2011 King County Waste Characterization and Customer Survey Report

King County Waste Monitoring Program

King County

Department of Natural Resources and Parks
Solid Waste Division

October 2012

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Executive Summary

Project Purpose and Background

Each year, residents and businesses in King County dispose of more than 800,000 tons of garbage, also known as municipal solid waste (MSW).[1] What are people disposing, where does this waste come from, and where does it go? Since 1990, the King County Solid Waste Division has conducted its Waste Monitoring Program to answer these questions and learn more about the County's disposed waste. The Waste Monitoring Program includes waste characterization studies, customer surveys, and other studies as needed to help King County provide efficient and effective services, plan for future needs, and track progress towards its recycling goals. In 2011, King County completed a waste characterization study and customer survey at its ten waste facilities as part of the Waste Monitoring Program.

- **Waste characterization studies** create a picture of the waste stream through the collection and sorting of materials disposed at King County's ten waste facilities. These studies help the County target recoverable materials, such as food scraps and other organics, for potential future efforts to increase diversion.
- **Customer surveys** provide King County with answers to crucial questions such as where the waste arriving at transfer stations comes from, how to increase recycling, and why and how often people visit a County facility. By answering these questions, these surveys help the County understand its customers and provide effective service.

To manage its current waste effectively and to plan for future needs, King County wants to understand both its existing MSW stream and its waste facility users. To facilitate analyzing waste materials and customers, waste flows and customers were divided into substreams according to where the waste came from and who brought it to the facility. Analysis by substream eases waste management planning because the different substreams may have different waste types, user profiles, and public programs designed to reach target customers.

In this study, waste loads were divided into substreams according to the source, or generator, of the waste: residential or nonresidential. Wastes were then further categorized according to how materials were delivered to waste facilities: commercially collected by waste hauling companies or self-hauled by residents or other businesses that bring loads to waste facilities.[2]

[1] This figure excludes wastes originating within the City of Seattle, which manages its solid waste separately from the rest of King County, and the City of Milton, which is serviced by Pierce County, but includes the waste from Bothell (Snohomish County part) and Auburn and Pacific (Pierce County part)

[2] Commercial haulers are firms that contract with local governments to operate a garbage collection company or operate under a state franchise in a particular geographic area. The City of Enumclaw and the Town of Skykomish operate their own waste collection systems, rather than contracting with commercial haulers. Loads hauled by the City of Enumclaw and Town of Skykomish are considered commercially hauled. Self-haul loads are categorized as residential or nonresidential according to the source of the load, not the type of hauler. Some companies collect waste from homes or businesses but they are not the franchised haulers (1-800-Got Junk, for example). These loads are considered self-haul residential if the waste is produced from homes, even though a company, not the residents, delivers the material to a waste facility.

Between January 2011 and December 2011 at the County's ten waste facilities (eight transfer station and two dropbox facilities), the project team hand sorted 420 waste samples into 98 material types (described in detail in Appendix B. Material Definitions) and completed more than 5,500 customer surveys. This report presents the results of those waste sorts and surveys.

Summary of Findings

This section summarizes the waste characterization and customer survey key findings. Detailed waste characterization results cans be found in Section 3. Waste Characterization Findings and Appendix D. Detailed Waste Composition Results. Detailed customer survey results can be found in Section 4. Transfer Station Customer Survey and Appendix E. Detailed Customer Survey Results.

Table 1 illustrates the annual disposed quantity of waste from each of the various substreams—residential and nonresidential, commercially collected and self-haul—in 2011.

Table 1. MSW Tonnage by Substream, 2011[3]

	Commercially Collected	Self-haul	Total
Residential	311,053	171,149	**482,202**
Nonresidential	300,985	24,764	**325,749**
Total	**612,038**	**195,913**	**807,951**

Key Waste Characterization Findings

To help identify additional diversion opportunities, the 98 material types were classified into five recoverability groups: Recoverable Paper; Other Recoverable; Compostable/Potentially Compostable; Potentially Recoverable; and Problem Materials. Material types included in each of these recoverability groups and the factors that affect recoverability are provided in Section 3. Waste Characterization Findings.

The waste composition results show that Compostable/Potentially Compostable materials and Recoverable Paper materials offer opportunities for increased recycling, composting, and waste reduction efforts. *Unpackaged/scrap vegetative food* is the largest material type in the overall waste stream (12.0%) as well as the commercially collected residential (16.9%) and commercially collected nonresidential (14.0%) substreams. In contrast, none of the material types in the **Food** or **Paper** material classes comprise more than 5% of self-haul loads. The largest material types in self-haul loads were *dimensional lumber* (13.5%) and *contaminated wood* (12.8%) in the residential and nonresidential substreams, respectively. Table 2 summarizes the materials that comprise more than 5% of each substream.

[3] King County disposed of approximately 4,733 tons of special waste at Cedar Hills (King County's landfill) in 2011. This waste was not sampled and is not included in the composition results or reported tonnages even though the quantities of some specific materials (contaminated soil, for example) are known.

Table 2. Materials Comprising More than 5% of Disposed Waste by Substream, 2011

	Overall	Residential		Nonresidential	
		Commercially Collected	Self-haul	Commercially Collected	Self-haul
Unpackaged/Scrap Vegetative Food	12.0%	16.9%		14.0%	
Other Compostable Paper	5.3%	6.8%		6.6%	
Low Grade Recyclable Paper	5.2%	5.9%		6.7%	
Packaged Vegetative Food		5.4%		6.1%	
Animal Feces		7.2%			
Disposable Diapers		7.0%			
Unpackaged/Scrap Non-vegetative Food				5.7%	
Plain Corrugated Cardboard (OCC/Kraft Bags)				5.6%	
Dimensional Lumber			13.5%		6.1%
Yard Waste			11.5%		
Carpet			5.5%		
Furniture			5.5%		
C&D Wastes			5.5%		
Other Ferrous			5.4%		
Contaminated Wood					12.8%
Gypsum Wallboard					9.9%
Plastic and Other Materials					9.5%
Other Wood					8.7%
Other Mixed Metals (items >20% non-metal)					6.1%
Total	**22.5%**	**49.2%**	**46.9%**	**44.7%**	**53.1%**

Comparisons Between Study Years (2007 – 2011)

Statistically significant changes in the overall disposed waste stream are summarized in Table 3. Key findings include:

- The proportion of Cardboard and Kraft has shown a statistically significant decrease in the overall disposed waste stream. This may be due in part to strong downward trends for Cardboard and Kraft in the commercially collected single family residential substream, the commercially collected nonresidential substream, and the self-haul substream.
- The Organics proportion has shown a statistically significant increase in the overall disposed waste stream. This may be due in part to a statistically significant increase in the in the commercially collected nonresidential substream.
- There is a strong downward trend in the proportion of Newspaper in the overall disposed waste stream. This may be due in part to a statistically significant decrease in the in the commercially collected nonresidential substream.

Table 3. Overall Disposed Waste T-Test Results, 2011

Material Grouping	Composition 2007	Composition 2011	Change in Composition	t-Statistic	p-Value	Statistically Significant Change*	Strength of Results
Cardboard and Kraft	5.8%	3.6%	-2.2% ↓	3.3123	0.0010 *	**Yes**	Statistically Significant
Newspaper	1.5%	1.1%	-0.4% ↓	2.1500	0.0318	No	Strong Trend
Other Curbside Paper	6.5%	6.4%	-0.1% ↓	0.1682	0.8664	No	
Curbside Containers	7.4%	8.5%	1.1% ↑	1.4063	0.1600	No	
Organics	25.8%	31.2%	5.4% ↑	2.9926	0.0028 *	**Yes**	Statistically Significant
Wood Waste	12.1%	10.8%	-1.3% ↓	0.8961	0.3704	No	
Construction & Demolition	8.8%	8.7%	-0.2% ↓	0.1215	0.9033	No	
Hazardous	0.9%	1.0%	0.2% ↑	0.4121	0.6804	No	
Number of Samples	421	420					

**(Cut-off for statistically significant difference = 0.0125)*

Key Customer Survey Findings

- Eighty-one percent of facility users surveyed were self-haul customers. Passenger vehicles compose nearly all (92%) of the self-haul traffic surveyed.[4]
- Self-haul loads came primarily from residences (90%).
- Half (50%) of commercially collected loads originated from nonresidential sources.
- Mixed garbage accounted for 72% of all loads surveyed. Construction and demolition materials represented 19%, and yard waste accounted for 9%.
- Most residential self-haul customers subscribed to curbside garbage service (65%); they make, on average, eight fewer trips per year than non-subscribing self-haul customers.
- "Large amount of garbage" was the top reason for customers to self-haul waste for both residential (18%) and nonresidential customers (20%).

Organization of the Report

The remainder of this report provides the project background, describes the study methodology, and presents the findings. Appendices follow the main body of the report detailing the study methodology, material definitions, and composition calculations, etc.

[4] Passenger vehicles include autos, pick-up trucks, vans, and sport-utility vehicles.

1. Project Purpose and Background

Each year, residents and businesses in King County dispose of more than 800,000 tons of garbage, also known as municipal solid waste (MSW).[5] What are people disposing, where does this waste come from, and where does it go? Since 1990, the King County Solid Waste Division has conducted its Waste Monitoring Program to answer these questions and learn more about the County's disposed waste. The Waste Monitoring Program includes waste characterization studies, customer surveys, and other studies as needed to help King County provide efficient and effective services, plan for future needs, and track progress towards its recycling goals. In 2011, King County completed a waste characterization study and customer survey at its ten waste facilities as part of the Waste Monitoring Program.

Waste Management in King County

The County designed its waste monitoring program to track the efforts and outcomes of its complex waste management system. In this system, private waste management companies collect much of the waste from the County's homes and businesses. Some individuals and companies also choose to haul their own waste, either occasionally or on a regular basis. After collection, most of King County's solid waste destined for disposal first arrives at one of ten facilities: eight County-owned transfer stations and two County-owned dropboxes. The County-owned transfer stations include Algona, Bow Lake, Enumclaw, Factoria, Shoreline, Houghton, Renton, and Vashon. The two dropboxes are located at Cedar Falls and Skykomish. From these facilities, trucks haul King County's waste to the Cedar Hills Regional Landfill for disposal. Some MSW is disposed of directly at Cedar Hills and does not pass through the transfer stations; this is referred to as regional direct waste, special waste and some direct deliveries from collection trucks which operate in the vicinity of the landfill.[6]

Table 4 shows the quantity of MSW delivered to each of King County's ten facilities, and directly to Cedar Hills landfill during the study period. Residents and businesses in King County disposed of nearly 808,000 tons of MSW at these facilities. Of the County facilities, the Bow Lake transfer station received the most waste, almost 249,200 tons or 31% of the County total. Waste taken to Skykomish represented the smallest share of the total tonnage, with just less than 1,000 tons or less than 1% of the total MSW waste stream.

Table 5 shows the total number of annual transactions, by facility. Bow Lake is the busiest, where approximately 23% of the 736,743 transactions occur. Skykomish is the least busy, with less than 1% of transactions occurring at that facility.

[5] This figure excludes wastes originating within the City of Seattle, which manages its solid waste separately from the rest of King County, and the City of Milton, which is serviced by Pierce County, but includes the waste from Bothell (Snohomish County part) and Auburn and Pacific (Pierce County part).

[6] *Regional direct waste* refers to any solid waste generated and collected in King County and transported to the Cedar Hills landfill by conventional long-haul transfer vehicles from solid waste transfer stations or intermediate processing facilities permitted by Public Health – Seattle & King County as provided for in KCC 10.08.090 and the Board of Health's regulation. Both definitions originate from the *King County Comprehensive Solid Waste Management Plan, Glossary.* These are primarily residual tons from regional MRF facilities.

Table 4. Annual Tons by Facility, 2011[7]

Site	Annual Tons	Percent of Total
Algona	137,532	17%
Bow Lake	249,199	31%
Cedar Falls Drop Box	3,285	0%
Enumclaw	19,570	2%
Factoria	121,854	15%
Houghton	149,380	18%
Renton	61,872	8%
Shoreline	44,648	6%
Skykomish Drop Box	999	0%
Vashon	7,849	1%
Subtotal	***796,188***	***99%***
Regional Direct Waste	11,763	1%
Total	**807,951**	**100%**

Table 5. Annual Transactions by Facility, 2011

Site	Annual Transactions	Percent of Total
Algona	134,108	18%
Bow Lake	169,620	23%
Cedar Falls Drop Box	17,967	2%
Enumclaw	40,813	6%
Factoria	97,871	13%
Houghton	108,024	15%
Renton	73,097	10%
Shoreline	70,380	10%
Skykomish Drop Box	2,420	0%
Vashon	20,597	3%
Subtotal	***734,897***	***100%***
Regional Direct Waste	1,846	0%
Total	**736,743**	**100%**

King County's Waste Monitoring Program

The Waste Monitoring Program assesses how much and what types of materials King County's residents and businesses dispose. This program includes waste characterization studies, customer surveys, and other studies as needed to help King County provide appropriate services to current customers, effectively manage disposed materials, and plan for the future. In 2011, King County completed a waste characterization study and customer survey at its ten waste facilities as part of the Waste Monitoring Program.

- **Waste characterization studies** create a picture of the waste stream through the collection and sorting of materials disposed at King County's ten waste facilities. These studies help the County target recoverable materials, such as food scraps and other organics, for potential future efforts to increase diversion.
- **Customer surveys** provide King County with answers to crucial questions such as where the waste arriving at transfer stations comes from, how to increase recycling, and why and how often people visit a transfer station. By answering these questions, these surveys help the County understand its customers and provide effective service.

Between January 2011 and December 2011, the project team hand sorted 420 waste samples into 98 material types and completed more than 5,500 customer surveys at the County's ten waste facilities. Table 6 summarizes the number of samples sorted as part of King County's Waste Monitoring Program since 1991. Table 7 summarizes the number of customer surveys completed as part of King County's Waste Monitoring Program since 1993.

[7] Data in Table 4 were obtained from King County solid waste facility transaction data. King County disposed of approximately 4,733 tons of special waste at Cedar Hills (King County's landfill) in 2011. This waste was not sampled and is not included in the composition results or reported tonnages.

Table 6. Number of Samples by Study Year

Study Period	# of Samples
2011	420
2007	421
2002-2003	369
1999-2000	412
1995-1996	630
1993-1994	568
1991	569
Total	**3,389**

Table 7. Number of Surveys by Study Year

Study Period	# of Surveys
2011	5,556
2008	5,086
2006	5,665
2002-2003	6,381
2001	7,050
1999-2000	7,809
1998	22,645
1997	12,610
1995-1996	11,132
1993-1994	12,523
Total	**96,457**

Understanding the Waste Stream

To understand the overall solid waste stream better, the total waste was divided into various substreams, according to where the waste came from and who brought it to the waste facilities. Analysis by substream is useful because the different substreams often have different waste types, user profiles, and public programs for reaching customers.

Substreams were divided by the source, or generator, of the waste (residential or nonresidential) as well as by how materials were delivered to waste facilities (commercially collected or self-haul) using the following definitions:

- **Residential waste** is material disposed from single family or multifamily dwellings.
- **Nonresidential waste** is material disposed from businesses, schools, government offices, and other institutions that are not residences.
- **Commercially collected** material is hauled by a firm under contract with local governments to operate a garbage collection company or operate under a state franchise in a particular geographic area.[8]
- **Self-haul** material is hauled by a resident or a business that is not primarily engaged in hauling waste.[9]

Waste loads and customers surveyed were first divided into residential and nonresidential generator substreams. Then those substreams were further divided between commercially collected and self-haul waste, as shown in Table 8. In some cases, loads contained a mixture of waste from residential and nonresidential sources, but these mixed loads represented only a small portion of the total waste.

[8] The City of Enumclaw and the Town of Skykomish operate their own waste collection systems, rather than contracting with commercial haulers. Beginning with the 2002-2003 study, King County has included these waste deliveries with the commercially hauled loads.

[9] Self-haul loads were categorized as residential or nonresidential according to the source of the load, not the type of hauler. For example, some companies collect waste from homes or businesses. These loads were considered self-haul residential if the waste was produced from homes, even though a company, not the residents, delivered the material to a waste facility.

Commercial waste haulers typically classify these mixed loads as nonresidential. To be consistent, tonnage from mixed loads is included in the nonresidential substream tonnage. However, survey results from mixed loads are reported separately. All regional direct waste is considered commercially collected nonresidential waste. The tonnage associated with each substream is shown in Figure 1.

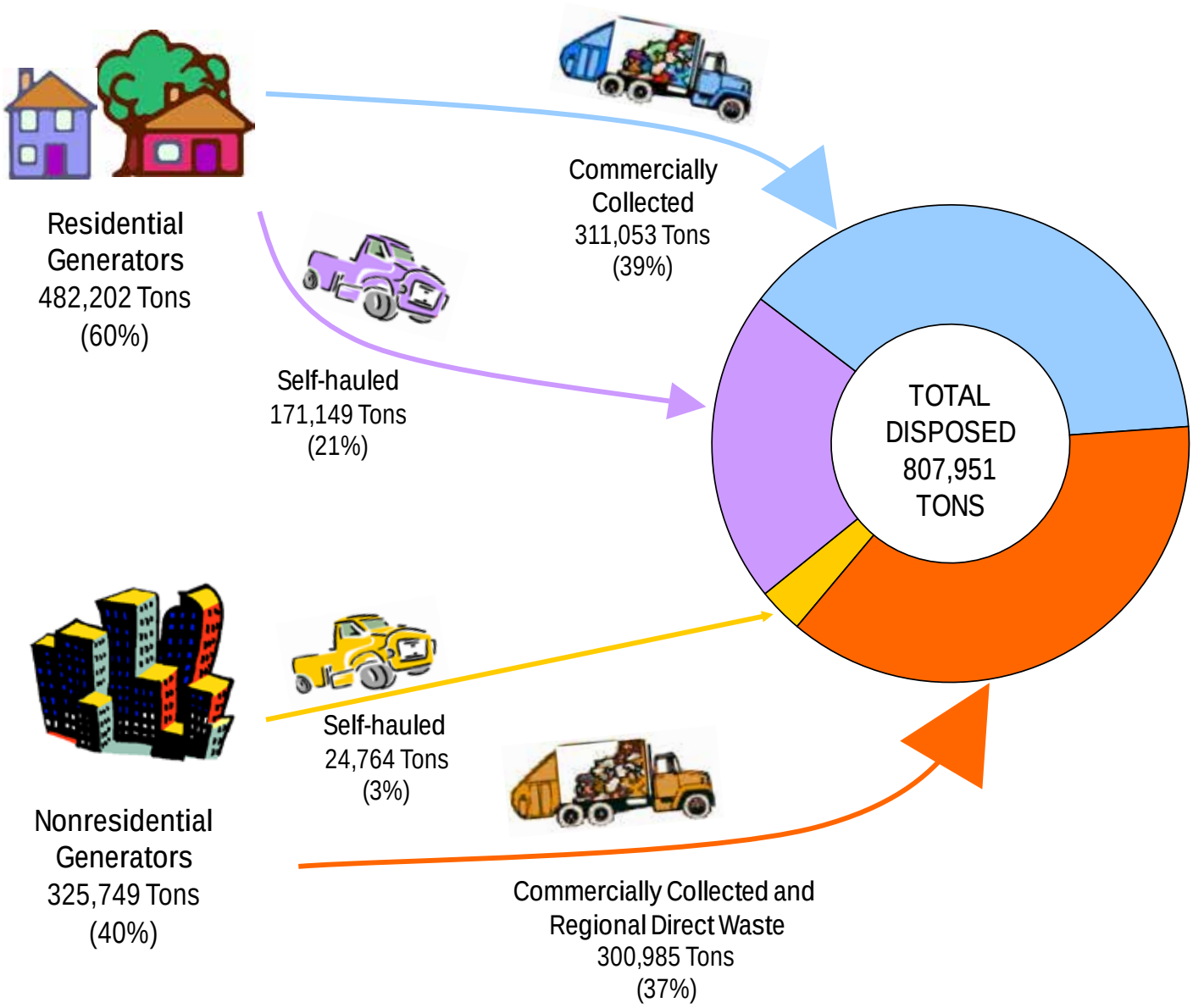
Table 8. Waste Streams and Substreams

	Commercially Collected	Self-haul
Residential Waste	Commercially collected waste from residential sources	Self-haul waste from residential sources
Nonresidential Waste	Commercially collected waste from nonresidential sources	Self-haul waste from nonresidential sources
Mixed Residential and Nonresidential Waste	Commercially collected waste from residential and nonresidential sources	Self-haul waste from residential and nonresidential sources

In addition to serving many kinds of customers, the transfer stations accept many different types of materials for disposal. The materials accepted for disposal were classified into one of the following four waste categories:

- **Yard Waste** is organic waste made primarily of plant material. This includes grass, leaves, and prunings.
- **Construction and Demolition Debris** is waste that is created by construction and/or demolition activities such as roofing or remodeling.
- **Special Waste** is petroleum-contaminated soil, sludge, or asbestos.
- **MSW/Mixed Garbage** is waste that does not fit into any of the above three categories or is a mix of several categories.

Figure 1. Waste Tonnage by Substream, 2011



2. Summary of Methodology

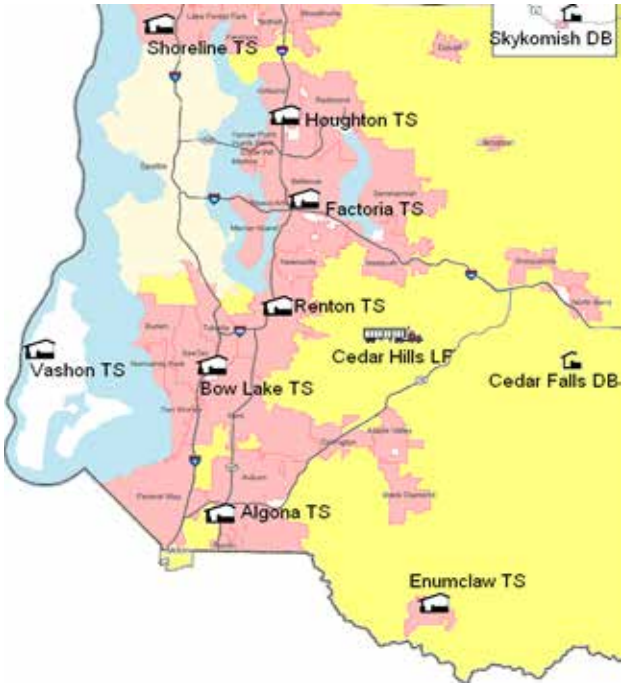
The following section summarizes the four main tasks of the study methodology: develop sampling plan, survey incoming vehicles, collect and sort samples, analyze data and prepare reports.

Task 1. Develop Sampling Plan

Samples were allocated by source or generator (residential or nonresidential) and then by collection type (commercially collected or self-haul) and vehicle type. The vehicle types for commercially collected loads were packers or dropboxes. For self-haul loads the vehicle types were passenger vehicles or other large vehicles. Examples of the vehicle types can be found in Appendix I. Example Field Forms.

A sampling schedule was constructed for the study period of January 2011 through December 2011, consisting of four to five days at each transfer station during the year. Sampling days were randomly selected to assure a representative distribution across the days of the week and weeks of the month. Sampling took place at each of the County's eight transfer stations and customer surveying occurred at all ten facilities. The Skykomish and Cedar Falls dropboxes were sampled using a different method described in Appendix A. Sample and Survey Methodology. The location of the eight transfer stations and two dropboxes are shown in Figure 2.

Figure 2. Map of Transfer Station Locations



Task 2. Survey Incoming Vehicles

The gatekeeper gathered information from the driver of every vehicle about the hauler type (commercially collected or self-haul), vehicle type (packer, passenger vehicle, etc.), waste type (mixed garbage, yard waste, construction/demolition), and generator (residential or nonresidential) of the load. When a surveyed vehicle met the daily sampling criteria, the gatekeeper affixed a *Sample Placard* to the vehicle's windshield and directed the driver to the sample collection area. A vehicle being surveyed is shown in Figure 3. The number of surveys completed each month at each facility is shown in Table 9. The full survey and vehicle selection methods are detailed in Appendix A. Sample and Survey Methodology.

Figure 3. Vehicle Surveyor at Renton Transfer Station

Table 9. Surveys Completed by Facility and Month, 2011

	February	March	April	May	June	July	August	September	October	November	December	Total
Algona	209		187		15			217	15		201	**844**
Bow Lake	203				383		687		13		15	**1,301**
Cedar Falls			122			53			41			**216**
Enumclaw		197			42			124			63	**426**
Factoria	146		14		196		298		176			**830**
Houghton	180				210		14		218	180	16	**818**
Renton			104				141		189		103	**537**
Shoreline			95		86		110				72	**363**
Skykomish		10				7						**17**
Vashon			61			85			58			**204**
Total	**738**	**207**	**583**	**0**	**932**	**145**	**1,250**	**341**	**710**	**180**	**470**	**5,556**

Task 3. Collect and Sort Samples

When a selected vehicle arrived at the sample collection area, the Sort Crew Manager removed the *Sample Placard,* asked the driver to dump their vehicle's load, and then directed a loader operator to scoop a 200-250 pound portion of the waste dumped from the vehicle. The loader placed the scoop on a tarpaulin for sorting. The average sample weight was 227 pounds. The field crew sorted and weighed each of the 420 samples into 98 material types such as *high-grade paper* or *clear glass containers* (see Appendix B. Material Definitions for the full material definitions and examples). The Sort Crew Manager recorded the weight for each sorted material type on the *Material Weight Tally Sheet* and reviewed the form. The number of samples planned and actually collected for facility is shown in Table 10.

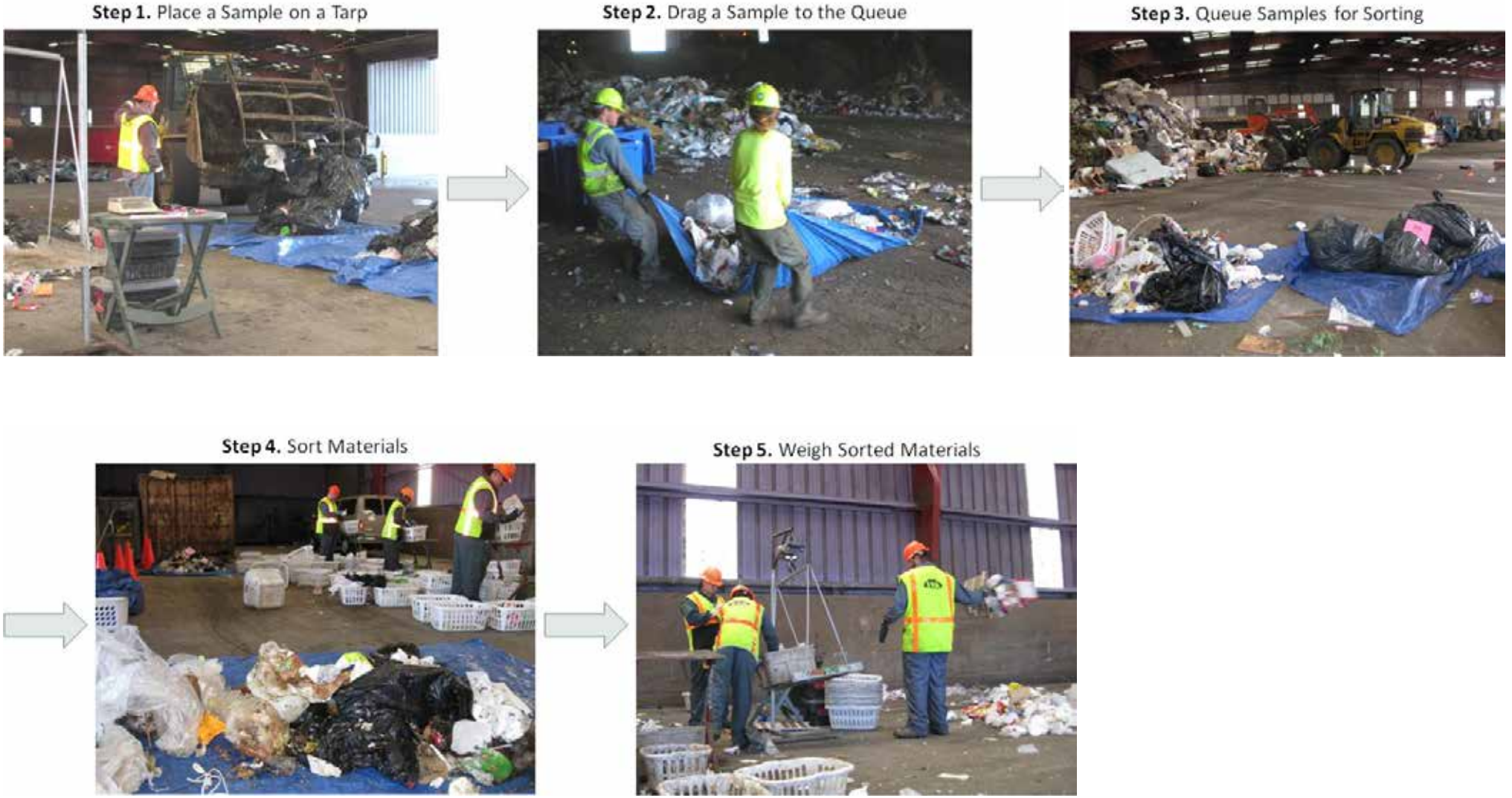
Figure 4 illustrates the hand-sort procedure. Examples of all field forms are found in Appendix I. Example Field Forms.

Table 10. Planned and Actual Samples by Facility and Month, 2011

	February		April		June		August		October		December		Total	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Algona	15	15	15	15	15	15			15	15			**60**	**60**
Bow Lake	15	16			16	15	30	30	13	13	14	15	**88**	**89**
Cedar Falls*									1	1			**1**	**1**
Enumclaw					16	16					15	15	**31**	**31**
Factoria	15	15	14	14	15	15			14	14			**58**	**58**
Houghton	15	15			15	15			14	14	14	16	**58**	**60**
Renton			15	15			15	15			15	15	**45**	**45**
Shoreline			15	15			15	14			16	15	**46**	**44**
Skykomish*									1	1			**1**	**1**
Vashon			16	16					16	15			**32**	**31**
Total	**60**	**61**	**75**	**75**	**77**	**76**	**60**	**59**	**74**	**73**	**74**	**76**	**420**	**420**

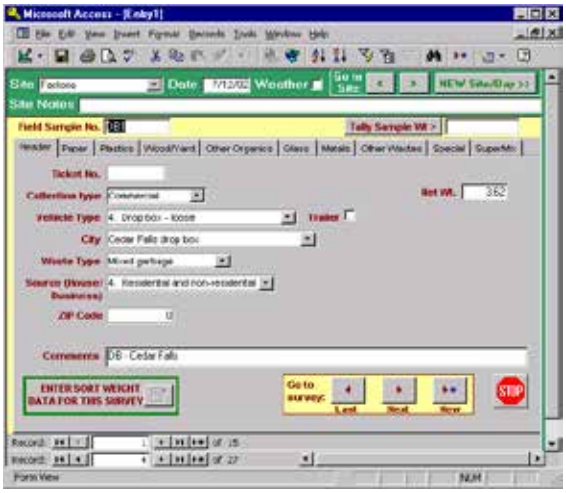
**The Skykomish drop box was sampled at Houghton and the Cedar Falls drop box was sampled at Factoria.*

Figure 4. Sample Collection and Sorting Procedures



Task 4. Analyze Data and Prepare Reports

Figure 5. Example Database Screenshot



Each month, the sort and survey data were entered into a customized database and reviewed for data entry errors. A screenshot of the database is shown in Figure 5. At the conclusion of the study, waste composition estimates were calculated by aggregating waste sample data using a weighted average procedure. The calculations for the weighted averages were based on the vehicle surveys as well as waste tonnage data provided by the King County Solid Waste Division. The composition calculations and weighting factors are described in detail in Appendix C. Waste Composition Calculation.

The number of samples collected and sorted at each waste facility is shown in Table 11. The number of surveys completed at each waste facility is shown in Table 12.

Table 11. Number of Samples Collected by Facility, 2011

Site	Samples
Algona	60
Bow Lake	89
Cedar Falls Drop Box	1
Enumclaw	31
Factoria	58
Houghton	60
Renton	45
Shoreline	44
Skykomish Drop Box	1
Vashon	31
Total	**420**

Table 12. Number of Surveys Completed by Facility, 2011

Site	Surveys
Algona	844
Bow Lake	1,301
Cedar Falls Drop Box	216
Enumclaw	426
Factoria	830
Houghton	818
Renton	537
Shoreline	363
Skykomish Drop Box	17
Vashon	204
Total	**5,556**

Changes in Methodology from Previous Studies

The 2011 waste characterization study followed the same basic methodology as the 2007 and prior studies. The main methodology change is an increase in the number of material types from 78 to 98. Materials were added to better align the list with materials currently accepted in diversion programs

and to gather additional detail on materials of interest for future diversion programs. The new material types are noted in Appendix B. Material Definitions.

The 2011 customer survey study followed the same basic methodology as the 2008 and prior studies. The main methodology change is a reduction in the number of questions asked of facility users. In particular, the 2008 study asked drivers several questions about their willingness to separate recyclable materials from their disposed materials at the transfer station for a reduction in their disposal fee. The 2011 study did not ask those questions.

3. Waste Characterization Findings

Interpreting the Results

How Data Are Presented

For the overall disposed waste stream, and for each substream, data are presented in three ways:

- First, an overview of waste composition by recoverability group is presented as a pie chart.
- Next, is an overview of waste composition, by **Material Class**, in a pie chart.
- The third presentation is of the 10 most prevalent individual *material types*, by weight, shown in a table.

Material Designations

For the sake of clarity, recoverability groups such as Recoverable Paper and Compostable/Potentially Compostable are capitalized. **Material Classes** such as **Paper**, **Plastic**, and **Glass** are capitalized and bolded. Material types such as *newspaper, PET bottles,* and *used oil* are italicized.

Detailed tables listing the full composition and quantity results for the 98 *material types* are included in Appendix D. Detailed Waste Composition Results.

Rounding

When interpreting the results presented in the tables and figures in this report, it is important to consider the effect of rounding.

To keep the waste composition tables and figures readable, estimated tonnages are rounded to the nearest ton, and estimated percentages are rounded to the nearest tenth of a percent. Due to this rounding, the tonnages presented in the report, when added together, may not exactly match the subtotals and totals shown. Similarly, the percentages, when added together, may not exactly match the subtotals or totals shown. Percentages less than 0.05% are shown as 0.0%.

It is important to recognize that the tons shown in the report were not calculated using the rounded percentages shown in the tables. Instead tons were calculated using more precise percentages. Using the rounded percentages to calculate tonnages may yield results that are different than the rounded numbers shown in the report.

For example, the rounded percentage for *unpackaged/scrap vegetative food* in Table 14 is shown as 12.0%. If the rounded number had been used in the calculations *unpackaged/scrap vegetative food* would be 96,954 tons. However, using the more precise number (12.0353583134423%), *unpackaged/scrap vegetative food* is calculated to 97,240 tons, a difference of 286 tons.

Material Recoverability Groups

To identify additional diversion opportunities, material types were classified according to their recoverability, using five recoverability groups:

- **Recoverable Paper –** Paper materials for which recycling technologies, programs, and markets are well developed, readily available, and currently utilized. An example of Recoverable Paper is the material type *newspaper.*
- **Other Recoverable –** Other, non-paper materials (plastic, metal, and glass) for which recycling technologies, programs, and markets are well developed, readily available, and currently utilized. An example Other Recoverable material type is *PET bottles.*
- **Compostable/Potentially Compostable –** Organic materials typically accepted for use in commercial compost or digestion systems. An example is *unpackaged/scrap vegetative food*
- **Potentially Recoverable –** Materials for which recycling technologies, programs, and markets exist, but are either not well developed or not currently utilized. Examples include *used oil filters* and *paint*.
- **Problem Materials –** Materials that are not readily recyclable or face other market-related barriers. An example problem material is *plastic trash bags*.

Each material type was assigned to one of the recoverability groups based on the definitions listed above. Table 13 shows how material types are categorized into each recoverability group.

Table 13. Recoverability Groups and Material Types

Recoverable Paper	Potentially Recoverable	Other Materials
Newspaper (ONP)	Other Expanded Polystyrene Packaging	Other Paper
Plain Corrugated Cardboard (OCC)	Industrial Packaging Film Plastic	Expanded Polystyrene Single-serve Food Packaging
Low Grade Recyclable Paper	Other Plastic Packaging	Expanded Polystyrene Products
High Grade Paper	Single Resin Plastic Products	Non-industrial Packaging Film Plastic
Other Recoverables	Mixed Resin Plastic Products	Plastic Garbage Bags
PET Bottles	Foam Rubber and Padding	Plastic Film Products
Other PET Containers	Carpet Padding	Plastic and Other Materials
HDPE Bottles	Mixed Metals (items <20% non-metal)	Kitchenware/Ceramics
Other HDPE Containers	Other Mixed Metals (items >20% non-metal)	Other Glass
Other #3-#7 Packaging	Compressed Gas Cylinders	Treated Wood
Recyclable Plastic Bags	Dimensional Lumber	Contaminated Wood
Aluminum Cans	Roofing and Siding Wood	Other Wood
Other Aluminum	Stumps	Other Textiles
Tinned Food Cans	Textiles: Clothes	Disposable Diapers
Other Ferrous	Tires	Rubber Products
Other Non-Ferrous	Small Household Appliances	Animal Carcasses
Clear Glass Containers	A/V Equipment	Animal Feces
Green Glass Containers	Printers/Copiers/Fax Machines	Miscellaneous Organics
Brown Glass Containers	CPU's	C&D Wastes
Compostable/ Potentially Compostable	Computer Peripherals	Nondistinct Fines
Waxed Corrugated Cardboard (OCC)	Other Electronics	Gypsum Wallboard
Single Use Food Service Compostable Paper	CRT Computer Monitors	Furniture
Other Compostable Paper	CRT TVs	Miscellaneous Inorganics
Compostable Plastics	LCD/Other TVs	Oil-based Paint
Packaged Vegetative Food	LCD Computer Monitors	Solvents and Thinners
Unpackaged/Scrap Vegetative Food	Laptops	Adhesives and Glue
Packaged Non-vegetative Food	Cell Phones	Cleaners and Corrosives
Unpackaged/Scrap Non-vegetative Food	Asphalt Shingles	Pesticides and Herbicides
Large Prunings	Ash	Gasoline and Fuel Oil
Yard Waste	Mattresses	Antifreeze/Brake Fluid
	Carpet	Medical Waste
	Used Oil	Pharmaceuticals and Vitamins
	Vehicle Batteries	Other Hazardous Waste
	Household Batteries	
	Latex Paint	
	Compact Flourescent Bulbs	
	Other Flourescent Bulbs/Tubes	

Composition and Recoverability of Waste

This section describes the composition and recoverability of King County's overall waste stream and of its many substreams. More detailed composition and quantity data for each substream is included in Appendix D. Detailed Waste Composition Results.

Overall Disposed Waste

The overall waste composition is the weighted average of samples from all substreams.

Key Findings

As shown in Figure 6, approximately 34% (274,901 tons) of the County's overall waste is Compostable/Potentially Compostable, shown in green. Additionally, approximately 21% (165,314 tons) of the County's overall waste is recoverable, including Recoverable Paper (11.9%; 95,890 tons), shown in blue, and Other Recoverables (8.6%; 69,423 tons), shown in purple.

The waste composition data are presented by material class in Figure 7. **Food** (22.1%) and **Paper** (21.1%) are the two most prevalent material classes.

Figure 6. Waste Recoverability, Overall, 2011

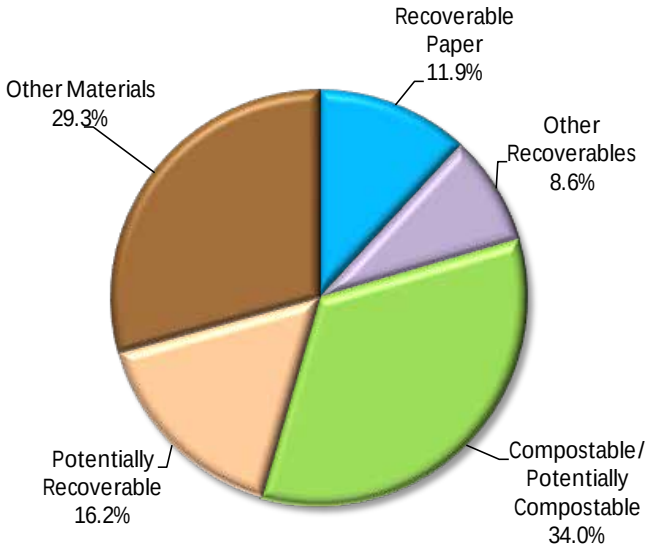
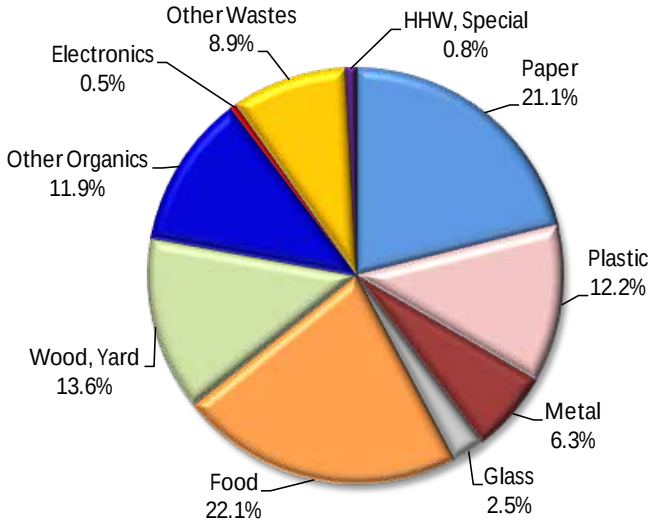


Figure 7. Waste Composition, Overall, 2011



The ten most prevalent disposed materials can be found in Table 14. As shown, *unpackaged/scrap vegetative food*, *other compostable paper,* and *low grade recyclable paper* are the three most prevalent materials; together they represent more than 20% of MSW disposed in the County.

Table 14. Ten Most Prevalent Disposed Materials, Overall, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Unpackaged/Scrap Vegetative Food	12.0%	12.0%	97,240
Other Compostable Paper	5.3%	17.4%	43,195
Low Grade Recyclable Paper	5.2%	22.6%	41,972
Yard Waste	4.8%	27.4%	38,620
Packaged Vegetative Food	4.7%	32.0%	37,678
Dimensional Lumber	4.6%	36.6%	36,942
Unpackaged/Scrap Non-vegetative Food	3.8%	40.3%	30,315
Animal Feces	3.6%	43.9%	29,031
Plain Corrugated Cardboard (OCC)	3.6%	47.5%	28,914
Disposable Diapers	3.5%	51.0%	28,200
Subtotal	***51.0%***		***412,107***
All other materials	49.0%		395,844
Total	**100.0%**		**807,951**

Residential Substreams

The residential waste composition is the weighted average of samples from the commercially collected residential and self-haul residential substreams.

Key Findings

Figure 8 summarizes recovery potential for the County's combined residential substreams. Key findings include:

- Almost 32% (152,718 tons) of the County's residential waste is Compostable/Potentially Compostable, shown in green.
- Around 18% (88,436 tons) of the County's residential waste is recoverable, including Recoverable Paper (9.4%; 45,175 tons), shown in blue, and Other Recoverables (9.0%; 43,261 tons), shown in purple.

The waste composition data are presented by material class in Figure 9. **Food** (20.0%) and **Paper** (16.3%) are the two most prevalent material classes.

Figure 8. Waste Recoverability, Residential Substreams, 2011

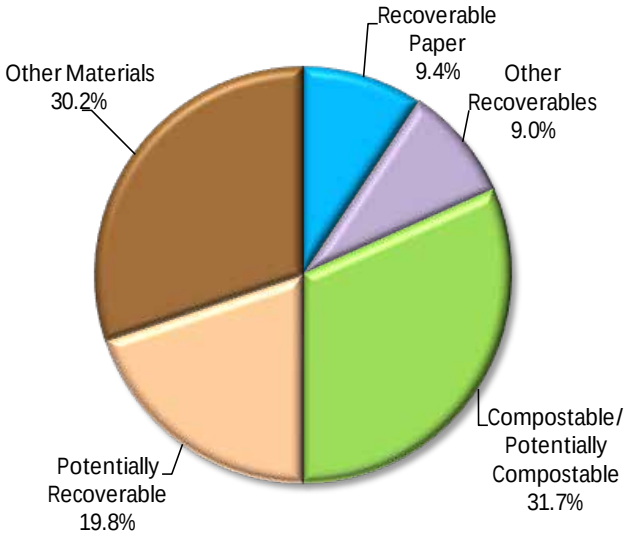
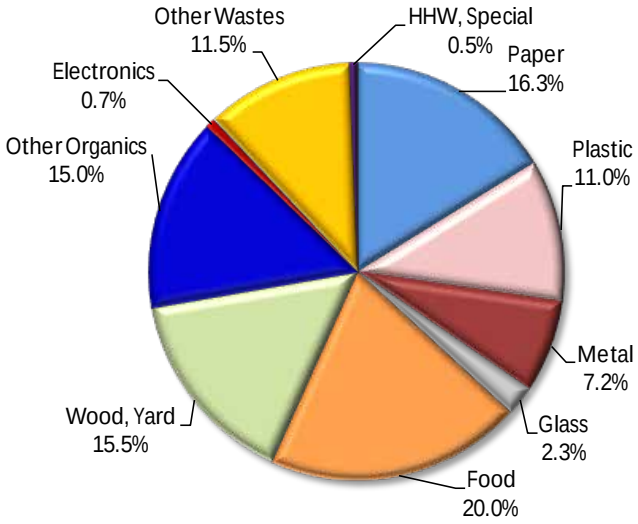


Figure 9. Waste Composition, Residential Substreams, 2011



As shown in Table 15, *unpackaged/scrap vegetative food*, *yard waste,* and *dimensional lumber* are the three most prevalent material types. The ten most prevalent materials combined account for more than 50% of the County's total residential waste.

Table 15. Ten Most Prevalent Disposed Materials, Residential Substreams, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Unpackaged/Scrap Vegetative Food	11.4%	11.4%	55,031
Yard Waste	5.8%	17.2%	28,072
Dimensional Lumber	5.5%	22.8%	26,608
Animal Feces	5.0%	27.7%	24,042
Other Compostable Paper	4.8%	32.5%	23,085
Disposable Diapers	4.8%	37.3%	23,003
Low Grade Recyclable Paper	4.5%	41.8%	21,595
Packaged Vegetative Food	4.0%	45.7%	19,083
Other Ferrous	3.3%	49.1%	16,058
C&D Wastes	2.8%	51.8%	13,268
Subtotal	***51.8%***		***249,843***
All other materials	48.2%		232,359
Total	**100.0%**		**482,202**

Nonresidential Substreams

The nonresidential waste composition is the weighted average of samples from the commercially collected nonresidential and self-haul nonresidential substreams.

Key Findings

The key recoverability and material class findings for the County's nonresidential substream are shown in Figure 10 and Figure 11. More than half (53%) of the nonresidential waste is Compostable/Potentially Compostable (37.5%, 122,184 tons) or Recoverable Paper (15.6%, 50,716 tons).

Figure 10. Waste Recoverability, Nonresidential Substreams, 2011

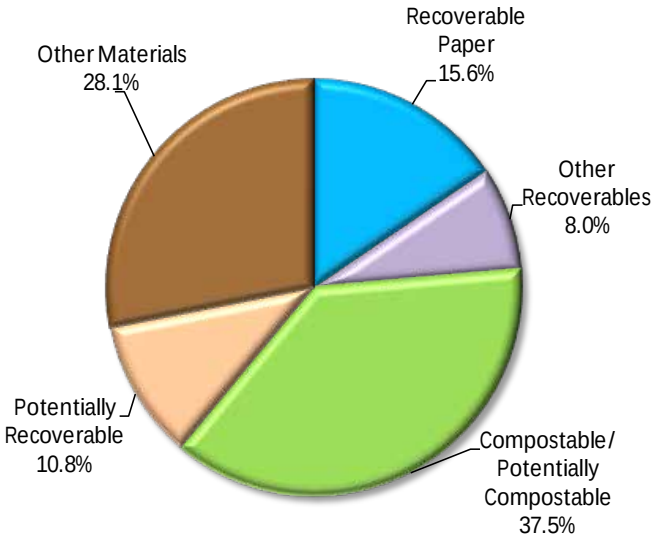
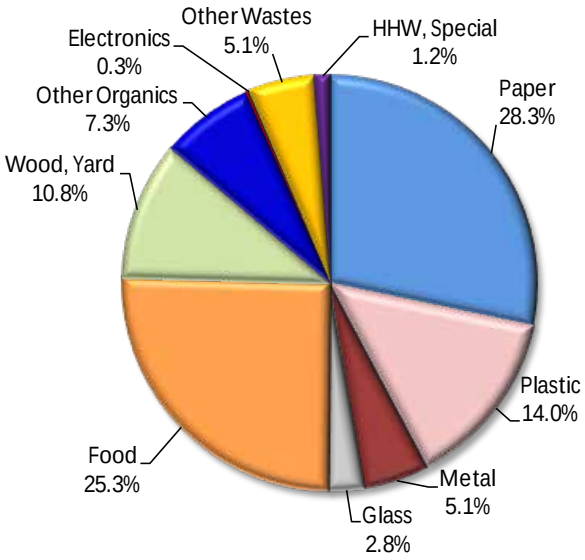


Figure 11. Waste Composition, Nonresidential Substreams, 2011



Unpackaged/scrap vegetative food, *low grade recyclable paper,* and *other compostable paper* are the three most prevalent materials; together they sum to more than 25% of the County's total nonresidential waste. The ten most prevalent disposed materials can be found in Table 16.

Table 16. Ten Most Prevalent Disposed Materials, Nonresidential Substreams, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Unpackaged/Scrap Vegetative Food	13.0%	13.0%	42,209
Low Grade Recyclable Paper	6.3%	19.2%	20,377
Other Compostable Paper	6.2%	25.4%	20,110
Packaged Vegetative Food	5.7%	31.1%	18,596
Plain Corrugated Cardboard (OCC)	5.3%	36.4%	17,137
Unpackaged/Scrap Non-vegetative Food	5.2%	41.6%	17,098
Other Paper	3.9%	45.5%	12,660
Non-industrial Packaging Film Plastic	3.8%	49.3%	12,324
Yard Waste	3.2%	52.5%	10,549
Dimensional Lumber	3.2%	55.7%	10,335
Subtotal	***55.7%***		***181,393***
All other materials	44.3%		144,355
Total	**100.0%**		**325,749**

Commercially Collected Substreams

The commercial waste composition is the weighted average of samples from the commercially collected residential and the commercially collected nonresidential substreams.

Key Findings

Approximately 40% (244,636 tons) of the County's commercially collected material, shown in green in Figure 12, is Compostable/Potentially Compostable. Shown as blue in Figure 12, Recoverable Paper (14.3%; 87,269 tons) is the second most prevalent recoverable material group. **Food** (28.2%) and **Paper** (25.8%) are the two most prevalent material classes (Figure 13).

Figure 12. Waste Recoverability, Commercially Collected Substreams, 2011

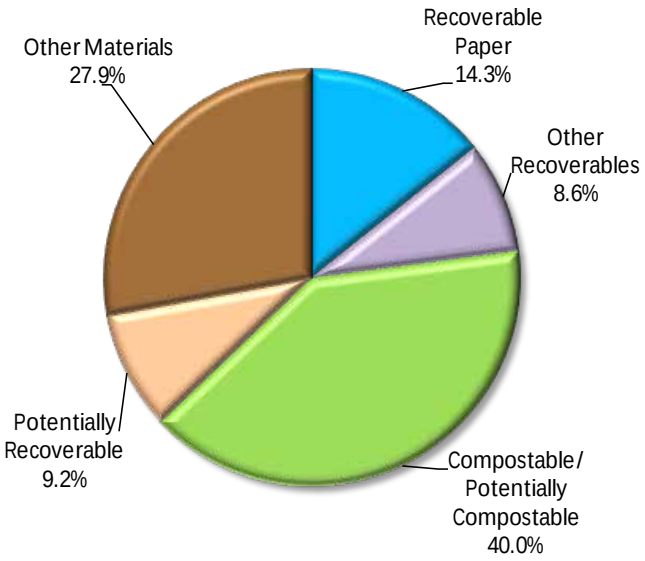
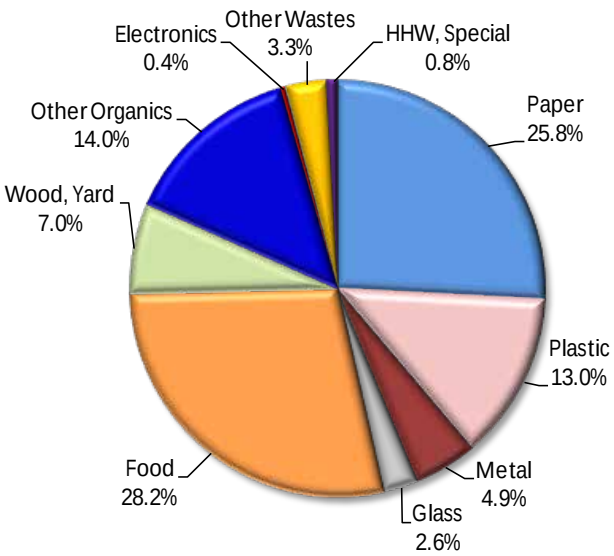


Figure 13. Waste Composition, Commercially Collected Substreams, 2011



The ten most prevalent materials are shown in Table 17; *unpackaged/scrap vegetative food*, *other compostable paper,* and *low grade recyclable paper* are the three most prevalent materials. Together they represent just under 30% of the County's commercially collected waste.

Table 17. Ten Most Prevalent Disposed Materials, Commercially Collected Substreams, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Unpackaged/Scrap Vegetative Food	15.5%	15.5%	94,769
Other Compostable Paper	6.7%	22.2%	41,041
Low Grade Recyclable Paper	6.3%	28.5%	38,542
Packaged Vegetative Food	5.8%	34.3%	35,344
Unpackaged/Scrap Non-vegetative Food	4.9%	39.1%	29,821
Animal Feces	4.5%	43.6%	27,299
Disposable Diapers	4.3%	47.9%	26,613
Plain Corrugated Cardboard (OCC)	4.1%	52.1%	25,165
Non-industrial Packaging Film Plastic	3.6%	55.7%	22,222
Yard Waste	3.0%	58.7%	18,537
Subtotal	***58.7%***		***359,353***
All other materials	41.3%		252,685
Total	**100.0%**		**612,038**

Commercially Collected Residential Substream

The composition data in this section are based on samples from the commercially collected residential substream.

Key Findings

Around 40% (123,548 tons) of the County's commercially collected residential waste is Compostable/Potentially Compostable, shown in green in Figure 14. Recoverable materials account for 21.0% (65,307 tons) of the County's commercially collected residential waste, including Recoverable Paper (12.0%; 37,313 tons), shown in blue, and Other Recoverables (9.0%; 27,994 tons), shown in purple.

The waste composition data are presented by material class in Figure 15. **Food** (29.1%) and **Paper** (21.8%) are the two most prevalent material classes.

Figure 14. Waste Recoverability, Commercially Collected Residential Substream, 2011

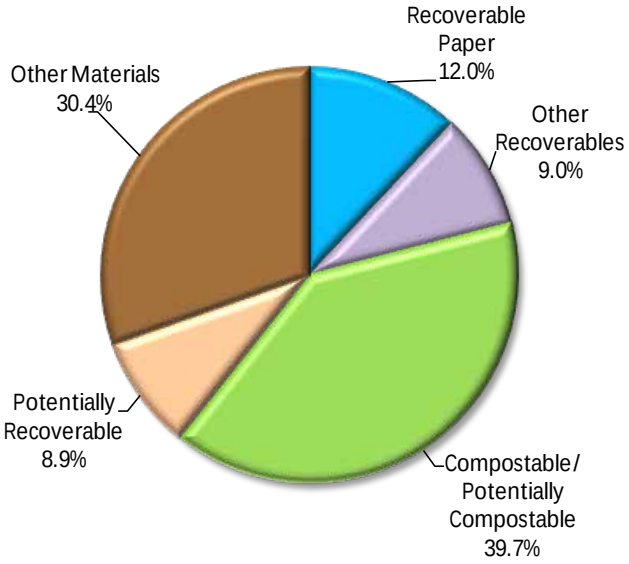
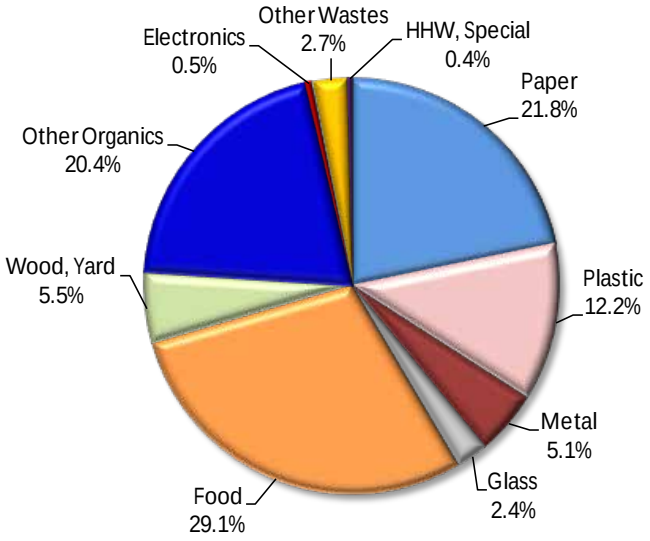


Figure 15. Waste Composition, Commercially Collected Residential Substream, 2011



The three most prevalent materials (*unpackaged/scrap vegetative food*, *animal feces,* and *disposable diapers*) combined represent more than 30% of the County's commercially collected residential waste. See Table 18 for a summary of the most prevalent materials in the commercially collected residential waste.

Table 18. Ten Most Prevalent Disposed Materials, Commercially Collected Residential Substream, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Unpackaged/Scrap Vegetative Food	16.9%	16.9%	52,580
Animal Feces	7.2%	24.1%	22,331
Disposable Diapers	7.0%	31.1%	21,823
Other Compostable Paper	6.8%	37.9%	21,132
Low Grade Recyclable Paper	5.9%	43.8%	18,349
Packaged Vegetative Food	5.4%	49.2%	16,850
Unpackaged/Scrap Non-vegetative Food	4.1%	53.3%	12,729
Non-industrial Packaging Film Plastic	3.2%	56.5%	10,003
Yard Waste	2.7%	59.2%	8,416
Plain Corrugated Cardboard (OCC)	2.7%	61.9%	8,343
Subtotal	***61.9%***		***192,557***
All other materials	38.1%		118,496
Total	**100.0%**		**311,053**

Commercially Collected Nonresidential Substream

The composition data in this section are based on commercially collected nonresidential samples.

Key Findings

Figure 16 shows the following key findings about the recovery potential for the commercially collected nonresidential substream:

- Just over 40% (121,088 tons) of the County's commercially collected nonresidential waste is Compostable/Potentially Compostable, shown in green.
- Almost 25% (74,860 tons) of the County's commercially collected nonresidential waste is recoverable, including Recoverable Paper (16.6%; 49,956 tons), shown in blue, and Other Recoverables (8.3%; 24,903 tons), shown in purple.

The waste composition data are presented by material class in Figure 17. **Paper** (30.0%) and **Food** (27.3%) are the two most prevalent material classes.

Figure 16. Waste Recoverability, Commercially Collected Nonresidential Substream, 2011

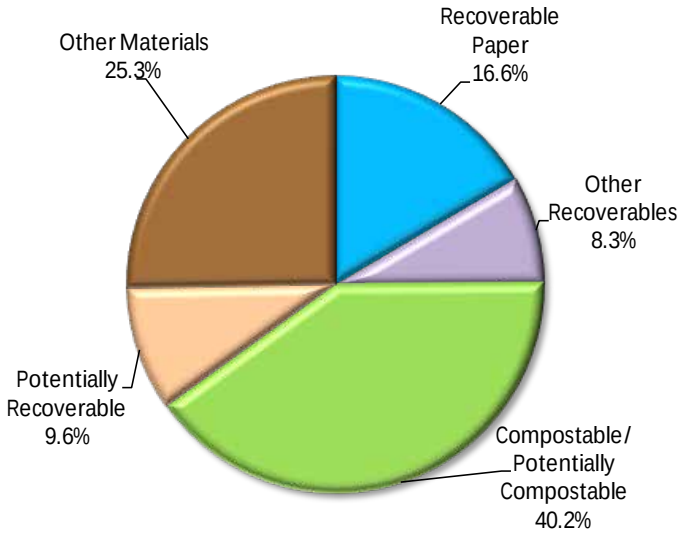
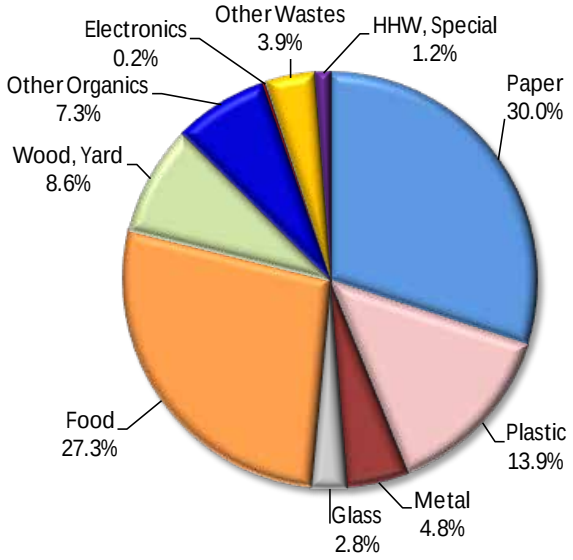


Figure 17. Waste Composition, Commercially Collected Nonresidential Substream, 2011



The ten most prevalent disposed materials can be found in Table 19. *Unpackaged/scrap vegetative food*, *low grade recyclable paper,* and *other compostable paper* are the three most prevalent materials; together they represent more than 25% of the County's commercially collected nonresidential waste.

Table 19. Ten Most Prevalent Disposed Materials, Commercially Collected Nonresidential Substream, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Unpackaged/Scrap Vegetative Food	14.0%	14.0%	42,189
Low Grade Recyclable Paper	6.7%	20.7%	20,193
Other Compostable Paper	6.6%	27.3%	19,909
Packaged Vegetative Food	6.1%	33.5%	18,494
Unpackaged/Scrap Non-vegetative Food	5.7%	39.2%	17,092
Plain Corrugated Cardboard (OCC)	5.6%	44.8%	16,822
Non-industrial Packaging Film Plastic	4.1%	48.8%	12,218
Other Paper	3.9%	52.7%	11,852
Yard Waste	3.4%	56.1%	10,121
High Grade Paper	3.2%	59.3%	9,745
Subtotal	***59.3%***		***178,634***
All other materials	40.7%		122,350
Total	**100.0%**		**300,985**

Self-haul Substreams

The overall self-haul waste composition is the weighted average of samples from the self-haul residential and self-haul nonresidential substreams.

Key Findings

Figure 18 summarizes recovery potential for the County's self-haul substreams. Approximately 38% (74,069 tons) of self-haul waste is Potentially Recoverable. Potentially Recoverable materials include *tires*, *dimensional lumber*, and *laptops*. The most prevalent recoverable material group is Compostable/Potentially Compostable material. These materials comprise approximately 16% (30,266 tons) of self-haul waste. The waste composition data are presented by material class in Figure 19. **Wood, Yard** (34.2%) and **Other Wastes** (26.4%) are the two most prevalent material classes.

Figure 18. Waste Recoverability, Self-haul Substreams, 2011

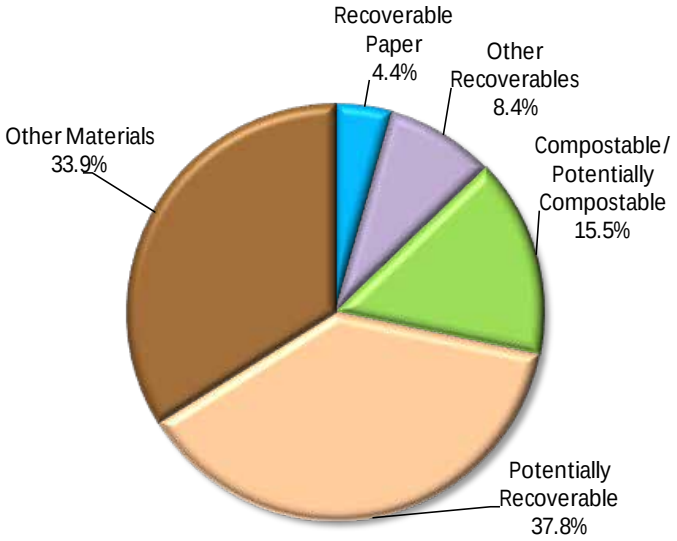
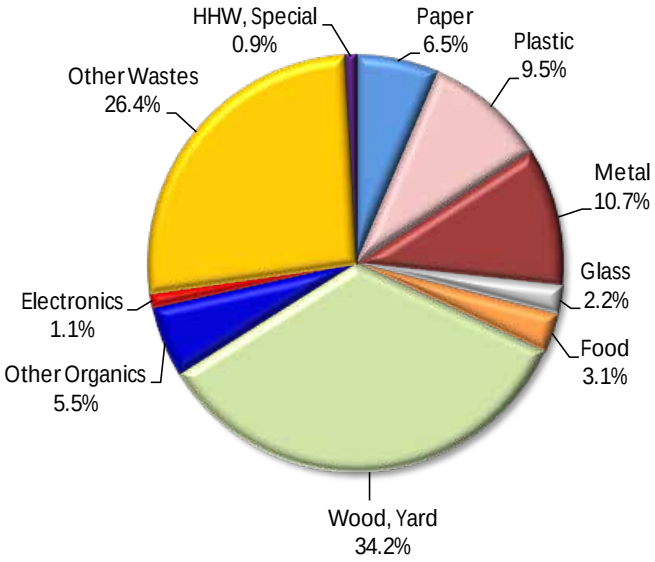


Figure 19. Waste Composition, Self-haul Substreams, 2011



As shown in Table 20, *dimensional lumber, yard waste,* and *C&D wastes* are the three most prevalent materials; together they represent approximately 28% of the County's total self-haul waste.

Table 20. Ten Most Prevalent Disposed Materials, Self-haul Substreams, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Dimensional Lumber	12.4%	12.4%	24,362
Yard Waste	10.3%	22.7%	20,083
C&D Wastes	5.6%	28.3%	10,983
Gypsum Wallboard	5.3%	33.6%	10,307
Carpet	5.0%	38.5%	9,768
Furniture	5.0%	43.5%	9,709
Other Ferrous	4.9%	48.4%	9,673
Contaminated Wood	2.9%	51.3%	5,708
Mixed Metals (items <20% non-metal)	2.7%	54.0%	5,195
Other Wood	2.4%	56.4%	4,740
Subtotal	***56.4%***		***110,528***
All other materials	43.6%		85,385
Total	**100.0%**		**195,913**

Self-haul Residential Substream

Self-haul residential samples are aggregated to estimate the composition for the self-haul residential substream.

Key Findings

Compostable/Potentially Compostable materials represent 17.0% (29,170 tons) of the County's self-haul residential waste (shown in green in Figure 20). The most prevalent recoverability group is Potentially Recoverable material. These materials (shown in peach in Figure 20) compose nearly 40% (67,838 tons) of the self-haul residential substream. The waste composition data are presented by material class in Figure 21. **Wood, Yard** (33.7%) and **Other Wastes** (27.3%) are the two most prevalent material classes.

Figure 20. Waste Recoverability, Self-haul Residential Substream, 2011

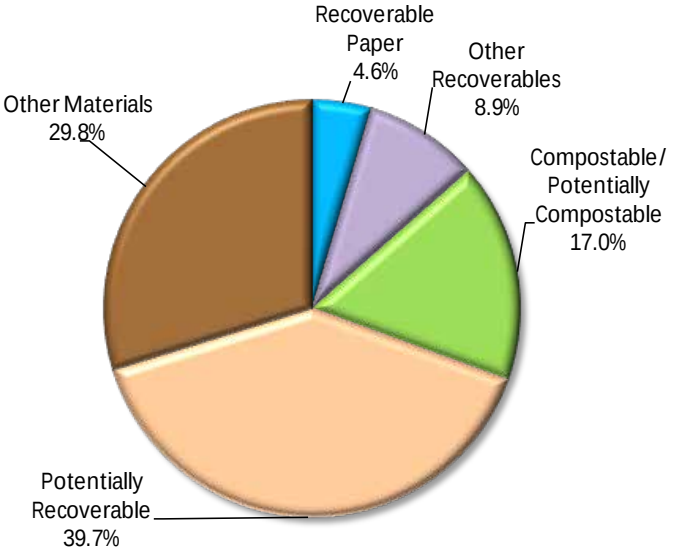
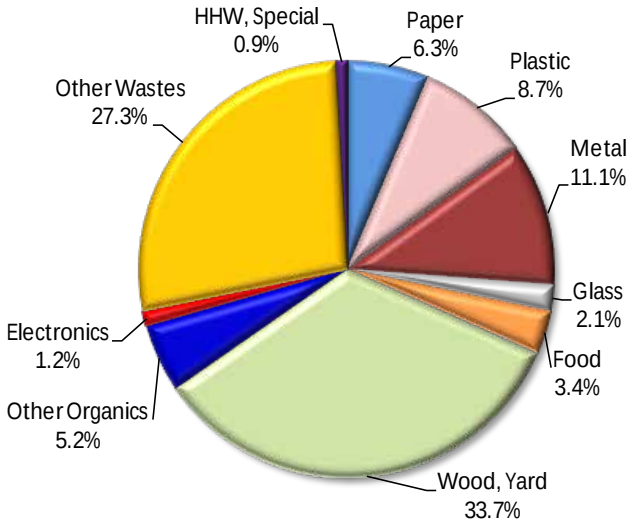


Figure 21. Waste Composition, Self-haul Residential Substream, 2011



The three most prevalent self-haul residential materials (*dimensional lumber, yard waste,* and *carpet*) combined represent about 31% of the substream's disposal. The ten most prevalent materials are summarized in Table 21.

Table 21. Ten Most Prevalent Disposed Materials, Self-haul Residential Substream, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Dimensional Lumber	13.5%	13.5%	23,142
Yard Waste	11.5%	25.0%	19,656
Carpet	5.5%	30.5%	9,483
C&D Wastes	5.5%	36.1%	9,469
Furniture	5.5%	41.6%	9,406
Other Ferrous	5.4%	47.0%	9,303
Gypsum Wallboard	4.6%	51.6%	7,857
Mixed Metals (items <20% non-metal)	3.0%	54.6%	5,082
Roofing and Siding Wood	2.5%	57.1%	4,252
Asphalt Shingles	2.2%	59.2%	3,749
Subtotal	***59.2%***		***101,398***
All other materials	40.8%		69,751
Total	**100.0%**		**171,149**

Self-haul Nonresidential Substream

The self-haul nonresidential composition is based on samples from the self-haul nonresidential substream.

Key Findings

Nearly 90% of the self-haul nonresidential substream is Other Materials (62.3%, 15,413 tons) or Potentially Recoverable (25.2%, 6,231 tons), shown as brown and peach respectively in Figure 22. Approximately 13% (3,114 tons) of the County's self-haul nonresidential waste is recoverable including Compostable/Potentially Compostable (4.4%, 1,096 tons), Recoverable Paper (3.1%; 759 tons), and Other Recoverables (5.1%; 1,259 tons).

The waste composition data are presented by material class in Figure 23. **Wood, Yard** (37.2%) and **Other Wastes** (19.9%) are the two most prevalent material classes.

Figure 22. Waste Recoverability, Self-haul Nonresidential Substream, 2011

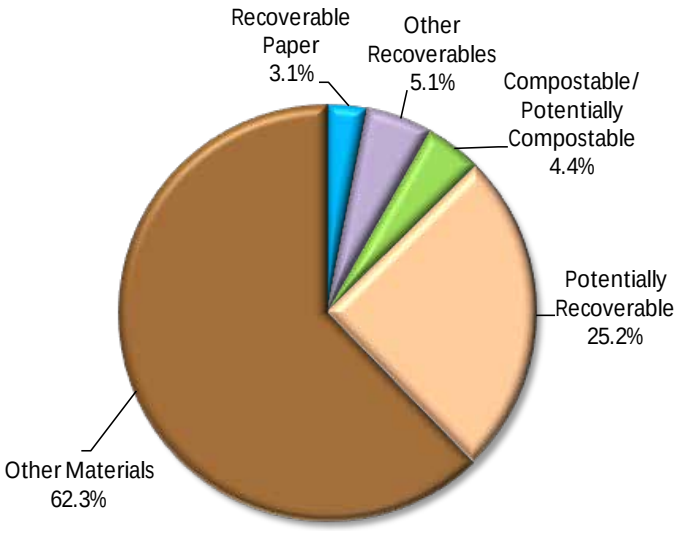
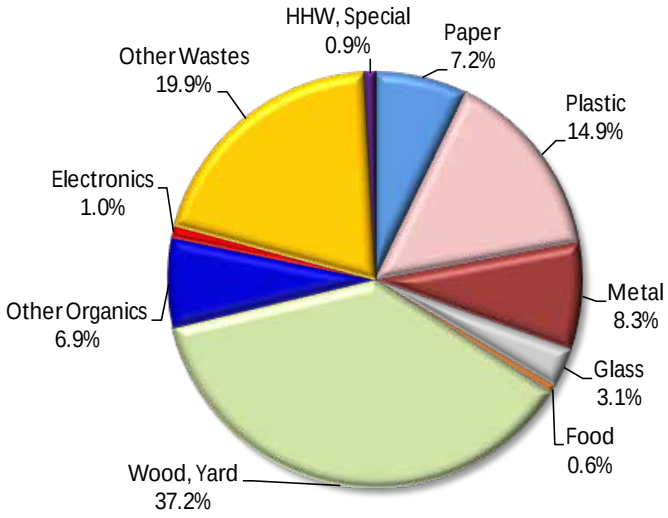


Figure 23. Waste Composition, Self-haul Nonresidential Substream, 2011



As shown in Table 22, *contaminated wood, gypsum wallboard,* and *plastic and other materials* are the three most prevalent materials; together they account for more than 30% of the County's self-haul nonresidential waste.

Table 22. Ten Most Prevalent Disposed Materials, Self-haul Nonresidential Substream, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Contaminated Wood	12.8%	12.8%	3,167
Gypsum Wallboard	9.9%	22.7%	2,450
Plastic and Other Materials	9.5%	32.1%	2,344
Other Wood	8.7%	40.9%	2,163
Other Mixed Metals (items >20% non-metal)	6.1%	47.0%	1,522
C&D Wastes	6.1%	53.1%	1,514
Dimensional Lumber	4.9%	58.1%	1,221
Rubber Products	4.4%	62.5%	1,098
Stumps	4.4%	66.9%	1,096
Other Paper	3.3%	70.2%	808
Subtotal	***70.2%***		***17,383***
All other materials	29.8%		7,381
Total	**100.0%**		**24,764**

Waste Characterization Changes Over Time

Comparing waste composition data collected during the previous study with the current study allows for a useful examination of trends and changes in the waste stream. This section presents findings from

statistical comparisons between the 2011 waste composition data and the previous study period in 2007. The analysis examines statistical differences, using *t*-tests, between the 2011 and the 2007 studies. These comparisons are meant to determine if changes in the composition of King County's disposed waste stream are statistically significant. This report does not attempt to examine potential causes of the changes in waste composition over time.

The year-to-year comparisons were made by examining the changes in the composition percentages for selected material groupings. The material groupings included:

- Newspaper,
- Cardboard and Kraft paper,
- Other curbside paper,
- Curbside recyclable containers,
- Compostable organics,(including food)
- Construction and demolition wastes,
- Wood waste, and
- Hazardous waste.

Statistical tests were used to analyze differences in the composition percentages between years for the following substreams:

- Commercially collected single family residential;
- Commercially collected multi-family residential;
- Commercially collected nonresidential; and
- Self-haul (including both residential and nonresidential).

The differences in material groupings between studies can be divided into two main categories:

- **Statistically significant**—These findings can be considered true differences because the probability of observing these results if there had been no actual year-to-year change is low.
- **Strong trend**—Although the results did not meet the requirements of the study's conservative statistical tests, the data suggest a possibly noteworthy change.

Because the waste composition results are expressed as percentages, rather than absolute tonnages, significant changes for one material may affect the percentages for other materials. Accordingly, increases over time in materials recycled may alter the percentages for other materials remaining in the waste stream.

As summarized below, the proportion of Cardboard and Kraft has shown a statistically significant decrease in the overall disposed waste stream. This may be due in part to strong downward trends in the commercially collected single family residential substream, the commercially collected nonresidential substream, and the self-haul substream. Organics have shown a statistically significant increase in the overall disposed waste stream. This may be due in part to a statistically significant increase in the in the commercially collected nonresidential substream. Newspaper and Organics have shown statistically significant decreases and increases respectively in the commercially collected

nonresidential substream. Strong trends are apparent in many other groups. Comparisons identified as "statistically significant" or "strong trends" in the tested substreams are summarized in Table 23.

Table 23. Waste Composition Changes and Trends, 2007 vs. 2011

	Material Grouping	Composition 2007	Composition 2011	Change in Composition	t-Statistic	p-Value	Statistically Significant Change*	Strength of Results
Overall								
Overall	Cardboard and Kraft	5.8%	3.6%	-2.2% ↓	3.3123	0.0010 *	**Yes**	Statistically Significant
Overall	Newspaper	1.5%	1.1%	-0.4% ↓	2.1500	0.0318	No	Strong Trend
Overall	Organics	25.8%	31.2%	5.4% ↑	2.9926	0.0028 *	**Yes**	Statistically Significant
Commercially Collected								
Single Family	Cardboard and Kraft	2.5%	1.6%	-0.9% ↓	1.7316	0.0867	No	Strong Trend
Single Family	Curbside Containers	7.8%	6.3%	-1.4% ↓	1.7774	0.0788	No	Strong Trend
Nonresidential	Cardboard and Kraft	9.1%	5.6%	-3.6% ↓	2.4503	0.0148	No	Strong Trend
Nonresidential	Newspaper	2.0%	1.1%	-0.9% ↓	3.1190	0.0020 *	**Yes**	Statistically Significant
Nonresidential	Organics	31.8%	40.2%	8.4% ↑	3.1931	0.0015 *	**Yes**	Statistically Significant
Nonresidential	Construction & Demolition	5.5%	3.2%	-2.2% ↓	1.8962	0.0588	No	Strong Trend
Self-haul								
Self-haul	Cardboard and Kraft	3.6%	2.0%	-1.6% ↓	2.3363	0.0201	No	Strong Trend

**(Cut-off for statistically significant difference = 0.0125)*

More detail regarding the material groupings and the statistical analyses can be found in Appendix F. Waste Composition Comparisons to Previous Studies. Detailed t-test results for each substream can be found in the same appendix beginning with Table 75.

4. Transfer Station Customer Survey Findings

In 2011, King County conducted more than 736,700 transactions at the eight County transfer stations and two dropbox facilities. During that time, the project team conducted 5,556 interviews with customers at those waste facilities to determine who uses each facility and why. Each survey day, an surveyor asked the driver of every vehicle entering the facility a series of survey questions.[10] This section presents the findings of these customer surveys. Appendix A. Sample and Survey Methodology provides additional details on the study methodology.

The figures presented describe the portion of waste transactions (customers, loads, visits, or users) surveyed at waste facilities – not the weight or tonnages of the waste they delivered.

Hauler Type

Self-haul residential customers represent the majority (73%) of customers surveyed. Commercially collected nonresidential customers (10%) were the next most prevalent customer type. Table 24 summarizes these results. More detailed results by facility can be found in Appendix E. Detailed Customer Survey Results.

Table 24. Reported Generator Type by Hauler Type, 2011

n=5556	Commercially Collected	Self-haul	Total
Residential	8%	73%	**82%**
Nonresidential	10%	7%	**16%**
Mixed	1%	1%	**2%**
Subtotal	***19%***	***81%***	***100%***
No Response	0%	0%	**0%**
Total	**19%**	**81%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Vehicle Type

As shown in Table 25, commercially collected loads are approximately evenly split between dropbox vehicles (44%) and packer vehicles (56%). No commercially collected loads are delivered in passenger vehicles or large other vehicles. The majority (92%) of self-haul loads are delivered in passenger vehicles. Examples of the various vehicle types may be found in Appendix I. Example Field Forms. More detailed results by facility can be found in Appendix E. Detailed Customer Survey Results.

[10] If traffic became too congested the surveyor skipped a few vehicles to avoid traffic flow problems at the facility.

Table 25. Observed Vehicle Types by Hauler Type, 2011

n=5556	Commercially Collected	Self-haul	Overall
Dropbox	44%	0%	**9%**
Packer	56%	0%	**11%**
Passenger Vehicle	0%	92%	**74%**
Large Other	0%	8%	**6%**
Subtotal	***100%***	***100%***	***100%***
No Response	0%	0%	**0%**
Total	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Waste Type

Table 26 summarizes the reported waste type being disposed by transfer station customers. All (100%) commercially collected customers report disposing of mixed garbage as did most (65%) self-haul customers. Overall, nearly three fourths of customers (72%) report disposing of mixed garbage. Construction and demolition debris is the next most prevalent waste type overall: 19% of customers report disposing of C&D debris and the remaining 9% of customers report disposing of yard waste. More detailed results by facility can be found in Appendix E. Detailed Customer Survey Results.

Table 26. Reported Waste Type by Hauler Type, 2011

n=5556	Commercially Collected	Self-haul	Overall
Mixed Garbage	100%	65%	**72%**
Construction & Demolition	0%	23%	**19%**
Yard Waste	0%	12%	**9%**
Subtotal	***100%***	***100%***	***100%***
No Response	0%	0%	**0%**
Total	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Generator Type

Table 27 and Table 28 detail the generator types by subtype and by facility for the commercially collected and self-haul substreams separately. More detailed results can be found in Appendix E. Detailed Customer Survey Results.

Commercially Collected

The Vashon transfer station has the highest reported proportion of residential loads; 100% of commercially collected customers report disposing of residential waste. However, only two commercially collected loads were surveyed at Vashon, and the small number of surveys may skew the commercially collected survey data for that facility. Bow Lake has the lowest proportion of residential loads (34%) and highest proportion of nonresidential loads (61%). Approximately 22% of customers at Bow Lake report disposing of single family residential loads and 12% of customers report disposing of multifamily loads. The Bow Lake transfer station is the only facility open 24 hours and receives a significant amount of nonresidential traffic between midnight and 8am. Algona has the highest proportion of mixed residential and nonresidential loads, 8%.

Overall, the commercially collected substream is approximately evenly split between residential loads (44%) and nonresidential loads (50%). Single family residential loads are approximately 27% of all commercially collected loads.

The reported generator type by facility data for commercially collected loads is detailed in Table 27. Commercially collected loads are not accepted at the Skykomish and Cedar Falls dropboxes.

Table 27. Reported Generator Type by Facility, Commercially Collected, 2011

Commercially Collected, n=1053	Algona	Bow Lake	Enumclaw	Factoria
Residential	**46%**	**34%**	**58%**	**50%**
Single Family	25%	22%	53%	30%
Multifamily	19%	12%	5%	19%
Mixed Residential	2%	0%	0%	0%
Nonresidential	**46%**	**61%**	**42%**	**44%**
Mixed Residential and Nonresidential	**8%**	**4%**	**0%**	**6%**
Subtotal	***100%***	***100%***	***100%***	***100%***
No Response	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**

Commercial, continued	Houghton	Renton	Shoreline	Vashon	Overall
Residential	**45%**	**46%**	**58%**	**100%**	**44%**
Single Family	32%	17%	42%	100%	27%
Multifamily	12%	28%	16%	0%	16%
Mixed Residential	1%	1%	0%	0%	1%
Nonresidential	**48%**	**48%**	**38%**	**0%**	**50%**
Mixed Residential and Nonresidential	**6%**	**6%**	**4%**	**0%**	**6%**
Subtotal	***100%***	***100%***	***100%***	***100%***	***100%***
No Response	0%	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Self-haul

At each facility more than 86% of self-haul loads are single family residential; the proportion is highest at the Cedar Falls dropbox (95%) and lowest at the Algona transfer station (86%). Overall, the self-haul substream is approximately 90% single family residential loads and 9% nonresidential loads. The remaining 1% is comprised of mixed residential and nonresidential loads. The reported generator type by facility data for self-haul loads is detailed in Table 27.

Table 28. Reported Generator Type by Facility, Self-haul, 2011

Self-haul, n=4503	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria
Residential	**86%**	**89%**	**95%**	**93%**	**93%**
Single Family	86%	89%	95%	93%	93%
Multifamily	0%	0%	0%	0%	0%
Mixed Residential	0%	0%	0%	0%	0%
Nonresidential	**13%**	**10%**	**4%**	**5%**	**6%**
Mixed Residential and Nonresidential	**0%**	**1%**	**1%**	**1%**	**1%**
Subtotal	***100%***	***100%***	***100%***	***99%***	***100%***
No Response	0%	0%	0%	1%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Self-haul, continued	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Residential	**88%**	**93%**	**92%**	**94%**	**89%**	**90%**
Single Family	88%	93%	92%	94%	89%	90%
Multifamily	0%	0%	0%	0%	0%	0%
Mixed Residential	0%	0%	0%	0%	0%	0%
Nonresidential	**10%**	**6%**	**8%**	**6%**	**10%**	**9%**
Mixed Residential and Nonresidential	**2%**	**0%**	**1%**	**0%**	**0%**	**1%**
Subtotal	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***
No Response	0%	0%	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Contractors and Landscapers

The surveyors asked self-haul customers disposing of loads of yard waste or C&D waste if they were a contractor or landscaper. Table 29 presents the proportion of C&D and yard waste loads from each source (residential, nonresidential, and mixed) brought by contractors, landscapers, and other self-haul customer types.

As shown, contractors and landscapers combined brought most (77%) of the surveyed C&D and yard waste loads from nonresidential sources. In contrast, only 33% of residential C&D and yard waste loads surveyed were delivered by contractors or landscapers. Overall, most (61%) loads of self-haul C&D and

yard waste were not disposed of at transfer stations by contractors or landscapers. More detailed results by facility can be found in Appendix E. Detailed Customer Survey Results.

Table 29.Proportion of C&D and Yard Waste by Type of Self-haul Customer and Generator, 2011

Self-haul, n=1579	Residential	Nonresidential	Mixed	No Response	Overall
Contractors	29%	72%	73%	0%	**34%**
Landscapers	4%	5%	0%	0%	**4%**
Other Users	67%	23%	27%	0%	**61%**
Total	**100%**	**100%**	**100%**	**0%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Curbside Garbage Service

Table 30 details the proportion of residential self-haul customers who report subscribing to curbside garbage service and the proportion that do not. Overall, 65% of residential self-haul customers report subscribing to curbside garbage service at home. At the Factoria transfer station 78% of customers report subscribing to curbside garbage service, the highest proportion at any transfer station. At the Skykomish dropbox no customers report subscribing to curbside garbage service, the lowest proportion at any transfer station.

Table 30. Reported Subscription to Curbside Garbage by Facility, Self-haul, 2011

Self-haul, n=3482	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria
Subscribe to Garbage Service	66%	70%	58%	47%	78%
Do Not Subscribe to Garbage Service	31%	27%	41%	51%	16%
Subtotal	***97%***	***97%***	***98%***	***98%***	***93%***
No Response	3%	3%	2%	2%	7%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Self-haul, continued	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Subscribe to Garbage Service	76%	68%	67%	0%	21%	**65%**
Do Not Subscribe to Garbage Service	23%	26%	26%	100%	78%	**32%**
Subtotal	***99%***	***94%***	***93%***	***100%***	***99%***	***97%***
No Response	1%	6%	7%	0%	1%	**3%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Trip Frequency

Self-haul customers were asked about the number of visits they make on a per day, per week, or per month basis. These responses were then converted to visits per year (i.e., "twice a week" equals 104 visits per year).

Residential Generators

Table 31 and Table 32 show the average number of annual visits residential self-haul customers make to each facility. Residential self-haulers are sorted into two groups: those who subscribe to curbside garbage collection service and those who do not subscribe.

Table 31 summarizes the data for all residential self-haul customers (including contractors, landscapers, and independent haulers). Table 32 includes the subset of self-haul customers who make an average of less than two visits per day. An employee for an independent hauler (i.e., companies such as "Got Junk") frequently makes several visits per day. To avoid a skew in the results due to this small number of respondents making hundreds of visits per year, Table 32 summarizes the annualized visits for residential self-haul customers making fewer than two visits per day.

All Residential Users

Overall, residential self-haul customers who do not subscribe to curbside garbage service make, on average, about eight more visits per year to waste facilities than residential self-haulers who do subscribe to curbside garbage service. This overall average was weighted by the proportion of self-haul customers surveyed at each transfer station.

Users who did not respond to this question are primarily contractors, landscapers, and other independent hauling companies that do not know if their client subscribes to curbside garbage service.

Of the residential self-haul customer that subscribe to curbside garbage service, users of the Bow Lake transfer station make the most visits, 12.7 annually. These results are detailed in Table 31.

Table 31. Reported Trips per Year by Subscription and by Facility, Residential Self-haul, 2011

All Residential Self-haul, n=3773	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria
Subscribe to Garbage Service	12.4	12.7	9.4	5.9	8.9
Do Not Subscribe to Garbage Service	18.8	28.3	14.0	12.5	15.0
No Response	193.7	166.5	19.2	36.0	119.3
Facility Average	**29.9**	**33.4**	**11.7**	**11.7**	**23.8**

All Residential Self-haul, continued	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Subscribe to Garbage Service	12.1	7.7	9.9	0.0	9.5	**10.5**
Do Not Subscribe to Garbage Service	12.9	13.9	27.5	11.1	17.0	**18.3**
No Response	275.9	49.6	88.6	0.0	46.3	**126.1**
Facility Average	**37.5**	**15.6**	**31.4**	**11.1**	**17.6**	**25.8**

Residential Users Making Less than Two Visits per Day

Residential self-haul customers making less than two visits per day that do not subscribe to curbside garbage service make, on average, about eight more visits per year to waste facilities than residential self-haulers that do subscribe to curbside garbage service. This overall average was weighted by the proportion of self-haul customers surveyed at each transfer station.

Users who did not respond to this question are primarily contractors, landscapers, and other independent hauling companies that do not know if their client subscribes to curbside garbage service.

Of the residential self-haul customers who subscribe to curbside garbage service, users of the Algona transfer station made the most annual visits to a King County facility (12.4). These results are detailed in Table 32.

Table 32. Reported Trips per Year by Subscription and by Facility, Residential Self-haul, 2011
Users Making Less Than Two Trips per Day

Residential Self-haul Making Less Than Two Visits/Day, n=3741	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria
Subscribe to Garbage Service	12.4	9.4	9.4	5.9	8.9
Do Not Subscribe to Garbage Service	18.8	23.2	14.0	12.5	15.0
No Response	77.7	70.4	19.2	36.0	58.4
Facility Average	**19.1**	**18.9**	**11.7**	**11.7**	**15.6**

Residential Self-haul Making Less Than Two Visits/Day, continued	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Subscribe to Garbage Service	9.7	7.7	9.9	0.0	9.5	**9.4**
Do Not Subscribe to Garbage Service	12.9	13.9	27.5	11.1	17.0	**17.3**
No Response	80.0	38.6	40.5	0.0	46.3	**55.7**
Facility Average	**15.7**	**13.8**	**19.9**	**11.1**	**17.6**	**16.4**

Nonresidential Generators

Table 31 and Table 34 show the average number of annual visits nonresidential self-haul customers make to each facility. Nonresidential self-haulers are sorted into two groups: those who subscribe to curbside garbage collection service and those who do not subscribe.

Table 33 summarizes the data for all nonresidential self-haul customers (including contractors, landscapers, and independent haulers). Table 34 includes the subset of self-haul customers who make an average of less than two visits per day. An employee for an independent hauler (i.e., companies such as "Got Junk") frequently makes several visits per day. To avoid a skew in the results due to this small number of respondents making hundreds of visits per year, Table 34 summarizes the annualize visits for nonresidential self-haul customers making fewer than two visits per day.

All Nonresidential Users

Nonresidential self-haul customers who do not subscribe to curbside garbage service make, on average, more than two times as many visits per year to waste facilities than nonresidential self-haulers who do subscribe to curbside garbage service. This overall average was weighted by the proportion of self-haul customers surveyed at each transfer station.

Users who did not respond to this question are primarily contractors, landscapers, and other independent hauling companies that do not know if their client subscribes to curbside garbage service.

Of the nonresidential self-haul customers who do subscribe to curbside garbage service, users of the Bow Lake facility make the most annual visits to a King County transfer station (74.4). These results are detailed in Table 33.

Table 33. Reported Trips per Year by Subscription and by Facility, Nonresidential Self-haul, 2011

All Nonresidential Self-haul, n=296	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria
Subscribe to Garbage Service	23.8	74.4	2.3	15.6	20.6
Do Not Subscribe to Garbage Service	71.3	154.1	260.0	16.5	95.5
No Response	269.4	172.9	1.0	25.0	47.8
Facility Average	**149.7**	**132.7**	**112.6**	**18.3**	**45.9**

All Nonresidential Self-haul, continued	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Subscribe to Garbage Service	53.5	7.4	26.0	0.0	18.0	**39.4**
Do Not Subscribe to Garbage Service	56.8	18.0	74.6	100.0	50.0	**93.5**
No Response	55.1	50.7	27.1	0.0	219.5	**136.5**
Facility Average	**55.1**	**33.5**	**42.0**	**100.0**	**80.6**	**93.0**

Nonresidential Users Making Less than Two Visits per Day

Nonresidential self-haul customers making less than two visits per day who do not subscribe to curbside garbage service make, on average, more than twice as many visits per year to transfer stations than nonresidential self-haulers who do subscribe to curbside garbage service. This overall average was weighted by the proportion of self-haul customers surveyed at each transfer station.

Users who did not respond to this question are primarily contractors, landscapers, and other independent hauling companies that do not know if their client subscribes to curbside garbage service.

Of the nonresidential self-haul customers who subscribe to curbside garbage service, users of the Houghton transfer station make the most annual visits to a King County facility (53.5). These results are detailed in Table 32.

Table 34. Reported Trips per Year by Subscription and by Facility, Nonresidential Self-haul, 2011 Users Making Less Than Two Trips per Day

Nonresidential Self-haul Making Less Than Two Visits/Day, n=287	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria
Subscribe to Garbage Service	23.8	52.5	2.3	15.6	20.6
Do Not Subscribe to Garbage Service	71.3	86.3	260.0	16.5	95.5
No Response	97.3	94.9	1.0	25.0	47.8
Facility Average	**61.6**	**72.6**	**112.6**	**18.3**	**45.9**

Nonresidential Self-haul Making Less Than Two Visits/Day, continued	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Subscribe to Garbage Service	53.5	7.4	26.0	0.0	18.0	**32.5**
Do Not Subscribe to Garbage Service	56.8	18.0	74.6	100.0	50.0	**75.0**
No Response	55.1	50.7	27.1	0.0	49.3	**69.2**
Facility Average	**55.1**	**33.5**	**42.0**	**100.0**	**40.0**	**56.0**

Reasons for Self-haul

The surveyors asked every self-haul customer their reason for self-hauling waste to the transfer station. Table 35 and Table 36 present the five most common reasons for self-hauling, by facility, for residential and nonresidential customers. The data include subscribers to curbside garbage service as well as non-subscribers.

All responses from residential and nonresidential customers regarding reasons for self-hauling waste can be found in Appendix E. Detailed Customer Survey Results.

Residential

Overall, the most common reason for self-haul reported by residential generators is "Large amount of garbage" (18%). The remaining top four reasons were "Items too big to fit into garbage can" (12%), "Cheaper or saves money" (11%), "Yard debris" (10%), and "Cleaning home or work place" (10%).

Table 35. Most Common Reasons to Self-haul by Facility, Residential Generators, 2011

Residential, n=3863	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria
Large amount of garbage	17%	18%	20%	15%	20%
Items too big to fit into garbage can	12%	13%	11%	9%	16%
Cheaper / Saves money	15%	12%	10%	20%	5%
Yard debris	7%	13%	8%	8%	12%
Cleaning home or workplace	15%	10%	6%	7%	7%
Subtotal	***66%***	***65%***	***55%***	***60%***	***60%***
All other responses	34%	35%	45%	40%	40%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Residential, continued	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Large amount of garbage	21%	22%	18%	0%	7%	**18%**
Items too big to fit into garbage can	11%	9%	16%	0%	2%	**12%**
Cheaper / Saves money	7%	8%	10%	18%	20%	**11%**
Yard debris	7%	9%	16%	0%	4%	**10%**
Cleaning home or workplace	17%	9%	7%	0%	4%	**10%**
Subtotal	***63%***	***58%***	***67%***	***18%***	***38%***	***61%***
All other responses	37%	42%	33%	82%	63%	**39%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Nonresidential

Overall, the most common reason to self-haul reported by nonresidential generators is "Large amount of garbage" (20%). The remaining top four reasons were "Items too big to fit into garbage can" (13%), "Cheaper or saves money" (12%), "Independent hauler" (9%), and "Cleaning home or work place" (6%).

Table 36. Most Common Reasons to Self-haul by Facility, Nonresidential Generators, 2011

Nonresidential, n=199	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria
Large amount of garbage	26%	17%	25%	29%	20%
Items too big to fit into garbage can	3%	19%	25%	21%	0%
Cheaper / Saves money	8%	19%	0%	7%	0%
Independent hauler	13%	8%	13%	7%	0%
Cleaning home or workplace	18%	4%	0%	7%	7%
Subtotal	***68%***	***66%***	***63%***	***71%***	***27%***
All other responses	32%	34%	38%	29%	73%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Nonresidential, continued	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Large amount of garbage	11%	27%	23%	0%	7%	**20%**
Items too big to fit into garbage can	18%	13%	8%	0%	7%	**13%**
Cheaper / Saves money	14%	0%	23%	0%	21%	**12%**
Independent hauler	4%	13%	31%	0%	0%	**9%**
Cleaning home or workplace	4%	0%	0%	0%	0%	**6%**
Subtotal	***50%***	***53%***	***85%***	***0%***	***36%***	***59%***
All other responses	50%	47%	15%	100%	64%	**41%**
Total	**100%**	**100%**	**100%**	**0%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Load Origin

The surveyors asked every customer the city of origin for their load. Additionally, self-haul customers were asked the load's zip code of origin. Table 37, Table 38, and Table 39 present the load origin for commercially collected and self-haul customers.

Commercially Collected

Table 37 details the reported city of origin for commercially collected loads to each of the County's facilities. Overall 93% of the commercially collected loads originated from incorporated areas.[11] Kent (14%) was the most commonly reported origin for commercially collected loads.

[11] Please note that Vashon Island is considered unincorporated King County.

Table 37. Reported City of Origin for Loads by Facility, Commercially Collected, 2011

Commercially Collected, n=1093	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Algona	1%	1%			1%						1%
Auburn	26%	8%									7%
Bellevue		2%			58%	9%					11%
Black Diamond		1%									
Bothell						8%					2%
Burien	3%	8%					1%				3%
Carnation						1%					
Covington	5%	1%									1%
Des Moines	3%	6%									2%
Duvall						4%					1%
Enumclaw				84%							2%
Federal Way	22%	7%									6%
Issaquah					15%						2%
Kenmore						1%		2%			
Kent	20%	33%									14%
Kirkland						28%		2%			6%
Lake Forest Park								4%			
Maple Valley	5%	2%					1%				1%
Mercer Island					4%						1%
Newcastle							6%				1%
Normandy Park		1%									
North Bend	1%				3%		2%				1%
Pacific	1%										
Redmond					2%	31%	3%				7%
Renton	1%	8%		5%			70%				9%
Sammamish					6%						1%
Seatac	5%	11%									4%
Shoreline								78%			3%
Skykomish						1%	1%				
Snoqualmie					4%						1%
Tukwila	2%	10%									3%
Woodinville						6%					1%
Subtotal Incorporated King County	***96%***	***97%***	***0%***	***89%***	***93%***	***91%***	***83%***	***86%***	***0%***	***0%***	***93%***
Unincorporated King County	3%	3%		11%	6%	8%	17%	14%		100%	7%
Subtotal All King County	***99%***	***100%***	***0%***	***100%***	***99%***	***99%***	***100%***	***100%***	***0%***	***100%***	***99%***
Seattle	1%										
Outside King County											
No Response						1%					
Total	**100%**	**100%**	**0%**	**100%**	**99%**	**100%**	**100%**	**100%**	**0%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding. Values less than .5% are left blank

Self-haul

Table 38 details the reported city of origin for self-haul loads to each of the County's facilities. Overall, 88% of the self-haul loads originated from incorporated areas.[12] Kent (14%) was the most commonly reported origin for self-haul loads.

[12] Please note that Vashon Island is considered unincorporated King County.

Table 38. Reported City of Origin for Loads by Facility, Self-haul, 2011

Self Haul, n=4501	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Algona	3%	1%									1%
Auburn	30%	7%		5%							6%
Beaux Arts											
Bellevue		1%			41%	9%	1%				8%
Black Diamond				7%							1%
Bothell					1%	10%		3%			2%
Burien	2%	10%									2%
Carnation			5%			1%					
Clyde Hill					1%	1%					
Covington	7%	3%		3%			2%				2%
Des Moines	3%	10%									3%
Duvall						3%					
Enumclaw				50%							5%
Federal Way	22%	7%									5%
Hunts Point											
Issaquah			3%		12%		4%				3%
Kenmore						3%		6%			1%
Kent	14%	30%		2%	1%		3%				9%
Kirkland					2%	26%		2%			4%
Lake Forest Park								8%			1%
Maple Valley	1%	1%		16%			7%				2%
Medina					1%	1%					
Mercer Island					12%	1%					2%
Milton	1%	1%									
Newcastle					2%		1%				
Normandy Park		3%									1%
North Bend			60%								3%
Pacific	3%	1%									1%
Redmond					3%	21%	1%	1%			3%
Renton	2%	5%			1%		68%				8%
Sammamish					12%	4%	1%				3%
Seatac	2%	12%									3%
Shoreline								68%			5%
Skykomish									44%		
Snoqualmie			17%		1%						1%
Tukwila	1%	5%									1%
Woodinville					2%	13%					2%
Yarrow Point											
Subtotal Incorporated King County	***91%***	***97%***	***85%***	***84%***	***95%***	***96%***	***89%***	***90%***	***44%***	***0%***	***88%***
Unincorporated King County	1%	2%	14%	11%	3%	1%	10%	2%	25%	100%	8%
Subtotal All King County	***92%***	***98%***	***100%***	***94%***	***98%***	***97%***	***100%***	***92%***	***69%***	***100%***	***97%***
Seattle					1%	1%					
Outside King County	7%	1%		5%	1%	2%		8%	31%		3%
No Response											
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding. Values less than .5% are left blank

Table 39 details the reported zip code of origin for self-haul loads to each of the County's facilities. Zip code 98000 was the most frequently reported origin, with 6% of customers reporting originating in zip code 98000.

Table 39. Reported Zip Code of Origin for Loads by Facility, Self-haul, 2011

Zip Code, n=4503	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
98000	8%	7%		1%	11%	10%	1%	2%			6%
98001	11%	4%									3%
98002	8%	2%									2%
98003	8%	4%									2%
98004					7%	6%		2%			2%
98005					6%	2%					1%
98006		1%			12%		13%				3%
98007					5%	2%					1%
98008					8%	1%					2%
98009											
98010				7%							1%
98011						5%		2%			1%
98012						2%					
98014			4%			1%					
98019						2%					
98020								3%			
98021						1%		1%			
98022				52%							5%
98023	10%	3%			1%	3%					3%
98024			9%		1%						1%
98025							1%				
98026								1%			
98027			4%		7%		6%				2%
98028						4%		6%			1%
98029					4%						1%
98030	2%	4%									1%
98031	3%	11%					1%				3%
98032	2%	8%				1%	1%	1%			2%
98033		1%			1%	9%					2%
98034					1%	11%		1%			2%
98035											
98036								1%			
98037											
98038		1%		16%			7%				2%
98039					1%						
98040					10%	1%					2%
98042	11%	5%		5%			2%				3%
98043								14%			1%
98044											
98045			58%								3%
98046											
98047	2%	1%									1%
98048											
98050			1%								
98051				6%							1%
98052					1%	12%		1%			2%
98053					1%	4%					1%
98054											
98055		1%					5%				1%
98056	1%	2%			2%		15%				2%
98057		1%					5%				1%

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding. Values less than .5% are left blank

Zip Code, Continued	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
98058	1%	2%			1%	1%	15%				2%
98059					1%		20%				2%
98062											
98063											
98064											
98065			17%								1%
98068											
98070										100%	4%
98072					1%	7%					1%
98073											
98074			1%		5%	3%					1%
98075					6%	1%					1%
98077						4%					1%
98082											
98087								1%			
98089											
98090											
98092	10%	2%		5%							2%
98093											
98098											
98103											
98104											
98105											
98106											
98107											
98108	1%	2%									1%
98115											
98117											
98118		1%									
98123											
98131											
98132											
98133								24%			2%
98146		1%									
98148	1%	2%									
98155								27%			2%
98160											
98166	1%	7%									2%
98168	1%	6%									1%
98177								10%			1%
98178							2%				
98188	1%	7%									2%
98190											
98198	2%	9%									2%
98199											
98200											
98206											
98223											
98224									18%		
98236											

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding. Values less than .5% are left blank

Zip Code, Continued	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
98251									29%		
98253											
98256									6%		
98258											
98270											
98272											
98284											
98288									18%		
98290											
98296						1%					
98301											
98321				3%							
98333											
98338											
98354	1%	1%									
98360											
98371	1%										
98372	1%										
98390	1%			1%							
98391	1%			1%							
98407											
98422	1%										
98424											
98445											
98446											
98455											
98528											
98618											
98631											
98642											
98723											
98731											
98732											
98755											
98772											
98788											
98798											
98902											
Subtotal	***100%***	***100%***	***99%***	***100%***	***100%***	***100%***	***100%***	***99%***	***71%***	***100%***	***100%***
No Response	0%	0%	1%	0%	0%	0%	0%	1%	29%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding. Values less than .5% are left blank

5. Appendices

Appendix A. Sample and Survey Methodology

Overview

The objective of the 2011 waste composition and transfer station customer survey study was to provide robust composition data, by weight, for King County's disposed waste stream. By sorting approximately 420 randomly selected samples, Cascadia derived representative composition estimates for the residential, commercial, and self-haul substreams. The current project followed the same basic methodology as the previous study conducted between February and December 2007.

This appendix outlines the sampling methodology for the current study. The material definitions, quality control plan, health and safety plan, and example field forms are included in separate appendices.

Sampling Populations

To gain a clearer understanding of the disposed solid waste stream, the total waste stream was divided into various substreams. Such division was useful because the various substreams often have different waste types, user profiles, and public programs for reaching customers. Substreams were identified according to the source, or generator, of the waste (residential or nonresidential) as well as how materials are delivered to waste sites (commercially collected or self-haul).[13]

The following terms were used to define the substreams:

- **Residential waste** is generated at single family or multifamily dwellings.
- **Nonresidential waste** is generated at businesses, schools, government offices, and other institutions that are not residences.
- **Commercial haulers** are firms that contract with local governments to operate a garbage collection company or operate under a state franchise in a particular geographic area.[14]
- **Self-haulers** are residents or businesses that bring waste themselves to transfer stations or dropboxes.[15]

In this study, waste loads were first divided into residential and nonresidential waste streams. These categories were then further divided into either commercially collected or self-haul substreams, as shown in Table 40. In some cases, loads contain a mixture of waste from residential and nonresidential generators, but these "mixed loads" represent only a small portion of the total waste.

[13] This study excluded waste from the construction, demolition and land-clearing (CDL) substream, which is disposed at special facilities designated for the purpose.
[14] The City of Enumclaw and the Town of Skykomish operate their own waste collection systems, rather than contracting with commercial haulers. In the 2011 study, King County considered these the commercially collected loads.
[15] Self-haul loads were categorized as residential or nonresidential according to the source of the load, not the type of hauler. For example, some companies, such as contractors and landscapers, collect waste from homes or businesses. These loads were considered self-haul residential if the waste originates from a residence, even though the company, not the resident, delivers the material to a waste facility.

Table 40. Waste Substream Definitions

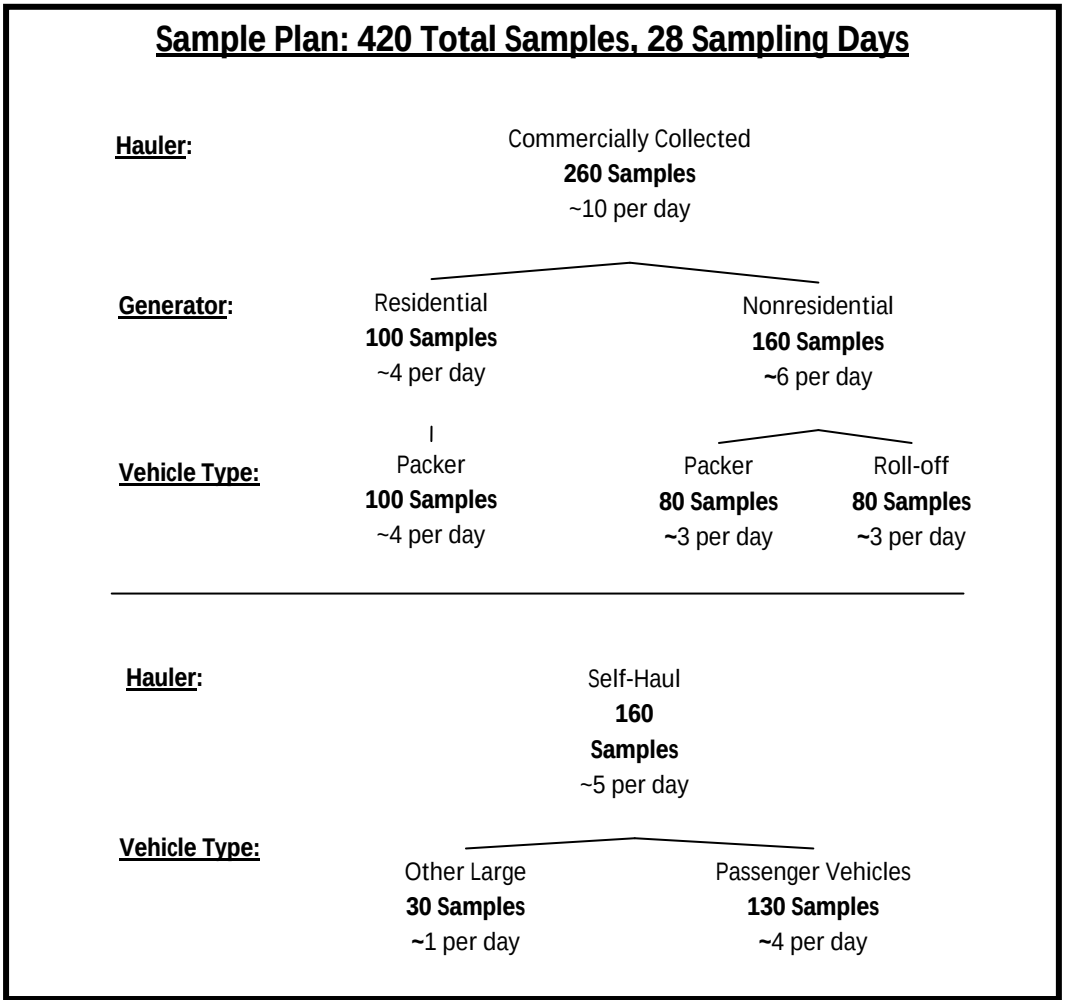
	Commercially Collected	Self-haul
Residential Waste	Commercially collected waste from residential sources	Self-haul waste from residential sources
Nonresidential Waste	Commercially collected waste from nonresidential sources	Self-haul waste from nonresidential sources
Mixed Residential and Nonresidential Waste	Commercially collected waste from residential and nonresidential sources	Self-haul waste from residential and nonresidential sources

Sampling Allocation

To provide reliable waste composition estimates, Cascadia hand-sorted 420 randomly selected samples from eight King County transfer stations and two dropboxes. The samples were divided among commercially collected residential, commercially collected nonresidential, self-haul residential, and self-haul nonresidential waste.

Figure 24 shows the distribution of samples. Approximately 100 commercially collected residential, 160 commercially collected nonresidential, and 160 self-haul (residential and nonresidential) samples were sorted over 28 days. Using predetermined sampling intervals, Cascadia sampled an average of 15 loads per day, resulting in 420 total samples.

Figure 24. Sample Allocation



As shown, greater numbers of samples were allocated to the nonresidential and self-haul substreams. The waste found in these streams tends to be more variable from load to load. Higher variability means that additional samples are required to provide precision levels comparable to the residential substream.

Within the commercially collected nonresidential substream, the samples were equally divided among packer trucks and dropboxes (80 samples for each vehicle type). The self-haul substream was divided between passenger vehicles (130 samples) and other large vehicles (30 samples). The planned and actual numbers of samples for each sampling stratum are shown in Table 41.

Table 41. Planned and Actual Samples by Sampling Strata, 2011

Sampling Strata	Number of Samples	
	Plan	Actual
Commercially Collected Residential	100	101
Commercially Collected Packer Trucks	80	80
Commercially Collected Dropboxes	80	80
Self-haul Passenger Vehicles	130	129
Self-haul Large Other	30	30
Total	**420**	**420**

Table 42 shows the planned and actual number of waste samples collected from each facility.

Table 42. Planned and Actual Samples by Facility and Month, 2011

	February		April		June		August		October		December		Total	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Algona	15	15	15	15	15	15			15	15			**60**	**60**
Bow Lake	15	16			16	15	30	30	13	13	14	15	**88**	**89**
Cedar Falls*									1	1			**1**	**1**
Enumclaw					16	16					15	15	**31**	**31**
Factoria	15	15	14	14	15	15			14	14			**58**	**58**
Houghton	15	15			15	15			14	14	14	16	**58**	**60**
Renton			15	15			15	15			15	15	**45**	**45**
Shoreline			15	15			15	14			16	15	**46**	**44**
Skykomish*									1	1			**1**	**1**
Vashon			16	16					16	15			**32**	**31**
Total	**60**	**61**	**75**	**75**	**77**	**76**	**60**	**59**	**74**	**73**	**74**	**76**	**420**	**420**

**The Skykomish drop box was sampled at Houghton and the Cedar Falls drop box was sampled at Factoria.*

Apportion Sampling and Surveying Days

A total of 28 sampling days were scheduled for the 2011 study, divided into six sampling events lasting four to five days each. Waste was sampled from ten King County facilities, including eight transfer stations and two dropboxes.

Sites with relatively more vehicle traffic were allocated additional sampling days. For example, sampling at Bow Lake occurred six times during the study year while Algona, Factoria, and Houghton were sampled four times. Shoreline and Renton hosted waste sampling three times, the Enumclaw and Vashon facilities were visited twice. Waste disposed at the Skykomish and Cedar Falls facilities is consolidated into dropboxes. The dropboxes are then hauled to the Houghton and Factoria transfer stations, respectively. Because of this unique arrangement and because only self-haul customers use the two dropbox sites, self-haul residential samples from Skykomish and Cedar Falls were collected from the dropboxes as they were dumped at Houghton and Factoria.

Surveying was completed over 39 days, including one Saturday at each facility and across all three shifts at Bow Lake. Every sampling day including surveying but not every survey day included sampling.

Assign Facilities to Dates

To capture any seasonal variation in the composition of waste or the mix of vehicles using the transfer stations, sampling occurred every other month and surveying nearly every month starting in February 2011. Cascadia used the random function in Microsoft Excel to select the first sampling day each month. The random number generated was used to assign a first sampling day in February, April, or June to each facility. Subsequent sampling days at each site were then distributed based on the number of planned sampling days for that facility. The interval between sampling or surveying days at a site varied depending on how often the site was visited by the project team during the study period. Table 43 shows the sampling and surveying dates for each facility.

Table 43. Sampling and Surveying Calendar

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
February	Date(s)		8	9	10	11	
4 Shifts	Site(s)		Houghton	Factoria	Bow Lake-Day	Algona	
March	Date(s)					25	26
2 Shifts	Site(s)					Skykomish	Enumclaw
April	Date(s)	4	5	6	7	8	9
6 Shifts	Site(s)	Factoria	Algona	Shoreline	Renton	Vashon	Cedar Falls
May	Date(s)						
0 Shifts	Site(s)						
June	Date(s)	20	21	22	23	24	25
6 Shifts	Site(s)	Algona	Enumclaw	Bow Lake-24hrs.	Factoria	Houghton	Shoreline
July	Date(s)					15	16
2 Shifts	Site(s)					Cedar Falls	Skykomish
August	Date(s)	8	9	10	11		6,13
6 Shifts	Site(s)	Renton	Shoreline	Bow Lake-Day	Bow Lake-Eve		Bow Lake, Factoria
September	Date(s)					16	17
2 Shifts	Site(s)					Enumclaw	Algona
October	Date(s)	24	25	26	27	28	29
7 Shifts	Site(s)	Houghton, Cedar Falls	Factoria	Vashon	Algona	Bow Lake-Night	Renton
November	Date(s)						5
1 Shift	Site(s)						Houghton
December	Date(s)	12	13	14	15	16	
5 Shifts	Site(s)	Enumclaw, Algona	Bow Lake-Day	Houghton	Shoreline	Renton	
	# of Shifts	**6 Shifts**	**6 Shifts**	**8 Shifts**	**6 Shifts**	**8 Shifts**	**9 Shifts**

Determine Sampling Frequency

Sampling frequency refers to the process by which particular vehicles were selected for sampling. Vehicles were selected for sampling through a randomizing process that involved systematic selection of vehicles as they arrived at each facility during a sampling day. A staff member was designated as the "gatekeeper." The gatekeeper surveyed and counted all incoming vehicles and applied the process described below to select loads from which samples were extracted. The survey script is detailed in a following section.

For each sampling day and each waste stream, the expected number, *L*, of arriving loads from each stream was estimated, using the vehicle survey data obtained in 2008. The number *L* was then reduced by 20% (producing 0.8 x *L*). This was done in order to ensure that the targeted number of loads for each waste stream can selected on each sampling day, even if traffic was lighter than expected.

Next, the sampling interval *n* was determined to insure systematic sampling of vehicles. If *r* represents the number of samples needed for the waste stream, and .8 x *L* represents the number of expected loads from the waste stream, then *n* is calculated by dividing .8 x *L* by *r*. To help facilitate this process, a *Daily Vehicle Selection Sheet* was constructed for each day and every n^{th} vehicle was selected for sampling. An example of a sample vehicle selection sheet appears in Appendix I. Example Field Forms.

Field Procedures

Vehicle Surveys

All incoming vehicles were surveyed using the follow survey script.

AS THE VEHICLE APPROACHES:

Select a numbered card; record the number.

Decide whether the vehicle is a commercial hauler or self-haul (review the attached list of garbage companies) and record the collection type.

Observe and record the vehicle type (from the list on the survey form; ask driver if you are uncertain).

Observe and record whether they are pulling a trailer ("X" if yes).

STOP THE VEHICLE, THEN BEGIN QUESTIONS:

All Drivers:

Introduction: "Hello, King County is conducting a customer survey today."

Hand the driver the numbered card. "This card will be collected when you leave the facility. Please don't leave without returning the card."

Ask where the load is from. Refer to the sheet entitled "City of Origin." If the load is from somewhere not on the list of cities, verify whether the load is from Unincorporated King County, all over King County, or Outside King County. Record the city on the survey form.

Ask the driver whether the load is yard waste, construction/demolition/landclearing (CDL), mixed garbage, or special waste (refer to attached sheet for definition of special waste). Record the waste type.

If the waste type is yard waste or construction/demolition, ask the driver if he/she is a contractor/builder or a landscaper. Record only if he/she is contractor/builder or landscaper.

Ask the driver where the load was generated: single family residential, multifamily residential, mixed residential, residential and nonresidential, or nonresidential (business/institutional). Record the generator type.

Self-haul Drivers Only:

Ask the driver how often he/she visits any transfer station. Record the trips/period in terms of XX times per DAY, WEEK, MONTH or YEAR only. For example, write down 3/year if he/she says "once every four months."

Ask the driver from which ZIP code the load originated.

Skip if Contractor of Landscaper:

Ask the driver whether he/she has curbside garbage service (circle yes or no). [This question pertains to: a) home if the driver indicated the load is from his/her home or b) business if the driver indicated the load is from his/her business.]

Ask the driver why he/she is self-hauling today. If the driver previously answered "no" to having curbside garbage service, ask why he/she does not subscribe, instead of asking why he/she is self-hauling. Refer to the list provided to code the answer.

All Drivers:

Record any additional comments the driver may offer. Thank the driver for his/her time and responses.

AS THE VEHICLE DEPARTS THE FACILITY:

Remove the numbered card and ask for the transaction receipt.

If you have a two-person survey team, the second person will record the numbered card's number and the ticket number on the exit form.

If only one person is conducting the survey, you will record the ticket number on the survey form, making sure to write it next to the correct numbered card number.

Survey responses were recorded using customized *Customer Survey Forms*.

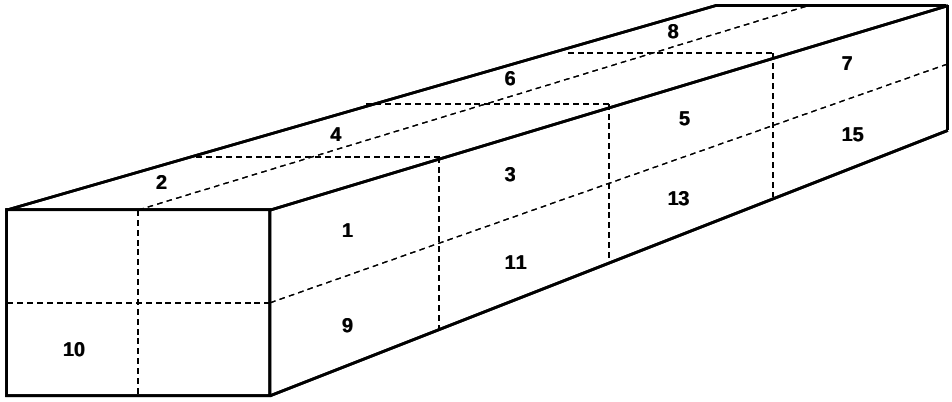
Obtaining Samples for Sorting

Using the process described in the previous section, the gatekeeper determined which vehicles were to be sampled. For a vehicle to be eligible for sampling, the load had to match one of the targeted waste stream categories. If the vehicle was eligible, and was the correct n^{th} vehicle, the gatekeeper placed a *Sample Placard* on the vehicle's windshield or dashboard. At the sorting area, the Sort Crew Manager intercepted the vehicle, took the *Sample Placard*, and recorded the sample ID number from the sample placard onto the *Material Weight Tally Sheet*. Examples of these field forms are included in Appendix I. Example Field Forms.

If selected for sampling, commercially collected loads arriving in compactors, roll-off containers, or packer trucks were instructed to dump their contents in an elongated pile. The sample was selected using an imaginary 16-cell grid (Figure 25) superimposed over the dumped material. The Sort Crew Manager then located the randomly pre-selected cell to be sorted. If the designated cell was blocked

due to site constraints, an alternate cell was randomly selected. Then, approximately 200 to 250 pounds of waste was extracted by machine or hand from the designated cell and placed on a tarp.

Figure 25. The 16 Cell Grid Applied to Selected Loads



Samples from large (greater than 500 pounds) self-haul loads were selected in much the same manner as commercially collected loads, using a random cell selection. If the self-haul load weighed less than 250 pounds, the entire load was sorted as a sample.

After the extracted material was deposited on the tarp, the Sort Crew Manager checked the weight of each sample manually. If judged to be too light, additional material was pulled from the same cell area until the desired weight was achieved. Samples judged to be excessively heavy were pared down by removing a homogenous slice of material from the tarp.

Sorting Samples

Once a sample was selected, extracted from the load, and placed on a clean tarp, it was sorted by hand into the 98 material types. Sorted materials were placed in plastic laundry baskets for weighing and recording. The Sort Crew Manager monitored the homogeneity of the baskets as material accumulated, rejecting items that were improperly classified. Open laundry baskets allowed the Sort Crew Manager to see the material at all times. The Sort Crew Manager also verified the purity of each component as it was weighed and recorded on the sampling form.

All sampling records were checked for accuracy, completeness, and legibility before being entered into a Microsoft Access database customized for this study.

Appendix B. Material Definitions

*Material types added to the material list for the 2011 study are noted with an asterisk.

Paper

Newspaper (ONP)—printed groundwood newsprint and other minimally bleached groundwood. This category also includes some glossy paper typically used in newspaper insert advertisements, unless found separately.

Plain Corrugated Cardboard (OCC/Kraft Bags)—Kraft linerboard, containerboard cartons, and shipping boxes with corrugated paper medium (unwaxed). This category also includes Kraft (brown) paper bags. Excludes waxed and plastic-coated cardboard, solid boxboard, and bags that are not pure unbleached Kraft.

Waxed Corrugated Cardboard*—Kraft linerboard, containerboard, cartons, and other boxes with a wax coating. Examples include commercial produce boxes.

Low Grade Recyclable Paper—all recyclable paper other than that listed in another category. This list includes magazines, phone books, junk mail, used envelopes, other material with sticky labels, construction paper, blueprint and thermal copy paper (NCR paper), fax paper, bright-dyed paper (fiesta or neon colors), paperback books, colored manila envelopes, and groundwood catalogues. This category also includes polycoated paperboard, aseptic packaging and other low-grade recyclable papers used in packaging, including polycoated or aseptic milk, ice cream, or juice containers, chipboard and other solid boxboard such as for beer, cereal, and soda cans, clothing forms, egg cartons (molded pulp), and other boxes.

High Grade Paper—white and lightly colored bond, rag, or stationary grade paper. This category is composed of high-grade paper, which includes white ledger, colored ledger, computer cards, bond, copy machine paper, manila envelopes and continuous-feed computer printouts and forms of various types. Excludes glossy coated paper such as magazines, bright papers, groundwood publications such as catalogs.

Single-use Food Service Compostable Paper*—includes paper soiled with food that was used in a "single use" capacity. Examples include, paper plates, pizza boxes, french-fry containers. Does not include napkins or paper towels.

Other Compostable Paper— includes paper soiled with food that was *not* used in a "single use" capacity. Examples include napkins, and paper towels. Also includes shredded paper.

Other Paper—includes materials that are primarily paper but combined with other materials that are not easily recyclable. Examples include frozen juice cans, oil cans, paper with foil laminates, foil-lined paper, spiral bound notebooks, carbon paper, photographs, poly-lined chipboard, microwave containers, gift wrapping paper, and hardcover books.

Plastics

PET Bottles—all bottles made from polyethylene terephthalate (PET), consisting of pop, oil, liquor, and other types of bottles (SPI code 1).

Other PET Containers*—PET containers other than bottles. Examples in include tubs, clamshells, cookie trays, etc. (SPI code 1).

HDPE Bottles—all bottles made of high-density polyethylene (HDPE), such as milk, juice, detergent, and other bottles (SPI code 2).

Other HDPE Containers*—HDPE containers other than bottles. Examples include some tubs and containers (SPI code 2).

Other #3-#7 Packaging*—all other rigid bottles and containers, with SPI codes 3 through 7.

Compostable Plastics*—all items made from compostable materials such as corn or potatoes, with the words "compostable" on the product.

Expanded Polystyrene Single Serve Food Packaging*—expanded polystyrene packaging used for carrying food. Examples include food trays, cups, plates, clamshells, egg cartons, and other packaging.

Other Expanded Polystyrene Packaging*—any expanded polystyrene packaging not used for food service, such as molded packing blocks and Styrofoam peanuts.

Expanded Polystyrene Products*—expanded polystyrene products such as some ice-chests, floatation devices, and EPS wig forms. This does not include EPS insulation, which is categorized in Construction/Demolition.

Recyclable Plastic Bags*—plastic shopping bags used to contain merchandise to transport from the place of purchase, given out by the store with the purchase. This type includes dry cleaning bags and newspaper bags intended for one-time use. Does not include produce bags.

Non-industrial Packaging Film Plastic*— all film used as food packaging or in another non-industrial capacity. Include produce bags, zip-lock bags, frozen vegetable bags, bread bags, food wrappers such as candy bar wrappers, deli bags, and other film packaging with a label or sticker.

Industrial Packaging Film Plastic*—film plastic used for large-scale packaging or transport packaging. Examples include shrink-wrap, mattress bags, furniture wrap, and film bubble wrap.

Plastic Garbage Bags*—plastic bags sold for use as trash bags, for both residential and commercial use. This type includes garbage, kitchen, compactor, can-liner, yard, lawn, leaf, and recycling bags. This type does not include other plastic bags, like shopping bags, that might have been used to contain trash.

Plastic Film Products*—Items made of film plastic not intended for a single use, such as shower curtains, kid's pools, and utility tarps.

Other Plastic Packaging—all other non-film packaging that does not fit into the above categories including caps, closures, rigid bubble packaging, plastic strapping, and other miscellaneous non-film packaging items.

Single Resin Plastic Products*—primarily rigid or solid consumer items made from a single resin type. Examples include dishware, utensils and other household items, vinyl products, plastic furniture and toys, car parts, and hangers. Also includes thermoset plastics such as Formica, fiberglass, and other related products.

Mixed Resin Plastic Products*—primarily rigid or solid consumer items made from more than one type of plastic resin. Examples include hair brushes, toothbrushes, and pens.

Foam Rubber and Padding—foam materials, consisting primarily of polyurethane, such as foam mattress pads.

Carpet Padding*—foam material used for carpet padding.

Plastic and Other Materials—items that are predominantly made of plastic, but are combined with other material, such as three-ring binders, some toys, razors, some kitchenware and car parts with wood or metal components.

Food

Packaged Vegetative Food—any vegetative food item such as pasta, grains, baked goods, beans, fruits, vegetables, sauces, soda, tea, juice and water where the package has remained intact. In the sorter's judgment, packaged vegetative food items *could* have been donated to a food bank or similar organization, rather than disposed. This category may include fresh fruits and vegetables (packaged in waxed boxes, for example) if, in the sorter's judgment, the food was not spoiled at the time of disposal.

Unpackaged/Scrap Vegetative Food—any vegetative food item such as pasta, grains, backed goods, beans, coffee grounds, fruits, vegetables, sauces, soda, tea bags, juice, water, and ice where the package has been opened or broken, the item is unpackaged, or where the vegetative food is found in scraps or pieces. In the sorter's judgment, theses food items *would not have been* acceptable for donation.

Packaged Non-vegetative Food—any non-vegetative food item such as fresh or canned meat or fish, cheeses, eggs, dairy items, and chili or soup containing meat, where the package has remained intact. In the sorter's judgment, packaged non-vegetative food items *could* have been donated to a food bank or similar organization, rather than disposed.

Unpackaged/Scrap Non-vegetative Food—any non-vegetative food item such fresh or canned meat or fish, cheeses, eggs, dairy items, and chili or soup containing meat, where the package has been opened or broken, the item is unpackaged, or where the food is found in scraps or pieces. In the sorter's judgment, theses food items *would not have been* acceptable for donation.

Wood and Yard

Dimensional Lumber/Engineered Wood—both clean and painted wood commonly used in construction for framing and related uses, including 2 x 4's, 2 x 6's, and sheets of plywood, strandboard, and particle board. Includes pallets and crates.

Treated Wood—wood treated with preservatives such as creosote, including dimension lumber. This category may also include some treated plywood, strandboard, chemically treated wood, and other wood.

Contaminated Wood—wood contaminated with other wastes in such a way that they cannot easily be separated, but consisting primarily (over 50 percent) of wood. Examples include wood with sheetrock attached.

Roofing and Siding Wood—painted or unpainted wood from demolition or construction waste that is commonly used for siding or roofing of buildings. This category includes only wood products, such as cedar shingles or shakes.

Stumps—stumps of trees and shrubs, with any adhering soil.

Large Prunings—other natural woods, such as logs and branches in excess of four inches in diameter (four inches is the limit used for defining prunings as yard wastes).

Yard Wastes—leaves, grass clippings, garden wastes, and brush up to four inches in diameter.

Other Wood—other types of wood including wood products that do not fit into the above categories.

Other Organics

Textiles: Clothes & Other Recyclables—fabric materials including natural and man-made textile materials such as cottons, wools, silks, woven nylon, rayon, polyesters and other materials. This category includes clothing, rags, curtains, and other fabrics.

Other Textiles—upholstery, shoes, and other non-recyclable products including leather products.

Disposable Diapers—diapers and similar products made from a combination of fibers, synthetic, and/or natural, and made for the purpose of a single use. Diapers that are all cloth and not originally intended for single use are classified as a textile. This category includes fecal matter contained within, sanitary napkins and tampons, and adult disposable protective undergarments.

Rubber Products—items made of natural and synthetic rubber, including door mats, car parts, hoses, rubber toys, and other products. This material type does not include tires or foam rubber.

Tires—whole tires from automobiles, trucks, motorcycles, bicycles, and other vehicles.

Animal Carcasses—carcasses of small animals and pieces of larger animals, unless the waste is the result of food storage or preparation.

Animal Feces—feces from animals, including kitty litter and bedding.

Miscellaneous Organics—hair, wax, soap, and other organics not otherwise classified.

Metals

Aluminum Cans—beverage cans composed of aluminum only.

Other Aluminum—other types of aluminum containers such as pans, some pet food cans, and trays; includes foil and foil products or packages and all other aluminum materials including furniture, house siding, cookware, and scrap.

Tinned Food Cans—tin-plated steel cans (food cans), does not include other bi-metals, paint cans, or other types of steel cans.

Other Ferrous—ferrous and alloyed ferrous scrap materials, without non metal contaminants, including household, industrial, and commercial products such as other cans and containers. This category includes scrap iron and steel to which a magnet adheres.

Other Non-Ferrous—metals that are not materials derived from iron, including copper, brass, bronze, aluminum bronze, lead, pewter, zinc, and other metals to which a magnet will not adhere. Examples include brass door knobs and copper pipes. Metals that are significantly contaminated are not included.

Mixed Metals (items <20% non-metal)*—composite, multi-metal products such as engines and electric motors with minor non metal contaminants. The metal content must be more than 80% by weight of the material.

Other Mixed Metals (items <20% non-metal)—metals combined with significant amounts of other materials, such as umbrellas and coated wire. The non metal content of the item must be greater than 20% by weight.

Compressed Gas Cylinders—metal gas tanks and cylinders most often used to contain propane or butane.

Glass

Clear Containers—bottles and jars that are clear in color; used for food, soft drinks, beer, and wine.

Green Containers—bottles and jars that are green in color; used for food, soft drinks, beer, and wine.

Brown Containers—bottles and jars that are brown in color; used for food, soft drinks, beer, and wine. This category also includes blue glass containers.

Kitchenware/Ceramics*—glass or ceramic cooking ware, dishware, and other products.

Other Glass—window glass, automotive glass, glass table-tops, mirrors, light bulbs and any other glass item that does not fit into a category above.

Electronics

Small Household Appliances*—small household appliances such as toasters, broilers, can openers, and blenders.

Audio/Visual Equipment*—stereos, VCRs, DVD players, large radios, and audio/visual equipment. This category does not include televisions or monitors.

Printers/Copiers/Fax Machines—computer printers (both inkjet and laser), facsimile machines, and photo copying machines.

Central Processing Units (CPUs)*—such as computer hard drives.

Computer Peripherals*—computer peripherals including keyboards, gaming controllers, and mice.

Other Electronics*—includes scanners, printers, personal digital assistants (PDAs), answering machines, electronic toys, and any other electronic item with some circuitry not categorized elsewhere.

Computer Monitors*—CRT computer monitors.

CRT Televisions*—televisions containing a cathode ray tube (CRT).

LCD/Other Televisions*—includes all non-CRT televisions.

LCD Monitors*—Liquid crystal display (LCD) and flat-screen monitors.

Laptops*—all laptop and notebook computers.

Cell Phones—cellular telephones.

Other Wastes

Construction/Demolition Waste (except wood)—construction, demolition, or land clearing waste that cannot be placed into one of the above categories, such as concrete, plaster, rocks, gravel, bricks, and non-wood roofing materials, and insulation of various types (including foam, fiberglass etc.).

Asphalt Shingles*—roofing material composed of fiberglass or organic felts saturated with asphalt and covered with asphalt and inert aggregates. Commonly known as three-tab roofing shingles.

Ash—material remaining after the combustion process, present in the waste stream as ash from fireplaces and wood stoves, used charcoal from grills, and similar materials.

Nondistinct Fines—soil, sand, dirt, and similar nondistinct materials.

Gypsum Wallboard—calcium sulfate dihydrate sandwiched between heavy layers of Kraft-type paper.

Furniture—furniture made of mixed materials and in any condition.

Mattresses—mattresses made of mixed materials and in any condition.

Carpet—general category of flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material.

Miscellaneous Inorganics—other non-combustible, inorganic material not classified elsewhere. Also includes non-C&D plaster and concrete statuary, or other products.

Household Hazardous/Special Waste

Used Oil—used lubricating oils, primarily used in cars but including other types with similar characteristics and oil filters.

Vehicle Batteries—car, motorcycle, and other lead-acid batteries used for motorized vehicles.

Household Batteries—batteries of various sizes and types, as commonly used in households, excluding alkaline and button cell batteries.

Latex Paint—water-based paints and similar products.

Oil-Based Paint—solvent-based paints, varnishes, and similar products.

Solvents and Thinners—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, and alcohols such as methanol and isopropanol.

Adhesives and Glue—glues and adhesives of various sorts, including rubber cement, wood putty, glazing and spackling compounds, caulking compounds, grout, and joint and auto body fillers.

Cleaners and Corrosives—various acids and bases whose primary purpose is to clean surfaces, unclog drains, or perform other actions.

Pesticides and Herbicides—variety of chemicals whose purpose is to discourage or kill pests, weeds, or microorganisms. Fungicides and wood preservatives, such as pentachlorophenol, are also included.

Gasoline and Fuel Oil—gasoline, diesel fuel, and fuel oils.

Antifreeze/Brake Fluid—automobile and other antifreeze mixtures based on ethylene or propylene glycol; also brake and other automotive fluids (except motor oil).

Medical Waste—wastes related to medical activities, including syringes, intravenous (I.V.) tubing, bandages, and other wastes.

Pharmaceuticals and Vitamins*—means 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.

Compact Fluorescent Bulbs*—all compact fluorescent bulbs.

Other Fluorescent Bulbs and Tubes*—includes other fluorescent lighting and fluorescent tube lighting.

Other Hazardous Waste—asbestos-containing wastes if this is the primary hazard associated with the waste; gunpowder, unspent ammunition, picric acid and other potentially explosive chemicals; radioactive materials (but smoke alarms are classified as "other plastic"); items that contain mercury, such as thermometers, thermostats, jewelry and mercury switches (alkaline and button cell batteries, which also contain mercury, are covered as a separate category of “Household Batteries”); and other hazardous wastes that do not fit into the above categories.

Appendix C. Waste Composition Calculation

Estimating Waste Composition

Waste composition estimates were calculated using a method that gave equal weighting or "importance" to each sample within a given stratum. Confidence intervals (error ranges) were calculated based on assumptions of normality in the composition estimates.

In the descriptions of calculation methods, the following variables are used frequently:

- *i* denotes an individual sample;
- *j* denotes the material type;
- c_j is the weight of the material type *j* in a sample;
- *w* is the weight of an entire sample;
- r_j is the composition estimate for material *j* (*r* stands for *ratio*);
- *s* denotes a particular stream or substream of the waste stream; and
- *n* denotes the number of samples in the particular group that is being analyzed at that step.

Estimating the Composition

For a given stratum (that is, for the samples belonging to the same generator type collected by the same hauler type), the composition estimate denoted by r_j represents the ratio of the component's weight to the total weight of all the samples in the stratum. This estimate was derived by summing each component's weight across all of the selected samples belonging to a given stratum and dividing by the sum of the total weight of waste for all of the samples in that stratum, 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; and
- for *j* = 1 to *m*, where *m* = number of components.

For example, the following simplified scenario involves three samples. For the purposes of this example, only the weights of the component *carpet* are shown.

	Sample 1	Sample 2	Sample 3
Weight (*c*) of *carpet* (in lbs)	5	3	4
Total Sample Weight (*w*) (in lbs)	80	70	90

$$r_{Carpet} = \sum \frac{5+3+4}{80+70+90} = 0.05$$

To find the composition estimate for the component *carpet*, the weights for that material are added for all selected samples and divided by the total sample weights of those samples. The resulting composition is 0.05, or 5%. In other words, 5% of the sampled material, by weight, is *carpet*. This finding is then projected onto the stratum being examined in this step of the analysis.

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

$$\mathrm{Var}(r_j) \approx \left(\frac{1}{n}\right)\left(\frac{1}{\bar{w}^2}\right)\left(\frac{\sum_i \left(c_{ij} - r_j w_i\right)^2}{n-1}\right)$$

where:

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

(For more information regarding Equation 2, refer to *Sampling Techniques, 3rd Edition* by William G. Cochran [John Wiley & Sons, Inc., 1977].)

Second, precision levels at the 90% confidence level were calculated for a component's mean as follows:

$$r_j \pm \left(z\sqrt{\mathrm{Var}(r_j)}\right)$$

where *z* = the value of the *z*-statistic (1.645) corresponding to a 90% confidence level.

Composition results for strata were then combined, using a weighted averaging method, to estimate the composition of larger portions of the waste stream (for example, the commercially collected residential

substream was combined with the commercially collected nonresidential substream to estimate the composition for the County's overall commercially collected waste stream). The relative tonnages associated with each stratum served as the weighting factors. The calculation was performed as follows:

$$O_j = \left(p_1 * r_{j1}\right) + (p_2 * r_{j2}) + (p_3 * r_{j3}) + \ldots$$

where:

- *p* = the proportion of tonnage contributed by the noted waste stratum (the weighting factor);
- *r* = ratio of component weight to total waste weight in the noted waste stratum (the composition percent for the given material component); and
- for *j* = 1 to *m*, where *m* = number of material components.

For example, the above equation is illustrated here using three waste strata.

	Stratum 1	**Stratum 2**	**Stratum 3**
Ratio (r) of *carpet*	5%	10%	10%
Tonnage	25,000	100,000	50,000
Proportion of tonnage (*p*)	14.3%	57.1%	28.6%

To estimate the portion of larger portions of the waste stream, the composition results for the three strata are combined as follows.

$$O_{Carpet} = (0.143 * 0.05) + (0.571 * 0.10) + (0.286 * 0.10) = 0.093 = 9.3\%$$

Therefore, 9.3% of this examined portion of the waste stream is *carpet*.

The variance of the weighted average was calculated as follows:

$$\mathrm{Var}(O_j) = \left(p_1^2\ \mathrm{Var}(r_{j1})\right) + \left(p_2^2\ \mathrm{Var}(r_{j2})\right) + \left(p_3^2\ \mathrm{Var}(r_{j3})\right) + \mathrm{K}$$

Estimating the Composition of King County's Overall Disposed Waste Stream

Composition results for all substreams were combined, using a weighted averaging method, to estimate the composition of the County's entire waste stream. The relative tonnages associated with each substream served as the weighting factors. The calculation was performed as follows:

$$O_j = \left(p_1 * r_{j1}\right) + (p_2 * r_{j2}) + (p_3 * r_{j3}) + \ldots$$

where:

- *p* = the proportion of tonnage contributed by the noted waste sector (the weighting factor);
- *r* = ratio of component weight to total waste weight in the noted waste sector (the composition percent for the given material component); and
- for *j* = 1 to *m*, where *m* = number of material components.

The following scenario illustrates the above equation. This example involves the component *carpet* in three waste sectors.

	Substream 1	**Substream 2**	**Substream 3**
Ratio of *carpet* (*r*)	0.05	0.10	0.15
Proportion of Tonnage (*p*)	50%	25%	25%

$$O_{Carpet} = (0.50 * 0.05) + (0.25 * 0.10) + (0.25 * 0.15) = 0.0875$$

So, it is estimated that 0.0875 or 8.75% of the entire waste stream is composed of *carpet*.

The variance of the weighted average was calculated as follows:

$$\mathrm{Var}(O_j) = \left(p_1^2\ \mathrm{Var}(r_{j1})\right) + \left(p_2^2\ \mathrm{Var}(r_{j2})\right) + \left(p_3^2\ \mathrm{Var}(r_{j3})\right) + \mathrm{K}$$

Appendix D. Detailed Waste Composition Results

This appendix contains the detailed composition tables for all substreams. The detailed composition tables show the mean, error range, and tons for each material type as well as the total substream tonnage and number of samples. In addition, this appendix contains the pie charts and top ten tables for the commercially collected single family and multifamily residential substreams.

Means and Error Ranges

The data from the sorting process were treated with a statistical procedure that provided two kinds of information for each of the *material types*:

- The percent-by-weight estimated composition of waste, represented by the samples examined in the study; and
- The degree of precision of the composition estimates.

All estimates of precision were calculated at the 90% confidence level. The equations used in these calculations appear in Appendix C. Waste Composition Calculation.

The example in Table 44 illustrates how the results can be interpreted. In this example, the best estimate of the amount of *unpackaged/scrap vegetative food* present in the universe of waste sampled is 12.0%. The figure 1.0% reflects the precision of the estimate. When calculations are performed at the 90% confidence level, we are 90% certain that the true amount of *unpackaged/scrap vegetative food* is between 12.0% plus 1.0% and 12.0% minus 1.0%. In other words, we are 90% certain that the mean lies between 11.0% and 13.0%.

Error Range (+/-)

The error range is a measure of the spread of values in a collection of data. For instance, if the quantities of *newspaper* were found to be nearly the same in each of the 420 samples collected for this study, the result would be a very narrow error range. By contrast, if some samples were comprised of 75% *newspaper* and others were 0% *newspaper,* the results would show a much broader error range.

Table 44. Example Composition

Material Type	Estimated Percent	+ / -
Unpackaged/Scrap Vegetative Food	12.0%	1.0%

Table 45. Detailed Composition, Overall Disposed Waste, 2011

Material	Estimated Percent	+ / -	Estimated Tons
Paper	**21.1%**		**170,771**
Newspaper (ONP)	1.2%	0.2%	9,877
Plain Corrugated Cardboard (OCC)	3.6%	0.5%	28,914
Waxed Corrugated Cardboard (OCC)	0.3%	0.2%	2,464
Low Grade Recyclable Paper	5.2%	0.5%	41,972
High Grade Paper	1.9%	0.4%	15,128
Single Use Food Service Compostable Paper	1.2%	0.2%	9,424
Other Compostable Paper	5.3%	0.5%	43,195
Other Paper	2.5%	0.5%	19,798
Plastic	**12.2%**		**98,409**
PET Bottles	0.7%	0.1%	5,556
Other PET Containers	0.2%	0.0%	1,592
HDPE Bottles	0.5%	0.1%	4,163
Other HDPE Containers	0.1%	0.0%	974
Other #3-#7 Packaging	0.7%	0.1%	5,412
Compostable Plastics	0.0%	0.0%	7
Expanded Polystyrene Single-serve Food Packaging	0.4%	0.1%	3,099
Other Expanded Polystyrene Packaging	0.2%	0.1%	1,436
Expanded Polystyrene Products	0.0%	0.0%	110
Recyclable Plastic Bags	0.3%	0.0%	2,336
Non-industrial Packaging Film Plastic	2.9%	0.4%	23,227
Industrial Packaging Film Plastic	0.6%	0.2%	5,035
Plastic Garbage Bags	1.6%	0.1%	12,851
Plastic Film Products	0.1%	0.0%	486
Other Plastic Packaging	0.7%	0.2%	5,421
Single Resin Plastic Products	1.2%	0.2%	9,489
Mixed Resin Plastic Products	0.3%	0.1%	2,296
Foam Rubber and Padding	0.3%	0.2%	2,209
Carpet Padding	0.4%	0.2%	2,961
Plastic and Other Materials	1.2%	0.5%	9,747
Food	**22.1%**		**178,660**
Packaged Vegetative Food	4.7%	0.8%	37,678
Unpackaged/Scrap Vegetative Food	12.0%	1.0%	97,240
Packaged Non-vegetative Food	1.7%	0.4%	13,426
Unpackaged/Scrap Non-vegetative Food	3.8%	0.6%	30,315
Wood/Yard	**13.6%**		**109,991**
Dimensional Lumber	4.6%	1.0%	36,942
Treated Wood	0.6%	0.3%	4,754
Contaminated Wood	1.1%	0.3%	8,980
Roofing and Siding Wood	0.6%	0.5%	5,156
Stumps	0.4%	0.3%	3,179
Large Prunings	0.3%	0.2%	2,532
Yard Waste	4.8%	1.1%	38,620
Other Wood	1.2%	0.4%	9,827
Other Organics	**11.9%**		**96,154**
Textiles: Clothes	1.7%	0.3%	13,418
Other Textiles	1.6%	0.6%	13,283
Disposable Diapers	3.5%	0.5%	28,200
Rubber Products	0.4%	0.2%	3,485
Tires	0.3%	0.2%	2,233
Animal Carcasses	0.0%	0.0%	303
Animal Feces	3.6%	0.7%	29,031
Miscellaneous Organics	0.8%	0.3%	6,201
Sample Count	**420**		

Material	Estimated Percent	+ / -	Estimated Tons
Metal	**6.3%**		**51,197**
Aluminum Cans	0.3%	0.0%	2,448
Other Aluminum	0.1%	0.0%	1,189
Tinned Food Cans	0.7%	0.1%	5,874
Other Ferrous	2.9%	0.9%	23,596
Other Non-Ferrous	0.4%	0.3%	3,199
Mixed Metals (items <20% non-metal)	1.0%	0.4%	8,234
Other Mixed Metals (items >20% non-metal)	0.8%	0.2%	6,321
Compressed Gas Cylinders	0.0%	0.0%	337
Glass	**2.5%**		**20,252**
Clear Glass Containers	0.9%	0.2%	7,065
Green Glass Containers	0.3%	0.1%	2,505
Brown Glass Containers	0.4%	0.1%	3,514
Kitchenware/Ceramics	0.2%	0.2%	1,232
Other Glass	0.7%	0.3%	5,935
Electronics	**0.5%**		**4,443**
Small Household Appliances	0.1%	0.1%	409
A/V Equipment	0.2%	0.3%	1,971
Printers/Copiers/Fax Machines	0.0%	0.0%	190
CPU's	0.0%	0.0%	162
Computer Peripherals	0.0%	0.0%	110
Other Electronics	0.1%	0.1%	1,106
CRT Computer Monitors	0.0%	0.0%	0
CRT TVs	0.1%	0.1%	492
LCD/Other TVs	0.0%	0.0%	0
LCD Computer Monitors	0.0%	0.0%	0
Laptops	0.0%	0.0%	0
Cell Phones	0.0%	0.0%	3
Other Wastes	**8.9%**		**71,749**
C&D Wastes	2.3%	0.7%	18,619
Asphalt Shingles	0.5%	0.4%	3,921
Ash	0.1%	0.1%	413
Nondistinct Fines	1.0%	0.4%	7,901
Gypsum Wallboard	1.7%	0.7%	13,507
Furniture	1.2%	0.7%	9,926
Mattresses	0.4%	0.1%	3,146
Carpet	1.5%	0.6%	12,439
Miscellaneous Inorganics	0.2%	0.2%	1,878
HHW/Special	**0.8%**		**6,326**
Used Oil	0.0%	0.0%	134
Vehicle Batteries	0.0%	0.0%	12
Household Batteries	0.0%	0.0%	148
Latex Paint	0.2%	0.1%	1,323
Oil-based Paint	0.0%	0.0%	14
Solvents and Thinners	0.0%	0.0%	109
Adhesives and Glue	0.0%	0.0%	37
Cleaners and Corrosives	0.0%	0.0%	213
Pesticides and Herbicides	0.0%	0.0%	167
Gasoline and Fuel Oil	0.0%	0.0%	16
Antifreeze/Brake Fluid	0.0%	0.0%	93
Medical Waste	0.3%	0.2%	2,309
Pharmaceuticals and Vitamins	0.0%	0.0%	105
Compact Flourescent Bulbs	0.0%	0.0%	18
Other Flourescent Bulbs/Tubes	0.0%	0.0%	79
Other Hazardous Waste	0.2%	0.2%	1,549
Totals	**100.0%**		**807,951**

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

Table 46. Detailed Composition, Residential Substreams, 2011

Material	Estimated Percent	+ / -	Estimated Tons
Paper	**16.3%**		**78,591**
Newspaper (ONP)	1.4%	0.4%	6,661
Plain Corrugated Cardboard (OCC)	2.4%	0.5%	11,776
Waxed Corrugated Cardboard (OCC)	0.1%	0.1%	351
Low Grade Recyclable Paper	4.5%	0.6%	21,595
High Grade Paper	1.1%	0.3%	5,142
Single Use Food Service Compostable Paper	0.6%	0.1%	2,842
Other Compostable Paper	4.8%	0.5%	23,085
Other Paper	1.5%	0.3%	7,138
Plastic	**11.0%**		**52,868**
PET Bottles	0.7%	0.1%	3,220
Other PET Containers	0.2%	0.0%	885
HDPE Bottles	0.5%	0.1%	2,215
Other HDPE Containers	0.1%	0.0%	479
Other #3-#7 Packaging	0.6%	0.1%	3,083
Compostable Plastics	0.0%	0.0%	0
Expanded Polystyrene Single-serve Food Packaging	0.4%	0.0%	1,745
Other Expanded Polystyrene Packaging	0.1%	0.0%	555
Expanded Polystyrene Products	0.0%	0.0%	66
Recyclable Plastic Bags	0.4%	0.0%	1,752
Non-industrial Packaging Film Plastic	2.3%	0.2%	10,903
Industrial Packaging Film Plastic	0.3%	0.2%	1,400
Plastic Garbage Bags	1.2%	0.1%	5,721
Plastic Film Products	0.0%	0.0%	212
Other Plastic Packaging	0.5%	0.1%	2,558
Single Resin Plastic Products	1.3%	0.3%	6,063
Mixed Resin Plastic Products	0.4%	0.2%	1,890
Foam Rubber and Padding	0.4%	0.4%	2,150
Carpet Padding	0.5%	0.3%	2,542
Plastic and Other Materials	1.1%	0.3%	5,429
Food	**20.0%**		**96,320**
Packaged Vegetative Food	4.0%	0.6%	19,083
Unpackaged/Scrap Vegetative Food	11.4%	1.2%	55,031
Packaged Non-vegetative Food	1.9%	0.6%	8,989
Unpackaged/Scrap Non-vegetative Food	2.7%	0.5%	13,217
Wood/Yard	**15.5%**		**74,835**
Dimensional Lumber	5.5%	1.5%	26,608
Treated Wood	0.5%	0.3%	2,648
Contaminated Wood	0.9%	0.5%	4,211
Roofing and Siding Wood	0.9%	0.8%	4,479
Stumps	0.4%	0.4%	2,083
Large Prunings	0.4%	0.4%	2,047
Yard Waste	5.8%	1.7%	28,072
Other Wood	1.0%	0.6%	4,687
Other Organics	**15.0%**		**72,413**
Textiles: Clothes	1.9%	0.3%	9,287
Other Textiles	1.9%	1.0%	9,371
Disposable Diapers	4.8%	0.7%	23,003
Rubber Products	0.2%	0.1%	981
Tires	0.5%	0.3%	2,231
Animal Carcasses	0.0%	0.0%	210
Animal Feces	5.0%	1.0%	24,042
Miscellaneous Organics	0.7%	0.2%	3,290
Sample Count	**236**		

Material	Estimated Percent	+ / -	Estimated Tons
Metal	**7.2%**		**34,690**
Aluminum Cans	0.3%	0.0%	1,284
Other Aluminum	0.2%	0.0%	731
Tinned Food Cans	0.5%	0.1%	2,627
Other Ferrous	3.3%	1.3%	16,058
Other Non-Ferrous	0.6%	0.5%	3,009
Mixed Metals (items <20% non-metal)	1.4%	0.6%	6,984
Other Mixed Metals (items >20% non-metal)	0.8%	0.3%	3,716
Compressed Gas Cylinders	0.1%	0.1%	280
Glass	**2.3%**		**11,106**
Clear Glass Containers	0.9%	0.2%	4,170
Green Glass Containers	0.3%	0.1%	1,441
Brown Glass Containers	0.5%	0.1%	2,308
Kitchenware/Ceramics	0.2%	0.3%	1,197
Other Glass	0.4%	0.2%	1,990
Electronics	**0.7%**		**3,600**
Small Household Appliances	0.0%	0.0%	0
A/V Equipment	0.4%	0.5%	1,930
Printers/Copiers/Fax Machines	0.0%	0.1%	190
CPU's	0.0%	0.0%	162
Computer Peripherals	0.0%	0.0%	19
Other Electronics	0.2%	0.1%	917
CRT Computer Monitors	0.0%	0.0%	0
CRT TVs	0.1%	0.1%	380
LCD/Other TVs	0.0%	0.0%	0
LCD Computer Monitors	0.0%	0.0%	0
Laptops	0.0%	0.0%	0
Cell Phones	0.0%	0.0%	2
Other Wastes	**11.5%**		**55,222**
C&D Wastes	2.8%	1.0%	13,268
Asphalt Shingles	0.8%	0.6%	3,753
Ash	0.1%	0.1%	413
Nondistinct Fines	1.1%	0.6%	5,219
Gypsum Wallboard	1.7%	0.9%	8,157
Furniture	2.0%	1.1%	9,575
Mattresses	0.6%	0.2%	3,034
Carpet	2.3%	1.0%	10,970
Miscellaneous Inorganics	0.2%	0.1%	833
HHW/Special	**0.5%**		**2,556**
Used Oil	0.0%	0.0%	93
Vehicle Batteries	0.0%	0.0%	11
Household Batteries	0.0%	0.0%	119
Latex Paint	0.1%	0.1%	701
Oil-based Paint	0.0%	0.0%	14
Solvents and Thinners	0.0%	0.0%	102
Adhesives and Glue	0.0%	0.0%	25
Cleaners and Corrosives	0.0%	0.0%	91
Pesticides and Herbicides	0.0%	0.1%	162
Gasoline and Fuel Oil	0.0%	0.0%	5
Antifreeze/Brake Fluid	0.0%	0.0%	93
Medical Waste	0.1%	0.1%	529
Pharmaceuticals and Vitamins	0.0%	0.0%	83
Compact Flourescent Bulbs	0.0%	0.0%	17
Other Flourescent Bulbs/Tubes	0.0%	0.0%	69
Other Hazardous Waste	0.1%	0.1%	441
Totals	**100.0%**		**482,202**

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

Table 47. Detailed Composition, Nonresidential Substreams, 2011

Material	Estimated Percent	+ / -	Estimated Tons	Material	Estimated Percent	+ / -	Estimated Tons
Paper	**28.3%**		**92,180**	**Metal**	**5.1%**		**16,507**
Newspaper (ONP)	1.0%	0.3%	3,215	Aluminum Cans	0.4%	0.1%	1,164
Plain Corrugated Cardboard (OCC)	5.3%	1.1%	17,137	Other Aluminum	0.1%	0.1%	457
Waxed Corrugated Cardboard (OCC)	0.6%	0.4%	2,113	Tinned Food Cans	1.0%	0.3%	3,247
Low Grade Recyclable Paper	6.3%	1.0%	20,377	Other Ferrous	2.3%	1.1%	7,539
High Grade Paper	3.1%	1.0%	9,986	Other Non-Ferrous	0.1%	0.0%	191
Single Use Food Service Compostable Paper	2.0%	0.4%	6,582	Mixed Metals (items <20% non-metal)	0.4%	0.2%	1,249
Other Compostable Paper	6.2%	0.9%	20,110	Other Mixed Metals (items >20% non-metal)	0.8%	0.2%	2,605
Other Paper	3.9%	1.2%	12,660	Compressed Gas Cylinders	0.0%	0.0%	56
Plastic	**14.0%**		**45,540**	**Glass**	**2.8%**		**9,146**
PET Bottles	0.7%	0.1%	2,336	Clear Glass Containers	0.9%	0.4%	2,895
Other PET Containers	0.2%	0.0%	707	Green Glass Containers	0.3%	0.1%	1,064
HDPE Bottles	0.6%	0.1%	1,948	Brown Glass Containers	0.4%	0.1%	1,206
Other HDPE Containers	0.2%	0.1%	495	Kitchenware/Ceramics	0.0%	0.0%	35
Other #3-#7 Packaging	0.7%	0.2%	2,329	Other Glass	1.2%	0.8%	3,945
Compostable Plastics	0.0%	0.0%	7				
Expanded Polystyrene Single-serve Food Packaging	0.4%	0.2%	1,354	**Electronics**	**0.3%**		**843**
Other Expanded Polystyrene Packaging	0.3%	0.1%	881	Small Household Appliances	0.1%	0.1%	409
Expanded Polystyrene Products	0.0%	0.0%	45	A/V Equipment	0.0%	0.0%	41
Recyclable Plastic Bags	0.2%	0.0%	585	Printers/Copiers/Fax Machines	0.0%	0.0%	0
Non-industrial Packaging Film Plastic	3.8%	0.9%	12,324	CPU's	0.0%	0.0%	0
Industrial Packaging Film Plastic	1.1%	0.5%	3,635	Computer Peripherals	0.0%	0.0%	91
Plastic Garbage Bags	2.2%	0.3%	7,130	Other Electronics	0.1%	0.1%	189
Plastic Film Products	0.1%	0.1%	274	CRT Computer Monitors	0.0%	0.0%	0
Other Plastic Packaging	0.9%	0.4%	2,864	CRT TVs	0.0%	0.1%	112
Single Resin Plastic Products	1.1%	0.3%	3,425	LCD/Other TVs	0.0%	0.0%	0
Mixed Resin Plastic Products	0.1%	0.1%	406	LCD Computer Monitors	0.0%	0.0%	0
Foam Rubber and Padding	0.0%	0.0%	59	Laptops	0.0%	0.0%	0
Carpet Padding	0.1%	0.1%	419	Cell Phones	0.0%	0.0%	1
Plastic and Other Materials	1.3%	1.0%	4,319				
				Other Wastes	**5.1%**		**16,527**
Food	**25.3%**		**82,339**	C&D Wastes	1.6%	0.8%	5,351
Packaged Vegetative Food	5.7%	1.8%	18,596	Asphalt Shingles	0.1%	0.0%	168
Unpackaged/Scrap Vegetative Food	13.0%	1.7%	42,209	Ash	0.0%	0.0%	0
Packaged Non-vegetative Food	1.4%	0.4%	4,437	Nondistinct Fines	0.8%	0.6%	2,682
Unpackaged/Scrap Non-vegetative Food	5.2%	1.3%	17,098	Gypsum Wallboard	1.6%	1.0%	5,351
				Furniture	0.1%	0.2%	350
Wood/Yard	**10.8%**		**35,156**	Mattresses	0.0%	0.1%	111
Dimensional Lumber	3.2%	0.9%	10,335	Carpet	0.5%	0.3%	1,468
Treated Wood	0.6%	0.6%	2,106	Miscellaneous Inorganics	0.3%	0.4%	1,045
Contaminated Wood	1.5%	0.3%	4,769				
Roofing and Siding Wood	0.2%	0.1%	677	**HHW/Special**	**1.2%**		**3,769**
Stumps	0.3%	0.0%	1,096	Used Oil	0.0%	0.0%	41
Large Prunings	0.1%	0.1%	484	Vehicle Batteries	0.0%	0.0%	2
Yard Waste	3.2%	1.2%	10,549	Household Batteries	0.0%	0.0%	29
Other Wood	1.6%	0.6%	5,140	Latex Paint	0.2%	0.1%	621
				Oil-based Paint	0.0%	0.0%	0
Other Organics	**7.3%**		**23,741**	Solvents and Thinners	0.0%	0.0%	6
Textiles: Clothes	1.3%	0.5%	4,131	Adhesives and Glue	0.0%	0.0%	13
Other Textiles	1.2%	0.4%	3,913	Cleaners and Corrosives	0.0%	0.0%	122
Disposable Diapers	1.6%	0.4%	5,197	Pesticides and Herbicides	0.0%	0.0%	5
Rubber Products	0.8%	0.5%	2,505	Gasoline and Fuel Oil	0.0%	0.0%	11
Tires	0.0%	0.0%	2	Antifreeze/Brake Fluid	0.0%	0.0%	0
Animal Carcasses	0.0%	0.0%	93	Medical Waste	0.5%	0.4%	1,780
Animal Feces	1.5%	0.9%	4,989	Pharmaceuticals and Vitamins	0.0%	0.0%	22
Miscellaneous Organics	0.9%	0.7%	2,911	Compact Flourescent Bulbs	0.0%	0.0%	1
				Other Flourescent Bulbs/Tubes	0.0%	0.0%	9
				Other Hazardous Waste	0.3%	0.4%	1,108
Sample Count	**184**			**Totals**	**100.0%**		**325,749**

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

Table 48. Detailed Composition, Commercially Collected Substreams, 2011

Material	Estimated Percent	+ / -	Estimated Tons	Material	Estimated Percent	+ / -	Estimated Tons
Paper	**25.8%**		**158,119**	**Metal**	**4.9%**		**30,209**
Newspaper (ONP)	1.5%	0.3%	9,283	Aluminum Cans	0.4%	0.0%	2,272
Plain Corrugated Cardboard (OCC)	4.1%	0.6%	25,165	Other Aluminum	0.2%	0.0%	1,036
Waxed Corrugated Cardboard (OCC)	0.4%	0.2%	2,464	Tinned Food Cans	0.9%	0.2%	5,609
Low Grade Recyclable Paper	6.3%	0.7%	38,542	Other Ferrous	2.3%	1.0%	13,924
High Grade Paper	2.3%	0.6%	14,279	Other Non-Ferrous	0.1%	0.0%	490
Single Use Food Service Compostable Paper	1.5%	0.2%	9,241	Mixed Metals (items <20% non-metal)	0.5%	0.2%	3,039
Other Compostable Paper	6.7%	0.6%	41,041	Other Mixed Metals (items >20% non-metal)	0.6%	0.2%	3,694
Other Paper	3.0%	0.7%	18,104	Compressed Gas Cylinders	0.0%	0.0%	145
Plastic	**13.0%**		**79,745**	**Glass**	**2.6%**		**15,912**
PET Bottles	0.8%	0.1%	5,172	Clear Glass Containers	0.9%	0.1%	5,706
Other PET Containers	0.2%	0.0%	1,528	Green Glass Containers	0.4%	0.1%	2,308
HDPE Bottles	0.6%	0.1%	3,875	Brown Glass Containers	0.5%	0.1%	3,129
Other HDPE Containers	0.1%	0.0%	754	Kitchenware/Ceramics	0.0%	0.0%	67
Other #3-#7 Packaging	0.8%	0.1%	4,883	Other Glass	0.8%	0.4%	4,702
Compostable Plastics	0.0%	0.0%	7				
Expanded Polystyrene Single-serve Food Packaging	0.5%	0.1%	2,998	**Electronics**	**0.4%**		**2,194**
Other Expanded Polystyrene Packaging	0.2%	0.1%	1,215	Small Household Appliances	0.1%	0.1%	409
Expanded Polystyrene Products	0.0%	0.0%	85	A/V Equipment	0.1%	0.1%	483
Recyclable Plastic Bags	0.4%	0.0%	2,210	Printers/Copiers/Fax Machines	0.0%	0.0%	190
Non-industrial Packaging Film Plastic	3.6%	0.5%	22,222	CPU's	0.0%	0.0%	162
Industrial Packaging Film Plastic	0.6%	0.3%	3,938	Computer Peripherals	0.0%	0.0%	46
Plastic Garbage Bags	2.0%	0.2%	12,140	Other Electronics	0.1%	0.1%	522
Plastic Film Products	0.0%	0.0%	273	CRT Computer Monitors	0.0%	0.0%	0
Other Plastic Packaging	0.9%	0.2%	5,258	CRT TVs	0.1%	0.1%	380
Single Resin Plastic Products	1.0%	0.2%	6,001	LCD/Other TVs	0.0%	0.0%	0
Mixed Resin Plastic Products	0.2%	0.1%	1,125	LCD Computer Monitors	0.0%	0.0%	0
Foam Rubber and Padding	0.0%	0.0%	273	Laptops	0.0%	0.0%	0
Carpet Padding	0.1%	0.1%	624	Cell Phones	0.0%	0.0%	3
Plastic and Other Materials	0.8%	0.2%	5,162				
				Other Wastes	**3.3%**		**20,002**
Food	**28.2%**		**172,676**	C&D Wastes	1.2%	0.6%	7,636
Packaged Vegetative Food	5.8%	1.1%	35,344	Asphalt Shingles	0.0%	0.0%	6
Unpackaged/Scrap Vegetative Food	15.5%	1.3%	94,769	Ash	0.0%	0.0%	146
Packaged Non-vegetative Food	2.1%	0.5%	12,742	Nondistinct Fines	0.8%	0.4%	4,618
Unpackaged/Scrap Non-vegetative Food	4.9%	0.8%	29,821	Gypsum Wallboard	0.5%	0.5%	3,201
				Furniture	0.0%	0.0%	217
Wood/Yard	**7.0%**		**43,059**	Mattresses	0.0%	0.0%	18
Dimensional Lumber	2.1%	0.5%	12,580	Carpet	0.4%	0.2%	2,671
Treated Wood	0.4%	0.4%	2,458	Miscellaneous Inorganics	0.2%	0.2%	1,490
Contaminated Wood	0.5%	0.3%	3,272				
Roofing and Siding Wood	0.1%	0.1%	455	**HHW/Special**	**0.8%**		**4,650**
Stumps	0.0%	0.0%	0	Used Oil	0.0%	0.0%	102
Large Prunings	0.1%	0.1%	670	Vehicle Batteries	0.0%	0.0%	12
Yard Waste	3.0%	0.8%	18,537	Household Batteries	0.0%	0.0%	142
Other Wood	0.8%	0.5%	5,087	Latex Paint	0.1%	0.1%	820
				Oil-based Paint	0.0%	0.0%	0
Other Organics	**14.0%**		**85,471**	Solvents and Thinners	0.0%	0.0%	109
Textiles: Clothes	1.9%	0.4%	11,917	Adhesives and Glue	0.0%	0.0%	37
Other Textiles	1.9%	0.8%	11,462	Cleaners and Corrosives	0.0%	0.0%	182
Disposable Diapers	4.3%	0.6%	26,613	Pesticides and Herbicides	0.0%	0.0%	5
Rubber Products	0.3%	0.2%	2,047	Gasoline and Fuel Oil	0.0%	0.0%	11
Tires	0.0%	0.1%	200	Antifreeze/Brake Fluid	0.0%	0.0%	86
Animal Carcasses	0.0%	0.0%	192	Medical Waste	0.3%	0.2%	1,858
Animal Feces	4.5%	0.9%	27,299	Pharmaceuticals and Vitamins	0.0%	0.0%	105
Miscellaneous Organics	0.9%	0.4%	5,741	Compact Flourescent Bulbs	0.0%	0.0%	18
				Other Flourescent Bulbs/Tubes	0.0%	0.0%	8
				Other Hazardous Waste	0.2%	0.2%	1,156
Sample Count	**261**			**Totals**	**100.0%**		**612,038**

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

Table 49. Detailed Composition, Commercially Collected Residential Substream, 2011

Material	Estimated Percent	+ / -	Estimated Tons	Material	Estimated Percent	+ / -	Estimated Tons
Paper	**21.8%**		**67,728**	**Metal**	**5.1%**		**15,748**
Newspaper (ONP)	2.0%	0.6%	6,087	Aluminum Cans	0.4%	0.0%	1,149
Plain Corrugated Cardboard (OCC)	2.7%	0.6%	8,343	Other Aluminum	0.2%	0.1%	579
Waxed Corrugated Cardboard (OCC)	0.1%	0.2%	351	Tinned Food Cans	0.8%	0.1%	2,363
Low Grade Recyclable Paper	5.9%	0.7%	18,349	Other Ferrous	2.2%	1.5%	6,755
High Grade Paper	1.5%	0.4%	4,534	Other Non-Ferrous	0.1%	0.1%	300
Single Use Food Service Compostable Paper	0.9%	0.2%	2,679	Mixed Metals (items <20% non-metal)	0.6%	0.3%	1,903
Other Compostable Paper	6.8%	0.7%	21,132	Other Mixed Metals (items >20% non-metal)	0.8%	0.4%	2,611
Other Paper	2.0%	0.4%	6,252	Compressed Gas Cylinders	0.0%	0.0%	89
Plastic	**12.2%**		**37,893**	**Glass**	**2.4%**		**7,527**
PET Bottles	0.9%	0.1%	2,849	Clear Glass Containers	1.1%	0.3%	3,455
Other PET Containers	0.3%	0.0%	822	Green Glass Containers	0.4%	0.1%	1,362
HDPE Bottles	0.6%	0.1%	1,933	Brown Glass Containers	0.6%	0.2%	1,922
Other HDPE Containers	0.1%	0.1%	279	Kitchenware/Ceramics	0.0%	0.0%	31
Other #3-#7 Packaging	0.8%	0.1%	2,579	Other Glass	0.2%	0.1%	757
Compostable Plastics	0.0%	0.0%	0				
Expanded Polystyrene Single-serve Food Packaging	0.5%	0.1%	1,646	**Electronics**	**0.5%**		**1,596**
Other Expanded Polystyrene Packaging	0.1%	0.0%	335	Small Household Appliances	0.0%	0.0%	0
Expanded Polystyrene Products	0.0%	0.0%	40	A/V Equipment	0.1%	0.1%	442
Recyclable Plastic Bags	0.5%	0.1%	1,649	Printers/Copiers/Fax Machines	0.1%	0.1%	190
Non-industrial Packaging Film Plastic	3.2%	0.3%	10,003	CPU's	0.1%	0.1%	162
Industrial Packaging Film Plastic	0.2%	0.1%	669	Computer Peripherals	0.0%	0.0%	2
Plastic Garbage Bags	1.6%	0.1%	5,077	Other Electronics	0.1%	0.1%	418
Plastic Film Products	0.0%	0.0%	60	CRT Computer Monitors	0.0%	0.0%	0
Other Plastic Packaging	0.8%	0.1%	2,410	CRT TVs	0.1%	0.1%	380
Single Resin Plastic Products	1.0%	0.3%	3,184	LCD/Other TVs	0.0%	0.0%	0
Mixed Resin Plastic Products	0.2%	0.1%	733	LCD Computer Monitors	0.0%	0.0%	0
Foam Rubber and Padding	0.1%	0.1%	234	Laptops	0.0%	0.0%	0
Carpet Padding	0.1%	0.1%	205	Cell Phones	0.0%	0.0%	2
Plastic and Other Materials	1.0%	0.3%	3,187				
				Other Wastes	**2.7%**		**8,413**
Food	**29.1%**		**90,498**	C&D Wastes	1.2%	0.8%	3,799
Packaged Vegetative Food	5.4%	0.9%	16,850	Asphalt Shingles	0.0%	0.0%	4
Unpackaged/Scrap Vegetative Food	16.9%	1.8%	52,580	Ash	0.0%	0.1%	146
Packaged Non-vegetative Food	2.7%	0.9%	8,338	Nondistinct Fines	0.6%	0.4%	1,988
Unpackaged/Scrap Non-vegetative Food	4.1%	0.8%	12,729	Gypsum Wallboard	0.1%	0.1%	300
				Furniture	0.1%	0.1%	170
Wood/Yard	**5.5%**		**17,120**	Mattresses	0.0%	0.0%	0
Dimensional Lumber	1.1%	0.4%	3,466	Carpet	0.5%	0.3%	1,487
Treated Wood	0.2%	0.2%	760	Miscellaneous Inorganics	0.2%	0.2%	520
Contaminated Wood	0.5%	0.6%	1,670				
Roofing and Siding Wood	0.1%	0.1%	226	**HHW/Special**	**0.4%**		**1,093**
Stumps	0.0%	0.0%	0	Used Oil	0.0%	0.0%	61
Large Prunings	0.2%	0.2%	472	Vehicle Batteries	0.0%	0.0%	11
Yard Waste	2.7%	0.9%	8,416	Household Batteries	0.0%	0.0%	113
Other Wood	0.7%	0.7%	2,110	Latex Paint	0.1%	0.1%	203
				Oil-based Paint	0.0%	0.0%	0
Other Organics	**20.4%**		**63,437**	Solvents and Thinners	0.0%	0.1%	102
Textiles: Clothes	2.5%	0.4%	7,800	Adhesives and Glue	0.0%	0.0%	25
Other Textiles	2.5%	1.5%	7,625	Cleaners and Corrosives	0.0%	0.0%	60
Disposable Diapers	7.0%	1.1%	21,823	Pesticides and Herbicides	0.0%	0.0%	0
Rubber Products	0.2%	0.1%	640	Gasoline and Fuel Oil	0.0%	0.0%	0
Tires	0.1%	0.1%	197	Antifreeze/Brake Fluid	0.0%	0.0%	86
Animal Carcasses	0.0%	0.0%	109	Medical Waste	0.1%	0.1%	279
Animal Feces	7.2%	1.4%	22,331	Pharmaceuticals and Vitamins	0.0%	0.0%	83
Miscellaneous Organics	0.9%	0.3%	2,913	Compact Flourescent Bulbs	0.0%	0.0%	17
				Other Flourescent Bulbs/Tubes	0.0%	0.0%	6
				Other Hazardous Waste	0.0%	0.0%	48
Sample Count	**101**			**Totals**	**100.0%**		**311,053**

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

Figure 26. Waste Recoverability, Commercially Collected Single Family Residential Substream, 2011

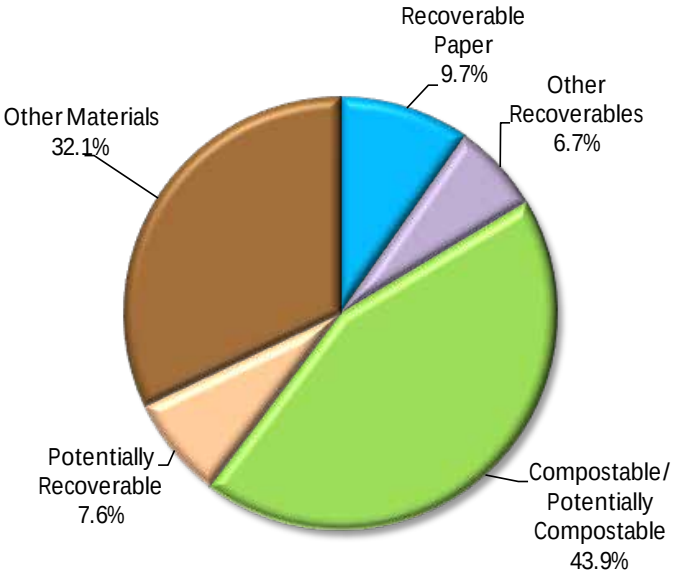


Figure 27. Waste Composition, Commercially Collected Single Family Residential Substream, 2011

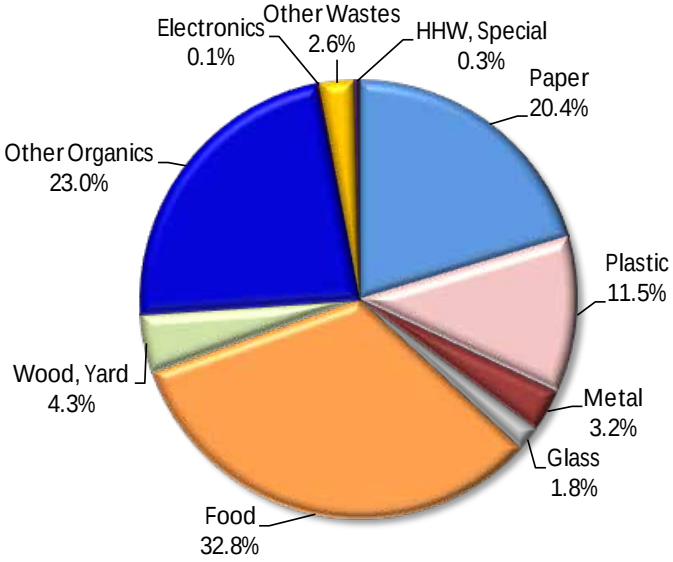


Table 50. Ten Most Prevalent Disposed Materials, Commercially Collected Single Family Residential Substream, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Unpackaged/Scrap Vegetative Food	17.9%	17.9%	33,455
Animal Feces	8.5%	26.4%	15,876
Other Compostable Paper	7.7%	34.1%	14,430
Disposable Diapers	7.4%	41.5%	13,843
Packaged Vegetative Food	6.7%	48.2%	12,591
Low Grade Recyclable Paper	5.5%	53.7%	10,380
Unpackaged/Scrap Non-vegetative Food	4.6%	58.3%	8,653
Non-industrial Packaging Film Plastic	3.6%	61.9%	6,730
Packaged Non-vegetative Food	3.5%	65.5%	6,645
Textiles: Clothes	2.8%	68.3%	5,202
Subtotal	***68.3%***		***127,806***
All other materials	31.7%		59,401
Total	**100.0%**		**187,206**

Table 51. Detailed Composition, Commercially Collected Single Family Residential Substream, 2011

Material	Estimated Percent	+ / -	Estimated Tons
Paper	**20.4%**		**38,152**
Newspaper (ONP)	1.3%	0.6%	2,477
Plain Corrugated Cardboard (OCC)	1.5%	0.3%	2,739
Waxed Corrugated Cardboard (OCC)	0.2%	0.3%	351
Low Grade Recyclable Paper	5.5%	1.1%	10,380
High Grade Paper	1.4%	0.5%	2,617
Single Use Food Service Compostable Paper	0.8%	0.2%	1,497
Other Compostable Paper	7.7%	1.0%	14,430
Other Paper	2.0%	0.5%	3,661
Plastic	**11.5%**		**21,554**
PET Bottles	0.8%	0.1%	1,447
Other PET Containers	0.3%	0.1%	597
HDPE Bottles	0.5%	0.1%	1,017
Other HDPE Containers	0.1%	0.1%	215
Other #3-#7 Packaging	0.9%	0.1%	1,627
Compostable Plastics	0.0%	0.0%	0
Expanded Polystyrene Single-serve Food Packaging	0.5%	0.1%	1,005
Other Expanded Polystyrene Packaging	0.1%	0.1%	199
Expanded Polystyrene Products	0.0%	0.0%	4
Recyclable Plastic Bags	0.5%	0.1%	922
Non-industrial Packaging Film Plastic	3.6%	0.4%	6,730
Industrial Packaging Film Plastic	0.1%	0.1%	270
Plastic Garbage Bags	1.6%	0.2%	3,007
Plastic Film Products	0.0%	0.0%	51
Other Plastic Packaging	0.8%	0.1%	1,466
Single Resin Plastic Products	0.6%	0.1%	1,119
Mixed Resin Plastic Products	0.2%	0.1%	329
Foam Rubber and Padding	0.0%	0.0%	9
Carpet Padding	0.1%	0.1%	196
Plastic and Other Materials	0.7%	0.2%	1,344
Food	**32.8%**		**61,343**
Packaged Vegetative Food	6.7%	1.4%	12,591
Unpackaged/Scrap Vegetative Food	17.9%	2.3%	33,455
Packaged Non-vegetative Food	3.5%	1.4%	6,645
Unpackaged/Scrap Non-vegetative Food	4.6%	1.1%	8,653
Wood/Yard	**4.3%**		**8,102**
Dimensional Lumber	0.5%	0.2%	999
Treated Wood	0.3%	0.4%	570
Contaminated Wood	0.8%	0.9%	1,469
Roofing and Siding Wood	0.0%	0.1%	73
Stumps	0.0%	0.0%	0
Large Prunings	0.2%	0.3%	459
Yard Waste	2.2%	1.0%	4,113
Other Wood	0.2%	0.2%	420
Other Organics	**23.0%**		**43,085**
Textiles: Clothes	2.8%	0.6%	5,202
Other Textiles	2.7%	2.4%	5,113
Disposable Diapers	7.4%	1.3%	13,843
Rubber Products	0.2%	0.2%	443
Tires	0.1%	0.2%	197
Animal Carcasses	0.1%	0.1%	109
Animal Feces	8.5%	2.1%	15,876
Miscellaneous Organics	1.2%	0.4%	2,300
Sample Count	**53**		

Material	Estimated Percent	+ / -	Estimated Tons
Metal	**3.2%**		**5,921**
Aluminum Cans	0.2%	0.1%	464
Other Aluminum	0.2%	0.1%	350
Tinned Food Cans	0.7%	0.1%	1,378
Other Ferrous	0.7%	0.2%	1,281
Other Non-Ferrous	0.1%	0.1%	135
Mixed Metals (items <20% non-metal)	0.4%	0.3%	801
Other Mixed Metals (items >20% non-metal)	0.8%	0.4%	1,488
Compressed Gas Cylinders	0.0%	0.0%	25
Glass	**1.8%**		**3,363**
Clear Glass Containers	0.9%	0.2%	1,636
Green Glass Containers	0.2%	0.1%	455
Brown Glass Containers	0.5%	0.2%	967
Kitchenware/Ceramics	0.0%	0.0%	31
Other Glass	0.1%	0.1%	274
Electronics	**0.1%**		**264**
Small Household Appliances	0.0%	0.0%	0
A/V Equipment	0.0%	0.1%	88
Printers/Copiers/Fax Machines	0.0%	0.0%	0
CPU's	0.0%	0.0%	0
Computer Peripherals	0.0%	0.0%	0
Other Electronics	0.0%	0.0%	41
CRT Computer Monitors	0.0%	0.0%	0
CRT TVs	0.1%	0.1%	133
LCD/Other TVs	0.0%	0.0%	0
LCD Computer Monitors	0.0%	0.0%	0
Laptops	0.0%	0.0%	0
Cell Phones	0.0%	0.0%	2
Other Wastes	**2.6%**		**4,821**
C&D Wastes	0.8%	0.7%	1,544
Asphalt Shingles	0.0%	0.0%	4
Ash	0.0%	0.0%	49
Nondistinct Fines	0.7%	0.5%	1,303
Gypsum Wallboard	0.1%	0.1%	138
Furniture	0.0%	0.1%	75
Mattresses	0.0%	0.0%	0
Carpet	0.7%	0.4%	1,284
Miscellaneous Inorganics	0.2%	0.3%	424
HHW/Special	**0.3%**		**602**
Used Oil	0.0%	0.0%	61
Vehicle Batteries	0.0%	0.0%	0
Household Batteries	0.0%	0.0%	89
Latex Paint	0.1%	0.1%	125
Oil-based Paint	0.0%	0.0%	0
Solvents and Thinners	0.1%	0.1%	102
Adhesives and Glue	0.0%	0.0%	0
Cleaners and Corrosives	0.0%	0.0%	22
Pesticides and Herbicides	0.0%	0.0%	0
Gasoline and Fuel Oil	0.0%	0.0%	0
Antifreeze/Brake Fluid	0.0%	0.0%	0
Medical Waste	0.1%	0.1%	115
Pharmaceuticals and Vitamins	0.0%	0.0%	65
Compact Flourescent Bulbs	0.0%	0.0%	17
Other Flourescent Bulbs/Tubes	0.0%	0.0%	6
Other Hazardous Waste	0.0%	0.0%	0
Totals	**100.0%**		**187,206**

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

Figure 28. Waste Recoverability, Commercially Collected Multifamily Residential Substream, 2011

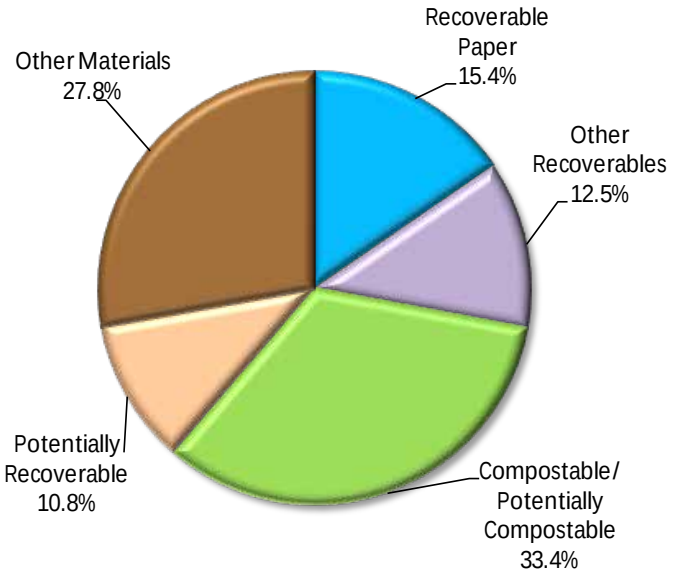


Figure 29. Waste Composition, Commercially Collected Multifamily Residential Substream, 2011

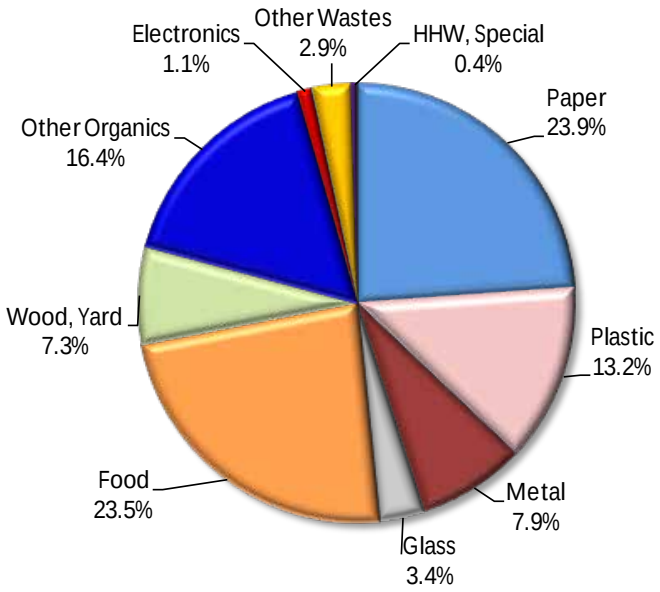


Table 52. Ten Most Prevalent Disposed Materials, Commercially Collected Multifamily Residential Substream, 2011

Material	Estimated Percent	Cumulative Percent	Estimated Tons
Unpackaged/Scrap Vegetative Food	15.4%	15.4%	19,126
Disposable Diapers	6.4%	21.9%	7,979
Low Grade Recyclable Paper	6.4%	28.3%	7,969
Other Compostable Paper	5.4%	33.7%	6,702
Animal Feces	5.2%	38.9%	6,454
Plain Corrugated Cardboard (OCC)	4.5%	43.5%	5,604
Other Ferrous	4.4%	47.9%	5,474
Yard Waste	3.5%	51.4%	4,303
Packaged Vegetative Food	3.4%	54.8%	4,259
Unpackaged/Scrap Non-vegetative Food	3.3%	58.1%	4,077
Subtotal	***58.1%***		***71,949***
All other materials	41.9%		51,898
Total	**100.0%**		**123,847**

Table 53. Detailed Composition, Commercially Collected Multifamily Residential Substream, 2011

Material	Estimated Percent	+ / -	Estimated Tons	Material	Estimated Percent	+ / -	Estimated Tons
Paper	**23.9%**		**29,576**	**Metal**	**7.9%**		**9,827**
Newspaper (ONP)	2.9%	1.1%	3,609	Aluminum Cans	0.6%	0.1%	685
Plain Corrugated Cardboard (OCC)	4.5%	1.4%	5,604	Other Aluminum	0.2%	0.1%	229
Waxed Corrugated Cardboard (OCC)	0.0%	0.0%	0	Tinned Food Cans	0.8%	0.1%	985
Low Grade Recyclable Paper	6.4%	0.9%	7,969	Other Ferrous	4.4%	3.8%	5,474
High Grade Paper	1.5%	0.7%	1,917	Other Non-Ferrous	0.1%	0.1%	164
Single Use Food Service Compostable Paper	1.0%	0.4%	1,182	Mixed Metals (items <20% non-metal)	0.9%	0.8%	1,102
Other Compostable Paper	5.4%	1.0%	6,702	Other Mixed Metals (items >20% non-metal)	0.9%	0.9%	1,123
Other Paper	2.1%	0.6%	2,591	Compressed Gas Cylinders	0.1%	0.1%	64
Plastic	**13.2%**		**16,339**	**Glass**	**3.4%**		**4,165**
PET Bottles	1.1%	0.2%	1,401	Clear Glass Containers	1.5%	0.5%	1,819
Other PET Containers	0.2%	0.0%	225	Green Glass Containers	0.7%	0.3%	907
HDPE Bottles	0.7%	0.1%	916	Brown Glass Containers	0.8%	0.4%	955
Other HDPE Containers	0.1%	0.0%	64	Kitchenware/Ceramics	0.0%	0.0%	0
Other #3-#7 Packaging	0.8%	0.1%	952	Other Glass	0.4%	0.3%	484
Compostable Plastics	0.0%	0.0%	0				
Expanded Polystyrene Single-serve Food Packaging	0.5%	0.1%	641	**Electronics**	**1.1%**		**1,332**
Other Expanded Polystyrene Packaging	0.1%	0.0%	135	Small Household Appliances	0.0%	0.0%	0
Expanded Polystyrene Products	0.0%	0.0%	36	A/V Equipment	0.3%	0.3%	353
Recyclable Plastic Bags	0.6%	0.1%	727	Printers/Copiers/Fax Machines	0.2%	0.2%	190
Non-industrial Packaging Film Plastic	2.6%	0.4%	3,273	CPU's	0.1%	0.2%	162
Industrial Packaging Film Plastic	0.3%	0.3%	399	Computer Peripherals	0.0%	0.0%	2
Plastic Garbage Bags	1.7%	0.2%	2,070	Other Electronics	0.3%	0.3%	377
Plastic Film Products	0.0%	0.0%	9	CRT Computer Monitors	0.0%	0.0%	0
Other Plastic Packaging	0.8%	0.2%	944	CRT TVs	0.2%	0.3%	247
Single Resin Plastic Products	1.7%	0.7%	2,065	LCD/Other TVs	0.0%	0.0%	0
Mixed Resin Plastic Products	0.3%	0.3%	404	LCD Computer Monitors	0.0%	0.0%	0
Foam Rubber and Padding	0.2%	0.2%	226	Laptops	0.0%	0.0%	0
Carpet Padding	0.0%	0.0%	10	Cell Phones	0.0%	0.0%	0
Plastic and Other Materials	1.5%	0.6%	1,844				
				Other Wastes	**2.9%**		**3,592**
Food	**23.5%**		**29,154**	C&D Wastes	1.8%	1.6%	2,255
Packaged Vegetative Food	3.4%	0.8%	4,259	Asphalt Shingles	0.0%	0.0%	0
Unpackaged/Scrap Vegetative Food	15.4%	3.0%	19,126	Ash	0.1%	0.1%	97
Packaged Non-vegetative Food	1.4%	0.6%	1,692	Nondistinct Fines	0.6%	0.6%	685
Unpackaged/Scrap Non-vegetative Food	3.3%	1.1%	4,077	Gypsum Wallboard	0.1%	0.2%	161
				Furniture	0.1%	0.1%	94
Wood/Yard	**7.3%**		**9,018**	Mattresses	0.0%	0.0%	0
Dimensional Lumber	2.0%	0.9%	2,467	Carpet	0.2%	0.2%	203
Treated Wood	0.2%	0.2%	190	Miscellaneous Inorganics	0.1%	0.1%	96
Contaminated Wood	0.2%	0.1%	201				
Roofing and Siding Wood	0.1%	0.2%	153	**HHW/Special**	**0.4%**		**492**
Stumps	0.0%	0.0%	0	Used Oil	0.0%	0.0%	0
Large Prunings	0.0%	0.0%	13	Vehicle Batteries	0.0%	0.0%	11
Yard Waste	3.5%	1.8%	4,303	Household Batteries	0.0%	0.0%	25
Other Wood	1.4%	1.7%	1,690	Latex Paint	0.1%	0.1%	79
				Oil-based Paint	0.0%	0.0%	0
Other Organics	**16.4%**		**20,352**	Solvents and Thinners	0.0%	0.0%	0
Textiles: Clothes	2.1%	0.6%	2,598	Adhesives and Glue	0.0%	0.0%	25
Other Textiles	2.0%	0.8%	2,512	Cleaners and Corrosives	0.0%	0.0%	38
Disposable Diapers	6.4%	1.9%	7,979	Pesticides and Herbicides	0.0%	0.0%	0
Rubber Products	0.2%	0.1%	197	Gasoline and Fuel Oil	0.0%	0.0%	0
Tires	0.0%	0.0%	0	Antifreeze/Brake Fluid	0.1%	0.1%	86
Animal Carcasses	0.0%	0.0%	0	Medical Waste	0.1%	0.2%	164
Animal Feces	5.2%	1.7%	6,454	Pharmaceuticals and Vitamins	0.0%	0.0%	18
Miscellaneous Organics	0.5%	0.2%	613	Compact Flourescent Bulbs	0.0%	0.0%	0
				Other Flourescent Bulbs/Tubes	0.0%	0.0%	0
				Other Hazardous Waste	0.0%	0.0%	48
Sample Count	**48**			**Totals**	**100.0%**		**123,847**

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

Table 54. Detailed Composition, Commercially Collected Nonresidential Substream, 2011

Material	Estimated Percent	+ / -	Estimated Tons
Paper	**30.0%**		**90,392**
Newspaper (ONP)	1.1%	0.3%	3,197
Plain Corrugated Cardboard (OCC)	5.6%	1.2%	16,822
Waxed Corrugated Cardboard (OCC)	0.7%	0.4%	2,113
Low Grade Recyclable Paper	6.7%	1.1%	20,193
High Grade Paper	3.2%	1.1%	9,745
Single Use Food Service Compostable Paper	2.2%	0.5%	6,562
Other Compostable Paper	6.6%	1.0%	19,909
Other Paper	3.9%	1.3%	11,852
Plastic	**13.9%**		**41,852**
PET Bottles	0.8%	0.1%	2,324
Other PET Containers	0.2%	0.0%	706
HDPE Bottles	0.6%	0.1%	1,942
Other HDPE Containers	0.2%	0.1%	476
Other #3-#7 Packaging	0.8%	0.2%	2,304
Compostable Plastics	0.0%	0.0%	7
Expanded Polystyrene Single-serve Food Packaging	0.4%	0.2%	1,352
Other Expanded Polystyrene Packaging	0.3%	0.1%	881
Expanded Polystyrene Products	0.0%	0.0%	45
Recyclable Plastic Bags	0.2%	0.0%	561
Non-industrial Packaging Film Plastic	4.1%	1.0%	12,218
Industrial Packaging Film Plastic	1.1%	0.5%	3,270
Plastic Garbage Bags	2.3%	0.3%	7,063
Plastic Film Products	0.1%	0.1%	213
Other Plastic Packaging	0.9%	0.4%	2,848
Single Resin Plastic Products	0.9%	0.3%	2,818
Mixed Resin Plastic Products	0.1%	0.1%	393
Foam Rubber and Padding	0.0%	0.0%	38
Carpet Padding	0.1%	0.2%	419
Plastic and Other Materials	0.7%	0.2%	1,974
Food	**27.3%**		**82,179**
Packaged Vegetative Food	6.1%	1.9%	18,494
Unpackaged/Scrap Vegetative Food	14.0%	1.9%	42,189
Packaged Non-vegetative Food	1.5%	0.5%	4,404
Unpackaged/Scrap Non-vegetative Food	5.7%	1.4%	17,092
Wood/Yard	**8.6%**		**25,939**
Dimensional Lumber	3.0%	1.0%	9,114
Treated Wood	0.6%	0.7%	1,699
Contaminated Wood	0.5%	0.3%	1,603
Roofing and Siding Wood	0.1%	0.1%	229
Stumps	0.0%	0.0%	0
Large Prunings	0.1%	0.1%	198
Yard Waste	3.4%	1.3%	10,121
Other Wood	1.0%	0.7%	2,977
Other Organics	**7.3%**		**22,034**
Textiles: Clothes	1.4%	0.6%	4,117
Other Textiles	1.3%	0.5%	3,838
Disposable Diapers	1.6%	0.4%	4,790
Rubber Products	0.5%	0.4%	1,407
Tires	0.0%	0.0%	2
Animal Carcasses	0.0%	0.0%	83
Animal Feces	1.7%	1.0%	4,968
Miscellaneous Organics	0.9%	0.8%	2,828
Sample Count	**160**		

Material	Estimated Percent	+ / -	Estimated Tons
Metal	**4.8%**		**14,461**
Aluminum Cans	0.4%	0.1%	1,124
Other Aluminum	0.2%	0.1%	457
Tinned Food Cans	1.1%	0.3%	3,246
Other Ferrous	2.4%	1.2%	7,169
Other Non-Ferrous	0.1%	0.0%	190
Mixed Metals (items <20% non-metal)	0.4%	0.2%	1,136
Other Mixed Metals (items >20% non-metal)	0.4%	0.2%	1,082
Compressed Gas Cylinders	0.0%	0.0%	56
Glass	**2.8%**		**8,384**
Clear Glass Containers	0.7%	0.2%	2,251
Green Glass Containers	0.3%	0.1%	947
Brown Glass Containers	0.4%	0.1%	1,206
Kitchenware/Ceramics	0.0%	0.0%	35
Other Glass	1.3%	0.9%	3,945
Electronics	**0.2%**		**598**
Small Household Appliances	0.1%	0.2%	409
A/V Equipment	0.0%	0.0%	41
Printers/Copiers/Fax Machines	0.0%	0.0%	0
CPU's	0.0%	0.0%	0
Computer Peripherals	0.0%	0.0%	44
Other Electronics	0.0%	0.1%	103
CRT Computer Monitors	0.0%	0.0%	0
CRT TVs	0.0%	0.0%	0
LCD/Other TVs	0.0%	0.0%	0
LCD Computer Monitors	0.0%	0.0%	0
Laptops	0.0%	0.0%	0
Cell Phones	0.0%	0.0%	1
Other Wastes	**3.9%**		**11,589**
C&D Wastes	1.3%	0.9%	3,837
Asphalt Shingles	0.0%	0.0%	2
Ash	0.0%	0.0%	0
Nondistinct Fines	0.9%	0.6%	2,630
Gypsum Wallboard	1.0%	1.1%	2,901
Furniture	0.0%	0.0%	47
Mattresses	0.0%	0.0%	18
Carpet	0.4%	0.3%	1,184
Miscellaneous Inorganics	0.3%	0.4%	970
HHW/Special	**1.2%**		**3,557**
Used Oil	0.0%	0.0%	41
Vehicle Batteries	0.0%	0.0%	2
Household Batteries	0.0%	0.0%	29
Latex Paint	0.2%	0.1%	617
Oil-based Paint	0.0%	0.0%	0
Solvents and Thinners	0.0%	0.0%	6
Adhesives and Glue	0.0%	0.0%	13
Cleaners and Corrosives	0.0%	0.0%	122
Pesticides and Herbicides	0.0%	0.0%	5
Gasoline and Fuel Oil	0.0%	0.0%	11
Antifreeze/Brake Fluid	0.0%	0.0%	0
Medical Waste	0.5%	0.4%	1,579
Pharmaceuticals and Vitamins	0.0%	0.0%	22
Compact Flourescent Bulbs	0.0%	0.0%	1
Other Flourescent Bulbs/Tubes	0.0%	0.0%	2
Other Hazardous Waste	0.4%	0.4%	1,108
Totals	**100.0%**		**300,985**

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

Table 55. Detailed Composition, Self-haul Substreams, 2011

Material	Estimated Percent	+ / -	Estimated Tons	Material	Estimated Percent	+ / -	Estimated Tons
Paper	**6.5%**		**12,652**	**Metal**	**10.7%**		**20,988**
Newspaper (ONP)	0.3%	0.2%	593	Aluminum Cans	0.1%	0.0%	175
Plain Corrugated Cardboard (OCC)	1.9%	0.9%	3,749	Other Aluminum	0.1%	0.0%	153
Waxed Corrugated Cardboard (OCC)	0.0%	0.0%	0	Tinned Food Cans	0.1%	0.1%	265
Low Grade Recyclable Paper	1.8%	0.7%	3,430	Other Ferrous	4.9%	1.9%	9,673
High Grade Paper	0.4%	0.2%	849	Other Non-Ferrous	1.4%	1.2%	2,709
Single Use Food Service Compostable Paper	0.1%	0.0%	183	Mixed Metals (items <20% non-metal)	2.7%	1.4%	5,195
Other Compostable Paper	1.1%	0.4%	2,154	Other Mixed Metals (items >20% non-metal)	1.3%	0.3%	2,627
Other Paper	0.9%	0.3%	1,694	Compressed Gas Cylinders	0.1%	0.1%	191
Plastic	**9.5%**		**18,663**	**Glass**	**2.2%**		**4,340**
PET Bottles	0.2%	0.1%	383	Clear Glass Containers	0.7%	0.6%	1,358
Other PET Containers	0.0%	0.0%	63	Green Glass Containers	0.1%	0.1%	197
HDPE Bottles	0.1%	0.1%	288	Brown Glass Containers	0.2%	0.1%	386
Other HDPE Containers	0.1%	0.0%	220	Kitchenware/Ceramics	0.6%	0.8%	1,166
Other #3-#7 Packaging	0.3%	0.1%	529	Other Glass	0.6%	0.4%	1,233
Compostable Plastics	0.0%	0.0%	0				
Expanded Polystyrene Single-serve Food Packaging	0.1%	0.0%	101	**Electronics**	**1.1%**		**2,249**
Other Expanded Polystyrene Packaging	0.1%	0.1%	221	Small Household Appliances	0.0%	0.0%	0
Expanded Polystyrene Products	0.0%	0.0%	25	A/V Equipment	0.8%	1.3%	1,488
Recyclable Plastic Bags	0.1%	0.0%	126	Printers/Copiers/Fax Machines	0.0%	0.0%	0
Non-industrial Packaging Film Plastic	0.5%	0.2%	1,005	CPU's	0.0%	0.0%	0
Industrial Packaging Film Plastic	0.6%	0.3%	1,097	Computer Peripherals	0.0%	0.0%	64
Plastic Garbage Bags	0.4%	0.1%	711	Other Electronics	0.3%	0.2%	584
Plastic Film Products	0.1%	0.1%	213	CRT Computer Monitors	0.0%	0.0%	0
Other Plastic Packaging	0.1%	0.0%	163	CRT TVs	0.1%	0.1%	112
Single Resin Plastic Products	1.8%	0.6%	3,488	LCD/Other TVs	0.0%	0.0%	0
Mixed Resin Plastic Products	0.6%	0.3%	1,171	LCD Computer Monitors	0.0%	0.0%	0
Foam Rubber and Padding	1.0%	0.9%	1,936	Laptops	0.0%	0.0%	0
Carpet Padding	1.2%	0.7%	2,337	Cell Phones	0.0%	0.0%	0
Plastic and Other Materials	2.3%	1.8%	4,586				
				Other Wastes	**26.4%**		**51,747**
Food	**3.1%**		**5,983**	C&D Wastes	5.6%	2.2%	10,983
Packaged Vegetative Food	1.2%	0.6%	2,335	Asphalt Shingles	2.0%	1.6%	3,915
Unpackaged/Scrap Vegetative Food	1.3%	0.5%	2,470	Ash	0.1%	0.2%	267
Packaged Non-vegetative Food	0.3%	0.2%	685	Nondistinct Fines	1.7%	1.4%	3,282
Unpackaged/Scrap Non-vegetative Food	0.3%	0.1%	494	Gypsum Wallboard	5.3%	2.1%	10,307
				Furniture	5.0%	2.7%	9,709
Wood/Yard	**34.2%**		**66,932**	Mattresses	1.6%	0.5%	3,128
Dimensional Lumber	12.4%	3.6%	24,362	Carpet	5.0%	2.4%	9,768
Treated Wood	1.2%	0.6%	2,296	Miscellaneous Inorganics	0.2%	0.1%	388
Contaminated Wood	2.9%	1.0%	5,708				
Roofing and Siding Wood	2.4%	2.1%	4,701	**HHW/Special**	**0.9%**		**1,675**
Stumps	1.6%	1.0%	3,179	Used Oil	0.0%	0.0%	32
Large Prunings	1.0%	1.0%	1,862	Vehicle Batteries	0.0%	0.0%	0
Yard Waste	10.3%	3.8%	20,083	Household Batteries	0.0%	0.0%	6
Other Wood	2.4%	0.8%	4,740	Latex Paint	0.3%	0.2%	503
				Oil-based Paint	0.0%	0.0%	14
Other Organics	**5.5%**		**10,684**	Solvents and Thinners	0.0%	0.0%	0
Textiles: Clothes	0.8%	0.3%	1,501	Adhesives and Glue	0.0%	0.0%	0
Other Textiles	0.9%	0.3%	1,821	Cleaners and Corrosives	0.0%	0.0%	31
Disposable Diapers	0.8%	0.5%	1,587	Pesticides and Herbicides	0.1%	0.1%	162
Rubber Products	0.7%	0.5%	1,439	Gasoline and Fuel Oil	0.0%	0.0%	5
Tires	1.0%	0.8%	2,033	Antifreeze/Brake Fluid	0.0%	0.0%	7
Animal Carcasses	0.1%	0.1%	111	Medical Waste	0.2%	0.2%	451
Animal Feces	0.9%	0.5%	1,732	Pharmaceuticals and Vitamins	0.0%	0.0%	0
Miscellaneous Organics	0.2%	0.1%	460	Compact Flourescent Bulbs	0.0%	0.0%	0
				Other Flourescent Bulbs/Tubes	0.0%	0.0%	71
				Other Hazardous Waste	0.2%	0.2%	394
Sample Count	**159**			**Totals**	**100.0%**		**195,913**

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

Table 56. Detailed Composition, Self-haul Residential Substream, 2011

Material	Estimated Percent	+ / -	Estimated Tons
Paper	**6.3%**		**10,863**
Newspaper (ONP)	0.3%	0.2%	575
Plain Corrugated Cardboard (OCC)	2.0%	1.0%	3,433
Waxed Corrugated Cardboard (OCC)	0.0%	0.0%	0
Low Grade Recyclable Paper	1.9%	0.8%	3,246
High Grade Paper	0.4%	0.3%	607
Single Use Food Service Compostable Paper	0.1%	0.0%	163
Other Compostable Paper	1.1%	0.5%	1,953
Other Paper	0.5%	0.3%	886
Plastic	**8.7%**		**14,975**
PET Bottles	0.2%	0.1%	372
Other PET Containers	0.0%	0.0%	63
HDPE Bottles	0.2%	0.1%	282
Other HDPE Containers	0.1%	0.1%	200
Other #3-#7 Packaging	0.3%	0.2%	505
Compostable Plastics	0.0%	0.0%	0
Expanded Polystyrene Single-serve Food Packaging	0.1%	0.0%	100
Other Expanded Polystyrene Packaging	0.1%	0.1%	220
Expanded Polystyrene Products	0.0%	0.0%	25
Recyclable Plastic Bags	0.1%	0.0%	102
Non-industrial Packaging Film Plastic	0.5%	0.2%	900
Industrial Packaging Film Plastic	0.4%	0.4%	732
Plastic Garbage Bags	0.4%	0.1%	644
Plastic Film Products	0.1%	0.1%	153
Other Plastic Packaging	0.1%	0.0%	148
Single Resin Plastic Products	1.7%	0.6%	2,880
Mixed Resin Plastic Products	0.7%	0.4%	1,157
Foam Rubber and Padding	1.1%	1.0%	1,916
Carpet Padding	1.4%	0.8%	2,337
Plastic and Other Materials	1.3%	0.8%	2,241
Food	**3.4%**		**5,823**
Packaged Vegetative Food	1.3%	0.6%	2,232
Unpackaged/Scrap Vegetative Food	1.4%	0.6%	2,450
Packaged Non-vegetative Food	0.4%	0.2%	652
Unpackaged/Scrap Non-vegetative Food	0.3%	0.2%	488
Wood/Yard	**33.7%**		**57,715**
Dimensional Lumber	13.5%	4.1%	23,142
Treated Wood	1.1%	0.6%	1,889
Contaminated Wood	1.5%	1.0%	2,541
Roofing and Siding Wood	2.5%	2.3%	4,252
Stumps	1.2%	1.2%	2,083
Large Prunings	0.9%	1.1%	1,575
Yard Waste	11.5%	4.3%	19,656
Other Wood	1.5%	0.9%	2,577
Other Organics	**5.2%**		**8,976**
Textiles: Clothes	0.9%	0.3%	1,487
Other Textiles	1.0%	0.4%	1,746
Disposable Diapers	0.7%	0.5%	1,180
Rubber Products	0.2%	0.1%	341
Tires	1.2%	0.9%	2,033
Animal Carcasses	0.1%	0.1%	101
Animal Feces	1.0%	0.6%	1,711
Miscellaneous Organics	0.2%	0.1%	377
Sample Count	**135**		

Material	Estimated Percent	+ / -	Estimated Tons
Metal	**11.1%**		**18,942**
Aluminum Cans	0.1%	0.0%	135
Other Aluminum	0.1%	0.0%	153
Tinned Food Cans	0.2%	0.1%	264
Other Ferrous	5.4%	2.2%	9,303
Other Non-Ferrous	1.6%	1.3%	2,709
Mixed Metals (items <20% non-metal)	3.0%	1.6%	5,082
Other Mixed Metals (items >20% non-metal)	0.6%	0.3%	1,105
Compressed Gas Cylinders	0.1%	0.2%	191
Glass	**2.1%**		**3,579**
Clear Glass Containers	0.4%	0.3%	715
Green Glass Containers	0.0%	0.0%	79
Brown Glass Containers	0.2%	0.2%	386
Kitchenware/Ceramics	0.7%	0.9%	1,166
Other Glass	0.7%	0.4%	1,233
Electronics	**1.2%**		**2,004**
Small Household Appliances	0.0%	0.0%	0
A/V Equipment	0.9%	1.4%	1,488
Printers/Copiers/Fax Machines	0.0%	0.0%	0
CPU's	0.0%	0.0%	0
Computer Peripherals	0.0%	0.0%	17
Other Electronics	0.3%	0.2%	498
CRT Computer Monitors	0.0%	0.0%	0
CRT TVs	0.0%	0.0%	0
LCD/Other TVs	0.0%	0.0%	0
LCD Computer Monitors	0.0%	0.0%	0
Laptops	0.0%	0.0%	0
Cell Phones	0.0%	0.0%	0
Other Wastes	**27.3%**		**46,809**
C&D Wastes	5.5%	2.4%	9,469
Asphalt Shingles	2.2%	1.8%	3,749
Ash	0.2%	0.3%	267
Nondistinct Fines	1.9%	1.6%	3,231
Gypsum Wallboard	4.6%	2.4%	7,857
Furniture	5.5%	3.1%	9,406
Mattresses	1.8%	0.6%	3,034
Carpet	5.5%	2.8%	9,483
Miscellaneous Inorganics	0.2%	0.1%	313
HHW/Special	**0.9%**		**1,463**
Used Oil	0.0%	0.0%	32
Vehicle Batteries	0.0%	0.0%	0
Household Batteries	0.0%	0.0%	6
Latex Paint	0.3%	0.3%	498
Oil-based Paint	0.0%	0.0%	14
Solvents and Thinners	0.0%	0.0%	0
Adhesives and Glue	0.0%	0.0%	0
Cleaners and Corrosives	0.0%	0.0%	31
Pesticides and Herbicides	0.1%	0.2%	162
Gasoline and Fuel Oil	0.0%	0.0%	5
Antifreeze/Brake Fluid	0.0%	0.0%	7
Medical Waste	0.1%	0.2%	250
Pharmaceuticals and Vitamins	0.0%	0.0%	0
Compact Flourescent Bulbs	0.0%	0.0%	0
Other Flourescent Bulbs/Tubes	0.0%	0.0%	64
Other Hazardous Waste	0.2%	0.3%	394
Totals	**100.0%**		**171,149**

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

Table 57. Detailed Composition, Self-haul Nonresidential Substream, 2011

Material	Estimated Percent	+ / -	Estimated Tons	Material	Estimated Percent	+ / -	Estimated Tons
Paper	**7.2%**		**1,788**	**Metal**	**8.3%**		**2,046**
Newspaper (ONP)	0.1%	0.1%	19	Aluminum Cans	0.2%	0.0%	40
Plain Corrugated Cardboard (OCC)	1.3%	1.1%	315	Other Aluminum	0.0%	0.0%	0
Waxed Corrugated Cardboard (OCC)	0.0%	0.0%	0	Tinned Food Cans	0.0%	0.0%	1
Low Grade Recyclable Paper	0.7%	0.3%	184	Other Ferrous	1.5%	1.0%	370
High Grade Paper	1.0%	0.6%	241	Other Non-Ferrous	0.0%	0.0%	0
Single Use Food Service Compostable Paper	0.1%	0.0%	20	Mixed Metals (items <20% non-metal)	0.5%	0.4%	113
Other Compostable Paper	0.8%	0.6%	201	Other Mixed Metals (items >20% non-metal)	6.1%	1.5%	1,522
Other Paper	3.3%	0.4%	808	Compressed Gas Cylinders	0.0%	0.0%	0
Plastic	**14.9%**		**3,688**	**Glass**	**3.1%**		**761**
PET Bottles	0.0%	0.0%	12	Clear Glass Containers	2.6%	4.5%	643
Other PET Containers	0.0%	0.0%	1	Green Glass Containers	0.5%	0.8%	118
HDPE Bottles	0.0%	0.0%	6	Brown Glass Containers	0.0%	0.0%	0
Other HDPE Containers	0.1%	0.1%	20	Kitchenware/Ceramics	0.0%	0.0%	0
Other #3-#7 Packaging	0.1%	0.0%	25	Other Glass	0.0%	0.0%	0
Compostable Plastics	0.0%	0.0%	0				
Expanded Polystyrene Single-serve Food Packaging	0.0%	0.0%	1	**Electronics**	**1.0%**		**245**
Other Expanded Polystyrene Packaging	0.0%	0.0%	0	Small Household Appliances	0.0%	0.0%	0
Expanded Polystyrene Products	0.0%	0.0%	0	A/V Equipment	0.0%	0.0%	0
Recyclable Plastic Bags	0.1%	0.0%	24	Printers/Copiers/Fax Machines	0.0%	0.0%	0
Non-industrial Packaging Film Plastic	0.4%	0.3%	106	CPU's	0.0%	0.0%	0
Industrial Packaging Film Plastic	1.5%	0.1%	365	Computer Peripherals	0.2%	0.3%	47
Plastic Garbage Bags	0.3%	0.1%	67	Other Electronics	0.3%	0.6%	86
Plastic Film Products	0.2%	0.0%	61	CRT Computer Monitors	0.0%	0.0%	0
Other Plastic Packaging	0.1%	0.1%	16	CRT TVs	0.5%	0.9%	112
Single Resin Plastic Products	2.5%	1.9%	608	LCD/Other TVs	0.0%	0.0%	0
Mixed Resin Plastic Products	0.1%	0.1%	14	LCD Computer Monitors	0.0%	0.0%	0
Foam Rubber and Padding	0.1%	0.1%	20	Laptops	0.0%	0.0%	0
Carpet Padding	0.0%	0.0%	0	Cell Phones	0.0%	0.0%	0
Plastic and Other Materials	9.5%	13.2%	2,344				
				Other Wastes	**19.9%**		**4,938**
Food	**0.6%**		**161**	C&D Wastes	6.1%	2.8%	1,514
Packaged Vegetative Food	0.4%	0.5%	102	Asphalt Shingles	0.7%	0.4%	166
Unpackaged/Scrap Vegetative Food	0.1%	0.1%	20	Ash	0.0%	0.0%	0
Packaged Non-vegetative Food	0.1%	0.2%	33	Nondistinct Fines	0.2%	0.3%	51
Unpackaged/Scrap Non-vegetative Food	0.0%	0.0%	6	Gypsum Wallboard	9.9%	0.6%	2,450
				Furniture	1.2%	2.1%	303
Wood/Yard	**37.2%**		**9,217**	Mattresses	0.4%	0.8%	94
Dimensional Lumber	4.9%	2.2%	1,221	Carpet	1.1%	1.6%	285
Treated Wood	1.6%	1.6%	407	Miscellaneous Inorganics	0.3%	0.5%	75
Contaminated Wood	12.8%	2.3%	3,167				
Roofing and Siding Wood	1.8%	0.0%	449	**HHW/Special**	**0.9%**		**212**
Stumps	4.4%	0.0%	1,096	Used Oil	0.0%	0.0%	0
Large Prunings	1.2%	0.1%	287	Vehicle Batteries	0.0%	0.0%	0
Yard Waste	1.7%	1.7%	428	Household Batteries	0.0%	0.0%	0
Other Wood	8.7%	0.5%	2,163	Latex Paint	0.0%	0.0%	4
				Oil-based Paint	0.0%	0.0%	0
Other Organics	**6.9%**		**1,708**	Solvents and Thinners	0.0%	0.0%	0
Textiles: Clothes	0.1%	0.1%	14	Adhesives and Glue	0.0%	0.0%	0
Other Textiles	0.3%	0.4%	75	Cleaners and Corrosives	0.0%	0.0%	0
Disposable Diapers	1.6%	2.8%	407	Pesticides and Herbicides	0.0%	0.0%	0
Rubber Products	4.4%	3.9%	1,098	Gasoline and Fuel Oil	0.0%	0.0%	0
Tires	0.0%	0.0%	0	Antifreeze/Brake Fluid	0.0%	0.0%	0
Animal Carcasses	0.0%	0.1%	10	Medical Waste	0.8%	1.4%	201
Animal Feces	0.1%	0.1%	21	Pharmaceuticals and Vitamins	0.0%	0.0%	0
Miscellaneous Organics	0.3%	0.3%	83	Compact Flourescent Bulbs	0.0%	0.0%	0
				Other Flourescent Bulbs/Tubes	0.0%	0.0%	7
				Other Hazardous Waste	0.0%	0.0%	0
Sample Count	**24**			**Totals**	**100.0%**		**24,764**

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

Appendix E. Detailed Customer Survey Results

This appendix includes data tables intended to provide additional detail on the customer survey results presented in the main body of the report. In most cases the tables in this appendix provide data for each facility individually instead of for all facilities combined as shown in the main body of the report.

Table 58. Detailed Reported Generator Type by Hauler Type and by Facility, 2011

Commercial haul, n=1053	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Residential	**12%**	**8%**	**0%**	**3%**	**9%**	**12%**	**8%**	**7%**	**0%**	**1%**	**8%**
Single Family	6%	5%	0%	2%	5%	8%	3%	5%	0%	1%	5%
Multifamily	5%	3%	0%	0%	3%	3%	5%	2%	0%	0%	3%
Mixed Single Family & Multifamily Residential	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Nonresidential	**12%**	**15%**	**0%**	**2%**	**8%**	**13%**	**9%**	**5%**	**0%**	**0%**	**10%**
Mixed Residential and Nonresidential	**2%**	**1%**	**0%**	**0%**	**1%**	**2%**	**1%**	**1%**	**0%**	**0%**	**1%**
Commercial Haul Subtotal	***26%***	***24%***	***0%***	***4%***	***17%***	***26%***	***18%***	***12%***	***0%***	***1%***	***19%***
No Response	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Self-haul, n=4503											
Residential	**64%**	**67%**	**95%**	**89%**	**77%**	**65%**	**77%**	**80%**	**94%**	**88%**	**73%**
Single Family	64%	67%	95%	89%	77%	65%	77%	80%	94%	88%	73%
Multifamily	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mixed Single Family & Multifamily Residential	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Nonresidential	**10%**	**8%**	**4%**	**5%**	**5%**	**8%**	**5%**	**7%**	**6%**	**10%**	**7%**
Mixed Residential and Nonresidential	**0%**	**1%**	**1%**	**1%**	**1%**	**1%**	**0%**	**1%**	**0%**	**0%**	**1%**
Self-haul Subtotal	***74%***	***76%***	***100%***	***95%***	***83%***	***74%***	***82%***	***87%***	***100%***	***99%***	***81%***
No Response	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Total, n=5556	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 59. Observed Vehicle Types by Hauler Type and by Facility, 2011

Commercial haul, n=1053	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Dropbox	11%	12%	0%	1%	8%	9%	9%	6%	0%	0%	8%
Packer	14%	12%	0%	3%	9%	17%	9%	7%	0%	1%	11%
Large Other	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Passenger Vehicles	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Commercial Haul Subtotal	***26%***	***24%***	***0%***	***4%***	***17%***	***26%***	***18%***	***12%***	***0%***	***1%***	***19%***
No Response	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Self-haul, n=4503											
Dropbox	0%	1%	0%	0%	0%	0%	0%	0%	6%	0%	0%
Packer	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%
Large Other	7%	6%	1%	5%	7%	7%	6%	9%	35%	8%	6%
Passenger Vehicles	67%	69%	98%	90%	76%	67%	76%	78%	59%	91%	74%
Self-haul Subtotal	***74%***	***76%***	***100%***	***96%***	***83%***	***74%***	***82%***	***88%***	***100%***	***99%***	***81%***
No Response	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total, n=5556	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 60. Reported Waste Type by Hauler Type and by Facility, 2011

Commercial haul, n=1053	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Mixed Garbage	26%	24%	0%	4%	17%	26%	18%	12%	0%	1%	19%
Construction&Demolition	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Yard Waste	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Commercial Haul Subtotal	***26%***	***24%***	***0%***	***4%***	***17%***	***26%***	***18%***	***12%***	***0%***	***1%***	***19%***
No Response	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Self-haul, n=4503											
Mixed Garbage	52%	48%	69%	76%	46%	42%	60%	52%	100%	70%	53%
Construction&Demolition	17%	16%	16%	12%	27%	27%	14%	20%	0%	18%	19%
Yard Waste	6%	12%	15%	8%	10%	6%	7%	16%	0%	11%	9%
Self-haul Subtotal	***74%***	***76%***	***100%***	***96%***	***83%***	***74%***	***82%***	***88%***	***100%***	***99%***	***81%***
No Response	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total, n=5556	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 61. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Algona, 2011

	Algona, n=628				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	10%	49%	0%	0%	**15%**
Landscapers	1%	5%	0%	0%	**2%**
Other Users	89%	46%	100%	100%	**83%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 62. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Bow Lake, 2011

	Bow Lake, n=985				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	9%	44%	38%	0%	**13%**
Landscapers	2%	2%	0%	0%	**2%**
Other Users	89%	54%	63%	100%	**85%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 63. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Cedar Falls, 2011

	Cedar Falls, n=216				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	4%	33%	50%	0%	**6%**
Landscapers	1%	0%	0%	0%	**1%**
Other Users	95%	67%	50%	0%	**93%**
Total	**100%**	**100%**	**100%**	**0%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 64. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Enumclaw, 2011

	Enumclaw, n=407				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	7%	25%	40%	0%	**9%**
Landscapers	1%	5%	0%	0%	**1%**
Other Users	92%	70%	60%	100%	**90%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 65. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Factoria, 2011

	Factoria, n=685				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	19%	57%	71%	0%	**22%**
Landscapers	2%	10%	0%	0%	**3%**
Other Users	78%	33%	29%	0%	**75%**
Total	**100%**	**100%**	**100%**	**0%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 66. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Houghton, 2011

	Houghton, n=604				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	24%	55%	55%	0%	**27%**
Landscapers	2%	5%	0%	0%	**2%**
Other Users	75%	40%	45%	100%	**71%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 67. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Renton, 2011

	Renton, n=441				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	8%	36%	100%	0%	**10%**
Landscapers	2%	4%	0%	0%	**2%**
Other Users	89%	60%	0%	100%	**87%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 68. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Shoreline, 2011

	Shoreline, n=318				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	17%	42%	100%	0%	**19%**
Landscapers	3%	0%	0%	0%	**3%**
Other Users	79%	58%	0%	100%	**77%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 69. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Skykomish, 2011

	Skykomish, n=17				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	0%	0%	0%	0%	**0%**
Landscapers	0%	0%	0%	0%	**0%**
Other Users	100%	100%	0%	0%	**100%**
Total	**100%**	**100%**	**0%**	**0%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 70. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; Vashon, 2011

	Vashon, n=202				
	Residential	Nonresidential	Mixed	No Response	Site Overall
Contractors	5%	29%	0%	0%	**7%**
Landscapers	5%	5%	0%	0%	**5%**
Other Users	90%	67%	100%	0%	**88%**
Total	**100%**	**100%**	**100%**	**0%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 71. Reported Generator for Self-haul Contractors, Landscapers, and Other Users; All Facilities, 2011

	All Facilities, n=4503				
	Residential	Nonresidential	Mixed	No Response	Overall
Contractors	13%	45%	53%	0%	**16%**
Landscapers	2%	4%	0%	0%	**2%**
Other Users	85%	50%	48%	100%	**82%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding.

Table 72. Reported Reasons to Self-haul by Facility, Residential Generators, 2011

Residential, n=3897	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Large amount of garbage	17%	17%	20%	15%	20%	21%	22%	18%		7%	18%
Cheaper / Saves money	15%	12%	10%	20%	5%	7%	8%	10%	13%	20%	11%
Cleaning home or workplace	15%	10%	6%	6%	7%	17%	9%	7%		4%	10%
Do not have garbage service	2%	1%	4%	5%	1%	1%	3%		44%	2%	2%
Items too big to fit into garbage can	12%	12%	11%	9%	15%	11%	9%	15%		2%	11%
Convenience	6%	3%	10%	15%	3%	5%	5%	3%	13%	21%	6%
Yard debris	7%	13%	8%	8%	12%	7%	9%	15%		4%	10%
Remodeling	11%	10%	5%	5%	13%	13%	11%	6%		5%	10%
Moving home or workplace	4%	4%	5%	3%	7%	4%	6%	7%		2%	5%
Garbage hauler will not pick up this type of waste	1%	1%			2%	2%					1%
Small amount of garbage / recycle almost everything	1%	1%	4%	1%	1%	2%	3%	1%		8%	2%
Dissatisfied with regular collection service	2%	1%	3%	1%	2%	1%	1%	1%		2%	2%
Forgot or missed the regular collection service		1%			1%		1%	1%		1%	1%
Disaster-related (flood, mud slide, etc)											
Self-sufficiency / do not like government		1%				1%					1%
Favor for friend/neighbor/family member		2%	3%	1%	3%	2%	3%	7%		3%	3%
Dogs get into garbage if left on curb			1%							2%	
Waste is from vacation home										3%	
Roadside litter removal											
Demolition trucking company											
Independent hauler	2%	2%	1%	1%	1%	3%	1%	3%			2%
Habit	2%	2%	2%	5%	1%	1%	4%	1%		12%	3%
Subtotal	***97%***	***95%***	***95%***	***98%***	***95%***	***98%***	***97%***	***97%***	***69%***	***97%***	***96%***
Other	2%	1%	2%	1%	1%		1%	1%		2%	1%
Refused to Answer											
No Response	2%	4%	3%	1%	4%	1%	2%	2%	31%	1%	3%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding. Values less than .5% are left blank

Table 73. Reported Reasons to Self-haul by Facility, Nonresidential Generators, 2011

Nonresidential, n=203	Algona	Bow Lake	Cedar Falls	Enumclaw	Factoria	Houghton	Renton	Shoreline	Skykomish	Vashon	Overall
Large amount of garbage	26%	16%	25%	21%	20%	11%	27%	21%		7%	19%
Cheaper / Saves money	8%	18%		7%		14%		21%		21%	12%
Cleaning home or workplace	18%	4%		7%	7%	4%					6%
Do not have garbage service				7%					100%		1%
Items too big to fit into garbage can	3%	18%	25%	21%		18%	13%	7%		7%	12%
Convenience	3%	2%		7%		4%	13%	7%		36%	6%
Yard debris		5%			7%	4%	20%			14%	5%
Remodeling	10%	2%		7%	13%	4%		7%			5%
Moving home or workplace	5%	2%			20%	7%					4%
Garbage hauler will not pick up this type of waste		7%									2%
Small amount of garbage / recycle almost everything					7%	7%					1%
Dissatisfied with regular collection service											
Forgot or missed the regular collection service											
Disaster-related (flood, mud slide, etc)											
Self-sufficiency / do not like government		2%			13%						1%
Favor for friend/neighbor/family member					13%	7%				7%	2%
Dogs get into garbage if left on curb											
Waste is from vacation home											
Roadside litter removal	3%	4%	25%				13%				3%
Demolition trucking company											
Independent hauler	13%	7%	13%	7%		4%	13%	29%			9%
Habit	3%										
Subtotal	***90%***	***87%***	***88%***	***86%***	***100%***	***82%***	***100%***	***93%***	***100%***	***93%***	***90%***
Other	5%	2%	13%								2%
Refused to Answer		2%									
No Response	5%	9%		14%		18%		7%		7%	8%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Estimates are rounded to the nearest percent and, when added together, may not equal 100%, due to rounding. Values less than .5% are left blank

Appendix F. Waste Composition Comparisons to Previous Studies

Background

King County has completed periodic waste characterization studies since 1991 in an ongoing effort to monitor the types and amounts of materials disposed locally. Differences are often apparent between project years. In this appendix, selected results from the current 2011 study are compared to findings from 2007 study. The purpose of this comparison is to identify changes in the composition of waste streams over time. The reasons why or how these changes occurred are not investigated. Future studies could be designed to identify the potential causes of these variations.

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 proportions, not tonnage. For example, if newspaper accounts for 5% of disposed waste totaling 1,000 tons during one study period and 5% of waste totaling 1,200 tons during another–while the amount of newspaper in terms of total tons has increased, the proportion of newspaper, 5%, in the waste stream has not. The tests would indicate no change in newspaper.

The statistical tests used assume the hypothesis that there is no change. For example, "There is no statistically significant difference, between the 2007 and 2011 study periods in the proportion of newspaper disposed by the commercially collected single-family 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 in composition over time. "Insignificant" results indicate that either 1) there is no true difference, or 2) even though there may be a difference, there is not enough evidence to prove it because the findings are limited by sample size. It is also possible that changes occurred in waste categories that were not considered in this part of the analysis.

Table 74 lists the eight waste categories chosen for analysis. Composition variations were measured for the following substreams or combinations of substreams:

- Overall disposed waste
- Commercially collected waste from single family residences
- Commercially collected waste from multifamily residences
- Commercially collected waste from nonresidential sources
- Self-hauled waste (from both residential and nonresidential sources)

Table 74. T-Test Material Groupings

Material Type	T-test Material Category
Plain Corrugated Cardboard (OCC)	Cardboard and Kraft
Newspaper (ONP)	Newspaper
Low Grade Recyclable Paper	Other Curbside Paper
High Grade Paper	Other Curbside Paper
PET Bottles	Curbside Containers
Other PET Containers	Curbside Containers
HDPE Bottles	Curbside Containers
Other HDPE Containers	Curbside Containers
Other #3-#7 Packaging	Curbside Containers
Aluminum Cans	Curbside Containers
Other Aluminum	Curbside Containers
Tinned Food Cans	Curbside Containers
Other Ferrous	Curbside Containers
Other Non-Ferrous	Curbside Containers
Clear Glass Containers	Curbside Containers
Green Glass Containers	Curbside Containers
Brown Glass Containers	Curbside Containers
Waxed Corrugated Cardboard (OCC)	Organics
Single Use Food Service Compostable Paper	Organics
Other Compostable Paper	Organics
Packaged Vegetative Food	Organics
Unpackaged/Scrap Vegetative Food	Organics
Packaged Non-vegetative Food	Organics
Unpackaged/Scrap Non-vegetative Food	Organics
Large Prunings	Organics
Yard Waste	Organics
Dimensional Lumber	Wood Waste
Treated Wood	Wood Waste
Contaminated Wood	Wood Waste
Roofing and Siding Wood	Wood Waste
Other Wood	Wood Waste
C&D Wastes	Construction & Demolition
Asphalt Shingles	Construction & Demolition
Ash	Construction & Demolition
Nondistinct Fines	Construction & Demolition
Gypsum Wallboard	Construction & Demolition
Carpet	Construction & Demolition
Miscellaneous Inorganics	Construction & Demolition
Used Oil	Hazardous
Vehicle Batteries	Hazardous
Household Batteries	Hazardous
Latex Paint	Hazardous
Oil-based Paint	Hazardous
Solvents and Thinners	Hazardous
Adhesives and Glue	Hazardous
Cleaners and Corrosives	Hazardous
Pesticides and Herbicides	Hazardous
Gasoline and Fuel Oil	Hazardous
Antifreeze/Brake Fluid	Hazardous
Medical Waste	Hazardous
Pharmaceuticals and Vitamins	Hazardous
Compact Flourescent Bulbs	Hazardous
Other Flourescent Bulbs/Tubes	Hazardous
Other Hazardous Waste	Hazardous

Main Findings

Several differences are evident when comparing the results of the 2011 study with the 2007 waste composition study. These differences can be grouped into two main categories:

- **Statistically significant.** These findings can be considered true differences. The probability of observing these results if there had been no actual year-to-year change is low (10% for all tests within each substream).
- **Strong trends.** Although the results did not meet the requirements of the study's conservative statistical tests, there does seem to be a possible indication of change.

Key Comparison Study Findings

- Cardboard and Kraft have shown a strong trend or statistically significant decrease in all tested substreams except commercially collected multifamily.
- Organics in the commercially collected nonresidential substream have shown a statistically significant increase since 2007.
- The proportion of Newspaper has shown a statistically significant decrease since 2007 in the commercially collected nonresidential substream.
- There have been no strong trends or statistically significant changes in the commercially collected multifamily substream since 2007.
- Wood Waste materials have increased in self-hauled waste loads since 2002-2003.

The statistically significant differences between the 2007 and 2011 study periods, along with the trend indicators, for each tested substream are summarized in the following tables.

Table 75. Overall Disposed Waste T-Test Results, 2011

Material Grouping	Composition 2007	Composition 2011	Change in Composition	t-Statistic	p-Value	Statistically Significant Change*	Strength of Results
Cardboard and Kraft	5.8%	3.6%	-2.2% ↓	3.3123	0.0010 *	**Yes**	Statistically Significant
Newspaper	1.5%	1.1%	-0.4% ↓	2.1500	0.0318	No	Strong Trend
Other Curbside Paper	6.5%	6.4%	-0.1% ↓	0.1682	0.8664	No	
Curbside Containers	7.4%	8.5%	1.1% ↑	1.4063	0.1600	No	
Organics	25.8%	31.2%	5.4% ↑	2.9926	0.0028 *	**Yes**	Statistically Significant
Wood Waste	12.1%	10.8%	-1.3% ↓	0.8961	0.3704	No	
Construction & Demolition	8.8%	8.7%	-0.2% ↓	0.1215	0.9033	No	
Hazardous	0.9%	1.0%	0.2% ↑	0.4121	0.6804	No	
Number of Samples	421	420					

**(Cut-off for statistically significant difference = 0.0125)*

Table 76. Commercially Collected Single Family Residential T-Test Results, 2011

Material Grouping	Composition 2007	Composition 2011	Change in Composition	t-Statistic	p-Value	Statistically Significant Change*	Strength of Results
Cardboard and Kraft	2.5%	1.6%	-0.9% ↓	1.7316	0.0867	No	Strong Trend
Newspaper	2.6%	1.5%	-1.0% ↓	1.2061	0.2309	No	
Other Curbside Paper	7.5%	6.8%	-0.7% ↓	0.7859	0.4340	No	
Curbside Containers	7.8%	6.3%	-1.4% ↓	1.7774	0.0788	No	Strong Trend
Organics	39.4%	43.8%	4.4% ↑	1.5465	0.1255	No	
Wood Waste	1.4%	2.5%	1.0% ↑	0.9616	0.3388	No	
Construction & Demolition	3.6%	2.7%	-0.9% ↓	0.7920	0.4304	No	
Hazardous	0.6%	0.3%	-0.3% ↓	1.5372	0.1277	No	
Number of Samples	40	53					

(Cut-off for statistically significant difference = 0.0125)

Table 77. Commercially Collected Multifamily Residential T-Test Results, 2011

Material Grouping	Composition 2007	Composition 2011	Change in Composition	t-Statistic	p-Value	Statistically Significant Change*	Strength of Results
Cardboard and Kraft	4.8%	4.5%	-0.3% ↓	0.3620	0.7181	No	
Newspaper	2.5%	2.9%	0.4% ↑	0.5192	0.6047	No	
Other Curbside Paper	10.0%	8.2%	-1.7% ↓	1.5297	0.1291	No	
Curbside Containers	9.2%	11.2%	2.0% ↑	1.1608	0.2483	No	
Organics	34.9%	33.5%	-1.4% ↓	0.4534	0.6512	No	
Wood Waste	2.7%	3.6%	0.9% ↑	0.6955	0.4883	No	
Construction & Demolition	2.1%	2.4%	0.4% ↑	0.4138	0.6799	No	
Hazardous	1.1%	0.4%	-0.6% ↓	1.5828	0.1164	No	
Number of Samples	60	48					

(Cut-off for statistically significant difference = 0.0125)

Table 78. Commercially Collected Nonresidential T-Test Results, 2011

Material Grouping	Composition 2007	Composition 2011	Change in Composition	t-Statistic	p-Value	Statistically Significant Change*	Strength of Results
Cardboard and Kraft	9.1%	5.6%	-3.6% ↓	2.4503	0.0148	No	Strong Trend
Newspaper	2.0%	1.1%	-0.9% ↓	3.1190	0.0020 *	**Yes**	Statistically Significant
Other Curbside Paper	8.7%	9.7%	1.0% ↑	0.9565	0.3395	No	
Curbside Containers	6.8%	8.2%	1.4% ↑	1.4083	0.1600	No	
Organics	31.8%	40.2%	8.4% ↑	3.1931	0.0015 *	**Yes**	Statistically Significant
Wood Waste	7.4%	5.3%	-2.2% ↓	1.3756	0.1699	No	
Construction & Demolition	5.5%	3.2%	-2.2% ↓	1.8962	0.0588	No	Strong Trend
Hazardous	0.7%	1.5%	0.8% ↑	1.1129	0.2666	No	
Number of Samples	161	160					

(Cut-off for statistically significant difference = 0.0125)

Table 79. Self-haul T-Test Results, 2011

Material Grouping	Composition 2007	Composition 2011	Change in Composition	t-Statistic	p-Value	Statistically Significant Change*	Strength of Results
Cardboard and Kraft	3.6%	2.0%	-1.6% ↓	2.3363	0.0201	No	Strong Trend
Newspaper	0.5%	0.3%	-0.1% ↓	0.6119	0.5411	No	
Other Curbside Paper	3.0%	2.3%	-0.6% ↓	0.7677	0.4433	No	
Curbside Containers	7.1%	8.5%	1.4% ↑	0.8295	0.4074	No	
Organics	13.5%	16.7%	3.2% ↑	1.0343	0.3018	No	
Wood Waste	22.6%	21.7%	-0.9% ↓	0.2790	0.7804	No	
Construction & Demolition	15.8%	18.5%	2.7% ↑	0.9342	0.3509	No	
Hazardous	1.0%	1.0%	0.0% ↔	0.0202	0.9839	No	
Number of Samples	160	159					

**(Cut-off for statistically significant difference = 0.0125)*

Statistical Considerations

The analyses are based on the component percentages, by weight, for each selected substream. 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 study year-to-study year variation.

Normality

The distribution of some of the waste categories (particularly the hazardous materials) are 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, most of the selected categories are sums of several individual waste components, which improves our ability to meet the assumptions of normality.

Dependence

There may be dependence between waste types (if a person disposes of material A, they always dispose of material 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 material A increases, the percentage of some other material must decrease). This type of dependence is somewhat controlled by choosing only a portion of the waste categories for the analyses. Future studies might be merited to examine these two types of dependence explicitly.

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 $\frac{0.10}{w}$ (w = the number of t-tests).

The adjustment can be explained as follows:

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

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).

Power Analysis

The greater the number of samples, the greater the ability to detect differences. In the future, an *a priori* power analysis might benefit this research by determining how many samples would be required to detect a particular minimum difference of interest.

Interpreting the Calculation Results

The following tables include detailed calculation results. An asterisk notes the 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, Table 78, the proportion of Newspaper in the commercially collected nonresidential substream decreased from 2.0% to 1.1% across the study periods. The t-statistic is relatively large (3.1190) and the probability (p-value) of observing that t-statistic if there had been no true difference between years is just 0.20%. This value is less than the study's pre-determined threshold for statistically significant results (alpha-level of 1.25%); thus the decrease in Newspaper is considered to be a true difference. On the other hand, the p-value corresponding to the decrease in Other Curbside Paper is very large (p=.3395). The chance of observing the 8.7 % to 9.7% increase when the actual proportion had not changed is 33.95%—much too high to be considered a true difference.

Appendix G. Quality Control Plan

This quality control plan throughout the 2011 King County Waste Monitoring study was executed to help ensure quality and consistency throughout fieldwork, data entry, and reporting.

Train Sorting Crew

To provide consistent sorting, the same crewmembers trained at the onset of the study continued to work until the study's completion in December 2011. All sorting crewmembers spent time in the field studying the components and practicing the sampling protocol. The training focused on the precise definitions for each waste component category and also covers safety procedures, sorting techniques, and quality control procedures.

The gatekeeper (the person who selects vehicles for sampling) was a Cascadia staff member trained in survey methods and familiar with transfer station protocol, safety procedures, and vehicle types. However, the gatekeeper also received training in selecting vehicles for sampling.

Select Vehicles

For each sampling day, the gatekeeper tallied vehicles as they entered the transfer station on a *Vehicle Selection* form. The form indicated the sampling frequency and the total number of vehicles needed for each substream and vehicle type. For each vehicle selected for sampling, the gatekeeper placed a fluorescent pink "Sample" card on the windshield and directed the vehicle to the sorting crew. The brightly colored cards enabled the sorting crew to identify the selected vehicle easily.

The gatekeeper assigned each vehicle a unique identification number and recorded it on both the pink card and the gatekeeper form. When the driver proceeded to the sorting area, the Sort Crew Manager collected the pink card from the vehicles driver.

Sample Waste

The crew sorted the waste samples by hand into plastic laundry baskets until only a small amount of homogeneous fine material remained. To ensure consistency among the samples, sorting crewmembers specialized in groups of materials, such as papers or plastics. The open laundry baskets allowed the Sort Crew Manager to observe the material at all times and to monitor the homogeneity of the components as they accumulated in the baskets.

Record and Review Data

The Sort Crew Manager recorded the composition weight information on a specially designed tally sheet. By combining the Cascadia designed tally sheet, database, and corresponding electronic data-entry forms together, Cascadia was able to ensure accuracy, consistency among forms, and efficient recording of data.

After each month's sampling event, a designated Cascadia staff member entered the tally sheet data, and the sampling task manager reviewed the entered results to ensure accuracy and reliability.

Report Preparation

Cascadia calculated waste composition estimates using automated analytical tools that Cascadia staff developed. These automated tools reduced the possibility for human error and were tailored, as required, to meet the needs of the study.

The automated calculation tools provided basic information that Cascadia used as a checkpoint to help ensure valid and correct data analysis. For example, the analysis tools showed the total number of samples and the average net weight of the samples when computing composition estimates. Additionally, the user selected what statistical procedures were applied.

A user's guide for the analytical tools provided new project staff with ongoing references and instructions.

Appendix H. Health and Safety Plan

The seven part Health and Safety Plan for Sky Valley Associates, the subcontractor assigned to perform the waste sorting, is detailed below:

Responsibility

Brad Anderson, acting as the designated Safety Officer, has the authority and the responsibility for implementing and maintaining the Health and Safety Program for Sky Valley Associates while working on-site. Managers and supervisors are responsible for implementing and maintaining safe working practices in their work areas and for answering worker questions about the Health and Safety Plan. A copy of this Health and Safety Plan is provided to all Sky Valley Associates employees.

The Health and Safety Plan is not a static plan. As conditions and situations arise, this Health and Safety Plan will be updated and augmented in accordance to OSHA and MSHA standards.

Compliance

All workers, including managers and supervisors, are responsible for complying with safe and healthful work practices. Our goal is to ensure that all workers understand and comply with these practices. To accomplish this, our procedures include informing workers of the provisions of our program, evaluating the on-going safety performance of all workers, and providing additional training to workers whose safety performance may be deficient.

The employees of Sky Valley Associates often perform their duties as guests of many different facilities The procedures described in our program in no way supersede the requirements which may already be in place at these facilities. Instead, this plan is designed to augment and work in conjunction with any site safety plans already existing at these facilities. We follow all host facility safety requirements which are more stringent than our own. Our safety procedures often exceed those of our host. Workers must follow our procedures, regardless of whether the host facility has any such requirements.

Communication

Sky Valley Associates is committed to providing a safe work environment for all of its workers. All managers and supervisors are responsible for communicating with all workers about occupational safety and health in a form readily understandable by all workers. Workers are encouraged to inform their managers and supervisors about workplace hazards without fear of reprisal. If the safety of the entire team could be in jeopardy – or if anything is discovered that could cause injury or is unsafe, workers are advised to tell their manager or supervisor immediately.

Sky Valley Associates routinely communicates with and instructs employees orally about general safe work practices and hazards unique to each employee's job assignment. Our overall communication system includes the following items:

- New worker orientation, including discussion of safety and health policies and procedures,
- Worker training in the specific protocols of our field procedures,

- Scheduled and "tailgate" safety meetings,
- Posted or distributed safety information,
- Periodic review of our Health and Safety Program.

The Safety Officer is responsible for ensuring that all field personnel have read, and understood, the master copy of this Health and Safety Plan document, and that all workers have received orientation and training on the safety protocols to be followed in conducting our work

The Safety Officer delegates daily on-site responsibilities to the Supervisor in charge of the work. Each Supervisor has the duties and responsibilities to:

- Ensure that the procedures in this document are followed for the day's work,
- Be familiar with local emergency services, and maintain a list of emergency phone numbers,
- Conduct "tailgate" health and safety meetings to notify workers of any changes in safety protocol,
- Inspect personal protective equipment and to ensure proper use of such equipment,
- Monitor on-site hazards and the early health warning signs (e.g., heat stress/stroke, dehydration, or fatigue) of site personnel,
- Stop unsafe operations, and to summon emergency services when needed.

Nearly every day we work, we may be at a different facility. The supervisor will brief workers on health and safety protocols of the host site. This will include emergency evacuation and rally point information, to ensure that, in the event of an emergency, all Sky Valley Associates workers will adhere to site-specific evacuation and management procedures.

Hazard Assessment

We perform assessments of possible work hazards, and the procedures to work safely around them, when:

- We initially established our Health & Safety protocols,
- New substances, processes, procedures or equipment which present potential new hazards are introduced into our workplace,
- New, previously unidentified hazards are recognized,
- Workplace conditions warrant an assessment,
- When occupational injuries and illnesses occur.

On a daily basis, Supervisors are to identify and evaluate workplace hazards which may be present at each work site. We routinely encounter the same day-to-day risks when we conduct our work. Yet, every facility is different, which may present unique hazards. These are some possible hazards that may occur during our work:

Physical hazards:

- Cuts and punctures,
- Lifting,

- Slipping and falling,
- Heat stress and fatigue,
- Traffic or heavy equipment movement,
- Noise exposure,
- Animal and/or insect bites.

Airborne contaminants:

- Dust and windblown debris.

Chemical hazards:

- Liquid spills from containers,
- Household and hazardous chemicals.

Biological hazards:

- Household hazardous wastes,
- Medical wastes,
- Blood/body fluid contaminated items,
- Hypodermic needles.

Due to the nature of waste composition sampling, exposures to airborne pathogens and subcutaneous introduction of pathogens are possible. Because of this, all Sky Valley Associates employees will be given the opportunity to be vaccinated with Tetanus and Hepatitis B vaccines at the cost of Sky Valley Associates. Any employee that forfeits having the vaccine will do so in writing.

Accident/Exposures Investigation

Procedures for investigating workplace accidents and hazardous substance exposures include:

- Interviewing injured workers and witnesses,
- Examining the workplace for factors associated with the accident/exposure,
- Determining the cause of the accident/exposure,
- Taking corrective action to prevent the accident/exposure from reoccurring,
- Recording the findings and actions taken.

Hazard Correction

Timely corrective action will be taken to remedy an unsafe condition, practice or procedure. When an imminent hazard exists that cannot be immediately abated without endangering employee(s) and/or property, we will remove all exposed workers from the area.

Training and Instruction

All Sky Valley Associates workers, including managers and supervisors, shall have training and instruction on general and job-specific safety and health practices. Training and instruction is provided:

- To all new workers,
- To all workers given new job assignments for which training has not previously provided,
- Whenever new substances, processes, procedures or equipment are introduced to the workplace and represent a new hazard,
- Whenever Sky Valley Associates is made aware of a new or previously unrecognized hazard,
- To supervisors to familiarize them with the safety and health hazards to which workers may be exposed,
- To all workers with respect to hazards specific to each employee's job assignment.

Sky Valley Associates provides for its workers the proper safety equipment for performance of duties associated with waste sampling. These items include:

- Coveralls or protective outer wear (optional),
- Rubber gloves and liners (required),
- Lower back support apparatus (optional),
- Hearing protection (optional/based on site requirements),
- Safety glasses (optional/based on site requirements),
- Reflective safety vests (required),
- Hard hats and liners (required),
- Knee pads (optional).

During the conduct of our fieldwork, the following personnel health and safety guidelines are to be followed:

- Workers should be in good physical condition, maintain a current tetanus booster and Hepatitis B shot, and not be over-sensitive to odors and dust. All workers must be able to communicate in English, and be able to read warning signs/labels.
- Workers should routinely check personal protective equipment and work clothing for proper fit and condition and replace or repair defective items immediately.
- Workers must look at what they are picking up or sorting – the most effective way to prevent cuts and punctures is first see the material. Workers must use one of the small rakes or shovels to move material around for sorting.
- Workers must lift properly, and ask for assistance when lifting heavy or bulky items. Be particularly careful when you are tired or fatigued.
- Workers must be on the lookout for slipping and tripping hazards.
- Workers should not attempt to identify unknown chemical substances in unlabeled containers.
- Workers much wash hands and face before eating or drinking, and must smoke only in designated areas.

- Workers should consume plenty of fluids during hot days, and watch for signs of heat-related illness.
- Workers should be aware of the surroundings and alert to the possibility of unexpected hazards.
- Workers must alert the Supervisor if feeling ill, overly fatigued, or injured. Even minor cuts and injuries must be treated immediately.

Appendix I. Example Field Forms

This appendix contains examples of all field forms including:

- Customer Survey Form
- Vehicle Type Identification Form
- Customer Information Sheet
- Daily Vehicle Selection Sheet
- Sample Placard
- Material Weight Tally Sheet

Figure 30. Customer Survey Form, Front

As All Vehicles Approach					*Ask All Vehicles*								*Ask Self-Haul Only*					
																Skip if CB/Landscaper		
ID	Collection Type	Vehicle Type	Trailer	Net Weight	City	Sector					Waste Type	**Contractor or Landscaper**	Trips to Any Station per Time Period		ZIP Code	**Subscribe Curbside Garbage Service?**	**Why Self-Haul?**	Comments
Either a number from a card or a sample ID if chosen for a sample.	C comm'l. S self-haul	1 Rear Packer 2 Front Packer 3 Side Packer 4 DB, Loose 5 DB, Compacted 6 Pick-up, Van, SUV 7 Large Other 8 Car	X if Yes	Record in Pounds (lbs) when possible	If city is not on the list of King County cities, clarify whether it is inside or outside of King County	SF: Single-family residential MF: Multi-family residential RES: Residential NRES: Non-residential If 100%, just check box. If not, fill out percents (must total 100%). If Commercial:			If Self-haul		**Y Yard Waste** **C Construction/ Demolition** M Mixed Garbage S Special Waste	If waste type = **Y** yard waste or **C** construction/demo., then ask: CB Contractor/Builder LN Landscaper	(Number)	(Circle time period) D day W week M month Y year E ever *(or <1 per 10 yrs)*		Yes No	If "**No**" to Garbage Service, ask "Why don't you subscribe to curbside garbage service?"	
						%SF	%MF	% NRes	%RES	%NRES								
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		
	C S										Y C M S	CB LN		D W M Y E	98_____	Y N		

Figure 31. Customer Survey Form, Back

Complete this section for every page

Page _____ of _____

Date _____

Surveyor(s) _____

_____

Circle the site:

Algona	Shoreline
Bow Lake	Houghton
Cedar Falls	Renton
Enumclaw	Skykomish
Factoria	Vashon Island

Complete this section for first page only

Inclement Weather? _____

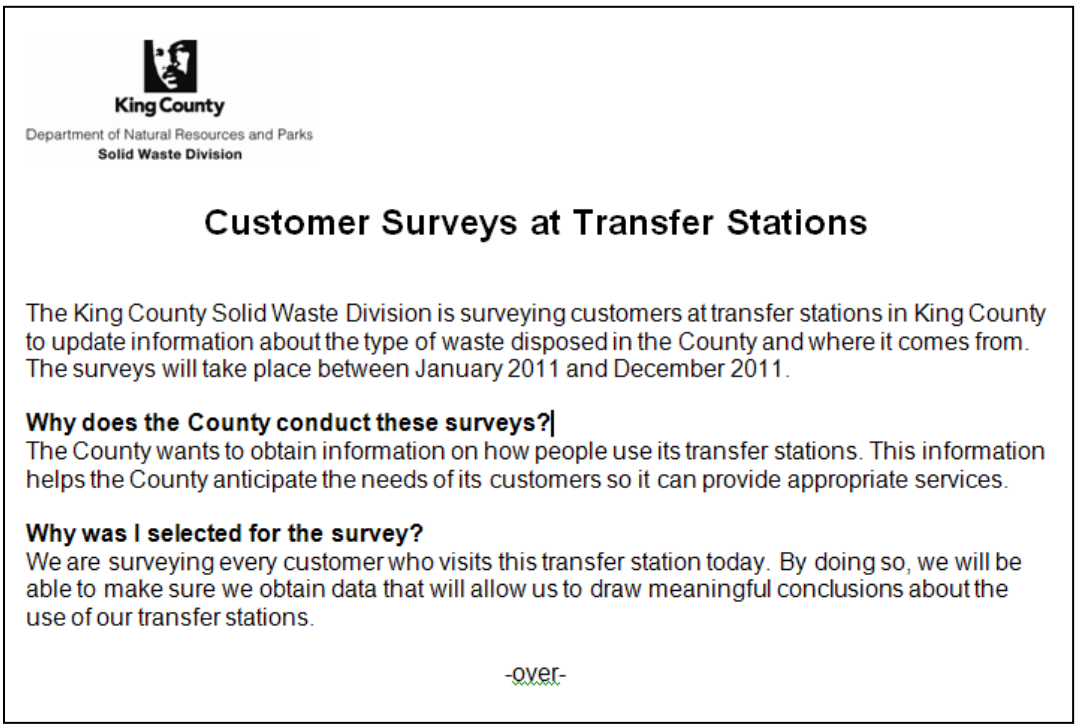
Start Time _____ Stop Time _____

Other Notes about Today's Surveying:

Figure 32. Vehicle Type Identification Form

1. Rear Packer	2. Front Packer	3. Side Packer
		
4. Drop Box, Loose	**5. Drop Box, Compacted**	**6. Pick-up, Van, SUV**
		
7. Large Other		
		
8. Car	**9. Semi Truck**	
		

Figure 33. Customer Information Sheet, Front



King County
Department of Natural Resources and Parks
Solid Waste Division

Customer Surveys at Transfer Stations

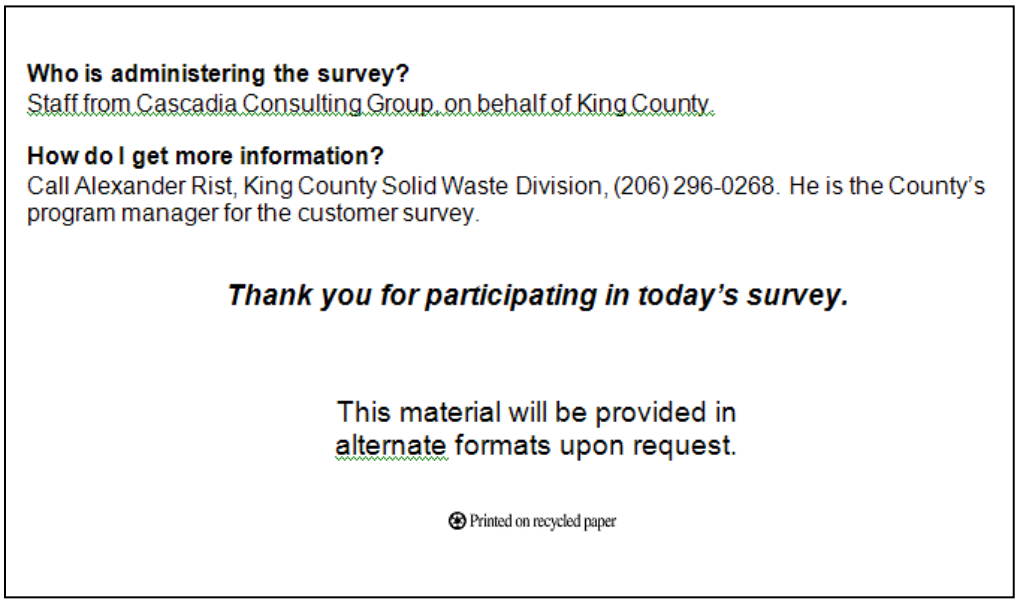
The King County Solid Waste Division is surveying customers at transfer stations in King County to update information about the type of waste disposed in the County and where it comes from. The surveys will take place between January 2011 and December 2011.

Why does the County conduct these surveys?
The County wants to obtain information on how people use its transfer stations. This information helps the County anticipate the needs of its customers so it can provide appropriate services.

Why was I selected for the survey?
We are surveying every customer who visits this transfer station today. By doing so, we will be able to make sure we obtain data that will allow us to draw meaningful conclusions about the use of our transfer stations.

-over-

Figure 34. Customer Information Sheet, Back



Who is administering the survey?
Staff from Cascadia Consulting Group, on behalf of King County.

How do I get more information?
Call Alexander Rist, King County Solid Waste Division, (206) 296-0268. He is the County's program manager for the customer survey.

Thank you for participating in today's survey.

This material will be provided in
alternate formats upon request.

Printed on recycled paper

Figure 35. Daily Vehicle Selection Sheet

King County Waste Monitoring Study
Vehicle Selection Form

Site: Renton

Date: Friday, December 16, 2011

Cross off one number for each type of vehicle entering the station.

When you reach the number circled, this vehicle should be asked to go to the sorting area to dump its load for sampling.

Continue for each block, beginning at #1, on the next line until the required number of vehicles is sampled.

FRANCHISED RESIDENTIAL: (Res) **NEED 3 TOTAL - SAMPLE EVERY VEHICLE**

(1)
(1)
(1)

packer trucks or drop boxes (compacting and loose)

FRANCHISED NONRESDROPBOX: (DB) **NEED 4 TOTAL - SAMPLE EVERY OTHER VEHICLE**

1 (2)
1 (2)
1 (2)
1 (2)

both compacting and loose drop boxes

FRANCHISED NONRES PACKER: (Com) **NEED 3 TOTAL - SAMPLE EVERY VEHICLE**

(1)
(1)
(1)

If enough FRANCHISED NONRESIDENTIAL PACKERS are unavailable,
make up diference with FRANCHISED RESIDENTIAL

SELF-HAUL PASSENGER: (SH) **NEED 3 TOTAL - SAMPLE EVERY 5th VEHICLE**

1 2 3 4 (5) 6 7 8 9 (10) 11 12 13 14 (15) 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56

SELF-HAUL LARGE OTHER: (SHO) **NEED 2 SAMPLE EVERY VEHICLE**

(1) (2)

Figure 36. Sample Placard

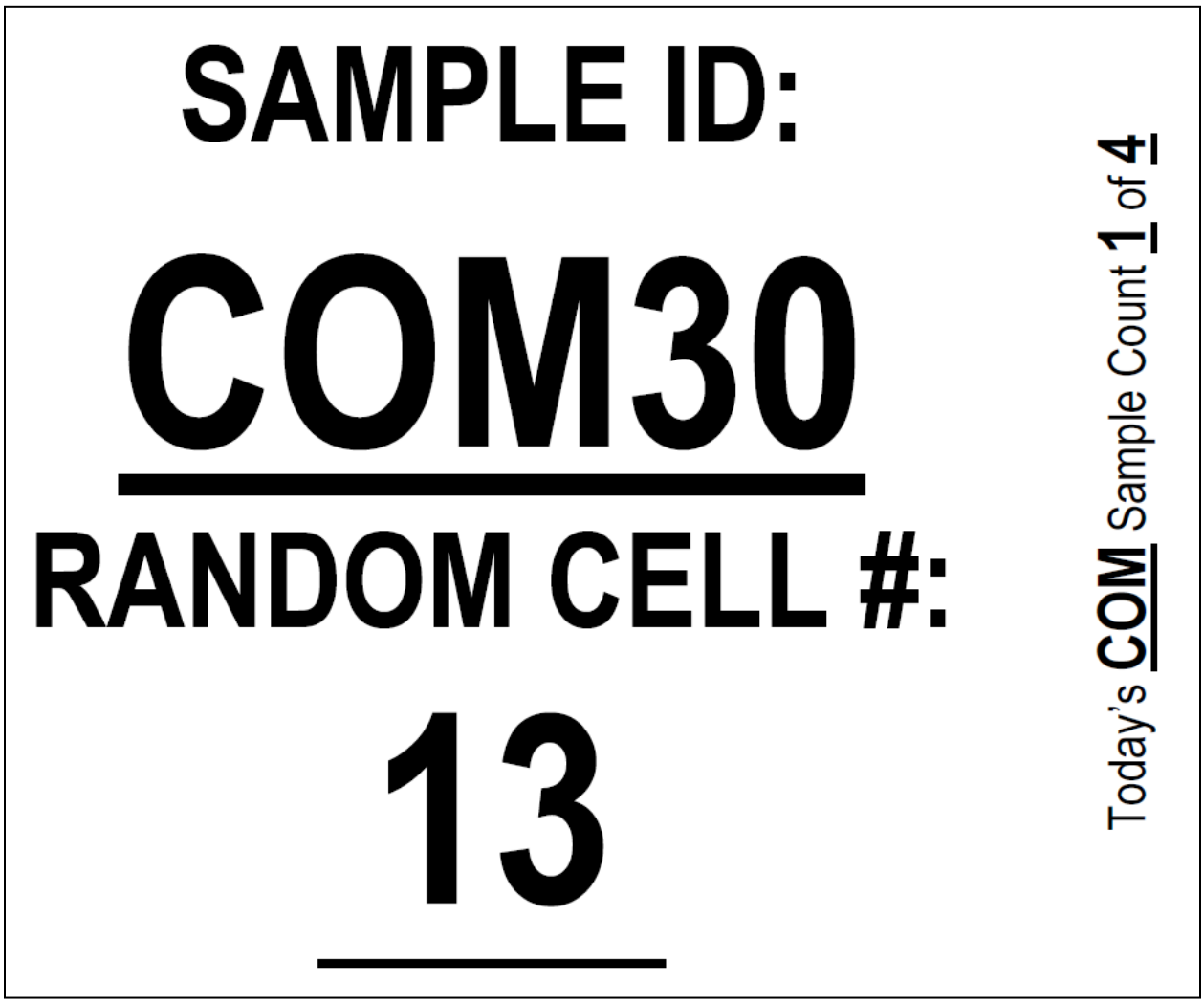


Figure 37. Material Weight Talley Sheet, Front

Tally Sheet - Page 1

2011 King County Waste Composition Study

PAPER	Newspaper (ONP)				
	Plain Corrugated Cardboard (OCC)				
	Waxed Corrugated Cardboard (OCC)				
	Low Grade Recyclable Paper				
	High Grade Paper				
	Single Use Food Service Compostable				
	Other Compostable Paper				
	Other Paper				
PLASTIC	PET Bottles				
	Other PET Containers				
	HDPE Bottles				
	Other HDPE Containers				
	Other #3-#7 Packaging				
	Compostable Plastics				
	EPS Single-serve Food Packaging				
	Other EPS Packaging				
	EPS Products				
	Recyclable Plastic Bags				
	Non-industrial Packaging Film Plastic				
	Industrial Packaging Film Plastic				
	Plastic Garbage Bags				
	Plastic Film Products				
	Other Plastic Packaging				
	Single Resin Plastic Products				
	Mixed Resin Plastic Products				
	Foam Rubber and Padding				
	Carpet Padding				
	Plastic and Other Materials				
METAL	Aluminum Cans				
	Other Aluminum				
	Tinned Food Cans				
	Other Ferrous				
	Other Non-Ferrous				
	Mixed Metals (metal <20% non-metal)				
	Other Mixed Metals (items >20% non-metal)				
	Compressed Gas Cylinders				

GLASS	Clear Glass Containers				
	Green Glass Containers				
	Brown Glass Containers				
	Kitchenware/Ceramics				
	Other Glass				
FOOD	Packaged Vegetative				
	Unpack/Scrap Veg				
	Packaged Non-vegetative				
	Unpack/Scrap Non-veg				
WOOD, YARD	Dimensional Lumber				
	Treated Wood				
	Contaminated Wood				
	Roofing and Siding Wood				
	Stumps				
	Large Prunings				
	Yard Waste				
	Other Wood				
OTHER ORGANICS	Textiles: Clothes				
	Other Textiles				
	Disposable Diapers				
	Rubber Products				
	Tires				
	Animal Carcasses				
	Animal Feces				
	Miscellaneous Organics				

DATE **TIME**

FACILITY ☐ **Photo?**

SAMPLE #

Figure 38. Material Weight Talley Sheet, Back

ELECTRONICS	Small Household Appliances				
	A/V Equipment				
	Printers/Copiers/Fax Machines				
	CPU's				
	Computer Peripherals				
	Other Electronics				
	CRT Computer Monitors				
	CRT TVs				
	LCD/Other TVs				
	LCD Computer Monitors				
	Laptops				
	Cell Phones				
OTHER WASTES	C&D Wastes				
	Asphalt Shingles				
	Ash				
	Nondistinct Fines				
	Gypsum Wallboard				
	Furniture				
	Mattresses				
	Carpet				
	Miscellaneous Inorganics				
HHW, SPECIAL	Used Oil				
	Vehicle Batteries				
	Household Batteries				
	Latex Paint				
	Oil-based Paint				
	Solvents and Thinners				
	Adhesives and Glue				
	Cleaners and Corrosives				
	Pesticides and Herbicides				
	Gasoline and Fuel Oil				
	Antifreeze/Brake Fluid				
	Medical Waste				
	Pharmaceuticals and Vitamins				
	Compact Flourescent Bulbs				
	Other Flourescent Bulbs/Tubes				
	Other Hazardous Waste				

Tally Sheet - Page 2

If Found, Please Call Cascadia Consulting Group at 206 343 9759.

Revised 1/31/11

Appendix J. Estimated Changes in GHG Emissions from Diversion

This appendix estimates the potential change in greenhouse gas (GHG) emissions associated with increased diversion of typical curbside recyclable and compostable materials. The GHG emissions calculations were performed using MEBCalc™, a life cycle assessment (LCA) model for measuring the environmental footprint of a community's solid waste management system, from collection through final disposition of each discarded product or packaging material.

The United Nations Intergovernmental Panel on Climate Change (IPCC) provides some methodological guidelines to simplify measuring and calculating GHG emissions reductions. This analysis followed the IPCC guidelines and considered local conditions (such as local landfill gas management practices and the local power grid) when local data were available. The GHG emissions analysis included emissions from:

- Collection vehicles. This assumed a 70%/30% mix between diesel/CNG -powered collection equipment.
- Equipment used to handle materials at compost facilities, recycling processors, and landfills.
- Hauling diverted materials to a local recycling and composting facility compared to hauling garbage to Cedar Hills landfill. This assumed an average 36 mile round trip to Cedar Grove composting and Cedar Hills landfill for composting and disposal respectively. The round trip distance for recyclables varies depending on the material.
- The production and use of petroleum-based fertilizers.
- Landfill gas (LFG) to energy projects, assuming a 90% capture rate for methane at the landfill .
- New material production using virgin materials.

The GHG emissions reduction analysis also considered:

- Carbon storage in landfills and composting facilities.[16]
- Local recycling markets.
- Ten percent rate of fugitive emissions from methane oxidation at landfills.
- The source of the waste (residential or commercial) and hauler (franchise or self-haul).

Most of the emissions and factors listed above tend to support increased diversion (recycling requires less electricity than production using virgin materials, for instance) but some support landfilling (sending organics to landfill can increase electricity generation from captured LFG thus displacing petroleum based fuels in the power grid).

Greenhouse Gas Emissions Estimates

Material Types

MEBCalc™ modeled the potential changes in GHG emissions when 25%, 50%, and 75% of an individual material was diverted from disposal, either to composting or recycling (as appropriate per material). MEBCalc performed this modeling for 28 material types; Table 80 lists the materials modeled and

[16] MEBCalc™ accounts for carbon storage using data and techniques developed and outlined in Morris, Jeffery. "Bury or Burn North America MSW? LCAs Provide Answers for Climate Impacts & Carbon Neutral Power Potential." *Environmental Science & Technology* 44 (2010): 7944-7949

whether they are considered recyclable or compostable. This list correlates with the recoverability groups listed in Table 13.

Table 80. Material Types Included in the GHG Analysis

Material Type	Recoverability
Newspaper (ONP)	Recyclable
Plain Corrugated Cardboard (OCC)	Recyclable
Waxed Corrugated Cardboard (OCC)	Compostable
Low Grade Recyclable Paper	Recyclable
High Grade Paper	Recyclable
Single Use Food Service Compostable Paper	Compostable
Other Compostable Paper	Compostable
PET Bottles	Recyclable
Other PET Containers	Recyclable
HDPE Bottles	Recyclable
Other HDPE Containers	Recyclable
Other #3-#7 Packaging	Recyclable
Compostable Plastics	Compostable
Recyclable Plastic Bags	Recyclable
Aluminum Cans	Recyclable
Other Aluminum	Recyclable
Tinned Food Cans	Recyclable
Other Ferrous	Recyclable
Other Non-Ferrous	Recyclable
Clear Glass Containers	Recyclable
Green Glass Containers	Recyclable
Brown Glass Containers	Recyclable
Packaged Vegetative Food	Compostable
Unpackaged/Scrap Vegetative Food	Compostable
Packaged Non-vegetative Food	Compostable
Unpackaged/Scrap Non-vegetative Food	Compostable
Large Prunings	Compostable
Yard Waste	Compostable

Recovered Tons

Table 81 outlines how many tons of each material type customers in King County disposed in 2011. These tonnages, detailed in the "Disposed" column, are the sum of tonnages from franchise haul and self-haul customers.

The subsequent three columns, "Recovered at 25% Diversion," "Recovered at 50% Diversion," and "Recovered at 75% Diversion," specify the tonnages considered for the GHG analysis at each modeled diversion level (25%, 50%, and 75%), and are based on the "Disposed" tonnages.

Table 81. Recovered Tons at Each Modeled Diversion Level

	Tons			
	Disposed	Recovered at 25% Diversion	Recovered at 50% Diversion	Recovered at 75% Diversion
Newspaper (ONP)	9,877	2,469	4,938	7,407
Plain Corrugated Cardboard (OCC)	28,914	7,228	14,457	21,685
Waxed Corrugated Cardboard (OCC)	2,464	616	1,232	1,848
Low Grade Recyclable Paper	41,972	10,493	20,986	31,479
High Grade Paper	15,128	3,782	7,564	11,346
Single Use Food Service Compostable Paper	9,424	2,356	4,712	7,068
Other Compostable Paper	43,195	10,799	21,597	32,396
PET Bottles	5,556	1,389	2,778	4,167
Other PET Containers	1,592	398	796	1,194
HDPE Bottles	4,163	1,041	2,081	3,122
Other HDPE Containers	974	244	487	731
Other #3-#7 Packaging	5,412	1,353	2,706	4,059
Compostable Plastics	7	2	4	5
Recyclable Plastic Bags	2,336	584	1,168	1,752
Aluminum Cans	2,448	612	1,224	1,836
Other Aluminum	1,189	297	594	892
Tinned Food Cans	5,874	1,469	2,937	4,406
Other Ferrous	23,596	5,899	11,798	17,697
Other Non-Ferrous	3,199	800	1,600	2,399
Clear Glass Containers	7,065	1,766	3,532	5,299
Green Glass Containers	2,505	626	1,253	1,879
Brown Glass Containers	3,514	879	1,757	2,636
Packaged Vegetative Food	37,678	9,420	18,839	28,259
Unpackaged/Scrap Vegetative Food	97,240	24,310	48,620	72,930
Packaged Non-vegetative Food	13,426	3,357	6,713	10,070
Unpackaged/Scrap Non-vegetative Food	30,315	7,579	15,158	22,736
Large Prunings	2,532	633	1,266	1,899
Yard Waste	38,620	9,655	19,310	28,965
Total	**440,215**	**110,054**	**220,108**	**330,161**

Estimated Changes in GHG Emissions

The change in GHG emissions for each material is measured in metric tonnes of CO_2 equivalent (MtCO2e) and noted in Table 82. Positive numbers denote reduced GHG emissions. The negative numbers associated with *large prunings* indicate that increased diversion actually increases GHG emissions. Possible reasons for this may include:

- An increase in the fuel used by equipment needed to handle the *large prunings* at a compost facility compared to a landfill, and
- A high LFG potential for *large prunings*.

The magnitude of the reduction (or increase) in GHG emissions per material is dependent on both the quantity of the material diverted and the material itself. Each material has a different GHG emission reduction potential based on how readily it degrades in the landfill, how far it travels to market, and

other factors. *Unpackaged/scrap vegetative food* offers the greatest reduction potential (22,850 MtCO2e at 25% diversion).

Diverting 25% of each material in Table 82 from disposal avoids more than 117,700 MtCO2e per year; this is equivalent to the annual emissions from more than 23,000 passenger vehicles.[17]

Table 82. Change in MtCO2e Emissions at Each Modeled Diversion Level

	GHG Tons Avoided (MtCO2e)		
	at 25% Diversion	at 50% Diversion	at 75% Diversion
Newspaper (ONP)	3,539	7,077	10,615
Plain Corrugated Cardboard (OCC)	17,547	35,093	52,636
Waxed Corrugated Cardboard (OCC)	143	286	428
Low Grade Recyclable Paper	10,464	20,926	31,386
High Grade Paper	9,578	19,155	28,732
Single Use Food Service Compostable Paper	547	1,093	1,639
Other Compostable Paper	2,505	5,008	7,511
PET Bottles	2,068	4,136	6,204
Other PET Containers	593	1,185	1,778
HDPE Bottles	1,220	2,440	3,659
Other HDPE Containers	286	571	856
Other #3-#7 Packaging	1,586	3,172	4,758
Compostable Plastics	0	1	1
Recyclable Plastic Bags	913	1,827	2,740
Aluminum Cans	5,472	10,943	16,415
Other Aluminum	2,657	5,315	7,972
Tinned Food Cans	1,555	3,110	4,664
Other Ferrous	6,133	12,260	18,382
Other Non-Ferrous	1,917	3,832	5,745
Clear Glass Containers	499	996	1,494
Green Glass Containers	177	353	530
Brown Glass Containers	248	496	743
Packaged Vegetative Food	8,854	17,707	26,559
Unpackaged/Scrap Vegetative Food	22,850	45,698	68,543
Packaged Non-vegetative Food	3,155	6,310	9,464
Unpackaged/Scrap Non-vegetative Food	7,124	14,247	21,369
Large Prunings	-288	-578	-868
Yard Waste	6,406	12,799	19,180
Total	**117,745**	**235,457**	**353,135**

[17] Equivalency calculated using the U.S. EPA *Greenhouse Gas Equivalencies Calculator* available at http://www.epa.gov/cleanenergy/energy-resources/calculator.html