



EDITH COWAN UNIVERSITY WASTE MANAGEMENT STRATEGY



Cardno (WA) Pty Ltd

ABN 77 009 119 000

Cardno

2 Bagot Road

Subiaco WA 6904

PO Box 155, Subiaco

Western Australia 6904 Australia

Telephone: 08 9273 3888

Facsimile: 08 9388 3831

International: +61 8 9273 3888

perth@cardno.com.au

www.cardno.com.au

Document Control

Version	Date	Author		Reviewer	
		Name	Initials	Name	Initials
Final	July 2008	Megan Haines / Robert Sim	RMS	William Marchbank	BFM

"© Cardno. All rights reserved 2008. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person without the prior written consent of Cardno."

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Background	1
1.2	Project Objectives	2
1.3	Methodology.....	2
2	REVIEW OF CURRENT WASTE MANAGEMENT PRACTICES	3
2.1	Metropolitan campuses (Joondalup and Mount Lawley)	3
2.1.1	Waste Management Service Structure and Resources.....	3
2.1.2	ECU Facilities and Services Department - Waste Management	3
2.1.2.1	General Refuse	3
2.1.2.2	Comingled Recyclables.....	4
2.1.2.3	Paper Waste	5
2.1.2.4	Cardboard Waste	5
2.1.2.5	Other Recyclables.....	5
2.1.3	School Coordinated Waste Management.....	6
2.1.3.1	School of Exercise, Biomedical and Health Sciences.....	6
2.1.3.2	School of Natural Sciences	7
2.1.3.3	School of Nursing, Midwifery and Postgraduate Medicine	8
2.1.3.4	School of Communication and Arts	8
2.1.3.5	WA Academy of Performing Arts (WAAPA).....	8
2.1.4	Hospitality and Recreational Services Waste Management	9
2.2	South West Campus (Bunbury)	9
2.2.1	Waste Management Service Resources	9
2.2.1.1	General Waste	9
2.2.1.2	Paper / Co-mingled	9
2.2.2	Student Accommodation Waste Management	10
2.2.2.1	General Waste	10
2.2.2.2	Comingled Recyclables.....	10
3	DATA REVIEW AND WASTE MANAGEMENT SERVICES PACKAGES.....	12
3.1	Previously Collected Data.....	12
3.1.1	Refuse Generation	12
3.1.2	Recyclable Generation	13
3.2	Data Gaps	14
3.3	Available Waste Management Services Packages	15
4	WASTE MANAGEMENT STRATEGY RECOMMENDATIONS.....	16
4.1	Waste Management Strategies	17
4.1.1	Avoid and Reduce	17
4.1.2	Recycle.....	17
4.1.3	Recovery	19

4.1.4	Treatment.....	19
4.1.5	Disposal.....	19
4.2	Roles and Responsibilities.....	20
4.3	Waste Education and Awareness	21
4.4	Waste Management Services Packages	21
5	FUNDING OPTIONS	22
6	CONCLUSION	22

APPENDICES

APPENDIX A	Campus Maps
APPENDIX B	Waste Stream Flows - ECU Joondalup Campus
APPENDIX C	Waste Stream Flows - ECU Mount Lawley Campus
APPENDIX D	Waste Stream Flows – ECU Bunbury Campus

1 INTRODUCTION

1.1 Background

Edith Cowan University (ECU) is Western Australia's second largest university with approximately 23,000 students. ECU has two campuses located in the Perth Metropolitan Area (Joondalup and Mount Lawley) and one regional campus located in the South West (Bunbury). ECU has recently decommissioned the Churchlands campus, which is gradually being redeveloped into a residential development (Churchlands Green). Courses offered at Churchlands have been moved to the Joondalup and Mount Lawley Campuses¹. ECU campus locations are outlined below in **Figure 1.1**.

Figure 1.1: ECU campus locations



Source: ECU (2008)

ECU's aim is to provide leadership and support, and to mobilise internal and external resources to respond to current environmental challenges, especially in regards to the management of waste. ECU is committed to the environmentally sustainable development and has adopted the following sustainability principle for all its operations:

“that meets the needs of the present without compromising the ability of future generations to meet their own needs. ...in the end, sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs”.

World Commission on Environment and Development, 1987, 9-10

¹ Churchlands campus has therefore not been addressed in this Waste Management Strategy

1.2 Project Objectives

Cardno (WA) Pty Ltd (Cardno) has been commissioned by ECU to develop a Waste Management Strategy (WMS) across its three campuses being; Joondalup, Mount Lawley and South West. The WMS will be designed to allow for integration with ECU's Environmental Management System that is currently under development.

The objectives of the WMS is to review the current waste management practices which will include an assessment of waste stream flows (from generation to disposal) and current waste management operations at each campus. The information collected during the review will be used to develop some broad strategies in order for ECU to improve the efficiency and sustainability of its waste management services.

1.3 Methodology

Methodology undertaken for the strategy is outlined below.

- Desktop Review and Analysis;
- Site Visits;
- Consultation with Stakeholders / Industry;
- Development of Strategies / Recommendations; and
- Reporting

Background data and waste audit reports in regards to waste streams being generated, their volumes and the waste management operations for each of the campuses were made available to the Cardno Project Team. Any data gaps identified were attempted to be rectified during site visits and stakeholder consultation.

All three ECU campuses were visited by Cardno personnel during May 2008. During the site visit, the ECU Environment Coordinator and Environment Consultants from Cardno met with ECU faculty staff and cleaning contractors to obtain a more detailed understanding of on-site waste management practices. The ECU Joondalup, Mount Lawley and Bunbury campuses were visited on 13th, 15th and 23rd May 2008 respectively.

A simple waste audit of Building 1 (administration) at the Joondalup campus (**Appendix A1**) was conducted during the site visit. This audit was conducted for comparative reasons as a similar small waste audit was conducted in 2007 of the same building.

Stakeholders unable to be consulted during the site visits e.g. waste collection contractors were contacted via phone. Once all available information was gathered, strategies and recommendations were developed by the Cardno project team for presentation to ECU.

2 REVIEW OF CURRENT WASTE MANAGEMENT PRACTICES

The three ECU campuses were visited by Cardno personnel during May 2008. During the site visit, the ECU Environment Coordinator and Environment Consultants from Cardno met with ECU faculty staff and cleaning contractors to obtain a more detailed understanding of on-site waste management practices.

Student Housing is located on campus at all ECU campuses. However, for the purposes of this study the Bunbury campus will only be reviewed, as waste is managed internally by ECU contracted cleaners. Waste management services provided at Mount Lawley and Joondalup Student Housing is managed outside ECU jurisdictions. This is further discussed below.

2.1 Metropolitan campuses (Joondalup and Mount Lawley)

2.1.1 Waste Management Service Structure and Resources

Waste management services are coordinated by ISS Cleaning who are contracted by the Facilities and Services Department of ECU. Facilities and Services are responsible for supplying waste management services for the following waste streams:

- General refuse;
- Comingled recyclables;
- Paper; and
- Cardboard.

These common waste management services are provided to all Faculties and Schools at the Mount Lawley and Joondalup campus and are further outlined in **Section 2.1.2**. A flow chart, showing the flow of waste streams from generation to collection and disposal is provided in **Appendix B1** and **C1**.

Additional waste streams are generated at the Metropolitan campuses through specialised activities undertaken by school and hospitality services. The cost and coordination of managing these waste streams are the responsibility of the faculty. These waste streams and associated management are further explained in **Section 2.1.3**. A summary of all waste management services, including cost information is provided **Section 3.3**.

2.1.2 ECU Facilities and Services Department - Waste Management

2.1.2.1 General Refuse

Small general waste bins are provided within offices, classrooms and lecture theatres and are emptied by ISS cleaners daily. Larger bins are located around common areas within buildings and on campus grounds. These bins are lined with black plastic bags and are collected and relined by ISS on a daily basis.

All general waste is disposed in 3 – 4.5m³ front lift bins provided by SITA (**Photo 2.1**). These bins are emptied on a daily basis from locations outlined in **Appendix A1** and **A2**.

In addition to the small general refuse bins, mini bins have been introduced within the library and main administration buildings at the Joondalup campus (Buildings 1, 2, 21 and 31 shown in **Appendix A1**). The system involves substituting the normal general waste bin, usually positioned under the desk, with a desktop mini bin shown in **Photo 2.2**. The mini bin system aims to aid in the collection of recyclables, as it is less likely for staff to fit or dispose of recyclables and paper in the smaller container. The mini bin complements office recycling while also promoting message of waste minimisation.

Photo 2.1 and 2.2: SITA front lift bins and Mini Bin



2.1.2.2 Comingled Recyclables

Comingled recycling bins (**Photo 2.3**) are provided in kitchens situated in the two main administration buildings (Buildings 1 and 2), library (Building 31) and Health and Wellness (Building 21) at the Joondalup Campus (**Appendix A1**). The comingled recyclables kitchen bins have not been extensively introduced at the Mount Lawley campus. Kitchen bins allow for the disposal of:

- Paper takeaway cups;
- Glass bottles and jars;
- Plastic bottles;
- Food tins; and
- Milk and juice cartons.

ISS cleaners dispose of comingled kitchen bin recyclables into 120 or 240L MGB's on a daily basis. Dedicated MGB's are located in the basement of Buildings 1 and 2 (see **Appendix A1**) at the Joondalup campus, however recycling stations are used at the Mount Lawley Campus (**Appendix A2**).

Recycling stations are located on the Joondalup and Mount Lawley campus grounds in close proximity to cafeterias located on site (**Photo 2.4**). The locations of the recycling stations are shown on campus maps outlined within **Appendix A1** and **A2**.

Photo 2.3 and 2.4: Kitchen Recyclables Bin (Joondalup) and Recycling Station at Mount Lawley Campus



The recycling stations contain one 120L general waste MGB and three 120L comingled recyclables MGB's supplied by VISY. The comingled MGB's are wheeled to the kerbside by ISS cleaners and collected by VISY on a weekly basis. The general refuse bin is emptied on a daily basis, similar to other ground refuse bins.

Although the stations provide a clear message of what material are accepted in each bin (yellow – commingled, black – refuse), ECU is currently reporting recycling station contamination problems at both metropolitan campuses. Students (and possibly staff) are currently still disposing general refuse into the incorrect commingled bin.

2.1.2.3 Paper Waste

Paper recycling boxes (**Photo 2.5**) are provided for ECU staff at both campuses to dispose of mixed paper for recycling. It is the responsibility of staff members to empty their own box into 120L or 240L paper recycling MGB's situated in the office corridors and/or photocopy rooms (**Photo 2.6**). These bins are taken out of the buildings by ISS cleaners on a weekly basis and placed at various points of the campus for pickup by Western Recycling (owned by SITA Environmental).

Photo 2.5 / 2.6: Desk-side Paper Recycling Boxes and Paper Recycling 120L MGB



2.1.2.4 Cardboard Waste

ECU Joondalup and Mount Lawley also offer cardboard recycling for their staff. Staff have the opportunity to flatten any cardboard boxes and place them next to paper recycling MGB's. ISS cleaners collect the flattened cardboard on a daily basis and dispose of them in the 3m³ front lift bin (**Photo 2.7**) provided by SITA. The front lift bin is emptied on a weekly basis from the locations outlined within **Appendix A1** and **A2**.

Photo 2.7: SITA Cardboard Recycling Front Lift Bin



2.1.2.5 Other Recyclables

Other recycling services available at the ECU Joondalup and Mount Lawley campus are outlined in **Table 2.1**.

Table 2.1: Additional Recycling Services Offered at ECU Joondalup and Mount Lawley

Recyclables	Recycling Service
Fluorescent Tubes	Old tubes are collected and taken to a recycling depot where the glass, mercury and other metals are separated out and recycled. This initiative prevents dangerous substances such as mercury from accumulating in landfill and polluting soil, water and the food chain.
Toner and Printer Cartridges	Empty printer and photocopier toner cartridges are collected by WA Toner Supplies and Toner Action. Cartridges are recycled when new cartridge replacements or refills are sought. Offices that have the new Sharp printers and copiers can recycle their toner cartridges through Sharp. Cartridges are stored in their original packing and collected by Sharp to be recycled by Cartridge Rescue.
Mobile Phones and Batteries	Mobile phone and battery collections are available in Building 6 at ECU Joondalup and Building 3 at Mount Lawley campus (Appendix A1 and A2).

2.1.3 School Coordinated Waste Management

A number of university courses at the Joondalup and Mount Lawley campuses involve laboratory and practical workshop activities. These activities generate special waste streams that fall outside the control of the Facilities and Services department. The coordination and cost of the waste management services to dispose of the waste streams is the responsibility of the School that generates them. Faculties that produce special waste streams include:

- School of Exercise, Biomedical and Health Sciences – Joondalup
- School of Natural Sciences – Joondalup
- School of Nursing, Midwifery and Post Graduate Medicine – Joondalup
- School of Communication and Arts – Mount Lawley
- WA Academy of Performing Arts – Mount Lawley

2.1.3.1 School of Exercise, Biomedical and Health Sciences

The School of Exercise, Biomedical and Health Sciences is located at the Joondalup Campus. Studies include (not limited to) anatomy, pharmacology, nutrition, genetics ect. Therefore laboratory activities undertaken at the school generate a significant amount of biological waste streams that can be deemed hazardous. These waste streams, collection and disposal methods are outlined in **Table 2.2**. Examples of collection bins are outlined below in **Photo 2.8 / Photo 2.9**.

Photo 2.8 / Photo 2.9: Laboratory waste collection systems at the Joondalup Campus

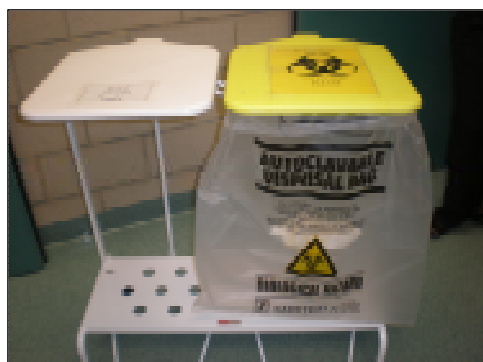


Table 2.2: School of Exercise, Biomedical and Health Science Waste Streams and associated treatment, collection and disposal

Waste Stream	Examples	Treatment / Disposal Method	Collection of disposed materials
Glass	Sharps, needles, syringes, scalpel blades	Material is disposed in yellow biohazard bins by students and staff members. Once three quarters full, the lid is sealed with tape.	All material is disposed by staff in 240L Medical MGB's supplied and collected by MediCollect. These bins are collected on a weekly basis for further treatment from a location shown in Appendix B2 .
Biological	Bacterial cultures, animal tissue and fluids, human blood products.	Waste streams and equipment coming into contact with the biological products are collected in plastic bags and autoclaved for 15 minutes at 121°C.	
Gloves		Gloves are collected in plastic bags and autoclaved for 15 minutes at 121°C.	
Quarantine		Solid waste is collected in bags and autoclaved for 15 minutes at 121°C. Liquid waste is bleached for 24 hours, diluted with large amount of water and disposed via the sewer.	
Animal	Carcass'	Carcass' are frozen and labelled in plastic bags. PC2 carcass' are autoclaved in bags for 15 minutes at 121°C	
Chemical	Acid and bases, heavy metals, hazardous, carcinogenic	Weak acid and bases are diluted with large amounts of water and disposed via the sink. Heavy metals are labelled in chemical stores.	Heavy metals and hazardous wastes are removed by a chemical waste contractor. Carcinogenic wastes and drugs are incinerated according to the material safety data sheet

2.1.3.2 School of Natural Sciences

The School of Natural Sciences is located at the Joondalup Campus. Studies include (not limited to) chemistry, forensics and soil science. Therefore waste streams generated through laboratory activities can sometimes be considered hazardous, requiring special disposal. Waste stream, collection and disposal methods are outlined in **Table 2.3**.

Table 2.3: School of Natural Sciences and associated collection and disposal

Waste Stream	Examples	Treatment / Collection Method	Collection of disposed materials
Chemicals	Explosives, flammables, oxidisers, toxic and poisons	Non-hazardous chemicals in low volumes are diluted with large amounts of water and disposed via the drain. Large and potentially dangerous chemicals are stored in the bulk storage storeroom.	Chemicals stored for disposal are collected by a chemical waste contractor periodically

The flow of waste from generation to disposal is outlined in **Appendix B2**.

2.1.3.3 School of Nursing, Midwifery and Postgraduate Medicine

The School of Nursing, Midwifery and Postgraduate Medicine is located at the Joondalup campus. Studies include (not limited to) chemistry, pharmacology and biological sciences. Equipment generally used in practicals does not come into contact with tissue or blood, therefore syringes, sucks and gastric tubes are reused where practicable. Any broken glass or used syringes are disposed in a sharps container. These sharps containers are then disposed in the School of Exercise, Biomedical and Health Sciences.

2.1.3.4 School of Communication and Arts

The School of Communication and Arts is located at the Mount Lawley campus. Studies include photography and visual arts. **Table 2.4** outlines the activities, waste streams generated by the school and the associated waste management practices undertaken for disposal.

Table 2.4: School of Communication and Arts and associated collection and disposal

Activity	Wastes Generated	Waste Management Practice
Photography	Broken cameras	Reuse for camera parts
	Photo developing agents	Chemical agents are reused as much as possible. Non-hazardous chemicals are disposed via the sink. Fixer and cleaning agents are collected for the sliver contained in the chemicals.
Visual Arts	Plaster, Glass, Metal Wood	Disposed in a 4.5m ³ front lift bin supplied and collected by Cleanaway on an as needed basis
	Glass dust	Poured down the drains
	Acrylic paint (water based)	Water based paints are diluted with water and disposed via the drain.
	Oil based paint, used turpentine, dyes	Collected by Environmental Recovery Services (ERS)
	Clear glass	Reused in glass blowing process
	Coloured glass	Disposed in a 4.5m ³ front lift bin supplied and collected by Cleanaway on an as needed basis
	Cloth off cuts	Reused as rags

The flow of waste from generation to disposal is outlined in **Appendix C2**.

2.1.3.5 WA Academy of Performing Arts (WAAPA)

The WA Academy of Performing Arts (WAAPA) is located at the Mount Lawley campus. **Table 2.5** outlines the activities, waste streams generated by the school and the associated waste management practices.

Table 2.5: WA Academy of Performing Arts and associated collection and disposal

Activity	Wastes Generated	Waste Management Practice
Production and set design	Wood off cuts Fibreglass resin Saw dust soaked turpentine* Cardboard Spray Cans	Disposed in 4.5m ³ bulk bin supplied and collected by SITA on an as needed basis A 25m ³ front lift bin is ordered every semester for a workshop cleanup

The flow of waste from generation to disposal is outlined in **Appendix C2**.

It is recommended WAPPA review the practice of disposing of saw dust soaked turpentine due it potentially being a fire hazard, when mixed with other materials, especially in the collection truck.

2.1.4 Hospitality and Recreational Services Waste Management

Hospitality and recreational services include (not limited to) cafeteria, taverns and sport and recreational facilities located on the ECU campus. At present there is limited cardboard and comingled recycling infrastructure provided and therefore recycling undertaken in these areas can be considered low. If staff so wish, cardboard and comingled recyclables can be disposed in the cardboard front lift bin located in the grounds compound or via a student recycling station respectively. Through consultation with Hospitality and Recreational Services, it is considered likely that most waste is disposed in general refuse

In regards to the generation of waste grease by hospitality, grease traps are located in certain areas around both campuses (as shown in campus maps **Appendix A1** and **A2**). Cooking oil from cafeterias is drained into the grease traps which are emptied every 16 weeks (as specified by the Water Corporation). The grease is collected and recycled by Fataway Industries based in Hazelmere. A chart representing the flow of waste from generation to disposal is outlined in **Appendix B2** and **C2**.

2.2 South West Campus (Bunbury)

2.2.1 Waste Management Service Resources

Waste Management services at the Bunbury campus are directly coordinated by the Facilities and Services Department. ECU Bunbury directly employs cleaners to manage and collect waste streams on campus, rather than contracting the activity out. Common waste management services are provided to Faculties and Schools at the campus that deal with the following waste streams:

- General refuse;
- Comingled recyclables;
- Paper; and
- Cardboard.

2.2.1.1 General Waste

Like the metropolitan campuses, small general waste bins are provided within offices, classrooms and lecture theatres and are emptied by the cleaners daily. Larger bins have been placed around common areas within buildings and around the campus grounds. These bins are lined with black plastic bags and are collected and relined by ECU cleaners on a daily basis.

All general waste is disposed to 240L MGB's supplied and collected by the City of Bunbury three times a week (**Appendix D1**).

2.2.1.2 Paper / Co-mingled

Paper recycling boxes are provided for staff at ECU Bunbury to dispose of mixed paper for recycling. It is the responsibility of staff members to empty their own box into larger boxes provided in common areas and corridors around the building (**Photo 2.10**). ECU cleaners empty the large cardboard boxes on a weekly basis into 240L comingled recycling MGB's.

The 240L comingled recycling MGB's accept comingled recyclables (including paper), however, the bins are generally filled with paper as comingled collection services are not provided on campus (**Appendix D1**).

Photo 2.10: Large paper box provided for the collection of mixed paper for recycling



2.2.2 Student Accommodation Waste Management

Student accommodation is provided on all campuses. Unlike at the metropolitan campuses, the Facilities and Services Department coordinates the waste collection services for the Bunbury campus. However, it is likely that the service will be contracted out in the near future. Nevertheless, the services currently provided have been outlined the following sections.

2.2.2.1 General Waste

General waste generated in Student Housing is collected by students and taken to a 4.5m³ front lift bin in proximity to the complex (**Photo 2.11**). The front lift bin is supplied and emptied by South West Waste two times a week.

Photo 2.11: Student Housing front lift bin provided and collected by South West Waste



The flow of waste from generation to disposal is outlined in **Appendix C2**.

2.2.2.2 Comingled Recyclables

A comingled recycling service is provided to student housing. Students are required to collect and dispose of their comingled recyclables in 240L MGB's located in an outside common area. These 240L MGB's are supplied and collected by the City of Bunbury's collection vehicles on a weekly basis (**Photo 2.12**).

Photo 2.12: Comingled Recycling bins provided and collected by the City of Bunbury's collection vehicles



The flow of waste from generation to disposal is outlined in **Appendix C2**.

3 DATA REVIEW AND WASTE MANAGEMENT SERVICES PACKAGES

3.1 Previously Collected Data

The collection of waste management data from ECU campuses in terms of waste streams and tonnages generated (until of late) has been limited and inconsistent. The adoption of sustainability principles by ECU has led to an investigation at the Joondalup campus into current waste management practices and the collection of data from waste contractors at the Bunbury campus. A detailed investigation was conducted into the following at the Joondalup campus:

- Quantity of waste being landfilled and recycled; and
- Types of waste being generated

3.1.1 Refuse Generation

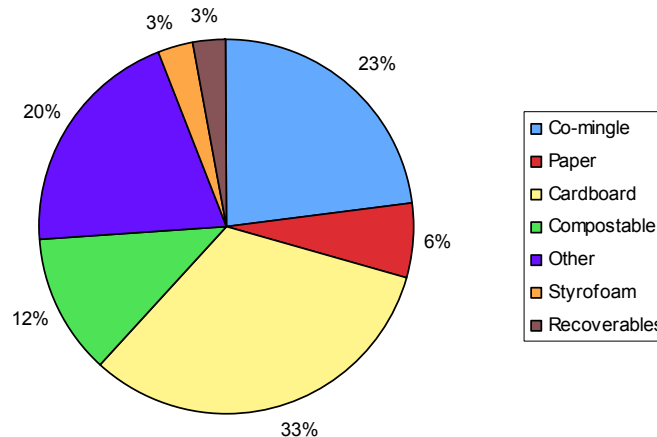
Waste audits have been conducted for 1-week’s waste generation across the Joondalup campus between 2003 and 2007 (excluding catering and student housing) (**Table 3.1**). Waste generation has generally shown an upwards trend in this time. It is likely the Mount Lawley and Bunbury campus are also generating a significant amount (>1 tonne) of waste per week.

Table 3.1: Waste audit results for one week refuse generation at the ECU Joondalup Campus – excluding catering and student housing

Year	Refuse Generated per week (kilograms)
2003	1,150
2004	1,070
2005	1,740
2006	1,740
2007	1,910

Potentially recyclable paper products (paper and cardboard) accounted for approximately 39% of all material being sent to landfill from Joondalup campus in 2007. This is followed by co-mingled (23%), “other” (20%), compostables (12%), “recoverables” (3%) and styrofoam (3%). Overall approximately 77% of waste material currently being generated by the Joondalup campus is potentially recyclable (**Figure 3.1**).

Figure 3.1: Composition of waste generated at the Joondalup campus (1-week during 2007) – excluding catering and student housing

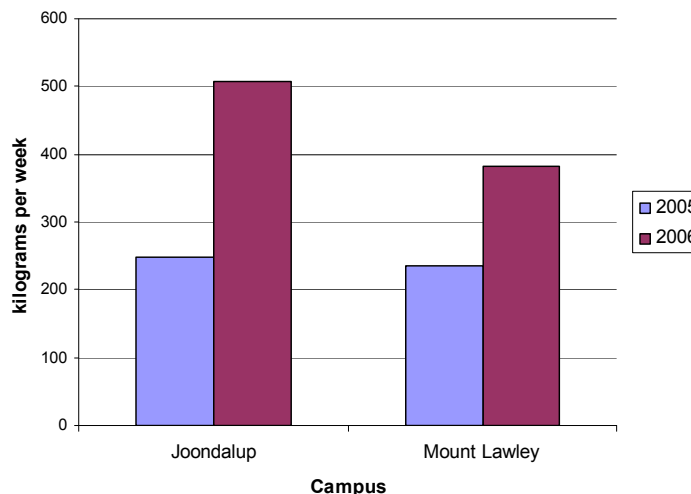


Data is collected by the ECU Bunbury Campus is based on an average bin weight (determined by the waste contractor) and the number of bins that are lifted / emptied every second day. Waste contractors have assumed that each bin is approximately 15.67 kilograms. Not every bin is emptied each day. During April 2008 approximately 1.6 tonnes of refuse was sent to landfill. The assumed weight of Student Housing front lift bin (set by South West waste) is approximately 148kg. The front lift is picked up twice per week. Based on these assumption approximately 1 tonne of waste is sent to landfill per month by Student Housing.

3.1.2 Recyclable Generation

Paper recovery programs have had success at both the Mount Lawley and Joondalup campuses between 2005 and 2006 with approximately 900kg of paper being recovered per week during 2006. A comparison between paper recycling recovery (1-week) at the Joondalup and Mount Lawley campuses between 2005 and 2006 is outlined below (**Figure 3.2**). Waste audits conducted between 2005 and 2007 at the Joondalup campus suggest there has been a significant reduction in paper being sent to landfill (43% of total waste stream in 2005 compared to 6% of total waste stream in 2007). Reported paper recycling activity from Western Recycling indicates that there was a 2-fold increase in paper recycling activity between 2005 (12.4 tonnes) and 2006 (25.3 tonnes). Actual paper recycling data was not available for 2007 or the Bunbury campus.

Figure 3.2: Comparison between paper recycling recovery (1-week) at the Joondalup and Mount Lawley Campus between 2005 and 2006 (in kilograms)



Note: Paper recycling data is unavailable for 2007 or Bunbury campus

Audits of the collection comingled recyclable (plastics / glass / cans) at the Joondalup campus suggest that tonnages recovered was negligible between 2005 and 2007.

As outlined in **Section 3.1.1**, data is collected by the ECU Bunbury Campus. It is based on an average bin weight (determined by the waste contractor) and the number of bins that are lifted / emptied. Co-mingled recyclables are emptied once a fortnight for campus grounds and once a week for the Student Housing. Waste contractors have assumed that each bin is approximately 14.25 kilograms. Comingled tonnages rely on whether the bin is placed on the kerb for collection. During April 2008 approximately 370 kilograms of co-mingled recyclables were collected for recycling.

During the Bunbury campus site visit an average bin weight audit of co-mingled recyclables was able to be conducted, as co-mingled bins were ready for collection. A comparison could therefore be achieved between assumed weights and actual weights. The weighing of six comingled bins suggests that each bin weighs approximately 13.3 kilograms.

Therefore the actual weight is similar to the average weight calculated by the waste collection contractor to invoice ECU Bunbury. Visually, the highest proportion of recyclables collected is office paper products.

3.2 Data Gaps

A number of data gaps were present in ECU administrative records, prior to the commissioning of this report in regards to location of waste infrastructure, flow of waste materials and waste contractors. Through a comprehensive analysis of all ECU campus waste operations a number of these data gaps have been filled, however there are further data gaps that require attention from ECU. These include:

- Total waste produced on each campus;
- Total waste diverted from landfill (recycled);
- Total greenwaste production / recycling;
- Total construction and demolition waste / recycling; and
- Total hazardous waste produced / disposed
- Waste audit data

At present an accurate depiction of the amount of waste being generated and either sent to landfill or recycled is very difficult to determine. This can be attributed to:

- waste services being organised and administrated by both the ECU Facilities and Services Department and individual Schools;
- waste services for the campuses being serviced by a number of different waste service providers; and
- tonnage data from refuse and recycling contractors not being provided regularly

The combination of these factors is making the aggregation of waste data difficult and time consuming and hence has been given little attention in the past.

Waste audit data, whilst useful in some respects in regards to composition of waste and the amount of potentially recyclable material going to landfill, it does not accurately represent the amount of waste being sent to landfill on a yearly basis. This is due to universities being very dynamic in the number of total student enrolments each year and the number of students being on site at one time.

Ways to address the current data gaps are outlined in **Section 4**. Current waste service providers in the Perth Metropolitan marketplace and potential waste packages they can provide is summarised in **Section 3.3**.

3.3 Available Waste Management Services Packages

The major waste and recycling collection contractors in the WA marketplace at present include AMCOR, Cleanaway, SITA Environmental, Veolia Environmental and VISY. Waste services provided by these waste contractors are outlined below in **Table 3.2**. Each company varies in the service that it can provide with its own fleet of collection vehicles. Where services are unavailable by the current fleet, subcontractors can be used. Therefore each waste collector can provide a complete package to meet the client's needs for any waste stream. All of the companies listed below are generally metropolitan based, therefore it is likely that services in Bunbury would be provided on a subcontracted basis. It is recommended that one service provider be sought for the three ECU campuses as a whole to increase administrative and cost efficiencies. This is explained further in **Section 4.4**. The selected contractor should then be recommended to all Schools as the “preferred contractor” for all waste services required during the year.

Table 3.2: Current waste services available by major waste contractors in WA marketplace (including Bunbury)

Waste Contractor Bin Type and Size	General Refuse		Recycling				Hazardous		Other
	MGB	Front Lift Bin	Comingled MGB	Comingled Bin	Paper MGB	Cardboard Bin	Clinical MGB	Chemicals	Florescent Tubes E-Waste Grease Trap
AMCOR	Subcontract	Subcontract	Subcontract	✓ 1,100L (1m ³) available	Subcontract (Secure bins also)	✓ Front Lift (sizes vary)	Subcontract	Subcontract	Subcontract
Cleanaway	✓ (120 - 1,100L)	✓ (1.5 – 4.5m ³)	✓ (120 - 1,100L)	✓ 1,100L (1m ³) available	✓ (Secure bin subcontract)	✓ (1,100L MGB – 4.5m ³ front lift)	✓ (120, 240, 660L)	Subcontract	Grease Trap Waste (Cleanaway) Fluoro Tubes, E- Waste - Subcontract
SITA Environmental	✓ (120 - 1,100L)	✓ (1.5 – 4.5m ³)	✓ (120 - 1,100L) (Plastic MGB also)	✓ 1,100L (1m ³) available	✓ (Secure bin subcontract)	✓ (1,100L MGB – 4.5m ³ front lift)	✓ (120, 240, 660L)	Subcontract (Tox Free or ERS)	Grease Trap Waste (SITA) Fluoro Tubes, E- Waste - Subcontract
Veolia Environmental	✓ (120 - 1,100L)	✓ (1.5 – 4.5m ³)	✓ (120 - 1,100L)	✓ 1,100L (1m ³) available	✓ (Secure bin subcontract)	✓ (1,100L MGB – 6m ³ front lift)	Subcontract (Stericorp)	Subcontract (WRR or ERS)	Dry Cell Batteries. Florescent Tubes Joint Venture with Sims E-Waste
VISY	Subcontract	Subcontract	✓ (120 / 240L)	✓ 1,100L (1m ³) available	✓ (Secure bin subcontract)	✓ Front Lift (sizes vary)	Subcontract	Subcontract	Subcontract

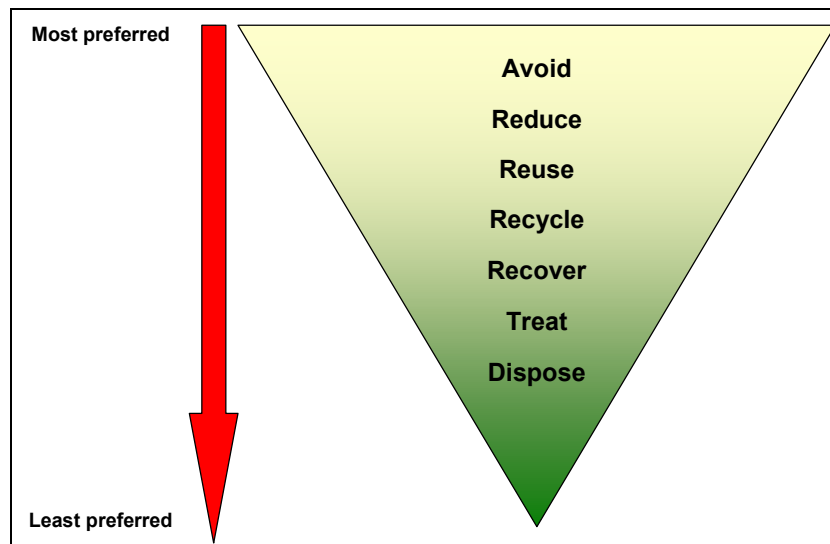
Education services can also be provided by each of the contractors. Services vary depending on the clients needs from education flyers to workshops and presentations.

4 WASTE MANAGEMENT STRATEGY RECOMMENDATIONS

Cardno in consultation with ECU and stakeholders has developed a number of waste management strategies for the ECU campuses to ensure efficient and sustainable waste management services at each campus. The strategies are presented in the form of an action plan and divided into campuses.

Cardno has adopted the Waste Management Hierarchy as the key decision making tool in the investigation of strategies for ECU. This approach reflects the underlining waste management principles adopted by Government and Non Government industries in Western Australia.

Figure 4.1: The Waste Management Hierarchy



4.1 Waste Management Strategies

The following strategies have been developed based on the Waste Management Hierarchy through a comprehensive desktop analysis, industry consultation and campus site visits.

4.1.1 Avoid and Reduce

Findings	Issues	Recommendations and Implementation Strategy	Priority	Responsibility	Outcome
High proportion of resource consumption and waste generation is low / high grade paper	Large environmental footprint and subsequent waste generation High economic cost burden to ECU and students	Holistic approach towards paper waste achieved through coordination between Environmental Coordinator and IT Department. This may include: <ul style="list-style-type: none"> • default double sided printing on all campus computers • default double sided printing on all campus photocopiers • encouragement of staff / students to minimise paper use through multi-sheet options. Provide instructions • where double-sided / multi-sheet options are not available on printers / photocopiers consider replacement of such machines • establish cost incentives to print double sided. i.e cost to print double sided is same as single sided • encourage staff / students to avoid printing and instead read directly off computer or store onto portable storage device 	Initiation Short Term Duration Initial Effort / Ongoing education	- ECU Facilities and Services Department - IT Department	- Reconfigure default setting through ECU servers. - Audit photocopiers / printers for required settings
High volume of waste is disposable cups	Whilst not generated in high tonnages, contributes significantly to contamination rates (especially styrofoam)	<ul style="list-style-type: none"> • Continue promotion of reusable Thermal Mug on campus • Removal of disposable cup options in staff rooms across all campuses • Encourage catering and hospitality to avoid procuring disposable items that are non-recyclable 	Initiation Short Term Duration Initial Effort / Ongoing education	- ECU Facilities and Services Department - Hospitality / Catering - Schools	Enter discussions with Schools and Catering
No consideration of waste treatment requirements when procuring materials	Contamination issues when recycling (e.g Type 4, 5, 6, 7 plastics cannot be recycled by current comingled collection contractor)	<ul style="list-style-type: none"> • Develop procurement policy across all ECU campuses that take into account environmental impacts (including waste) • Establish meeting with stakeholders responsible for procuring materials for ECU activities (possibly representative from administration, hospitality/catering, each School ect) and develop practical procurement policy • Encourage the use of products produced from recyclable materials 	Initiation Medium Term Duration Initial Effort / Ongoing enforcement	All Departments	Policy that becomes part of operational procedures

4.1.2 Recycle

Findings	Issues	Recommendations and Implementation Strategy	Priority	Responsibility	Outcome
High proportion (33%) of waste stream is cardboard	Cardboard is very bulky and requires front lift bins to be collected frequently.	<ul style="list-style-type: none"> • Greater promotion and education of staff and students regarding cardboard pickups by ISS and cardboard front lift bins available on campus. • Greater access to cardboard bins in areas that generate high quantities of cardboard (e.g provision of portable 1,100L Cardboard MGB's). 	Initiation Short Term Duration Initial effort / Ongoing education	- ECU Facilities and Services Department - Schools - Environmental / Recycling Coordinator	- Less cardboard waste and increased capacity of current front lift bins. - Possible reduction in collections (and costs).
Comingled recycling was trialled outside lecture theatres in the past. Limited comingled recycling in café areas	Bins were contaminated with drink straws and Styrofoam cups Waste collection contractor will likely reject load and dispose to landfill. Potential to charge higher amount due to higher cost of landfill.	<ul style="list-style-type: none"> • Locate sources of contamination (e.g Styrofoam – type 6) and procure materials that are recyclable (i.e corrugated paper cups) (Section 4.1.1) • Introduce comingled recycling in common areas such as cafes with careful consideration of labelling and placement of bins to reduce contamination rates • Once the education and awareness is successful, attempt to introduce recycling near lecture theatres. 	Initiation Short Term Duration Initial effort / Ongoing education	- ECU Facilities and Services - Department / Hospitality / Catering	- Reduced probability of contamination. - Procurement policy that becomes part of operational procedures
Recyclable collection contractor is reporting high rates of contamination / low recovery	Students / staff continuing to place non-recyclable materials into incorrect bin	<ul style="list-style-type: none"> • Continue education of students and staff through media sources • Highlight recycling stations on student maps and provide information regarding recycling on campus 	Initiation Short Term Duration Initial effort / Ongoing	ECU Facilities and Services Department	Reduced contamination and increased recycling

Catering and hospitality find it difficult to recycle	No recycling infrastructure in proximity to operations	<ul style="list-style-type: none"> • Comingled bin (1,100L) be trialled in addition to waste front lift bins 	<p>Initiation Short Term</p> <p>Duration Initial effort / Ongoing</p>	ECU Facilities and Services Department Hospitality / Catering	Increased recycling
No events recycling currently in place at any campus	High quantities of waste generation which contributes to poor green image	<ul style="list-style-type: none"> • Trial a comingled recycling option for events and introduce permanently if successful • Potentially recruit volunteers to man stations and provide education and information 	<p>Initiation Medium Term</p> <p>Duration Initial trial / Ongoing if successful</p>	ECU Facilities and Services Department	<ul style="list-style-type: none"> - Reduced waste - Opportunity for education of students in regards to recycling
Comingled bins outside Joondalup library inconsistent to other recycling stations	Complex material source separation (aluminium / plastic and glass). Contamination high	<ul style="list-style-type: none"> • Remove and replace with standard established recycling station 	<p>Initiation Short Term</p> <p>Duration No further effort once station installed</p>	ECU Facilities and Services Department	<ul style="list-style-type: none"> - Consistent message across campus - Budget identified and position to be filled by the end of 2008
Comingled recycling not greatly promoted at Bunbury campus No recycling station at Bunbury Campus	No opportunity for students /staff to recycle comingled materials when on campus grounds	<ul style="list-style-type: none"> • Installation of small recycling station in proximity to catering / hospitality areas • Greater promotion, number of co-mingled recycling bins 	<p>Initiation Short Term</p> <p>Duration No further effort once station installed</p>	ECU Facilities and Services Department	<ul style="list-style-type: none"> Budget identified and station constructed Strategic areas identified for indoor comingled bins
Electronic goods (E-waste) is auctioned every three years or donated (where possible) to charity organisations. ECU looking at auction every four years in near future.	E-waste eventually ends up in landfill in the short to medium term	<ul style="list-style-type: none"> • Continue e-waste auctioning and charity program • Investigate services currently provided through chosen "preferred contractor" or directly through Sims E-waste 	<p>Initiation Medium term</p> <p>Duration Periodic disposal of outdated equipment</p>	IT Department Environmental Coordinator	E-waste broken down into raw materials and recycled back into new products.
No mobile phone or dry cell battery recycling at Bunbury Campus	No opportunity for students /staff to recycle mobiles phones and dry cell batteries	<ul style="list-style-type: none"> • Contact Mobilemuster to install free collection bin. Enquire with waste contractor whether a dry cell battery service is available. 	<p>Initiation Short Term</p> <p>Duration No further effort once station installed</p>	ECU Facilities and Services Department	- Reduced hazardous waste generation on and off site
Construction and demolition waste is currently landfilled	No consideration that C&D waste can be readily recycled by some contractors in the Perth Metropolitan Area	<ul style="list-style-type: none"> • Make it a condition of contract that all C&D waste generated in significant quantities be sent to a C&D Recycler instead of an inert landfill • Source separate C&D materials (e.g concrete, sand, bricks) where possible. • Source recycled aggregates for onsite construction activities where possible (e.g recycled aggregate for sub base in pathways or carparks) 	<p>Initiation Short Term</p> <p>Duration When required</p>	ECU Facilities and Services	<ul style="list-style-type: none"> - Reduction in inert waste to landfill - Potentially cost savings due to reduced transport costs and lower gate fees - Potential raw aggregate cost savings
A number of desks in offices did not have paper recycling bins	High generation of paper waste	<ul style="list-style-type: none"> • Continue promotion of desk-side paper recycling bins through the Green Office Program • Conduct audit of all offices for paper recycling bins (possibly using ISS) 	<p>Initiation Short Term</p> <p>Duration Little further effort once offices with no boxes are identified</p>	- ECU Facilities and Services Department - ISS	<ul style="list-style-type: none"> - Reduced paper to landfill - Likely recycling company can provide bins free of charge

4.1.3 Recovery

Findings	Issues	Recommendations and Implementation Strategy	Priority	Responsibility	Outcome
<p>No organics recycling is currently in place at any ECU campus with the exception of greenwaste being stockpiled and utilised across the campus grounds</p> <p>Organics currently account for approximately 17% of all waste produced</p>	<p>Organics contribute significantly to greenhouse gas effect through the generation of methane (25 times more potent than CO₂) when degrading in anaerobic conditions in landfill.</p> <p>No opportunities for Alternate Waste Treatment of commercial waste in WA at present</p>	<ul style="list-style-type: none"> Investigate composting trial at one of the campuses Encourage hospitality and catering to source separate waste organics in waste food activities to feed into the composting trial 	<p>Initiation Medium Term</p> <p>Duration 3 months trial. Ongoing if successful</p>	<ul style="list-style-type: none"> Environmental Coordinator / Recycling Coordinator Hospitality / Catering Ground staff 	<ul style="list-style-type: none"> Reduced putrescible material to landfill High nutrient fertiliser for grounds and gardens Reduced costs for fertilisers Increasing carbon sink of campuses

4.1.4 Treatment

Findings	Issues	Recommendations and Implementation Strategy	Priority	Responsibility	Outcome
<p>Hazardous waste (biological / chemical) is being generated by a number of schools across the ECU campuses. The wastes are being collected by Licensed contractors for correct treatment and disposal. Chemicals are being reused as much as possible before disposal (e.g photography)</p>	<p>None at present, however, there is minimal coordination of collection by contractors across each campus.</p>	<ul style="list-style-type: none"> Continue education of staff and students in regards to correct disposal of hazardous waste streams Schools to use preferred waste collection contractor 	<p>Initiation Short Term</p> <p>Duration Ongoing</p>	<p>School staff</p>	<p>Continue the good practices currently being employed by each School in regards to hazardous waste streams</p>

4.1.5 Disposal

Findings	Issues	Recommendations and Implementation Strategy	Priority	Responsibility	Outcome
<p>Schools have regular cleanups and order large front lift bin for disposal. High proportion of waste is potentially reusable or recyclable. Contractor utilised is inconsistent amongst schools</p>	<p>High waste volumes to landfill.</p> <p>High waste disposal costs</p>	<ul style="list-style-type: none"> Schools to contact Environmental Coordinator prior to cleanup Schools to inform Environmental Coordinator on waste streams disposed. Environmental coordinator will identify possible recycling, reuse, recovery. Schools to use preferred waste collection contractor 	<p>Initiation Short Term</p> <p>Duration Ongoing</p>	<ul style="list-style-type: none"> Schools Environmental Coordinator / Recycling Coordinator 	<ul style="list-style-type: none"> Potentially reduced costs to Schools Reduced waste generation
<p>Some schools dispose of the same waste streams, but use different contractors</p>	<p>Doubling up on costs</p>	<ul style="list-style-type: none"> Communication and coordination of collections 	<p>Initiation Short Term</p> <p>Duration Initial agreement between Schools</p>	<ul style="list-style-type: none"> Schools Environmental Coordinator / Recycling Coordinator 	<ul style="list-style-type: none"> Reduced costs to Schools
<p>WAAPA are disposing of high quantities waste from set/prop production (especially wood)</p>	<p>Higher waste volumes sent to landfill.</p> <p>High cost burden for Schools</p>	<ul style="list-style-type: none"> Contact EMRC wood recycling centre for possible collection and recovery of wood waste Encourage WAAPA to separate out cardboard for collection by cleaners and recycling 	<p>Initiation Short Term</p> <p>Duration Ongoing</p>	<ul style="list-style-type: none"> Environmental Coordinator / Recycling Coordinator WAAPA 	<ul style="list-style-type: none"> Reduced waste Reduced costs to WAAPA

4.2 Roles and Responsibilities

Successful waste management services rely on the involvement of all staff members but also on the roles and responsibilities of groups to maintain the system.

Findings	Issues	Recommendations and Implementation Strategy	Priority	Responsibility	Outcome
The current environmental coordinator's role has changed. Waste Management coordination has been neglected in recent times.	Waste management practices would be more effective if it was coordinated through a dedicated role.	ECU should be tasked to create a centralised recycling coordination position that works with all campuses, facilities and school, as well as hospitality and recreational services.	Initiation Short Term Duration Ongoing	ECU Facilities and Services Department	Budget identified and position to be filled by the end of 2008
Lack of communication between ECU Facilities and Services, various Schools and Hospitality and Recreational Services	There is confusion on who should pay for what service. A number of different collection contractors are used within campuses.	ECU Facilities and Services Department should establish and maintain a Waste Management Committee so that strategies are communicated across all groups. Any issues and suggestions between groups can be raised at committee meeting. The Environmental Coordinator should chair the committee which should include at least one representative from the following groups: There should be at least one representative from the following: <ul style="list-style-type: none"> • ISS Cleaning • All faculties • Guild • Cafes • Recreation and sporting services 	Initiation Short Term Duration Ongoing	ECU Facilities and Services Department - Environmental Coordinator / Recycling Coordinator	Committee established and meetings scheduled by the end of 2008
Some lessees are using the waste management services that should only be provided to Faculties and Schools	ECU is paying for the waste management services	<ul style="list-style-type: none"> • ECU should insert a condition within the lease that enforces that lessees pay and coordinate their own waste management services • Schools to use preferred waste collection contractor 	Initiation Short Term Duration Ongoing	ECU Facilities and Services Department	Once the leases are up for renewal, enter the new condition.
The head cleaner from ISS has commented that there is no dedicated washdown area to clean the bins	Bins can become contaminated and produce odours	<ul style="list-style-type: none"> • Allocate space for a bin wash down area, close to the main collection area at all campuses. • Alternatively, contract a specialised bin cleaning contractor to attend and clean bins in an environmentally appropriate manner on an as required basis 	Initiation Short Term Duration One-off construction / allocation of area	ECU Facilities and Services	Less probability of odours and recyclables contamination (especially paper)
Some commingled recyclables and paper MGB's are not returned to the building, after collected from the kerb	Bins are not being utilised	Environmental Coordinator to identify and notify school to return to building.	Initiation Short Term Duration Ongoing encouragement	- Environmental Coordinator / Recycling Coordinator - Schools	Increased recycling (especially after collection)

4.3 Waste Education and Awareness

The education and awareness of staff is key to the successful implementation of any waste minimisation initiatives.

Findings	Issues	Recommendations and Implementation Strategy	Priority	Responsibility	Outcome
<p>Although an education programme has been introduced at ECU, the amount of time allocated towards waste education and awareness has decreased due to the role change of the Environmental Coordinator.</p> <p>Most waste education and awareness strategies have been implemented at the Joondalup campus.</p>	<p>Confusion amongst students and staff in regards to waste management</p> <p>Contamination issues at Recycling Stations</p>	<p>ECU should be tasked to create a centralised recycling coordination position that works with all campuses, facilities and school, as well as hospitality and recreational services.</p>	<p>Initiation Short Term</p> <p>Duration Ongoing</p>	<p>ECU Administration</p>	<p>- Greater resource base available to coordinate waste reduction activities</p> <p>- Greater likelihood of implementation of programs and reduction of waste generation</p>
<p>ECU have developed a "EcoECU" website that contains useful information regarding the Environmental Services currently provided by ECU and initiatives currently taking place across the campuses.</p>	<p>Website is difficult to find from the ECU homepage</p>	<p>Greater promotion of the EcoECU website through current communication mediums and ECU homepage.</p>	<p>Initiation Short Term</p> <p>Duration Ongoing</p>	<p>ECU Administration Environmental Coordinator</p>	<p>- Greater education and awareness of environmental issues towards students and staff and what ECU is doing to address these issues.</p> <p>- Empowers staff and students to make right choices.</p>

4.4 Waste Management Services Packages

As outlined in **Section 3.3**, there are a number of consolidated waste services packages currently available in the WA marketplace

Findings	Issues	Recommendations and Implementation Strategy	Priority	Responsibility	Outcome
<p>A number of different waste collection contractors are used within campuses</p>	<p>Inefficient use of resources and increased costs</p>	<p>Waste collection contractors have been contacted by Cardno (WA) as part of the ECU Waste Management Strategy. The services offered by the contractors are outlined in Section 3.3.</p> <p>ECU to develop and tender waste collection contract across all three campuses in regards to refuse, recyclable and hazardous waste collections</p> <p>Continue to utilise current industry Extended Producer Responsibility Schemes (i.e mobile phones, printer toner cartridges, dry cell batteries)</p>	<p>Initiation Short Term</p> <p>Duration When contracts expire</p>	<p>Environmental Coordinator Recycling Coordinator</p>	<p>- More coordinated single point of contact for waste management services</p> <p>- Increased efficiency</p> <p>- Cost Savings to ECU and Schools</p>
<p>Current contractors are unable (or unwilling) to provide waste tonnage or composition data</p>	<p>Difficult for ECU to prioritise or target waste streams with confidence</p>	<p>Make it a condition of contract that the preferred contractor provide waste tonnage and composition data (if possible)</p>	<p>Initiation Short Term</p> <p>Duration During formulation of tender document</p>	<p>Environmental Coordinator Recycling Coordinator</p>	<p>- ECU will be able to target problem waste streams and initiate waste reduction programs with greater ease and confidence</p>

5 FUNDING OPTIONS

Additional funding will be required for the implementation of the recommendations listed in **Section 4**. Funding will generally need to be sought internally through ECU Facilities and Services and through the Schools themselves; however there may be the opportunity to seek funding through the Strategic Waste Initiatives Scheme (SWIS), a WA Government Waste Authority initiative.

Support will be provided for initiatives which are consistent with the Waste Management Board's Statement of Strategic Direction for Waste Management in Western Australia. Targeted waste streams can vary from year to year, so it is recommended ECU regularly seek updates from the Zero Waste website for targeted funding areas.

www.zerowastewa.com.au

6 CONCLUSION

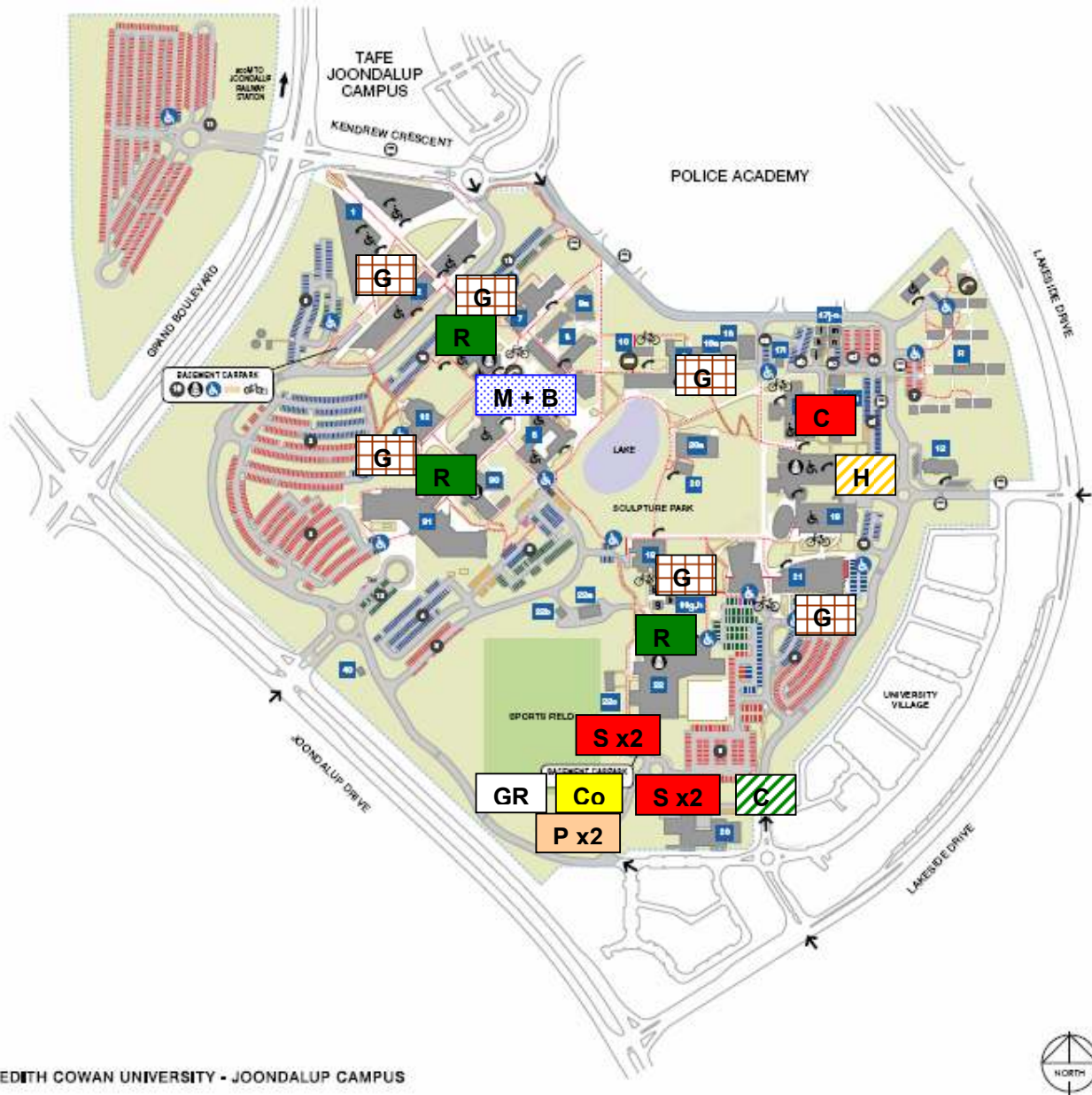
Edith Cowan University (ECU) currently has a number of waste minimisation initiatives at the Joondalup, Mount Lawley and Bunbury campuses including paper, cardboard and co-mingled recycling. Whilst a number of waste services have been provided to staff and students, there is potential for the improvement and coordination of these waste service activities and increased education to staff and students.

Information in regards to what services are currently provided at ECU and associated recommendations provided within this document will help ECU staff and students to reduce the current level of waste generation across all campuses in turn helping ECU reach its goal of environmental sustainable development.

APPENDIX A

Campus Maps

Figure A1: ECU Joondalup Campus Map showing waste management service locations

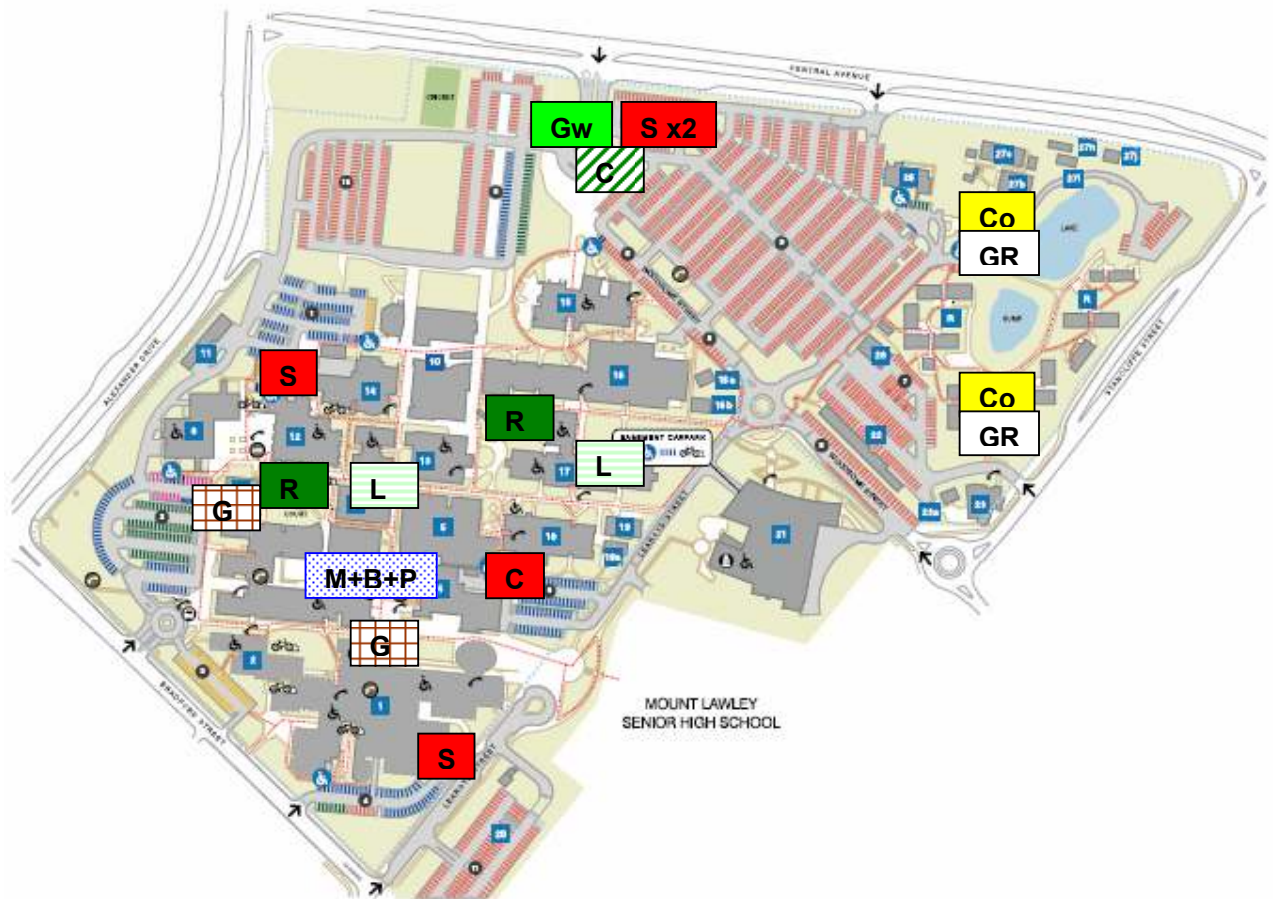


EDITH COWAN UNIVERSITY - JOONDALUP CAMPUS

Legend

	Waste Disposal Infrastructure	Collection Contractor
R	Recycling Station	VISY
C	Front Lift Bin	Cleanaway
S	Front Lift Bin	SITA Environmental
GR	General Refuse MGB	Unknown
Co	Comingled MGB	VISY
P	Plastics MGB	VISY
G	Cardboard Front Lift Bin	SITA Environmental
H	Hazardous / Clinical Bins MGB	MediCollect
G	Grease Trap	Unknown
M+B	Mobile Phone and Battery Drop Off	Industry
x2	Multiple Bins	

Figure A2: ECU Mount Lawley Campus Map showing waste management service locations



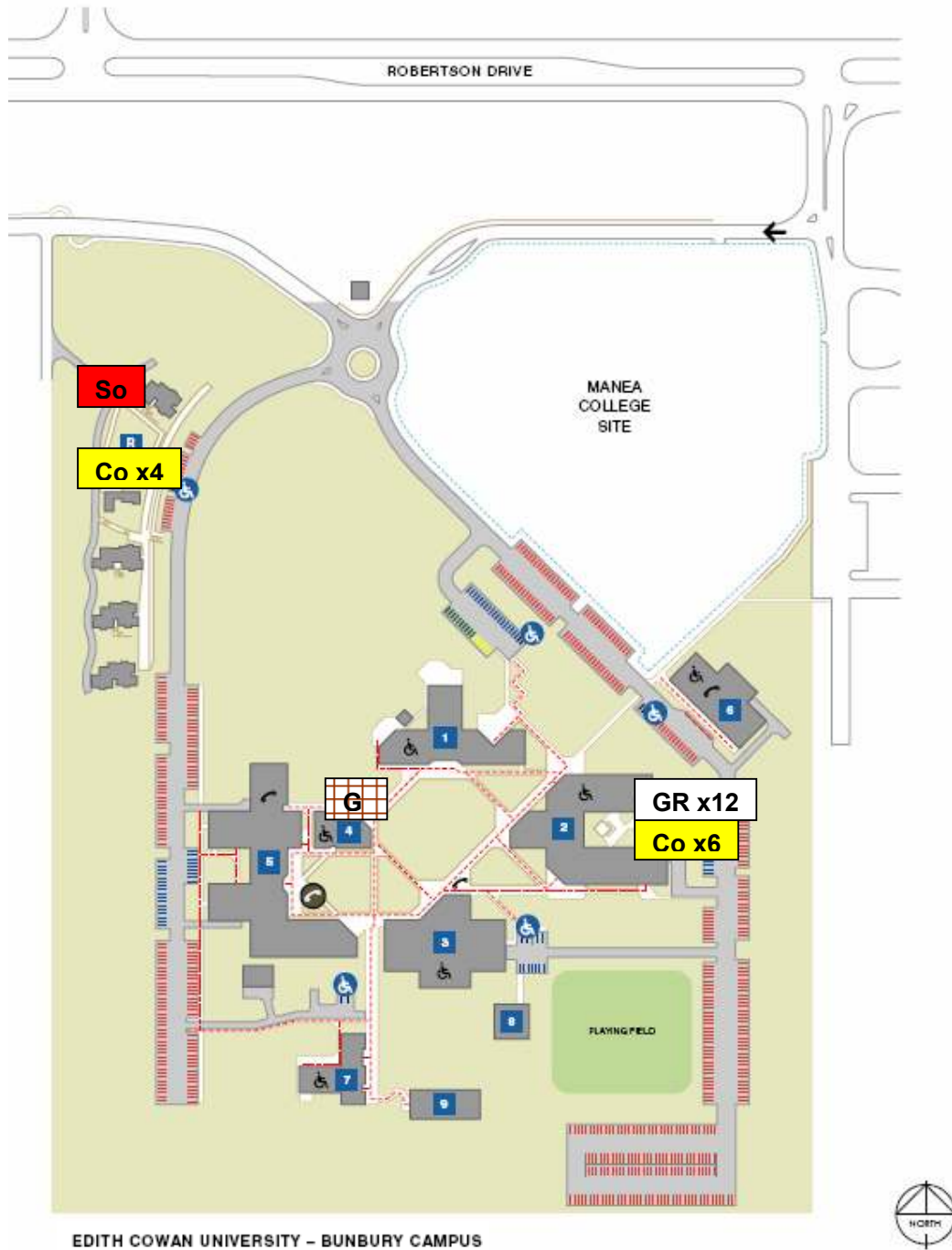
EDITH COWAN UNIVERSITY – MT LAWLEY CAMPUS



Legend

	Waste Disposal Infrastructure	Collection Contractor
R	Recycling Station	VISY
C	Front Lift Bin	Cleanaway
S	Front Lift Bin	SITA Environmental
GR	General Refuse MGB	Unknown (outside operations)
Co	Comingled MGB	Unknown (outside operations)
C	Cardboard Front Lift Bin	SITA Environmental
L	Hazardous Liquid Storage	ERS
Gw	Greenwaste Stockpile	
G	Grease Trap	Unknown
M+B+P	Mobile Phone / Battery / Printer Cartridge Drop Off	Industry
x2	Multiple Bins	

Figure A3: ECU Bunbury Campus Map showing waste management service locations



Legend

	Waste Disposal Infrastructure	Collection Contractor
So	Front Lift Bin	South West Waste
GR	General Refuse	City of Bunbury
Co	Comingled MGB	City of Bunbury
G	Grease Trap	Unknown
x2	Multiple Bins	

EDITH COWAN UNIVERSITY - JOONDALUP CAMPUS



MAP SYMBOLS

- BUILDING NUMBER
- VISITOR CARPARK
- STAFF CARPARK
- STUDENT CARPARK
- RESERVED STAFF CARPARK
- UNIVERSITY VEHICLES
- DISABLED PERSONS PARKING
- WHEELCHAIR ACCESSIBLE TOILET
- WHEELCHAIR ACCESS ROUTE
- PUBLIC PHONE
- SECURITY PHONE
- ATM (AUTOMATIC TELLER MACHINE)
- TAXI STATION
- BUS STOP
- BICYCLE RACK
- SECURE BICYCLE PARKING
- SHOWER FACILITY

Art Gallery	1
Bookshop	31
Bookshop Receipts	26
Buildings & Services - Grounds & Maintenance	26
Central Plant	16
Centre for Ecosystem Management	19
Centre for Human Genetics	17
Centre for Social Research	4
Chancellery	1
Child Care Centre (Joondalup Early Learning Centre)	12
Coffee Shop	1, 6, 31, 22
Conference Rooms	1, 31, 2
Corporate Relations	1
Counselling Service	19
Degreed Brewery Restaurant	9
E-labs	31
Equity, Diversity & Disability Advisor	18
EDU Copy Service	26
EDU Sport & Fitness Centre	22
Edith Cowan House	22
Facilities Management Office (Level 2)	6
Faculty of Business & Law	2
- Executive Depts Office	2
- Faculty Administration	2
- International & Commercial	2
- Research & Higher Degrees	2
- Teaching & Learning	2
- School of Accounting, Finance & Economics	2
- School of Law & Justice	2
- School of Management	2
- School of Marketing, Tourism & Leisure	2
- The Sallinger Centre	2
- Student Information Centre	2
Faculty of Computing Health & Science	17, 19
- Executive Depts Office	21
- International & Commercial	21
- Occupational Therapy	21
- Research & Higher Degrees	21
- School of Computer & Information Science	19
- School of Engineering	5, 8
- Electron Science Research Institute - ESRI	8
- School of Exercise Biomedical & Health Sciences	17, 19
- School of Natural Sciences	19

- Teaching & Learning	21
- School of Psychology & Social Science	4, 6, 30
- Viro Health Institute	21
Faculty of Education and Arts	4, 8, 9a
- School of Education - Reception	8a
- School of Education - Middle Years/Kindergarten through 7)	8
I.T. Infrastructure	31
I.T. Support Services	31
Joondalup Rehabilitation Health & Exercise Clinic	19
Lecture Science Shed	22a
Lecture Theatre (Rooms: 7, 101, 7, 102, 19, 141, 19, 143, 32, 101)	7, 10, 32
Library	31
Mail Room	6
Micro Brewery	9
Multifath Chaplaincy Service	16
Multimedia Resources	31
Muzalah	171
National Networked Tele-Test Facility Integrated Systems	2
Off Campus Support	16
Peter Cowan's Writers' Centre (Edith Cowan House)	20
Pines Picture Garden	20a
Public Relations	1
Security Office (Level 2)	1
Staff Room	8
Student Central	16
- Enrolment Enquiries	16
- General Campus Enquiries	16
Student Services Centre	31
Student Guild	10
Student Health Services (Level 1)	6
Student Recruitment & Careers	16
Student Village	8
Tavern	9
Ukigashi	2
University's Central Administration	1
Victor's Centre (Level 2)	1

EDITH COWAN UNIVERSITY - MT LAWLEY CAMPUS



MAP SYMBOLS

- BUILDING NUMBER
- VISITOR CARPARK
- STAFF CARPARK
- STUDENT CARPARK
- RESERVED STAFF CARPARK
- UNIVERSITY VEHICLES
- DISABLED PERSONS PARKING
- WHEELCHAIR ACCESSIBLE TOILET
- WHEELCHAIR ACCESS ROUTE
- PUBLIC PHONE
- SECURITY PHONE
- ATM (AUTOMATIC TELLER MACHINE)
- TAXI STATION
- BUS STOP
- BICYCLE RACK
- SECURE BICYCLE PARKING
- SHOWER FACILITY

Library	8
Mail Room	9
Multimedia Resources	8
Multifath Chaplaincy Services	16b
Muzalah	16a
Postgraduate Studies	18
Professional Development Centre	9
School of Communication & Arts	9
- Advertising	9
- Ceramics, Textiles, Drawing, Printmaking	4, 5
- Film & Video	6
- Interactive Multimedia	9
- Journalism	6
- Mass Communications	6
- Media Studies	6
- Printing	27, 27a, 27b
- Promedia	9
- Public Relations	9
- Screen Academy	2
School of Computer & Information Science	13
- Communications & IT	13
- Computer Science	13
- Computer Security	13
- Library Technology	13
- Research Support	13
- Software Engineering	13
School of Education	14, 16, 17, 18, 27
School of Indigenous Studies - Kurungkur, Kallitjin	16
School of International Cultural & Communication Studies	17
Security Office	14
Staff Room	18
Student Central	9
- Enrolment Enquiries	9
- General Campus Enquiries	9
Student Equity Office	9
Student Guild	12
Student Housing Administration	22
Student Housing Recreation	22a
Student Village	R1, 22
Tavern	12

WAAcademy of Performing Arts	1
- Acting	1
- Acting Studio	1
- Administration	1
- Arts Management	2
- Broadcasting	6
- Classical Music	1
- Costumes	1
- Dance	1
- Design	1
- Jazz & Contemporary Music	1
- Music Auditorium	1
- Musical Theatre	1
- Production Teaching	1
- Sets Construction And Properties	1
- Sound Studios	1
- Stage Management	1
- Staging	1
- Store	28
- The Geoff Gibbs Theatre (Room: 1, 150)	1
- The Roundhouse (Room: 1, 100C)	1
- Venue Operations	1
- WA Institute of Music	1
- Workshop	1

EDITH COWAN UNIVERSITY - BUNBURY CAMPUS



MAP SYMBOLS

- BUILDING NUMBER
- VISITOR CARPARK
- STAFF CARPARK
- STUDENT CARPARK
- RESERVED STAFF CARPARK
- DISABLED PERSONS PARKING
- WHEELCHAIR ACCESSIBLE TOILET
- WHEELCHAIR ACCESS ROUTE
- PUBLIC PHONE
- SECURITY PHONE

BUILDING IDENTIFICATION LEGEND

Administration	1
- Academic Depts Advisor	
- Cashier	
- Finance Office	
- Student Central	
Specialist Teaching Block	2
- Centre for Sustainable Regional Future	
- Computer Industries	
- Health	
- Social Work	
- Student Guild	

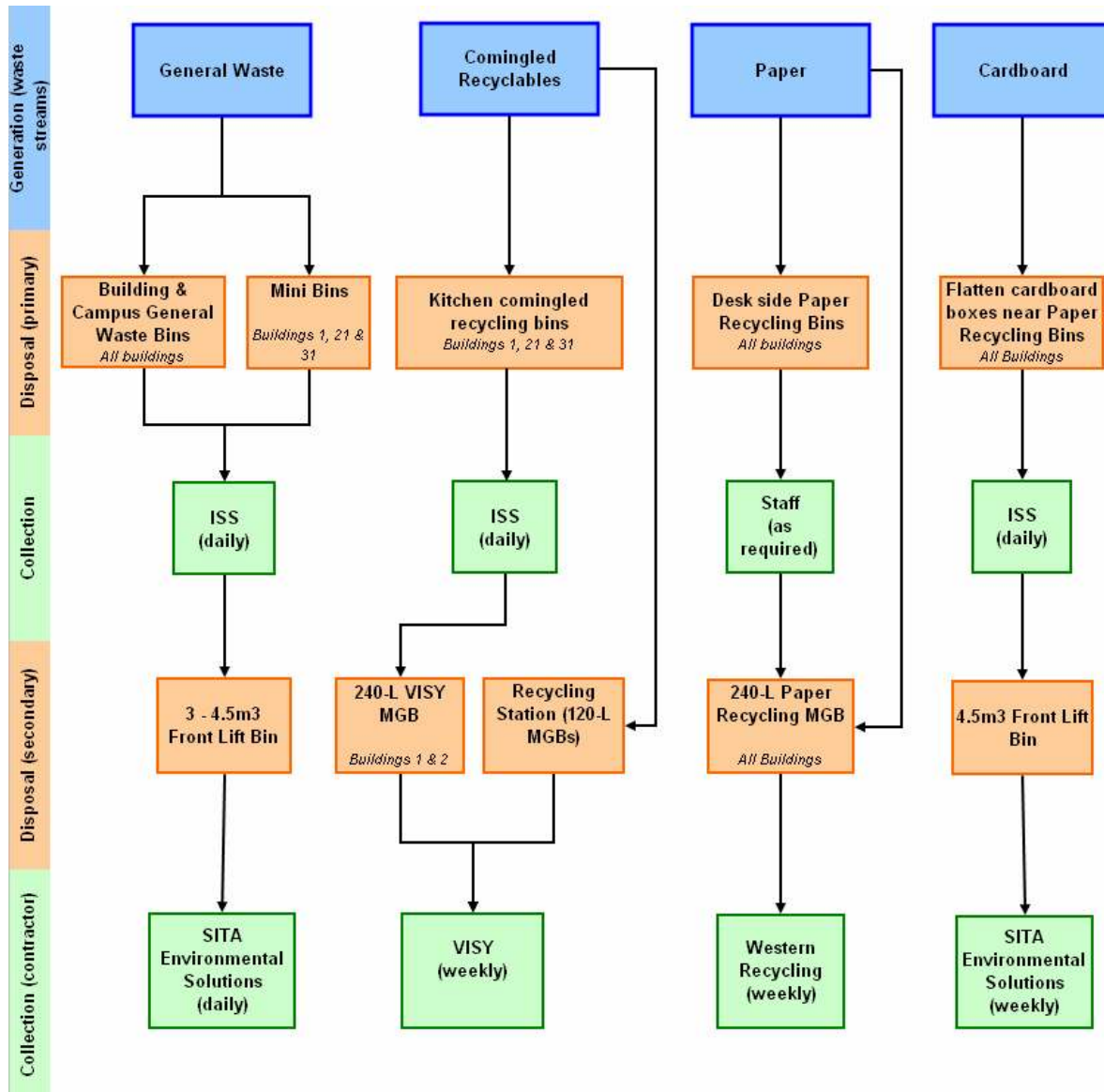
Libraries	3
- Media Services	
Centres	4
- Career Advice	
- Consulting Services	
General Teaching Block	5
- Business	
- Computer Labs	
- Computer Technology	
- Creative Industries	
- Education	
- Foreign Student Centre	
- Staff Science	

Leisure & Tourism	6
Facilities and Services	7
- Enrolment	
- Enrolment Security	
- Facilities Management Office	
- Student Village Administration	
Student Common Room	8
Staff Science Workshop	9
Student's Shop	10

APPENDIX B

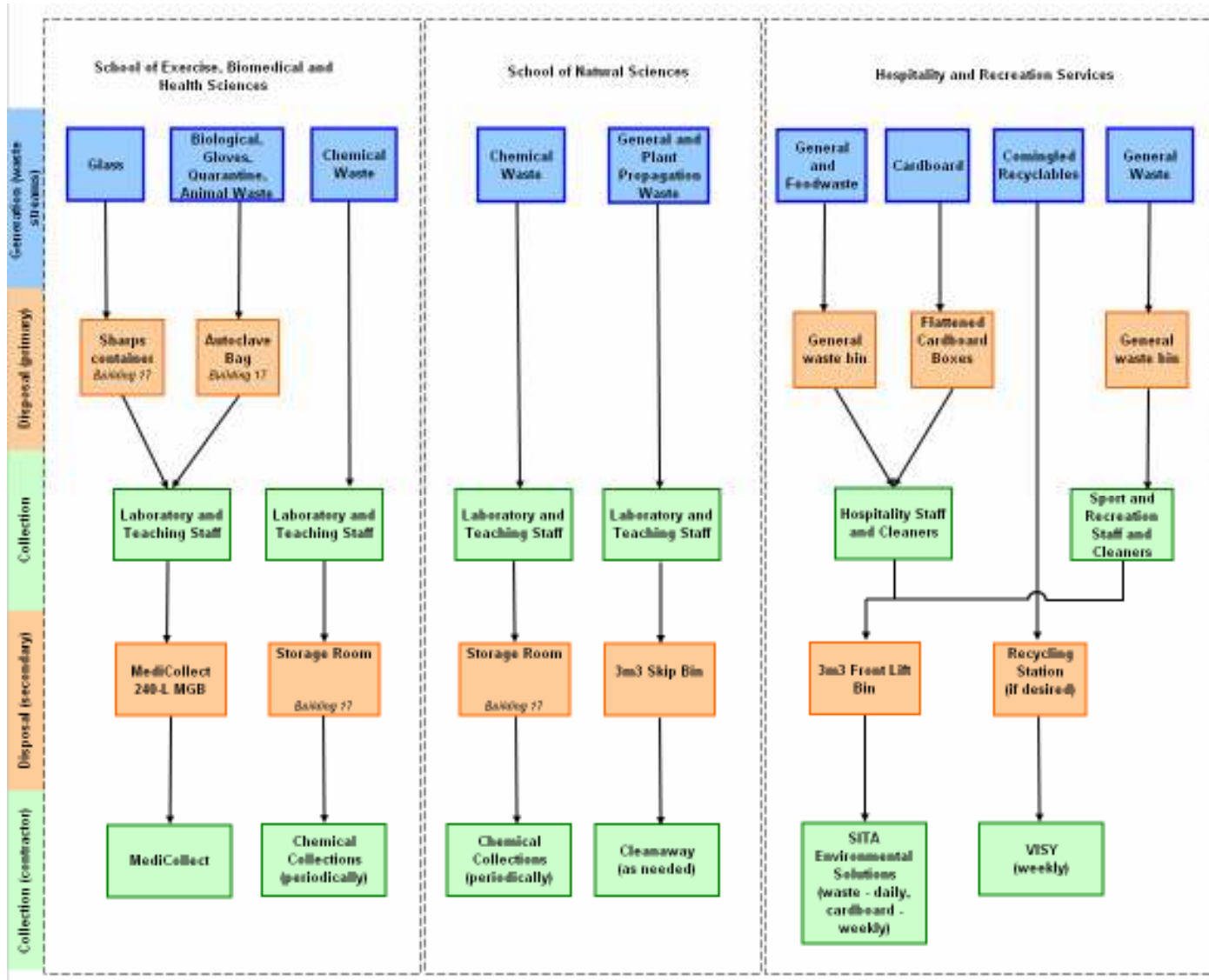
Waste Stream Flows – ECU Joondalup Campus

Figure B1: ECU Joondalup Waste Stream Flow Chart – Facilities and Services Coordinated Waste Management²



² Excludes Other Recyclables

Figure B2: ECU Joondalup Waste Stream Flow Chart – other coordinated Waste Management



APPENDIX C

Waste Stream Flows – ECU Mount Lawley Campus

Figure C1: ECU Mount Lawley Waste Stream Flow Chart – Facilities and Services Coordinated Waste Management

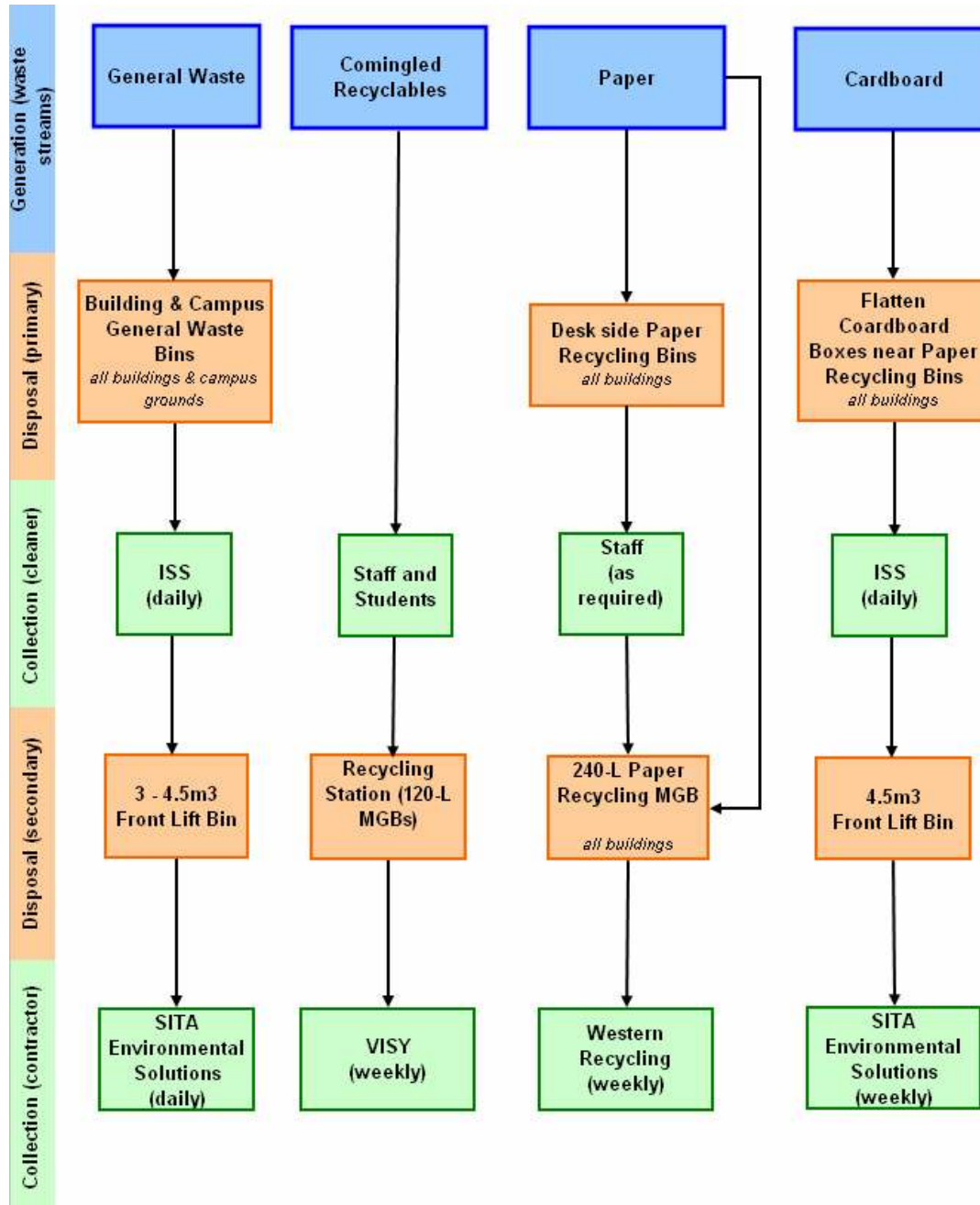
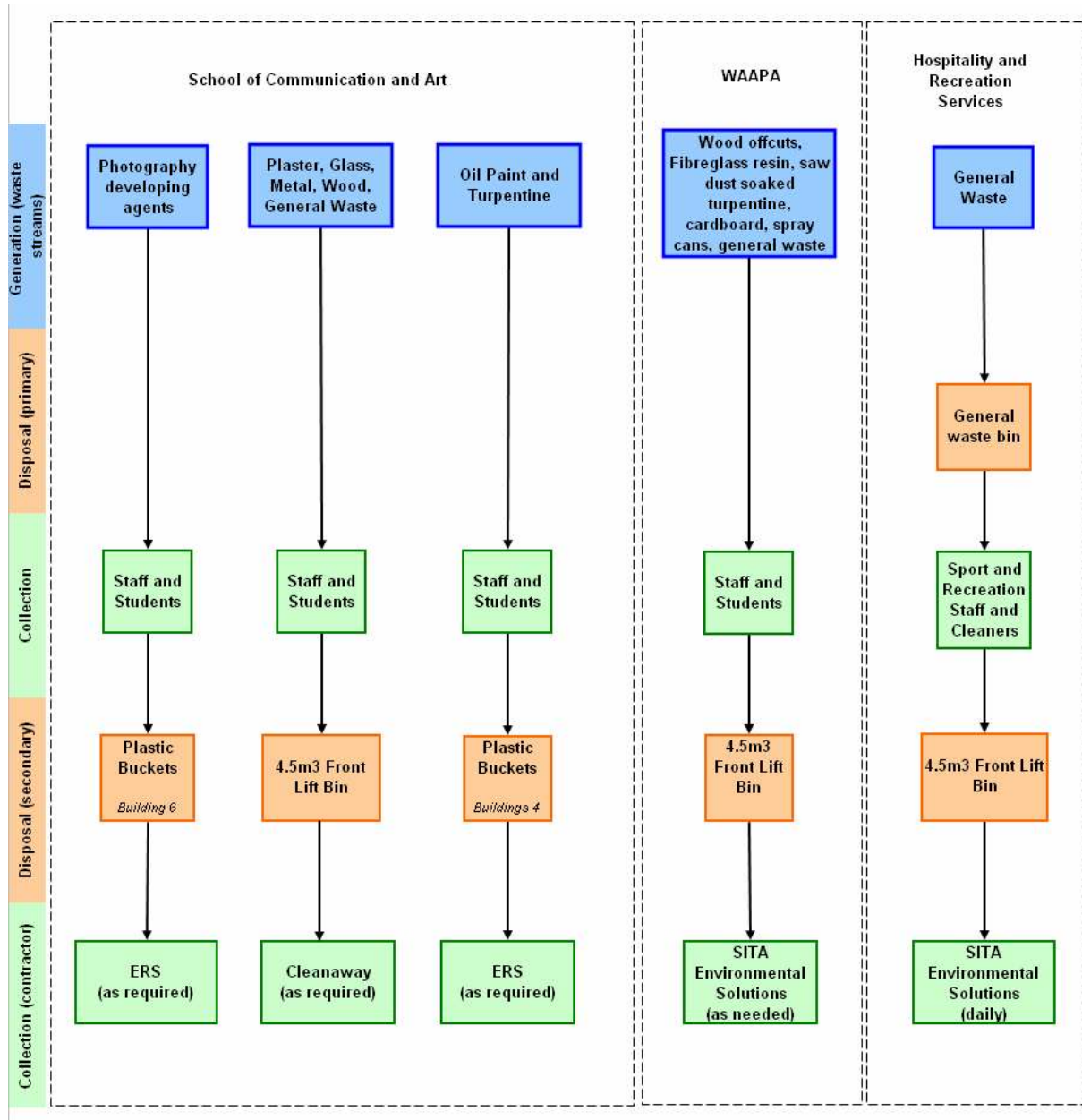


Figure C2: ECU Mount Lawley Waste Stream Flow Chart – other coordinated waste management



APPENDIX D

Waste Stream Flows – ECU Bunbury Campus

Figure D1: ECU Bunbury Waste Stream Flow Chart – Facilities and Services Coordinated Waste Management

