Waste Assessment

2017 Report

Date prepared: October 19, 2017

Prepared for:

QuadReal Property Group

Prepared by:

Green Calgary

Since 1978, Green Calgary has been a leading urban environmental charity empowering Calgarians to green the way they live, work and play

Monday, November 06, 2017

Sharlene Quain
Property Manager
QuadReal Property Group
308 - 4th Avenue SW

Dear Sharlene,

Green Calgary's Green Workplace team is pleased to present a completed copy of our detailed report from the October 18th, 2017 waste assessment that took place at Jamieson Place.

The report provides a breakdown of composition and detailed analysis of the findings from the waste assessment. From this analysis, our visits to the site and conversations with you, we have put forth a series of recommendations for your facility. These recommendations are considered to be the best next step for your organization in your building's waste and recycling initiatives.

We are confident that these recommendations will continue to guide the building's diversion programs in the right direction. If you require any help in implementing these plans, Green Calgary would be happy to assist you.

If you have any questions or concerns, please do not hesitate to contact me.

Kind regards,

Alex Berthin

Team Lead Green Workplace

Green Calgary

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#100, 301-14th Street NW

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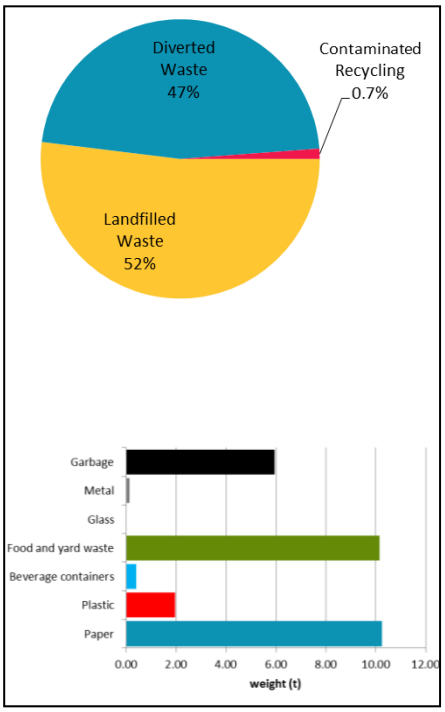
1.0 – Executive Summary

Green Calgary performed a waste assessment for Jamieson Place on October 18th, 2017. This report outlines Green Calgary's findings and provides recommendations on how to further divert waste from the landfill.



The assessment visually analyzed 24 hours of waste created between October 17th 2017 and October 18th 2017. This assessment acts under the assumption that this 24 hour period is representative of an average day of waste. Using this information, as well as recycling data provided by facilities staff, Green Calgary found that Jamieson Place had a diversion rate of 47%.

The largest contributors to Jamieson Place's waste were paper waste, food and yard waste, and garbage. Paper waste contributed to 35.2% of all material going to the landfill, whereas food and yard waste and garbage contributed to 34.9% and 20.4% respectively.

Green Calgary estimates that Jamieson Place could reach a potential diversion rate of 89% at their office with higher participation in the current programs. Notably, the building could witness drastic increases in its diversion rate with higher compliance in the paper recycling and food and yard waste programs. Further, the building had a large amount of disposable coffee cups in their waste. This waste can be removed entirely from the landfill with the use of reusable coffee mugs.

Company Quick Facts

Diversion Rate	49%
Waste and recycling per business day	221.5kg

Staff and tenant education is vital for the introduction of new programs, effectiveness of current programs and - perhaps most importantly – the reduction of waste generated. Initiatives, such as bringing a reusable water bottle, adding signage, assessing bin placement and informing guests of recycling programs could drastically reduce the garbage generated at Jamieson Place.

2.0 – Overview

Green Calgary conducts waste assessments to measure the overall diversion rate, as well as the composition of the waste stream. Measurement is necessary to understand the current state of waste generated within a facility and the relative impact of existing diversion programs. Waste assessments help clients strategically implement waste reduction and recycling programs that reduce the overall environmental impact associated with their waste generation.

This is the seventh Green Calgary waste assessment that has been conducted at Jamieson Place. To continue the building's waste management measurement and diversion plans, Green Calgary completed a waste assessment on October 18th 2017.

This report highlights findings in a series of figures and tables, and includes a discussion of the results plus recommendations to further improve the diversion rate.

Appendix A provides a detailed material breakdown of the waste stream, and Appendix B provides a summary of the raw data used in the report.

It is important to note that the results and information are based on a snapshot that is taken from a 24 hour sample. If operations are normal, the results are typical over a year even though there may be daily variances. The purpose of the report is to identify the composition of the material that is leaving the building, determine the effectiveness of existing recycling programs, and determine the need for additional programs or steps to further improve waste reduction and diversion.

3.0 – Methodology

The waste assessment analyzes a 24-hour sample of waste generated. Through visual estimation, the composition of the waste is categorized into paper, plastic, metal, food and yard waste, beverage containers, electronics, etc. This data is converted to weight, which is the standard measurement of waste and is then extrapolated to reflect annual waste generation. Specifically, values in this assessment are expressed in metric tonnes (t). The sample of waste analyzed should be representative of the annual waste generated, provided that day reflects typical operations. The amount of waste collected for the assessment is utilized in order to determine annual waste generated, along with provided waste disposal data and waste bin size and frequency of pickup.

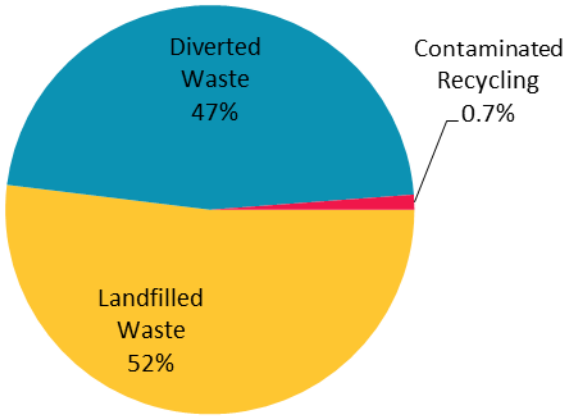
The success of a waste assessment requires the cooperation and participation from property managers, tenants and custodial staff. The custodial staff was required to use clear garbage bags during the 24-hours of waste collection. The garbage bags were staged in a pre-determined area so Green Calgary staff could analyze the waste. Green Calgary did not receive any recycling information from the tenants at Jamieson Place. The food and yard waste program was not included in this assessment.

4.0 – Waste Assessment Results

4.1 – Diversion Rate

The building's annual diversion rate is 47% as seen in Figure 1. The diversion rate is calculated by dividing the total amount of material diverted from the landfill over the total waste and recycling output from the building. The total annual waste that left the building was 56.1 t, of which, 26.3 t were diverted from the landfill.

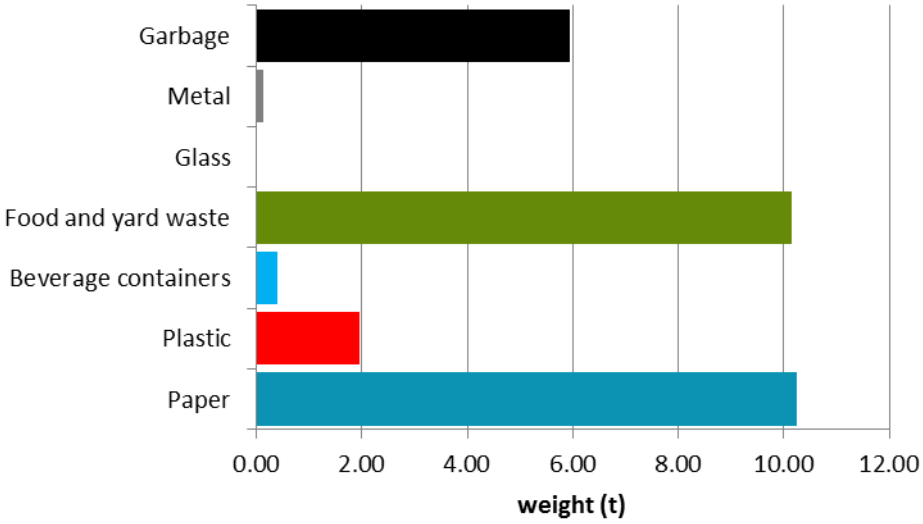
Figure 1: Diversion Rate for Jamieson Place in 2017



4.2 – Waste Results

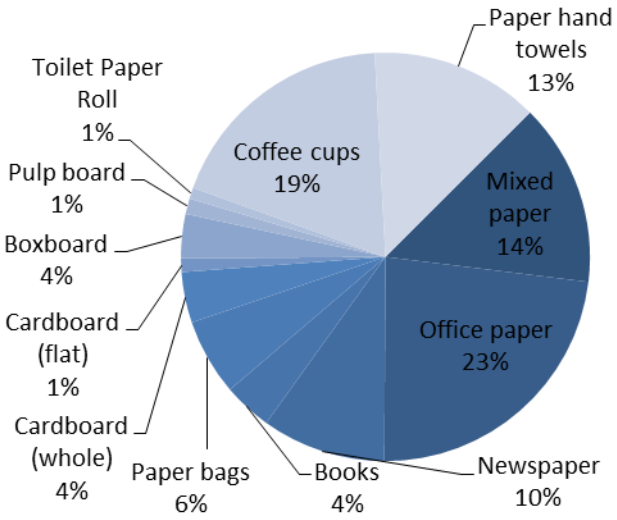
Figure 2 displays the waste material breakdown based on the 24 hour sample of landfilled waste collected from the building. The industry standard for comparing waste output is by weight or in this case metric tonnes annually. The largest categories by weight were paper waste, food and yard waste, and garbage.

Figure 2: Annual Waste Material Breakdown for Jamieson Place in 2017



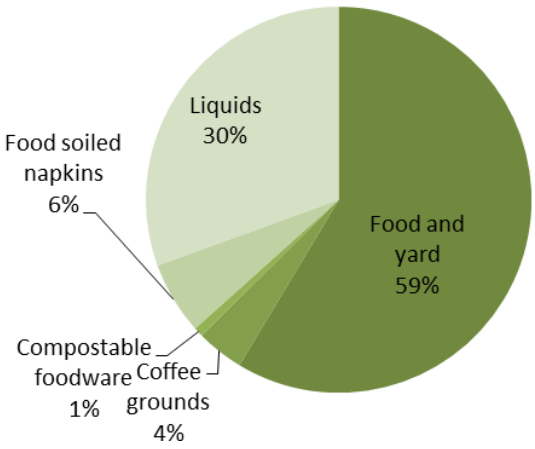
Paper waste was the most landfilled material from Jamieson Place at 10.24 t annually (35.2%). This category encompasses all materials produced from wood pulp and fiber. The most common paper products in this category were office paper (2.4 t), followed by coffee cups (1.9 t), mixed paper (1.5 t), paper hand towels (1.4 t), and newspaper (1.0 t). A complete breakdown of the paper waste is shown in Figure 3.

Figure 3: Paper Waste Breakdown



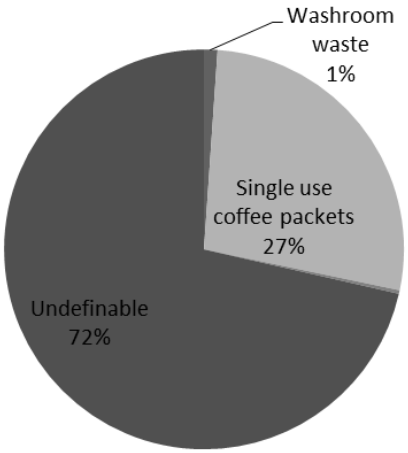
The second most abundant material found at Jamieson Place was food and yard waste, totaling 34.9% of the landfill waste stream (10.2 t) annually. This category includes all organic matter in the waste stream. The most common material observed in the assessment was food waste and plant materials at 59% (6.0 t). The second most common was liquids (30%), weighing in at 3.1 t. A complete breakdown of the food and yard waste is shown in Figure 4.

Figure 4: Food and Yard Waste Breakdown



The third most common material was garbage, totaling 20.4% of the landfilled waste stream (5.59 t) annually. Garbage encompasses any materials that cannot be diverted into a recycling or food and yard waste stream. Undefinables – obscured materials tightly packed or in opaque bags, were the most prominent items. Second most common and still significant, single use coffee packets made up 27% of the garbage, 1.6 t annually. A complete breakdown of the garbage waste is shown in Figure 5.

Figure 5: Garbage Waste Material Breakdown



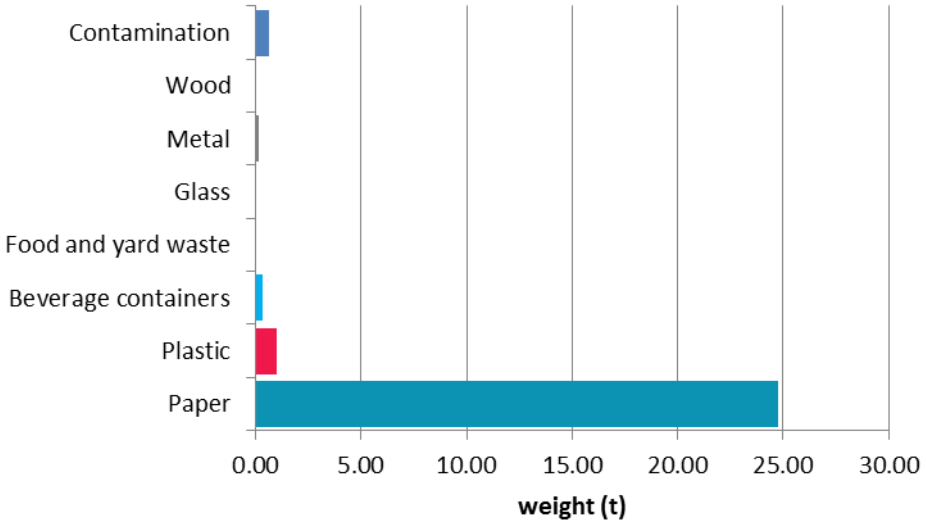
Note that not all items above are recyclable. Appendix A provides a detailed breakdown of the materials found in the waste stream and each material's diversion potential. This information is

useful to determine the success of current recycling programs and indicate potential next steps to increase the diversion rate for the building.

Figure 6 below shows the breakdown of recycled material which is diverted from the landfill throughout the year. A total of 26.94 t of waste was diverted from the landfill through Jamieson Place's current programs. Please note that the food and yard waste program was not included during this assessment. The most recycled category was by far paper material, at 91.9%. The remainder of recycling was made up of plastic (3.7%) and beverage containers (1.2%).

A contamination rate of 2.5% was also noticed due to food waste in the recycling stream. Recycling facilities cannot handle contamination rates higher than 5%; contamination rates over the threshold result in all collected recycling materials being sent to landfill.

Figure 6: Annual Recycled Material Breakdown for Jamieson Place in 2017



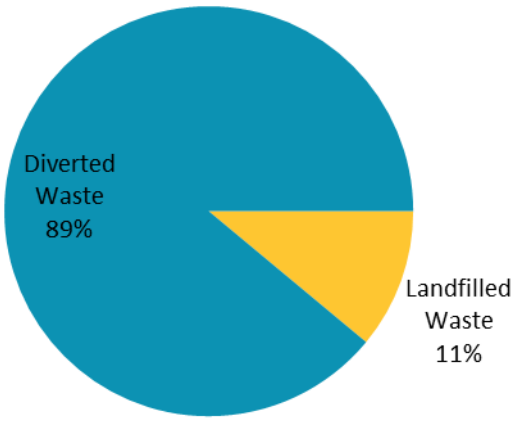
4.3 –Recycling Potential

Figure 7 illustrates the diversion rate potential. This value represents the amount of material that could be diverted from the landfill, if all materials were captured in their respective diversion programs.

The recycling potential is calculated by taking the weight of recyclable material which was found in the waste stream (indicated in Appendix A), adding it to the weight of the material which is currently being recycled and dividing by the total waste output.

The assessment also found that, 89% of all materials found in the building's waste stream were divertible and could be diverted either through a recycling stream or the composting stream as opposed to the waste stream. It was found that 35.2% of the total landfilled waste was recyclable paper, 34.9% compostable food and yard waste, 4.4% recyclable plastic, 1.4% refundable beverage containers, and 0.5% recyclable metals.

Figure 7: Potential Diversion Rate for Jamieson Place



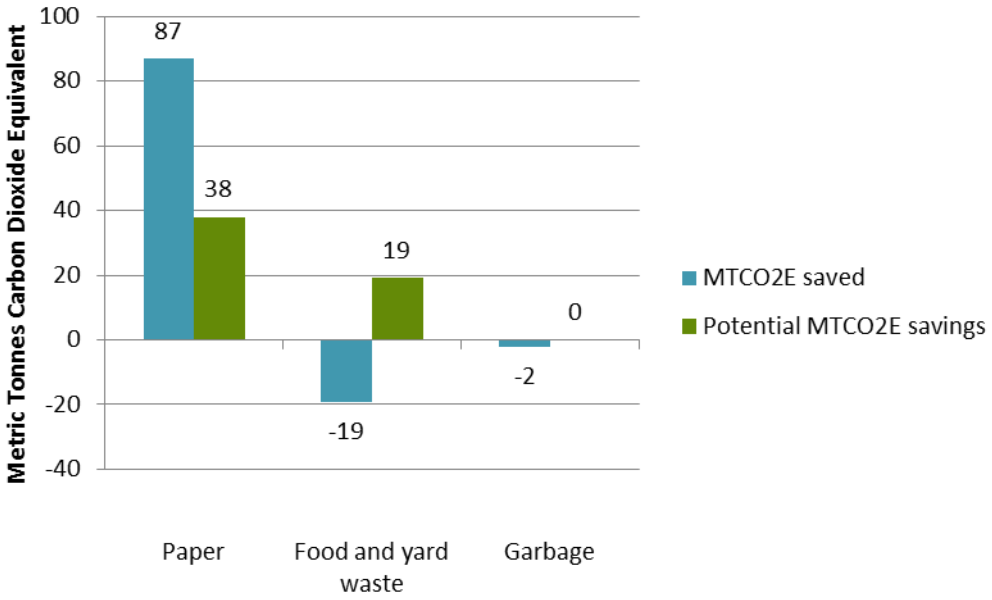
4.4 – Environmental Benefits

Jamieson Place's largest contribution to waste generation was from paper waste, a total of 35 tonnes in one year. Green Calgary calculated that by recycling 24.76 t of paper, Jamieson Place saved approximately 418 trees from being harvested.

In addition, waste diversion efforts resulted in 69.7 metric tonnes of CO2E (carbon dioxide equivalent) being prevented from release this year. An average car emits about one metric tonne every 5,000 km. The amount of CO2E saved by Jamieson Place equates to driving an average vehicle for 348,528 km. That's equal to driving around the Earth 8.7 times

Figure 8 depicts the total MTCO2E emitted by Jamieson Place by its top three waste categories as well as the potential additional savings if the diversion rate were to approach the 89% target. If the diversion rate could approach the target, an additional 60.3 metric tonnes of CO2E would be saved, equivalent to driving to Toronto and back about 44 times.

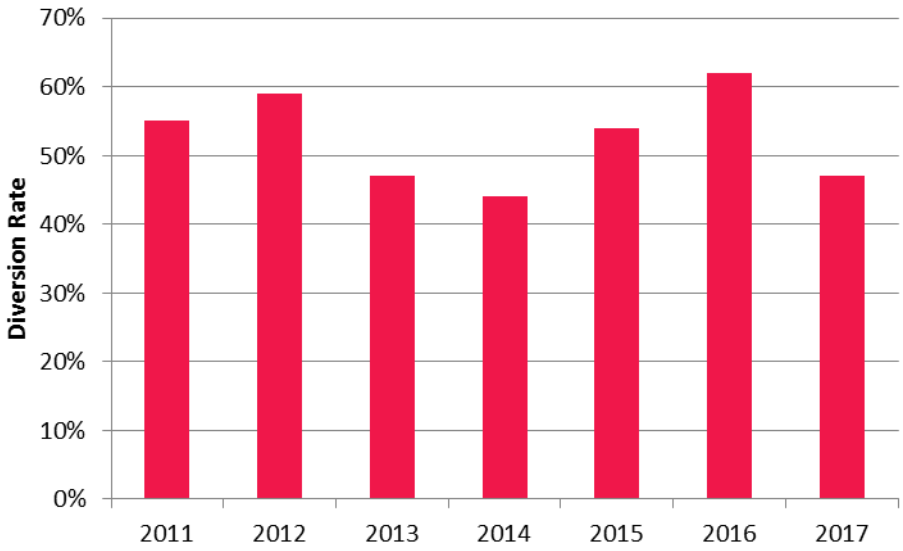
Figure 8: Current and Potential savings of MTCO2E at Jamieson Place



4.5 – Historical Diversion Trends

The waste assessment performed on October 18th 2017 was the seventh assessment performed at Jamieson Place. Figure 9 illustrates the changes in diversion rate over the past six years. The trend shows a fair amount of variance in diversion rate from year to year, indicating the current approach to encouraging recycling and composting may not be the most effective.

Figure 9: Historical Diversion Trends at Jamieson Place



5.0 – Recommendations

Based on this assessment, it is estimated that the diversion rate of the main office could be increased from 47% to 89% with an additional 22.94 t of waste being diverted to the various recycling streams.

Below is a list of recommendations that are a combination of building occupant and staff education and operational suggestions. These recommendations consider the 3Rs (reduce, reuse, recycle) and are meant to be seen as a hierarchy, with reduction as the first priority, followed by reuse and finally recycling. The main problems identified are:

- Recyclable paper in the landfill stream (i.e. Office paper, mixed paper, coffee cups)
- Food and yard waste in the landfill stream
- Garbage generation (i.e. single use coffee pods)

Note that while the diversion rate at the main office is low, the cause is in large due to the amount of recyclable materials in the landfill stream, and disposable coffee pods. However, the amount of paper recycled significantly outweighs the amount of paper being landfilled. This shows that the recycling programs are well understood and are being used.

5.1 – Paper Waste

Paper waste contributed to 35.2% of the landfilled waste from the main office. The highest contributing item was office paper. Office paper can be accepted in the recycling program. The second and third largest items were paper coffee cups and mixed paper, which are also accepted in the recycling program. With education on the existing program, the waste to landfill could be further reduced. With full compliance, Jamieson Place could see a 14.8% increase in diversion rate.

In order to reduce the production of paper waste, a focus in the buildings can be made to:

- Encourage the use of reusable coffee mugs
- Reduce printing
- Print double sided or with more than one page per sheet
- Reduce the use of paper at meetings – opt for digital options, where possible

It is important to note that the City of Calgary has also added paper and cardboard to the designated materials list in Q1 of 2016, has implemented increased rates for these items in Q1 2016 and will fully ban the materials from the landfill by Q3 2018. This means that the monetary costs to landfill paper and cardboard materials will increase for haulers, and by default, the companies employing them to manage their waste.

5.2 – Food and Yard Waste

Food and yard waste accounted for 34.9% of Jamieson Place's landfill waste, and can therefore have a great impact on future diversion. Increasing participation in the current food and yard waste program could result in a diversion rate increase of 14.7%. The most significant materials in this stream were food materials, liquids, and food soiled napkins. Liquids can be reduced simply by encouraging tenants to pour excess fluids into kitchen or bathroom sinks. Food waste is easy to divert from the landfill with commitment to an effective food and yard waste program.

Food and yard waste in the landfill does not decompose the way it will in a composting facility. Due to the nature of a landfill, an anaerobic environment is created where the waste will not break down. An example of this can be seen in Figure 10, showing a 1974 newspaper pulled from a Calgary landfill in 2016 in near perfect condition.

Figure 10: Example of how waste is preserved in landfills

This result of anaerobic environments inside landfills is increased production of methane gas – a greenhouse gas 25 times more potent than carbon dioxide, and a major driver of climate change. Composting not only helps to mitigate the formation of methane from landfills, but also turns food and yard waste into a new and useful product, diversifying the local economy and returning nutrients to the soil.

In addition to the environmental benefits of diverting food and yard waste, The City of Calgary is in the process of passing a by-law to keep food and yard waste out of the landfill. The plan presented is a multi-year strategy to add food and yard waste to the designated materials list, increase tipping fees and ultimately ban the material from the landfill. For QuadReal Property Group, this could mean much higher costs from the waste hauler for loads that have food and yard waste. It is expected that food and yard waste will be added to the designated material list in Q3 2017, with increased rates in Q3 2018 and a complete ban of food and yard waste from the landfill by Q3 2019.

5.3 – Garbage Waste

As was previously mentioned, reduction of waste is more beneficial than diversion for many economic, social, and ecological reasons. Therefore, reducing the total amount of waste produced in the workplace should be a top priority. To this end, behavioral changes may assist in reducing total waste generated.

For example, it was found that building occupants dispose an estimated 1.6 t of disposable coffee pods per year. This material can be easily removed from the waste stream entirely with one of many solutions. There are several alternatives which could drastically reduce this number. Examples include:

- Disposable coffee pods could be replaced with compostable coffee pods.
- A re-usable coffee pod can be purchased with either a re-usable filter or disposable filter
- Replace the single use coffee maker with a drip coffee maker
- Replace the single use coffee maker with a kettle and French press

In addition to reducing waste, Green Calgary has found that the cost of the average cup of coffee with a disposable coffee pod is $0.67, which drops to $0.26 when using a reusable coffee pod. Jamieson Place currently uses around 48 disposable coffee pods per day, amounting to over 12,000 per year. At the current rate of consumption, approximately $8 thousand is being spent yearly on K-cup style coffee. With a switch to reusable coffee pods, coffee savings could amount to almost $5 thousand per year.

5.4 – Waste Diversion

5.4.1 – Bin Labelling and Signage

Green Calgary recommends clearly labelling the collection bins with depictions of the allowable materials. Labelling with only words, without colour or visual cues, is often not a strong enough approach to encouraging diversion. The best management practices for signage are: clear consistent terminology; image based, relevant; use of negative/white space; vivid, high contrast

colors; colour coded; and use of a slogan or tag line. Good signage is needed on any waste container as it helps to inform the users to place their materials into the correct streams.

It should be noted that changes to the bylaw in November, 2017 will include a requirement for all businesses to have proper signage for their bins

5.4.2 – Tenant Engagement

An impactful way to engage building employees and tenants to encourage higher compliance with the recycling and composting programs is for Jamieson Place to host a "mock" waste assessment in the lobby of the building. This will engage building occupants by educating and increasing awareness about the building's waste diversion programs. It will also provide occupants the chance to provide feedback on the programs and make suggestions for any improvements. In Green Calgary's experience, showing the actual waste leaving the building on a daily basis can provide a "shock factor" for building occupants to encounter the waste that is produced at the building (especially if it is a portion of a single day's worth of waste).

Another recommendation is to provide environmental messages and reminders in monthly newsletters to tenants. Giving feedback on how a program is going can help employees see that their efforts are making a difference (or where their efforts can be improved). Also, sharing goals with employees can help encourage them to participate in order to reach a shared goal

Green Calgary would be pleased to assist in the implementation of these recommendations. If further direction is required, an action plan could be compiled to outline steps and tasks required for successful implementation of the recommendations. Additionally, Green Calgary is available to consult on each step required to complete any of these actions. Green Calgary can also assist in creating a Community Based Social Marketing program to identify potential barriers to behavior change and develop strategies to eliminate these barriers, which may result in more sustainable behaviour.

5.5 – Potential Cost Savings

Often inaccurately considered a barrier to recycling, cost is an important factor to consider with these findings. As mentioned above, the standard unit for measuring waste is weight in metric tonnes (t). Likewise, waste is charged to haulers based off the weight of their hauler – that is, the landfill charges based on a dollar value per tonne. In Calgary in 2017, that charge (known as a tipping fee) is $113 per tonne, and $170 per tonne containing paper and metal. The charges to the consumer from the hauler are often a combination of hauling costs (number of trips) and tipping fees. Quite commonly, the heaviest materials in our waste stream are also very easily divertible. Notably, paper and food and yard waste are almost completely divertible, and in this assessment made up 70% of all the building's landfilled waste. If successfully diverted, the charges to haulers for the same volume will likely be reduced (as the total weight will be less). In this sense, there are two major opportunities to reduce the cost of waste significantly with added or improved recycling programs:

1. It is possible to negotiate a reduced rate per cubic yard, noting that your waste is now lighter than it was previously.

2. It is possible to reduce the number of pick ups of your garbage bin, as more of your staff begins to use your recycling programs.

**Note: the above cost savings are not guaranteed and we recommend discussing options with your hauler.*

Memberships, Donations and Volunteering

As a local environmental charity we are fueled by the support we receive from Calgarians—indeed, we exist because of them. When you make a contribution to Green Calgary you enable us to deliver hands on environmental programming to green the way Calgarians live, work and play by making healthier and greener choices. You know that when you are giving to Green Calgary you are investing in your community and in the future of your community.

Here are some examples of how you can support our environmental work:

Become a Member

Join a community of environmentally conscious individuals and business who, like you, support positive environmental action in Calgary. As a Corporate Member you get access to:

- Discounts in our EcoStore
- Discounts on Green Workplace workshops, waste audits & special offerings
- A Facebook post, Tweet, & announcement in our newsletter
- Eligibility to buy ads in our newsletter
- Membership to our Little Green Library for all your staff

Become a Volunteer

We offer a variety of volunteer opportunities through our Corporate Volunteer Program. We work with you to find the best fit for your team's availability and skills. Take advantage of this opportunity to engage with the community while learning how to work as a team.

Volunteering Grant

In recognition of employees and retirees who volunteer in the community, many companies award grants to local nonprofit organizations to support their work. If your company offers compensation for your invaluable volunteer hours please let us know and we'll assist you through the application process.

Donate

Please make a gift to further our environmental work in Calgary and empower your fellow Calgarians to live more sustainable lives.

Monetary Donation

When you make a monetary contribution to Green Calgary you are enabling us to deliver hands on environmental programming to green the way Calgarians live, work and play.

You become a hero at Green Calgary. You are the one making positive environmental change happen!

Electronics Donation

Donate your old or unwanted electronics (Cell phones, computers, screens, printer cartridges, etc.) to us and you'll be helping.

We make sure the items you donate are properly recycled by our Canadian recycling partner: Think Recycle.

Contact us to arrange a pick up or keep us in mind for your next hardware overhaul!

Appendix A – Waste Material Breakdown

Paper - Recyclable	
Books	
Boxboard	
Cardboard	
Coffee cups	
Mixed paper	
Newspaper	
Office paper	
Paper bags, packaging paper	
Percent of Landfilled Waste	35.2%
Plastic - Recyclable	
Mixed containers	
Plastic film & wrapping	
Percent of Landfilled Waste	4.4%
Plastic - Non-Recyclable	
TO container - plastic (non-recyclable)	
TO container - Styrofoam	
Wrappers (i.e. chip , creamers, stir stix)	
Percent of Landfilled Waste	2.3%
Organic - Recyclable	
Coffee grounds	
Edible organics	
Food soiled napkins	
Inedible organics	
Percent of Landfilled Waste	34.9%
Metal - Recyclable	
Ferrous; i.e tin can	
Non-ferrous; i.e. foil	
Percent of Landfilled Waste	0.5%
Refundable - Recyclable	
BC-aluminum	
BC-carton, juice tetra, pouches	
BC-glass	
BC-plastic	
Percent of Landfilled Waste	1.4%
Garbage - Non-Recyclable	
Undefinables	
Disposable coffee pods	
Bathroom waste	
Binders	
Percent of Landfilled Waste	20.4%
Miscellaneous - Recyclable	
Textiles	
Percent of Landfilled Waste	0.9%

Appendix B – Raw Data Tables

Actual Diversion Rate		
	Weight (t)	Percent (%)
Waste	29.11	51.9
Recycled	26.28	46.9
Contamination	0.66	1.2
Total	**56.05 t**	**100%**

Potential Diversion Rate		
	Weight (t)	Percent (%)
Waste	6.18	11.0
Recycled	49.87	89.0
Total	**56.05 t**	**100%**

Material Composition of Waste Stream		
Material	Weight (t)	Percent (%)
Paper	10.24	35.2
Plastics	1.95	6.7
Food and yard	10.15	34.9
Metals	0.15	0.5
Beverage Containers	0.41	1.4
Garbage	5.59	20.4
Textiles	0.26	0.9
Total	**29.11 t**	**100%**

Material Composition of Recycling Stream		
Material	Weight (t)	Percent (%)
Paper	24.76	91.9
Plastics	1.0	3.7
Metals	0.19	0.7
Beverage Containers	0.32	1.2
Contamination	0.66	2.5
Total	**26.94 t**	**100%**