



FINAL REPORT

# WASTE AND RECYCLING CHARACTERIZATION STUDY

SUBMITTED TO  
CITY OF DECATUR, GEORGIA

JULY 2021  
TEAMING PARTNERS:

**TABLE OF CONTENTS**

	<b><u>Page No.</u></b>
<b>1.0 INTRODUCTION .....</b>	<b>1-1</b>
1.1 Project Overview .....	1-1
1.2 Report Organization.....	1-1
<b>2.0 METHODOLOGY .....</b>	<b>2-1</b>
2.1 Waste and Recycling Characterization Methodology.....	2-1
2.1.1 Material Categories .....	2-1
2.1.2 Load and Sample Selection.....	2-3
2.1.3 Sorting Procedures .....	2-3
2.1.4 Data Analysis .....	2-4
2.2 Participation Rate Methodology .....	2-4
<b>3.0 REFUSE PROGRAM RESULTS.....</b>	<b>3-1</b>
3.1 Composition and Quantity .....	3-1
3.2 Program Participation Rate.....	3-5
3.3 Conclusions.....	3-5
<b>4.0 COMMINGLED RECYCLING PROGRAM RESULTS .....</b>	<b>4-1</b>
4.1 Composition and Quantity .....	4-1
4.2 Program Capture Rate.....	4-4
4.3 Program Participation Rate.....	4-5
4.4 Estimated Market Value .....	4-5
4.5 Conclusions.....	4-7
<b>5.0 GLASS RECYCLING PROGRAM RESULTS.....</b>	<b>5-1</b>
5.1 Composition and Quantity .....	5-1
5.2 Program Capture Rate.....	5-3
5.3 Program Participation Rate.....	5-3
5.4 Conclusions.....	5-4
<b>6.0 YARD WASTE PROGRAM RESULTS .....</b>	<b>6-5</b>
6.1 Composition and Quantity .....	6-5
6.2 Program Capture Rate.....	6-7
6.3 Program Participation Rate.....	6-7
6.4 Conclusions.....	6-7
<b>7.0 AGGREGATE WASTE AND RECYCLING CHARACTERIZATION RESULTS.....</b>	<b>7-1</b>
7.2 Conclusions.....	7-3

<b>8.0</b>	<b>SUMMARY OF CONCLUSIONS.....</b>	<b>8-1</b>
8.1	Refuse Program Conclusions.....	8-1
8.2	Commingled Recycling Program Conclusions.....	8-1
8.3	Glass Recycling Program Conclusions.....	8-1
8.4	Yard Waste Program Conclusions.....	8-2
8.5	Other General Conclusions.....	8-2

## APPENDIX A - MATERIAL DEFINITIONS

### LIST OF TABLES

	<u><b>Page No.</b></u>
Table 2-1: List of MSW Characterization Material Groups and Categories .....	2-2
Table 3-1: Refuse Program Composition by Material Category .....	3-3
Table 4-1: Commingled Recycling Program Composition by Material Category .....	4-2
Table 4-2: Commingled Recycling Program Capture Rate by Targeted Material Category .....	4-5
Table 4-3: Historical Market Value by Commodity in Commingled Recycling Program .....	4-6
Table 4-4: Estimated Market Value for Commodities in City Commingled Recycling Program .....	4-6
Table 5-1: Glass Recycling Program Composition by Material Category .....	5-2
Table 6-1: Yard Waste Recycling Program Composition by Material Category .....	6-6
Table 7-1: Aggregate Composition by Material Category .....	7-2

### LIST OF FIGURES

	<u><b>Page No.</b></u>
Figure 3-1: Aggregate Refuse Program Composition by Program Targeted for Materials.....	3-2
Figure 3-2: Top Ten Material Categories Collected in Refuse Program (tons per year).....	3-5
Figure 4-1: Aggregate Commingled Recycling Composition by Targeted Materials and Contaminants.....	4-1
Figure 4-2: Top Ten Material Categories Collected in Commingled Recycling Program (tons per year).....	4-4
Figure 5-1: Aggregate Glass Recycling Composition by Targeted Materials and Contaminants.....	5-1
Figure 6-1: Aggregate Yard Waste Program Composition by Targeted Materials and Contaminants.....	6-5
Figure 7-1: Comparison of Refuse Program and Other Program Tonnage .....	7-1

## 1.0 INTRODUCTION

### 1.1 Project Overview

The City of Decatur, Georgia (City) Public Works Department provides comprehensive waste and recycling services to approximately 6,700 single-family residential households. The City Public Works Department provides once per week curbside collection of refuse, commingled recyclables, glass recyclables, and yard waste to single-family residential households. Single-family residential collection services are provided Monday, Tuesday, Thursday, and Friday. Residents receive all services on the same day (i.e., same day collection for refuse, commingled recyclables, glass recyclables, and yard waste for each household). The following summarizes the single-family residential solid waste and recycling services provided curbside by the City Public Works Department:

- **Refuse Services:** Collection and disposal of waste contained in City Pay As You Throw (PAYT) refuse bags. In addition, bulky items are accepted as part of the refuse services.
- **Commingled Recycling Services:** Collection and processing of program paper, plastic, and metal recyclables contained in or adjacent to commingled recycling bins or carts.
- **Glass Recycling Services:** Collection and processing of program glass recyclables contained in glass recycling bins.
- **Yard Waste Services:** Collection and processing of yard waste bundles or contained in customer provided cans or kraft bags.

Additional residential recycling services are provided via special events and drop-off sites. The City Public Works Department offers special events for City residents to recycle electronics and expanded polystyrene (i.e., Styrofoam) packaging. In addition, City residents may utilize regional recycling programs to recycle other materials such as plastic retail bags, clothing, paints, solvents, etc.

The City retained Burns & McDonnell, MSW Consultants, and A. Goldsmith Resource, collectively referred to as the Burns & McDonnell Project Team, to characterize the composition of waste and recyclables generated by single-family residential households and managed via the curbside program (Study). The objective of the Study is to provide an understanding of the key performance metrics of each curbside solid waste and recycling program in an effort to increase diversion. The results of the Study provide insight into current and future residential recycling programs.

### 1.2 Report Organization

This report is organized into eight sections. The sections of this report are listed below:

- **Section 1 – Introduction.** This section presents the background to the Study and provides an overview of the organization of the report.
- **Section 2 – Methodology.** This section describes the methodology used in the field research and the data analysis.
- **Section 3 – Refuse Program.** This section presents the findings regarding the composition of material generated by single-family residential households and managed via the curbside refuse program. In addition, this section presents performance metrics of the program.
- **Section 4 – Commingled Recycling Program.** This section presents the findings regarding the composition of material generated by single-family residential households and managed via the commingled recycling program. In addition, this section presents performance metrics of the program and estimation of the value of recyclables diverted via the program.
- **Section 5 – Glass Recycling Program.** This section presents the findings regarding the composition of material generated by single-family residential households and managed via the curbside glass recycling program. In addition, this section presents performance metrics of the program.
- **Section 6 – Yard Waste Program.** This section presents the findings regarding the composition of material generated by single-family residential households and managed via the curbside yard waste program. In addition, this section presents performance metrics of the program.
- **Section 7 – Aggregate Waste and Recycling Characterization Results.** This section presents the findings regarding the aggregate composition of waste and recyclables generated by single-family residential households and managed via the curbside program.
- **Section 8 – Summary of Conclusions.** This section summarizes the conclusions from the Study included in the prior sections of this report.



## **2.0 METHODOLOGY**

The Burns & McDonnell Project Team developed the Study methodology to estimate the composition of waste and recyclables generated by single-family residential households and managed via the curbside program. In addition, the methodology was designed to evaluate key metrics of each program.

The Burns & McDonnell Project Team conducted the one-week sampling and sorting event during the week of Monday, April 26, 2021 through Friday, April 30, 2021. As part of the Study and during the sorting event, the Burns & McDonnell also surveyed households to estimate the participation rate in each curbside program. This section of the report discusses the key elements of the methodology for the Study.

### **2.1 Waste and Recycling Characterization Methodology**

The Burns & McDonnell Project Team physically sorted refuse, commingled recyclables, glass, and yard waste curbside program set-outs from 120 single-family residential households. This section summarizes the following key elements of the waste and recycling characterization methodology:

- Material categories;
- Load and sample selection;
- Sorting procedures; and
- Data analysis.

#### **2.1.1 Material Categories**

For the waste and recycling characterization, the Burns & McDonnell Project Team, in collaboration with the City, developed a comprehensive list of material categories. The following comprehensive list of material categories includes eight material groups that are subdivided into 47 material categories. Table 2-1 presents waste characterization material groups and material categories developed for the Study. Detailed definitions for each material category are included in Appendix A.

**Table 2-1: List of MSW Characterization Material Groups and Categories**

<b>Material Group</b>	<b>Material Categories</b>	
Paper	Corrugated Cardboard/Kraft Paper <sup>1</sup> Aseptic Boxes & Gable Top Cartons <sup>1</sup> Office Paper <sup>1</sup> Mixed Recyclable Paper <sup>1</sup>	Pizza Boxes <sup>1</sup> Compostable Paper <sup>3, 7</sup> Remainder/Composite Paper <sup>8</sup>
Plastics	PET (#1) Bottles/Jars <sup>1</sup> PET (#1) Non-bottle Containers <sup>8</sup> HDPE (#2) Natural Bottles/Jugs <sup>1</sup> HDPE (#2) Colored Bottles/Jugs <sup>1</sup> Plastic #3-#7 Bottles/Jugs <sup>8</sup> Plastic Tubs & Lids (#5) <sup>6</sup> Other Rigid Plastic Containers #2-#7 <sup>8</sup>	Expanded Polystyrene "Styrofoam" Food Service <sup>8</sup> Expanded Polystyrene "Styrofoam" Packaging <sup>5</sup> City Program Film Bags (by green, yellow, blue) <sup>8</sup> Retail Bags, Sleeves <sup>6</sup> All Other Film <sup>8</sup> Durable/Bulky Rigid Plastics <sup>8</sup> Remainder/Composite Plastic <sup>8</sup>
Metal	Aluminum Cans/Tins <sup>1</sup> Other Non-Ferrous Metals <sup>8</sup>	Steel Cans & Lids <sup>1</sup> Other Ferrous Metals <sup>8</sup>
Glass	Glass Bottles/Jars – Intact <sup>2</sup> Broken Glass Bottles/Jars <sup>2, 4</sup>	Remainder/Composite Glass <sup>8</sup>
Organics	Vegetative – Loose <sup>7</sup> Meat/Dairy/Mixed - Loose <sup>7</sup> Packaged Food <sup>8</sup>	Grass, Leaves, Prunings, Trimmings <sup>3, 7</sup> Branches, Limbs, Stumps <sup>3, 7</sup> Other Compostable <sup>8</sup>
C&D	Construction and Renovation Debris <sup>8</sup>	
Household Hazardous Waste (HHW)	Batteries (All Types) <sup>8</sup> Medically Related Waste <sup>8</sup> Electronics <sup>5</sup>	Other HHW <sup>6</sup>
Other	Textiles & Leather Products <sup>6</sup> Rubber Products <sup>8</sup> Disposable Diapers & Sanitary Products <sup>8</sup> Pet Waste <sup>8</sup>	Bulky Materials <sup>8</sup> Other Materials Not Elsewhere Classified <sup>8</sup> Dirt & Fines <sup>8</sup> Bagged Materials <sup>4, 8</sup>

1. Materials accepted in commingled recycling program.

2. Materials accepted by glass recycling program.

3. Materials accepted by yard waste program. Note compostable paper included only Kraft yard waste bags for yard waste characterization.

4. Broken Glass Bottles/ Jars and Bagged Materials was used for waste characterization of commingled recyclables and glass recyclables streams only. Bagged materials were not broken, and all contents were considered contamination.

5. Materials accepted by other City non-curbide recycling programs.

6. Materials accepted by other regional non-curbide recycling programs. Materials accepted at CHaRM and other regional non-curbide recycling programs was accurate at the time of Study. Materials may be added or removed in the future.

7. Materials that may be accepted by potential composting program. Materials accepted by yard waste program may also be accepted by potential composting program.

8. Materials accepted by refuse program only.

### **2.1.2 Load and Sample Selection**

The Study characterized refuse, commingled recyclables, glass recyclables, and yard waste from 120 single-family residential households, with 30 households sampled each collection day. The Burns & McDonnell Project Team utilized computer software to randomly select single-family residential households amongst the City collection days. Then, the Burns & McDonnell Project Team mapped the randomly selected residential households and reviewed the map with the City. Upon review of the map, the Burns & McDonnell Project Team, in select instances, replaced households within areas with multiple households selected with alternative randomly selected residential households in areas with limited or no selections.

For the single-family residential households randomly selected for sampling, the Burns & McDonnell Project Team, with the assistance of the City, collected all materials set out (i.e., refuse, commingled recyclables, glass recyclables, or yard waste) by the household. If a household had no materials set out (i.e., no refuse, commingled recyclables, glass recyclables, or yard waste), the adjacent household with a set-out was selected.

All materials were aggregated (or batched) by program (i.e., all refuse collected from sampled households on a given day was combined, all commingled recyclables from selected households of a given day were combined, etc.). The Burns & McDonnell Project Team placed samples of refuse, commingled recyclables, and yard waste in City carts and samples of glass recyclables in City recycling bins. The Burns & McDonnell Project Team, with the assistance of City, transported samples to the designated sorting area at the City Public Works Building.

### **2.1.3 Sorting Procedures**

Sorting was conducted at the designated sorting area at the City Public Works Building. The sorting area consisted of a sorting table, containers for each material type, and a digital scale. The field sort team performed batch sorting (i.e., all refuse from Monday was sorted together, all recyclables from Monday were sorted together, etc.).

Prior to sorting the first sample, each of the containers into which sorted materials were to be placed were labeled with the material categories and weighed to obtain the tare weight of the empty container. The field sort team hand-sorted the materials into individual containers designated for the material category. Then, the field sort team weighed each container to determine the quantity of materials by material category in each sample. These weights were recorded to the nearest 0.1 pound in a proprietary online resource. In addition, the field sort team counted the City program bags by color. At the conclusion of



sorting each sample, the field sort team placed the sorted waste at a designated area next to the sorting area for collection and disposal or recycling by the City.

#### **2.1.4 Data Analysis**

The data gathered in the sorting event was combined with the customer count information by collection day and with historical tonnage information for Fiscal Year 2019/2020 provided by the City.<sup>1,2</sup> All of the data from the sorting event was entered into a proprietary online resource. The proprietary online resource statistically manipulates the data to calculate the mean, 90 percent confidence interval, and standard deviation for individual material categories by program and in aggregate. The aggregate composition was calculated by weighting the mean composition of the programs based on the historical tonnage information provided by the City. In addition to calculation of the composition, the Burns & McDonnell Project Team calculated the generation rate and average pounds by program (refuse, commingled recycling, glass recycling, and yard waste). Lastly, the Burns & McDonnell Project Team calculated the capture rate and contamination rate by diversion program (commingled recycling, glass recycling, and yard waste).

### **2.2 Participation Rate Methodology**

In addition to conducting the waste and recycling characterization, the Burns & McDonnell Project Team surveyed refuse, commingled recycling, glass recycling, and yard waste program participation from 800 single-family residential households, with 200 households observed each collection day. For each collection day, the Burns & McDonnell Project Team conducted surveys of 100 households, including households located on both sides of the street, approximately midway through the collection of waste and recycling characterization samples and an additional 100 households upon conclusion of the collection of waste and recycling characterization samples.

The Burns & McDonnell Project Team, with the assistance of the City, documented set-outs by program. The Burns & McDonnell Project Team calculated the participation rate by program (refuse, commingled recycling, glass recycling, and yard waste).

Participation rates for refuse are based on weekly participation. However, participation rates for commingled recycling, glass recycling, and yard waste are often calculated based on participation within the month. Since the participation rate was calculated based on participation within the sampling and

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<sup>1</sup> The City fiscal year commences on July 1<sup>st</sup> and concludes on June 30<sup>th</sup> of each year.

<sup>2</sup> COVID-19 may have impacted the volumes in the last quarter of Fiscal Year 2019/2020.

sorting week, the reported participation rate herein should be viewed as representative for the refuse program but minimum for the commingled recycling, glass recycling, and yard waste programs.

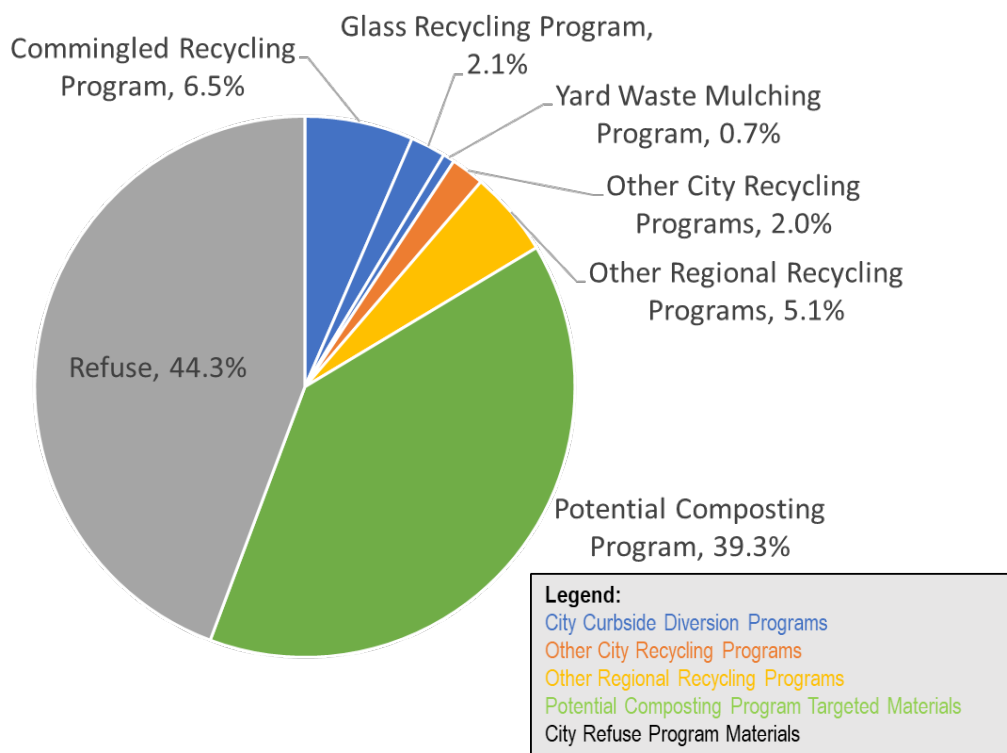
### **3.0 REFUSE PROGRAM RESULTS**

In Fiscal Year 2019/2020, 3,163 tons of material were collected via the single-family residential refuse program. The refuse program represented 40.5 percent of the total tonnage collected from single-family residential households by the City Public Works Department in Fiscal Year 2019/2020 (See Section 7). The following sections present the results of the characterization analysis and performance metrics for the refuse program.

#### **3.1 Composition and Quantity**

A total of 2,892 pounds of material from the refuse program were sampled during the waste characterization event. The Burns & McDonnell Project Team observed a high compliance with the PAYT program (i.e., refuse contained in City PAYT refuse bags). The average pounds per set-out was 27 pounds.

Figure 3-1 presents the aggregate composition of materials collected via the refuse program based on the program targeted for such materials. As shown, approximately 44.3 percent of the material collected by the refuse program is targeted by the refuse program. The majority of materials disposed via the refuse program, approximately 55.7 percent, could be diverted via current City or regional recycling programs and potential composting program. A significant fraction of the materials disposed via the refuse program may be diverted via a potential composting program.



**Figure 3-1: Aggregate Refuse Program Composition by Program Targeted for Materials**

Table 3-1 presents the composition and estimated annual tonnage by material category disposed via the single-family residential refuse program. The majority of material collected via the refuse program was paper (949 tons per year or 29.8 percent) and organics (731 tons per year or 23.1 percent).

**Table 3-1: Refuse Program Composition by Material Category**

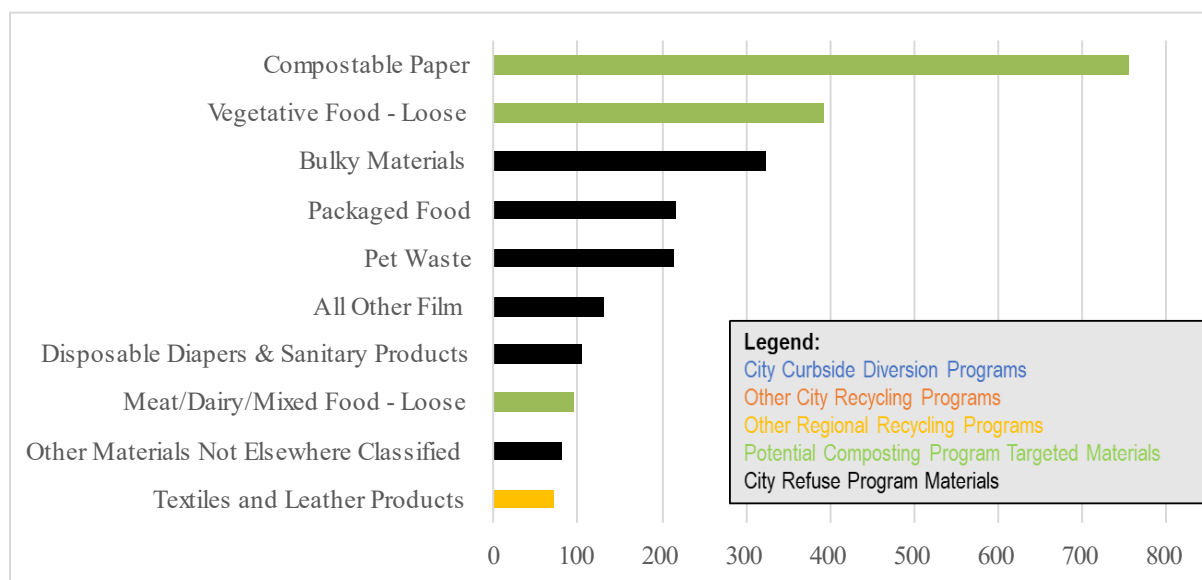
Material Group	Material Category	Mean (%)	Estimated Annual Tonnage
Paper	1 Corrugated Cardboard/Kraft Paper <sup>1</sup>	0.8%	25
	2 Aseptic Boxes & Gable Top Cartons <sup>1</sup>	0.5%	16
	3 Office Paper <sup>1</sup>	1.9%	59
	4 Mixed Recyclable Paper <sup>1</sup>	1.5%	48
	5 Pizza Boxes <sup>1</sup>	0.1%	3
	6 Compostable Paper <sup>3, 7</sup>	24.0%	758
	7 Remainder/Composite Paper <sup>8</sup>	1.0%	33
	<b>Paper Subtotal</b>	<b>29.8%</b>	<b>941</b>
Plastic	8 PET (#1) Bottles/Jars <sup>1</sup>	0.9%	30
	9 PET (#1) Non-Bottle Containers <sup>8</sup>	0.6%	19
	10 HDPE (#2) Natural Bottles/Jugs <sup>1</sup>	0.1%	3
	11 HDPE (#2) Colored Bottles/Jugs <sup>1</sup>	0.1%	2
	12 Plastic #3-#7 Bottles/Jugs <sup>8</sup>	0.0%	1
	13 Plastic Tubs & Lids (#5) <sup>6</sup>	0.5%	14
	14 Other Rigid Plastic Containers #2-#7 <sup>8</sup>	0.4%	12
	15 Expanded Polystyrene "Styrofoam" Food Service <sup>8</sup>	0.5%	17
	16 Expanded Polystyrene "Styrofoam" Packaging <sup>5</sup>	0.2%	7
	17 City Program Film Bags <sup>8</sup>	1.2%	37
	18 Retail Bags, Sleeves <sup>6</sup>	0.9%	29
	19 All Other Film <sup>8</sup>	4.1%	131
	20 Durable/Bulky Rigid Plastics <sup>8</sup>	0.6%	20
	21 Remainder/Composite Plastic <sup>8</sup>	0.8%	26
	<b>Plastic Subtotal</b>	<b>11.0%</b>	<b>348</b>
Metals	22 Aluminum Cans/Tins <sup>1</sup>	0.3%	9
	23 Other Non-Ferrous Metals <sup>8</sup>	1.2%	38
	24 Steel Cans & Lids <sup>1</sup>	0.3%	10
	25 Other Ferrous Metals <sup>8</sup>	0.6%	20
	<b>Metal Subtotal</b>	<b>2.4%</b>	<b>77</b>
Glass	26 Glass Bottles/Jars – Intact <sup>2</sup>	2.1%	67
	27 Broken Glass Bottles/Jars <sup>2</sup>	NA	NA
	28 Remainder/Composite Glass <sup>8</sup>	0.3%	9
	<b>Glass Subtotal</b>	<b>2.4%</b>	<b>75</b>
Organics	29 Vegetative Food – Loose <sup>7</sup>	12.4%	392
	30 Meat/Dairy/Mixed Food – Loose <sup>7</sup>	3.0%	95
	31 Packaged Food <sup>8</sup>	6.8%	216
	32 Grass, Leaves, Prunings, Trimmings <sup>3</sup>	0.7%	21
	33 Branches, Limbs, Stumps <sup>3</sup>	0.1%	2
	34 Other Compostable <sup>8</sup>	0.2%	5
	<b>Organics Subtotal</b>	<b>23.1%</b>	<b>731</b>
C&D	35 Construction and Renovation Debris <sup>8</sup>	1.1%	35
	<b>C&amp;D Subtotal</b>	<b>1.1%</b>	<b>35</b>

Material Group	Material Category	Mean (%)	Estimated Annual Tonnage
Household Hazardous Waste (HHW)	36 Batteries (All Types) <sup>8</sup>	0.2%	7
	37 Medically Related Waste <sup>8</sup>	0.2%	7
	38 Electronics <sup>5</sup>	1.8%	56
	39 Other HHW <sup>6</sup>	1.6%	49
	<b>HHW Subtotal</b>	<b>3.8%</b>	<b>119</b>
Other	40 Textiles and Leather Products <sup>6</sup>	2.2%	69
	41 Rubber Products <sup>8</sup>	0.1%	4
	42 Disposable Diapers & Sanitary Products <sup>8</sup>	3.3%	104
	43 Pet Waste <sup>8</sup>	6.8%	214
	44 Bulky Materials <sup>8</sup>	10.3%	324
	45 Other Materials Not Elsewhere Classified <sup>8</sup>	2.6%	82
	46 Dirt & Fines <sup>8</sup>	1.2%	39
	47 Bagged Materials <sup>4, 8</sup>	NA	NA
	<b>Other Subtotal</b>	<b>26.4%</b>	<b>836</b>
	<b>Total</b>	<b>100.0%</b>	<b>3,163</b>

1. Materials accepted in commingled recycling program.
2. Materials accepted by glass recycling program.
3. Materials accepted by yard waste program. Note compostable paper included only Kraft yard waste bags for yard waste characterization.
4. Broken Glass Bottles/ Jars and Bagged Materials was used for waste characterization of commingled recyclables and glass recyclables streams only. Bagged materials were not broken, and all contents were considered contamination.
5. Materials accepted by other City non-curbide recycling programs.
6. Materials accepted by other regional non-curbide recycling programs.
7. Materials that may be accepted by potential composting program.
8. Materials accepted by refuse program only.

Figure 3-2 shows the top 10 most prevalent materials collected via the refuse program. Compostable paper and vegetative food- loose represent the top two most predominant materials disposed via the refuse program.



**Figure 3-2: Top Ten Material Categories Collected in Refuse Program (tons per year)**

### 3.2 Program Participation Rate

The Burns & McDonnell Project Team surveyed 800 single-family residential households during the field event. The refuse program participation rate was on average 79.5 percent, that is, on average, 79.5 percent of single-family households set out refuse during the week of sampling. The refuse program participation rate by collection day ranged from a maximum of 84.0 percent to minimum of 74.0 percent. Generally, the City's refuse program participation rate is lower than other once per week refuse programs. The low refuse program participation rate may be due to the high overall diversion rate and commingled recycling and glass recycling capture rates discussed in subsequent sections.

### 3.3 Conclusions

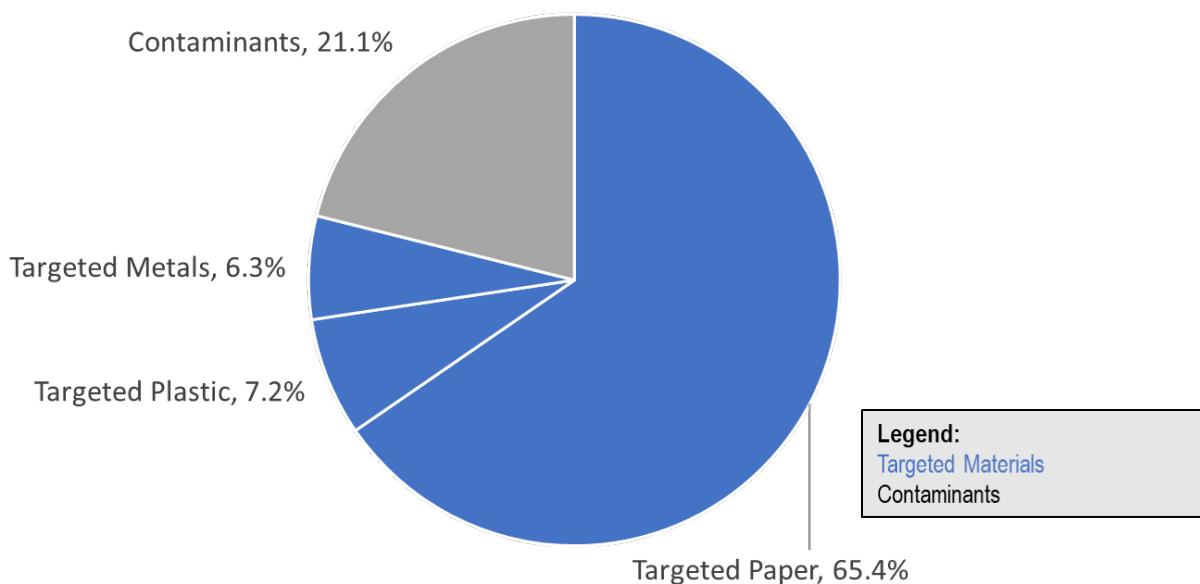
- Potential additional diversion via current programs.** Currently, approximately 16.4 percent of materials collected via the refuse program may be diverted by current City and regional recycling programs. Approximately 9.3 percent may be captured via the City's commingled recycling and glass recycling curbside program.
- Potential additional diversion via evaluation of composting program.** A significant fraction of the materials collected via the refuse program, 39.3 percent, may be diverted via a potential composting program. Compostable paper and loose food (vegetative and meat/dairy/mixed) accounted for 24.0 percent and 12.4 percent, respectively, of what was collected in the refuse program. The City may consider evaluating a composting program to divert these materials, backyard and/or curbside.

## 4.0 COMMINGLED RECYCLING PROGRAM RESULTS

In Fiscal Year 2019/2020, 1,815 tons of material were collected via the single-family residential commingled recycling program. The commingled recycling program represented 23.2 percent of the total tonnage collected from single-family residential households by the City Public Works Department in Fiscal Year 2019/2020 (See Section 7). The following sections present the results of the characterization analysis and performance metrics for the commingled recycling program.

### 4.1 Composition and Quantity

A total of 1,244 pounds of material from the commingled recycling program were sampled during the waste characterization event. The Burns & McDonnell Project Team observed that the majority of commingled recyclables were properly set out loose. The average pounds per set-out was 11.5 pounds. Figure 4.1 presents the aggregate composition of materials collected via the commingled recycling program based on targeted materials and contaminants. Recyclable paper represented the majority of material collected in the single-family residential commingled recycling program. As shown, the commingled recycling program had a contamination rate of approximately 21.1 percent. The City may consider a campaign to reduce the commingled recycling program contamination rate.



**Figure 4-1: Aggregate Commingled Recycling Composition by Targeted Materials and Contaminants**

Table 4-1 presents the composition and estimated annual tonnage by material category collected via the single-family residential commingled recycling program. The primary contaminant was non-recyclable paper (6.5 percent) followed by non-targeted plastics #1 non-bottle containers, #5 plastic tubs & lids and #2-#7 other rigid plastics (4.2 percent) and other non-recyclable plastic (3.9 percent).

**Table 4-1: Commingled Recycling Program Composition by Material Category**

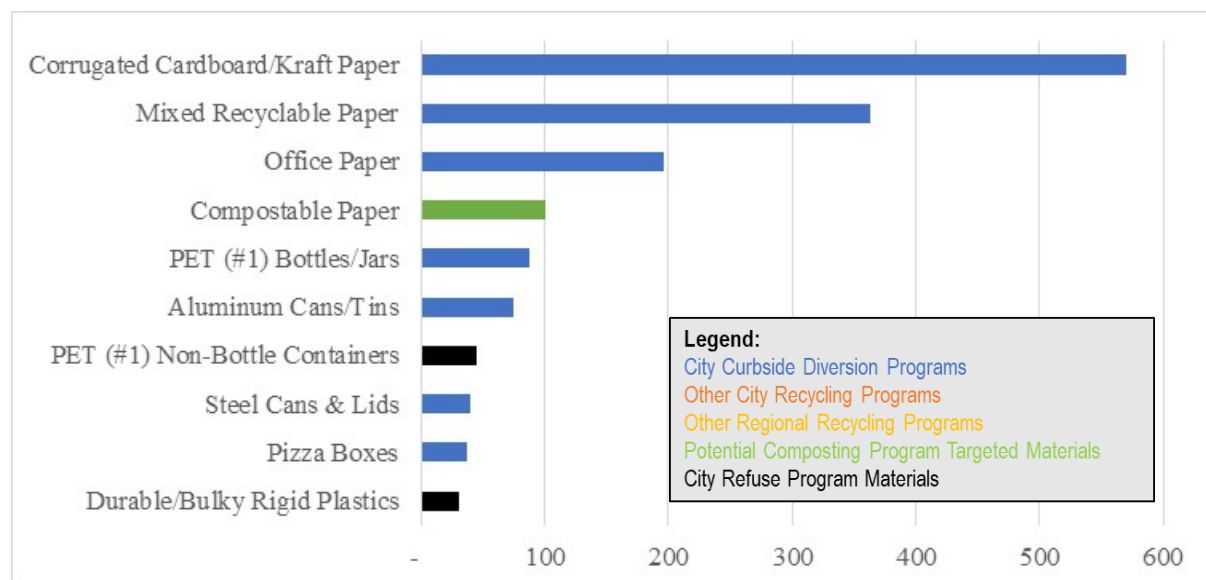
Material Group	Material Category	Mean (%)	Estimated Annual Tonnage
Paper	1 Corrugated Cardboard/Kraft Paper <sup>1</sup>	31.4%	570
	2 Aseptic Boxes & Gable Top Cartons <sup>1</sup>	1.2%	22
	3 Office Paper <sup>1</sup>	10.8%	196
	4 Mixed Recyclable Paper <sup>1</sup>	20.0%	363
	5 Pizza Boxes <sup>1</sup>	2.1%	37
	6 Compostable Paper <sup>3, 7</sup>	5.5%	100
	7 Remainder/Composite Paper <sup>8</sup>	1.0%	19
	<b>Paper Subtotal</b>	<b>71.9%</b>	<b>1,306</b>
Plastic	8 PET (#1) Bottles/Jars <sup>1</sup>	4.8%	87
	9 PET (#1) Non-Bottle Containers <sup>8</sup>	2.5%	45
	10 HDPE (#2) Natural Bottles/Jugs <sup>1</sup>	1.1%	21
	11 HDPE (#2) Colored Bottles/Jugs <sup>1</sup>	1.3%	24
	12 Plastic #3-#7 Bottles/Jugs <sup>8</sup>	0.0%	1
	13 Plastic Tub & Lids (#5) <sup>6</sup>	1.3%	24
	14 Other Rigid Plastic Containers #2-#7 <sup>8</sup>	0.4%	7
	15 Expanded Polystyrene "Styrofoam" Food Service <sup>8</sup>	0.2%	5
	16 Expanded Polystyrene "Styrofoam" Packaging <sup>5</sup>	0.3%	5
	17 City Program Film Bags <sup>8</sup>	0.0%	-
	18 Retail Bags, Sleeves <sup>6</sup>	0.1%	2
	19 All Other Film <sup>8</sup>	1.0%	18
	20 Durable/Bulky Rigid Plastics <sup>8</sup>	1.7%	30
	21 Remainder/Composite Plastic <sup>8</sup>	0.6%	11
	<b>Plastic Subtotal</b>	<b>15.3%</b>	<b>278</b>
Metals	22 Aluminum Cans/Tins <sup>1</sup>	4.1%	74
	23 Other Non-Ferrous Metals <sup>8</sup>	0.5%	8
	24 Steel Cans & Lids <sup>1</sup>	2.2%	40
	25 Other Ferrous Metals <sup>8</sup>	0.4%	7
	<b>Metal Subtotal</b>	<b>7.1%</b>	<b>129</b>
Glass	26 Glass Bottles/Jars – Intact <sup>2</sup>	0.8%	15
	27 Broken Glass Bottles/Jars <sup>2</sup>	NA	NA
	28 Remainder/Composite Glass <sup>8</sup>	0.0%	0
	<b>Glass Subtotal</b>	<b>0.8%</b>	<b>15</b>

Material Group	Material	Mean (%)	Tonnage
Organics	29 Vegetative Food – Loose <sup>7</sup>	0.2%	3
	30 Meat/Dairy/Mixed Food – Loose <sup>7</sup>	0.0%	0
	31 Packaged Food <sup>8</sup>	0.2%	4
	32 Grass, Leaves, Prunings, Trimmings <sup>3</sup>	0.3%	6
	33 Branches, Limbs, Stumps <sup>3</sup>	0.0%	-
	34 Other Compostable <sup>8</sup>	0.0%	0
	<b>Organics Subtotal</b>	<b>0.7%</b>	<b>13</b>
C&D	35 Construction and Renovation Debris <sup>8</sup>	0.2%	4
	<b>C&amp;D Subtotal</b>	<b>0.2%</b>	<b>4</b>
Household Hazardous Waste (HHW)	36 Batteries (All Types) <sup>8</sup>	0.0%	0
	37 Medically Related Waste <sup>8</sup>	0.1%	2
	38 Electronics <sup>5</sup>	0.0%	-
	39 Other HHW <sup>6</sup>	0.3%	5
	<b>HHW Subtotal</b>	<b>0.4%</b>	<b>6</b>
Other	40 Textiles and Leather Products <sup>6</sup>	0.0%	0
	41 Rubber Products <sup>8</sup>	0.0%	0
	42 Disposable Diapers & Sanitary Products <sup>8</sup>	0.1%	2
	43 Pet Waste <sup>8</sup>	0.0%	0
	44 Bulky Materials <sup>8</sup>	0.9%	17
	45 Other Materials Not Elsewhere Classified <sup>8</sup>	1.2%	22
	46 Dirt & Fines <sup>8</sup>	0.2%	3
	47 Bagged Materials <sup>4, 8</sup>	1.0%	19
	<b>Other Subtotal</b>	<b>3.5%</b>	<b>64</b>
<b>Total</b>		<b>100.0%</b>	<b>1,815</b>

1. Materials accepted in commingled recycling program.
2. Materials accepted by glass recycling program.
3. Materials accepted by yard waste program. Note compostable paper included only Kraft yard waste bags for yard waste characterization.
4. Broken Glass Bottles/ Jars and Bagged Materials was used for waste characterization of commingled recyclables and glass recyclables streams only. Bagged materials were not broken, and all contents were considered contamination.
5. Materials accepted by other City non-curbide recycling programs.
6. Materials accepted by other regional non-curbide recycling programs.
7. Materials that may be accepted by potential composting program.
8. Materials accepted by refuse program only.

Figure 4-2 shows the top 10 most prevalent materials collected via the commingled recycling program. Corrugated cardboard/Kraft paper, mixed recyclable paper, and office paper represent the top three most predominant materials recycled via the commingled recycling program.

**Figure 4-2: Top Ten Material Categories Collected in Commingled Recycling Program (tons per year)**



## 4.2 Program Capture Rate

Capture rate is the percentage of targeted materials captured by the recycling program. The commingled recycling program capture rate was 87.5 percent, that is, on average, 87.5 percent of targeted commingled recycling program was found in the commingled recycling program set-outs. The City's commingled recycling program capture rate is higher than national estimated capture rate of 32 percent.<sup>3</sup> The City's program is highly successful in diverting targeted materials. Table 4-2 presents the capture rate by targeted commingled program material category.

<sup>3</sup> Source: The Recycling Partnership 2020 State of Curbside Recycling Report

**Table 4-2: Commingled Recycling Program Capture Rate by Targeted Material Category**

Material Group	Material Category	Capture Rate (%)
Paper	Corrugated Cardboard/Kraft Paper	95.9%
	Aseptic Boxes & Gable Top Cartons	76.8%
	Office Paper	88.4%
	Mixed Recyclable Paper	57.0%
	Pizza Boxes	92.6%
	<b>Paper Capture Rate</b>	<b>88.7%</b>
Plastic	PET (#1) Bottles/Jars	74.5%
	HDPE (#2) Natural Bottles/Jugs	87.7%
	HDPE (#2) Colored Bottles/Jugs	92.9%
	<b>Plastic Capture Rate</b>	<b>79.2%</b>
Metals	Aluminum Cans/Tins	89.6%
	Steel Cans & Lids	79.3%
	<b>Metal Capture Rate</b>	<b>85.7%</b>
<b>Total Capture Rate</b>		<b>87.5%</b>

### 4.3 Program Participation Rate

The Burns & McDonnell Project Team surveyed 800 single-family residential households during the field event. The commingled recycling program participation rate was on average 86.1 percent, that is, on average, 86.1 percent of single-family households set out commingled recyclables during the week of sampling. The commingled recycling program participation rate by collection day ranged from a maximum of 88.5 percent to minimum of 81.5 percent. The City's commingled recycling program participation rate is higher than national estimated participation rate of 72 percent.<sup>4</sup>

### 4.4 Estimated Market Value

Market value represents the value for processed commodities (i.e., contaminants removed, sorted from other commodities, baled, truckload quantities). Market values varies based on factors such as region, commodity, timing, global economic factors, quantity, quality, etc.

As shown in Table 4-3, aluminum cans/tins and HDPE (#2) natural bottles/jugs had the highest average market value of the commingled recycling program commodities. Table 4-3 presents the historical average market value by commodity in commingled recycling program in the region.

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<sup>4</sup> Id.



**Table 4-3: Historical Market Value by Commodity in Commingled Recycling Program**

Material Group	Material Category	Average \$/ton 2021 <sup>1</sup>	Average \$/ton 5 years <sup>1</sup>
Paper	Corrugated Cardboard/Kraft Paper	\$87.50	\$89.74
	Aseptic Boxes & Gable Top Cartons	\$2.50	\$52.71
	Office Paper	\$95.71	\$139.68
	Mixed Recyclable Paper	\$28.93	\$27.63
	Pizza Boxes	\$87.50	\$89.74
Plastic	PET (#1) Bottles/Jars	\$239.75	\$249.86
	HDPE (#2) Natural Bottles/Jugs	\$1,619.81	\$812.15
	HDPE (#2) Colored Bottles/Jugs	\$566.15	\$317.14
Metals	Aluminum Cans/Tins	\$1,232.96	\$1,202.89
	Steel Cans & Lids	\$143.33	\$112.71

1. Source: [www.recyclingmarkets.net](http://www.recyclingmarkets.net) for Atlanta (Southeast USA) Region. Average \$/ton 2021 based on December 31, 2020 thru May 17, 2021. Average \$/ton 5 year based on May 31, 2016 to May 17, 2021.

Table 4-4 presents the estimated market value based on the composition and annual tonnage by material category collected via the single-family residential commingled recycling program. The estimated market value per ton for commodities in the City commingled recycling program before and after applying the cost of disposing of contamination was \$172.60 and \$123.57 per ton respectively.

**Table 4-4: Estimated Market Value for Commodities in City Commingled Recycling Program**

Material Group	Material Category	Average \$/ton 2021 <sup>1</sup>	Tons <sup>2</sup>	Estimated Market Value <sup>1</sup>
Paper	Corrugated Cardboard/Kraft Paper	\$87.50	570.06	\$49,880
	Aseptic Boxes & Gable Top Cartons	\$2.50	21.56	\$54
	Office Paper	\$95.71	195.73	\$18,734
	Mixed Recyclable Paper	\$28.93	362.78	\$10,495
	Pizza Boxes	\$87.50	37.29	\$3,263
Plastic	PET (#1) Bottles/Jars	\$239.75	87.06	\$20,873
	HDPE (#2) Natural Bottles/Jugs	\$1,619.81	20.52	\$33,238
	HDPE (#2) Colored Bottles/Jugs	\$566.15	23.73	\$13,432
Metals	Aluminum Cans/Tins	\$1,232.96	74.32	\$91,638
	Steel Cans & Lids	\$143.33	39.70	\$5,690
Total		\$172.60	1,432.75	\$247,297
Contamination		(\$60.00)	382.70	(\$22,962)
		\$123.57	1,615.45	\$224,335

1. Source: [www.recyclingmarkets.net](http://www.recyclingmarkets.net) for Atlanta (Southeast USA) Region. Average \$/ton 2021 based on December 31, 2020 thru May 17, 2021. Average \$/ton 5 year based on May 31, 2016 to May 17, 2021.

2. Source: tonnage information for Fiscal Year 2019/2020

## 4.5 Conclusions

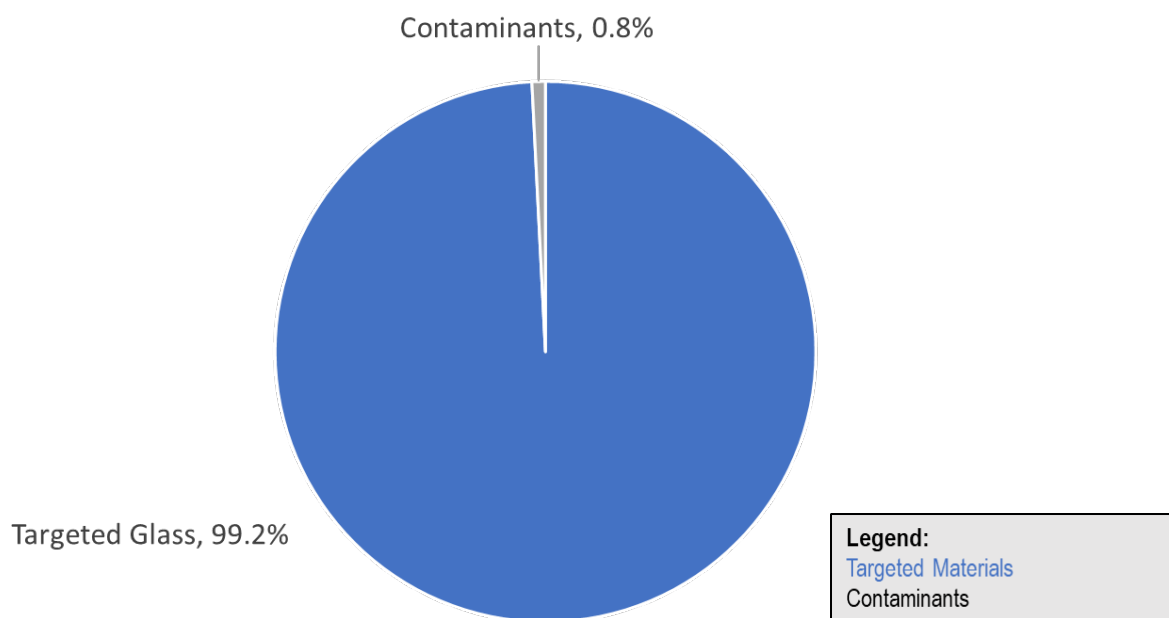
- **Consider campaign to reduce commingled recycling contamination rate.** The commingled recycling program had a contamination rate of approximately 21.1 percent. The primary contaminant was non-recyclable paper followed by non-targeted plastics #1, #3, #4, and #7, and other non-recyclable paper. The City may consider a campaign to reduce the commingled recycling program contamination rate.
- **High commingled recycling program capture rate.** On average, the commingled recycling program capture rate was 87.5 percent. The City's program is highly successful in diverting targeted materials.
- **High commingled recycling program participation rate.** The commingled recycling program participation rate was on average 86.1 percent. The City's commingled recycling program participation rate is higher than the national estimated participation rate.
- **Evaluate commingled recycling program processing contract.** The City may evaluate the financial terms (i.e. processing fee and recyclable revenue share), expansion of materials, etc. and other contractual provisions of the commingled program processing contract. In addition, the City may consider regional collaboration as an opportunity to enhance the commingled program processing contract.

## 5.0 GLASS RECYCLING PROGRAM RESULTS

In Fiscal Year 2019/2020, 497 tons of material were collected via the single-family residential glass recycling program. The glass recycling program represents 6.4 percent of the total tonnage collected from single-family residential households by the City Public Works Department in Fiscal Year 2019/2020 (See Section 7). The following sections present the results of the characterization analysis and performance metrics for the glass recycling program.

### 5.1 Composition and Quantity

A total of 431 pounds of material from the glass recycling program were sampled during the waste and recycling characterization event. The average pounds per set-out was 9.2 pounds. Figure 5.1 presents the aggregate composition of materials collected via the glass recycling program based on targeted materials and contaminants. As shown, the glass recycling program had minimal contamination. The glass recycling program has a contamination rate of approximately 0.8 percent.



**Figure 5-1: Aggregate Glass Recycling Composition by Targeted Materials and Contaminants**

Table 5-1 presents the composition and estimated annual tonnage by material category collected via the single-family residential glass recycling program. The majority of targeted glass was intact (444 tons per year or 89.3 percent).

**Table 5-1: Glass Recycling Program Composition by Material Category**

Material Group	Material Category	Mean (%)	Estimated Annual Tonnage
Paper	1 Corrugated Cardboard/Kraft Paper <sup>1</sup>	0.0%	-
	2 Aseptic Boxes & Gable Top Cartons <sup>1</sup>	0.0%	-
	3 Office Paper <sup>1</sup>	0.0%	-
	4 Mixed Recyclable Paper <sup>1</sup>	0.0%	-
	5 Pizza Boxes <sup>1</sup>	0.0%	-
	6 Compostable Paper <sup>3, 7</sup>	0.0%	-
	7 Remainder/Composite Paper <sup>8</sup>	0.0%	-
	<b>Paper Subtotal</b>	<b>0.0%</b>	<b>-</b>
Plastic	8 PET (#1) Bottles/Jars <sup>1</sup>	0.0%	-
	9 PET (#1) Non-Bottle Containers <sup>8</sup>	0.0%	-
	10 HDPE (#2) Natural Bottles/Jugs <sup>1</sup>	0.0%	-
	11 HDPE (#2) Colored Bottles/Jugs <sup>1</sup>	0.0%	-
	12 Plastic #3-#7 Bottles/Jugs <sup>8</sup>	0.0%	-
	13 Plastic Tubs & Lids (#5) <sup>6</sup>	0.0%	-
	14 Other Rigid Plastic Containers #2-#7 <sup>8</sup>	0.0%	-
	15 Expanded Polystyrene "Styrofoam" Food Service <sup>8</sup>	0.0%	-
	16 Expanded Polystyrene "Styrofoam" Packaging <sup>5</sup>	0.0%	-
	17 City Program Film Bags <sup>8</sup>	0.0%	-
	18 Retail Bags, Sleeves <sup>6</sup>	0.0%	-
	19 All Other Film <sup>8</sup>	0.0%	-
	20 Durable/Bulky Rigid Plastics <sup>8</sup>	0.0%	-
	21 Remainder/Composite Plastic <sup>8</sup>	0.0%	-
	<b>Plastic Subtotal</b>	<b>0.0%</b>	<b>-</b>
Metals	22 Aluminum Cans/Tins <sup>1</sup>	0.0%	-
	23 Other Non-Ferrous Metals <sup>8</sup>	0.0%	-
	24 Steel Cans & Lids <sup>1</sup>	0.0%	-
	25 Other Ferrous Metals <sup>8</sup>	0.0%	-
	<b>Metal Subtotal</b>	<b>0.0%</b>	<b>-</b>
Glass	26 Glass Bottles/Jars – Intact <sup>2</sup>	89.3%	444
	27 Broken Glass Bottles/Jars <sup>2</sup>	9.9%	49
	28 Remainder/Composite Glass <sup>8</sup>	0.8%	4
	<b>Glass Subtotal</b>	<b>100.0%</b>	<b>497</b>
Organics	29 Vegetative Food – Loose <sup>7</sup>	0.0%	-
	30 Meat/Dairy/Mixed Food – Loose <sup>7</sup>	0.0%	-
	31 Packaged Food <sup>8</sup>	0.0%	-
	32 Grass, Leaves, Prunings, Trimmings <sup>3</sup>	0.0%	-
	33 Branches, Limbs, Stumps <sup>3</sup>	0.0%	-
	34 Other Compostable <sup>8</sup>	0.0%	-
	<b>Organics Subtotal</b>	<b>0.0%</b>	<b>-</b>
C&D	35 Construction and Renovation Debris <sup>8</sup>	0.0%	-
	<b>C&amp;D Subtotal</b>	<b>0.0%</b>	<b>-</b>

Material Group	Material	Mean (%)	Tonnage
Household Hazardous Waste (HHW)	36 Batteries (All Types) <sup>8</sup>	0.0%	-
	37 Medically Related Waste <sup>8</sup>	0.0%	-
	38 Electronics <sup>5</sup>	0.0%	-
	39 Other HHW <sup>6</sup>	0.0%	-
	<b>HHW Subtotal</b>	<b>0.0%</b>	<b>-</b>
Other	40 Textiles and Leather Products <sup>6</sup>	0.0%	-
	41 Rubber Products <sup>8</sup>	0.0%	-
	42 Disposable Diapers & Sanitary Products <sup>8</sup>	0.0%	-
	43 Pet Waste <sup>8</sup>	0.0%	-
	44 Bulky Materials <sup>8</sup>	0.0%	-
	45 Other Materials Not Elsewhere Classified <sup>8</sup>	0.0%	-
	46 Dirt & Fines <sup>8</sup>	0.0%	-
	47 Bagged Materials <sup>4, 8</sup>	NA	NA
	<b>Other Subtotal</b>	<b>0.0%</b>	<b>-</b>
<b>Total</b>		<b>100.0%</b>	<b>497</b>

1. Materials accepted in commingled recycling program.
2. Materials accepted by glass recycling program.
3. Materials accepted by yard waste program. Note compostable paper included only Kraft yard waste bags for yard waste characterization.
4. Broken Glass Bottles/ Jars and Bagged Materials was used for waste characterization of commingled recyclables and glass recyclables streams only. Bagged materials were not broken, and all contents were considered contamination.
5. Materials accepted by other City non-curbide recycling programs.
6. Materials accepted by other regional non-curbide recycling programs.
7. Materials that may be accepted by potential composting program.
8. Materials accepted by refuse program only.

## 5.2 Program Capture Rate

On average, the glass recycling program capture rate was 93.8 percent, that is, on average, 93.8 percent of targeted glass was found in the glass recycling program set-outs. The City's program is highly successful in diverting glass recyclables.

## 5.3 Program Participation Rate

The Burns & McDonnell Project Team surveyed 800 single-family residential households during the field event. The glass recycling program participation rate was on average 31.9 percent, that is, 31.9 percent of the single-family households set out materials in the glass recycling program during the week the Team sampled. The glass recycling program participation rate by collection day ranged from a maximum of 36.5 percent to minimum of 29.0 percent. Since the glass recycling program has a high capture rate (See Section 5.2), the low glass program participation rate is likely due to residents storing glass recyclables and setting out such material less frequently.

## 5.4 Conclusions

- **Minimal contamination in glass recycling program.** The glass recycling program has a contamination rate of approximately 0.8 percent.
- **High glass recycling program capture rate.** On average, the glass recycling program capture rate was 93.8 percent. The City's program is highly successful in diverting glass recyclables.

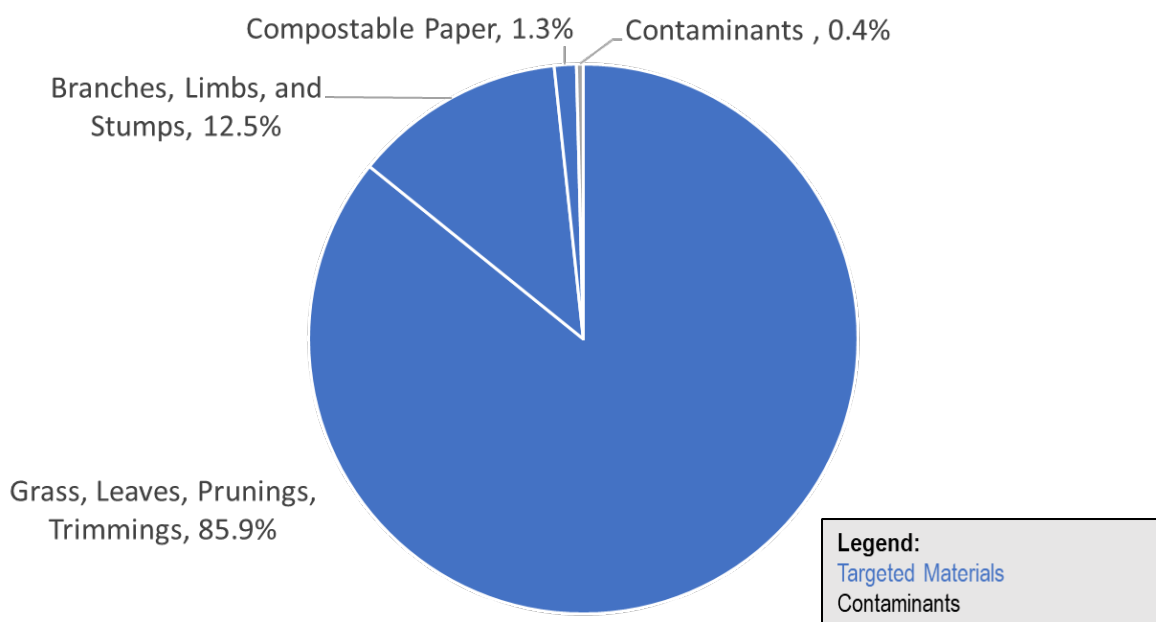


## 6.0 YARD WASTE PROGRAM RESULTS

In Fiscal Year 2019/2020, 2,343 tons of material were collected via the single-family residential yard waste program. The glass recycling program represents 30.0 percent of the total tonnage collected from single-family residential households by the City Public Works Department in Fiscal Year 2019/2020 (See Section 7). The following sections present the results of the characterization analysis and performance metrics for the yard waste program.

### 6.1 Composition and Quantity

A total of 1,141 pounds of material from the yard waste program were sampled during the waste and recycling characterization event. The average pounds per set-out was 38.0 pounds. Figure 6.1 presents the aggregate composition of materials collected via the yard waste program based on targeted materials and contaminants. Like the glass recycling program, the yard waste program had minimal contamination. The yard waste program has a contamination rate of approximately 0.4 percent.



**Figure 6-1: Aggregate Yard Waste Program Composition by Targeted Materials and Contaminants<sup>5</sup>**

Table 6-1 presents the composition and estimated annual tonnage by material category collected via the single-family residential yard waste program. The majority of yard waste was grass, leaves, prunings, and trimmings (2,012 tons per year or 85.9 percent).

<sup>5</sup> For yard waste characterization, compostable paper included only Kraft yard waste bags for yard waste characterization.

**Table 6-1: Yard Waste Recycling Program Composition by Material Category**

Material Group	Material Category	Mean (%)	Estimated Annual Tonnage
Paper	1 Corrugated Cardboard/Kraft Paper <sup>1</sup>	0.0%	-
	2 Aseptic Boxes & Gable Top Cartons <sup>1</sup>	0.0%	-
	3 Office Paper <sup>1</sup>	0.0%	-
	4 Mixed Recyclable Paper <sup>1</sup>	0.0%	-
	5 Pizza Boxes <sup>1</sup>	0.0%	-
	6 Compostable Paper <sup>3, 7</sup>	1.3%	29
	7 Remainder/Composite Paper <sup>8</sup>	0.0%	-
	<b>Paper Subtotal</b>	<b>1.3%</b>	<b>29</b>
Plastic	8 PET (#1) Bottles/Jars <sup>1</sup>	0.0%	-
	9 PET (#1) Non-Bottle Containers <sup>8</sup>	0.0%	-
	10 HDPE (#2) Natural Bottles/Jugs <sup>1</sup>	0.0%	-
	11 HDPE (#2) Colored Bottles/Jugs <sup>1</sup>	0.0%	-
	12 Plastic #3-#7 Bottles/Jugs <sup>8</sup>	0.0%	-
	13 Plastic Tubs & Lids (#5) <sup>6</sup>	0.0%	-
	14 Other Rigid Plastic Containers #2-#7 <sup>8</sup>	0.0%	-
	15 Expanded Polystyrene "Styrofoam" Food Service <sup>8</sup>	0.0%	-
	16 Expanded Polystyrene "Styrofoam" Packaging <sup>5</sup>	0.0%	-
	17 City Program Film Bags <sup>8</sup>	0.0%	-
	18 Retail Bags, Sleeves <sup>6</sup>	0.0%	-
	19 All Other Film <sup>8</sup>	0.0%	-
	20 Durable/Bulky Rigid Plastics <sup>8</sup>	0.0%	-
	21 Remainder/Composite Plastic <sup>8</sup>	0.0%	-
	<b>Plastic Subtotal</b>	<b>0.0%</b>	<b>-</b>
Metals	22 Aluminum Cans/Tins <sup>1</sup>	0.0%	-
	23 Other Non-Ferrous Metals <sup>8</sup>	0.0%	-
	24 Steel Cans & Lids <sup>1</sup>	0.0%	-
	25 Other Ferrous Metals <sup>8</sup>	0.0%	-
	<b>Metal Subtotal</b>	<b>0.0%</b>	<b>-</b>
Glass	26 Glass Bottles/Jars – Intact <sup>2</sup>	0.0%	-
	27 Broken Glass Bottles/Jars <sup>2</sup>	0.0%	-
	28 Remainder/Composite Glass <sup>8</sup>	0.0%	-
	<b>Glass Subtotal</b>	<b>0.0%</b>	<b>-</b>
Organics	29 Vegetative Food – Loose <sup>7</sup>	0.2%	4
	30 Meat/Dairy/Mixed Food – Loose <sup>7</sup>	0.0%	-
	31 Packaged Food <sup>8</sup>	0.0%	-
	32 Grass, Leaves, Prunings, Trimmings <sup>3</sup>	85.9%	2,012
	33 Branches, Limbs, Stumps <sup>3</sup>	12.5%	293
	34 Other Compostable <sup>8</sup>	0.0%	-
	<b>Organics Subtotal</b>	<b>98.6%</b>	<b>2,309</b>
C&D	35 Construction and Renovation Debris <sup>8</sup>	0.1%	1
	<b>C&amp;D Subtotal</b>	<b>0.1%</b>	<b>1</b>

Material Group	Material	Mean (%)	Tonnage
Household Hazardous Waste (HHW)	36 Batteries (All Types) <sup>8</sup>	0.0%	-
	37 Medically Related Waste <sup>8</sup>	0.0%	-
	38 Electronics <sup>5</sup>	0.0%	-
	39 Other HHW <sup>6</sup>	0.0%	-
	<b>HHW Subtotal</b>	<b>0.0%</b>	<b>-</b>
Other	40 Textiles and Leather Products <sup>6</sup>	0.0%	-
	41 Rubber Products <sup>8</sup>	0.0%	-
	42 Disposable Diapers & Sanitary Products <sup>8</sup>	0.0%	-
	43 Pet Waste <sup>8</sup>	0.1%	3
	44 Bulky Materials <sup>8</sup>	0.0%	-
	45 Other Materials Not Elsewhere Classified <sup>8</sup>	0.0%	-
	46 Dirt & Fines <sup>8</sup>	0.0%	-
	47 Bagged Materials <sup>4, 8</sup>	0.0%	-
	<b>Other Subtotal</b>	<b>0.1%</b>	<b>3</b>
<b>Total</b>		<b>100.0%</b>	<b>2,343</b>

1. Materials accepted in commingled recycling program.
2. Materials accepted by glass recycling program.
3. Materials accepted by yard waste program. Note compostable paper included only Kraft yard waste bags for yard waste characterization.
4. Broken Glass Bottles/ Jars and Bagged Materials was used for waste characterization of commingled recyclables and glass recyclables streams only. Bagged materials were not broken, and all contents were considered contamination.
5. Materials accepted by other City non-curbide recycling programs.
6. Materials accepted by other regional non-curbide recycling programs.
7. Materials that may be accepted by potential composting program.
8. Materials accepted by refuse program only.

## 6.2 Program Capture Rate

On average, the yard waste program capture rate was 98.8 percent meaning nearly all of the yard waste was found in the yard waste program rather than in the other programs. Like the glass recycling program, the City's yard waste program is highly successful in diverting yard waste.

## 6.3 Program Participation Rate

The Burns & McDonnell Project Team surveyed 800 single-family residential households during the field event. The yard waste program participation rate was on average 26.6 percent. The yard waste program participation rate by collection day ranged from a maximum of 36.5 percent to minimum of 18.5 percent. The low yard waste program participation rate is likely due to residents not conducting yard work weekly and setting out such material less frequently.

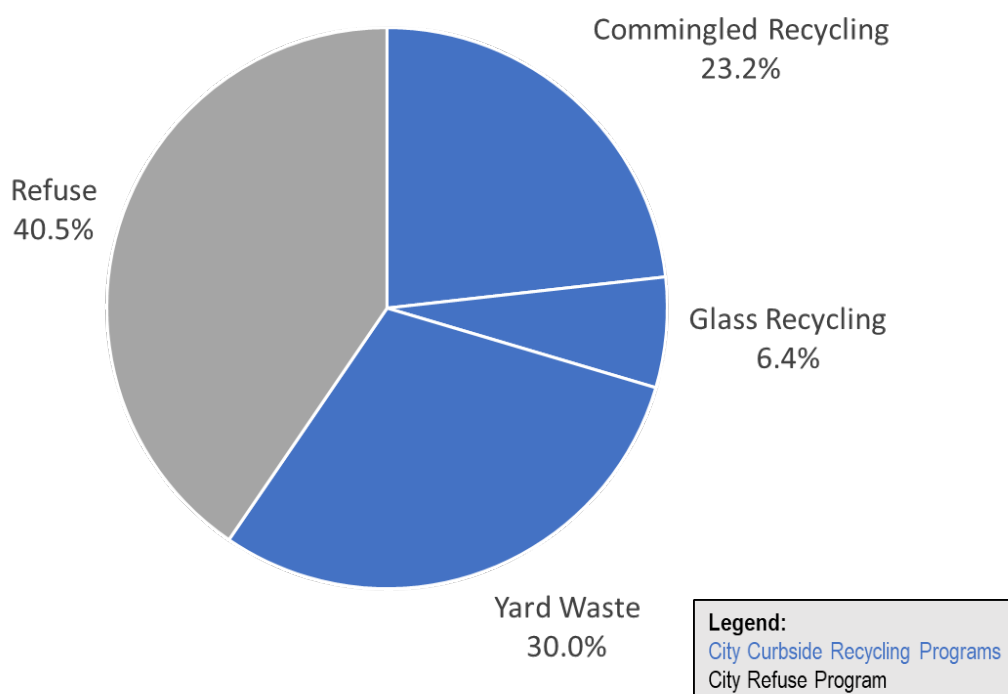
## 6.4 Conclusions

- **Minimal contamination in yard waste program.** The yard waste program has a contamination rate of approximately 0.4 percent.

- **High yard waste program capture rate.** On average, the yard waste program capture rate was 98.8 percent. Like the glass recycling program, the City's yard waste program is highly successful in diverting yard waste.

## 7.0 AGGREGATE WASTE AND RECYCLING CHARACTERIZATION RESULTS

In Fiscal Year 2019/2020, City residents generated 7,818 tons of solid waste and recyclables that were collected via the single-family residential program. Figure 7-1 shows the breakdown of tonnage collected via the single-family residential program provided by the City Public Works Department.



**Figure 7-1: Comparison of Refuse Program and Other Program Tonnage**

As shown in Figure 7-1, 59.5 percent of the total tonnage set out by single-family residents for collection was set out for one of the City's diversion programs (commingled recycling, glass recycling, and yard waste). The adjusted City diversion rate, excluding contamination, is 54.1 percent. The City has a high overall diversion rate.

Detailed evaluation of each program is presented in Sections 3 thru 6. Tables 7-1 presents the aggregate composition and tonnage for the single-family residential programs provided by the City Public Works Department.

**Table 7-1: Aggregate Composition by Material Category**

Material Group	Material	Mean (%)	Tonnage
Paper	1 Corrugated Cardboard/Kraft Paper <sup>1</sup>	7.2%	595
	2 Aseptic Boxes & Gable Top Cartons <sup>1</sup>	0.5%	38
	3 Office Paper <sup>1</sup>	3.3%	255
	4 Mixed Recyclable Paper <sup>1</sup>	5.1%	410
	5 Pizza Boxes <sup>1</sup>	0.5%	40
	6 Compostable Paper <sup>3, 7</sup>	13.9%	887
	7 Remainder/Composite Paper <sup>8</sup>	0.8%	51
	<b>Paper Subtotal</b>	<b>31.3%</b>	<b>2,276</b>
Plastic	8 PET (#1) Bottles/Jars <sup>1</sup>	1.5%	117
	9 PET (#1) Non-Bottle Containers <sup>8</sup>	0.9%	65
	10 HDPE (#2) Natural Bottles/Jugs <sup>1</sup>	0.3%	23
	11 HDPE (#2) Colored Bottles/Jugs <sup>1</sup>	0.3%	26
	12 Plastic #3-#7 Bottles/Jugs <sup>8</sup>	0.0%	1
	13 Plastic Tubs & Lids (#5) <sup>6</sup>	0.5%	38
	14 Other Rigid Plastic Containers #2-#7 <sup>8</sup>	0.3%	18
	15 Expanded Polystyrene "Styrofoam" Food Service <sup>8</sup>	0.3%	22
	16 Expanded Polystyrene "Styrofoam" Packaging <sup>5</sup>	0.2%	12
	17 City Program Film Bags <sup>8</sup>	0.6%	37
	18 Retail Bags, Sleeves <sup>6</sup>	0.5%	30
	19 All Other Film <sup>8</sup>	2.4%	149
	20 Durable/Bulky Rigid Plastics <sup>8</sup>	0.7%	50
	21 Remainder/Composite Plastic <sup>8</sup>	0.6%	38
	<b>Plastic Subtotal</b>	<b>9.0%</b>	<b>626</b>
Metals	22 Aluminum Cans/Tins <sup>1</sup>	1.1%	83
	23 Other Non-Ferrous Metals <sup>8</sup>	0.7%	46
	24 Steel Cans & Lids <sup>1</sup>	0.6%	50
	25 Other Ferrous Metals <sup>8</sup>	0.4%	28
	<b>Metal Subtotal</b>	<b>2.8%</b>	<b>207</b>
Glass	26 Glass Bottles/Jars – Intact <sup>2</sup>	8.0%	525
	27 Broken Glass Bottles/Jars <sup>2</sup>	0.9%	49
	28 Remainder/Composite Glass <sup>8</sup>	0.2%	13
	<b>Glass Subtotal</b>	<b>9.2%</b>	<b>588</b>
Organics	29 Vegetative Food – Loose <sup>7</sup>	6.5%	399
	30 Meat/Dairy/Mixed Food – Loose <sup>7</sup>	1.5%	95
	31 Packaged Food <sup>8</sup>	3.6%	220
	32 Grass, Leaves, Prunings, Trimmings <sup>3</sup>	16.6%	2,038
	33 Branches, Limbs, Stumps <sup>3</sup>	2.6%	295
	34 Other Compostable <sup>8</sup>	0.1%	5
	<b>Organics Subtotal</b>	<b>30.8%</b>	<b>3,052</b>
C&D	35 Construction and Renovation Debris <sup>8</sup>	0.7%	40
	<b>C&amp;D Subtotal</b>	<b>0.7%</b>	<b>40</b>

Material Group	Material	Mean (%)	Tonnage
Household Hazardous Waste (HHW)	36 Batteries (All Types) <sup>8</sup>	0.1%	7
	37 Medically Related Waste <sup>8</sup>	0.1%	8
	38 Electronics <sup>5</sup>	0.9%	56
	39 Other HHW <sup>6</sup>	0.8%	54
	<b>HHW Subtotal</b>	<b>1.9%</b>	<b>125</b>
Other	40 Textiles and Leather Products <sup>6</sup>	1.1%	70
	41 Rubber Products <sup>8</sup>	0.1%	4
	42 Disposable Diapers & Sanitary Products <sup>8</sup>	1.7%	106
	43 Pet Waste <sup>8</sup>	3.7%	217
	44 Bulky Materials <sup>8</sup>	5.2%	341
	45 Other Materials Not Elsewhere Classified <sup>8</sup>	1.7%	104
	46 Dirt & Fines <sup>8</sup>	0.7%	43
	47 Bagged Materials <sup>4, 8</sup>	0.2%	19
	<b>Other Subtotal</b>	<b>14.3%</b>	<b>903</b>
<b>Total</b>		<b>100.0%</b>	<b>7,818</b>

1. Materials accepted in commingled recycling program.
2. Materials accepted by glass recycling program.
3. Materials accepted by yard waste program. Note compostable paper included only Kraft yard waste bags for yard waste characterization.
4. Broken Glass Bottles/ Jars and Bagged Materials was used for waste characterization of commingled recyclables and glass recyclables streams only. Bagged materials were not broken, and all contents were considered contamination.
5. Materials accepted by other City non-curbide recycling programs.
6. Materials accepted by other regional non-curbide recycling programs.
7. Materials that may be accepted by potential composting program.
8. Materials accepted by refuse program only.

## 7.2 Conclusions

- **City has high overall single-family residential diversion rate.** The City diverts single-family residential materials from the landfill via the commingled recycling, glass recycling, and yard waste programs. The City's diversion rate is 59.5 percent. The adjusted City diversion rate, excluding contamination, is 54.1 percent.

## 8.0 SUMMARY OF CONCLUSIONS

This section summarizes the conclusions by program and overall presented in Section 3 thru 7. Refer to Sections 3 thru 7 for additional explanation of the following conclusions.

### 8.1 Refuse Program Conclusions

- **Potential additional diversion via current programs.** Currently, approximately 16.4 percent of materials disposed via the refuse program may be diverted by current City and regional recycling programs. Approximately 9.3 percent may be captured via the City's commingled recycling and glass recycling curbside program.
- **Potential additional diversion via evaluation of composting program.** A significant fraction of the materials disposed via the refuse program, 39.3 percent, may be diverted via a potential composting program. Compostable paper and food loose (vegetative and meat/dairy/mixed) accounted for 24.0 percent and 12.4 percent, respectively, of what was collected in the refuse program. The City may consider evaluating a composting program to divert these materials, backyard and/or curbside.

### 8.2 Commingled Recycling Program Conclusions

- **Consider campaign to reduce commingled recycling contamination rate.** The commingled recycling program had a contamination rate of approximately 21.1 percent. The primary contaminant was non-recyclable paper followed by non-targeted plastics #1, #3, #4, and #7 and other non-recyclable paper. The City may consider a campaign to reduce the commingled recycling program contamination rate.
- **High commingled recycling program capture rate.** On average, the commingled recycling program capture rate was 87.5 percent. The City's program is highly successful in diverting targeted materials.
- **High commingled recycling program participation rate.** The commingled recycling program participation rate was on average 86.1 percent. The City's commingled recycling program participation rate is higher than the national estimated participation rate.

### 8.3 Glass Recycling Program Conclusions

- **Minimal contamination in glass recycling program.** The glass recycling program has a contamination rate of approximately 0.8 percent.
- **High glass recycling program capture rate.** On average, the glass recycling program capture rate was 93.8 percent. The City's program is highly successful in diverting glass recyclables.



## 8.4 Yard Waste Program Conclusions

- **Minimal contamination in yard waste program.** The yard waste program has a contamination rate of approximately 0.4 percent.
- **High yard waste program capture rate.** On average, the yard waste program capture rate was 98.8 percent. Like the glass recycling program, the City's yard waste program is highly successful in diverting yard waste.

## 8.5 Other General Conclusions

- **City has high overall single-family residential diversion rate.** The City diverts single-family residential materials from the landfill via the commingled recycling, glass recycling, and yard waste programs. The City's diversion rate is 59.5 percent. The adjusted City diversion rate, excluding contamination, is 54.1 percent.

## **APPENDIX A - MATERIAL DEFINITIONS**

Class	#	Material Category	Definition
Paper	1	Corrugated Cardboard/Kraft Paper	Paper laminate usually composed of three layers. The center wavy layer is sandwiched between the two outer layers. Examples include cardboard packaging and containers, such as shipping and moving boxes, computer packaging cartons, and sheets and pieces used as dividers in boxes. This type does not include chipboard boxes such as cereal and tissue boxes and excludes wax-coated material.
Paper	2	Aseptic Boxes and Gable Top Cartons	Bleached polycoated paperboard containers or paper containers with a foil liner of various sizes and shapes that contains shelf-stable food products such as apple juice, soup, soy/rice milk, etc. Aseptic containers may include a plastic pour spout as part of the container. Gable top cartons means cartons for both non-refrigerated items, such as granola and crackers, and refrigerated items, such as milk, juice, and egg substitutes. These are usually paper-based, may be any shape, and may include a plastic pour spout as part of the carton.
Paper	3	Office Paper	White paper used in offices and mail. Examples of office-type paper include copy paper, computer printer paper, letter paper and business forms; examples of mail include letter paper, bills/business forms, greeting cards, and white envelopes with or without clear windows. Does not include envelopes lined with plastic or bubblewrap.
Paper	4	Mixed Recyclable Paper	Items made of paper that do not fit into any of the other paper types (such as folding cartons), but that are generally recyclable or not generally composted. Paper may be combined with minor amounts of other materials such as wax or glues. This type includes general office-type papers (other than white office-type paper and mail) such as colored ledger, manila folders, manila envelopes, index cards, colored notebook paper, and carbonless forms, and items made of chipboard, ground wood paper, deep-toned or fluorescent dyed paper, unused paper plates and cups, school construction paper, self-adhesive notes, paperback books (excludes hardcover books), phone books and directories, and bagged shredded paper.
Paper	5	Pizza Boxes	Clean or greasy/food-contaminated corrugated cardboard pizza boxes.
Paper	6	Compostable Paper	Items that are made mostly of paper that don't fit into any other material types or are contaminated with large amounts of wax, food, and/or moisture, and which are compostable. Examples include waxed corrugated cardboard, food-soiled packaging paper, and moisture-soiled packaging paper. Also includes pulp paper egg cartons, unused pulp plant pots, molded paper packing materials, some berry trays, and plates, cups, bowls, trays, take-out containers, etc. that are clearly not coated.
Paper	7	Remainder/Composite Paper	Items made mostly of paper but combined with large amounts of other materials. These are items that do not fit into any other categories, and are not generally compostable or recyclable. Examples include blueprints, sepia, onion skin, carbon paper, photographs, packaging with paper barrels and metal ends, paper take-out containers with metal handles, sheets of paper stick-on labels, butcher paper, and envelopes lined with plastic or bubble wrap.
Plastic	8	PET (#1) Bottles/Jars	Clear and colored bottles and jars coded as polyethylene terephthalate (PET #1). Examples include soda bottles, water bottles, food jars, salad dressing bottles/jars, food sauce bottles/jars, and some household cleaning products.
Plastic	9	PET (#1) Non-Bottle Containers	Clear and colored plastic non-bottle, non-jar containers coded PET #1. Examples include some clamshell containers, fruit or vegetable platters, plastic drink cups, and frozen food trays.
Plastic	10	HDPE (#2) Natural Bottles/Jugs	Translucent or clear/natural plastic bottles and jugs coded as high-density polyethylene (HDPE #2). Examples include milk jugs, vinegar bottles, and some gallon water bottles.

Class	#	Material Category	Definition
Plastic	11	HDPE (#2) Colored Bottles/Jugs	Colored, opaque, or pigmented plastic bottles coded as high-density polyethylene (HDPE #2). Examples include detergent and shampoo bottles.
Plastic	12	Plastic #3-#7 Bottles/Jugs	All other plastic bottles and jugs which are not marked as PET #1 or HDPE #2.
Plastic	13	Plastic Tubs & Lids (#5)	Clear and colored plastic tubs and lids coded as polypropylene (PP #5). This excludes food trays and other #5 packaging. Examples include dairy product cups and tubs (yogurt, sour cream) and household goods packaging.
Plastic	14	Other Rigid Plastic Containers #2-#7	Containers, lids, and other packaging that are made of types of plastic other than PET #1. Examples include clamshells, trays, tray lids, cups, bowls, plates, hardware and fastener packaging, frozen food containers, microwave food trays, cookie trays found in cookie packages, small (less than one gallon) plant containers such as nursery pots and plant six-packs, plastic strapping and string.
Plastic	15	Expanded Polystyrene "Styrofoam" Food Service	Food packaging items made of expanded polystyrene such as egg cartons, cups, plates, bowls, and clamshells.
Plastic	16	Expanded Polystyrene "Styrofoam" Packaging	Packaging items made of expanded polystyrene such as foam ice chests, foam inserts, and other packaging used in shipping.
Plastic	17	City Program Film Bags	City of Decatur solid waste program bags which include blue 33-gallon, yellow 15-gallon, and green 8-gallon bags.
Plastic	18	Retail Bags, Sleeves	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 intended for one-time use. This also includes newspaper sleeves and produce bags.
Plastic	19	All Other Film	All other plastic film that does not fit into any other type. Examples include other types of plastic bags (sandwich bags, zipper-recloseable bags, frozen vegetable bags, bread bags), food wrappers such as candy bar wrappers, potato chip bags, drink pouches, mailing pouches, bank bags, X-ray film, metallized film (such as balloons), and plastic food wrap.
Plastic	20	Durable/Bulky Rigid Plastics	Plastic items other than containers or film plastic, that are made to last for more than one use. Examples include crates, buckets (including 5-gallon buckets), baskets, totes, large plastic garbage cans, large tubs, large storage tubs/bins (usually with lids), flexible (non-brittle) flower pots of 1 gallon size or larger, lawn furniture, large plastic toys, tool boxes, first aid boxes, some sporting goods, CDs and their cases, and plastic housewares such as durable (not single-use) dishes, cups, and cutlery.
Plastic	21	Remainder/Composite Plastic	Plastic that cannot be put in any other type. This type includes items made mostly of plastic but combined with other materials. Examples include auto parts made of plastic attached to metal, some kitchenware, some toys, window blinds, plastic lumber, insulating foam, imitation ceramics, handles and knobs, new Formica, new vinyl, or new linoleum, plastic rigid bubble/foil packaging (as for medications), disposable plastic forks, knives, spoons, straws, stirrers, and expanded polystyrene items not used for packaging, such as insulation boards.
Metals	22	Aluminum Cans/Tins	Any food or beverage container that is made mainly of aluminum. Examples include most aluminum soda or beer cans. This subtype does not include bimetal containers with steel sides and aluminum ends.
Metals	23	Other Non-Ferrous Metals	Any metal item, other than aluminum cans, that is not stainless steel and that is not magnetic. These items may be made of aluminum, copper, brass, bronze, lead, zinc, or other metals. Examples include aluminum window frames, aluminum siding, copper wire, shell casings, brass pipe, and aluminum foil.

Class	#	Material Category	Definition
Metals	24	Steel Cans & Lids	Rigid containers made mainly of steel. These items will stick to a magnet and may be tin-coated. This subtype is used to store food, beverages, paint, and a variety of other household and consumer products. Examples include canned food and beverage containers, empty metal paint cans, empty spray paint and other aerosol containers, and bimetal containers with steel sides and aluminum ends.
Metals	25	Other Ferrous Metals	All ferrous metal items other than steel cans that are magnetic.
Glass	26	Glass Bottles/Jars - Intact	Any color soda, liquor, wine, juice, beer, and food bottles, jars, and containers which are intact or largely intact.
Glass	27	Broken Glass Bottles/Jars*	Any color soda, liquor, wine, juice, beer, and food bottles, jars, and containers, which have been broken into pieces 2 inches or smaller in size in the recyclables stream.
Glass	28	Remainder/Composite Glass	Glass that cannot be put in any other type. It includes flat glass and items made mostly of glass but combined with other materials. Examples include glass window panes, doors and table tops, flat automotive window glass (side windows), safety glass, architectural glass, Pyrex, Corningware, crystal and other glass tableware, mirrors, non-fluorescent light bulbs, auto windshields, laminated glass, or any curved glass.
Organics	29	Vegetative Food - Loose	Any food that is predominantly vegetative, but product's packaging has been opened, or the product was not contained in any packaging at all.
Organics	30	Meat/Dairy/Mixed Food - Loose	Any food that is predominantly meat or dairy, but product's packaging has been opened, or the product was not contained in any packaging at all.
Organics	31	Packaged Food	Any food which is still contained in its original packaging.
Organics	32	Grass, Leaves, Prunings, Trimmings	Plant material from any public or private landscape. Examples include leaves, grass clippings, plants, woody plant trimmings up to 4 inches, and seaweed.
Organics	33	Branches, Limbs, and Stumps	Branches and Stumps means woody plant material, branches, and stumps that exceed 4 inches in diameter, from any public or private landscape.
Organics	34	Other Compostable	Organic material that cannot be put in any other type that is compostable. Examples include cork, hemp rope, hair, small wood products (such as popsicle sticks and toothpicks), sawdust, and agricultural crop residues.
C&D	35	Construction and Renovation Debris	Dimensional lumber, pallets/crates, treated/contaminated wood, gypsum, insulation, rock/concrete/bricks, asphalt shingles/roofing, other construction debris, and mixed fine building material scraps.
HHW	36	Batteries (All Types)	Any type of battery, including lead-acid (automotive), household batteries such as AA, AAA, D, button cell, 9 volt, and rechargeable batteries used for power tools, computers, small appliances, watches, etc.
HHW	37	Medically Related Waste	Medical waste including pharmaceutical products, sharps, dialysis bags and tubings, and first aid supplies.
HHW	38	All Electronics	Electronics and small household appliances primarily composed of mixed materials (plastic, metal and glass), such as coffee makers, microwaves, fans, irons, hair dryers, electrical kitchenware, computers, televisions, and salvageable items such as machinery.
HHW	39	Other HHW	Paints and solvents, glues and adhesives, caulking compounds and grouts, hazardous cleaners and household chemicals, pesticides/herbicides, oil/gas/fuel tanks, any substances or products containing potentially harmful material.
Other	40	Textiles and Leather Products	Clothing, rags, and accessories made of natural and synthetic textiles such as cotton, wool, silk, woven nylon, rayon, polyester, leather, and other materials. Examples include pants, shirts, fabric purses, bed sheets, towels, and shoes.
Other	41	Rubber Products	Items made from rubber
Other	42	Disposable Diapers & Sanitary Products	Diapers and sanitary products
Other	43	Pet Waste	Includes animal feces, bedding, litter, bagged or unbagged.

Class	#	Material Category	Definition
Other	44	Bulky Materials	Large items that are not defined elsewhere in the material types list, including furniture and other large items. Examples include all sizes and types of furniture, box springs, and base components for beds.
Other	45	Other Materials Not Elsewhere Classified	Material that cannot be put in any other type that is not compostable. This type includes items made mostly of organic materials, but combined with other material types.
Other	46	Dirt & Fines	Material smaller than 2 inches in size or which can not be identified due to its small size.
Other	47	Bagged Materials*	Material in the recyclables stream that has been bagged and with the bag still intact, which are supposed to be loose in the recyclables container.



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Burns & McDonnell World Headquarters  
4004 Summit Blvd., Suite 1200  
Atlanta, GA 30319  
O 770-587-4776  
F 770-587-4772  
[www.burnsmcd.com](http://www.burnsmcd.com)