Waste Audit 2012: Environment and Natural Resources and Shared Services' Scotia Centre Operations

ENR Green Team

2012

Northwest Territories Environment and Natural Resources

This waste audit was an Environment and Natural Resources (ENR) Green Team initiative. This report was written by Michelle Hannah, Waste Reduction Specialist. For further information about the project, information in the report, or advice on how to organize your own departmental waste audit, contact the ENR Green Team at ENR_GreenTeam@gov.nt.ca.

Acknowledgements

The Green Team would like to thank Ernie Campbell, Rick Wind and Nancy Magrum for authorizing the audit of ENR and Shared Services operations, and Bellanca Developments Ltd. management and cleaning staff. This report would not have been possible without the cooperation of Darwin Elliot from Document Securities Systems Inc. (DSS), who provided annual data for confidential paper recycling. Public Works and Services' Russ Jones was especially helpful in providing a wealth of information relative to items not covered in this audit, such as e-waste and furniture.

This project would not have been possible without the help of all those who rolled up their sleeves to get sorting and clean up the mess at the end of it all: Brooke Jen, Nicholas Hurst, Victoria Budgell, Gerald Enns, Lloyd Thiessen, Tasha Stephenson, Stephanie Yuill, Diep Duong, Claudia Haas, and Patrick Hough. A special thanks also goes out to the individuals who reviewed and commented on the document before you: Shannon Ripley, Gerald Enns, Keirra Alty, Claudia Haas and Jordan Reid.

Eager summer students, Nicholas and Brooke prepare to open the first bag of the waste audit. The green team would like to thank all those who graciously sorted through our waste for a week.

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Executive Summary

The Department of Environment and Natural Resources' (ENR) Green Team conducted an internal waste audit in order to collect baseline information on ENR's ecological footprint. The two goals of the audit were to:

1) identify target waste streams in order to focus future waste reduction programs; and
2) develop practical experience and knowledge in the process of conducting a waste audit.
   This will help their capacity to aid other departments who want to conduct a waste audit.

The waste audit was conducted over one business week, August 20 to 24, 2012, and consisted of waste gathered from the four floors of ENR Headquarters in Yellowknife, NT. Waste was collected in two streams:

a) diversion stream – collected from recycling bins; and
b) disposal stream – collected from the garbage bins.

Results

The audit results (by weight) found that the diverted waste stream consisted of 70% (157.1 kg) of the total waste collected and the discarded stream consisted of 30% (67.5 kg).

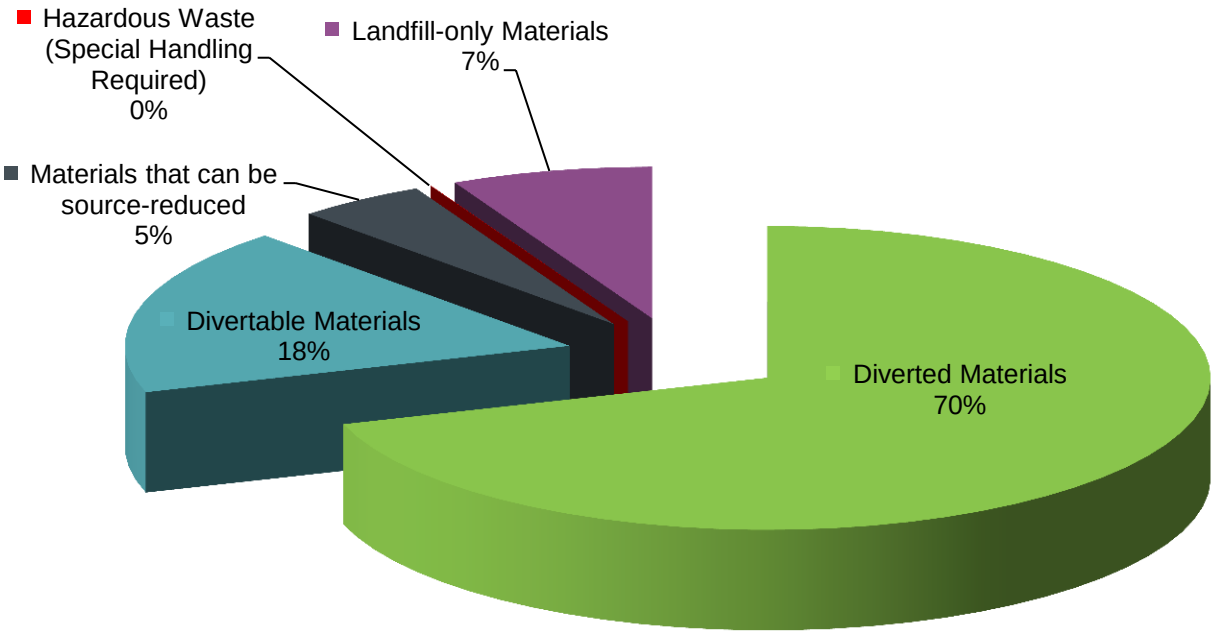
The vast majority, 89% (by weight), of the diverted waste stream was confidential paper. While the bulk of the disposal waste stream fell into three categories: organics (35.3%), fibre products – recyclable (14.9%), and bathroom waste (10.5%). Table ES1 summarizes the results of the waste audit and estimated annual disposal and diversion rates for all material categories (by weight).

Table ES1: Summary of Materials Discarded and Diverted (by Weight)

Material Category	Weight Disposed (kg)	Weight Diverted (kg)	Estimation of Annual Disposal (kg/yr)	Estimated Annual Diversion (kg/yr)
Recyclable Containers	1.76	2.08	96.36	140.92
Containers and Rigid Plastics / Polystyrene (non-recyclable)	3.86	0	210.23	0
Soft Plastics	5.62		306.59	
Fibre Products (recyclable)	10.05	155.0	547.48	7641.51
Bathroom Waste	7.11		385.42	
Organics	23.80		1296.42	
Fibre Products (Compostable)	5.06		275.93	
Fibre Products - Contaminated	1.31		70.08	
Office Supplies	0.87		48.18	
Metal	3.18		175.19	
E-waste (computer-related items) and Batteries	1.30		70.08	
Other Food-related Items	2.43		131.39	
Other	0.98		52.56	
Contaminants in Recycling Bins	0.17		8.98	
Total of all Materials:	**67.50**	**157.1**	**3,674.9**	**7,782.4**

Figure ES1, below, paints a picture of the portion of its waste stream ENR/Shared Services is currently diverting, and the portion of the current disposal stream that could be further reduced through source reduction or diversion efforts.

Figure ES1: Potential and Actual Diversion and Source Reduction (by weight)



Conclusions and Recommendations

The waste audit conducted provided key insight to help ENR/Shared Services to reduce its ecological footprint with regard to waste. The disposal stream contained a number of items that can either be reduced at the source, or can be otherwise diverted with the infrastructure available in Yellowknife. Currently, approximately 30% (by weight) of the total waste stream is sent to landfill. If recommendations in this report are followed, the disposal stream could be reduced to as low as 7% (by weight) of the total waste stream.

The Green Team recommends that the following steps be taken to reduce waste:

1. **Implement a composting program.** This has the potential to reduce the total waste stream (waste disposed and diverted) by 11% to 16%[1]. According to the waste audit, up to 53% of materials that are currently being disposed of consist of materials, such as food scraps, that could be diverted through a composting program. This translates to 1.30 to 1.57 tonnes of waste that could be diverted annually. Composting all food waste could also avoid one metric tonne of carbon dioxide equivalent (1 MT CO_2e) emissions annually.[2]
2. **Identify strategic actions to reduce office paper use.** If ENR and SS offices in Scotia Centre reduced their paper use by 35%, it would prevent an additional 15 MT of CO_2e emissions annually[3] relative to recycling 100% of what is currently being recycled. It could also result in up to $10,900 in cost savings from reduced purchase requirements and recycling costs.
3. **Explore options to reduce other waste items.** Addressing items such as bathroom waste, waste paper towels and Keurig® K-cups® could prevent approximately 575 kg of waste annually.
4. **Explore options to increase collection of recyclables at communal recycling stations.** This may include public education activities and materials, or a reconfiguration of communal work stations.
5. **Through cooperation with the Interdepartmental Green Advisory Team, explore options to conduct more waste audits across multiple GNWT departments and regions, and at different times of year if possible.** Waste audits would best be conducted in offices that have comprehensive waste reduction and recycling programs in place. More information is needed to identify the current status of waste reduction and recycling programs in GNWT occupied spaces (leased and owned). Summer students could help collect this information and conduct future waste audits. (Resource estimate: if all departments approve a waste audit of their offices, and provide staff time of three summer students for half days over the period of one week per department, a minimum of six to ten waste audits could be conducted in a summer.)
6. **Explore options to perform periodic audits of the Public Works and Services (PWS) Yellowknife Warehouse, and to track data of materials entering and leaving the facility for reuse, recycling and disposal**. The PWS warehouse receives all GNWT surplus office equipment in the North Slave Region, recycles e-waste, and sends any materials that are not sold to the public or reused by other departments to the landfill. As such, data collected on material flow in this warehouse would provide the best snapshot of disposal and diversion of large items. In the absence of all other audits, it would also provide the richest insight into GNWT-wide waste generation, diversion and disposal in the region.

[1] 10.6% if compost only food waste, 16% if compost food waste, bathroom waste, and compostable fibre products.
[2] Using USEPA's WARM model (Assuming 2 miles to landfill and to compost facility)
[3] Using USEPA's WARM model (Assuming 35% reduction equally split between the amount of paper currently being recycled and disposed of. Also assumes 2 miles to landfill and 932 miles to the closest recycling facility in Edmonton.)

Photo Stephanie Yuill, ENR

Happy volunteers satisfied with a job well done!

Waste Audit 2012

Overview

The Department of Environment and Natural Resources (ENR) is a leader in environmental issues throughout the Northwest Territories (NWT) and within the Government of the Northwest Territories (GNWT).

ENR's Green Team was established to initiate green activities and influence policy within the Department, to promote sustainability as a core priority within all decision-making, and to provide leadership to other Green Teams within the GNWT.

To be effective in its mandate to initiate green activities within the Department, the Green Team is striving to collect baseline information regarding ENR's present ecological footprint. With regard to waste reduction, the Green Team performed a waste audit to better understand the composition and quantity of waste generated in ENR and Shared Services' (SS) Scotia Centre offices. This will help strategically target efforts to address the most prevalent and/or easily diverted items that are currently being sent to the landfill.

Goals

1. Increase the Green Team's success in reducing and/or diverting waste generated by ENR's Scotia Centre operations by identifying target waste stream items to address through green activities and initiatives.

2. Increase the Green Team's capacity as a leader in greening government practices by developing practical experience and knowledge in the process of conducting a waste audit, which can be shared with other GNWT departments, and with the general public.

Objectives

1. Develop a better understanding of the composition and quantity of solid, non-hazardous waste and recyclable materials generated by ENR and SS staff.

2. Identify and prioritize materials to be addressed by the Green Team in future activities to increase the reduction, reuse, recycling or other diversion of such materials.

3. Gain experience in conducting waste audits in order to better advise other departments or businesses wishing to undertake their own waste audits.

Required Authorization and Special Considerations

Consideration	Action/Solution
Permission to perform audit	Permission sought from ENR and from Directors of both Shared Services Divisions involved.
Cooperation from Bellanca Developments Ltd. (Bellanca)	Contacted Darin Benoit to request assistance from cleaning staff for one week.
Confidential paper recycling data	Obtained from Document Securities Systems Inc.(DSS)
Staff Attendance Numbers	Provided by divisional Administrative Assistants. Monthly staff names provided to ENR by Human Resources to calculate average number of staff from July 2011 to June 2012.
Washroom waste	Weighed and visually assessed, but was not sorted in a thorough manner as part of this audit.

Materials

Item	Source
Clear 100L garbage bags	Pioneer Supply House
2 large tarpaulins for protecting floor	ENR warehouse
51 containers for sorting waste types (16 x 80L containers, 35 x 40L pails)	80L recycling bins from The Bottle shop. 40L pails from ENR warehouse
Scales: • Kilotech KCY 10 (10kg) • Kilotech KHS-C3120 250lb x 1 lb (120 kg x 500g)	ENR - Wildlife Division
Tables & plastic sheeting for sorting	Large piece of scrap plywood and two sawhorses
Old clothing and boots	Volunteers responsible for own
Heavy duty rubber gloves	Pioneer Supply House
Nitrile gloves	Pioneer Supply House
Masking tape, label sheets, sharpie markers, pens, clip-board	Environment Division supplies
Audit forms	Created based on CCME template
Space	Garage – Waste Audit Coordinator's house
Staff: • 3 staff for first 4 days of audit (approximately 2.5 – 3 hours on first day to set up station and sort, and 1.5 hours for days 2,3 and 4) • Work on Day 5 required additional help for final clean-up	2-3 summer students and coordinator for most sorting, additional volunteers for final sorting, weighing and clean-up
Environment Division Truck (for picking up waste and recyclables and disposing of them at end)	ENR truck
Keys to recycling stations	Environment Division has keys to all bins

Methodology

A waste audit was conducted for one business week from Monday to Friday, August 20 to 24, 2012. Waste was collected from ENR and SS offices on the second, fifth, sixth and seventh floors of the Scotia Centre, and separated into categories (Appendix 2). Of 51 possible categories, ENR and SS generated items that could be included into 44 distinct categories. The weight and volume of waste was recorded and the approximate average weekly waste generation rates were calculated. Weekly and annual staff attendance records were used to calculate per capita estimates for total annual waste generation, disposal, and recycling.

Waste diversion data was recorded for fifth, sixth and seventh floors based on the material collected in floor recycling bins. Recyclable materials were not collected from the second floor collective recycling station since ENR accounts for only one small portion of the volume generated in those bins. DSS provided data on the quantity of paper collected over a one-year period from confidential paper recycling bins on floors two, five, six and seven.

80 L bins lined with clear plastic bags for sorting materials into categories

Waste from washroom bins was collected and visually assessed for waste composition. Due to the potentially hazardous contents of such bins, and the volunteer nature of the project, it was determined that the main categories of waste would be visually identified for toilet garbage bags

instead of being sorted into audit categories. The weight and approximate volume of toilet waste bags were recorded.

More specifically, the Green Team executed the following methodology:

1. On the Green Team's request, Bellanca Developments Ltd. (Bellanca) cleaning staff consolidated waste emptied from all waste bins in ENR and SS offices on the second, fifth, sixth and seventh floors. Consolidated bags were labeled according to the floor they were collected on. At the end of each evening, the waste audit coordinator picked up approximately one bag of office waste from each floor being audited. Washroom waste was set aside in separate bags.
2. Since DSS collects recyclables on Thursdays, the audit team collected bags of recyclables on Wednesday evening to quantify and characterize the contents recycled from Thursday to Wednesday (August 16 – 22).
3. All waste collected was transported to the designated sorting space (a downtown garage) in the evenings.

Waste audit volunteers Brooke and Nic set up the sorting site on Day1. All sort bins are lined with clear plastic bags and labeled by category. One day's worth of collected waste in the foreground awaits sorting.

4. Three or four audit staff sorted items into categories the morning after waste was collected, or on Monday morning for Friday's waste. In general, for the quantities of waste generated on the designated floors, sorting and clean-up took approximately one hour per day. Set-up and sorting on day one was completed in approximately three hours by three volunteers. Final sorting, clean-up and returning all equipment and waste/recycling to their respective locations was completed in approximately five hours, with the presence of up to nine volunteers. Most volunteers contributed less than two hours on the final day, however four or five were active for the full five hours.
5. On the final day of sorting, more Green Team members joined to assist in sorting and weighing collected materials. Two members of the core sorting team were not present on the final day.
6. The weight and approximate volume was recorded for each material type.
7. Weight was measured using a Kilotech KCY 10 (10kg) hanging scale (for most items), and a Kilotech KHS-C3120 250lb x 1 lb. (120 kg x 500g) hanging scale for heavier items (such as organics). Materials were consolidated into large plastic bags and weight was recorded by one volunteer for consistency in reading the scale.
8. Uncompacted volume was visually estimated as a proportion of a 40L or 80L container it occupied.
9. The waste audit team delivered all collected items for appropriate final disposal or recycling at the Yellowknife Solid Waste Facility (including compost facility), and Beverage Container Recycling Depot.

10. Staff attendance numbers were collected from each division's Administrative Assistant to estimate the amount of waste per capita, and to correct for staff who may have been on vacation during the audit. Staff members present for only half a day were counted as 0.5, while staff present the full day were counted as 1.0.
11. DSS supplied the waste audit coordinator with the weight of confidential office paper collected from floors two, five, six and seven, from July 2011 to June 2012.
12. The Department of Human Resources supplied staff names and numbers for ENR's Yellowknife employees for each month from July 2011 to June 2012. Duplicate entries were removed. The annual average number of staff was used to determine a per capita generation rate for office paper diverted through DSS' confidential paper shredding service. It was also used to extrapolate annual waste generation, disposal and diversion data based on a full staff complement.
13. For all categories aside from confidential paper, annual waste disposal was extrapolated by multiplying the weekly totals by 48.8 weeks to account for the 16 days offices are closed per year.
14. Individual recycling bins in staff offices were not included as part of the waste audit, since many of these contain items collected over the course of multiple weeks. Furthermore, since annual data for fine paper recycling was provided by DSS, it was determined that DSS data would be a more reliable source of information.

To keep the interpretation consistent, one volunteer (Gerald) weighed and visually assessed the volume of all material categories.

Results

For clarity, in this report, three "waste" streams will be discussed: total waste stream, diversion stream, and disposal stream. *Diversion stream* refers to all materials that were collected from recycling bins. *Disposal stream* refers to all materials collected from garbage bins that were destined for disposal at the solid waste facility. *Total waste stream*, or *total waste generated*, refers to all materials discarded (for both disposal and recycling). Total waste stream is the combined total of the disposal and diversion streams, or in other words, all the materials collected, sorted and weighed through the course of this audit.

Waste Generation - Quantity

The first objective of the waste audit was to qualify and quantify waste generated, disposed and diverted by ENR and SS' Scotia Centre operations. As shown in Table 1, the audit revealed that the offices sampled generated 225.39 kg of solid waste (total waste stream), of which 157.08[4] kg was diverted through municipal and territorial recycling programs (diversion stream), and 67.5 kg were discarded for disposal (disposal stream). These amounts are also equivalent to 2,401 L of waste generated, of which 1,256 L were diverted, and 1,145 L were discarded for disposal.

[4] This figure is approximate since cardboard and beverage container recycling and disposal rates are not certain. See discussion.

NB: All volume data in this report is material that has not been compacted in any way. Volume figures cannot be used to estimate the space such items would occupy in a landfill.

Table 1: Total Waste Disposed, Diverted, and Generated Weekly, Including Estimated Annual Totals[5]

	Weekly Totals		Annual Estimates	
	Weight (kg/week)	Volume (L/week)	Weight (kg/yr)	Volume (L/yr)
Discarded for Disposal	67.50	1,145	3,674.9	62,196
Diverted (Recycled)	157.08	1,256	7,782.4	62,064
Total Generation (Waste + Diversion)	224.58	2,401	11,466	124,348

Figure 1 and Figure 2 demonstrate the weekly generation rate of waste and recycled materials for the designated floors.

Figure 1: Waste Disposed and Diverted Weekly (kg)

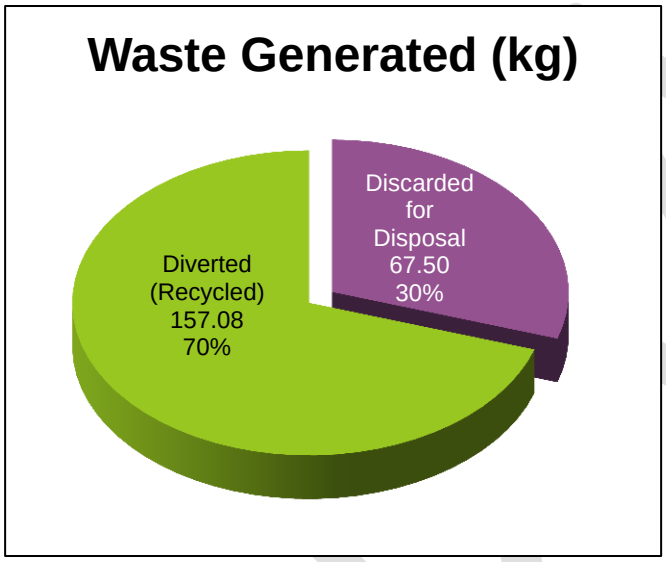
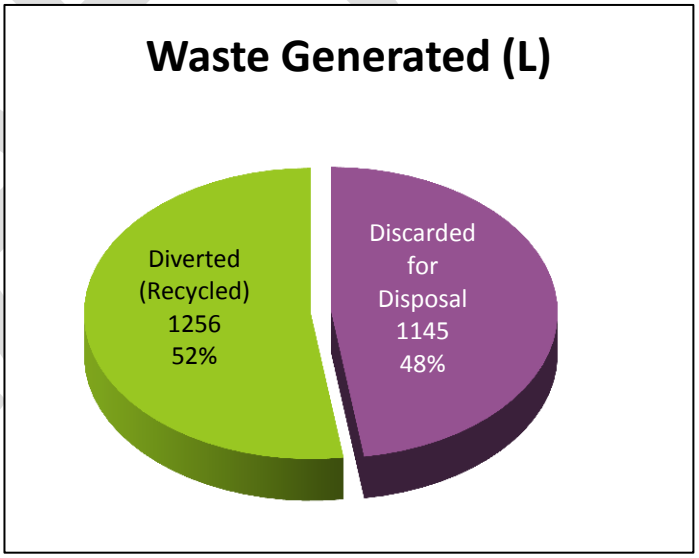


Figure 2: Waste Disposed and Diverted Weekly (L)



Waste Generation - Composition

Table 2 provides the composition by weight, un-compacted volume, and by proportion of the disposal stream. Per capita totals have been estimated based on the number of staff present at the office during the audit period, and annual totals extrapolated from these numbers. Detailed individual category results are available in Appendix 1.

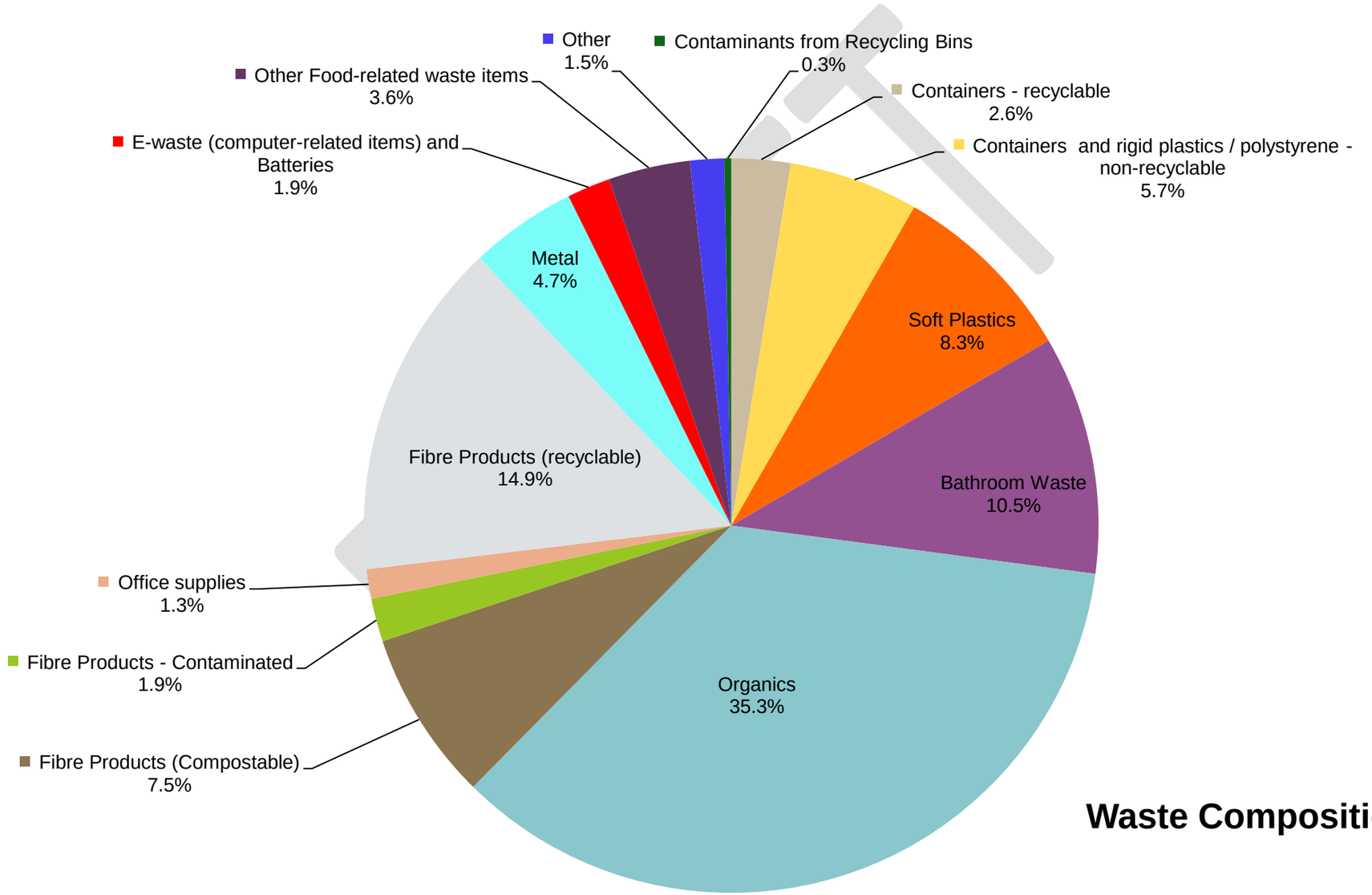
Table 2: Composition of Waste Discarded for Disposal and Extrapolated Annual Waste Generation (Disposal Stream) [5] [6]

Category	Net Weight (Kg)	Volume (L)	Proportion of Waste Stream (by weight)	Proportion of Waste Stream (by volume)	Estimation of Annual Disposal (kg/yr)	Estimation of Annual Waste Disposal (L/yr)	Waste per capita per week (kg/pers·wk)	Waste per capita per year (kg/pers·yr)	Waste Per capita per week (L/pers·wk)	Waste per capita per year (L/pers·yr)
Beverage Containers - Recyclable	1.76	60	2.6%	5%	96.36	3066	0.022	1.07	0.7	34
Containers and rigid plastics / polystyrene - non-recyclable	3.86	109	5.7%	10%	210.23	6132	0.048	2.34	1.4	68
Soft Plastics	5.62	348	8.3%	30%	306.59	18833	0.070	3.42	4.3	210
Bathroom Waste	7.11	120	10.5%	10%	385.42	6570	0.088	4.29	1.5	73
Organics	23.80	50	35.3%	4%	1296.42	2628	0.296	14.4	0.6	29
Fibre Products (Compostable)	5.06	122	7.5%	11%	275.93	6570	0.063	3.07	1.5	73
Fibre Products - Contaminated	1.31	45	1.9%	4%	70.08	2628	0.016	0.78	0.6	29
Office supplies	0.87	20	1.3%	2%	48.18	876	0.011	0.54	0.2	10
Fibre Products (recyclable)	10.05	225	14.9%	20%	547.48	12263	0.125	6.10	2.8	137
Metal	3.18	3	4.7%	0.3%	175.19	175	0.040	1.95	0.04	2
E-waste (computer-related items) and Batteries	1.30	3	1.9%	0.3%	70.08	175	0.016	0.78	0.04	2
Other Food-related waste items	2.43	30	3.6%	3%	131.39	1752	0.030	1.46	0.4	20
Other	0.98	8	1.5%	1%	52.56	438	0.012	0.59	0.1	5
Contaminants from Recycling Bins	0.17	2	0.3%	0.2%	8.76	88	0.002	0.10	0.02	1
Total of all Materials:	**67.50**	**1145**			**3674.9**	**62196**	**0.84**	**40.9**	**14**	**693**

[5] Annual extrapolation based on 48.8 weeks per year (16 holidays per year where office is closed), and average number of staff on an annual basis (89.75 individuals).
[6] Darker shaded cells represent extrapolated data.

Figure 3 shows the waste composition of the disposal stream (by weight). Organics made up the largest single source of waste by weight, accounting for 35.3% of the disposal stream, followed by recyclable fibre products (14.9%), bathroom waste (10.5%), soft plastics (8.3%), and compostable fibre products (7.5%).

Figure 3 : Composition of Disposal Stream (by weight)



Waste Composition (by Weight)

Figure 4 shows the waste composition by un-compacted volume. Soft plastics occupied the largest volume of the waste stream (30%), followed by recyclable fibre products (20%), compostable fibre products (11%), and bathroom waste (10%).

Figure 4: Composition of Disposal Stream (by un-compacted volume)

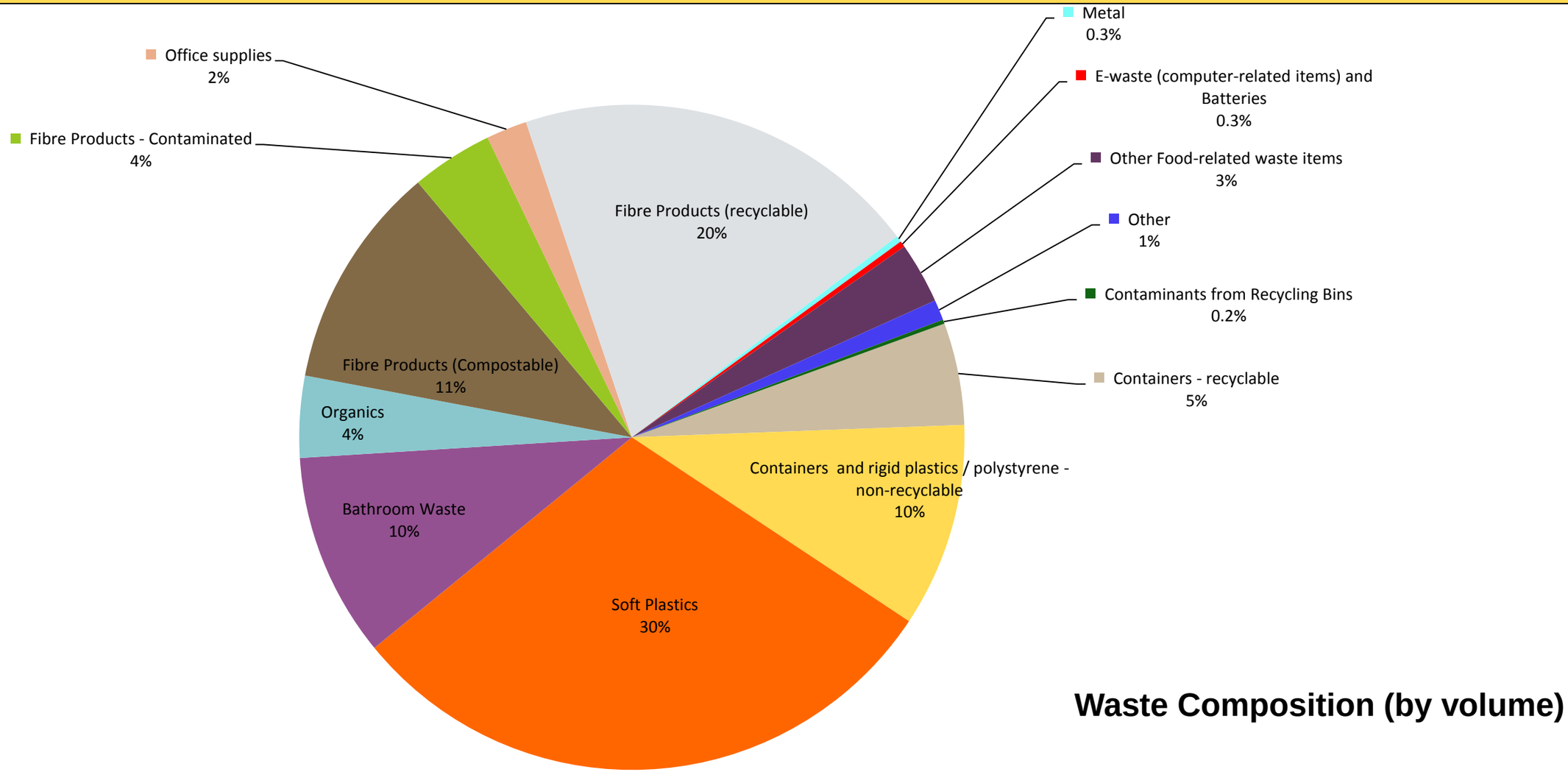


Table 3 provides the composition by weight, un-compacted volume, and by relative proportion of materials diverted from landfill. Per capita totals have been estimated based on the number of staff present at the office during the audit period, and annual totals extrapolated from these numbers. Annual numbers for confidential office paper recycled are based on annual data.

Table 3: Composition of Materials Diverted from Waste Stream from Scotia Centre floor 5, 6, and 7 (including confidential paper recycling from floor 2) [7][8]

Material	Material Types	Net Weight (kg)	Approximate volume (L)	Proportion of Diversion Stream (by weight)	Proportion of Diversion Stream (by volume)	Diversion per capita per week (kg/pers·wk)	Estimated annual diversion (kg/yr)	Estimated annual diversion per capita (kg/pers·yr)	Diversion per capita week (L/pers·wk)	Estimated annual diversion (L/yr)	Estimated annual diversion per capita (L/pers·yr)
Beverage Containers	Glass <1L = 2; Plastic <1L = 20; Tetra pak <1L = 4; Milk <1L = 12; Gable top>1L = 1; Al cans<1L = 36	1.49	42	0.9%	3%	0.02	87.96	0.98	0.5	2154	24
Plastics (#2,3,5,7)	50% yogurt, 1 Tim iced cap, 1 coffee whitener	0.14	2	0.1%	0.2%	0.002	8.98	0.10	0.02	90	1.0
Cans (non-BCP)	coffee tin lids, soup tins	0.45	4	0.3%	0.3%	0.01	43.98	0.49	0.05	180	2
Boxboard and Mixed Paper		3.15	30	2.0%	2%	0.04	175.01	1.95	0.4	1795	20
Cardboard	95% publication boxes, 1 toner box	6.67	50	4.2%	4%	0.08	350.03	3.90	0.6	2603	29
Fine/Office Paper	80% white, 20% beige	0.05	1	0.03%	0.1%	0.001	4.49	0.05	0.01	45	0.5
Glass (non-beverage)		0	0	0%	0%	0	0	0	0.0	0	0
Newsprint		1.13	15	0.7%	1%	0.01	43.98	0.49	0.2	898	10
Confidential paper (weekly average)	Office paper	144	1112	91.7%	89%	1.60	7068	78.08	12.4	54299	605
Contaminants (Waste Items Deposited in Recycling Bins)	Tim Hortons cups, dish soap container, #1 clam shell, paper /plastic wrappers, beverage container lids	0.17	2	0.1%	0.2%	0.002	8.98	0.10	0.02	90	1.0
Total Diversion		**157.08**	**1256**	**100%**	**100%**	**1.76**	**7782.4**	**86.0**	**14**	**62064**	**692**

[7] Darker shaded columns indicate extrapolated data.
[8] Annual extrapolation based on 48.8 weeks per year (16 holidays per year where office is closed), and average number of staff on an annual basis (89.75 individuals).

Figure 5 shows the composition of diverted materials on a weight basis. Confidential office paper is the main item recycled by staff, accounting for 91.7% of the recycling stream. Altogether fibre products make up more than 98% of materials recycled: cardboard (4.2%), boxboard and mixed paper (2.0%), and newsprint (0.7%).

Figure 5: Composition of Diversion Stream (by weight)

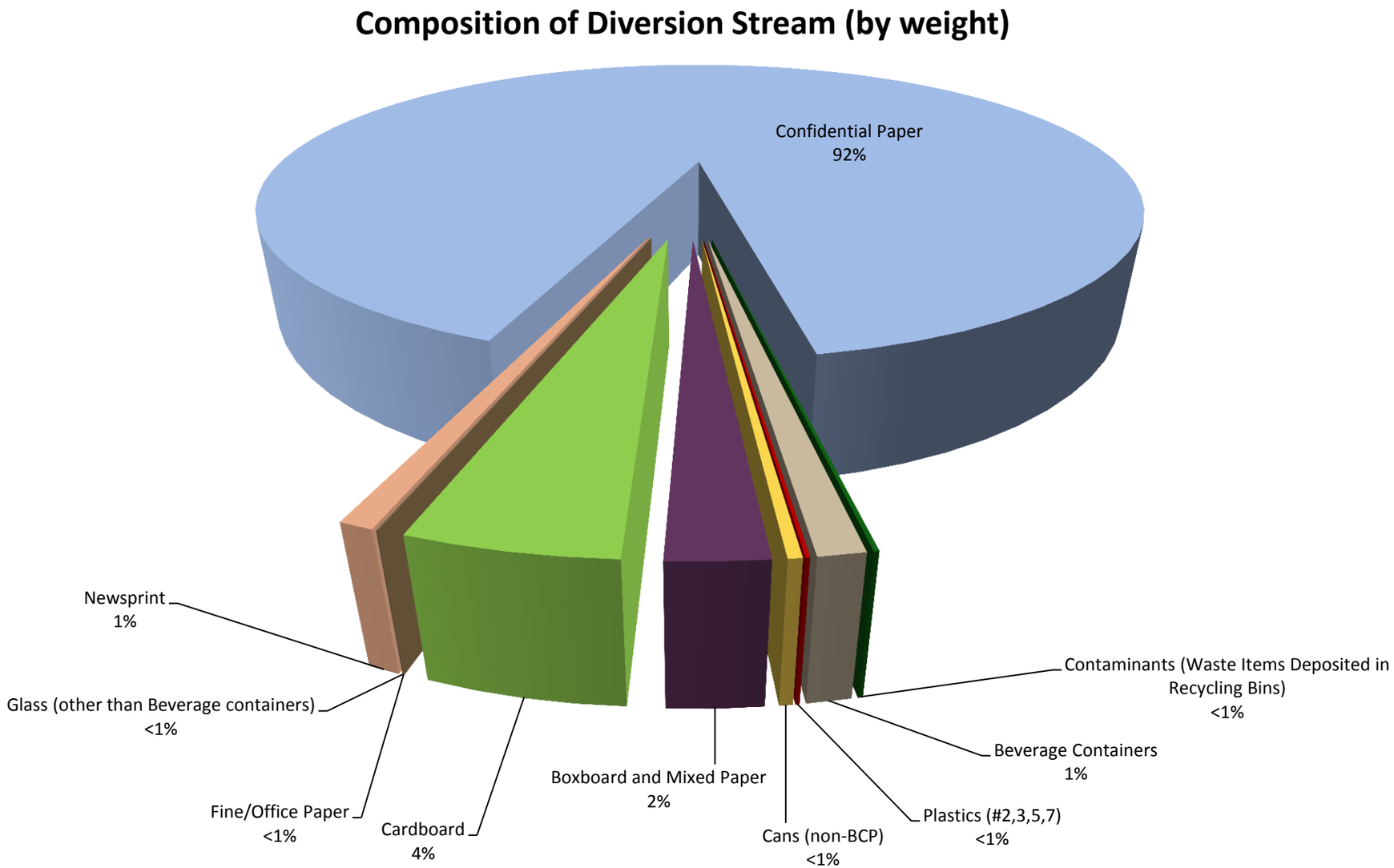
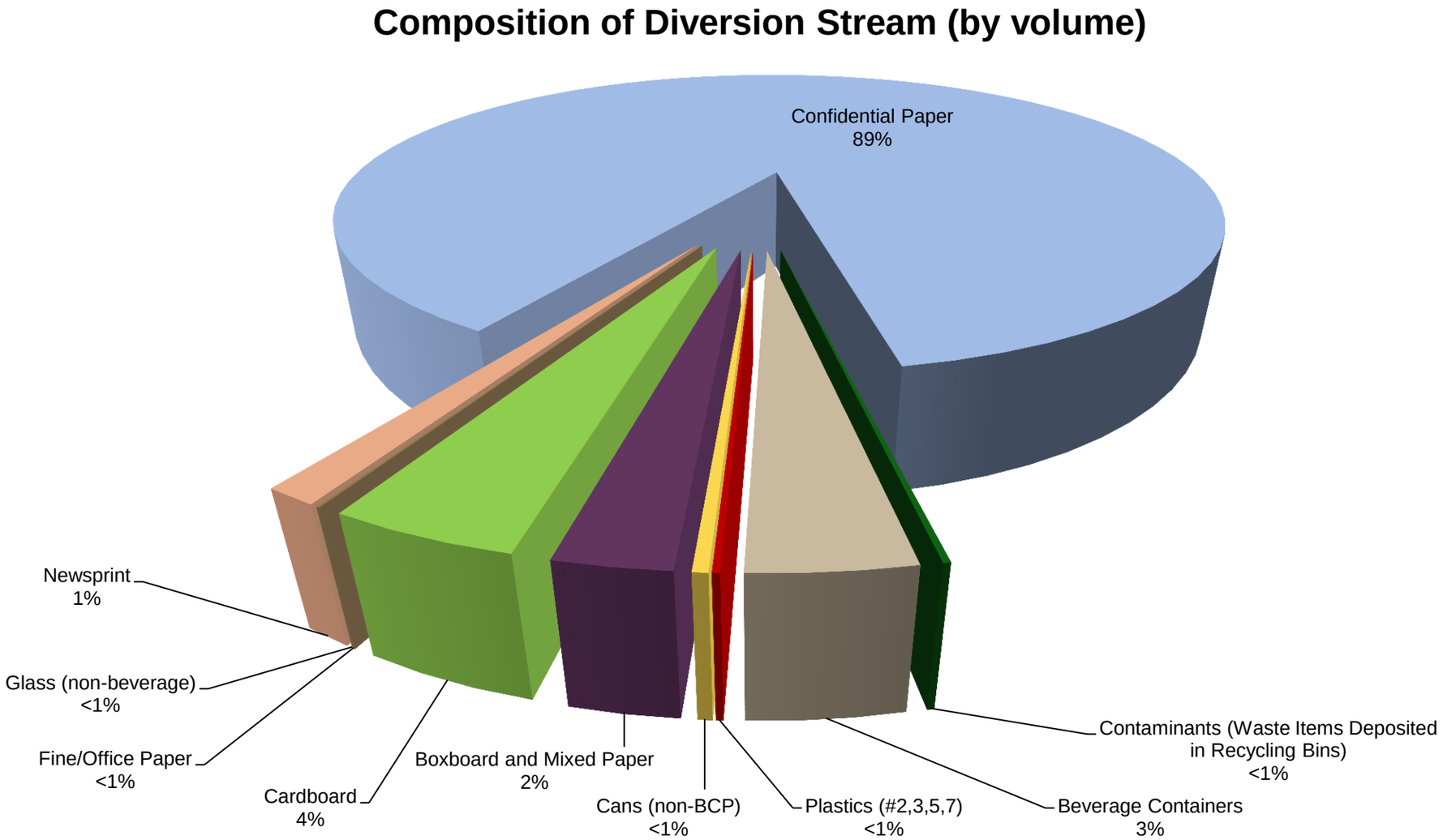


Figure 6 shows the composition of diverted materials by volume. Confidential office paper is the main item recycled by volume (89%) of the diversion stream. By volume, fibre products account for more than 96% of volume of the diverted items.

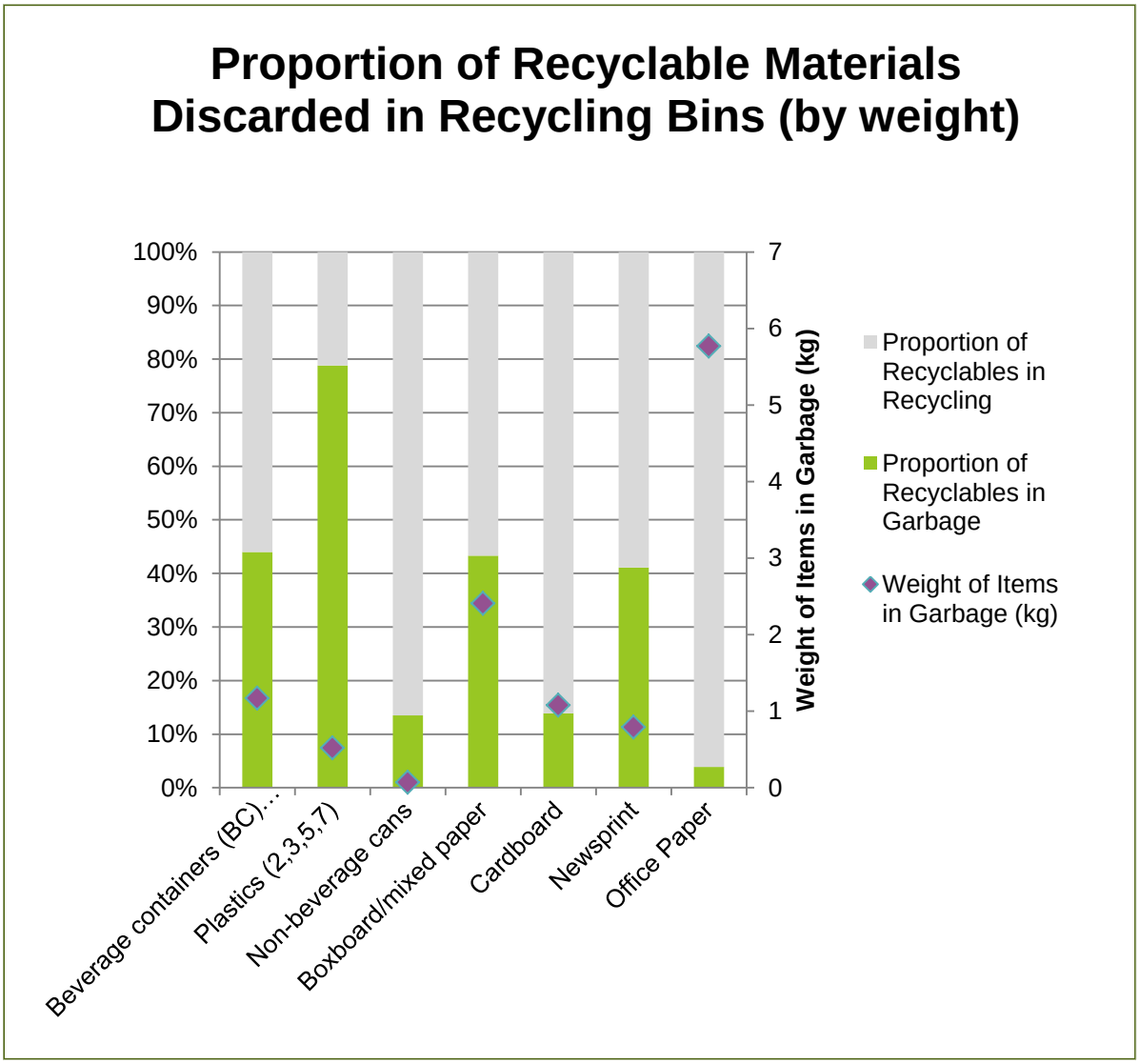
Figure 6: Composition of Diversion Stream (by un-compacted volume)



Recyclables in Garbage Bins

Figure 7 below shows the proportion of recyclables found in the garbage is significant, especially with regard to the following categories: beverage containers (including non-beverage #1 plastics); mixed plastics (#2,3,5,7); boxboard and mixed paper; and newsprint. While most office paper was sent for recycling, it is noteworthy that nearly 6kg of office paper were discarded for disposal.[9]

Figure 7: Proportion of Recyclable Materials Discarded as Garbage



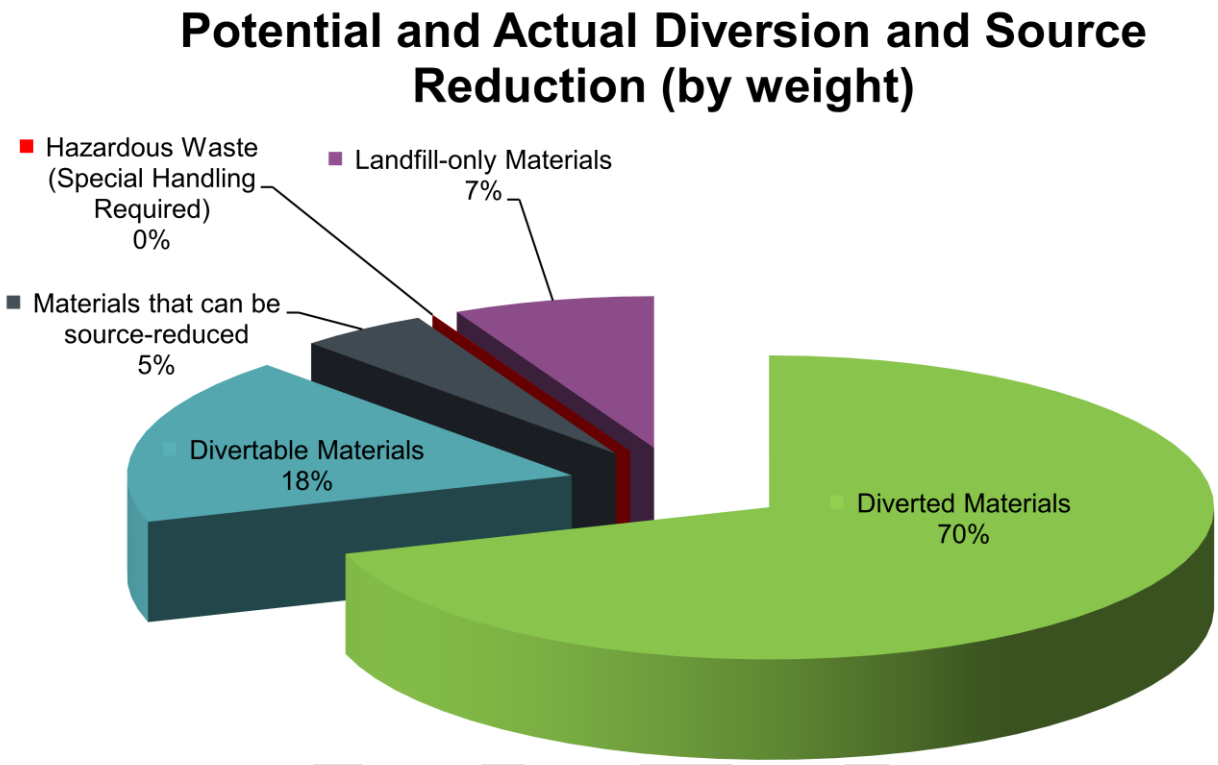
Area for Improvement

The waste audit showed that ENR and SS operations on the second, fifth, sixth and seventh floors of the Scotia Centre diverted (recycled) approximately 70% of total waste generated, and disposed of 30% of waste generated. As illustrated in **Figure 8**, however, approximately 76% of the 67.5kg sent for disposal, (22.7% of the total waste stream), was composed of materials that could be eliminated through source reduction, recycling or composting.[10] If reduction and diversion of all material types were maximized, approximately 7%

[9] See discussion section for further information regarding corrugated cardboard. It is possible the disposal rate for cardboard is underestimated, and the recycling rate overestimated as a result of a collections error.
[10] Based on diversion options available in Yellowknife

of the total waste generated would be sent for disposal instead of 30%. This is equivalent to approximately 18.4 kg per week, or 898 kg per year that would be landfilled.

Figure 8: Potential and Actual Diversion and Source Reduction (by weight)



Discussion

The results of the waste audit were affected by a number of factors

1. *Corrugated cardboard recycling values may be overestimated, and disposal values under-estimated in this report.*
   Similarly to the recyclable beverage containers, the data for corrugated cardboard may be somewhat mixed. It is possible that some cardboard was sent for disposal, however was mixed in with materials collected for recycling prior to sorting, and was therefore counted as having been recycled. As a result, corrugated cardboard recycling values may be overestimated by this report.

2. *Bathroom waste weight may be less accurate than weight for other items.*
   Since bathroom waste was not sorted by audit staff, it was left in the black plastic garbage bags provided by cleaning staff. No empty bag was requested by audit staff, and therefore a tare weight for these bags was not measured. The tare weight for clear plastic bags used for all other sort categories was used to estimate the weight of these bags.

3. *It is difficult to accurately extrapolate annual data from audit results, since the time of year an audit is conducted may affect results.*
   The audit was conducted during a mostly sunny week in the summer. As such, staff may have been more likely to eat outdoors and discard lunch-related waste items elsewhere than they might do during more inclement periods of the year.

This may be somewhat countered by the fact that there is no designated lunch room or cafeteria available on any of the floors audited, which creates incentive for staff to leave the building for their lunch hour. However, some staff may be more likely to eat at their desks and discard the waste nearby during winter months than they would during the summer.

Annual projections were estimated by multiplying per capita observed data by the average number of staff working on the designated floors on an annual basis. These estimates are meant to give a broad idea of the quantity of waste that may be generated annually. Future audits conducted at other times of the year are recommended.

4. *Electronic Waste was not included as part of this audit.*
When discarded, electronic equipment, including computers and peripherals, is sent to the Public Works and Services (PWS) warehouse. Items in good working condition are passed to Computers for Schools (CFS) for refurbishing and reuse, while those that are no longer viable are sent to Shanked Computer Recycling Inc. (SCRI) [11] in Acheson, Alberta.

Photo 1: E-waste category in audit consisted mainly of computer accessories such as CDs and floppy disks

Since the North Slave Region began recycling surplus electronic waste (e-waste) from all GNWT departments in July 2008, nearly 200 tonnes of e-waste (an average of nearly 40 tonnes per year) have been sent to SCRI. Since 2004, the North Slave Region has donated approximately 400 desktop computers and 200 laptops (around 1,100 to 1,600 kg) to CFS annually[12]. Since these numbers cannot be broken down by department, or by specific offices included in this audit, they were not used for comparison with the data generated in this study.

Research into the generation of e-waste by the individual floors involved in the survey was not included as part of the scope of this audit. With no generation rate, the calculation of the diversion rate is not possible; however it assumed that it is quite high for such items. All printers that are sent to the PWS warehouse are reused by other departments, or recycled. GNWT-owned photocopiers and any printers with hard drives, have the hard drives removed and destroyed, and are then sent for recycling with no reuse option. Leased photocopiers are returned to the manufacturer.[13] Peripherals received by the PWS warehouse are also sent to SCRI.

Questions for future exploration on this topic at the GNWT-wide level include:

a. What is the total inventory of electronic equipment in the GNWT's portfolio?
b. What is the standard rate for *evergreening*[14] equipment?
c. Are all electronic items and their peripherals reused/refurbished, or recycled, or are some types of equipment more likely to be landfilled?
d. Is source reduction an option for a portion of the e-waste generated by the GNWT?

5. *Furniture collected for surplus has not been considered in this audit.*
The waste audit did not take into account any furniture or large items that may have been sent to the

[11] SCRI is an approved recycler with the Alberta Recycling Management Authority. SCRI pays all shipping costs from Yellowknife.
[12] Personal Communication with Russ Jones, April 2013
[13] This audit provides no further downstream investigation of the fate of photocopiers returned to individual manufacturers.
[14] Evergreening is the GNWT's regular renewal of electronic equipment. Older functional equipment is replaced by newer models over a set period of time.

PWS warehouse as surplus items. These items are generally placed in the elevator lobby of each floor for pick-up. This study offers no data on the annual amount of material sent for surplus by ENR.

When items are sent to the PWS warehouse, they are subject to a triage: items in poor shape are sent directly to landfill; items in reasonable shape are set aside for the monthly public sale; and good furniture is stored by PWS until it can be used by another GNWT department. Items that are not sold in the public sale after two months are sent to landfill. Warehouse staff have looked into recycling furniture in the past, but have not found a local recycling option.

According to PWS warehouse staff, good items set aside for internal GNWT reuse are redistributed quickly. No data on these items is tracked; however PWS staff offered a guestimate that 35-40% of items sent to the warehouse are reused internally.[15]

An audit of invoices from the City of Yellowknife Solid Waste Facility to the PWS warehouse would likely provide a rough picture of waste generated by all North Slave operations of all GNWT departments. Such an audit was not included as part of the scope for this project. Furthermore, the data from such an audit would not be broken down to indicate what portion of such items came from the few floors included in this waste audit, and would therefore not be as useful for comparison. It may, however, be a useful activity should the GNWT decide to perform a GNWT-wide waste audit in the future. In the interim, PWS staff estimated they send between 500 and 1000 kg of items to the Yellowknife Solid Waste Facility on a monthly basis.

6. *Other items that may be part of larger take-back programs were also not included in this audit.*
   A number of items that may be diverted as part of producer take-back programs were not collected as part of this audit. Once consumed, items like printer cartridges are collected by administrative staff and returned to the vendor or manufacturer for recycling. (Administrative staff estimated that printer cartridges last approximately two to four months for Environment Division printers[16].) Cellular telephones and rechargeable batteries are also accepted through Call2Recycle's recycling program, but were not included as part of the audit.

7. *The assistance of additional staff on the final day of the audit may have affected the results*
   a. *Potential inconsistency in sorting materials for one day's worth of items collected:*
      The core team of sorters was consistent in sorting materials into categories. When new sorters were introduced on the last day of sorting, some mix-up of categories was noted by the coordinator. The coordinator removed a number of items from some category bins and placed them in in their correct bin to try to maintain the consistency built up over the first four days of the audit, but it is not known if all inconsistencies were caught prior to recording results.

[15] Personal Communication with Russ Jones, May 14, 2013
[16] Personal communication with Kari Van Geffen, May 2013

b. *Estimation of beverage containers that were recycled vs. discarded in waste bins:*
Beverage containers that had been separated into two categories by sorters (containers retrieved from waste bins, and containers retrieved from recycling bins) were accidentally combined and weighed together. Audit team staff estimated the relative volume in each category based on visual recollection of what was in both bags prior to consolidation; however there can be no confirmation of accuracy for this category. The same proportion was used to estimate the relative weight of containers in each category, which may not be accurate.

This error makes it impossible for the audit to assess whether certain types of containers are more likely to be thrown away instead of recycled.

Other topics – Relevance of this waste audit for other departments and regions

1. *How would waste audit numbers differ across departments?*
The waste audit was conducted in ENR offices, where staff might be expected to have a higher than average awareness of environmental issues. If this is the case, one would expect to find a higher waste reduction or diversion rate for ENR operations than for other departments. This audit did not address this question, and therefore it remains a hypothesis for future exploration.

It should be noted that whether ENR does have a higher consciousness of environmental practices relative to other departments, it still did not achieve a 100% diversion of all materials that could have been placed in available recycling bins, and there was a small amount of garbage discarded in recycling bins.

2. *How might audit results vary from region to region?*
   While it is beyond the scope of this project to provide an in-depth analysis of how the results may be applicable to GNWT operations in other regions, it does provide some insight.

   Relative to other offices in the Sahtu, Dehcho, Inuvik, and South Slave regions, Yellowknife and Hay River[17] benefit from a wider variety of waste diversion programs and options. Therefore, one can expect that GNWT offices in other regions are not able to divert as much of the waste stream as Yellowknife.

   Assuming the generation rates per capita observed in this audit were the same for all GNWT offices, one could expect to divert less than one percent of waste generated in all communities excluding Hay River and Yellowknife, given the current availability of recycling programs. Given that recycling services in Hay River are similar to those in Yellowknife, in theory Hay River offices are able to divert as much as the offices studied in the waste audit (70%). Figure 9 and Figure 10 illustrate the projected disposal vs. diversion profiles for offices in other communities, and in Hay River, assuming these offices generate the same types and quantities of waste as observed during the audit. Projections in Figure 10 are based on the assumption that offices in Hay River utilize all recycling services available through the Beverage Container Program, and Tri-R Recycling's services.

   NB: There is no evidence to suggest that waste generation in regional offices would mirror that of the offices audited. Figure 9 and Figure 10 are included for general comparative purposes only.

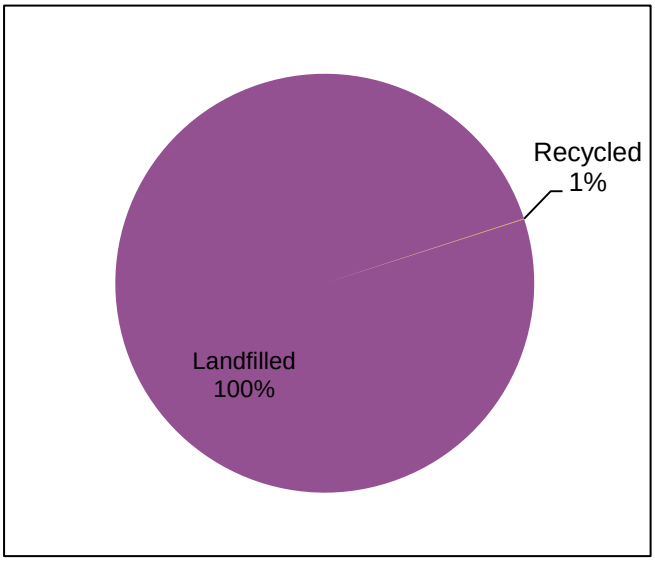


Figure 9: Projected Waste Disposal Vs. Diversion in Regional Offices, Excluding Hay River and Yellowknife (Assuming Waste Composition and Per capita quantity mirrors that observed in the audit)

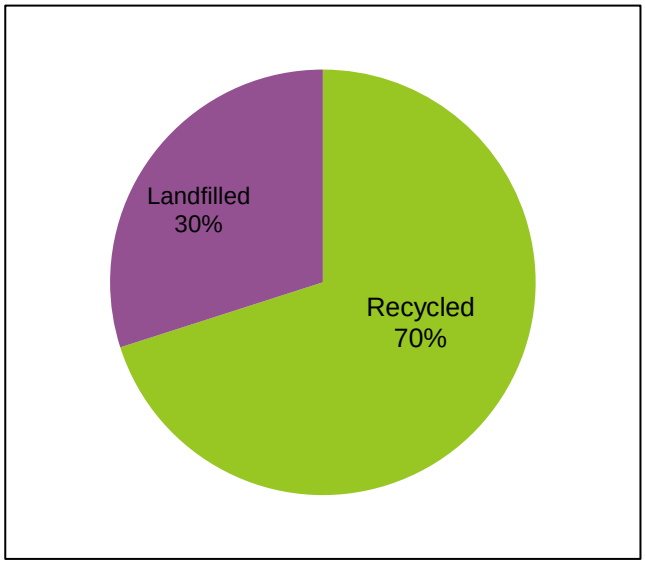


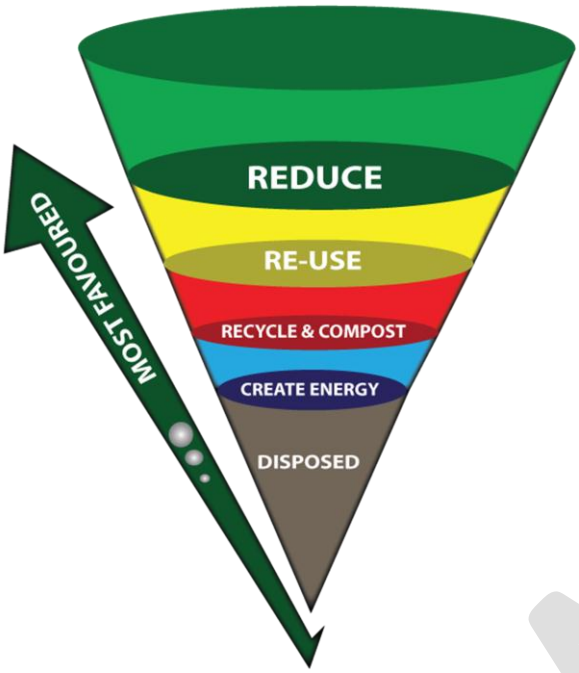
Figure 10: Projected Waste Disposal Vs. Diversion for Hay River (Assuming per capita quantity and composition of waste mirrors that of the audit, and that all recycling options are utilized)

Hay River offices would, in theory, be able to match Yellowknife's current diversion rates. However, the absence of a centralized compost facility in Hay River means that offices in this community have a lower potential to reduce the disposal of their organic materials in the landfill.

[17] The City of Yellowknife's Solid Waste Facility recycles paper products, clean plastics (2,3,5 & 7), and metal (tin cans, etc.). In Hay River, Tri-R operates a recycling business that also accepts these material types. Yellowknife also accepts organic materials, and the Yellowknife Bottle Depot will accept clean #1 PET containers that are not beverage containers.

While backyard composters may be able to accommodate some of the organic wastes generated in all communities other than Yellowknife, Yellowknife still offers a greater potential for diverting organic waste items such as meat, fish, dairy products, and other oily or cooked items that are not readily composted in a backyard bin. There was no attempt made to quantify what portion of the organic materials collected in the survey were compostable in a backyard bin relative to the quantity requiring processing in a centralized facility.

Figure 11: The Waste Management Hierarchy



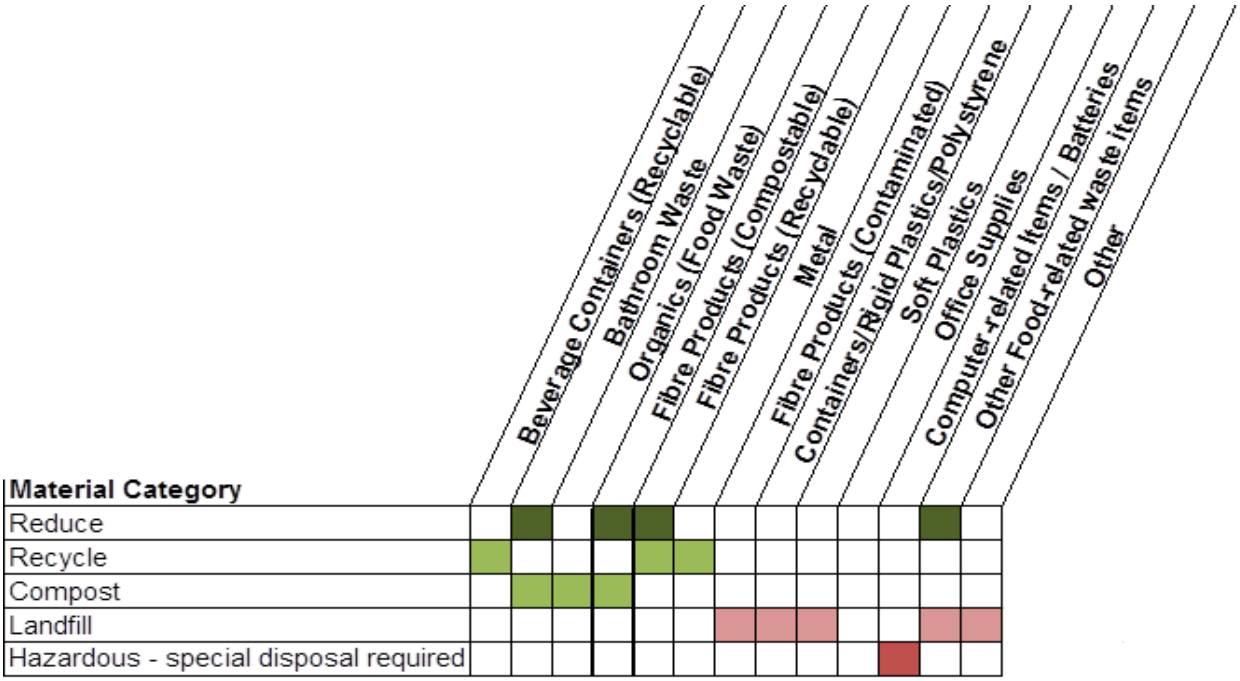
Where do we go from here? Insight for future waste reduction and diversion in ENR/Shared Services' Offices

The audit results flag key areas for improvement in reducing the amount of waste generated and disposed of in ENR and Shared Services' Scotia Centre offices. According to the waste management hierarchy, as pictured in Figure 11[18], the most desirable way to address waste is not to produce any at all, or source reduction. This is followed by reusing, recycling/composting, then recovering energy from waste, and finally disposing of any remaining matter. Since the volumes of waste reported in this audit are un-compacted, and do not provide accurate insight into the true volume that these waste items would occupy in a landfill, the remainder of this section will be based solely on the weight of waste items recorded.

At a glance, Table 4 (below) provides an overview of alternate options for various waste categories. Some of the options described in this section may be actions that can be directly implemented by ENR/SS, and others include actions that the GNWT may be able to influence, yet ultimately remain the responsibility of the property manager. The potential actions provided below are preliminary suggestions only; further exploration of potential options is recommended.

[18] The Waste Management Hierarchy depicted in Figure 10 is copied from the Government of South Africa's Department of Environmental Affairs (Government of South Africa, 2012)

Table 4: Options for Future Reduction and Diversion for Waste Categories[19]



Source Reduction Options

- Paper towels
- Bathroom waste
- Confidential paper
- Other food-related waste items

1. Paper Towels and Bathroom Waste

As demonstrated in **Figure 8**, at least five percent of the total waste stream (approximately 575 kg per year) generated by the floors audited could be reduced at the source. This five percent consists of waste paper towels, and napkins, most of which originates in staff washrooms.

Some ways to eliminate waste paper towels and napkins include:

- Equip washrooms with high efficiency hand driers[20]
- Provide reusable cloths in staff coffee/kitchen areas to wipe up spills
- Encourage employees to refuse disposable napkins when purchasing take-out meals

[19] Order of actions in highlights the most preferred action to the least preferred action according to the waste management hierarchy

[20] A Life Cycle Assessment (LCA) of Hand Drying Systems performed by MIT and commissioned by Dyson found that the Dyson Airblade™ hand dryer is the overall best environmental option when compared to an Excel XLERATOR®, a generic standard warm air dryer, generic cotton roll towels, generic paper towels manufactured from 100% virgin content, and generic paper towels manufactured from 100% recycled content. Areas considered in the LCA include global warming potential, human health, ecosystem quality, cumulative energy demand, water consumption and land occupation. (Montalbo, Gregory, & Kirchain, 2011)

2. Confidential paper

By weight, confidential paper accounted for nearly 62% of the estimated annual waste generated, and for 92% of the amount diverted through recycling. While it is positive that nearly all office paper discarded was recycled and not landfilled, it is likely that a portion of the ***more than seven tonnes of paper*** recycled over a one-year period could have been reduced at the source.

Since this paper was collected by DSS, it is unknown what portion might have included single-sided prints, unnecessary banner sheets, misprints, and/or documents that are available on-line or on shared file servers. It is also unknown how many copies or versions of a given document may have been used by the same individual.

Reducing the amount of paper would also result in cost savings to the departments. ENR and SS spent $8,544 to shred and recycle approximately 7,070 kg of confidential office paper. Currently, all fine office paper is being recycled through the confidential shredding service, however one can assume that not all of this would be considered confidential documents, and therefore would not require the added step of shredding before being recycled. Additional savings to ENR and SS would be possible if there were separate recycling bins for confidential and non-confidential paper. This service could be provided by DSS, in direct contract with ENR/SS, or as part of its existing recycling contract with Bellanca.

A **35%** REDUCTION IN PAPER USE COULD SAVE ENR/SHARED SERVICES UP TO **$10,900** ANNUALLY.

Depending on how much of this paper was printed in-house, avoiding printing could result in greater savings by reducing the amount of paper and toner purchased annually. One ream of letter format recycled paper (used in the Environment division) weighs approximately 2.232 kg (500 sheets of paper). The amount of paper collected in one year would amount to more than 3100 reams of paper, which would have cost the department approximately $23,800[21]. Assuming that all papers collected in the confidential bins were printed in-house, if all floors involved in the audit reduced their paper use by 35% it would mean a cost saving of $10,900 ($2,570 in avoided shredding costs, and $8,330 in paper purchases).

Some ways to reduce the use of office paper include:

- Encourage employees to print less
- Require double-sided printing with no banner sheets as default printer setting for all staff
- Dedicate one tray on network printers to print on the reverse side of paper that has already been printed on one side, and is not confidential[22]
- Increase dependence on network printers, and reduce/eliminate individual desktop printers
- Encourage employees to read digital copies of documents instead of printing[23]

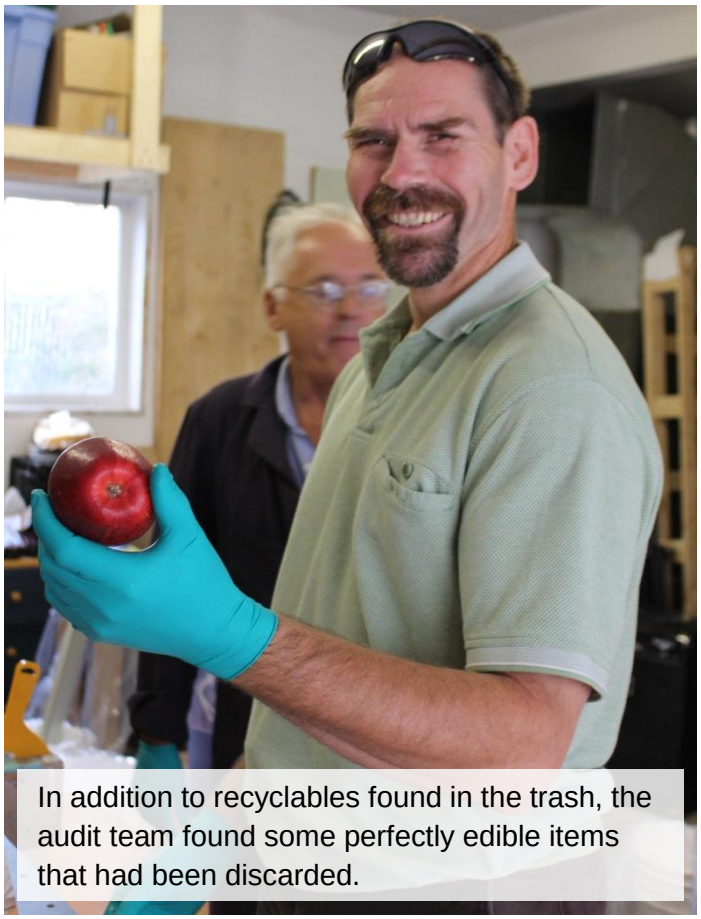
[21] Based on a cost of $7.68 per ream of 100% recycled paper
[22] Care should be taken to ensure no confidential paper is reused in this manner.
[23] A more in-depth review of LCAs for printed vs. digital media is recommended to assess the benefits of using digital technology to avoid paper use.

- Ensure printer feed instructions are clear to prevent wastage of letterhead, labels or other items that must be oriented in a certain direction when being fed into the printer
- Public education activities to encourage employees to print less
- Assess and amend policies and standard operating procedures that affect the amount of printing required (i.e. hard copies of records required, use of fax machines, etc.)
- Identify and work with employees who print the most sheets per month or year. (Such data may be stored on newer model network printers.)

The authors recommend further investigation into options to reduce paper use within GNWT departments.

3. Other Food-related Waste Items:

Keurig® K-cups® were a prominent feature of 'other food-related waste items'. Over the long term, it is recommended that ENR and SS consider replacing old Keurig® machines[24] with other single-serving coffee machines that allow one to put coffee grinds directly into the machine without the requirement for the excess plastic packaging. This would eliminate the co-mingled waste created by K-cups®, and allow for more composting of organic waste.



In addition to recyclables found in the trash, the audit team found some perfectly edible items that had been discarded.

Diversion Options

Once we have prevented waste from being generated, the next step is to increase the amount of diversion achieved through recycling and composting. The results of this study point to a variety of materials that could be targeted to increase overall diversion rates.

1. **Organic materials**

   Food waste made up more than one third (35.3%) of the waste disposal stream, and 10.6% of the total waste stream. When other compostable items, including boxboard and cardboard contaminated with food items are included,12.9% of the total waste stream (42.8% of the disposal stream) could have been composted at the City of Yellowknife's Centralized Compost Facility. If the paper towels and napkins mentioned in the previous section are not reduced at the source, they could also be composted, to achieve an additional 22.6% diversion (1,957 kg annually), which could bring the total diversion rate to nearly 93%. This would mean an estimated 10,554 kg could be diverted, and 898 kg would be disposed of annually.

   A composting program could be achieved by hiring a contractor[25] to collect compost on a weekly basis for disposal at the Centralized Compost Facility. Alternatively, as a longer term solution, the GNWT could try to negotiate an agreement with the property manager and the City of Yellowknife to provide a

[24] Keurig® K-cups® were specifically observed during this audit, however this discussion point applies equally to all other brands of single-serve coffee/tea makers that generate a waste 'pod' of plastic, foil, and/or other materials.
[25] The Association for Community Living is willing to provide such a service.

roll-off compost bin to be shared with other tenants, and/or other nearby buildings managed by the same company.

2. **Beverage containers**
   While beverage container recycling bins are accessible to staff on all floors audited, it is estimated that approximately one third of containers were still being sent to landfill. Since recycled and discarded containers were accidentally combined on the last day of the audit, it is not possible to determine whether some containers are more likely to be thrown away instead of recycled. As such, this report can only recommend that employees be encouraged to recycle all types of beverage containers. This may be achieved by:
   a. displaying posters showing types of containers accepted by the Bottle Shop in employee kitchen/coffee station areas; and
   b. placing a beverage container bin/bag in kitchen/coffee/boardroom areas to facilitate recycling.

3. **Fibre products (recyclable)**
   Despite the availability of recycling services for all types of paper products, some recyclable fibre products are being sent to landfill. Of the 67.5 kg sent to landfill during the week of the audit, 10.05 kg (14.9%) were recyclable products such as boxboard, office paper, glossy paper/magazines, newsprint, and cardboard. Office paper made up more than half the amount of discarded paper (5.77 kg). Removing waste bins from individual offices, and ensuring all offices have recycling bins, may help to reduce this waste by making it less convenient for people to throw recyclables in the garbage, and encourage them to put them in recycling bins instead.

4. **Metal**
   Metal items accounted for a small but recyclable portion of the waste stream (3.13 kg or 4.7% of the disposal stream for the week of the audit). The City of Yellowknife's recycling program accepts tin cans and other metals as part of its recycling program. It is not advertised, and therefore not widely known, that it also accepts all types of metal items as part of this category. Metal is baled by the City and shipped south to be fed through a grinder, and separated into different types of metals which can then be recycled into new products.

   Better labeling and public/employee education of what is accepted by the municipal recycling program could help improve metal recycling rates.

5. **Improving General Recycling Rates: Explore options to work with the property manager and recycling hauler to improve clarity of recycling stations.**
   Currently, three recycling bins, labeled "beverage", "boxboard/magazines", and "newspaper" are provided by the property manager to collect all recyclables (excluding confidential paper) on all Scotia Centre floors. Cardboard boxes should be flattened and left near communal recycling bins to be collected weekly with other recyclables.

   Recycling infrastructure exists to accommodate six general categories in Yellowknife: mixed paper/boxboard; mixed plastics (#2, 3, 5 & 7); office paper; cardboard; metal; and beverage containers[26]. Clean #1 PET clear plastic containers are also accepted at Bottle Shop, however there is

[26] Glass, other than refundable glass beverage containers, is not included here. While it is separated for collection, it is not currently being recycled at the solid waste facility.

no deposit on these items. While only three bins are clearly labeled for ENR/SS staff and/or the general public, the recycling hauler (DSS) also accepts cardboard (through the un-labeled system mentioned above), mixed plastics, cans, and glass containers. DSS has stated that if non-beverage container program containers, such as mixed plastics, cans and glass containers, are placed in the beverage container recycling bin, DSS will sort these containers and send them for recycling through the City of Yellowknife's program.

When one considers the weight of recyclable materials found in the garbage relative to the weight of the same material categories found in communal recycling bins (not including confidential paper recycling bins), it is clear that a significant amount of recyclable materials are being sent to landfill. As noted in *Figure 7: Proportion of Recyclable Materials Discarded as Garbage* in the results section, the proportion of recyclables found in the garbage is significant, especially with regard to mixed plastics (#2,3,5,7) (79% disposed); beverage containers and other clean #1 plastic containers (44% disposed); boxboard and mixed paper (43% disposed); and newsprint (41% disposed).

It is beyond the scope of this audit to assess why these recyclables are being placed in waste receptacles instead of recycling bins, however this study can offer suggestions to improve overall recycling rates. In addition to providing more public education materials or activities to communicate what is recyclable in Yellowknife and the benefits of recycling; communal recycling stations could be configured in a manner that reduces the potential for user confusion. Reduced user confusion can lead to higher recycling rates and reduced contamination of recycling bins with waste items.

Given the informal collection for all container types in the bin labeled 'Beverage', it should not be surprising if users are not aware that other recyclable, non-beverage containers can also be placed in this bin. At a minimum, this bin could be labeled with a full list (in words or representative images) of what can be recycled in this bin. Alternatively, two additional bins could be provided to collect mixed plastics and cans/metal items. Currently, non-beverage containers make up about 40% of the weight of items in this recycling bin. Audit staff have no information regarding the time required by DSS to sort these containers before they are sent to the Bottle Shop or the City's recycling programs, and how this sorting requirement might affect the cost of recycling charged to the property manager. It is, however, clear that pre-sorting of containers into their own clearly-labeled bins would reduce the amount of sorting required by DSS. In general, better source separation reduces contamination and can increase overall recycling rates.

Office paper is collected only through the confidential paper system, which has already been addressed under the *Source Reduction* section above.

Proper disposal of hazardous materials

The audit revealed that little hazardous waste is generated in offices: two alkaline batteries were discarded. Aside from alkaline and lithium batteries, the authors believe that some aerosol containers and possibly solvents could be discarded as a result of general office activities. To properly manage such items, it is recommended that at least one administrative assistant per floor maintain a pail for hazardous wastes which can then be sent for proper disposal. This could be managed in the same manner as the current practice for spent toner cartridges, on an as-needed basis as waste items build up. A Call-2-Recycle cellular phone and rechargeable battery collection box could also be part of the designated administrative assistant's waste collection kit.

Recommendations for Future Waste Audits

Overall, the waste audit went well, and future audits could follow the methodology outlined in this report. Lessons learned in this exercise can be useful for future waste audits:

1. Keep audit staff (sorters and weighers) consistent throughout the entire period of the audit.
2. Ensure clear communication with all sorters to ensure that materials are placed in consistent sort categories. A brief meeting at the end the first sorting session to review what materials went into each bin is useful. With only three to four sorters, this may not be necessary as they can communicate throughout the sorting process.
3. Consider separating food waste based on what is compostable in a backyard or worm bin, vs. what is compostable in a centralized compost facility. This may provide useful information for offices or regions that do not have access to a centralized facility.
4. Consider fully including bathroom waste. In retrospect, the washroom waste did not include any hazardous materials that sorters were not protected from by wearing simple nitrile gloves. A visual inspection upon opening the bag could reveal whether any hazards are present. The occupational health and safety committee could be contacted prior to committing to this option.
5. As more waste audits are performed, it may be useful to revise or simplify sort categories if some categories consistently contain little to no materials.

Conclusions / Overall Recommendations:

The waste audit conducted provided key insight to help ENR/Shared Services to reduce its ecological footprint with regard to waste. The Green Team recommends that the following steps be taken to reduce waste:

1. **Implement a composting program.** This has the potential to reduce the total waste stream (waste disposed and diverted) by 11% to 16%[27]. According to the waste audit, up to 53% of materials that are currently being disposed of consist of materials, such as food scraps, that could be diverted through a composting program. This translates to 1.30 to 1.57 tonnes of waste that could be diverted annually. Composting all food waste could also avoid one metric tonne of carbon dioxide equivalent (1 MT CO_2e) emissions annually.[28]
2. **Identify strategic actions to reduce office paper use.** If ENR and SS offices in Scotia Centre reduced their paper use by 35%, it would prevent an additional 15 MT of CO_2e emissions annually[29] relative to recycling 100% of what is currently being recycled. It could also result in up to $10,900 in cost savings from reduced purchase requirements and recycling costs.
3. **Explore options to reduce other waste items.** Addressing items such as bathroom waste, waste paper towels and Keurig® K-cups® could prevent approximately 575 kg of waste annually.
4. **Explore options to increase collection of recyclables at communal recycling stations.** This may include public education activities and materials, or a reconfiguration of communal work stations.
5. **Through cooperation with the Interdepartmental Green Advisory Team, explore options to conduct more waste audits across multiple GNWT departments and regions, and at different times of year if possible.** Waste audits would best be conducted in offices that have comprehensive waste reduction and recycling programs in place. More information is needed to identify the current status of waste reduction and recycling programs in GNWT occupied spaces (leased and owned). Summer students could help collect this information and conduct future waste audits. (Resource estimate: if all departments approve a waste audit of their offices, and provide staff time of three summer students for half days over the period of one week per department, a minimum of six to ten waste audits could be conducted in a summer.)
6. **Explore options to perform periodic audits of the Public Works and Services (PWS) Yellowknife Warehouse, and to track data of materials entering and leaving the facility for reuse, recycling and disposal**. The PWS warehouse receives all GNWT surplus office equipment in the North Slave Region, recycles e-waste, and sends any materials that are not sold to the public or reused by other departments to the landfill. As such, data collected on material flow in this warehouse would provide the best snapshot of disposal and diversion of large items. In the absence of all other audits, it would also provide the richest insight into GNWT-wide waste generation, diversion and disposal in the region.

[27] 10.6% if compost only food waste, 16% if compost food waste, bathroom waste, and compostable fibre products.
[28] Using USEPA's WARM model (Assuming 2 miles to landfill and to compost facility)
[29] Using USEPA's WARM model (Assuming 35% reduction equally split between the amount of paper currently being recycled and disposed of. Also assumes 2 miles to landfill and 932 miles to the closest recycling facility in Edmonton.)

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Appendix 1: Results for all Individual Material Categories

Waste Items for Disposal:

Category	Material	Gross Weight (kg)	Tare Weight (kg)	Net Weight (kg)	Volume (L)	% by Weight	% by volume	Material Types
Containers - recyclable	Refundable Beverage containers (all types)	2.18	0.05	0.639	18			65% pop, 15% juice, 20% dairy. *(70% recycle depot, 30% garbage cans)
	Cans - non-beverage container (aluminum & bi-metal)	0.12	0.05	0.07	0.2			tuna cans
	#1 (PET) plastic containers (non-BCP)	0.58	0.05	0.53	30			mostly dessert trays
	#2 (HDPE) plastic containers (non-BCP)	0.11	0.05	0.06	0.7			food container lids
	#3 (PVC) plastic containers (non-BCP)	0	0	0	0			
	#5 (PP) plastic containers (non-BCP)	0.45	0.05	0.4	10			90% dairy containers
	#7 (Other) Plastic Containers (non-BCP)	0.11	0.05	0.06	0.5			100% fruit cups
	Total			**1.759**	**59.4**	**2.61%**	**5.19%**	
Containers and rigid plastics / polystyrene - non-recyclable	Rigid plastic - no number	1	0.05	0.95	15			lids (pop and other), yogurt containers, toilet brush
	#4 (LDPE) plastic containers (non-BCP)	0.11	0.05	0.06	1			honey bottle
	#6 (PS) Plastic containers (non-BCP)	1.15	0.05	1.1	40			98% take out containers
	Polystyrene (no number)	0.74	0.1	0.64	50			take out containers, packaging styrofoam
	Glass containers (non-beverage)	0.96	0.05	0.91	1			pampered chef container, peanut butter jar
	Aseptic containers (cartons, tetra-paks)	0.12	0.05	0.07	1			
	Disposable utensils & straws	0.18	0.05	0.13	1			50% utensils, 50%straws

Category	Material	Gross Weight (kg)	Tare Weight (kg)	Net Weight (kg)	Volume (L)	% by Weight	% by volume	Material Types
	Plastic strapping	0.05	0.05	0	0.1			99% strapping
	Total			**3.86**	**109.1**	**5.72%**	**9.54%**	
Soft Plastics	Plastic bags	4.32	0.1	4.22	220.1			92.5% black, 7.5% clear
	Plastic wrap/wrappers	1.2	0.1	1.1	120			92.5% clear, 7.5% coloured
	Soft plastics	0.35	0.05	0.3	8			90% balloons, 1 binder cover
	Total			**5.62**	**348.1**	**8.33%**	**30.43%**	
Organics	Organics	24.85	1.05	23.8	50			coffee, fruit
	Total			**23.8**	**50**	**35.26%**	**4.37%**	
Fibre Products - Contaminated	Boxboard - waxed or contained food (contaminated)	0.91	0.05	0.86	25			95% microwavable food packaging, 5% chocolate milk
	Paper wrap	0.5	0.05	0.45	20			waxed paper, food/gum/candy wrappers
	Total			**1.31**	**45**	**1.94%**	**3.93%**	
Office supplies	Carbon paper	0.05	0.05	0	0.1			100% carbon paper
	Envelopes	0.55	0.05	0.5	15			90% plastic, 10% plastic/bubble
	Pens/markers	0.15	0.05	0.1	0.5			95% pens, 5% markers
	Labels/backings	0.32	0.05	0.27	4			80% labels
	Total			**0.87**	**19.6**	**1.29%**	**1.71%**	
Fibre Products (recyclable)	Boxboard - clean	1.06	0.05	1.01	30			tea, cereal, gum packets, iced tea packaging, Kleenex, cookies, cigarettes
	Fine paper (office paper)	5.87	0.1	5.77	100			65% white, 35% mixed
	Glossy paper/magazines	1.45	0.05	1.4	30			20% magazine, 80% brochures
	Newspaper	0.84	0.05	0.79	15			
	Cardboard - clean	1.13	0.05	1.08	50			file folders, shoe box

Category	Material	Gross Weight (kg)	Tare Weight (kg)	Net Weight (kg)	Volume (L)	% by Weight	% by volume	Material Types
	Total			**10.05**	**225**	**14.89%**	**19.67%**	
Fibre Products (Compostable)	Disposable cups (paper)	1.32	0.05	1.27	50			99% cups and sleeves, 1% paper plates
	Kraft/paper bags	0.22	0.05	0.17	20			food take out bags
	Paper towel/tissue	3.52	0.05	3.47	50	5.14%		
	Cardboard - waxed or contained food (contaminated)	0.2	0.05	0.15	2			pizza box
	Total			**5.06**	**122**	**7.50%**	**10.66%**	
Bathroom Waste	Bathroom waste (floors 5, 6 & 7)	7.31	0.2	7.11	120			97% paper towels, 3% feminine hygiene products/paper rolls/waste
	Total			**7.11**	**120**	**10.53%**	**10.49%**	
Metal	Non-ferrous metal	0.1	0.05	0.05	0.25			steel
	Ferrous metal	3.18	0.05	3.13	3			
	Total			**3.18**	**3.25**	**4.71%**	**0.28%**	
E-waste and Batteries	Batteries	0.08	0.05	0.03				2 alkaline
	Electronics	1.32	0.05	1.27	3			90% floppy disks, 8% CDs, 1 calculator
	Total			**1.3**	**3**	**1.93%**	**0.26%**	
Other Food-related waste items	K-Cups	2.21	0.05	2.16	10			*100% cups, but k-cups still had coffee inside
	Foil/foil wrappers	0.32	0.05	0.27	20			100% snack wrappers
	Total			**2.43**	**30**	**3.60%**	**2.62%**	
Other	Rags/textiles	0.14	0.05	0.09	0.5			bear spray holster x 2
	Other/mixed materials	0.41	0.05	0.36	5			plastic travel mug, gum packets, paper, food with plastic liner
	Other	0.58	0.05	0.53	2			rope, plate, thermal paper/receipts, wax, Blistex
	Total			**0.98**	**7.5**	**1.45%**	**0.66%**	
Contaminants Collected from Recycling Bins	**Total**	**0.22**	**0.05**	**0.17**	**2**	**0.25%**	**0.17%**	

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Category	Material	Gross Weight (kg)	Tare Weight (kg)	Net Weight (kg)	Volume (L)	% by Weight	% by volume	Material Types
Total of all Materials:				**67.50**	**1143.95**	**100.00%**	**100.00%**	

Recycled Items:

Material	Gross Weight (kg)	Tare Weight (kg)	Net Weight (kg)	Net Weight (Recycled BCs = 70% of total) (kg)	Approx Volume (L)	Proportion of Diversion Stream (kg)	Proportion of Diversion Stream (L)	Material Types
Beverage Containers	2.18	0.05	2.13	1.491	42	0.94%	3.33%	Glass <1L = 2; Plastic <1L = 20; Tetra pak <1L = 4; Milk <1L = 12; Gable top>1L = 1; Al cans<1L = 36
Plastics (#2,3,5,7)	0.19	0.05	0.14	0.14	2	0.09%	0.16%	50% yogurt, 1 Tim iced cap, 1 coffee whitener
Cans (non-BCP)	0.5	0.05	0.45	0.45	4	0.28%	0.32%	coffee tin lids, soup tins
Boxboard and Mixed Paper	3.2	0.05	3.15	3.15	30	1.99%	2.38%	
Cardboard	6.72	0.05	6.67	6.67	50	4.22%	3.96%	95% publication boxes, 1 toner box
Fine/Office Paper	0.1	0.05	0.05	0.05	1	0.03%	0.08%	80% white, 20% beige
Glass (other than Beverage containers)			0	0		0.00%	0.00%	
Newsprint	1.18	0.05	1.13	1.13	15	0.72%	1.19%	
Confidential paper (weekly average)			144	144	1118.06	91.72%	88.59%	Office paper
Contaminants (Waste Items Deposited in Recycling Bins)	0.22	0.05	0.17	0.17	2	0.11%	0.16%	Tim Hortons cups, dish soap container, #1 clam shell, paper/plastic wrappers, beverage container lids
Total Net Weight			**158.72**	**157.08**	**1,262.062**			

Appendix 2: Waste Composition Sort and Weigh forms

Recorder: _____ Date: _____

Material	Gross Weight	Tare Weight	Net Weight	Material Types	Producer's Name
(i.e. envelope)				(10% windowed)	(Brand name)
Cans - non-beverage container (aluminum & bi-metal)					
Refundable Beverage Containers (all types)					
#1 (PET) plastic containers (non-BCP)					
#2 (HDPE) plastic containers (non-BCP)					
#3 (PVC) plastic containers (non-BCP)					
#4 (LDPE) plastic containers (non-BCP)					
#5 (PP) plastic containers (non-BCP)					
#6 (PS) Plastic containers (non-BCP)					
#7 (Other) Plastic Containers (non-BCP)					
Rigid plastic - no number					
Glass containers (non-beverage)					
Aseptic containers/tetra paks (non-beverage)					
Coffee grounds					
Food waste / organics					
Cardboard - waxed or contained food					
Cardboard – clean					
Disposable cups (paper)					
Disposable cups (plastic)					
Disposable utensils					
K-cups / Stir sticks					
Total Net Weight					

Recorder: _____

Date: _____

Material	**Gross Weight**	**Tare Weight**	**Net Weight**	**Material Types**	**Producer's Name**
(i.e. envelope)				(10% windowed)	(Brand name)
Blue prints					
Boxboard					
Carbon paper					
Envelopes					
File folders					
Fine paper (office paper)					
Glossy paper/magazines					
Newspaper					
Kraft/paper bags					
Kraft paper					
Paper towel/tissue					
Paper wrap					
Plastic bags					
Plastic strapping					
Binders					
Pens/markers					
Cerlox bindings					
Rags/textiles					
String					
Wood					
Total Net Weight					

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Recorder: _____

Date: _____

Material	Gross Weight	Tare Weight	Net Weight	Material Types	Producer's Name
(i.e. envelope)				(10% windowed)	(Brand name)
Antifreeze containers					
Aerosol Cans					
Toner cartridges					
Lubricants					
Motor oil					
Batteries					
Tires					
Solvents					
Paints					
Non-ferrous metal					
Ferrous metal					
Other					
Total Net Weight					