

- site preparation works, including the termination or relocation of site services and infrastructure, tree removal and the erection of site protection hoardings and fencing;
- demolition of existing buildings including the existing Riverbank Car Park, 'Willow Grove', 'St George's Terrace' and all other existing structures located on the site;
- construction of the Powerhouse Paramatta, including:
    - front and back-of-house spaces;
    - seven major public presentation spaces for the exhibition of Powerhouse Collection;
    - front and back-of-house spaces;
    - studio, co-working and collaboration spaces comprising the 'Powerlab', supported by 40 residences (serviced apartments) for scientists, researchers, students and artists, and 60 dormitory beds for school students;
    - education and community spaces for staff, researchers and the Powerlab residents, the community, and education and commercial hirers;
    - commercial kitchen comprising the 'Powerlab Kitchen' used for cultural food programs, research, education and events.
    - film, photography, and postproduction studios that will connect communities with industry and content that will interpret the Powerhouse Collection;
    - public facing research library and archive for community, industry, students and researchers to access materials; and
    - a mix of retail spaces including food and drink tenancies with outdoor dining.
- operation and use of the Powerhouse Parramatta including use of the public domain provided on the site to support programs and functions;
- maintenance of the existing vehicular access easement via Dirrabarri Lane, the removal of Oyster Lane and termination of George Khattar Lane, and the provision of a new vehicular access point to Wilde Avenue for loading;

- public domain within the site including new public open space areas, landscaping and tree planting across the site; and
- building identification signage.

The project does not seek consent for the carrying out of works outside of the site boundary, and in particular does not involve any alterations to the existing edge of the formed concrete edge of the Parramatta River or to the waterway itself.

5 Assessment Requirements

The Department of Planning, Industry and Environment have issued Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report addresses relevant SEARs requirements as follows:

SEAR	Where Addressed
13. Servicing and Waste The EIS shall:	
• identify, quantify and classify the likely waste streams to be generated during construction and operation of the development and describe the measures to be implemented to minimise, manage, reuse, recycle and safely dispose of this waste with reference to relevant guidelines; and	Section 8
• identify appropriate servicing arrangements (including but not limited to, waste management, loading zones and mechanical plant) for the site.	Section 11

Table 1 - SEARs requirements for proposed Powerhouse-Paramatta development

6 Legislation, policy and guidelines

6.1 NSW legislation and policy

6.1.1 The Protection of the Environment Operations Act, 1997 (NSW)

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.

6.1.2 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 (WARR Act) 2001, superseding the Waste Minimisation and Management Act 1995 following its five-year review.

The objective 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).

A Waste management plan is a requirement for all new developments in NSW and must be 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 main objective of the Act:

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

6.1.3 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.

6.1.4 Waste Avoidance and Resource Recovery Strategy 2014– 2021

The NSW Waste and Resource Recovery Strategy 2014-2021 was released in December 2014. 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%.

6.1.5 The NSW 20-year waste strategy

The NSW 20-Year Waste Strategy is still in development and discussions with stakeholders are still ongoing. The strategy is a whole-of-government initiative to provide a long-term strategic direction for communities, industry and for all levels of government to work together to build resilient services and markets for waste resources.

This strategy relates to the proposed development's sustainability objectives, because its supports NSW's realisation of a circular economy in which resources are valued by keeping products and materials in use for as long as possible. The strategy also recognises shifts that are taking place in the domestic and global waste markets and aims to provide the industry with certainty, goals and incentives. The guiding principles of the strategy revolve around three focus areas which are

- Sustainability
- Reliability
- Affordability

6.2 Local government requirements

6.2.1 City of Paramatta Development Control 2011

The City of Paramatta, Development Control Plan (DCP) 2011 does not apply to the project directly since it is a SSDA but it has been referenced in this instance because it provides detailed guidelines on waste management for all developments within the local government area. City of Parramatta council considers the management of waste as of high importance for the protection and enhancement of both the natural and built environments. The council also recognises wastes as a valuable resource because of the potential to reuse, recycle and recover resources from the various waste streams.

Part 3.3.7 of the Council's DCP outlines the waste management objectives and requirements for Development Applications (DA)within the City of Paramatta. All DAs to which Part 3.3.7 applies must be accompanied by a Waste Management Plan (WMP), that includes location and design details of waste storage facilities of the proposed development. The waste management plan must be developed according to current best practise and the councils *Waste Management Guidelines for new Development Applications 2016* document, listed as Appendix 8 of the Council's DCP. Key requirements for submissions include:

- Details of expected volumes and types of waste to be generated
- Details of how waste will be stored on site, including provisions for the separation of waste streams
- Details of how ongoing management of waste will be conducted.

- Details on location and design of the waste storage room, that should be able to accommodate all waste generated on the premises and allow for separation of waste streams.

There are other numerous requirements specified within the Council's DCP however this is a SSDA and the DCP does not apply; relevant sections have been addressed where applicable.

6.3 Green star requirements

This proposed development will be pursuing green star accreditation and it is anticipated that the project will pursue the new "green star for new buildings" tool to be released in June 2020. Key highlights and changes of the new tool compared with previous versions will be on:

- Recognition of organic wastes as a separate and collectable waste stream.
- Introduction of waste generation targets
- Introduction of cleaning contracts for waste service providers
- Storage room size provisions to cater for at least two-day's volume of wastes as a minimum

There are other changes expected from the new tool and this plan will be modified where applicable to address all the requirements.

7 Targets, monitoring and measurement

7.1 Targets

The Powerhouse Paramatta building aims to set an exemplary sustainability standard and as a result waste related targets have been set to ensure continuous improvement of waste segregation and recycling.

The Powerhouse Paramatta building will adopt a **landfill diversion target of 75%** and a **recycling rate of 70%** for operational waste, in line with the NSW Waste Avoidance and Resource Recovery Strategy 2014-21. Due to the nature of the new build, there are no historical landfill diversion rates and recycling rates available for comparison.

The baseline data for these targets will be sourced from bin weights collected by the nominated waste service provider for the development. The onsite Building manager will calculate the diversion rate based on data provided by the waste service provider. The landfill diversion rate shall be calculated as follows:

$$\frac{total\ waste\ (\mathrm{t}) - landfill\ waste\ (\mathrm{t})}{total\ waste\ (\mathrm{t})} \times 100\%$$

7.2 Monitoring and measurement

Data pertaining to waste generation and the end-destination for Powerhouse-Paramatta buildings will be collected, collated and recorded by the waste service provider to ensure best practice monitoring procedures and reports will be provided to the Building's manager at the agreed intervals. This data will help building management measure their progress towards achieving the set waste targets.

High quality waste data improves the overall level of accuracy, transparency of, and confidence in, the waste management plan. It enables meaningful and accurate comparisons and benchmarking to be conducted.

Good waste data will also inform strategic resource planning and provide insight into equipment and operational efficiency as well as ensuring accuracy of invoicing and fees. The Powerhouse buildings can achieve greater resource recovery by accurately measuring waste data to be used later for performance analysis.

7.2.1 Operational waste data

The waste service provider for the Powerhouse-Paramatta must adhere to this WMP and comply with minimum operational safety standards. The waste service provider must be able to attribute a weight to each bin collected and the wastes must be weighed according to the individual waste stream with evidence regarding the integrity of the scales/meters used. Weight must be recorded in an agreed format and forwarded on to building management at the close of each invoicing period or as agreed.

The parameters for contamination should be outlined by the waste service provider in accordance with their own accepted contamination rates. Where the waste service provider observes significant contamination in any of the bins, that bin must be weighed and reported as a 'contamination incident'. The contents in the contaminated bin must then be disposed of as general waste and the incident reported to building management.

The waste service provider must supply equipment (bins, signage/stickers etc.) that is colour-coded in accordance with the Australian Standard 4123.7 and as approved by the building manager. The waste service provider must ensure that collection services are done according agreed periods and when necessary to ensure the bins are not greater than three quarters full, and to maintain a hygienic and odour free environment.

7.2.2 Contamination audit

A site-specific contamination audit of each recycling stream is to be conducted annually. The purpose of this audit will be to assess efficiency of the precinct separation systems and levels of contamination. This audit may be conducted or overseen by an independent competent person.

For at least two consecutive collections, the contents of the sample are to 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.

$$\text{Contamination rate} = \frac{\text{Total mass of "non-acceptable" items}}{\text{Total mass of sample wastes}} \times 100$$

Where contamination level is deemed as unacceptable, the building management should seek to address this issue as soon as possible with stakeholders and tenants e.g. through educational or other means deemed necessary.

7.2.3 Reporting

The waste service provider is to issue periodic waste reports e.g. on a monthly or quarterly basis, to building management that includes:

- A list quantifying the amount and types of waste generated at the Powerhouse precinct for the period.
- A list of contamination incidents including the masses of contaminated bins.

8 Construction wastes

8.1 Waste streams

Management of construction and demolition waste for this development shall be the responsibility of the Contractor, including tracking of quantities and end-destination of all waste during the construction phase. SEARs requirements for construction wastes are dealt with in the Construction Management Plan prepared by Aver. Demolition and construction work for this development are to take place with consideration of the project's Green Star pathway 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 and demolition phase is to reduce the generation of waste as far as possible, and ensure the highest possible proportion of unavoidable waste is recycled or reused. The target for construction and demolition waste diversion from landfill will be 90% or higher.

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

8.2 Management

Waste generation and management during the construction and demolition 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 and demolition, 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 and demolition waste,
- Separated sorting of construction and demolition waste, and
- Removal of construction and demolition for re-use, recycling 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 are licensed to handle the material it is designated to carry.

As a requirement of Green Star, the construction contractor will develop a CWMP in order to ensure that construction waste is minimised and diverted from landfill wherever possible.

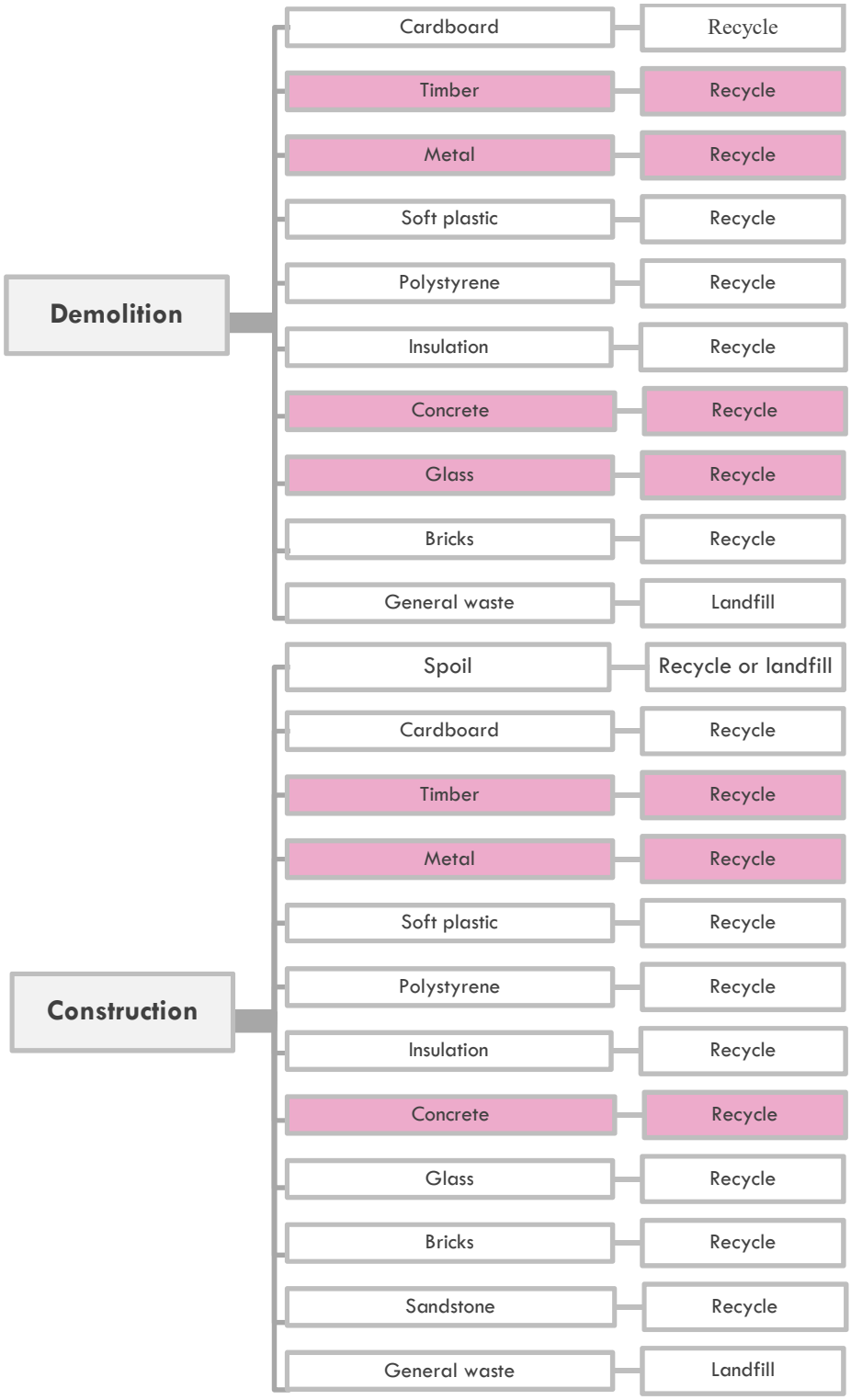

Figure 3 - Overview of expected construction and demolition waste streams

9 Operational wastes

This section includes an overview of likely waste streams to be generated during operation of the buildings, details on their segregation and their estimated volumes. Waste streams for this development will include general wastes, co-mingled recyclables, cardboard and paper, and food organics. Source separation and contamination avoidance will be key to the success of the precinct's waste management strategy. The waste management strategy aims to achieve targets outlined in section 7.1, through diverting as much wastes as possible from landfill and sending it to recycling and resource recovery facilities.

9.1 Operational waste streams

The waste streams which will be generated during operation of the proposed development are summarised in table 2 below

Waste streams	Operational areas
General Waste	Entire building, public realm
Paper and cardboard recycling	Entire building,
Organics	Entire building, public realm
Co-mingled recyclables	Entire building, public realm
Hard bulky waste	Entire building, BOH, maintenance space
Polystyrene	Markets, retail, BOH
Liquid wastes	Kitchens, Canteens
Printer cartridges/ e waste etc.	Learning space, office spaces
Chemical waste	Chemical storage

Table 2 - Waste streams per operational area

Other waste streams are unable to be estimated as metrics do not exist at present due to their small volumes or infrequent occurrence. Paper and card will be estimated though using assumptions on composition and diversion of co-mingled recycling.

9.2 Waste generation rates

Waste volumes for the proposed development have been estimated in order to determine waste storage and collection requirements. They have been calculated according to the appropriate waste generation rates and total gross floor area (GFA) of each space. The City of Paramatta guidelines 2011 do not have waste generation rates for commercial developments similar to this project. Therefore, waste generation estimates from the *"City of Sydney,(2019) Guidelines for Waste Management in New development"* will be used as they are most relevant to the

project in the CBD context and include estimates on food organics[1]. The building spaces for the proposed development are quite unique and consideration of which waste generation rates to use was largely reliant on similarities of space uses, with the spaces outlined in the City of Sydney's waste guide line being the most relevant.

The waste generation rates which are applicable to this development are shown below in Table 3.

Powerhouse space	**Area Schedule in m²**	**Applicable space type**	**Expected Litres per 100m² per day**		
			General waste	**Recyclable wastes**	**Food waste**
Amenities/ Education/ Staff area/ BOH	7,374	Commercial Office	15	25	5
Presentation Space / FOH	17,489	Commercial Office	15	25	5
Residential area	1,248	Hotel	20	25	15
Retail	1,555	Supermarket	75	450	25

Table 3 - Powerhouse-Paramatta waste generation rates based on City of Sydney 2019 rates

9.3 Daily waste generation estimates

Estimates of total daily waste generation estimates for the spaces within the development are summarised below in table 4.

[1] The City of Sydney rates have also been selected because they are the most relevant to the development's space use and most recent waste generation rates released comparing with other councils.

Powerhouse Space	General waste (L/day)	Co-mingled Recycling (L/day)	Paper and Card (L/day)	Food Organics (L/day)
Amenities/BOH Education/ Staff area	1,106.1	69	1,774.5	368.7
Presentation Space / FOH circulation & other	2,623.4	163.7	4,208.6	874.5
Residential area	311	190.4	198.3	233.3
Retail	936	609.6	5,006.4	312
Total	**4,976.5**	**1,032.7**	**11,187.8**	**1,788.4**

Table 4 - Estimated waste generation (volume)

Since there is no historical waste collection data available, it has not been possible to cross-reference estimated waste volumes with historical waste collection data, therefore actual waste generation may vary. This variance can be addressed through adjusting waste collection frequencies or changing bin layout as required.

10 Storage room design and facilities

10.1 Central storage room size

Waste storage area requirements are calculated from the total volume of weekly waste generation, collection frequencies, and City of Paramatta standard mobile garbage bin sizes.

All waste storage rooms will be designed according to the provisions stipulated by the Council's DCP. All waste storage areas and bins will be provided with clear labels and directions for use in order to maximise appropriate separation of waste streams.

The recommended waste storage room requirements are outlined in Table 5 below.

Component	Waste stream	Daily bin requirements (in 1100L size except for organics)	Area m^2
General Waste storage	General waste	10	14.8
Recycling Storage	Co-mingled	1	1.5
	Paper/Card	21	31.1
	Food and organics	5 (360L size bins for organics only)	5.3
Hard waste	Bulky items/e-waste	N/A	10
Bin wash down area			10
Bin compactor /equipment area			5
Bin scale factor (* total bins)			**1.5**
Maximum number of days between collection (* total daily bin area requirements)			**2 days**
Total Required			**114 sqm**

Table 5 - Waste storage area provisions

10.2 Storage room location

The central waste storage room will be located away from public access to minimise visual, odour, and safety impacts. The proposed central waste storage room will be located in the loading dock area of the western building as illustrated below in Figure 4.

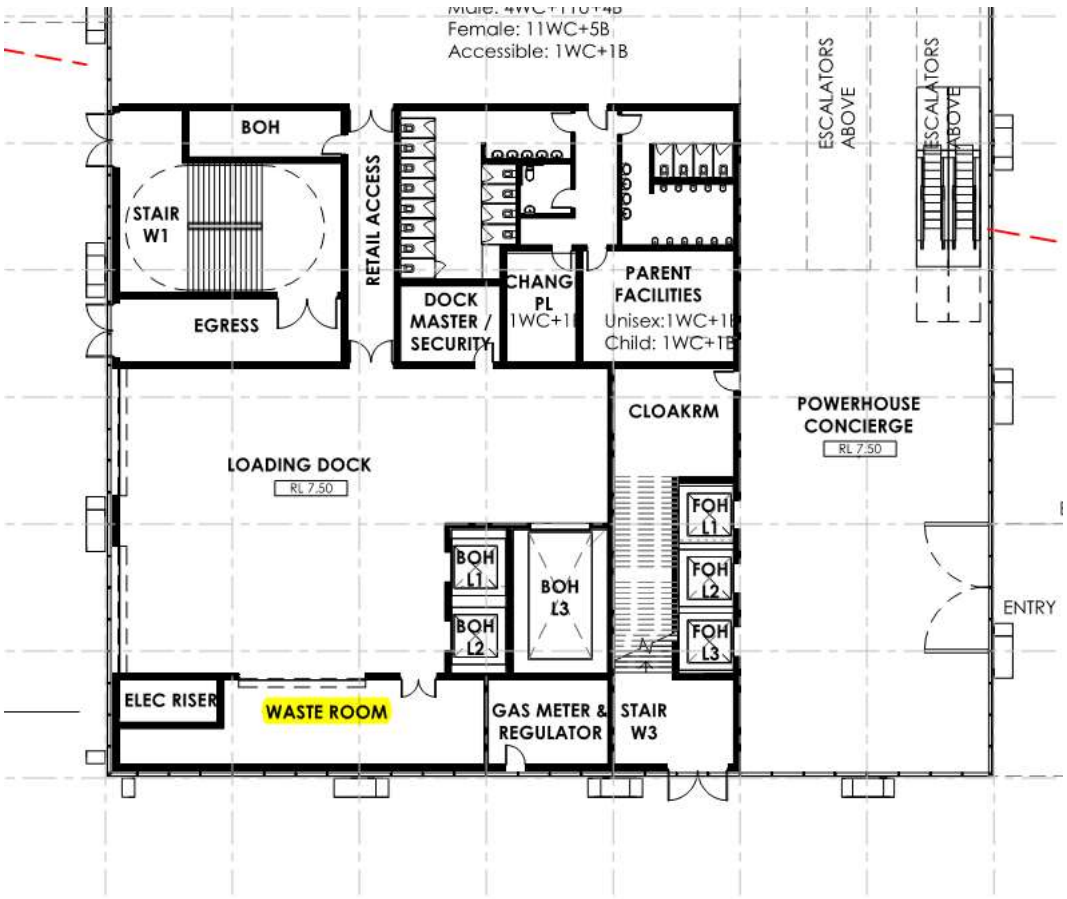

Figure 4 - location of central waste storage room

10.3 Signage

Signage will be provided in all waste disposal, storage and collection areas demonstrating how waste management system works, 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 *AS4123.7-2006* standard colours of each waste stream are outlined in Table 6. These measures are necessary in order to encourage the appropriate separation of waste streams and the recovery of resources.

Bin	Colour
General waste	Red lid and dark green body
Organics	Dark Green lid and dark green body
Co-mingled recycling	Yellow lid and dark green body
Paper / card recycling	Blue lid and dark green body

Table 6 - Standard bin colours

10.4 Storage room design

The central waste storage room will be designed according to the provisions stipulated by Council's DCP and the Building Code of Australia. The central waste storage room must be in a position that is convenient for both users and waste service contractors. The access pathway for wheeling bins between a storage point and collection point must be free of steps or kerbs. The waste collection point for this development will be located adjacent the waste storage room.

Table 7 below provides a summary of design requirements from City of Paramatta council DCP, and EPA best practise relating to the waste storage facilities.

Design aspect	Design provision
General	All waste management facilities will be compliant with the Building Code of Australia (BCA) and all relevant Australian Standards. The waste management system and storage areas will not be visible from the exterior of the building.
Surfaces	The floors of the waste storage rooms will be constructed of concrete of at least 75mm thickness and graded and drained to the sewerage system. The floors will be finished to a smooth, even surface, and covered at their intersection with walls and plinths. A ramp to the doorway will be provided if necessary.
Structure	The walls, ceilings and floors of the storage rooms will be finished with a light colour. The walls of the waste storage rooms will be constructed of approved solid impervious material and will be cement rendered internally to a smooth even surface coved at all intersections. The storage area will be constructed and finished to prevent absorption of liquids and odours and will be easily cleanable.
Doors	A close-fitting and self-closing door or gate operable from within the room must be fitted to all waste and recycling storage areas (rooms or bin bays). Doors/gates to the waste storage rooms must provide a minimum clearance of 1,200mm. At least one door or gate to the waste and recycling storage area must have enough dimensions to allow the entry and exit of waste containers of a capacity nominated for the development. Lightweight roller shutter-type doors or grilles should be considered for access to waste and recycling storage areas, as these do not impact on the available storage space. If these types of doors or grilles are used, the requirement for a close-fitting and self-closing door remains, so that waste collectors can access the waste storage area other than through the roller door or grille.

Design aspect	Design provision
Water	Cold water will be provided to the waste storage rooms. Water will be mixed through a centralised mixing valve with hose cock.
Lighting	Adequate lighting will be provided for all rooms, controllable from a switch located both outside and inside the room. Lighting will ensure safe access to the area at night. Automatic light sensors may be installed for ease of manual handling during transfer of bins.
Pest control	The waste storage rooms, areas and containers will be constructed in a manner as to prevent the entry of vermin.
Ventilation	The room shall be adequately ventilated (either natural or mechanical) in accordance with the Building Code of Australia. Arup recommends waste storage rooms be supplied with an approved system of mechanical exhaust ventilation that complies with AS1668 and not cause any inconvenience, noise or odour problem.
Signage	Signs will be provided to demonstrate how to use the waste management system (including segregation of wastes for recycling, use of waste compactor), as well as appropriate safety signage. The different recycling and waste bins will be clearly identified and signed appropriately. Standard signage on how to use the waste management system and what materials are acceptable in the recycling system will be posted in all waste and recycling rooms, waste service compartments and communal bin areas, after the Occupation Certificate is issued

Table 7 - Storage room design provisions according to City of Parramatta DCP and EPA best practice

10.5 Amenity

The management systems and constructed elements of this development will be designed and installed 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 (refer to Acoustic assessment report).
- **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.

11 Collections

11.1 Location and access

The central room for storing waste and recycling will be located inside the loading dock on ground floor. This position is convenient for staff and facilities management and is close to the goods lift which will be used for vertical transportation of wastes. The collection of waste and recycling receptacles will occur adjacent to the storage room.

Waste collection vehicles will access the loading dock by reversing in and driving out in a forward direction. The nominated collection point where the waste loading operations will 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. To avoid injury through manual handling during collection times, the waste contractor must not move mobile garbage bins larger than 660L more than 5 metres.

11.2 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 co-mingled recycling, and paper/cardboard recycling is to occur 3 x per working week (every second day).
- Collection of general waste, and food / garden organics is to occur 3 x per week (every second 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.

These assumptions will be confirmed when waste generation calculations have been carried out and storage constraints observed. Waste collection frequencies can be adjusted once the building is in operation

11.3 Collection vehicles

The route for waste contractor access to the internal loading dock is via the driveway, which can be accessed from Philip Street. Access will at no time cause the flow of traffic on Philip Street to be blocked.

The loading dock of the Powerhouse Paramatta building must cater for the size of a standard waste service provider collection vehicle. At the time of writing, a specific waste contractor has not been appointed. Therefore, vehicle access to the basement will be designed according to the indicative rear loading waste collection vehicle specifications outlined in Table 8 below.

A minimum unobstructed height clearance of 4.5m will be maintained as stipulated by Council's DCP.

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

Table 8 - Indicative rear loading collection vehicle for MGBs

12 Waste management systems

The proposed Waste Management System (WMS) is summarised in table 9 below**.** 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.

Space	Local Disposal	Transfer to central waste storage room	Central waste room	Transfer to collection point	Collection point
Powerhouse concierge	Bins / receptacles as needed in shared spaces	Cleaners (using Trolleys, BOH pathways, Goods lift)	Central waste storage room	Collection point will be located adjacent to storage room area and waste services provider will be	Waste contractors enter collections side of the loading dock to carry out bin collection services
Presentation space (1-6)	Bins /	Cleaners (using			

Space	Local Disposal	Transfer to central waste storage room	Central waste room	Transfer to collection point	Collection point
	receptacles as needed in shared spaces	Trolleys, BOH pathways, Goods lift)		responsible for movement of bins during collection times	
Power lab	Bins / receptacles as needed in shared spaces	Cleaners (using Trolleys, BOH pathways, Goods lift)			
Back of house (BOH)	Bins / receptacles as needed in shared spaces	Cleaners (using Trolleys, BOH pathways, Goods lift)			
Presentation BOH	Bins / receptacles as needed in shared spaces	Cleaners (using Trolleys, BOH pathways, Goods lift)			
Retail	Bins / receptacles as needed in shared spaces	Cleaners (using Trolleys, BOH pathways, Goods lift)			
Public Realm	Bins / receptacles as needed in public spaces	Building management / grounds keeper (using automated grounds vehicles)			

Table 9 - Proposed operational waste management system

13 Waste initiatives

To encourage and improve correct segregation of all waste streams, it is recommended that Powerhouse Paramatta host regular seminars to inform and motivate staff, retail and commercial tenants about waste management onsite and the importance this has on a local, national and global level. Results from contamination audit outlined in 7.2.2 can be used to provide feedback on current performance and help identify key constraints in current waste system. Staff and commercial tenant's involvement will be invaluable in driving sustainable waste management onsite.

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.

13.1 Best practice separation

13.1.1 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.

13.1.2 Organics

For Powerhouse Paramatta to achieve its waste targets and to encourage best practice waste management, off-site treatment of organics at a licensed facility shall be considered. For this to succeed organic waste will be source separated on-site and collected by a contractor for processing.

13.2 Waste Education

Waste education will also be integral for Powerhouse to achieve its waste targets. The precinct 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 Powerhouse Paramatta staff development and broader educational programs.
- Expand public place recycling and accelerate awareness programs for staff and commercial / retail tenants.

- Bold signage in all common areas that clearly illustrate correct recycling practices.
- Educational and awareness initiatives at Powerhouse Paramatta events to educate staff, visitors, commercial / retail tenants and visitors about the importance of waste minimisation.
- Sustainable procurement workshop with suppliers to review current
- procurement practices and whether the need for some products can be reduced.

14 Conclusion

This WMP forms a framework to implement best practice for waste management across all design and planning stages. The waste management approach will also support the selected Green Star tool for this project, to enhance outcomes for waste minimisation, reuse and recycling.

15 Mitigation Measures

Proposed Measure	Timing
Prepare a Construction and demolition waste management plan that will identify and quantify anticipated waste streams. The plan will describe how wastes will be managed in terms of storage, recycling and recovery, transportation and disposal.	Prior to commence of construction

Table 10 – Mitigation Measures

Appendix A

Area Schedules

Ground Level 0	
AMENITIES	176 m²
BOH	59 m²
FOH CIRCULATION	120 m²
FOH OTHER	364 m²
PRESENTATION SPACE	2759 m²
RETAIL	1248 m²
Ground Level 0	4727 m²

Ground Level Mezzanine 1	
AMENITIES	105 m²
FOH CIRCULATION	91 m²
Ground Level Mezzanine 1	197 m²

Ground Level Mezzanine 2	
FOH CIRCULATION	100 m²
FOH OTHER	219 m²
Ground Level Mezzanine 2	319 m²

Level 1	
AMENITIES	8 m²
BOH	185 m²
EDUCATION	319 m²
FOH CIRCULATION	582 m²
PRESENTATION SPACE	1486 m²
STAFF AREA	123 m²
Level 1	2703 m²

Level 1.1	
AMENITIES	94 m²
BOH	27 m²
EDUCATION	294 m²
FOH CIRCULATION	118 m²
Level 1.1	533 m²

Level 1.2	
AMENITIES	25 m²
BOH	41 m²
EDUCATION	183 m²
Level 1.2	248 m²

Level 2	
AMENITIES	158 m²
BOH	288 m²
EDUCATION	146 m²
FOH CIRCULATION	1124 m²
PRESENTATION SPACE	3608 m²

STAFF AREA	131 m²
Level 2	**5454 m²**
Level 2.1	
EDUCATION	388 m²
Level 2.1	388 m²
Level 2.2	
BOH	41 m²
EDUCATION	388 m²
Level 2.2	429 m²
Level 3	
AMENITIES	158 m²
BOH	275 m²
EDUCATION	146 m²
FOH CIRCULATION	1124 m²
PRESENTATION SPACE	3608 m²
STAFF AREA	131 m²
Level 3	5442 m²
Level 3.1	
EDUCATION	388 m²
Level 3.1	388 m²
Level 3.2	
AMENITIES	68 m²
BOH	41 m²
EDUCATION	239 m²
FOH CIRCULATION	215 m²
Level 3.2	**563 m²**
Level 4	
AMENITIES	85 m²
BOH	308 m²
FOH CIRCULATION	286 m²
PRESENTATION SPACE	1182 m²
Level 4	1862 m²
Level 4.1	
BOH	31 m²
Level 4.1	**31 m²**
Level 5	
BOH	54 m²
STAFF AREA	2207 m²
Level 5	**2261 m²**

Level 6	
BOH	64 m²
FOH CIRCULATION	503 m²
RESIDENTIAL AREA	1555 m²
Level 6	**2122 m²**
Grand total	**27667 m²**

Appendix B

Loading Deck - Architectural drawings


Ac
Ad
Ae
Af
Ag
Ah
Ai
Aj
Ak
Al
RETAIL
RL 7.50
Male: 4WC+11U+4B
Female: 11WC+5B
Accessible: 1WC+1B
ESCALATORS ABOVE
ESCALATORS ABOVE
BOH
STAIR W1
EGRESS
RETAIL ACCESS
DOCK MASTER / SECURITY
CHANG PL 1WC+1
PARENT FACILITIES
Unisex:1WC+1
Child: 1WC+1
CLOAKRM
POWERHOUSE CONCIERGE
RL 7.50
LOADING DOCK
RL 7.50
FOH L1
FOH L2
FOH L3
BOH L1
BOH L2
BOH L3
ENTRY
ELEC RISER
WASTE ROOM
GAS METER & REGULATOR
STAIR W3
1
DA250