



# Commercial Food Scraps Composition Study

November 2020

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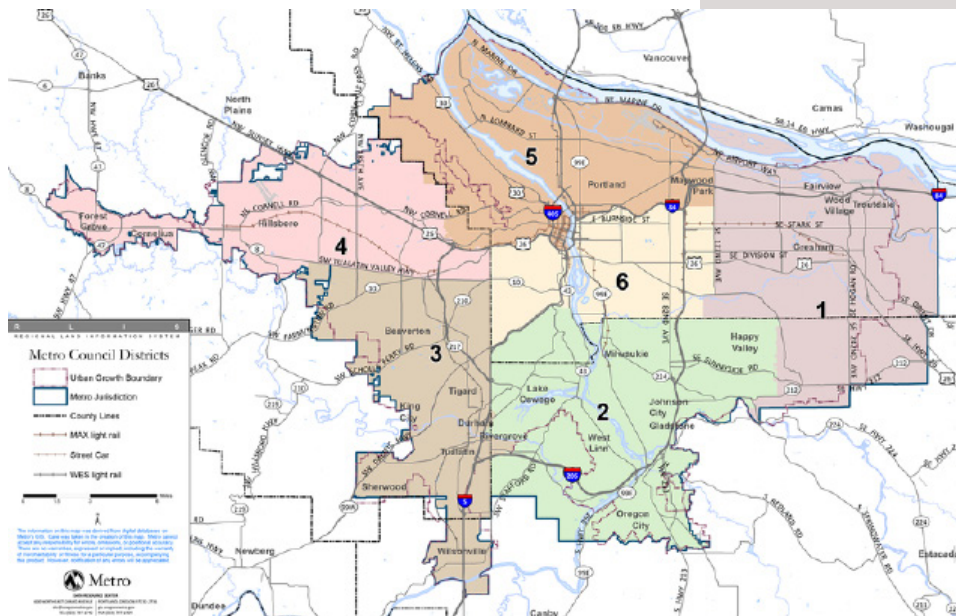
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## SECTION 1: INTRODUCTION

In November 2019, Metro completed the Commercial Food Scraps Composition Study to evaluate the amount and types of non-acceptable material, known as contaminants, placed in food scraps bins by businesses and their employees in the Metro region. Nearly 28,000 pounds of food scraps, or 50 samples, were collected and sorted over the course of this study. The information gathered will be used by Metro and local governments to inform the development and implementation of strategies designed to decrease the overall level of contamination in food scraps.



### Food Only Program

The business food scraps program is food only. This means that businesses must ensure that the food scraps they place in collection bins are free of non-food items, such as cups, napkins, cutlery and other materials. Food scraps are defined as excess, spoiled or unusable and inedible food such as waste from fruits, vegetables, meats, dairy products, fish, shellfish, nuts, seeds, grains, coffee grounds and similar material that results from the storage, preparation, cooking, handling, selling or serving of food for human consumption. Food scraps do not include large amounts of oils and meats that are collected for rendering or other beneficial uses or any food fit for human consumption that has been set aside, stored properly and is accepted for donation.

## About Metro

Metro is a directly-elected regional government that serves more than 1.5 million people in Clackamas, Multnomah and Washington counties. The agency's boundary encompasses Portland, Oregon and 23 other cities. The Metro Council consists of a president, elected region-wide, and six councilors who are elected by district every four years. The council appoints a chief operating officer to carry out council policies and manage a diverse portfolio of functions. Metro services include maintaining 17,000 acres of parks and natural areas, coordinating and planning investments for the regional transportation system and operation of visitor venues including the Oregon Zoo, performing arts centers and the Oregon Convention Center.

Metro also plans and oversees the region's solid waste system – working with local communities and industry partners to reduce waste while managing garbage, recycling and composting in a safe, healthy and cost-effective manner. Metro owns and operates two garbage and recycling stations and hazardous waste facilities (Metro Central Transfer Station and Metro South Transfer Station). A hotline and an online search tool help people recycle everything from batteries to leftover paint to construction debris. Education and outreach programs offer tips and tools for saving resources and protecting clean air and water at home and on the job.

## BACKGROUND

Food is the largest component of the Metro region's garbage: about 18 percent of our overall disposed waste—more than any other material by far. Businesses are responsible for more than half of that—approximately 100,000 tons of food per year. For more than 15 years, Metro and local government partners have been working to keep food out of landfills and put it to better use. Today about 1,400 businesses participate in this program, but food scraps collection services are not available consistently throughout the metropolitan area, and a tremendous amount of food is still being sent to landfills.

In July 2018, the Metro Council adopted a new policy requiring the largest food service businesses to separate their food scraps from other garbage starting in March 2020, with smaller food service businesses phased in over the following three to four years. The policy requires city and county governments, which oversee the collection of garbage and recycling, to ensure that food scraps collection services are available to businesses in their communities starting in March 2020. Due to the unanticipated impacts of the COVID-19 pandemic, the implementation of the collection requirement has been delayed by one year to March 2021. Some of the most economically distressed businesses are in the food sector; restaurants, food service operations and the hospitality industry. The economic health of these businesses is already uncertain and any changes imposed at this time, such as the Business Food Waste Requirement, would create unnecessary hardship. Until that time, voluntary collection programs throughout the region will continue and businesses can continue to participate as best suits their needs.

Collecting food scraps allows that material to be used to create clean energy as well as compost products that benefit farms, nurseries and gardens. The stability of collection programs is reliant on the strength and redundancy of end-markets—therefore the quality of material collected is paramount. Metro's goal is, and will continue to be, to collect food scraps that are as free from contamination as possible and that are desired by multiple markets. Establishing a baseline level and type of contamination is important prior to the implementation of the collection requirement—providing a program quality standard to which the program will be compared as it rolls out region-wide over the next 4 to 5 years. The information gathered in this and subsequent studies will help direct outreach and education efforts to assist businesses with correct material preparation. The baseline will also be used to indicate any unintended consequences of the commercial food waste disposal ban set to be effective in January 2025.

## SECTION 2: STUDY METHODOLOGY

Currently, only one of Metro’s two publically-owned transfer stations has the capability to receive commercial food scraps (Metro Central Transfer Station). In 2019, 62% of the commercial food scraps collected by franchised and non-franchised haulers was taken to Metro Central Transfer Station. The other 38% was taken to privately owned facilities including Willamette Resources Inc., a private transfer station owned by Republic Services, and then for composting at Pacific Region Compost, also owned by Republic Services. Some food was taken outside of the region to a company called Divert. The material came directly from specific grocery chains under contract with Divert for data collection, distribution of some food to food rescue agencies with the remainder pre-processed and delivered to an agricultural anaerobic digestion facility.

**Table 1: Commercial food scrap tons recovered in 2019<sup>1</sup>**

Receiving Facility	2019 Food Scraps (tons)	Percent Share
Metro Central Transfer Station	17,890	62%
Willamette Resources (WRI)	6,789	24%
Divert	3,503	12%
Vancouver/Waste Connections	657	2%
<b>Total</b>	<b>28,839 tons</b>	<b>100%</b>

<sup>1</sup>Commercial food scraps sent directly to farms for permitted agricultural use are not included.

This scope of this study focused on trucks delivering loads of commercial food scraps to Metro Central Transfer Station. Commercial food scraps sent to WRI and Divert were not included in this study because the operators of these facilities have material acceptance standards that differ from the regional program. The standard for commercial material arriving at Metro facilities is food only while WRI and Divert have agreements with some specific businesses to receive loads that include non-food items.

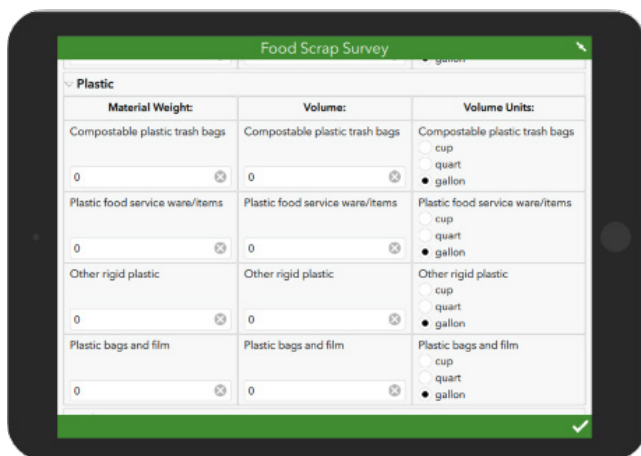
### Study Purpose

The purpose of the Commercial Food Scraps Characterization Study was to measure the amounts and types of contamination present in source-separated food scraps generated by businesses in the Metro region. This study was designed to identify the most prevalent types of contamination in a program with a food-only acceptance standard. The results of the study also provide a baseline for contamination rates prior to the implementation of the Business Food Waste Requirement, scheduled for implementation beginning in spring 2021. Findings will be used to update acceptance standards and inspection protocols for incoming loads of commercial food scraps to Metro transfer stations and other facilities receiving Metro-region food scraps for processing.

The goal for this study was to collect 50 samples and the desired number of samples was not based on previously collected data. Samples were captured and sorted in ten days at Metro Central Transfer Station during fall 2019 with data collection occurring the week of October 14th and November 11th. At the end of the two week period, 50 samples were collected but three were removed from the analysis because of errors in data collection. Samples were selected randomly by the contractor from trucks transferring commercial food scraps to Metro Central Transfer Station. To ensure the study was representative of the commercial customer base, targets for the number of samples taken from each collector were provided to the contractor. The target was based on commercial food scraps tonnage data submitted by haulers to local governments and Metro—the sample targets were a goal and not a contract requirement. Although Metro conducted a previous commercial study in 2012, it is not comparable primarily due to the fact that this study was conducted prior to Metro moving to a food-only standard.

It is typical for waste characterization studies to measure material streams based on weight but this study includes results based on an assessment of both weight and volume. Because commercial food scraps are dense and heavy, volume-based measurement was included in the methodology to ensure lightweight contaminants, like film plastics, were fully accounted for. Measuring both weight and volume provides a more complete picture of source-separated food scraps because it normalizes the differences between heavy and light materials. The most problematic contaminants in food waste loads are lightweight plastics. Measuring by volume allows for a clearer picture of true contamination. In addition, the volume-based results are also more effective in providing useful information for load-check protocols that are visual in nature.

**Figure 1: Data collection app**



Metro’s Research Center staff built a specialized data collection application for this study. The web-based ArcGIS Survey 123 tool was used to create the survey and was administered on iPads supplied by Metro. This was the third characterization study conducted by Metro using web based technology. Previously, contractors used laptops and Excel to collect and transfer data to Metro manually. The use of web-based technology improves the accuracy of the data because the project manager can monitor information as it’s collected and trouble shoot with the contractor as issues arise.





The minimum volume requirement for a sample was 96 gallons.

Samples were taken from the collection trucks and placed into a 100 gallon container on wheels. Any excess, overflowing material was leveled off the top of the container to ensure an accurate total sample volume measurement. The minimum volume requirement for a sample was 96 gallons. All of the samples were sorted into the material categories listed in Table 2 and then weight and volume measurements of each category were taken. More detailed information about the categories is available in Appendix A.

Volume was measured with appropriately-sized containers (cup, quart, or gallon) as determined by the sorting team for each material. Food scraps and contaminants were placed in containers and lightly flattened to level the contents without compacting the material. Volume measurements were based on unit and the nearest graduation marking of the container (e.g., 1, 1.25, 2.75). Figure 1 is the data collection application tool designed specifically to collect the volume and weight based information for this study on tablets in live time. As data was collected, Metro’s project manager had constant access to a dashboard used to monitor the data and help troubleshoot issues immediately.

**Table 2: Material categories**

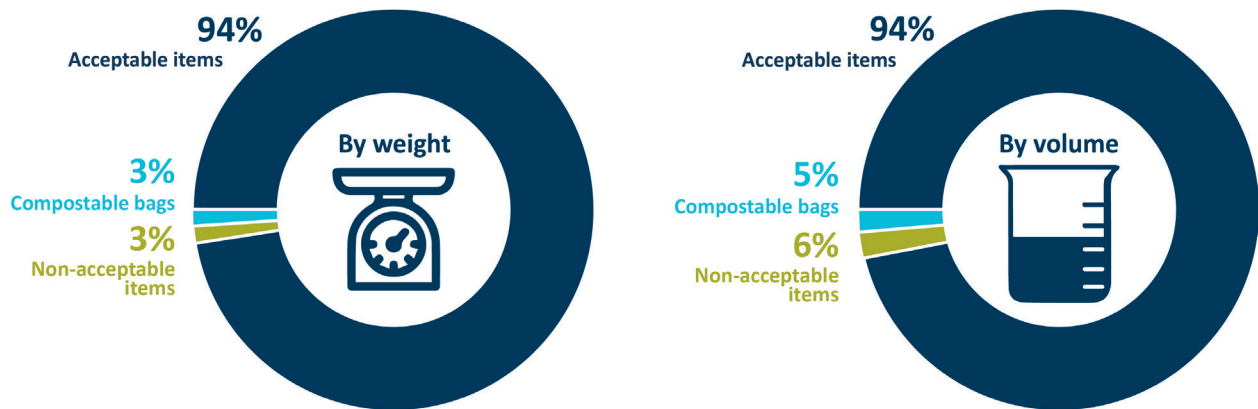
Acceptable material	Paper contaminants	Other contaminants
<ul style="list-style-type: none"> <li>Compostable plastic can liners</li> <li>Food</li> </ul>	<ul style="list-style-type: none"> <li>Corrugated cardboard</li> <li>Paper, wood, or fiber-based food service ware/items</li> <li>Other paper</li> </ul>	<ul style="list-style-type: none"> <li>Glass and ceramics</li> <li>Metal</li> <li>Yard debris/plants</li> <li>Unclassified food service and sanitation items</li> <li>Other non-food items not otherwise classified</li> <li>Packaged food</li> <li>Bagged municipal solid waste</li> </ul>
	<p><b>Plastic contaminants</b></p>	
	<ul style="list-style-type: none"> <li>Plastic food service ware/items</li> <li>Other rigid plastic</li> <li>Plastic bags and film</li> </ul>	

### SECTION 3: REGIONAL COMPOSITION

Using the study results, Metro calculated regional averages for the amount and types of contaminants in food scraps bins from businesses. The study showed an average contamination rate for all samples combined of 3 percent by weight and 6 percent by volume. By weight, the sample with the least amount of contamination was 0% and the maximum was 28%. By volume, the sample with the least amount of contamination was 0% and the maximum was 20%. Compostable can liners were 3 percent of the samples by weight and 5 percent of the samples by volume. Compostable can liners are considered an acceptable item but were sorted from food to better understand what portion of the stream they represent.

For all of the samples combined, the average volume was 124 gallons and the average weight per sample was 593 pounds. The average sample weight was higher than the minimum requirement because the container used during the first week of the study was larger than originally intended. The 150 gallon container used initially was replaced with the 100 gallon container after the first week of sample collection and the data assumptions were adjusted accordingly to ensure the analysis was accurate and valid.

Figure 2: Material composition of commercial food scraps by weight and volume



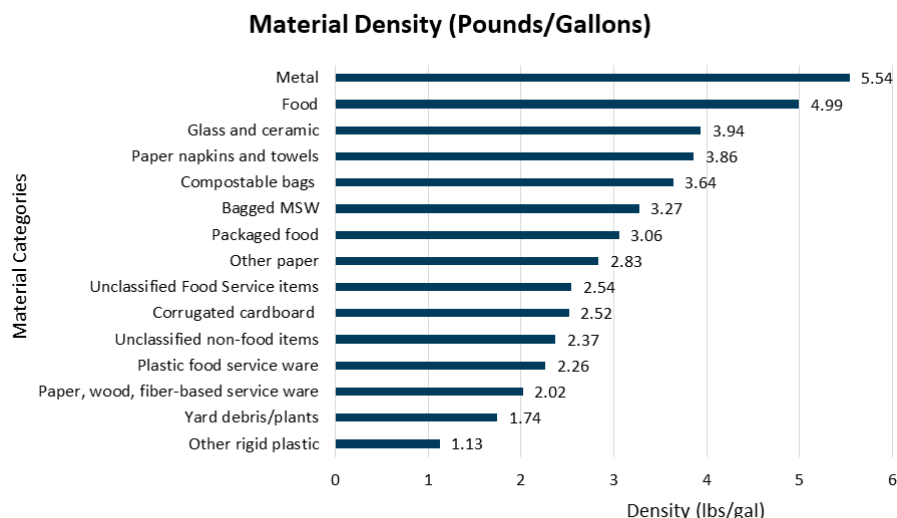
The prevalence of lightweight yet problematic materials, such as plastics, are likely underestimated in composition studies when measured solely by weight. When lightweight contaminants present in a heavy, wet stream are measured by volume, a more accurate picture can be drawn. In addition, when measured by volume, more categories of contamination can be measured in greater detail. A detailed breakdown of the contaminants found in samples are show in Figure 3 below.

**Figure 3: Contaminants in food scraps by weight and volume**



### Individual material density

Material density is calculated as the average weight of the material category divided by the average volume of the material present in each sample, for all samples with the material present. Taking the average across all samples provided a normalized density value that doesn't favor larger samples. These densities are provided for context to the study. Densities of some materials, such as napkins or compostable bags, are relatively high because of the unremoved water and food adhered to the material.



## SECTION 4: SUMMARY OF CONCLUSIONS

Contamination in the commercial food scraps stream is 3% by weight and 6% by volume. In comparison, the contamination rate in the commercial mixed recycling stream is 14% by weight. Despite the low rate for commercial food scraps, film plastics are still of concern as they are highly problematic for any potential end-market. In addition, although technically acceptable in the program, most end-markets consider compostable can liners contaminants; they are removed as waste by compost facilities and are not acceptable at facilities that convert food scraps into renewable energy. Many businesses need to line their collection bins for cleanliness but the compostable liners are expensive and often do not perform well. This is a complex issue—film plastic liners are less expensive and more reliable for businesses, but they are the most problematic contaminant in the food scraps stream. As the program moves forward, Metro and local government partners will need to address the use of bin liners over the longer term.

One of the benefits of a “food only” standard is that it provides a clear message for educating program participants—there’s very little nuance regarding what is and is not a food item. Prior to 2015, the program accepted a variety of compostable service ware products which proved problematic on many fronts. It was challenging for businesses to understand what was and was not acceptable and they often received conflicting information. It was also nearly impossible to discern acceptable items from contaminants once material was mixed in a collection truck and delivered to the transfer station. Many contaminants mimic the appearance of acceptable items and sorting individual items is simply not feasible. The adjustment to “food only” was challenging at first, but has vastly improved the quality of the material received.

Despite the low contamination rate baseline established through this study, the advent of a mandatory program could bring added contamination due to the increased number of participants. In addition, current participants are in the program voluntarily—they have intentionally chosen to separate food scraps for higher and better use and may be more vigilant about material quality. Continued close monitoring of incoming loads, tight quality standards, and rejecting loads with excessive contamination will remain an important feedback loop for businesses, haulers and local governments. More importantly, the high-quality technical assistance and education provided to program participants by local governments is critical in maintaining the low contamination rate the program benefits from today. Without high-quality incoming material, the region’s ability to maintain stable and sustainable markets for food scraps is unlikely.

### What happens to commercial food scraps

The majority of food scraps from the Metro region currently go to privately-owned compost facilities in Aumsville and Adair Village, OR between 50 and 70 miles from Portland. Food scraps from three large grocery chains are delivered to a private facility in Albany, OR where they are pre-processed and sent for anaerobic digestion at an agricultural facility. Metro is in the process of upgrading Metro Central station and installing equipment designed to pre-process food scraps into a homogenous product that can be used either by compost facilities or further liquefied and used in anaerobic digestion for the production of renewable energy. Beginning in late 2022, Metro expects to be sending the majority of the region’s food scraps to the City of Portland’s wastewater treatment plant where it will be treated separately and made into clean fuel for vehicles.



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### **Metro Staff**

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## APPENDIX A: MATERIAL CATEGORY DEFINITIONS

### Commercial Food Scraps Composition Study material category definitions

Material	Definition
<b>Food</b>	
Food	All unpackaged food and food residuals including fruits, vegetables, meats, baked goods, dairy, fish, shellfish, nuts, seeds, grains, coffee grounds, pits, shells, bones, peels. Includes coffee filters and tea bags. Does not include large amounts of oils or liquids.
<b>Compostable bags</b>	
Compostable bags	Plastic bags that are made of materials such as cornstarch or soy and are designed to compost at commercial composting facilities. Approved bags are BPI-labeled and are typically semi-translucent and milky white or light green.
<b>Paper, wood, cardboard contaminants</b>	
Paper, wood, or fiber-based food service ware	Items such as fiber or paper-based bowls, plates, trays and cups of all sizes (coated and uncoated), wood stir sticks, wood chopsticks, other wood utensils, paper straws, portion cups used to serve or consume food. Includes paper takeout and grocery bags.
Other paper	Office and writing paper, berry boxes, magazines, catalogs, boxboard (e.g., cereal boxes), egg cartons, produce box liners, shredded paper, tissue paper, foil-lined paper products, photographs, polycoated cartons (e.g., milk, juice) aseptic containers and other predominantly paper items with other attached materials, such as bindings.
Corrugated cardboard	Wax-coated and uncoated corrugated cardboard.
<b>Paper towels and napkins</b>	
Paper towels and napkins	Paper napkins and paper towels commonly used in food service. Does not include industrial wipes or cloth rags and towels.
<b>Plastic bags and film</b>	
Plastic bags and film	Plastic bags including trash bags, produce bags, bread or other food bags, shopping bags, plastic sheeting and stretch wrap. Does not include plastic food service gloves.
<b>Plastic food service ware and other food service items</b>	
Unclassified food service items	Textiles such as towels, wiping cloths, oven mitts, aprons; food safety/sanitation items such as hair nets, beard guards, plastic aprons, plastic/rubber/nitrile/latex gloves used for food handling or cleaning.
Plastic food service ware	Plastic clamshells, trays, plates, bowls, beverage and food portion cups, condiment packages, full or empty single-serving condiment packages (ketchup, mayonnaise, soy sauce, etc.), plastic chopsticks, other utensils, straws, plastic lids for cups, to-go containers, and other items used to serve or consume food. Includes those that appear plastic but may be labeled "compostable" or "biodegradable". Does not include plastic food service gloves.
Packaged food	Large amounts of food in original packaging such as jars of pickles, buckets of sauce, full bags of pasta, unopened cans of food, unopened cartons of dairy or juice, bags of onions, etc.

Yard debris/plants	
Yard debris/plants	Grass, leaves, branches, decorative flowers and plants not used in food preparation.
Other contaminants	
Metal	Aluminum (including foil), tin and steel food cans, empty aerosol cans, silverware, utensils and scrap metal (smaller than 30 inches and less than 30 pounds).
Glass and ceramic	All glass including bottles, jars, beverage glasses. All ceramic including dishware and mugs, decorative pottery, etc.
Other rigid plastic	Plastic bottles, tubs, plant pots, buckets, bulk tubs, milk crates, plastic containers that do not fit into the food service ware definition, items such as bottle caps, lids for food tubs and jars, etc.
Unclassified non-food items	All other contaminants not otherwise classified.
Bagged MSW	Wax-coated and uncoated corrugated cardboard.

## APPENDIX B: CONTAMINANTS IN FOOD SCRAPS STATISTICAL ANALYSIS

Appendix B provides a summary of the data and analysis staff produced for the figures and tables in this study. The first section provides background on the calculations used in the study, number of samples and average sample weight. The remaining sections are organized by figure or table and include analysis and outputs from R, the statistical software program used for the analysis of the data collected for the study.

### Background data calculations

The amount of unacceptable material per sample is calculated as a ratio of weight and volume by dividing the measured contaminants in each sample by the sample's total. The regional average is then calculated by taking the average of these sample ratios since this method accommodates varying sample size.

$$\text{Average contamination} = \frac{1}{n} \sum \frac{[\text{weight or volume}] \text{ of contaminants in sample} * 100}{[\text{weight or volume}] \text{ of sample}}$$

## Standard deviation

The standard deviation of the amount of contaminants in the commercial food scraps was 4.4% by weight and 5.8% by volume. A low standard deviation value indicates the data points are closer to the mean and are therefore less variable. A high standard deviation value indicates there is a wider spread of the data points from the mean and therefore the results are more variable.

**Table 1: Descriptive statistics**

	Sample size	Measure	Minimum	Maximum	Mean	Standard deviation
Percent contamination in food scrap samples	47 samples	Weight	0%	27.6%	3.0%	4.4%
		Volume	0%	19.5%	5.8%	5.8%

## Material composition of commercial food scraps

The mean for the percentage of all contaminants in food scraps sample by weight is 3.0%, 95% CI [1.7%, 4.3%]. To put this into context, the average weight of contamination materials in a food scrap sample is 17 pounds. The mean for the percentage of all contaminants in food scraps by volume is 5.8%, 95% CI [4.1%, 7.5%]. The average volume of contamination materials in a food scrap sample is 6.8 gallons.

Table 2 provides the mean percentage of the sample for individual contaminants by weight and volume at a 95% confidence interval (CI). This confidence interval tells us that based on the results of the study, we are 95% confident that the range in the table below contains the true population mean of the percentage of contaminants in the commercial food scraps.



**Table 2: Contaminants in the commercial food scraps by material type\***

<b>Material</b>	<b>Weight Mean% [min%, max%]</b>	<b>Volume Mean% [min%, max%]</b>
<b>Paper contaminants</b>	<b>1.27% +/- 0.48 [1.75, 0.79]</b>	<b>1.68% +/- 0.68 [2.36, 1]</b>
Corrugated cardboard	0.02% +/- 0.02 [0.04, 0]	0.06% +/- 0.07 [0.13, -0.01]
Paper napkins and towels	0.8% +/- 0.37 [1.17, 0.43]	1.11% +/- 0.53 [1.64, 0.58]
Paper, wood, fiber-based food service ware	0.2% +/- 0.09 [0.29, 0.11]	0.55% +/- 0.24 [0.79, 0.31]
Other paper	0.25% +/- 0.14 [0.39, 0.11]	0.51% +/- 0.24 [0.75, 0.27]
<b>Plastic contaminants</b>	<b>0.82% +/- 1.02 [1.84, -0.2]</b>	<b>1.36% +/- 0.59 [1.95, 0.77]</b>
Plastic food service ware	0.59% +/- 0.98 [1.57, -0.39]	0.64% +/- 0.33 [0.97, 0.31]
Other rigid plastic	0.01% +/- 0.01 [0.02, 0]	0.12% +/- 0.09 [0.21, 0.03]
Plastic bags and film	0.21% +/- 0.11 [0.32, 0.1]	0.6% +/- 0.25 [0.85, 0.35]
<b>Other Contaminants</b>	<b>0.92% +/- 0.41 [1.33, 0.51]</b>	<b>2.78% +/- 1.04 [3.82, 1.74]</b>
Glass and ceramic	0.01% +/- 0.01 [0.02, 0]	0.01% +/- 0.01 [0.02, 0]
Metal	0.04% +/- 0.04 [0.08, 0]	0.1% +/- 0.09 [0.19, 0.01]
Yard debris/plants	0.54% +/- 0.37 [0.91, 0.17]	1.43% +/- 0.95 [2.38, 0.48]
Unclassified food service and sanitation items	0.1% +/- 0.06 [0.16, 0.04]	0.22% +/- 0.12 [0.34, 0.1]
Other non-food items not otherwise classified	0.11% +/- 0.11 [0.22, 0]	0.24% +/- 0.16 [0.4, 0.08]
Packaged food	0.03% +/- 0.02 [0.05, 0.01]	0.05% +/- 0.04 [0.09, 0.01]
Bagged MSW	0.09% +/- 0.12 [0.21, -0.03]	0.18% +/- 0.24 [0.42, -0.06]
<b>All contamination</b>	<b>3.01% +/- 1.27 [4.28, 1.74]</b>	<b>5.82% +/- 1.66 [7.48, 4.16]</b>

\*The individual mean material percentages do not add up to the mean for the overall percentage of contaminants found in commercial food scraps because the overall percentage of contaminants is calculated by taking an average of the total contaminants for all the samples.