

# Brock University

Waste Audit Report 2011

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**UNWIN & ASSOCIATES**  
*ENVIRONMENTAL CONSULTING*

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## **1.0 Introduction- Facility and Review of Operations**

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A solid, non-hazardous waste audit was completed for Brock University located at 500 Glenridge Avenue. The waste audit was conducted to ensure compliance with Ontario Regulations 102/94 and 103/94. This regulation stipulates that all educational institutions with more than 350 full time students enrolled at the facility must conduct a solid waste audit on their solid waste stream and that the audit must be conducted on an annual basis. The Ministry of the Environment (MOE) requires that a solid waste audit address three main aspects. These include:

1. The nature, amount and composition of the waste generated in functional areas,
2. The manner in which the waste is generated including any relevant management policies and/or procedures; and
3. The manner in which the waste is managed after its generation

Brock University has 17,877 students enrolled and therefore must comply with Regulation 102/94. The objective of this regulation is to achieve the provincial waste reduction and diversion goal of 60% by the year 2008. This provincial goal acts as a benchmark for institutions to gauge their waste reduction progress.

As well as achieving compliance with pertinent provincial legislation, a solid waste audit can provide useful information for a facility to reduce the solid waste generated. It can also assist in identifying potential cost savings associated with the disposal of solid waste. Information gathered during the solid waste audit may provide insight into wasteful activities currently taking place at the Brock University. Recommendations will focus on these activities and will form the basis of the waste reduction work plan. The waste reduction work plan will outline the recommended initiatives that Brock University should implement to further reduce solid waste generation and improve the schools standing with respect to the provincial waste reduction target. The waste reduction work plan must be updated on an annual basis once the results of the annual waste audit are completed.

The solid non-hazardous waste audit for the Brock University was conducted between October 27, 2011 and December 13, 2011. The methodology utilized is detailed in section 2.0. Current waste management practices and relevant policies are detailed in section 3.0. Waste audit results have been compiled in section 4.0. Finally, recommendations that will be utilized to formulate the waste reduction work plan are located in section 6.0. All ministry forms associated with regulation 102/94 and 103/94 can be found in I and II. Appendix III includes the Regulations.

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## 2.0 Waste Audit Methodology

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The waste audits were completed in accordance to Ontario Regulations 102/94 and 103/94 of the Environmental Protection Act. The waste audit was conducted in three phases:

Phase I: Pre-Audit Activities

Phase II: Quantification and Characterization of Solid non-hazardous Wastes

Phase III: Data Interpretation and Report Generation.

### 2.1 Phase I

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Phase I of the solid waste audit was conducted during the week of October 17, 2011. Pre-audit phase interviews and site tours were conducted to gather background information required to conduct Phase II of the solid waste audit. A site tour and interview Domenic Manicia for the school, took place to gather the majority of information about the waste practices.

### 2.2 Phase II

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Phase II of the waste audit included the physical collection of samples of solid waste from the waste generating areas of the facility. The waste was then quantified and characterized according to the following steps:

**Step 1:** A twenty four hour sample period was used where waste was set outside at the disposal bins by facilities management from the following waste locations at the school:

- Schmon Tower
- Central Utility Building
- Walkers Gymnasium
- Decew Residence
- Decew Cafeteria
- Daycare
- Lowenberger Residence
- 573 Glenridge
- International Building
- Earp Residence
- Village Residence
- Centre for the Arts
- Alphie's Trough
- MacKenzie Chown Complex
- Welch Hall
- Plaza/Bookstore
- East Academic Building
- Isaacs

The waste was then transported by the audit team to a predetermined location where the sorting took place.

**Step 2:** The audit team members recorded the original location of the waste and determined the gross sample weight for the solid waste. Weights of the twenty four hour samples were measured using an electronic scale. Weights were recorded on a data collection record sheet and saved for later transfer to a computerized spreadsheet format.

**Step 3:** After the gross weights were recorded for the twenty four hour sample period, audit team members sorted the waste according to the Ministry of the Environment waste classes identified.

**Step 4:** After the samples were sorted, all material classes were weighed. The sample waste was then disposed of. Steps 1 through 4 were repeated for each of the waste locations listed previously. All information and data collected was then transferred to a computerized spreadsheet format.

The recyclable material the facility produces was also sampled at each of the locations listed above. All waste and recyclables were weighed by material type collected at the various locations. These materials included:

- Aluminum and Metal Cans
- Plastics (PETE, HDPE, LDPE, PP, PS)
- Clear and Coloured Glass
- Polycoat Containers
- Recyclable Paper
- Corrugated Cardboard
- Boxboard
- Glass

Contaminants (non-recyclable material) captured in the recycling stream were also weighed for each material type.

### 2.3 Phase III

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Once data collection for each waste generating area was completed, annual waste generation rates were determined. Annualizing the data was accomplished by extrapolating waste generation data measured over the twenty four hour sample period for the entire year by expressing the data on a per student basis. Per student rates were then extrapolated for the remainder of the year based on the enrollment data. An example calculation can be seen below.

***Example Calculation: Classrooms***

$$= \# \text{ days in semester} \times \frac{\text{one day sample weight}}{\# \text{ of students}}$$

*Where: One week sample = 397.776 (cumulated during the audit)*

*Open 351 days per year*

*Audit completed in spring when 17,877 people at the school (provided by Institutional Analysis)*

*Spring/Summer had 6,284 people on campus (provided by Institutional Analysis)*

*Therefore each person generated 0.0223kg/p/d (397.776/17,877 people)*

*Fall/Winter (225 x 17,877 x 0.0223kg/p/d) = 89,499.60kg*

*Spring/Summer (126 x 6,842 x 0.0223kg/p/d) = 50,119.78*

*Therefore: Total weight is 139,619.38kg for one year*

### **3.0 Current Waste Management Systems**

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The documentation of current waste management systems employed at Brock University was mainly accomplished through a site tour and site interview with various personnel. Other basic information was provided by Domenic Manicia. The following section details the current systems that the Brock University utilizes to dispose of and divert solid non-hazardous waste.

#### **3.1 Material Summary**

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This section summarizes the various methods of disposal and/or the diversion currently employed at Brock University for the various waste compositions.

##### **3.1.1 Regular Waste**

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Regular solid non-hazardous waste is disposed of in disposal bins distributed throughout the school. The disposal bins are consolidated into larger waste bins and are disposed of at the rear loading dock where Modern Corporation is responsible for the collection of waste weekly depending on the waste generating area.

##### **3.1.2 Recyclable Paper**

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Individual recycling bins of various sizes are distributed throughout the institution except for Alphie's Trough and the Child Care Centre. The bins are then disposed of in larger 96-gallon roll away bins by facilities management and Niagara Recycling picks up recyclables weekly depending on the waste generating area.

##### **3.1.3 Cans, Glass and Plastic**

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Recyclables including aluminum and metal cans, clear and coloured glass, assorted plastics (PET, HDPE, LDPE, PP, and PS) is collected throughout the school. Individual recycling bins are distributed throughout the school including except for Alphie's Trough and the Child Care Centre. They are primarily concentrated in high waste generating areas. The bins are then disposed of in larger 96-gallon roll away bins by facilities management and Niagara Recycling picks up recyclables weekly depending on the waste generating area.

##### **3.1.4 Cardboard**

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Cardboard/Boxboard recycling is provided at the following locations at Brock University: Central Receiving, the Tower complex, Decew Cafeteria, Walker Complex, and Lowenberger Cafeteria. Cardboard is flattened and placed in large cardboard receptacles, which are then picked up by Modern or Niagara Recycling which pick up smaller 96 gallon blue totes at Central Receiving and the Decew Cafeteria. In addition, the Plaza building utilizes a compactor unit for cardboard generated at that facility.

##### **3.1.5 Organic Waste**

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Organic based food waste is collected at the following locations for composting: Decew Cafeteria, Tower complex, Student Centre, Walker Complex, Inniskillen Hall, the International building and the Lowenberger cafeteria. Organic waste generated from the preparation of food is placed in the receptacles provided by Davidson Environmental.



Organic waste from various food vendors is also placed in receptacles at the back of the Tower complex. Davidson Environmental picks the organic waste up from these locations six days per week. In addition, an organics pulping unit has recently been installed in the newly renovated market cafeteria in the Tower Complex.

#### 3.1.6 Scrap Metal

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Recyclable ferrous metal is collected at the Central Utilities Building by the Facilities Management staff. Larger pieces of metal recovered through the repair and recovery of broken and old equipment are deposited in a lugger box where it is collected by Sam Adelstein and Co. for recycling.

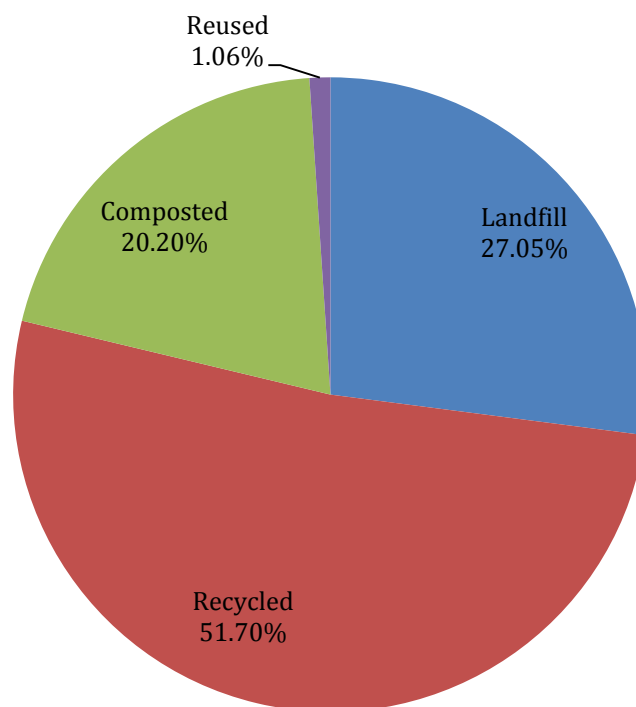
## 4.0 Waste Audit Results

The following sections outline the results for the overall facility as well as the results of the recycling programs at Brock University. This section also outlines the results for each waste generating area. The waste stream composition and the recycling stream composition are also included in this section.

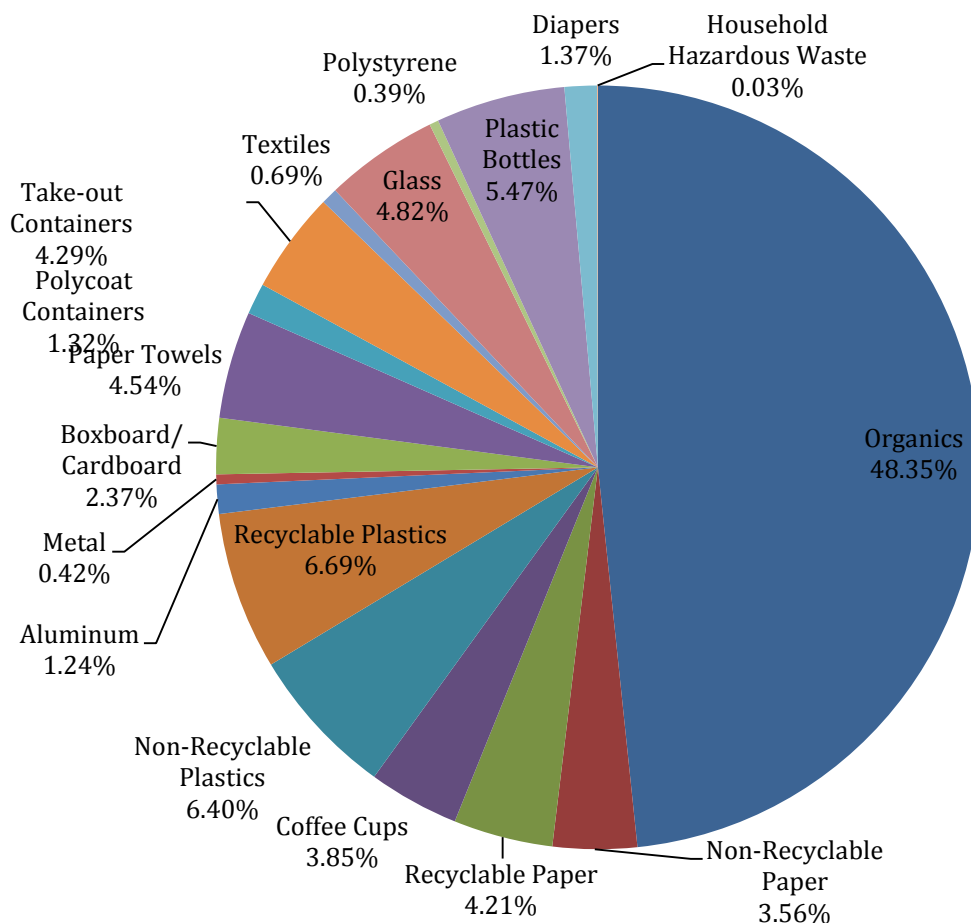
### 4.1 Brock University Wide

According to the waste audit findings, Brock University generates approximately 1,737,824.40kg of solid non-hazardous waste on an annual basis. Of this total, 898,374.46kg was recycled, 351,019.96kg were composted, 18,417.81kg was reused and a total of 470,012.17kg was sent to landfill. As seen in Figure 1, this translates to a diversion rate of 73%.

**Figure 1: Overall Waste Diversion**



As seen in Figure 2, of the materials being sent to landfill, Organics was the largest component of the overall waste stream at 48.35%. Recyclable Plastics was the next most significant contributor to the waste stream at 6.69%. Other categories include Non-Recyclable Plastics at 6.40%, Plastic Bottles at 5.47%, Glass at 4.82% and Paper Towels at 4.54% composition. The Household Hazardous Waste found was comprised of batteries and ink cartridges. There are also categories such as Polystyrene and Plastic Bottles that are also Recyclable Plastic; however, they have been separated out for comparison purposes. These categories will be consolidated for the capture rates. For a complete list of materials and associated weights, please refer to Table 1.

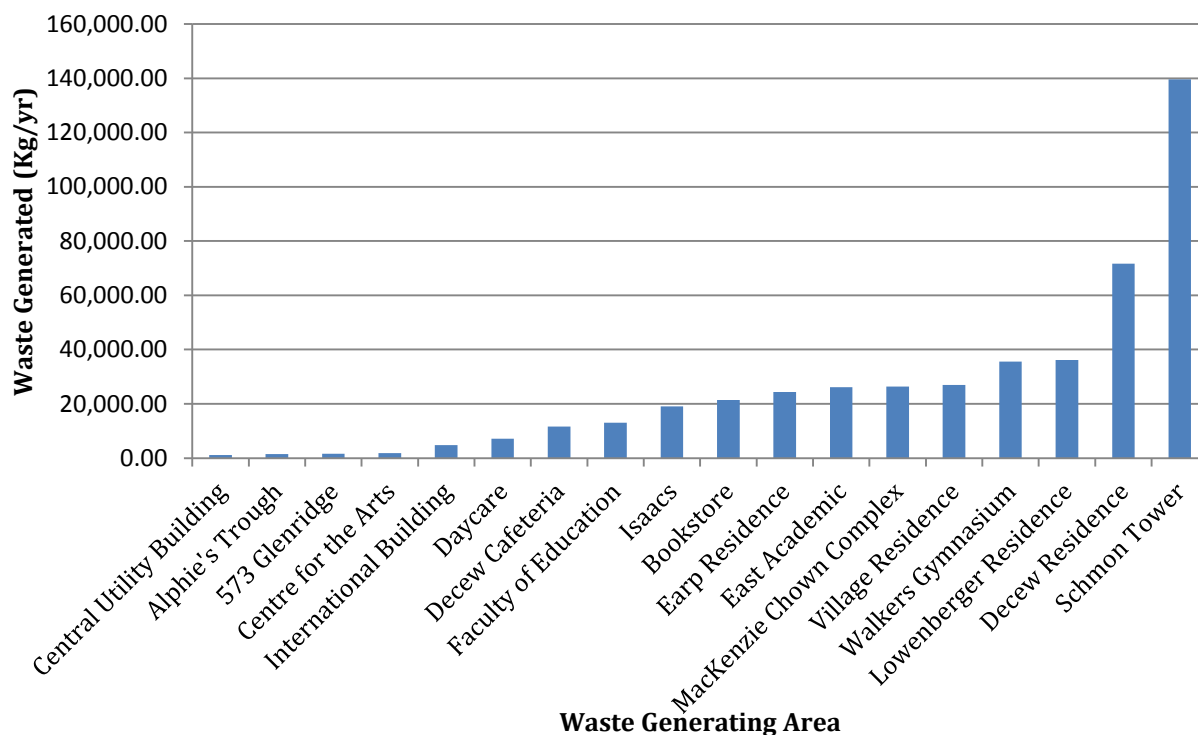
**Figure 2: All Regular Waste Stream Composition- Landfill**

As seen in Figure 2, of the materials being sent to landfill, Organics was the largest component of the overall waste stream at 48.35%. Recyclable Plastics was the next most significant contributor to the waste stream at 6.69%. Other categories include Non-Recyclable Plastics at 6.40%, Plastic Bottles at 5.47%, Glass at 4.82% and Paper Towels at 4.54% composition. The Household Hazardous Waste found was comprised of batteries and ink cartridges. There are also categories such as Polystyrene and Plastic Bottles that are also Recyclable Plastic; however, they have been separated out for comparison purposes. These categories will be consolidated for the capture rates. For a complete list of materials and associated weights, please refer to Table 1.

**Table 1: Overall Summary of Regular Waste Stream**

<b>Waste Class</b>	<b>Total Annual Weight (kg)</b>	<b>Annual Percent Composition</b>
Organics	227,242.59	48.35%
Non-Recyclable Paper	16,734.19	3.56%
Recyclable Paper	19,782.21	4.21%
Coffee Cups	18,090.63	3.85%
Non-Recyclable Plastics	30,060.48	6.40%
Recyclable Plastics	31,425.92	6.69%
Non-Ferrous Metal	7,801.68	1.66%
Boxboard/Cardboard	11,133.04	2.37%
Paper Towels	21,357.96	4.54%
Polycoat Containers	6,183.64	1.32%
Take-out Containers	20,179.49	4.29%
Textiles	3,254.92	0.69%
Glass	22,634.09	4.82%
Polystyrene	1,822.15	0.39%
Plastic Bottles	25,710.87	5.47%
Diapers	6,444.43	1.37%
Household Hazardous Waste	154.37	0.03%
<b>Totals</b>	<b>470,012.66</b>	<b>100.00%</b>

The Schmon Tower was the largest generator of non-hazardous solid waste at the Brock University at approximately 29.71% of waste annually. The second largest generator of waste was the Decew Residence with 15.25% of waste annually followed by the Lowenberger Residence that generates approximately 7.57% of the waste at Brock University. These three areas combined generate 52.65% of the waste at the Brock University on an annual basis. For a detailed summary of the facility waste distribution, please refer to Figure 3 and Table 2.

**Figure 3: Overall Brock University Waste Distribution****Table 2: Summary of Waste Generated by Waste Generating Area**

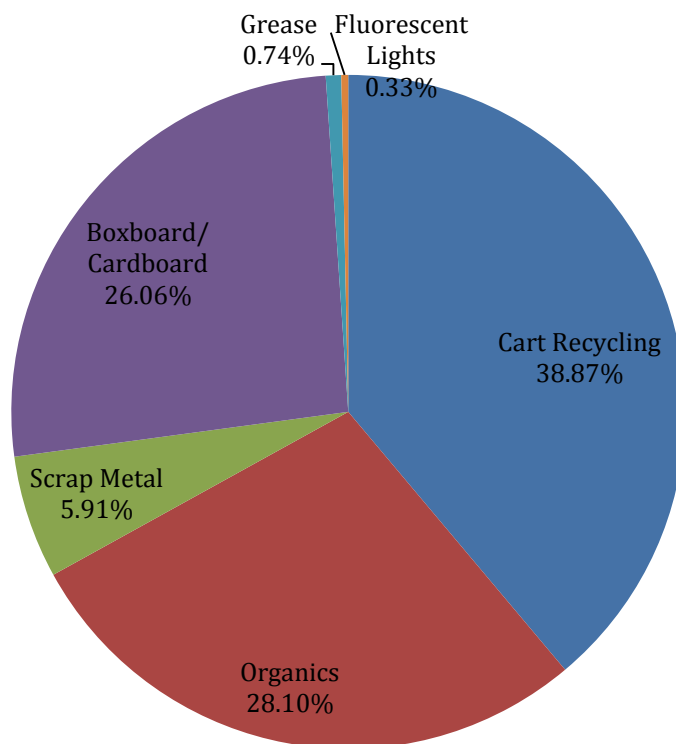
Waste Generating Areas	Total Waste Generated (kg)	Annual Composition
Schmon Tower	139,619.38	29.71%
Central Utility Building	1,119.69	0.24%
Walkers Gymnasium	35,567.88	7.57%
Decew Residence	71,688.59	15.25%
Decew Cafeteria	11,615.99	2.47%
Daycare	7,173.74	1.53%
Lowenberger Residence	36,155.11	7.69%
573 Glenridge	1,607.58	0.34%
International Building	4,738.50	1.01%
Earp Residence	24,310.26	5.17%
Centre for the Arts	1,797.12	0.38%
Alphie's Trough	1,464.02	0.31%
MacKenzie Chown Complex	26,412.75	5.62%
Welch Hall	13,067.73	2.78%
Village Residence	26,971.89	5.74%
Plaza/Bookstore	21,421.53	4.56%
East Academic	26,181.09	5.57%
Isaacs	19,099.31	4.06%
<b>Total Waste Generation</b>	<b>470,012.17</b>	<b>100.00%</b>

**Table 3: Overall Waste Generating Area Recycling Capture Rates**

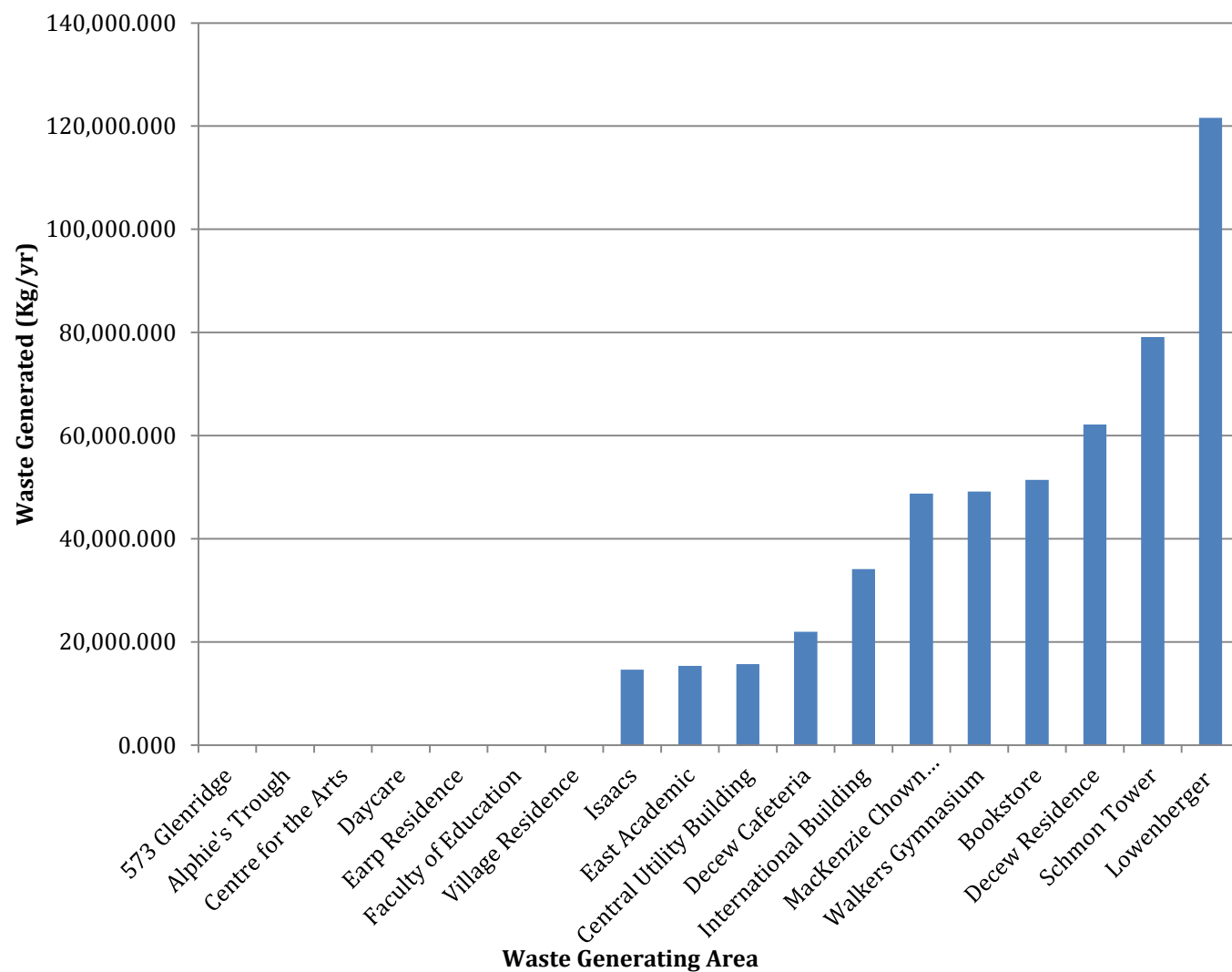
Material	Amount in Waste (kg)	Amount in Recycling (kg)	Total Amount	Capture Rate (%)	Target Capture Rate (%)	Increased Capture Rate (kg/yr)
<b>Recyclable Material</b>						
Aluminum	5,829.05	24,960.64	30,789.69	81.07%	95%	4,289.56
Glass	22,634.09	34,944.90	57,578.99	60.69%	95%	19,755.14
Polycoat Containers	6,183.64	29,952.78	36,136.42	82.89%	95%	4,376.82
Recyclable Paper	19,782.21	335,895.13	355,677.34	94.44%	95%	1,998.34
Recyclable Plastic	58,958.94	59,905.55	118,864.49	50.40%	95%	53,015.72
Grease	0.00	9,200.00	9,200.00	100.00%	100%	N/A
Metal	1,971.22	73,784.03	75,755.25	97.40%	95%	N/A
Cardboard/Boxboard	11,133.04	325,588.60	336,721.64	96.69%	95%	N/A
Fluorescent Lights	0.00	4,142.83	4,142.83	100.00%	100%	N/A
<b>Compostable Material</b>						
Organics	227,242.59	351,019.96	578,262.55	60.70%	95%	198,329.46
<b>Total</b>	<b>353,734.78</b>	<b>1,249,394.42</b>	<b>1,603,129.20</b>	<b>77.93%</b>	<b>N/A</b>	<b>N/A</b>

Table 3 illustrates the overall capture rates (*percentage of recyclables/compostables captured by recycling/composting containers as compared with regular disposal bins*) at Brock University, as well as the proposed target capture rate for each item. The capture rates range from 50.40% to 100%. The target capture rates of 95% (or higher) have been recommended to help achieve and surpass the Provincial goal of 60% diversion rate. The target capture rates can be reassessed once Brock University has attained the targets.

Brock University operates a number of different recycling programs. These programs include Cart Recycling, Organics Collection, Scrap Metal, Boxboard/Cardboard, Grease and Fluorescent Lights. Figure 4 depicts the contribution each program makes to the overall recycling at this facility. At approximately 42.07%, the Cart Recycling is the largest component of the recycling at the Brock University. The Organics Collection is the second largest component at approximately 28.10% and the Boxboard/Cardboard contributes 26.06% to the recycled materials. The remaining contributing programs can be seen in Figure 4.

**Figure 4: Recycling Program Composition**

The Cart Recycling Program generated a total of 485,659.00kg on an annual basis. Lowenberger generated the largest quantity of recyclables using the Recycling Program. Also, the Schmon Tower and the Decew Residence generated significant amounts of recyclable materials with the Cart Recycling Program. Figure 5 further details the waste generating areas and their contributions to the Cart Recycling Program.

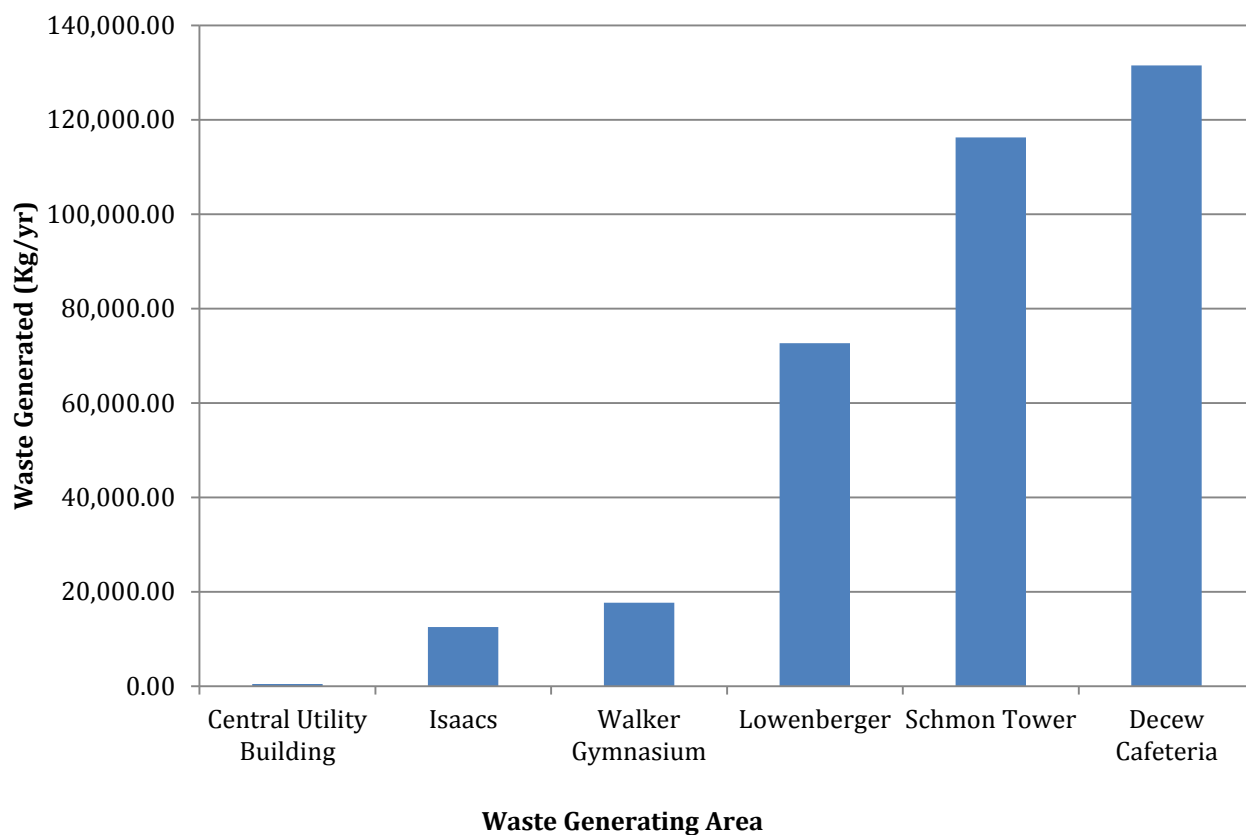
**Figure 5: Overall Distribution- Cart Recycling Program**

Note: The Cart Recycling Program collects commingled recyclables and paper throughout the Brock University. The commingled recycling program includes aluminum and metal cans, clear and coloured glass, assorted plastics (PET, HDPE, LDPE, PP, PS) as well as polycoat containers.



The largest contributor to the Compost Collection Program at Brock University is the Decew Cafeteria, followed by the Schmon Tower and Lowenberger. Figure 6 provides a complete breakdown of facilities contributing to the Brock University Compost Program.

**Figure 6: Overall Distribution- Organics Collection Program**



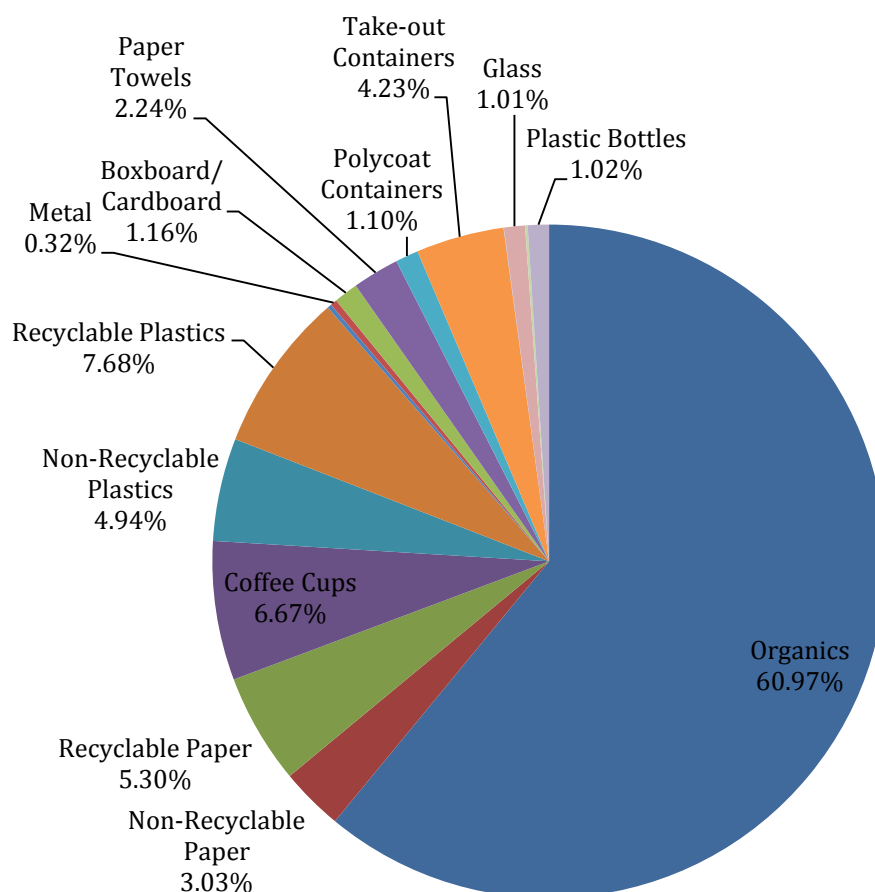
## 4.2 Waste Generated per Waste Generating Area

This section of the waste audit report summarizes the various waste generating areas at Brock University and the waste compositions for each area.

### 4.2.1 Schmon Tower

At 61%, Organics was the largest waste class category of the waste stream in the Schmon Tower. Recyclable Plastic and Coffee Cups made up 8% and 7% respectively of the waste stream. Recyclable Paper was also a significant contributor with 6%. Figure 7 depicts other waste categories found in the Schmon Tower.

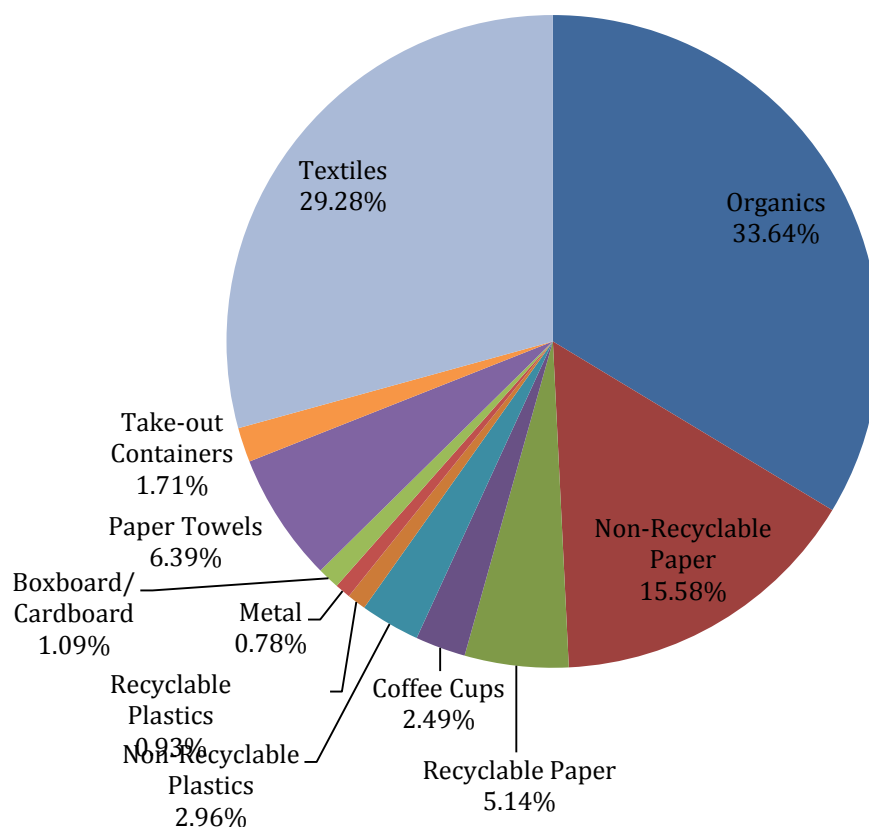
**Figure 7: Composition of Regular Waste Stream- Schmon Tower**



#### 4.2.2 Central Utility Building

In the Central Utility Building, Organics were the most significant component of the waste stream at 34%. Textiles (30%), Non-Recyclable Paper (16%) and Paper Towels (6%) were also contributors to the waste stream. Figure 8 depicts the composition of the regular waste stream in the Central Utility Building.

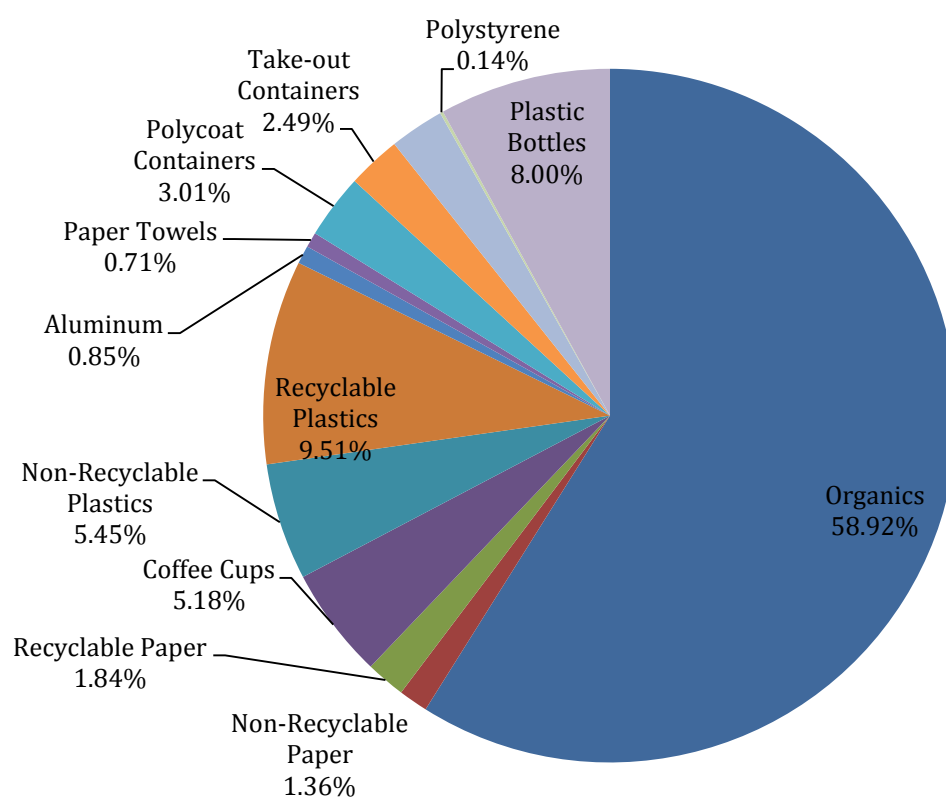
**Figure 8: Composition of Regular Waste Stream- Central Utility Building**



### 4.2.3 Walkers Gymnasium

Organics represents the largest component of the waste stream at 59% in the Walkers Gymnasium Area. Recyclable Plastics (10%) and Plastic Bottles (8%) also made up the waste stream. Figure 9 depicts the composition of the regular waste stream in the Walkers Gymnasium.

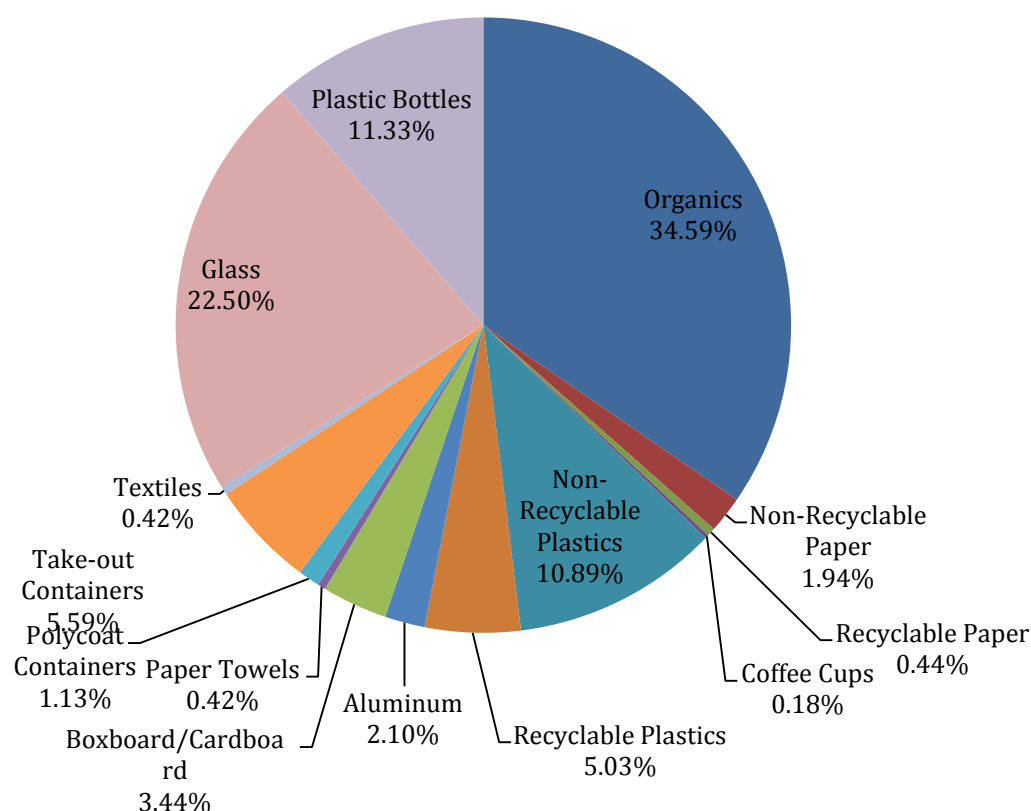
**Figure 9: Composition of Regular Waste Stream- Walkers Gymnasium**



#### 4.2.4 Decew Residence

Organics made up the largest component of the waste stream with 34%. Glass (22%), Plastic Bottles (11%), Non-Recyclable Plastics (11%) and Takeout Containers (6%) were also significant contributors to the waste in the Decew Residence. Figure 10 depicts the composition of the regular waste stream in the Decew Residence.

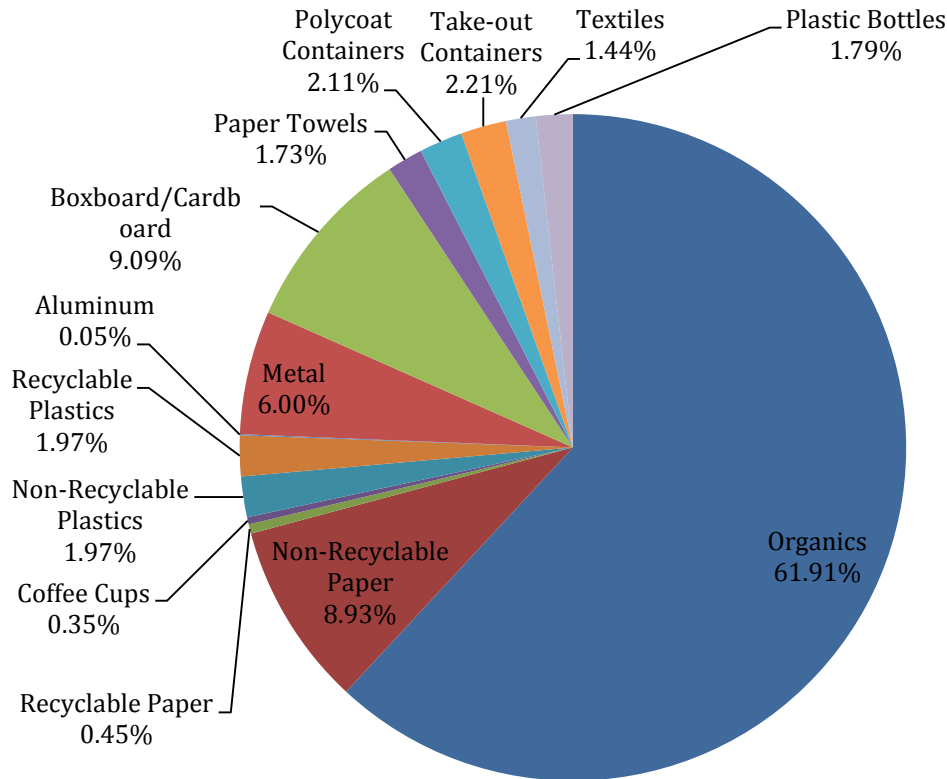
**Figure 10: Composition of Regular Waste Stream- Decew Residence**



#### 4.2.5 Decew Cafeteria

The largest components of the waste stream in the Decew Cafeteria are Organics at 66% and Non-Recyclable Paper at 10% as well as Boxboard/Cardboard (10%) also make up the waste stream. Figure 11 depicts the composition of the regular waste stream in the Decew Cafeteria.

**Figure 11: Composition of Regular Waste Stream- Decew Cafeteria**

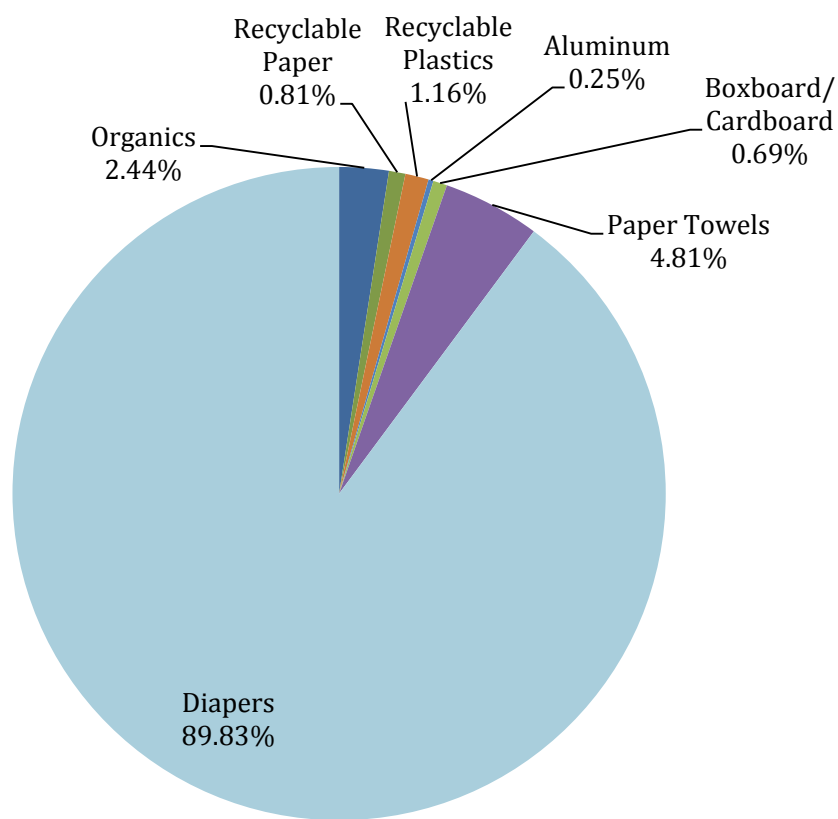


#### 4.2.6 Daycare

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In the Daycare, Diapers were the most significant component of the waste stream at 90%. Paper Towels (5%) and Organics (2%) were also large contributors to the waste stream. Figure 12 depicts the composition of the regular waste stream in the Daycare.

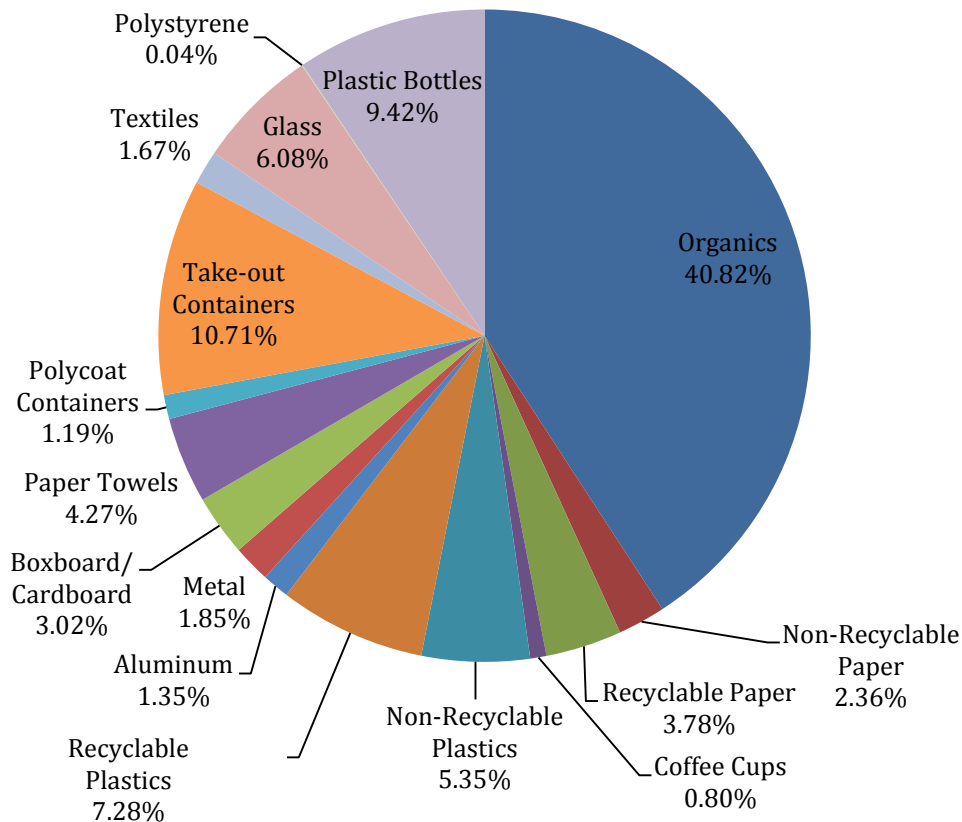
**Figure 12: Composition of Regular Waste Stream- Daycare**



#### 4.2.7 Lowenberger Residence

Organics represented the largest waste category in the Lowenberger Residence at 41%. Take-Out Containers (11%), Plastic Bottles (10%), Recyclable Plastics (7%), Glass (6%) and Non-Recyclable Plastic (6%) were also components of the waste stream. Figure 13 depicts the composition of the regular waste stream in the Lowenberger Residence.

**Figure 13: Composition of Regular Waste Stream- Lowenberger Residence**

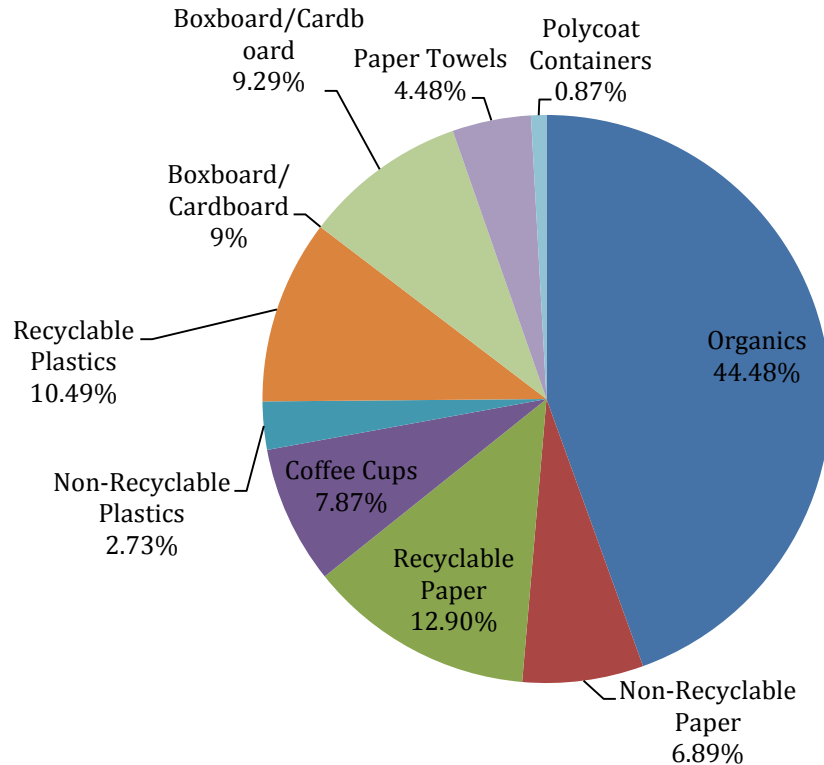




#### 4.2.8 573 Glenridge

In the 573 Glenridge Building, Organics was the most significant component of the waste stream at 44%. Recyclable Paper (13%), Recyclable Plastics (11%), Boxboard/Cardboard (9%) and Coffee Cups (8%) were also large contributors to the waste stream. Figure 14 depicts the composition of the regular waste stream in the 573 Glenridge Building.

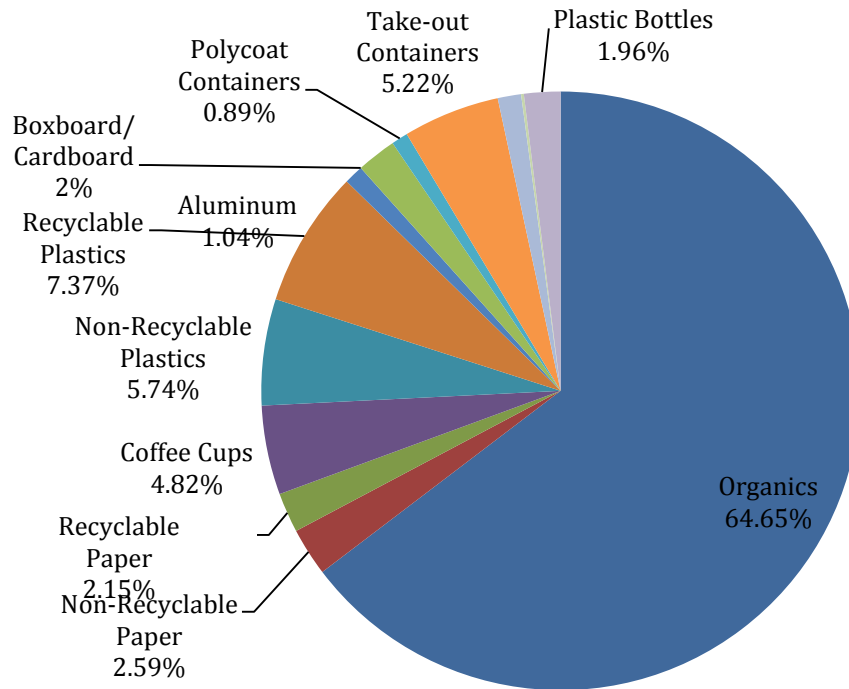
**Figure 14: Composition of Regular Waste Stream- 573 Glenridge**



#### 4.2.9 International Building

At 65%, Organics was the largest waste class category of the waste stream in the International Building. Recyclable Plastic and Non-Recyclable Plastics made up 7% and 6% respectively of the waste stream. Coffee Cups and Take-Out Containers were also a significant contributor with 5% respectively. Figure 15 depicts other waste categories found in the International Building.

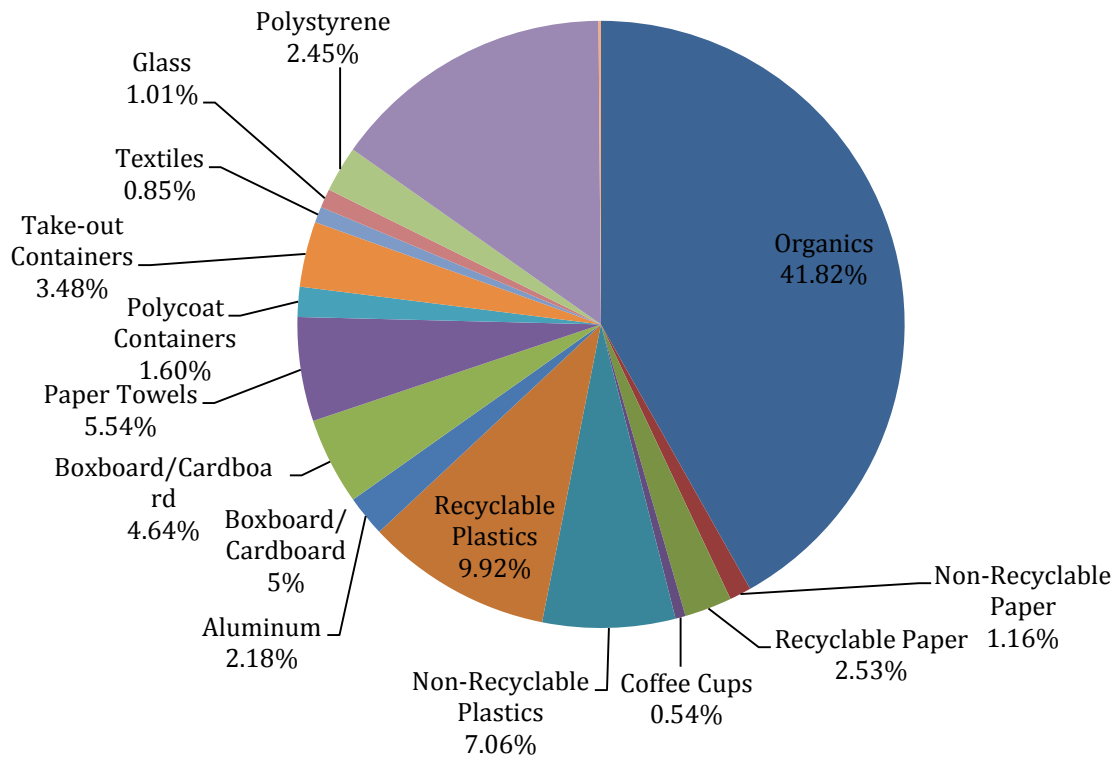
**Figure 15: Composition of Regular Waste Stream- International Building**



#### 4.2.10 Earp Residence

In the Earp Residence, Organics was the most significant component of the waste stream at 42%. Plastic Bottles (15%), Recyclable Plastics (10%), Non-Recyclable Plastics (7%) and Paper Towels (6%) were also large contributors to the waste stream. Figure 16 depicts the composition of the regular waste stream in the Earp Residence.

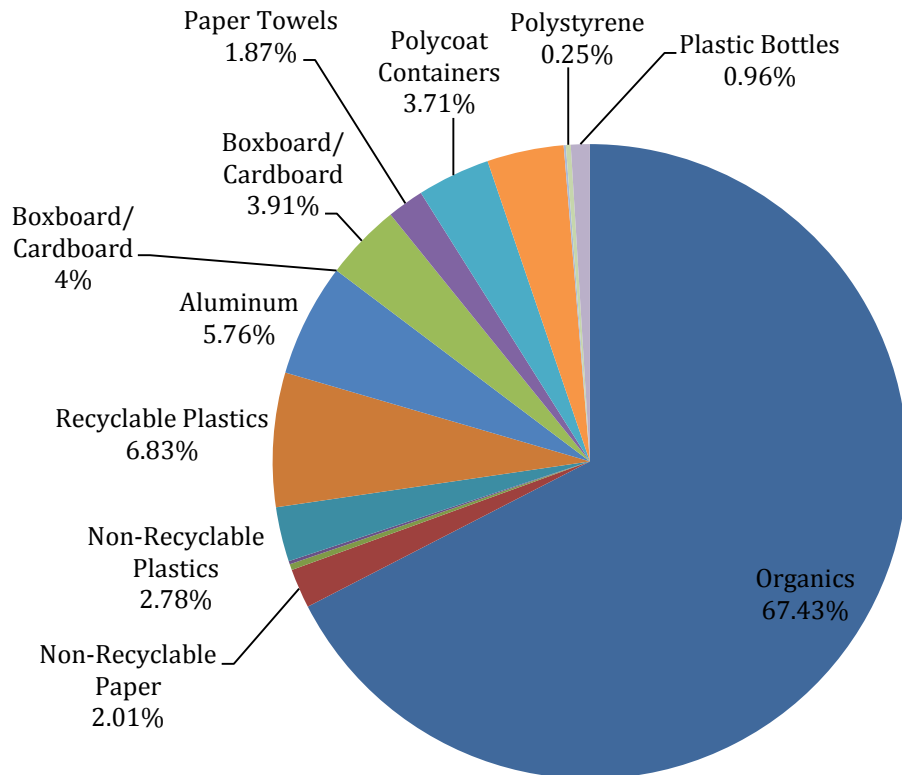
**Figure 16: Composition of Regular Waste Stream- Earp Residence**



#### 4.2.11 Village Residence

At 66%, Organics was the largest waste class category of the waste stream in the Village Residence. Recyclable Plastic and Metal made up 7% each respectively. Polycoat Containers, Boxboard/Cardboard and Take-Out Containers were also a significant contributor with 4% each respectively. Figure 17 depicts other waste categories found in the Village Residence.

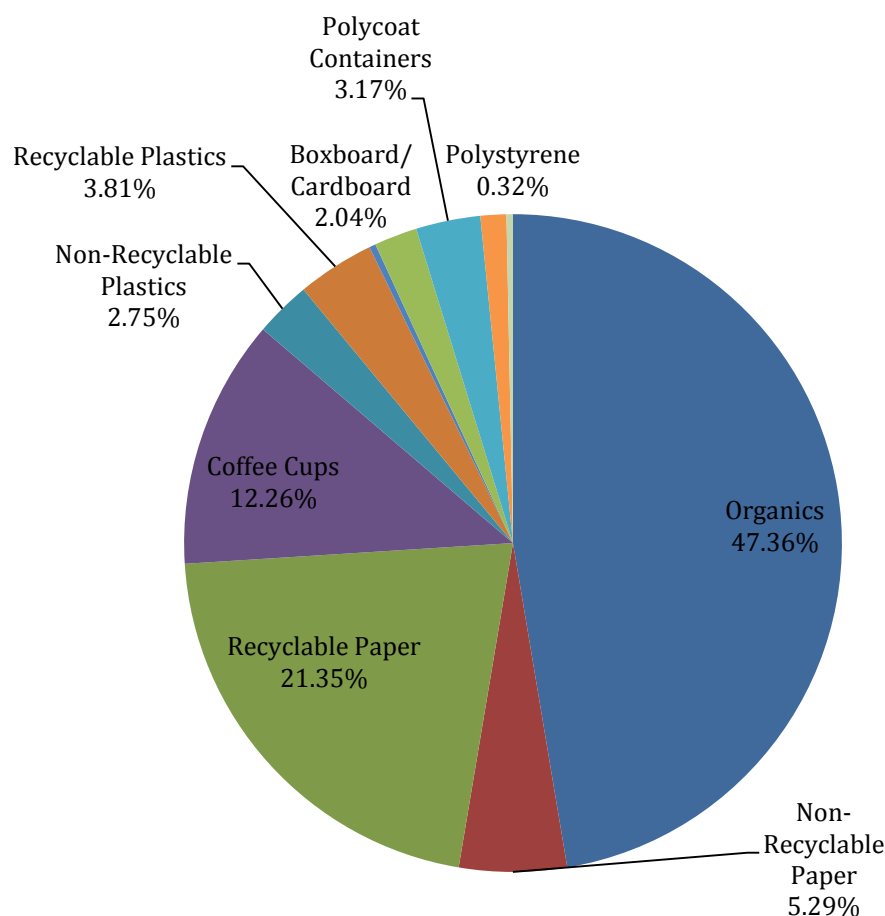
**Figure 17: Composition of Regular Waste Stream- Village Residence**



#### 4.2.12 Centre for the Arts

At 48%, Organics was the largest waste class category of the waste stream in the Centre for the Arts. Recyclable Paper and Coffee Cups made up 22% and 12% respectively. Non-Recyclable Paper (5%), Recyclable Plastics (4%), Polycoat Containers (3%) and Non-Recyclable Plastics (3%) were also significant contributors. Figure 18 depicts other waste categories found in the Centre for the Arts.

**Figure 18: Composition of Regular Waste Stream- Centre for the Arts**

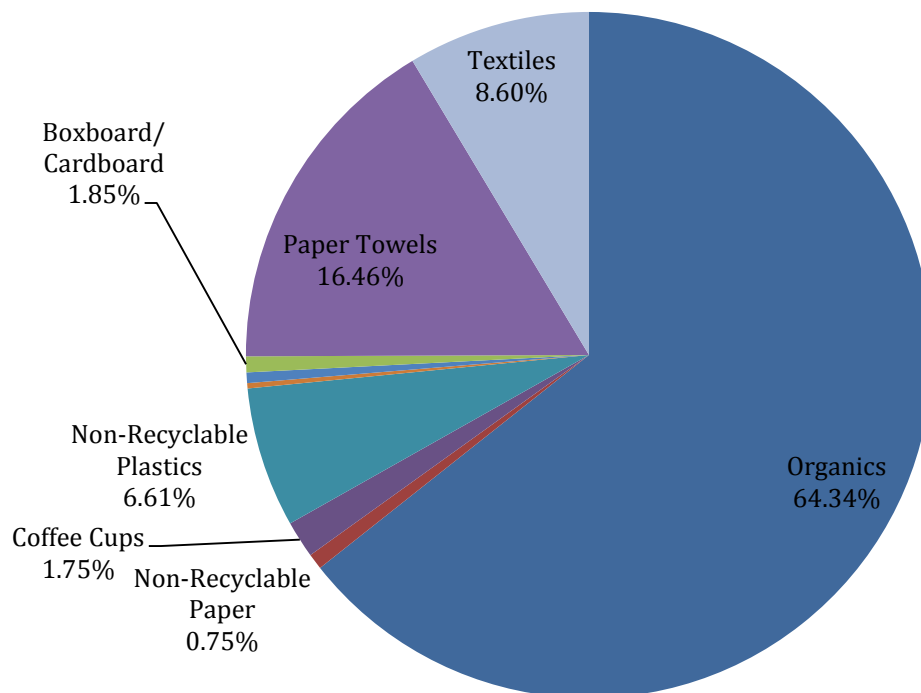


#### 4.2.13 Alpie's Trough

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In Alpie's Trough, Organics was the most significant component of the waste stream at 64%. Paper Towels (16%), Textiles (9%) and Non-Recyclable Plastics (7%) were also large contributors to the waste stream.

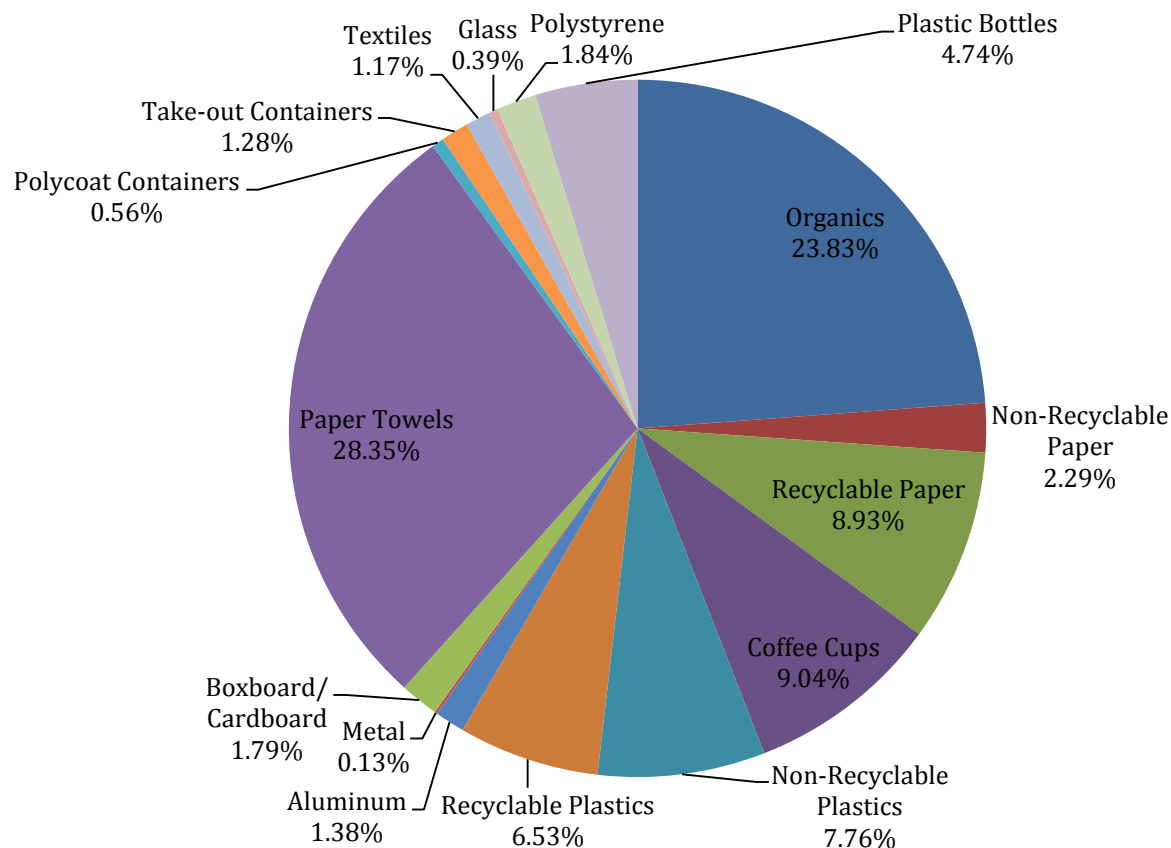
**Figure 19: Composition of Regular Waste Stream- Alpie's Trough**



#### 4.2.14 MacKenzie Chown Complex

In the MacKenzie Chown Complex, Paper Towels were the most significant component of the waste stream at 28%. Organics (24%), Coffee Cups (9%), Recyclable Paper (9%) and Non-Recyclable Plastics (8%) were also large contributors to the waste stream. Figure 20 depicts the composition of the regular waste stream in the MacKenzie Chown Complex.

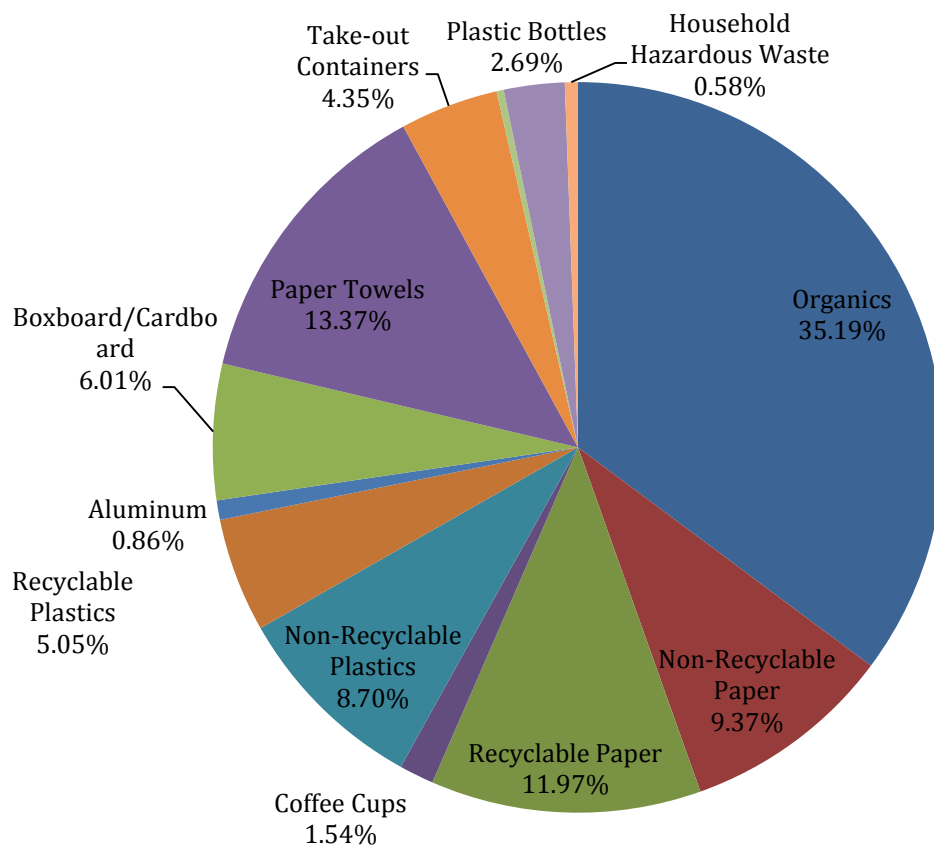
**Figure 20: Composition of Regular Waste Stream- MacKenzie Chown Complex**



#### 4.2.15 Plaza/Bookstore

In the Bookstore, Organics were the most significant component of the waste stream at 35%. Paper Towels (13%), Recyclable Paper (12%), Non-Recyclable Paper (9%) and Non-Recyclable Plastics (9%) were also large contributors to the waste stream. Figure 21 depicts the composition of the regular waste stream in the Plaza/Bookstore.

**Figure 21: Composition of Regular Waste Stream- Plaza/Bookstore**

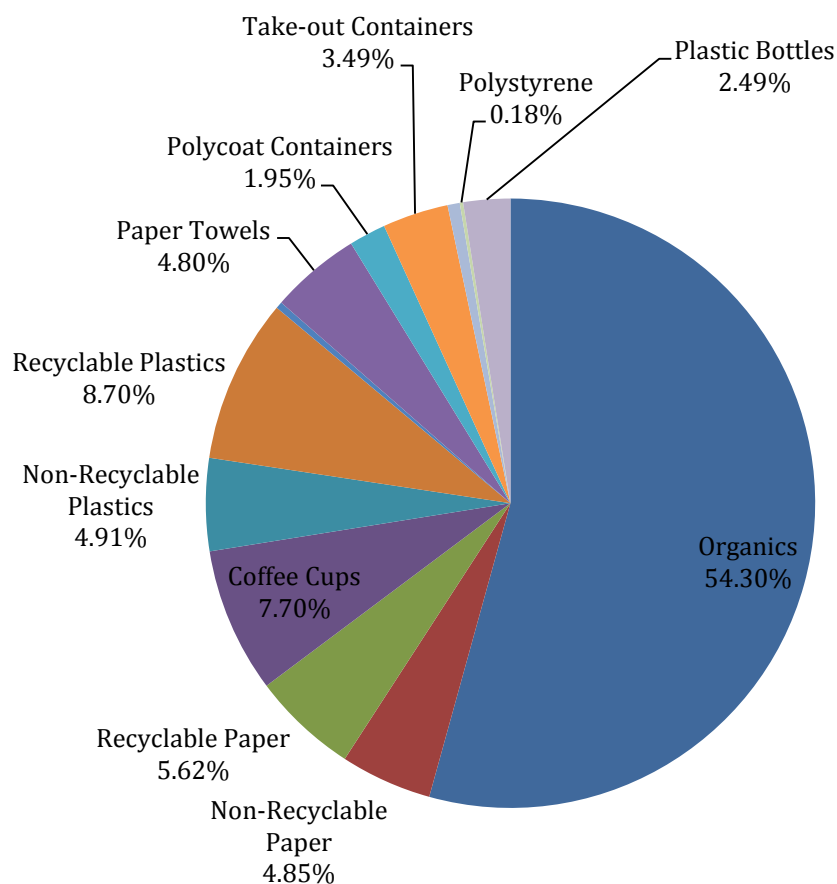




#### 4.2.16 Welch Hall

At 54%, Organics was the largest waste class category of the waste stream in Welch Hall. Recyclable Plastics and Coffee Cups made up 9% and 8% respectively. Recyclable Paper (6%), Non-Recyclable Paper (5%), Non-Recyclable Plastics and Paper Towels (5%) were also significant contributors. Figure 22 depicts other waste categories found in the Faculty of Education.

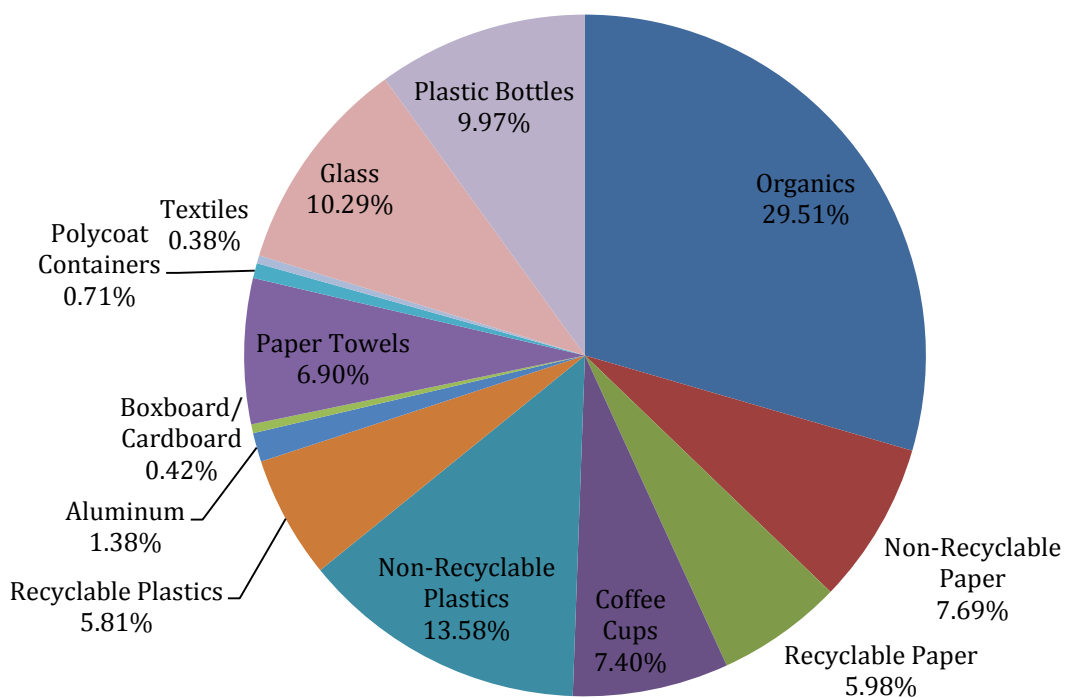
**Figure 22: Composition of Regular Waste Stream- Welch Hall**



#### 4.2.17 East Academic

In East Academic, Organics were the most significant component of the waste stream at 29%. Non-Recyclable Plastics (14%), Glass (10%), Plastic Bottles (10%) and Non-Recyclable Paper (8%) were also large contributors to the waste stream. Figure 23 depicts the composition of the regular waste stream in the East Academic.

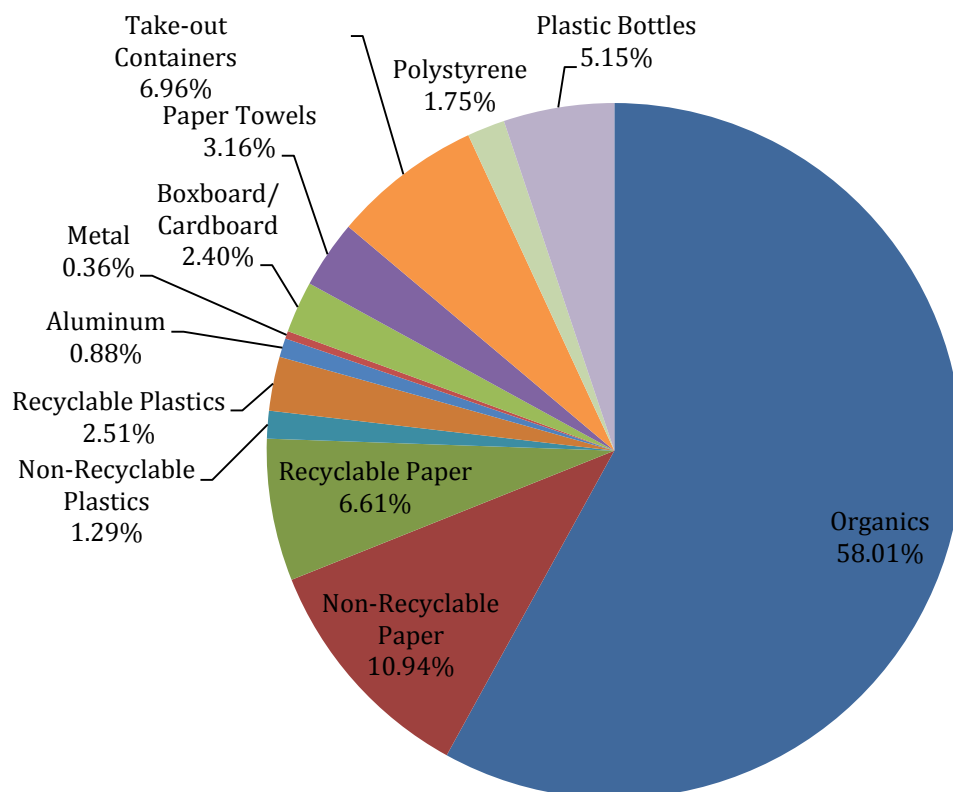
**Figure 23: Composition of Regular Waste Stream- East Academic**



#### 4.2.18 Isaacs

In Isaacs, Organics were the most significant component of the waste stream at 58%. Non-Recyclable Paper (11%), Recyclable Paper (7%), Take-Out Containers (7%) and Plastic Bottles (5%) were also large contributors to the waste stream. Figure 24 depicts the composition of the regular waste stream in the Isaacs.

**Figure 24: Composition of Regular Waste Stream- Isaacs**



## 5.0 Discussion and Analysis

Through the undertaking of this waste audit, it was discovered that Organic waste was the largest contributor to the waste stream at Brock University. Organics can be easily recycled especially in high generating areas such as the Schmon Tower.

As this waste audit will serve as a baseline audit for future waste audits to be compared, it is critical for the waste audit methodology to be repeated annually and for the audit to occur at approximately the same time of year for reasonable comparison. There is room for improvement through a waste reduction and waste diversion program and the success of these programs will be seen in future waste audits. Based on the findings from this year's waste audit, recommendations have been provided to help guide Brock University toward developing a waste reduction and waste diversion work plan program.

### 5.1 Comparison of Overall Diversion Rates, 2009 and 2010

As can be seen in Table 4, overall diversion rates for Brock University decreased slightly between 2010 and 2011. Table 4 illustrates the diversion rates for 2010 and 2011, including overall diversion rate.

**Table 4: Comparison of Overall Waste Diversion Rates**

<b>Waste</b>	<b>2010 Diversion Rate (%)</b>	<b>2011 Diversion Rate (%)</b>
Composted	26.49	20.20%
Recycled	51.33	51.70%
Reuse	1.09	1.06%
Landfilled	21.09	27.05%
<b>Overall Diversion Rate</b>	<b>78.90</b>	<b>72.95</b>

As can be seen in Table 5 there was an increase in the total amount of waste generated between 2010 and 2011. This increase can be attributed to the sizeable reported decrease in organic waste composted. The total amount of waste sent to landfill was much higher in 2011 as compared to 2010. The decrease in Organics composted and increase in materials recycled was based on data provided by the service providers for both recycling (commingled and cardboard) and Organics collection. Overall waste generated in 2011 was higher than what occurred a year previous.

**Table 5: Comparison of Overall Waste Generation**

<b>Waste</b>	<b>2010 Weights (kgs)</b>	<b>2011 Weight (kgs)</b>
Composted	448,057.44	351,019.96
Recycled	868,268.86	898,374.46
Reuse	18,417.81	18,417.81
Landfilled	356,688.50	470,012.17
<b>Overall Waste Generation</b>	<b>1,691,432.61</b>	<b>1,737,824.40</b>

## 5.2 Comparison of Recycling Capture Rates, 2010 and 2011

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**Table 6: Comparison of Recycling Capture Rates**

<b>Material</b>	<b>2010 Capture Rate (%)</b>	<b>2011 Capture Rate (%)</b>
Aluminum	87.8	81.07
Cardboard/Boxboard	97.6	96.69
Polycoat Containers	77.3	82.89
Glass	89.3	60.69
Metal	94.6	97.40
Paper	91.9	94.44
Plastic	78.7	50.40
Organic Waste	72.3	60.70

## 6.0 Recommendations

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The following list of recommendations may provide the basis of the waste reduction work plan. Recommendations will be made in order of priority according to the Environmental Management Hierarchy:

1. Source Reduction
2. Recycling (offsite)
3. Treatment
4. Disposal

Top priority is always given to source reduction initiatives since it is through these that resource consumption is minimized. It is also where the most significant cost savings occur for a facility. Money is not only saved in the reduction of disposal costs but also in the purchasing and consumption of those resources as well. Recycling is the second priority because it still involves the consumption of that resource to a certain extent. Money is saved in disposal costs when recycling opportunities are maximized but it still requires the replenishment of resources.

#### 6.1 Source Reduction Recommendations

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1. To reduce the amount of fine paper waste generated at the school, paper resources should be replaced with digital alternatives. Recyclable paper was prevalent in the waste stream so encouraging double sided printing, and only printing when necessary can help reduce the amount of paper in the waste stream. A paper use policy would help enforce the commitment Brock University has to reducing its paper consumption.
2. Many unopened food items were found in the waste stream. These food items place unnecessary strain on the waste stream. It is recommended that staff and students (including the food generating areas) be educated about the importance of not wasting food, and encouraging the students to take home any uneaten food items. A food drive for unopened, non-perishable items could be established to help divert some items from the waste stream and provide food for local food drives.
3. Non-recyclable plastic, in the form of food wrappers was prevalent in the waste stream. Emails and newsletters could be sent to staff and students to encourage using reusable containers and reduce waste. Giving a monetary incentive to bring reusable containers similar to what is done with coffee cups may be an alternative.
4. Eliminate the sale of bottled water in the building would remove recyclable plastics from the waste and recycling stream. Providing students and staff with reusable water bottles would re-enforce this commitment.
5. Continue to replace paper towels in washrooms with hand dryers. Replace paper towels in the Schmon Tower and Bookstore with rags or hand towels for cleaning with sanitation permitted.
6. During the composition sorting, many garbage bags were found within other garbage bags. In most cases, these bags were only slightly or moderately full. Instructing staff to only replace bags once they have been filled to capacity or empty smaller bags into larger bags would reduce the amount of garbage bags in the waste stream and would save on waste and procurement costs.

7. Reduce the amount of raw materials being consumed by generated purchasing policies that target the highest percentage of post-consumer recycled content. Some areas have already employed products that are environmentally conscious, so expanding these areas would further help reduce consumption of raw materials. Examples of this would include:
  - a. Purchasing napkins that has recycled content
  - b. Purchasing paper that has recycled content
  - c. Purchasing paper plates and takeout food containers that has recycled content
8. Staff and students will be encouraged to take reading materials (e.g. newsprint) home with them after they are finished with them. Reading materials could also be left in a common area for others to read, reducing the amount purchased by staff and students. Encouraging digital alternatives for reading materials is also an option.

## 6.2 Recycling Recommendations

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1. A promotional campaign to encourage further scrutiny when disposing of waste should be employed. An educational campaign to help staff and students understand what can be recycled and in what bin would be beneficial. This could include pictures of what items go in the different recycling bins or volunteers helping educate to ensure staff and students know what can and cannot be recycled and in which receptacle items can be placed.
2. A significant amount of organic waste observed at Alphie's Trough. Consideration should be given to providing this area with a small organics bin to be serviced by Davidson Environmental for inclusion in their collection program.
3. The cardboard receptacle located at the Decew Cafeteria appears to be exceeding capacity on a frequent basis resulting in the Kitchen staff discarding cardboard in the regular waste bin when there is no longer room for it in the recycling bin. Consideration should be given to increasing the size of the receptacle at this location or increasing the frequency of collection so that capacity exists on an ongoing basis.

## 6.3 Treatment Initiatives

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1. There is currently no wood recycling program at Brock University. If an onsite composting program were to be introduced, the wood scraps could be made into saw dust which could be applied to the compost material as a bulking agent. If a compost program at the Brock University is not initiated, research could be done to determine if there are community members or community organizations that could utilize the wood scraps more effectively than paying to have it removed from the college. The wood chips may also be used for landscaping purposes at on campus.

## 6.4 Initiatives in Disposal of Waste

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1. Ensure waste is being placed in the proper receptacle through educational campaigns. This includes items such as batteries and ink cartridges which should be placed in the hazardous waste collection bin instead of placing them in the waste stream being sent to landfill.

2. What can and cannot be placed in the waste stream should be conveyed through educational signs and campaigns throughout the school as well as delivered to each student through email and postings.
3. Consideration may also be given to the utilization of a trash compactor in high generation areas such as the Schmon Tower complex. Currently the Tower has daily pickup service. It was observed during the sampling at this location that both 8 cubic yard containers reach capacity on almost a daily basis. Trash compactors reduce volumes of waste generated through compaction. This reduction in volume can translate into a decrease in collection frequency, which may result in significant cost savings.
4. There are also many areas of waste pickup that have small quantities of waste. By consolidating areas such as Alphie's Trough and Centre for the Arts with the Walker Complex or consolidating the 573 Glenridge Building with the International Building and East Academic would allow reduced pick up locations, ultimately resulting in cost savings.

#### 6.5 Other Initiatives

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1. It is strongly recommended that Brock University continue to ensure that a solid waste audit is conducted on an annual basis. This will help monitor progress and provide new opportunities for better waste management practices in the future. In addition, a Waste Reduction Work Plan should be updated annually to reflect information gathered during the audit. Completion of these activities will ensure compliance with Regulation 102/94 and 103/94.
2. It is also recommended that communication between management, staff, faculty and the students within the school continues. The results of this waste audit should be shared with the students and campaigns should be introduced that can help to increase the diversion rate.
3. It is also recommended that a program be developed for the school which will educate the staff and students on the process of conducting waste audits as well as the benefits of waste audits and how to use the information gathered from the waste audits to improve the diversion and capture rates.