Laing O'Rourke Mount St Pty Ltd

100 Mount Street

Waste Management Plan

Construction and Operational Waste

Hyder Consulting Pty Ltd
ABN 76 104 485 289
Level 5, 141 Walker Street
Locked Bag 6503
North Sydney NSW 2060
Australia
Tel: +61 2 8907 9000
Fax: +61 2 8907 9001
www.hyderconsulting.com

Laing O'Rourke Mount St Pty Ltd

100 Mount Street

Waste Management Plan

Construction and Operational Waste

Author	Dimitris Dimoliatis, Ylva Engqvist
Checker	Dimitris Dimoliatis
Approver	Ron Wainberg
Report No	AA002375-R01-02
Date	Friday, 8 May 2009
Report Status	FINAL

CONTENTS

1 Introduction 1
2 Demolition and Construction Waste Management Plan 1
2.1 Demolition and Construction Scope of Works 1
2.2 Waste Regulatory Framework 1
2.3 Waste Details 2
2.4 Construction types and quantities of waste materials 4
2.5 Waste Classification and Removal 5
2.6 Waste Minimisation Recommendations 7
2.7 Waste Reporting 9
2.8 Concluding Remarks 10
3 Operational Waste Management Plan 11
3.1 Sources of waste 11
3.2 Waste storage 11
3.3 Waste Generation and Composition 11
3.4 Waste Management Options 13
4 General waste management recommendations 16
4.1 Adherence to the Waste Handling Guide 16
4.2 Education Programme 16
4.3 Additional Organics Separation 17
4.4 Waste caretaker 18
5 Waste management by tenants 19
5.1 Retail and other commercial tenants 19
5.2 Office tenants 19
6 References and Bibliography 20

1 Introduction

Laing O'Rourke Mount Street Pty Ltd (Laing O'Rourke Mount Street) are pursuing the construction of a commercial office development on 100 Mount Street in North Sydney. The proposed development will involve large scale demolition and construction works and Laing O'Rourke Mount Street commissioned Hyder Consulting to prepare appropriate plans for Part 3A submission to the NSW Department of Planning for management of construction and demolition waste and operational waste management.

North Sydney Council's Waste Handling Guide[1] gives essential information to architects, developers and builders for the design and construction of waste handling facilities in new developments. The guide expands on requirements for waste facilities contained in Councils' Development Control Plan and development application conditions. The guide ensures that all waste facilities in new or existing developments comply with Council's collection service and waste minimisation policy[2]. The policy outlines the following waste objectives:

1 Reduce the amount of waste going to landfill – in accordance to the "avoid, reduce, reuse, recycle" waste management hierarchy

2 Ensure waste disposal does not compromise the integrity of the environment or human health

3 Educate and assist the community, industry and business in waste minimisation

Hyder has prepared this waste management plan which comprises of two parts. The first part outlines a plan for the management of construction and demolition waste. An operational waste management plan for consolidated waste management activities at the completed site forms the second part. Both waste management plans adhere to the waste management requirements of North Sydney Council and NSW Department of Environment and Climate Change.

Information to be provided as part of the demolition and construction waste management plan includes the type of waste generated during demolition and construction, the location to which each type of waste will be taken for reuse, recycling, and/or disposal and waste management reporting and auditing.

Part 2 presents an operational waste management plan for ongoing waste management activities at the development, including recommendations for the handling of waste, in adherence to Council's waste management guidelines.

Both Plans will cover the following aspects:

- Estimated waste types and quantities for the development
- Options for waste minimisation through source separation
- Recommendations for transfer, handling and storage of waste. These will include area requirements for waste management facilities in the new building
- Appropriate waste infrastructure such as compactors, balers and bins
- Recommendations for infrastructure logistics including the collection of waste

The following reports address relevant issues such as access and noise from waste vehicles and are part of the Concept Application submitted to the Department of Planning:

- *Construction Management Plan*
- *Acoustic Report - Environmental Noise Impact Report*
- *Traffic Impact Study*

2 Demolition and Construction Waste Management Plan

Waste generation estimates detailed in this waste management plan are in line with the best calculation methods available and information provided by the client. However at this stage exact quantities are unknown.

The prime intent of this waste management plan is to allow for the demolition and construction operations to have a positive impact on the environment and minimise disposal costs.

The objectives of the demolition and construction waste management plan are to:

- Reduce the demand for waste disposal during demolition and construction.
- Maximise resource recovery through reuse and recycling.
- Assist in achieving Federal and Local Government waste minimisation targets in accordance with overarching regulations and plans.
- Document wastes that may be generated as part of the demolition and construction works (identification and proposed disposal method and destination).
- Aim to be awarded 2 credit points for Waste Management as stipulated under Green Star Office version 3. Two credit points are awarded where 80% of waste, by weight, generated on-site during the construction phase is re-used or recycled. In the unlikely event that the 80% recycling target is not achieved, Green Star Office version 3 allows for 1 credit point to be claimed if at least 60% of waste is recycled (category Man-7 Waste Management[3]).

The above target will be achieved through maintained and consistent reuse and recycling efforts throughout the entire construction phase. Other construction and demolition related issues such as impact of the development on surrounding land used and public streets are addressed in the *Construction Management Plan*.

2.1 Demolition and Construction Scope of Works

The development will involve the following stages:

1 Demolition

2 Excavation

3 Construction

It is recommended to stage the construction so that optimum levels of waste materials can be recycled.

2.2 Waste Regulatory Framework

The construction phase of the project will take place within the framework of NSW waste related regulations as detailed below.

2.2.1 Waste Avoidance and Resource Recovery Act 2001

The Waste Avoidance and Resource Recovery (WARR) Act 2001 establishes the waste hierarchy to ensure that resource management options are considered against the following principles:

1. Avoidance – actions to reduce the amount of waste generated
2. Resource Recovery – which includes reuse, reprocessing, recycling and energy recovery, consistent with the most efficient use of the recovered resources; and
3. Disposal – an 'end-of pipe' option that must be carefully undertaken to minimise any negative environmental outcomes.

The NSW Government's priority areas and actions for waste avoidance and resource recovery is outlined in the Waste Strategy 2007 (an update of the Waste Strategy 2003).

The four identified key areas in the strategy are:

1. Preventing and avoiding waste
2. Increasing recovery and use of secondary materials
3. Reducing toxicity on products and materials, and
4. Reducing litter and illegal dumping

The Strategy also includes the following recycling targets relevant to the proposed construction:

- Increase recycling of construction and demolition waste from baseline 65% to 76% in 2014.

2.2.2 Protection of the Environment Operations Act 1997

All material to be excavated and removed from the site (including associated activities such as classification) should be undertaken in strict accordance with the POEO Act 1997. Requirements include:

- Ensuring waste is classified appropriately and in accordance with relevant guidelines
- Waste materials are disposed of to appropriately licensed facilities, and
- Other materials are removed to facilities lawfully able to accept such materials.

2.2.3 Protection of the Environment (Waste) Operations Act 2005

The regulations make requirements relating to non-licensed waste activities and waste transporting. The proposed works on the site will not require to be licensed. Section 48 of the Reg. requires that wastes are stored in an environmentally safe manner. It also stipulates that vehicles used to transport waste must be covered when loaded.

The regulation exempts certain waste streams from full waste tracking and record keeping requirements as waste tracking is required only for industrial and hazardous waste.

2.3 Waste Details

2.3.1 Types and quantities of waste

The following estimates of waste type and quantities have been made based on the anticipated extent of demolition and construction works. Demolition and Construction waste generation data has been provided by Laing O'Rourke Mount St based on a LOR project of comparable type and size at Macquarie Park.

2.3.2 Demolition types and quantities of waste materials

Excluding excavated soil, only 7.5% of the waste generated during the demolition phase is expected to be landfilled while over 92% is expected to be recycled and a small quantity (around 0.1%) reused. Table 1 identifies the types of materials likely to be generated during demolition of the current building. Accurate records of amount, type and destination of waste materials will be kept throughout the works.

Table 1 Proposed waste types and area of generation.

Materials on Site			Location generated	Destination		
Type of materials	Total waste			Re-use and recycling		Disposal Contractor and landfill site
	Vol. (m^3)	Wt. (t)		On-Site Proposed reuse/recycling methods	Off-Site Contractor and recycling outlet	
Sandstone	Small amounts		Excavation	Space limitations do not allow for on-site storage.	Transported by Expanded Pty Ltd to approved disposal site.	
Soil	12,500	19,025				
Concrete/ Bricks	12,000	20,400	All areas		Transported by Metropolitan Demolitions to Metropolitan Demolitions and Recycling at 396 Princess Hwy, St Peters for crushing and screening to produce roadbase and aggregate alternatives to quarry products.	
Tiles	Small amounts		All areas		Treat with concrete and bricks where practical	
Paper and cardboard	Very small amounts from all areas				Recycle clean product.	
Timber	10	5			Transported to Metropolitan Demolitions and Recycling timber yard where it will be processed and onsold to furniture manufactureres.	
Doors & scrap timber	1,000	1,500	All areas	Neither the infrastructure nor markets are in place to provide for practical or economical recovery of these materials.		Transported by Metropolitan Demolitions Pty Ltd. Disposal facilities: Kurnell Landfill, Captain Cook Drive, Kurnell or Enviroguard Pty Ltd, Erskine Park or Blacktown Waste Services, Blacktown.
Glass			All areas			
Plasterboard			Ceilings/ partitions			
Plastics including PVC			All areas			
Light fittings			All areas			
Carpet			From office and retail space interiors			
Metals	350	840	Mainly steel from all areas	Steel beams and lintels that can be recovered for reuse will be transported to Metropolitan Demolitions yard at St Peters and sold as second hand materials.	Transported by Metropolitan Demolitions to Sell and Parker scrap metal yard at 19a Baker Street, Botany for recycling.	
Other	TBC		All areas	Procedure to be decided on a per material/case basis as needed.		
Hazardous	Please refer to separate Hazardous Material report Handling prepared by GHD Pty Ltd.					

2.4 Construction types and quantities of waste materials

The exact materials to be used in the construction are yet to be confirmed. Therefore quantities of waste construction materials have not been determined. Nevertheless, Table 2 presents the estimated type, volume and fate of these wastes. The anticipated recycling and reuse rate for construction waste is 85% while the target is set at a minimum of 80% recycling and reuse.

Table 2 Waste Management and Resource Recovery Plan. An 85% recycling and reuse rate is expected.

Materials on Site		Destination		
Type of materials	Total waste	Re-use and recycling		Disposal (m^3) Contractor and landfill site
	Vol. (m^3)	On-Site Proposed reuse/recycling methods	Off-Site Contractor and recycling outlet	
Landscaping materials				
Soil	Very small ammounts	Lack of space does not allow for temporary storage on-site.	Separated onsite and sent to recycling facility	
Rock/Rubble				
Green Waste	None anticipated			
Hardcore	4894			734
Concrete		Lack of space does not allow for temporary storage on-site.	Separated onsite and sent to recycling facility	
Tiles			Where possible separate bins for onsite separation. Alternatively, seperated at waste contractors facility and then sent to recycling facility.	
Bricks			Remainder to recycling materials however opportunities for reuse will have priority.	
Glass			Separated onsite and sent to recycling facility	Dirty or contaminated to landfill
Softcore	1847			277
Plasterboard/ cladding			Separated onsite and sent to recycling facility.	
Wood			Separated onsite and sent to recycling facility	
Plastics including PVC			Separated onsite and sent to recycling facility	
Paper and cardboard			Separated onsite and sent to recycling facility	Dirty to landfill
Light fittings			Separated onsite and sent to recycling facility	
Office furniture			Separated onsite and sent to recycling facility	
Metals	1108		Separated onsite and sent to recycling facility	166
Other				Disposal if no reuse/ recyclable material can be identified
Hazardous	None anticipated		Should the need arise, to be removed by accredited contractor, disposed of at an EPA licensed facility.	

2.5 Waste Classification and Removal

2.5.1 Waste classification

All liquid and non-liquid wastes generated during construction works shall be classified in accordance with the requirements of DECC 2008[4]. Six waste classes are identified:

- Special waste
- Liquid waste
- Hazardous waste
- Restricted solid waste
- General solid waste (putrescible)
- General solid waste (non-putrescible)

2.5.2 Waste transportation access

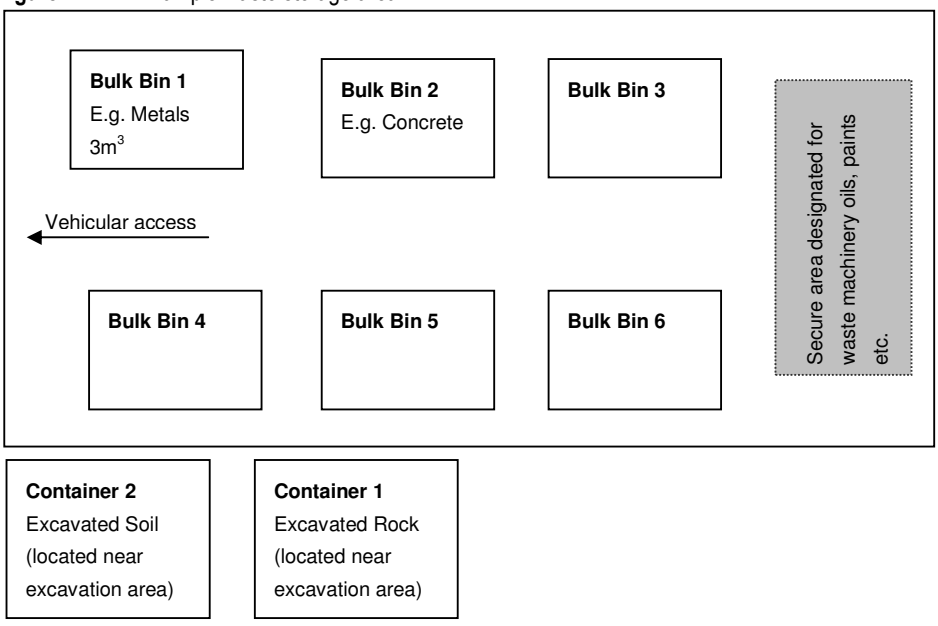
Access to the site for waste removal vehicles would be as determined for all construction and demolition vehicles. Details on vehicle, including waste trucks, access to the site can be found in the separate *Traffic Impact Study*, while related noise issues have been addressed as part of the *Acoustic Report - Environmental Noise Impact Report*.

2.5.3 Waste storage, recycling and disposal

It is anticipated that where possible, waste will be sorted and stored according to material type in a designated waste storage area on site. Clearly labelled bulk bins would be available for the placement of different materials.

Figure 1 depicts an example of how the waste storage area could be established at the demolition site. The exact configuration and number of bins would be determined by the materials being generated at the time.

Figure 1 Example waste storage area



In addition to the above, the following waste management methods should be adhered to during construction to ensure the highest percentage of construction waste possible is diverted from landfill for reuse or recycling.

- Salvageable materials shall be diverted from landfill where feasible.
- Prior to the removal of any demolition or construction materials from the construction site, recycling coordinators will inspect containers for compliance with WMP requirements.
- Wood cutting will occur in centralized locations to maximize reuse and facilitate collection.
- Hazardous waste shall be managed by a licensed hazardous waste vendor.

Further recommendations for the waste storage area include:

- Waste management during Project Construction Phase to be centrally administered in order to maintain one consistent system throughout the project.
- Between collection periods, all waste/recyclable materials generated on site should be kept in appropriately labelled containers.
- The waste storage area should be appropriately sized to accommodate bins of sufficient volume to contain the quantity of waste generated between collections.
- The positioning, type and size of containers used to hold waste should be compatible with the collection practices of the nominated waste contractor.
- Waste management facilities should be suitably enclosed, covered and maintained to prevent potentially contaminated waste/rain water runoff from entering the storm water system.
- Consideration should be given to the time of day at which containers are collected to minimise the adverse impacts on residential amenity, pedestrian movement and local traffic.
- Arrangements should be in place regarding the regular maintenance and cleaning of waste management facilities.
- The waste storage areas should be appropriately lit to maintain security of staff and be equipped with fire extinguishing equipment and smoke alarms.
- The waste storage areas should be secure.
- The waste storage areas should meet all relevant OH & S requirements.

2.6 Waste Minimisation Recommendations

2.6.1 Recommendations for waste minimisation during demolition and preparations for construction

Measures to improve the minimisation of demolition waste may include:

- Re-use of material will have priority over recycling.
- Recycling will have priority over disposal.
- Selection of reputable waste removal contractors who will guarantee that recyclable material will be recycled and will provide any relevant certificates.
- Any vegetative matter removed as a result of demolition activities should be either preserved for use in the new development, or mulched for inclusion in landscaping activities. The remainder would be sent to a composting facility.
- Earth excavated from the demolition site would be used for infill and landscaping where feasible, the remainder would be sent to a recycling facility.
- Concrete components from existing structures would if possible be crushed and reused on site, the remainder would be sent to a recycling facility.
- Fuel and oil storage from demolition machinery would be secured and managed responsibly within compound sites during works, and removed upon completion of works.

All waste that cannot be re-used or recycled would be disposed of in accordance with the NSW EPA's *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes (1997)*.

2.6.2 Recommendations for waste minimisation during construction

In keeping with the reduce, reuse, recycle hierarchy to waste management, it is recommended that the following measures are taken for the minimisation of construction waste at site:

- Reduce potential waste by ordering the correct quantities of materials,
- Coordinate and sequence trades people to minimise waste.
- Prefabricate materials where possible,
- Use modular construction and basic designs to reduce the need for off-cuts,
- Reuse formwork,
- Reuse or recycle materials from the demolition phase where possible, e.g. use timber from demolition as formwork,
- Separate off-cuts to facilitate reuse, resale or efficient recycling,
- Minimise site disturbance and limit unnecessary excavation,
- Select landscaping which reduces green waste, and

- Select waste removal contractors who will guarantee that recyclable waste will be recycled,

In addition it is recommended that:

- Recycling bins be provided on site for paper and cardboard, metals, glass, plastic and oil, which would then be sent to approved recyclers.

All waste that cannot be re-used or recycled should be disposed of in accordance with the NSW EPA's *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes (1997)*.

2.7 Waste Reporting

2.7.1 Evaluation plan

The General Contractor could develop, update, and post at the jobsite a graph indicating the progress to date for achieving the project's waste recycling goal of at least 80% by weight of the total projected waste stream. Ideally the anticipated 85% recycling rate will also be demonstrated.

An audit of records could be conducted of material generated and removed off site. Where only volumetric measurements are possible, standard approved density conversion factors can be applied to calculate relevant weights.

2.7.2 Communications Plan

WMP communication & education plan

To ensure that the WMP targets are realised by those on-site during construction:

- The General Contractor should conduct an on-site pre-construction meeting with subcontractors. Attendance will be required for the subcontractors' key field personnel. The purpose of the meeting will be to reinforce to the subcontractors' key field employees the commitments made with regard to construction waste management goals and requirements.
- There should be a nominated WMP site 'champion' to ensure the WMP is adhered to throughout works.
- Waste prevention and recycling activities should be discussed at the beginning of each subcontractor 'toolbox' meeting to reinforce plans are on track and to communicate reuse and recycling progress to date.
- As each new subcontractor comes on site, the recycling coordinators should present him/her with a summary of the WMP and provide a tour of the waste and recycling areas.
- The subcontractor will be expected to make sure all their crews comply with the Waste Management Plan.
- All recycling skips/containers will be clearly labelled. Containers shall be located in close proximity to the building(s) under construction in which recyclables/salvageable materials will be placed.
- Lists of acceptable/unacceptable materials will be posted throughout the site.
- All subcontractors should be informed in writing of the importance of non-contamination with other materials or general waste.
- Recycling coordinators shall inspect the containers frequently to insure that no contamination is occurring and precautions shall also be taken to deter any contamination by the public.

2.8 Concluding Remarks

The WMP is somewhat limited by the information available at the current time as some detail on the waste breakdown will not be available until the demolition and construction process commences. Despite this, adherence to the WMP, will promote documentation and management of all wastes generated as part of the demolition and construction works and assist with identifying best practice disposal methods and destinations even for waste types not covered in detail here..

By establishing a reduce, reuse, recycle hierarchy, the WMP guides the contractors to adhere to actions that reduce the demand for waste disposal while minimising the overall environment impacts of waste during construction. Further, the recommendations laid out in this plan will assist adherence to waste minimisation targets in accordance with the overarching Federal and NSW waste regulations.

3 Operational Waste Management Plan

A waste profile for the proposed development has been developed in order to understand the flows of wastes and in order to estimate quantities of operational waste which will arise. The waste profile will also help to identify what proportion of waste could be separated for recycling. Hyder has reviewed architectural plans, and estimated waste generation for the daily operations at 100 Mount Street based on waste/recycling generation rates outlined in DECC's *Model Waste not DCP Chapter 2008*[5] and waste composition data adopted from Resource NSW's *Waste Reduction in Office Buildings A Guide for Building Managers*[6] as well as Hyder in-house data[7].

Based on the architectural plans for project 08001 (DA 00-23) dated March 09 and information provided by the client and other subcontractors, we anticipate the waste management situation at the new development at 100 Mount Street as outlined below. Issues relating to waste vehicle access and noise issues have been dealt with in separate reports, *Traffic Impact Study* and *Acoustic Report - Environmental Noise Impact Report* respectively.

3.1 Sources of waste

The new development's waste will arise from the following main sources:

- Offices (mainly paper)
- Unspecified retail (assuming mainly glass, food and packaging)

3.2 Waste storage

The hub of waste storage at 100 Mount St will be the garbage room on basement level 2 on the side of Spring St. Waste will be collected from, and stored pending collection at the delivery bay on Spring St. It is estimated that the garbage room should have a floor area of at least 45m^2 in order to accommodate all mobile garbage bins (MGBs) and also allow some space for bulky waste storage and potentially higher waste quantities in the future. Calculations relating to garbage room size and waste generation from retail areas have been conducted assuming a "worst case scenario" situation where the properties are occupied by retailers generating large quantities of waste.

To facilitate easy access and transportation of MGBs, all doors to and within the garbage room should be sufficiently wide and easy to operate (roller doors are an option) while the room itself should be graded and drained to the sewer.

Several waste and recycling stations will be located throughout the complex. These are generally located on each office floor in kitchen areas and next to printers/photocopiers. Commercial users will too have temporary storage areas for waste and recyclables.

3.3 Waste Generation and Composition

Hyder has estimated generation of waste from published waste generation rates, and calculations are based on generation per floor area for different waste sources such as office areas, retail stores, hotels, restaurants, and cafés. Data references are included in the Reference list. Table 3 presents daily waste and recyclables generation in litres while a graphical illustration of the composition of waste stream is provided in Figure 2.

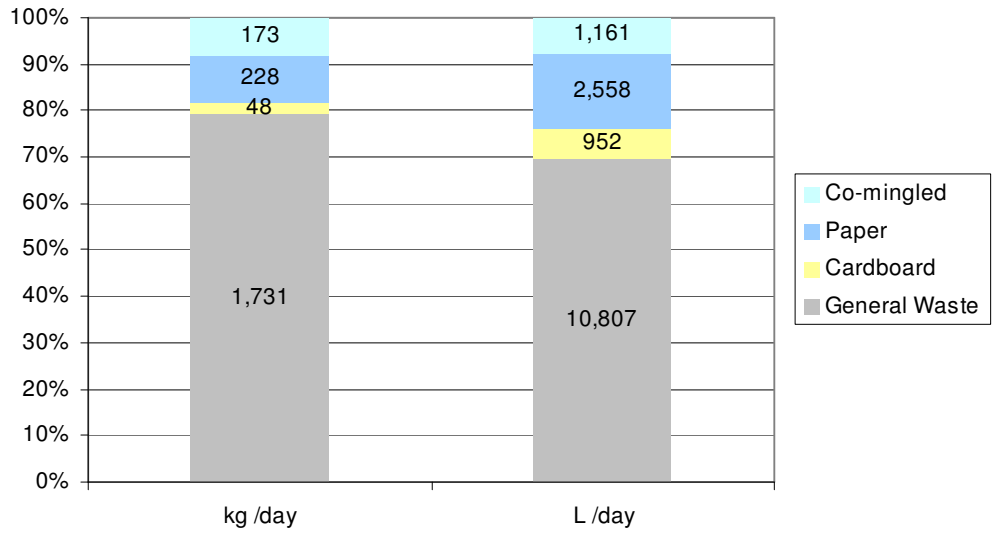
Anticipated waste volumes are an estimate only and will largely depend upon the types of tenants that will occupy the retail areas. Building management decisions and attitudes towards waste and the tenants' and their employees' attitude to disposal and recycling will also influence the quantity of waste generated.

Calculations for office space were based on a five day working week, 6.5 day working week for unspecified retail to capture a wide variety of potential tenants. It should be noted that waste generation volumes will be affected by working days different to those assumed above and by actual office and retail occupancy rates.

Table 3 Predicted waste quantities

Waste Category	Generation	Generation
	kg /day	L /day
General Waste	1,731	10,807
Cardboard	48	952
Paper	228	2,558
Co-mingled	173	1,161
Total	2,180	15,479

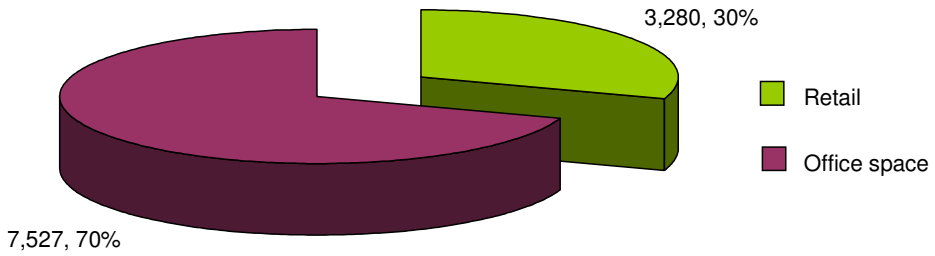
Figure 2 Breakdown of predicted waste stream



Hyder's estimate for 100 Mount St presented in Figure 2 shows that approximately 70% of the waste generated is general waste based on volume, with paper being the second most important material both by weight and volume. Overall, recyclables only account for 20% of the total weight of waste.

Figure 3 depicts the breakdown of the waste in terms of its source. Approximately 45% of the waste is generated by restaurants and cafés. Although office space is a significant source of waste overall, on a per m^2 basis the relative contribution of this source is much smaller than that of unspecified retail.

Figure 3 Waste breakdown by source



3.4 Waste Management Options

Hyder have identified 2 potential waste management options to accommodate the waste at 100 Mount St. All recommendations regarding waste management equipment have been made on the basis of estimated waste generation rates. All MGB numbers appearing below refer only to the bins to be provided in the central garbage room. Tenants are expected to have a number of MGBs for temporary waste storage. Specific numbers, sizes, types and locations have to be determined at a later stage depending on tenant types and floor layouts.

Although the details of the day to day waste management activities within the building will depend on specific lease requirements and the building management, it is envisaged that during the day the cleaners will transport waste from the office floors to the garbage room MGBs and to the compactor. A common approach would be to either carry a 240L MGB from floor to floor and empty smaller commingled recycling bins into it or take small bins to the basement. This should be done before the bins on each floor get really full in order for weight issues to be minimised during handling. For paper and cardboard recycling a similar approach can be followed. However, in the event that option 1 below is selected, it is more practical to replace full MGBs in each floor with empty ones from the basement garbage room.

3.4.1 Option 1

This option is in line with the project developers' wish to integrate a wet waste compactor for the disposal of general waste arising at the complex. The compactor unit would be situated at the Spring St delivery bay. The projected frequency of compactor collection is 2-3 times a week.

Cardboard, paper and co-mingled recyclables would be disposed of in 240L mobile garbage bins. An estimate of the number of bins required for these remaining waste materials, based on a twice a week collection schedule, is shown below (Table 4). Higher collection frequency would reduce the number of MGBs required.

Table 4 Number of 240L MGBs required for recyclable materials

Waste Category	Number of 240L MGBs
Paper and Cardboard	40
Co-mingled Recyclables	25
Total	**65**

Compactors and Bins

The following table outlines the space requirements for bins and compactors and the location, under Option 1.

Table 5 Compactor and bin numbers and measurements *

Bin / Compactor type	Number	Width (mm)	Depth (mm)	Height (mm)
$8m^3$ compactor*	1	2,103	5,905	1,935
240 L MGB	65	580	735	1,080

* Note: Dimensions relate to the size of the units, not the area required to install, operate and maintain them.

3.4.2 Option 2

This option also incorporates a wet waste compactor for general waste, as outlined in Option 1. The compactor would need to be emptied 2-3 times a week. This option would also include a baler for paper and cardboard, which is capable of reducing $6m^3$ of paper and cardboard at a time into approximately 0.5 m^3 bales (~900x710x710mm). Paper and cardboard would be transported from the various building areas to the baler which would also act as temporary storage. Once the desired capacity is reached the caretaker would operate the baler and remove the compressed paper and cardboard bale. The weight of the bales will vary with the type and amount of material to be compacted, but as a general guide, it would range from 60-100kg. 3 to 4 bales would need to be stored weekly, assuming a twice a week collection frequency. The baler can operate of mains power and can be situated in the garbage room on basement level 2, or in the delivery bay area to minimise bale transportation and facilitate collection. As the baler does not require permanent installation it can be relocated with relative ease should the client decides to.

Co-mingled recyclables will be disposed of and stored in 240L MGBs. An estimate of the number of bins required for co-mingled recyclables, based on a twice a week collection schedule, is shown below (Table 6). Garbage room floor area should remain unchanged as, despite the smaller number of MGBs, there are still space requirements for storing the bales and installing the baler.

* Assuming a compaction rate of 4:1

Table 6 Number of 240L MGBs required for co-mingled recyclables

Waste Category	Number of 240L MGBs
Co-mingled Recyclables	25

Compactors and Bins

Table 7 presents the estimated numbers of bins, balers and compactors their proposed location and respective dimensions, under Option 2.

Table 7 Compactor and bin numbers and measurements *

Bin / Compactor type	Number	Width (mm)	Depth (mm)	Height (mm)	Location
8m^3 compactor*	1	2,103	5,905	1,935	Delivery Bay
0.80 m^3 paper/cardboard baler	1	1,000	750	2,600	Delivery Bay or Basement 2
240 L MGB	25	580	735	1,080	Basement 2

* Note: Dimensions relate to the size of the units, not the area required to install, operate and maintain them.

3.4.3 Recommendation

Although the final decision will depend on the client's needs at the time, Hyder suggests that option 2 is the most appropriate and the one that will minimise the need for waste handling. A baler can also reduce the number of bins needed while bales can be stacked and easily transported by hand truck to the delivery bay prior to collection making the whole process a lot faster. Transporting three or four bales is significantly faster than 40 bins while it also speeds up and cardboard collection by the waste truck.

3.4.4 Waste management capacity

In estimating waste generation in 100 Mount St a precautionary approach was adopted and where tenants are unknown worse case scenarios were adopted. Therefore the estimates presented here are sufficient to account for very high waste generation rates. The waste storage room has been sized in accordance to these estimates and additional extra space for contingency purposes. Therefore it is expected that the options presented here will easily accommodate all waste generated by the offices and the retail tenants. In the unlikely event of significantly higher than predicted waste generation, the waste management system for 100 Mount St allows for increasing the frequency of collection both for the waste compactor and the recyclables.

* Assuming a compaction rate of 4:1

4 General waste management recommendations

This section presents recommendations in terms of waste minimisation, and training, and adherence to the North Sydney Council's waste handling guide.

4.1 Adherence to the Waste Handling Guide

The purpose of the North Sydney's Waste Handling Guide is to encourage waste minimisation and resource recovery and in addition to facilitate efficient and safe waste and recycling collection from all premises in the North Sydney Local Government Area.

All commercial premises are to be provided with a garbage/recycling storage area for all waste generated from the premises. To avoid subsequent alteration of plans these requirements should form part of the overall design for the new building. Basic requirements for waste facilities are:

- Adequate size
- Integration with building design and site landscaping
- Suitable screening from public areas
- Appropriate access for collection
- Ensuring OH&S requirements for waste contractors are met

For detailed information on construction, ventilation, water supply and lighting of waste storage rooms, refer to the North Sydney Waste Handling Guide.

4.2 Education Programme

In order to maximise recycling opportunities, an education programme and on-going monitoring would need to be implemented for training tenants to properly sort and transport waste into the right components and destinations.

4.2.1 Standard Recycling Signs and Bins

Appropriate signage is essential to assist staff and patrons with recycling. The Department of Environment and Climate Change provides signage for waste and recycling collection systems and bins and promoting recycling facilities at events, workplaces and home as per Figure 4 below.

Figure 4 Standard recycling signs

An Australian Standard has recently been developed for mobile bin colours (AS4123.7-2006 mobile waste containers - Part 7: colours, markings and designation requirements)*. The colour designations for common waste categories are listed in Table 8 below.

Table 8 Bin standards

Waste Category	Bin Body Colour	Bin Lid Colour
Garbage	Dark Green or Black	Red
Recycling (commingled and containers)	Dark Green or Black	Yellow
Paper / Cardboard	Dark Green or Black	Blue
Organics	Dark Green or Black	Lime Green

4.3 Additional Organics Separation

Food waste recycling could be a major opportunity for source separation. Especially since separation of, and provision of a dedicated storage area for, food waste (along with paper, glass, plastics and metals) is a minimum requirement to obtain two points for Green Star Office Design's Recycling Waste Storage credit criteria.

Restaurant and café waste typically contain 50% food waste, while other similar retail outlets often generate waste comprising of up to 35% food organics.[8]

Separating organics would result to a requirement for a smaller general waste compactor or more appropriately for less frequent collection of the 8m^3 one specified above. Containment of food waste would also reduce issues associated with including organics in the general waste compactor, particularly odour and leachate.

* The full content of the new Standard is available for purchase from http://www.standards.org.au/

4.4 Waste caretaker

The employment of at least one full time caretaker is recommended to manage the waste management system of 100 Mount Street. Caretaker duties would include:

- Cleaning and maintenance of the garbage room located in basement 2.
- Ensuring recyclables are separated efficiently by tenants.
- Supervising waste disposal by tenant employees using the central waste management facilities.
- Managing and organising MGBs in the garbage room.
- Coordinating and organising for compactor and recyclables collection by waste management contractor.
- Transporting MGBs from the garbage room to the delivery bay for collection.
- Operating compactor and baler as/if required.
- Arranging for maintenance of compactor and baler as/if required.

5 Waste management by tenants

5.1 Retail and other commercial tenants

It is recommended that all retail and commercial tenants assume responsibilities for source separation of waste and that each tenant be responsible for temporary in house storage of general waste and recyclables. At the end of the day, staff from the retail tenancies or the caretaker (depending on lease requirements) will transport general waste to the compactor located on the delivery bay, commingled recyclables to the garbage room in Basement 2 and paper/cardboard either to the baler or to the garbage storage room, depending on the approach taken by the developer.

5.2 Office tenants

The office tenancies will store all waste and recyclables in MGBs situated on each floor. Exact space allocation for MGBs on each floor cannot be specified prior to floor layout finalisation. However, it is common practice to place 120L MGBs for commingled recyclables in kitchen areas along with bins for general residual waste and 240L MGBs for paper/cardboard recycling in printing/photocopying areas. It is recommended that office employees be educated on simple waste management issues and broadly introduced to the building's waste management plan in order to achieve high participation levels in waste recycling and promote waste minimisation. Cleaners and/or the waste caretaker(s) are expected to be responsible for transporting residual waste to the compactor and recyclables to the garbage storage room and baler (if available).

6 References and Bibliography

[1] North Sydney Council, *Waste Handling Guide*. Available online: <http://www.northsydney.nsw.gov.au/resources/documents/Waste_Handling_Guide.pdf>

[2] North Sydney Council (2004). *Towards Sustainability Plan 200*4. Available online: <http://www.northsydney.nsw.gov.au/resources/documents/Sustainability_Plan_2004.pdf>

[3] Green Building Council of Australia (2008). Green Star- Office design & Office As Built v3 2008.

[4] Department of Environment & Climate Change NSW (2008). Waste Classification Guidelines, *Part 1: Classifying waste*. Available online: www.environment.nsw.gov.au/resources/waste/08202classifyingwaste.pdf

[5] Department of Environment & Climate Change NSW (2008). *Model Waste not DCP Chapter 2008*. Available online: <http://www.environment.nsw.gov.au/resources/warr/08353SiteWasteMin2.pdf>

[6] Resource NSW (2002). *Waste Reduction in Office Buildings A Guide for Building Managers*. Available online: <http://www.environment.nsw.gov.au/resources/sustainbus/spd_ob_buildmgrrecyguideweb.pdf >

[7] Hyder Consulting (2008). Internal Waste Audit 2008. Confidential data.

[8] CIWMB, California Integrated Waste Management Board. (2007). Solid Waste Characterization Database. Available online: <http://www.ciwmb.ca.gov/WasteChar/WasteGenRates/Commercial.htm>

CIWMB, California Integrated Waste Management Board. (2006. Targeted statewide waste characterisation study: Waste Disposal and Diversion Findings for Selected Industry Groups. Available online: <http://www.ciwmb.ca.gov/Publications/Disposal/34106006.pdf>

Tchobanoglous, G., Theisen, H. & Vigil, S.A., (1993). Integrated Solid Waste Management, Engineering principles and management issues. McGraw- Hill International Editions, New York, USA.