



McMaster University
1280 Main Street West
Hamilton, Ontario, L8S 4L8

2023 Waste Audit

Prepared For
McMaster University
1280 Main Street W
Hamilton, Ontario, L8S 4L8

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Executive Summary

Waste Reduction Group (“WRG”) was retained by McMaster University to conduct a solid, non-hazardous waste audit (in compliance with the Environmental Protection Act, O.Reg. 102/94: Waste Audits and Waste Reduction Work Plans and O.Reg. 103/94: Industrial, Commercial and Institutional Source Separation Program) for their campus located at 1280 Main Street West, Hamilton, Ontario (the Site). McMaster University is a multi-building facility with an annual enrolment of approximately 34,720 FTE students.

The objectives of the audit were to determine the composition of the garbage stream by point of origin; quantify the estimated annual waste generation for all waste streams using the 2023 annual data; determine the waste diversion and capture rates; identify additional opportunities for waste reduction and diversion; and address any specific concerns identified during the study.

The scope of the waste audit included collecting representative samples of the garbage stream from the functional areas of the Site.

Findings and Conclusions

- 325.40 kg of waste materials were collected for the waste audit from eight (8) functional areas of the campus.
- Materials found in the garbage stream included mixed papers (30.1%), mixed containers (16.6%), paper towels (12.3%), non-recyclables/residual materials (11.9%), organics (8.2%), plastic films (7.1%) had a combined weight which contributed to approximately 86% of the sample weight.
- Specific functional areas generated the following quantities of waste materials for the waste audit: John Hodgins Engineering Building (14.2%), Burke Science Building (14.9%), Mills Library (5.4%), General Science Building (24.6%), Student Centre (3.1%), Hedden Hall (13.3%), Peter George (11.4%), and Mary Keyes Building (13.0%).
- The sample consisted of 15.2% Mandatory Recyclables, 62.1% Other Recyclables, and 22.7% Other (Non-Recyclable) material.
- Existing 3Rs programs at the Campus include garbage, cardboard, mixed recycling, confidential papers, scrap metals, electronic wastes, fluorescent bulbs, batteries, oil & grease, organics, LCBO/Beer Store bottle returns, textbook donations, wood pallet returns/reuse, printer toners, and reusable meal containers.
- 3Rs programs implemented on-campus exceed the minimum requirements of O.Reg. 103/94 for educational institutions.
- Mixed paper contributed 30.1% of the garbage stream. A mixed recycling 3Rs program is implemented on campus. Results suggest that an improved collection system, improved labels and/or staff and student education may be required to increase the capture rate of this material. Fine paper and newsprint are mandatory recyclable materials for educational institutions per O.Reg.103/94.
- Mixed containers contributed 16.6% of the garbage stream. A mixed recycling 3Rs program is implemented on campus. Results suggest an improved collection system and improved labels.

And/or staff and student education may be required to increase the capture rate of these materials. Glass, steel, and aluminum containers are mandatory recyclable materials per O.Reg.103/94 for educational institutions.

- Paper towels contributed 12.3% of the garbage stream. It is recommended that the facility investigate the feasibility of implementing a dedicated paper towel 3Rs program with a separate collection bin in specific areas of campus. Paper towels are not a mandatory recyclable material per O.Reg.103/94.
- Organics contributed 8.2% of the garbage stream. An organics 3Rs program is implemented in some areas of campus. Results suggest that expanding the existing program, improving collection systems, improving labels, and/or staff and student education may be required to increase the capture rate of organic materials. Organic materials are not mandatory recyclable materials per O.Reg.103/94. However, according to Ontario's Food and Organic Waste Policy Statement, it is proposed that ICI Sectors will have to reduce and/or recover food and organic wastes between 50%-70% by 2025.
- Waste Diversion Rate - was calculated to be 36.24% based on 792.83 MT of waste produced annually, of which 287.38 MT of waste is diverted from landfills through existing 3Rs programs.

Recommendations

- Providing clear signage with pictures/graphics to help staff identify opportunities for proper disposal at the source should improve capture rates. This can include signage with pictures to help staff identify their waste.
- Dedicated receptacles as part of a collection program should be made available at each disposal location, including offices, to help staff dispose of their waste accordingly at source.
 - Receptacles should include color coordination to identify the type of waste (i.e., green for organics/compost, blue for recycling, and black for garbage).
 - Receptacles should be sized accordingly based on the type of activity or use.
- Promote a culture of waste diversion through education on the importance of waste diversion and communicate the corporate goals for waste diversion and sustainability. Create a positive message around the benefits of waste diversion and the role that the individual plays. Set achievable goals and metrics, track year-over-year changes in waste diversion, capture rates and communicate progress to staff to encourage further participation/engagement.

1. Introduction

Waste Reduction Group (“WRG”) was retained by McMaster University to conduct a solid, non-hazardous waste audit for its campus located at 1280 Main Street West, Hamilton, Ontario (the Site). The waste audit complied with the Environmental Protection Act, O.Reg. 102/94: Waste Audits and Waste Reduction Work Plans and O.Reg. 103/94: Industrial, Commercial and Institutional Source Separation Program.

1.1 Purpose and Objectives

The purpose of the waste audit was to comply with Ontario Regulation 102/94 – Waste Audits and Waste Reduction Work Plans Part X, which requires educational institutions with more than 350 full- or part-time students enrolled during the calendar year to conduct an annual waste audit and implement a waste reduction work plan. Refer to Appendix A for a partial excerpt of O.Reg.102/94 and to confirm compliance with Ontario Regulation 103/94 – IC&I Source Separation Programs.

The objectives are as follows:

- Determine the composition of the Garbage stream by point of origin,
- Quantify the estimated annual waste generation for all waste streams using the 2023 annual data provided by the Facility,
- Determine the waste diversion and capture rates,
- Identify additional opportunities for waste reduction and diversion; and
- Address any specific concerns identified during the study.

1.2 Site Description

McMaster University, located at 1280 Main St W, Hamilton, Ontario, is a multi-building facility with an annual enrolment of approximately 34,720 FTE students. The Site is considered to apply to O.Reg. 103./94 – Educational Institutions.

2. Scope of Work

To meet the objectives outlined above, the following activities were undertaken by WRG:

- Collected garbage samples from the site on November 6 and 7, 2023, over 24 hours.
- Sorted samples into predetermined categories as set out by WRG (detailed in Appendix A: List of Categories)
- Determined the total quantity of waste diverted from landfills through current reduction, reuse, and recycling programs implemented at the facility (provided by Facility, Appendix B: Annual Data Request Form).
- Completed a waste audit report summarizing the findings of the audit and provided recommendations for increased waste diversion efficiency.

- Conducted a tour of the Site accompanied by Site personnel and interviewed staff to obtain information on existing waste diversion practices.

3. Sampling Methodology

Samples of the garbage waste stream were collected on November 5th and 6th, 2023, over 24 hours and audited on November 6th and 7th, 2023, to determine the composition of the waste stream. Samples were collected from eight (8) functional areas of the campus.

The materials were sorted by qualified WRG staff using containers to keep materials separate. Waste was sorted into individual material categories and weighed using a calibrated scale (Appendix C: Scale Calibration Certificate). The waste was then re-bagged and disposed of in an appropriate waste container.

The total amount of materials source separated by the facility for recycling (other than mixed recycling) was not collected and categorized in the audit. However, annual quantities of all reused and recycled materials were reviewed and included in the audit results.

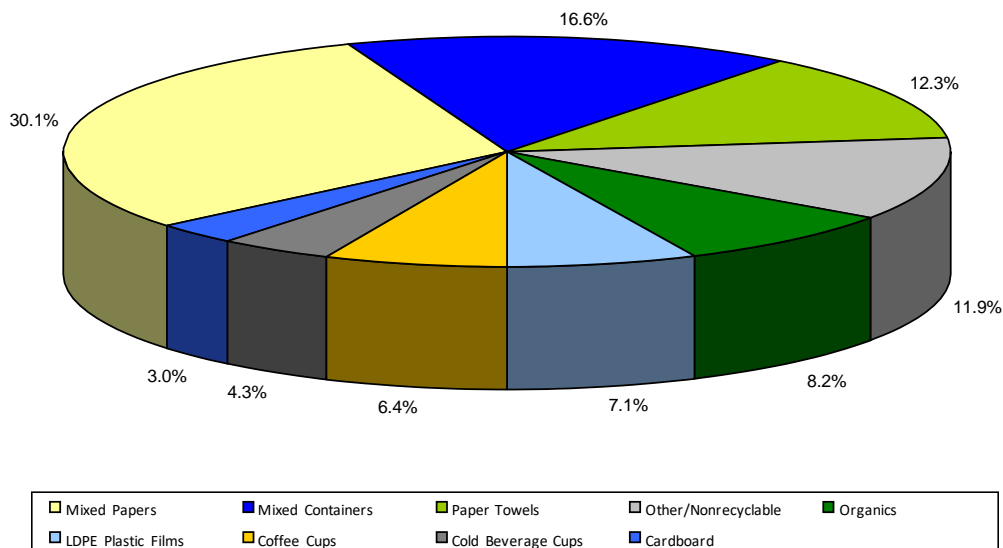
4. Waste Audit Findings

In total, 325.40 kg of waste materials were collected for the waste audit, as summarized in the following report sections.

4.1 Waste Sample Composition

Based on the audit findings, the materials with the highest mass (kg) from the waste stream are shown in the visual below.

Figure 1: Waste Sample Composition by Material



Mixed papers (30.1%), mixed containers (16.6%), paper towels (12.3%), non-recyclables/residual materials (11.9%), organics (8.2%), plastic films (7.1%) had a combined weight which contributed to approximately 86% of the sample weight.

4.2 Waste Sample Composition per Functional Area

The garbage composition determined based on 24-hour sample results for each building is presented below.

Figure 2: John Hodgins Engineering Building

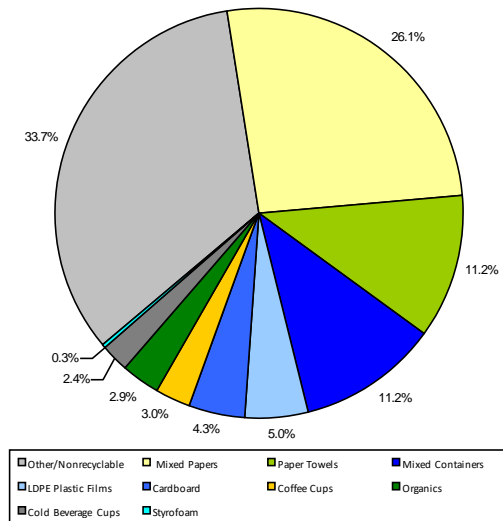


Figure 3: Burke Science Building

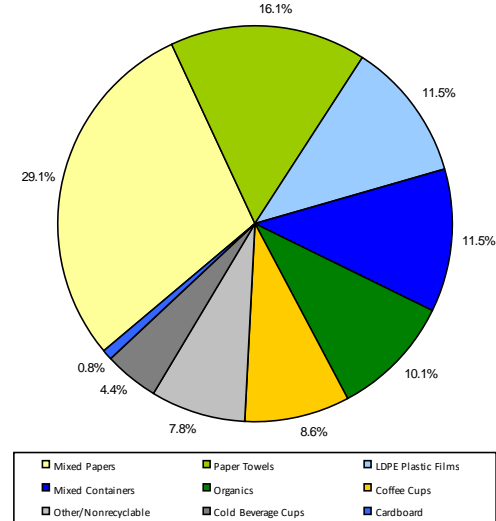


Figure 4: Mills Library

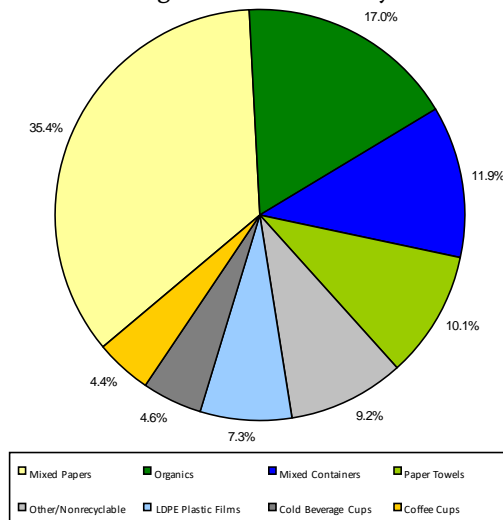


Figure 5: General Science Building

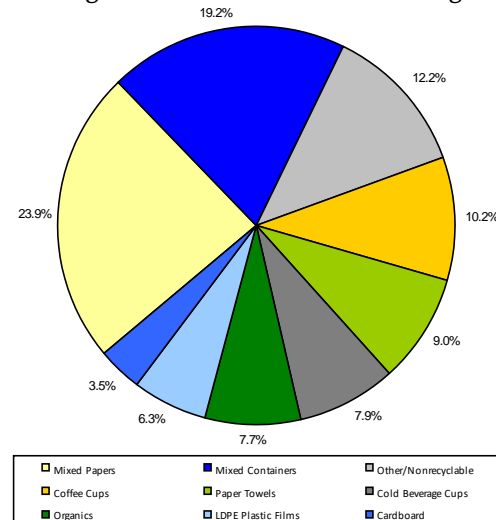


Figure 6: University Student Centre

Figure 7: Hedden Hall

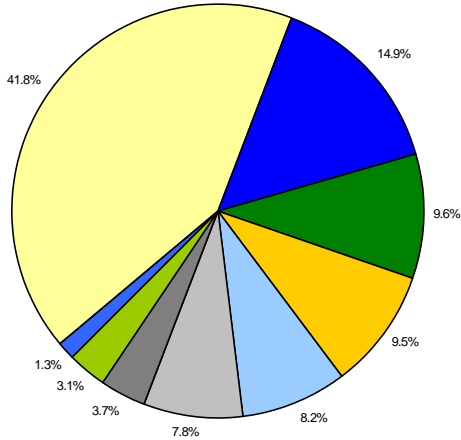


Figure 8: Peter George Centre

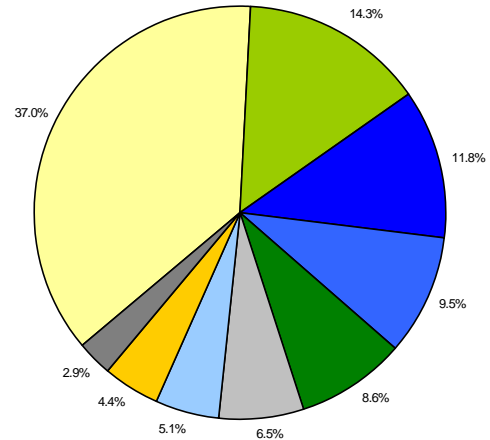
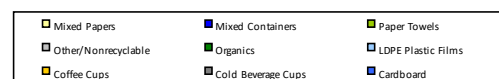
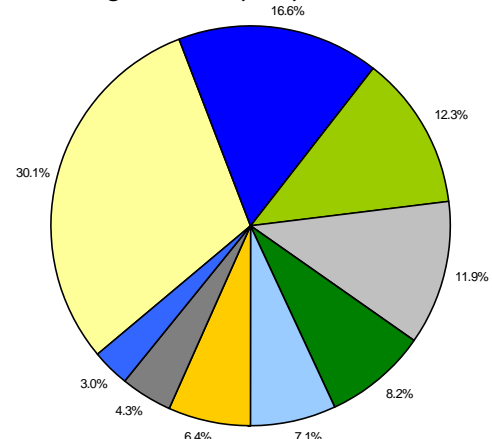
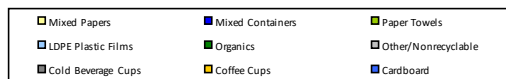
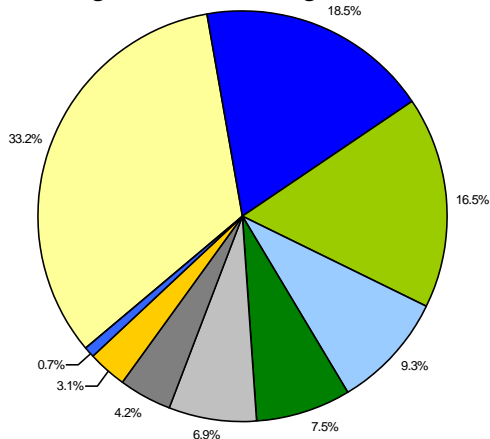


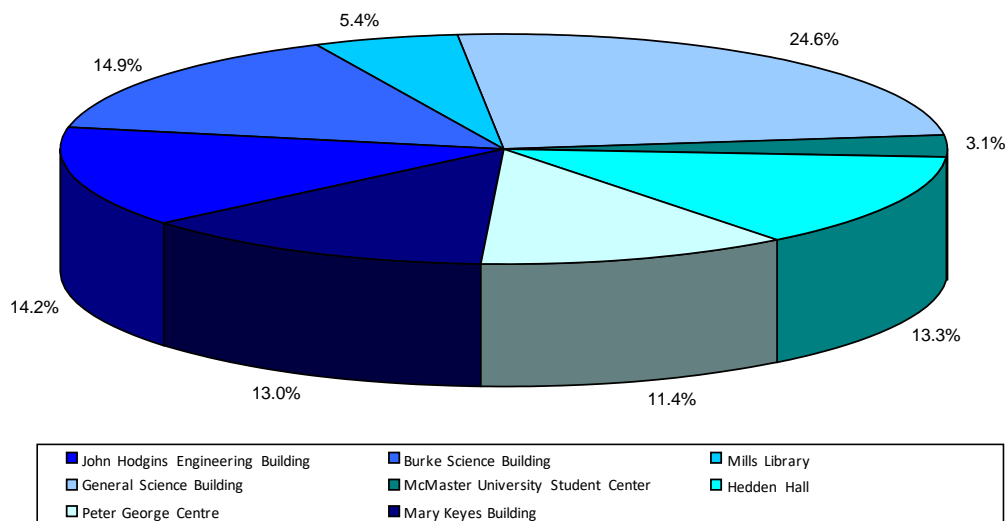
Figure 9: Mary Keyes Centre



4.3 Waste Sample Mass by Functional Area

A breakdown of the waste sample mass, which originates by functional area, is provided below.

Figure 10: Waste Sample Composition by Functional Area



4.4 Waste Sample Mass by Functional Area and Material

Based on a detailed analysis of the waste sample, the following observations were made:

- General Science Building accounted for 24.6% of the overall sample, which largely consisted of mixed papers (23.9%), mixed containers (19.2%), non-recyclables (12.2%), coffee cups (10.2%) and paper towels (9.0%).
- Burke Science Building accounted for 14.9% of the overall sample, which largely consisted of mixed papers (29.1%), paper towels (16.1%), plastic films (11.5%), mixed containers (11.5%) and organics (10.1%).
- John Hodgins Engineering Building accounted for 14.2% of the overall sample, which largely consisted of non-recyclables (33.7%), mixed papers (26.1%), paper towels (11.2%) and mixed containers (11.2%).
- Hedden Hall accounted for 13.3% of the overall sample, which largely consisted of mixed containers (37.0%), paper towels (14.3%), mixed containers (11.8%), cardboard (9.5%) and organics (8.6%).
- Mary Keyes Building accounted for 13.0% of the overall sample, which largely consisted of mixed papers (33.2%), mixed containers (18.5%), paper towels (16.5%), plastic films (9.3%) and organics (7.5%).
- Peter George Centre accounted for 11.4% of the overall sample, which largely consisted of mixed papers (32.6%), mixed containers (30.3%), paper towels (12.4%), organics (9.3%) and coffee cups (5.9%).

- Mills Library accounted for 5.4% of the overall sample, which largely consisted of mixed papers (35.4%), organics (17.0%), mixed containers (11.9%), paper towels (10.1%) and non-recyclables (9.2%).
- McMaster University Student Centre accounted for 3.1% of the overall sample, which largely consisted of mixed papers (41.8%), mixed containers (14.9%), organics (9.6%), coffee cups (9.5%) and plastic films (8.2%).

A detailed breakdown of the waste sample composition is provided in Appendix D.

4.5 Types of Recycling Material in the Garbage Stream

Based on analysis of the waste sample composition, Mandatory Recyclables and Other Recyclables were identified in the waste stream. The sample consisted of 15.2% Mandatory Recyclables, 62.1% Other Recyclables, and 22.7% Other (Non-Recyclable) material. A description of the categories is provided below.

Mandatory Recyclables

O.Reg.193/04 requires that large manufacturing facilities source separate the following materials (at a minimum):

- Cardboard
- Fine Paper
- Newsprint
- Glass food & beverage containers
- Aluminum food & beverage containers
- Steel food & beverage containers

Other Recyclables

Includes the following materials:

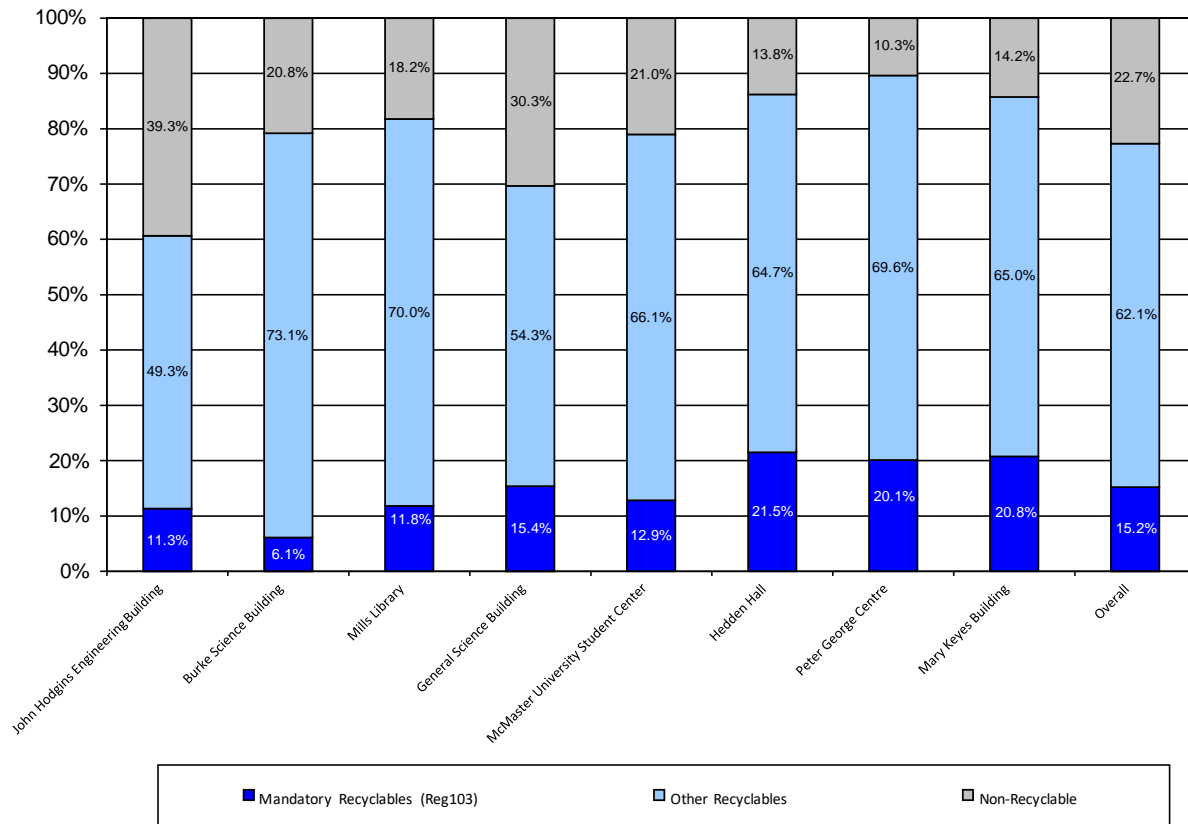
- Aseptic containers
- Batteries
- Boxboard
- Other recyclable paper fibres
- Electronic waste
- Organics
- Gable top containers
- Paper towels
- PET #1
- PP #5
- Scrap metal
- Scrap wood

Other (non-recyclables)

Includes all other non-recyclable residual materials.

Analysis of the Mandatory Recyclables, Other Recyclables and Non-Recyclables is provided below.

Figure 11: Composition of Waste Stream by Mandatory Source Separated Waste vs Non-Mandatory Source Separated Waste, by Site Building and Functional Area.



5.0 Waste Diversion Programs and Disposal Systems

As part of the waste audit, WRG staff conducted a discussion with Site personnel to document existing waste disposal and diversion systems. The following waste diversion programs exist at the Site:

- Garbage - Collected and disposed of in on-site bins. Dedicated garbage bins are collected by a contractor as required.
- 3Rs Programs – The following diversion programs have been implemented on-site: cardboard, mixed recycling, confidential papers, scrap metals, electronic wastes, fluorescent bulbs, batteries, oil & grease, organics, LCBO/Beer Store bottle returns, textbook donations, wood pallet returns/reuse, printer toners, and reusable meal containers.



Based on the information provided by the Site, the campus generated approximately 505.45 MT of garbage and diverted approximately 287.38 MT of recyclable and reusable materials, totalling approximately 792.83 MT annually for 2023, as shown below.

Annual Waste Disposal Quantities

Material	Quantity (MT)	%
Waste/Garbage	505.45	63.75%
Organics	77.77	9.81%
Cardboard	49.79	6.28%
Scrap Metals	49.58	6.25%
Electronic Wastes	29.98	3.78%
Wood Pallets	18.00	2.27%
Confidential Papers	15.67	1.98%
Office Supply Donation (Chairs/Desks)	13.97	1.76%
Mixed Recycling	13.18	1.66%
Oil & Grease	5.28	0.67%
Textbook Donations	5.20	0.66%
Bulbs & Ballasts	4.20	0.53%
Printer Toners	3.14	0.40%
LCBO/Beer Store Returns	0.91	0.11%
Batteries	0.48	0.06%
Reusable Meal Containers	0.23	0.03%
TOTAL	792.83	100.00%

6.0 Waste Diversion Rate

Waste diversion is the percentage of waste materials that a facility diverts from landfills due to reducing, reuse and recycling (3Rs) programs versus the total amount of waste generated (3Rs plus landfill waste). The Ministry of the Environment, Conservation and Parks defines the Waste Diversion Rate calculation as follows:

$$\text{Waste Diversion Rate} = \frac{\text{Total Waste Diverted (3Rs)}}{\text{Total Waste Generated}} \times 100$$

Where,

$$\text{Total Waste Diverted (3Rs)} = 287.38 \text{ MT}$$

$$\text{Total Waste Generated} = 792.83 \text{ MT}$$

$$\text{Waste Diversion Rate} = 36.24\%$$

7.0 Waste Audit Summary and Waste Reduction Work Plan

Refer to Appendix F for the Waste Audit Summary and the Waste Reduction Work Plan.

According to O.Reg.102/94, the Waste Reduction Work Plan or a summary of the plan must be posted at the facility in a place where employees can review it. If a summary is posted, the entire

Work Plan should also be made available for review by any employee upon request.

8.0 Findings and Conclusions

Based on the findings of the waste audit, the following conclusions can be made:

- 325.40 kg of waste materials were collected for the waste audit from eight (8) functional areas of the campus.
- Materials found in the garbage stream included mixed papers (30.1%), mixed containers (16.6%), paper towels (12.3%), non-recyclables/residual materials (11.9%), organics (8.2%), plastic films (7.1%) had a combined weight which contributed to approximately 86% of the sample weight.
- Specific functional areas generated the following quantities of waste materials for the waste audit: John Hodgins Engineering Building (14.2%), Burke Science Building (14.9%), Mills Library (5.4%), General Science Building (24.6%), Student Centre (3.1%), Hedden Hall (13.3%), Peter George (11.4%), and Mary Keyes Building (13.0%).
- The sample consisted of 15.2% Mandatory Recyclables, 62.1% Other Recyclables, and 22.7% Other (Non-Recyclable) material.
- Existing 3Rs programs at the Campus include garbage, cardboard, mixed recycling, confidential papers, scrap metals, electronic wastes, fluorescent bulbs, batteries, oil & grease, organics, LCBO/Beer Store bottle returns, textbook donations, wood pallet returns/reuse, printer toners, and reusable meal containers.
- 3Rs programs implemented on-campus exceed the minimum requirements of O.Reg. 103/94 for educational institutions.
- Mixed paper contributed 30.1% of the garbage stream. A mixed recycling 3Rs program is implemented on campus. Results suggest that an improved collection system, improved labels and/or staff and student education may be required to increase the capture rate of this material. Fine paper and newsprint are mandatory recyclable materials for educational institutions per O.Reg.103/94.
- Mixed containers contributed 16.6% of the garbage stream. A mixed recycling 3Rs program is implemented on campus. Results suggest that an improved collection system, improved labels and/or staff and student education may be required to increase the capture rate of these materials. Glass, steel, and aluminum containers are mandatory recyclable materials per O.Reg.103/94 for educational institutions.
- Paper towels contributed 12.3% of the garbage stream. It is recommended that the facility investigate the feasibility of implementing a dedicated paper towel 3Rs program with a separate collection bin in specific areas of campus. Paper towels are not a mandatory recyclable material per O.Reg.103/94.
- Organics contributed 8.2% of the garbage stream. An organics 3Rs program is implemented in some areas of campus. Results suggest that expanding the existing program, improving collection systems, improving labels, and/or staff and student education may be required to increase the capture rate of organic materials. Organic materials are not mandatory recyclable materials per O.Reg.103/94. However, according to Ontario's Food and Organic Waste Policy Statement, it is proposed that ICI Sectors will have to reduce and/or recover food and organic wastes between 50%-70% by 2025.
- Waste Diversion Rate - was calculated to be 36.24% based on 792.83 MT of waste produced annually, of which 287.38 MT of waste is diverted from landfills through existing 3Rs programs.

9.0 Recommendations

Based on the conclusions, the following is recommended to improve the Waste Diversion Rate. These recommendations are tied to conclusions discussed in the previous section.

9.1 Update Signage

Providing clear signage with pictures to help staff identify opportunities for proper disposal at the source should improve capture rates. Below is an example of signage that can guide staff in identifying their waste and encourage proper disposal.



9.2 Update Bins

Updated receptacles may be required throughout the Site. Dedicated receptacles for waste, including landfills, organics/compost, and mixed recyclables, should be implemented as part of collection programs. Receptacles should be sized appropriately according to the use, and receptacles should be color coordinated to identify the type of waste (i.e., green for organics/compost, blue for recycling, black for garbage).

An example of dedicated, color-coded receptacles is provided below.



9.3 Promoting Culture

It is recommended to establish a committee that oversees waste reduction and sustainability and to promote a culture of waste diversion. Educate staff on the importance of waste diversion and communicate the corporate goals for waste diversion and sustainability. Create a positive message around the benefits of waste diversion, and the role that the individual plays.

Support and encourage the purchase and use of “environmentally friendly,” reusable or recyclable materials and packaging, and/or those that contain recycled content.

9.4 Continuous Monitoring and Process Improvement

Track year-over-year changes in waste diversion rate and communication progress to staff to encourage further participation/engagement from staff and students.

Continuous monitoring and reporting for this site annually and comparison with year-over-year changes would provide insight into trends, which can then be used as a basis for policy decisions regarding solid waste management for future projects. Further refinements to programs/processes can be made, and adherence to provincial requirements can be achieved.

Appendices

Appendix A: List of Categories

Material Category	Description
1. Paper and Paper Products	
Fine Paper	Includes mixed fine papers, writing paper, office paper, copy paper, bills and statements, ad mail, lottery tickets, receipts, envelopes, promotional cards, promotional calendars, printed information found within packaged products, etc. Also includes softcover books, booklets, magazines, catalogues, calendars, flyers, and inserts.
Newsprint	Major daily and weekly newspapers and community newspapers. Does not include flyers and inserts.
Shredded Confidential Papers	Any paper that has been shredded.
Boxboard	Single layered paperboard and fibre board with no corrugation. Includes cereal boxes, shoe boxes, cores from toilet paper/paper towels/gift wrap, etc.
Kraft Paper	Kraft paper bags and wrap, grocery or retail bags, potato bags, some pet food bags, etc. Includes brown, white, and coloured kraft paper and bags. No bags with bonded plastic or foil lining.
Corrugated Cardboard	Waxed or unwaxed corrugated cardboard containers. Includes moulded pulp materials such as egg cartons, drink trays, other trays, etc.
Gable Top Containers	Polycoat containers with a gable-shaped top are used for milk, juice, some foods, etc.
Aseptic Containers	Tetra-Pak type Polycoat packaging containers used for juice, milk, some soups & broths, alternative milk beverages, alcoholic beverages, etc.

Composite Cans	Spiral wound cans with paper walls and plastic or metal tops or bottoms. Includes frozen juice, Pringles chips, dough, some raisins, etc.
2. Plastic	
#1 Polyethylene Terephthalate (PET)	All PET #1 plastics. This includes clear or coloured thermoform packaging, beverage bottles, non-beverage bottles used for food items, and non-food items such as dish soap, shampoo, mouthwash, window cleaner, floor cleaner, etc. Does not include Black Plastics.
#2 High-Density Polyethylene (HDPE)	All HDPE #2 plastics. Includes natural and coloured bottles, jugs, and containers for beverages, food items, and non-food items such as laundry soap, shampoo, bleach, vinegar, pill bottles, etc. Does not include Black Plastics.
#4 Low-Density Polyethylene (LDPE) Films	All #4 LDPE plastic films. Includes soft "stretchy" PE plastic used for items such as produce bags, overwrap for water bottles, garbage bags, kitchen liners, blue or clear recycling bags, sandwiches, freezer bags, etc. Does not include Black Plastics.
#5 Polypropylene (PP)	All #5 PP plastics. Includes clear and coloured food containers, jugs, jars, take-out beverage cups, bottles, and jars for food items, etc. Does not include Black Plastics.
#6 Non-Expanded Polystyrene (PS)	All non-expanded (rigid) #6 PS plastics. Includes clear or coloured rigid food trays, clamshells, cup lids, yogurt cups, CD and DVD cases only (no disk), etc. Does not include Black Plastics.
Other Recyclable Plastics (#3, 4, 7)	All other recyclable plastics (#3, 4, 7). Includes clear and coloured bottles, jugs, jars, and containers.
3. Glass/Metal	

Glass	<p>All clear and coloured glass.</p> <p>Includes bottles and containers for food, beverages, cosmetics, toiletries, household pharmaceutical products, candle jars etc.</p> <p>Does not include non-recyclable glass such as windowpane glass, plates, drinking glasses, figures, or incandescent light bulbs.</p>
Aluminum	<p>All aluminum containers and foils.</p> <p>Includes food and beverage containers, rigid aluminum trays (pie plates, baking trays, etc.), empty aerosol containers, and containers for hair products, tubes, etc.</p> <p>Does not include full or partially full pressurized cans.</p>
Steel	<p>All steel containers.</p> <p>Includes food and beverage containers, empty spray cans (for cooking oil, whipped cream, etc.), and empty paint cans.</p> <p>Does not include full or partially full pressurized cans.</p>
4. Organics	
Organic Food Waste	<p>All edible and non-edible organic wastes that result from food items.</p> <p>Includes untouched and leftover bakery, meat & fish, dried food, fruits & vegetables, dairy, and other foods.</p>
Other Organics	<p>All other organic materials that do not result from food items.</p> <p>Includes yard waste, grass clippings, small wood waste, pet waste, diapers and sanitary products, certified compostable plastic bin liners, and other compostable papers.</p>
Compostable Fibres	<p>Paper towels, paper napkins, toilet paper, facial tissues, etc.</p>
5. Operational Waste	
Other Metals	<p>Scrap metals, copper pipes, hardware, etc. Includes multi-material items that are mainly metal.</p>
Non-Treated Wood	<p>Non-treated wood materials.</p> <p>Includes skids/pallets, wooden furniture, etc.</p> <p>Does not include branches, brush, or wood chips.</p>

Batteries	All single-use and rechargeable batteries. Includes Alkaline-Manganese, Lithium, Silver Oxide, Zinc Air, Zinc-Carbon, etc.
Printer Toners	All ink cartridges and printer toners.
E-Waste	All Waste from Electrical and Electronic Equipment (WEEE). Anything that is battery-operated and/or can be plugged into an electrical outlet. Includes computer / IT equipment, telecom equipment, TV & audio equipment, small kitchen appliances, wires/chargers/adapters, cocks, gadgets, etc.
Plastic Strapping	All Plastic Strapping material. This material is used to bundle products together for retail sales and can come in a variety of colours and plastic materials.
6. Non-Recyclable Waste	
Non-Recyclable/Garbage	All other non-recyclable waste materials are not classified elsewhere. Includes hazardous waste, coffee cups, black plastics, and expanded polystyrene, all described below. Includes chip bags, furnace filters, laminated papers, rigid or durable plastics, non-recyclable glass, dust, single-use cleaning wipes, single-use coffee pods, plastic straws and cutlery, materials too small to process, etc.
Hazardous Wastes	All hazardous wastes are not classified elsewhere. Includes full or partially full pressurized cans, paints, and oil containers. Also includes fluorescent light bulbs and tubes, medical sharps and syringes, mercury-containing devices, pharmaceuticals, antifreeze, fertilizers, solvents, pesticides, etc. Also includes all other liquid or non-liquid items with signal words such as "Poison", "Danger", "Warning", "Caution", and "Precautionary Statements".

Coffee Cups	<p>All cups and containers are used for hot/cold beverages and food with a plastic or wax lining.</p> <p>Multiple layered, primarily fibre, hot/cold food, and beverage containers are common in the fast food industry.</p> <p>Includes paper-based cups with a plastic lining, water cooler cups, freezer boxes, etc.</p>
Black Plastics	<p>Includes all Black Plastics #1-7 and unmarked.</p> <p>Also includes rigid, durable, and expanded Black Plastics, as well as black plastic bags.</p>
Expanded Polystyrene	<p>Includes white, coloured, and black polystyrene foam packaging.</p> <p>Includes food trays, clamshells, etc. Also includes foam packaging "peanuts" and foam blocks used to protect boxed products.</p>



Appendix B: Annual Request Form

Waste Audit Report

McMaster University
 Waste Reduction Group Project P1423

Table B6: Annual Waste Management & Diversion Summary

Material Stream	3Rs or disposed	2016 Total ¹			2017 Total ²			2018 Total ²			2019 Total ²			2022 Total ²			2023 Total ²		
		kg	MT	%	kg	MT	%	kg	MT	%	kg	MT	%	kg	MT	%	kg	MT	%
Garbage - Disposed to Landfill	Disposed	1,256,560	1256.56	100.0%	1,182,530	1182.53	100.0%	915.93	100.0%	1152.00	100.0%	615.33	100.0%	505.45	100.0%				
Sub-Total			1256.56	64.0%		1182.53	50.3%	915.93	46.0%	1152.00	48.1%	615.33	47.5%	505.45	64.9%				
Cardboard	Recycled	135,460	135.46	19.2%	106,550	106.55	9.1%	100.09	9.3%	134.51	10.8%	91.00	13.4%	49.79	18.2%				
Mixed Containers	Recycled	68,274	68.27	9.7%	125,610	125.61	10.7%	119.19	11.1%	93.81	7.5%	14.15	2.1%		0.0%				
Mixed Papers	Recycled	14,958	14.96	2.1%	1,820	1.82	0.2%	66.00	6.1%	66.00	5.3%	35.25	5.2%		0.0%				
Mixed Recycling	Recycled														4.8%				
Confidential Papers	Recycled	109,240	109.24	15.5%	254,205	254.21	21.7%	27.77	2.6%	29.33	2.4%	15.67	2.3%	15.67	5.7%				
Scrap Metals	Recycled	81,290	81.29	11.5%	81,030	81.03	6.9%	73.06	6.8%	63.68	5.1%	42.49	6.3%	49.58	18.1%				
Scrap Wood	Recycled	53,880	53.88	7.6%	82,080	82.08	7.0%	48.21	4.5%	12.03	1.0%	37.73	5.6%		0.0%				
Electronic Wastes	Recycled	900	0.90	0.1%	24,796	24.80	2.1%	24,796	2.3%	40.89	3.3%	21.84	3.2%	29.98	11.0%				
Concrete	Recycled	8,000	8.00	1.1%	30,000	30.00	2.6%	20.00	1.9%	15.00	1.2%	0.00	0.0%		0.0%				
Bulbs & Ballasts	Recycled		0.00	0.0%		0.00	0.0%	0.00	0.0%	0.13	0.0%	0.07	0.0%	4,198.60	1.5%	4.20	0.0%		
Batteries	Recycled		0.00	0.0%		0.00	0.0%	0.00	0.0%	0.39	0.0%	0.21	0.0%	481.10	0.2%	0.48	0.2%		
Oil & Grease	Recycled		0.00	0.0%	27,254	27.25	2.3%	27,254	2.5%	27,254	2.2%	14.56	2.1%	5,283	1.9%	5.28	1.9%		
Organics	Composted	234,840	234.84	33.2%	330,160	330.16	28.2%	461.59	42.9%	645.28	51.9%	344.67	50.7%	77.77	28.4%				
Yard Wastes	Composted		0.00	0.0%		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%		0.0%				
LCBO/Beer Store Returns	Reused		0.00	0.0%	75,744	75.74	6.5%	75,744	7.0%	75,744	6.1%	40.46	6.0%	909	0.3%	0.91	0.3%		
Textbook Donations	Reused		0.00	0.0%		0.00	0.0%	0.00	0.0%	9.77	0.8%	5.22	0.8%	5.20	1.9%				
Wood Pallets	Reused		0.00	0.0%	27,240	27.24	2.3%	27,240	2.5%	27,240	2.2%	14.55	2.1%	18,000	6.6%	18.00	6.6%		
Used Furniture/Equipment	Recycled		0.00	0.0%		0.00	0.0%		0.0%	0.00	0.0%	0.00	0.0%	13.97	1.76%				
Printer Toners	Reused		0.00	0.0%		0.00	0.0%	0.00	0.0%	3.07	0.2%	1.64	0.2%	3.14	1.1%				
Clothing Donations	Reused		0.00	0.0%		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%		0.0%				
Water Bottle Filling Stations	Reduced		0.00	0.0%		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%		0.0%				
Double-sided printing	Reduced		0.00	0.0%		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%		0.0%				
Refillable coffee/Lug-a-Mug programs	Reduced		0.00	0.0%		0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	230.0	0.1%	0.23	0.1%		
Sub-Total			706.84	36.0%		1170.49	49.7%	1074.95	54.0%	1244.11	51.9%	679.51	52.5%	301.35	38.01%				
Total Generated			1963.4	100.0%		2353.02	100.0%	1990.87	100.0%	2396.11	100.0%	1294.84	100.0%	792.83	100.0%				
Total Recycled			472.0	24.0%		733.35	31.2%	506.37	25.4%	483.01	20.2%	272.97	21.1%	182.13	22.97%				
Total Reused			0.0	0.00%		106.98	4.55%	106.98	5.37%	115.82	4.83%	61.87	4.78%	27.25	3.44%				
Total Reduced			0.0	--		0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.23	0.03%				
Total Composted			234.8	12.0%		330.16	14.0%	461.59	23.2%	645.28	26.9%	344.67	26.6%	77.77	10.0%				
Total Disposed			1256.6	64.0%		1182.53	50.3%	915.93	46.0%	1152.00	48.1%	615.33	47.5%	505.45	64.9%				
			TRUE																
Achieved Waste Diversion Rate			36.0%			49.7%		54.0%		51.9%		52.5%		36.24%					
Additional Recyclable Materials in Wastes Disposed to Landfill (MT)						612.3		339.0		374.6		255.9		213.0					
Potential Waste Diversion Rate						75.8%		71.0%		67.6%		72.2%		62.4%					

Notes:

- 1: Annual values taken from McMaster 2016 Waste Audit Report.
- 2: Annual Values provided by the Client.

Appendix C: Scale Calibration Certificate



CALIBRATION CERTIFICATE

DATE: Aug 17 2023

SR # 51702

CUSTOMER:

Waste Reduction Group
214 Merton St. Unit 101
Toronto ON

REMARKS

This is to certify that the following scale has been tested and verified in relation to the Standards maintained by **CANADIAN SCALE COMPANY LIMITED**, with test weights traceable to the Legal Metrology Laboratories of, Industry Canada and National Research Council, Canada.

Western model EWA-150
Capacity - 150 kg
S/N - 202304031

CANADIAN SCALE COMPANY LIMITED is accredited with Measurement Canada

Technician's signature



CANADIAN SCALE COMPANY LIMITED

305 Horner Avenue, Toronto, ON M8W 1Z4
1-800-461-0634 www.canscale.com



Appendix D: Detailed Sample Composition

Waste Audit Report
McMaster University
Waste Reduction Group Project P1423

Table B1: Garbage Sample Summary - By Building

Sample #	Location	Waste Audit Date	Sample	
			kg	%
1	John Hodgins Engineering Building	06/11/2023	46.29	14.2%
2	Burke Science Building	06/11/2023	48.58	14.9%
3	Mills Library	06/11/2023	17.54	5.4%
4	General Science Building	06/11/2023	80.21	24.6%
5	McMaster University Student Center	07/11/2023	10.18	3.1%
6	Hedden Hall	07/11/2023	43.27	13.3%
7	Peter George Centre	07/11/2023	37.12	11.4%
8	Mary Keyes Building	07/11/2023	42.21	13.0%
Total			325.40	100.0%

Table B2: Garbage Sample Summary - By Building

Waste Generating Area	John Hodgins Engineering Building	Burke Science Building	Mills Library	General Science Building	McMaster University Student Center	Hedden Hall	Peter George Centre	Mary Keyes Building	Total	
Sample Date	06/11/2023	06/11/2023	06/11/2023	06/11/2023	07/11/2023	07/11/2023	07/11/2023	07/11/2023		
Sample Size	46.29	48.58	17.54	80.21	10.18	43.27	37.12	42.21	325.40	
Percent of Sample Size	14.2%	14.9%	5.4%	24.6%	3.1%	13.3%	11.4%	13.0%	100.0%	
	kg	%	kg	%	kg	%	kg	%	kg	%
Mixed Containers										
PET (#1)	1.18	2.5%	0.41	0.8%	0.21	1.2%	2.19	2.7%	0.46	4.5%
HDPE (#2)	0.12	0.3%	0.00	0.0%	0.26	1.5%	1.21	1.5%	0.00	0.0%
PP (#5)	3.15	6.8%	2.81	5.8%	0.94	5.4%	6.18	7.7%	0.31	3.0%
PS (#6)	0.00	0.0%	0.00	0.0%	0.13	0.7%	1.23	1.5%	0.07	0.7%
Glass	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.47	0.6%	0.00	0.0%
Aluminum	0.43	0.9%	1.39	2.9%	0.18	1.0%	2.89	3.6%	0.09	0.9%
Steel	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.37	0.9%
Gable Top	0.21	0.5%	0.21	0.4%	0.00	0.0%	0.78	1.0%	0.00	0.0%
Aseptic	0.09	0.2%	0.78	1.6%	0.37	2.1%	0.49	0.6%	0.59	5.8%
Mixed Papers										
Fine Paper	2.81	6.1%	1.18	2.4%	1.89	10.8%	6.19	7.7%	1.09	10.7%
Newspaper	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Boxboard	7.12	15.4%	11.26	23.2%	2.89	16.5%	9.83	12.3%	2.19	21.5%
Other Fibres	2.14	4.6%	1.72	3.5%	1.43	8.2%	3.19	4.0%	0.98	9.6%
Cardboard	2.01	4.3%	0.38	0.8%	0.00	0.0%	2.81	3.5%	0.13	1.3%
Paper Towels	5.19	11.2%	7.82	16.1%	1.78	10.1%	7.19	9.0%	0.32	3.1%
Coffee Cups	1.39	3.0%	4.18	8.6%	0.78	4.4%	8.15	10.2%	0.97	9.5%
Cold Beverage Cups	1.09	2.4%	2.13	4.4%	0.81	4.6%	6.37	7.9%	0.38	3.7%
Organics	1.32	2.9%	4.89	10.1%	2.98	17.0%	6.18	7.7%	0.98	9.6%
LDPE Plastic Films	2.31	5.0%	5.61	11.5%	1.28	7.3%	5.05	6.3%	0.83	8.2%
Styrofoam	0.12	0.3%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Plastic Strapping	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Scrap Wood	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Scrap Metal	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Electronic Waste	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Bulbs	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Batteries	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Printer Toners	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
PPE	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Textiles	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Other/Nonrecyclable	15.61	33.7%	3.81	7.8%	1.61	9.2%	9.81	12.2%	0.79	7.8%
QAQC Check	46.29	100.0%	48.58	100.0%	17.54	100.0%	80.21	100.0%	10.18	100.0%
Mixed Containers	5.18	11.2%	5.60	11.5%	2.09	11.9%	15.44	19.2%	1.52	14.9%
Mixed Papers	12.07	26.1%	14.16	29.1%	6.21	35.4%	19.21	23.9%	4.26	41.8%
Mandatory Recyclables (Reg103)	5.25	11.3%	2.95	6.1%	2.07	11.8%	12.36	15.4%	1.31	12.9%
Other Recyclables	22.83	49.3%	35.51	73.1%	12.27	70.0%	43.52	54.3%	6.73	66.1%
Non-Recyclable	18.21	39.3%	10.12	20.8%	3.20	18.2%	24.33	30.3%	2.14	21.0%
QAQC Check	TRUE	100.0%	TRUE	100.0%	TRUE	100.0%	TRUE	100.0%	TRUE	100.0%

Note: Highlighted cells represent those items identified in Section 4.3 of the report.

Table B3: Overall Garbage Composition (Ranked)

Waste Composition	%	Annual	Divert?	Est.
Mixed Papers	30.1%	505.45	MT	91.38
Mixed Containers	16.6%	83.79	MT	50.27
Paper Towels	12.3%	62.26	MT	37.35
Other/Nonrecyclable	11.9%	60.05	MT	
Organics	8.2%	41.46	MT	24.87
LDPE Plastic Films	7.1%	35.84	MT	
Coffee Cups	6.4%	32.45	MT	
Cold Beverage Cups	4.3%	21.96	MT	
Cardboard	3.0%	15.16	MT	9.10
Styrofoam	0.04%	0.19	MT	
QAQC Check	100.0%	505.45	MT	212.98

1. Assume a 60% capture rate of materials in garbage streams.

Table B4: Overall Mixed Container Summary

Material	kg	%	Disposed	
			MT	MT
PET (#1)	7.32	13.6%	11.37	0.63
HDPE (#2)	2.84	5.3%	4.41	0.25
PP (#5)	22.27	41.3%	34.59	1.93
PS (#6)	2.15	4.0%	3.34	0.19
Glass	4.73	8.8%	7.35	0.41
Aluminum	5.99	11.1%	9.30	0.52
Steel	1.74	3.2%	2.70	0.15
Gable Top	3.36	6.2%	5.22	0.29
Aseptic	3.54	6.6%	5.50	0.31
Total	53.94	100.0%	83.79	4.68

Table B5: Overall Mixed Paper Summary

Material	kg	%	Disposed	
			MT	MT
Fine	27.26	27.8%	42.34	2.36
Newspaper	0.00	0.0%	0.00	0.00
Boxboard	54.57	55.7%	84.76	4.73
Other	16.22	16.5%	25.19	1.41
Total	98.05	100.0%	152.30	8.50

Appendix E: Waste Audit Report & Waste Reduction Work Plan