

SOLID NON-HAZARDOUS WASTE AUDIT

(MAY 2006-APRIL 2007)

**UNIVERSITY OF TORONTO
TORONTO, ONTARIO**

**ENVIROVISION INC.
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1.0 INTRODUCTION

The University of Toronto (“U of T”) is a large multi-building, multi-facility community that has approximately 60 thousand students, staff and faculty occupying several major city blocks with over 140 buildings that generate waste and recycling materials. This study audits representative samples of waste from various buildings and facility types on campus and, as much as possible, compares the findings to last year’s study. At the same time it audits new areas to better understand the composition and quantities of the solid waste generated.

2.3 Purpose

The purpose of the solid non-hazardous waste audit is described as follows:

- to comply with the Ministry of the Environment’s (“MOE”) 3R’s Regulation, specifically Part X of Ontario Regulation (“O. Reg.”) 102/94 – Waste Audits and Waste Reduction Workplans (“O. Reg. 102/94”) which requires educational institutions to conduct waste audits and prepare waste reduction plans on an annual basis,
- to determine the current annual waste diversion rates for U of T resulting from existing waste reduction, reuse, and recycling programs,
- to identify and quantify the composition and point of generation of waste at U of T, and
- to identify any additional opportunities for waste reduction and diversion, which may exist at U of T.

1.2 Scope

Generally stated, the scope of work for this project was as follows:

- to collect data pertaining to the waste collection practices and one day waste audit data of select buildings at U of T, and select compactor scale waste loads audited at a transfer station;
- to determine the total quantity of waste diverted from landfill through current reduction, reuse, and recycling initiatives by auditing files provided and
- to complete a report on the waste audit’s findings and prepare a Waste Audit Summary and a Waste Reduction Action Plan.

2.0 WASTE AUDIT RESULTS

2.3 Methodology

Waste categories were established prior to the audit based on the MOE's requirements for source separation at Educational Institutions:

- Corrugated Cardboard
- Mixed Paper
- Mixed Containers
- Polystyrene
- Wood
- Metal
- Yard Waste
- e-waste
- Special Plastics
- Organic Waste

In coordination with the waste management supervisor and caretaking department, 24 hr samples of bagged waste were kept aside the day before the audit. Each area of the building was designated with a different colour tab. The waste was audited by two qualified staff persons using containers to keep materials separate, a conversion of quantity counts to weight for containers, a portable scale, and relevant safety gear. The source separated containers, paper towels and organic waste bins were also audited to verify the volume to weight conversions. Extra safety supervision was provided on the site during the audit of laboratories. The audit was performed outdoors during the summer of 2007; therefore, Envirovision considers that this constitutes an indicative sample of the activities and waste types generated during the regular school year.

The compactor scale loads of waste were audited at the King transfer station on Shorncliffe Road, Toronto Ontario, with emphasis placed on qualitative observation and large and special items that were perhaps overlooked at the 24 hours sample level in the buildings. Observations were made for furniture, electronics scrap metals, construction and contractor waste, and source separated recyclables that should not have been thrown in the garbage by staff. Many pictures and even some weights were noted as well as other interesting observations.

Annual tonnages supplied by the U of T were re-checked to the best of our ability. A week's accumulation of bottles and cans collected by the city and cardboard at selected locations were weighed as well as a sample of totes used in organics and mixed container programs.

2.2 Sources of Waste Generation

A review of U of T activities identified the following sources of waste generation:

- Office & Administration
- Washrooms
- Cafeteria
- Laboratories
- Classrooms, hallways, and public areas
- Washrooms

2.3 Waste Quantities, Composition and Distribution

The waste type, composition and distribution at U of T were determined by performing an audit of all solid non-hazardous waste generated at the facility over a twenty four hour period and with select off site auditing of compactor scale waste loads. The total waste quantities diverted from landfill through current reduction and recycling initiatives and the total waste shipped to landfill from May 2006 to April 2007 were provided by U of T.

The solid waste generated at U of T's St. George Campus was divided in the following generation areas:

Name	Address	Area
Huron Street-215 (HU)	215 Huron Street M5S 1A2	Office & Administration, Washrooms, Kitchenettes, Hallways, Classrooms, and Public Space
Bahen Centre for Information Technology (BA)	40 St. George Street M5S 2E4	Office & Administration, Washrooms, Hallways, Classrooms, and Public Space
Architecture Building (AR)	230 College Street M5T 1R2	Office & Administration, Washrooms, Cafeteria, Hallways, Classrooms, and Public Space
Best Institute (CB)	112 College St M5G 1L6	Office & Administration, Washrooms, Laboratories, Hallways, Classrooms, and Public Space
Spadina Crescent - 1 (SP)	1 Spadina Crescent M5S 2J5	Office & Administration, Washrooms, Laboratories, Kitchenettes, Hallways, Classrooms, and Public Space
Wallberg Building (WB)	184-200 College Street M56 3E5	Office & Administration, Washrooms, Laboratories, Hallways, Classrooms, and Public Space
Medical Sciences Building (MS)	1 King's College Circle M5S 1A8	Office & Administration, Washrooms, Cafeteria, Hallways, Classrooms, and Public Space
Ontario Institute for Studies in Education (OI)	252 Bloor Street West M5S 1V6	Washrooms, Hallways, Classrooms, and Public Space
Woodsworth College (WW)	119 St. George Street M5S 1A9	Office & Administration, Washrooms, and Cafeteria
Ramsay Wright Laboratories (RW) - Zoology Department	25 Harbord Street M5S 3G5	Office & Administration, Washrooms, Kitchenettes, Laboratories, Hallways, Classrooms, and Public Space
Simcoe Hall (SI)	27 King's College Circle M5S 1A1	Office & Administration, Hallways, Classrooms, and Public Space

One of the key aspects of *O. Reg. 102/94* is for waste generators to get a good understanding of the areas of their operation that generate the most waste, how it is generated and what the composition is. In so doing, one can be aware of where to focus the recycling and waste reduction efforts.

During the one-day waste audit conducted in the summer of 2007, the areas generating most of the waste by weight are as follow:

• 215 Huron Street	83.9 kilograms
• Bahen Centre	100.3 kilograms
• Architecture Building	18.2 kilograms
• Best Institute.	84.8 kilograms
• Spadina Crescent - 1	37.5 kilograms
• Wallberg Building	139.3 kilograms
• Medical Sciences Building	181.2 kilograms
• Ontario Institute for Studies in Education	18.5 kilograms
• Woodsworth College	36.6 kilograms
• Zoology	197.2 kilograms
• Simcoe Hall	39.1 kilograms
• Outdoors	391.4 kilograms

During the waste audit, a total of approximately 1,328.14 kilograms of waste was audited. Spread sheets showing the individual waste categories and the weight of each category generated from all areas of U of T are included in Appendix 1.

Based on the total amount of waste sorted, the percentage of waste generate by each building were:

• 215 Huron Street	6.32 %
• Bahen Centre	7.55%
• Architecture Building	1.37%
• Best Institute	6.39%
• Spadina Crescent - 1	2.82%
• Wallberg Building	10.49%
• Medical Sciences Building	13.64%
• Ontario Institute for Studies in Education	1.39%
• Woodsworth College	2.76%
• Zoology	14.85%
• Simcoe Hall	2.94%
• Outdoors	29.48%

Based on the total amount of waste sorted, the areas of the buildings audited within U of T generating the greatest quantities of waste were:

- 215 Huron Street
 - Kitchenettes 41.1 %
 - Other (All waste from trades, except paper towels) 21.7%
 - Office and Administration 17.2 %

- Bahen Centre
 - Hallways, Classrooms, Public Space 69.2 %
 - Office and Administration 20.7 %

- Architecture Building
 - Hallways, Classrooms, Public Space 58.2 %
 - Office and Administration 11.5 %

- Best Institute
 - Laboratories 56.5 %
 - Hallways, Classrooms, Public Space 17.3 %

- Spadina Crescent - 1
 - Kitchenettes 50.9 %
 - Washroom 20.0%

- Wallberg Building
 - Laboratories 61.9 %
 - Office and Administration 22.0 %

- Medical Sciences Building
 - Hallways, Classrooms, Public Space 59.2 %
 - Office and Administration 17.2 %

- Ontario Institute for Studies in Education
 - Hallways, Classrooms, Public Space 61.2 %
 - Washroom 25.9 %

- Woodsworth College
 - Cafeteria 38.3 %
 - Office and Administration 35.0 %

- Zoology
 - Laboratories 57.6 %
 - Hallways, Classrooms, Public Space 22.2 %

- Simcoe Hall
 - Kitchenettes 74.4 %
 - Office and Administration 18.2 %

Based on the total amount of waste sorted, the largest primary categories of waste generated during the audit were:

- 215 Huron Street
 - Non- recyclable 46.01 %
 - Paper Towels 25.39 %
 - Organic 15.97 %

- Bahen Centre
 - Non- recyclable 68.1 %
 - Mixed Paper 22.03 %
 - Mixed Containers 4.59 %

- Architecture Building
 - Non- recyclable 45.05 %
 - Paper Towels 21.43 %
 - Mixed Paper 19.23 %

- Best Institute
 - Laboratories Waste 31.13 %
 - Paper Towels 23.00 %
 - Non- recyclable 18.87 %

- Spadina Crescent - 1
 - Non- recyclable 29.80 %
 - Paper Towels 23.60 %
 - Mixed Containers 22.60 %

- Wallberg Building
 - Non- recyclable 65.08 %
 - Paper Towels 19.10 %
 - Mixed Containers 6.03 %

- Medical Sciences Building
 - Non- recyclable 42.11 %
 - Mixed Paper 27.70 %
 - Paper Towels 11.04 %

- Ontario Institute for Studies in Education
 - Non- recyclable 43.78 %
 - Paper Towels 25.95 %
 - Mixed Containers 20.54 %

- Woodsworth College
 - Paper Towels 29.51 %
 - Non- recyclable 23.22 %
 - Organic Waste 22.40 %

- Zoology
 - Non- recyclable 37.73 %
 - Laboratories Waste 21.45 %
 - Paper Towels 18.15 %

- Simcoe Hall
 - Non- recyclable 49.87 %
 - Mixed Containers 18.67 %
 - Paper Towels 13.81 %

NOTES FOR OFF SITE AUDITS AT TRANSFER STATION

Please refer to photographs.

August 15, 2007

Sidney Smith Hall (SS) - 100 St. George Street M5S 3G3

- paper fiber animal bedding bags 21.96 kilograms
- mixed containers 31.35 kilograms + approximately 10-15% of the entire load
- cardboard 8.7 kilograms
- styrofoam 1.6 kilograms
- 20 bags of laboratories waste (i.e. vials, containers, paper towels, and gloves)
- 3 bags of insulation
- 1 large plant pot
- 2 paint cans
- 1 complete plastic waste bin, labeled as “ U of T caretaking”

New College - 300 Huron Street M5S 2Z3

- 10-12 bags mixed containers (at least 25-30% of the entire sample)
- mixed fiber (paper 24.8 kilograms, newspaper 33.7 kilograms, and cardboard 25.6 kilograms)
- miscellaneous (6 bags insulation, 5 bags yard waste, 3 hard plastic boxes, and 1 bag used clothing)
- organic waste throughout the entire sample

August 16, 2007

Donnelly Ctr. Cellular & Biomolecular Res (DC) - 160 College Street

- paper towels 27.60 kilograms
- mixed containers 5.85 kilograms
- bubble plastic wrap 2.75 kilograms
- mixed fiber 3.1 kilograms
- 7 hard plastic boxes 6.9 kilograms

Earth Sciences Centre (ES) 33 Willcocks Street M5S 3B3

- styrofoam 11.65 kilograms
- paper towels and full rolls of toilet paper 36.2 kilograms
- 5 bags mixed containers 41.25 kilograms
- e-waste (scanner and some other type of machine) 32.25 kilograms
- miscellaneous (one large piece of luggage 7.45 kilograms and 8 large plastic buckets 11.2 kilograms)

August 17, 2007

Spadina Crescent 1

- paper towels 18.75 kilograms
- styrofoam 14.60 kilograms
- newspaper 8.64 kilograms
- miscellaneous (plastic trays 6.15 kilograms, yard waste 11.43 kilograms)
- trace amounts of mixed containers found on the entire load (approximately 5 % of the entire sample)

John P. Robarts Library Building (RL) 130 St. George Street M5S 1A5

- paper towels 8.9 kilograms
- mixed fiber (newspaper and cardboard) 11.7 kilograms
- bubble plastic wrap 4.4 kilograms
- styrofoam 1.9 kilograms
- mixed containers (approximately 2% of the entire sample)

August 20, 2007

Medical Sciences Building

- paper towels 6.41 kilograms
- mixed fiber 1.20 kilograms
- mixed containers 0.36 kilograms
- styrofoam 0.60 kilograms
- miscellaneous (one large cardboard bin with metal lid 3.10 kilograms)

Ontario Institute for Studies in Education

- mixed fiber, including cardboard and paper (approximately 65-70% of the entire sample)
- paper towels 45.10 kilograms
- mixed containers 9.76 kilograms
- e-waste (computer/printer parts and ink cartridges) 1.45 kilograms

2 daycares

- diapers

500 metric tonnes of concrete were also recycled on philosophers walk and pedestrian pathways for capital projects.

3.0 DIVERSION PROGRAMS & WASTE MANAGEMENT SYSTEMS

3.1 Waste Diversion Programs

Recycling and reuse programs have been initiated at U of T for the following materials:

Recycled

- Mixed Fiber (mixed paper) and paper towels
- Metal
- Wood
- Yard Waste
- Pallets
- Corrugated Cardboard
- Toner Cartridge
- Batteries
- Fluorescent Lamps
- Foam Packaging (Polystyrene)
- Organics (Food Waste)
- Mixed Containers (Bottles and Cans)
- Tires
- Soil
- e-Waste (electronic equipment), Special Plastics and Transparencies
- Concrete

Reused

- Furniture, equipment and supplies, office supplies, clothing, books, etc.

The amount of waste diverted from landfill due to the above initiatives is presented in Table 1 entitled “*Waste Diversion Summary (May 2006-April 2007)*” and found on the following page.

Table 1: Waste Diversion Summary (May 2006-April 2007)

Waste Category	Quantity (metric tonnes) ^A
Recycled	
Mixed Paper	928.4
Metal	113.52
Wood	102.52
Yard Waste	36.60
Pallets	7.03
Corrugated Cardboard	300.82
Toner Cartridge	0.84
Batteries	3.61
Fluorescents	9.48
Polystyrene	4.08
Organics	1,705.77
Bottles and Cans	250.88
e-Waste and special plastics	49.56
Tires	0.00
Concrete	20.00
Soil	14.40
Total Recycled	3,547.51
Reused	
Equipment and Supplies	47.77
Total Reused	47.77
Total Recycled + Reused	3,595.28

A - Based on the information provided by U of T.

3.2 Waste Disposal Systems

Approximately 2095.86 tonnes of general waste was generated by U of T from May 2006 to April 2007.

3.3 Current Annual Diversion Rate

Table 2: Waste Management Summary

Waste Management	Quantity(metric tonnes)	Percent (%)
Disposed (general waste)	2,095.86	36.83
Reused	47.77	0.84
Recycled	3,547.51	62.33
Generated = Disposed + Reused + Recycled	5,691.14	100.0

A - Based on the information provided by U of T.

Based on the total amounts of waste generated and materials recycled and reused, the current annual diversion rate through existing programs at U of T is 63.17 %. This percentage could be increased if U of T chose to include other reuse programs such as milk, egg and bread trays, etc. To be consistent with past record keeping these considerations are not part of the scope of this study. Also, there are countless vendors and departments in such a large community as U of T that it is difficult to track individual reuse programs although we acknowledge that they do exist. Furthermore, the projection section of the waste reduction and recycling workplan summary has been left blank as per discussions with U of T staff so that they may fill it in as appropriate to their objectives.

As part of fulfilling the *O. Reg. 102/94* requirements, institutions are required to identify who is responsible for implementing each action that will lead to further improvements in the waste reduction programs. Given the large and complex nature of the U of T, these issues were discussed at various site meetings and involved various people at the departmental, faculty, facility and business unit level.

4.0 CONCLUSIONS AND RECOMMENDATIONS

U of T is a leader and a winning institution in its field when it comes to waste reduction and recycling, accepts a wide range of materials for recycling, and the depth and breadth of the programs is impressive. The data used to calculate diversion rates is as accurate as can be and it has been checked, re-checked and makes use of conservative estimates. As previously mentioned, although other programs for reuse have been excluded, they would only further add to the impressive numbers.

Based on the findings of our solid non-hazardous waste audit conducted at U of T, the following conclusions and recommendations are intended to maximize U of T's waste diversion potential:

1. In 2006, U of T sent approximately 2,095.86 metric tonnes of waste to landfill and diverted approximately 3,595.28 metric tonnes of waste from landfill through recycling and reuse. This represents a diversion rate of approximately 63.17 %.
2. According to *O. Reg. 102/94*, the Waste Audit Summary (Appendix 2) or the Waste Reduction Workplan (Appendix 3) must be posted at U of T in a place where employees/students can review it. Furthermore, according to *O. Reg. 102/94*, when the summary is posted, the workplan should also be available for review for any of U of T's employees/students who may requests it.
3. A copy of the waste audit and reduction workplan must be retained on file for at least five years. Other reports and studies done in the past should also be available for review and incorporated in future audits for the sake of comparison and to track progress. *O. Reg.102/94* audits should be conducted annually.
4. Make use of multi-compartment containers for waste collection and recycling as much as possible. This practice is excellent. Given the large size and numerous buildings and departments, there is still a presence of "solitary" waste bins on campus. If an individual is carrying a recyclable material on their person, he/she is more than likely to throw it in a convenient waste can near by than to carry it for long stretches looking for a recycling centre. We recommend eliminated lonely waste bins and only having waste bins that are attached or close to recycling containers. More work is needed to supply depots, especially in the classroom.
5. In general, public areas (i.e. classrooms, hallways) generate more waste and have lower

capture rates of materials.

6. Given the huge size of U of T, both from a geographical foot print point of view and the large numbers of faculties, schools, colleges, administrative and business units, it is important for all of these different communities within the greater community to be aware of what the programs are, who to contact for help or questions and to have as much consistency as possible across the campus.
7. The full waste load audits at the transfer station as shown in the attached tables revealed a very important observation about sample size and procedure. The twenty four hour samples, primarily of bagged waste kept aside by caretaking, were not indicative of large recyclable items and/or full bags of source separated recyclables that were observed in the compactor scale audits. Had this extra step not been taken, the capture rate of a given material would have been greatly skewed.
8. Outside garbage bins represent a significant proportion of waste generated. Informal observation reveals a high percentage of recyclable materials. An audit to quantify this will be helpful in establishing an outdoor recycling system.
9. Continued training of F&S staff to minimize bags of clean material ending up in the garbage.

Suggestions for next audit:

- quantify leaf, yard waste and grass mulching;
- working on develop new and better sign;
- reduce “solitary” bins;
- purchased 60 additional bins to be distributed on campus;
- reuse old recycling depots instead of throwing out;
- alternate winter and summer audits year by year;
- reuse interlock paving; and
- Sustainability Office to collect single sided paper and redistribute.

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