



Waste Composition Study Summary of Results

Presented to:



Mecklenburg County, North Carolina

Solid Waste Land Use & Environmental Services
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1 INTRODUCTION AND BACKGROUND

Mecklenburg County (County), North Carolina is considered a leader in waste reduction and recycling, having spearheaded innovative programs that have received national attention. Coupled with this is the County's desire to develop solutions to waste reduction far beyond the 2020 goal of 20 percent. To this end, the County contracted with SCS Engineers (SCS) to conduct a waste composition analysis of waste generated by Charlotte – Mecklenburg Schools (CMS), County government buildings such as the Department of Social Services and Medical Facilities (County Facilities) and the Central Piedmont Community College (CPCC). The primary objectives of the study are as follows:

- To estimate types and quantities of recyclable waste components in the waste streams of different building types; and
- To identify opportunities for greater waste stream diversion.

To meet the County's objectives, SCS developed a detailed approach to provide the qualitative and quantitative data needed by the County to take its recycling program to the next level. SCS used a systematic mix of hands-on waste sorting and information gathering activity (facility surveys and employee interviews) to collect the information needed to make recommendations to the County for increased waste diversion. It is SCS' experience that doing physical waste sorts, in conjunction with other information gathering efforts, is the best method for identifying appropriate programmatic changes.

Based on the County's objectives, the work plan consisted of the following tasks which are presented in the corresponding sections of this report:

- **Section 2: Waste Stream Analysis** - The objective of this task was to conduct qualitative and quantitative sampling of the waste stream from designated types of facilities to estimate quantities of recyclable materials that could be targeted to enhance the County's existing recycling program and/or practices. There were 30 waste samples acquired from CMS from elementary, middle, and high schools as well as CMS support facilities; 10 waste samples from CPCC from administrative, academic, and support buildings; and 10 waste samples from County Facilities, mainly from the Department of Social Services and Medical Facilities.
- **Section 3: Potential Waste Diversion Capability** - The objective of this task was to assess the extent of materials that could be diverted through increased recycling and composting.
- **Section 4: Comparable Recycling Programs** – The objective of this task was to select and survey successful recycling and composting programs with aspects that could be implemented in the County. Information was gained mainly through available public information on websites and promotional materials.

Section 5: Program Implementation and Recommendations - The objectives of this task were to meet with representatives from selected facilities to conduct interviews and site observations in order to evaluate the current recycling strategy. Based on the existing waste composition, potential waste diversion capability, and successful programs at comparable facilities, SCS identified practical programmatic changes and strategies that will assist in achieving the County's recycling and waste reduction goals.

2 WASTE STREAM ANALYSIS

This section summarizes methods used to characterize the waste stream generated by CMS, CPCC, and County Facilities. Sorting activities for the study took place from December 5th through December 9th 2011. Waste characterization activities were performed by manually sorting samples from municipal solid waste (MSW) into distinct waste categories.

WASTE SAMPLING AND SORTING METHODS

Waste Sampling

Waste sorting was performed at the Fort Mill Transfer Station during the operating hours of the facility. Given the limited size of the data set, it was important that unrepresentative data were avoided. Each day vehicles carrying waste from targeted buildings were directed to dump their waste loads on the transfer station floor. A representative of SCS manually gathered samples from a random portion of each target load (approximately two hundred pounds) for classification (sorting). Two important procedural factors were considered:

- The target vehicle selected for sampling contained MSW that was representative of the type of waste typically generated in that sector; and
- The process of acquiring the waste sample did not, in itself, alter the apparent MSW composition.

After being filled with solid waste, the trash cans were weighed and set aside until at least two hundred pounds from the discharged load had been selected for characterization. This process was repeated until samples had been collected from all of the targeted loads.

Number of Samples

A total of 50 samples were collected during the week: 30 from CMS; 10 from CPCC; and 10 from County facilities (Department of Social Services and other general County buildings).

Waste Sorting

The sorting and weighing program for samples entailed the use of one sorting crew and an SCS Crew Supervisor. During each day of fieldwork, samples were collected from waste loads that were discharged at the Fort Mill Transfer Station. The basic procedures and objectives for sorting (as described below) were identical for each sample, each day. Sorting was performed as follows:

1. The sort crew transferred the refuse sample onto the sorting table until it was full and began sort activities. Large or heavy waste items, such as bags of yard waste, were torn open, examined and then placed directly into the appropriate waste container for subsequent weighing.

2. Plastic bags of refuse were opened and sort crew members manually segregated each item of waste, according to categories defined in **Exhibit 1** and placed it in the appropriate waste container. These steps were repeated until the entire sample was sorted.
3. At the completion of sorting, the waste containers were moved to the scale where a representative of SCS weighed each category and recorded the net weight on the Sort Data Sheet. Measurements were made to the nearest 0.1 pounds.
4. After each waste category had been recorded, the waste was piled near the sorting area and transferred back to the transfer station floor by a front-end loader.
5. This four-step process was repeated until all of the day's samples taken at the site were characterized. Waste samples were maintained in as-disposed condition or as close to this as possible until the actual sorting began. Proper site layout and close supervision of sampling was maintained to avoid the need to repeatedly handle sampled wastes.

Members of the sorting crew were fully equipped with high visibility vests, puncture/cut resistant gloves, safety glasses, and tyvek suits. The Health and Safety Plan is presented in **Appendix A**.

Consistent with good practice in such sampling programs, efforts were made to minimize sampling bias or other impacts on the integrity of the database. To this end, field sampling had been coordinated to avoid holidays and other out of ordinary events.

Due to the County's expressed objective for this study to evaluate recycling programs, waste sorting activities targeted recyclable materials. **Exhibit 1** details the categories for the waste sorting activities.

Data Reduction

50 samples were manually sorted during the December 2011 field activities. Data presented include mean percentages by weight, standard deviations, and statistical confidence intervals (95 percent confidence interval) for each group of data. Derivation of this data is as follows:

$$\text{Mean}(\bar{X}) = \sum_{i=1}^n x_i * \frac{1}{n};$$

$$\text{Standard Deviation} (s) = \sqrt{\frac{(n \sum x^2) - (\sum x)^2}{n(n-1)}}; \text{ and}$$

$$\text{Upper/Lower Confidence Interval Limits} = \bar{X} \pm \left[1.96 * \left(\frac{\sigma}{\sqrt{n}} \right) \right]$$

Where: n = number of samples; and
x = sample percentage.

Exhibit 1. Waste Categories

Major Waste Types	Waste Component Categories	Examples
Paper	Newspaper/Print	Daily, weekly newspapers
	Glossy/Magazines	TV Guide, Periodicals, Journals
	Recyclable Corrugated Cardboard	Packing/shipping boxes
	Non-Recyclable Cardboard	Wax or plastic coated, pizza boxes
	Kraft Paper	Brown shopping bags
	Paperboard	Cereal/Soda Boxes
	Phone Books	Phone number listings
	Other Books	Hard and soft-cover books
	White Office Paper	High grade white copy paper or letterhead
	Gable Top/Aseptic Cartons	Milk/Juice Cartons/Boxes
	Paper Plates/Cups	Paper plates/cups/bowls – used for food
	File Folders	Manila or colored file folders
	Paper Packaging	Crumpled paper used for package padding
	Shredded Paper	Lengthwise and crosscut shredded paper
	Other Recyclable Paper	Junk mail, notebook paper, colored copy paper
Compostable Paper	Napkins, Tissues, food stained paper	
Non-Recyclable Paper	Paper coated with plastic or foil	
Plastics	PET (#1) Bottles	Water, Soda
	HDPE (#2) Bottles	Milk, Detergent
	Other (#3-#7) Bottles	Prescriptions
	Plastic Film	Garbage, chip, candy bags, bubble wrap
	Plastic Cups and Tubs	Recyclable margarine tubs, yogurt tubs
	Polystyrene (#6)	Clamshell containers
	Rigid Plastics	Plastic toys, items without a number
	Grocery Bags	Shopping bags from Harris Teeter, Kroger, etc.
	Flower Pots	Recyclable flower pots
	DVD/CD Cases	Self explanatory
	Other Plastic	Not defined above
Glass	Clear Glass Bottles/Jars	Clear containers used for food/beverages
	Green Glass Bottles/Jars	Green containers used for food/beverages
	Brown Glass Bottles/Jars	Brown containers used for food/beverages
	Ceramic Glass	Ceramic/porcelain containers
	Other Glass	Plate or window glass, pint glasses

Exhibit 1. Waste Categories (continued)

Major Waste Types	Waste Component Categories	Examples
Metal	Bi-Metal/Steel Cans	Ferrous cans generally used to contain food
	Aluminum Cans	Soda, beer cans
	Aluminum Tins/Foil	Aluminum tins and foils
	Aerosol Cans	Self explanatory
	Other Ferrous	Ferrous metals not otherwise classified
	Other Non-Ferrous	Non-ferrous metals not otherwise classified
Organic	Food Waste	Meat, vegetables, food and byproducts
	Treated Wood	Pressure treated or painted wood
	Untreated Wood	Lumber, 2x4's, unpainted/untreated
	Furniture	Chairs, couches, tables, shelves
	Mattresses	Mattresses, box springs
	Pallets	Broken or unbroken wooden pallets
	Yard Waste	Sticks, grass, leaves, yard trimmings
	Rubber	Gloves, boots, inner tubes
	Stumps	Self explanatory
Other Organics	Organics not otherwise classified	
Textiles	Textiles	Clothes, blankets
	Other Textiles	Carpet
	Leather	Clothes
Electronics	Computers	Monitors, CPUs
	Televisions	Cathode ray tubes
	Cell Phones	Self explanatory
	Printers	Self explanatory
	DVDs/CDs	Self explanatory
	Printer Ink Cartridges	Self explanatory
	VCRs	Self explanatory
	MP3 Players	Self explanatory
	Other Electronic Waste	Electronics not categorized above
HHW	Household Hazardous Waste (HHW)	Cleaners, oil based paints, pesticides
	Oil Filters	Used oil filters for automobiles or machinery
	Dry Cell Batteries	Alkaline, Zinc-carbon, household batteries
	Lead-Acid Batteries	Automotive batteries

Exhibit 1. Waste Categories (continued)

Major Waste Types	Waste Component Categories	Examples
Other	Infectious Waste	Biohazardous materials
	Diapers	Adult and infant diapers
	Brick	Red brick
	Concrete	Crushed or broken up concrete slabs
	Roofing Materials	Asphalt Shingles, tar paper
	Drywall (Gypsum)	Self Explanatory
	Vinyl Siding	Vinyl siding boards
	Fines	Materials less than ¼ inch by ¼ inch
	Other	Materials not categorized above

Waste samples are acquired to estimate the true waste composition (i.e., the proportion of each waste component present in the waste stream of the various sets of targeted buildings). The mean is the arithmetic average of all data and the standard deviation is a measure of the dispersion in the data. Together, the mean and standard deviation determine the confidence interval. A 95 percent confidence interval is said to contain the true proportion of a waste component with 95 percent confidence (i.e., similar studies will produce the same results 95 percent of the time).

SUMMARY OF RESULTS**Charlotte – Mecklenburg Schools**

Exhibit 2 presents a compilation of the thirty waste samples collected and sorted in December 2011. The composition includes confidence intervals based on the number of samples and variability between the samples. Based on the samples collected, the three largest subcomponents, by weight, of the school waste stream are Food Waste (28.0 percent), Compostable Paper (9.4 percent) and Plastic Films (7.5 percent). During the field activities it was noted that a significant portion of the food waste was composed of full milk and juice containers. Compostable paper was composed of napkins and tissues from cafeterias and bathrooms. The plastic films category was mostly composed of bags used to contain trash.

Exhibit 2. CMS Waste Composition

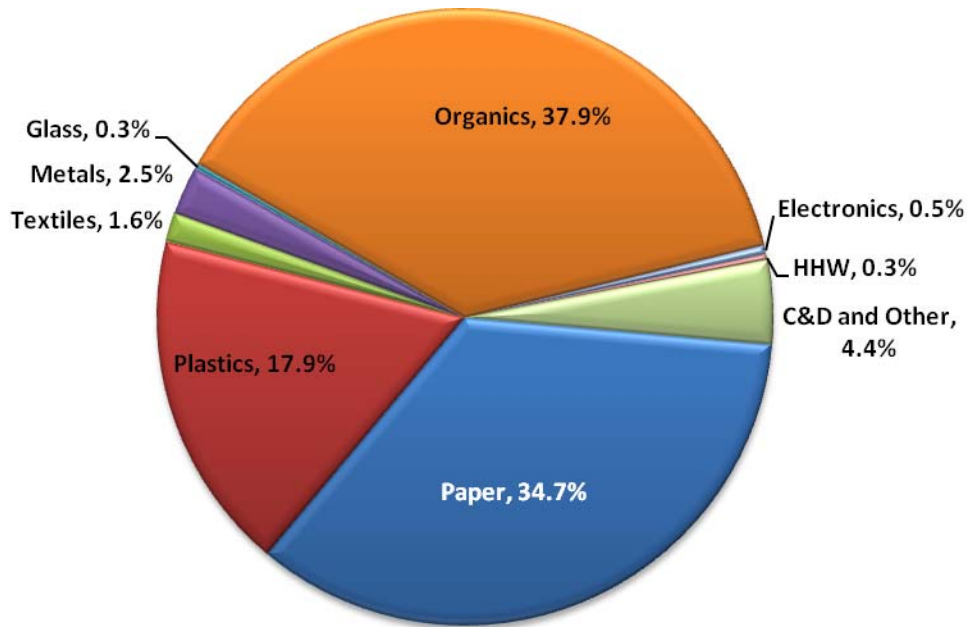
Material Components	Mean Composition	Standard Deviation	95% Confidence Limits	
			Lower	Upper
PAPER				
1 Newspaper/Print	0.4%	0.6%	0.2%	0.6%
2 Glossy Magazines	<0.1%	0.2%	<0.1%	0.1%
3 Recyclable Cardboard	3.3%	4.1%	1.8%	4.8%
4 Kraft Paper	0.7%	1.1%	0.3%	1.1%
5 Paperboard (Chipboard)	1.2%	1.1%	0.8%	1.6%
6 Other Recyclable Paper	2.7%	2.1%	1.9%	3.4%
7 White Office Paper	3.9%	2.6%	3.0%	4.8%
8 Gable Top/Aseptic	5.6%	3.6%	4.4%	6.9%
9 Paper Plates/Cups	5.4%	4.4%	3.9%	7.0%
10 File Folders	0.4%	0.6%	0.1%	0.6%
11 Paper Packaging	0.1%	0.4%	<0.1%	0.3%
12 Phone Books	<0.1%	<0.1%	<0.1%	<0.1%
13 Other Books	0.4%	1.0%	<0.1%	0.8%
14 Shredded Paper	0.2%	0.6%	<0.1%	0.4%
15 Non-Recycl Cardboard	<0.1%	0.2%	<0.1%	0.1%
16 Compostable Paper	9.4%	4.0%	8.0%	10.9%
17 Non-Recyclable Paper	0.8%	1.0%	0.5%	1.2%
Total Paper	34.6%			
PLASTIC				
18 PET (#1) Bottles	1.9%	1.4%	1.4%	2.4%
19 HDPE (#2) Bottles)	0.3%	0.3%	0.2%	0.4%
20 Other (#3-#7) Bottles	<0.1%	<0.1%	<0.1%	<0.1%
21 Plastic Films	7.5%	2.2%	6.6%	8.3%
22 Grocery Bags	0.2%	0.2%	0.1%	0.3%
23 Plastic Cups and Tubs	1.1%	0.9%	0.7%	1.4%
24 Polystyrene (#6) Foam	3.7%	2.8%	2.7%	4.7%
25 Disposable Trays	1.8%	1.5%	1.2%	2.3%
26 Rigid Plastics	1.5%	1.7%	0.9%	2.1%
27 Flower Pots	<0.1%	0.2%	<0.1%	<0.1%
28 DVD/CD Cases	<0.1%	<0.1%	<0.1%	<0.1%
Total Plastic	17.8%			
GLASS				
29 Clear Glass Bottles/Jars	0.2%	0.3%	<0.1%	0.3%
30 Green Glass Bottles/Jars	<0.1%	<0.1%	<0.1%	<0.1%
31 Brown Glass Bottles/Jars	<0.1%	<0.1%	<0.1%	<0.1%
32 Ceramic Glass	<0.1%	0.2%	<0.1%	0.1%
33 Other Glass	<0.1%	<0.1%	<0.1%	<0.1%
Total Glass	0.2%			
METAL				
34 Steel/Bi Metal Food Cans	0.7%	1.0%	0.4%	1.1%
35 Aluminum Cans	0.4%	0.3%	0.3%	0.5%
36 Aluminum Tin/Foil	0.3%	0.4%	0.1%	0.4%
37 Aerosol Cans	<0.1%	0.2%	<0.1%	0.1%
38 Other Ferrous	0.9%	2.5%	<0.1%	1.8%
39 Other Non-Ferrous	0.2%	0.4%	<0.1%	0.3%
Total Metals	2.5%			

Exhibit 2. CMS Waste Composition (continued)

Material Components	Mean Composition	Standard Deviation	95% Confidence Limits	
			Lower	Upper
TEXTILE				
40 Textiles	1.1%	2.1%	0.4%	1.8%
41 Other Textiles	0.4%	2.4%	<0.1%	1.3%
42 Leather	<0.1%	<0.1%	<0.1%	<0.1%
Total Textiles	1.5%			
ORGANIC				
43 Food Waste	28.0%	8.8%	24.9%	31.1%
44 Treated Wood	0.5%	1.9%	<0.1%	1.2%
45 Untreated Wood	0.9%	2.7%	<0.1%	1.9%
46 Furniture	<0.1%	<0.1%	<0.1%	<0.1%
47 Mattresses	<0.1%	<0.1%	<0.1%	<0.1%
48 Pallets	0.3%	1.6%	<0.1%	0.9%
49 Yard Waste	0.6%	1.7%	<0.1%	1.2%
50 Rubber	<0.1%	0.3%	<0.1%	0.2%
51 Stumps	<0.1%	<0.1%	<0.1%	<0.1%
52 Condiments	<0.1%	<0.1%	<0.1%	<0.1%
53 Other Organics	7.1%	2.6%	6.1%	8.0%
54 Diapers	0.5%	1.3%	<0.1%	0.9%
Total Organics	37.8%			
ELECTRONICS				
55 Computers	<0.1%	<0.1%	<0.1%	<0.1%
56 Televisions	<0.1%	<0.1%	<0.1%	<0.1%
57 Cell Phones	<0.1%	<0.1%	<0.1%	<0.1%
58 Printers	<0.1%	<0.1%	<0.1%	<0.1%
59 DVD's/CD's	<0.1%	<0.1%	<0.1%	<0.1%
60 VCR's	<0.1%	<0.1%	<0.1%	<0.1%
61 MP3 Players	<0.1%	<0.1%	<0.1%	<0.1%
62 Other Electronic Waste	0.5%	1.3%	<0.1%	0.9%
Total Electronics	0.5%			
HHW				
63 Hazardous Waste	<0.1%	<0.1%	<0.1%	<0.1%
64 Oil Filters	<0.1%	<0.1%	<0.1%	<0.1%
65 Infectious Waste	<0.1%	<0.1%	<0.1%	<0.1%
66 Printer Ink Cartridges	<0.1%	<0.1%	<0.1%	<0.1%
67 Fluorescent Bulbs (# of bulbs)	0.3%	1.6%	<0.1%	0.9%
68 Dry Cell Batteries	<0.1%	<0.1%	<0.1%	<0.1%
69 Lead-Acid Batteries	<0.1%	<0.1%	<0.1%	<0.1%
Total Household Hazardous Wastes	0.3%			
C&D and OTHER WASTES				
70 Brick	<0.1%	<0.1%	<0.1%	<0.1%
71 Concrete	<0.1%	<0.1%	<0.1%	<0.1%
72 Roofing Material	<0.1%	<0.1%	<0.1%	<0.1%
73 Drywall (Gypsum)	<0.1%	<0.1%	<0.1%	<0.1%
74 Vinyl Siding	<0.1%	<0.1%	<0.1%	<0.1%
75 Fines	1.9%	1.6%	1.3%	2.4%
76 Other	2.5%	3.6%	1.2%	3.8%
Total C&D and Other Wastes	4.4%			
TOTALS	100.0%			

Note: Composition based on 30 samples.

Exhibit 2. CMS Waste Composition (continued)



Central Piedmont Community College

Exhibit 3 presents a compilation of the ten waste samples collected and sorted in December 2011. The composition includes confidence intervals based on the number of samples and variability between the samples. Based on the samples collected, the three largest subcomponents, by weight, of the college waste stream are Food Waste (14.9 percent), Plastic Films (9.5 percent) and Compostable Paper (9.0 percent). During field activities it was noted that a significant portion of the food waste was generated by restaurants on the CPCC campus.

Exhibit 3. CPCC Waste Composition

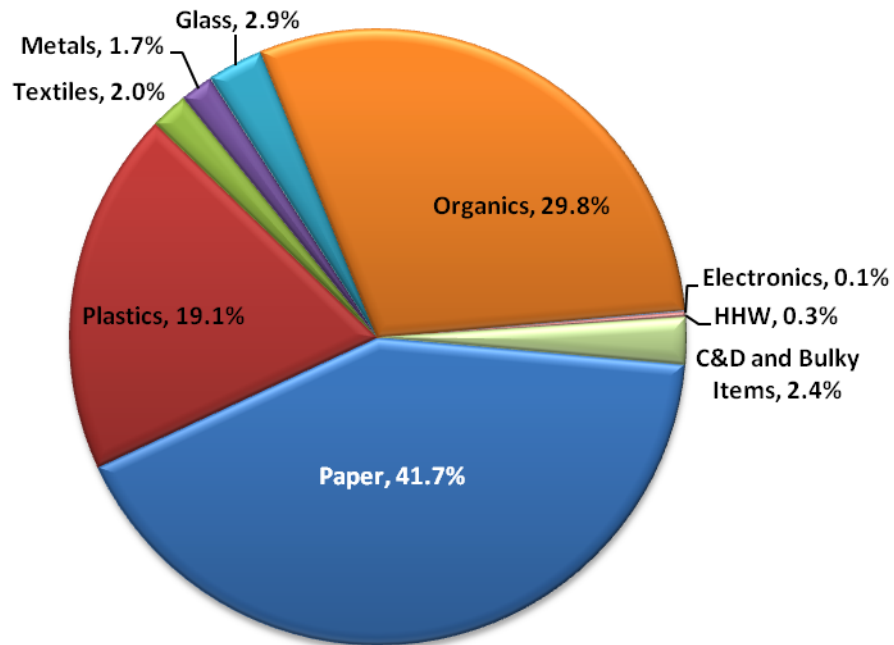
Material Components	Mean Composition	Standard Deviation	95% Confidence Limits	
			Lower	Upper
PAPER				
1 Newspaper/Print	1.6%	2.2%	0.2%	3.0%
2 Glossy Magazines	1.0%	1.4%	0.1%	1.9%
3 Recyclable Cardboard	7.9%	9.5%	2.0%	13.9%
4 Kraft Paper	0.5%	0.6%	0.1%	0.8%
5 Paperboard (Chipboard)	1.7%	1.1%	1.0%	2.4%
6 Other Recyclable Paper	3.6%	2.6%	2.0%	5.2%
7 White Office Paper	7.7%	6.7%	3.5%	11.8%
8 Gable Top/Aseptic	<0.1%	0.1%	<0.1%	0.1%
9 Paper Plates/Cups	4.0%	5.1%	0.8%	7.1%
10 File Folders	0.4%	0.6%	<0.1%	0.8%
11 Paper Packaging	<0.1%	<0.1%	<0.1%	<0.1%
12 Phone Books	<0.1%	<0.1%	<0.1%	<0.1%
13 Other Books	1.9%	4.9%	<0.1%	4.9%
14 Shredded Paper	1.4%	2.1%	0.1%	2.7%
15 Non-Recycl Cardboard	<0.1%	<0.1%	<0.1%	<0.1%
16 Compostable Paper	9.0%	3.6%	6.8%	11.3%
17 Non-Recyclable Paper	0.9%	0.9%	0.4%	1.5%
Total Paper	41.6%			
PLASTIC				
18 PET (#1) Bottles	2.7%	1.3%	1.9%	3.5%
19 HDPE (#2) Bottles)	0.6%	0.4%	0.3%	0.8%
20 Other (#3-#7) Bottles	<0.1%	<0.1%	<0.1%	<0.1%
21 Plastic Films	9.5%	5.8%	5.9%	13.1%
22 Grocery Bags	0.3%	0.3%	0.1%	0.5%
23 Plastic Cups and Tubs	1.1%	1.0%	0.4%	1.7%
24 Polystrene (#6) Foam	2.1%	1.3%	1.2%	2.9%
25 Disposable Trays	1.2%	1.5%	0.3%	2.2%
26 Rigid Plastics	1.6%	1.5%	0.7%	2.6%
27 Flower Pots	<0.1%	<0.1%	<0.1%	<0.1%
28 DVD/CD Cases	<0.1%	<0.1%	<0.1%	<0.1%
Total Plastic	19.1%			
GLASS				
29 Clear Glass Bottles/Jars	0.9%	1.0%	0.3%	1.6%
30 Green Glass Bottles/Jars	0.5%	0.6%	<0.1%	0.9%
31 Brown Glass Bottles/Jars	0.1%	0.2%	<0.1%	0.3%
32 Ceramic Glass	1.3%	2.5%	<0.1%	2.9%
33 Other Glass	<0.1%	0.3%	<0.1%	0.3%
Total Glass	2.8%			
METAL				
34 Steel/Bi Metal Food Cans	0.3%	0.3%	0.1%	0.5%
35 Aluminum Cans	0.8%	0.5%	0.5%	1.1%
36 Aluminum Tin/Foil	0.3%	0.3%	0.1%	0.5%
37 Aerosol Cans	<0.1%	<0.1%	<0.1%	<0.1%
38 Other Ferrous	<0.1%	0.2%	<0.1%	0.2%
39 Other Non-Ferrous	0.1%	0.4%	<0.1%	0.4%
Total Metals	1.6%			

Exhibit 3. CPCC Waste Composition (continued)

Material Components	Mean Composition	Standard Deviation	95% Confidence Limits	
			Lower	Upper
TEXTILE				
40 Textiles	2.0%	2.0%	0.8%	3.2%
41 Other Textiles	<0.1%	<0.1%	<0.1%	<0.1%
42 Leather	<0.1%	<0.1%	<0.1%	<0.1%
Total Textiles	2.0%			
ORGANIC				
43 Food Waste	14.9%	7.9%	10.0%	19.8%
44 Treated Wood	<0.1%	<0.1%	<0.1%	<0.1%
45 Untreated Wood	0.4%	1.2%	<0.1%	1.2%
46 Furniture	1.4%	4.4%	<0.1%	4.1%
47 Mattresses	<0.1%	<0.1%	<0.1%	<0.1%
48 Pallets	<0.1%	<0.1%	<0.1%	<0.1%
49 Yard Waste	7.0%	7.8%	2.2%	11.9%
50 Rubber	<0.1%	<0.1%	<0.1%	<0.1%
51 Stumps	<0.1%	<0.1%	<0.1%	<0.1%
52 Condiments	<0.1%	<0.1%	<0.1%	<0.1%
53 Other Organics	6.0%	1.9%	4.9%	7.2%
54 Diapers	<0.1%	<0.1%	<0.1%	<0.1%
Total Organics	29.8%			
ELECTRONICS				
55 Computers	<0.1%	<0.1%	<0.1%	<0.1%
56 Televisions	<0.1%	<0.1%	<0.1%	<0.1%
57 Cell Phones	<0.1%	<0.1%	<0.1%	<0.1%
58 Printers	<0.1%	<0.1%	<0.1%	<0.1%
59 DVD's/CD's	<0.1%	<0.1%	<0.1%	<0.1%
60 VCR's	<0.1%	<0.1%	<0.1%	<0.1%
61 MP3 Players	<0.1%	<0.1%	<0.1%	<0.1%
62 Other Electronic Waste	<0.1%	0.2%	<0.1%	0.2%
Total Electronics	0.0%			
HHW				
63 Hazardous Waste	0.3%	0.8%	<0.1%	0.8%
64 Oil Filters	<0.1%	<0.1%	<0.1%	<0.1%
65 Infectious Waste	<0.1%	<0.1%	<0.1%	<0.1%
66 Printer Ink Cartridges	<0.1%	<0.1%	<0.1%	<0.1%
67 Fluorescent Bulbs (# of bulbs)	<0.1%	<0.1%	<0.1%	<0.1%
68 Dry Cell Batteries	<0.1%	<0.1%	<0.1%	<0.1%
69 Lead-Acid Batteries	<0.1%	<0.1%	<0.1%	<0.1%
Total Household Hazardous Wastes	0.3%			
C&D and OTHER WASTES				
70 Brick	<0.1%	<0.1%	<0.1%	<0.1%
71 Concrete	<0.1%	<0.1%	<0.1%	<0.1%
72 Roofing Material	<0.1%	<0.1%	<0.1%	<0.1%
73 Drywall (Gypsum)	<0.1%	<0.1%	<0.1%	<0.1%
74 Vinyl Siding	<0.1%	<0.1%	<0.1%	<0.1%
75 Fines	1.5%	1.2%	0.8%	2.2%
76 Other	0.9%	1.1%	0.2%	1.6%
Total C&D and Other Wastes	2.4%			
TOTALS	100.0%			

Note: Composition based on 10 samples.

Exhibit 3. CPCC Waste Composition (continued)



County Facilities and Department of Social Services

Exhibit 4 presents a compilation of the ten waste samples collected and sorted in December 2011. The composition includes confidence intervals based on the number of samples and variability between the samples. Based on the samples collected, the three largest subcomponents, by weight, are Textiles (19.7 percent), Compostable Paper (8.8 percent) and Concrete (8.8 percent). During field activities it was noted that the majority of the textiles were used clothing, blankets, and shoes. The concrete consisted of broken pieces that were a few inches thick and did not contain rebar. The compostable paper in these samples consisted of napkins and tissues, mostly from bathrooms.

These samples may not reflect the actual waste from typical County Facilities, as Textiles and Concrete are usually not a significant source of waste in these types of buildings. **Exhibit 5** presents an alternate composition, which omits Textiles and Concrete from the composition.

Exhibit 4. County Facilities Waste Composition

Material Components	Mean Composition	Standard Deviation	95% Confidence Limits	
			Lower	Upper
PAPER				
1 Newspaper/Print	2.0%	2.1%	0.8%	3.3%
2 Glossy Magazines	0.6%	0.6%	0.2%	1.0%
3 Recyclable Cardboard	1.4%	1.1%	0.8%	2.1%
4 Kraft Paper	0.4%	0.4%	0.2%	0.6%
5 Paperboard (Chipboard)	2.6%	1.7%	1.5%	3.7%
6 Other Recyclable Paper	2.6%	2.9%	0.7%	4.4%
7 White Office Paper	2.9%	2.9%	1.1%	4.7%
8 Gable Top/Aseptic	0.3%	0.4%	<0.1%	0.6%
9 Paper Plates/Cups	0.7%	0.6%	0.3%	1.1%
10 File Folders	0.3%	0.7%	<0.1%	0.7%
11 Paper Packaging	0.4%	0.4%	0.2%	0.7%
12 Phone Books	<0.1%	<0.1%	<0.1%	<0.1%
13 Other Books	2.1%	2.9%	0.3%	3.9%
14 Shredded Paper	0.4%	0.8%	<0.1%	0.9%
15 Non-Recycl Cardboard	<0.1%	<0.1%	<0.1%	<0.1%
16 Compostable Paper	8.8%	3.2%	6.8%	10.8%
17 Non-Recyclable Paper	0.5%	1.0%	<0.1%	1.2%
Total Paper	26.0%			
PLASTIC				
18 PET (#1) Bottles	1.7%	1.6%	0.7%	2.7%
19 HDPE (#2) Bottles)	<0.1%	0.1%	<0.1%	0.1%
20 Other (#3-#7) Bottles	<0.1%	<0.1%	<0.1%	<0.1%
21 Plastic Films	6.9%	6.3%	2.9%	10.8%
22 Grocery Bags	0.4%	0.5%	0.1%	0.7%
23 Plastic Cups and Tubs	0.6%	0.5%	0.2%	0.9%
24 Polystrene (#6) Foam	1.7%	1.2%	1.0%	2.4%
25 Disposable Trays	0.3%	0.4%	<0.1%	0.5%
26 Rigid Plastics	6.0%	3.8%	3.7%	8.4%
27 Flower Pots	<0.1%	<0.1%	<0.1%	<0.1%
28 DVD/CD Cases	<0.1%	<0.1%	<0.1%	<0.1%
Total Plastic	17.6%			
GLASS				
29 Clear Glass Bottles/Jars	0.2%	0.3%	<0.1%	0.3%
30 Green Glass Bottles/Jars	0.1%	0.4%	<0.1%	0.4%
31 Brown Glass Bottles/Jars	<0.1%	<0.1%	<0.1%	<0.1%
32 Ceramic Glass	<0.1%	<0.1%	<0.1%	<0.1%
33 Other Glass	0.5%	1.0%	<0.1%	1.1%
Total Glass	0.8%			
METAL				
34 Steel/Bi Metal Food Cans	0.2%	0.3%	<0.1%	0.4%
35 Aluminum Cans	0.6%	0.6%	0.2%	1.0%
36 Aluminum Tin/Foil	0.3%	0.4%	<0.1%	0.5%
37 Aerosol Cans	0.2%	0.4%	<0.1%	0.4%
38 Other Ferrous	1.0%	1.2%	0.2%	1.7%
39 Other Non-Ferrous	0.3%	0.8%	<0.1%	0.7%
Total Metals	2.6%			

Exhibit 4. County Facilities Waste Composition (continued)

Material Components	Mean Composition	Standard Deviation	95% Confidence Limits	
			Lower	Upper
TEXTILE				
40 Textiles	19.7%	10.3%	13.4%	26.1%
41 Other Textiles	3.8%	5.4%	0.5%	7.1%
42 Leather	<0.1%	<0.1%	<0.1%	<0.1%
Total Textiles	23.5%			
ORGANIC				
43 Food Waste	7.2%	5.0%	4.1%	10.4%
44 Treated Wood	1.3%	2.2%	<0.1%	2.7%
45 Untreated Wood	0.4%	1.1%	<0.1%	1.1%
46 Furniture	0.4%	1.4%	<0.1%	1.3%
47 Mattresses	<0.1%	<0.1%	<0.1%	<0.1%
48 Pallets	<0.1%	<0.1%	<0.1%	<0.1%
49 Yard Waste	<0.1%	<0.1%	<0.1%	<0.1%
50 Rubber	<0.1%	<0.1%	<0.1%	<0.1%
51 Stumps	<0.1%	<0.1%	<0.1%	<0.1%
52 Condiments	<0.1%	<0.1%	<0.1%	<0.1%
53 Other Organics	4.8%	2.8%	3.1%	6.5%
54 Diapers	0.3%	0.5%	<0.1%	0.6%
Total Organics	14.5%			
ELECTRONICS				
55 Computers	<0.1%	<0.1%	<0.1%	<0.1%
56 Televisions	<0.1%	<0.1%	<0.1%	<0.1%
57 Cell Phones	<0.1%	<0.1%	<0.1%	<0.1%
58 Printers	0.6%	1.8%	<0.1%	1.6%
59 DVD's/CD's	<0.1%	<0.1%	<0.1%	<0.1%
60 VCR's	<0.1%	<0.1%	<0.1%	<0.1%
61 MP3 Players	<0.1%	<0.1%	<0.1%	<0.1%
62 Other Electronic Waste	2.3%	3.7%	<0.1%	4.6%
Total Electronics	2.9%			
HHW				
63 Hazardous Waste	<0.1%	<0.1%	<0.1%	<0.1%
64 Oil Filters	<0.1%	<0.1%	<0.1%	<0.1%
65 Infectious Waste	<0.1%	<0.1%	<0.1%	<0.1%
66 Printer Ink Cartridges	<0.1%	<0.1%	<0.1%	<0.1%
67 Fluorescent Bulbs (# of bulbs)	<0.1%	<0.1%	<0.1%	<0.1%
68 Dry Cell Batteries	<0.1%	<0.1%	<0.1%	<0.1%
69 Lead-Acid Batteries	<0.1%	<0.1%	<0.1%	<0.1%
Total Household Hazardous Wastes	<0.1%			
C&D and OTHER WASTES				
70 Brick	<0.1%	<0.1%	<0.1%	<0.1%
71 Concrete	8.8%	15.5%	<0.1%	18.3%
72 Roofing Material	<0.1%	<0.1%	<0.1%	<0.1%
73 Drywall (Gypsum)	0.3%	0.9%	<0.1%	0.8%
74 Vinyl Siding	<0.1%	<0.1%	<0.1%	<0.1%
75 Fines	1.7%	1.4%	0.8%	2.6%
76 Other	1.3%	3.1%	<0.1%	3.2%
Total C&D and Other Wastes	12.1%			
TOTALS	100.0%			

Note: Composition based on 10 samples.

Exhibit 4. County Facilities Waste Composition (continued)

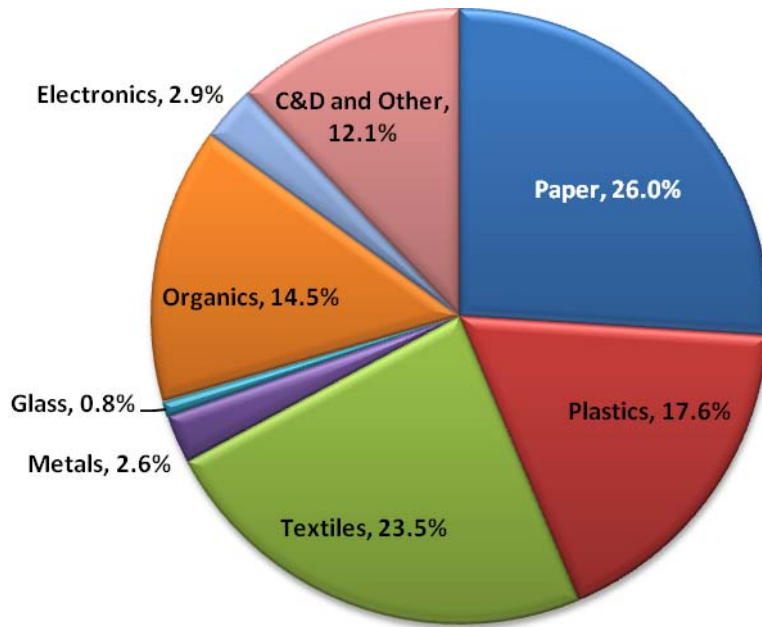


Exhibit 5. County Facilities Waste Alternate Composition

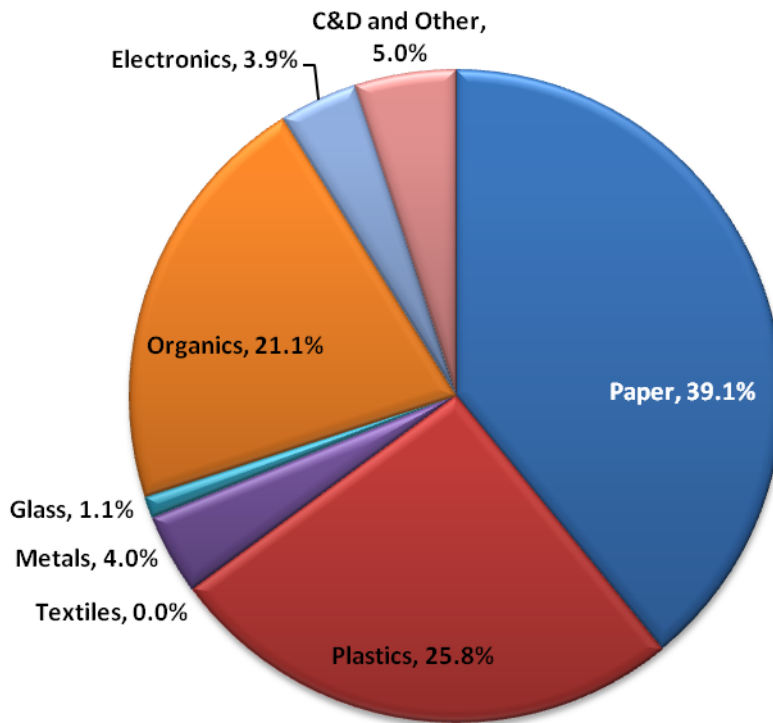
Material Components	Mean Composition	Standard Deviation	95% Confidence Limits	
			Lower	Upper
PAPER				
1 Newspaper/Print	3.0%	3.0%	1.1%	4.9%
2 Glossy Magazines	0.8%	0.8%	0.3%	1.3%
3 Recyclable Cardboard	2.2%	1.6%	1.3%	3.2%
4 Kraft Paper	0.6%	0.5%	0.3%	0.9%
5 Paperboard (Chipboard)	3.9%	2.3%	2.5%	5.4%
6 Other Recyclable Paper	3.8%	3.9%	1.4%	6.2%
7 White Office Paper	4.1%	4.2%	1.5%	6.7%
8 Gable Top/Aseptic	0.5%	0.6%	0.1%	0.8%
9 Paper Plates/Cups	1.0%	0.9%	0.5%	1.5%
10 File Folders	0.5%	1.0%	<0.1%	1.1%
11 Paper Packaging	0.7%	0.7%	0.3%	1.1%
12 Phone Books	<0.1%	<0.1%	<0.1%	<0.1%
13 Other Books	3.5%	5.1%	0.3%	6.6%
14 Shredded Paper	0.5%	1.1%	<0.1%	1.2%
15 Non-Recycl Cardboard	<0.1%	<0.1%	<0.1%	<0.1%
16 Compostable Paper	13.4%	4.3%	10.7%	16.1%
17 Non-Recyclable Paper	0.7%	1.1%	<0.1%	1.4%
Total Paper	39.1%			
PLASTIC				
18 PET (#1) Bottles	2.3%	1.6%	1.3%	3.4%
19 HDPE (#2) Bottles)	<0.1%	0.1%	<0.1%	0.2%
20 Other (#3-#7) Bottles	<0.1%	<0.1%	<0.1%	<0.1%
21 Plastic Films	9.2%	6.0%	5.5%	12.9%
22 Grocery Bags	0.6%	0.6%	0.2%	1.0%
23 Plastic Cups and Tubs	0.8%	0.7%	0.4%	1.2%
24 Polystyrene (#6) Foam	2.4%	1.4%	1.6%	3.3%
25 Disposable Trays	0.3%	0.6%	<0.1%	0.7%
26 Rigid Plastics	10.1%	7.1%	5.6%	14.5%
27 Flower Pots	<0.1%	<0.1%	<0.1%	<0.1%
28 DVD/CD Cases	<0.1%	<0.1%	<0.1%	<0.1%
Total Plastic	25.7%			
GLASS				
29 Clear Glass Bottles/Jars	0.3%	0.4%	<0.1%	0.5%
30 Green Glass Bottles/Jars	0.2%	0.6%	<0.1%	0.5%
31 Brown Glass Bottles/Jars	<0.1%	<0.1%	<0.1%	<0.1%
32 Ceramic Glass	<0.1%	<0.1%	<0.1%	<0.1%
33 Other Glass	0.6%	1.4%	<0.1%	1.5%
Total Glass	1.1%			
METAL				
34 Steel/Bi Metal Food Cans	0.3%	0.4%	<0.1%	0.5%
35 Aluminum Cans	0.8%	0.7%	0.4%	1.3%
36 Aluminum Tin/Foil	0.5%	0.6%	0.1%	0.9%
37 Aerosol Cans	0.3%	0.5%	<0.1%	0.6%
38 Other Ferrous	1.7%	2.6%	0.1%	3.3%
39 Other Non-Ferrous	0.4%	1.1%	<0.1%	1.1%
Total Metals	4.0%			

Exhibit 6. County Facilities Waste Alternate Composition (continued)

Material Components	Mean Composition	Standard Deviation	95% Confidence Limits	
			Lower	Upper
TEXTILE				
40 Leather	<0.1%	<0.1%	<0.1%	<0.1%
Total Textiles	0.0%	(Textiles omitted)		
ORGANIC				
41 Food Waste	9.8%	5.7%	6.2%	13.3%
42 Treated Wood	1.8%	2.9%	<0.1%	3.6%
43 Untreated Wood	1.1%	3.1%	<0.1%	3.0%
44 Furniture	0.7%	2.1%	<0.1%	2.0%
45 Mattresses	<0.1%	<0.1%	<0.1%	<0.1%
46 Pallets	<0.1%	<0.1%	<0.1%	<0.1%
47 Yard Waste	<0.1%	<0.1%	<0.1%	<0.1%
48 Rubber	<0.1%	<0.1%	<0.1%	<0.1%
49 Stumps	<0.1%	<0.1%	<0.1%	<0.1%
50 Condiments	<0.1%	<0.1%	<0.1%	<0.1%
51 Other Organics	7.3%	4.1%	4.7%	9.8%
52 Diapers	0.5%	1.0%	<0.1%	1.1%
Total Organics	21.1%			
ELECTRONICS				
53 Computers	<0.1%	<0.1%	<0.1%	<0.1%
54 Televisions	<0.1%	<0.1%	<0.1%	<0.1%
55 Cell Phones	<0.1%	<0.1%	<0.1%	<0.1%
56 Printers	0.8%	2.6%	<0.1%	2.4%
57 DVD's/CD's	<0.1%	<0.1%	<0.1%	<0.1%
58 VCR's	<0.1%	<0.1%	<0.1%	<0.1%
59 MP3 Players	<0.1%	<0.1%	<0.1%	<0.1%
60 Other Electronic Waste	3.1%	4.4%	0.4%	5.8%
Total Electronics	3.9%			
HHW				
61 Hazardous Waste	<0.1%	<0.1%	<0.1%	<0.1%
62 Oil Filters	<0.1%	<0.1%	<0.1%	<0.1%
63 Infectious Waste	<0.1%	<0.1%	<0.1%	<0.1%
64 Printer Ink Cartridges	<0.1%	<0.1%	<0.1%	<0.1%
65 Fluorescent Bulbs	<0.1%	<0.1%	<0.1%	<0.1%
66 Dry Cell Batteries	<0.1%	<0.1%	<0.1%	<0.1%
67 Lead-Acid Batteries	<0.1%	<0.1%	<0.1%	<0.1%
Total Household Hazardous Wastes	<0.1%			
C&D and OTHER WASTES				
68 Brick	<0.1%	<0.1%	<0.1%	<0.1%
69 Roofing Material	<0.1%	<0.1%	<0.1%	<0.1%
70 Drywall (Gypsum)	0.3%	1.1%	<0.1%	1.0%
71 Vinyl Siding	<0.1%	<0.1%	<0.1%	<0.1%
72 Fines	3.0%	3.0%	1.1%	4.8%
73 Other	1.7%	3.3%	<0.1%	3.7%
Total C&D and Other Wastes	5.0%	(Concrete omitted)		
TOTALS	100.0%			

Note: Composition based on 10 samples.

**Exhibit 5. County Facilities Waste Alternate Composition
(continued)**



3 POTENTIAL WASTE DIVERSION CAPABILITY

Significant portions of the waste streams generated by CMS, CPCC, and County Facilities are compostable or recyclable. Some materials, such as Treated Wood, Ceramic Glass, and Plastic Film (largely plastic bags used to contain trash materials), are considered trash since they do not have markets for recycling nor composting. **Exhibit 6** details the materials included in the compostable, recyclable, and trash classifications used for this section.

Exhibit 6. Compostable, Recyclable, and Trash Classifications for Waste Materials

Compostable	Recyclable		Trash
Paper Plates/Cups	Newspaper/Print	DVD/CD Cases	Non-Recyclable
Compostable Paper	Glossy Magazines	Steel/Bi Metal Food	Cardboard
Food Waste	Recyclable Cardboard	Cans	Non-Recyclable Paper
Untreated Wood	Kraft Paper	Aluminum Cans	Plastic Films
Yard Waste	Paperboard (Chipboard)	Aluminum Tin/Foil	Polystyrene
Stumps	Other Recyclable Paper	Aerosol Cans	Ceramic Glass
Other Organics	White Office Paper	Other Ferrous	Other Glass
	Gable Top/Aseptic	Other Non-Ferrous	Other Textiles
	File Folders	Textiles	Leather
	Paper Packaging	Pallets	Treated Wood
	Phone Books	Electronics	Furniture
	Other Books	Oil Filters	Mattresses
	Shredded Paper	Printer Ink Cartridges	Rubber
	Glass Bottles/Jars	Fluorescent Bulbs	Condiments
	PET (#1) Bottles	Dry Cell Batteries	Diapers
	HDPE (#2) Bottles	Lead-Acid Batteries	Hazardous Waste
	Other (#3-#7) Bottles	Brick	Infectious Waste
	Grocery Bags	Concrete	Fines
	Plastic Cups and Tubs	Roofing Material	Other
	Disposable Trays	Drywall (Gypsum)	
	Rigid Plastics	Vinyl Siding	
	Flower Pots		

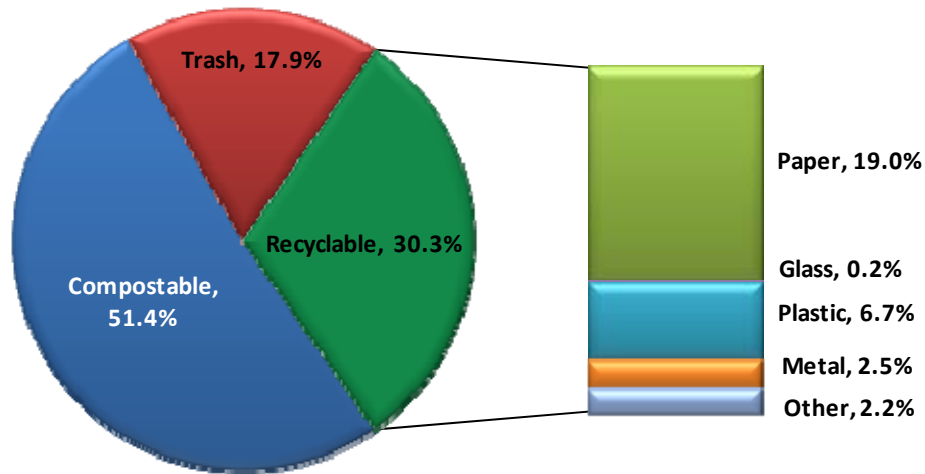
CHARLOTTE-MECKLENBURG SCHOOLS

The largest waste diversion opportunity for CMS is composting of food waste. According to the results of the waste stream analysis, food waste comprised 28 percent of the waste stream. Food waste includes liquids, such as full milk and juice containers which were noted to be prevalent in the waste stream. Other significant sources of compostable materials included Compostable Paper (9.4 percent), Other Organic (7.1 percent), and Paper Plates/Cups (5.4 percent).

Recyclable paper comprised the largest segment of the recyclable portion of the waste stream at about 19 percent. The largest subcomponents of the Recyclable paper category were Gable

Top/Aseptic Containers (5.6 percent), White Office Paper (3.9 percent), and Recyclable Cardboard (3.3 percent). **Exhibit 7** portrays the waste composition by recyclable, compostable, and trash materials. At CMS, approximately 82 percent of the waste stream is considered recyclable or compostable.

Exhibit 7. Diversion Opportunities for CMS

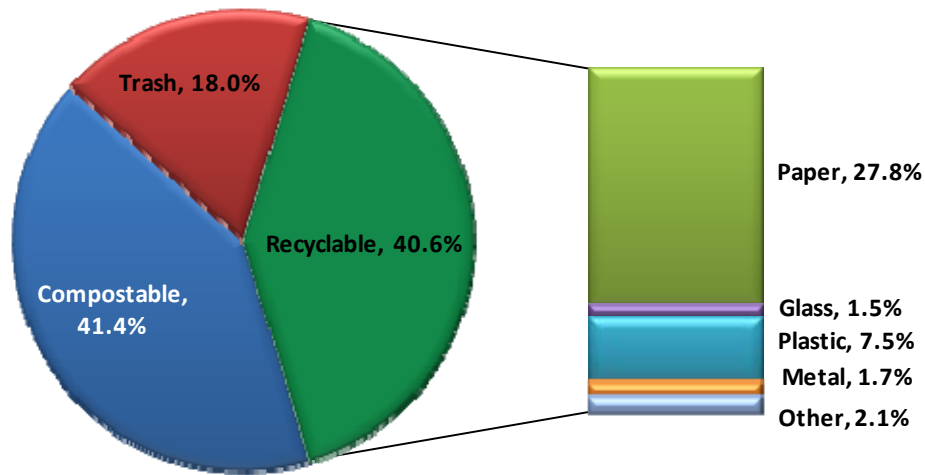


CENTRAL PIEDMONT COMMUNITY COLLEGE

The largest waste diversion opportunities for the CPCC are composting of Food Waste and Compostable Paper. According to the results of the waste stream analysis, Food Waste comprised 14.9 percent of the waste stream and Compostable Paper comprised 9.0 percent. Materials such as napkins and tissues were noted to be prevalent in the waste stream.

Recyclable paper comprised 27.8 percent of the waste stream. The largest subcomponents in this category were Cardboard (7.9 percent) and White Office Paper (7.7 percent). **Exhibit 8** portrays the waste composition by recyclable, compostable, and trash materials. At CPCC, about 82 percent of the waste stream is considered recyclable or compostable.

Exhibit 8. Diversion Opportunities for CPCC

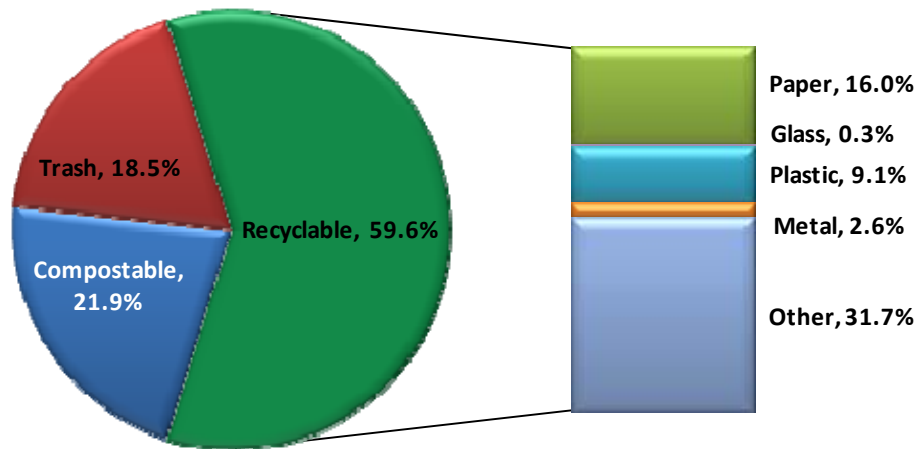


COUNTY FACILITIES

The largest waste diversion opportunity for County Facilities is recycling of textiles. According to the results of the waste stream analysis conducted in December 2011, Textiles comprised 19.7 percent of the waste stream. Food Waste (7.3 percent) and Compostable Paper (8.8 percent) also comprised a significant portion of the waste stream.

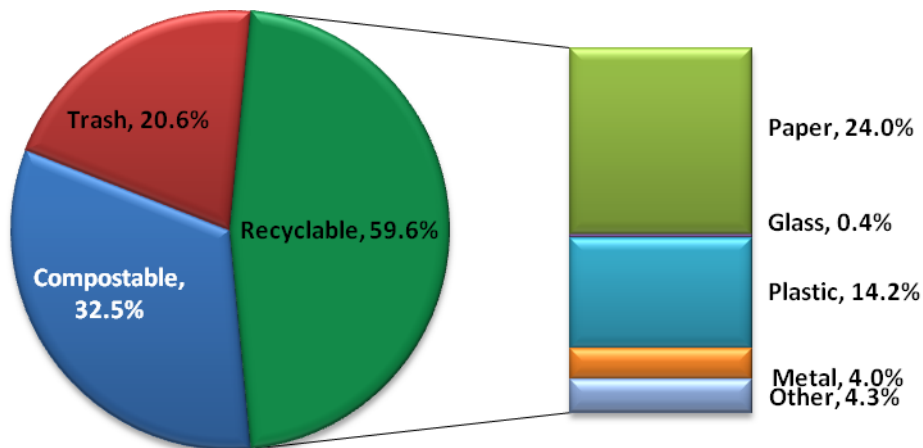
Recyclable paper comprised about 16 percent of the waste stream. The largest subcomponents in this category were White Office Paper (2.9 percent) and Paperboard (2.6 percent). The samples collected in December also had a large amount of concrete, which comprised 8.7 percent of the waste stream. Although this may not be typical of the year round waste stream, concrete is considered recyclable. **Exhibit 9** portrays the waste composition by recyclable, compostable, and trash materials. **Exhibit 9** is generated from the actual data collected, while **Exhibit 10** presents the alternate waste composition (omitting Textiles, Other Textiles, and Concrete). At the County Facilities, about 82 percent of the waste stream is considered recyclable or compostable.

Exhibit 9. Diversion Opportunities for County Facilities



In the alternate composition, Recyclable paper comprised about 24 percent of the waste stream. The largest subcomponents in this category were White Office Paper (4.1 percent) and Paperboard (3.9 percent). Recyclable Plastics comprised about 14.2 percent of the waste stream. The largest subcomponents in this category were Rigid Plastics (10.1 percent) and PET #1 Bottles (2.3 percent)

Exhibit 10. Diversion Opportunities for County Facilities – Alternate Composition



4 COMPARABLE RECYCLING PROGRAMS

SCHOOL SYSTEMS

Montgomery County Maryland Public Schools

Establishment and Participation in Recycling Team

Montgomery County Public Schools has created the School Energy and Recycling Team (SERT) to encourage and monitor recycling programs in public schools. Participation in SERT is mandatory and requires schools to submit a SERT Action Plan each year. The Montgomery County Government requires all public facilities to recycle 50 percent of all solid waste material generated. SERT facilitators are available to help engage school staff and students in an active recycling program.

Principals' support of the SERT team is strongly encouraged to establish school wide awareness and participation, to promote environmental stewardship and to ensure proper use of awards. SERT developed a Principal's Handbook to provide the energy conservation and recycling guidelines that should be followed for efficient building management. All schools are assigned a SERT facilitator based on their maintenance depot.

Benchmarking, Events, and Contests

SERT manages recycling data from all schools and monitors progress toward the 40 percent recycling goal. Monthly progress reports for each school and for the entire school system are posted to their website (www.montgomeryschoolsmd.org/departments/facilities/greenschoolsfocus/sert.shtm).

Exhibit 10 presents example recycling benchmarking reports.

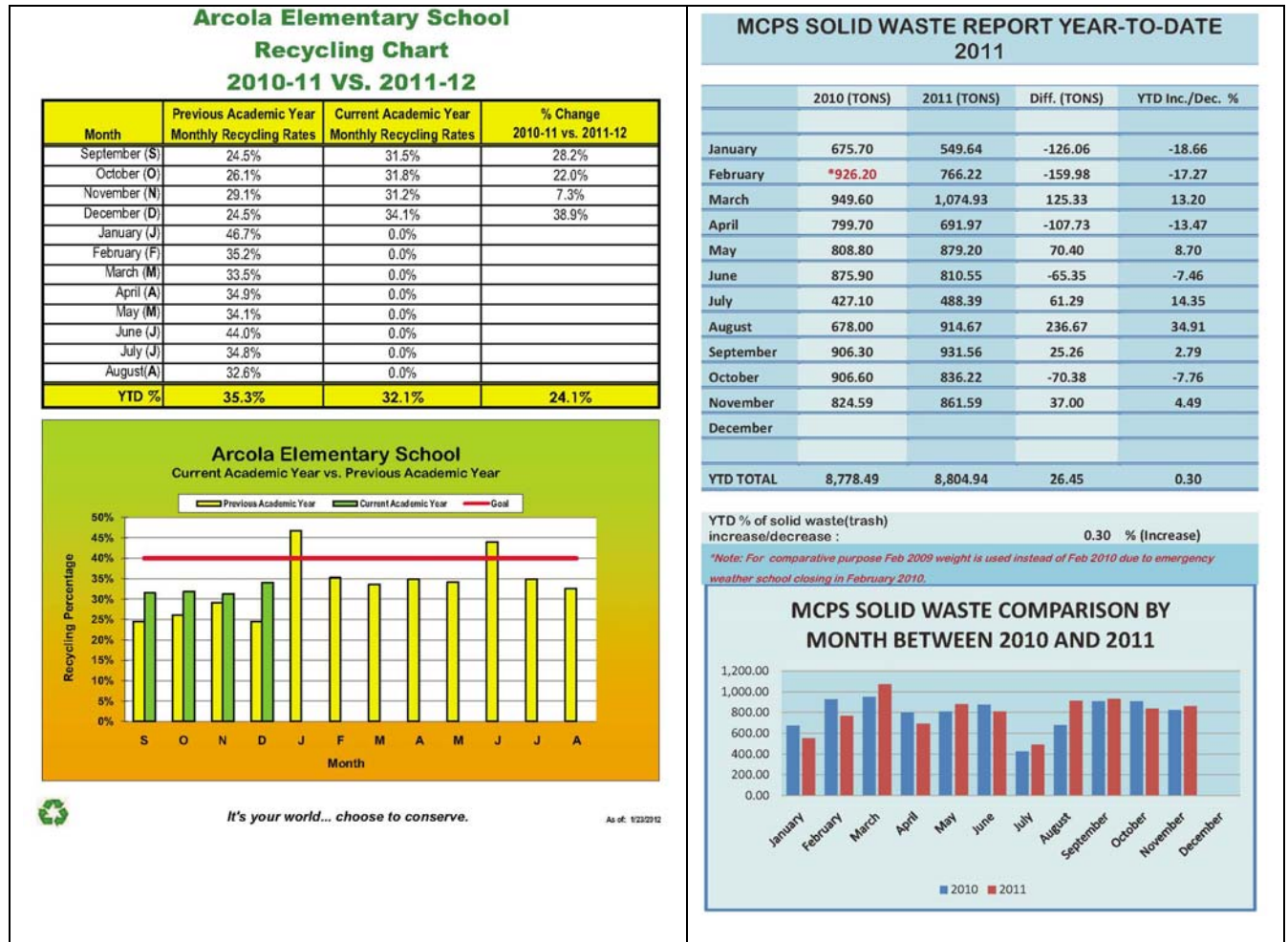
SERT sponsors or facilitates many recycling events throughout the year including:

- **Drive for Supplies Program** – This program encourages students to donate used, but usable school supplies (pens, pencils, crayons, note paper, glue, rulers, notebooks, etc.) at the end of the school year when they clean out their lockers, bookbags, and desks. Materials collected are donated to disadvantaged children. Local businesses can also participate: for example, SAIC donated 33 boxes of binders last school year. This program saves Montgomery County Public Schools (MCPS) money by reducing disposal costs while also reducing waste in community landfills.
- **Waste Free Lunch** – This program encourages students to make their lunch more earth friendly by adopting a few waste free ideas while packing your lunch such as using reusable containers for meals and drinks, eliminating use of plastic utensils which are not recyclable, and using cloth napkins. This program is promoted through flyers and the SERT website.
- **Cafeteria Tray Reduction** – This program encourages cafeterias to establish tray-free days or eliminate trays entirely. To promote this program the school broadcasts a video made by students on tray reduction to remind students that food will not be served on trays that particular day. All other times, the trays are placed away from the main serving

area. A student standing in the serving area will have to make a conscious effort in order to obtain a tray.

- **Field Trips Focused on Recycling and Waste Reduction** – This program encourages both elementary and secondary students to visit the County’s Recycling Center, Solid Waste Transfer Station, Waste-To-Energy Facility, and Composting Facility.

Exhibit 11. Benchmarking School Recycling



SERT also holds various recycling contests among individual schools including:

- **Recycling Spirit Contest** - SERT requests all high schools to demonstrate their recycling spirit by promoting recycling at all MCPS high school extracurricular activities. SERT encourages schools to increase awareness through delivering announcements at all MCPS sporting venues to promote responsible recycling. Schools can apply for a recycling award when they demonstrate their recycling spirit (cheers, chants, songs, skits, announcements, mascot, ushers, etc.). Awards are made in January for the previous Fall.

- **Lead by Example** – SERT requests all MCPS high schools to participate in the Lead by Example contest where proven projects/initiatives will be highlighted in the SERT manual “SERT Best Management Practices”. This on-line resource provides schools with proven conservation strategies and expectations with regard to efficient building use and operations. Entries can include behavioral strategies, energy efficiency projects, and awareness campaigns. SERT awards will be granted to the top three high schools along with certificates of participation for all participating students. Submissions should demonstrate the effectiveness of each project by creating a plan and measuring results.

Educational Resources

SERT’s website provides recycling resources such as signs, flyers, and posters for schools to download and print. Flyers cover topics such as ‘Tap and Stack Lunch Recycling’ which enforces the method for recycling food trays in cafeterias and announcements/reminders to participate in various recycling initiatives.

Chicago Public Schools (CPS)

Rewards Program

Each semester CPS awards top recyclers with gift cards ranging up to \$500 (up to \$1,000 per year) for meeting or exceeding their recycling targets. Recycling targets are specific to each school and are based on the size and number of students. Purchasing products with recycled content (paper, toner, folders, etc) through the CPS office supply vendor, Office Depot, will also fund a gift card to the school

The program is monitored by the recycling truck drivers, who record the volume of recyclables in the dumpsters each week. That volume is compared to the recycling target set for each school. Weekly reports are presented on their website (www.cps.edu/GoGreen/Pages/WasteandRecycling.aspx).

Composting Program

Chicago Public Schools have also incorporated back yard composting in some schools. Informational documents posted on their website make it easier for schools to implement this program. A comprehensive document details the steps required to begin a composting program. The document explains how to delegate responsibilities, obtain the necessary equipment, develop the collection process, and communicate the composting program. The document also contains troubleshooting information and tips on including composting in the science curriculum.

Appendix B presents “Composting in Chicago Public Schools” which is prepared by the Environmental Impact Initiative. This resource is a comprehensive guide to establishing and operating a successful composting program.

COLLEGE PROGRAMS

Penn State

Food Waste and Napkin Composting

Penn State has an Organic Materials Processing and Education Center where compost is manufactured by blending food residuals, leaves, manure, crop residue, and wood chips. Food waste is captured at cafeterias throughout the campus. The compost is used for campus landscaping projects, athletic field maintenance, and agricultural research and demonstration projects. Food waste composting has also reduced water usage, as less food is disposed via garbage disposal units. Each table in the dining halls has an information tent that often contains information about the recycling program or upcoming recycling events.

Recycling at Special Events

A notable strength in Penn State's recycling program is recycling at special events. In 1995, the Beaver Stadium Recycling Effort and the Bryce Jordan Recycling Effort were implemented. These events use Boy Scout volunteers to collect recyclables generated at football and basketball games. The proceeds from the sale of the collected material are donated to the United Way of Centre County.

Education and Outreach

Penn State also has a strong educational program to promote recycling around campus. The recycling program manager writes numerous letters and gives presentations to faculty, staff, and students, both individuals and organizations. Educational materials and initiatives include:

- Promotion of the Recycling Hotline;
- The RA recycling packet;
- Posters, banners, and pamphlets;
- Recycling fact sheet distributed to every employee and student on campus;
- Public Service Announcement videos;
- Beaver Stadium pictorial ad and video boards;
- Giveaways (mugs, shirts, hats, buttons, mouse pads, pencils, cozies, safety knives);
- Recycling promotions on trash collection vehicles; and
- Special Events.

University of Maryland (UM)

University of Maryland achieved a recycling rate of 63 percent in 2010, up from 17 percent in 2003.

Special Events

Recycling and Composting at special events such as football and basketball games has been very successful; over the course of seven home games, 59 tons of waste were diverted from landfills. The program includes 'valet recycling' at tailgating events. Composting and recycling bins are strategically located throughout the stands and high traffic areas.

Composting

The composting program at UM focuses on pre and post-consumer food waste and packaging in order to divert compostable waste. The Dining Services have eliminated the use of polystyrene and replaced those containers with a compostable product made from sugarcane.

Recycling Contests

Recyclemania is an eight-week-long contest sponsored by the Environmental Protection Agency. In 2011, 630 universities and colleges throughout the nation participated. Annual participation in the nationwide contest allows UM to benchmark their diversion rates and compare the success of their recycling program to other colleges throughout the country.

LOCAL GOVERNMENT FACILITIES

City of Bellevue, Washington

The City of Bellevue has been listed from 2007 to 2011 as one of King County's (Washington) Best Workplaces for Recycling and Waste Reduction. To qualify as a Best Workplace for Recycling, organizations had to meet at least 10 criteria out of a list of 33 good recycling practices. The City has increased waste diversion by expanding the types of items that can be recycled to include:

- All plastic containers (including hot and cold cups)
- Compostable service ware in their food service operations
- Block Styrofoam
- Compact fluorescent light bulbs
- Plastic lids

The City uses shadow boxes to educate employees on how to sort their recyclables.

In late 2010, the City conducted a waste sort to monitor progress toward their recycling goals and discovered that it had reduced the overall amount of waste generated. The City continues to promote zero-waste events, and all nine fire stations continue to recycle food waste after a successful pilot program. Other government facilities have had success by instituting green procurement programs, which can promote the use of recycled materials and cut down on packaging waste.

Pierce County, Washington

Sustainability Goals

Pierce County is striving to purchase 50 percent of office products containing recycled paper, reduce purchase and consumption of paper by 15 percent, increase recycling by 50 percent, and reduce landfill waste by 30 percent, by 2015. Pierce County is striving to reach a recycling rate of 25 percent in 2011.

Green Procurement

Pierce County monitors purchases of all products for recycled content. From 2008 to 2009 they increased the percentages of purchases with recycled content from 22 percent to 26 percent. The goal is to reach 50 percent by 2015.

Sustainability Manager

Pierce County received a grant from the Department of Energy to fund a Sustainability Manager position. The Sustainability Manager works with each department on environmental initiatives, including green purchasing and recycling.

Reporting

Each County Department reports their activities that lead towards a more sustainable workplace.

Activities include:

- Public works recycled 75 tons of tires for use in chip-sealing projects, and recycled obsolete aluminum road signs.
- Community Services houses a CFL recycling station in the lobby and recycles toner cartridges.
- Parks and Recreation expanded their recycling program from just paper to include more materials, attempted to eliminate plastic water bottles from special events, and provides/promotes recycling bins at special events.

5 PROGRAM IMPLEMENTATION AND RECOMMENDATIONS

CURRENT PRACTICES

CMS), County Facilities, and CPCC each have an Interlocal Agreement with Mecklenburg County for garbage collection services. The agreement authorizes the County to administer garbage collection services to these programs. This partnership has allowed for greater economies of scale by combining collection services for CMS, CPCC, and Mecklenburg County office buildings and facilities.

Mecklenburg County serves as the central point of contact for the dissemination of information pertaining to the internal recycling program for CPCC, CMS, and County Facilities. The County provides services including the following: waste collection from containers at CMS, City/County Facilities, and CPCC; educational posters and fliers; a contract administrator through the waste hauler; and a program manager.

Local governing laws require each CMS, CPCC, and Mecklenburg County facility to recycle paper and cardboard under Mecklenburg County's Source Separation Ordinance. New single stream recycling capabilities for CMS, CPCC and Mecklenburg County, allow all recyclable materials to be placed in the same dumpster and provide a greater range of potentially recyclable materials.

Charlotte- Mecklenburg Schools

The County currently provides trash and recycling services to 180 CMS locations. Each school location has a Recycling Coordinator to implement and facilitate the recycling program. According to interviews with custodial services, in most cases, the dumpsters are collected when close to full, but not overflowing. During some events such as the end of the school year, extra pickups are necessary. CMS could save money by increasing their diversion rate and therefore requiring fewer trash dumpster pickups. CMS estimated their recycling rate to be between 15 and 18 percent during the 2010-11 school year.

SCS conducted site visits at Barringer Elementary School, Mountain Island Elementary School, Carmel Middle School, David W Butler High School, and the Transportation Building at 3901 Craig Avenue. During the site visits, recycling operations were observed in order to provide recommendations on improving the recycling program.

At the schools visited, recycling bins were located in all of the classrooms and most of the faculty offices. Larger 35-gallon totes were located in the hallways and in common areas such as copy and break rooms. Some schools had recycling teams that were responsible for emptying classroom bins into the larger totes. Custodial services are responsible for emptying the totes into recyclable single stream dumpsters which are collected by Republic and delivered to the County's Materials Recovery Facility. All of the four schools visited were participating in milk carton recycling and had a dedicated container for milk cartons in the cafeteria.

The Bus Maintenance building at 3901 Craig Avenue was also visited. Most of the recycling activities at this location were related to auto maintenance (tires, antifreeze, oil, oil filters, and scrap metal). Employees here were under the impression that their dumpster was cardboard only. While the dumpster is labeled 'cardboard only' it can be used for single stream recycling. The dumpster is serviced by Republic Services Inc.

Central Piedmont Community College

The County provides service to 19 trash dumpsters on CPCC campuses throughout Mecklenburg County. According to interviews with custodial services, the dumpsters are collected when close to full, but not overflowing. During some events such as the end of the school year, extra pickups are necessary. CPCC could save money by increasing their diversion rate and therefore requiring fewer trash dumpster pickups.

SCS conducted site visits at Levine Information Technology Building, the Overcash Center, and the Sommers Administrative buildings. During the site visits, recycling operations were observed in order to provide recommendations on improving the recycling program.

At the buildings visited, recycling bins were noted in some classrooms and offices, but not all. Recycling bins were absent in most common areas such as hallways and food courts. Recycling bins were emptied into larger totes located in break rooms and copy rooms in each building. These totes are transferred by custodial staff to one of the three recyclables dumpsters located on campus. The recyclable dumpsters are single stream and serviced by Republic Services Inc.

County Facilities

The County provides service to 93 trash dumpsters for Mecklenburg County/City of Charlotte Facilities.

SCS conducted site visits at the Valerie C. Woodward Center at 3205 Freedom Drive and the Wallace H. Kuralt DSS building at 301 Billingsley Road. During the site visits, recycling operations were observed in order to provide recommendations on improving the recycling program.

At the buildings visited, recycling bins were located in almost all offices and workspaces. Recycling bins were observed in most copy and break rooms, but were usually not present in meeting and conference rooms. Employees are responsible for emptying their bins into larger totes located in hallways and break rooms. Custodial staff transfers the contents of the totes twice a week into single stream recyclable dumpsters which are serviced by Republic Services Inc.

PROGRAM WIDE INITIATIVES

Recycling

A County-wide committee could be established to develop standards and guidelines to enhance recycling between schools and offices. Periodic meetings of the committee could be used to

share challenges and successes. If appropriate, students could be allowed participate in the committee so that students play an active role in identifying and solving problems.

Such a committee could be charged with:

- Developing a consistent recycling logo throughout County Facilities, CMS, and CPCC. Consistent labeling on containers and in public education materials will allow greater recognition of the program by students, staff, faculty, and the public.
- Developing a more structured and reliable process for departments and offices to report annual recycling data/accomplishments.
- Identifying and applying for grant opportunities for new recycling program initiatives.

Procurement and Waste Reduction

Reuse Products and Supplies

Using durable, reusable products rather than single-use materials is one of the more effective waste prevention strategies. Examples include using ceramic mugs rather than disposable cups, reusing envelopes for interoffice mail, and reusing file folders and report binders. Posting notices in common areas and using email and electronic bulletin boards are means of communication with virtually no waste generated.

Electronic Documents

Prepare final versions of large documents in Portable Document File (PDF) format on CD as an alternative to the hard paper copy version. Minimize the number of documents that are printed – use electronic versions when practical. While writing letters or other documents, review the first proof on the computer screen rather than printing a draft.

Packaging

Use minimal or reusable packaging. Work with suppliers to minimize the amount of packaging used and to return shipping materials such as crates, cartons, and pallets for reuse; alternatively, save the packaging and reuse it for outgoing shipments. Promote the purchase of items in bulk to reduce packaging.

Reuse Construction Materials

Encourage acceptance of reused materials on construction contracts where the material will serve the intended purpose; e.g., using crushed concrete or asphalt as road base or chipped wood as mulch.

CHARLOTTE-MECKLENBURG SCHOOLS

The CMS system supports more than 141,000 students from kindergarten to 12th grade in 159 schools throughout the County. The school system employs about 18,000 teachers, support staff, and administrators. Serving almost 100,000 lunches daily, the cafeterias offer one of the greatest

diversion opportunities. Although milk carton recycling programs are in place in many cafeterias, the waste audit showed that a large amount of milk cartons from students' lunches are still in the waste stream. SCS toured several school buildings in order to make recommendations to improve the recycling program.

Program Success:

- Recycling containers in every classroom
- Carton recycling in cafeterias
- Student involvement in collection

Recommendations:

Recycling Bins in Offices

Some faculty offices were lacking recycling bins. The best management practice is to have a recycling bin everywhere there is a trash can so that it is never more convenient to throw recyclables in the trash.

Milk Carton Capture Rate

According to interviews with faculty, student participation in the carton recycling program was poor at times. According to the waste characterization activities, Gable Top and Aseptic containers comprised 5.6 percent of the waste stream at CMS. Reward programs and events should be considered to encourage student participation in the milk carton recycling program. Cafeterias could also make use of student monitors to remind other students to recycle their cartons when they clear their tables and conduct student training and demonstrations as Chicago Public Schools does.

Schools that have successful recycling programs typically follow best practices guidelines which includes consistent program monitoring and routine training and education for students, teachers and administrators. Schools with the best recycling programs assign these duties to someone who makes the recycling program a priority.

Signage and Education

Generally, insufficient posters, signage, and recycling education materials were observed during site visits. Posters and educational materials should be placed in the central collection areas to demonstrate that recycling is a priority. Maintaining a recycling program requires on-going effort. After each break or at the beginning of new school years, recycling education should be reinforced. Volunteer school programs or environmental clubs can be used to play a key role in educational activities.

A well-run public education campaign can increase the recycling rate of target materials up to 20 percent.

Student Participation

Students should be encouraged to actively participate in the recycling program. Students should form groups that create and present educational materials on the recycling program and the

importance of recycling. Field trips to material recovery facilities and waste processing facilities can provide students with hands-on experience and may spark interest in recycling programs.

Recycling at Events

During interviews with faculty, it was indicated that recycling at events, such as football games, was an area for improvement. Initiatives should be made to place recycling containers near trash cans during special events, especially those that generate large quantities of waste. Signage is of vital importance for special event recycling to ensure that trash is not placed into recycling bins.

Recycling at Transportation and Support Buildings

Recycling at a maintenance building that was visited was very limited. Although automotive fluids and parts were all recycled, the office staff was not aware that their dumpster was single stream, and that they could recycle mixed paper and comingled materials in it. The employees at this location were under the impression that their dumpster was cardboard only.

Recycling Events and Competitions

Students love classroom competitions and schools can take advantage of this by establishing a recycling contest in concert with other Earth Day activities. Classroom recyclables could be weighed for a period of time and the winning classroom rewarded appropriately. Students could also be encouraged to bring recyclables, such as paper, from home to increase participation. Local businesses could be approached to provide awards for the winners.

Backyard Composting Programs

Many schools have the resources and could use compost for science and horticulture classes. A pamphlet on backyard composting should be assembled that details the equipment required and the composting process. Composting can be included in science curriculums. A composting demonstration area could be established and compost used directly on school landscaping projects. According to the waste characterization, 51.4 percent of the waste stream is compostable.

Polystyrene Usage in Cafeterias

Replacing polystyrene with recyclable materials (PET, HDPE, or compostable trays and cups) will allow more dining materials to be diverted and recycled. According to the waste characterization, 3.7 percent of the waste stream is composed of polystyrene.

Recycling Bins in Kitchens

Steel/tin cans were noted during the waste characterization study. Recycling bins should be installed in kitchens near trash collection containers, and kitchen staff should be educated on recyclable materials.

Benchmark Recycling per School

The County could work with the waste collection company to record recyclables collected in each building. Track results and offer rewards for improvements and high diversion rates. Rates achieved can be highlighted in school newsletters.

CENTRAL PIEDMONT COMMUNITY COLLEGE

There are six CPCC campuses throughout Mecklenburg County, serving more than 70,000 students and employing more than 2,500 faculty and staff. CPCC has the basic infrastructure for a recycling program, including recycling dumpsters and bins in many classrooms. The waste composition study showed that there is substantial room for improvement in diverting recyclables from CPCC buildings. SCS toured several CPCC buildings in order to make recommendations to improve the recycling program.

Recommendations:

Accompany Trash Cans with Recycling Bins

During site visits, many rooms were noted to have only trash cans without recycling bins. All offices and classrooms should have a recycling bin. Placing bins in each of these spaces is the first step to a higher diversion rate. Trash cans in hallways, lobbies and other common areas should be accompanied by single stream recycling bins.

Signage and Education

Recycling bins, especially in high traffic areas, should be accompanied by posters and educational materials. New students and faculty should be briefed on the recycling program.

Recycling Events and Competitions

Individual buildings and campuses should participate in recycling events and competitions. Rewards for competitions would encourage student and faculty participation. The data generated from participating in competitions would allow CPCC to benchmark their recycling program and monitor future successes. Events such as *Recyclemania* are free to enter and provide free promotional materials.

Placement of Recycling Dumpsters

Under the current contract, recycling dumpsters are relatively inexpensive compared to trash removal dumpsters. The CPCC central campus currently has three dumpsters for about 28 buildings. Some buildings on the east side of the campus are relatively far from a recycling dumpster. More efficient dumpster placement would allow for higher diversion rates and less labor for custodial staff.

Outdoor Recycling Collection Containers

During site visits, trash collection containers were noted outside on sidewalks and in common areas. No accompanying recycling containers were noted. Recycling containers should be placed near trash collection containers in heavily traveled areas.

Contractor Participation

Contractors leasing space from the college, such as restaurants, should be required to participate in the recycling program. Recycling containers should be placed near trash cans in these areas.

Develop a Recycling Committee

Develop a more structured and reliable process for departments and offices to report annual recycling data/accomplishments, pursue grants, and monitor the budget. Appoint personnel to administrate and work on improving the recycling program.

Benchmark Recycling per Building

Work with the waste collection company to record recyclables collected in each building. Track results and offer rewards for improvements and high diversion rates. Rates achieved should also be highlighted in employee newsletters.

COUNTY FACILITIES

SCS visited the Valerie C. Woodward Center at 3205 Freedom Drive and the Wallace H. Kuralt Building at 301 Billingsley Road. These buildings primarily serve as offices for County employees. During site visits, single stream recycling bins were observed in practically every employee workspace. Employees are responsible for emptying their bins into toters placed in common areas. Confidential documents are collected by a private contractor, shredded, and recycled.

Program Success:

- Recycling containers in almost all offices and break rooms.
- Good employee participation.
- Confidential documents are shredded and recycled.

Recommendations:

Recycling Containers in Meeting and Conference Rooms

During site visits, it was noted that many meeting and conference rooms had trash bins, but no recycling bin. It is considered a best management practice to accompany all trash bins with recycling bins.

Signage and Education

Recycling bins, especially in high traffic areas, should be accompanied by posters and educational materials. New employees should be briefed on the recycling program, and existing employees should be refreshed often during staff meetings or through routine publications.

Recycling Events and Competitions

Employees should be encouraged to participate in recycling events and competitions. Competitions help to benchmark the recycling diversion rate and monitor the program's future successes. Many communities, in association with America Recycles Day, hold "Clean Out Your Files" days. Such events can easily be turned into friendly competitions to see which department can recycle the most material. Shredding services can be provided at events to ensure that confidential materials are properly managed.

Education on Single Stream Recycling

In some cases, employees do not realize they can recycle bottles/cans in the same collection containers as office/mixed paper. Many bins are labeled 'paper only'. While replacing all of these bins is cost prohibitive, stickers could be applied that would designate the bins as single stream and remind employees of potential recyclable materials. Simple signage could also be placed on walls near recycling bins.

Benchmark Recycling per Building

Work with the waste collection company to record recyclables collected in each building. Track results and offer rewards for improvements and high diversion rates. Rates achieved should also be highlighted in employee newsletters.

FURTHER STUDY

To continue to divert waste materials into a recycling or composting program, Mecklenburg County should supplement their existing studies and knowledge with the following actions:

1. **Assess Recycling Capture Rates:** The capture rate indicates the proportion of each material being "captured" by the recycling program. Information generated by the waste composition study can be used to estimate the quantity of each material disposed of in the waste stream. The quantity of recyclable materials in the waste stream should be compared to the quantity of materials diverted from the waste stream to assess how successful the recycling program is.
2. **Recycling Assessment:** Similar to the field activity performed for this study, a separate study should be conducted to assess the types, quantities, and condition of materials that are diverted to the recycling program. Sampling and hand-sorting waste materials diverted to the recycling program can educate participants about contamination issues and help the County negotiate costs/revenue with the hauler that collects recyclables.

Appendix A

SCS Health and Safety Plan

Appendix B
Chicago Public Schools Composting Handbook

Appendix C Site Sampling Schedule