MEMORIAL UNIVERSITY

THE HARRIS CENTRE Memorial University

MEMORIAL UNIVERSITY WASTE AUDIT 2011-12

St. John's Campus

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Waste Audit 2011-12

St. John's Campus

Final Report

to Harris Centre MMSB

Waste Management

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Submitted by:

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Summary

From March 1, 2011 to March 30, 2012, the Sustainability Office, in partnership with the Department of Geography, conducted waste audits of garbage from 13 locations on the St. John's campus of Memorial University. These audits were generally one-time events, providing a snapshot of the composition of garbage collected from a given area. The composition of the garbage was determined through manual sorting into waste categories and weighing these categories. This report presents the results by location (sub-divided into areas where applicable) in waste categories by percentage of total weight.

Results for the audit revealed some general trends regarding what is being thrown in the garbage and opportunities for waste diversion.

In office areas of nine of the buildings audited, more than 15 per cent of the garbage by weight was recyclable paper. With increased awareness of the mandatory paper recycling program, this paper should be an easy target for waste diversion.

Food waste made up over 20 per cent of the garbage in 10 locations. Two areas, the Main Dining Hall and the Campus Childcare Centre, have been identified as good potential locations to reduce waste through composting with over 40 per cent of garbage composed of food waste.

In public areas with bathrooms, paper towel made up more than 20 per cent of the garbage by weight in nine buildings.

In high use areas that generate a lot of garbage, such as the library and the University Centre, and in Burton's Pond Apartments, there is a potential to increase refundable beverage container recycling.

Further data and information are required in order to estimate and interpret the potential for waste diversion on the St. John's campus and to make more recommendations on how waste management could be improved.

Introduction to the Report

This is a report of results for the 13 locations that were audited during the project period with recommendations for further work required in order to meet the objectives stated in the project proposal.

The objectives at the outset of the project were:

- To identify and quantify the composition and point of generation of garbage at the university
- To identify any additional opportunities for waste reduction and diversion which may exist at Memorial
- To determine how much of the waste being disposed as garbage consists of materials for which recycling programs currently exist at the university and thereby determine what programs need to be improved and/or better promoted
- To determine how much food waste is being disposed of in order to collect data required for a feasibility study on composting
- To determine the how much of waste being disposed of as garbage could be recycled if new recycling initiatives were put in place, and
- To create recommendations based on the waste audit data to improve the current system of waste management on campus and improve diversion rates.

Not all of the objectives were completed by the end of the funding period due to time constraints of the project (1 year project length as required by the funder and audit schedule dictated by the school year) and due to the inability to obtain data and information from other sources as required. As information is received, the objectives will be completed and further recommendations will be developed.

While designing the audit method, audit reports from several universities were reviewed. Challenges related to doing such a project in a university setting were generally not addressed in these reports. These potential barriers were not considered when setting out the objectives of this audit, and made the management of the project and the collection of consistent data challenging. Details and advice about the planning and administration of this audit that would be useful to other institutions, to other Memorial campuses or for continuing audits of the St. John's campus are available from the Sustainability Office.

Method Overview

Phase 1: Planning the Audit Project

There were many components in planning this project including reviewing other audits, hiring student assistants, developing the method and data sheets, obtaining the required materials and equipment, and communicating with various departments and offices of the university. The following provides information on the main areas of planning; further details are available from the Sustainability Office.

Facilities Management Consultations
The director of Facilities Management and the manager of Custodial Services were consulted early in the planning of the audit to determine the level of support that could be provided. After being notified of the audit by the manager, all custodial supervisors were contacted by the Sustainability Office to explain the purpose of the audit and to consult with them on the process of garbage collection for each location being audited. Central Stores was consulted to determine what equipment and materials could be ordered and what would need to be sourced externally.

Health and Safety
The Department of Health and Safety was consulted prior to the start of the audit and several times during the project. As required by the Office of Research, the Department of Health and Safety was consulted to determine if the project required a biohazard certificate (none required). Also, the department established the following safety requirements for the audit:

- Personal protective equipment for auditors as listed in the materials and equipment in Appendix A
- Respiratory protection – fit tested respirators with cartridges to protect against particulate matter
- Packaging of waste – plastic bottles and metal cans in plastic bags, glass waste in cardboard boxes with plastic liners, chemicals in plastic pails, sharps container on site, unknown substances contact Dept. of Health and Safety, food stuffs to be placed in plastic garbage bags
- Vaccinations – tetanus shots for anyone that has not had a tetanus shot in 10 years
- Decontamination – have custodial staff properly clean area before leaving

The audit coordinator and Sustainability Office staff were trained in first aid so that at least one person present at each audit event had first aid training. (All auditors were required Safety to undergo Respirator Fit Training prior to taking part in the project. The Department of Health and Safety required that all auditors undergo Respirator Fit Training prior to taking part in the project.)

Contact information was obtained for the appropriate staff of Health and Safety in case chemical or biological waste was found during the audit.

Privacy
Memorial's Information Access and Privacy Protection Office was consulted to ensure personal privacy was not compromised during the audit. The City of St. John's and other universities that have conducted audits of student residences were contacted to determine how they dealt with privacy concerns during audits. Concerning office waste, privacy was not a great concern since there is recycling for office paper and anything confidential should be shredded. Privacy was a concern for the audit of Burton's Pond Apartments as the residents dispose of their personal garbage in the dumpsters. Residents were notified of the audit through e-mail communication from the Department of Housing, Food and Conference Services and posters in each building. All auditors signed a confidentiality form.

Risk Management
Memorial's Enterprise Risk Management (ERM) was notified of the project prior to its start. The only requirement was that volunteers helping with any audit event sign a waiver provided by ERM. This was only required for the launch of the audit in March 2011 prior to student employees assisting with the audit.

Staffing and Support
In total, two Sustainability Office staff and 10 student research assistants (hired through the Department of Geography) worked part-time on the audit from March 2011 to April 2012. The Sustainability Office coordinated the project including recruiting staff, scheduling audit events and audit assistants, booking rooms, consulting with custodial and health and safety staff, and ensuring supplies were purchased. The Department of Geography administered the funding and provided academic oversight. The audit method was developed in part by students taking a graduate level geography course taught by Dr. Ratana Chuenpagdee.

Two graduate students were audit coordinators at different times during the project. The audit coordinator worked with the Sustainability Office to design the audit method and data forms, coordinated audit events, designated roles for the audit assistants, and recorded and analyzed data. Five other students (undergraduate and graduate) worked solely on the audit events: setting up, sorting the waste and cleaning up. Two graduate students worked on the audit events and reviewed the data.

Phase 2: Planning an Audit for a Specific Location

Buildings on campus are divided into zones where garbage collection is the responsibility of different custodial supervisors. As explained in the results section, the management and schedule of garbage collection varied by custodial supervisor making it difficult to have one consistent process for each location.

For each audit location, several weeks prior to the desired audit date the custodial supervisor (and other staff as needed) was contacted by the Sustainability Office:

- to determine a possible site in the building to sort the garbage and how to book that site (site requirements: no carpet, moveable desks if in a classroom, windows that open),
- to discuss the garbage collection schedule for the building and the best typical day to collect garbage, and
- to determine if any specific issues might affect the audit.

Once a site was booked for a given date, audit assistants were notified and tables were ordered through Facilities Management.

About one week prior to the audit, the following audit logistics were confirmed with the custodial supervisor:

- the schedule of garbage collection
- the placement of designated coloured bags in garbage containers in specific areas at the appropriate time prior to the audit day
- the sites where garbage would be stored and sorted, and
- the name and contact number of the custodian scheduled to work during the audit.

Two days before the audit, all details were re-confirmed.

Phase 3: Conducting the Audit

The materials and equipment list, the audit method and data sheets are provided in Appendix A. For an average-size building, five to six auditors were present plus the audit coordinator.

On the day of the audit, the custodial supervisor was contacted to confirm that the garbage had been collected as planned from the designated areas.

Results

Explanation of Audit Results

The audits took place from March 2011 to March 2012 for 13 locations on the St. John's campus (Table 1).

Table 1. Buildings audited during waste audit project.

Location	Date	Description of Waste Audited
University Centre	8-Mar-11	Waste audit launch and testing method: food court only for short period. Data not included in this report
	5-Apr-11	Food court and public areas (no bathrooms) for 24 hour period, some staff offices, student society offices
	17-Jan-12	Food court and other public areas for 24 hour period
Main Dining Hall (R. Gushue Hall)	29-Mar-11	Mar. 29 breakfast and lunch
	30-Mar-11	Mar. 29 supper
Childcare Centre	5-Jul-11	Entire building for 24 hour period
	7-Jul-11	Entire building for 24 hour period
Arts and Administration	27-Sep-11	Public areas and classrooms for 24 hour period, some offices
Education	4-Oct-11	Public areas and classrooms for 24 hour period, offices
Engineering and Applied Science	19-Oct-11	Public areas and classrooms for 24 hour period, offices
	2-Nov-11	Engineering Café for 24 hour period
QEII Library	9-Nov-11	Public areas for 24 hour period and offices
Facilities Management	22-Nov-11	Lunchrooms and public areas for 24 hour period, offices
Music	22-Nov-11	Public areas and classrooms for 24 hour period, offices
Science	12-Jan-12	Public areas, classrooms and teaching labs, Science Cafe for 24 hour period, offices and research labs
Chemistry-Physics	25-Jan-12	Public areas, classrooms and teaching labs for 24 hour period, offices and research labs
Business Administration	15-Mar-12	Public areas and classrooms for 24 hour period; office data not included due to scheduling problem
Burton's Pond Apartments	26-Mar-12	Garbage bags taken from four dumpsters located outside of buildings
	30-Mar-12	

Explanation of Audit Results (cont'd)

The results are presented by location in order of date audited. The results show a snapshot of the composition of the garbage in a particular location on a given day. Through consultation with custodial staff, typical days were selected whenever possible. For example, garbage was not collected after a special event when there would be an abundance of garbage related to the event. Unless otherwise noted in the results by location, the each location was audited one time and all the garbage collected was sorted and weighed.

The results are provided in waste categories by percentage of total weight audited for each area audited in the location. Not all charts (figures) are explained or referred to in the text as the charts are generally self-explanatory. A comparison of locations by weight is not presented since different collection periods and dates affected the amount of garbage collected for each audit.

For each location, information ("special considerations") is provided that should be considered in interpreting the results. Some locations will require further research and collection of data to focus on specific aspects of waste management. For example, for the main dining hall, once data is received on the number of meals served each year, the total amount of food waste could be estimated on an annual basis which would aid in the development of a composting program.

This audit did not include garbage placed directly in dumpsters (with the exception of Burton's Pond apartments), large items that would not be put in a garbage container in an office or public area, garbage collected from outdoor areas, or construction waste put in temporary dumpsters on site or brought directly to the landfill.

Building occupants and users were not notified of the audit unless noted in the results. Custodial supervisors and custodians were aware of the audit since they helped with the collection of garbage.

Areas within Audit Locations

For most locations, garbage was collected from three general areas: public areas/classrooms, bathrooms, and offices. If there was a deviation from this, it is stated in the results section for the location. Public areas/classrooms and offices were audited separate from each other due to different frequency of garbage collection and different primary user groups to target for education and awareness programs. Bathroom garbage was collected in clear bags so that it could be assessed visually and described without manually sorting. For some locations, food service areas were audited separately.

Public areas/classrooms are areas that have garbage collected daily and have a high rate of use by students in most buildings. For some locations, daily collection also includes teaching laboratories, student or employee lunchrooms and large general offices. These areas were audited for a 24-hour period.

Bathroom garbage is collected daily. Bathroom garbage was described only in terms of percentage of paper towel and other waste. From the visual assessments, bathroom waste was considered to be on average 80 per cent paper towels and 20 per cent other waste.

Office garbage is generally collected weekly, however there are various collection schedules in different buildings making it difficult to collect garbage from all offices of a given building for a defined period. Research laboratories were included in the office garbage since they had weekly garbage collection.

For the results presented in this report, bathroom and food service areas are combined with public/classrooms unless otherwise noted since those areas are collected daily. If there is any deviation from the areas and collection schedule as described above, it is noted in the results for a given location.

Audit Categories

As seen on the Waste Audit Form - Detailed Sort (Appendix A), garbage was sorted into several categories. These categories were selected by considering the following: what materials are currently recycled on the St. John's campus, what materials could be recycled based on the City of St. John's curbside recycling program, what materials are accepted for recycling at the Robin Hood Bay Waste Management Site, what materials are compostable, and categories of waste that could be reduced through behavior.

For the final results, some of the categories were combined. The final results include the categories described in Table 2.

Table 2. Description of audit categories as presented in results.

Category Name in Final Results	Description	Categories Included
Recyclable paper	All paper accepted through paper recycling program on campus	Office paper, box board, other
Cardboard	All cardboard accepted through cardboard recycling program on campus	Cardboard
Refundable beverage containers	Refundable beverage containers that are currently recycled on campus	Refundable beverage containers
Non-refundable beverage containers	Beverage containers that are not recyclable or not being recycled on campus	Coffee cups, milk cartons, Booster Juice, other beverage containers (eg. paper and Styrofoam cups)
Recyclable plastic	Plastics that are currently recycled by City of St. John's curbside program, but not currently recycled on campus	Plastic containers #1-7
Non-recyclable plastic	Plastics that are not accepted by City of St. John's curbside recycling program including plastic wrap and bags	Cutlery, other (plastic bags, plastic wrap, etc.)
Metals	All metals including metal that is currently recycled on campus	Food cans, other
Organics	All food waste (includes meat and vegetable products, cooked or raw)	Organics
Paper Towel	Commercial-type paper towels provided in most bathrooms, lunchrooms/kitchens on campus	Paper towel and 80% of bathroom waste (unless otherwise stated)
Waste	Any waste that is not part of any of the other audit categories including packaging contaminated by food waste combined with the Styrofoam, glass and liquid waste categories	Waste, Styrofoam, glass (other than refundable beverage containers), liquid waste
Electronics and Office	Items included cables, batteries, pens, CD's, printer cartridges, etc.	Electronics and Office

Results by Location

University Centre

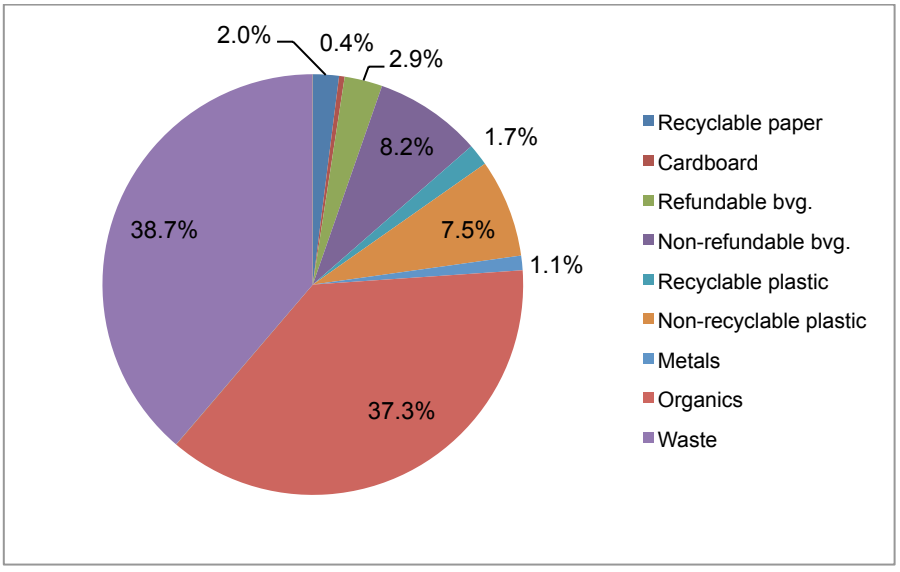
Description of location: The University Centre contains public areas including a food court, administrative offices and a medical clinic, retail and meeting spaces, student union and student society offices, and the Breezeway Bar. It has high use by students.

Audit period: The centre was audited three times. The first audit was in March 2011 for the launch of the waste audit during Sustainability Week. It was used to promote the project and refine the sorting method so the results are not presented here. A second audit was conducted in April 2011, prior to the end of classes, and before new recycling bins were installed. A third audit was conducted in January 2012 after new recycling bins (September 2011) and signage (November 2011) had been installed. The office audit is for a portion of the offices in the building for a period of approximately one week.

Special considerations:

- Although classes were still in session during the April 2011 audit, a custodian estimated that the volume of garbage was about 40% less than during peak student use.
- For the April 2011 audit (Figure 1), paper towels were not considered as a separate category; they were included with the waste category. Also, bathroom garbage was not collected due to miscommunication. In January 2012 (Figure 2), bathroom garbage was collected. Bathroom garbage has been removed from Figure 2 to compare the results from the food court and public areas for April 2011and January 2012.
- Due to large amount of garbage collected for the January 2012 audit of public areas (Figure 3), only one third of the waste was sorted.
- Food vendors and the Breezeway Bar were not included in the audits since their garbage is not collected by custodians.
- Audits were done before and after installation of recycling bins and signage. From these results, the installation of new containers and signage seems to have little or no effect on the amount of recyclable materials in the garbage (comparison of Figure 1 and 2).

Figure 1. Composition of garbage collected from food court and public areas (not including bathrooms) for 24 hours in the University Centre on April 5, 2011.



University Centre (cont'd)

Figure 2. Composition of garbage collected from food court and public areas (not including bathrooms) for 24 hours in University Centre on Jan. 17, 2012.

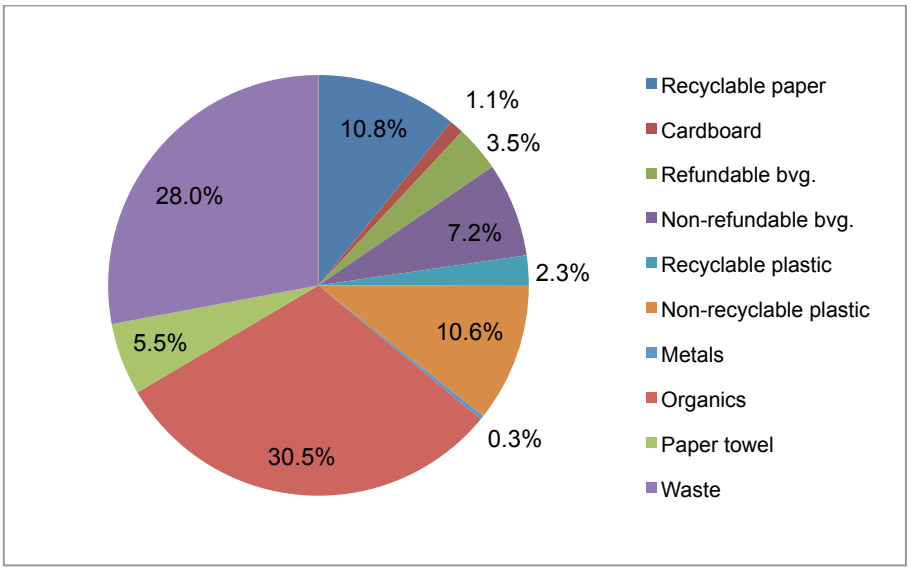
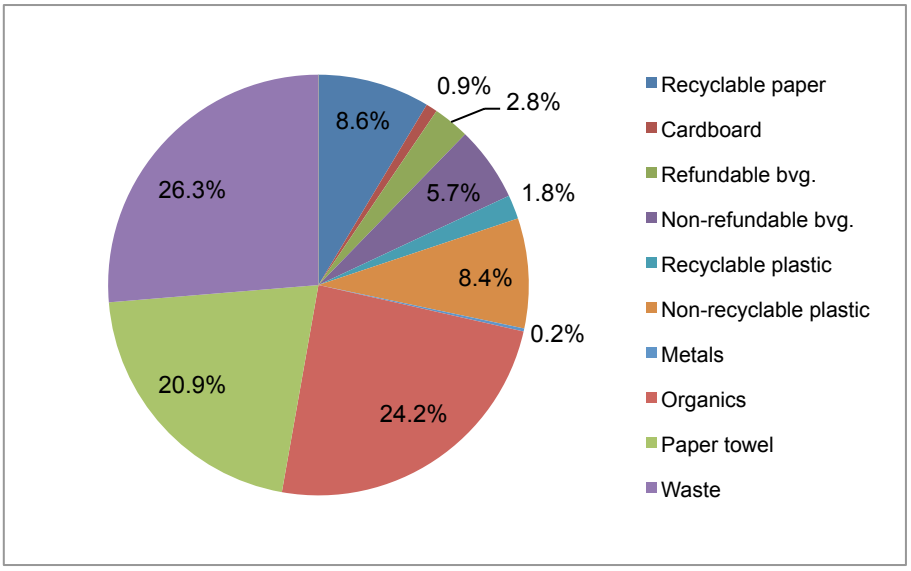
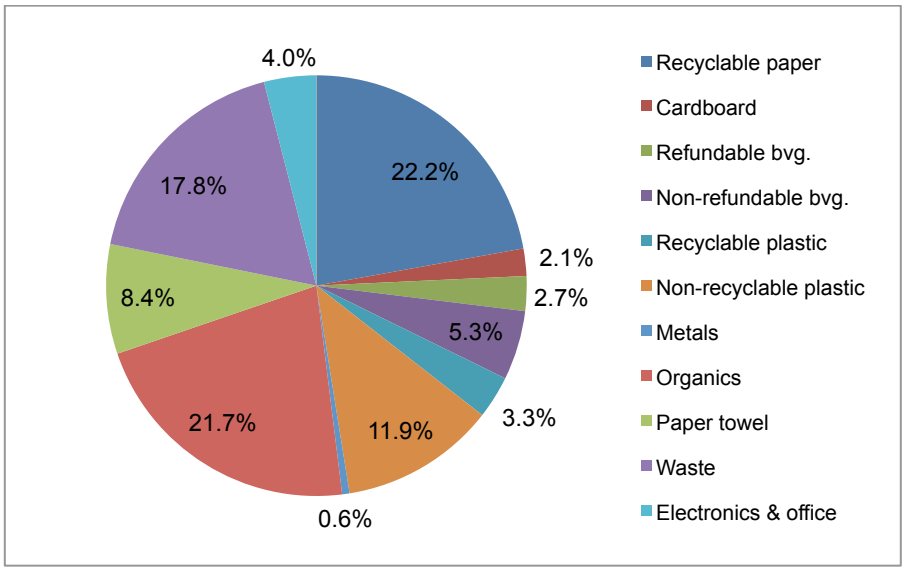


Figure 3. Composition of garbage collected from food court and public areas (including bathrooms) for 24 hours in University Centre on Jan. 17, 2012.



University Centre (cont'd)

Figure 4. Composition of garbage collected from offices in University Centre on Jan. 17, 2012.



Main Dining Hall (R. Gushue Hall)

Description of location: The Dining Hall is used primarily by students living in residence (Paton College) and some residents of Burton's Pond Apartments. The set-up of the dining hall is all-you-can-eat, buffet style, with some areas where food is served to the customers. The dining hall is trayless meaning that users must carry their food and drinks without the help of a tray. This is an initiative to encourage less food wastage.

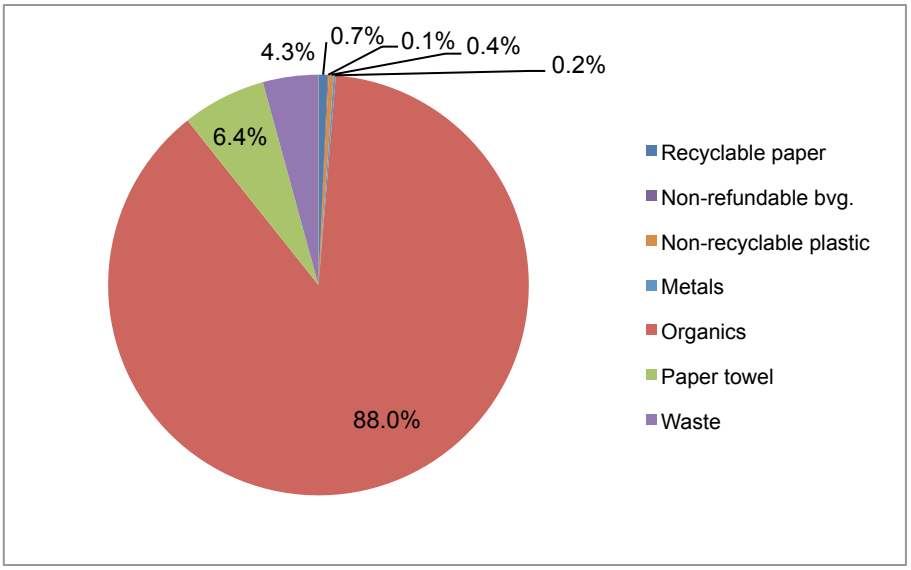
Audit period: Results are based on 24 hour period in the dining hall including breakfast, lunch and supper. Communications with staff confirmed that the number of diners at each meal was a typical number.

Audit areas: The audit included anything placed in garbage containers in the dining hall, and food and other waste that were left on customers' plates once they had finished eating. Normally, the food waste left on plates is put into a garburator, however for the purpose of this audit; the food waste was collected in containers. It did not include food waste left over from the preparation of food (the food service provider collected this data) or food containers disposed of in the kitchen.

Special considerations:

- Kitchen staff were aware of the audit since they were required to collect food waste from plates; students and other diners were not aware of the audit.
- The paper towel category includes napkins which are 100% recycled content and could possibly be composted.
- Additional data has been requested from the food service provider on how much food waste is collected in the kitchen and number of meals served annually.
- Although the food containers disposed of in the kitchen were not included (kitchen waste was disposed of separately), this information should be available from food service provider based on types and amounts of products purchased. These containers could potentially be recycled if a program were put in place.
- There have been discussions about the potential of starting a composting program on the St. John's campus. This audit was completed to help estimate the amount of food waste and other compostable materials disposed of at the dining hall. This data will help determine what capacity would be needed for a composting program, and how much diversion could occur from the dining hall's garbage.
- The dining hall is a good candidate for on-site composting and expanded recycling programs due to the presence of a kitchen where meals are prepared daily, the availability of areas to wash recyclable containers, and the importance of educating students about these initiatives.

Figure 5. Composition of garbage collected for 24 hours from Main Dining Hall on March 29, 2012.



Campus Childcare Centre

Description of location: The Childcare Centre provided over 160 full time equivalent spaces for children aged 2 to 12 at the time of the audit. Each day, two snacks and lunch are provided to the children. Most food is prepared in the kitchen at the centre. Some food arrives at the centre partially prepared (for example, peeled carrots). Staff members have a staff room where they can eat lunch. The centre is at full capacity year-round.

Audit period: The centre was audited for two 24 hour periods. The results for the two days were combined to provide an average 24 hour period.

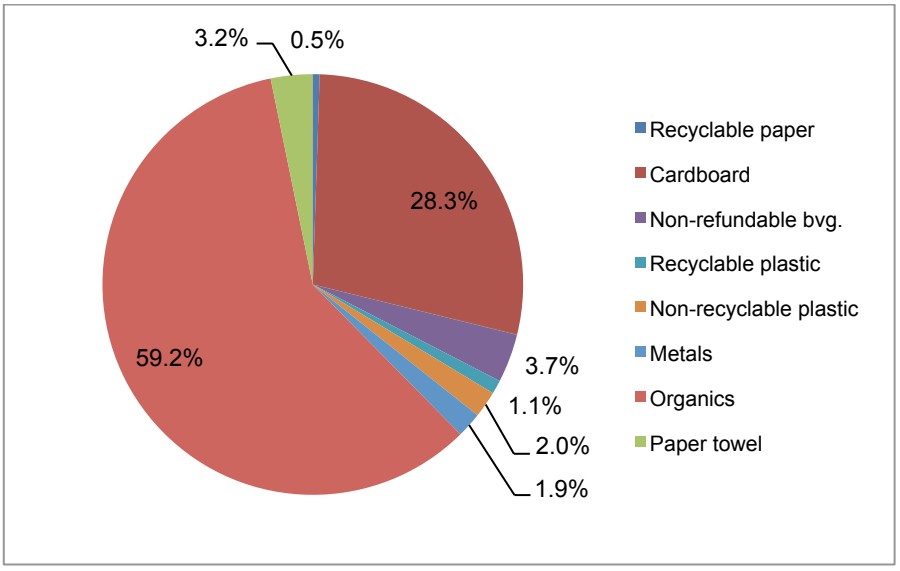
Audit areas: The audit was divided into two areas:

- kitchen
- children's centres, offices and staff room (includes bathrooms)

Special considerations:

- Staff of the Childcare Centre were notified of the audit in advance so that they could separate food waste.
- There was a weekly food shipment received on the first day of the audit creating a large amount of cardboard on that day. Although cardboard is recycled at Memorial, communications with a custodian revealed that at the time of the audit, cardboard was not being recycled from the Childcare Centre.
- Much of the paper that was in the garbage had been used for arts and crafts and was therefore categorized as waste instead of recyclable paper due to the presence of paint, glue, shiny paper, etc.
- Much of the paper used at the centre for arts and crafts is office paper already used on one side that has been discarded by other offices on campus.
- Since all of the areas were collected for a known period (24 hour), the results could be combined to provide results for the whole building (Figure 8).
- The centre is a good candidate for on-site composting and expanded recycling programs due to the presence of a kitchen where meals are prepared daily, the availability of areas to wash recyclable containers, and the importance of educating children about these initiatives
- In Figures 7 and 8, the paper towel category included diapers which contributed to the high weight.

Figure 6. Composition of garbage collected from kitchen area of Childcare Centre on July 5 and 7, 2011. Results collected for two-24 hour periods were averaged to reflect a 24 hour period.



Campus Childcare Centre (cont'd)

Figure 7. Composition of garbage collected from children's centres, offices and staff room of Childcare Centre on July 5 and 7, 2011. Results collected for two-24 hour periods were averaged to reflect a 24 hour period.

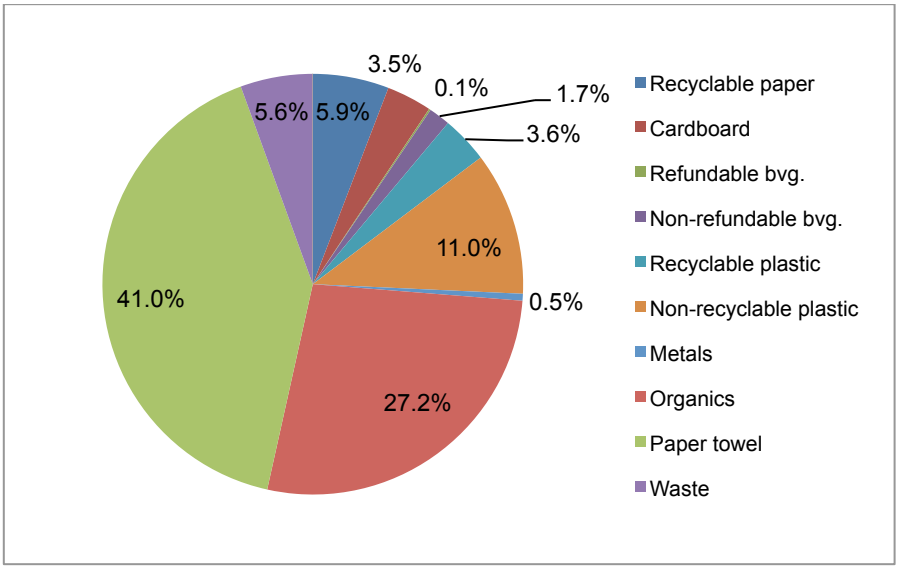
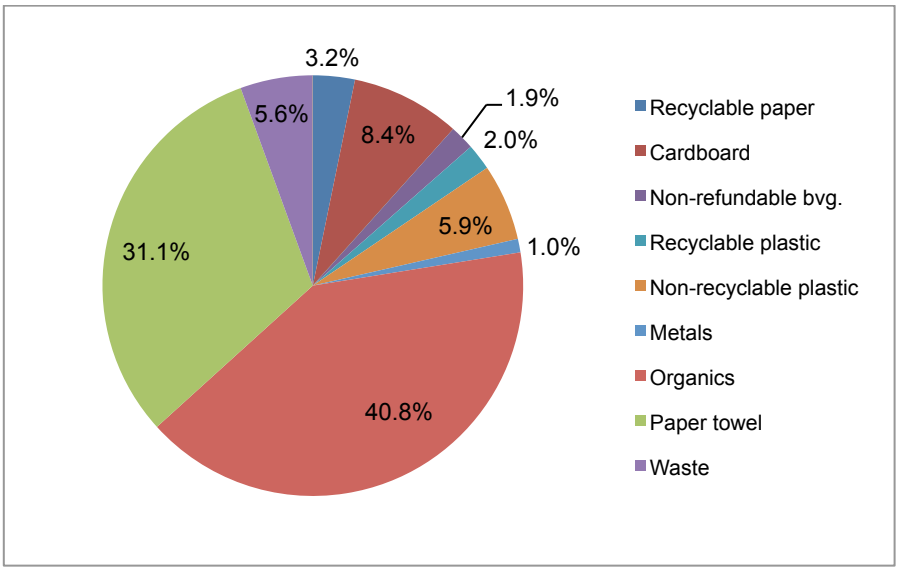


Figure 8. Composition of garbage collected from entire Childcare Centre on July 5 and 7, 2011. Results collected for two-24 hour periods were averaged to reflect a 24 hour period.



Arts and Administration

Description of location: The Arts and Administration building contains staff and faculty offices, classrooms and lecture halls, and a small take-out café in an open area.

Special considerations:

- Garbage collected from offices was for a period of approximately one week, but only some of the offices were collected due to a rotating pick-up schedule therefore the sample size was small.
- The café was not audited separately; food is not prepared on site and there is no seating area.

Figure 9. Composition of garbage collected from public areas/classrooms in Arts and Administration building for 24 hour period on September 27, 2011.

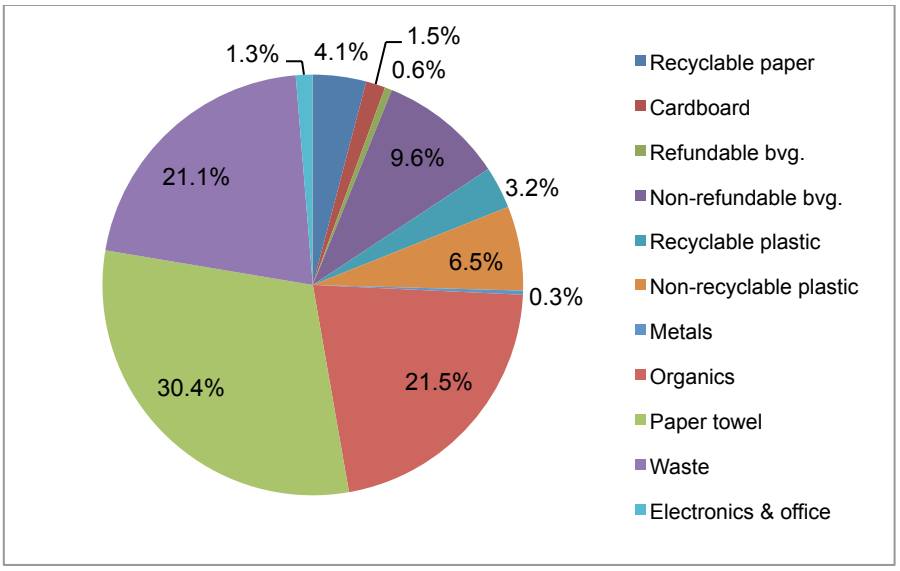
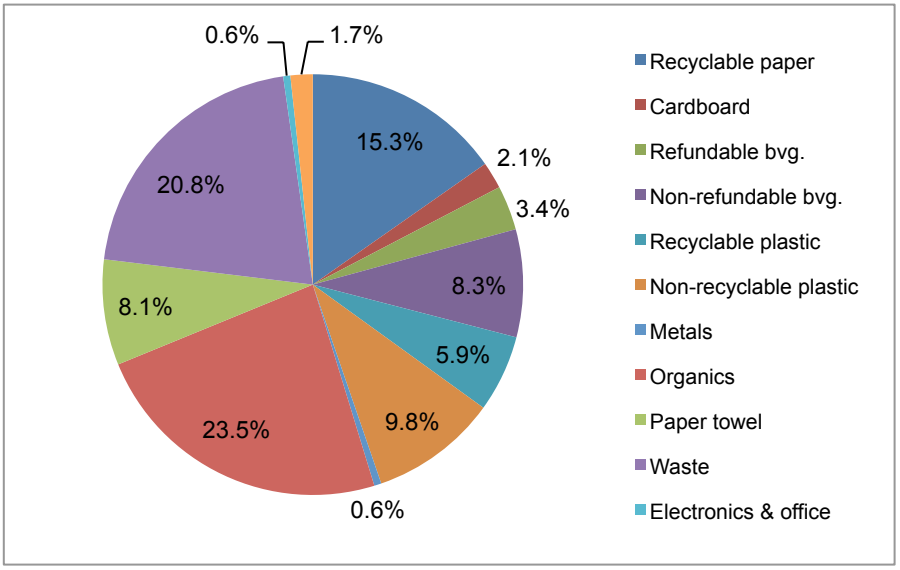


Figure 10. Composition of garbage collected from offices in Arts and Administration building on September 27, 2011.



Education

Description of location: The Education building contains staff and faculty offices, classrooms and lecture halls, and a small take-out café with some seating.

Special considerations:

- Garbage collected from offices was for a period of 3 to 7 days due to office waste being picked up on different days.
- The garbage in the café is collected and put directly outside in a dumpster by café staff. This waste was not included in the audit.

Figure 11. Composition of garbage collected from public areas and classrooms in Education building for 24 hour period on October 4, 2011.

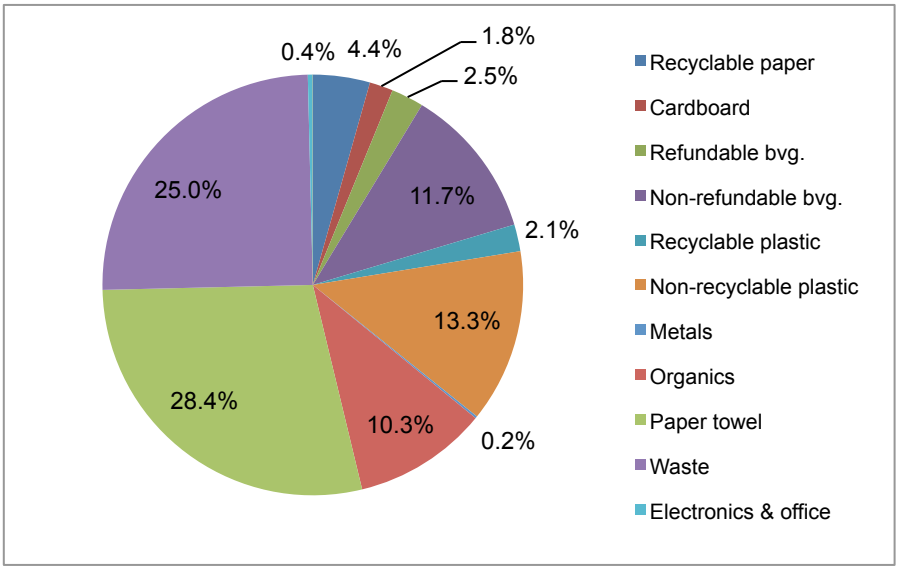
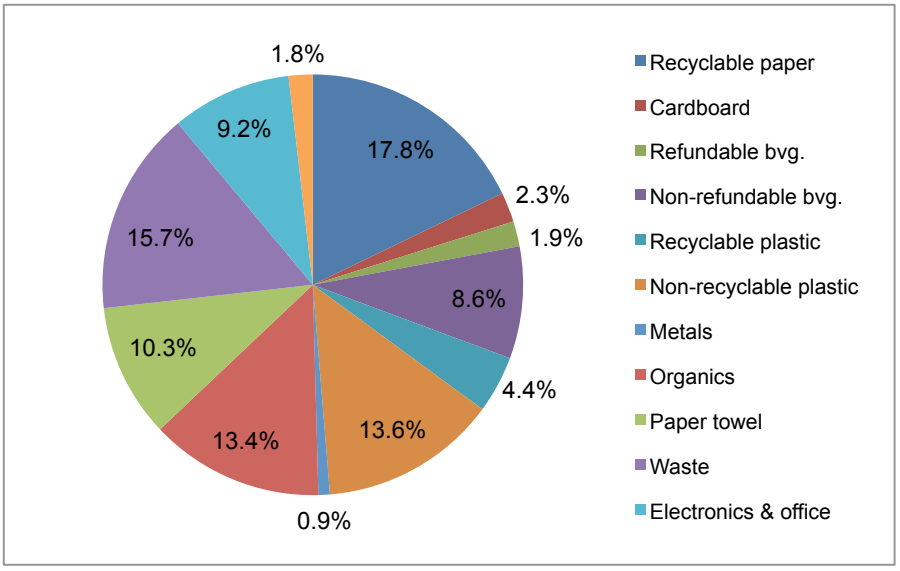


Figure 12. Composition of garbage collected from offices in Education building on October 4, 2011.



Engineering and Applied Science

Description of location: The Engineering building contains staff and faculty offices, classrooms, labs and lecture halls, and a cafeteria.

Audit areas: The Engineering Cafeteria was audited separately from the other areas.

Special considerations:

- The Engineering Cafeteria was audited separately to determine if it creates a large amount of food waste and would be a candidate for a potential composting program. The results are presented separately in Figure 15 and combined with the public/classroom and bathroom in Figure 16.

Figure 13. Composition of garbage collected from public areas and classrooms in Engineering building for 24 hour period on October 19, 2011.

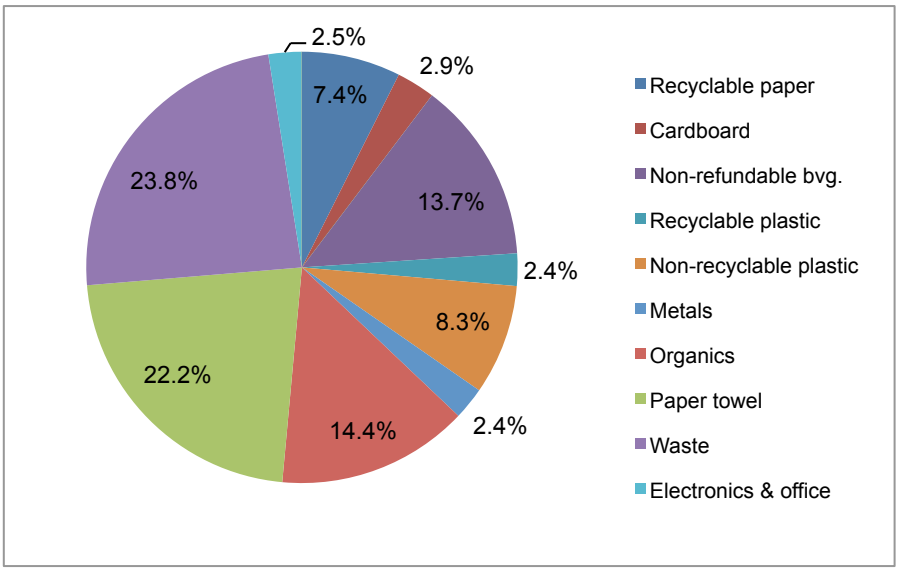
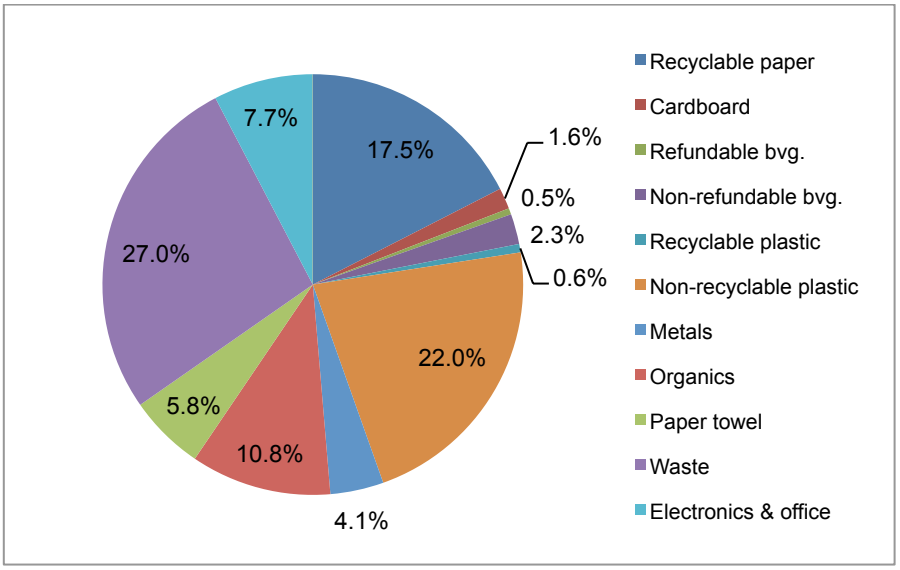


Figure 14. Composition of garbage collected from offices in Engineering building on October 19, 2011.



Engineering and Applied Science (cont'd)

Figure 15. Composition of garbage collected from Engineering Café for 24 hour period on November 2, 2011.

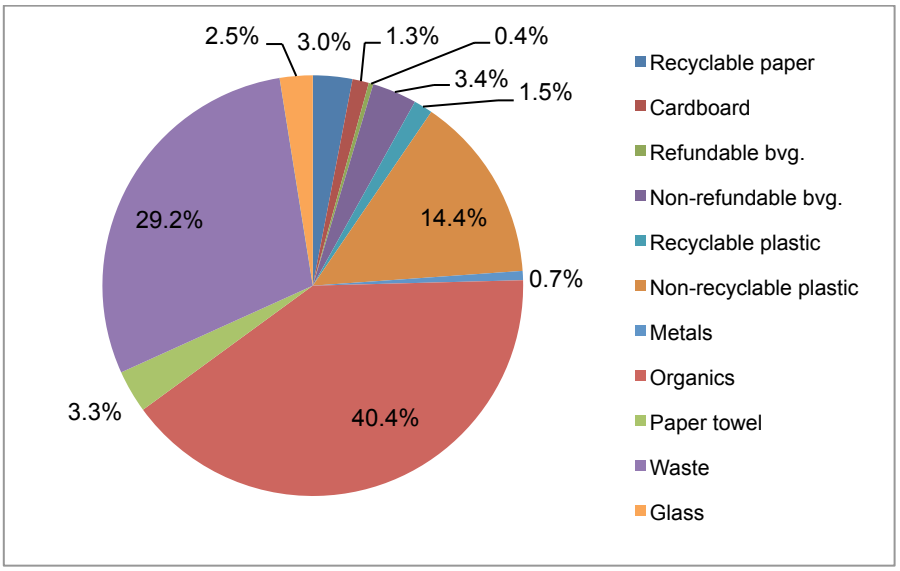
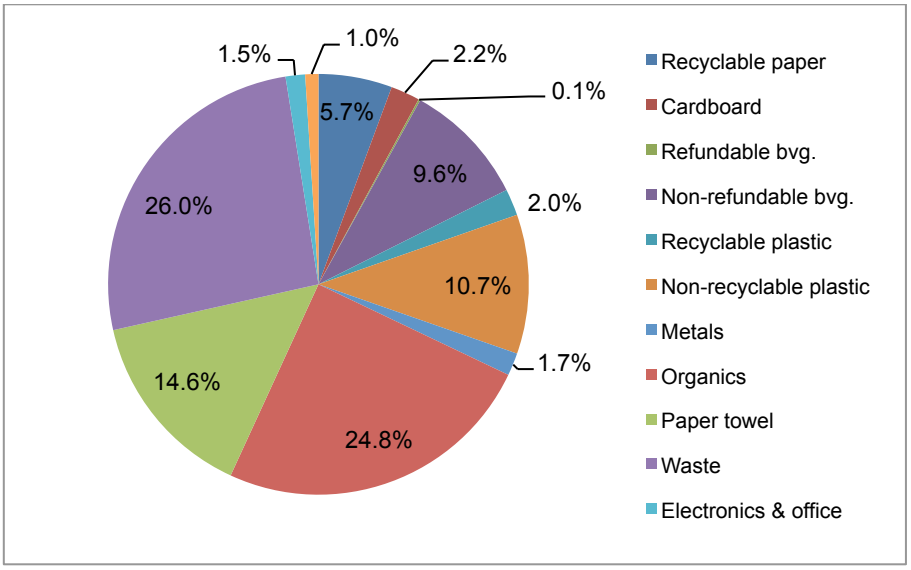


Figure 16. Composition of garbage collected from public area/classrooms and Engineering Café in Engineering building for 24 hour period on October 19 and November 2, 2011, respectively.



Queen Elizabeth II Library

Description of location: The library contains public areas used by a large number of students, and offices. The library has long hours and allows food. At the time of the audit, there was no café in the library.

Special considerations:

- Employees of the building were notified of the audit in advance because of concerns by administration that they needed to know that the loading bay was being used for the audit.

Figure 17. Composition of garbage collected from public areas in QEII Library for 24 hour period on November 9, 2011.

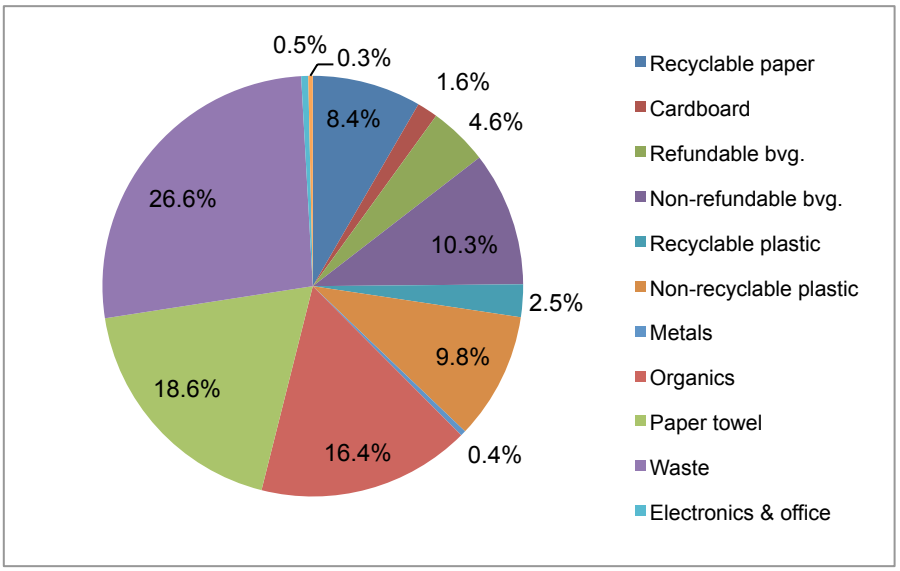
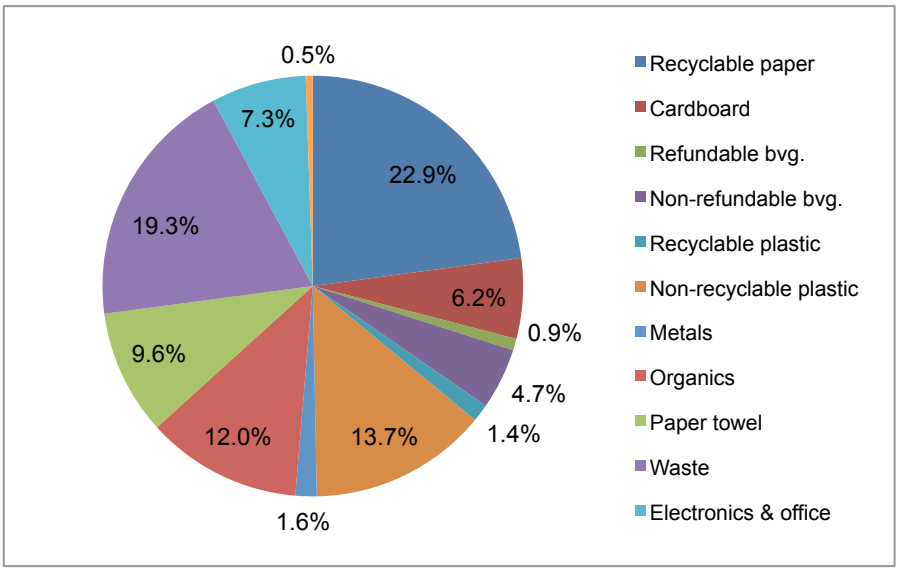


Figure 18. Composition of garbage collected from offices in QEII Library on November 9, 2011.



Facilities Management

Description of location: The Facilities Management building houses several units of Facilities Management including Campus Enforcement and Patrol, as well as Image Services of Marketing and Communications and a few other offices external to Facilities Management. At the time of the audit, part of the ground floor of the building was vacant. Except for one training room, there are no classrooms or public areas.

Audit period: Garbage collected in lunch rooms and bathrooms was for a 24 hour period.

Figure 19. Composition of garbage collected from lunch rooms and bathrooms in the Facilities Management building for a 24 hour period on November 22, 2011.

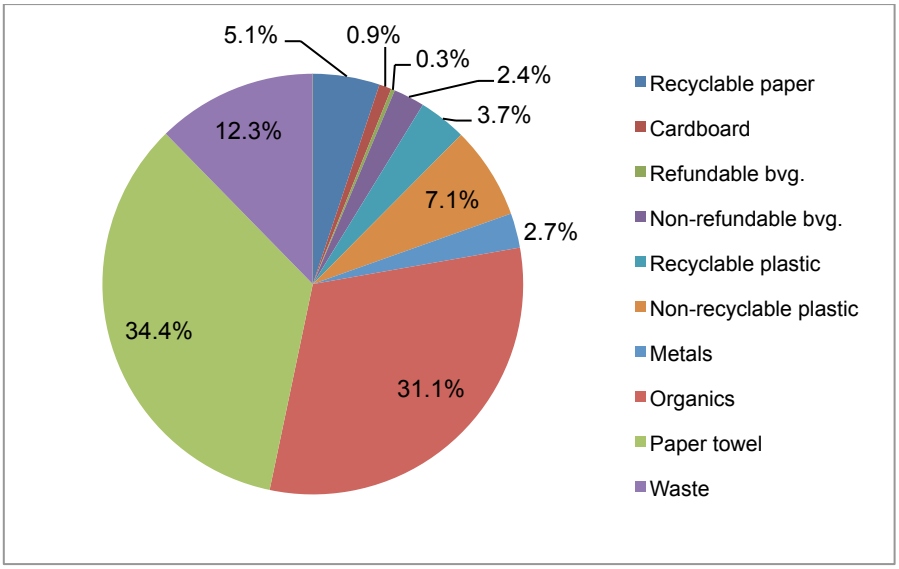
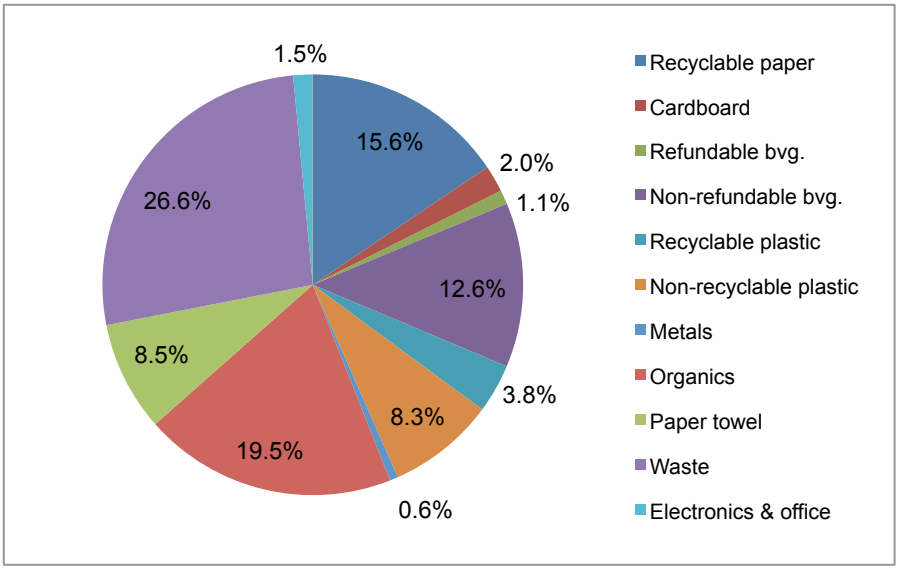


Figure 20. Composition of garbage collected from offices in the Facilities Management building on November 22, 2011.



Music

Description of location: The Music building contains staff and faculty offices, classrooms, and lecture halls.

Special considerations: The Music building hosts many events and concerts where food and beverages are served however there was none during the audit.

Figure 21. Composition of garbage collected from classrooms and public areas in the Music building for a 24 hour period on November 22, 2011.

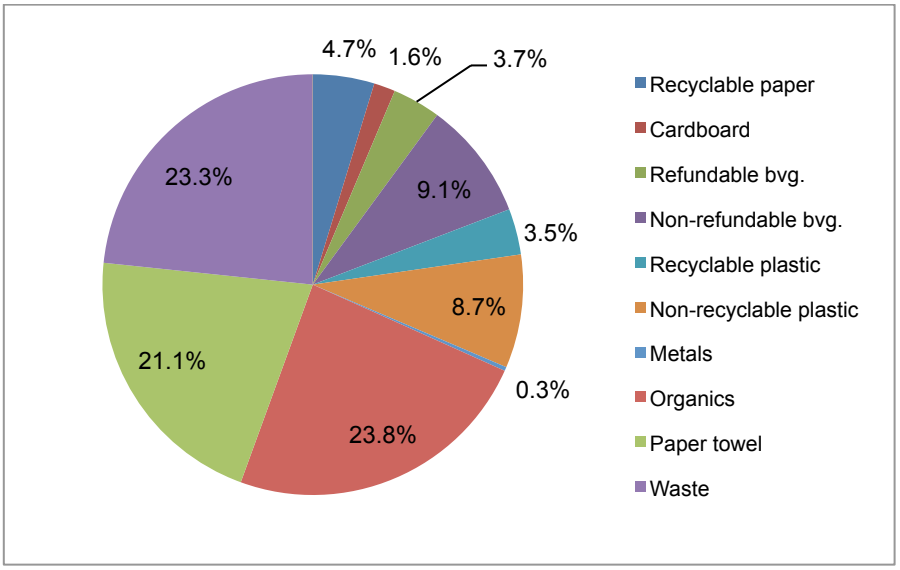
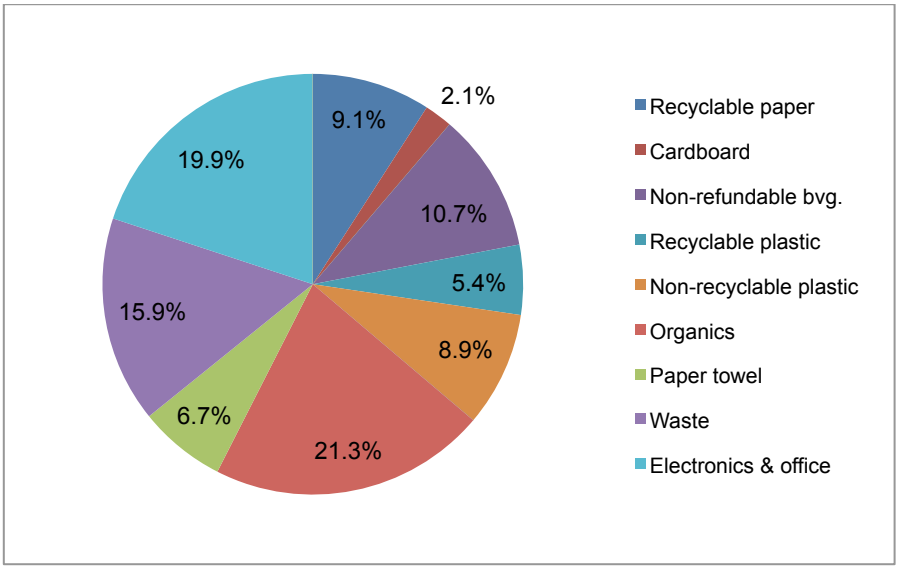


Figure 22. Composition of garbage collected from offices in the Music building on November 22, 2011.



Science

Description of location: The Science building contains staff and faculty offices, classrooms, research and teaching labs, lecture halls, and a café with limited seating.

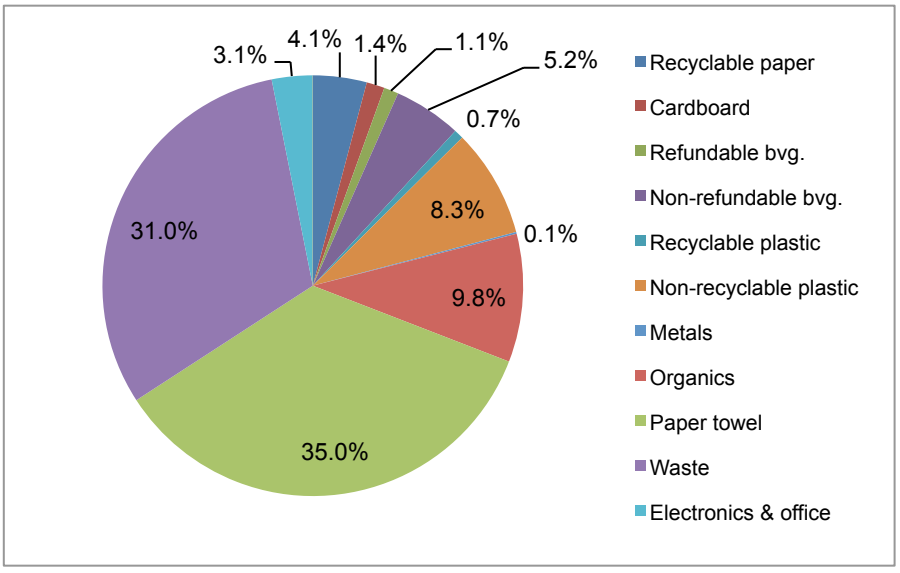
Audit Categories:

- The Science Café was audited separately from the other areas.

Special considerations:

- There were some communication issues with custodial staff prior to and during this audit. On the first planned audit day, the garbage was thrown out by staff who were not aware of or forgot about the audit procedure. On the day before garbage was collected for the audit, it was observed that some of the bathrooms and the hallways did not have the appropriate coloured bags placed in the garbage containers. It is possible that some bags from these areas were mixed in with the office bags that were collected in the regular black garbage bags.
- Biological waste (invertebrates frozen in ice and rocks) was found in the garbage collected from the office/research lab area. Biological waste is not normally disposed of in the regular garbage. It was categorized as waste in Figure 24 since there was no category for it. Due to the excessive weight of the biological waste, the percentage of waste is very high compared to other locations. An assumption was made that the biological waste was disposed of improperly or collected in error. Figure 25 shows the results with the biological waste removed.

Figure 23. Composition of garbage collected from public areas and classrooms in the Science building for a 24 hour period on January 12, 2012.



Science (cont'd)

Figure 24. Composition of garbage collected from offices and research labs in the Science building on January 12, 2012.

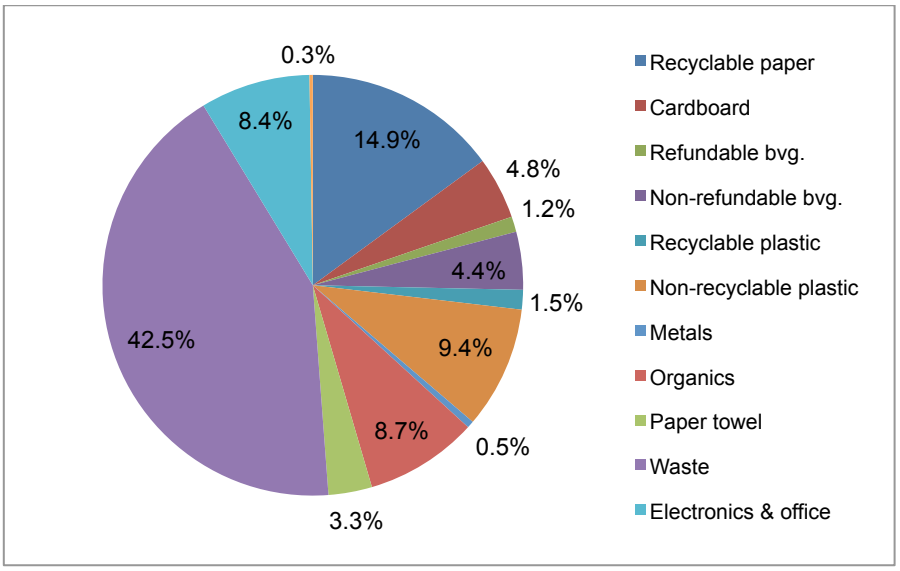


Figure 25. Composition of garbage collected from offices and research labs in the Science building on January 12, 2012 with biological waste removed.

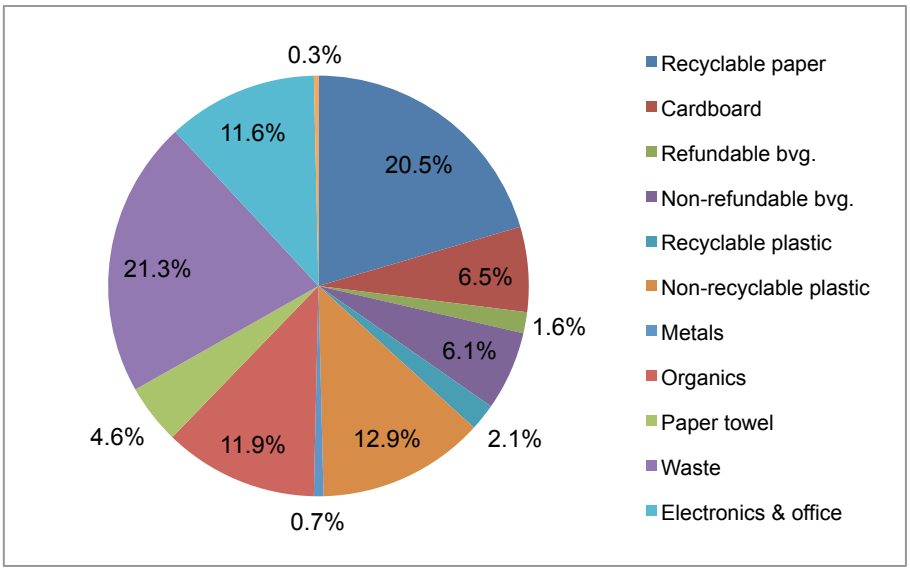


Figure 26. Composition of garbage collected from the Science Café for a 24 hour period on January 12, 2012.

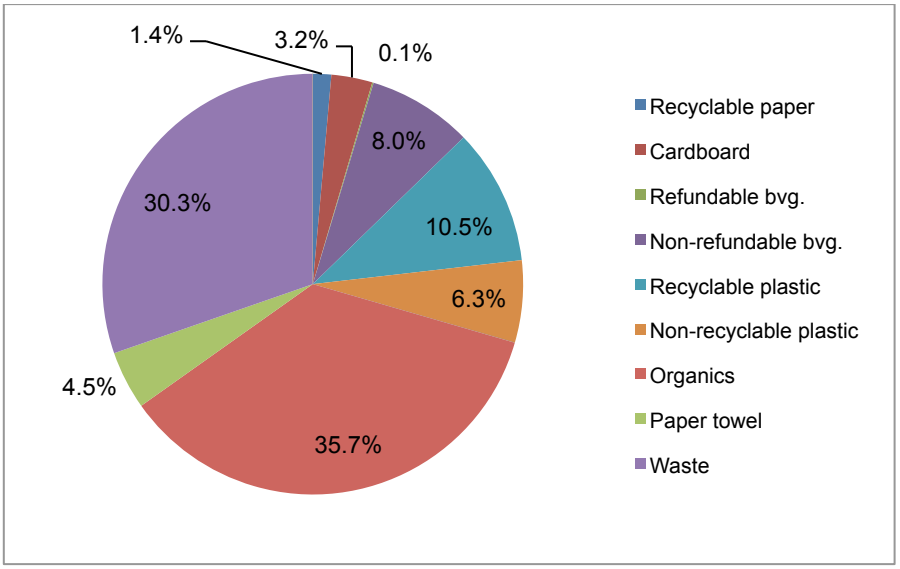
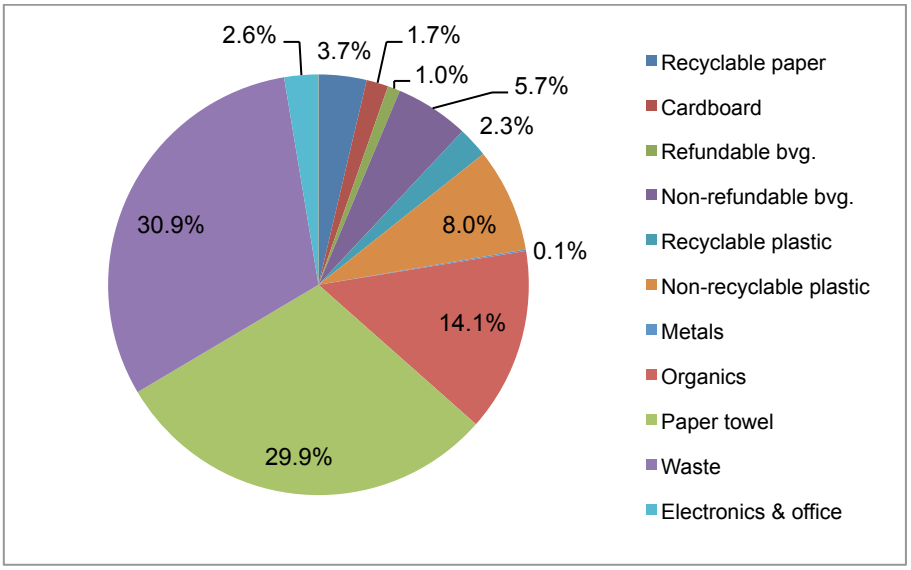


Figure 27. Composition of garbage collected from public areas, classrooms, teaching labs and the Science Café for a 24 hour period on January 12, 2012.



Chemistry-Physics

Description of location: The Chemistry building contains staff and faculty offices, classrooms, research and teaching labs, and lecture halls.

Special considerations:

- Chemical waste and sharps were found in garbage bags from offices/research labs. These items should have been segregated and disposed of as hazardous waste as specified by the Department of Health and Safety. The manager of Custodial Services and the custodial supervisor for the building were notified immediately of the findings. The manager notified the Department of Health and Safety.
- The audit was done in a classroom during regular working hours. A phone call and e-mail were received by the Sustainability Office from the Department of Chemistry listing several concerns about the audit.

Figure 28. Composition of garbage collected from classrooms and public areas in the Chemistry-Physics building for a 24 hour period on January 25, 2012.

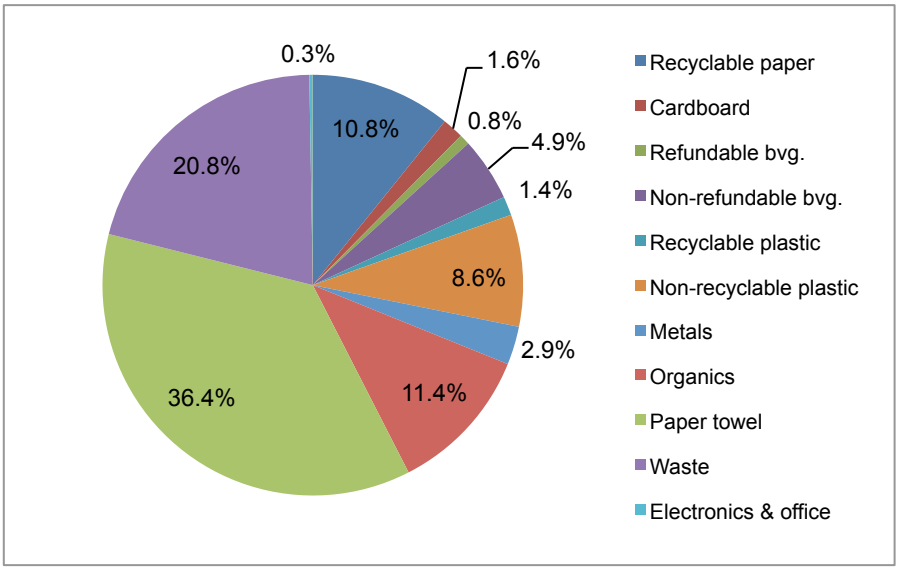
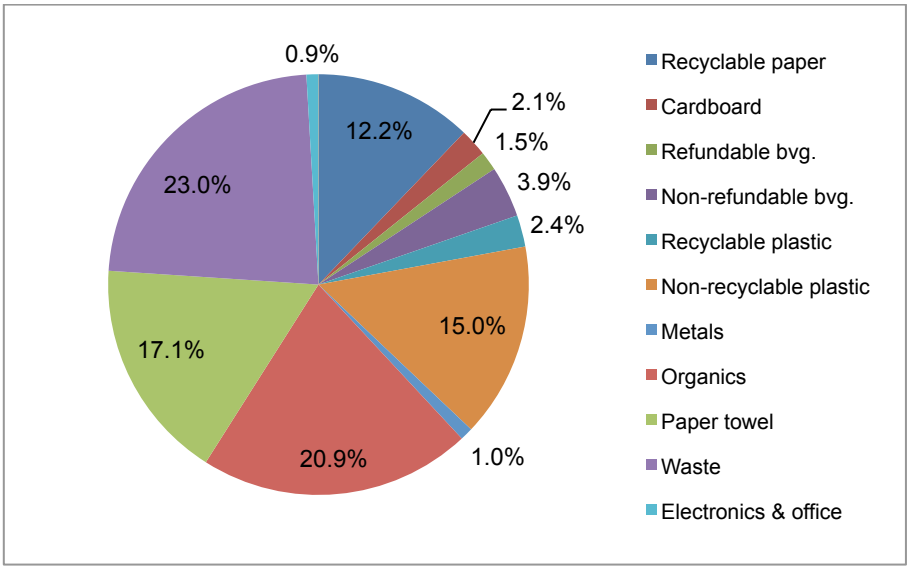


Figure 29. Composition of garbage collected from offices in the Chemistry-Physics building on January 25, 2012.



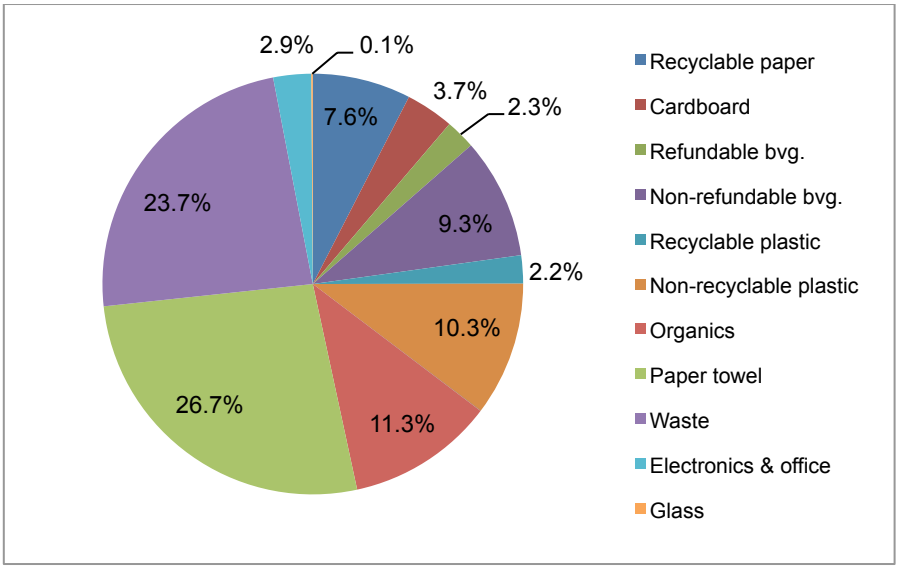
Business Administration

Description of location: The Business building contains staff and faculty offices, classrooms, lecture halls and the Gardiner Centre.

Special considerations:

- There was only one bag of garbage collected from offices on the audit day due to scheduling complications and a snow storm the day before therefore there are no results for offices.

Figure 30. Composition of garbage collected from classrooms and public areas in the Business building for a 24 hour period on March 15, 2012.



Burton's Pond Apartments

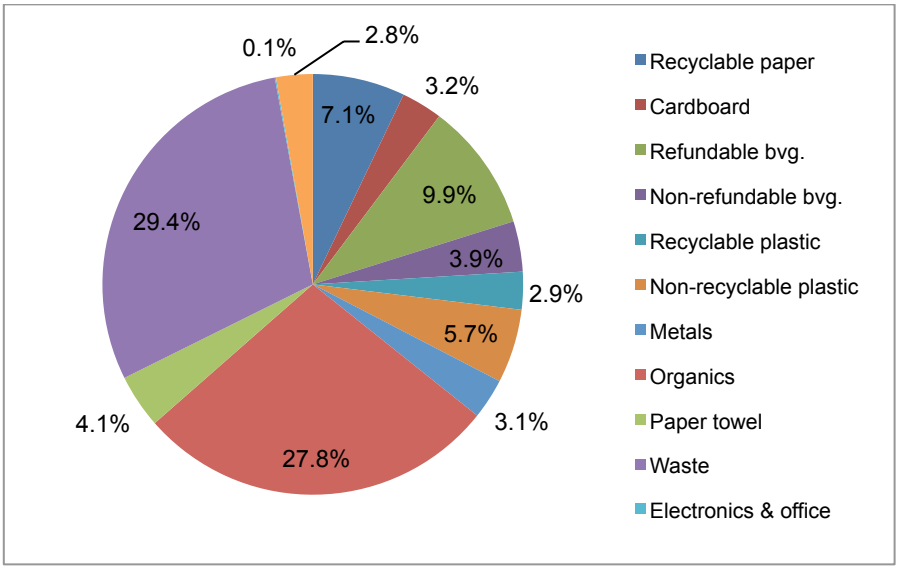
Description of location: Burton's Pond Apartments consists of six buildings. Five of these buildings house students including one building for families. The other building has offices, the campus food bank, a laundry area and recreational space. There are five dumpsters outside of the buildings where residents bring their garbage at any time; there is no pick up within the buildings by custodial staff. Apartments have kitchens and students can also choose to be part of the meal plan at the dining hall and other locations on campus. Residents are able to recycle refundable beverage containers by bringing them to Corte Real, the building housing the recreational space and laundry area. There is no pick-up in the apartment buildings or curbside pick-up of recycling, however sometimes residents volunteer to collect recycling.

Audit period: Garbage was collected on two days at 9:30 am, prior to the contractor emptying the dumpsters. A sample of five to six bags was collected from each dumpster on each audit day. The results for the two days were combined.

Special considerations:

- Since residents can place their waste in the dumpsters at any time, the audit cannot be used to show amount of waste produced in a given period.
- Only a small sample of garbage was taken from the dumpsters. Data on the total weight of garbage collected by trucks has been requested to estimate composition of a typical week of garbage.
- As these dumpsters are publicly accessible and not locked, there is the possibility that waste from outside of the university is dumped there.
- Many bags in the dumpsters were broken open. Initially, this was thought to be from birds. On the first day of the audit, only bags that were not broken open were selected. Upon reflection, it was thought that collecting some open bags might be more accurate. On the second day of the audit, garbage was also collected from broken bags. During the garbage collection, two people were seen taking beverage containers out of the dumpsters. One of them said that the bags were ripped open from the collection of refundable beverage containers. By taking the ripped open bags, the results may have been skewed to reflect fewer refundable beverage containers than actual. When the two days were compared, there were a lot fewer beverage containers on the second day.
- There has been some consideration of starting a more thorough recycling program in Burton's Pond. These results will be provided to Facilities Management for review.

Figure 31. Composition of garbage collected from dumpsters outside Burton's Pond apartments on March 26 and March 30, 2012, averaged for the two collection periods.



Overall Trends

Paper

Paper recycling in office areas has been on-going for several years at Memorial with legislation introduced in 2005 requiring that businesses and organizations with greater than 25 employees recycle paper. For employees, this is the recycling program on campus with the least effort required. Small blue bins are located in most offices and are emptied by custodial staff. Occupants of offices simply have to place paper in the blue bins. There are also large recycling bins in hallways of some buildings and a paper recycling slot in the new waste/recycling containers in the University Centre.

In office areas of nine of the buildings audited, 15 per cent or more of the garbage by weight was recyclable paper (Table 3). The weight of the paper may have been higher due to some soiled or wet paper being included in the recyclable paper category. This paper was included because had it not been placed in the garbage it would not have been soiled, and could have been recycled.

Table 3. Percentage of recyclable paper in the garbage by location.

Percentage of Paper by Weight	Location
>10%	Chemistry-Physics Public
	Chemistry-Physics Offices
	University Centre Public
>15%	Arts and Administration Offices
	Education Offices
	Engineering Offices
	Music Offices
	Science Offices
>20%	Facilities Management Offices
	QEII Library Offices
	University Centre Offices

The most obvious reason for a high percentage of paper in office garbage is that some employees are not placing paper in the blue bins as required. In addition, there might be other factors contributing to these results:

- Lack of knowledge of types of paper acceptable in the blue bins. For example, boxboard (e.g. cereal and cracker boxes) was categorized as recyclable paper in the audit as the paper recycling contractor said it is accepted. The audit results show that, generally, boxboard is being disposed of as garbage in offices, however it only makes up a small amount of the recyclable paper in the garbage compared to office paper.
- Lack of blue bins in office areas.
- Some custodial staff might be disposing of the contents of paper recycling bins as garbage (the Sustainability office has received complaints in the past from occupants of one building). This could be due to contamination of paper or other reasons.

Recommendations:

- Ask custodial staff for recommendations to increase paper recycling, for example locations where bins are lacking.
- Have custodial supervisors remind custodial staff of the requirement to keep paper separate from the garbage.
- Provide information to employees about what is accepted in the blue bins and remind them that paper recycling is mandatory.

Paper Towel

Paper towel is provided in most bathrooms and lunchrooms on campus. There were several areas (public areas with bathrooms) where paper towel made up more than 30 per cent of the garbage by weight (Table 4). While paper towel is not heavy itself, it is usually wet, adding to the weight.

Table 4. Percentage of paper towel in the garbage by location.

Percentage of Paper Towel by Weight	Location
>10%	Chemistry-Physics Offices
	Education Offices
	QEII Library Public
>20%	Business Public
	Education Public
	Engineering Public (including café)
	Music Public
	University Centre Public including bathrooms
>30%	Arts and Administration Public
	Facilities Management Public
	Science Public
	Chemistry-Physics Public
	Campus Childcare

Recommendations:

- For areas with a high percentage of paper towel waste and high overall output of garbage, determine the feasibility of installing hand dryers. Determine if Memorial is interested in increasing use of hand dryers and if they are being installed in new buildings. There is debate on whether paper towel or dryers are more sustainable in an institutional setting.
- Determine if paper towels from bathrooms could be accepted in a composting program.

Refundable Beverage Containers

Burton's Pond Apartments stands out as the audit location which had more than double the percentage of refundable beverage containers (10 per cent) compared to other locations (less than five per cent in all other locations).

Even though the percentage by weight of beverage containers in most locations is not high, it is important to recycle as many containers as possible since deposit refunds contribute to the Campus Food Bank and Ever Green Recycling. For areas that have a high output of garbage on a daily basis (for example, the University Centre food court and the library), diverting more beverage containers daily could have a large impact. Using the public area of the library as an example, approximately 200 refundable beverage containers (equivalent to $10 in refunds) were found in the garbage in one day. Since the library is open more than 300 days per year, the university could be contributing $1500 more to the food bank annually (half of the $3000 in refunds goes to Evergreen Recycling), while diverting 60 000 containers from the garbage.

Recommendations:

- Improve the recycling system for beverage containers at Burton's Pond Apartments.
- Target areas of high output of garbage for education to increase beverage container recycling.

Food Waste

As expected, areas that serve food and have seating areas create a high percentage of food waste (Table 5). Areas where the food waste made up over 40 % of the garbage were the Engineering Café, the Campus Childcare Centre and the Dining Hall.

Table 5. Percentage of food waste in the garbage by location.

Percentage of Food by Weight	Location
> 10%	Business Public
	Chemistry-Physics Public
	Education Public
	Education Offices
	Engineering Public
	Engineering Offices
	Facilities Management Offices
	QEII Library Public
	QEII Library Offices
>20%	Arts and Administration Offices
	Arts and Administration Public
	Burton's Pond Apartments
	Chemistry-Physics Offices
	Engineering Public (including café)
	Music Offices
	Science Offices
	University Centre Offices
	University Centre Public (including bathrooms)
>30%	Facilities Management Public
	Science Café
	University Centre Public (not including bathrooms)
>40 %	Engineering Café
	Dining Hall
	Campus Childcare

Recommendations:

- Estimate how much food waste by weight is created annually in the areas with over 30% food waste.
- Encourage composting at the Campus Childcare Centre.
- Continue research with MMSB into potential composting in the Main Dining Hall.

Potential for Diversion into Current Recycling Stream

Paper, cardboard and refundable beverage containers are the three categories that have well established recycling programs on the St. John's campus. Combining these three categories provides an estimate of how much waste could be diverted from the garbage right now, without adding any new programs. For public areas in the 10 administrative/ academic buildings audited, these recyclable materials combined made up from 6 to 14 per cent by weight of the garbage collected. Half of the buildings could divert over 10 per cent from the garbage immediately. For the office areas, the range was from 11 to 30 per cent, with half over 20 per cent.

Recommendations:

- Based on annual weight of garbage collected for each building, determine where efforts should be focused to divert recyclable materials from the garbage.

Appendix A: Materials and Equipment, Method and Data Sheets for Audit Event

Materials and Equipment

Prior to Audit Event (for distribution to custodial staff)

- bags: clear garbage bags (bathrooms), blue recycling bags (public areas), green or black garbage bags (offices)

For Audit Event

For Set-up and Clean-up:

- 3 large plastic boxes to carry supplies to audit
- sign in/out sheet for auditors
- 5 or 6 tables (might need to be delivered prior to audit event depending on location)
- large roll of clear plastic (2 ml)
- packing tape
- scissors
- sticky notes or tags with category types for sorting tables
- marker, pen, pencil
- garbage bag holders (with clips to hold bags in holders) or other containers for sorting waste
- large and small scales: Weight Watchers digital scale model WW38WC (accuracy 50 g, capacity 180 kg); Starfrit electronic kitchen scale (accuracy 1.0 g, capacity 5 kg)
- extra scale and batteries for scales
- container or top of box to hold items being weighed on small scale
- plastic pail for liquid waste
- cart to move garbage bags from storage to audit location
- antibacterial wipes, respirator wipes
- fan, camera, radio (optional)

Containers for Hazardous Waste:

- sharps container
- several plastic pails and containers with lids for chemical waste
- box lined with plastic for glass

Safety Equipment

- first aid kit
- cell phone
- emergency contact list: Health and Safety (chemical and biological contacts), Campus Enforcement and Patrol, Sustainability Co-ordinator or designate, on-site custodial staff

Personal Protective Equipment

- safety glasses (2 types: for audit assistants with eyeglasses and without)
- respirators (3M Half Facepiece, medium and 3M Half Facepiece, small)
- plastic sleeves
- gloves (2 types: cut-proof and Nitrile)
- disposable coveralls
- tongs
- steel-toe boots (for minimum of one auditor at each audit for heavy lifting)

For Data Recording

- waste audit forms (most audits required 3quick sort forms, 3 detailed sort forms, 2 bathroom forms)
- clipboard with attached pen/pencil

Method

Set-Up

1. Confirm with custodial staff the area where each colour of bag was collected and obtain any other information that might be important to the audit results.
2. Bring garbage (custodial staff or auditors as decided in advance) to the sorting area.
3. Ensure that the auditor who will do heavy lifting is wearing safety boots.
4. Ensure all equipment and materials are at the audit location.
5. Record auditors' names and time they start work on sign-in sheet.
6. Ensure room is fully lit, cool (turn down temperature), and aerated (open windows).
7. Move furniture as needed (e.g. desks and chairs not being used for audit to free up floor space).
8. Cover required floor area with plastic and secure with tape. Ensure covered area is large enough for tables, containers and bags used for sorting, scales, unsorted and sorted garbage, etc.
9. Cover sorting tables with plastic and secure with tape.
10. For the quick sorting station, set up four tables around seven clear plastic garbage bags held open by bag holders and clips.
11. For the detailed sorting station, set up one to two tables with at least four clear plastic garbage bags held open by bag holders and clips.
12. Place the small scale on the detailed sort table and the large scale on the floor next to the detailed sort table.
13. Once set-up is complete, auditors put on personal protective equipment: coveralls, nitrile gloves, cut resistant gloves, plastic arm sleeves, safety glasses and respirators.

Garbage Sorting

1. Place bags of garbage on plastic on the floor. Keep different colour bags separate.
2. Record the weight of the auditor(s) who will be weighing the garbage on the waste audit form. If a different auditor starts weighing, ensure the change is noted.
3. For each colour of bag, count all the bags and weigh them four or five at a time. Record the colour of bag, area collected, number of bags and total weight on Quick Sort Waste Audit Form. Complete quick sort and detailed sort for each colour of bag before moving on to next colour of bag.
4. Bathroom garbage is not sorted. Estimate the percentage of paper towel visually through the clear bags.
5. For all other garbage: sort the garbage into 12 categories as shown on the Quick Sort Waste Audit Form.
6. Place hazardous waste (chemicals) in a plastic bucket with a lid. Different chemicals should be put in separate containers. If known, record specific location where waste was collected. Unless, immediate action is required, contact Department of Health and Safety for instruction on disposal the next day.
7. Place any sharps (needles) in sharps container to be disposed of at a later date.
8. Place any broken glass in box lined with plastic and discard with garbage at the end of the audit.
9. Weigh separated categories and record data. When using the small scale, ensure that it is zeroed with container or tray on the scale prior to adding the items to be weighed.
10. Proceed with detailed sort by sorting the paper, beverage containers, plastic and metal waste categories as shown on Detailed Sort Waste Audit Form.
11. Weigh separated categories, counting items where specified, and record data on the Detailed Sort Waste Audit Form. When using the small scale, ensure that it is zeroed with tray or container on the scale prior to adding the items to be weighed.

Clean-Up

1. Clean tables, scales, tongs, bag holders, clips and safety glasses using disinfecting wipes; clean respirators with respirator wipes.
2. Dispose of plastic sheets from tables and floor and used nitrile gloves.
3. Dispose of garbage in manner determined in advance with custodial staff.

4. Place used coveralls, arm sleeves and cut resistant gloves in a bag to be washed.
5. Fold up tables and set aside to be picked up if required.
6. Pack up audit equipment and materials and return to storage location or label “to be picked up”.
7. Inform custodian that the audit has been completed so that required cleaning (mopping floors) can commence.
8. Record auditors’ time finished.
9. Ensure doors are locked if required.

QUICK SORT - Waste Audit Form

Date of audit:	# of unsorted bags:
Location:	Weight of unsorted bags (kg):
Auditors:	
Recorder:	
Date(s) of waste collection:	

Categories	Batch	Reading on scale (kg)	Weight to minus (kg)	Weight (kg)	Total weight (kg)	Remarks (e.g., location)
PAPER *eg, cardboard (corrugated), office paper, box board (no soiled food pkg)*	1					
	2					
	3					
	4					
BVG. CONTAINERS *eg, coffee cups, refundable (with deposit), milk cartons (no deposit), Booster Juice*	1					
	2					
	3					
	4					
PLASTICS (no bvg cntrs) *eg, plastics # 1-3, 5-7, cutlery*	1					
	2					
	3					
	4					
METALS *eg, food cans (soup cans)*	1					
	2					
GLASS (no bvg cntrs)	1					
	2					
ORGANICS (food only)	1					
	2					
	3					
	4					
STYROFOAM	1					
	2					
LIQUID WASTE	1					
	2					
WASTE	1					
	2					
	3					
	4					
PAPER TOWEL	1					
	2					
ELECTRONICS & OFFICE EQUIPMENT	1					
	2					
OTHER						

Total weight from this location (kg):

QUICK SORT - Waste Audit Form	# of unsorted bags:
Date of audit:	Weight of unsorted bags (kg):
Location: BATHROOMS	
Auditors:	
Recorder:	
Date(s) of waste collection:	

Instructions : waste from bathroom locations are not sorted; the audit consists of weighing the waste, a visual inspection of contents, and an estimation of contents

Categories	Batch	Reading on scale (kg)	Weight to minus (kg)	Weight (kg)	Total weight (kg)	Percent paper towels (%)
UNSORTED BAGS	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
OTHER						
			Total weight from bathrooms (kg):			

DETAILED SORT - Waste Audit Form

Date of audit:
Location:
Auditors:
Recorder:
Date(s) of waste collection:

	Categories	Batch	Reading on scale (kg)	Weight to minus (kg)	Weight (kg)	Total weight (kg)	Count
PAPER	CARDBOARD *(corrugated)*	1					
		2					
	OFFICE PAPER	1					
		2					
	BOX BOARD *(no soiled food pkg)*	1					
		2					
	OTHER	1					
		2					
BVG. CONTAINERS	COFFEE CUPS	1					
		2					
		3					
	REFUNDABLES *(with deposit)*	1					
		2					
		3					
	MILK CARTONS *(no deposits)*	1					
		2					
		3					
	BOOSTER JUICE	1					
		2					
		3					
	OTHER	1					
		2					
		3					
PLASTICS	RECYCLABLES *(plastics #1-3, 5-7)*	1					
		2					
		3					
	CUTLERY	1					
		2					
		3					
	OTHER *(non-recyclable, eg, #4)*	1					
		2					
		3					
METALS	FOOD CANS *(eg, soup cans)*	1					
		2					
	OTHER	1					
		2					
OTHER							

Appendix B: Project Promotion

Date	Media	Event/Description
	External	
Mar. 8, 2011	CBC News	Audit launch event in UC, Mar. 8, during Sustainability Days
Mar. 8, 2011	NTV News	Audit launch event in UC, Mar. 8, during Sustainability Days
Mar. 9, 2011	The Telegram	Audit launch event in UC, Mar. 8, during Sustainability Days
June 7, 2012	NL Environment Network Year in Review 2011	Overview of waste audit in report on member organizations
	Memorial	
Dec. 17, 2010	today.mun.ca	MMSB-Harris Centre fund announces 2010 recipients
Mar. 1, 2011	Sustainability Office website	Audit launch event in UC, Mar. 8, during Sustainability Days
Mar. 1, 2011	MUNSU website	Audit launch event in UC, Mar. 8, during Sustainability Days
Mar. 7, 2011	CUPE 1615 Newsletter	Audit launch event in UC, Mar. 8, during Sustainability Days
Mar. 8, 2011	today.mun.ca	Food Court Waste Audit Results and Waste Diversion in St. John's
Mar. 16, 2011	Sustainability Office website	Description of audit with photos
Mar. 17, 2011	Sustainability Office website	Photos from waste audit (Mar. 8) and presentations
Apr. 8, 2011	today.mun.ca	Photo of the day - mini-audit in UC, Mar. 8 during Sustainability Days
Vol. 25 No. 2 (Spring)	The Communicator	Waste audit photo
Oct. 18, 2011	today.mun.ca	Waste Reduction Week promotion and preliminary waste audit results
Nov. 17, 2011	FM Light Newsletter	Waste audits - thanks to custodians

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