

The University of
Melbourne

Waste Audit Report
October 2019



1. Summary

Great Forest Australia (GFA) conducted an audit of a sample of The University of Melbourne's general waste stream on October 24, 2019. The objective of the audit was to understand the composition of waste currently being sent to landfill, specifically quantifying the amount of material being placed in the general waste stream that is recyclable using the University's existing systems.

This information will be used by the University of Melbourne to drive improvements to current processes that will result in reduced quantities of waste being sent to landfill and enhanced sustainability performance.

The audit was conducted at a facility located at 74 Maygar Street, Broadmeadows, arranged for by Speedie Waste. In addition to GFA's auditing staff, representatives of the University were present to photographically document the auditing process and assist with data recording. Speedie Waste delivered the previous day's landfill waste, totaling 5.05 tonnes, from the Parkville Campus to the audit site at around 7 am on the audit day.

As it was not feasible to audit this quantity of material, GFA's audit team took a representative sample of 871.3 kg, or 17.3% of the total. This was deemed sufficient for sampling purposes given the resources and time available to conduct an in-depth compositional analysis.

Details of the audit process and results are provided in Section 2. In summary, 38.4% by weight of the general waste stream consisted of materials that could have been recycled through the University's existing systems. A further 19.8% consisted of potentially hazardous materials such as medical waste, animal waste, and soiled nappies.

This quantitative evidence suggests that further engagement with staff and students will be required to achieve improved materials recovery and reduced waste to landfill.

General recommendations for such initiatives are presented in Section 6.

We would like to thank all those whose cooperation contributed to the successful conduct of the audit, particularly Judith Alcorn of The University of Melbourne and Jess Barilla of Speedie Waste.

2. Auditing Process

Speedie Waste arranged for two loads of waste to be delivered to the auditing site at 7 am, one in a front lift vehicle and one in a side-lift vehicle. A total of 5.05 tonnes were deposited for auditing, consisting of materials from across the Parkville Campus. No recycling or other specialised waste streams were audited.

The audit team worked from around 8 am to 4 pm, auditing as large a sample as possible of the waste delivered. As the waste was collected from a number of different areas across the Parkville Campus, an effort was made to audit a diverse and representative sample by taking material from different parts of the aggregated waste pile.

The audit team removed loose and bagged materials from the waste pile and then sorted, weighed, and measured the contents according to the categories listed in Section 3. Liquid from containers was emptied into a bucket and the weight of the liquid recorded.

The entire audit process was recorded onto video by The University of Melbourne for review and educational purposes.

On completion of the audit, all sorted materials were emptied into skips provided by Speedie Waste. Figures 1-3 show photographs of the materials prior to sorting and analysis, and following sorting, respectively.

Figure 1: Aggregated Waste Prior to Sorting



Figure 2: Potentially Recyclable Materials Following Sorting



Figure 3: Residual Waste (Non-Recyclable) Following Sorting



3. Material Category Definitions

Table 1: Material Categories & Recyclable Status

Material Category	Definition	Status
Paper	Office paper, newspapers, magazines, etc.	Recyclable
Cardboard	Dry non-waxed cardboard	Recyclable
Glass	Glass bottles & jars	Recyclable
Metal	Aluminium cans, ferrous metal cans	Recyclable
Recyclable Plastic Containers	Plastic bottles & take-away food containers (#1-7)	Recyclable
Food Organics	Food waste from kitchens, plate scrapings	Recyclable
Garden Organics	Green garden waste, dead flowers	Recyclable
E-Waste	Electrical and electronic items, including batteries & lamps	Recyclable
Non-Recyclable Plastic	All rigid plastics other than as defined above	Non-Recyclable
Soft Plastics	Dry plastic wrap, plastic bags	Non-Recyclable
Disposable Cups	Cups for juice, iced tea, etc. (not hot liquids)	Non-Recyclable
Hazardous/Medical Materials	Clinic/lab waste comprising disposable masks, swabs, syringes, etc.	Non-Recyclable
Other	All materials other than those defined elsewhere in table	Non-Recyclable
Fines & Liquids	Bottle tops, broken glass, liquids from containers	Non-Recyclable
Bin Liners		Non-Recyclable
Non-Recyclable Paper	Paper towels, tissues, contaminated food packaging	Non-Recyclable
Scientific Rock Samples		Non-Recyclable
Botanical Soil & Pots		Non-Recyclable
Biological Hazard	Autoclaved labelled yellow bags containing miscellaneous substances	Non-Recyclable
Coffee Cups	Disposable cups for hot liquids	Non-Recyclable
Nappies		Non-Recyclable
Animal Cage Waste	Wood shavings, animal droppings, bedding, etc.	Non-Recyclable
Textiles	Natural & synthetic materials such as rubber, rags, etc.	Non-Recyclable
Sawdust		Non-Recyclable
Timber		Non-Recyclable

4. Audit Findings

Data from the audit is presented in Table 2, ranked in order from highest to lowest.

Table 2: Ranked Audit Data (Audit Sample)

Waste Category	Kg	% of Total Waste
Food Organics	147.49	16.93%
Non-Recyclable Paper	99.20	11.39%
Hazardous/Medical Materials	93.76	10.76%
Animal Cage Waste	64.06	7.35%
Recyclable Plastic Containers	61.42	7.05%
Soft Plastics	55.00	6.31%
Other	50.20	5.76%
Cardboard	49.79	5.71%
Fines & Liquids	42.86	4.92%
Non-Recyclable Plastic	27.44	3.15%
Paper	25.38	2.91%
Coffee Cups	19.56	2.24%
E-Waste	17.44	2.00%
Scientific Rock Samples	16.72	1.92%
Metal	14.76	1.69%
Glass	14.28	1.64%
Timber	13.98	1.60%
Sawdust	12.26	1.41%
Bin Liners	11.70	1.34%
Botanical Soil & Pots	9.70	1.11%
Nappies	9.10	1.04%
Biological Hazard	5.24	0.60%
Disposable Cups	4.50	0.52%
Garden Organics	4.30	0.49%
Textiles	1.14	0.13%
Subtotal	871.28	100.00%

Analysis of the data enables further definition into recyclable and non-recyclable categories as shown in Table 3. In this context 'recyclable' refers to materials that could have been recycled using the existing systems at the Parkville campus, but were instead disposed of in general waste, with 'non-recyclable' consisting of all other materials.

Table 3: Recyclable vs Non-Recyclable (Audit Sample)

Waste Category	Kg	% of Total Waste
Food Organics	147.49	16.93%
Recyclable Plastic Containers	61.42	7.05%
Cardboard	49.79	5.71%
Paper	25.38	2.91%
E-Waste	17.44	2.00%
Metal	14.76	1.69%
Glass	14.28	1.64%
Garden Organics	4.30	0.49%
<i>All Other</i>	536.42	61.58%
Subtotal	871.28	100.00%

Tables 4 and 5 extrapolate the audit data across the total quantity of waste delivered, as reported by Speedie Waste (5,050 kg):

Table 4: Ranked Audit Data (Total Daily Material)

Waste Category	Kg	% of Total Waste
Food Organics	854.86	16.93%
Non-Recyclable Paper	574.97	11.39%
Hazardous/Medical Materials	543.44	10.76%
Animal Cage Waste	371.30	7.35%
Recyclable Plastic Containers	355.99	7.05%
Soft Plastics	318.78	6.31%
Other	290.96	5.76%
Cardboard	288.59	5.71%
Fines & Liquids	248.42	4.92%
Non-Recyclable Plastic	159.04	3.15%
Paper	147.10	2.91%
Coffee Cups	113.37	2.24%
E-Waste	101.08	2.00%
Scientific Rock Samples	96.91	1.92%
Metal	85.55	1.69%
Glass	82.77	1.64%
Timber	81.03	1.60%
Sawdust	71.06	1.41%
Bin Liners	67.81	1.34%
Botanical Soil & Pots	56.22	1.11%
Nappies	52.74	1.04%
Biological Hazard	30.37	0.60%
Disposable Cups	26.08	0.52%
Garden Organics	24.92	0.49%
Textiles	6.61	0.13%
Subtotal	5,050.00	100.00%

Analysis of the data enables further definition into recyclable and non-recyclable categories as shown in Table 2. In this context 'recyclable' refers to materials that could have been recycled using the existing systems at the Parkville campus, but were instead disposed of in general waste, with 'non-recyclable' consisting of all other materials.

Table 5: Recyclable vs Non-Recyclable (Total Daily Material)

Waste Category	Kg	% of Total Waste
Food Organics	854.86	16.93%
Recyclable Plastic Containers	355.99	7.05%
Cardboard	288.59	5.71%
Paper	147.10	2.91%
E-Waste	101.08	2.00%
Metal	85.55	1.69%
Glass	82.77	1.64%
Garden Organics	24.92	0.49%
<i>All Other</i>	<i>3,109.13</i>	<i>61.58%</i>
Subtotal	5,050.00	100.00%

Charts 1 and 2 display this information in graphical form:

Chart 1: Total Landfill Composition

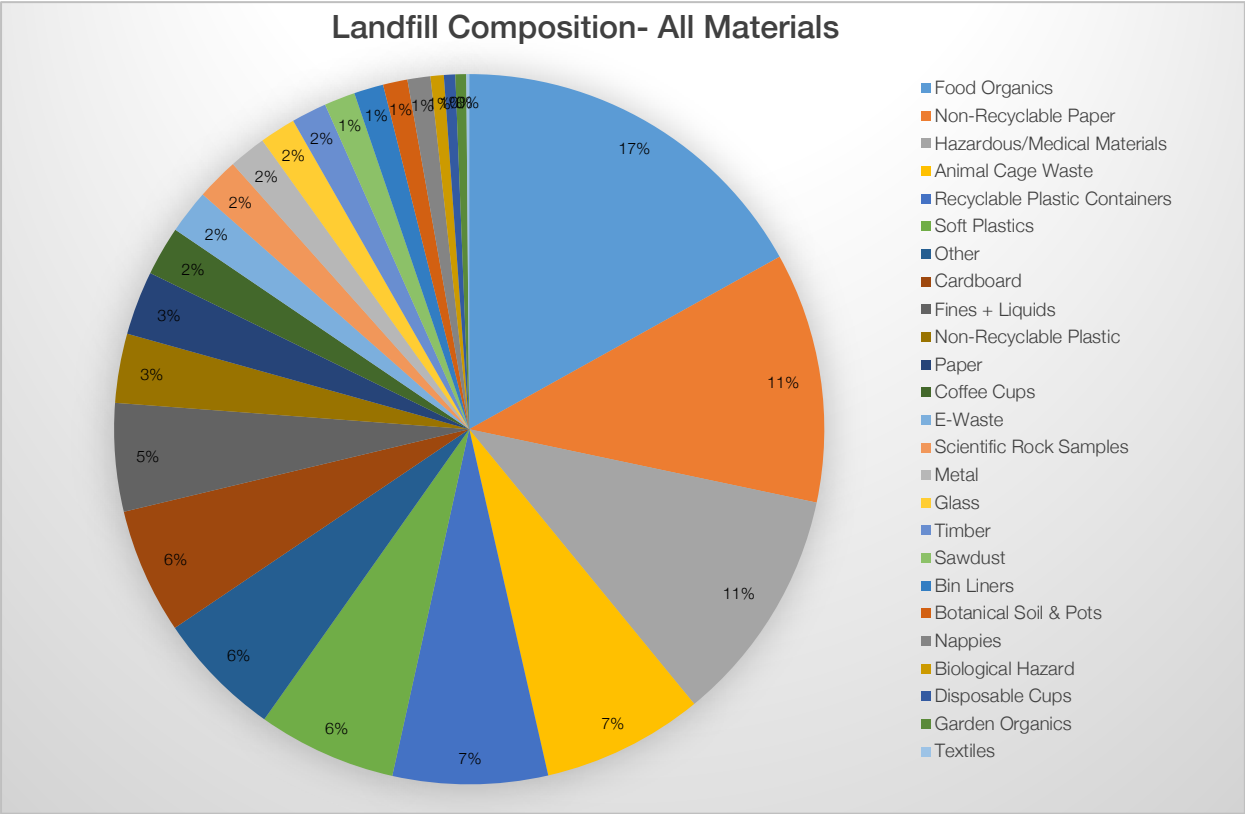
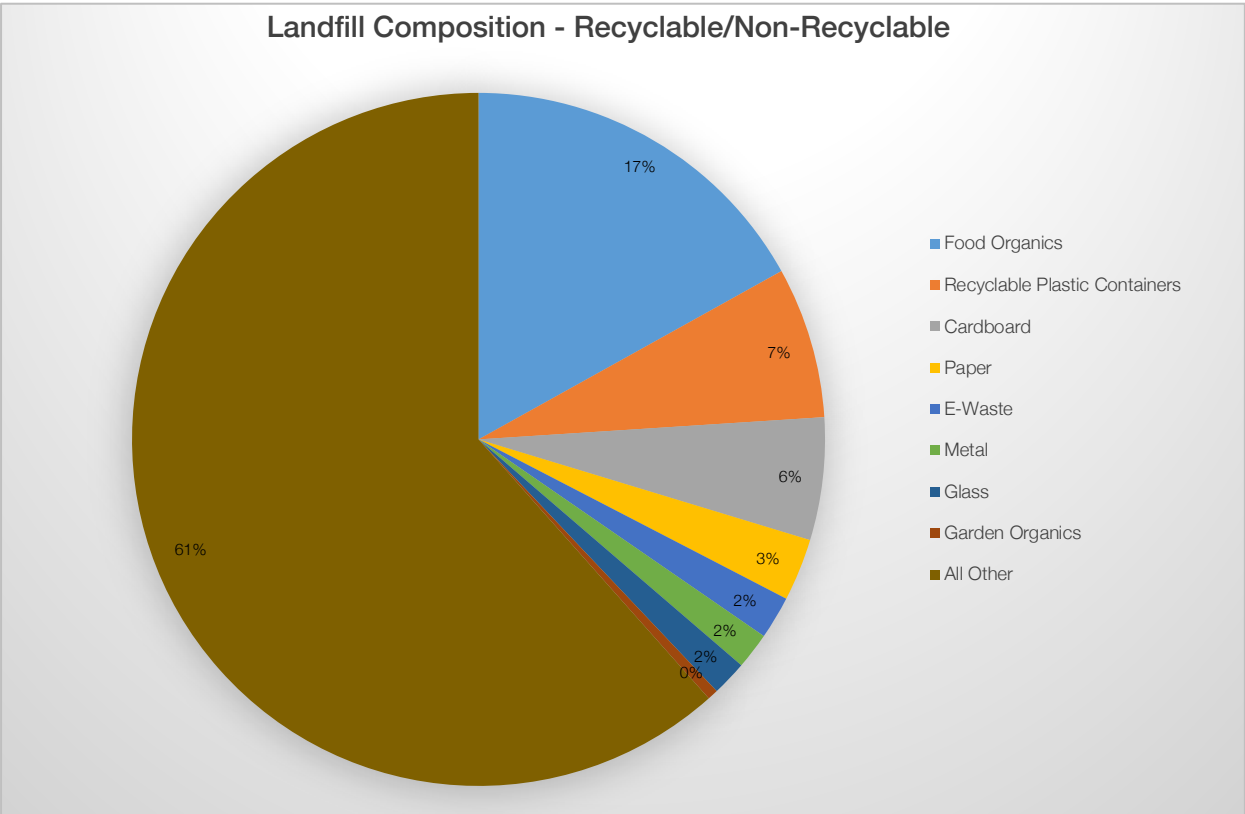


Chart 2: Recyclable/Non-Recyclable



5. Analysis & Commentary

The most prevalent single material category found in the audited sample of general waste was food organics, which represented 16.9% of the total quantity of waste. Non-recyclable paper, consisting mainly of wet paper towels from bathrooms, was the next highest ranked category, making up 11.4% of the total.

Potentially hazardous waste, consisting of single-use disposable masks, swabs, etc. from labs and clinical areas was the third highest ranked category, at 10.8%. No used syringes were observed during the audit; it is expected that these would be disposed of according to standard protocols for these items. Single-use disposable items should generally be managed separately and segregated from other types of waste, to prevent the spread of infection.

Taken together, the above three material categories made up 39.1% of the general waste stream. The remaining 60.9% of general waste consisted of other recyclable (21.5%) and non-recyclable (39.4%) materials.

In total, 38.4% of daily general waste (1,940.9 kg) consisted of materials that could have been recycled using the existing systems at the Parkville campus.

These findings indicate significant opportunities for The University of Melbourne to improve resource recovery and reduce waste to landfill. Taking the daily total of 5,050 kg as representative, over the period of a full year the Parkville Campus would send around 1,262.50 tonnes of waste to landfill, of which 485.05 tonnes would be recyclable based on the current waste profile.

The data can also be used to perform the simple analysis shown in Table 6 of the GHG emissions impacts of sending various materials to landfill, based on current National Greenhouse Accounts emissions factors and recorded audit weights, extrapolated to yearly totals using the figure of 250 operating days agreed with the University.

Based on this analysis, the University's GHG impacts from sending waste to landfill are around 1,039.63 tonnes per year.

Please note that annual paper and cardboard tonnages include both recyclable and non-recyclable paper, as both types of paper produce GHG emissions when sent to landfill.

Table 6: Emissions Analysis

Material Category	Emission Factor ¹	Annual Tonnes Landfill ²	GHG Emissions ³
Paper & Cardboard	2.9	244.23	708.27
Food Organics	1.9	143.74	273.11
Garden Waste	1.4	6.23	8.72
Wood & Sawdust	0.6	38.02	22.81
Textiles	1.8	1.65	2.97
Nappies	1.8	13.19	23.73
Other (Inert) Materials	0.0	815.43	0.00
Totals		1,262.50	1,039.63

¹ Tonnes of CO₂-e produced per tonne of emissions-producing materials sent to landfill

² Total annual tonnes of GHG emissions-producing materials sent to landfill

³ Tonnes of CO₂-e per year

Our recommendations for achieving improved resource recovery, reduced waste to landfill, emissions reductions, and cost savings, are presented in Section 6.

6. Recommendations

The following specific recommendations are based on our analysis of the audit data and our understanding of the University's current resource recovery systems, and focus on the three materials categories of food waste, paper towels, and single-use clinical disposables.

Food Organics

Detailed analysis of the University's organics recycling systems was beyond the scope of this project; however, from the audit data alone, it is clear that improving the recovery rate for this resource stream should be a priority for the University.

We recommend undertaking a separate review of existing organics recycling processes, focusing on kitchens and other areas where the majority of this waste is likely to be being generated.

As well as improving the effectiveness of organics recycling, we also recommend exploring donation opportunities for leftover food from catered events. This may already be taken place but may not be a consistent process across the entire Parkville campus.

Paper Towels

Some recyclers accept paper towel in mixed paper or food organics streams – these options should be explored with Speedie Waste.

Alternatively, or additionally, switching to electric hand dryers in bathrooms would significantly reduce the quantity of this material being generated. A number of studies have shown that making this change leads to significant cost savings and environmental benefits over time.

Clinical Disposables

These materials should be disposed of in a separate stream unless it is absolutely certain that they are not hazardous or infectious. If this is the case, they should be able to be placed in the landfill stream. Reducing the use of single-use disposables from labs and clinical areas, where feasible, may also be a fruitful area for further investigation.

Great Forest Australia would be pleased to work with The University of Melbourne to conduct further investigations in these areas and provide assistance with implementation of initiatives.