



# RESIDENTIAL RECYCLING CAPTURE RATES IN PRINCE GEORGE'S COUNTY

**FINAL REPORT**

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## TABLE OF CONTENTS

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<b>1. INTRODUCTION.....</b>	<b>1</b>
<b>2. WASTE GENERATION .....</b>	<b>1</b>
<b>3. STUDY METHODOLOGY.....</b>	<b>2</b>
3.1 Host Facilities and Field Data Collection Schedule.....	2
3.2 Sampling Targets.....	2
3.3 Material Categories.....	2
3.4 Sampling.....	5
3.5 Manual Sorting .....	6
3.6 Data Recording.....	6
3.7 Data Analysis .....	7
<b>4. RESULTS.....</b>	<b>7</b>
4.1 Refuse Composition .....	7
4.2 Recyclables Composition .....	8
4.3 Bagged Recyclables and Bagged Waste Composition.....	11
4.4 Capture Rate .....	13
4.5 Supplemental Results.....	15
<b>5. CONCLUSIONS.....</b>	<b>16</b>

### LIST OF APPENDICES

Appendix A – Manual Sort Material Categories & Definitions

# TABLE OF CONTENTS

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## List of Figures

Figure 3-1 Systematic Sampling Procedure for Incoming Loads .....	6
Figure 4-1 Unincorporated Area Curbside Recycling Composition Summary .....	10
Figure 4-1 Comparison of Bagged Waste and Bagged Recyclables Composition .....	13
Figure 4-2 Targeted Material Capture Rates .....	15

## List of Tables

Table 2-1 Waste and Recycling Generation (2021).....	2
Table 3-1 Number of Samples Obtained by Season .....	2
Table 3-2 Material Categories and Recyclability Class.....	3
Table 3-3 Additional Categories Added for Capture Rate Analysis .....	5
Table 4-1 Residential Refuse Composition.....	8
Table 4-2 Residential Curbside Recycling Composition .....	9
Table 4-3 Composition of Supplemental Recyclable Categories .....	11
Table 4-3 Bagged Material Composition.....	12
Table 4-4 Capture Rates (Lbs/Household/Year).....	14
Table 4-3 School and Municipal Recycling Composition.....	16

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

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## 1. INTRODUCTION

Prince George's County (County) recently funded and completed a four-season county-wide waste composition study (WCS) at the County's Brown Station Road Sanitary Landfill (BSRSL). This study provided detailed estimates of the composition of disposed refuse that originated from multiple residential and commercial waste generator sectors within the County. A final report containing detailed results of this study was completed in December 2022.<sup>1</sup>

The Recycling Partnership (TRP) is a mission-driven non-governmental organization (NGO) charged with deploying private funding to improve the U.S. recycling system through a variety of initiatives involving local governments, recyclable materials processors, and end markets for recovered commodities. TRP has identified long-standing deficiencies in the availability of sound practices to measure recycling performance and has accordingly focused its efforts on improving such measurement and reporting to better understand how to optimize recycling programs. In particular, TRP has an ongoing research initiative to measure recycling capture rates in residential curbside recycling programs across the U.S.

A capture rate specifies the percentage of each targeted recyclable commodity that is properly separated in the curbside recycling program rather than discarded. High capture rates reflect strong recycling program performance. This metric can be developed individually for each specific targeted commodity, provided the local jurisdiction has completed both a waste composition study and a curbside single stream recycling composition study. Because the County was already in the process of performing its own WCS, TRP was able to fund an add-on study of the composition of the County's single stream recycling program for use in developing capture rates for the County unincorporated area.

This report provides the results of a statistically representative composition and capture rate analysis for the County's unincorporated area, which serves over 180,000 households. This study also provides supplemental composition data for a non-representative sample of inbound single stream recyclables originating from incorporated municipalities in the County, and also from the County Public Schools.

## 2. WASTE GENERATION

A capture rate measures the percentage of a material targeted in the recycling program that is actually captured in the recycling program (rather than discarded with the refuse). To measure the capture rate, it is necessary to determine the composition of both discarded refuse and single stream recyclables, so the incidence of each targeted recyclable material in each stream can be determined. Capture rates provide valuable information regarding the effectiveness of a recycling program.

Accurate waste and recycling generation rates are needed to calculate accurate capture rates. Table 2-1 shows the total tonnage and per household generation in Prince George's County's unincorporated areas for calendar year 2021. These values are within expected ranges. As shown, excluding yard wastes (which were not considered within the scope of this study), County unincorporated households generate an average of roughly 50 pounds per week, 20 percent of which is set out in the curbside recycling stream.

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<sup>1</sup> *Four-Season Waste Composition Study at the Brown Station Road Sanitary Landfill*, prepared for Prince George's County and the Maryland Environmental Service, December 7, 2022

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

**Table 2-1 Waste and Recycling Generation (2021)**

Material	Tons	Households (HHs)	Tons/HH/Yr	Lbs/HH/Yr	Lbs/HH/Wk
MSW for Disposal	184,512	180,452	1.02	2045.0	39.3
Curbside Recycling	45,822	180,452	0.25	507.9	9.8
<b>Total</b>	<b>230,334</b>	<b>180,452</b>	<b>1.28</b>	<b>2,552.9</b>	<b>49.1</b>

The household-level waste generation data in this table have been used to calculate the County's unincorporated recycling capture rates in this report.

## 3. STUDY METHODOLOGY

The following subsections provide details of the facilities and methodology of the pre- and post-implementation study.

### 3.1 HOST FACILITIES AND FIELD DATA COLLECTION SCHEDULE

As stated previously, the WCS was performed over four seasons at the BSRSL in November 2021; and February, June and August 2022. A composition study of curbside recyclables was performed at the County's Material Recovery Facility (MRF) over a single season, spanning August 23-26, 2022. The four-day recycling composition study captured a County-wide snapshot of recycling composition, as the County's weekly curbside recycling collection program operates Tuesdays through Fridays.

### 3.2 SAMPLING TARGETS

Table 3-1 summarizes the sample acquisition for the capture rate study. As shown, the WCS sample acquisition occurred over the four seasonal field data collection events as governed by the primary WCS. Conversely, the recycling composition study was conducted over just one season. Although not shown in the table, an additional eight samples of accumulated bagged waste and bagged recyclables (described below) were also sorted at the MRF.

**Table 3-1 Number of Samples Obtained by Season**

Material	Fall	Winter	Spring	Summer	Total
MSW for Disposal	14	12	12	14	52
Recycling	0	0	0	43	43
<b>Total</b>					<b>95</b>

Both studies obtained a sufficient number of samples, distributed across all collection days, to provide highly representative composition estimates. However, the recycling composition results do not incorporate seasonal representation. In the professional opinion of MSW Consultants, the geographic representativeness of the weekly sampling events is more important than matching the seasonal sampling, and consequently the results of this study are believed to be highly representative of the County's unincorporated capture rates.

### 3.3 MATERIAL CATEGORIES

Throughout the WCS, each sample of material was sorted into 59 material categories. After consultation with TRP, additional categories were added to the recycling composition study. Table 3-2 lists the material categories and recyclability class used during the study. Appendix B contains detailed definitions for each category. As shown, materials were grouped into primary components, and recyclability of each constituent was assigned based on the County's recycling program definitions. Constituents were further segmented

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

into targeted program recyclables, and unwanted contaminants. Contaminants include unacceptable variants of targeted materials such as shredded paper, liquid-filled plastic bottles, and multi-material products that cannot be separated (for example, padded envelopes, which are composed of paper and plastic). Contaminants also include non-program material groups such as food and yard waste.

**Table 3-2 Material Categories and Recyclability Class**

Material Group	Recyclability Class	Material Description
<b>Paper</b>	Targeted	Corrugated Cardboard (OCC)
	Targeted	Newspaper/Print (ONP)
	Targeted	Magazines/Catalogs/Other Books
	Targeted	Kraft Paper/Boxboard
	Targeted	Mixed Paper
	Targeted	Aseptic/Gable Top Cartons
	Contaminant	Paper Towels/Napkins
	Contaminant	Other Compostable Paper
	Contaminant	Remainder/Composite Paper
<b>Plastic</b>	Targeted	PET (#1) Bottles
	Targeted	HDPE (#2) Bottles
	Targeted	Other (#3-#7) Bottles
	Targeted	Jars, Jugs, Tubs, Trays
	Targeted	Flowerpots
	Contaminant	Other Rigid Plastic
	Contaminant	Plastic Shopping Bags
	Contaminant	Other Plastic Film
	Contaminant	Garbage Bags
	Contaminant	Chip bags/Candy wrappers (multiple layered packaging)
	Contaminant	Polystyrene
	Contaminant	Remainder/Composite Plastic
<b>Metals</b>	Targeted	Aluminum Cans/Foil
	Targeted	Ferrous Cans
	Contaminant	Other Ferrous Metals
	Contaminant	Non-Ferrous Metals
<b>Glass</b>	Targeted	Glass Bottles & Jars
	Contaminant	Remainder/Composite Glass
<b>Organics</b>	Contaminant	Vegetative Food
	Contaminant	Non-Vegetative Food
	Contaminant	Leaves
	Contaminant	Grass
	Contaminant	Brush
	Contaminant	Pallets/Lumber
	Contaminant	Other Wood
	Contaminant	Remainder/Composite Organics

## PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

Material Group	Recyclability Class	Material Description
<b>Electronics</b>	Contaminant	E-waste and Small Appliances
	Contaminant	CRTs
<b>HHW</b>	Contaminant	Paint
	Contaminant	Remainder/Composite HHW
<b>C&amp;D</b>	Contaminant	Concrete/Brick/Rock
	Contaminant	Sheet Rock
	Contaminant	Shingles
	Contaminant	Carpet/Carpet Padding
	Contaminant	Dirt
	Contaminant	Remainder/Composite C&D
<b>Other</b>	Contaminant	Textiles
	Contaminant	Shoes
	Contaminant	Rags
	Contaminant	Diapers/Sanitary Products
	Contaminant	Animal Bi-Products
	Contaminant	Mattresses
	Contaminant	Box Springs
	Contaminant	Furniture
	Contaminant	Fines
	Contaminant	Other MSW
	Contaminant	PPE
	Contaminant	Other Bulky
	Contaminant	Bagged Waste
	Contaminant	Bagged Recyclables

TRP identified several refinements to the material categories, which were incorporated into the Capture Rate study. Table 3-3 itemizes the additional categories added to the sort for the final season of the WCS, as well as to the recycling composition study. These additional subsorts improve TRP's ability to differentiate among various components in the recycling stream.



# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

**Table 3-3 Additional Categories Added for Capture Rate Analysis**

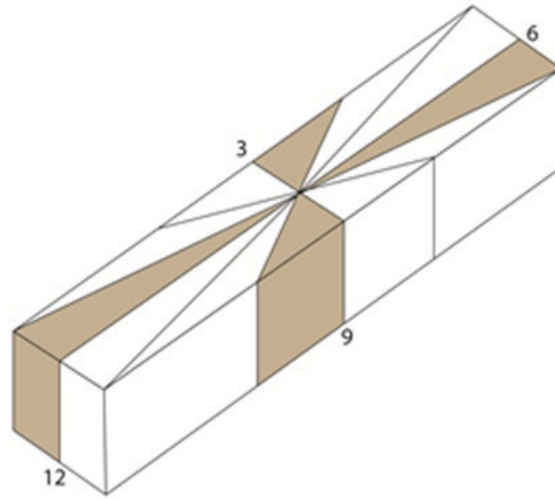
Material Category	Subsorts
Corrugated Cardboard (OCC)	Corrugated Cardboard (OCC) E-commerce Corrugated Cardboard Clean Pizza Boxes
HDPE (#2) Bottles	Natural HDPE (#2) Bottles Colored HDPE (#2) Bottles
Other (#3-#7) Bottles	Other (#3-#7) Bottles PP Bottles
Jars, Jugs, Tubs, Trays	Jars, Jugs, Tubs, Trays PP (#%) Tubs, Trays
Other Rigid Plastic	Bulky Rigid Plastic Other (Non-Bulky) Rigid Plastic
Aluminum Cans/Foil	Aluminum Cans Aluminum Foils & Trays
Bagged Materials*	Bagged Refuse Bagged Recycling

\* Only sorted within the curbside recycling stream

## 3.4 SAMPLING

Targeted refuse and recycling routes were delivered by the County's contract haulers to the landfill or MRF, respectively, for sampling and sorting. Sampling at both facilities was coordinated with loader operators to collect representative "grabs" from targeted loads that had been recently tipped. Figure 3-1 illustrates how a tipped load can be viewed from above as a clock face, with each "hour" representing a "grab" of the load. Before the tipping of the load, the field supervisor randomly selected from one of these sections for sampling, directing the loader operator to take a grab from that section.

Figure 3-1 Systematic Sampling Procedure for Incoming Loads



These grabs were transferred into barrels and weighed to confirm the minimum required sample weight had been met. Then each sample was labeled with identifying information and staged for sorting.

### 3.5 MANUAL SORTING

A field supervisor and a crew chief, both from MSW Consultants, trained locally sourced crew members in the sorting and labeling of samples. After each sample was loaded onto a sort table, crew members manually sorted samples into the prescribed component categories. Plastic 18-gallon recycling bins with sealed bottoms and 30-gallon trash cans were used to contain the separated components. Sample material was sorted down to a 2-inches-or-less particle size with the use of a screen. The fine material beneath the screen was portioned and allocated to the appropriate categories based on the judgment rendered by the crew chief. The remaining fine material was recorded as “Other Contaminants.” Sorters were trained to specialize in specific material groups, with someone handling the paper categories; another, the plastics; another, the glass, and metals; and so on. In this way, sorters became highly knowledgeable in a short period of time as to the definitions of individual material categories. The overall goal was to sort each sample directly into component categories in order to reduce the amount of indistinguishable fine materials or miscellaneous categories.

For all recycling samples (but not for refuse samples), bagged material in each sample was further separated into two categories: “Bagged Waste” and Bagged Recyclables.” Each bag on the sort table underwent a quick visual and tactile assessment from the crew chief to determine the nature of the bagged contents. After this determination was made, the bag was placed into the appropriate material category bin, weighed as part of the sample, and stored for later. When a sizable portion of bagged material had accumulated for either the Bagged Waste or Bagged Recyclable categories (typically at the end of each day), the contents of the bagged material were sorted as a unique sample. These cumulative bagged material samples provided insight on the mix of materials being put into bags by County households.

### 3.6 DATA RECORDING

The weigh-out and data recording process was the most critical process of the sort and, as such, was overseen by the MSW Consultants’ Crew Chief. Once each sample was sorted, and fines swept from the table, the weigh-out of each bin or barrel was performed. The crew carried the containers to the scale and weighed them. Using a rugged tablet computer, the Crew Chief recorded the composition weights into *WasteInsight™*, MSW Consultants’ cloud-based data management program. The tablet allowed for samples

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

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to be tallied in real time so that field data collection could immediately identify and rectify errors associated with light sample weights. The tablet synchronizes with the cloud via the Internet, providing excellent data security. Each sample was cross-referenced against the Field Supervisor's sample sheet to assure accurate tracking of the samples each day.

The capability for real-time data entry offered several important advantages:

- ◆ *WasteInsight*<sup>TM</sup> contains built-in logic and error checking to prevent erroneous entries.
- ◆ *WasteInsight*<sup>TM</sup> sums sample weights in real time so the Crew Chief can confirm achievement of weight targets for each and every sample.

## 3.7 DATA ANALYSIS

A statistical analysis was performed to calculate the mean composition for each of the material categories and for each material stream in this study. Manually sorted samples were first normalized by converting the sample data from weight to percentage. Then, the sample mean was determined by averaging the percent composition of each material across all samples.

For each material category, as well as each material group, the margin of error was determined with a 90 percent confidence level. (This means we are 90% certain the upper and lower bounds of a confidence interval created from the margin of error successfully captured its respective population mean.)

## 4. RESULTS

This section presents the resulting composition estimates of the County's unincorporated residential refuse and curbside recyclables. It then combines these results to calculate the capture rates for all of the targeted commodities in Prince George's County's curbside recycling program. Finally, this section includes supplemental composition estimates for a small number of residential curbside samples from incorporated municipalities, and from County Public Schools.

### 4.1 REFUSE COMPOSITION

Table 4-1 shows the composition of the County's residential unincorporated area refuse stream applied to the average annual household generation rate, measured in pounds. This table shows the mean composition percentage, as well as the margin of error at a 90 percent level of confidence. The results in this table are further analyzed in the County's October 2022 WCS report, and no further discussion is provided here.

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

Table 4-1 Residential Refuse Composition

Material Category	Mean	+/-	Lbs/HH/Yr	Material Category	Mean	+/-	Lbs/HH/Yr
<b>Paper</b>	<b>23.0%</b>	<b>1.1%</b>	<b>469.8</b>	<b>Organics</b>	<b>30.0%</b>	<b>1.6%</b>	<b>613.7</b>
Corrugated Cardboard (OCC)	3.2%	0.4%	65.4	Vegetative Food	14.8%	1.3%	302.6
Newspaper/Print (ONP)	0.6%	0.1%	11.9	Non-Vegetative Food	8.6%	1.0%	174.9
Magazines/Catalogs/Other Books	0.7%	0.2%	13.5	Leaves	1.6%	0.6%	32.4
Kraft Paper/Boxboard	1.7%	0.2%	35.1	Grass	0.5%	0.3%	9.6
Mixed Paper	3.8%	0.5%	76.7	Brush	1.3%	0.5%	26.9
Aseptic/Gable Top Cartons	0.2%	0.0%	4.6	Pallets/Lumber	0.3%	0.3%	5.3
Paper Towels/Napkins	4.9%	0.5%	99.9	Other Wood	2.1%	0.7%	43.9
Other Compostable Paper	3.7%	0.9%	76.6	Remainder/Composite Organics	0.9%	0.3%	18.1
Remainder/Composite Paper	4.2%	0.4%	86.1	<b>C&amp;D</b>	<b>2.0%</b>	<b>0.8%</b>	<b>39.9</b>
<b>Plastic</b>	<b>16.4%</b>	<b>0.8%</b>	<b>334.4</b>	Concrete/Brick/Rock	0.0%	0.0%	0.1
PET (#1) Bottles	2.2%	0.2%	45.0	Sheet Rock	0.3%	0.3%	5.5
HDPE (#2) Bottles	0.6%	0.1%	13.0	Shingles	0.2%	0.2%	4.0
Other (#3-#7) Bottles	0.1%	0.0%	1.6	Carpet/Carpet Padding	0.8%	0.5%	16.2
Jars, Jugs, Tubs, Trays	2.3%	0.2%	47.8	Dirt	0.1%	0.1%	1.7
Flower Pots	0.0%	0.0%	0.4	Remainder/Composite C&D	0.6%	0.4%	12.4
Other Rigid Plastic	2.0%	0.5%	41.2	<b>HHW</b>	<b>0.3%</b>	<b>0.2%</b>	<b>7.1</b>
Plastic Shopping Bags	0.8%	0.1%	15.5	Paint	0.0%	0.0%	0.8
Other Plastic Film	3.0%	0.2%	61.2	Remainder/Composite HHW	0.3%	0.2%	6.3
Garbage Bags	2.5%	0.3%	51.2	<b>Other</b>	<b>20.8%</b>	<b>1.8%</b>	<b>425.7</b>
Multiple Layered Packaging	0.2%	0.0%	5.1	Textiles	3.5%	0.7%	71.1
Polystyrene	0.9%	0.1%	18.2	Shoes	0.8%	0.3%	16.1
Remainder/Composite Plastic	1.7%	0.2%	34.2	Rags	0.0%	0.0%	0.2
<b>Metal</b>	<b>3.3%</b>	<b>0.5%</b>	<b>68.0</b>	Diapers/Sanitary Products	6.2%	0.9%	126.8
Ferrous Cans	0.7%	0.1%	13.8	Animal Bi-Products	2.7%	0.5%	54.5
Aluminum Cans/Foil	1.2%	0.1%	24.2	Mattresses	2.4%	1.3%	48.8
Other Ferrous Metals	1.2%	0.5%	24.6	Box Springs	0.1%	0.2%	2.3
Non-Ferrous Metals	0.3%	0.1%	5.4	Furniture	1.9%	0.8%	38.3
<b>Glass</b>	<b>3.8%</b>	<b>0.5%</b>	<b>78.5</b>	Fines	0.7%	0.1%	14.8
Glass Bottles/Jars	3.5%	0.5%	70.7	Other MSW	0.9%	0.2%	19.2
Remainder/Composite Glass	0.4%	0.1%	7.8	PPE	0.1%	0.0%	3.0
<b>Electronics</b>	<b>0.4%</b>	<b>0.2%</b>	<b>7.8</b>	Other Bulky	1.5%	0.5%	30.6
Electronics	0.4%	0.2%	7.8	<b>Total</b>	<b>100.0%</b>		<b>2,045.0</b>
CRTs	0.0%	0.0%	0.0	<b>No. of Samples</b>		<b>52</b>	

## 4.2 RECYCLABLES COMPOSITION

Table 4-2 shows the composition of curbside recyclables collected from unincorporated area residential households, applied to the average annual household recycling generation rate. These results are similarly calculated to a 90 percent level of confidence.

Figure 4-1 immediately following highlights the breakdown between targeted paper constituents, targeted container constituents, and unwanted contaminants. As shown in this figure, the contamination rate of the County's unincorporated curbside recyclables was found to be just under 20 percent. In the opinion of MSW Consultants, this level of contamination is within the range commonly observed in large-scale, cart-based residential recycling programs with effective education and outreach programs. Contamination rates for carted, curbside single stream recyclables seldom are found below 15 percent, and can range above 30 percent (and even higher in some jurisdictions).

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

**Table 4-2 Residential Curbside Recycling Composition**

Material Category	Lbs/HH/			Material Category	Lbs/HH/		
	Mean	+/-	Yr		Mean	+/-	Yr
<b>Paper</b>	<b>50.3%</b>	<b>1.6%</b>	<b>255.6</b>	<b>Organics</b>	<b>2.9%</b>	<b>0.6%</b>	<b>14.8</b>
Corrugated Cardboard (OCC)	31.1%	1.2%	157.9	Vegetative Food	0.6%	0.2%	3.0
Newspaper/Print (ONP)	2.4%	0.6%	12.1	Non-Vegetative Food	1.8%	0.4%	9.1
Magazines/Catalogs/Other Books	1.8%	0.4%	9.2	Leaves	0.0%	0.0%	0.0
Kraft Paper/Boxboard	5.7%	0.5%	29.0	Grass	0.0%	0.1%	0.2
Mixed Paper	5.5%	0.7%	27.7	Brush	0.0%	0.1%	0.2
Aseptic/Gable Top Cartons	0.6%	0.1%	3.1	Pallets/Lumber	0.0%	0.0%	0.0
Paper Towels/Napkins	0.6%	0.2%	3.2	Other Wood	0.1%	0.1%	0.6
Other Compostable Paper	0.9%	0.2%	4.7	Remainder/Composite Organics	0.3%	0.1%	1.6
Remainder/Composite Paper	1.7%	0.3%	8.7	<b>C&amp;D</b>	<b>0.2%</b>	<b>0.1%</b>	<b>0.9</b>
<b>Plastic</b>	<b>17.0%</b>	<b>0.8%</b>	<b>86.2</b>	Concrete/Brick/Rock	0.0%	0.0%	0.0
PET (#1) Bottles	6.8%	0.4%	34.8	Sheet Rock	0.0%	0.0%	0.0
HDPE (#2) Bottles	2.9%	0.2%	14.5	Shingles	0.0%	0.0%	0.0
Other (#3-#7) Bottles	0.2%	0.1%	1.0	Carpet/Carpet Padding	0.0%	0.0%	0.1
Jars, Jugs, Tubs, Trays	2.0%	0.1%	10.3	Dirt	0.0%	0.0%	0.0
Flower Pots	0.1%	0.0%	0.4	Remainder/Composite C&D	0.2%	0.1%	0.8
Other Rigid Plastic	1.7%	0.4%	8.8	<b>HHW</b>	<b>0.2%</b>	<b>0.1%</b>	<b>0.9</b>
Plastic Shopping Bags	0.3%	0.1%	1.7	Paint	0.0%	0.0%	0.0
Other Plastic Film	1.2%	0.1%	6.2	Remainder/Composite HHW	0.2%	0.1%	0.9
Garbage Bags	0.2%	0.1%	1.1	<b>Other</b>	<b>6.5%</b>	<b>1.4%</b>	<b>33.2</b>
Multiple Layered Packaging	0.1%	0.0%	0.3	Textiles	0.8%	0.3%	3.8
Polystyrene	0.5%	0.1%	2.6	Shoes	0.3%	0.1%	1.3
Remainder/Composite Plastic	0.9%	0.1%	4.4	Rags	0.0%	0.0%	0.1
<b>Metal</b>	<b>3.7%</b>	<b>0.5%</b>	<b>18.9</b>	Diapers/Sanitary Products	0.3%	0.1%	1.7
Ferrous Cans	1.6%	0.2%	7.9	Animal Bi-Products	0.2%	0.1%	0.8
Aluminum Cans/Foil	1.4%	0.1%	7.0	Mattresses	0.0%	0.0%	0.0
Other Ferrous Metals	0.7%	0.3%	3.7	Box Springs	0.0%	0.0%	0.0
Non-Ferrous Metals	0.0%	0.1%	0.2	Furniture	0.0%	0.0%	0.0
<b>Glass</b>	<b>19.0%</b>	<b>1.4%</b>	<b>96.5</b>	Fines	0.5%	0.1%	2.6
Glass Bottles/Jars	18.1%	1.4%	91.9	Other MSW	0.6%	0.3%	3.0
Remainder/Composite Glass	0.9%	0.3%	4.6	PPE	0.0%	0.0%	0.2
<b>Electronics</b>	<b>0.2%</b>	<b>0.1%</b>	<b>1.0</b>	Other Bulky	0.2%	0.2%	1.2
Electronics	0.2%	0.1%	1.0	Bagged Waste	2.0%	1.0%	10.0
CRTs	0.0%	0.0%	0.0	Bagged Recyclables	1.6%	0.6%	8.3
				<b>Total</b>	<b>100.0%</b>		<b>507.9</b>
				<b>No. of Samples</b>		<b>43</b>	

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

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Figure 4-1 Unincorporated Area Curbside Recycling Composition Summary

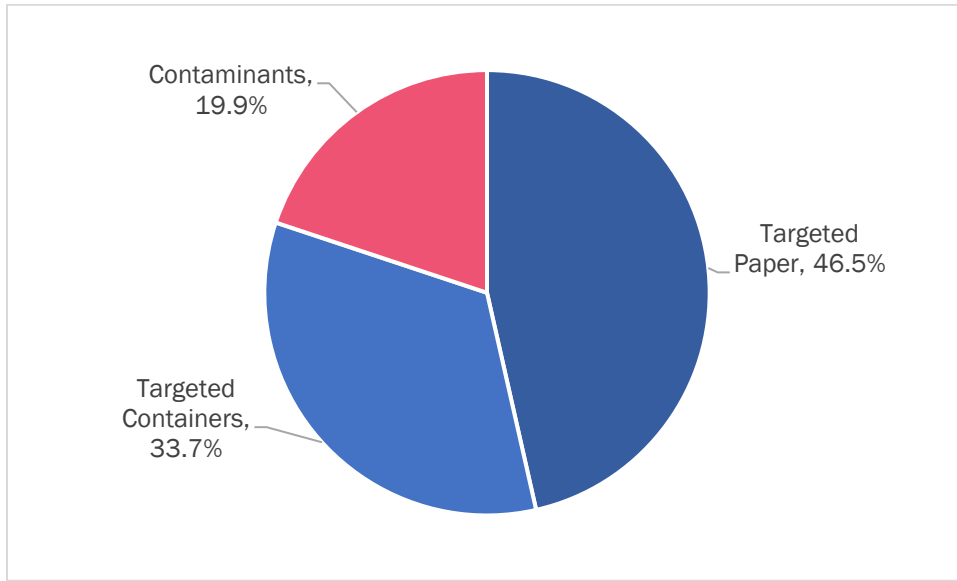


Table 4-3 provides the supplemental composition of the additional recyclable material subsorts that were incorporated into the capture rate study to meet TRP's study specifications. As shown, these refinements provide greater clarity on certain constituents that were combined in the WCS.

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

**Table 4-3 Composition of Supplemental Recyclable Categories**

Material Category	Refuse			Recycling		
	Mean	+/-	Lbs/HH/ Yr	Mean	+/-	Lbs/HH/ Yr
<b>Corrugated Cardboard (OCC)</b>	<b>3.2%</b>	<b>0.4%</b>	<b>65.4</b>	<b>31.1%</b>	<b>1.2%</b>	<b>157.9</b>
Corrugated Cardboard (OCC)	2.5%	0.7%	51.4	24.5%	1.2%	124.4
E-commerce Corrugated Cardboard	0.6%	0.3%	11.9	5.7%	0.5%	29.1
Clean Pizza Boxes	0.1%	0.1%	2.2	0.9%	0.1%	4.4
<b>HDPE (#2) Bottles</b>	<b>0.6%</b>	<b>0.1%</b>	<b>13.0</b>	<b>2.9%</b>	<b>0.2%</b>	<b>14.5</b>
Natural HDPE (#2) Bottles	0.2%	0.1%	4.8	1.0%	0.1%	4.9
Colored HDPE (#2) Bottles	0.4%	0.3%	8.2	1.9%	0.2%	9.6
<b>Other (#3-#7) Bottles</b>	<b>0.1%</b>	<b>0.0%</b>	<b>1.6</b>	<b>0.2%</b>	<b>0.1%</b>	<b>1.0</b>
Other (#3-#7) Bottles	0.0%	0.0%	0.4	0.1%	0.0%	0.4
PP Bottles	0.1%	0.0%	1.3	0.1%	0.1%	0.6
<b>Jars, Jugs, Tubs, Trays</b>	<b>2.3%</b>	<b>0.2%</b>	<b>47.8</b>	<b>2.0%</b>	<b>0.1%</b>	<b>10.3</b>
Jars, Jugs, Tubs, Trays	0.8%	0.2%	16.0	1.0%	0.1%	4.9
PP Tubs, Trays	1.6%	0.2%	31.8	1.1%	0.1%	5.4
<b>Other Rigid Plastic</b>	<b>2.0%</b>	<b>0.5%</b>	<b>41.2</b>	<b>1.7%</b>	<b>0.4%</b>	<b>8.8</b>
Other Rigid Plastic	0.4%	0.6%	7.7	0.7%	0.2%	3.8
Bulky Rigid Plastic	1.6%	1.0%	33.6	1.0%	0.4%	5.0
<b>Aluminum Cans/Foil</b>	<b>1.2%</b>	<b>0.1%</b>	<b>24.2</b>	<b>1.4%</b>	<b>0.1%</b>	<b>7.0</b>
Aluminum Cans	0.5%	0.2%	10.2	1.2%	0.1%	6.0
Aluminum Foils & Trays	0.7%	0.2%	14.0	0.2%	0.0%	1.0

### 4.3 BAGGED RECYCLABLES AND BAGGED WASTE COMPOSITION

Bagged Waste and Bagged Recyclables were accumulated each day and sorted as a batch sample at the end of the day. The composition profile of the Bagged Waste and Bagged Recyclables samples are shown in Table 4-3.

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

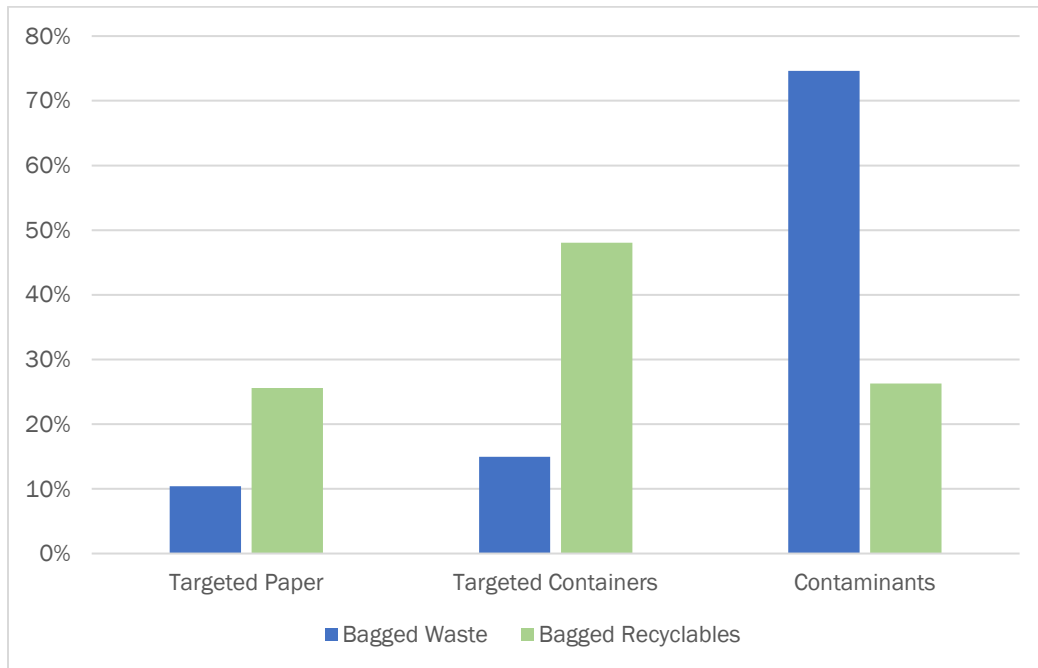
Table 4-4 Bagged Material Composition

Material Category	Bagged Waste	Bagged Recyclables	Material Category	Bagged Waste	Bagged Recyclables
<b>Paper</b>	<b>23.0%</b>	<b>36.8%</b>	<b>Organics</b>	<b>19.8%</b>	<b>3.4%</b>
Corrugated Cardboard (OCC)	2.6%	4.8%	Vegetative Food	2.5%	0.5%
Newspaper/Print (ONP)	0.2%	0.7%	Non-Vegetative Food	17.0%	2.3%
Magazines/Catalogs/Other Books	0.2%	2.5%	Leaves	0.0%	0.0%
Kraft Paper/Boxboard	3.9%	9.0%	Grass	0.0%	0.0%
Mixed Paper	3.6%	8.5%	Brush	0.0%	0.0%
Aseptic/Gable Top Cartons	0.6%	1.3%	Pallets/Lumber	0.0%	0.0%
Paper Towels/Napkins	7.7%	1.6%	Other Wood	0.0%	0.0%
Other Compostable Paper	1.7%	3.6%	Remainder/Composite Organics	0.3%	0.5%
Remainder/Composite Paper	2.5%	4.7%	<b>C&amp;D</b>	<b>3.7%</b>	<b>0.0%</b>
<b>Plastic</b>	<b>23.9%</b>	<b>30.2%</b>	Concrete/Brick/Rock	0.0%	0.0%
PET (#1) Bottles	3.9%	15.0%	Sheet Rock	0.0%	0.0%
HDPE (#2) Bottles	2.3%	2.6%	Shingles	0.0%	0.0%
Other (#3-#7) Bottles	0.0%	0.5%	Carpet/Carpet Padding	0.0%	0.0%
Jars, Jugs, Tubs, Trays	3.2%	4.0%	Dirt	0.9%	0.0%
Flower Pots	0.0%	0.4%	Remainder/Compsite C&D	2.8%	0.0%
Other Rigid Plastic	0.5%	0.0%	<b>HHW</b>	<b>0.0%</b>	<b>0.1%</b>
Plastic Shopping Bags	1.3%	0.3%	Paint	0.0%	0.0%
Other Plastic Film	7.0%	2.7%	Remainder/Composite HHW	0.0%	0.1%
Garbage Bags	2.7%	2.4%	<b>Other</b>	<b>24.2%</b>	<b>1.8%</b>
Multiple Layered Packaging	0.1%	0.2%	Textiles	1.1%	0.1%
Polystyrene	1.0%	1.2%	Shoes	0.0%	0.0%
Remainder/Composite Plastic	1.8%	0.9%	Rags	0.0%	0.0%
<b>Metal</b>	<b>3.2%</b>	<b>6.2%</b>	Diapers/Sanitary Products	14.2%	0.4%
Ferrous Cans	0.7%	3.5%	Animal Bi-Products	6.8%	0.0%
Aluminum Cans/Foil	2.5%	2.6%	Mattresses	0.0%	0.0%
Other Ferrous Metals	0.0%	0.0%	Box Springs	0.0%	0.0%
Non-Ferrous Metals	0.0%	0.0%	Furniture	0.0%	0.0%
<b>Glass</b>	<b>2.0%</b>	<b>21.6%</b>	Fines	0.6%	0.2%
Glass Bottles/Jars	1.8%	18.3%	Other MSW	1.2%	0.7%
Remainder/Composite Glass	0.2%	3.3%	PPE	0.3%	0.4%
<b>Electronics</b>	<b>0.2%</b>	<b>0.0%</b>	Other Bulky	0.0%	0.0%
Electronics	0.2%	0.0%	Bagged Waste	0.0%	0.0%
CRTs	0.0%	0.0%	Bagged Recyclables	0.0%	0.0%
			<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>
			<b>No. of Samples</b>	<b>4</b>	<b>4</b>

Figure 4-1 summarizes the recyclability and contamination levels of the bagged materials. As shown, the visual/tactile analysis was found to be reasonably indicative of the contents of the bags. Bagged recyclables tended to contain a higher fraction of containers (i.e., not OCC or paper), and had slightly higher contamination than loose materials. Conversely, bagged refuse was consistent with the composition of disposed refuse. Prince George's County residents were found to largely be avoiding the use of bags in their recycling carts, which minimizes the issues associated with removing plastic film and other contaminants from at the MRF.



**Figure 4-2 Comparison of Bagged Waste and Bagged Recyclables Composition**



## 4.4 CAPTURE RATE

This section combines the composition and generation data from the unincorporated refuse and recycling stream to estimate Prince George’s County’s capture rates for its targeted recyclables. Table 4-4 displays the capture rate for each targeted material in the Prince George’s County recycling program, and Figure 4-2 shows the capture rates graphically.

In the professional opinion of MSW Consultants, and based on the relatively limited availability of capture rate studies in other jurisdictions that are publicly available, these findings suggest:

- ◆ Nationally, average capture rates for curbside recycling programs range from 50 to 60 percent, with even higher rates representing strong performance. Prince George’s County’s unincorporated single stream residential recycling program is at the low end of this average range, due in part to low capture of residential mixed paper. However, the County has a solid foundation increasing its capture rates over time.
- ◆ Capture rates are highest for corrugated cardboard, followed by what have historically been included in most curbside recycling programs for the longest duration, including constituents of newspaper, some mixed paper, glass and plastic bottles.
- ◆ Capture rates nudge downward for steel and aluminum cans. However, it is possible that differences in the level of contamination that adhere to these commodities (which tend to be more contaminated in the refuse stream than in the recycling stream) could artificially reduce their estimated capture rates by raising the relative weight of these commodities as measured in the refuse stream.
- ◆ Non-bottle plastics exhibit the lowest capture rates, suggesting that residents are less inclined to consider these items as being targeted in their recycling program. The capture rates for commodities could also be influenced by different contamination levels in the refuse vs. recycling streams.

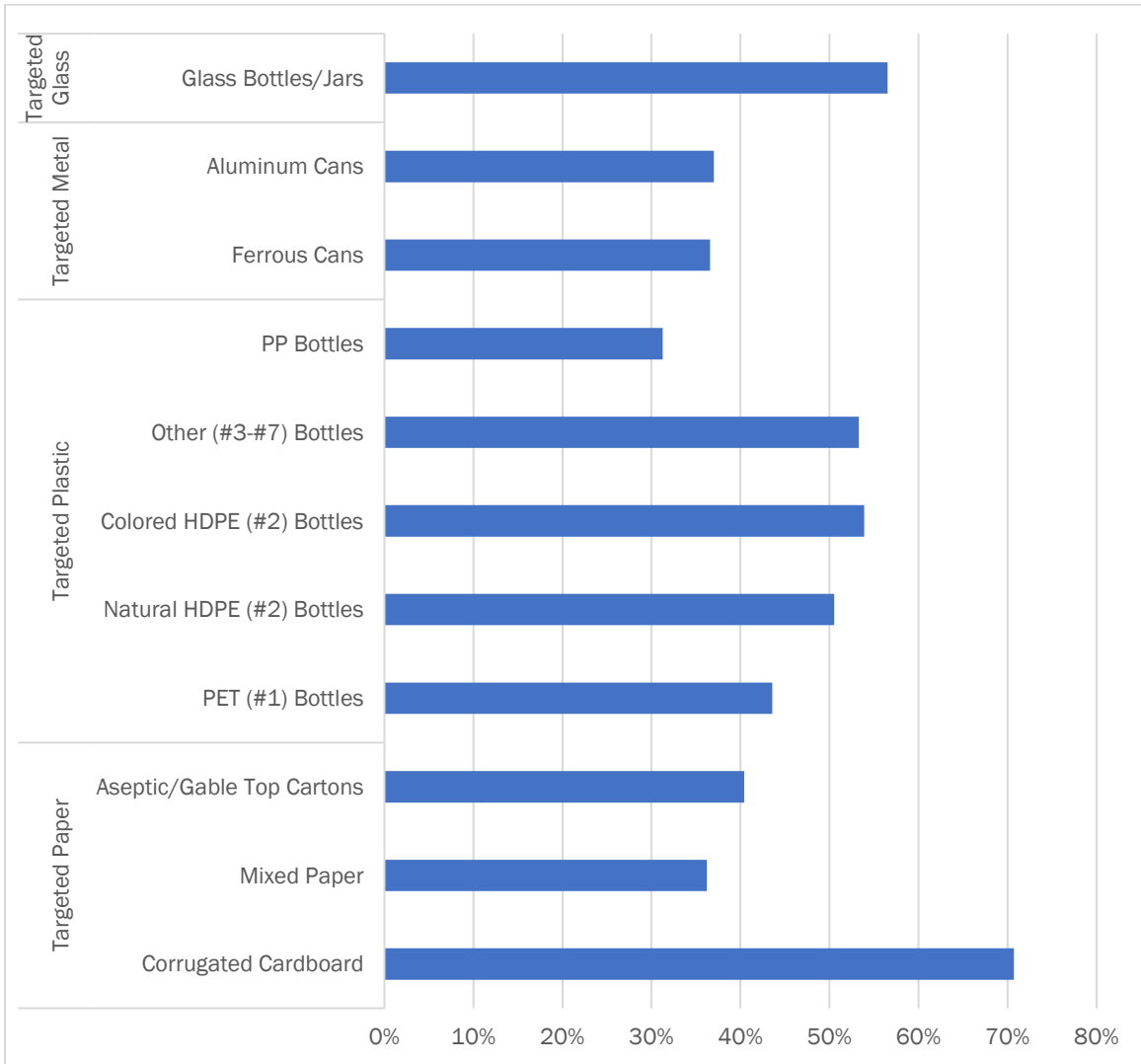
# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

Table 4-5 Capture Rates (Lbs/Household/Year)

Material Category	Refuse Lbs	Recycling Lbs	Total Lbs	Capture Rate
<b>Paper</b>	<b>207.2</b>	<b>239.0</b>	<b>446.3</b>	<b>53.6%</b>
<i>Corrugated Cardboard (OCC)</i>	65.4	157.9	223.4	70.7%
Corrugated Cardboard (OCC)	51.4	124.4	175.7	70.8%
E-commerce Corrugated Cardboard	11.9	29.1	41.0	71.0%
Clean Pizza Boxes	2.2	4.4	6.6	67.1%
<i>Mixed Paper</i>	137.2	78.0	215.2	36.2%
Newspaper/Print (ONP)	11.9	12.1	24.0	50.5%
Magazines/Catalogs/Other Books	13.5	9.2	22.6	40.6%
Kraft Paper/Boxboard	35.1	29.0	64.1	45.2%
Mixed Paper	76.7	27.7	104.4	26.5%
Aseptic/Gable Top Cartons	4.6	3.1	7.7	40.4%
<b>Plastic</b>	<b>107.9</b>	<b>61.0</b>	<b>168.9</b>	<b>36.1%</b>
PET (#1) Bottles	45.0	34.8	79.8	43.6%
Natural HDPE (#2) Bottles	4.8	4.9	9.8	50.5%
Colored HDPE (#2) Bottles	8.2	9.6	17.8	53.9%
Other (#3-#7) Bottles	0.4	0.4	0.8	53.3%
PP Bottles	1.3	0.6	1.8	31.3%
PP Tubs, Trays*	32.2	5.8	38.0	15.3%
Jars, Jugs, Tubs, Trays	16.0	4.9	20.9	23.4%
<b>Metals</b>	<b>24.0</b>	<b>13.9</b>	<b>37.9</b>	<b>36.8%</b>
Ferrous Cans	13.8	7.9	21.7	36.6%
Aluminum Cans	10.2	6.0	16.2	37.0%
<b>Glass</b>	<b>70.7</b>	<b>91.9</b>	<b>162.5</b>	<b>56.5%</b>
Glass Bottles/Jars	70.7	91.9	162.5	56.5%
<b>Total</b>	<b>409.8</b>	<b>405.8</b>	<b>815.6</b>	<b>49.8%</b>

\* Includes Flowerpots

Figure 4-3 Targeted Material Capture Rates



**4.5 SUPPLEMENTAL RESULTS**

Due to anticipated gaps in the receipt of inbound curbside recycling samples at the MRF, the County requested that additional samples be obtained opportunistically to gain some insight into the composition of single stream recyclables originating from incorporated municipalities and from the Public Schools in the County. Table 4-3 provides the resulting composition estimated from this small set of supplemental samples. This data has been provided for informational purposes only, and these estimates should not be considered as statistically representative of the actual composition of curbside recyclables from incorporated communities, nor from public schools. It would be necessary to design a more representative sampling protocol to improve the estimates shown in Table 4-3.

# PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

Table 4-6 School and Municipal Recycling Composition

Material Category	School	Municipal	Material Category	School	Municipal
<b>Paper</b>	<b>81.3%</b>	<b>57.5%</b>	<b>Organics</b>	<b>4.6%</b>	<b>0.4%</b>
Corrugated Cardboard (OCC)	73.9%	33.9%	Vegetative Food	0.0%	0.2%
Newspaper/Print (ONP)	1.0%	2.7%	Non-Vegetative Food	0.0%	0.1%
Magazines/Catalogs/Other Books	0.0%	2.2%	Leaves	0.0%	0.0%
Kraft Paper/Boxboard	0.6%	6.1%	Grass	0.0%	0.0%
Mixed Paper	5.6%	8.2%	Brush	0.0%	0.0%
Aseptic/Gable Top Cartons	0.0%	0.7%	Pallets/Lumber	4.6%	0.0%
Paper Towels/Napkins	0.0%	1.1%	Other Wood	0.0%	0.2%
Other Compostable Paper	0.3%	0.3%	Remainder/Composite Organics	0.0%	0.0%
Remainder/Composite Paper	0.0%	2.4%	<b>C&amp;D</b>	<b>0.0%</b>	<b>0.0%</b>
<b>Plastic</b>	<b>13.0%</b>	<b>19.9%</b>	Concrete/Brick/Rock	0.0%	0.0%
PET (#1) Bottles	0.5%	6.1%	Sheet Rock	0.0%	0.0%
HDPE (#2) Bottles	0.5%	4.3%	Shingles	0.0%	0.0%
Other (#3-#7) Bottles	0.0%	0.2%	Carpet/Carpet Padding	0.0%	0.0%
Jars, Jugs, Tubs, Trays	0.4%	4.3%	Dirt	0.0%	0.0%
Flower Pots	0.0%	0.0%	Remainder/Compsite C&D	0.0%	0.0%
Other Rigid Plastic	4.2%	2.2%	<b>HHW</b>	<b>0.0%</b>	<b>0.0%</b>
Plastic Shopping Bags	0.0%	0.1%	Paint	0.0%	0.0%
Other Plastic Film	3.1%	0.7%	Remainder/Composite HHW	0.0%	0.0%
Garbage Bags	0.7%	0.0%	<b>Other</b>	<b>0.0%</b>	<b>3.1%</b>
Multiple Layered Packaging	0.0%	0.0%	Textiles	0.0%	0.1%
Polystyrene	1.5%	0.4%	Shoes	0.0%	0.0%
Remainder/Composite Plastic	2.3%	1.6%	Rags	0.0%	0.0%
<b>Metal</b>	<b>1.0%</b>	<b>4.6%</b>	Diapers/Sanitary Products	0.0%	0.1%
Ferrous Cans	0.0%	2.8%	Animal Bi-Products	0.0%	0.0%
Aluminum Cans/Foil	1.0%	1.4%	Mattresses	0.0%	0.0%
Other Ferrous Metals	0.0%	0.2%	Box Springs	0.0%	0.0%
Non-Ferrous Metals	0.0%	0.1%	Furniture	0.0%	0.0%
<b>Glass</b>	<b>0.0%</b>	<b>14.5%</b>	Fines	0.0%	1.4%
Glass Bottles/Jars	0.0%	13.5%	Other MSW	0.0%	0.0%
Remainder/Composite Glass	0.0%	1.0%	PPE	0.0%	0.0%
<b>Electronics</b>	<b>0.0%</b>	<b>0.0%</b>	Other Bulky	0.0%	0.0%
Electronics	0.0%	0.0%	Bagged Waste	0.0%	1.0%
CRTs	0.0%	0.0%	Bagged Recyclables	0.0%	0.5%
			<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>
			<b>No. of Samples</b>	<b>2</b>	<b>2</b>

## 5. CONCLUSIONS

This study confirms that Prince George's County was a strong candidate to host this capture rate analysis, due to the detailed and accurate accounting available to define the customer base and the associated tonnage of refuse and recyclables they generate on an annual basis. The resulting capture rate estimates are believed to be accurate and defensible as a result.

This study further found that the curbside single stream recycling program is performing reasonably well in the unincorporated area for many commonly targeted recyclables but has room for improvement with

## PRINCE GEORGE'S COUNTY CAPTURE RATE STUDY

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several recyclable materials. Future public education should focus on diverting and capturing fully rinsed steel and aluminum cans, junk mail (largely captured in Other Mixed Paper), and non-bottle plastics, which exhibited the lowest capture rates.

Given the County's strong management and good access to data surrounding its unincorporated waste management system, it may be worthwhile to retest the County's capture rates in the future, especially if widespread curbside collection of food wastes is implemented. The County may also wish to incorporate yard waste diversion capture rates into this analysis to provide a more complete picture of the current system at this time. Incorporating yard waste capture rates was beyond the scope of this grant-funded project.

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**APPENDIX A**  
**MANUAL SORT MATERIAL CATEGORIES &**  
**DEFINITIONS**

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## APPENDIX A – MANUAL SORT MATERIAL CATEGORIES & DEFINITIONS

Material Description	Divertibility Category	Definition
<b>PAPER</b>		
<b>1</b>	<b>Corrugated Cardboard (OCC)</b>	Recyclable Paper All corrugated cardboard used for e-commerce or pizza boxes
<b>1A</b>	<b>E-commerce Corrugated Cardboard</b>	Recyclable Paper Corrugated cardboard boxes used in e-commerce and shipping.
<b>1B</b>	<b>Clean Pizza Boxes</b>	Recyclable Paper Corrugated cardboard pizza boxes not soiled with grease, moisture, or other contaminants
<b>2</b>	<b>Newspaper/Print (ONP)</b>	Recyclable Paper Daily/weekly newspapers, including inserts.
<b>3</b>	<b>Magazines/Catalogs/Other Books</b>	Recyclable Paper TV Guide, periodicals, journals, hard cover books
<b>4</b>	<b>Kraft Paper/Boxboard</b>	Recyclable Paper Grocery/shopping bags, paper grocery bags, soda/cereal boxes
<b>5</b>	<b>Mixed Paper</b>	Recyclable Paper Copy paper, computer printouts, envelopes, brochures, flyers, junk mail, receipts, notebook paper
<b>6</b>	<b>Aseptic/Gable Top Cartons</b>	Recyclable Paper Milk and juice cartons, juice boxes
<b>7</b>	<b>Paper Towels/Napkins</b>	Compostable Tissues, napkins, paper towels
<b>8</b>	<b>Other Compostable Paper</b>	Compostable Non-coated paper food trays, wax OCC
<b>9</b>	<b>Remainder/Composite Paper</b>	Other All paper that doesn't fit into the categories specified above and items that are primarily paper but include other materials such as plastic or metal. Examples paper or boxboard coated with plastic or metal foil, photographs, laminated paper
<b>PLASTIC</b>		
<b>10</b>	<b>PET (#1) Bottles</b>	Recyclable Containers Plastic water and soda bottles, marked #1
<b>11</b>	<b>Natural HDPE (#2) Bottles</b>	Recyclable Containers Plastic non-pigmented bottles marked #2, such as those often used for milk.
<b>11A</b>	<b>Colored HDPE (#2) Bottles</b>	Recyclable Containers Plastic pigmented bottled marked #2, such as detergent bottles.
<b>12</b>	<b>Other (#3-#7) Bottles</b>	Recyclable Containers Syrup bottles and other bottles with resin numbers marked #3, #4, #6, and #7
<b>12A</b>	<b>PP Bottles</b>	Recyclable Containers Bottles marked #5
<b>13</b>	<b>Jars, Jugs, Tubs, Trays</b>	Recyclable Containers Jars/Jugs/Tubs/Trays marked with #1 through #4.

## APPENDIX A MATERIAL CATEGORIES AND DEFINITIONS

13A	PP Tubs, Trays	Recyclable Containers	Jars/Jugs/Tubs/Trays marked with #5.
14	Flowerpots	Recyclable Containers	Recyclable flowerpots, usually marked #5
15	Other Rigid Plastic	Recyclable Containers	Storage totes, furniture, toys, not marked with a #
15A	Bulky Rigid Plastic	Recyclable Containers	Plastic products and containers larger than a bread box.
16	Plastic Shopping Bags	Divertible	Grocery bags and shopping bags comprised of plastic film
17	Other Plastic Film	Other	Tarps, bubble wrap, food packaging bags, zipper pouches, etc.
18	Garbage Bags	Other	Plastic film bags used to contain trash
19	Multiple Layered Packaging	Other	Multi-layer chip bags and some wrappers
20	Polystyrene	Other	Expanded/regular clamshells, cutlery, cups
21	Remainder/Composite Plastic	Other	All other rigid plastic not elsewhere classified. Items such as food service, cup lids, toothbrushes, toys, and composite items that are made of 50% or more plastic.
<b>METAL</b>			
22	Ferrous Cans	Recyclable Containers	Pet food cans, soup cans, fruit cans, aerosols
23	Aluminum Cans	Recyclable Containers	Soda and beer cans
23A	Aluminum Foils & Trays	Recyclable Containers	Aluminum sheets of foil and trays used in food preparation or packaging
24	Other Ferrous Metals	Divertible	Ferrous and alloyed ferrous scrap materials originated from residential commercial, or institutional sources which are attracted to a magnet. This category includes wire coat hangers auto parts and composite materials that are made of 50% more ferrous.
25	Non-Ferrous Metals	Divertible	Non-magnetic metals such as brass, bronze, silver, lead copper, aluminum, zinc, and composite non-ferrous materials that are made of 50% or more metal. Items such as insulated wiring or plumbing parts. Stainless steel house wares are also part of this category.
<b>GLASS</b>			
26	Glass Bottles/Jars	Recyclable Containers	Beer, wine, soda bottles, all colors
27	Remainder/Composite Glass	Other	All other glass items such as plate glass such as window and door glass, tabletops; auto glass; heat resistant cookware (Pyrex); pottery; drinking glasses; and. any other glass that was not used for containing food or drinks.

## APPENDIX A MATERIAL CATEGORIES AND DEFINITIONS

<b>ORGANICS</b>			
28	Vegetative Food	Compostable	Fruits, vegetables and rinds, breads
29	Non-Vegetative Food	Compostable	Meats, Dairy products
30	Leaves	Compostable	Leaves and pine needles
31	Grass	Compostable	Lawn clippings and hay
32	Brush	Compostable	Branches, brush, small sticks, and twigs
33	Pallets/Lumber	Divertible	Forklift pallets, plywood, 2x4's, dimensional lumber
34	Other Wood	Divertible	Tree stumps, wooden chairs, misc. wooden items
35	Remainder/Composite Organics	Other	Organic material that doesn't fit into the categories specified above, and items that are primarily organic but include other materials such as plastic or metal. Examples include cotton balls, hair, Q-tips, wax, soap, animal carcasses, and wooden chopsticks/toothpicks/stirrers.
<b>ELECTRONICS</b>			
36	Electronics	E-Waste Program	Corded electronics, cell phones, appliances, etc.
37	CRTs	E-Waste Program	Cathode ray tube monitors (CRTs)
<b>HHW</b>			
38	Paint	HHW Program	Latex and oil-based paint
39	Remainder/Composite HHW	HHW Program	All other household or commercial products not categorized elsewhere characterized as "toxic", "corrosive", "flammable", "ignitable", "radioactive", "poisonous", and "reactive". Examples include pesticides, automotive fluids, fluorescent tubes and bulbs, medical waste, and lithium batteries.
<b>C&amp;D</b>			
40	Concrete/Brick/Rock	Divertible	Gravel, bricks, stones, broken-up asphalt, concrete
41	Sheet Rock	Divertible	Drywall or gypsum board
42	Shingles	Divertible	Roofing shingles
43	Carpet/Carpet Padding	Divertible	Vinyl siding used for exterior house siding
44	Dirt	Divertible	Soil, rocky soil, clay, potting soil, silt, dirt
45	Remainder/Composite C&D	Other	Material generated from construction and demolition activities. Items such as HVAC ducting, caulking or adhesive tubes, used paint brushes, insulation, and other C&D material not elsewhere classified.
<b>OTHER</b>			
46	Textiles	Divertible	Clothing, upholstery, fabrics
47	Shoes	Divertible	Footwear
48	Rags	Divertible	Cloth rags

## APPENDIX A MATERIAL CATEGORIES AND DEFINITIONS

49	Diapers/Sanitary Products	Other	Diapers and sanitary products.
50	Animal Bi-Products	Other	Animal feces, kitty litter
51	Mattresses	Divertible	Mattresses
52	Box Springs	Divertible	Box Springs
53	Furniture	Other	Tables, chairs, couches, other furniture
54	Fines	Other	Small ½" or less fragments that are too mixed/indistinguishable to allocate to another category
55	Other MSW	Other	Materials not otherwise categorized
56	PPE	Other	Personal protective equipment, particularly used for COVID-19 protection (gloves, masks, face shields)
57	Other Bulky	Other	Other bulky material that does not fall in the bulky plastics, furniture or other categories that are usually mixed materials
58	Bagged Waste	Other	Recycling category only. Any bagged material with less than 20% of non-recyclables.
59	Bagged Recyclables	Other	Recycling category only. Any bagged material with more than 20% of non-recyclables or heavily contaminated recyclables. Does not include clean, bagged recyclables.





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