

## **Appendix D – City of Winnipeg Residential Waste Composition Study 2009**

# City of Winnipeg Residential Waste Composition Study 2009

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Prepared for  
Multi-Material Stewardship Manitoba (MMSM)  
Province of Manitoba  
Manitoba Product Stewardship Corporations (MPSC)

Submitted by

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## City of Winnipeg Residential Waste Composition Study 2009

### 1.0 Introduction

Multi-Material Stewardship Manitoba (MMSM) commissioned a residential waste composition study in the City of Winnipeg in 2008. In addition to MMSM, the Province of Manitoba and the Manitoba Product Stewardship Corporations (MPSC) also funded the study.

The main goal of the study was to provide reliable information on the amounts and composition of all waste materials generated from residential dwellings in the City of Winnipeg. Specifically, the objectives of the study were as follows:

- to determine overall residential solid waste generation rates,
- to determine the composition of the residential waste stream,
- to compare single-family dwelling and multi-family dwelling waste generation characteristics
- to provide the basis for a comparative analysis of residential generation and composition collected in the 1996, 1998, and 2000 Winnipeg Waste Composition studies
- to determine the set-out and participation rates in the sample areas studied, and
- to describe the City of Winnipeg's waste and recycling collection system.

To achieve these goals, waste material from 10 single family dwelling (SFD) areas and 3 multi-family dwellings (MFDs) was collected and sorted over a two-week period. Two low income areas, 6 middle income areas (2 with autobin service<sup>1</sup>, 4 with curbside service) and 2 high income areas were selected for the SFD sample group. Three MFDs were also sampled: one from a Lower/Middle Income area, one from a Middle/High Income area, and a Seniors' Residence.

The recycling services for single-family homes are contracted to Canadian Waste, which services these homes with multi-compartment recycling trucks. The collection contract includes front curbside collection and backlane collection. Furthermore, there are six recycling depots in the City of Winnipeg.

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<sup>1</sup> Autobin service refers to areas in which a four to six cubic metre bin services a number of households. These bins are typically placed in the back lanes and are emptied by City of Winnipeg trucks.

## 2.0 Study Methodology

### 2.1. Timeframe

Data collection took place in two periods: June 2008 and February 2009. In each period, the waste from 10 single family dwelling (SFD) areas and 3 multi-family dwellings (MFDs) was collected and sorted over a two-week period.

The breakdown of SFD areas involved in the study is as follows:

- 2 low income areas
- 6 middle income areas
  - 2 with autobin service
  - 4 with curbside service
- 2 high income areas

The breakdown of MFD areas is as follows:

- 1 Lower/Middle income area
- 1 Middle/High Income area
- 1 Seniors' Residence

### 2.2. Description of Sample Areas

Tables 1 and 2 below presents a description of the Single-Family (SF) and Multi-Family sample areas used for data collection in this study.

**Table 1: Single-Family Sample Area Profiles Selected for Winnipeg 2009 Waste Composition Study**

Area Number	Number of Samples	No. of persons per HH	Median HH income (2006 Census)	Income Level	Collection Type
1	2	3.0	\$24,610	Low income	Backlane collection
2	2	2.8	\$61,314	Middle-income	Curbside collection
3	2	2.2	\$45,244	Middle Income	Backlane autobin collection in block <sup>2</sup>
4	2	2.3	\$52,045	Middle Income	Curbside collection
5	2	3.1	\$90,041	High income	curbside collection
Winnipeg average (Stats Can 2006)		2.3	\$62,955 (2005) <sup>3</sup>		

<sup>2</sup> Ibid as footnote 2)

<sup>3</sup> Although the Census information is for 2006, the Median family income is 2005 (reference: <http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/details/Page.cfm?Lang=E&Geo1=CSD&Code1=4611040&Geo2=PR&Code2=46&Data=Count&SearchText=Winnipeg&SearchType=Begins&SearchPR=01&B1=All&Custom=>)

**Table 2: Multi-Family Sample Area Profiles Selected for Winnipeg 2009 Waste Composition Study**

Area	No. of units	dimensions	Income level
Bldg 1	93 units (9 story complex)	4 x 2.25 cubic metre waste bins, 9 recycling carts	Lower/Middle Income
Bldg 2	60 units	2 x 3 cubic metre waste bins, 6 recycling carts	Middle/High Income
Bldg 3	53 units	1 x 3 cubic metre waste bin, 4 recycling carts	Seniors' Residence

### 2.3. *Sorting*

All sorting took place in a garage (converted firehall) at the City of Winnipeg Building located at 1466 William Ave. A container as well as a recycling dumpster were placed outside the building for the materials post-sorting. The sort data was recorded on data collection sheets as containers were filled. The full container weights minus the tare weights were entered into spreadsheets used to analyze the data. There were separate data sheets for garbage sorts and for material collected from blue boxes and MFD recycling bins.

### 2.4. *Data Analysis*

Data from the daily sort sheets was entered into Microsoft Excel spreadsheets. Each day of sort information had a separate spreadsheet file that was then linked to a main summary document.

When developing the final citywide generation numbers a weighting factor was applied to the data from each sample area to adjust for the different proportions of each socio-economic area in the overall population. For the purposes of developing a weighting factor, the citywide population was apportioned using data collected during the 2006 Statistics Canada census. Due to seasonal variations in yard waste generation no annualized estimate can be made. ***Unless otherwise stated yard waste has been excluded from all remaining sections of this report.***

### 2.5. *Changes in Study Methodology*

The methodological changes between the 2009 & 2000 studies and the 1996 & 1998 studies are outlined in Table 3.

**Table 3: Methodological Changes Between Winnipeg Waste Composition Studies**

Parameter	1996	1998	2000	2008
Methodology for assigning relative weighting to each sample area (i.e. low, medium and high income)	City of Winnipeg Assessment Department data (i.e. property value)		1996 Statistics Canada Census data <sup>1</sup>	2006 Statistics Canada Census Data
City of Winnipeg population figures		652,446	618,475 – reduced 1998 value by approximately 5% <sup>2</sup>	633,451 (taken from 2006 Census data)

Notes:

- 1) The change in methodology for assigning relative weighting to each sample area was made based on the fact that the correlation between average household income and waste generation is closer than the correlation between the assessed value of properties and waste generation, given that waste generation is normally more closely related to the amount of goods purchased by the household than the value of their home.
- 2) The adjustment to the City of Winnipeg population figures in 2000 was made to exclude the people living in communities adjacent to the city who do not fall within City of Winnipeg jurisdiction.

These methodological changes mean comparisons between the various studies need to be made with care.

**2.6. Definition of Recyclable Materials**

The list of materials that are currently accepted in the City of Winnipeg’s recycling program is provided in Appendix 1. It should be noted that, in addition to all materials eligible for MPSC funding, the City also collects a number of additional materials (e.g. Laminated Paper Packaging and Composite Cans).

**2.7. Waste Generation Rates**

Table 4 presents the per capita waste generation rates for the sample areas included in the study. Based on this data, the estimated total (waste + recyclables) per capita weighted average waste generation rate for the City of Winnipeg is 298 kg/capita/year.

**Table 4: Annual Total Waste (waste + recyclables) Generation Rates**

	Annual Per Capita Total Generation (kg/cap)
Low Income	335
Middle income (autobin)	335
Middle income (non autobin)	282
High income	272
Multi-family dwellings	266
Weighted Average	298

Multiplying this estimated figure by the current population of Winnipeg (633,451) results in approximately 188,712 tonnes of total waste generated (waste + recyclables) in the residential sector.

According to the City's web site<sup>4</sup>, the actual tonnage of residential waste, *including yard waste* delivered to City of Winnipeg Landfill sites in 2008 was 229,845 tonnes. This would also include waste dropped off directly by residents, as well as bulky items and white goods, all of which would not be captured in the waste characterization study results.

Also according to the City's web site<sup>5</sup>, the quantity of recyclable material collected in 2008 was 45,560 tonnes. This includes curbside and multi-family recycling, as well as tonnes collected through depots (2,386 tonnes).

### 2.8. Autobin Area Generation Rates

The autobin area sampled (middle income) had a generation rate of 335 kgs/cap/yr. Along with the low income areas, this is the highest generation rate of all the sampled areas and compares to 282 in the middle-income non-autobin sample area. While the 2000 audit results indicated that the autobin area generated 75 kgs/cap/yr of combined wood waste (compared to a wood waste generation rate of between 5 and 18 kgs/cap/yr in the other sample areas), the 2009 audit results do not indicate a higher generation of construction and renovation waste for the autobin area compared to the others.

However, caution must be exercised in interpreting these numbers, as construction and renovation waste are typically punctual activities that may not be captured in the timeframe of an audit period.

### 2.9. By Material Generation Rate

Table 5 presents the population of Winnipeg according to income groups. This information was derived using the representative proportions of each group, taken from the 2006 Census data (more recent information was not available). These ratios were then applied to the 2006 population number to obtain the distribution of Winnipeg's population by income group. The population by income group information was in turn used to calculate the Estimated Annual Generation in tonnes per year for the City of Winnipeg (see last column in Table 6).

**Table 5: Split of Winnipeg Population According to Annual Income Level**

	Single Family Low Income	Single Family Middle Income (autobin)	Single Family Middle Income (non-autobin)	Single Family High Income	Multi-Family Dwellings	Total Population
Population split	28.15%	10.12%	27.15%	16.26%	18.32%	
Population by income group (based on 2006 Census)	178,311	64,103	71,957	103,001	116,079	633,451

<sup>4</sup> <http://www.winnipeg.ca/WaterandWaste/garbage/residentialReport.stm>

<sup>5</sup> <http://www.winnipeg.ca/waterandwaste/recycle/recyclingReport.stm>

Table 6 provides a breakdown of per capita generation for all categories of material collected in the study. As stated above, these amounts are then extrapolated to estimate the total amount of material in each category generated in Winnipeg on a yearly basis.

**Table 6: Winnipeg Annual Generation Rates – All Wastes (Recyclables + Garbage)**

	Single Family Low Income (kg/cap/yr)	Single Family Middle Income (non-autobin) (kg/cap/yr)	Single Family Middle Income (autobin) (kg/cap/yr)	Single Family High Income (kg/cap/yr)	Multi-Family Dwellings (kg/cap/yr)	Per Cap Weighted Average (kg/cap/yr)	Estimated Annual Generation (tonnes/yr)
<b>1. PAPER</b>							
Newspaper – Dailys and Weeklies	5.05	19.34	34.94	10.50	26.36	16.74	10,607
Newspaper - Other	9.44	13.72	20.54	15.15	12.38	13.19	8,358
Telephone Books / Directories	2.17	0.96	1.31	0.00	0.82	1.15	730
Magazines & Catalogues	1.00	6.31	5.73	3.00	3.63	3.73	2,361
Mixed Fine Paper	3.54	11.08	3.70	7.32	7.05	6.86	4,346
Books	0.36	1.73	0.00	0.07	0.83	0.73	465
Other Paper	1.25	0.90	0.69	0.50	1.64	1.05	665
<b>Total Paper</b>	<b>22.81</b>	<b>54.03</b>	<b>66.91</b>	<b>36.54</b>	<b>52.72</b>	<b>43.46</b>	<b>27,533</b>
<b>2. PAPER PACKAGING</b>							
Corrugated Cardboard	18.50	11.28	11.36	18.58	11.12	14.48	9,171
Kraft Paper	1.13	1.32	2.46	1.02	1.29	1.33	840
Boxboard / Cores	10.11	10.56	10.91	12.62	9.01	10.52	6,664
Molded Pulp	0.94	0.45	1.99	0.74	0.84	0.86	546
Paper Cups and Paper Ice-Cream Containers	1.43	0.82	1.27	0.95	1.12	1.11	705
Laminated Paper Packaging	1.05	0.87	1.21	0.68	0.72	0.90	568
Composite Cans	0.55	0.27	0.40	0.40	0.37	0.40	254
Gable Top Cartons	1.27	1.21	2.95	1.15	2.23	1.58	1,002
Aseptic Alcohol Over 630 ml	0.00	0.00	0.00	0.00	0.01	0.00	1
Aseptic Alcohol 630 ml and Under	0.00	0.01	0.00	0.00	0.00	0.00	2
Aseptic Other Containers	0.57	0.50	0.72	0.57	0.92	0.63	399
Tissue/Toweling	7.49	7.61	4.51	7.74	8.76	7.50	4,748
<b>Total Paper Packaging</b>	<b>43.02</b>	<b>34.90</b>	<b>37.79</b>	<b>44.47</b>	<b>36.39</b>	<b>39.31</b>	<b>24,900</b>
<b>3. PLASTICS</b>							
PET Beer Bottles	0.00	0.03	0.00	0.00	0.00	0.01	6
PET Other Alcohol Bottles Over 630 ml	0.00	0.23	0.00	0.08	0.05	0.08	53
PET Other Alcohol Bottles Over 100 ml and Less Than or Equal to 630 ml	0.00	0.05	0.00	0.00	0.03	0.02	13
PET Other Alcohol Bottles 100 ml and Under	0.02	0.08	0.00	0.00	0.00	0.03	16
PET Other Beverage Bottles Over 1 litre	2.41	1.3	2.75	1.35	1.44	1.83	1,115

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	Single Family Low Income	Single Family Middle Income (non-autobin)	Single Family Middle Income (autobin)	Single Family High Income	Multi-Family Dwellings	Per Cap Weighted Average	Estimated Annual Generation
	(kg/cap/yr)	(kg/cap/yr)	(kg/cap/yr)	(kg/cap/yr)	(kg/cap/yr)	(kg/cap/yr)	(tonnes/yr)
PET Other Beverage Bottles 1 litre and Less	2.3	1.57	1.27	2.94	1.87	2.02	1282
PET Other Bottles & Jars	1.47	0.66	2.30	2.02	1.10	1.36	859
PET Other Packaging	0.74	0.98	0.64	0.60	0.70	0.76	484
HDEP Milk	1.90	1.69	1.67	1.34	0.99	1.56	991
HDPE Other Beverage Bottles	0.37	0.17	0.13	0.28	0.22	0.25	157
HDPE Other Bottles & Jugs	1.67	1.83	2.24	1.53	1.53	1.72	1,092
PVC Bottles & Jars	0.05	0.06	0.08	0.02	0.03	0.05	30
Other Plastic Alcohol Containers 100 ml and Under	0.00	0.00	0.00	0.00	0.00	0.00	0
Other Bottles, Jars & Jugs	0.78	0.42	1.34	0.23	0.36	0.57	363
Polystyrene Packaging	1.89	1.64	1.53	1.31	1.30	1.58	1,003
Wide Mouth Tubs & Lids	0.80	1.27	1.25	0.93	1.49	1.12	710
Large HDPE & PP Pails & Lids	0.41	0.29	0.00	0.69	0.31	0.36	231
Polyethylene PE Retail and Carry-out Bags/Sacks	2.40	2.08	2.65	1.64	2.54	2.24	1,419
Polyethylene PE Plastic Bags & Film - Other Packaging	3.76	2.36	4.72	4.05	3.37	3.45	2,187
Polyethylene Plastic Bags & Film - Non-Packaging	3.07	3.09	3.08	2.91	3.06	3.05	1,931
Laminated Pouches & Bag in Box Liners for Alcoholic Beverages	0.00	0.22	0.00	0.00	0.13	0.08	52
Laminated/Other Plastic Film and Bags	2.27	1.56	0.80	1.51	1.70	1.70	1,078
Other Rigid Plastic Packaging	1.52	2.22	1.10	2.64	1.44	1.84	1,163
Durable Plastic Products	6.78	2.86	1.71	3.01	2.98	3.89	2,465
<b>Total Plastics</b>	<b>34.62</b>	<b>26.66</b>	<b>29.25</b>	<b>28.93</b>	<b>26.59</b>	<b>29.52</b>	<b>18,700</b>
<b>4. METALS</b>							
Aluminum Alcoholic Beverage Cans Over 1 L	0.00	0.00	0.00	0.00	0.00	0.00	0
Aluminum Alcoholic Beverage Cans 1 L and Under	0.82	0.39	1.25	0.07	0.47	0.56	355
Aluminum Beverage Cans	1.72	1.51	0.85	1.12	0.97	1.34	849
Aluminum Food Cans	1.59	0.43	0.09	0.72	0.62	0.80	509
Aluminum Foil & Foil Trays	0.54	0.60	1.31	0.83	1.12	0.79	498
Other Aluminum Containers	0.05	0.08	0.42	0.04	0.04	0.09	58
Steel Alcoholic Beverage Cans Over 1 L	0.00	0.00	0.00	0.00	0.00	0.00	0
Steel Alcoholic Beverage Cans 1 L and Under	0.00	0.00	0.00	0.00	0.00	0.00	0
Steel Beverage Containers	0.84	0.16	0.08	0.25	0.07	0.34	215
Steel Food Containers	4.60	4.22	5.91	2.51	3.42	4.07	2,580
Steel Aerosol Cans	0.48	0.33	0.22	0.18	0.34	0.34	215
Steel Paint Cans	0.14	0.16	0.00	0.00	0.10	0.10	64
Other Metal	1.26	1.59	2.30	1.99	2.45	1.79	1,134

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	Single Family Low Income (kg/cap/yr)	Single Family Middle Income (non-autobin) (kg/cap/yr)	Single Family Middle Income (autobin) (kg/cap/yr)	Single Family High Income (kg/cap/yr)	Multi-Family Dwellings (kg/cap/yr)	Per Cap Weighted Average (kg/cap/yr)	Estimated Annual Generation (tonnes/yr)
<b>Total Metals</b>	<b>12.04</b>	<b>9.45</b>	<b>12.43</b>	<b>7.70</b>	<b>9.61</b>	<b>10.22</b>	<b>6,476</b>
<b>5. GLASS</b>							
Clear Glass Beer	0.91	0.35	5.26	0.09	0.82	1.05	663
Clear Glass Other Alcohol	1.58	4.11	4.69	2.38	3.05	2.98	1,887
Clear Glass Other Beverage	0.44	0.42	0.37	0.00	0.70	0.40	256
Coloured Glass Beer	0.39	0.71	0.27	0.74	0.57	0.55	351
Coloured Glass Alcohol	0.83	6.28	7.32	1.55	3.16	3.51	2,223
Coloured Glass Other Beverage Containers	0.00	0.51	0.56	0.05	0.38	0.27	173
Clear Glass Food Containers	6.21	7.15	6.92	3.89	4.55	5.86	3,709
Coloured Glass Food Containers	0.18	0.12	0.18	0.18	0.07	0.14	90
Other Glass	1.46	1.32	2.00	2.16	2.50	1.78	1,128
<b>Total Glass</b>	<b>11.99</b>	<b>20.97</b>	<b>27.55</b>	<b>11.03</b>	<b>15.79</b>	<b>16.55</b>	<b>10,481</b>
<b>6. HOUSEHOLD SPECIAL WASTE</b>							
Batteries	0.45	0.43	0.05	0.21	0.21	0.32	202
Paint & Stain	0.28	0.73	0.00	0.11	0.08	0.31	196
Motor Oil	1.07	0.05	0.00	0.00	0.19	0.35	221
Other HSW liquids	0.06	0.02	0.00	0.02	0.02	0.03	19
Other HSW	0.74	0.25	0.00	0.01	0.08	0.29	185
<b>Total HSW</b>	<b>2.60</b>	<b>1.48</b>	<b>0.05</b>	<b>0.35</b>	<b>0.58</b>	<b>1.30</b>	<b>824</b>
<b>7. ORGANICS (excluding yard waste)</b>							
Food Waste	103.54	73.16	95.11	72.42	68.59	82.98	52,561
Pet waste	13.31	22.77	33.77	19.13	17.74	19.71	12,484
<b>Total Organics</b>	<b>116.85</b>	<b>95.94</b>	<b>128.88</b>	<b>91.55</b>	<b>86.33</b>	<b>102.68</b>	<b>65,045</b>
<b>8. OTHER MATERIALS</b>							
Diapers and Sanitary Products	30.58	16.60	11.81	25.69	13.57	20.97	13,286
Textiles	14.07	5.23	3.20	3.66	7.40	7.66	4,850
Carpeting	2.83	0.57	0.00	0.00	0.37	1.02	646
Construction & Renovation	36.19	12.51	16.52	19.54	5.89	19.51	12,359
Computer / IT Equipment	0.26	0.05	0.09	0.95	0.06	0.26	166
Telecom Equipment	0.27	0.00	0.00	0.10	0.37	0.16	101
TV & Audio Equipment	0.02	0.00	0.00	0.05	0.53	0.11	71
Small Kitchen Appliances	0.44	0.03	0.00	0.00	0.66	0.25	160
Other Electronics	0.30	0.38	0.08	0.07	0.41	0.28	178
Tires and Other Rubber	0.33	0.64	0.02	0.14	0.05	0.30	190
Ceramics	1.02	0.97	0.28	0.42	0.80	0.79	504
Furniture	0.00	0.00	0.00	0.00	0.00	0.00	0

	Single Family Low Income (kg/cap/yr)	Single Family Middle Income (non-autobin) (kg/cap/yr)	Single Family Middle Income (autobin) (kg/cap/yr)	Single Family High Income (kg/cap/yr)	Multi-Family Dwellings (kg/cap/yr)	Per Cap Weighted Average (kg/cap/yr)	Estimated Annual Generation (tonnes/yr)
Mattresses	0.00	0.00	0.00	0.00	6.23	1.14	724
Other Large Bulky Items	0.00	0.00	0.00	0.00	0.21	0.04	24
Other Waste	5.07	1.45	0.57	0.93	1.79	2.36	1,495
<b>Total Other Materials</b>	<b>91.39</b>	<b>38.44</b>	<b>32.57</b>	<b>51.54</b>	<b>38.34</b>	<b>54.86</b>	<b>34,754</b>
<b>Grand Total</b>	<b>335.33</b>	<b>281.88</b>	<b>335.42</b>	<b>272.11</b>	<b>266.36</b>	<b>297.91</b>	<b>188,712</b>

Table 7 summarizes the per capita generation rates for MPSC eligible materials.

*Note: The materials highlighted in yellow are those that are accepted in Winnipeg's recycling program, but are NOT eligible for MPSC funding.*

**Table 7: Generation of MPSC and City of Winnipeg Eligible Materials<sup>6</sup>**

	Single Family Low Income (kg/cap/yr)	Single Family Middle Income (non-autobin) (kg/cap/yr)	Single Family Middle Income (autobin) (kg/cap/yr)	Single Family High Income (kg/cap/yr)	Multi- Family Dwellings (kg/cap/yr)	Per Cap Weighted Average (kg/cap/yr)	Estimated Annual Generation (tonnes/yr)
<b>1. PAPER</b>							
Newspaper – Dailys and Weeklys	5.05	19.34	34.94	10.50	26.36	16.74	10,607
Newspaper - Other	9.44	13.72	20.54	15.15	12.38	13.19	8,358
Telephone Books / Directories	2.17	0.96	1.31	0.00	0.82	1.15	730
Magazines & Catalogues	1.00	6.31	5.73	3.00	3.63	3.73	2,361
Mixed Fine Paper	3.54	11.08	3.70	7.32	7.05	6.86	4,346
<b>Total Paper</b>	<b>21.2</b>	<b>51.41</b>	<b>66.22</b>	<b>35.97</b>	<b>50.24</b>	<b>41.67</b>	<b>26,402</b>
<b>2. PAPER PACKAGING</b>							
Corrugated Cardboard	18.50	11.28	11.36	18.58	11.12	14.48	9,171
Kraft Paper	1.13	1.32	2.46	1.02	1.29	1.33	840
Boxboard / Cores	10.11	10.56	10.91	12.62	9.01	10.52	6,664
Molded Pulp	0.94	0.45	1.99	0.74	0.84	0.86	546
Laminated Paper Packaging	1.05	0.87	1.21	0.68	0.72	0.90	568
Composite Cans	0.55	0.27	0.40	0.40	0.37	0.40	254
Gable Top Cartons	1.27	1.21	2.95	1.15	2.23	1.58	1,002
Aseptic Alcohol Over 630 ml	0.00	0.00	0.00	0.00	0.01	0.00	1
Aseptic Alcohol 630 ml and Under	0.00	0.01	0.00	0.00	0.00	0.00	2
Aseptic Other Containers	0.57	0.50	0.72	0.57	0.92	0.63	399
<b>Total Paper Packaging</b>	<b>34.12</b>	<b>26.47</b>	<b>32</b>	<b>35.76</b>	<b>26.51</b>	<b>30.7</b>	<b>19,447</b>
<b>3. PLASTICS</b>							
PET Beer Bottles	0.00	0.03	0.00	0.00	0.00	0.01	6
PET Other Alcohol Bottles Over 630 ml	0.00	0.23	0.00	0.08	0.05	0.08	53
PET Other Alcohol Bottles Over 100 ml and Less Than or Equal to 630 ml	0.00	0.05	0.00	0.00	0.03	0.02	13
PET Other Alcohol Bottles 100 ml and Under	0.02	0.08	0.00	0.00	0.00	0.03	16
PET Other Beverage Bottles Over 1 litre	2.41	1.3	2.75	1.35	1.44	1.83	1,115
PET Other Beverage Bottles 1 litre and Less	2.3	1.57	1.27	2.94	1.87	2.02	1282
PET Other Bottles & Jars	1.47	0.66	2.30	2.02	1.10	1.36	859

<sup>6</sup> Additional City of Winnipeg eligible material highlighted in yellow.

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	Single Family Low Income (kg/cap/yr)	Single Family Middle Income (non-autobin) (kg/cap/yr)	Single Family Middle Income (autobin) (kg/cap/yr)	Single Family High Income (kg/cap/yr)	Multi- Family Dwellings (kg/cap/yr)	Per Cap Weighted Average (kg/cap/yr)	Estimated Annual Generation (tonnes/yr)
PET Other Packaging	0.74	0.98	0.64	0.60	0.70	0.76	484
HDEP Milk	1.90	1.69	1.67	1.34	0.99	1.56	991
HDPE Other Beverage Bottles	0.37	0.17	0.13	0.28	0.22	0.25	157
HDPE Other Bottles & Jugs	1.67	1.83	2.24	1.53	1.53	1.72	1,092
PVC Bottles & Jars	0.05	0.06	0.08	0.02	0.03	0.05	30
Other Plastic Alcohol Containers 100 ml and Under	0.00	0.00	0.00	0.00	0.00	0.00	0
Other Bottles, Jars & Jugs	0.78	0.42	1.34	0.23	0.36	0.57	363
Wide Mouth Tubs & Lids	0.80	1.27	1.25	0.93	1.49	1.12	710
Large HDPE & PP Pails & Lids	0.41	0.29	0.00	0.69	0.31	0.36	231
<b>Total Plastics</b>	<b>12.92</b>	<b>10.63</b>	<b>13.64</b>	<b>11.87</b>	<b>10.07</b>	<b>11.67</b>	<b>7,402</b>
<b>4. METALS</b>							
Aluminum Alcoholic Beverage Cans Over 1 L	0.00	0.00	0.00	0.00	0.00	0.00	0
Aluminum Alcoholic Beverage Cans 1 L and Under	0.82	0.39	1.25	0.07	0.47	0.56	355
Aluminum Beverage Cans	1.72	1.51	0.85	1.12	0.97	1.34	849
Aluminum Food Cans	1.59	0.43	0.09	0.72	0.62	0.80	509
Steel Alcoholic Beverage Cans Over 1 L	0.00	0.00	0.00	0.00	0.00	0.00	0
Steel Alcoholic Beverage Cans 1 L and Under	0.00	0.00	0.00	0.00	0.00	0.00	0
Steel Beverage Containers	0.84	0.16	0.08	0.25	0.07	0.34	215
Steel Food Containers	4.60	4.22	5.91	2.51	3.42	4.07	2,580
<b>Total Metals</b>	<b>9.57</b>	<b>6.71</b>	<b>8.18</b>	<b>4.67</b>	<b>5.55</b>	<b>7.11</b>	<b>4,508</b>
<b>5. GLASS</b>							
Clear Glass Beer	0.91	0.35	5.26	0.09	0.82	1.05	663
Clear Glass Other Alcohol	1.58	4.11	4.69	2.38	3.05	2.98	1,887
Clear Glass Other Beverage	0.44	0.42	0.37	0.00	0.70	0.40	256
Coloured Glass Beer	0.39	0.71	0.27	0.74	0.57	0.55	351
Coloured Glass Alcohol	0.83	6.28	7.32	1.55	3.16	3.51	2,223
Coloured Glass Other Beverage Containers	0.00	0.51	0.56	0.05	0.38	0.27	173
Clear Glass Food Containers	6.21	7.15	6.92	3.89	4.55	5.86	3,709
Coloured Glass Food Containers	0.18	0.12	0.18	0.18	0.07	0.14	90

	Single Family Low Income (kg/cap/yr)	Single Family Middle Income (non-autobin) (kg/cap/yr)	Single Family Middle Income (autobin) (kg/cap/yr)	Single Family High Income (kg/cap/yr)	Multi-Family Dwellings (kg/cap/yr)	Per Cap Weighted Average (kg/cap/yr)	Estimated Annual Generation (tonnes/yr)
<b>Total Glass</b>	<b>10.54</b>	<b>19.65</b>	<b>25.57</b>	<b>8.88</b>	<b>13.3</b>	<b>14.76</b>	<b>9,352</b>
<b>TOTAL MPSC-Eligible Materials</b>	<b>82.42</b>	<b>101.61</b>	<b>139.58</b>	<b>88.13</b>	<b>96.8</b>	<b>96.94</b>	<b>61,429</b>
<b>City of Winnipeg additional materials</b>	<b>5.93</b>	<b>13.26</b>	<b>6.03</b>	<b>9.02</b>	<b>8.87</b>	<b>8.97</b>	<b>5,682</b>
<b>TOTAL all Recyclables</b>	<b>88.35</b>	<b>114.87</b>	<b>145.61</b>	<b>97.15</b>	<b>105.67</b>	<b>105.91</b>	<b>67,111</b>

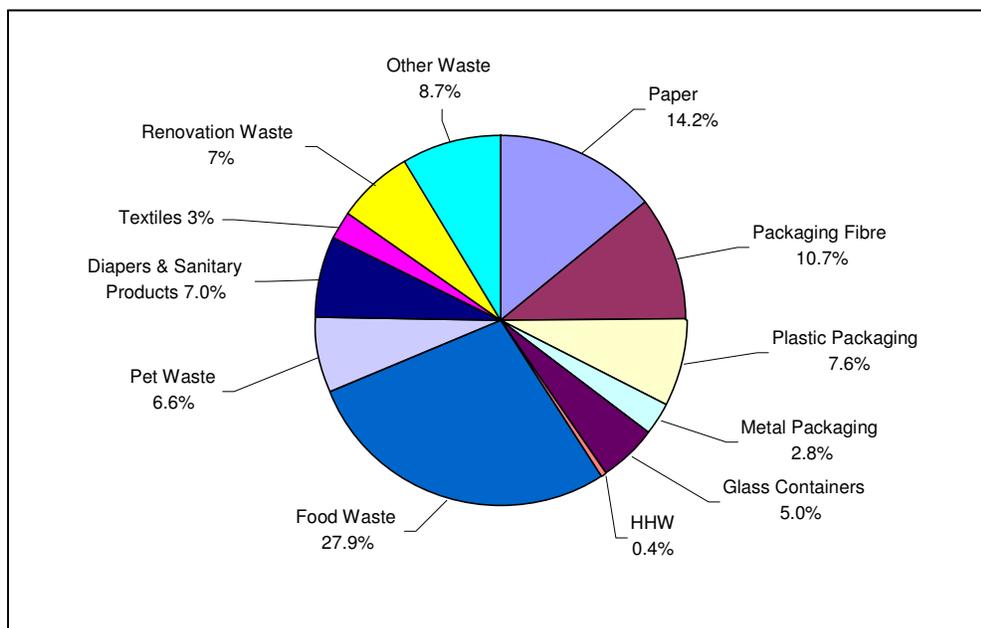
Based on this analysis, an estimated 97 kgs of MPSC eligible materials are generated per capita in Winnipeg every year. This results in an estimated total generation of 61,429 tonnes/yr. An additional 9 kgs/cap/yr of City of Winnipeg eligible recycling material is generated for an additional 5,682 tonnes annually, and for a total for all recyclables of 67,111 tonnes.

### 3.0 Waste Composition Analysis

#### 3.1. Overall Waste Composition

A graphical breakdown of the main categories of material included in the study is found in Figure 1.<sup>7</sup>

**Figure 1 - Overall Waste Composition**



The combined fibre stream (fibre print at 14.2% and fibre packaging at 10.7%) and the food waste stream (27.9%) comprise over 50% of the waste stream by weight.

<sup>7</sup> The Print Fibre and Packaging Fibre categories include all fibre materials and not just those that are eligible for MPSC funding.

### 3.2. Plastic Bags

The audit study involved recording the use of plastic bags found in the waste stream – i.e. whether or not they were being reused as a waste receptacle (e.g. kitchen catchers, pet refuse). The results are presented in Table 8 below.

**Table 8: Bag Counts for Polyethylene Retail and Carry Out Bags**

	Single Family Low Income	Single Family Middle Income (non-autobin)	Single Family Middle Income (autobin)	Single Family High Income	Multi-Family Dwellings	Per Cap Weighted Average	Percentage
Reused as a Waste Receptacle	95	65	146	52	98	86	47%
Empty	122	79	121	51	102	95	53%
Total	217	144	267	103	200	181	100%

As shown in the table above, just under half of the bags are currently being reused as a waste receptacle, while just over half are theoretically available for collection.

### 3.3. Food Waste Category

Table 9 provides information on food waste generation.

**Table 9: Food Waste Generation**

Single Family Low Income (kg/cap/yr)	Single Family Middle Income (non-autobin) (kg/cap/yr)	Single Family Middle Income (autobin) (kg/cap/yr)	Single Family High Income (kg/cap/yr)	Multi-Family Dwellings (kg/cap/yr)	Per Cap Weighted Average (kg/cap/yr)	Estimated Annual Generation (tonnes/yr)
103.54	73.16	95.11	72.42	68.59	82.98	52,561

### 3.4. Breakdown of Other Waste

Table 10 presents a breakdown of the Other Waste generated category identified in Figure 1.

**Table 10: Generation of Other Waste Category**

	Single Family Low Income (kg/cap/yr)	Single Family Middle Income (non-autobin) (kg/cap/yr)	Single Family Middle Income (autobin) (kg/cap/yr)	Single Family High Income (kg/cap/yr)	Multi-Family Dwellings (kg/cap/yr)	Per Cap Weighted Average (kg/cap/yr)	Estimated Annual Generation (tonnes/yr)
Diapers and Sanitary Products	30.58	16.60	11.81	25.69	13.57	20.97	13,286
Textiles	14.07	5.23	3.20	3.66	7.40	7.66	4,850
Carpeting	2.83	0.57	0.00	0.00	0.37	1.02	646
Construction & Renovation	36.19	12.51	16.52	19.54	5.89	19.51	12,359
Computer / IT Equipment	0.26	0.05	0.09	0.95	0.06	0.26	166
Telecom Equipment	0.27	0.00	0.00	0.10	0.37	0.16	101
TV & Audio Equipment	0.02	0.00	0.00	0.05	0.53	0.11	71
Small Kitchen Appliances	0.44	0.03	0.00	0.00	0.66	0.25	160
Other Electronics	0.30	0.38	0.08	0.07	0.41	0.28	178

Tires and Other Rubber	0.33	0.64	0.02	0.14	0.05	0.30	190
Ceramics	1.02	0.97	0.28	0.42	0.80	0.79	504
Furniture	0.00	0.00	0.00	0.00	0.00	0.00	0
Mattresses	0.00	0.00	0.00	0.00	6.23	1.14	724
Other Large Bulky Items	0.00	0.00	0.00	0.00	0.21	0.04	24
Other Waste	5.07	1.45	0.57	0.93	1.79	2.36	1,495
<b>Total Other Materials</b>	<b>91.39</b>	<b>38.44</b>	<b>32.57</b>	<b>51.54</b>	<b>38.34</b>	<b>54.86</b>	<b>34,754</b>

#### 4.0 Set-Out and Participation Rates

A record was kept of the numbers of households in each sample area that set out blue boxes. The *recycling participation rate* is the percentage of households that participated in the recycling program at least once during the two-week study period. The *recycling set out rate* is an estimation of the percentage of households that set out recyclables on a given collection day. The results are presented in table 11 below.

**Table 11: Set-Out and Participation Rates in SFD Sample Areas**

Area	Participation Rate (%)	Average Set-Out Rate (%)
Low Income	40	38
Middle Income (non-autobin)	82	75
Middle Income (autobin)	50	38
High Income	93	84
<b>Overall Weighted Average</b>	<b>66</b>	<b>59</b>

Note: This analysis applies only to the set-out and participation rates achieved by the City of Winnipeg's curbside blue box program. Only data from the single-family dwelling sample areas has therefore been included.

The overall weighted average participation rate was 66% and the overall weighted average set-out rate was 59%.

#### 5.0 Contamination Rates

Any materials collected in blue boxes during the sample period that are not officially accepted by the City of Winnipeg curbside program were defined as contaminants. Contamination takes place when non-recyclable materials such as food wastes, tissue, and plastic toys are placed in the blue box, as well as when a material that is not accepted in the city's program (e.g. polystyrene) is placed in the blue box, even though it may be technically feasible to recycle. As Table 12 shows, the overall contamination rate for the City's recycling program according to the results from this study is 5.4%.

**Table 12: Observed Blue Box Contamination Rates**

Area	Contamination Rate (%)
Low Income	9
Middle Income - Autobin	3
Middle Income – non Autobin	5

High Income	4
Multi-Family	6
Overall	5.4

## 6.0 Comparative Analysis 1996 – 2008

### 6.1. Waste Generation Comparison

Table 13 below compares total generation (waste + recyclables) for the years for which a waste characterization study was conducted

**Table 13: Total Generation Comparison**

Year	Generation (kg/cap/yr)
1996	275
1998	279
2000	253
2008	298

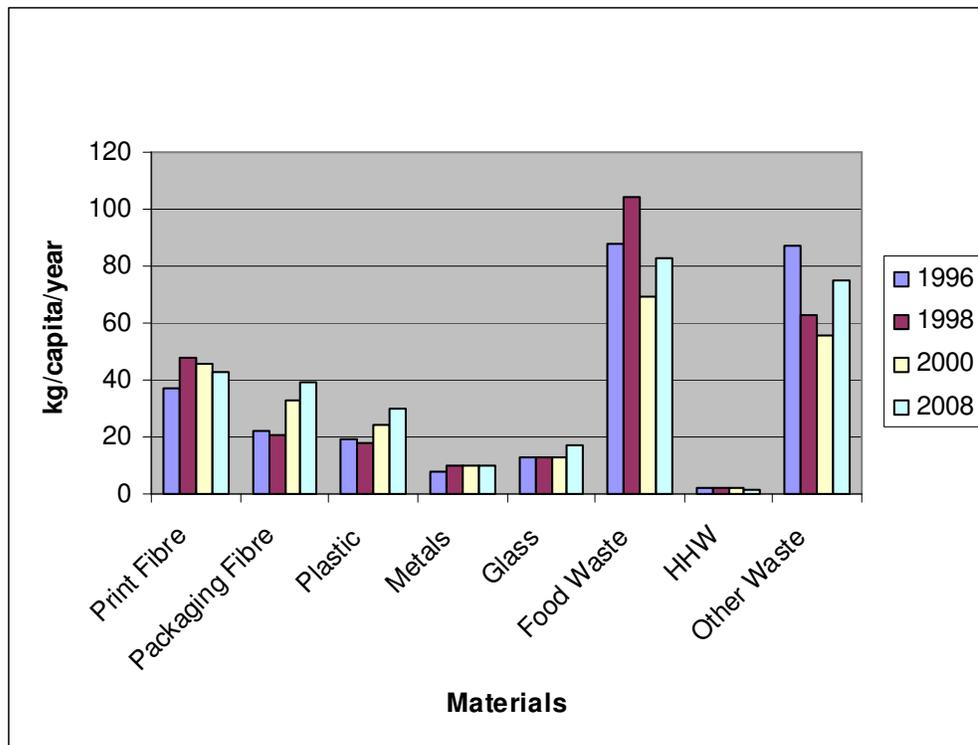
Table 14 provides a comparison of the breakdown of total waste generation according to main material categories.

**Table 14: City of Winnipeg Total Waste Generation Comparison (1996-1998-2000-2008)**

Material	Year			
	1996 Kg/cap/yr	1998 Kg/cap/yr	2000 Kg/cap/yr	2009 Kg/cap/yr
Print Fibre	37	48	46	43
Packaging Fibre	22	21	33	39
Plastic	19	18	24	30
Metals	8	10	10	10
Glass	13	13	13	17
Food Waste	88	104	69	83
HHW	2	2	2	1.3
Other Waste	87	63	56	75
Total	275	279	253	298

Table 15 and Figure 2 provide a comparison on the generation of MPSC-eligible materials over the four data years.

**Figure 2: City of Winnipeg Total Waste Generation Comparison (1996-1998-2000-2008)**



**Table 15: City of Winnipeg Recyclable Generation Comparison (1996-1998-2000-2008)**

Material	Year			
	1996 Kg/cap/yr	1998 Kg/cap/yr	2000 Kg/cap/yr	2009 Kg/cap/yr
Recyclable Fibre Print <sup>1</sup>	30.8	41.3	37.7	41.67
Recyclable Fibre Packaging <sup>2</sup>	18.7	17.1	18.6	30.7
Recyclable Plastics <sup>3,4</sup>	2.0	5.0	5.6	11.67
Recyclable Metals	5.2	5.8	6.0	7.11
Recyclable Glass	11.9	12.3	12.2	14.76
<b>Total Recyclable Materials</b>	<b>68.6</b>	<b>81.5</b>	<b>80.1</b>	<b>105.91</b>

Notes:

- 1) the 2009 printed fibre category includes “other paper”, which is collected by the City of Winnipeg but not eligible for funding under MPSC
- 2) the 2009 fibre packaging number includes laminated paper packaging and composite cans, which are collected by the City of Winnipeg but not eligible under MPSC
- 3) the MPSC-eligible plastics category was broadened in 2009 to include “wide mouth tubs and lids”
- 4) the 2009 plastics number includes PVC bottles and jars and other PET packaging, which are collected by the City of Winnipeg but are not eligible for MPSC funding

## 6.2. Set-Out and Participation Rate Comparison

Table 16 below compares the participation and set-out rates for the years 1998, 2000 and 2009

**Table 16: Participation and set-out rates for the years 1998, 2000 and 2009**

Area	1998		2000		2009	
	Part. Rate (%)	Set-Out Rate (%)	Part. Rate (%)	Set-Out Rate (%)	Part. Rate (%)	Set-Out Rate (%)
Low Income	n/a	n/a	27	11	40	38
Middle Income (non-autobin)	n/a	n/a	73	50	82	75
Middle Income (autobin)	n/a	n/a	24	11	50	38
High Income	n/a	n/a	83	69	93	84
Overall Weighted Average	66	50	53	35	66	59

The average set-out rate has increased from 35% in 2000 to 59% in 2009. Similarly, the participation rate increased from 53% in 2000 to 66% in 2009 (although the participation rate stood at 66% in 1998).

## 6.3. Contamination Rate Comparison

Table 17 below compares the measured contamination rates for 2000 and 2009.

**Table 17: Comparison of Observed Blue Box Contamination Rate for the City of Winnipeg**

Sample Area	2000 (% contamination)	2009 (% contamination)
Low income	4.01	9.3
Auto bin middle-income	2.78	2.7
Non auto-bin middle-income	2.85	5.4
High income	1.80	4.0
Multi-family	1.04	6.1
<b>Overall</b>	<b>2.03</b>	<b>5.4</b>

It is important to note that Winnipeg transitioned from a 2-stream recycling system to a single stream collection system in 2003. Higher contamination levels are typically expected in single-stream programs.

## 7.0 Conclusions

### 7.1. Generation Rates

The average resident of the City of Winnipeg generates just under 300 kg of non-hazardous solid waste per year, excluding yard waste. Waste generation rates are above average in low-income areas and in the autobin middle income areas. Apartment dwellers generate the least amount of waste on a per capita basis.

This compares to an average generation of 253 kg/capita in 2000, 279 in 1998 and 275 in 1996.

## **7.2. Waste Composition**

The combined fibre stream (fibre print at 14.2% and fibre packaging at 10.7%) and the food waste stream (27.9%) comprise over 50% of the waste stream by weight.

## **7.3. Seasonality**

The 2008 Winnipeg Waste Composition Study took place in both Summer and Winter and represents an average of those two seasons. The 2000 Study took place in the late winter as compared to the 1996 and 1998 studies which took place in the Fall of those years. The composition and generation rates are likely affected by these different seasons during which they were held. The food waste generation in the 2000 study was significantly lower than in the previous two studies and in the 2008 study. This may be the result of less garden produce being consumed in the winter.

## **7.4. MPSC-Eligible Materials**

Approximately 97 kgs of MPSC eligible materials are generated per capita in Winnipeg every year. This results in a total generation of approximately 61,429 tonnes. This compares with 80 kg/cap/year in 2000 and 81.5kg/cap/year in 1998. The increased volume of MPSC eligible material is due in part to the expansion of the list of MPSC eligible materials, although this only account for a small fraction of the increase.

## **7.5. Participation and Set-out rates**

The average participation rate was 66% and the average set out rate was 59%. This compares to a 53% participation rate and a set-out rate of 35% in 2000; and 66% and 55% respectively in 1998.

## **7.6. Contamination Levels**

The observed overall contamination rate for the curbside recycling system was 5.4%, while in 2000 the contamination level was 2%. The increase in contamination is likely due to the City of Winnipeg's transition from a 2-stream to a single-stream system in 2003.

## Appendix 1 - Materials Accepted in the City of Winnipeg's Recycling Program

<b>Material Category</b>
<b>1. PAPER</b>
Newspaper – Dailys and Weeklys
Newspaper - Other
Telephone Books / Directories
Magazines & Catalogues
Mixed Fine Paper
<b>2. PAPER PACKAGING</b>
Corrugated Wine Bag in Box
Other Corrugated
Kraft Paper
Boxboard / Cores
Molded Pulp
Laminated Paper Packaging
Composite Cans
Gable Top Cartons
Aseptic Alcohol Over 630 ml
Aseptic Alcohol 630 ml and Under
Aseptic Other Containers
<b>3. PLASTICS</b>
PET Beer Bottles
PET Other Alcohol Bottles Over 630 ml
PET Other Alcohol Bottles Over 100 ml and Less Than or Equal to 630 ml
PET Other Alcohol Bottles 100 ml and Under
PET Other Beverage Bottles Over 1 litre
PET Other Beverage Bottles 1 litre and Less
PET Other Bottles & Jars
PET Other Packaging
HDEP Milk
HDPE Other Beverage Bottles
HDPE Other Bottles & Jugs
PVC Bottles & Jars
Other Plastic Alcohol Containers 100 ml and Under
Other Bottles, Jars & Jugs
Wide Mouth Tubs & Lids
Large HDPE & PP Pails & Lids
<b>4. METALS</b>

Aluminum Alcoholic Beverage Cans Over 1 L
Aluminum Alcoholic Beverage Cans 1 L and Under
Aluminum Beverage Cans
Aluminum Food Cans
Steel Alcoholic Beverage Cans Over 1 L
Steel Alcoholic Beverage Cans 1 L and Under
Steel Beverage Containers
Steel Food Containers
<b>5. GLASS</b>
Clear Glass Beer
Clear Glass Other Alcohol
Clear Glass Other Beverage
Coloured Glass Beer
Coloured Glass Alcohol
Coloured Glass Other Beverage Containers
Clear Glass Food Containers
Coloured Glass Food Containers