Seattle Public Utilities

2016
Commercial Waste Stream Composition Study
FINAL Report

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1 Overview

1.1 Introduction and Background

Seattle Public Utilities (SPU) provides for the collection, transfer, and disposal of municipal solid waste (MSW) from within the City of Seattle. As part of this responsibility, SPU designs and implements programs that help the City meet its goal to achieve a 70% recycling rate by 2022. To better understand the types and quantities of MSW disposed, and to assess the city's recycling potential, SPU has conducted composition studies every two years since 1988. The 1988 study included the city's entire waste stream, and each subsequent study has analyzed two of the city's three waste streams (residential, commercial, and self-haul) so that every stream is sampled once every four years. Table 1-1 shows the number of waste samples sorted from these three waste streams from 1988 through the current study in 2016.

Table 1-1. Samples per Study Period, by Substream

Year	Commercial	Residential	Self-Haul	Total
1988-89	121	212	217	550
1990	0	114	203	317
1992	251	0	197	448
1994-95	0	368	0	368
1996	348	0	199	547
1998-99	0	360	0	360
2000	347	0	200	547
2002	0	309	0	309
2004	270	0	216	486
2006	0	356	0	356
2008	271	0	216	487
2010	0	361	0	361
2012	259	0	226	476
2014	0	362	0	362
2016	292	0	0	292

All of these studies share the following three objectives:

- Obtaining information about the City's residential, commercial, and self-haul waste substreams in order to estimate the recycling potential for each;

- Understanding differences among these three substreams so that targeted recycling programs can be designed, implemented, and monitored for each; and

- Establishing a baseline for continued, long-term measurement of system performance.

This report, which consists of four sections, presents the results of the 2016 commercial waste study. This section, Section 1, briefly introduces the project and the methodology, and Section 0 summarizes the study's findings. Section 3 compares the 2016 commercial findings with those from the 1988/89, 1992, 1996, 2000, 2004, 2008, and 2012 study periods. Detailed results of the 2016 commercial waste composition study are presented in Section 4. Appendices follow the main body of the report and provide material component definitions, detailed study methodology, comments on sampling events, waste composition calculations, year-to-year comparison calculations, and copies of field forms.

1.2 Seattle's Commercial Waste Substream

For any specific geographic area, the total waste stream is composed of various substreams. A substream is determined by the particular generation, collection, or composition characteristics that make it a unique portion of the total waste stream. This study targets one of three main substreams in Seattle: the commercial substream.[1]

The **commercial** substream is waste that is: a) generated at businesses and institutions; and, b) collected by contracted hauling companies. In Seattle, all materials are collected by two contracted haulers, each serving two of four distinct "zones" (Figure 1-1) in the city.[2] One of the contracted haulers handles Zones 1 and 4, and the other hauler handles Zones 2 and 3.[3]

Figure 1-1. Seattle's Collection Zones

1.3 Study Methodology

The following section provides an overview of the 2016 study methodology. As shown, there were four major steps involved in conducting this waste composition study. The steps are

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[1] The residential and self-haul substreams were not included in this study. For the most recent analysis of Seattle's residential waste stream, please see the 2014 Residential Waste Stream Composition Study at http://www.seattle.gov/util/Documents/Reports/SolidWasteReports/CompositionStudies/index.htm. For the most recent analysis of Seattle's self-haul waste stream, please see the 2012 Commercial and Self-haul Waste Streams Composition Report at http://www.seattle.gov/util/cs/groups/public/@spu/@garbage/documents/webcontent/01_026659.pdf

[2] In 2010, the City of Seattle was divided into four "zones" rather than the two service areas (North and South) previously studied.

[3] Through the Clear Alleys Program, commercial waste from select downtown neighborhoods is collected in bags. This waste was excluded from the study since it is difficult to segregate and obtain representative samples of this material and it represents a small portion (about 3% in 2016 tons) of Seattle's commercial waste.

presented according to the order in which they occurred during the course of the study. Please see Appendix B for a detailed description of the methodology.

Step 1: Develop Sampling Plan

- A total 270 commercial samples were allocated across zones, shifts, and vehicle types using the following process:
  - 90 samples were assigned to the night shift and distributed among the four zones and vehicle types based on 2015 commercial tonnage data.
  - The remaining 180 samples were allocated to the day shift in each of the four zones in order to achieve an even distribution of samples across the four zones. Within each zone, samples were then assigned to vehicle types, based on the tonnage delivered by each in 2015.
- A sampling schedule was constructed for the 2016 calendar year so that sampling occurred every other month for three consecutive days each selected month for a total of 18 days of sampling for the calendar year. Working around major holidays and the sorting crew's availability, sampling days were randomly selected to assure a representative distribution across the days of the week and weeks of the month.
- A complete list of Seattle's commercial collection routes was assembled in conjunction with the City's contracted waste haulers.

Step 2: Schedule and Collect Waste Samples

Commercial:
- Prior to each sampling event, commercial collection routes were randomly pre-selected for sampling.
- The haulers were sent a list of routes pre-selected for each sampling day. On each sampling day, drivers of pre-selected routes were asked to consolidate commercial pick-ups at the beginning or the end of their trip so that a pure sample of commercial waste could be captured from the front or back of the truck.
- Drivers delivered their loads to the appropriate transfer station for sampling.

Step 3: Capture and Sort Samples

As each selected commercial vehicle entered the facility, the sampling crew supervisor verified information with the driver about the waste collected, and asked the driver to dump the load in a specified location. The supervisor then directed the front loader operator to extract a 250-pound sample of waste and place it on a tarpaulin for sorting. Sample extraction methods varied by facility.

Step 4: Analyze Data and Prepare Report

- Following each sampling event, all sorting data were entered into a customized database and reviewed for data entry errors.
- At the conclusion of the study, waste composition estimates were calculated by aggregating sampling data using a *weighted average* procedure. SPU and haulers provided 2016 waste tonnage data estimates that were used to perform final calculations. The weighted average procedure is detailed in Appendix D.
- Once the data were analyzed, an accompanying report was prepared.

1.4 Changes in Waste Component Categories

A total of 115 components were included in this study, a net increase of two components compared to the list of 113 that was used in the 2012 study. There were two new components in the **hazardous waste** category compared to the 2012 commercial study: *pharmaceuticals and vitamins* and *personal care/cosmetics*.

For a description of all the changes to the component list, reference Table A-1 in Appendix A.

2 Summary of Year 2016 Sampling Results

In 2016, the waste samples were sorted into nine broad material categories: **paper**, **plastic**, **glass**, **metal**, **organics**, **appliances & electronics**, **CDL wastes** (construction, demolition, and landclearing debris), **hazardous waste**, and **fines and miscellaneous materials**. Each broad material category was then sorted into various components such as *newspaper* or *PET plastic bottles*. A total of 115 components were included in this study.

Composition results are presented in the following order in this report. First, a pie chart reflects the composition percentages of the nine broad material categories. A table that lists the top ten components, by weight, follows the pie charts. Lastly, a table depicting the full composition

results of all 115 components is presented.[4] Weighted averages were used to calculate composition estimates. Please see Appendix D for more detail regarding these calculations.

Figure 2-1 summarizes the composition results. As shown, **paper** and **organics** together accounted for almost 60% of the commercial tonnage.

Figure 2-1. Overview of Composition Estimates: by Substream

(January – December 2016)

Overall Commercial

2.1 Overall Commercial Substream

A total of 292 loads were sampled from the commercial substream between January and December 2016. The commercial substream disposed of 122,036 tons of waste during the 2016 calendar year. The composition estimates for this substream were applied to the 122,036 tons to estimate the amount of waste disposed for each component.

The top ten components disposed in the commercial substream are listed in Table 2-1. When summed, they accounted for nearly 60% of the overall commercial tonnage. Accounting for nearly 25%, *food* stood out as the largest single component of the commercial substream. *Compostable/soiled paper* and *other plastic film* were large components (each more than 5%, by weight) of this substream as well. Table 2-2 lists the composition percentages, by weight, of each component in the overall commercial substream.

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[4] All waste composition results were derived using a 90% confidence level. This means that there is a 90% certainty that the actual composition is within the calculated range. In charts throughout this report, the values graphed represent the mean component percentage, not the range.

Table 2-1. Top Ten Components: Overall Commercial

(January – December 2016)

Class	Material	Est. Percent	Cum. Percent	Est. Tons
Compostable Organics	Food	24.5%	24.5%	29,935
Paper	Compostable/Soiled	8.1%	32.6%	9,879
Plastic	Other Film	6.5%	39.1%	7,877
Other Organics	Disposable Diapers	3.9%	43.0%	4,735
Paper	Plain OCC/Kraft	3.7%	46.7%	4,565
Potentially Harmful Wastes	Medical Wastes	3.5%	50.2%	4,253
Paper	Mixed Low-grade Paper	3.1%	53.3%	3,829
Other Organics	Textiles	2.2%	55.5%	2,652
Paper	Mixed/Other Paper	2.2%	57.7%	2,637
Other Organics	Animal By-products	2.1%	59.8%	2,621
Total		**59.8%**		**72,982**

Table 2-2. Composition by Weight: Overall Commercial
(January – December 2016)

Material	Est. Percent	+ / -	Est. Tons	Material	Est. Percent	+ / -	Est. Tons
Paper	**22.7%**		**27,723**	**Furniture, Appliances, and Electronics**	**1.1%**		**1,289**
Newspaper	0.8%	0.2%	1,037	Furniture	0.5%	0.2%	618
Plain OCC/Kraft	3.7%	0.7%	4,565	Mattresses	0.1%	0.1%	164
Waxed OCC	0.6%	0.3%	696	Small Appliances	0.1%	0.1%	139
Grocery/Shopping Bags	0.2%	0.0%	301	Cell Phones	0.0%	0.0%	0
High-grade Paper	1.2%	0.3%	1,498	Audio/Visual Equipment	0.1%	0.1%	123
Mixed Low-grade Paper	3.1%	0.3%	3,829	CRT Computer Monitors	0.0%	0.0%	0
Polycoated Containers	0.2%	0.1%	287	CRT Televisions	0.0%	0.0%	0
Compostable/Soiled	8.1%	0.7%	9,879	Other Electronics	0.2%	0.1%	245
Pot. Comp. Single-use Food Service	0.7%	0.1%	813				
Non-Comp. Single-use Food Service	1.8%	0.2%	2,182	**Construction Debris**	**11.8%**		**14,420**
Mixed/Other Paper	2.2%	0.4%	2,637	Clean Dimension Lumber	1.4%	0.4%	1,648
				Clean Engineered Wood	1.4%	0.6%	1,717
Plastic	**14.6%**		**17,858**	Pallets	1.7%	0.7%	2,092
#1 PET Bottles	0.6%	0.1%	772	Crates	0.2%	0.2%	198
#2 HDPE Natural Bottles	0.2%	0.0%	243	Other Untreated Wood	0.1%	0.1%	146
#2 HDPE Colored Bottles	0.2%	0.1%	248	New Painted Wood	0.8%	0.4%	992
Other Plastic Bottles	0.0%	0.0%	35	Old Painted Wood	0.3%	0.2%	410
Tubs #1-#7	0.9%	0.1%	1,149	Creosote-treated Wood	0.1%	0.1%	118
Expanded Poly. Non-food	0.3%	0.1%	404	Other Treated Wood	0.2%	0.2%	232
Expanded Poly. Food-grade	0.1%	0.0%	139	Contaminated Wood	1.5%	0.5%	1,891
Rigid Poly. Foam Insulation	0.0%	0.0%	21	New Gypsum Scrap	0.1%	0.1%	178
Pot. Comp. Single-use Food Service	0.1%	0.1%	159	Demo Gypsum Scrap	0.6%	0.4%	719
Non-Comp. Single-use Food Service	0.8%	0.1%	937	Carpet	0.4%	0.2%	459
Other Rigid Packaging	0.9%	0.2%	1,062	Felt Carpet Pad	0.0%	0.0%	27
Shopping/Dry Cleaning Bags	0.1%	0.0%	172	Fiberglass Insulation	0.2%	0.4%	305
Stretch Wrap	0.3%	0.1%	418	Concrete	0.5%	0.3%	574
Clean Polyethylene Film	0.8%	0.2%	1,020	Asphalt Paving	0.0%	0.0%	0
Other Film	6.5%	0.5%	7,877	Other Aggregates	0.8%	0.6%	943
Plastic Pipe	0.0%	0.0%	56	Rock	0.0%	0.0%	36
Foam Carpet Padding	0.0%	0.1%	54	Asphalt Shingles	0.2%	0.2%	292
Durable Plastic Products	1.6%	0.3%	1,975	Other Asphaltic Roofing	0.0%	0.1%	54
Plastic/Other Materials	0.9%	0.4%	1,117	Ceramics	0.4%	0.2%	433
				Cement Fiber Board	0.0%	0.0%	40
Glass	**2.6%**		**3,142**	Dried Latex Paints	0.2%	0.3%	205
Clear Beverage	0.7%	0.1%	805	Single-ply Roofing Membranes	0.0%	0.0%	0
Green Beverage	0.5%	0.1%	632	Ceiling Tiles	0.0%	0.0%	52
Brown Beverage	0.5%	0.1%	631	Other Construction Debris	0.5%	0.4%	660
Container Glass	0.2%	0.1%	229				
Fluorescent Tubes	0.0%	0.0%	1	**Potentially Harmful Wastes**	**3.9%**		**4,808**
CFLs	0.0%	0.0%	3	Liquid Latex Paints	0.1%	0.1%	174
Flat Glass	0.1%	0.2%	169	Solvent-based Adhesives	0.0%	0.0%	6
Automotive Glass	0.3%	0.4%	383	Water-based Adhesives	0.0%	0.0%	9
Other Glass	0.2%	0.1%	288	Oil-based Paint/Solvent	0.0%	0.0%	7
				Caustic Cleaners	0.0%	0.0%	21
Metal	**4.6%**		**5,659**	Pesticides/Herbicides	0.0%	0.0%	0
Aluminum Cans	0.3%	0.0%	364	Rechargeable Batteries	0.0%	0.0%	1
Aluminum Foil/Containers	0.2%	0.0%	267	Other Dry-cell Batteries	0.0%	0.0%	21
Other Aluminum	0.1%	0.0%	67	Wet-cell Batteries	0.0%	0.0%	0
Other Nonferrous	0.1%	0.1%	72	Gasoline/Kerosene	0.0%	0.0%	2
Steel Food Cans	0.4%	0.1%	480	Motor Oil/Diesel Oil	0.0%	0.0%	48
Empty Aerosol Cans	0.1%	0.0%	79	Asbestos	0.0%	0.0%	0
Other Ferrous	1.5%	0.4%	1,791	Explosives	0.0%	0.0%	0
Oil Filters	0.0%	0.0%	49	Medical Wastes	3.5%	1.4%	4,253
Mixed Metals/Material	2.0%	0.5%	2,490	Other Cleaners/Chemicals	0.0%	0.0%	20
				Pharmaceuticals/Vitamins	0.0%	0.0%	16
Compostable Organics	**26.5%**		**32,325**	Personal Care/Cosmetics	0.1%	0.0%	99
Leaves and Grass	1.4%	0.6%	1,751	Other Potentially Harmful Wastes	0.1%	0.1%	128
Prunings	0.4%	0.2%	535				
Food	24.5%	1.6%	29,935	**Fines and Misc Materials**	**1.9%**		**2,323**
Fats, Oils, Grease	0.1%	0.1%	104	Sand/Soil/Dirt	0.6%	0.3%	789
				Non-distinct Fines	0.3%	0.2%	415
Other Organics	**10.2%**		**12,489**	Miscellaneous Organics	0.6%	0.1%	699
Textiles	2.2%	0.3%	2,652	Miscellaneous Inorganics	0.3%	0.3%	421
Mixed Textiles	1.2%	0.3%	1,455				
Disposable Diapers	3.9%	0.9%	4,735				
Animal By-products	2.1%	0.6%	2,621				
Rubber Products	0.8%	0.2%	940	**Totals**	**100%**		**122,036**
Tires	0.1%	0.1%	86	Sample Count	292		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

2.2 Results by Commercial Subpopulation

Commercial waste composition estimates were calculated for the overall commercial substream as well as for each subpopulation: vehicle type, season, and generator type. The largest components are shown in Table 2-3. The largest components are those that accounted for at least 5% of the subpopulation's total tonnage, by weight. *Compostable/soiled paper*, *other plastic film*, and *food* were large components disposed by many commercial subpopulations. When the data are reported by subpopulation, the sample size for each analysis is smaller, which means that the calculations are subject to a more substantial range of error than calculations for the commercial stream as a whole.

Table 2-3. Largest Waste Components: by Commercial Subpopulation
(January – December 2016)

Subpopulation	Paper						Plastics		Glass	Metal	
	Compostable/ Soiled	High-grade Paper	Mixed Low-grade Paper	Mixed/ Other Paper	Plain OCC/ Kraft	Waxed OCC	Non-Comp. Single-use Food Service	Other Film	Flat Glass	Mixed Metals/ Material	Other Ferrous
Vehicle Type											
Front Loader								6.3%			
Rear Loader								6.7%			
Compactor Roll-off								6.8%			
Loose Roll-off								6.0%			
Season											
Spring											
Summer								6.9%			
Fall								7.7%			
Winter								6.1%			
Generator Type, by Site											
Education											
Health Care											
Hotel/Motel	8.9%							8.4%			
Manufacturing				8.1%				5.5%	7.8%	14.5%	
Office	14.5%	6.2%	6.2%					7.2%			
Other Services	5.3%				8.3%						
Retail	9.3%				7.3%			8.0%			
Transportation	9.6%							7.6%			
Wholesale	6.6%				16.1%			13.0%			
Mixed Commercial Generators	7.3%							6.2%			
Overall Commercial								6.5%			

Table 2-3. Continued, Largest Waste Components: by Commercial Subpopulation
(January – December 2016)

Subpopulation	Organics				Textiles/ Clothing	CDL Wastes					Hazardous	Fines & Misc Materials
	Animal By-products	Disposable Diapers	Food	Leaves and Grass		Cement Fiber Board	Clean Dimension Lumber	Clean Engineered Wood	Contaminated Wood	New Gypsum Scrap	Medical Wastes	Miscellaneous Inorganics
Vehicle Type												
Front Loader			25.1%									
Rear Loader	5.7%		30.8%									
Compactor Roll-off		5.9%	23.9%								9.6%	
Loose Roll-off			15.8%	6.3%								
Season												
Spring	6.9%	5.1%	23.0%									
Summer		5.2%	25.7%									
Autumn												
Winter			22.3%									
Generator Type, by Site												
Education												
Health Care		21.5%	11.5%								34.9%	
Hotel/Motel			33.8%		5.5%							
Manufacturing			6.5%	7.0%			8.6%					
Office			23.3%									
Other Services			17.0%	10.2%								
Retail			29.3%									
Transportation		7.1%	26.5%									
Wholesale			12.8%					11.3%				8.9%
Mixed Commercial Generators			25.8%									
Overall Commercial			24.5%									

3   Commercial Results Compared to Previous Studies

In this section, the commercial results from the 2016 study are compared to the 1988/89, 1992, 1996, 2000, 2004, 2008, and 2012 commercial results. These studies followed the same basic methodology as the 2016 study. Changes in the composition percentages and the total amount of waste disposed from each broad material category were analyzed to compare findings among study periods.[5] Section 3.1 provides an overview of the changes in the last 28 years. Sections 3.2 and 3.3 provide detailed results of the comparisons.

3.1   Trends in Disposed Commercial Waste

Figure 3-1 illustrates the changes in disposed commercial waste over the last 28 years. Overall, the **Paper** and **CDL Wastes** broad material categories showed the greatest change in tonnage disposed since 1988/89. **Paper** decreased by 52,104 tons, and **CDL Wastes** decreased by 60,504 tons during the 29-year period.
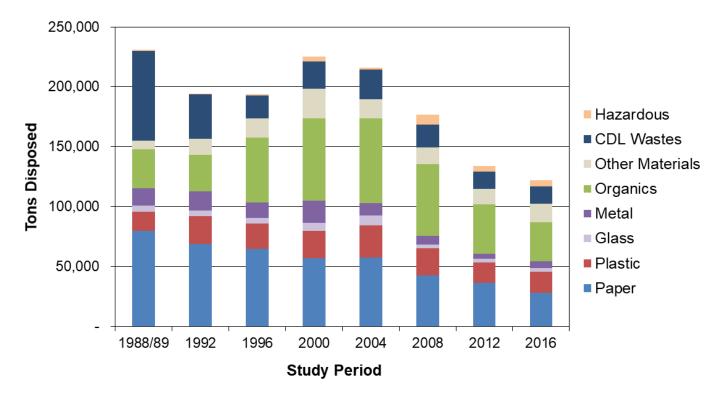
Figure 3-1. Changes in Commercial Disposed Tons: 1988/89 to 2016

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[5] The composition percentages used to analyze the differences in disposed tonnage and to perform statistical tests were calculated using unweighted averages. Please see Appendix D for more detail.

3.2 Changes in Commercial Waste: 1988/89 to 2016

In Table 3-1, broad material categories that are bolded showed significant differences in composition between the 1988/89 and 2016 study periods. **Glass** was the only material category without significant changes between the two study periods: **paper**, **plastic**, **metal**, **organics**, **other materials** (such as *textiles/clothing*, *carpet, and furniture*), **CDL wastes**, and **hazardous** all changed significantly. [6] Of note, the percentage of **CDL wastes** decreased from about 32.5% (75,004 tons) in 1988/89 to 11.9% (14,500 tons) in 2016. **Organics** displayed the largest increase in composition, from 14.1% in 1988/89 to 26.5% in 2016, though the tonnage remained fairly constant (32,517 tons in 1988/89 to 32,325 tons in 2016).

Table 3-1. Changes in Commercial Waste: 1988/89 to 2016

	Percent		Change in Composition %		Disposed Tons	
	1988/89	**2016**			**1988/89**	**2016**
Paper	**34.6%**	**22.7%**	**-11.9%** ⬇		**79,827**	**27,723**
Plastic	**6.9%**	**14.6%**	**7.8%** ⬆		**15,878**	**17,858**
Glass	2.3%	2.6%	0.3% ⬇		5,308	3,142
Metal	**6.1%**	**4.6%**	**-1.5%** ⬇		**14,170**	**5,659**
Organics	**14.1%**	**26.5%**	**12.4%** ⬆		**32,517**	**32,325**
Other Materials	**3.1%**	**13.0%**	**9.9%** ⬆		**7,154**	**15,817**
CDL Wastes	**32.5%**	**11.9%**	**-20.6%** ⬇		**75,004**	**14,500**
Hazardous	**0.4%**	**4.1%**	**3.7%** ⬆		**923**	**5,012**
Total	**100%**	**100%**			**230,780**	**122,036**

 * Bold type indicates statistically significant changes.

3.3 Changes in Commercial Waste: 2012 to 2016

In Table 3-2, broad material categories that are bolded showed significant differences in percentages between the 2012 and 2016 study periods. Five categories experienced significant changes: **paper**, **plastic**, **metal**, **organics**, and **other materials**. The **organics** category experienced the largest change in composition and decreased from 31.1% (41,711 tons) in 2012 to 26.5% (32,325 tons) in 2016.

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[6] For the purposes of this study, only calculation results with a p-value of less than 1.25% are considered statistically significant. For more detail about these calculations, please see Appendix E.

Table 3-2. Changes in Commercial Waste: 2012 to 2016

	Percent		Change in Composition %	Disposed Tons	
	2012	2016		2012	2016
Paper	**27.0%**	**22.7%**	**-4.2%** ⬇	**36,145**	**27,723**
Plastic	**12.9%**	**14.6%**	**1.7%** ⬆	**17,282**	**17,858**
Glass	2.0%	2.6%	0.5% ⬆	2,716	3,142
Metal	**3.1%**	**4.6%**	**1.6%** ⬆	**4,112**	**5,659**
Organics	**31.1%**	**26.5%**	**-4.6%** ⬇	**41,711**	**32,325**
Other Materials	**9.5%**	**13.0%**	**3.4%** ⬆	**12,801**	**15,817**
CDL Wastes	10.7%	11.9%	1.2% ⬆	14,310	14,500
Hazardous	3.7%	4.1%	0.4% ⬆	5,013	5,012
Total	**100%**	**100%**		**134,089**	**122,036**

* Bold type indicates statistically significant changes.

4   Commercial Composition Results, by Subpopulation

A total of 292 loads from the commercial stream were sampled from January to December 2016. Table 4-1 summarizes the sample information for each commercial subpopulation. The average sample weight for the 292 commercial samples was approximately 271 pounds. The City and its two contracted haulers provided the total 2016 disposal tonnages presented in this section of the report.

As shown in Table 4-1, many of the generator-specific analyses are based on a very small number of samples and are thus subject to a relatively wide margin of error.[7]

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[7] There was no intent to capture a certain number of samples from any particular generator type. Sample selection was based on vehicle type; please refer to Appendix C for more detail.

Table 4-1. Description of Samples for each Commercial Subpopulation
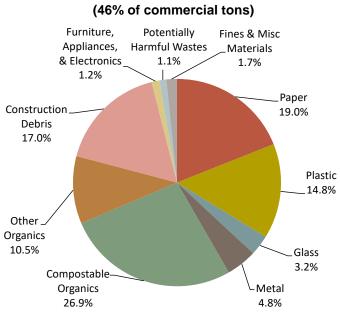**(January – December 2016)**

Subpopulation	Sample Count	Total Sample Weight	Average Sample
		(All weights in pounds)	
Vehicle Type			
Front Loader	106	28,943.5	273.1
Rear Loader	73	20,238.6	277.2
Compactor Roll-off	80	20,949.3	261.9
Loose Roll-off	33	9,028.6	273.6
Season			
Spring	44	12,600.7	286.4
Summer	90	25,612.3	284.6
Fall	45	12,178.6	270.6
Winter	113	28,768.4	254.6
Generator Type			
Health Care	19	5,086.8	267.7
Hotel/Motel	5	1,483.4	296.7
Manufacturing	4	1,004.9	251.2
Office	14	3,554.7	253.9
Other Services	14	3,948.3	282.0
Retail	32	8,431.1	263.5
Transportation	8	2,027.8	253.5
Wholesale	5	1,282.2	256.4
Mixed Commercial	191	52,340.8	274.0
Overall	**292**	**79,160.0**	**271.1**

Composition results by commercial subpopulation are presented in Section 4.1 by vehicle type, Section 4.2 by season, and Section 4.3 by generator.

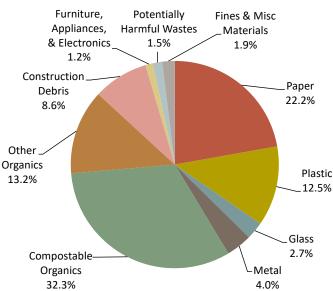# 4.1 Commercial Composition by Vehicle Type

Figure 4-1 displays the overall composition results, by weight, of all commercial disposed waste including loads collected in front loaders, rear loaders, compactor roll-offs, and loose roll-offs. Combined, **paper** and **organics** were the most prevalent broad material categories for all vehicle types, ranging from about 53% of material in loose roll-offs to nearly 68% in rear loaders. The following sections examine each vehicle type's waste in more detail.

Figure 4-1. Commercial Composition Summary: by Vehicle Type
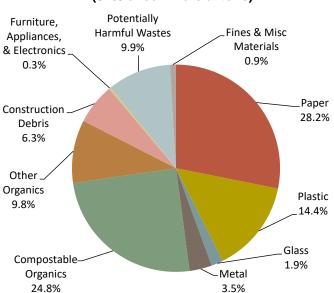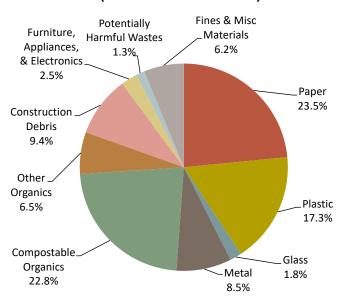
(January – December 2016)

Front Loaders
(46% of commercial tons)

Furniture, Appliances, & Electronics 1.2%
Potentially Harmful Wastes 1.1%
Fines & Misc Materials 1.7%
Paper 19.0%
Construction Debris 17.0%
Plastic 14.8%
Other Organics 10.5%
Glass 3.2%
Compostable Organics 26.9%
Metal 4.8%

Rear Loaders
(12% of commercial tons)

Furniture, Appliances, & Electronics 1.2%
Potentially Harmful Wastes 1.5%
Fines & Misc Materials 1.9%
Construction Debris 8.6%
Paper 22.2%
Other Organics 13.2%
Plastic 12.5%
Compostable Organics 32.3%
Glass 2.7%
Metal 4.0%

Compactor Roll-off
(32% of commercial tons)

Furniture, Appliances, & Electronics 0.3%
Potentially Harmful Wastes 9.9%
Fines & Misc Materials 0.9%
Construction Debris 6.3%
Paper 28.2%
Other Organics 9.8%
Plastic 14.4%
Compostable Organics 24.8%
Glass 1.9%
Metal 3.5%

Loose Roll-off
(10% of commercial tons)

Furniture, Appliances, & Electronics 2.5%
Potentially Harmful Wastes 1.3%
Fines & Misc Materials 6.2%
Construction Debris 9.4%
Paper 23.5%
Other Organics 6.5%
Plastic 17.3%
Compostable Organics 22.8%
Glass 1.8%
Metal 8.5%

4.1.1 Front Loaders

A total of 106 front loader truckloads were sampled during this study period. Commercial front loaders disposed approximately 56,351 tons of waste, or about 46% of the commercial waste stream, during the study period. The composition estimates for this subpopulation were applied to the 56,351 tons to estimate the amount of waste disposed for each component category. As shown in Table 4-2, *food* was the largest component, accounting for approximately 25% of the total tons disposed by front loaders in 2016. The top ten components summed to over 57% of the total, by weight. The full composition results for front loaders are presented in Table 4-6.

Table 4-2. Top Ten Components: Commercial Front Loaders
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent	Est. Tons
Compostable Organics	Food	25.1%	25.1%	14,161
Paper	Compostable/Soiled	6.7%	31.8%	3,787
Plastic	Other Film	6.3%	38.1%	3,527
Other Organics	Disposable Diapers	3.4%	41.5%	1,930
Paper	Mixed Low-grade Paper	2.9%	44.4%	1,616
Paper	Plain OCC/Kraft	2.8%	47.2%	1,596
Other Organics	Animal By-products	2.6%	49.8%	1,452
Construction Debris	Contaminated Wood	2.5%	52.3%	1,407
Other Organics	Textiles	2.5%	54.8%	1,384
Construction Debris	Pallets	2.3%	57.1%	1,309
Total		**57.1%**		**32,168**

4.1.2 Rear Loaders

73 rear loaders were sampled from the commercial substream. Commercial rear loaders disposed approximately 14,950 tons of waste, or approximately 12% of the commercial waste stream. The composition estimates for this subpopulation were applied to the 14,950 tons to estimate the amount of waste disposed for each component category. Table 4-3 lists the top ten components disposed by rear loader trucks. *Food* alone accounted for approximately 31%, by weight. *Compostable/soiled paper* made up 10% of the total. The top ten components listed in Table 4-3 summed to approximately 68% of the total waste disposed by rear loaders. The full composition results for rear loaders are listed in Table 4-7.

Table 4-3. Top Ten Components: Commercial Rear Loaders
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent	Est. Tons
Compostable Organics	Food	30.8%	30.8%	4,603
Paper	Compostable/Soiled	10.0%	40.8%	1,498
Plastic	Other Film	6.7%	47.5%	1,002
Other Organics	Animal By-products	5.7%	53.2%	853
Paper	Mixed Low-grade Paper	3.4%	56.6%	509
Other Organics	Disposable Diapers	2.7%	59.4%	410
Paper	Plain OCC/Kraft	2.5%	61.9%	371
Other Organics	Textiles	2.5%	64.3%	368
Metal	Mixed Metals/Material	2.1%	66.4%	314
Paper	Non-Comp. Single-use Food Service	1.6%	68.1%	247
Total		**68.1%**		**10,175**

4.1.3 Compactor Roll-offs

A total of 80 compactor roll-off boxes were sampled during this study period. Commercial compactor roll-offs disposed approximately 38,771 tons of waste (about 32% of the commercial waste stream) from January to December 2016. The composition estimates for this subpopulation were applied to the 38,771 tons to estimate the amount of waste disposed for each component category. As shown in Table 4-4, *food* was the largest component of waste hauled in compactors and accounted for about 24% of the total compactor tonnage, by weight. *Compostable/soiled paper* and *medical wastes* were also large components, each around 10% of the total tonnage. Together, the top ten components made up over 70% of the total, by weight. Table 4-8 contains detailed composition results for compactor roll-offs.

Table 4-4. Top Ten Components: Commercial Compactor Roll-offs
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent	Est. Tons
Compostable Organics	Food	23.9%	23.9%	9,277
Paper	Compostable/Soiled	10.0%	33.9%	3,884
Potentially Harmful Wastes	Medical Wastes	9.6%	43.6%	3,734
Plastic	Other Film	6.8%	50.4%	2,630
Other Organics	Disposable Diapers	5.9%	56.3%	2,295
Paper	Plain OCC/Kraft	4.4%	60.7%	1,705
Paper	Mixed Low-grade Paper	3.7%	64.4%	1,439
Paper	Mixed/Other Paper	2.6%	67.0%	1,022
Paper	Non-Comp. Single-use Food Service	2.4%	69.4%	931
Paper	High-grade Paper	1.9%	71.3%	737
Total		**71.3%**		**27,655**

4.1.4 Loose Roll-offs

A total of 33 commercial samples were captured from loose roll-off drop boxes. Commercial loose roll-offs disposed approximately 11,963 tons of waste during the study period, making up approximately 10% of the commercial waste stream. The composition estimates for this subpopulation were applied to the 11,963 tons to estimate the amount of waste disposed for each component category. Table 4-5 lists the top ten components of waste hauled in loose roll-offs. *Food* was the largest component, accounting for almost 16% of loose roll-off tonnage, by weight. When summed, the top ten components made up nearly 57% of all loose roll-off waste. Table 4-9 lists the complete composition results for loose roll-offs.

Table 4-5. Top Ten Components Commercial Loose Roll-offs
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent	Est. Tons
Compostable Organics	Food	15.8%	15.8%	1,894
Paper	Plain OCC/Kraft	7.5%	23.3%	892
Compostable Organics	Leaves and Grass	6.3%	29.6%	756
Plastic	Other Film	6.0%	35.6%	718
Paper	Compostable/Soiled	5.9%	41.5%	710
Metal	Mixed Metals/Material	4.6%	46.2%	554
Plastic	Plastic/Other Materials	2.8%	49.0%	337
Paper	Mixed/Other Paper	2.8%	51.8%	336
Fines & Misc Materials	Sand/Soil/Dirt	2.7%	54.5%	318
Metal	Other Ferrous	2.5%	56.9%	294
Total		**56.9%**		**6,809**

4.1.5 Comparisons among Vehicle Types

The wastes disposed by front loaders, rear loaders, compactor roll-offs, and loose roll-offs contain many of the same top ten components. *Food* was the largest component for waste hauled by all vehicle types. *Compostable/soiled paper*, *other plastic film*, and *plain OCC/Kraft* were also top ten components for all vehicle types.

There were also differences among the top ten components in waste hauled by these vehicles. *Leaves and grass*, *plastic/other materials, sand/soil/dirt,* and *other ferrous* were top ten components for loose roll-offs only. *Contaminated wood* and *pallets* only appeared in the top ten component list for front loaders. *Medical wastes* and *high-grade paper* were unique to compactor roll-offs. There were no material components among the top ten components in waste unique to rear loaders.

Table 4-6. Composition by Weight: Commercial Front Loaders
(January – December 2016)

Material	Est. Percent	+/-	Est. Tons	Material	Est. Percent	+/-	Est. Tons
Paper	**19.0%**		**10,685**	**Furniture, Appliances, and Electronics**	**1.2%**		**694**
Newspaper	0.9%	0.2%	489	Furniture	0.6%	0.4%	353
Plain OCC/Kraft	2.8%	0.5%	1,596	Mattresses	0.1%	0.1%	48
Waxed OCC	0.7%	0.5%	375	Small Appliances	0.2%	0.2%	95
Grocery/Shopping Bags	0.3%	0.1%	155	Cell Phones	0.0%	0.0%	0
High-grade Paper	0.9%	0.2%	484	Audio/Visual Equipment	0.1%	0.1%	59
Mixed Low-grade Paper	2.9%	0.3%	1,616	CRT Computer Monitors	0.0%	0.0%	0
Polycoated Containers	0.1%	0.0%	79	CRT Televisions	0.0%	0.0%	0
Compostable/Soiled	6.7%	0.9%	3,787	Other Electronics	0.2%	0.2%	138
Pot. Comp. Single-use Food Service	0.4%	0.1%	208				
Non-Comp. Single-use Food Service	1.4%	0.3%	808	**Construction Debris**	**17.0%**		**9,552**
Mixed/Other Paper	1.9%	0.6%	1,089	Clean Dimension Lumber	2.0%	0.8%	1,151
				Clean Engineered Wood	1.6%	1.0%	907
Plastic	**14.8%**		**8,338**	Pallets	2.3%	1.1%	1,309
#1 PET Bottles	0.6%	0.1%	326	Crates	0.3%	0.4%	175
#2 HDPE Natural Bottles	0.2%	0.0%	86	Other Untreated Wood	0.2%	0.1%	102
#2 HDPE Colored Bottles	0.2%	0.1%	131	New Painted Wood	1.1%	0.6%	630
Other Plastic Bottles	0.0%	0.0%	17	Old Painted Wood	0.5%	0.3%	298
Tubs #1-#7	1.1%	0.2%	617	Creosote-treated Wood	0.2%	0.2%	112
Expanded Poly. Non-food	0.3%	0.1%	174	Other Treated Wood	0.4%	0.5%	224
Expanded Poly. Food-grade	0.1%	0.0%	67	Contaminated Wood	2.5%	1.1%	1,407
Rigid Poly. Foam Insulation	0.0%	0.1%	18	New Gypsum Scrap	0.2%	0.2%	114
Pot. Comp. Single-use Food Service	0.1%	0.1%	62	Demo Gypsum Scrap	1.2%	0.8%	684
Non-Comp. Single-use Food Service	0.5%	0.1%	289	Carpet	0.5%	0.5%	284
Other Rigid Packaging	1.0%	0.4%	576	Felt Carpet Pad	0.0%	0.0%	0
Shopping/Dry Cleaning Bags	0.2%	0.0%	85	Fiberglass Insulation	0.0%	0.0%	3
Stretch Wrap	0.4%	0.2%	253	Concrete	0.5%	0.4%	265
Clean Polyethylene Film	0.9%	0.4%	509	Asphalt Paving	0.0%	0.0%	0
Other Film	6.3%	0.6%	3,527	Other Aggregates	1.6%	1.4%	922
Plastic Pipe	0.0%	0.1%	24	Rock	0.0%	0.1%	22
Foam Carpet Padding	0.1%	0.1%	45	Asphalt Shingles	0.5%	0.5%	286
Durable Plastic Products	1.8%	0.5%	1,007	Other Asphaltic Roofing	0.0%	0.0%	0
Plastic/Other Materials	0.9%	0.3%	527	Ceramics	0.6%	0.5%	314
				Cement Fiber Board	0.1%	0.1%	30
Glass	**3.2%**		**1,791**	Dried Latex Paints	0.0%	0.0%	1
Clear Beverage	0.6%	0.1%	363	Single-ply Roofing Membranes	0.0%	0.0%	0
Green Beverage	0.6%	0.2%	331	Ceiling Tiles	0.0%	0.0%	0
Brown Beverage	0.5%	0.2%	293	Other Construction Debris	0.6%	0.3%	313
Container Glass	0.2%	0.1%	138				
Fluorescent Tubes	0.0%	0.0%	1	**Potentially Harmful Wastes**	**1.1%**		**596**
CFLs	0.0%	0.0%	0	Liquid Latex Paints	0.2%	0.3%	121
Flat Glass	0.2%	0.3%	121	Solvent-based Adhesives	0.0%	0.0%	0
Automotive Glass	0.7%	0.8%	383	Water-based Adhesives	0.0%	0.0%	1
Other Glass	0.3%	0.1%	161	Oil-based Paint/Solvent	0.0%	0.0%	6
				Caustic Cleaners	0.0%	0.0%	10
Metal	**4.8%**		**2,685**	Pesticides/Herbicides	0.0%	0.0%	0
Aluminum Cans	0.3%	0.1%	169	Rechargeable Batteries	0.0%	0.0%	1
Aluminum Foil/Containers	0.1%	0.0%	81	Other Dry-cell Batteries	0.0%	0.0%	9
Other Aluminum	0.1%	0.0%	36	Wet-cell Batteries	0.0%	0.0%	0
Other Nonferrous	0.1%	0.1%	55	Gasoline/Kerosene	0.0%	0.0%	2
Steel Food Cans	0.4%	0.1%	244	Motor Oil/Diesel Oil	0.0%	0.0%	0
Empty Aerosol Cans	0.1%	0.0%	32	Asbestos	0.0%	0.0%	0
Other Ferrous	1.6%	0.5%	899	Explosives	0.0%	0.0%	0
Oil Filters	0.1%	0.1%	37	Medical Wastes	0.6%	0.5%	342
Mixed Metals/Material	2.0%	0.7%	1,132	Other Cleaners/Chemicals	0.0%	0.0%	15
				Pharmaceuticals/Vitamins	0.0%	0.0%	5
Compostable Organics	**26.9%**		**15,153**	Personal Care/Cosmetics	0.0%	0.0%	27
Leaves and Grass	1.1%	0.7%	613	Other Potentially Harmful Wastes	0.1%	0.1%	58
Prunings	0.6%	0.5%	362				
Food	25.1%	2.3%	14,161	**Fines and Misc Materials**	**1.7%**		**930**
Fats, Oils, Grease	0.0%	0.0%	17	Sand/Soil/Dirt	0.7%	0.4%	366
				Non-distinct Fines	0.2%	0.1%	139
Other Organics	**10.5%**		**5,927**	Miscellaneous Organics	0.6%	0.1%	356
Textiles	2.5%	0.5%	1,384	Miscellaneous Inorganics	0.1%	0.1%	68
Mixed Textiles	1.3%	0.5%	709				
Disposable Diapers	3.4%	1.1%	1,930				
Animal By-products	2.6%	0.9%	1,452				
Rubber Products	0.7%	0.3%	384	**Totals**	**100%**		**56,351**
Tires	0.1%	0.1%	68	Sample Count	106		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-7. Composition by Weight: Commercial Rear Loaders
(January – December 2016)

Material	Est. Percent	+/-	Est. Tons	Material	Est. Percent	+/-	Est. Tons
Paper	**22.2%**		**3,316**	**Furniture, Appliances, and Electronics**	**1.2%**		**172**
Newspaper	0.9%	0.4%	137	Furniture	0.7%	0.6%	104
Plain OCC/Kraft	2.5%	0.5%	371	Mattresses	0.0%	0.0%	0
Waxed OCC	0.6%	0.6%	86	Small Appliances	0.2%	0.1%	23
Grocery/Shopping Bags	0.2%	0.0%	26	Cell Phones	0.0%	0.0%	0
High-grade Paper	0.7%	0.2%	100	Audio/Visual Equipment	0.1%	0.1%	12
Mixed Low-grade Paper	3.4%	0.4%	509	CRT Computer Monitors	0.0%	0.0%	0
Polycoated Containers	0.2%	0.1%	31	CRT Televisions	0.0%	0.0%	0
Compostable/Soiled	10.0%	3.2%	1,498	Other Electronics	0.2%	0.2%	33
Pot. Comp. Single-use Food Service	0.8%	0.6%	120				
Non-Comp. Single-use Food Service	1.6%	0.4%	247	**Construction Debris**	**8.6%**		**1,284**
Mixed/Other Paper	1.3%	0.3%	190	Clean Dimension Lumber	1.3%	1.1%	196
				Clean Engineered Wood	0.8%	0.7%	113
Plastic	**12.5%**		**1,862**	Pallets	0.8%	1.0%	124
#1 PET Bottles	0.5%	0.1%	78	Crates	0.0%	0.0%	2
#2 HDPE Natural Bottles	0.3%	0.2%	46	Other Untreated Wood	0.1%	0.0%	9
#2 HDPE Colored Bottles	0.2%	0.1%	23	New Painted Wood	0.8%	0.5%	119
Other Plastic Bottles	0.0%	0.0%	5	Old Painted Wood	0.2%	0.2%	29
Tubs #1-#7	1.0%	0.4%	157	Creosote-treated Wood	0.0%	0.1%	6
Expanded Poly. Non-food	0.2%	0.1%	24	Other Treated Wood	0.1%	0.1%	8
Expanded Poly. Food-grade	0.1%	0.0%	22	Contaminated Wood	0.7%	0.5%	99
Rigid Poly. Foam Insulation	0.0%	0.0%	0	New Gypsum Scrap	0.0%	0.0%	0
Pot. Comp. Single-use Food Service	0.1%	0.0%	11	Demo Gypsum Scrap	0.1%	0.1%	19
Non-Comp. Single-use Food Service	0.5%	0.1%	77	Carpet	1.0%	0.5%	144
Other Rigid Packaging	0.5%	0.1%	73	Felt Carpet Pad	0.0%	0.0%	1
Shopping/Dry Cleaning Bags	0.2%	0.0%	28	Fiberglass Insulation	0.1%	0.1%	8
Stretch Wrap	0.2%	0.2%	26	Concrete	0.6%	0.9%	93
Clean Polyethylene Film	0.5%	0.3%	75	Asphalt Paving	0.0%	0.0%	0
Other Film	6.7%	0.8%	1,002	Other Aggregates	0.0%	0.0%	0
Plastic Pipe	0.0%	0.0%	0	Rock	0.1%	0.1%	13
Foam Carpet Padding	0.0%	0.0%	7	Asphalt Shingles	0.0%	0.1%	6
Durable Plastic Products	0.9%	0.3%	140	Other Asphaltic Roofing	0.0%	0.0%	0
Plastic/Other Materials	0.5%	0.2%	70	Ceramics	0.4%	0.2%	58
				Cement Fiber Board	0.0%	0.0%	0
Glass	**2.7%**		**410**	Dried Latex Paints	1.4%	2.4%	204
Clear Beverage	0.8%	0.5%	119	Single-ply Roofing Membranes	0.0%	0.0%	0
Green Beverage	0.8%	0.8%	118	Ceiling Tiles	0.1%	0.1%	12
Brown Beverage	0.6%	0.3%	90	Other Construction Debris	0.1%	0.1%	21
Container Glass	0.2%	0.1%	24				
Fluorescent Tubes	0.0%	0.0%	0	**Potentially Harmful Wastes**	**1.5%**		**218**
CFLs	0.0%	0.0%	0	Liquid Latex Paints	0.3%	0.4%	51
Flat Glass	0.0%	0.0%	1	Solvent-based Adhesives	0.0%	0.0%	3
Automotive Glass	0.0%	0.0%	0	Water-based Adhesives	0.0%	0.0%	3
Other Glass	0.4%	0.2%	58	Oil-based Paint/Solvent	0.0%	0.0%	0
				Caustic Cleaners	0.0%	0.0%	1
Metal	**4.0%**		**599**	Pesticides/Herbicides	0.0%	0.0%	0
Aluminum Cans	0.3%	0.1%	45	Rechargeable Batteries	0.0%	0.0%	0
Aluminum Foil/Containers	0.3%	0.1%	43	Other Dry-cell Batteries	0.0%	0.0%	2
Other Aluminum	0.0%	0.0%	3	Wet-cell Batteries	0.0%	0.0%	0
Other Nonferrous	0.0%	0.0%	4	Gasoline/Kerosene	0.0%	0.0%	0
Steel Food Cans	0.5%	0.1%	70	Motor Oil/Diesel Oil	0.0%	0.0%	1
Empty Aerosol Cans	0.0%	0.0%	7	Asbestos	0.0%	0.0%	0
Other Ferrous	0.7%	0.3%	112	Explosives	0.0%	0.0%	0
Oil Filters	0.0%	0.0%	1	Medical Wastes	0.6%	0.5%	90
Mixed Metals/Material	2.1%	1.9%	314	Other Cleaners/Chemicals	0.0%	0.0%	0
				Pharmaceuticals/Vitamins	0.0%	0.0%	1
Compostable Organics	**32.3%**		**4,825**	Personal Care/Cosmetics	0.1%	0.1%	11
Leaves and Grass	1.0%	0.7%	154	Other Potentially Harmful Wastes	0.4%	0.5%	55
Prunings	0.2%	0.1%	29				
Food	30.8%	3.5%	4,603	**Fines and Misc Materials**	**1.9%**		**290**
Fats, Oils, Grease	0.3%	0.4%	38	Sand/Soil/Dirt	0.4%	0.2%	52
				Non-distinct Fines	0.2%	0.1%	27
Other Organics	**13.2%**		**1,974**	Miscellaneous Organics	0.7%	0.3%	109
Textiles	2.5%	0.7%	368	Miscellaneous Inorganics	0.7%	1.0%	102
Mixed Textiles	1.4%	0.8%	210				
Disposable Diapers	2.7%	1.0%	410				
Animal By-products	5.7%	3.3%	853				
Rubber Products	0.8%	0.5%	125	**Totals**	**100%**		**14,950**
Tires	0.0%	0.1%	7	Sample Count		73	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-8. Composition by Weight: Commercial Compactor Roll-offs
(January – December 2016)

Material	Est. Percent	+ / -	Est. Tons	Material	Est. Percent	+ / -	Est. Tons
Paper	**28.2%**		**10,916**	**Furniture, Appliances, and Electronics**	**0.3%**		**120**
Newspaper	1.0%	0.4%	373	Furniture	0.0%	0.0%	0
Plain OCC/Kraft	4.4%	1.8%	1,705	Mattresses	0.1%	0.2%	37
Waxed OCC	0.4%	0.2%	140	Small Appliances	0.1%	0.1%	20
Grocery/Shopping Bags	0.2%	0.1%	96	Cell Phones	0.0%	0.0%	0
High-grade Paper	1.9%	1.0%	737	Audio/Visual Equipment	0.1%	0.2%	50
Mixed Low-grade Paper	3.7%	0.6%	1,439	CRT Computer Monitors	0.0%	0.0%	0
Polycoated Containers	0.4%	0.1%	167	CRT Televisions	0.0%	0.0%	0
Compostable/Soiled	10.0%	1.4%	3,884	Other Electronics	0.0%	0.0%	12
Pot. Comp. Single-use Food Service	1.1%	0.4%	421				
Non-Comp. Single-use Food Service	2.4%	0.4%	931	**Construction Debris**	**6.3%**		**2,454**
Mixed/Other Paper	2.6%	0.8%	1,022	Clean Dimension Lumber	0.2%	0.2%	68
				Clean Engineered Wood	1.3%	1.2%	503
Plastic	**14.4%**		**5,589**	Pallets	1.1%	1.0%	416
#1 PET Bottles	0.7%	0.1%	281	Crates	0.0%	0.0%	0
#2 HDPE Natural Bottles	0.2%	0.1%	83	Other Untreated Wood	0.1%	0.1%	32
#2 HDPE Colored Bottles	0.1%	0.0%	40	New Painted Wood	0.3%	0.4%	109
Other Plastic Bottles	0.0%	0.0%	11	Old Painted Wood	0.1%	0.1%	55
Tubs #1-#7	0.8%	0.2%	305	Creosote-treated Wood	0.0%	0.0%	1
Expanded Poly. Non-food	0.3%	0.2%	128	Other Treated Wood	0.0%	0.0%	0
Expanded Poly. Food-grade	0.1%	0.0%	39	Contaminated Wood	0.7%	0.5%	267
Rigid Poly. Foam Insulation	0.0%	0.0%	0	New Gypsum Scrap	0.2%	0.2%	64
Pot. Comp. Single-use Food Service	0.2%	0.1%	81	Demo Gypsum Scrap	0.0%	0.0%	1
Non-Comp. Single-use Food Service	1.4%	0.3%	527	Carpet	0.0%	0.0%	9
Other Rigid Packaging	0.7%	0.2%	282	Felt Carpet Pad	0.1%	0.1%	26
Shopping/Dry Cleaning Bags	0.1%	0.0%	50	Fiberglass Insulation	0.7%	1.2%	280
Stretch Wrap	0.2%	0.1%	73	Concrete	0.5%	0.7%	177
Clean Polyethylene Film	0.6%	0.3%	246	Asphalt Paving	0.0%	0.0%	0
Other Film	6.8%	0.8%	2,630	Other Aggregates	0.0%	0.0%	0
Plastic Pipe	0.0%	0.0%	9	Rock	0.0%	0.0%	0
Foam Carpet Padding	0.0%	0.0%	2	Asphalt Shingles	0.0%	0.0%	0
Durable Plastic Products	1.6%	0.7%	620	Other Asphaltic Roofing	0.1%	0.2%	54
Plastic/Other Materials	0.5%	0.2%	183	Ceramics	0.1%	0.1%	47
				Cement Fiber Board	0.0%	0.0%	0
Glass	**1.9%**		**721**	Dried Latex Paints	0.0%	0.0%	0
Clear Beverage	0.6%	0.2%	233	Single-ply Roofing Membranes	0.0%	0.0%	0
Green Beverage	0.4%	0.2%	153	Ceiling Tiles	0.1%	0.1%	22
Brown Beverage	0.6%	0.4%	228	Other Construction Debris	0.8%	1.1%	326
Container Glass	0.1%	0.0%	46				
Fluorescent Tubes	0.0%	0.0%	0	**Potentially Harmful Wastes**	**9.9%**		**3,834**
CFLs	0.0%	0.0%	2	Liquid Latex Paints	0.0%	0.0%	0
Flat Glass	0.0%	0.0%	0	Solvent-based Adhesives	0.0%	0.0%	2
Automotive Glass	0.0%	0.0%	0	Water-based Adhesives	0.0%	0.0%	0
Other Glass	0.2%	0.1%	59	Oil-based Paint/Solvent	0.0%	0.0%	0
				Caustic Cleaners	0.0%	0.0%	7
Metal	**3.5%**		**1,352**	Pesticides/Herbicides	0.0%	0.0%	0
Aluminum Cans	0.3%	0.1%	111	Rechargeable Batteries	0.0%	0.0%	0
Aluminum Foil/Containers	0.3%	0.1%	106	Other Dry-cell Batteries	0.0%	0.0%	9
Other Aluminum	0.0%	0.0%	3	Wet-cell Batteries	0.0%	0.0%	0
Other Nonferrous	0.0%	0.0%	9	Gasoline/Kerosene	0.0%	0.0%	0
Steel Food Cans	0.3%	0.1%	134	Motor Oil/Diesel Oil	0.0%	0.0%	2
Empty Aerosol Cans	0.0%	0.0%	13	Asbestos	0.0%	0.0%	0
Other Ferrous	1.3%	0.8%	486	Explosives	0.0%	0.0%	0
Oil Filters	0.0%	0.0%	0	Medical Wastes	9.6%	4.4%	3,734
Mixed Metals/Material	1.3%	0.6%	490	Other Cleaners/Chemicals	0.0%	0.0%	0
				Pharmaceuticals/Vitamins	0.0%	0.0%	8
Compostable Organics	**24.8%**		**9,617**	Personal Care/Cosmetics	0.1%	0.1%	58
Leaves and Grass	0.6%	0.4%	228	Other Potentially Harmful Wastes	0.0%	0.0%	15
Prunings	0.2%	0.2%	66				
Food	23.9%	3.1%	9,277	**Fines and Misc Materials**	**0.9%**		**360**
Fats, Oils, Grease	0.1%	0.2%	46	Sand/Soil/Dirt	0.1%	0.1%	52
				Non-distinct Fines	0.2%	0.1%	67
Other Organics	**9.8%**		**3,808**	Miscellaneous Organics	0.5%	0.2%	195
Textiles	1.7%	0.6%	643	Miscellaneous Inorganics	0.1%	0.1%	45
Mixed Textiles	0.9%	0.4%	347				
Disposable Diapers	5.9%	2.4%	2,295				
Animal By-products	0.5%	0.4%	205				
Rubber Products	0.8%	0.4%	308	**Totals**	**100%**		**38,771**
Tires	0.0%	0.0%	11	Sample Count	80		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-9. Composition by Weight: Commercial Loose Roll-offs
(January – December 2016)

Material	Est. Percent	+ / -	Est. Tons	Material	Est. Percent	+ / -	Est. Tons
Paper	**23.5%**		**2,806**	**Furniture, Appliances, and Electronics**	**2.5%**		**303**
Newspaper	0.3%	0.2%	38	Furniture	1.4%	1.5%	162
Plain OCC/Kraft	7.5%	3.4%	892	Mattresses	0.7%	0.9%	79
Waxed OCC	0.8%	0.8%	95	Small Appliances	0.0%	0.0%	0
Grocery/Shopping Bags	0.2%	0.1%	25	Cell Phones	0.0%	0.0%	0
High-grade Paper	1.5%	0.7%	177	Audio/Visual Equipment	0.0%	0.0%	2
Mixed Low-grade Paper	2.2%	0.7%	265	CRT Computer Monitors	0.0%	0.0%	0
Polycoated Containers	0.1%	0.0%	10	CRT Televisions	0.0%	0.0%	0
Compostable/Soiled	5.9%	1.5%	710	Other Electronics	0.5%	0.7%	61
Pot. Comp. Single-use Food Service	0.5%	0.4%	63				
Non-Comp. Single-use Food Service	1.6%	0.6%	196	**Construction Debris**	**9.4%**		**1,129**
Mixed/Other Paper	2.8%	1.3%	336	Clean Dimension Lumber	1.9%	1.6%	232
				Clean Engineered Wood	1.6%	1.4%	195
Plastic	**17.3%**		**2,070**	Pallets	2.0%	2.9%	243
#1 PET Bottles	0.7%	0.3%	87	Crates	0.2%	0.3%	22
#2 HDPE Natural Bottles	0.2%	0.2%	28	Other Untreated Wood	0.0%	0.0%	2
#2 HDPE Colored Bottles	0.5%	0.4%	55	New Painted Wood	1.1%	1.3%	135
Other Plastic Bottles	0.0%	0.0%	3	Old Painted Wood	0.2%	0.4%	28
Tubs #1-#7	0.6%	0.3%	70	Creosote-treated Wood	0.0%	0.0%	0
Expanded Poly. Non-food	0.6%	0.4%	77	Other Treated Wood	0.0%	0.0%	0
Expanded Poly. Food-grade	0.1%	0.1%	12	Contaminated Wood	1.0%	0.9%	118
Rigid Poly. Foam Insulation	0.0%	0.0%	3	New Gypsum Scrap	0.0%	0.0%	0
Pot. Comp. Single-use Food Service	0.0%	0.0%	5	Demo Gypsum Scrap	0.1%	0.2%	15
Non-Comp. Single-use Food Service	0.4%	0.2%	45	Carpet	0.2%	0.3%	22
Other Rigid Packaging	1.1%	0.8%	131	Felt Carpet Pad	0.0%	0.0%	0
Shopping/Dry Cleaning Bags	0.1%	0.0%	10	Fiberglass Insulation	0.1%	0.1%	14
Stretch Wrap	0.6%	0.3%	67	Concrete	0.3%	0.3%	40
Clean Polyethylene Film	1.6%	0.9%	190	Asphalt Paving	0.0%	0.0%	0
Other Film	6.0%	2.4%	718	Other Aggregates	0.2%	0.2%	21
Plastic Pipe	0.2%	0.3%	24	Rock	0.0%	0.0%	0
Foam Carpet Padding	0.0%	0.0%	0	Asphalt Shingles	0.0%	0.0%	0
Durable Plastic Products	1.7%	0.9%	209	Other Asphaltic Roofing	0.0%	0.0%	0
Plastic/Other Materials	2.8%	3.5%	337	Ceramics	0.1%	0.2%	14
				Cement Fiber Board	0.1%	0.1%	11
Glass	**1.8%**		**219**	Dried Latex Paints	0.0%	0.0%	0
Clear Beverage	0.7%	0.4%	89	Single-ply Roofing Membranes	0.0%	0.0%	0
Green Beverage	0.3%	0.2%	31	Ceiling Tiles	0.2%	0.2%	18
Brown Beverage	0.2%	0.1%	21	Other Construction Debris	0.0%	0.0%	0
Container Glass	0.2%	0.1%	21				
Fluorescent Tubes	0.0%	0.0%	0	**Potentially Harmful Wastes**	**1.3%**		**160**
CFLs	0.0%	0.0%	0	Liquid Latex Paints	0.0%	0.0%	2
Flat Glass	0.4%	0.7%	47	Solvent-based Adhesives	0.0%	0.0%	1
Automotive Glass	0.0%	0.0%	0	Water-based Adhesives	0.0%	0.1%	6
Other Glass	0.1%	0.1%	9	Oil-based Paint/Solvent	0.0%	0.0%	1
				Caustic Cleaners	0.0%	0.0%	3
Metal	**8.5%**		**1,023**	Pesticides/Herbicides	0.0%	0.0%	0
Aluminum Cans	0.3%	0.1%	39	Rechargeable Batteries	0.0%	0.0%	0
Aluminum Foil/Containers	0.3%	0.2%	36	Other Dry-cell Batteries	0.0%	0.0%	1
Other Aluminum	0.2%	0.2%	25	Wet-cell Batteries	0.0%	0.0%	0
Other Nonferrous	0.0%	0.1%	4	Gasoline/Kerosene	0.0%	0.0%	0
Steel Food Cans	0.3%	0.2%	32	Motor Oil/Diesel Oil	0.4%	0.4%	46
Empty Aerosol Cans	0.2%	0.2%	27	Asbestos	0.0%	0.0%	0
Other Ferrous	2.5%	1.5%	294	Explosives	0.0%	0.0%	0
Oil Filters	0.1%	0.1%	12	Medical Wastes	0.7%	1.0%	88
Mixed Metals/Material	4.6%	2.2%	554	Other Cleaners/Chemicals	0.0%	0.0%	6
				Pharmaceuticals/Vitamins	0.0%	0.0%	2
Compostable Organics	**22.8%**		**2,731**	Personal Care/Cosmetics	0.0%	0.0%	3
Leaves and Grass	6.3%	5.4%	756	Other Potentially Harmful Wastes	0.0%	0.0%	0
Prunings	0.7%	0.6%	78				
Food	15.8%	5.0%	1,894	**Fines and Misc Materials**	**6.2%**		**743**
Fats, Oils, Grease	0.0%	0.0%	2	Sand/Soil/Dirt	2.7%	2.3%	318
				Non-distinct Fines	1.5%	2.2%	181
Other Organics	**6.5%**		**780**	Miscellaneous Organics	0.3%	0.2%	38
Textiles	2.2%	1.1%	258	Miscellaneous Inorganics	1.7%	2.2%	205
Mixed Textiles	1.6%	0.5%	188				
Disposable Diapers	0.8%	0.9%	100				
Animal By-products	0.9%	1.0%	111				
Rubber Products	1.0%	0.9%	123	**Totals**	**100%**		**11,963**
Tires	0.0%	0.0%	0	Sample Count		33	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

4.2 Commercial Composition by Season

Commercial waste composition results were examined for seasonal variations. Samples were classified by season according to the month in which they were captured: March, April, and May are spring months; June, July, and August are summer; September, October, and November are autumn; and December, January, and February are winter. Figure 4-2 summarizes the results of the broad material categories by season. When summed together, **paper** and **organics** accounted for at least 53% of the total tonnage for each of the four seasons.

Figure 4-2. Commercial Composition Summary: by Season

Spring

- Furniture, Appliances, & Electronics 1.6%
- Potentially Harmful Wastes 3.4%
- Fines & Misc Materials 3.3%
- Paper 18.0%
- Construction Debris 11.2%
- Plastic 11.5%
- Glass 1.6%
- Other Organics 17.5%
- Metal 6.1%
- Compostable Organics 25.8%

Summer

- Furniture, Appliances, & Electronics 1.3%
- Potentially Harmful Wastes 2.3%
- Fines & Misc Materials 2.3%
- Paper 22.6%
- Construction Debris 10.6%
- Plastic 14.1%
- Other Organics 13.1%
- Glass 2.3%
- Compostable Organics 27.5%
- Metal 4.1%

Autumn

- Furniture, Appliances, & Electronics 0.9%
- Potentially Harmful Wastes 5.6%
- Fines & Misc Materials 1.7%
- Construction Debris 4.3%
- Paper 30.4%
- Other Organics 4.7%
- Compostable Organics 29.3%
- Plastic 17.3%
- Metal 3.1%
- Glass 2.8%

Winter

- Furniture, Appliances, & Electronics 1.5%
- Potentially Harmful Wastes 4.2%
- Fines & Misc Materials 1.2%
- Paper 20.5%
- Construction Debris 16.1%
- Plastic 14.9%
- Other Organics 9.0%
- Glass 3.2%
- Compostable Organics 24.1%
- Metal 5.2%

4.2.1 Spring

A total of 44 samples were captured from commercial loads between the months of March and May 2016. *Food* accounted for 23% of the total tons disposed in the spring. *Animal by-products*, *compostable/soiled paper*, and *disposable diapers* were also large components (each more than 5%, by weight). The top ten components, which are listed in Table 4-10, sum to 61% of the total commercial materials sampled in spring, by weight. Table 4-14 lists the full composition results for commercial waste during this season.

Table 4-10. Top Ten Components: Commercial in Spring
(March – May 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	23.0%	23.0%
Other Organics	Animal By-products	6.9%	29.9%
Paper	Compostable/Soiled	5.6%	35.6%
Other Organics	Disposable Diapers	5.1%	40.6%
Plastic	Other Film	4.8%	45.4%
Other Organics	Textiles	3.8%	49.2%
Potentially Harmful Wastes	Medical Wastes	3.3%	52.4%
Paper	Mixed Low-grade Paper	3.1%	55.5%
Paper	Plain OCC/Kraft	2.7%	58.2%
Metal	Mixed Metals/Material	2.7%	61.0%
Total		**61.0%**	

4.2.2 Summer

In the summer, 90 samples were taken from the commercial substream. As shown in Table 4-11, *food* was the single largest component at almost 26%, by weight, followed by *compostable/soiled paper*, *other plastic film*, and *disposable diapers.* See Table 4-15 for a complete list of the summer composition results.

Table 4-11. Top Ten Components: Commercial in Summer
(June – August 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	25.7%	25.7%
Paper	Compostable/Soiled	9.3%	35.0%
Plastic	Other Film	6.9%	41.8%
Other Organics	Disposable Diapers	5.2%	47.1%
Paper	Mixed Low-grade Paper	3.6%	50.7%
Other Organics	Textiles	3.1%	53.9%
Paper	Plain OCC/Kraft	2.9%	56.7%
Other Organics	Animal By-products	2.3%	59.1%
Paper	Non-Comp. Single-use Food Service	2.0%	61.1%
Potentially Harmful Wastes	Medical Wastes	1.9%	62.9%
Total		**62.9%**	

4.2.3 Autumn

Between September and November of 2016, a total of 45 samples were captured from commercial loads. Table 4-12 lists the top ten components of waste disposed in the autumn. *Food* composed 28% of the total, while *compostable/soiled paper*, *other plastic film*, and *plain*

OCC/Kraft each made up at least 5% of the total. When summed together, the top ten components made up approximately 69% of the total waste disposed in the autumn of 2016. Table 4-16 lists the composition results for this season in detail.

Table 4-12. Top Ten Components: Commercial in Autumn
(September – November 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	28.0%	28.0%
Paper	Compostable/Soiled	10.5%	38.5%
Plastic	Other Film	7.7%	46.2%
Paper	Plain OCC/Kraft	5.5%	51.7%
Potentially Harmful Wastes	Medical Wastes	4.9%	56.6%
Paper	Mixed Low-grade Paper	3.2%	59.8%
Paper	Mixed/Other Paper	3.0%	62.8%
Paper	Non-Comp. Single-use Food Service	2.3%	65.1%
Paper	Waxed OCC	2.0%	67.0%
Paper	High-grade Paper	1.7%	68.8%
Total		**68.8%**	

4.2.4 Winter

A total of 113 samples were sorted from commercial waste disposed during January, February, and December of 2016. The top ten components are listed in Table 4-13 and sum to almost 56% of the total commercial waste sampled in winter, by weight. *Food* was the largest component, over 22% of the total, followed by *compostable/soiled paper* and *other plastic film*, at 6.1% each. Table 4-17 details the full composition results of commercial waste for winter 2016.

Table 4-13. Top Ten Components: Commercial in Winter
(January, February, and December 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	22.3%	22.3%
Paper	Compostable/Soiled	6.1%	28.4%
Plastic	Other Film	6.1%	34.5%
Paper	Plain OCC/Kraft	3.9%	38.4%
Other Organics	Disposable Diapers	3.6%	42.0%
Potentially Harmful Wastes	Medical Wastes	3.3%	45.4%
Paper	Mixed Low-grade Paper	3.0%	48.4%
Construction Debris	Pallets	3.0%	51.4%
Construction Debris	Clean Engineered Wood	2.3%	53.7%
Plastic	Durable Plastic Products	2.2%	55.9%
Total		**55.9%**	

4.2.5 Comparisons among Seasons

Food was the largest component of commercial waste disposed in each of the four seasons. *Compostable/soiled paper* was one of the three largest components across all seasons. Other common components making up the top ten components among the four seasons included *other plastic film*, *plain OCC/Kraft, medical wastes,* and *mixed low-grade paper*. Several top ten components were specific to individual seasons, including: *mixed metals/materials* in the spring, *waxed OCC* in the autumn, and *pallets* in the winter.

Table 4-14. Composition by Weight: Commercial in Spring
(March – May 2016)

Material	Est. Percent	+/-		Material	Est. Percent	+/-
Paper	**18.0%**			**Furniture, Appliances, and Electronics**	**1.6%**	
Newspaper	0.5%	0.2%		Furniture	0.8%	0.8%
Plain OCC/Kraft	2.7%	0.5%		Mattresses	0.5%	0.5%
Waxed OCC	0.3%	0.4%		Small Appliances	0.1%	0.1%
Grocery/Shopping Bags	0.0%	0.0%		Cell Phones	0.0%	0.0%
High-grade Paper	0.9%	0.4%		Audio/Visual Equipment	0.2%	0.3%
Mixed Low-grade Paper	3.1%	0.5%		CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.2%	0.1%		CRT Televisions	0.0%	0.0%
Compostable/Soiled	5.6%	0.9%		Other Electronics	0.1%	0.1%
Pot. Comp. Single-use Food Service	0.7%	0.2%				
Non-Comp. Single-use Food Service	1.3%	0.3%		**Construction Debris**	**11.2%**	
Mixed/Other Paper	2.6%	1.7%		Clean Dimension Lumber	2.1%	1.1%
				Clean Engineered Wood	1.7%	1.0%
Plastic	**11.5%**			Pallets	0.6%	0.5%
#1 PET Bottles	0.5%	0.1%		Crates	0.3%	0.5%
#2 HDPE Natural Bottles	0.2%	0.1%		Other Untreated Wood	0.1%	0.0%
#2 HDPE Colored Bottles	0.3%	0.1%		New Painted Wood	1.0%	0.6%
Other Plastic Bottles	0.0%	0.0%		Old Painted Wood	0.5%	0.7%
Tubs #1-#7	1.3%	0.2%		Creosote-treated Wood	0.4%	0.5%
Expanded Poly. Non-food	0.2%	0.1%		Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.1%	0.0%		Contaminated Wood	1.6%	1.1%
Rigid Poly. Foam Insulation	0.0%	0.0%		New Gypsum Scrap	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.1%	0.1%		Demo Gypsum Scrap	0.5%	0.8%
Non-Comp. Single-use Food Service	0.0%	0.0%		Carpet	1.4%	1.2%
Other Rigid Packaging	0.4%	0.1%		Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.2%	0.0%		Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	0.2%	0.2%		Concrete	0.1%	0.1%
Clean Polyethylene Film	0.2%	0.1%		Asphalt Paving	0.0%	0.0%
Other Film	4.8%	0.6%		Other Aggregates	0.1%	0.1%
Plastic Pipe	0.0%	0.0%		Rock	0.0%	0.0%
Foam Carpet Padding	0.3%	0.3%		Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	1.7%	0.8%		Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	0.9%	0.4%		Ceramics	0.3%	0.2%
				Cement Fiber Board	0.1%	0.2%
Glass	**1.6%**			Dried Latex Paints	0.2%	0.4%
Clear Beverage	0.5%	0.2%		Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.4%	0.2%		Ceiling Tiles	0.1%	0.2%
Brown Beverage	0.3%	0.1%		Other Construction Debris	0.0%	0.0%
Container Glass	0.1%	0.1%				
Fluorescent Tubes	0.0%	0.0%		**Potentially Harmful Wastes**	**3.4%**	
CFLs	0.0%	0.0%		Liquid Latex Paints	0.0%	0.0%
Flat Glass	0.1%	0.1%		Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%		Water-based Adhesives	0.0%	0.0%
Other Glass	0.1%	0.1%		Oil-based Paint/Solvent	0.0%	0.0%
				Caustic Cleaners	0.0%	0.0%
Metal	**6.1%**			Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.4%	0.1%		Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.3%	0.1%		Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.3%	0.3%		Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.0%		Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.4%	0.2%		Motor Oil/Diesel Oil	0.1%	0.1%
Empty Aerosol Cans	0.1%	0.1%		Asbestos	0.0%	0.0%
Other Ferrous	1.9%	1.1%		Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%		Medical Wastes	3.3%	3.1%
Mixed Metals/Material	2.7%	1.3%		Other Cleaners/Chemicals	0.0%	0.0%
				Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**25.8%**			Personal Care/Cosmetics	0.0%	0.0%
Leaves and Grass	2.2%	1.5%		Other Potentially Harmful Wastes	0.0%	0.0%
Prunings	0.4%	0.4%				
Food	23.0%	3.4%		**Fines and Misc Materials**	**3.3%**	
Fats, Oils, Grease	0.1%	0.1%		Sand/Soil/Dirt	1.6%	1.4%
				Non-distinct Fines	0.8%	1.2%
Other Organics	**17.5%**			Miscellaneous Organics	0.9%	0.3%
Textiles	3.8%	1.1%		Miscellaneous Inorganics	0.0%	0.1%
Mixed Textiles	1.1%	0.5%				
Disposable Diapers	5.1%	3.2%				
Animal By-products	6.9%	2.1%				
Rubber Products	0.6%	0.3%		**Totals**	**100%**	
Tires	0.0%	0.0%		Sample Count	44	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-15. Composition by Weight: Commercial in Summer
(June – August 2016)

Material	Est. Percent	+/-		Est. Percent	+/-
Paper	**22.6%**		**Furniture, Appliances, and Electronics**	**1.3%**	
Newspaper	0.9%	0.2%	Furniture	0.7%	0.5%
Plain OCC/Kraft	2.9%	0.8%	Mattresses	0.1%	0.2%
Waxed OCC	0.1%	0.1%	Small Appliances	0.3%	0.2%
Grocery/Shopping Bags	0.3%	0.1%	Cell Phones	0.0%	0.0%
High-grade Paper	1.2%	0.4%	Audio/Visual Equipment	0.0%	0.0%
Mixed Low-grade Paper	3.6%	0.4%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.2%	0.0%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	9.3%	0.9%	Other Electronics	0.2%	0.2%
Pot. Comp. Single-use Food Service	0.7%	0.3%			
Non-Comp. Single-use Food Service	2.0%	0.4%	**Construction Debris**	**10.6%**	
Mixed/Other Paper	1.3%	0.3%	Clean Dimension Lumber	0.9%	0.5%
			Clean Engineered Wood	0.5%	0.3%
Plastic	**14.1%**		Pallets	1.2%	1.0%
#1 PET Bottles	0.7%	0.2%	Crates	0.0%	0.0%
#2 HDPE Natural Bottles	0.2%	0.1%	Other Untreated Wood	0.0%	0.1%
#2 HDPE Colored Bottles	0.1%	0.0%	New Painted Wood	1.6%	0.9%
Other Plastic Bottles	0.0%	0.0%	Old Painted Wood	0.1%	0.1%
Tubs #1-#7	0.7%	0.1%	Creosote-treated Wood	0.1%	0.1%
Expanded Poly. Non-food	0.3%	0.2%	Other Treated Wood	0.4%	0.5%
Expanded Poly. Food-grade	0.1%	0.0%	Contaminated Wood	0.8%	0.7%
Rigid Poly. Foam Insulation	0.0%	0.0%	New Gypsum Scrap	0.1%	0.2%
Pot. Comp. Single-use Food Service	0.1%	0.0%	Demo Gypsum Scrap	0.4%	0.3%
Non-Comp. Single-use Food Service	0.9%	0.2%	Carpet	0.8%	0.8%
Other Rigid Packaging	1.0%	0.2%	Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.1%	0.0%	Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	0.4%	0.2%	Concrete	0.7%	0.5%
Clean Polyethylene Film	0.4%	0.2%	Asphalt Paving	0.0%	0.0%
Other Film	6.9%	0.7%	Other Aggregates	1.5%	1.5%
Plastic Pipe	0.0%	0.1%	Rock	0.1%	0.1%
Foam Carpet Padding	0.0%	0.1%	Asphalt Shingles	0.3%	0.4%
Durable Plastic Products	1.5%	0.6%	Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	0.6%	0.2%	Ceramics	0.5%	0.3%
			Cement Fiber Board	0.0%	0.0%
Glass	**2.3%**		Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.6%	0.2%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.5%	0.2%	Ceiling Tiles	0.0%	0.0%
Brown Beverage	0.6%	0.2%	Other Construction Debris	0.5%	0.4%
Container Glass	0.2%	0.0%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**2.3%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.1%	0.1%
Flat Glass	0.0%	0.0%	Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%	Water-based Adhesives	0.0%	0.0%
Other Glass	0.4%	0.1%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.0%	0.0%
Metal	**4.1%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.2%	0.0%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.3%	0.1%	Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.0%	0.0%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.1%	0.1%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.3%	0.1%	Motor Oil/Diesel Oil	0.0%	0.0%
Empty Aerosol Cans	0.1%	0.0%	Asbestos	0.0%	0.0%
Other Ferrous	1.4%	0.5%	Explosives	0.0%	0.0%
Oil Filters	0.1%	0.1%	Medical Wastes	1.9%	1.2%
Mixed Metals/Material	1.6%	0.5%	Other Cleaners/Chemicals	0.0%	0.0%
			Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**27.5%**		Personal Care/Cosmetics	0.2%	0.1%
Leaves and Grass	1.5%	1.4%	Other Potentially Harmful Wastes	0.1%	0.1%
Prunings	0.3%	0.3%			
Food	25.7%	1.9%	**Fines and Misc Materials**	**2.3%**	
Fats, Oils, Grease	0.0%	0.0%	Sand/Soil/Dirt	1.0%	0.5%
			Non-distinct Fines	0.4%	0.1%
Other Organics	**13.1%**		Miscellaneous Organics	0.7%	0.2%
Textiles	3.1%	0.6%	Miscellaneous Inorganics	0.1%	0.1%
Mixed Textiles	1.6%	0.6%			
Disposable Diapers	5.2%	1.7%			
Animal By-products	2.3%	0.7%			
Rubber Products	0.8%	0.3%	**Totals**	**100%**	
Tires	0.0%	0.0%	Sample Count	90	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-16. Composition by Weight: Commercial in Autumn
(September – November 2016)

Material	Est. Percent	+/-		Material	Est. Percent	+/-
Paper	**30.4%**			**Furniture, Appliances, and Electronics**	**0.9%**	
Newspaper	1.0%	0.6%		Furniture	0.8%	1.0%
Plain OCC/Kraft	5.5%	2.7%		Mattresses	0.0%	0.0%
Waxed OCC	2.0%	1.3%		Small Appliances	0.1%	0.1%
Grocery/Shopping Bags	0.2%	0.1%		Cell Phones	0.0%	0.0%
High-grade Paper	1.7%	1.3%		Audio/Visual Equipment	0.1%	0.1%
Mixed Low-grade Paper	3.2%	0.8%		CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.2%	0.2%		CRT Televisions	0.0%	0.0%
Compostable/Soiled	10.5%	2.0%		Other Electronics	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.8%	0.4%				
Non-Comp. Single-use Food Service	2.3%	0.6%		**Construction Debris**	**4.3%**	
Mixed/Other Paper	3.0%	0.8%		Clean Dimension Lumber	0.7%	0.8%
				Clean Engineered Wood	1.3%	2.0%
Plastic	**17.3%**			Pallets	0.2%	0.2%
#1 PET Bottles	0.6%	0.1%		Crates	0.0%	0.0%
#2 HDPE Natural Bottles	0.2%	0.1%		Other Untreated Wood	0.1%	0.1%
#2 HDPE Colored Bottles	0.1%	0.0%		New Painted Wood	0.0%	0.0%
Other Plastic Bottles	0.0%	0.0%		Old Painted Wood	0.1%	0.1%
Tubs #1-#7	0.6%	0.2%		Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	0.4%	0.2%		Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.1%	0.1%		Contaminated Wood	1.1%	0.9%
Rigid Poly. Foam Insulation	0.0%	0.0%		New Gypsum Scrap	0.2%	0.4%
Pot. Comp. Single-use Food Service	0.1%	0.1%		Demo Gypsum Scrap	0.0%	0.0%
Non-Comp. Single-use Food Service	1.4%	0.4%		Carpet	0.2%	0.3%
Other Rigid Packaging	1.3%	0.7%		Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.2%	0.1%		Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	0.4%	0.2%		Concrete	0.1%	0.1%
Clean Polyethylene Film	1.7%	0.7%		Asphalt Paving	0.0%	0.0%
Other Film	7.7%	1.0%		Other Aggregates	0.0%	0.0%
Plastic Pipe	0.0%	0.0%		Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%		Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	0.9%	0.5%		Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	1.7%	1.9%		Ceramics	0.1%	0.0%
				Cement Fiber Board	0.0%	0.0%
Glass	**2.8%**			Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.8%	0.3%		Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.4%	0.2%		Ceiling Tiles	0.0%	0.0%
Brown Beverage	0.7%	0.5%		Other Construction Debris	0.1%	0.1%
Container Glass	0.1%	0.1%				
Fluorescent Tubes	0.0%	0.0%		**Potentially Harmful Wastes**	**5.6%**	
CFLs	0.0%	0.0%		Liquid Latex Paints	0.0%	0.1%
Flat Glass	0.6%	1.1%		Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%		Water-based Adhesives	0.0%	0.0%
Other Glass	0.1%	0.1%		Oil-based Paint/Solvent	0.0%	0.0%
				Caustic Cleaners	0.0%	0.0%
Metal	**3.1%**			Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.3%	0.1%		Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.2%	0.1%		Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.1%	0.1%		Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.0%		Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.4%	0.2%		Motor Oil/Diesel Oil	0.0%	0.0%
Empty Aerosol Cans	0.1%	0.0%		Asbestos	0.0%	0.0%
Other Ferrous	0.7%	0.4%		Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%		Medical Wastes	4.9%	4.7%
Mixed Metals/Material	1.4%	0.8%		Other Cleaners/Chemicals	0.0%	0.0%
				Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**29.3%**			Personal Care/Cosmetics	0.1%	0.1%
Leaves and Grass	0.6%	0.9%		Other Potentially Harmful Wastes	0.4%	0.5%
Prunings	0.6%	0.7%				
Food	28.0%	4.1%		**Fines and Misc Materials**	**1.7%**	
Fats, Oils, Grease	0.0%	0.0%		Sand/Soil/Dirt	0.3%	0.3%
				Non-distinct Fines	0.0%	0.1%
Other Organics	**4.7%**			Miscellaneous Organics	0.7%	0.3%
Textiles	1.2%	0.5%		Miscellaneous Inorganics	0.6%	0.9%
Mixed Textiles	1.0%	0.4%				
Disposable Diapers	1.3%	0.7%				
Animal By-products	0.6%	0.5%				
Rubber Products	0.6%	0.3%		**Totals**	**100%**	
Tires	0.1%	0.1%		Sample Count	45	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-17. Composition by Weight: Commercial in Winter
(January, February, and December 2016)

Material	Est. Percent	+/-		Est. Percent	+/-
Paper	**20.5%**		**Furniture, Appliances, and Electronics**	**1.5%**	
Newspaper	0.9%	0.2%	Furniture	0.4%	0.3%
Plain OCC/Kraft	3.9%	1.3%	Mattresses	0.1%	0.1%
Waxed OCC	0.5%	0.3%	Small Appliances	0.3%	0.2%
Grocery/Shopping Bags	0.4%	0.1%	Cell Phones	0.0%	0.0%
High-grade Paper	1.3%	0.4%	Audio/Visual Equipment	0.2%	0.2%
Mixed Low-grade Paper	3.0%	0.5%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.3%	0.1%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	6.1%	0.9%	Other Electronics	0.6%	0.4%
Pot. Comp. Single-use Food Service	0.5%	0.2%			
Non-Comp. Single-use Food Service	1.5%	0.3%	**Construction Debris**	**16.1%**	
Mixed/Other Paper	2.1%	0.4%	Clean Dimension Lumber	1.7%	0.8%
			Clean Engineered Wood	2.3%	1.3%
Plastic	**14.9%**		Pallets	3.0%	1.4%
#1 PET Bottles	0.6%	0.1%	Crates	0.3%	0.4%
#2 HDPE Natural Bottles	0.2%	0.0%	Other Untreated Wood	0.2%	0.2%
#2 HDPE Colored Bottles	0.3%	0.2%	New Painted Wood	0.5%	0.3%
Other Plastic Bottles	0.0%	0.0%	Old Painted Wood	0.4%	0.2%
Tubs #1-#7	1.1%	0.3%	Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	0.4%	0.2%	Other Treated Wood	0.2%	0.2%
Expanded Poly. Food-grade	0.1%	0.0%	Contaminated Wood	2.0%	0.7%
Rigid Poly. Foam Insulation	0.0%	0.1%	New Gypsum Scrap	0.2%	0.2%
Pot. Comp. Single-use Food Service	0.1%	0.0%	Demo Gypsum Scrap	1.0%	0.6%
Non-Comp. Single-use Food Service	0.7%	0.2%	Carpet	0.8%	0.7%
Other Rigid Packaging	0.7%	0.1%	Felt Carpet Pad	0.1%	0.1%
Shopping/Dry Cleaning Bags	0.1%	0.0%	Fiberglass Insulation	0.6%	1.0%
Stretch Wrap	0.3%	0.1%	Concrete	0.5%	0.6%
Clean Polyethylene Film	1.0%	0.3%	Asphalt Paving	0.0%	0.0%
Other Film	6.1%	0.8%	Other Aggregates	0.2%	0.3%
Plastic Pipe	0.1%	0.1%	Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%	Asphalt Shingles	0.3%	0.4%
Durable Plastic Products	2.2%	0.5%	Other Asphaltic Roofing	0.1%	0.1%
Plastic/Other Materials	0.8%	0.3%	Ceramics	0.4%	0.5%
			Cement Fiber Board	0.1%	0.1%
Glass	**3.2%**		Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.7%	0.2%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.6%	0.2%	Ceiling Tiles	0.1%	0.2%
Brown Beverage	0.5%	0.2%	Other Construction Debris	1.1%	1.0%
Container Glass	0.3%	0.2%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**4.2%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.4%	0.3%
Flat Glass	0.2%	0.3%	Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.8%	0.9%	Water-based Adhesives	0.0%	0.0%
Other Glass	0.2%	0.1%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.0%	0.0%
Metal	**5.2%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.3%	0.1%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.2%	0.1%	Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.1%	0.0%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.0%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.5%	0.2%	Motor Oil/Diesel Oil	0.1%	0.1%
Empty Aerosol Cans	0.1%	0.1%	Asbestos	0.0%	0.0%
Other Ferrous	1.7%	0.7%	Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%	Medical Wastes	3.3%	1.8%
Mixed Metals/Material	2.2%	0.8%	Other Cleaners/Chemicals	0.0%	0.0%
			Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**24.1%**		Personal Care/Cosmetics	0.1%	0.0%
Leaves and Grass	1.2%	0.6%	Other Potentially Harmful Wastes	0.3%	0.4%
Prunings	0.4%	0.4%			
Food	22.3%	2.9%	**Fines and Misc Materials**	**1.2%**	
Fats, Oils, Grease	0.1%	0.2%	Sand/Soil/Dirt	0.1%	0.1%
			Non-distinct Fines	0.2%	0.1%
Other Organics	**9.0%**		Miscellaneous Organics	0.4%	0.1%
Textiles	1.4%	0.3%	Miscellaneous Inorganics	0.6%	0.6%
Mixed Textiles	1.3%	0.6%			
Disposable Diapers	3.6%	1.6%			
Animal By-products	1.4%	0.7%			
Rubber Products	0.9%	0.3%	**Totals**	**100%**	
Tires	0.4%	0.5%	Sample Count	113	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

4.3 Commercial Composition by Generator Type

Commercial drivers were asked to identify from which type of business they had collected the sample load.[8] Since commercial garbage trucks often haul waste from a variety of different business types, most samples are of the *mixed generator type*. The remaining generator-specific analyses are based on a very small number of samples and are thus subject to a relatively wide margin of error. These results provide rough estimates only.

This section first presents the top ten components for each of the commercial generator types. The detailed composition tables for each commercial generator group follow the top ten tables.

4.3.1 Health Care

A total of 19 loads from *health care* facilities were sampled. As shown in Table 4-18, the top ten components accounted for a combined total of more than 89% of the *health care* waste. The largest components were *medical wastes* at almost 35% and *disposable diapers* at nearly 22% of the total. Table 4-27 shows the detailed composition results for the samples taken from *health care* facilities.

Table 4-18. Top Ten Components: Health Care
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent
Potentially Harmful Wastes	Medical Wastes	34.9%	34.9%
Other Organics	Disposable Diapers	21.5%	56.5%
Compostable Organics	Food	11.5%	68.0%
Paper	Compostable/Soiled	6.5%	74.5%
Plastic	Other Film	4.6%	79.1%
Construction Debris	Other Construction Debris	3.1%	82.2%
Paper	Mixed Low-grade Paper	2.3%	84.4%
Paper	Plain OCC/Kraft	2.1%	86.5%
Other Organics	Textiles	1.6%	88.2%
Paper	Pot. Comp. Single-use Food Service	1.2%	89.4%
Total		**89.4%**	

4.3.2 Hotel/Motel

A total of five loads were sampled from hotels/motels. As shown in Table 4-19, the top ten components in the stream were more than 77% of the total. *Food* made up about 34% of waste from *hotel/motel* generators, by weight. Table 4-28 shows the detailed composition results for the samples taken from these generators.

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[8] These generator types are categorized by Standard Industry Codes (SIC) in Appendix B.

Table 4-19. Top Ten Components: Hotel/Motel
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	33.8%	33.8%
Paper	Compostable/Soiled	8.9%	42.8%
Plastic	Other Film	8.4%	51.2%
Other Organics	Textiles	5.5%	56.7%
Paper	Mixed Low-grade Paper	4.7%	61.4%
Paper	Newspaper	3.6%	65.0%
Metal	Mixed Metals/Material	3.6%	68.6%
Metal	Other Ferrous	3.5%	72.1%
Construction Debris	Pallets	2.8%	74.8%
Paper	Non-Comp. Single-use Food Service	2.6%	77.5%
Total		**77.5%**	

4.3.3 Manufacturing

A total of four loads from *manufacturing* businesses were sampled. As shown in Table 4-20, the top ten components accounted for a combined total of almost 70% of the tonnage. *Mixed metals/material* made up over 14% of waste from *manufacturing* businesses, by weight, followed by *clean dimensional lumber* at approximately 9%. Table 4-29 shows the detailed composition results for the samples taken from these businesses.

Table 4-20. Top Ten Components: Manufacturing
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent
Metal	Mixed Metals/Material	14.5%	14.5%
Construction Debris	Clean Dimension Lumber	8.6%	23.1%
Paper	Mixed/Other Paper	8.1%	31.3%
Glass	Flat Glass	7.8%	39.0%
Compostable Organics	Leaves and Grass	7.0%	46.1%
Compostable Organics	Food	6.5%	52.5%
Plastic	Other Film	5.5%	58.0%
Paper	Compostable/Soiled	4.4%	62.4%
Paper	Plain OCC/Kraft	3.8%	66.2%
Other Organics	Rubber Products	3.4%	69.6%
Total		**69.6%**	

4.3.4 Office

A total of 14 samples were taken from *office* waste loads. As shown in Table 4-21, the top ten components accounted for a combined total of over 74% of the tonnage from these loads. *Food* and *compostable/soiled paper* were the two most prevalent components from this generator group, at 23.3% and 14.5%, respectively. Table 4-30 shows the detailed composition results for the samples taken from *office* waste loads.

Table 4-21. Top Ten Components: Office
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	23.3%	23.3%
Paper	Compostable/Soiled	14.5%	37.8%
Plastic	Other Film	7.2%	44.9%
Paper	Mixed Low-grade Paper	6.2%	51.1%
Paper	High-grade Paper	6.2%	57.3%
Paper	Non-Comp. Single-use Food Service	4.5%	61.7%
Paper	Mixed/Other Paper	4.0%	65.7%
Potentially Harmful Wastes	Medical Wastes	4.0%	69.7%
Plastic	Non-Comp. Single-use Food Service	2.6%	72.3%
Metal	Other Ferrous	2.2%	74.4%
Total		**74.4%**	

4.3.5 Other Services

A total of 14 samples were taken from *other services* loads. As shown in Table 4-22, the top ten components accounted for a combined total of about 64% of the tonnage, with *food* the most common component in the stream (17.0%). *Leaves and grass, plain OCC/Kraft,* and *compostable/soiled paper* were also prevalent in the selected samples from this generator type. Table 4-31 shows the detailed composition results for the samples taken from *other services* loads.

Table 4-22. Top Ten Components: Other Services
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	17.0%	17.0%
Compostable Organics	Leaves and Grass	10.2%	27.3%
Paper	Plain OCC/Kraft	8.3%	35.5%
Paper	Compostable/Soiled	5.3%	40.9%
Plastic	Plastic/Other Materials	4.4%	45.3%
Construction Debris	Fiberglass Insulation	4.3%	49.6%
Fines & Misc Materials	Sand/Soil/Dirt	4.2%	53.8%
Plastic	Other Film	3.8%	57.6%
Metal	Mixed Metals/Material	3.5%	61.1%
Other Organics	Textiles	3.0%	64.1%
Total		**64.1%**	

4.3.6   Retail

A total of 32 samples were taken from *retail* business loads. As shown in Table 4-23, the top ten components accounted for a combined total of 69% of the tonnage. *Food* made up nearly 30% of *retail* waste, by weight. Table 4-32 shows the detailed composition results for the samples taken from *retail* loads.

Table 4-23. Top Ten Components: Retail
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	29.3%	29.3%
Paper	Compostable/Soiled	9.3%	38.6%
Plastic	Other Film	8.0%	46.6%
Paper	Plain OCC/Kraft	7.3%	53.9%
Paper	Mixed Low-grade Paper	3.4%	57.2%
Paper	Mixed/Other Paper	3.1%	60.3%
Paper	Non-Comp. Single-use Food Service	2.3%	62.6%
Plastic	Durable Plastic Products	2.3%	64.9%
Construction Debris	Contaminated Wood	2.2%	67.1%
Paper	High-grade Paper	1.9%	69.0%
Total		**69.0%**	

4.3.7   Transportation

A total of eight samples were taken from the *transportation* industry. As shown in Table 4-24, the top ten components accounted for a combined total of about 72% of the tonnage, with *food* and *compostable/soiled paper* the most common components at 26.5% and 9.6% of the total, respectively. Table 4-33 shows the detailed composition results for the samples taken from the *transportation* loads.

Table 4-24. Top Ten Components: Transportation
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	26.5%	26.5%
Paper	Compostable/Soiled	9.6%	36.1%
Plastic	Other Film	7.6%	43.7%
Other Organics	Disposable Diapers	7.1%	50.9%
Other Organics	Mixed Textiles	4.6%	55.4%
Paper	Mixed Low-grade Paper	4.4%	59.8%
Plastic	Durable Plastic Products	3.9%	63.7%
Paper	Non-Comp. Single-use Food Service	3.4%	67.1%
Metal	Other Ferrous	2.3%	69.4%
Paper	Plain OCC/Kraft	2.3%	71.7%
Total		**71.7%**	

4.3.8 Wholesale

A total of five samples were taken from *wholesale* establishments. As shown in Table 4-25, the top ten components in the *wholesale* stream made up almost 84% of the stream, by weight. *Plain OCC/Kraft* was the most prevalent component, and accounted for approximately 16% of the *wholesale* waste, followed by *other plastic film* at 13% and *food* at 12.8%.Table 4-34 shows the detailed composition results for the samples taken from *wholesale* establishments.

Table 4-25. Top Ten Components: Wholesale
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent
Paper	Plain OCC/Kraft	16.1%	16.1%
Plastic	Other Film	13.0%	29.1%
Compostable Organics	Food	12.8%	41.8%
Construction Debris	Clean Engineered Wood	11.3%	53.2%
Fines & Misc Materials	Miscellaneous Inorganics	8.9%	62.0%
Paper	Compostable/Soiled	6.6%	68.7%
Paper	Waxed OCC	4.4%	73.1%
Metal	Other Ferrous	3.7%	76.8%
Plastic	Clean Polyethylene Film	3.5%	80.3%
Paper	Mixed/Other Paper	3.5%	83.8%
Total		**83.8%**	

4.3.9 Mixed Commercial Generators

A total of 191 samples were taken from *mixed commercial generator* loads. Table 4-26 lists the top ten materials in the stream, by weight. These materials account for almost 60% of the components in the stream, with *food* composing 26% of the waste from these loads. Table 4-35 shows the detailed composition results for the samples taken from *mixed commercial generator* loads.

Table 4-26. Top Ten Components: Mixed Commercial Generators
(January – December 2016)

Class	Material	Est. Percent	Cum. Percent
Compostable Organics	Food	25.8%	25.8%
Paper	Compostable/Soiled	7.3%	33.1%
Plastic	Other Film	6.2%	39.3%
Other Organics	Animal By-products	3.5%	42.8%
Other Organics	Disposable Diapers	3.5%	46.2%
Paper	Mixed Low-grade Paper	3.2%	49.4%
Paper	Plain OCC/Kraft	2.8%	52.2%
Other Organics	Textiles	2.6%	54.7%
Construction Debris	Pallets	2.2%	57.0%
Metal	Mixed Metals/Material	1.9%	58.9%
Total		**58.9%**	

4.3.10 Comparisons among Generator Types

Food, *other plastic film*, and *compostable/soiled paper* were among the top ten components disposed by all generator types.

Table 4-27. Composition by Weight: Health Care
(January – December 2016)

Material	Est. Percent	+ / -	Material	Est. Percent	+ / -
Paper	**15.3%**		**Furniture, Appliances, and Electronics**	**0.0%**	
Newspaper	0.3%	0.3%	Furniture	0.0%	0.0%
Plain OCC/Kraft	2.1%	1.1%	Mattresses	0.0%	0.0%
Waxed OCC	0.0%	0.0%	Small Appliances	0.0%	0.0%
Grocery/Shopping Bags	0.0%	0.0%	Cell Phones	0.0%	0.0%
High-grade Paper	0.6%	0.4%	Audio/Visual Equipment	0.0%	0.0%
Mixed Low-grade Paper	2.3%	0.7%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.3%	0.2%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	6.5%	1.7%	Other Electronics	0.0%	0.0%
Pot. Comp. Single-use Food Service	1.2%	0.6%			
Non-Comp. Single-use Food Service	0.9%	0.3%	**Construction Debris**	**3.4%**	
Mixed/Other Paper	1.0%	0.5%	Clean Dimension Lumber	0.0%	0.0%
			Clean Engineered Wood	0.1%	0.1%
Plastic	**8.2%**		Pallets	0.0%	0.0%
#1 PET Bottles	0.3%	0.1%	Crates	0.0%	0.0%
#2 HDPE Natural Bottles	0.1%	0.1%	Other Untreated Wood	0.2%	0.3%
#2 HDPE Colored Bottles	0.1%	0.1%	New Painted Wood	0.0%	0.0%
Other Plastic Bottles	0.0%	0.0%	Old Painted Wood	0.0%	0.0%
Tubs #1-#7	0.4%	0.1%	Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	0.2%	0.2%	Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.1%	0.0%	Contaminated Wood	0.0%	0.0%
Rigid Poly. Foam Insulation	0.0%	0.0%	New Gypsum Scrap	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.1%	0.0%	Demo Gypsum Scrap	0.0%	0.0%
Non-Comp. Single-use Food Service	0.5%	0.3%	Carpet	0.0%	0.0%
Other Rigid Packaging	0.6%	0.4%	Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.0%	0.0%	Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	0.0%	0.0%	Concrete	0.0%	0.0%
Clean Polyethylene Film	0.2%	0.2%	Asphalt Paving	0.0%	0.0%
Other Film	4.6%	1.0%	Other Aggregates	0.0%	0.0%
Plastic Pipe	0.0%	0.0%	Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%	Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	0.6%	0.3%	Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	0.3%	0.2%	Ceramics	0.0%	0.0%
			Cement Fiber Board	0.0%	0.0%
Glass	**0.3%**		Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.1%	0.1%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.1%	0.1%	Ceiling Tiles	0.0%	0.0%
Brown Beverage	0.0%	0.0%	Other Construction Debris	3.1%	5.1%
Container Glass	0.1%	0.0%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**35.0%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.0%	0.0%
Flat Glass	0.0%	0.0%	Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%	Water-based Adhesives	0.0%	0.0%
Other Glass	0.0%	0.0%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.0%	0.0%
Metal	**0.9%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.1%	0.0%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.1%	0.1%	Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.0%	0.0%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.0%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.3%	0.2%	Motor Oil/Diesel Oil	0.0%	0.0%
Empty Aerosol Cans	0.0%	0.0%	Asbestos	0.0%	0.0%
Other Ferrous	0.1%	0.1%	Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%	Medical Wastes	34.9%	11.8%
Mixed Metals/Material	0.3%	0.4%	Other Cleaners/Chemicals	0.0%	0.0%
			Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**11.6%**		Personal Care/Cosmetics	0.0%	0.0%
Leaves and Grass	0.0%	0.0%	Other Potentially Harmful Wastes	0.0%	0.0%
Prunings	0.1%	0.1%			
Food	11.5%	3.5%	**Fines and Misc Materials**	**0.5%**	
Fats, Oils, Grease	0.0%	0.0%	Sand/Soil/Dirt	0.0%	0.0%
			Non-distinct Fines	0.1%	0.2%
Other Organics	**24.7%**		Miscellaneous Organics	0.4%	0.3%
Textiles	1.6%	0.6%	Miscellaneous Inorganics	0.0%	0.0%
Mixed Textiles	1.1%	0.6%			
Disposable Diapers	21.5%	10.6%			
Animal By-products	0.2%	0.2%			
Rubber Products	0.3%	0.1%	**Totals**	**100%**	
Tires	0.0%	0.0%	Sample Count	19	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-28. Composition by Weight: Hotel/Motel
(January – December 2016)

Material	Est. Percent	+/-		Est. Percent	+/-
Paper	**25.7%**		**Furniture, Appliances, and Electronics**	**0.0%**	
Newspaper	3.6%	3.3%	Furniture	0.0%	0.0%
Plain OCC/Kraft	1.8%	1.3%	Mattresses	0.0%	0.0%
Waxed OCC	0.0%	0.0%	Small Appliances	0.0%	0.0%
Grocery/Shopping Bags	0.6%	0.4%	Cell Phones	0.0%	0.0%
High-grade Paper	1.1%	0.6%	Audio/Visual Equipment	0.0%	0.0%
Mixed Low-grade Paper	4.7%	1.9%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.4%	0.3%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	8.9%	2.6%	Other Electronics	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.3%	0.3%			
Non-Comp. Single-use Food Service	2.6%	2.1%	**Construction Debris**	**2.8%**	
Mixed/Other Paper	1.6%	1.8%	Clean Dimension Lumber	0.0%	0.0%
			Clean Engineered Wood	0.0%	0.0%
Plastic	**13.8%**		Pallets	2.8%	4.7%
#1 PET Bottles	1.5%	0.5%	Crates	0.0%	0.0%
#2 HDPE Natural Bottles	0.5%	0.1%	Other Untreated Wood	0.0%	0.0%
#2 HDPE Colored Bottles	0.1%	0.1%	New Painted Wood	0.0%	0.0%
Other Plastic Bottles	0.1%	0.2%	Old Painted Wood	0.0%	0.0%
Tubs #1-#7	0.9%	0.8%	Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	0.0%	0.0%	Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.0%	0.0%	Contaminated Wood	0.0%	0.0%
Rigid Poly. Foam Insulation	0.0%	0.0%	New Gypsum Scrap	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.1%	0.1%	Demo Gypsum Scrap	0.0%	0.0%
Non-Comp. Single-use Food Service	0.7%	0.4%	Carpet	0.0%	0.0%
Other Rigid Packaging	0.7%	0.3%	Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.1%	0.1%	Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	0.1%	0.2%	Concrete	0.0%	0.0%
Clean Polyethylene Film	0.1%	0.2%	Asphalt Paving	0.0%	0.0%
Other Film	8.4%	2.2%	Other Aggregates	0.0%	0.0%
Plastic Pipe	0.0%	0.0%	Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%	Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	0.3%	0.3%	Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	0.1%	0.1%	Ceramics	0.0%	0.1%
			Cement Fiber Board	0.0%	0.0%
Glass	**5.0%**		Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.7%	0.4%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	2.6%	1.4%	Ceiling Tiles	0.0%	0.0%
Brown Beverage	0.8%	0.7%	Other Construction Debris	0.0%	0.0%
Container Glass	0.6%	0.6%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**1.4%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.0%	0.0%
Flat Glass	0.0%	0.0%	Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%	Water-based Adhesives	0.0%	0.0%
Other Glass	0.4%	0.3%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.1%	0.1%
Metal	**8.1%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.2%	0.2%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.1%	0.1%	Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.3%	0.5%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.0%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.5%	0.6%	Motor Oil/Diesel Oil	0.0%	0.0%
Empty Aerosol Cans	0.0%	0.0%	Asbestos	0.0%	0.0%
Other Ferrous	3.5%	5.5%	Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%	Medical Wastes	0.0%	0.0%
Mixed Metals/Material	3.6%	5.5%	Other Cleaners/Chemicals	0.0%	0.0%
			Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**33.8%**		Personal Care/Cosmetics	1.3%	0.9%
Leaves and Grass	0.0%	0.0%	Other Potentially Harmful Wastes	0.0%	0.0%
Prunings	0.0%	0.0%			
Food	33.8%	11.1%	**Fines and Misc Materials**	**0.8%**	
Fats, Oils, Grease	0.0%	0.0%	Sand/Soil/Dirt	0.0%	0.0%
			Non-distinct Fines	0.4%	0.7%
Other Organics	**8.5%**		Miscellaneous Organics	0.1%	0.1%
Textiles	5.5%	4.9%	Miscellaneous Inorganics	0.4%	0.6%
Mixed Textiles	0.7%	0.5%			
Disposable Diapers	1.8%	1.6%			
Animal By-products	0.0%	0.0%			
Rubber Products	0.5%	0.6%	**Totals**	**100%**	
Tires	0.0%	0.0%	Sample Count	5	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-29. Composition by Weight: Manufacturing
(January – December 2016)

Material	Est. Percent	+ / -		Est. Percent	+ / -
Paper	**20.1%**		**Furniture, Appliances, and Electronics**	**0.0%**	
Newspaper	0.0%	0.0%	Furniture	0.0%	0.0%
Plain OCC/Kraft	3.8%	1.6%	Mattresses	0.0%	0.0%
Waxed OCC	0.0%	0.0%	Small Appliances	0.0%	0.0%
Grocery/Shopping Bags	0.0%	0.0%	Cell Phones	0.0%	0.0%
High-grade Paper	1.5%	0.7%	Audio/Visual Equipment	0.0%	0.0%
Mixed Low-grade Paper	1.3%	0.8%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.0%	0.1%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	4.4%	2.8%	Other Electronics	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.1%	0.1%			
Non-Comp. Single-use Food Service	0.9%	1.1%	**Construction Debris**	**15.2%**	
Mixed/Other Paper	8.1%	4.6%	Clean Dimension Lumber	8.6%	8.2%
			Clean Engineered Wood	0.0%	0.0%
Plastic	**11.2%**		Pallets	0.1%	0.2%
#1 PET Bottles	0.4%	0.3%	Crates	0.0%	0.0%
#2 HDPE Natural Bottles	0.1%	0.1%	Other Untreated Wood	0.0%	0.0%
#2 HDPE Colored Bottles	0.4%	0.5%	New Painted Wood	0.0%	0.0%
Other Plastic Bottles	0.0%	0.0%	Old Painted Wood	0.0%	0.0%
Tubs #1-#7	0.3%	0.4%	Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	1.0%	1.0%	Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.3%	0.4%	Contaminated Wood	0.0%	0.0%
Rigid Poly. Foam Insulation	0.0%	0.0%	New Gypsum Scrap	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.0%	0.0%	Demo Gypsum Scrap	2.4%	3.9%
Non-Comp. Single-use Food Service	0.1%	0.2%	Carpet	0.0%	0.0%
Other Rigid Packaging	0.4%	0.3%	Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.1%	0.1%	Fiberglass Insulation	1.1%	1.7%
Stretch Wrap	0.4%	0.4%	Concrete	0.0%	0.0%
Clean Polyethylene Film	0.2%	0.3%	Asphalt Paving	0.0%	0.0%
Other Film	5.5%	4.5%	Other Aggregates	0.0%	0.0%
Plastic Pipe	1.3%	2.0%	Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%	Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	0.6%	0.6%	Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	0.1%	0.2%	Ceramics	0.0%	0.0%
			Cement Fiber Board	0.0%	0.0%
Glass	**8.0%**		Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.1%	0.1%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.0%	0.0%	Ceiling Tiles	2.9%	4.2%
Brown Beverage	0.0%	0.0%	Other Construction Debris	0.0%	0.0%
Container Glass	0.2%	0.3%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**0.8%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.2%	0.2%
Flat Glass	7.8%	13.4%	Solvent-based Adhesives	0.1%	0.1%
Automotive Glass	0.0%	0.0%	Water-based Adhesives	0.3%	0.4%
Other Glass	0.0%	0.0%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.2%	0.3%
Metal	**18.2%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.2%	0.2%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.1%	0.1%	Other Dry-cell Batteries	0.0%	0.1%
Other Aluminum	0.6%	0.9%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.0%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.1%	0.1%	Motor Oil/Diesel Oil	0.0%	0.0%
Empty Aerosol Cans	0.1%	0.1%	Asbestos	0.0%	0.0%
Other Ferrous	2.4%	2.5%	Explosives	0.0%	0.0%
Oil Filters	0.2%	0.4%	Medical Wastes	0.0%	0.0%
Mixed Metals/Material	14.5%	8.2%	Other Cleaners/Chemicals	0.0%	0.0%
			Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**13.5%**		Personal Care/Cosmetics	0.0%	0.0%
Leaves and Grass	7.0%	9.8%	Other Potentially Harmful Wastes	0.0%	0.0%
Prunings	0.0%	0.0%			
Food	6.5%	4.4%	**Fines and Misc Materials**	**3.8%**	
Fats, Oils, Grease	0.0%	0.0%	Sand/Soil/Dirt	1.2%	2.0%
			Non-distinct Fines	0.3%	0.5%
Other Organics	**9.3%**		Miscellaneous Organics	0.3%	0.5%
Textiles	2.7%	1.3%	Miscellaneous Inorganics	2.0%	3.1%
Mixed Textiles	3.1%	2.6%			
Disposable Diapers	0.0%	0.0%			
Animal By-products	0.0%	0.0%			
Rubber Products	3.4%	1.8%	**Totals**	**100%**	
Tires	0.0%	0.0%	Sample Count	4	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-30. Composition by Weight: Office
(January – December 2016)

Material	Est. Percent	+ / -	Material	Est. Percent	+ / -
Paper	**41.4%**		**Furniture, Appliances, and Electronics**	**1.8%**	
Newspaper	1.4%	0.8%	Furniture	0.0%	0.0%
Plain OCC/Kraft	2.1%	0.7%	Mattresses	0.0%	0.0%
Waxed OCC	0.1%	0.2%	Small Appliances	0.0%	0.0%
Grocery/Shopping Bags	0.3%	0.2%	Cell Phones	0.0%	0.0%
High-grade Paper	6.2%	4.4%	Audio/Visual Equipment	0.6%	1.1%
Mixed Low-grade Paper	6.2%	1.8%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.6%	0.3%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	14.5%	3.4%	Other Electronics	1.1%	1.6%
Pot. Comp. Single-use Food Service	1.5%	0.6%			
Non-Comp. Single-use Food Service	4.5%	1.3%	**Construction Debris**	**1.6%**	
Mixed/Other Paper	4.0%	2.9%	Clean Dimension Lumber	0.0%	0.0%
			Clean Engineered Wood	0.0%	0.0%
Plastic	**16.9%**		Pallets	0.2%	0.4%
#1 PET Bottles	0.9%	0.2%	Crates	0.0%	0.0%
#2 HDPE Natural Bottles	0.3%	0.2%	Other Untreated Wood	0.1%	0.1%
#2 HDPE Colored Bottles	0.1%	0.1%	New Painted Wood	0.0%	0.0%
Other Plastic Bottles	0.0%	0.0%	Old Painted Wood	0.3%	0.5%
Tubs #1-#7	0.8%	0.2%	Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	0.4%	0.4%	Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.0%	0.0%	Contaminated Wood	0.2%	0.3%
Rigid Poly. Foam Insulation	0.0%	0.0%	New Gypsum Scrap	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.5%	0.4%	Demo Gypsum Scrap	0.0%	0.0%
Non-Comp. Single-use Food Service	2.6%	0.9%	Carpet	0.0%	0.0%
Other Rigid Packaging	1.2%	0.5%	Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.2%	0.0%	Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	0.1%	0.1%	Concrete	0.0%	0.1%
Clean Polyethylene Film	0.3%	0.2%	Asphalt Paving	0.0%	0.0%
Other Film	7.2%	1.9%	Other Aggregates	0.0%	0.0%
Plastic Pipe	0.0%	0.0%	Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%	Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	1.9%	1.4%	Other Asphaltic Roofing	0.7%	1.1%
Plastic/Other Materials	0.5%	0.4%	Ceramics	0.0%	0.1%
			Cement Fiber Board	0.0%	0.0%
Glass	**2.6%**		Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.7%	0.5%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.3%	0.2%	Ceiling Tiles	0.0%	0.0%
Brown Beverage	1.4%	1.7%	Other Construction Debris	0.0%	0.0%
Container Glass	0.2%	0.1%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**4.3%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.0%	0.0%
Flat Glass	0.0%	0.0%	Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%	Water-based Adhesives	0.0%	0.0%
Other Glass	0.0%	0.1%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.0%	0.0%
Metal	**4.1%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.5%	0.2%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.3%	0.1%	Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.0%	0.0%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.1%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.4%	0.3%	Motor Oil/Diesel Oil	0.0%	0.0%
Empty Aerosol Cans	0.0%	0.0%	Asbestos	0.0%	0.0%
Other Ferrous	2.2%	2.5%	Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%	Medical Wastes	4.0%	6.3%
Mixed Metals/Material	0.6%	0.6%	Other Cleaners/Chemicals	0.0%	0.0%
			Pharmaceuticals/Vitamins	0.1%	0.1%
Compostable Organics	**23.8%**		Personal Care/Cosmetics	0.0%	0.1%
Leaves and Grass	0.4%	0.3%	Other Potentially Harmful Wastes	0.1%	0.1%
Prunings	0.1%	0.2%			
Food	23.3%	6.6%	**Fines and Misc Materials**	**1.2%**	
Fats, Oils, Grease	0.0%	0.0%	Sand/Soil/Dirt	0.3%	0.5%
			Non-distinct Fines	0.2%	0.2%
Other Organics	**2.3%**		Miscellaneous Organics	0.6%	0.2%
Textiles	0.6%	0.3%	Miscellaneous Inorganics	0.1%	0.2%
Mixed Textiles	0.3%	0.2%			
Disposable Diapers	0.6%	0.8%			
Animal By-products	0.0%	0.0%			
Rubber Products	0.7%	1.0%	**Totals**	**100%**	
Tires	0.1%	0.1%	Sample Count	14	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-31. Composition by Weight: Other Services
(January – December 2016)

Material	Est. Percent	+ / -		Est. Percent	+ / -
Paper	**23.2%**		**Furniture, Appliances, and Electronics**	**2.5%**	
Newspaper	0.7%	0.7%	Furniture	1.4%	2.4%
Plain OCC/Kraft	8.3%	6.3%	Mattresses	0.9%	1.5%
Waxed OCC	0.3%	0.4%	Small Appliances	0.0%	0.0%
Grocery/Shopping Bags	0.1%	0.1%	Cell Phones	0.0%	0.0%
High-grade Paper	1.0%	0.8%	Audio/Visual Equipment	0.0%	0.0%
Mixed Low-grade Paper	2.7%	1.2%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.2%	0.2%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	5.3%	2.4%	Other Electronics	0.2%	0.3%
Pot. Comp. Single-use Food Service	1.3%	1.2%			
Non-Comp. Single-use Food Service	1.7%	1.0%	**Construction Debris**	**9.9%**	
Mixed/Other Paper	1.6%	0.9%	Clean Dimension Lumber	0.8%	0.6%
			Clean Engineered Wood	1.4%	1.5%
Plastic	**14.7%**		Pallets	0.0%	0.1%
#1 PET Bottles	1.5%	1.1%	Crates	0.0%	0.0%
#2 HDPE Natural Bottles	0.2%	0.2%	Other Untreated Wood	0.0%	0.0%
#2 HDPE Colored Bottles	0.2%	0.2%	New Painted Wood	1.9%	2.3%
Other Plastic Bottles	0.0%	0.0%	Old Painted Wood	0.0%	0.0%
Tubs #1-#7	0.4%	0.2%	Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	0.1%	0.1%	Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.1%	0.0%	Contaminated Wood	1.0%	1.2%
Rigid Poly. Foam Insulation	0.1%	0.1%	New Gypsum Scrap	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.1%	0.1%	Demo Gypsum Scrap	0.0%	0.0%
Non-Comp. Single-use Food Service	0.4%	0.4%	Carpet	0.0%	0.0%
Other Rigid Packaging	1.1%	1.3%	Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.1%	0.0%	Fiberglass Insulation	4.3%	7.1%
Stretch Wrap	0.5%	0.4%	Concrete	0.1%	0.2%
Clean Polyethylene Film	0.6%	0.5%	Asphalt Paving	0.0%	0.0%
Other Film	3.8%	1.3%	Other Aggregates	0.2%	0.3%
Plastic Pipe	0.0%	0.0%	Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%	Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	1.1%	0.8%	Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	4.4%	5.7%	Ceramics	0.0%	0.0%
			Cement Fiber Board	0.0%	0.0%
Glass	**1.7%**		Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.9%	0.8%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.2%	0.3%	Ceiling Tiles	0.0%	0.0%
Brown Beverage	0.2%	0.1%	Other Construction Debris	0.0%	0.0%
Container Glass	0.1%	0.1%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**0.4%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.0%	0.0%
Flat Glass	0.0%	0.0%	Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%	Water-based Adhesives	0.0%	0.0%
Other Glass	0.3%	0.4%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.0%	0.0%
Metal	**6.3%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.4%	0.2%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.4%	0.4%	Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.0%	0.0%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.2%	0.3%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.6%	0.6%	Motor Oil/Diesel Oil	0.2%	0.3%
Empty Aerosol Cans	0.1%	0.1%	Asbestos	0.0%	0.0%
Other Ferrous	1.1%	0.7%	Explosives	0.0%	0.0%
Oil Filters	0.1%	0.1%	Medical Wastes	0.2%	0.3%
Mixed Metals/Material	3.5%	1.9%	Other Cleaners/Chemicals	0.0%	0.0%
			Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**28.3%**		Personal Care/Cosmetics	0.0%	0.0%
Leaves and Grass	10.2%	9.2%	Other Potentially Harmful Wastes	0.0%	0.0%
Prunings	1.1%	1.1%			
Food	17.0%	5.9%	**Fines and Misc Materials**	**7.2%**	
Fats, Oils, Grease	0.0%	0.0%	Sand/Soil/Dirt	4.2%	3.6%
			Non-distinct Fines	2.6%	3.9%
Other Organics	**5.7%**		Miscellaneous Organics	0.4%	0.4%
Textiles	3.0%	1.8%	Miscellaneous Inorganics	0.0%	0.0%
Mixed Textiles	1.3%	0.7%			
Disposable Diapers	0.6%	0.8%			
Animal By-products	0.7%	1.1%			
Rubber Products	0.1%	0.1%	**Totals**	**100%**	
Tires	0.0%	0.0%	Sample Count	14	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-32. Composition by Weight: Retail
(January – December 2016)

Material	Est. Percent	+/-		Material	Est. Percent	+/-
Paper	**29.6%**			**Furniture, Appliances, and Electronics**	**0.7%**	
Newspaper	0.4%	0.1%		Furniture	0.2%	0.4%
Plain OCC/Kraft	7.3%	4.4%		Mattresses	0.3%	0.5%
Waxed OCC	0.6%	0.5%		Small Appliances	0.1%	0.1%
Grocery/Shopping Bags	0.4%	0.1%		Cell Phones	0.0%	0.0%
High-grade Paper	1.9%	1.2%		Audio/Visual Equipment	0.0%	0.1%
Mixed Low-grade Paper	3.4%	1.0%		CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.3%	0.2%		CRT Televisions	0.0%	0.0%
Compostable/Soiled	9.3%	2.4%		Other Electronics	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.7%	0.6%				
Non-Comp. Single-use Food Service	2.3%	0.7%		**Construction Debris**	**8.7%**	
Mixed/Other Paper	3.1%	1.0%		Clean Dimension Lumber	0.9%	1.0%
				Clean Engineered Wood	1.8%	2.1%
Plastic	**17.9%**			Pallets	0.5%	0.4%
#1 PET Bottles	0.6%	0.1%		Crates	0.4%	0.7%
#2 HDPE Natural Bottles	0.3%	0.1%		Other Untreated Wood	0.1%	0.0%
#2 HDPE Colored Bottles	0.4%	0.4%		New Painted Wood	0.2%	0.2%
Other Plastic Bottles	0.1%	0.1%		Old Painted Wood	0.1%	0.2%
Tubs #1-#7	0.8%	0.3%		Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	0.6%	0.5%		Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.2%	0.1%		Contaminated Wood	2.2%	1.8%
Rigid Poly. Foam Insulation	0.0%	0.0%		New Gypsum Scrap	0.3%	0.5%
Pot. Comp. Single-use Food Service	0.1%	0.1%		Demo Gypsum Scrap	0.0%	0.0%
Non-Comp. Single-use Food Service	1.0%	0.3%		Carpet	0.5%	0.7%
Other Rigid Packaging	0.9%	0.3%		Felt Carpet Pad	0.2%	0.3%
Shopping/Dry Cleaning Bags	0.1%	0.0%		Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	0.3%	0.2%		Concrete	1.2%	2.0%
Clean Polyethylene Film	1.4%	0.7%		Asphalt Paving	0.0%	0.0%
Other Film	8.0%	1.5%		Other Aggregates	0.0%	0.0%
Plastic Pipe	0.0%	0.1%		Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%		Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	2.3%	1.3%		Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	0.8%	0.4%		Ceramics	0.3%	0.4%
				Cement Fiber Board	0.0%	0.0%
Glass	**1.7%**			Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.7%	0.3%		Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.2%	0.1%		Ceiling Tiles	0.0%	0.0%
Brown Beverage	0.4%	0.2%		Other Construction Debris	0.0%	0.1%
Container Glass	0.2%	0.1%				
Fluorescent Tubes	0.0%	0.0%		**Potentially Harmful Wastes**	**0.4%**	
CFLs	0.0%	0.0%		Liquid Latex Paints	0.0%	0.0%
Flat Glass	0.0%	0.0%		Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%		Water-based Adhesives	0.0%	0.0%
Other Glass	0.2%	0.2%		Oil-based Paint/Solvent	0.0%	0.0%
				Caustic Cleaners	0.0%	0.1%
Metal	**4.8%**			Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.3%	0.1%		Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.3%	0.1%		Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.4%	0.4%		Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.0%		Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.2%	0.1%		Motor Oil/Diesel Oil	0.2%	0.4%
Empty Aerosol Cans	0.2%	0.2%		Asbestos	0.0%	0.0%
Other Ferrous	1.9%	1.2%		Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%		Medical Wastes	0.0%	0.0%
Mixed Metals/Material	1.6%	0.8%		Other Cleaners/Chemicals	0.0%	0.0%
				Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**30.3%**			Personal Care/Cosmetics	0.0%	0.0%
Leaves and Grass	0.9%	1.0%		Other Potentially Harmful Wastes	0.0%	0.0%
Prunings	0.1%	0.1%				
Food	29.3%	5.9%		**Fines and Misc Materials**	**1.0%**	
Fats, Oils, Grease	0.0%	0.0%		Sand/Soil/Dirt	0.1%	0.2%
				Non-distinct Fines	0.2%	0.2%
Other Organics	**4.9%**			Miscellaneous Organics	0.6%	0.3%
Textiles	1.4%	0.9%		Miscellaneous Inorganics	0.1%	0.2%
Mixed Textiles	1.1%	0.7%				
Disposable Diapers	0.6%	0.3%				
Animal By-products	0.2%	0.2%				
Rubber Products	1.5%	1.0%		**Totals**	**100%**	
Tires	0.0%	0.0%		Sample Count	32	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Material	Est. Percent	+ / -		Est. Percent	+ / -
Paper	**25.4%**		**Furniture, Appliances, and Electronics**	**1.4%**	
Newspaper	1.9%	1.2%	Furniture	1.4%	2.3%
Plain OCC/Kraft	2.3%	1.0%	Mattresses	0.0%	0.0%
Waxed OCC	0.0%	0.0%	Small Appliances	0.0%	0.0%
Grocery/Shopping Bags	0.4%	0.3%	Cell Phones	0.0%	0.0%
High-grade Paper	1.1%	0.6%	Audio/Visual Equipment	0.0%	0.0%
Mixed Low-grade Paper	4.4%	1.5%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.6%	0.4%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	9.6%	3.2%	Other Electronics	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.4%	0.2%			
Non-Comp. Single-use Food Service	3.4%	1.2%	**Construction Debris**	**1.7%**	
Mixed/Other Paper	1.5%	1.0%	Clean Dimension Lumber	0.1%	0.2%
			Clean Engineered Wood	0.0%	0.0%
Plastic	**18.9%**		Pallets	0.1%	0.1%
#1 PET Bottles	1.3%	0.5%	Crates	0.0%	0.0%
#2 HDPE Natural Bottles	0.4%	0.5%	Other Untreated Wood	0.1%	0.1%
#2 HDPE Colored Bottles	0.1%	0.1%	New Painted Wood	0.0%	0.0%
Other Plastic Bottles	0.0%	0.0%	Old Painted Wood	0.3%	0.4%
Tubs #1-#7	1.2%	0.6%	Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	0.1%	0.1%	Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.2%	0.1%	Contaminated Wood	0.1%	0.2%
Rigid Poly. Foam Insulation	0.0%	0.0%	New Gypsum Scrap	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.5%	0.5%	Demo Gypsum Scrap	0.0%	0.0%
Non-Comp. Single-use Food Service	1.1%	1.1%	Carpet	0.0%	0.0%
Other Rigid Packaging	0.5%	0.3%	Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.2%	0.1%	Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	0.5%	0.5%	Concrete	0.6%	0.9%
Clean Polyethylene Film	0.8%	0.6%	Asphalt Paving	0.0%	0.0%
Other Film	7.6%	2.0%	Other Aggregates	0.0%	0.0%
Plastic Pipe	0.0%	0.0%	Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%	Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	3.9%	3.9%	Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	0.4%	0.7%	Ceramics	0.4%	0.6%
			Cement Fiber Board	0.0%	0.0%
Glass	**3.5%**		Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.9%	0.6%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.8%	0.7%	Ceiling Tiles	0.0%	0.0%
Brown Beverage	1.1%	1.0%	Other Construction Debris	0.0%	0.0%
Container Glass	0.2%	0.2%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**0.3%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.0%	0.0%
Flat Glass	0.0%	0.0%	Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%	Water-based Adhesives	0.0%	0.0%
Other Glass	0.5%	0.7%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.0%	0.0%
Metal	**5.1%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.6%	0.2%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.4%	0.5%	Other Dry-cell Batteries	0.1%	0.1%
Other Aluminum	0.0%	0.0%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.0%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.3%	0.3%	Motor Oil/Diesel Oil	0.0%	0.0%
Empty Aerosol Cans	0.1%	0.1%	Asbestos	0.0%	0.0%
Other Ferrous	2.3%	2.8%	Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%	Medical Wastes	0.0%	0.1%
Mixed Metals/Material	1.4%	1.6%	Other Cleaners/Chemicals	0.0%	0.0%
			Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**26.7%**		Personal Care/Cosmetics	0.0%	0.1%
Leaves and Grass	0.0%	0.0%	Other Potentially Harmful Wastes	0.2%	0.3%
Prunings	0.1%	0.2%			
Food	26.5%	7.8%	**Fines and Misc Materials**	**0.3%**	
Fats, Oils, Grease	0.0%	0.0%	Sand/Soil/Dirt	0.0%	0.0%
			Non-distinct Fines	0.0%	0.0%
Other Organics	**16.7%**		Miscellaneous Organics	0.3%	0.3%
Textiles	2.1%	1.1%	Miscellaneous Inorganics	0.0%	0.0%
Mixed Textiles	4.6%	4.6%			
Disposable Diapers	7.1%	4.0%			
Animal By-products	1.6%	2.6%			
Rubber Products	1.3%	1.3%	**Totals**	**100%**	
Tires	0.0%	0.0%	Sample Count	8	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-34. Composition by Weight: Wholesale
(January – December 2016)

Material	Est. Percent	+/-		Est. Percent	+/-
Paper	**33.5%**		**Furniture, Appliances, and Electronics**	**0.0%**	
Newspaper	0.0%	0.0%	Furniture	0.0%	0.0%
Plain OCC/Kraft	16.1%	13.7%	Mattresses	0.0%	0.0%
Waxed OCC	4.4%	5.2%	Small Appliances	0.0%	0.0%
Grocery/Shopping Bags	0.0%	0.0%	Cell Phones	0.0%	0.0%
High-grade Paper	0.5%	0.5%	Audio/Visual Equipment	0.0%	0.0%
Mixed Low-grade Paper	1.3%	1.0%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.0%	0.0%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	6.6%	3.5%	Other Electronics	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.0%	0.0%			
Non-Comp. Single-use Food Service	1.1%	1.3%	**Construction Debris**	**13.1%**	
Mixed/Other Paper	3.5%	2.8%	Clean Dimension Lumber	0.2%	0.3%
			Clean Engineered Wood	11.3%	18.3%
Plastic	**24.3%**		Pallets	0.7%	0.8%
#1 PET Bottles	0.3%	0.2%	Crates	0.0%	0.0%
#2 HDPE Natural Bottles	0.1%	0.1%	Other Untreated Wood	0.0%	0.0%
#2 HDPE Colored Bottles	0.1%	0.1%	New Painted Wood	0.0%	0.0%
Other Plastic Bottles	0.0%	0.0%	Old Painted Wood	0.0%	0.0%
Tubs #1-#7	0.5%	0.6%	Creosote-treated Wood	0.0%	0.0%
Expanded Poly. Non-food	2.3%	1.6%	Other Treated Wood	0.0%	0.0%
Expanded Poly. Food-grade	0.0%	0.1%	Contaminated Wood	0.0%	0.0%
Rigid Poly. Foam Insulation	0.0%	0.0%	New Gypsum Scrap	0.0%	0.0%
Pot. Comp. Single-use Food Service	0.0%	0.0%	Demo Gypsum Scrap	0.0%	0.0%
Non-Comp. Single-use Food Service	0.3%	0.4%	Carpet	0.0%	0.0%
Other Rigid Packaging	0.7%	0.8%	Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.1%	0.1%	Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	1.3%	0.7%	Concrete	0.5%	0.8%
Clean Polyethylene Film	3.5%	2.1%	Asphalt Paving	0.0%	0.0%
Other Film	13.0%	10.2%	Other Aggregates	0.4%	0.7%
Plastic Pipe	0.0%	0.0%	Rock	0.0%	0.0%
Foam Carpet Padding	0.0%	0.0%	Asphalt Shingles	0.0%	0.0%
Durable Plastic Products	1.9%	2.3%	Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	0.2%	0.2%	Ceramics	0.0%	0.0%
			Cement Fiber Board	0.0%	0.0%
Glass	**0.8%**		Dried Latex Paints	0.0%	0.0%
Clear Beverage	0.4%	0.4%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.1%	0.2%	Ceiling Tiles	0.0%	0.0%
Brown Beverage	0.2%	0.4%	Other Construction Debris	0.0%	0.0%
Container Glass	0.1%	0.1%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**0.1%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.0%	0.0%
Flat Glass	0.0%	0.0%	Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.0%	0.0%	Water-based Adhesives	0.0%	0.0%
Other Glass	0.0%	0.0%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.0%	0.0%
Metal	**4.2%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.2%	0.2%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.2%	0.2%	Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.0%	0.0%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.0%	0.0%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.1%	0.2%	Motor Oil/Diesel Oil	0.0%	0.0%
Empty Aerosol Cans	0.0%	0.0%	Asbestos	0.0%	0.0%
Other Ferrous	3.7%	6.2%	Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%	Medical Wastes	0.0%	0.0%
Mixed Metals/Material	0.0%	0.0%	Other Cleaners/Chemicals	0.1%	0.2%
			Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**12.8%**		Personal Care/Cosmetics	0.0%	0.0%
Leaves and Grass	0.0%	0.0%	Other Potentially Harmful Wastes	0.0%	0.0%
Prunings	0.0%	0.0%			
Food	12.8%	6.6%	**Fines and Misc Materials**	**9.7%**	
Fats, Oils, Grease	0.0%	0.0%	Sand/Soil/Dirt	0.0%	0.0%
			Non-distinct Fines	0.1%	0.2%
Other Organics	**1.5%**		Miscellaneous Organics	0.8%	1.2%
Textiles	0.4%	0.4%	Miscellaneous Inorganics	8.9%	13.7%
Mixed Textiles	0.7%	0.6%			
Disposable Diapers	0.0%	0.0%			
Animal By-products	0.0%	0.0%			
Rubber Products	0.4%	0.3%	**Totals**	**100%**	
Tires	0.0%	0.0%	Sample Count	5	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Table 4-35. Composition by Weight: Mixed Commercial Generators
(January – December 2016)

Material	Est. Percent	+ / -		Est. Percent	+ / -
Paper	**20.0%**		**Furniture, Appliances, and Electronics**	**1.6%**	
Newspaper	0.8%	0.2%	Furniture	0.7%	0.4%
Plain OCC/Kraft	2.8%	0.4%	Mattresses	0.1%	0.1%
Waxed OCC	0.6%	0.4%	Small Appliances	0.3%	0.2%
Grocery/Shopping Bags	0.3%	0.1%	Cell Phones	0.0%	0.0%
High-grade Paper	1.0%	0.2%	Audio/Visual Equipment	0.1%	0.1%
Mixed Low-grade Paper	3.2%	0.3%	CRT Computer Monitors	0.0%	0.0%
Polycoated Containers	0.2%	0.0%	CRT Televisions	0.0%	0.0%
Compostable/Soiled	7.3%	0.7%	Other Electronics	0.3%	0.2%
Pot. Comp. Single-use Food Service	0.5%	0.1%			
Non-Comp. Single-use Food Service	1.5%	0.2%	**Construction Debris**	**14.4%**	
Mixed/Other Paper	1.8%	0.4%	Clean Dimension Lumber	1.7%	0.5%
			Clean Engineered Wood	1.6%	0.7%
Plastic	**14.0%**		Pallets	2.2%	0.9%
#1 PET Bottles	0.6%	0.1%	Crates	0.2%	0.2%
#2 HDPE Natural Bottles	0.2%	0.0%	Other Untreated Wood	0.1%	0.1%
#2 HDPE Colored Bottles	0.2%	0.1%	New Painted Wood	1.1%	0.4%
Other Plastic Bottles	0.0%	0.0%	Old Painted Wood	0.4%	0.2%
Tubs #1-#7	1.0%	0.2%	Creosote-treated Wood	0.1%	0.1%
Expanded Poly. Non-food	0.3%	0.1%	Other Treated Wood	0.3%	0.3%
Expanded Poly. Food-grade	0.1%	0.0%	Contaminated Wood	1.7%	0.5%
Rigid Poly. Foam Insulation	0.0%	0.0%	New Gypsum Scrap	0.2%	0.1%
Pot. Comp. Single-use Food Service	0.1%	0.0%	Demo Gypsum Scrap	0.8%	0.4%
Non-Comp. Single-use Food Service	0.6%	0.1%	Carpet	1.1%	0.6%
Other Rigid Packaging	0.8%	0.2%	Felt Carpet Pad	0.0%	0.0%
Shopping/Dry Cleaning Bags	0.2%	0.0%	Fiberglass Insulation	0.0%	0.0%
Stretch Wrap	0.3%	0.1%	Concrete	0.4%	0.3%
Clean Polyethylene Film	0.7%	0.2%	Asphalt Paving	0.0%	0.0%
Other Film	6.2%	0.5%	Other Aggregates	0.8%	0.7%
Plastic Pipe	0.0%	0.0%	Rock	0.0%	0.1%
Foam Carpet Padding	0.1%	0.1%	Asphalt Shingles	0.3%	0.3%
Durable Plastic Products	1.7%	0.4%	Other Asphaltic Roofing	0.0%	0.0%
Plastic/Other Materials	0.8%	0.2%	Ceramics	0.5%	0.3%
			Cement Fiber Board	0.1%	0.1%
Glass	**2.9%**		Dried Latex Paints	0.1%	0.1%
Clear Beverage	0.7%	0.1%	Single-ply Roofing Membranes	0.0%	0.0%
Green Beverage	0.6%	0.2%	Ceiling Tiles	0.1%	0.1%
Brown Beverage	0.6%	0.1%	Other Construction Debris	0.6%	0.3%
Container Glass	0.3%	0.1%			
Fluorescent Tubes	0.0%	0.0%	**Potentially Harmful Wastes**	**1.7%**	
CFLs	0.0%	0.0%	Liquid Latex Paints	0.3%	0.2%
Flat Glass	0.1%	0.2%	Solvent-based Adhesives	0.0%	0.0%
Automotive Glass	0.4%	0.5%	Water-based Adhesives	0.0%	0.0%
Other Glass	0.3%	0.1%	Oil-based Paint/Solvent	0.0%	0.0%
			Caustic Cleaners	0.0%	0.0%
Metal	**4.5%**		Pesticides/Herbicides	0.0%	0.0%
Aluminum Cans	0.3%	0.0%	Rechargeable Batteries	0.0%	0.0%
Aluminum Foil/Containers	0.2%	0.0%	Other Dry-cell Batteries	0.0%	0.0%
Other Aluminum	0.0%	0.0%	Wet-cell Batteries	0.0%	0.0%
Other Nonferrous	0.1%	0.1%	Gasoline/Kerosene	0.0%	0.0%
Steel Food Cans	0.5%	0.1%	Motor Oil/Diesel Oil	0.0%	0.0%
Empty Aerosol Cans	0.1%	0.0%	Asbestos	0.0%	0.0%
Other Ferrous	1.4%	0.4%	Explosives	0.0%	0.0%
Oil Filters	0.0%	0.0%	Medical Wastes	1.0%	0.5%
Mixed Metals/Material	1.9%	0.5%	Other Cleaners/Chemicals	0.0%	0.0%
			Pharmaceuticals/Vitamins	0.0%	0.0%
Compostable Organics	**27.4%**		Personal Care/Cosmetics	0.1%	0.1%
Leaves and Grass	1.0%	0.3%	Other Potentially Harmful Wastes	0.3%	0.3%
Prunings	0.5%	0.3%			
Food	25.8%	1.7%	**Fines and Misc Materials**	**1.8%**	
Fats, Oils, Grease	0.1%	0.1%	Sand/Soil/Dirt	0.6%	0.3%
			Non-distinct Fines	0.2%	0.1%
Other Organics	**11.8%**		Miscellaneous Organics	0.7%	0.1%
Textiles	2.6%	0.4%	Miscellaneous Inorganics	0.2%	0.2%
Mixed Textiles	1.3%	0.4%			
Disposable Diapers	3.5%	0.8%			
Animal By-products	3.5%	0.7%			
Rubber Products	0.7%	0.2%	**Totals**	**100%**	
Tires	0.2%	0.2%	Sample Count	191	

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Appendix A.   Waste Component Categories

Waste samples were sorted by hand into 115 waste components, which are grouped into nine broad categories. The waste categories in the 2016 study are based on those used in Seattle's 2012 commercial waste study. *Pharmaceutical and vitamins* and *personal care/cosmetics* are two new categories since the 2012 study.

Medical wastes were excluded from sorting; virtually everything else was weighed and recorded. A list of component categories and definitions follows.

PAPER

1.   *NEWSPAPER*: Printed ground wood newsprint. Includes advertising "slicks" (glossy paper), if found mixed with newspaper; otherwise, advertising slicks are included with mixed low-grade paper.

2.   *PLAIN OCC/KRAFT PAPER*: Old unwaxed/uncoated corrugated container boxes and Kraft paper.

3.   *WAXED OCC*: Old waxed/coated corrugated container boxes and Kraft paper.

4.   *GROCERY/SHOPPING BAGS:* Paper grocery and shopping bags. Includes all brown paper bags and bags with non-paper handles.

5.   *HIGH-GRADE PAPER*: White and lightly colored bond, rag, or stationary grade paper. This includes white or lightly colored sulfite/sulfate bond, copy papers, notebook paper, envelopes, continuous-feed sulfite/sulfate computer printouts and forms of all types, excluding carbonless paper.

6.   *MIXED LOW-GRADE PAPER*: Mixed paper acceptable in Seattle's residential curbside program. This includes junk mail; magazines; colored papers; bleached Kraft; boxboard; mailing tubes; carbonless copy paper; ground wood computer printouts; paperback books; telephone directories; spiral notebooks; and frozen/refrigerator packaging. Excludes juice concentrate cans.

7.   POLYCOATED CONTAINERS: Polycoated milk, ice cream, and aseptic juice containers, including those with plastic spouts attached.

8.   *COMPOSTABLE/SOILED PAPER*: Paper towels, waxed paper, tissues, and other papers that were soiled with food during use (e.g., pizza box inserts).

9.   *POTENTIALLY COMPOSTABLE SINGLE-USE FOOD SERVICE PAPER:* Paper plates, bowls, and cups, including wax-coated paper plates, bowls and cups and items labeled "compostable." Excludes items with visible plastic coating or lining.

10.   *NON-COMPOSTABLE SINGLE-USE FOOD SERVICE PAPER*: Paper plates, bowls, and cups not labeled "compostable" and that appear to have a plastic lining or coating.

11.   *MIXED/OTHER PAPER*: Predominantly paper with other materials attached (e.g. orange juice cans), and other non-recyclable papers such as carbon copy paper, hardcover books, and photographs.

PLASTIC

12. *PET BOTTLES*: Blow-molded polyethylene terephthalate (#1) bottles and jars excluding toxic product containers.

13. *HDPE NATURAL BOTTLES*: Blow-molded high-density translucent polyethylene (#2) bottles and jars excluding toxic product containers. Examples include milk, juice, beverage, oil, vinegar, and distilled water.

14. *HDPE COLORED BOTTLES*: Blow-molded high-density colored polyethylene (#2) bottles and jars excluding toxic product containers. Examples include liquid detergent bottles and some hair care bottles.

15. *OTHER PLASTIC BOTTLES*: Blow-molded #3-#7 plastic bottles and jars and unknown bottles. Excludes toxic product containers.

16. *TUBS:* #1-#7 tubs such as yogurt, cottage cheese, prescription vials, and margarine. Excludes toxic product containers.

17. *EXPANDED POLYSTYRENE NON-FOOD GRADE:* Includes non-food packaging and finished products made of expanded polystyrene. Excludes Styrofoam products such as cups, plates, and bowls and rigid foam insulation.

18. *EXPANDED POLYSTYRENE FOOD-GRADE:* "Styrofoam" products used to contain food such as "clamshells," cups, plates, and bowls.

19. *RIGID POLYSTYRENE FOAM INSULATION*: rigid panels of expanded polystyrene used to insulate walls and roofs. Excludes non-polystyrene rigid foam insulation.

20. *POTENTIALLY COMPOSTABLE SINGLE-USE FOOD SERVICE PLASTICS:* Includes clamshells, cups, cup lids, and salad trays labeled "compostable." Excludes clamshells, cups plates and bowls and other food service items made of Styrofoam.

21. *NON-COMPOSTABLE SINGLE-USE FOOD SERVICE PLASTICS:* Includes forks and spoons, clamshells, cups, cup lids, and salad trays not labeled "compostable." Excludes clamshells, cups plates and bowls and other food service items made of Styrofoam.

22. *OTHER RIGID PACKAGING*: #1-#7 and unmarked rigid plastic packaging (excluding expanded polystyrene – Styrofoam), such as cookie tray inserts, plastic spools, plastic frozen food trays, plastic toothpaste tubes, and disposable plant pots. Also includes toxic product containers, such as for motor oil or antifreeze.

23. *CLEAN SHOPPING/DRY CLEANER BAGS*: Labeled grocery and merchandise, dry cleaner, and newspaper polyethylene film bags that were not contaminated with food, liquid or grit during use.

24. *STRETCH WRAP:* Polyethylene pallet wrap or stretch wrap.

25. *OTHER CLEAN POLYETHYLENE FILM*: Polyethylene film and bags, other than those identified above, which were not contaminated with food, liquid, or grit during use. Includes clean plastic sheeting, clean trash bags, and mattress packaging.

26. *OTHER FILM*: Film packaging not defined above, or: was contaminated with food, liquid or grit during use; is woven together (e.g., grain bags); or that contains multiple layers of film or other materials that have been fused together (e.g., potato chip bags). This category also includes contaminated plastic sheeting, photographic negatives, shower curtains, any bags used to contain food or liquid (e.g., produce), contaminated trash bags, used garbage bags, and shopping bags used as garbage bags.

27. *PLASTIC PIPE*: pipes and fittings made of PVC (polyvinyl chloride), ABS (acrylonitrile butadiene styrene), or other rigid plastics.

28. *FOAM CARPET PADDING:* foam material used under carpet to provide insulation and padding. Most commonly made of urethane foam. Can be solid-colored or have a marbled appearance.

29. *DURABLE PLASTIC PRODUCTS*: Finished plastic products made entirely of plastic such as toys, toothbrushes, vinyl hose, plastic lawn furniture, and foam mattresses. Includes fiberglass resin products and materials, and durable plastic pots.

30. *PLASTIC/OTHER MATERIALS*: Items that are predominately plastic with other materials attached such as disposable razors, pens, lighters, toys, and 3-ring binders.

GLASS

31. *CLEAR BEVERAGE*: Bottles that are clear in color, including pop, liquor, wine, juice, beer, and vinegar bottles.

32. *GREEN BEVERAGE*: Bottles that are green in color, including green pop, liquor, wine, beer, and lemon juice bottles.

33. *BROWN BEVERAGE*: Bottles that are brown in color, including brown pop, beer, liquor, juice, and extract bottles.

34. *CONTAINER GLASS*: Glass containers of all colors, holding solid materials such as mayonnaise, non-dairy creamer, and facial cream.

35. *FLUORESCENT TUBES*: Fluorescent light tubes.

36. *COMPACT FLUORESCENT LIGHTS (CFL):* small, fluorescent bulbs similar in appearance to incandescent bulbs. These bulbs typically have a spiral or tubular design.

37. *FLAT GLASS:* Clear or tinted glass that is flat. Examples include glass window panes, doors and table tops, safety glass, and architectural glass. Excludes windshields, laminated glass, or any curved glass.

38. *AUTOMOTIVE GLASS:* Windshield and side window auto glass.

39. *OTHER GLASS:* Mirrors, light bulbs (except fluorescent tubes), glassware, and blue glass bottles.

METAL

40. *ALUMINUM CANS*: Aluminum beverage cans (UBC) and bi-metal cans made mostly of aluminum.

41. *ALUMINUM FOIL/CONTAINERS*: Aluminum food containers, trays, and foil.

42. *OTHER ALUMINUM*: Aluminum products and scrap such as window frames, cookware.

43. *OTHER NONFERROUS*: Metals not derived from iron, to which a magnet will not adhere, and which are not significantly contaminated with other metals or materials.

44. *STEEL FOOD CANS*: Steel food containers, including bi-metal cans made mostly of steel.

45. *EMPTY AEROSOL CANS:* Empty, mixed material/metal aerosol cans. (Aerosols that still contain product are sorted according to that material—for instance, solvent-based paint.)

46. *OTHER FERROUS*: Ferrous and alloyed ferrous scrap metals to which a magnet adheres and which are not significantly contaminated with other metals or materials.

47. *OIL FILTERS:* Metal oil filters used in cars and other automobiles.

48. *MIXED METALS/MATERIALS*: Items that are predominately metal with other materials attached such as motors, insulated wire, and finished products containing a mixture of metals, or metals and other materials. White goods are banned from Seattle's disposal. However, segments of large appliances are occasionally found; they are included in this category.

ORGANICS

49. *LEAVES AND GRASS*: Non-woody plant materials from a yard or garden area, including grass clippings, leaves, weeds, and garden wastes.

50. *PRUNINGS*: Cut prunings, 6" or less in diameter, from bushes, shrubs, and trees.

51. *FOOD*: Food wastes and scraps, including bone, rinds, etc. Excludes the weight of food containers, except when container weight is not appreciable compared to the food inside. Biodegradable packaging peanuts (made from corn starch) are also included in this category. Excludes fats, oils, and grease.

52. *FATS, OILS, AND GREASE:* Fatty by-products of food preparation. Includes cooking oil, butter, lard, and gravy. Can be in liquid or solid form.

53. *TEXTILES*: Rag stock fabric materials including natural and synthetic textiles such as cotton, wool, silk, woven nylon, rayon, and polyester.

54. *MIXED TEXTILES:* Non-rag stock grade textiles such as upholstered items, non-leather shoes and handbags, heavy linens, and draperies.

55. *DISPOSABLE DIAPERS:* Diapers made from a combination of fibers, synthetic, and/or natural, and made for single use. This includes disposable baby diapers and adult protective undergarments.

56. *ANIMAL BY-PRODUCTS*: Animal carcasses not resulting from food storage or preparation, animal wastes, and kitty litter.

57. *RUBBER PRODUCTS*: Finished products and scrap materials made of natural and synthetic rubber, such as bath mats, inner tubes, rubber hoses, rubber carpet padding, and foam rubber.

58. *TIRES*: Vehicle tires of all types. Tubes are put into the rubber category.

APPLIANCES AND ELECTRONICS

59. *FURNITURE*: Mixed-material furniture such as upholstered chairs. Furniture that is made purely of one material, such as plastic or metal, would be categorized according to that material (e.g., plastic products or other ferrous metal).

60. *MATTRESSES*: Mattresses and box springs.

61. *SMALL APPLIANCES*: Small electric appliances such as toasters, microwave ovens, power tools, curling irons, and light fixtures.

62. *CELL PHONES:* Personal digital assistants (PDA) and cell phones.

63. *AUDIO/VISUAL EQUIPMENT*: Examples include stereos, radios, tape decks, VCRs, camcorders, and digital cameras.

64. *COMPUTER MONITORS:* Computer monitors containing a cathode ray tube (CRT).

65. *TELEVISIONS:* Television sets containing a cathode ray tube (CRT).

66. *OTHER ELECTRONICS:* Computer items not containing CRTs such as processors, mice and mouse pads, keyboards, disk drives, laptops, and other video display without cathode ray tubes (CRT).

CONSTRUCTION, DEMOLITION, & LANDCLEARING DEBRIS

67. *CLEAN DIMENSION LUMBER:* Milled lumber commonly used in construction for framing and related uses, including 2 x 4's, 2 x 6's, that is clean (only including trace amounts of paint, nails, and other contaminants). Includes 2 x 4's with painted ends.

68. *CLEAN ENGINEERED WOOD*: Sheets of plywood, strandboard, particleboard, and other wood created using glue that are clean (only including trace amounts of paint, nails, and other contaminants).

69. *PALLETS*: Untreated wood pallets, whole and broken.

70. *CRATES*: Untreated crates, pieces of crates, and other packaging lumber/panelboard.

71. *OTHER UNTREATED WOOD*: Compostable prunings or stumps 6" or greater in diameter.

72. *NEW PAINTED WOOD:* Lumber and wood products from new construction that have been painted so as to render them difficult to compost.

73. *OLD PAINTED WOOD*: Painted wood from demolition jobs. May be flaky and oxidized. Includes lead-based painted wood

74. *CREOSOTE-TREATED WOOD*: Lumber and wood products that have been treated with creosote so as to render them difficult to compost (with generally 50% or more of the surface area treated).

75. *OTHER TREATED WOOD*: Lumber and wood products that have been treated (other than painted or treated with creosote) so as to render them difficult to compost. This includes chemically treated lumber.

76. *CONTAMINATED WOOD:* Predominantly wood and lumber products that are mixed with other materials in such a way that they cannot easily be separated. This includes wood with metal, gypsum, concrete, or other contaminants that would not compost easily.

77. *NEW GYPSUM SCRAP*: Calcium sulfate dehydrate sandwiched between heavy layers of Kraft-type paper. Also known as drywall. This category includes new drywall that has not been painted or treated in other ways. Excludes GP DensGlass (and other brands) of exterior or roof paneling which is gypsum sandwiched between a fiberglass-reinforced coating.

78. *DEMO GYPSUM SCRAP*: Used or demolition gypsum wallboard scrap that has been painted or treated.

79. *CARPET:* General category of flooring applications and non-rag stock textiles consisting of various natural or synthetic fibers bonded to some type of backing material.

80. *FELT CARPET PAD:* Fiber carpet pads made of jute, hair, or synthetic materials, such as recycled carpet fibers. This material may be coated with latex or other resin.

81. *FIBERGLASS INSULATION*: Fiberglass building and mechanical insulation, batt or rigid.

82. *CONCRETE:* A hard material made from sand, gravel, aggregate, cement mix, and water. This category includes concrete containing steel mesh and/or reinforcement bars, or "rebar". Examples include pieces of building foundations, concrete paving, and cinder blocks.

83. *ASPHALT PAVING*: a black or brown, tar-like material mixed with aggregate used as a paving material. This category includes asphalt paving containing steel mesh and/or reinforcement bars, or "rebar."

84. *OTHER AGGREGATES:* Aggregates other than concrete and asphalt paving such as bricks, masonry tile, and clay roofing tiles.

85.   *ROCK:* Rock gravel larger than 2" in diameter.

86.   *ASPHALT SHINGLES*: Roofing material composed of fiberglass or organic felts saturated with asphalt and covered with inert aggregates as well as attached roofing tar and tar paper. Commonly known as three-tab roofing shingles but including older designs as well.

87.   *OTHER ASPHALTIC ROOFING*: Other roofing material made with layers of felt, asphalt, aggregates, and attached roofing tar and tar paper normally used on flat/low pitched roofs usually on commercial buildings. Includes tar and gravel or "built-up roof membranes" as well as other asphaltic roofing membranes.

88.   *CERAMICS*: Finished ceramic or porcelain products such as toilets, sinks, and some dishware.

89.   *CEMENT FIBER BOARD*: a composite building material containing cement and wood fiber. Includes Hardiplank, Hardiboard, tile backer board, and other similar products.

90.   *DRIED LATEX PAINTS:* Water-based paints and similar products that have dried. Excludes empty paint containers and paint that is outweighed by that of the container.

91.   *SINGLE-PLY ROOFING MEMBRANES:* Plastic roofing membranes typically installed in gray, white, or black sheets. This category includes thermoplastic membranes, such as PVC or thermoplastic olefin (TPO), or thermoset roofing membranes, such as Ethylene Propylene Diene Monomer (EPDM) or "rubber" roofs.

92.   *CEILING TILES*: Fiber or composite acoustic ceiling tiles.

93.   *OTHER CONSTRUCTION DEBRIS:* Construction debris (other than wood) that cannot be classified elsewhere and mixed fine building material scraps. For example, floor sweepings from construction activities containing sawdust, nails, wire, etc. Includes GP DensGlass (and other brands) of exterior or roof paneling which is gypsum sandwiched between a fiberglass-reinforced coating.

HAZARDOUS WASTES

94.   *LIQUID LATEX PAINTS*: Water-based paints and similar products in liquid form. Excludes empty paint containers and paint that is outweighed by that of the container.

95.   *SOLVENT-BASED ADHESIVES/GLUES*: Oil/resin/volatile solvent-based glues and adhesives, including epoxy, rubber cement, two-part glues and sealers, and auto body fillers.

96.   *WATER-BASED ADHESIVES/GLUES*: Water-based glues, caulking compounds, grouts, and Spackle.

97.   *OIL-BASED PAINT/SOLVENT*: Solvent-based paints, varnishes, and similar products. Various solvents, including chlorinated and flammable solvents, paint strippers, solvents contaminated with other products such as paints, degreasers and some other cleaners if

the primary ingredient is (or was) a solvent, or alcohol such as methanol and isopropanol.

98.   *CAUSTIC CLEANERS:* Caustic acids and bases whose primary purpose is to clean surfaces, unclog drains, or perform other actions.

99.   *PESTICIDES/HERBICIDES*: Variety of poisons with the purpose of discouraging or killing insects, weeds, or microorganisms. Fungicides and wood preservatives, such as pentachlorophenol, are also included.

100. *RECHARGEABLE BATTERIES:* Rechargeable batteries, such as those found in cordless power tools, cell phones, laptops, digital cameras, toothbrushes, and remote control toys.

101. *OTHER DRY-CELL BATTERIES*: Dry-cell batteries of various sizes and types as commonly used in households. Includes button cell batteries, such as those found in watches and hearing aids.

102. *WET-CELL BATTERIES*: Wet-cell batteries of various sizes and types as commonly used in automobiles.

103. *GASOLINE/KEROSENE*: Gasoline, diesel fuel, and fuel oils.

104. *MOTOR OIL/DIESEL OIL*: Lubricating oils, primarily used in vehicles but including other types with similar characteristics.

105. *ASBESTOS*: Asbestos and asbestos-containing wastes (if this is the primary hazard associated with these wastes).

106. *EXPLOSIVES*: Gunpowder, unspent ammunition, picric acid, and other potentially explosive chemicals.

107. *MEDICAL WASTES*: Materials typically discarded in a health care setting such as I.V. tubing and patient drapes, specimen containers, and Petri dishes. Medical wastes that could be considered a biohazard are weighed, but not further sorted.

108. *OTHER CLEANERS/CHEMICALS*: Soaps, non-caustic cleaners, medicines, cosmetics, and other household chemicals.

109. *PHARMACEUTICALS AND VITAMINS:* Both prescription and over-the-counter medications and supplements in all forms, including pills, liquid medications, creams, and ointments. Does not include containers for these items, except for tubes for creams and ointments and other containers that cannot be easily separated from the product they contain.

110. *PERSONAL CARE/COSMETICS:* Hygiene and grooming products, including bar soap, shower gel, shampoo, conditioner, hairspray, deodorant, body powder, lotions, nail polish and remover, makeup, etc. Does not include containers for these items, except when containers cannot be easily separated from the product they contain.

111.   *OTHER POTENTIALLY HARMFUL WASTES*: Other chemicals or potentially harmful wastes that do not fit into the above categories, including unidentifiable materials.

FINES AND MISCELLANEOUS MATERIALS

112.   *SAND/SOIL/DIRT*: Sand, soil, dirt, and gravel smaller than 2" in diameter.

113.   *NONDISTINCT FINES:* Mixed MSW fines smaller than 2" in diameter.

114.   *MISCELLANEOUS ORGANICS*: Combustible materials including wax; bar soap; cigarette butts; scraps of leather and leather products including shoes and belts; feminine hygiene products; briquettes; fireplace, burn barrel and fire pit ash; and other organic materials not classified elsewhere.

115.   *MISCELLANEOUS INORGANICS*: Other inorganic, non-combustible materials not classified elsewhere.

Changes to Waste Component Categories

The material types used to categorize Seattle's waste stream have been refined over the years. Table A-1 tracks these changes. (An "X" signifies that the component remains the same from the previous study period; an outline border reflects how components were split apart or grouped together.)

Table A-1. Changes to Waste Component Categories, 1988 to present

1988/89	1990	1992	1994	1996	1998/99	2000	2002	2004	2006	2008	2010	2012	2016
PAPER													
Newspaper	x	x	x	x	x	x	x	x	x	x	x	x	x
Corrugated Paper	x	x	x	x	x	x	x	x	x	x	x	x	Plain OCC/ Kraft Paper	x
													Grocery/ Shopping Bags	x
Office Paper	x	x	x	x	x	x	x	High-grade Paper	x	x	x	x	x
Computer Paper	x	x	x	x	x	x	x	(High-grade Paper)					
Mixed Scrap Paper	x	x	Mixed Scrap Paper	x	x	x	x	Mixed Low-grade Paper	Mixed Low-grade Paper	x	x	Mixed Low-grade Paper	x
			Phone Books	x	x	x	x						
Other Paper	x	x	Milk/Juice Polycoats	x	x	x	x	Polycoated Paper	(Mixed Low-grade Paper)	x	x	Polycoated Paper	x
			Frozen Food Polycoats	x	x	x	x						
			Compostable/ Soiled Paper	Compostable/ Soiled Paper	x	x	x	x	x	Compostable/ Soiled Paper	**X**	x	x
										Single-use Food Service Paper	Potentially Compostable Single-use Food Service	x	x
											Other Single-use Food Service Paper	Non-Compostable Single-Use Food Service	x
				OCC/Kraft, Waxed	x	x	x	x	x	x	x	x	x
			Paper/ Other Materials	x	x	x	x	Mixed/Other Paper	x	x	x	x	x

1988/89	1990	1992	1994	1996	1998/99	2000	2002	2004	2006	2008	2010	2012	2016
PLASTIC													
PET Bottles	x	x	x	PET Pop & Liquor	x	x	x	x	#1 PET Bottles	#1 PET Bottles	x	x	x
				Other PET Bottles	x	x	x	x	Moved to "Other Plastic Bottles"				
HDPE Bottles	x	x	HDPE Milk & Juice	x	x	x	x	#2 HDPE Natural Bottles	x	x	x	x	x
								#2 HDPE Colored	x	x	x	x	x
			Other HDPE Bottles	x	x	x	x	Moved to "Other Plastic Bottles"	Moved to "Other Rigid Packaging"	x	x	x	x
Plastic Packaging	Other Plastic Bottles	x	x	x	x	x	x	x	x	x	x	Other Plastic Bottles	x
	Plastic Packaging	x	Other Rigid Containers	Jars & Tubs	x	x	x	x	x	Tubs #1-#7	x	x	x
Plastic Packaging	x	x	Other Rigid Packaging	x	x	x	x	x	x	Single-use Food Service Plastics	Potentially Compostable Single-use Food Service	x	x
											Non-Compostable Single-use Food Service	x	x
										Other Rigid Packaging #1-#7	x	x	x
Plastic Packaging	x	x	Grocery/Bread Bags	x	x	x	x	Clean Shopping/Dry Cleaner Bags	x	x	x	x	x
			Other Film	Garbage Bags	x	x	x	Other Clean PE Film	x	x	x	Other Clean PE Film	x
				Other Film	x	x	x					Stretch Wrap	x
								Other Film	x	x	x	x	x

Table A-1. Changes to Waste Component Categories, 1988 to present (continued)

1988/89	1990	1992	1994	1996	1998/99	2000	2002	2004	2006	2008	2010	2012	2016
Expanded Polystyrene	x	x	x	x	x	x	x	x	x	Expanded Poly. Food-grade	x	x	x
										Expanded Polystyrene Non-food Grade	Rigid Poly. Foam Insulation	x	x
											Expanded Poly. Non-food Grade	x	x
Other Plastic Products	x	x	Plastic Products	x	x	x	x	x	x	x	Plastic Pipe	x	x
											Foam Carpet Padding	x	x
											Durable Plastic Products	x	x
			Plastic/ Other Materials	x	x	x	x	x	x	x	x	x	x
GLASS													
Non-refillable Pop	x	x	Clear Beverage	x	x	x	x	x	x	x	x	x	x
Refillable Pop	x	x	Green Beverage	x	x	x	x	x	x	x	x	x	x
Non-refillable Beer	x	x	Brown Beverage	x	x	x	x	x	x	x	x	x	x
Refillable Beer	x	x	*(After 1994, characterized according to color)*										
Container Glass	x	x	x	x	x	x	x	x	x	x	x	x	x
Non-recyclable Glass	x	x	x	Fluorescent Tubes	x	x	x	x	x	x	CFLs	x	x
											Fluorescent Tubes	x	x
				Other Glass	x	x	x	x	x	Flat Glass	x	Flat Glass	x
												Automotive Glass	x
										Other Glass	x	x	x

1988/89	1990	1992	1994	1996	1998/99	2000	2002	2004	2006	2008	2010	2012	2016
METAL													
Aluminum Cans	x	x	x	x	x	x	x	x	x	x	x	x	x
Aluminum Foil/ Containers	x	x	x	x	x	x	x	x	x	x	x	x	x
Nonferrous	x	x	Nonferrous	Other Nonferrous	x	x	x	x	x	x	x	x	x
			Other Aluminum	Other Aluminum	x	x	x	x	x	x	x	x	x
				Empty Aerosol Cans	x	x	x	x	x	x	x	x	x
Tinned Cans	x	x	x	x	x	x	x	x	x	x	x	Steel Food Cans	x
Bi-metal Cans	x	x	*(After 1994, characterized according to predominant metal)*											
Ferrous	x	x	x	x	x	x	x	x	x	x	x	Other Ferrous	x
Mixed Metals/ Materials	x	x	x	x	x	x	x	x	x	x	x	x	x
(Before 1998/99, was not characterized)				Metal Oil Filters	x	x	x	x	x	x	x	x	
White Goods	x	x	*(After 1994, banned from disposal. Parts show up in "Mixed Metals")*											
COMPOSTABLE ORGANICS													
Leaves and Grass	x	x	x	x	x	x	x	x	x	x	x	x	x
Prunings	x	x	x	x	x	x	x	x	x	x	x	x	x
Food	x	x	x	x	x	x	x	x	x	x	Fats, Oils, & Grease	x	x
											Food	x	x

1988/89	1990	1992	1994	1996	1998/99	2000	2002	2004	2006	2008	2010	2012	2016
					(COMPOSTABLE and OTHER ORGANICS Combined as ORGANICS prior to 2012)							**OTHER ORGANICS**	
Textiles	x	x	Textiles	Textiles/ Clothing	x	x	x	Moved to "Organics"	Textiles	x	x	x	x
			Carpet/ Upholstery	x	x	x	x		Mixed Textiles	x	x	x	x
									Carpet	x	x	Moved to Construction Debris	x
Disposable Diapers	x	x	x	x	x	x	x		Disposable Diapers	x	x	x	x
(Discarded from samples prior to 1994)			Animal By-Products	x	x	x	x		Animal By-products	x	x	x	x
Rubber Products	x	x	moved to "Other Materials"	x	x	x	x		Rubber Products	x	x	x	x
Tires	x	x	moved to "Other Materials"	x	x	x	x		Tires	x	x	x	x
FURNITURE, APPLIANCES, AND ELECTRONICS													
(Prior to 1994, split among various materials; Mixed Metal, Textiles, Other Plastics, etc.)			Furniture	x	x	x	x	Moved to "Furniture, Appliances, & Electronics"	Furniture	x	x	x	x
(Prior to 1994, split among various materials; Mixed Metal, Textiles, Other Plastics, etc.)			Mattresses	x	x	x	x		Mattresses	x	x	x	x
(Prior to 1994, split among various materials; Mixed Metal, Textiles, Other Plastics, etc.)			Small Appliances	x	x	x	x		Small Appliances	x	x	x	x

1988/89	1990	1992	1994	1996	1998/99	2000	2002	2004	2006	2008	2010	2012	2016
(Prior to 1994, split among various materials; Mixed Metal, Textiles, Other Plastics, etc.)			A/V Equipment	x	x	x	x	Moved to "Furniture, Appliances, & Electronics"	Audio/Visual Equipment	x	Cell Phones	x	x
											Audio/Visual Equipment	x	x
						Televisions & Computer Monitors	Television Sets		Computer Monitors	x	x	x	x
							Computer Monitors		Televisions	x	x	x	x
						Other Computer Equipment	x		Other Computer Equipment	x	Other Electronics	x	x
CONSTRUCTION DEBRIS													
Wood	x	Untreated Wood	Untreated Wood	Dimension Lumber	x	x	x	x	x	Clean Dimension Lumber	x	x	x
										Clean Engineered Wood	x	x	x
			Crates/Pallets	Other Untreated Wood	x	x	x	x	x	x	x	x	x
				Pallets	x	x	x	x	x	x	x	x	x
				Crates/Boxes	x	x	x	x	Crates	x	x	x	x
Wood	x	Treated Wood	x	Treated Wood	x	x	x	x	x	New Painted Wood	x	x	x
										Old Painted Wood	x	x	x
										Creosote-treated Wood	x	x	x
										Other Treated Wood	x	x	x
				Contaminated Wood	x	x	x	x	x	x	x	x	x

Table A-1. Changes to Waste Component Categories, 1988 to present (continued)

1988/89	1990	1992	1994	1996	1998/99	2000	2002	2004	2006	2008	2010	2012	2016
Gypsum Drywall	x	x	x	New Gypsum Scrap	x	x	x	x	x	x	x	x	x
				Demo Gypsum Scrap	x	x	x	x	x	x	x	x	x
Fiberglass Insulation	x	x	x	*Moved to "Construction Debris"*	x	x	x	x	x	x	x	x	x
Rock/ Concrete/ Brick	x	x	x	*Moved to "Construction Debris"*	x	x	x	x	x	x	x	Concrete	x
												Asphalt Paving	x
												Other Aggregates	x
												Rock	x
Ceramics, Porcelain, China	x	x	x	x	x	x	x	*Moved to "Construction Debris"*	Ceramics	x	x	x	x
Other Construction Debris	x	x	x	Asphaltic Roofing	x	x	x	x	x	Asphalt Shingles	x	x	x
										Other Asphaltic Roofing	x	x	x
										Other Construction Debris	Cement Fiber Board	x	x
											Other Construction Debris	Dried Latex Paint	x
												Single-ply Roofing Membranes	x
												Ceiling Tiles	x
												Other Construction Debris	x

Table A-1. Changes to Waste Component Categories, 1988 to present (continued)

1988/89	1990	1992	1994	1996	1998/99	2000	2002	2004	2006	2008	2010	2012	2016
POTENTIALLY HARMFUL WASTE													
Latex Paints	x	x	x	x	x	x	x	x	x	x	Liquid Latex Paint	x	x
											Dried Latex Paint	Moved to "Construction Debris"	x
Adhesives/ Glues	x	x	x	Hazardous Glue/Adhesives	x	x	x	Solvent-based Adhesives/ Glues	x	x	x	x	x
				Non-hazardous Glue/Adhesives	x	x	x	Water-based Adhesives/ Glues	x	x	x	x	x
Oil-based Paints/ Solvents	x	x	x	x	x	x	x	x	x	x	x	x	x
Cleaners	x	x	x	x	x	x	x	Caustic Cleaners	x	x	x	x	x
Pesticides/ Herbicides	x	x	x	x	x	x	x	x	x	x	x	x	x
Batteries	x	x	Dry-cell Batteries	x	x	x	x	x	x	x	x	x	x
			Wet-cell Batteries	x	x	x	x	x	x	x	x	x	x
Gasoline/ Kerosene	x	x	x	x	x	x	x	x	x	x	x	x	x
Motor Oil/ Diesel Oil	x	x	x	x	x	x	x	x	x	x	x	x	x
Asbestos	x	x	x	x	x	x	x	x	x	x	x	x	x
Explosives	x	x	x	x	x	x	x	x	x	x	x	x	x

1988/89	1990	1992	1994	1996	1998/99	2000	2002	2004	2006	2008	2010	2012	2016
								Medical Waste	x	x	x	x	x
Other Chemicals	x	x	x	Other Hazardous Chemicals	x	x	x	Other Cleaners/ Chemicals	x	x	x	x	Other Cleaners/ Chemicals
													Pharmaceuticals/ Vitamins
													Personal Care/ Cosmetics
				Other Non-hazardous Chemicals	x	x	x	Other Potentially Harmful Wastes	x	x	x	x	x
FINES AND MISCELLANEOUS MATERIALS													
Sand, Dirt, Non-distinct Fines	x	x	Sand/Soil/ Dirt	*Moved to "Construction Debris"*	x	x	x	*Moved to "Fines & Miscellaneous Materials"*	Sand/Soil/ Dirt	x	x	x	x
			Non-distinct Fines	x	x	x	x	*Moved to "Fines & Miscellaneous Materials"*	Non-distinct Fines	x	x	x	x
Ash	x	x	x	x	x	x	x						
Leather	x	x	x	x	x	x	x	*Moved to "Fines & Miscellaneous Materials"*	Misc. Organics	x	x	x	x
(Prior to 1994, mostly in "Sand, Dirt, Non-distinct Fines; also in various "Mixed" and "Other" categories)			Misc. Organics	x	x	x	x						
(Prior to 1994, mostly in "Sand, Dirt, Non-distinct Fines; also in various "Mixed" and "Other" categories)			Misc. Inorganics	x	x	x	x	*Moved to "Fines & Miscellaneous Materials"*	Misc. Inorganics	x	x	x	x

Appendix B.   Sampling Methodology

Overview

The objective of the 2016 Seattle Waste Composition Study was to provide statistically significant data on the composition of commercial waste in the City of Seattle. Commercial waste was last sampled in 2012. The current project followed the same basic methodology as the 2012 study though the component categories and definitions were revised and are included in Appendix A.

Substream Definition

For any specific geographic area, the total waste stream is composed of various substreams. A "substream" is determined by the particular generation, collection, or composition characteristics that make it a unique portion of the total waste stream. This study targeted Seattle's commercial substream.[9] The **commercial** substream comprises waste that is both (a) generated at businesses and institutions and (b) collected by contracted hauling companies.

The city contracts with two haulers, each serving two of four distinct "zones" in the city (Figure B-1**Error! Reference source not found.**).[10] One of the contracted haulers handles zones one and four, and the other hauler handles zones two and three.[11] The commercial substream can be further divided into 24 subpopulations as shown in Table B-1. Subpopulations are defined according to three groupings: city collection zone (one, two, three, or four), shift (day or night), and vehicle type (front loader, rear loader, or roll-off).

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[9] The residential and self-haul substreams were not included in this study. For the most recent analysis of Seattle's residential waste stream, please see the *2014 Residential Waste Composition Study Final Report* prepared for the Seattle Public Utilities by Cascadia Consulting Group, Inc. The *2012 Commercial and Self-Haul Waste Streams Composition Study* contains the most recent analysis of the self-haul substream. The self-haul substream will next be sampled in 2017.

[10] In 2010, the City of Seattle was divided into four "zones" rather than the two service areas (North and South) previously studied.

[11] Through the Clear Alleys Program, commercial waste from select downtown neighborhoods is collected in bags. This waste was excluded from the study due to the difficulty of segregating and obtaining representative samples of this material and since it represents a small portion (about 3% in 2016 tons) of Seattle's commercial waste.

Figure B-1. Seattle's Collection Zones

Table B-1. Commercial Subpopulations by Zone, Shift, and Vehicle Type

Collection Zone	Vehicle Type	Shift Day	Shift Night
1	Front Loader	Zone 1 Day FL	Zone 1 Night FL
	Rear Loader	Zone 1 Day RL	Zone 1 Night RL
	Roll-off	Zone 1 Day RO	Zone 1 Night RO
2	Front Loader	Zone 2 Day FL	Zone 2 Night FL
	Rear Loader	Zone 2 Day RL	Zone 2 Night RL
	Roll-off	Zone 2 Day RO	Zone 2 Night RO
3	Front Loader	Zone 3 Day FL	Zone 3 Night FL
	Rear Loader	Zone 3 Day RL	Zone 3 Night RL
	Roll-off	Zone 3 Day RO	Zone 3 Night RO
4	Front Loader	Zone 4 Day FL	Zone 4 Night FL
	Rear Loader	Zone 4 Day RL	Zone 4 Night RL
	Roll-off	Zone 4 Day RO	Zone 4 Night RO

Commercial waste is hauled to the city-owned disposal stations: North Transfer Station (NTS) and South Transfer Station (STS). North Transfer Station is currently closed for a rebuild and expected to re-open in mid-2016.

Sample Allocation

For this study, a total of 270 commercial samples were characterized. These samples were allocated to the 24 commercial subpopulations using the following three steps.

1. Samples were allocated equally to each of the four collection zones: either 67 or 68 samples were allocated to each zone. An equivalent number of samples in each collection zone provides a comparable level of precision (e.g., similar error rates) in the resulting composition data for each of these geographic service areas.

2. Within each zone, samples were assigned to vehicle types – front loaders, rear loaders, or roll-offs. Samples were distributed across vehicle types proportionally by tonnage. [12]

3. To maintain comparability with the previous study conducted in 2012, a third of the samples (90 samples) were assigned to night shifts. These samples were assigned to zones and vehicle types as described above.

The numbers of samples allocated to the various subpopulations are detailed in Table B-2. Commercial Sample Allocation.

Table B-2. Commercial Sample Allocation

			Shift	
			Day	*Night*
1	Vehicle Type	Front Loader	41	2
		Rear Loader	5	0
		Roll-off	13	6
2	Vehicle Type	Front Loader	25	3
		Rear Loader	8	2
		Roll-off	10	19
3	Vehicle Type	Front Loader	22	1
		Rear Loader	6	5
		Roll-off	7	27
4	Vehicle Type	Front Loader	22	14
		Rear Loader	4	2
		Roll-off	15	11

Collection Zone

Sampling Calendar

A minimum of 270 commercial samples were sorted during this study. Since the field crew can sort approximately 15 commercial loads per day, 18 days of sampling were required to meet the study's sampling goals. In order to capture any seasonal variation, the sampling events were distributed across the 12-month study period. Sampling occurred every other month for three consecutive days each selected month for a total of 18 days. Six of the 18 days of commercial sampling took place at night.

Taking into account major holidays and the sorting crew's availability, sampling dates for each sampling month were selected using a random number generator and refined so that the distribution across weeks of the month and days of the week was roughly even. The sampling calendar was designed using the following steps:

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[12] Seattle Public Utilities provided 2015 commercial tonnages used for allocating samples in the study.

1. The week of the month was randomly selected using the *Rand()* function in Excel.
2. The start day of each month's sampling was randomly selected to be a Monday, Tuesday, or Wednesday.
3. The six night-time sampling events were randomly assigned over the six sampling events.
4. Two weekend sampling events (one day and one night) were scheduled.
5. Finally, a random selection method was used to adjust the sampling events to achieve a balanced distribution across days of the week and weeks of the month.

During sampling planning, Seattle Public Utilities was rebuilding North Transfer Station (NTS), and the facility was expected to re-open in mid-2016. Although the sampling calendar could have been adjusted to include sampling at the NTS, the NTS did not open until late 2016 and did not receive typical vehicle traffic during the 2016 commercial study. Instead, trucks were specifically routed to the STS during sampling even after NTS re-opened.

The sampling calendar is shown in Table B-3. Sampling Calendar. The resulting allocation of waste sampling days by day or night sampling is shown in Table B-4. In addition to the scheduled sampling days, two make-up sampling days were scheduled in late December 2016.

Table B-3. Sampling Calendar

Date	Sector	Day/Night	No. of Samples	Day of the Week	Week of the Month	Season
2/24/16	COM	Day	15	Wednesday	4	Winter
2/25/16	COM	Day	15	Thursday	4	Winter
2/26/16	COM	Day	15	Friday	4	Winter
4/10/16	COM	Night	15	Sunday	2	Spring
4/12/16	COM	Day	15	Tuesday	2	Spring
4/13/16	COM	Day	15	Wednesday	2	Spring
6/6/16	COM	Day	15	Monday	1	Summer
6/7/16	COM	Day	15	Tuesday	1	Summer
6/8/16	COM	Day	15	Wednesday	2	Summer
8/17/16	COM	Night	15	Wednesday	3	Summer
8/19/16	COM	Day	15	Friday	3	Summer
8/20/16	COM	Day	15	Saturday	3	Summer
10/4/16	COM	Night	15	Tuesday	1	Autumn
10/5/16	COM	Night	15	Wednesday	1	Autumn
10/7/16	COM	Day	15	Friday	1	Autumn
12/19/16	COM	Day	15	Monday	3	Winter
12/20/16	COM	Night	15	Tuesday	3	Winter
12/22/16	COM	Day	15	Thursday	4	Winter

Table B-4. Distribution of Commercial Sampling Days

Week of the Month	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
DAY								
1		1	1			1		1
2			1	2				
3		1				1	1	1
4				1	2	1		
Day Total	2	2	3	2	3	1		2
NIGHT								
1			1	1				2
2	1							1
3			1	1				2
4								
Night Total	1		2	2				5

Hauler and Transfer Station Participation

Each contracted hauler received the sampling schedule for the year. Sampling occurred every other month starting in February 2016. Prior to each sampling event, the affected haulers were sent a vehicle selection sheet. The haulers were then asked to notify the drivers of the loads selected for sampling and record the estimated time of arrival for each load on the vehicle selection sheet to assist the Field Supervisor in identifying sample trucks.

This study was designed to sample "pure" loads of commercial waste only. Both contracted haulers operate vehicles that service both commercial customers and multi-family residences. During sampling events, selected vehicles either brought in "pure" commercial loads or made a series of commercial stops at the beginning or end of their route so that the sorting crew could take a pure sample.

A sample vehicle selection sheet is included in Appendix F.

Load Selection[13]

Commercial collection vehicles typically transport more than one load per shift. Since there were more vehicles per shift than the quota to be sampled, the field team used numerical identifiers assigned to every expected load on a given sampling day to select specific loads for sampling. A random number generator sorted the identifiers by vehicle type; loads were then selected in

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[13] Several accounts are not serviced under the city contract. These "non-contract" tons were treated as follows for the purposes of this study.

- University of Washington waste is collected by Waste Management, but included in SPU reports as self-haul. This waste was sampled as part of the commercial substream and the tons were added to the commercial total.
- Coast Guard and the Veteran's Administration Hospital waste is collected by Waste Management and hauled to Eastmont. When feasible, this waste was sampled as part of the commercial substream.
- Seattle Public Schools waste is collected by Waste Management, but included in SPU reports as self-haul. This waste was sampled as part of the commercial substream and the tons were added to the commercial total.

that randomly sorted sequence until the quota for each vehicle type was filled. Selected loads for a sampling day were summarized on vehicle selection sheets such as the one shown in Appendix F.

Field Procedures

The Field Supervisor coordinated vehicle selection, sample extraction, sorting, and disposal of sorted waste with the transfer station manager.

When a vehicle selected for sampling arrived, the Field Supervisor obtained the origin of the load, truck, and route information. The Field Supervisor asked drivers or roll-off trucks to identify the type of business the sample load is from. Table B-5 lists Standard Industry Codes (SIC) by business type, which the Field Supervisor used to categorize loads. Information collected from each driver, including SICs, were recorded on the load's corresponding tally sheet, appearing in Appendix F.

Table B-5. SIC Codes, by Business Type

Business Type	SIC Codes
Construction, Demolition, and Landclearing	15-17
Education	82
Health Care	80
Hotel/Motel	70
Manufacturing	20, 22-26, 28-36, 38-39, 372, 373, 376
Office	01-02, 08-09, 10, 14, 27, 48, 49, 60-67, 73, 81
Other Non-residential	- -
Other Services	7, 55, 72, 75, 76, 78-79, 84, 86, 89
Restaurant	58
Retail	52-54, 56-57, 59
Transportation	40-47, 371, 374, 375, 379
Wholesale	50, 51
Mixed Commercial Generators	- -

Sample Selection

As a selected vehicle tipped its load, the Field Supervisor directed the front loader operator to scoop a portion of the waste being tipped out of the vehicle. About 250 pounds of this waste was placed on a tarpaulin for sorting.

In order to meet the sampling goals outlined in Table B-2. Commercial Sample Allocation, it was necessary to capture two samples from some selected loads. These samples were extracted from two randomly selected cells from the same load. This occurred on a limited basis, and only when there were fewer vehicles than the number of desired samples.

Sorting Procedures

When the load arrived at the tipping area, the field supervisor instructed the loader operator to extract approximately one to two cubic yards (approximately 250 pounds) of the material that represented a cross-section of the load and deposit it on a tarp for sorting. The field supervisor did a visual check to verify that the sampled material appeared to be from commercial generators. If it did not appear to be from commercial generators, the sample was discarded.

Each sample was sorted by hand into the material component categories as defined in Waste Component Categories. Components were placed in plastic laundry baskets to be weighed and recorded. The field supervisor monitored the homogeneity of the component baskets as material accumulated, rejecting items that were improperly classified. Open laundry baskets allowed the field supervisor to see the material at all times.

Appendix C.   Comments on Monthly Sampling Events

For the 2016 study, sampling occurred every other month for three consecutive days each selected month, for a total of 18 days plus two make-up days of sampling. This appendix summarizes sampling activities for each selected month and is presented as written during the indicated time period.

February 2016

Sampling in February 2016 took place over three days: 2/24, 2/25, and 2/26. Table C-1 compares the number of samples that were sorted to the number originally planned, by date, vehicle type, and zone. In total, 42 commercial samples were sorted.

Table C-1. Summary of Planned vs. Actual Samples for February

Zone ID	Shift	Vehicle Type	2/24/2016	2/25/2016	2/26/2016	Actual	Target	Difference from Target
1	Day	Packer	2	2	2	6	9	-3
		Roll-off		3		3	3	0
2	Day	Packer	2	1	2	5	9	-4
		Roll-off	2	2	1	5	3	2
3	Day	Packer	1	2	2	5	9	-4
		Roll-off	2	1	2	5	3	2
4	Day	Packer	2	3	1	6	6	0
		Roll-off	3	2	2	7	3	4
			14	**16**	**12**	**42**	**45**	**-3**

Overall, three fewer samples were sorted than planned for this sampling event. 11 fewer packer samples were captured than planned, while eight more roll-off samples were captured.

April 2016

Sampling in April 2016 took place over three days: 4/10 at night and 4/12 and 4/13 during the day. Table C-2 compares the number of samples that were sorted to the number originally planned, by date, vehicle type, and zone. In total, 44 commercial samples were sorted.

Table C-2. Summary of Planned vs. Actual Samples for April

Zone	Shift	Vehicle Type	4/10/2016	4/12/2016	4/13/2016	Actual	Target	Difference from Target
1	Day	Packer		3	4	7	6	1
		Roll-off		3		3	2	1
2	Day	Packer		3	4	7	6	1
		Roll-off			2	2	2	0

Zone	Shift	Vehicle Type						
3	Day	Packer		2	3	5	6	-1
		Roll-off				0	2	-2
4	Day	Packer		4	1	5	4	1
		Roll-off		2	1	3	2	1
1	Night	Packer				0	0	0
		Roll-off				0	1	-1
2	Night	Packer	1			1	1	0
		Roll-off	1			1	3	-2
3	Night	Packer	2			2	1	1
		Roll-off	6			6	5	1
4	Night	Packer	1			1	2	-1
		Roll-off	1			1	2	-1
Total			**12**	**17**	**15**	**44**	**45**	**-1**

One fewer sample was sorted than planned for this sampling event. Two more packer samples were captured than planned, while three fewer roll-off samples were captured.

Table C-3 presents an overview of sampling progress to date. The current target is based on number of sampling days complete and the number of total sampling days. For instance, 5 of 12 (42%) sampling days and one of six (17%) sampling nights are complete. Overall, we are one sample short of the goal for the day shift and three samples short of the goal for the night shift.

Table C-3. Sampling Progress for Overall Study (January – April 2016)

Zone	Vehicle Type	Day	Night	Target for Day Samples	Target for Night Samples	Difference from Day Target	Difference from Night Target	Difference from Current Overall Target
1	Packer	13		20	0	-7	0	-7
	Roll-off	6		5	1	1	-1	0
2	Packer	12	1	14	1	-2	0	-2
	Roll-off	7	1	4	3	3	-2	1
3	Packer	10	2	12	1	-2	1	-1
	Roll-off	5	6	3	4	2	2	4
4	Packer	11	1	11	3	0	-2	-2
	Roll-off	10	1	6	2	4	-1	3
Total		**74**	**12**	**75**	**15**	**-1**	**-3**	**-4**

June 2016

Sampling in June 2016 took place over four days: 6/6 through 6/9. Only two make-up samples were taken on 6/9. Table C-4 compares the number of samples that were actually sorted to the number originally planned, by date, vehicle type, and zone. In total, 45 commercial samples were sorted.

Table C-4. Summary of Planned vs. Actual Samples for June

Zone	Shift	Vehicle Type	6/6/2016	6/7/2016	6/8/2016	6/9/2016	Actual	Target	Difference from Target
1	Day	Packer	5	3	4		12	9	3
		Roll-off		1	1		2	3	-1
2	Day	Packer	3	2	3		8	9	-1
		Roll-off		1	1		2	3	-1
3	Day	Packer	4	3	2		9	9	0
		Roll-off		1			1	3	-2
4	Day	Packer	2	3	1	2	8	6	2
		Roll-off		2	1		3	3	0
Total			14	16	13	2	45	45	0

The overall sampling target was reached for this sampling event. Four more packer samples were captured than planned, while four fewer roll-off samples were captured.

Table C-5 presents an overview of sampling progress to date. The current target is based on number of sampling days complete and the number of total sampling days. For instance, 8 of 12 (67%) sampling days and one of six (17%) sampling nights are complete. Overall, we are meeting the goal for the day shift and three samples short of the goal for the night shift. We will oversample packers from Zones 1 and 2 to compensate for those shortages in upcoming sampling events.

Table C-5. Sampling Progress for Overall Study (January – June 2016)

Zone	Vehicle Type	Day	Night	Current Target for Day Samples	Current Target for Night Samples	Difference from Day Target	Difference from Night Target	Difference from Current Overall Target
1	Packer	25		31	0	-6	0	-6
	Roll-off	8		9	1	-1	-1	-2
2	Packer	20	1	22	1	-2	0	-2
	Roll-off	9	1	7	3	2	-2	0
3	Packer	19	2	19	1	0	1	1
	Roll-off	6	6	5	4	1	2	3
4	Packer	19	1	18	3	1	-2	-1
	Roll-off	13	1	10	2	3	-1	2
Total		119	12	120	15	-1	-3	-4

August 2016

Sampling in August 2016 took place over three days: 8/18, during the night shift, and during the day shifts on 8/19 and 8/20. Table C-6 compares the number of samples that were actually

sorted to the number originally planned, by date, vehicle type, and zone. In total, 45 commercial samples were sorted.

Table C-6. Summary of Planned vs. Actual Samples for August

Zone	Vehicle Type	8/18/2016 Night	8/19/2016 Day	8/20/2016 Day	Actual	Target	Difference from Target
1	Packer	1	4	4	9	7	3
	Roll-off	3	1	0	4	4	-1
2	Packer	0	3	0	3	7	-1
	Roll-off	3	0	3	6	5	-1
3	Packer	0	4	6	10	7	0
	Roll-off	3	1	2	6	5	-2
4	Packer	3	1	0	4	7	2
	Roll-off	2	1	0	3	4	0
Total		**15**	**15**	**15**	**45**	**45**	**0**

Table C-7 presents an overview of sampling progress to date. The current target is based on number of sampling days complete and the number of total sampling days. For instance, 10 of 12 (83%) sampling days and two of six (33%) sampling nights are complete. Overall, we are one short of the goal for the day shift and three samples short of the goal for the night shift. We will attempt to oversample packers from Zones 2 and 4 to compensate for those shortages in upcoming sampling events.

Table C-7. Sampling Progress for Overall Study (January – August 2016)

Zone	Vehicle Type	Actual Day Samples	Actual Night Samples	Current Target for Day Samples	Current Target for Night Samples	Difference from Day Target	Difference from Night Target	Difference from Current Overall Target
1	Packer	33	1	30	2	3	-1	3
	Roll-off	9	4	8	6	1	-2	-1
2	Packer	23	1	29	1	-6	0	-6
	Roll-off	11	4	9	6	2	-2	0
3	Packer	29	2	30	1	-1	1	0
	Roll-off	10	9	8	6	2	3	5
4	Packer	20	4	24	4	-4	0	-4
	Roll-off	14	2	14	3	0	-1	-1
Total		**149**	**27**	**150**	**30**	**-1**	**-3**	**-4**

October 2016

Sampling in October 2016 took place over three days: 10/4 and 10/5, during the night shift, and 10/7, during the day shift. Table C-8 compares the number of samples that were actually sorted to the number originally planned, by date, vehicle type, and zone. In total, 45 commercial samples were sorted.

Table C-8. Summary of Planned vs. Actual Samples for October

Zone	Vehicle Type	10/4/2016 Night	10/5/2016 Night	10/7/2016 Day	Actual	Target	Difference from Target
1	Packer	0	0	2	2	5	3
	Roll-off	2	2	0	4	7	-1
2	Packer	0	0	2	2	4	-1
	Roll-off	4	3	1	8	7	-1
3	Packer	0	0	6	6	4	0
	Roll-off	3	4	1	8	7	-2
4	Packer	4	4	2	10	7	2
	Roll-off	2	2	1	5	5	0
Total		**15**	**15**	**15**	**45**	**45**	**0**

Table C-9 presents an overview of sampling progress to date. The current target is based on number of sampling days complete and the number of total sampling days. For instance, 11 of 12 (92%) sampling days and four of six (67%) sampling nights are complete. Overall, we are one short of the goal for the day shift and three samples short of the goal for the night shift. We will try to oversample Zone 1 roll-offs and Zone 2 packers and undersample Zone 3 roll-offs in the remaining sampling event.

Table C-9. Sampling Progress for Overall Study (January – October 2016)

Zone	Vehicle Type	Actual Day Samples	Actual Night Samples	Current Target for Day Samples	Current Target for Night Samples	Difference from Day Target	Difference from Night Target	Difference from Current Overall Target
1	Packer	35	1	33	3	2	-2	0
	Roll-off	9	7	9	12	0	-5	-4
2	Packer	25	1	32	3	-7	-2	-9
	Roll-off	12	11	9	12	3	-1	1
3	Packer	35	2	33	3	2	-1	2
	Roll-off	11	16	9	12	2	4	6
4	Packer	22	12	26	9	-4	3	-1
	Roll-off	15	7	15	6	0	1	1
Total		**164**	**57**	**165**	**60**	**-1**	**-3**	**-4**

December 2016

Sampling in December 2016 took place over three days: 12/19, 12/20 (during the night shift), and 12/22. Table C-10 compares the number of samples that were actually sorted to the number originally planned, by date, vehicle type, and zone. In total, 41 commercial samples were sorted.

Table C-10. Summary of Planned vs. Actual Samples for December

Zone	Vehicle Type	12/19/2016 Day	12/20/2016 Night	12/22/2016 Day	Actual	Target	Difference from Target
1	Packer	3	0	4	7	7	0
	Roll-off	0	0	0	0	4	-4
2	Packer	2	3	6	11	7	4
	Roll-off	0	0	0	0	5	-5
3	Packer	1	2	0	3	7	-4
	Roll-off	2	5	1	8	5	3
4	Packer	2	1	3	6	7	-1
	Roll-off	0	5	1	6	4	2
Total		**10**	**16**	**15**	**41**	**45**	**-4**

In addition to the scheduled sampling days, one additional day and one additional night sampling event were conducted to make up for missed samples. Table C-11 presents the number of samples sorted by vehicle type and zone for the two make-up events.

Table C-11. Summary of Samples for Make-up Sampling Events

Zone	Vehicle Type	12/28/2016 Day	12/28/2016 Night
1	Packer	2	2
	Roll-off	0	0
2	Packer	3	0
	Roll-off	0	0
3	Packer	5	0
	Roll-off	0	7
4	Packer	5	2
	Roll-off	0	4
Total		**15**	**15**

Table C-12 presents an overview of sampling progress to date. The current target is based on number of sampling days complete and the number of total sampling days. All the sampling days and sampling nights are complete at this point. When including the make-up days, we are 24 over the goal for the day shift and two samples short of the goal for the night shift.

Table C-12. Sampling Progress for Overall Study (January – December 2016)

Zone	Vehicle Type	Actual Day Samples	Actual Night Samples	Current Target for Day Samples	Current Target for Night Samples	Difference from Day Target	Difference from Night Target	Difference from Current Overall Target
1	Packer	44	3	36	5	8	-2	6
2	Packer	36	4	34	4	2	0	2
3	Packer	41	4	36	4	5	0	5
4	Packer	32	15	28	13	4	2	6
1 & 4	Roll-off	25	22	28	15	-3	7	4
2 & 3	Roll-off	26	40	18	49	8	-9	-1
Total		**204**	**88**	**180**	**90**	**24**	**-2**	**22**

Appendix D.   Waste Composition Calculations

Composition Calculations

The composition estimates represent the **ratio of the components' weight to the total waste** for each noted substream. They are derived by summing each component's weight across all the selected records and dividing by the sum of the total weight of waste, as shown in the following equation:

$$r_j = \frac{\sum_i c_{ij}}{\sum_i w_i}$$

where:

c	=	weight of particular component
w	=	sum of all component weights

for   i = 1 to n

      where n = number of selected samples

for   j = 1 to m

      where m = number of components

The confidence interval for this estimate is derived in two steps. First, the variance around the estimate is calculated, accounting for the fact that the ratio includes two random variables (the component and total sample weights). The **variance of the ratio estimator** equation follows:

$$\hat{V}_{r_j} = \left(\frac{1}{n}\right) \cdot \left(\frac{1}{\overline{w}^2}\right) \cdot \left(\frac{\sum_i \left(c_{ij} - r_j w_i\right)^2}{n-1}\right)$$

where:

$$\overline{w} = \frac{\sum_i w_i}{n}$$

Second, **confidence intervals** at the 90% confidence level are calculated for a component's mean as follows:

$$r_j \pm \left(t \cdot \sqrt{\hat{V}_{r_j}}\right)$$

where:

    t   =   the value of the t-statistic (1.645) corresponding to a 90% confidence level

For more detail, please refer to Chapter 6 "Ratio, Regression and Difference Estimation" of *Elementary Survey Sampling* by R.L. Scheaffer, W. Mendenhall and L. Ott (PWS Publishers, 1986).

Weighted Averages

The overall commercial waste composition estimates were calculated by performing a weighted average across the relevant substreams: each zone, vehicle type, and shift.

Seattle provided the estimate of tonnage disposed by the commercial substream for the study period (January thru December 2016). The composition estimates for each substream and subpopulation were applied to the relevant tonnages to estimate the amount of waste disposed for each component category.

The **weighted average for an overall composition estimate** is performed as follows:

$$O_j = (p_1 * r_{j1}) + (p_2 * r_{j2}) + (p_3 * r_{j3}) + ...$$

where:

      p = the proportion of tonnage contributed by the noted substream

      r = ratio of component weight to total waste weight in the noted substream

for

      j = 1 to m

where

      m = number of components

The **variance of the weighted average** is calculated:

$$VarO_j = (p_1{}^2 * \hat{V}_{r_{j1}}) + (p_2{}^2 * \hat{V}_{r_{j2}}) + (p_3{}^2 * \hat{V}_{r_{j3}}) + ...$$

The weighting percentages that were used to perform the composition calculations are listed below in Table D-1 through Table D-5. Weighting percentages were not used to perform composition calculations on sampling data by generator type (e.g., health care) or season.

Table D-1. Weighting Percentages: Overall Commercial

Zone Shift Vehicle Type	Tons Disposed	Percent of Total
Zone 1		
Day		
Front Loader	12,966.85	10.63%
Rear Loader	1,454.58	1.19%
Night		
Front Loader	513.24	0.42%
Rear Loader	56.00	0.05%
Zone 2		
Day		
Front Loader	5,872.69	4.81%
Rear Loader	1,588.04	1.30%
Night		
Front Loader	657.21	0.54%
Rear Loader	54.51	0.04%
Zone 3		
Day		
Front Loader	16,422.05	13.46%
Rear Loader	4,446.59	3.64%
Night		
Front Loader	875.46	0.72%
Rear Loader	4,389.99	3.60%
Zone 4		
Day		
Front Loader	11,949.84	9.79%
Rear Loader	1,918.64	1.57%
Night		
Front Loader	7,094.02	5.81%
Rear Loader	1,041.62	0.85%
Zones 1 & 4		
Day		
Compactor Roll-off	6,396.52	5.24%
Loose Roll-off	4,756.89	3.90%
Night		
Compactor Roll-off	4,841.86	3.97%
Loose Roll-off	3,417.55	2.80%
Zones 2 & 3		
Day		
Compactor Roll-off	6,269.06	5.14%
Loose Roll-off	1,887.65	1.55%
Night		
Compactor Roll-off	21,263.79	17.42%
Loose Roll-off	1,901.32	1.56%
Overall	**122,035.96**	**100.00%**

Table D-2. Weighting Percentages: Commercial Front Loaders

Zone Shift	Tons Disposed	Percent of Total
Zone 1		
Day	12,966.85	23.01%
Night	513.24	0.91%
Zone 2		
Day	5,872.69	10.42%
Night	657.21	1.17%
Zone 3		
Day	16,422.05	29.14%
Night	875.46	1.55%
Zone 4		
Day	11,949.84	21.21%
Night	7,094.02	12.59%
Overall	56,351.36	100.00%

Table D-3. Weighting Percentages: Commercial Rear Loaders

Zone Shift	Tons Disposed	Percent of Total
Zone 1		
Day	1,454.58	9.73%
Night	56.00	0.37%
Zone 2		
Day	1,588.04	10.62%
Night	54.51	0.36%
Zone 3		
Day	4,446.59	29.74%
Night	4,389.99	29.36%
Zone 4		
Day	1,918.64	12.83%
Night	1,041.62	6.97%
Overall	14,949.97	100.00%

Table D-4. Weighting Percentages: Commercial Compactor Roll-offs

Zone Shift	Tons Disposed	Percent of Total
Zone 1 & 4		
Day	6,396.52	16.50%
Night	4,841.86	12.49%
Zone 2 & 3		
Day	6,269.06	16.17%
Night	21,263.79	54.84%
Overall	**38,771.23**	**100.00%**

Table D-5. Weighting Percentages: Commercial Loose Roll-offs

Zone Shift	Tons Disposed	Percent of Total
Zone 1 & 4		
Day	4,756.89	39.76%
Night	3,417.55	28.57%
Zone 2 & 3		
Day	1,887.65	15.78%
Night	1,901.32	15.89%
Overall	**11,963.40**	**100.00%**

Comparison Calculations

Identifying statistically significant differences requires a two-step calculation. First, assuming that the two groups to be compared have the same variance, a **pooled sample variance** is calculated:

$$S_{pool}{}^2 = \frac{\left[(n1-1)\cdot\left(n1\cdot\hat{V}_{r_j1}\right)\right] + \left[(n2-1)\cdot\left(n2\cdot\hat{V}_{r_j2}\right)\right]}{n1+n2-2}$$

Next, the **t-statistic** is constructed:

$$t = \frac{(r1-r2)}{\sqrt{\dfrac{S_{pool}{}^2}{n1} + \dfrac{S_{pool}{}^2}{n2}}}$$

The **p-value** of the t-statistic is calculated based on (n1+n2 – 2) degrees of freedom.

Appendix E.   Year-to-Year Comparison Calculations

This section outlines the technical issues involved with the year-to-year comparison calculations. The calculation formulae are outlined in Appendix D.

Background

In an ongoing effort to monitor the types and amounts of materials disposed locally, Seattle has performed waste composition studies since 1988. Differences are often apparent between study periods. In this appendix, selected results from the year 2016 study are compared to 1988/89, 1990, 1992, 1996, 2000, 2004, 2008, and 2012 findings.[14]

For the purposes of this study, composition variations in the percentage of each broad material category disposed were measured within the following substreams:

- Commercial Substream
  1988/89, 1992, 1996, 2000, 2004, 2008, 2012 vs. 2016

In order to control for population changes and other factors that may influence the total amount of waste disposed from year-to-year, the tests described in this appendix measure waste <u>proportions</u>, and not actual <u>tonnage</u>. For example, if newspaper accounts for 5% of a particular substream's disposed waste each year, and that substream disposed a total of 1,000 tons of waste in one year and 2,000 tons of waste in the next, while the amount of newspaper increased from 50 to 100 tons, the percentage remained the same. Therefore, the tests would indicate that there had been no change.

The purpose of conducting these comparison tests is to identify statistically significant changes in the percentage of broad material categories of waste disposed in each substream over time. One specific example is stated as follows:

Hypothesis: "There is no statistically significant difference, between the 2012 and 2016 study periods, in the percentage of paper disposed in the commercial substream."

Statistics are then employed to look for evidence disproving the hypothesis. A "significant" result means that there is enough evidence to disprove the hypothesis, and it can be concluded that there is a true difference across years. "Insignificant" results indicate that either a) there is no true difference, or b) even though there may be a difference, there is not enough evidence to prove it.

The purpose of these tests is to identify changes across years. However, the study did not attempt to investigate *why* or *how* these changes occurred. The changes may be due to a variety of factors. For example, a decrease in paper disposed in the commercial substream could be due to any combination of the following:

- Consumer preferences—electronic media might have captured some of the market previously held by paper;

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[14] The prior studies were also conducted by Cascadia Consulting Group and followed the same basic methodology as the 2016 project.

- Technology—manufacturers might use thinner paper than in the past, which would decrease the weight of paper, even if the same number of pages was disposed; or
- Recycling—more businesses may participate in paper recycling programs.

Statistical Considerations

The analyses are based on the component percentages, by weight, for each selected substream. As described in Appendix D, these percentages are calculated by dividing the sum of the selected component weights by the sum of the corresponding sample weights. T-tests (modified for ratio estimation) were used to examine the year-to-year variation.

Normality

The distribution of some of the broad material categories (particularly the hazardous materials) is skewed and may not follow a normal distribution. Although t-tests assume a normal distribution, they are very robust to departures from this assumption, particularly with large sample sizes. In addition, the broad material categories are sums of several individual waste components, which improve our ability to meet the assumptions of normality.

Dependence

There may be dependence between waste components (if a person disposes of component A, they always dispose of component B at the same time).

There is certainly a degree of dependence between the calculated percentages. (Since the percentages sum to 100, if the percentage of component A increases, the percentage of some other component must decrease). This type of dependence is somewhat controlled by choosing only a portion of the waste categories for the analyses.

Multiple T-tests

In all statistical tests, there is a chance of incorrectly concluding that a result is significant. The year-to-year comparison required conducting several t-tests, (one for each waste category within each set of substreams) **each** of which carries that risk. However, we were willing to accept only a 10% chance, **overall**, of making an incorrect conclusion. Therefore, each test was adjusted by setting the significance threshold to $\dfrac{0.10}{w}$ (w = the number of t-tests).

The adjustment can be explained as follows:

For each test, we set a $1 - \dfrac{0.10}{w}$ chance of not making a mistake, which results in a $\left(1 - \dfrac{0.10}{w}\right)^{w}$ chance of not making a mistake during all w tests.

Since one minus the chance of not making a mistake equals the chance of making a mistake, by making this adjustment, we have set the overall risk of making a wrong conclusion during any one of the tests at $\left(1 - \left(1 - \dfrac{0.10}{w}\right)^{w}\right) = 0.10$.

The chance of a "false positive" for this study is restricted to 10% overall, or 1.25% for each test (10% divided by the eight tests within each substream equals 1.25%).

For more detail regarding this issue, please refer to Section 11.2 "The Multiplicity Problem and the Bonferroni Inequality" of *An Introduction to Contemporary Statistics* by L.H. Koopmans (Duxbury Press, 1981).

Interpreting the Calculation Results

The following tables include detailed calculation results for the commercial substream. The comparisons are shown for all eight tests; an asterisk indicates statistically significant differences.

For the purposes of this study, only those calculation results with a p-value of less than 1.25% are considered to be statistically significant. As described above, the threshold for determining statistically significant results (the "alpha-level") is conservative, accounting for the fact that so many individual tests were calculated.

The t-statistic is calculated from the data. According to statistical theory, the larger the absolute value of the t-statistic, the less likely that the two populations have the same mean. The p-value describes the probability of observing the calculated t-statistic if there were no true difference between the population means.

For example, in Table E-1, the proportion of **Plastic** in the disposed commercial substream increased from 7.0% to 14.5% across the study periods. The t-statistic is relatively large (9.0970) and the probability (p-value) of observing that t-statistic if there had been no true difference between years is approximately 0.0%. This value is less than the study's pre-determined threshold for statistically significant results (alpha-level of 1.25%); thus the increase in **Plastic** is considered to be a true difference. On the other hand, the p-value corresponding to the decrease in **Glass** is very large. The chance of observing the 2.7% to 2.6% decrease when the actual proportion had not changed is approximately 86.4% -- much too high to be considered a true difference.

Changes in Commercial Waste

In Table E-1, **Paper**, **Plastic**, **Metal**, **Organics**, **Other Materials**, **CDL Wastes**, and **Hazardous** broad material categories showed a significant change across study periods. The proportions of the **Glass** category did not experience a significant increase or decrease.

Table E-1. Changes in Commercial Waste Composition: 1988/89 to 2016

	Mean Ratio *(Material Wt/Total Wt)*		t-Statistic	p-Value *(Cut-off for statistically valid difference = 0.0125)*
	1988/89	*2016*		
Paper	**31.9%**	**22.3%**	**4.6592**	**0.0000** *
Plastic	**7.0%**	**14.5%**	**9.0970**	**0.0000** *
Glass	2.7%	2.6%	0.1710	0.8643
Metal	**7.9%**	**4.6%**	**3.3348**	**0.0009** *
Organics	**11.3%**	**26.3%**	**7.6726**	**0.0000** *
Other Materials	**3.1%**	**14.6%**	**8.5149**	**0.0000** *
CDL Wastes	**35.5%**	**11.5%**	**8.5283**	**0.0000** *
Hazardous	**0.6%**	**3.7%**	**2.7176**	**0.0069** *
Number of Samples	*121*	*292*		

Table E-2 illustrates changes in commercial waste composition from 2012 to 2016. The **Paper**, **Plastic**, **Metal**, **Organics**, and **Other Materials** broad material categories significantly changed across the two study periods.

Table E-2. Changes in Commercial Waste Composition: 2008 to 2016

	Mean Ratio (Material Wt/Total Wt)		t-Statistic	p-Value (Cut-off for statistically valid difference = 0.0125)
	2012	*2016*		
Paper	**25.8%**	**22.3%**	**2.8240**	**0.0049** *
Plastic	**12.5%**	**14.5%**	**2.7915**	**0.0054** *
Glass	2.1%	2.6%	1.1415	0.2542
Metal	**3.1%**	**4.6%**	**3.2573**	**0.0012** *
Organics	**30.8%**	**26.3%**	**2.6871**	**0.0074** *
Other Materials	**9.9%**	**14.6%**	**3.7633**	**0.0002** *
CDL Wastes	10.8%	11.5%	0.3990	0.6900
Hazardous	5.0%	3.7%	1.0981	0.2726
Number of Samples	*262*	*292*		

Appendix F.　Field Forms

The 2016 field forms are included in the following order:

- Vehicle selection sheet
- Waste tally sheet

Vehicle Selection Sheet

Monday, December 19, 2016

Seattle Commercial Waste Composition Study

SRDS

Sample ID	Sector	Zone	Hauler	Truck No.	Truck Type	Driver	Route	Notes/Biz Names
	COM	2	CS	2009	FL		SE-225	
	COM	2	CS	3054	RL		SE-248	
	COM	2	CS	3030	RL		SE-249	
	COM	3	CS	3050	RL		SE-246	Need Zone 3 sample
	COM	3	CS	2015	FL		SE-223	Need Zone 3 sample
	COM	3	CS	3049	RL		SE-225	
	COM	3	CS	3048	RL		SE-248	
cont.	COM	3	CS	2017	FL		SE-249	
cont.	COM	3	CS	2012	FL		SE-246	
	COM	1	WM	362949	RL		A32J	
	COM	1	WM	209791	FL		A31P	
	COM	1	WM	363088	RL		A32H	
	COM	1	WM	363089	RL		A32I	
	COM	4	WM	362948	RL		A32G	
	COM	4	WM	210648	FL		A31A	
	COM	4	WM	209796	FL		A31C	
	COM	4	WM	209794	FL		A31E	

2016 Seattle Waste Composition Study

PAPER				
Newspaper				
Plain OCC/Kraft				
Waxed OCC/Kraft				
Grocery/Shopping Bags				
High Grade				
Mixed Low-grade				
Polycoated Containers				
Compostable/Soiled				
Pot. Comp. Single-use Food Service				
Non-comp. Single-use Food Service				
Mixed/Other Paper				

PLASTIC				
#1 PET Bottles				
#2 HDPE Natural Bottles				
#2 HDPE Colored Bottles				
#3-#7 Other Bottles				
#1-#7 Tubs				
Expanded Poly. Nonfood				
Expanded Poly. Food grade				
Rigid Poly. Foam Insulation				
Pot. Comp. Single-use Food Service				
Non-comp. Single-use Food Service				
Other Rigid Packaging				
Shopping/Dry Cleaning Bags				
Stretch Wrap				
Clean PE Film				
Other Film				
Plastic Pipe				
Foam Carpet Padding				
Durable Plastic Products				
Plastic/Other Materials				

GLASS				
Clear Bottles				
Green Bottles				
Brown Bottles				
Container Glass				
Fluorescent Tubes				
CFLs				
Flat Glass				
Automotive Glass				
Other Glass				

SAMPLE #		DATE:	
Hauler:	Recology		Waste Management
TRUCK #		LOAD #	
ROUTE #		ZONE #	

Company Name:

GENERATOR TYPE	VEHICLE TYPE
Percent SF _____%	
Percent MF _____%	RL - Rear Loader
Percent COM_____%	
If COM, what type of bus.?	FL - Front Loader
A - Manufacturing	
B - Wholesale	SL - Side Loader
C - Retail	
D - Restaurant	ROD - Loose Roll-Off
E - Hotel/Motel	
F - Office	ROC - Compactor Roll-Off
G - Health Care	
H - Education	T - Other Truck
I - Transportation	
J - Other Services	
K - Mixed Businesses	
L - CDL	
M - Other Non-residential	
N - Homeowner Box	

METAL				
Alum. Beverage Cans				
Alum. Foil/Containers				
Other Aluminum				
Other Nonferrous				
Steel Food Cans				
Empty Aerosol Cans				
Other Ferrous				
Oil filters		Filter Count:		
Mixed Metals/Material				

2016 Seattle Waste Composition Study

ORGANICS

Leaves & Grass				
Prunings				
Food				
Fats/Oils/Grease				
Textiles/Clothing				
Mixed Textiles				
Disposable Diapers				
Animal By-products				
Rubber Products				
Tires				

CONSTRUCTION DEBRIS

Clean Dimension Lumber				
Clean Engineered Wood				
Pallets				
Crates				
Other Untreated Wood				
New Painted Wood				
Old Painted Wood				
Creosote-treated Wood				
Other Treated Wood				
Contaminated Wood				
New Gypsum Scrap				
Demo Gypsum Scrap				
Carpet				
Felt Carpet Pad				
Fiberglass Insulation				
Concrete				
Asphalt Paving				
Other Aggregates				
Rock				
Asphalt Shingles				
Other Asphaltic Roofing				
Ceramics				
Cement Fiber Board				
Dried Latex Paint				
Single-ply Roofing Materials				
Ceiling Tiles				
Other Construction Debris				

FURNITURE, APPLIANCES, AND ELECTRONICS

Furniture				
Mattresses				
Small Appliances				
Cell Phones				
Audio/Visual Equipment				
CRT Monitors				
CRT Televisions				
Other Electronics				

POTENTIALLY HARMFUL WASTE

Liquid Latex Paint				
Solvent-based Adhesives				
Water-based Adhesives				
Oil-based Paint/Thinners				
Caustic Cleaners				
Pesticides/Herbicides				
Rechargeable Batteries				
Other Dry-cell Batteries				
Wet-cell Batteries				
Gasoline/Kerosene				
Motor Oil/Diesel Oil				
Asbestos				
Explosives				
Medical Wastes				
Other Cleaners/Chemicals				
Pharmaceuticals/Vitamins				
Cosmetics				
Other Potentially Toxic				

FINES & MISC.

Sand/Soil/Dirt				
Non-distinct Fines				
Misc. Organics				
Misc. Inorganics				

NOTES:

Revised 02/23/16