Final Report

Statewide Waste Composition Study

Pennsylvania Department of Environmental Protection

April 2003

R·W·BECK

PENNSYLVANIA DEP
2001 STATEWIDE MSW CHARACTERIZATION STUDY

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EXECUTIVE SUMMARY

Introduction

In 2001 the Pennsylvania Department of Environmental Protection (DEP) retained R.W. Beck to perform a State-wide municipal solid waste (MSW) characterization study to better understand the composition of solid waste being disposed in Pennsylvania. The study was designed to estimate the composition of disposed MSW generated in the Commonwealth's six regions, as well as the State-wide aggregate composition. Understanding the quantity of recoverable materials remaining in the municipal waste stream will enable the Commonwealth to develop programs to target the diversion or recovery of these materials.

Project Objectives

Successful completion of the Pennsylvania Municipal Waste Composition Study has provided extensive solid waste and recycling planning data for use across the Commonwealth. Specifically, the project helps the Commonwealth meet the following objectives:

- Evaluate and validate County-level MSW disposal estimates currently compiled by DEP on an annual basis;
- Determine the aggregate composition of the Commonwealth's disposed MSW stream, as well as the composition of MSW in each of its six regions,
- For each region and for the Commonwealth as a whole, differentiate MSW composition from the residential and commercial generating sectors;
- For each region and for the Commonwealth as a whole, differentiate MSW composition from urban, suburban and rural areas;
- Provide additional insight into the composition of self-haul waste across the Commonwealth;
- Provide additional insight into the composition of roll-off box MSW across the Commonwealth; and
- Estimate the amount and composition of packaging versus non-packaging material in the Commonwealth's disposed MSW stream.

By meeting the objectives listed above, the 2001 Study provides data for use by solid waste and recycling planners in DEP and each of the Commonwealth's 67 counties and over 2,500 incorporated municipalities. Solid waste planners are better able to measure the effectiveness of current solid waste diversion programs, identify specific sub-sectors of the municipal solid waste stream that may be targeted for future recycling or diversion programs, and, if necessary, design future solid waste management facilities to process the solid waste stream. Each of these outcomes is

beneficial as the Commonwealth seeks additional municipal solid waste diversion opportunities that may be needed to maintain and exceed a 35 percent recycling rate.

Demographic Overview

Pennsylvania, the nation's 6th most populous state, spans a land area of almost 45,000 square miles. In 2000, Pennsylvania was home to 12.3 million people living in 5.2 million housing units with a mean annual household income of $51,100. Pennsylvania is comprised of 67 counties that are subdivided into six DEP planning regions based on geographical location. The communities within Pennsylvania vary from urban metropolitan areas such as Philadelphia and industrial centers such as Pittsburgh, through suburban regions outlying cities across the Commonwealth, down to thousands of small rural boroughs and townships that make up the majority of the Commonwealth's land area.

Table 1 presents the breakdown of Pennsylvania's 2,579 communities by region and by demographic origin (urban, suburban and rural). As shown, the majority of municipalities in the Commonwealth—almost 75 percent—are rural communities.

Table 1 Community Demographic Summary

Region	Number of Communities				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	6	94	293	393	15.2%
Northcentral	2	15	408	425	16.5%
Northwest	2	26	363	391	15.2%
Southeast	2	165	72	239	9.3%
Southcentral	5	108	437	550	21.3%
Southwest	4	254	323	581	22.5%
State Totals	**21**	**662**	**1,896**	**2,579**	100.0%
Pct. of total	**0.8%**	**25.7%**	**73.5%**	**100.0%**	

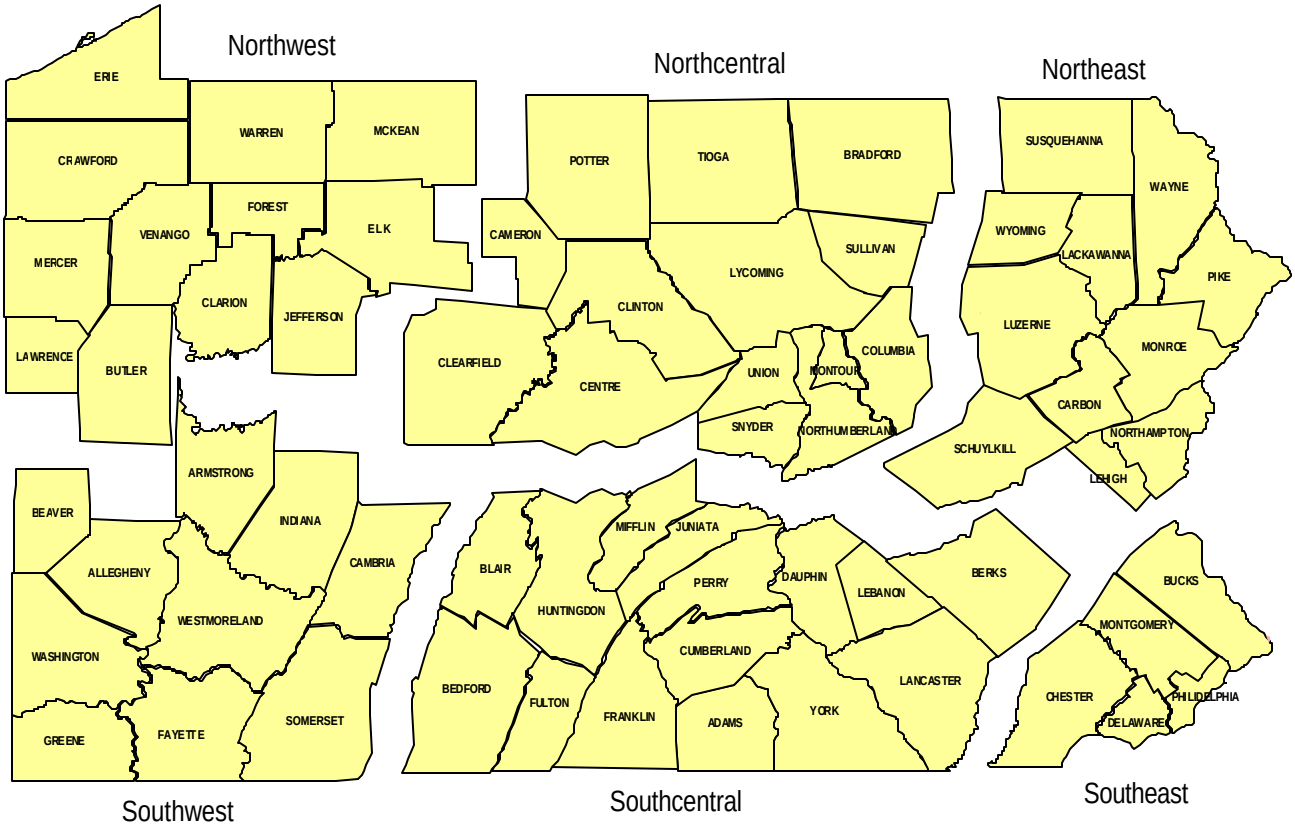
Table 2 presents a breakdown by population. Although most of the communities are rural, Pennsylvania's population is more evenly divided across urban, suburban and rural areas. By population, almost 45 percent of Pennsylvania residents reside in suburban areas, followed by rural areas and urban areas. It is of interest to note that although there are only 21 urban municipalities in the Commonwealth, 22 percent of Pennsylvania's population resides in these communities.

Table 2 Population Summary

Region	Population				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	323,762	589,788	710,318	1,623,868	13.2%
Northcentral	69,126	107,815	591,014	767,955	6.3%
Northwest	120,045	251,667	663,635	1,035,347	8.4%
Southeast	1,539,409	2,042,782	267,456	3,849,647	31.3%
Southcentral	276,890	926,053	1,181,392	2,384,335	19.4%
Southwest	391,178	1,540,325	688,399	2,619,902	21.3%
State Totals	**2,720,410**	**5,458,430**	**4,102,214**	**12,281,054**	**100.0%**
Pct. of total	**22.2%**	**44.4%**	**33.4%**	**100.0%**	

Figure 1 illustrates the geographic breakdown of the Commonwealth's six regions.

Figure 1 Pennsylvania Regions



Waste Generating Sectors and Disposal Quantities

This study sought to independently estimate the composition of disposed MSW from the following two generating sectors:

- **Residential Waste** – Solid waste collected by public or private haulers from single-family or multi-family residential dwellings; and
- **Commercial Waste** – Solid waste collected by public or private haulers from any non-residential source, such as offices, restaurants, retail establishments, malls, institutions, warehouses, hotels, etc.

For the purposes of this study, we have relied on landfilled and processed/incinerated material quantities that have been reported by the State's landfills and waste-to-energy facilities (Facility Reports). All Pennsylvania facilities permitted to handle MSW report landfilled/processed material receipts to the Division of Reporting and Fee

Collection on a quarterly basis. Materials are reported by county of origin. The Facility Reports database captured 9.3 million tons of MSW reported to be disposed in 2001.

Table 3 Summarizes the MSW reported to be disposed by region of origin in 2001.

Table 3 Regional MSW Disposal Quantities (Tons)

Region	MSW Tons
Northeast	1,281,588
Northcentral	469,179
Northwest	537,144
Southeast	3,572,730
Southcentral	1,636,192
Southwest	1,872,249
State Totals	**9,369,082**

Waste composition data has been collected for this study by region, by demographic origin, and by generating sector. For the purpose of aggregating waste composition data from these substreams into regional and state-wide averages, we relied on waste generation indicators. Waste generation indicators—such as population, employment, and number of households—combined with average municipal waste disposal rates collected from communities delivering their waste to facilities that hosted sorting events for this study were used to allocate the Commonwealth's total disposed waste stream into region, demographic area, and generating sector of origin. Table 4 summarizes this breakdown.

Table 4 Origin of Disposed MSW in Pennsylvania

Measure	Demographic Origin	Generating Sector Origin		
		Residential	Commercial	Total
Percentage	Urban	10.4%	16.7%	27.1%
	Suburban	26.2%	19.1%	45.3%
	Rural	17.6%	10.0%	27.6%
	Total	**54.3%**	**45.7%**	**100.0%**
Absolute Quantities [1]	Urban	976,187	1,564,279	2,540,466
	Suburban	2,459,299	1,785,064	4,244,363
	Rural	1,647,857	936,396	2,584,253
	Total	**5,083,343**	**4,285,739**	**9,369,082**

[1] Based on 2001 disposed MSW quantities as reported in Facility Reports.

The following observations can be made about the analysis shown in Table 4.

- **Generating Sector Origin**: Based on the methodology used to allocate State-wide disposed MSW totals, we estimate that approximately 54 percent of the Commonwealth's disposed municipal waste comes from residential generators, with 46 percent from commercial generators. This breakdown is in line with other composition and generation studies across the country that have attempted to evaluate the split between residential and commercial waste. Note that these numbers are estimates only, and that there are sources of both statistical and data-source error inherent in the estimates.
- **Demographic Origin**: Almost one half of the Commonwealth's disposed municipal waste stream comes from regions within the Commonwealth that are classified as suburban. Interestingly, almost equal quantities of waste come from urban areas and rural areas.
- **Residential Waste Origin**: Within the residential generating sector, the majority of waste again comes from suburban demographic areas. However, a significantly greater fraction of residential waste comes from the Commonwealth's rural areas as compared to urban areas.
- **Commercial Waste Origin**: Within the commercial generating sector, there is almost as much waste originating in urban areas as from suburban areas, with rural commercial waste trailing behind.

Based on available data from other regions of the country, we believe the 54/46 percent residential/commercial split is within ranges reported in other generation and composition studies across the country that have evaluated such a split.

Methodology

This section discusses the representativeness and breadth of sampling that took place for this study. A total of 1,634 samples were ultimately taken. These samples, collected over a twelve-month period, were intended to be representative of all of the waste disposed in the Commonwealth. Sample distribution and representativeness are discussed below.

Seasonality

It was important that the annual aggregate results reflected seasonal distribution of samples. Sampling was therefore distributed across all four seasons over a one-year time-frame. Table 5 summarizes the sort dates and samples taken by season.

Table 5 Seasonal Field Data Collection Schedule

Season	Sort Dates	Number of Samples		
		Physical	Visual	Total
Summer	July 16- September 3, 2001	286	103	389
Fall	September 24- November 16, 2001	290	122	412
Winter	January 7- March 15, 2002	298	113	411
Spring	April 1- June 17, 2002	311	111	422
Totals		**1,185**	**449**	**1,634**

Regional Distribution

Significant sampling was performed in all six regions of the Commonwealth. A total of 13 facilities ultimately hosted at least one week of field sampling and sorting, with the majority of the facilities hosting two weeks of sorting. Table 6 summarizes the facilities that hosted field sorting, as well as the seasons in which sorting occurred, the origin of waste, and the number of samples taken.

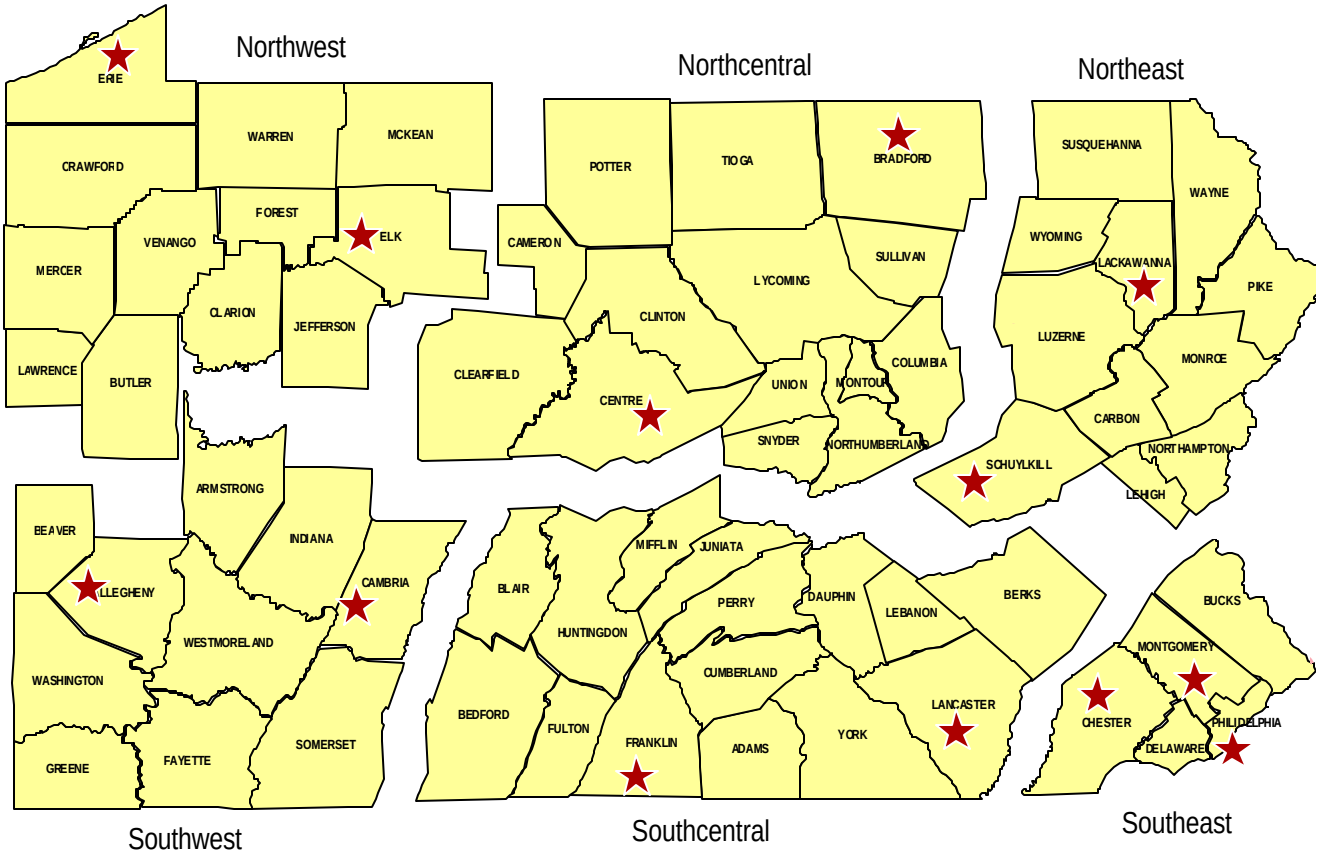
Table 6 Host Facility Summary

Region	Facility	Seasons of Sorting				Targeted Demographic Area(s) [1]	Samples Taken [2]
		Sum	Fall	Win	Spr		
Northeast	Keystone Landfill	✓		✓		U, S, R	129
	Commonwealth Environmental Systems (CES) Landfill		✓		✓	S, R	125
Northcentral	Centre County Solid Waste Authority Transfer Station	✓		✓	✓	U, S, R	195
	Bradford County Landfill		✓			R	57
Northwest	Superior Greentree Landfill	✓		✓		R	132
	Lake View Landfill		✓		✓	U, S, R	141
Southeast	Montgomery/Montenay RRF	✓				S	45
	TRC Transfer Station		✓		✓	U	104
	Chester County Landfill			✓	✓	S, R	123
Southcentral	Lancaster RRF	✓		✓		U, S, R	153
	Mountainview Landfill		✓		✓	S, R	153
Southwest	Laurel Highlands Landfill	✓		✓		U, S, R	139
	Imperial Landfill		✓		✓	U, S, R	138
Totals							**1,634**

[1] Key: U=urban, S=suburban, R=rural
[2] Includes both physical and visual samples

Figure 2 shows the locations of the 13 facilities that hosted field sorting.

Figure 2 Location of Host Facilities



Generating Sector Detail

To provide the greatest insight into the field sampling and sorting effort, the following types of incoming loads of MSW were differentiated in the study:

- Single family residential waste;
- Multifamily residential waste;
- Commercial waste;
- Self-haul waste; and
- Bulky/Roll-off waste.

These are described more fully in Section 3 of this report.

Sampling and Sorting

Field data collection included three primary tasks:

(1) Identifying and taking samples from targeted truckloads from the specified generating sectors and demographic areas;

(2) Physically sorting or visually surveying each sample into the target material categories; and

(3) Recording the weight (physical) or volume (visual) of sorted materials.

In addition to physically sorting most samples, an allowance was made to visually characterize samples that contained homogenous or primarily bulky items. A complete description of the sampling and sorting process is described more fully in Section 3 of this report.

Attainment of Targeted Samples

Overall, the original sampling plan targeted 1,224 physical samples and allowed up to 360 visual samples. Ultimately, the study obtained the targeted number of samples. However, after eliminating samples during the quality control process, 1,185 physical samples and 449 visual samples were ultimately retained for the analysis. This represents 97 percent of the targeted physical samples, and over 100 percent of the expected visual samples. As described below, these samples were distributed across the seasons, regions, generating sectors, and demographic areas targeted in the study.

Table 7 summarizes the distribution of samples compared to the study targets. As shown, 97 percent of the targeted physical samples and 125 percent of visual samples were ultimately obtained.

Table 7 Comparison of Targeted Vs Actual Samples by Demographic Area and Generating Sector

Region	Physically Sorted Samples			Visual Samples		
	Targeted	Actual	Coverage	Allotted [1]	Actual	Coverage
Urban	408	362	89%	120	136	113%
Suburban	408	386	95%	120	134	112%
Rural	408	437	107%	120	179	149%
Total	**1,224**	**1,185**	**97%**	**360**	**449**	**125%**
Residential	612	630	103%	180	131	73%
Commercial	612	555	91%	180	318	177%
Total	**1,224**	**1,185**	**97%**	**360**	**449**	**125%**

State-wide Aggregate Results

Results of the Pennsylvania Municipal Waste Composition Study were developed by aggregating individual sort results across demographic areas, generating sectors, and regions. Section 4 of this report contains detailed results about the composition of Pennsylvania's disposed MSW. Selected findings are presented below.

Figure 3 shows the breakdown of disposed MSW in Pennsylvania by major material group. As shown, Organics and Paper make up the largest fractions of the waste stream, followed by Inorganics, Plastic, Metals and Glass. This overall breakdown tracks with the composition of waste in most other areas of the country.

Figure 3 Pennsylvania State-wide Aggregate Disposed MSW Composition

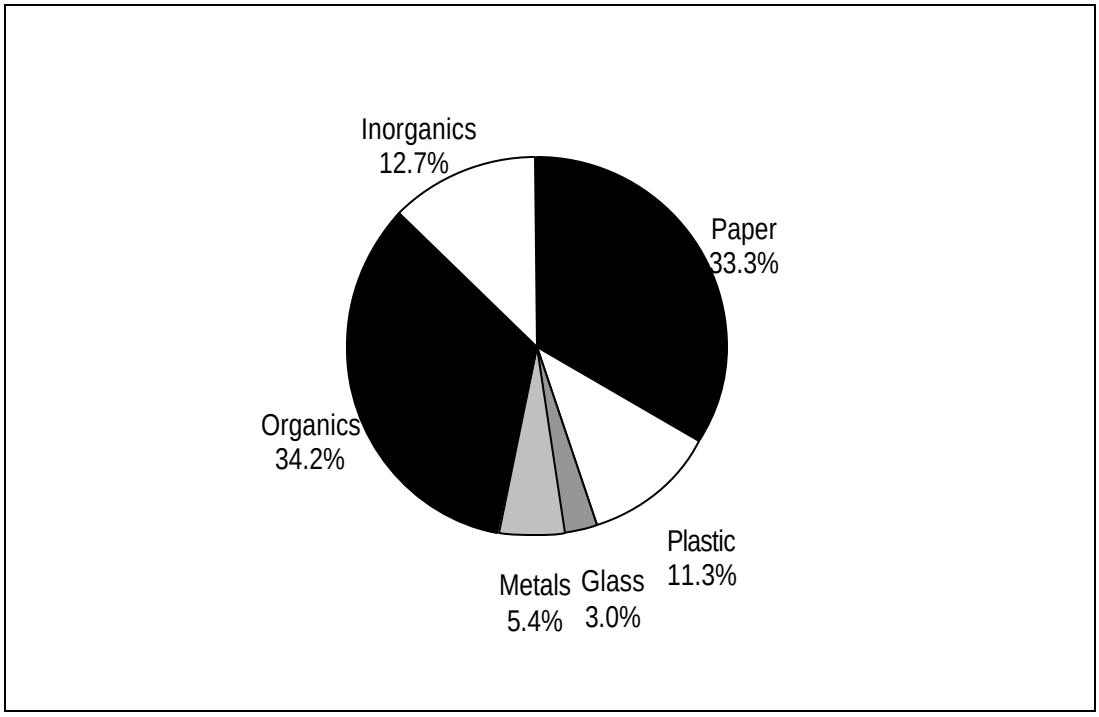


Figure 4 shows a bar graph of the actual tons of Pennsylvania MSW that are estimated to be disposed in the State's landfills (based on 2001 facility reports). In absolute terms, over 3.2 million tons of Organics and 3.1 million tons of Paper were disposed in 2001.

Figure 4 Pennsylvania State-wide Aggregate MSW Tons Disposed

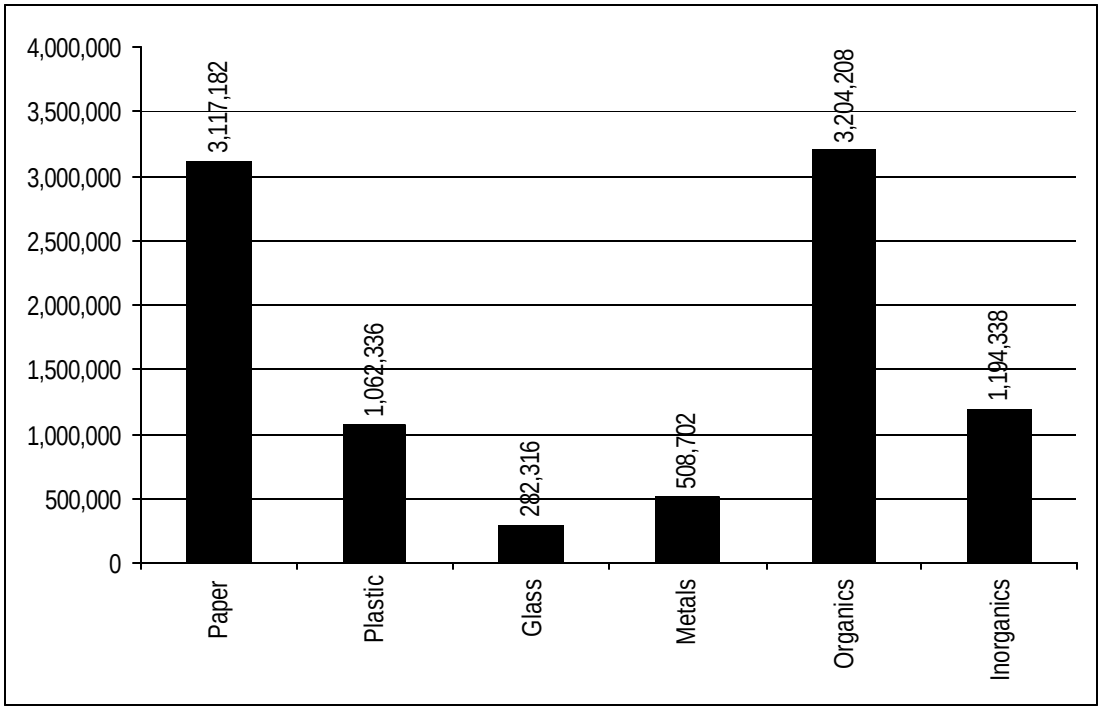


Figure 5 focuses on the quantity of Act 101-specified materials that were disposed. As shown, Corrugated Cardboard, Newspaper, and even High Grade Office Paper were found to be disposed in significant quantities in Pennsylvania, with recyclable containers at relatively lower disposal rates. This suggests that the residential recycling programs that target containers and some paper grades have been successful in recycling many of these materials prior to disposal. However, Corrugated Cardboard and High Grade Paper, which are predominantly generated in the commercial generating sector, appear to remain in the disposed municipal waste stream and could be targeted for future diversion.

Figure 5 Act 101 Recyclables in Disposed MSW

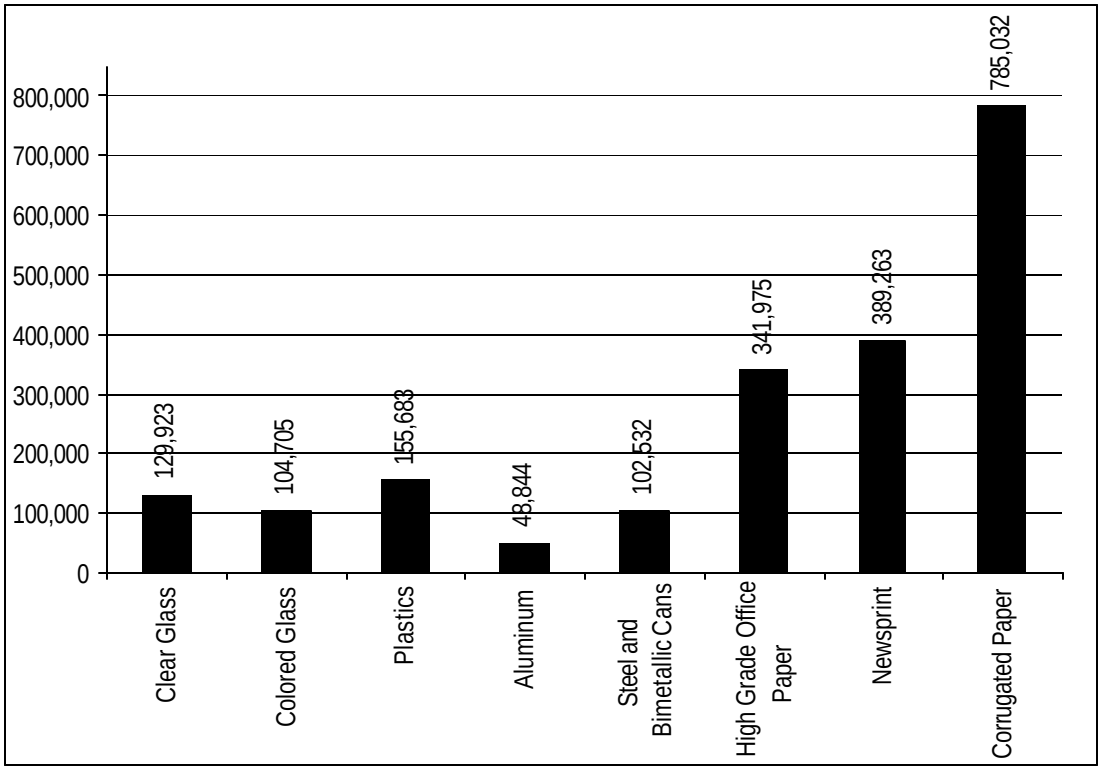


Figure 6 lists the top ten individual materials that were most prevalent in the State-wide disposed municipal waste stream. State-wide, Food Waste makes up the largest fraction of disposed waste at 12.0 percent, followed closely by Non-recyclable Paper (9.3 percent), Corrugated Cardboard (8.4 percent), Unpainted Wood (5.8 percent) and Film Plastic (5.0 percent). No other materials make up more than 4.8 percent of the State-wide waste stream. The top ten most prevalent materials make up 61.7 percent of the disposed municipal waste stream.

Figure 6 Top Ten Most Prevalent Materials Disposed in Pennsylvania

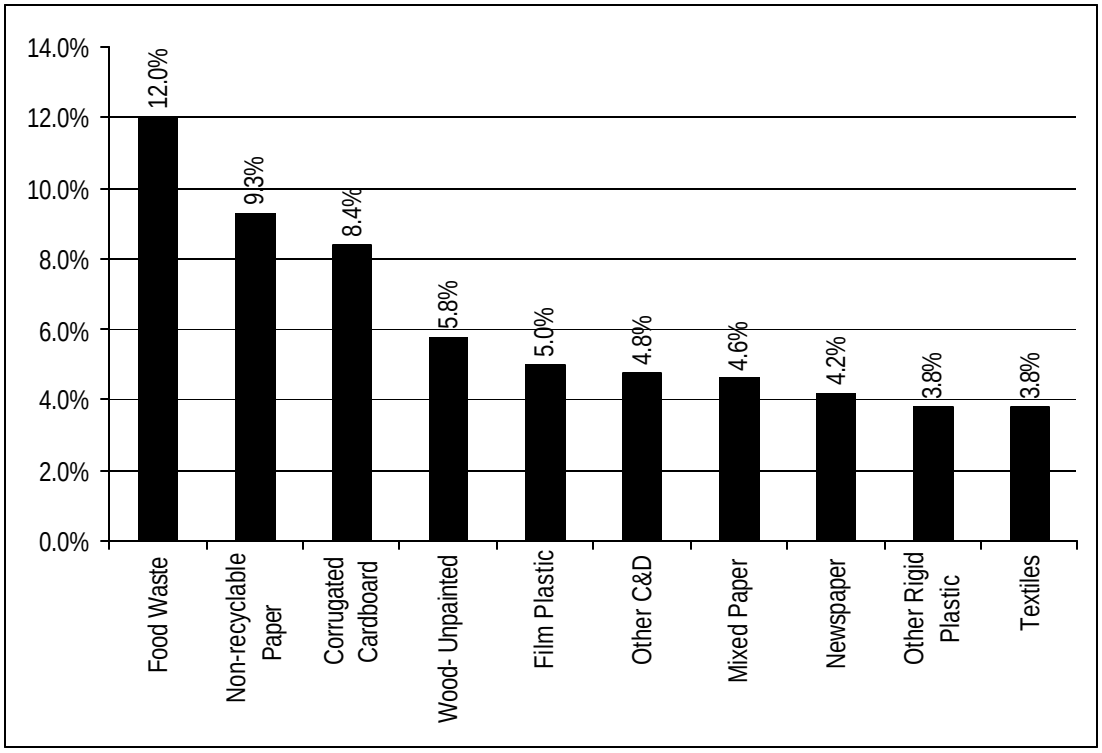


Figure 7 compares the actual tons disposed from each generating sector (based on an allocation of 2001 facility reports). Note that some of the difference between residential and commercial waste quantities is due to there being more residential waste in the disposed municipal waste stream State-wide.

Figure 7 Residential and Commercial Aggregate Tons Disposed

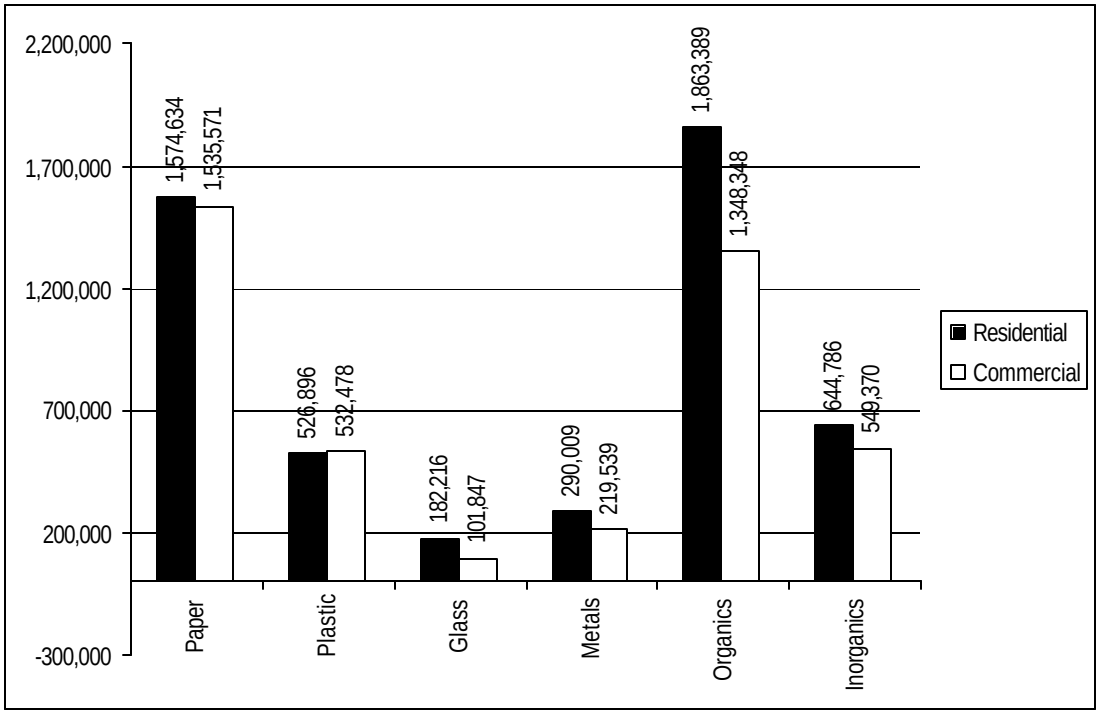
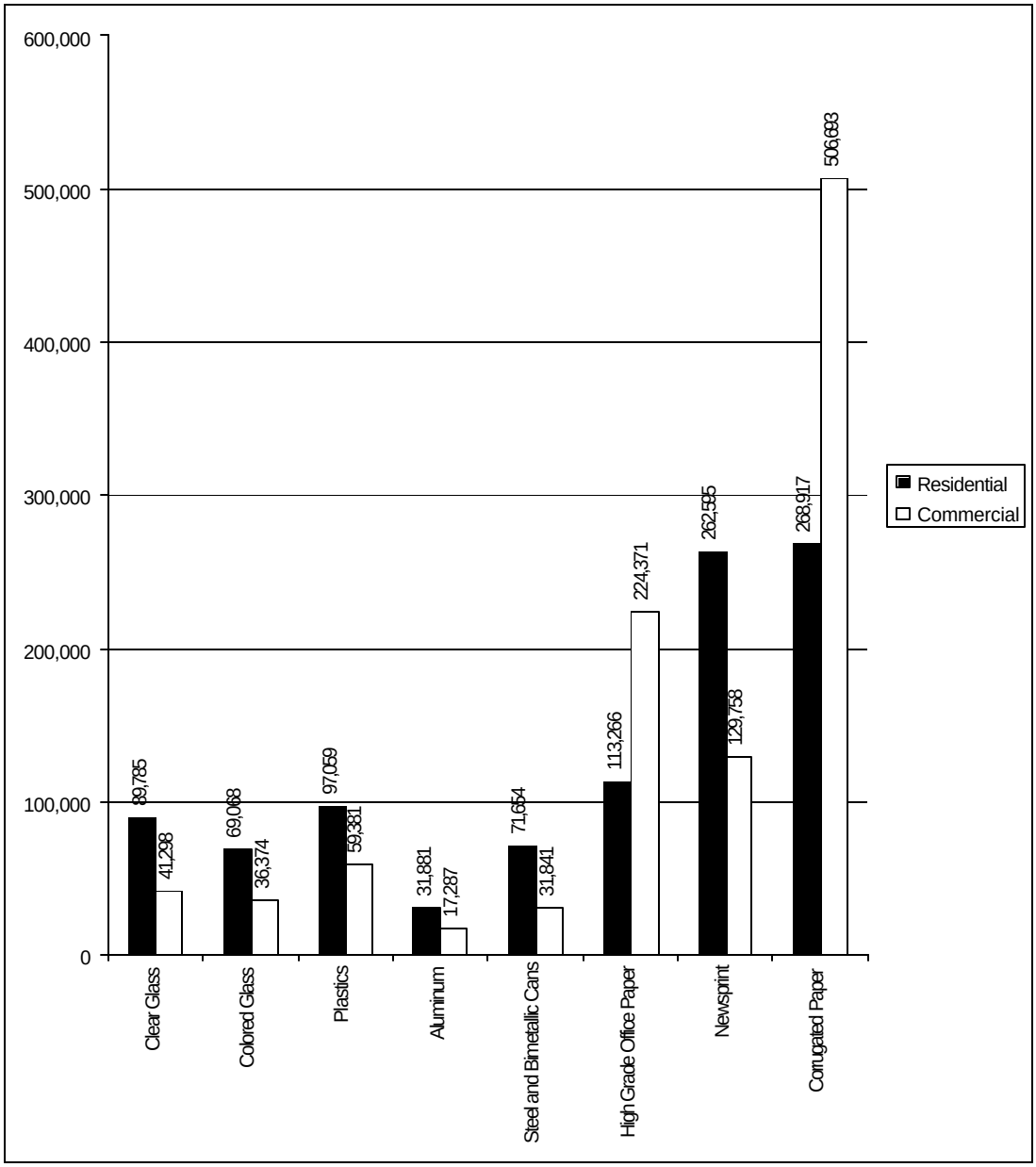


Figure 8 compares the quantity of materials defined in Act 101 that are being disposed from the residential and commercial waste streams. Note that the recyclable containers typically associated with residential recycling programs are being disposed in relatively small quantities. Only newspaper, which is also commonly collected in residential recycling programs, appears to be getting disposed in large quantities. Interestingly, the most commonly disposed material defined in Act 101—corrugated cardboard—is primarily coming from the commercial sector. This is also the case for high grade office paper. Such findings suggest that additional diversion opportunities exist for these materials in the commercial sector.

Figure 8 Act 101 Recyclables Disposed, by Generating Sector



Figures 9 and 10 divide the disposed municipal waste stream by demographic origin. Figure 9 compares the composition of urban, suburban, and rural residential waste by major material group. It is of interest to note that urban areas have the lowest percentage of paper, plastic, glass, and metals. Although beyond the scope of this study to determine the cause, it is likely that the State's residential recycling programs—which are more extensive in urban and suburban areas—are diverting more of these wastes in urban and suburban areas compared to rural areas. Figure 10 shows an opposite trend in terms of the percentage of paper, plastic, and glass being disposed. Disposed fractions of these materials are higher in urban areas and lower in rural areas.

Figure 9 Landfilled Residential Waste Composition by Demographic Origin

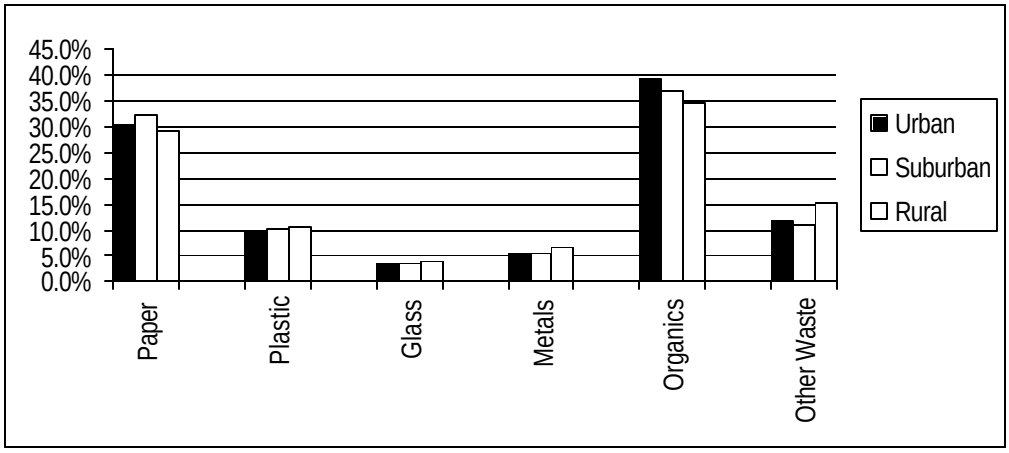
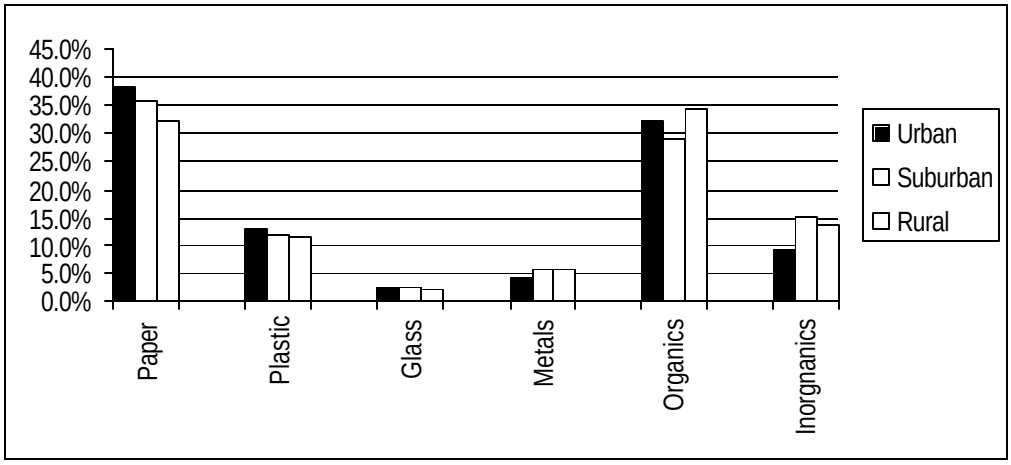


Figure 10 Landfilled Commercial Waste Composition by Demographic Origin



Complete State-wide sort results can be found in Section 4 of this report. Results by region can be found in Sections 6 through 11 if this report.

Packaging Analysis

Packaging and packaging materials make up a large fraction of the disposed MSW in Pennsylvania and across the country. To further evaluate the prevalence of packaging components in the disposed municipal waste stream, a packaging analysis was performed during the winter season of sorting. During all six weeks of sorting that took place during the winter season, all physical samples were divided into the 37 targeted material categories, and then split between packaging and non-packaging within each material category. Based on the 298 physically sorted samples taken in the winter season, a total of 19 material categories were found to contain at least some packaging or packaging components.

Figure 11 shows a pie chart of the composition of residential waste by major material group. As shown, roughly one-quarter (24.4 percent) of the disposed residential waste stream was found to be made up of packaging and packaging components. The top five packaging components in residential waste were found to be corrugated cardboard (5.7 percent), non-recyclable paper (2.6 percent), recyclable paper (2.3 percent), film plastic (2.2 percent), and steel cans (1.7 percent).

Figure 11 Packaging Composition of Residential Waste

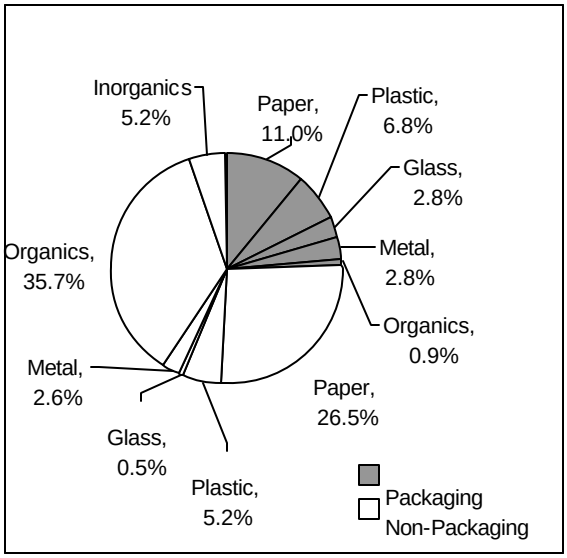
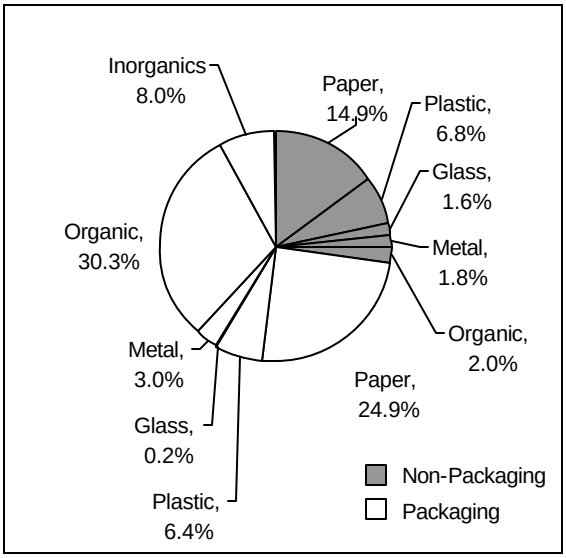


Figure 12 shows a pie chart of the composition of commercial waste by major material group. As shown, there was slightly more packaging in the commercial disposed waste stream (27.1 percent) compared to the residential stream. The top five most prevalent packaging components in the commercial waste stream were corrugated cardboard (11.2 percent), film plastic (2.1 percent), non-recyclable paper (1.9 percent), unpainted wood (1.7 percent), and other rigid plastic (1.6 percent).

Figure 12 Packaging Composition of Commercial Waste



Section 5 of this report contains additional details about the prevalence of packaging and packaging components in Pennsylvania's disposed municipal waste stream.

Availability of Data

The body of this report contains a wealth of information on the amounts and composition of disposed MSW generated in Pennsylvania. However, it is recognized that the value of this project will be optimized if the findings of the study can be made readily and electronically available to Pennsylvania's solid waste stakeholders.

Accordingly, DEP has provided additional options for interested parties to obtain and manipulate the municipal waste composition data compiled in this study. Subsequent to the delivery of this report, the following products will be generated and made available to interested parties across the Commonwealth:

- **Educational Video**: Details of the sampling and sorting process have been captured and will be published in an educational video. The video will provide an overview of the project, footage of the actual sampling and sorting, and summary state-wide aggregate results.
- **Waste Composition Computer Model**: This study captured over 1,600 samples of disposed MSW from across the Commonwealth. Although this report presents a

wide range of composition estimates by region, by demographic origin, and by generating sector, there may be solid waste and recycling planners who desire a more local view of their waste stream. To maximize the ability of interested stakeholders to view and download composition data that is applicable to their municipality, county or region, this project will also entail development of an Internet-based computer model to provide customized composition estimates. The computer model will apply regression analysis to a range of waste disposal indicators—such as solid waste program characteristics, population and employment—to estimate local municipal waste composition anywhere in the Commonwealth.

These work products are currently under development and will be available to the Commonwealth at the conclusion of the project.

Conclusion

The 2001 Pennsylvania Municipal Waste Composition Study provides comprehensive information about the composition and quantities of the Commonwealth's disposed municipal solid waste. This study places Pennsylvania at the forefront of the nation in terms of better understanding and managing solid waste. The information contained in the remainder of this report will be useful to solid waste and recycling planners throughout the State.

Complete details of the study background, methodology, State-wide results, and region-specific results are contained in the body of the report.

Section 1
INTRODUCTION

Introduction

In the last decade, Pennsylvania has made great strides in meeting the challenge of reducing the waste stream by promoting waste reduction, reuse and recycling. The Commonwealth met its original 25 percent recycling goal in 1996, two years ahead of schedule. When the Governor raised the goal to 35 percent in October 1998, the Commonwealth responded by once again meeting the goal early. The 35 percent recycling rate was met in 2001, one year ahead of schedule.

This recycling rate places Pennsylvania near the top of the nation in recycling efforts. Given an already high recycling rate, it is clear that finding additional recycling and diversion opportunities will be a great challenge. Increasing diversion even more will require a continued commitment to recycling. Certainly, the Commonwealth's efforts to educate and promote recycling will be important. However, to recover a higher percentage of materials that are currently targeted by recycling programs, and to identify and target potential additional materials, the Commonwealth would benefit greatly from better solid waste data.

Recognizing this need, in 2001 the Pennsylvania Department of Environmental Protection (DEP) retained R.W. Beck to perform a State-wide municipal solid waste (MSW) characterization study to better understand the composition of solid waste being disposed in Pennsylvania. The study was designed to estimate the composition of solid waste generated in the Commonwealth's six regions, as well as the State-wide aggregate composition. Understanding the quantity of recoverable materials remaining in the waste stream will enable the Commonwealth to develop programs to target the diversion or recovery of these materials.

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- For each region and for the Commonwealth as a whole, differentiate waste composition from urban, suburban and rural areas;
- Provide additional insight into the composition of self-haul waste across the Commonwealth;
- Provide additional insight into the composition of roll-off box MSW across the Commonwealth; and
- Estimate the amount and composition of packaging versus non-packaging material in the Commonwealth's disposed waste stream to evaluate compliance with the Safe Packaging Act (Act 1994-112).

By meeting the objectives listed above, the 2001 Study will provide data for use by solid waste and recycling planners in DEP and each of the Commonwealth's 67 counties and over 2,500 incorporated municipalities. Solid waste planners will be better able to measure the effectiveness of current solid waste diversion programs, identify specific sub-sectors of the solid waste stream that may be targeted for future recycling or diversion programs, and, if necessary, design future solid waste management facilities to process the solid waste stream. Each of these outcomes is beneficial as the Commonwealth seeks additional solid waste diversion opportunities that may be needed to maintain and exceed a 35 percent recycling rate.

Recycling Composition Study

Note that one of the components of the State-wide Waste Composition Study project was a series of recycling composition sorts at material recovery facilities (MRFs) across the Commonwealth. The results of the recycled material composition studies are not included in this report. Full results of the MRF sorts will be prepared in a separate report.

Report Organization

Due to the extensive quantity of data that is reported, there are 11 sections to this report, plus appendices:

Section 2 – Background. This section summarizes Pennsylvania's key demographic and solid waste system data that was considered in developing a comprehensive sampling plan. Additionally, this section includes an evaluation of the county-level waste disposal data currently compiled by DEP, which forms the basis of the aggregate results in subsequent sections.

Section 3 – Methodology. This section describes the sampling plan, field data collection procedures, sorting procedures, and visual sampling procedures used in the 2001 Study.

Section 4 – Statewide MSW Composition. This section of the report presents the results for the Commonwealth as a whole (i.e., all regions aggregated). Composition results are broken down by material type, by solid waste generating sector, and by demographic area.

Section 5 – Packaging Analysis. Pennsylvania legislature has targeted the hazardous substances mercury, lead, cadmium, and hexavalent chromium to be eliminated from packaging and packaging components. This section presents an analysis of the proportion and composition of packaging in the disposed MSW stream.

Section 6 – Northeast Regional Solid Waste Composition and Disposal Quantities. This section of the report presents the results for the Northeast Region.

Section 7 – Northcentral Regional Solid Waste Composition and Disposal Quantities. This section of the report presents the results for the Northcentral Region.

Section 8 – Northwest Regional Solid Waste Composition and Disposal Quantities. This section of the report presents the results for the Northwest Region.

Section 9 – Southeast Regional Solid Waste Composition and Disposal Quantities. This section of the report presents the results for the Southeast Region.

Section 10 – Southcentral Regional Solid Waste Composition and Disposal Quantities. This section of the report presents the results for the Southcentral Region.

Section 11 – Southwest Regional Solid Waste Composition and Disposal Quantities. This section of the report presents the results for the Southwest Region.

Appendix A – Solid Waste Material Definitions. This appendix presents the material definitions used in this study.

Appendix B – Solid Waste Characterization Study Data Collection Form. Field data for the study were collected via a customized field data recording form. A sample of this form is included in this appendix.

Acknowledgements

This study was completed with assistance from many organizations and individuals across the Commonwealth. We would specifically like to thank the following organizations and individuals for the assistance they provided throughout the project.

Host Facilities	
Bradford County Landfill (Burlington, Bradford County)	
Centre County Transfer Station (Bellefonte, Centre County)	
Chester County Landfill (Narvon, Chester County)	
Commonwealth Environmental Systems Landfill (Hegins, Schuylkill County)	
Imperial Landfill (Imperial, Allegheny County)	
Keystone Sanitary Landfill (Dunmore, Lackawanna County)	
Lake View Landfill (Erie, Erie County)	
Lancaster County RRF (Lancaster, Lancaster County)	
Laurel Highlands Landfill (Vintondale, Cambria County)	
Montenay Energy Resources of Montgomery County (Conshohocken, Montgomery County)	
Mountain View Landfill (Greencastle, Franklin County)	
Superior Greentree Landfill (Kersey, Elk County)	
TRC Transfer Station (Philadelphia, Philadelphia County)	
Local Sort Coordinators	
Tim Breneisen, Lancaster County	Kathy Jones, Erie County
Amy Ciccolo, PROP	Tanya McCoy-Caretti, Cambria County
Amy Farkas, PROP	Lori Robson, Northern Tier Solid Waste Authority
Nancy Fromnick, Chester County	Joanne Shafer, Centre County
Joyce Hatala, Lackawanna County	Bekki Titchner, Elk County

Section 2
BACKGROUND

Introduction

This section provides background information about the demographics, generator sectors, and disposed solid waste quantities in Pennsylvania. All of these variables were considered in developing a sampling plan for this study.

Demographic Overview

Pennsylvania, the nation's 6th most populous state, spans a land area of almost 45,000 square miles. In 2000, Pennsylvania was home to 12.3 million people living in 5.2 million housing units with a mean annual household income of $51,100. Pennsylvania is comprised of 67 counties that are subdivided into six DEP planning regions based on geographical location. The communities within Pennsylvania vary from urban metropolitan areas such as Philadelphia and industrial centers such as Pittsburgh, through suburban regions outlying cities across the Commonwealth, down to thousands of small rural boroughs and townships that make up the majority of the Commonwealth's land area.

From the outset of this project, an objective was to differentiate waste composition between urban, suburban and rural areas. Accordingly, this project has relied on a Commonwealth database that defines all 2,579 incorporated municipalities within Pennsylvania as either urban, suburban or rural[1]. Table 1 summarizes the number of communities in each DEP region that are urban, suburban and rural. As expected, the vast majority of the communities (73.5 percent) are rural. Only 21 municipalities, less than one percent, are characterized as urban.

[1] Source: Department of Environmental Protection

Table 1 Community Demographic Summary

Region	Number of Communities				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	6	94	293	393	15.2%
Northcentral	2	15	408	425	16.5%
Northwest	2	26	363	391	15.2%
Southeast	2	165	72	239	9.3%
Southcentral	5	108	437	550	21.3%
Southwest	4	254	323	581	22.5%
State Totals	**21**	**662**	**1,896**	**2,579**	100.0%
Pct. of total	**0.8%**	**25.7%**	**73.5%**	**100.0%**	

Source: U.S. Census 2001

Table 2 presents another picture of the urban, suburban and rural demographics of Pennsylvania. This table shows the population breakdown by region and by demographic sector. Although the vast majority of communities are rural (see Table 1), as shown in Table 2 the population residing in rural areas is much smaller. Suburban areas contain the highest percentage of Pennsylvania's population, followed by rural areas. Philadelphia County (located in the Southeast Region) accounts for 12.4 percent of the total state population and 56 percent of the total urban population in the Commonwealth.

Table 2 Population Summary

Region	Population				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	323,762	589,788	710,318	1,623,868	13.2%
Northcentral	69,126	107,815	591,014	767,955	6.3%
Northwest	120,045	251,667	663,635	1,035,347	8.4%
Southeast	1,539,409	2,042,782	267,456	3,849,647	31.3%
Southcentral	276,890	926,053	1,181,392	2,384,335	19.4%
Southwest	391,178	1,540,325	688,399	2,619,902	21.3%
State Totals	**2,720,410**	**5,458,430**	**4,102,214**	**12,281,054**	**100.0%**
Pct. of total	**22.2%**	**44.4%**	**33.4%**	**100.0%**	

Source: U.S. Census 2001

Table 3 shows the distribution of the number of households by region and by demographic sector, as well as the persons per household. This table was developed by applying county-specific persons per household estimates from the 2000 Census to the population of each county, and aggregating by region and by demographic area.

Note that the persons per household does not appear to vary greatly between demographic areas, although the regional variation is higher.

Table 3 Housing Summary

Region	Households				Persons per Household
	Urban	Suburban	Rural	Total	
Northeast	132,258	243,830	284,368	660,457	2.46
Northcentral	28,266	44,479	241,385	314,130	2.44
Northwest	48,013	101,496	267,390	416,899	2.48
Southeast	620,521	786,844	100,799	1,508,165	2.55
Southcentral	110,266	369,733	467,418	947,417	2.52
Southwest	168,881	654,008	283,027	1,105,916	2.37
State Totals	**1,108,206**	**2,200,390**	**1,644,387**	**4,952,983**	2.48
Persons/HH	**2.45**	**2.48**	**2.49**	**2.48**	

Source: U.S. Census 2001

Tables 4, 5 and 6 present similar summaries of the number of commercial establishments, employment, and gross sales receipts, respectively. As expected, these commercial data track relatively closely with population. As of 2001, the Commonwealth contained roughly 368,000 businesses with 4.2 million employees generating over 728 million in gross sales.

Table 4 Commercial Establishment Summary

Region	Number of Commercial Establishments				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	10,788	19,012	14,902	44,702	12.2%
Northcentral	2,253	4,328	12,737	19,318	5.3%
Northwest	3,796	9,787	18,148	31,731	8.6%
Southeast	42,383	67,952	7,370	117,705	32.0%
Southcentral	9,914	31,907	33,271	75,092	20.4%
Southwest	15,764	48,519	14,843	79,126	21.5%
State Totals	**84,898**	**181,505**	**101,271**	**367,674**	100.0%
Pct. of total	**23.1%**	**49.4%**	**27.5%**	**100.0%**	

Source: ESRI-BIS 2001 projections based on U.S. Census Bureau data

Table 5 Employment

Region	Employment				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	137,870	227,906	121,079	486,855	11.7%
Northcentral	34,212	48,735	118,387	201,334	4.8%
Northwest	54,357	122,076	167,848	344,281	8.2%
Southeast	465,733	841,068	63,202	1,370,003	32.8%
Southcentral	145,774	434,103	332,718	912,595	21.9%
Southwest	220,156	500,628	138,488	859,272	20.6%
State Totals	**1,058,102**	**2,174,516**	**941,722**	**4,174,340**	100.0%
Pct. of total	**25.3%**	**52.1%**	**22.6%**	**100.0%**	

Source: ESRI-BIS 2001 projections based on U.S. Census Bureau data

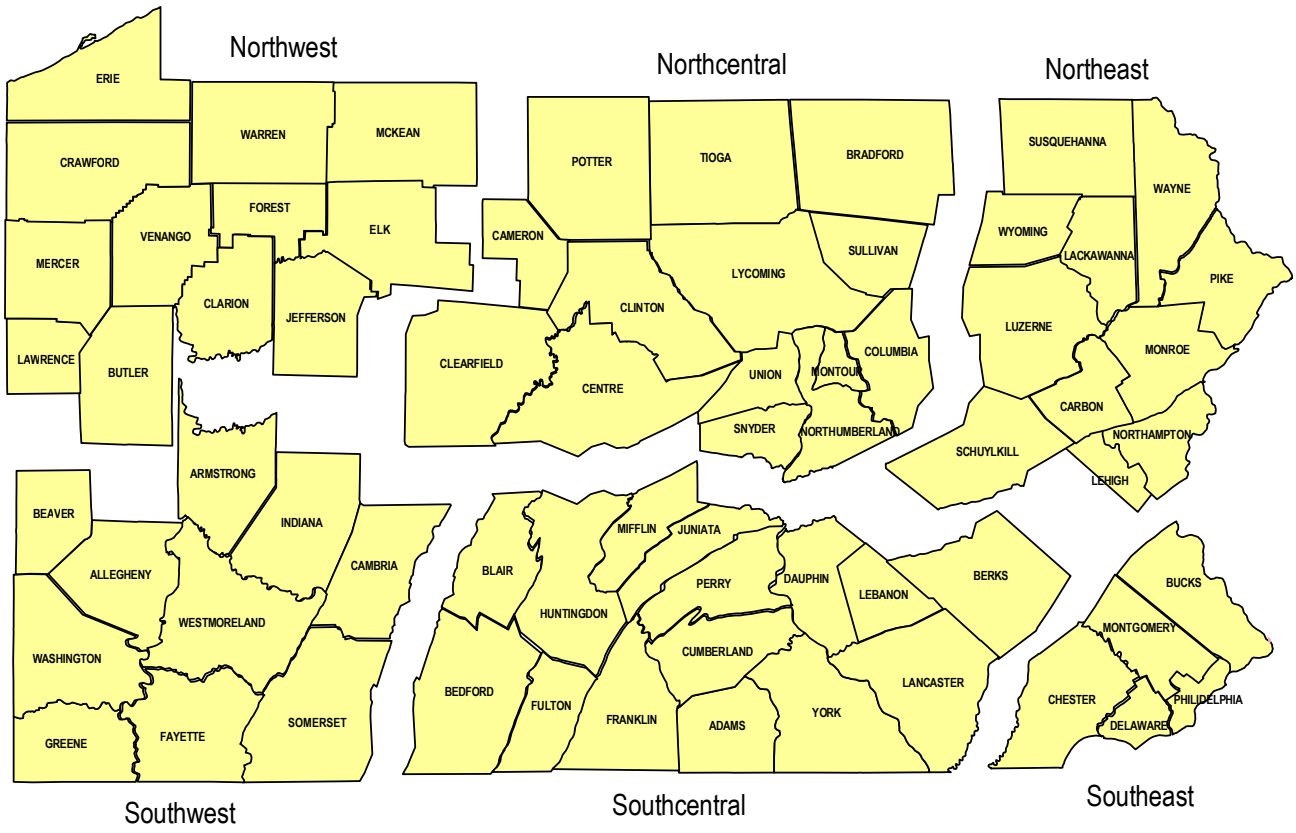
Table 6 Gross Sales Receipts

Region	Gross Receipts				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	$20,329,169	$43,816,581	$22,085,942	$86,231,692	11.8%
Northcentral	$4,769,629	$8,205,883	$19,322,419	$32,297,931	4.4%
Northwest	$8,189,540	$21,983,433	$31,976,162	$62,149,135	8.5%
Southeast	$63,009,874	$170,209,073	$12,168,363	$245,387,310	33.7%
Southcentral	$20,628,004	$79,548,884	$61,984,406	$162,161,294	22.3%
Southwest	$26,749,188	$87,530,172	$26,103,544	$140,382,904	19.3%
State Totals	**$143,675,404**	**$411,294,026**	**$173,640,836**	**$728,610,266**	100.0%
Pct. of total	**19.7%**	**56.4%**	**23.8%**	**100.0%**	

Source: U.S. Census 2001

Figure 1 illustrates the geographic breakdown of the Commonwealth's six regions.

Figure 1 Pennsylvania Regions



Waste Generating Sectors

This study sought to independently estimate the composition of waste from the following two generating sectors:

- **Residential Waste** – Solid waste collected by public or private haulers from single-family or multi-family residential dwellings; and
- **Commercial Waste** – Solid waste collected by public or private haulers from any non-residential source, such as offices, restaurants, retail establishments, malls, institutions, warehouses, hotels, etc.

Note that waste from large multi-unit dwellings such as apartments and condominiums is often collected by commercial front-end loading vehicles, and is therefore reported as "commercial waste" in some municipalities. Whenever possible, we attempted to treat waste from apartments and condominiums as residential waste, even if it was collected on so-called commercial trucks.

Throughout the study, data collection and analysis was performed to differentiate between these two generating sectors.

Waste Disposal Quantities

This section is divided into two subsections:

- County-level waste disposal data; and
- Apportionment of disposed waste.

County-Level Waste Disposal Data

The purpose of the field sampling and sorting that was performed for this project was to definitively characterize the composition of disposed[2] municipal solid waste (MSW). Accordingly, we have relied on landfilled and processed/incinerated material quantities that have been reported by the State's landfills and waste-to-energy facilities (Facility Reports). All Pennsylvania facilities permitted to handle MSW report landfilled/processed material receipts to the Division of Reporting and Fee Collection on a quarterly basis. Materials are reported by county of origin. The Facility Reports database captured 9.3 million tons of MSW reported to be disposed in 2001.

Table 7 Summarizes the MSW reported to be disposed by region of origin in 2001.

[2] The terms "disposed " and "disposal," as used throughout the report, are intended to include municipal waste that is delivered to a municipal waste landfill or to a municipal waste processing facility such as a transfer station or resource recovery facility. It excludes source-separated recyclables that are delivered to a recycling facility or green waste (leaves, grass, yard waste) delivered to a composting facility.

Table 7 Regional MSW Disposal Quantities (Tons)

Region	MSW Tons
Northeast	1,281,588
Northcentral	469,179
Northwest	537,144
Southeast	3,572,730
Southcentral	1,636,192
Southwest	1,872,249
State Totals	**9,369,082**

We have opted to use the Facility Report database as a basis for aggregating disposed waste composition percentages in the remainder of our analysis. This data source was selected because it is based on a consistent reporting process that encompasses all Pennsylvania MSW facilities. Accordingly, the original sampling plan was based on the Facility Reports. However, to minimize the focus on the absolute quantities, we have opted to focus on State-wide and regional material quantity breakdowns in terms of percentages, rather than absolute tons. Where absolute material quantities are shown, they reflect the disposal quantities from the Commonwealth's Facility Reports.

Apportionment of Disposed Waste

Starting with the Facility Reports for the State-wide analysis, we have used a four-step process to apportion the Commonwealth's disposed waste stream by region, by generating sector (residential or commercial), and by demographic origin (urban, suburban and rural). These steps are described below:

1) Compile residential waste disposal rates by demographic sector;
2) Project aggregate residential waste disposal based on the residential waste disposal rates;
3) Statistically analyze and adjust county-level waste disposal totals (as reported in the Facility Reports); and
4) Calculate disposed commercial waste by netting out residential waste from county-level totals.

Throughout the study, R. W. Beck contacted many municipalities to verify the origin of samples taken at the 13 host facilities that participated in the study. When available during these telephone conversations, we also gathered information about residential waste collection and disposal. Many municipalities provide (or contract for) refuse collection for all residential households within the jurisdiction. These jurisdictions would be expected to have accurate annual residential waste disposal data, as well as detailed customer counts (i.e., number of households served, including single family and multi-family). Table 8 presents residential waste disposal rates for those

communities that were found during the study to maintain detailed quantity and customer base information.

Table 8 Residential Waste Disposal Rates

Demographic Sector	Municipality	Region	Number of Units	Tons Disposed	Disposal Rate (tons/year)	Average Rate (tons/year)
Urban	City of Erie	NW	38,000	31,000	0.82	0.93
	Scranton City	NE	32,637	31,049	0.95	
	Sharon Borough	NW	2,380	2,265	0.95	
	State College Borough	NC	3,155	3,180	1.01	
Suburban	Blakley Borough	NE	2,802	3,188	1.14	1.18
	Centre Regional COG	NC	10,501	9,521	0.91	
	Dickson City Borough	NE	2,663	3,000	1.13	
	Dunmore Borough	NE	5,996	7,000	1.17	
	East Brandywine Township	SE	2,168	2,481	1.14	
	East Hempfield Township	SC	6,344	8,083	1.27	
	East Petersburg	SC	1,780	1,944	1.09	
	Lancaster Township	NW	3,975	5,051	1.27	
	Littz Borough	SC	3,245	4,421	1.36	
	Moosic Borough	NE	2,250	2,023	0.90	
	Plymouth Township	NE	4,463	6,956	1.56	
	Wesleyville Borough	NW	1,323	1,395	1.05	
	West Conshohocken	SE	500	695	1.39	
Rural	East Donegal Township	SC	1,700	1,947	1.15	1.06
	Frackville	NE	1,732	1,740	1.00	
	Mahanoy City	NE	2,109	2,164	1.03	
	Mount Joy Borough	SC	2,250	2,484	1.10	
	West Donegal Township	SC	2,194	2,216	1.01	

As shown in Table 8, the average residential waste disposal rates vary by demographic origin. These data suggest that urban households dispose of the least waste, followed by rural households. Suburban households dispose of the most waste. We note anecdotally that the rural communities shown above may not be representative of the range of rural communities in the Commonwealth, primarily because the communities in our survey provided collection to all households within their boundary. In many rural areas, there is no mandatory collection, which may result in waste being incinerated on site, composted, or illegally dumped. Note again that the residential waste disposal data points collected during the project were not selected based on representative sampling methods. It may be possible to improve on these estimates

with future representative surveying of additional urban, suburban and rural communities.

By applying these residential waste disposal rates to county-level household data, and proceeding through the steps described at the outset of this subsection, we have arrived at a breakdown of waste disposal from urban, suburban, and rural communities, including the residential and commercial waste streams. Table 9 summarizes this breakdown.

Table 9 Origin of Disposed Waste in Pennsylvania

Measure	Demographic Origin	Generating Sector Origin		
		Residential	Commercial	Total
Percentage	Urban	10.4%	16.7%	27.1%
	Suburban	26.2%	19.1%	45.3%
	Rural	17.6%	10.0%	27.6%
	Total	**54.3%**	**45.7%**	**100.0%**
Absolute Quantities [1]	Urban	976,187	1,564,279	2,540,466
	Suburban	2,459,299	1,785,064	4,244,363
	Rural	1,647,857	936,396	2,584,253
	Total	**5,083,343**	**4,285,739**	**9,369,082**

[1] Based on 2001 disposed MSW quantities as reported in Facility Reports.

The following observations can be made about the analysis shown in Table 9 above.

- **Generating Sector Origin**: Based on this methodology used to allocate State-wide disposed waste totals, we estimate that approximately 54 percent of the Commonwealth's disposed waste comes from residential generators, with 46 percent from commercial generators. This breakdown is in line with other composition and generation studies across the country that have attempted to evaluate the split between residential and commercial waste. Note that these numbers are estimates only, and that there are sources of both statistical and data-source error inherent in the estimates.
- **Demographic Origin**: Almost one half of the Commonwealth's disposed waste stream comes from regions within the Commonwealth that are classified as suburban. Interestingly, almost equal quantities of waste come from urban areas and rural areas.
- **Residential Waste Origin**: Within the residential generating sector, the majority of waste again comes from suburban demographic areas. However, a significantly greater fraction of residential waste comes from the Commonwealth's rural areas as compared to urban areas.
- **Commercial Waste Origin**: Within the commercial generating sector, there is almost as much waste originating in urban areas as from suburban areas, with rural commercial waste trailing behind.

Based on available data from other regions of the country, we believe the 54/46 percent residential/commercial split is within ranges reported in other generation and composition studies across the country that have evaluated such a split.

Section 3
METHODOLOGY

Introduction

The sampling plan for the State-wide Waste Composition Study was designed to achieve statistical representation by region, demographic area, and generating sector. A detailed sampling plan was included with the original scope of work for this study, which was subsequently refined prior to implementing the actual field data collection efforts. As a result of this sampling plan, a total of 1,185 samples were physically sorted, with another 449 samples visually characterized. The sections below describe significant elements of the sampling plan, as well as a summary of the sample breakdown.

Material Definitions

R. W. Beck worked with DEP to define a list of disposed MSW material types that are of greatest interest to the Commonwealth's solid waste and recycling planners. Ultimately, a list of 37 individual materials, categorized into six major material groups, were defined for the purposes of the study. The final list of materials that were analyzed in the study are shown below in Table 1. Detailed definitions are contained in Appendix A

Table 1 Targeted Materials in Disposed MSW

Paper	**Metals**
Newspaper	Steel Cans
Corrugated Cardboard	Aluminum Cans
Office/High Grade Paper	Other Ferrous Metals
Magazine/Glossy Paper	Other Aluminum
Polycoated/Aseptic Containers	Other Nonferrous Metals
Mixed Paper (Recyclable)	**Glass**
Other Paper (Non-recyclable)	Clear Glass Containers
Plastic	Green Glass Containers
#1 PET Bottles	Brown Glass Containers
#2 HDPE Bottles	Non-Recyclable Glass
#3 - #7 Bottles	**Organics**
Expanded Polystyrene	Yard Waste—Grass
Film Plastic	Yard Waste—Other
Other Rigid Plastic	Wood—Unpainted
Inorganics	Wood—Painted
Electronics	Food Waste
Carpet	Textiles
Drywall	Diapers
Other C&D	Fines
Household Hazardous Waste	Other Organics
Other Inorganics	

Seasonal Sample Distribution

Waste composition has been shown to vary by season. Certain components of the MSW stream—such as yard waste, construction and renovation debris, and selected packaging materials—are known to occur in the waste stream more frequently in one or more seasons. To assure that the study results accurately captured variability associated with seasonal changes in the waste stream, field data collection was performed across a full 12 month timeframe.

In total, four seasonal sampling and sorting events were performed, with each event featuring six weeks of field sorting. Field data collection was initiated in the summer of 2001, and concluded in the spring of 2002. Table 2 summarizes the dates of each of the four seasons of field sorting, as well as the number of samples obtained each season.

Table 2 Seasonal Field Data Collection Schedule

Season	Sort Dates	Number of Samples		
		Physical	Visual	Total
Summer	July 16- September 3, 2001	286	103	389
Fall	September 24- November 16, 2001	290	122	412
Winter	January 7- March 15, 2002	298	113	411
Spring	April 1- June 17, 2002	311	111	422
Totals		**1,185**	**449**	**1,634**

Host Facility and Regional Overview

Significant sampling was performed in all six regions of the Commonwealth. In order to obtain a range of samples from different demographic areas and generating sectors in each region, it was important to select host facilities that received representative waste from each region.

A total of 13 facilities ultimately hosted at least one week of field sampling and sorting. At most of the facilities, two weeks of sorting was performed, with the two weeks separated by six months to obtain seasonally opposite samples (e.g., sorting was either done in summer and winter, or in fall and spring). In general, we were successfully able to obtain the targeted distribution of samples at only two facilities in each region. However, due to the low occurrence of rural communities in the Southeast Region, a third facility was added to allow samples to be obtained from all targeted demographic areas.

Table 3 summarizes the facilities that hosted field sorting, as well as the targeted demographic areas surrounding each facility, the seasons in which sorting occurred, and the number of samples obtained from that facility.

Table 3 Host Facility Summary

Region	Facility	Seasons of Sorting				Targeted Demographic Area(s) [1]	Samples Taken [2]
		Sum	Fall	Win	Spr		
Northeast	Keystone Landfill	✓		✓		U, S, R	129
	Commonwealth Environmental Systems (CES) Landfill		✓		✓	S, R	125
Northcentral	Centre County Transfer Station	✓		✓	✓	U, S, R	195
	Bradford County Landfill		✓			R	57
Northwest	Superior Greentree Landfill	✓		✓		R	132
	Lake View Landfill		✓		✓	U, S, R	141
Southeast	Montgomery/Montenay RRF	✓				S	45
	TRC Transfer Station		✓		✓	U	104
	Chester County Landfill			✓	✓	S, R	123
Southcentral	Lancaster RRF	✓		✓		U, S, R	153
	Mountainview Landfill		✓		✓	S, R	153
Southwest	Laurel Highlands Landfill	✓		✓		U, S, R	139
	Imperial Landfill		✓		✓	U, S, R	138
Totals							**1,634**

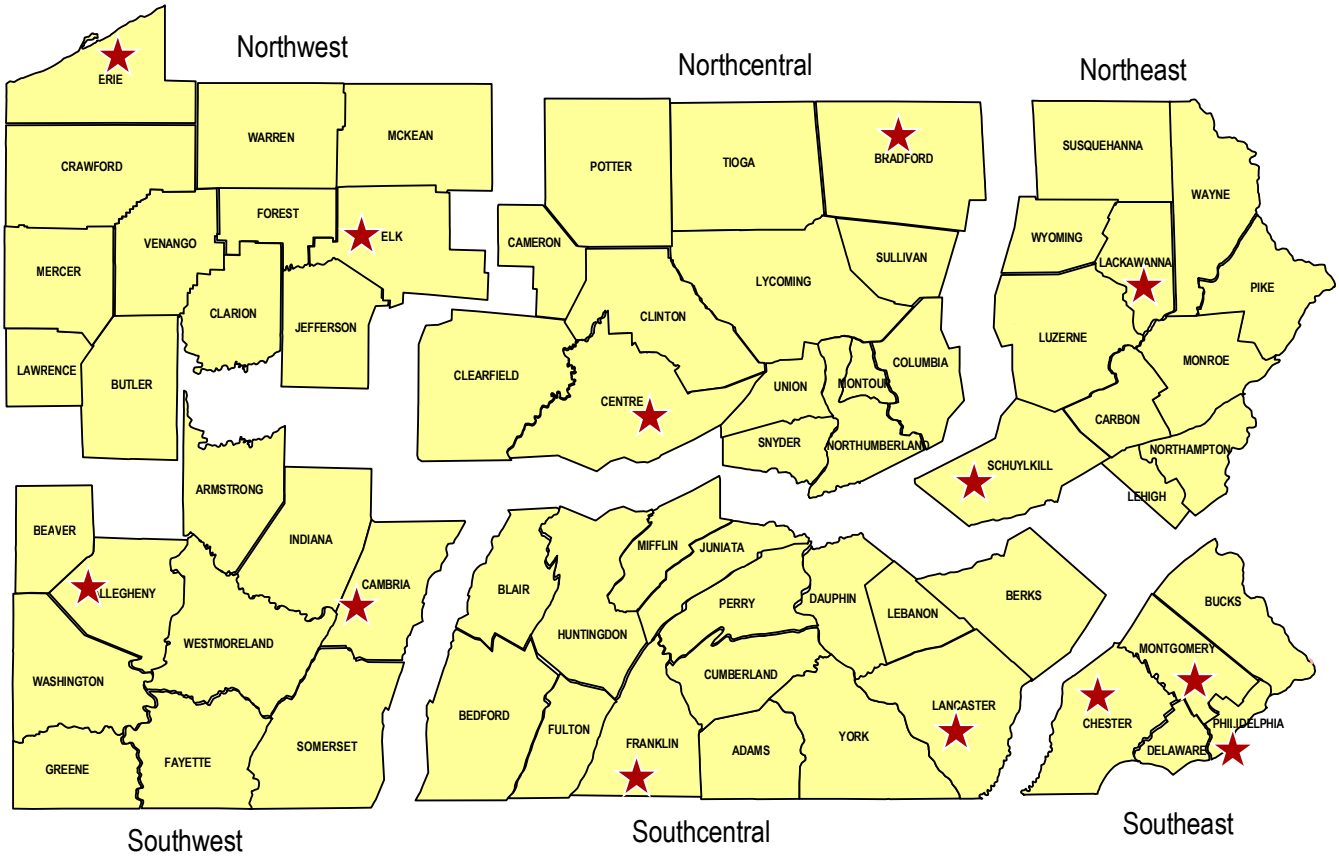
[1] Key: U=urban, S=suburban, R=rural
[2] Includes both physical and visual samples

As shown, at most facilities sorting was performed for one-week periods during each of two seasons. Note, however, that it was necessary to adjust the sorting schedule within several of the regions to assure that the targeted number of samples from specific demographic areas could be obtained. Specific adjustments are described below:

- **Northcentral Region**: Due to the lack of availability of urban and suburban samples at the Bradford County landfill, only one week of sorting was performed at this facility. The remaining three weeks of sorting were performed at the Centre County Transfer Station to capture suburban and urban (as well as some rural) samples from surrounding communities.
- **Southeast Region**: Because this region has very limited rural areas, as well as a large urban concentration around Philadelphia, it was necessary to sort at three facilities to obtain the targeted samples. During the final season of sorting (spring), data collection was divided between the TRC Transfer Station and the Chester County Landfill. Only one week of sorting was performed at the Montgomery/Montenay RRF.

Figure 1 presents a map of Pennsylvania showing the location of each of the host facilities within each region. As shown, these facilities were distributed across the Commonwealth's urban, suburban and rural areas, and allowed the project team to obtain a wide variety of sample material from many different local waste management systems.

Figure 1 Location of Host Facilities



Generating Sector Detail

In order to achieve statistically meaningful results, the overall sampling plan required that a minimum number of samples be obtained from each of the targeted regions, demographic areas, and generating sectors. To provide the greatest insight into the field sampling and sorting effort, the following types of incoming loads of MSW were differentiated in the study

- Single family residential waste;
- Multifamily residential waste;

- Commercial waste;
- Self-haul waste; and
- Bulky/Roll-off waste.

These are described more fully below.

Single-Family Residential Waste

Throughout the Commonwealth, single family waste makes up a majority of residential waste. In urban, suburban and many rural areas, single family waste is collected from the curb or alley on a regular basis and delivered to disposal facilities. Collection technologies include rearload or sideload manual, semi-automated, and automated collection performed on a weekly or twice per week basis. However, in some rural areas no mandatory curbside waste collection service exists. Residents in these areas may contract with a local hauler, self-haul their waste to a local disposal facility, or rely on rural convenience centers as drop-off points for residential waste.

Sampling and sorting single family waste was relatively straightforward at the host facilities included in the study. In some areas, both residential and commercial waste were commingled together in the same rearload vehicles. We were generally successful sampling from segregated single family truckloads at all of the host facilities.

Multi-family Residential Waste

In urban and suburban areas, multi-family waste is typically collected in dumpsters by front-end loading vehicles (although in rural areas it may be collected along with other residential waste in rearload compacting vehicles). Because most commercial waste is also collected via dumpsters, multi-family waste is often grouped in with commercial waste.

However, the multi-family residential waste stream is unique from both commercial waste and from single-family residential waste, and may represent an opportunity for increased diversion. The curbside recycling programs that target single-family households often cannot be offered to multi-family households. Additionally, different demographic and income characteristics of these households give rise to specific challenges that must be addressed to increase diversion from this generator segment.

Accordingly, throughout the field data collection, we attempted to obtain a fraction of residential samples from multi-family dwellings, especially in urban and suburban areas where multi-family dwellings are more common (or even prevalent over single family dwellings). Prior to conducting each of the weekly sorts, local haulers delivering waste to each facility were contacted to assess the fraction of multi-family waste. Although our sampling of residential waste was primarily focused on single-family waste, multi-family samples were targeted in proportion to the existence of multi-family dwellings in the waste shed of each host facility. For this reason, a greater percentage of multi-family samples were obtained in the urban and suburban areas of the Commonwealth (such as Philadelphia and Pittsburgh), while rural residential sampling targeted largely or entirely single family samples.

Because multi-family waste is often collected in the same vehicle with commercial waste, obtaining multi-family samples required closer coordination with local haulers to identify specific truckloads that contained entirely multi-family waste, or at least an identifiable fraction of multi-family waste within the collection truck body. While some multi-family waste samples may have contained trace amounts of commercial waste, the study was generally successful in obtaining multi-family samples at each host facility around which significant multi-family waste was collected.

Commercial Waste

Commercial waste in urban and suburban areas is often collected in dumpsters, although a significant amount of commercial waste is also collected manually or in carts. Collection techniques include front-end loading collection trucks, as well as rearloaders and compacting roll-off boxes at some larger commercial establishments. "Commercial" refers to all non-residential sources of waste, including retail establishments, offices, hotels, grocery stores, restaurants, and institutions like churches and hospitals. Note that commercial waste excludes industrial waste, which was outside the scope of this study.

Commercial waste tends to be collected by private haulers competing in the open market for refuse removal services. We were successfully able to identify incoming truckloads of commercial waste at the host facilities throughout this study.

Self-Haul Waste

At some of the facilities across the Commonwealth, at least a small fraction of residential and commercial self-haulers deliver material for disposal. Past studies have shown that the waste delivered by self-haulers is often different from normal residential and commercial waste generation. This material typically includes bulkier, less frequently disposed material such as construction, demolition and renovation debris; land clearing or yard cleaning debris; household/basement/garage clean-up waste; and other waste generated under special circumstances.

Often, no diversion programs have been implemented to capture this type of waste. As such, the sampling plan in each region allowed for some samples to be taken of self-haul waste, such that a separate analysis of self-haul waste could be performed to highlight the differences in this type of waste from the overall waste stream. During each weekly sort, self-haul loads were sampled and characterized based on the quantity of incoming waste delivered from self-haulers.

Bulky/Roll-off Waste

The majority of waste delivered to Pennsylvania's disposal facilities arrives in compacting trucks and some roll-off containers, and tends to be made up of items that are small enough to physically sort. However, at least some fraction of deliveries to any disposal facility consist of roll-off or self-haul trucks that contain bulky materials that are not conducive to physical sorting. Although physically sorting these loads is not feasible, they may make up a significant portion of the waste stream. These types

of loads often exhibit significant potential for improved diversion (although they generally originate from a diverse set of generators for which no consistent diversion programs can be implemented).

To accommodate the occurrence of randomly sampled truckloads that were found to contain bulky materials that are not conducive to physical sorting, we performed visual, volumetric samples of these loads throughout the sort. Visual sampling was intended to provide additional insight on the types of materials that are found in roll-off and possibly self-haul loads that were too bulky to physically sort, and to allow the composition of these loads to be captured in the State-wide analysis. Because there was no way to estimate the number of bulky loads that would be found at each host facility, we allowed for a floating number of bulky visual samples to be taken at each site.

Within each region, the final sampling plan sought to obtain the breakdown of physical and visual samples shown in Table 4.

Table 4 Regional Sampling Targets

Generating Sector	Demographic Area			
	Urban	Suburban	Rural	Total
Residential Samples [1]	30	30	30	90
Commercial Samples	30	30	30	90
Self-haul Samples	8	8	8	24
Total Physical Samples	**68**	**68**	**68**	**204**
Visual Samples				***Up to 60***

[1] Includes both single family and multi-family households
[2] No distribution of visually assessed bulky waste samples was set prior to the study; the actual number and distribution of visual samples was dependent on the distribution of incoming truckloads warranting visual analysis.

As shown, a total of 204 physical samples were targeted within each region, ideally distributed across the demographic areas and generating sectors as shown. Note that these targets represented an optimal distribution of samples. In some regions, it was not possible to obtain the precise distribution of samples targeted. Every effort was made to come as close as possible to these targets.

The majority of the samples were intended to be physically sorted samples. Physical sorting is appropriate for the majority of truckloads of waste that are delivered for disposal. The typical truckload of waste arrives in a compacting collection vehicle, with contents mixed together in the truck. However, sixty samples were allotted for taking visual samples of bulky waste loads in each region, although the actual number of visual samples was also dependent on the number of bulky loads that were found to enter each host facility during the sorts.

Sampling and Sorting

Field data collection includes three primary tasks:

(1) Identifying and taking samples from targeted truckloads from the specified generating sectors and demographic areas;

(2) Physically sorting or visually surveying each sample into the target material categories; and

(3) Recording the weight (physical) or volume (visual) of sorted materials.

These steps are described below

Sampling

Proper sampling requires that the origin and contents of each sampled truckload be verified prior to taking samples. Each week of sorting at a host facility, Field Supervisors were provided with a list of local haulers delivering waste, as well as information about the origin and type of waste collected by the haulers. Truckloads were selected using a stratified random sampling methodology.

When targeted trucks entered the facility, the Field Supervisor conducted a brief interview with the driver to verify certain information about the contents of the truckload. Questions included:

- Is the load residential, commercial, or mixed?
- Where did the material originate (specific geographic origin)?
- Were any out-of-the-ordinary items picked up on route?

The hauler, truck number, and truck type were recorded, as well as the scale ticket number (if applicable). We attempted to record all sampled truckloads should there be a need to verify the truck contents.

At each host facility, a designated area was established to conduct the physical sorting. Verified trucks were directed to tip in a designated area for "grab" sampling. Once the full load was tipped, a loader operator was directed to "grab" a 200- to 250-pound sample to be staged next to the sorting area. Industry literature specifies a minimum sample size of 200 pounds, which is consistent with the past sorting experience. However, in any field sort it is to be expected that some samples will weigh less than the 200-pound target. This discrepancy arises with less dense commercial loads that contain a significant fraction of corrugated boxes, foam packaging, or other light material. Conversely, some of the denser samples may be significantly heavier than 200 pounds. Despite these issues, samples were targeted at 200 to 225 pounds.

Specific grab samples were selected by dividing the load or an unbiased portion of the load into six to eight rectangular cells and then having the loader operator take a scoop from one of the cells. To minimize bias, the loader operator was directed to take a vertical slice from the pile at the selected quadrant of the load. As a precaution, the visible characteristics of the full waste load were observed by the Field Supervisor,

and any obviously non-representative material was noted and avoided in the sampling process.

Physical Sorting

Once samples are staged for sorting, each sample was manually loaded onto a specially designed sorting table. Bagged waste was carried to the table, while loose waste was loaded into a 40-gallon bucket to be moved to the table top. Certain large or bulky items were placed next to the scale for direct weighing.

From the sort table, which was covered by 1/2-inch screening, solid waste was manually sorted into labeled bins or baskets. Bagged material was broken open, and boxes were opened and all waste sorted. Sorting continued until the screen-top material was largely removed. Particles small enough to fall through the screen were characterized as Fines.

All samples were manually sorted into the 37 defined material categories[1].

Visual Surveying

To the extent incoming truckloads were found to contain bulky items, volumetric composition estimates were taken from the tipped load.

Visual estimation required the Field Supervisor to record the size of the incoming truckload, as well as the weight of the load, and then to systematically estimate the volumetric composition of the load. Standard visual estimation protocol requires the surveyor to first annotate all of the materials observed in the load, and then to estimate the volume percentage of each material from the largest to the smallest. Note that there is significantly greater error in visual volumetric estimation compared to physical sorting. For that reason, volumetric estimates for large materials are typically to the nearest five percent, with trace amounts of materials recorded as one percent.

Data Recording

On the first and last day of each weekly sort, tare weights were recorded for each of the containers used in the sort. Tare weights must be backed out from gross container weights to obtain accurate net material weight data.

After material from a given sample was sorted into the appropriate bins, the gross weight of each bin was systematically recorded on a custom designed data collection sheet. Bulky items too large to fit into a labeled container were weighed out separately and recorded as net weights. Especially large items were noted on the data collection sheet.

All weights were recorded to the nearest 0.1 pound. A blank data recording form is included in Appendix B.

[1] During the winter season sort, wastes were further segregated between packaging and non-packaging waste. This resulted in the addition of 19 more material categories during this sort. Details about the packaging analysis are provided in Section 5 of this report.

Attainment of Sampling Targets

Overall, the original sampling plan targeted 1,224 physical samples and allowed up to 360 visual samples. Ultimately, the study obtained the targeted number of samples. However, after eliminating samples during the quality control process, 1,185 physical samples and 449 visual samples were ultimately retained for the analysis. This represents 97 percent of the targeted physical samples, and over 100 percent of the expected visual samples. As described below, these samples were distributed across the seasons, regions, generating sectors, and demographic areas targeted in the study.

Tables 5 and 6 compare the targeted number of samples with the actual number of samples obtained in the study. Table 5 compares the samples taken by region.

Table 5 Comparison of Targeted Vs Actual Samples by Region

Region	Physical Samples			Visual Samples		
	Targeted	Actual	Coverage	Allotted [1]	Actual	Coverage
Northeast	204	187	92%	60	67	112%
Northcentral	204	193	95%	60	59	98%
Northwest	204	198	97%	60	74	123%
Southeast	204	199	98%	60	73	122%
Southcentral	204	206	101%	60	101	168%
Southwest	204	202	99%	60	75	125%
Totals	**1,224**	**1,185**	**97%**	**360**	**449**	**125%**

[1] Note that visual samples were taken based on the availability of these incoming truckloads during each weekly sort. Bulky waste truckloads at some facilities were infrequent, resulting in fewer samples from these facilities.

As shown in Table 5, at least 92 percent of the targeted physical samples were obtained for each region, and at least 98 percent of the targeted visual samples were obtained for each region. Some of the sampling shortfalls were caused by operational obstacles beyond the project team's control, such as inclement weather, unforeseen staffing and operational obstacles and low availability of targeted truckloads. Additionally, some samples were eliminated from the analysis based on our quality control review. Samples were primarily excluded if they did not meet minimum size requirements, although some samples were omitted due to incomplete background information that allowed the samples to be properly classified by demographic origin and generator type. The shortfalls have not been found to have adversely impacted the results of the analysis.

Table 6 evaluates compares the samples taken by demographic area and by generating sector.

Table 6 Comparison of Targeted Vs Actual Samples by Demographic Area and Generating Sector

Region	Physically Sorted Samples			Visual Samples		
	Targeted	Actual	Coverage	Allotted [1]	Actual	Coverage
Urban	408	362	89%	120	136	113%
Suburban	408	386	95%	120	134	112%
Rural	408	437	107%	120	179	149%
Total	**1,224**	**1,185**	**97%**	**360**	**449**	**125%**
Residential	612	630	103%	180	131	73%
Commercial	612	555	91%	180	318	177%
Total	**1,224**	**1,185**	**97%**	**360**	**449**	**125%**

As shown, a minimum of 89 percent of the targeted number of physically sorted samples were obtained from each demographic area, with 107 percent of the targeted number obtained from rural areas of the Commonwealth. Not surprisingly, the greatest shortfall occurred with urban samples, due to the limited number of host facilities that receive direct-haul waste from urban areas. The number of samples by generating sector show that the targeted number of physically sorted residential samples was slightly exceeded, while a slight shortfall occurred in the number of physically sorted commercial samples. These shortfalls have not been found to have adversely impacted the results of the analysis.

Complete results of the analysis of all sample data are shown in the remaining sections of this report.

Section 4
PENNSYLVANIA STATE-WIDE WASTE COMPOSITION

Interpretation of Results

This section provides a detailed summary of the aggregate composition of Pennsylvania's disposed waste stream. Within the section are many graphical and tabular summaries of State-wide waste composition. To adequately interpret these data, it is important to have a layman's understanding of the statistical analysis that was used to generate the results.

Aggregation of Data

Over 1,500 samples of waste were physically sorted or visually characterized for this study. Preparing the results for the study involved multiple steps of analyzing and aggregating these samples. The State-wide results presented here actually represent several layers of statistical analysis and aggregation. The process for estimating all of the results are described below:

- **Step 1 – Demographic- and generator-specific results by region**: Separately calculate the mean composition, standard deviation, confidence intervals, and measures of sampling error for *each generating sector* and *each demographic area* within *each of the six regions* in the State. There were a total of 36 results sets calculated in this step (2 generating sectors x 3 demographic areas x 6 regions). Regional results are shown in Sections 7 through 12 of this report.
- **Step 2 – Aggregate regional totals**: Aggregate the results of Step 1 based on a weighted average percentage of disposed tons from each generating sector and from each demographic area within each region. This step yielded another six results sets (one in each of the six jurisdictions). The results of this step are also summarized in Sections 7 through 12.
- **Step 3 – State-wide results by generating sector and by demographic origin**: For each generating sector and each demographic area, aggregate the regional total results based on the percentage of disposed waste from each region. This step yielded the State-wide composition estimates for the six combinations of generating sector and demographic area (e.g., "residential urban", etc.). State-wide results by generating sector and by demographic area are shown in this section.
- **Step 4 – Aggregate State-wide results**: This step involves aggregating the State-wide generator/demographic results (from Step 3) into the Statewide aggregate composition. The results of this step are the focal point of the study, and are also shown in this section.

Statistical Measures

Within each of the results sets described above, this report presents several statistical measures. These are described below:

Sample Mean – The sample mean composition is the average composition of each material category (or material group) for the samples included in a given results set. Because it is conceptually easy to understand, the sample mean values are often cited as a definitive estimate of the actual mean (i.e., the mean of the entire population). It is important to remember that the sample mean has associated uncertainty, described below.

Standard Deviation – The standard deviation measures the level of dispersion of the underlying data around the sample mean. Higher standard deviation indicates the individual data points are more widely variant (i.e., spread across a wider range) compared to lower standard deviation.

Confidence Intervals – The lower and upper confidence intervals indicate the likelihood that the population mean (i.e., the composition of the entire waste stream) falls close to the sample mean (i.e., the samples analyzed in the study). The lower and upper bound throughout this report have been calculated at a 90 percent level of confidence. In layman's terms, this means we can be 90 percent confident that the fraction of this material in the overall population falls between the lower and upper bound shown. The inverse is also true—that there is a ten percent chance that the true mean falls outside the intervals. For example, the sample mean composition of all Paper in the State is 33.3 percent. We can be 90 percent confident that the fraction of Paper in the State's waste stream falls between 31.7 percent and 34.9 percent.

Sampling Error – Although not a formal definition from a statistical standpoint, this measure has been created to compare the width of the confidence intervals to the mean composition. Confidence intervals are not equidistant from the mean—because of the statistical methods used, the lower bound is generally closer to the sample mean than the upper bound. The sampling error is therefore calculated as one-half the total width of the confidence intervals [i.e., ½ x (upper bound - lower bound)] divided by the sample mean.

Several other concepts are helpful in evaluating the statistical measures above. The standard deviation by itself is not intuitively meaningful. However, the ratio of standard deviation (SD) to the mean (M) can be used to evaluate whether or not the underlying data exhibits normal distribution. Normal distribution of the underlying data assures us that the mean and confidence intervals shown are statistically unbiased.

Generally, as long as the ratio of standard deviation to mean is less than 2 (SD/M<2), we can be reasonably sure that the underlying data falls within a normal distribution. Most categories in the study exhibit a normal distribution. For example, the ratio of standard deviation to mean for Paper in Pennsylvania is 0.6 (20.0/33.3=0.6). This suggests most of the samples contained between 31.7 and 34.9 percent Paper, and that Paper is common in almost all State waste.

Conversely, a ratio of standard deviation to mean that is greater than 2 indicates a non-normal distribution. The impact of such a situation is best explained via an example: In the study, yard waste was divided into two categories: grass and all other yard waste. Grass was found to make up a mean of 1.4 percent of the State's waste stream. The standard deviation of the proportion of Grass in the waste stream is 3.9 percent. The ratio of standard deviation to mean in the case of Grass is 2.8 (3.9/1.4=2.8). As discussed above, this suggests that Grass is not disposed consistently in all loads delivered in the State, but when it is disposed, it is in a relatively large quantity. Material categories that

are characterized by infrequent samples containing large quantities of that category are said to exhibit non-normal distribution.

Non-normal distribution alone does not necessarily imply that statistical bias is introduced into the results. Statistical bias will only occur in cases where the non-normally distributed material makes up a significant part of the waste stream. When evaluating the impact of non-normally distributed materials, it is generally only necessary to focus on those materials that make up more than one percent of the waste stream. In the aggregate Statewide results, the non-normally distributed materials include yard waste and the range of organic and inorganic materials associated with construction and renovation waste, such as Painted and Unpainted Wood, Drywall, Carpet, and Other C&D. These types of waste do not appear in large amounts in most samples, but are extremely prevalent in a relatively small number of samples. These materials were also large enough fractions of the overall waste stream to potentially introduce a low level of bias into the sort results. However, due to the extensive number of samples (over 1,500) taken to derive that number, it is also reasonable to rely on the results as being reasonably representative of the State waste stream as a whole.

Pennsylvania Aggregate Disposed MSW Composition Results

The remainder of this section provides a range of graphical and tabular summaries of the composition of disposed waste in Pennsylvania. Figures and tables are included at the end of this section, but described below.

Figure 1 presents the aggregate composition of major material groups in Pennsylvania's disposed waste stream. As shown, Organics and Paper make up the largest fractions of the waste stream, followed by Inorganics, Plastic, Metals and Glass. This overall breakdown tracks with the composition of waste in most other areas of the country. Figure 2 shows a bar graph of the actual tons of Pennsylvania waste that are estimated to be disposed in the State's landfills (based on 2001 facility reports). In absolute terms, over 3.2 million tons of Organics and 3.1 million tons of Paper were disposed in 2001.

Figure 3 focuses on the quantity of Act 101-specified materials that were disposed. As shown, Corrugated Cardboard, Newspaper, and even High Grade Office Paper were found to be disposed in significant quantities in Pennsylvania, with recyclable containers at relatively lower disposal rates. This suggests that the residential recycling programs that target containers and some paper grades have been successful in recycling many of these materials prior to disposal. However, Corrugated Cardboard and High Grade Paper, which are predominantly generated in the commercial generating sector, appear to remain in the disposed waste stream and could be targeted for future diversion.

Figure 4 lists the top ten individual materials that were most prevalent in the Statewide disposed waste stream. Statewide, Food Waste makes up the largest fraction of disposed waste at 12.0 percent, followed closely by Non-recyclable Paper (9.3 percent), Corrugated Cardboard (8.4 percent), Unpainted Wood (5.8 percent) and Film Plastic (5.0 percent). No other materials make up more than 4.8 percent of the State-wide waste stream. The top ten most prevalent materials make up 61.7 percent of the disposed waste stream.

Finally, Table 1 presents a detailed statistical summary of the composition of disposed MSW in Pennsylvania.

Comparisons by Demographic Origin and Generating Sector

An objective of the study was to differentiate the composition and quantity of disposed waste by demographic area and by generating sector. This section provides a series of tables and figures with such comparisons.

Figure 5 compares the composition of waste by material group from urban, suburban and rural areas of the State. As shown, urban areas were found to have lower Glass, Metals, and Inorganics fractions, but the highest fractions of Paper, Organics and Plastic. Interestingly, rural areas have the lowest fraction of Paper, but the highest fraction of Glass, Metals and Inorganics. Table 2 presents detailed mean composition percentages for all materials in the urban, suburban, and rural waste streams.

The pie charts in Figures 6 and 7 compare the composition percentage by material group for residential waste versus commercial waste in Pennsylvania. Although disposed waste composition from the two generating sectors is relatively comparable, the differences are statistically significant. The residential stream has less Paper, Plastics, and Inorganics, but significantly higher Organics. The difference in Organics is driven largely by yard waste, textiles and diapers, which are far more prevalent in the residential waste stream. The difference in Inorganics is driven almost entirely by a lower fraction of other C&D materials in the residential stream. Residential waste also contains a higher percentage of Glass and Metals. Although it was beyond the scope of this project to determine the cause of the difference, the composition data suggests that there may be more glass and steel containers in the residential stream that drive the higher occurrence of these items in disposed residential waste.

Figure 8 compares the actual tons disposed from each generating sector (based on an allocation of 2001 facility reports). Note that some of the difference between residential and commercial waste quantities is due to there being more residential waste in the disposed waste stream State-wide.

Figure 9 compares the quantity of materials defined in Act 101 that are being disposed from the residential and commercial waste streams. Note that the recyclable containers typically associated with residential recycling programs are being disposed in relatively small quantities. Only newspaper, which is also commonly collected in residential recycling programs, appears to be getting disposed in large quantities. Interestingly, the most commonly disposed material defined in Act 101—corrugated cardboard—is primarily coming from the commercial sector. This is also the case for high grade office paper. Such findings suggest that additional diversion opportunities exist for these materials in the commercial sector.

Figures 10 and 11 compare the ten most prevalent residential materials and the ten most prevalent commercial materials. It is of interest to note that food waste is the most commonly disposed material in the residential sector, while corrugated cardboard is the most common commercial disposed material. Food waste ranks third in the commercial sector, contributing to its position as the State's most commonly disposed material. Five other materials—non-recyclable paper, corrugated cardboard, other C&D, unpainted wood, film plastic, and mixed paper—appear in the top ten in both generating sectors. In the residential sector, the top ten materials make up 58.7 percent of all disposed waste, while in the commercial sector the top ten contribute 69.0 percent.

Tables 3 and 4 provide detailed statistics, including composition percentages and absolute quantities, for all materials for the residential and commercial waste streams, respectively.

Figures 12 and 13 divide the disposed waste stream by demographic origin. Figure 12 compares the composition of urban, suburban, and rural residential waste by major material group. It is of interest to note that urban areas have the lowest percentage of paper, plastic, glass, and metals. Although beyond the scope of this study to determine the cause, it is likely that the State's residential recycling programs—which are more extensive in urban and suburban areas, are diverting more of these wastes in urban and suburban areas compared to rural areas. Figure 13 shows an opposite trend in terms of the percentage of paper, plastic, and glass being disposed. Disposed fractions of these materials are higher in urban areas and lower in rural areas.

Detailed statistical results for the residential and commercial waste streams by demographic origin are shown in Tables 5 and 6, respectively.

Bulky Waste Composition

The study methodology allowed for bulky material loads to be visually surveyed for inclusion in the overall waste composition results. The final two figures in this section provide a summary of the composition of bulky waste loads (typically open top roll-offs and commercial contractor self-haulers).

Figure 14 presents a pie chart of the composition of bulky waste loads. Note that Organics and Inorganics are the most prevalent material in these loads. This is because of the high occurrence of C&D-related materials such as painted and unpainted wood in Organic waste, and other C&D material in the Inorganics.

This is shown more clearly in Figure 15. Other C&D and unpainted wood are the two most prevalent bulky materials by a significant margin. Cardboard, painted wood, and other ferrous metals are also common, but no other material was found to make up more than five percent of bulky loads.

Conclusion

The aggregate Pennsylvania disposed MSW composition shown in this section highlights the percentages and quantities of materials that are still being disposed in the State's landfills and resource recovery facilities. Solid waste planners can use these results to better target the materials from specific generating sectors and demographic areas that have the highest potential for meaningful diversion. Sections 6 through 11 of this report provide comparable results for each of the State's six regions.

Figure 1
Pennsylvania Statewide Aggregate Disposed MSW Composition

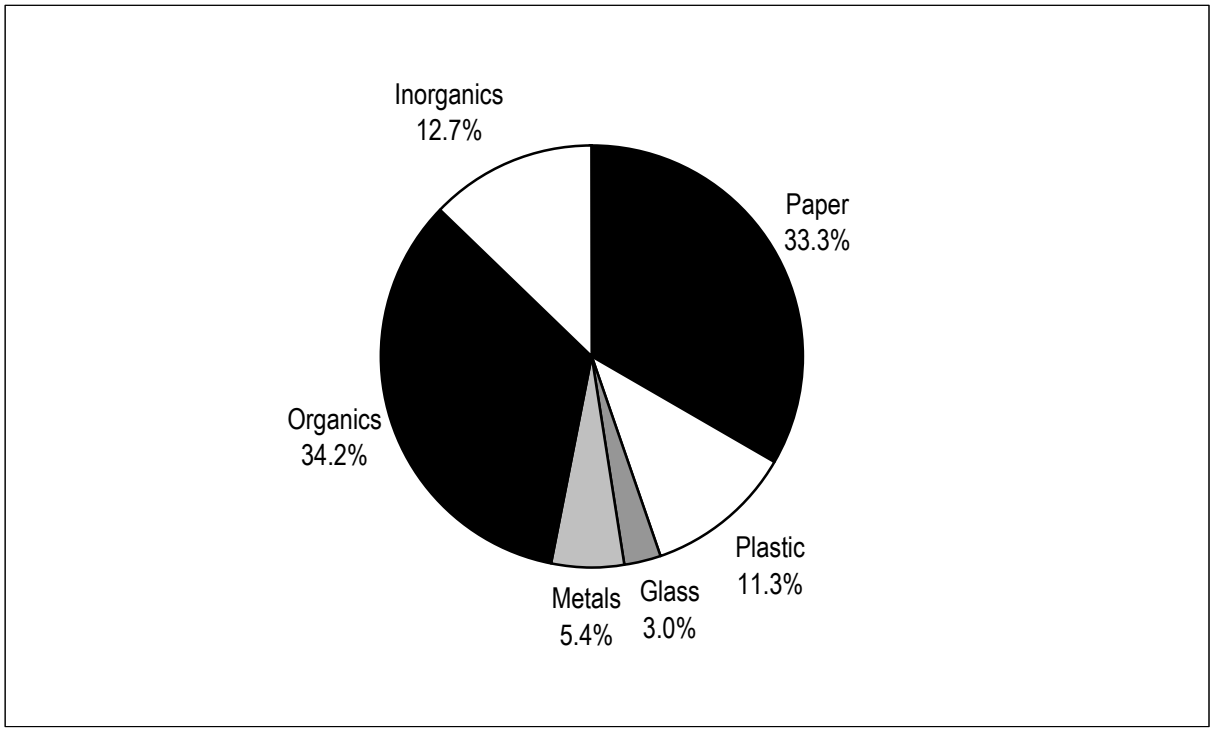


Figure 2
Statewide Aggregate MSW Tons Disposed

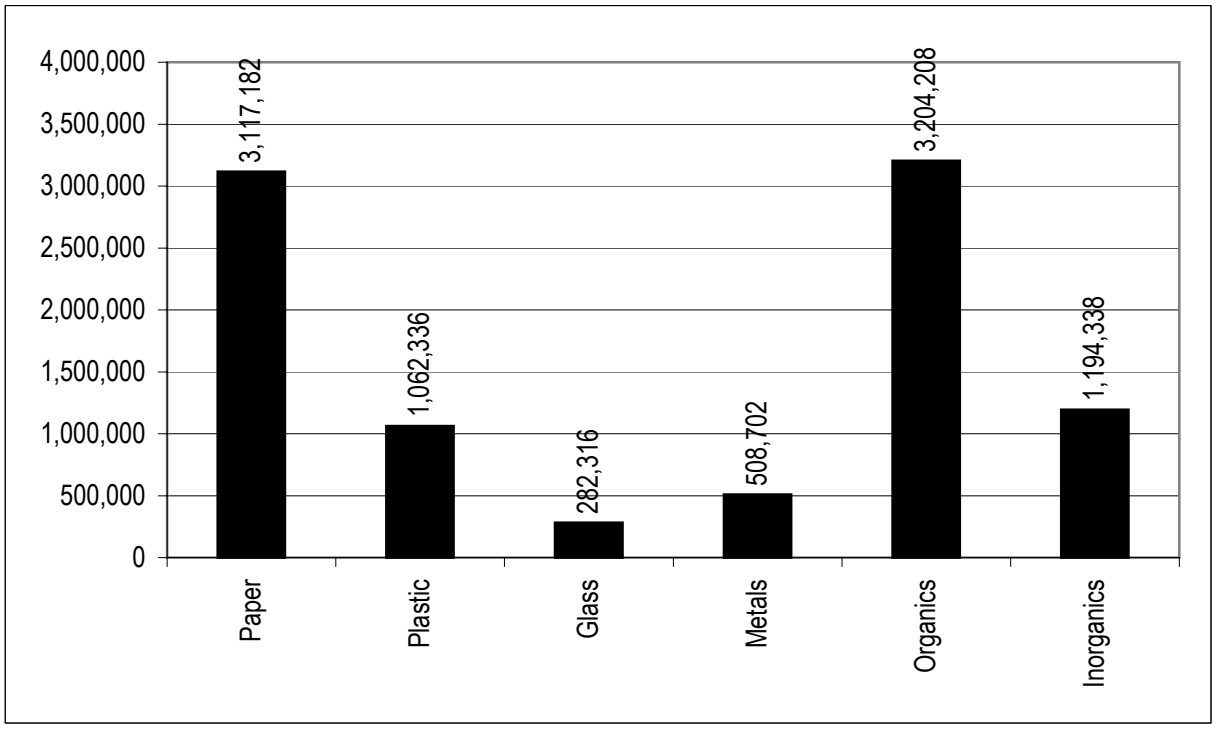


Figure 3

Act 101 Recyclables in Disposed MSW (tons)

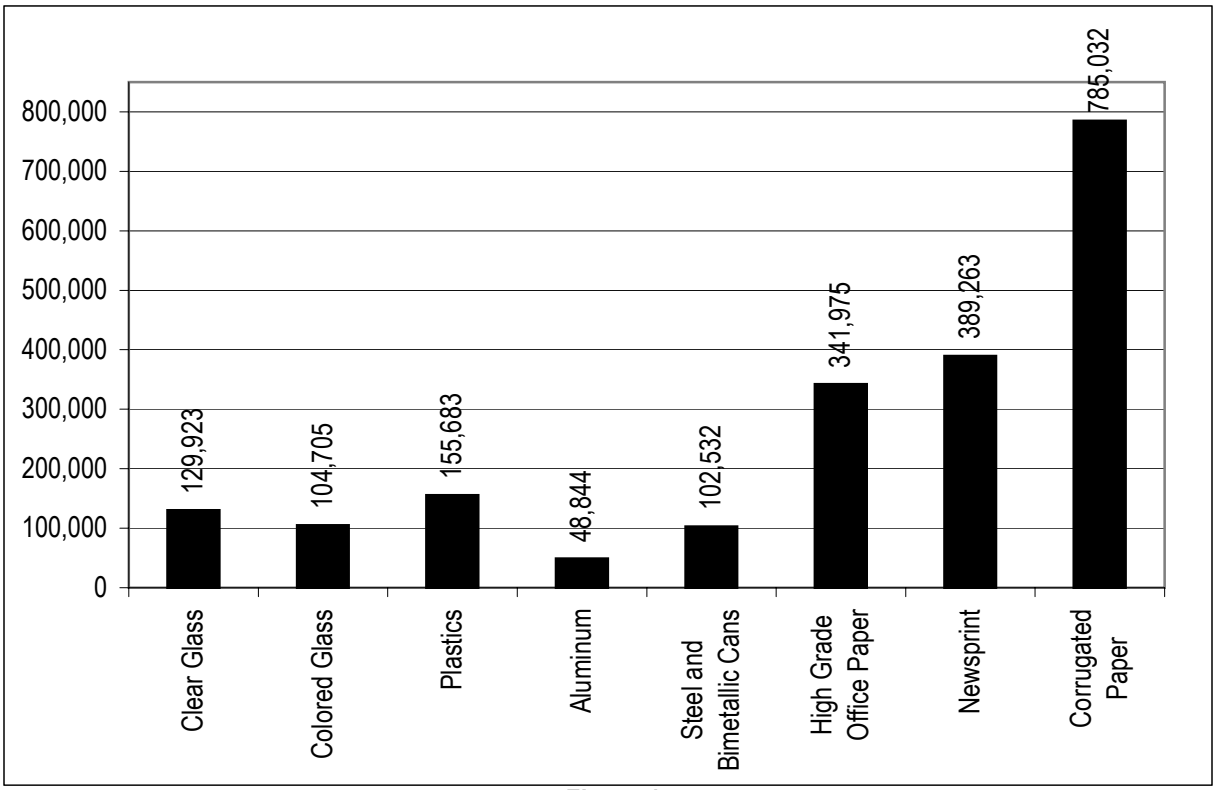


Figure 4

Top 10 Most Prevalent Materials Disposed in Pennsylvania

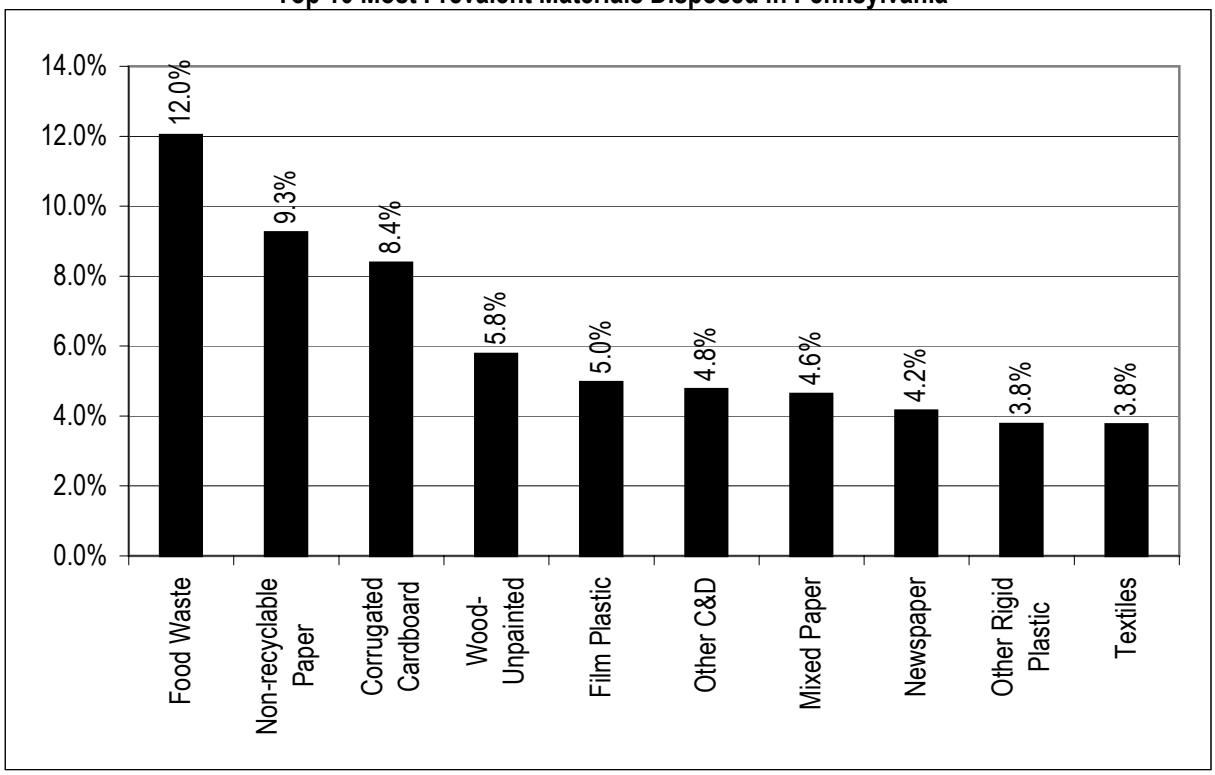


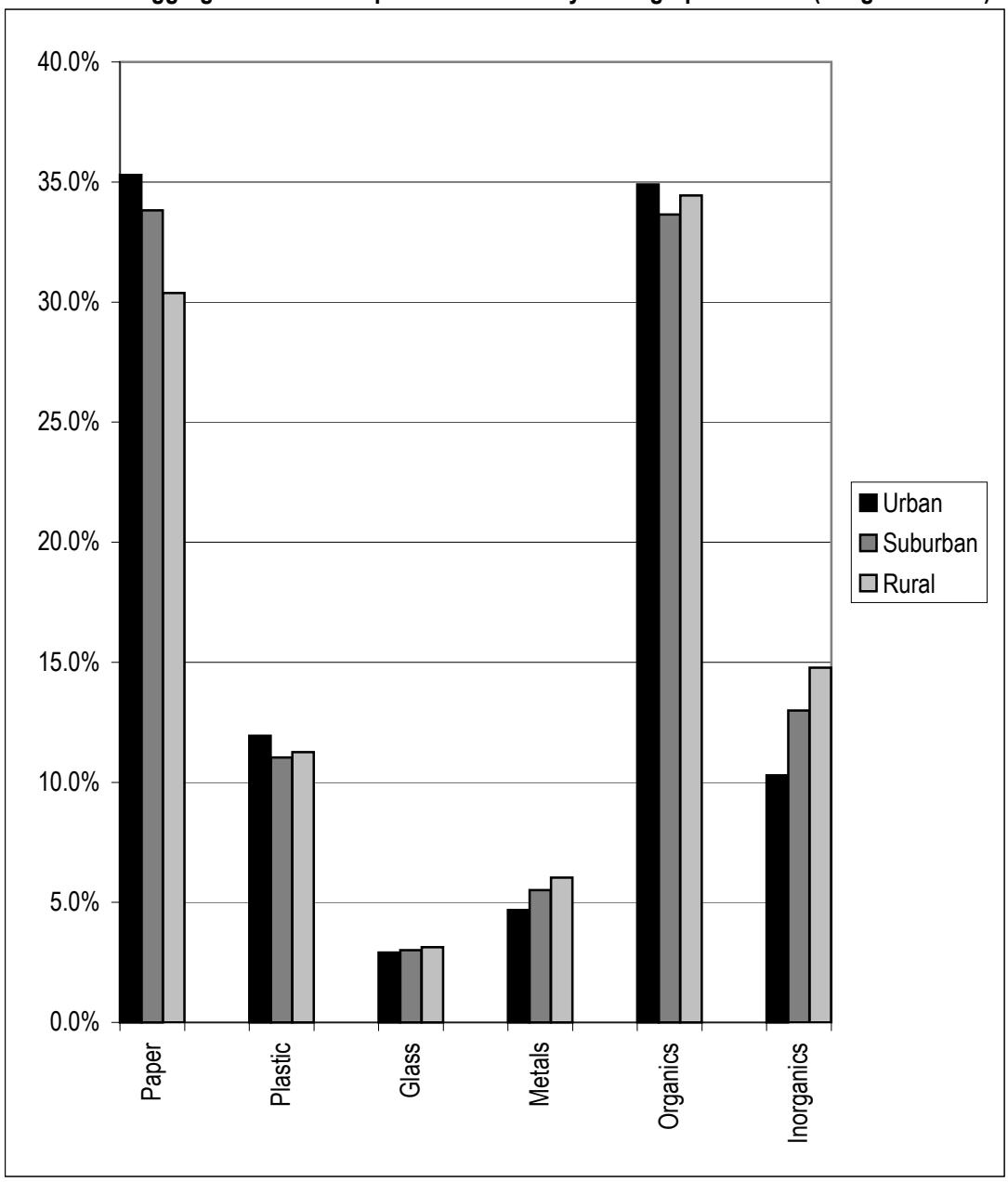
Table 1

Statewide Aggregate Landfilled MSW Composition Detail (Weight Percent)

		Material Categories	Tons Disposed	Mean Composition	Standard Deviation	Confidence Interval		Sampling Error
						Lower (%)	Upper (%)	
Paper			**3,117,182**	**33.3%**	**20.0%**	**31.7%**	**34.9%**	**4.9%**
	1	Newspaper	389,263	4.2%	4.4%	3.9%	4.5%	8.2%
	2	Corrugated Cardboard	785,032	8.4%	10.7%	7.7%	9.3%	9.2%
	3	Office	341,975	3.7%	5.7%	3.3%	4.2%	13.0%
	4	Magazine/ Glossy	251,027	2.7%	4.1%	2.4%	3.1%	14.4%
	5	Polycoated/Aseptic Containers	49,074	0.5%	1.2%	0.5%	0.6%	13.3%
	6	Mixed Paper	433,821	4.6%	5.0%	4.3%	5.1%	7.8%
	7	Non-recyclable Paper	866,990	9.3%	7.5%	8.7%	10.0%	6.7%
Plastic			**1,062,336**	**11.3%**	**9.2%**	**10.7%**	**12.1%**	**6.3%**
	8	#1 PET Bottles	87,601	0.9%	1.4%	0.9%	1.0%	9.7%
	9	#2 HDPE Bottles	68,082	0.7%	0.8%	0.7%	0.8%	8.0%
	10	#3-#7 Bottles	16,871	0.2%	0.4%	0.2%	0.2%	16.2%
	11	Expanded Polystyrene	71,088	0.8%	1.5%	0.7%	0.9%	12.5%
	12	Film Plastic	465,586	5.0%	4.8%	4.7%	5.4%	7.1%
	13	Other Rigid Plastic	353,108	3.8%	5.1%	3.4%	4.2%	10.8%
Glass			**282,316**	**3.0%**	**5.3%**	**2.7%**	**3.4%**	**10.3%**
	14	Clear Glass	129,923	1.4%	2.0%	1.3%	1.5%	10.0%
	15	Green Glass	38,468	0.4%	1.1%	0.4%	0.5%	18.6%
	16	Amber Glass	66,238	0.7%	1.9%	0.6%	0.9%	23.6%
	17	Non-recyclable Glass	47,688	0.5%	2.1%	0.4%	0.6%	15.8%
Metals			**508,702**	**5.4%**	**8.6%**	**5.1%**	**5.9%**	**7.3%**
	18	Steel Cans	102,532	1.1%	1.3%	1.0%	1.2%	8.1%
	19	Aluminum Cans	48,844	0.5%	1.1%	0.5%	0.6%	12.7%
	20	Other Ferrous	282,131	3.0%	8.0%	2.7%	3.4%	12.1%
	21	Other Aluminum	43,057	0.5%	1.2%	0.4%	0.5%	10.4%
	22	Other Non-Ferrous	32,138	0.3%	1.4%	0.3%	0.4%	15.9%
Organics			**3,204,208**	**34.2%**	**21.7%**	**32.8%**	**35.7%**	**4.2%**
	23	Yard Waste- Grass	136,084	1.5%	3.9%	1.2%	1.8%	21.7%
	24	Yard Waste- Other	347,164	3.7%	8.2%	3.1%	4.6%	19.4%
	25	Wood- Unpainted	540,611	5.8%	15.8%	5.2%	6.7%	12.9%
	26	Wood- Painted	234,406	2.5%	8.6%	2.3%	2.9%	12.6%
	27	Food Waste	1,127,170	12.0%	11.8%	11.3%	13.1%	7.7%
	28	Textiles	352,570	3.8%	6.8%	3.5%	4.2%	9.8%
	29	Diapers	217,875	2.3%	4.1%	2.1%	2.6%	10.5%
	30	Fines	92,451	1.0%	1.3%	0.9%	1.1%	8.4%
	31	Other Organics	155,877	1.7%	4.1%	1.5%	1.9%	12.7%
Inorganics			**1,194,338**	**12.7%**	**23.2%**	**11.8%**	**13.9%**	**8.3%**
	32	Electronics	137,299	1.5%	4.3%	1.3%	1.8%	16.4%
	33	Carpet	163,371	1.7%	6.2%	1.5%	2.1%	17.4%
	34	Drywall	99,009	1.1%	6.1%	0.9%	1.3%	15.7%
	35	Other C&D	446,516	4.8%	16.0%	4.2%	5.5%	13.7%
	36	HHW	28,203	0.3%	1.2%	0.3%	0.4%	13.6%
	37	Other Inorganics	207,682	2.2%	5.9%	2.0%	2.6%	14.2%
	38	Furniture	112,258	1.2%	6.8%	1.0%	1.6%	25.5%
		Total	9,369,083	100.0%				

Figure 5

Landfilled Aggregate Waste Composition Results by Demographic Sector (Weight Percent)



	% Composition			
Generator	Urban	Suburban	Rural	Aggregate
Paper	35.3%	33.8%	30.4%	33.3%
Plastic	11.9%	11.0%	11.3%	11.3%
Glass	2.9%	3.0%	3.1%	3.0%
Metals	4.7%	5.5%	6.0%	5.4%
Organics	34.9%	33.6%	34.4%	34.2%
Other Waste	10.3%	13.0%	14.8%	12.7%
Total	100.0%	100.0%	100.0%	100.0%

Table 2

Landfilled Aggregate MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**35.3%**	**33.8%**	**30.4%**	**33.3%**
	1	Newspaper	3.6%	4.5%	4.1%	4.2%
	2	Corrugated Cardboard	10.5%	7.8%	7.2%	8.4%
	3	Office	4.3%	3.9%	2.6%	3.7%
	4	Magazine/ Glossy	3.4%	2.5%	2.4%	2.7%
	5	Polycoated/Aseptic Containers	0.5%	0.5%	0.5%	0.5%
	6	Mixed Paper	4.7%	4.8%	4.2%	4.6%
	7	Non-recyclable Paper	8.2%	9.8%	9.4%	9.3%
Plastic			**11.9%**	**11.0%**	**11.3%**	**11.3%**
	8	#1 PET Bottles	1.0%	0.9%	1.0%	0.9%
	9	#2 HDPE Bottles	0.5%	0.7%	0.9%	0.7%
	10	#3-#7 Bottles	0.2%	0.2%	0.1%	0.2%
	11	Expanded Polystyrene	0.8%	0.8%	0.7%	0.8%
	12	Film Plastic	4.9%	4.9%	5.1%	5.0%
	13	Other Rigid Plastic	4.5%	3.5%	3.4%	3.8%
Glass			**2.9%**	**3.0%**	**3.1%**	**3.0%**
	14	Clear Glass	1.4%	1.3%	1.4%	1.4%
	15	Green Glass	0.5%	0.4%	0.3%	0.4%
	16	Amber Glass	0.7%	0.8%	0.6%	0.7%
	17	Non-recyclable Glass	0.3%	0.5%	0.7%	0.5%
Metals			**4.7%**	**5.5%**	**6.0%**	**5.4%**
	18	Steel Cans	0.9%	1.0%	1.5%	1.1%
	19	Aluminum Cans	0.5%	0.5%	0.5%	0.5%
	20	Other Ferrous	2.6%	3.3%	3.0%	3.0%
	21	Other Aluminum	0.4%	0.4%	0.6%	0.5%
	22	Other Non-Ferrous	0.3%	0.3%	0.4%	0.3%
Organics			**34.9%**	**33.6%**	**34.4%**	**34.2%**
	23	Yard Waste- Grass	0.4%	2.1%	1.4%	1.5%
	24	Yard Waste- Other	4.9%	4.3%	1.6%	3.7%
	25	Wood- Unpainted	6.6%	5.1%	6.1%	5.8%
	26	Wood- Painted	2.8%	2.1%	2.8%	2.5%
	27	Food Waste	12.4%	11.2%	13.1%	12.0%
	28	Textiles	3.7%	3.6%	4.0%	3.8%
	29	Diapers	1.9%	2.5%	2.5%	2.3%
	30	Fines	1.0%	0.9%	1.0%	1.0%
	31	Other Organics	1.1%	1.9%	1.8%	1.7%
Other			**10.3%**	**13.0%**	**14.8%**	**12.7%**
Waste	32	Electronics	1.4%	1.9%	0.8%	1.5%
	33	Carpet	1.1%	2.0%	1.9%	1.7%
	34	Drywall	1.1%	1.0%	1.1%	1.1%
	35	Other C&D	3.1%	4.6%	6.7%	4.8%
	36	HHW	0.3%	0.3%	0.3%	0.3%
	37	Other Inorganics	1.2%	2.7%	2.4%	2.2%
	38	Furniture	2.0%	0.5%	1.5%	1.2%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 6
Statewide Residential MSW Composition

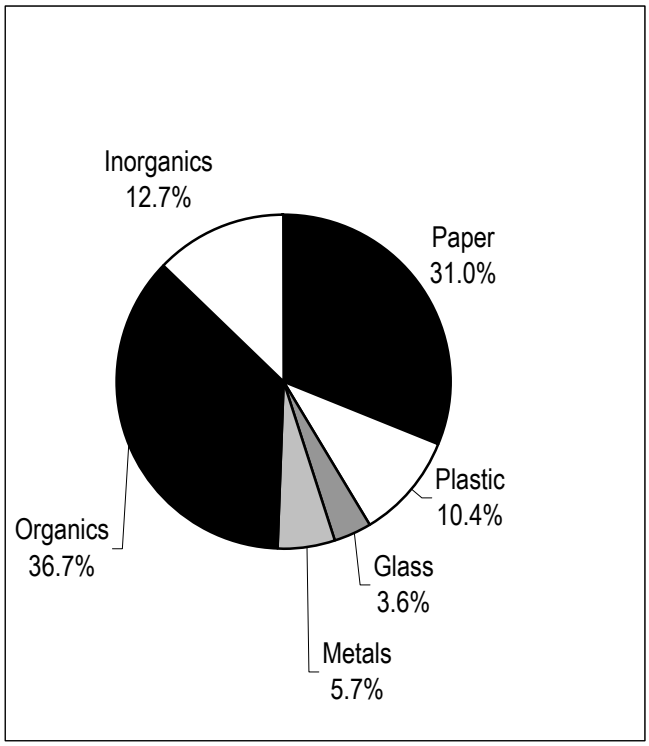


Figure 7
Statewide Commercial MSW Waste Composition

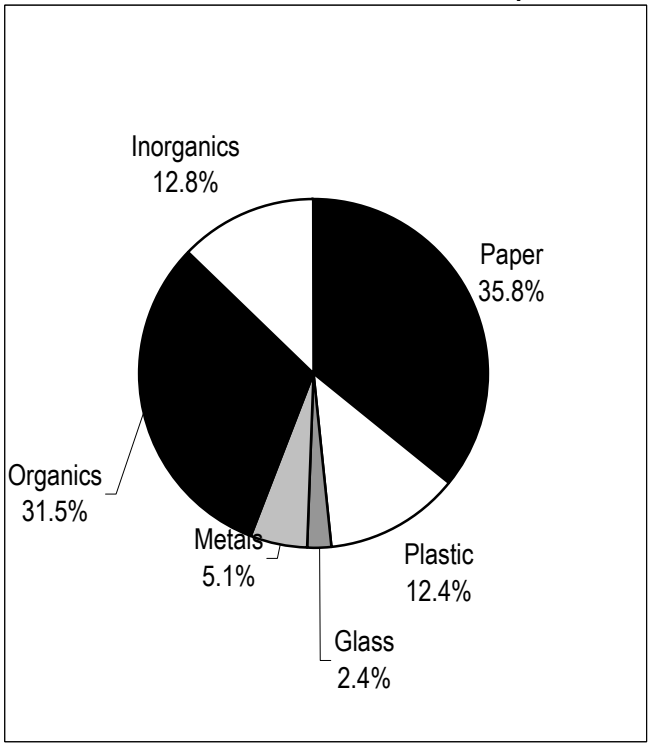


Figure 8
Residential and Commercial Aggregate MSW Tons Disposed

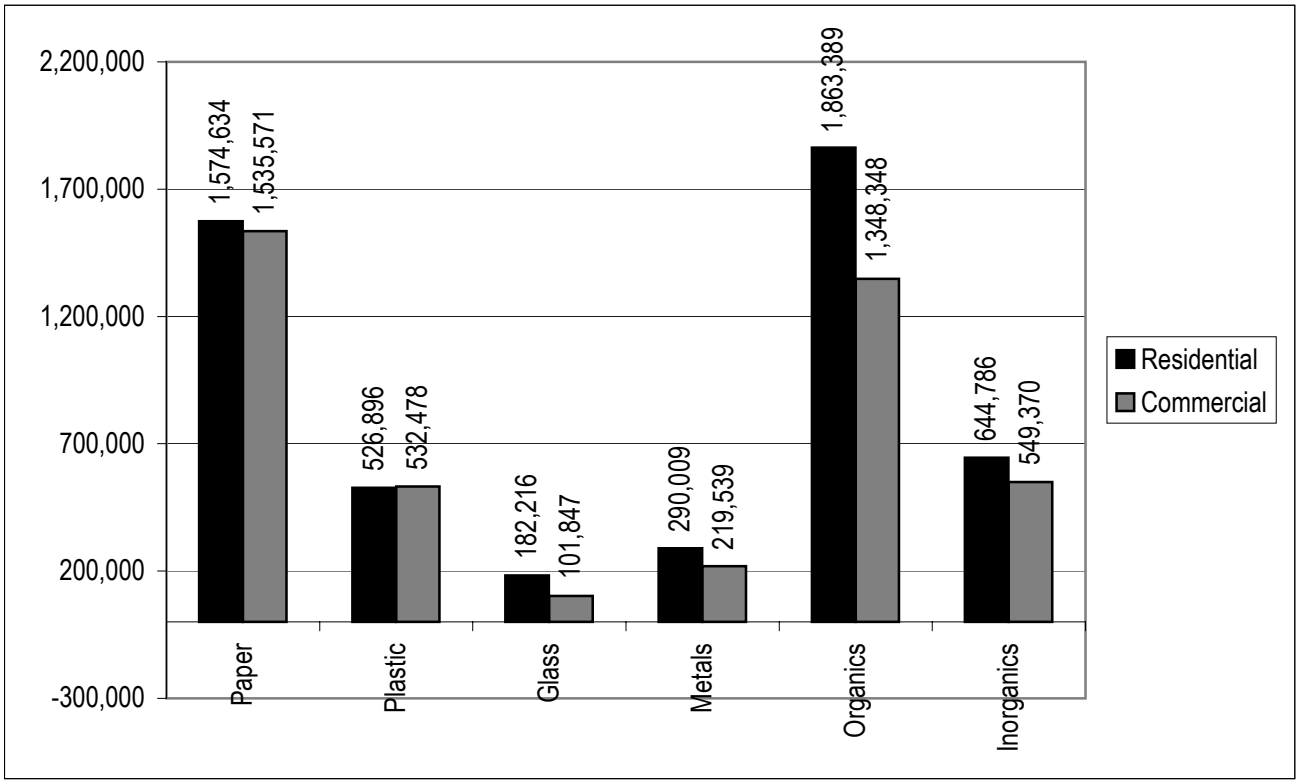


Figure 9

Act 101 Recyclables Disposed by Generating Sector (tons)

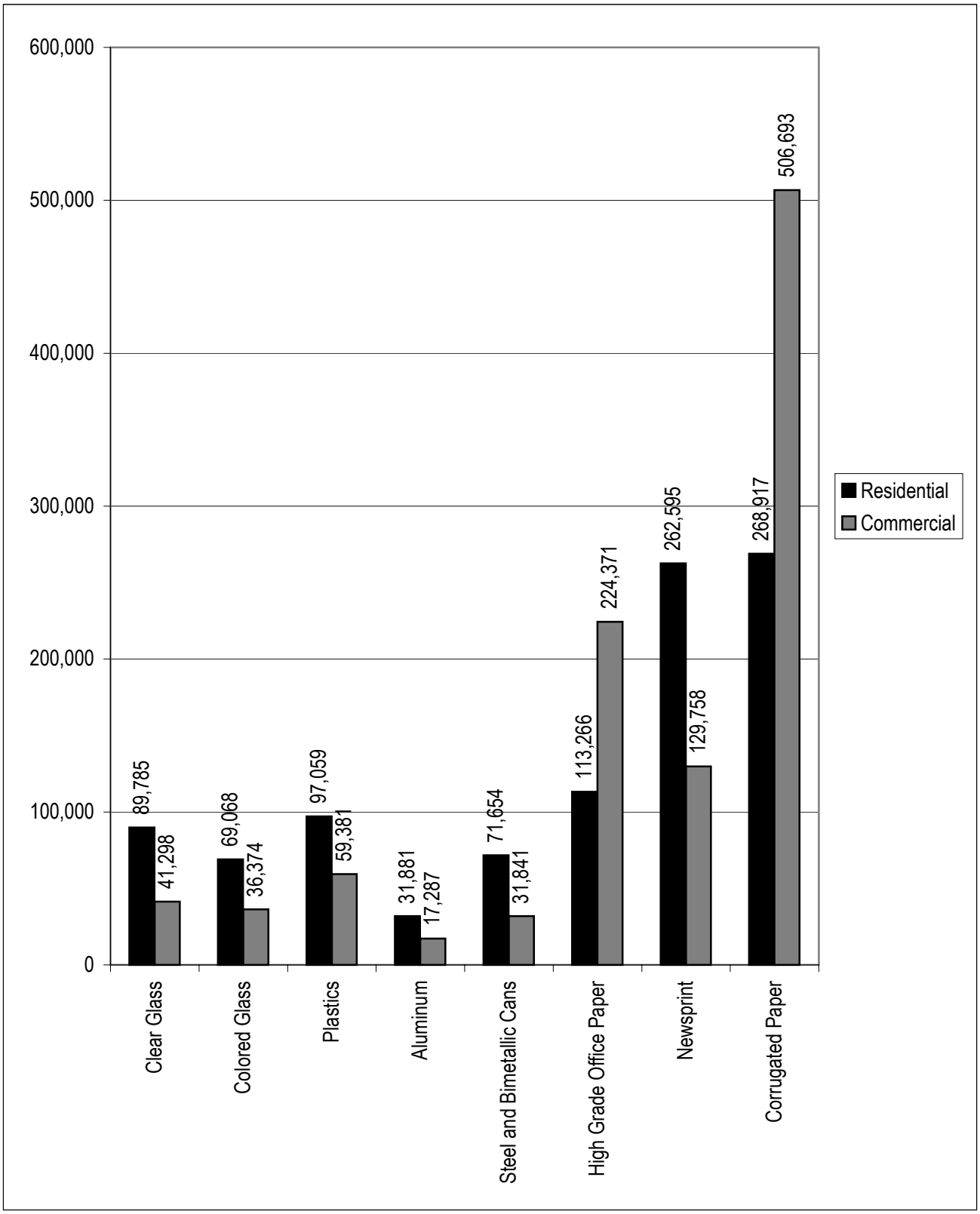


Figure 10
Top 10 Most Prevalent Materials in Pennsylvania Residential Waste

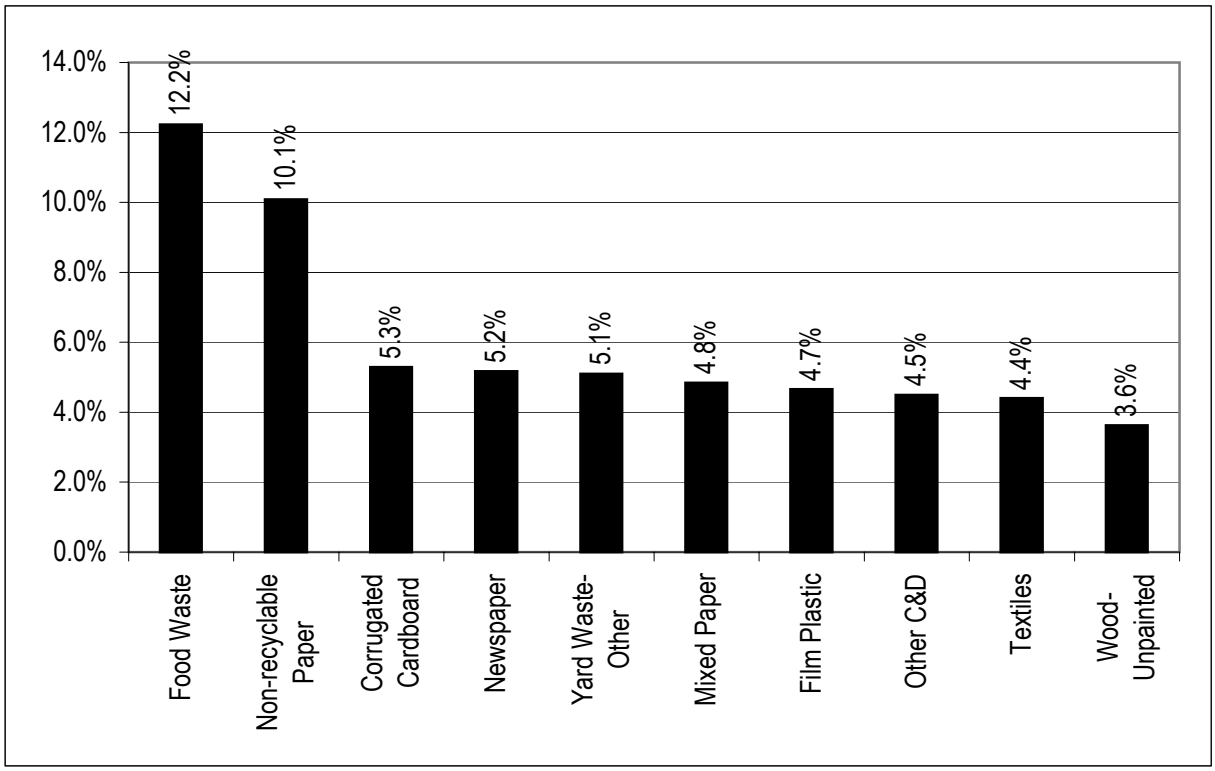


Figure 11
Top 10 Most Prevalent Materials in Pennsylvania Commercial Waste

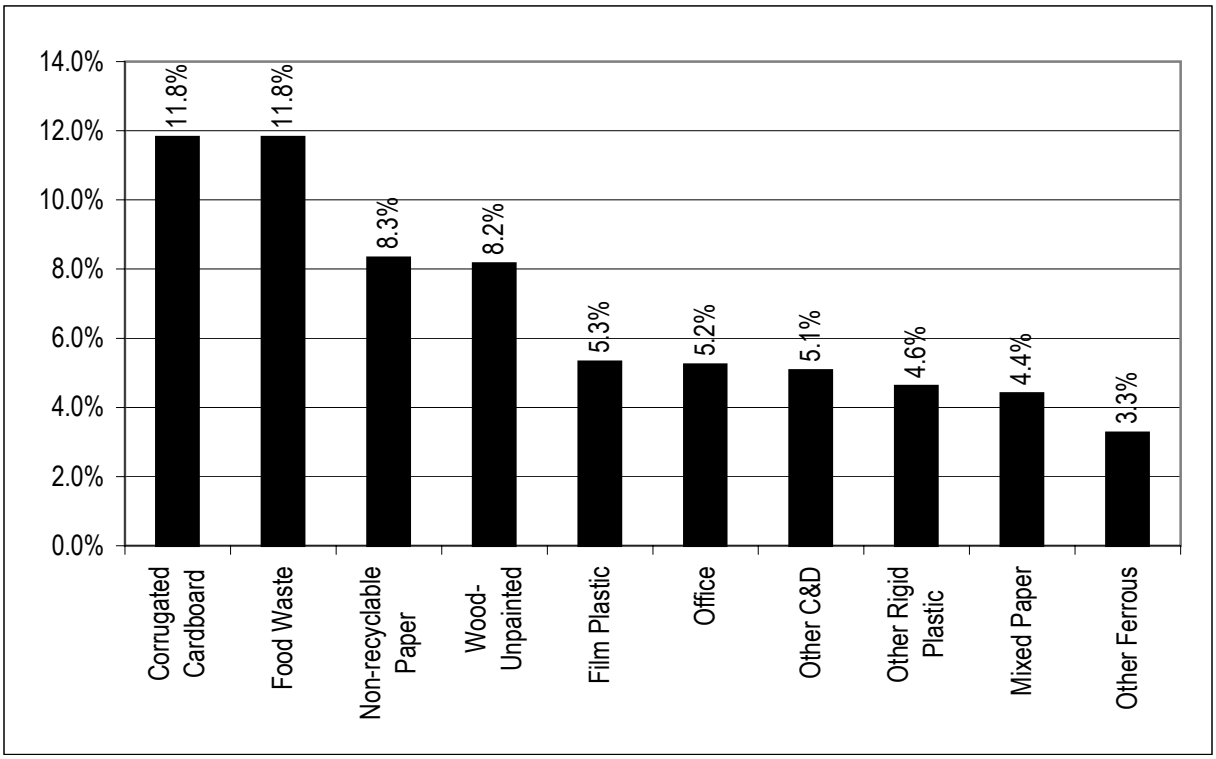


Table 3

Statewide Residential Aggregate Landfilled MSW Composition Detail (Weight Percent)

		Material Categories	Tons Disposed	Mean Composition	Standard Deviation	Confidence Interval		Sampling Error
						Lower (%)	Upper (%)	
Paper			**1,574,634**	**31.0%**	**15.7%**	**29.4%**	**32.6%**	**5.2%**
	1	Newspaper	262,595	5.2%	4.3%	4.8%	5.7%	9.0%
	2	Corrugated Cardboard	268,917	5.3%	5.9%	4.8%	6.0%	11.5%
	3	Office	113,266	2.2%	3.8%	2.0%	2.6%	13.8%
	4	Magazine/ Glossy	146,754	2.9%	3.0%	2.6%	3.2%	10.3%
	5	Polycoated/Aseptic Containers	24,695	0.5%	0.9%	0.4%	0.6%	17.7%
	6	Mixed Paper	245,801	4.8%	3.7%	4.5%	5.3%	8.5%
	7	Non-recyclable Paper	512,605	10.1%	6.9%	9.4%	11.0%	7.5%
Plastic			**526,896**	**10.4%**	**6.1%**	**9.8%**	**11.0%**	**5.6%**
	8	#1 PET Bottles	49,262	1.0%	1.0%	0.9%	1.1%	9.8%
	9	#2 HDPE Bottles	47,797	0.9%	0.9%	0.9%	1.0%	9.4%
	10	#3-#7 Bottles	8,378	0.2%	0.3%	0.1%	0.2%	15.5%
	11	Expanded Polystyrene	32,204	0.6%	0.8%	0.6%	0.7%	9.9%
	12	Film Plastic	236,551	4.7%	3.4%	4.4%	5.0%	7.3%
	13	Other Rigid Plastic	152,705	3.0%	2.5%	2.8%	3.3%	7.5%
Glass			**182,216**	**3.6%**	**5.4%**	**3.2%**	**4.1%**	**13.0%**
	14	Clear Glass	89,785	1.8%	2.5%	1.6%	2.0%	12.1%
	15	Green Glass	22,988	0.5%	0.9%	0.4%	0.6%	22.5%
	16	Amber Glass	46,081	0.9%	2.2%	0.7%	1.3%	30.9%
	17	Non-recyclable Glass	23,363	0.5%	1.5%	0.4%	0.6%	17.7%
Metals			**290,009**	**5.7%**	**8.1%**	**5.2%**	**6.2%**	**8.8%**
	18	Steel Cans	71,654	1.4%	1.4%	1.3%	1.6%	9.4%
	19	Aluminum Cans	31,881	0.6%	1.3%	0.5%	0.7%	15.9%
	20	Other Ferrous	141,481	2.8%	7.3%	2.4%	3.3%	16.3%
	21	Other Aluminum	26,422	0.5%	1.3%	0.5%	0.6%	13.5%
	22	Other Non-Ferrous	18,571	0.4%	1.6%	0.3%	0.5%	21.5%
Organics			**1,863,389**	**36.7%**	**18.6%**	**35.1%**	**38.3%**	**4.5%**
	23	Yard Waste- Grass	125,403	2.5%	6.3%	2.0%	3.2%	23.4%
	24	Yard Waste- Other	259,161	5.1%	8.3%	4.3%	6.2%	18.9%
	25	Wood- Unpainted	184,131	3.6%	12.3%	3.1%	4.5%	19.1%
	26	Wood- Painted	139,868	2.8%	9.2%	2.4%	3.3%	17.3%
	27	Food Waste	621,205	12.2%	8.8%	11.4%	13.3%	7.8%
	28	Textiles	223,459	4.4%	5.4%	4.0%	4.9%	10.2%
	29	Diapers	135,128	2.7%	3.0%	2.4%	3.0%	10.5%
	30	Fines	64,113	1.3%	1.1%	1.2%	1.4%	8.9%
	31	Other Organics	110,920	2.2%	3.9%	1.9%	2.6%	15.6%
Inorganics			**644,786**	**12.7%**	**21.2%**	**11.4%**	**14.1%**	**10.5%**
	32	Electronics	71,102	1.4%	3.9%	1.2%	1.7%	19.7%
	33	Carpet	79,436	1.6%	5.6%	1.3%	2.0%	24.7%
	34	Drywall	49,627	1.0%	5.2%	0.8%	1.3%	24.4%
	35	Other C&D	228,167	4.5%	13.6%	3.8%	5.5%	18.3%
	36	HHW	15,198	0.3%	0.8%	0.3%	0.4%	14.9%
	37	Other Inorganics	127,096	2.5%	5.7%	2.1%	3.1%	19.8%
	38	Furniture	74,161	1.5%	7.3%	1.2%	1.9%	27.0%
		Total	5,081,930	100.0%				

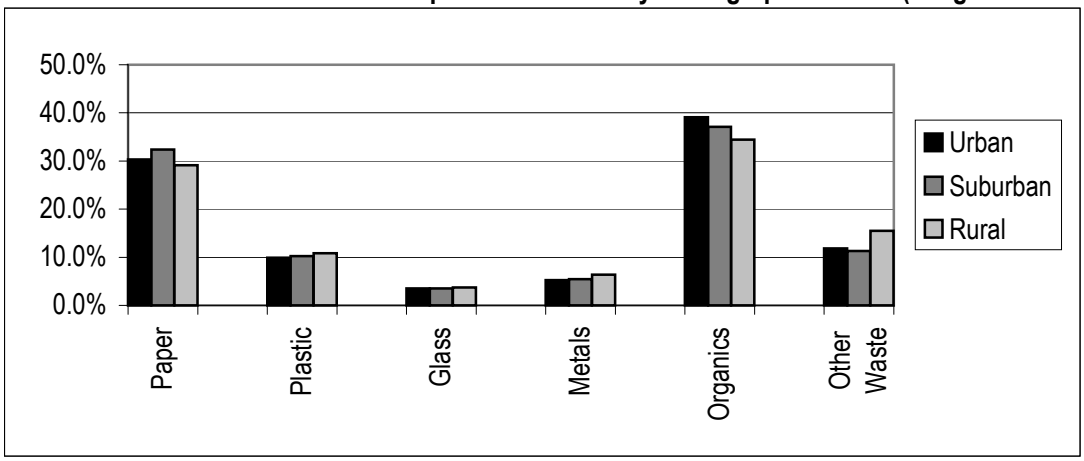
Table 4

Statewide Commercial Aggregate Landfilled MSW Composition Detail (Weight Percent)

		Material Categories	Tons Disposed	Mean Composition	Standard Deviation	Confidence Interval		Sampling Error
						Lower (%)	Upper (%)	
Paper			**1,535,571**	**35.8%**	**25.2%**	**32.9%**	**38.9%**	**8.3%**
	1	Newspaper	129,758	3.0%	4.6%	2.9%	3.2%	4.5%
	2	Corrugated Cardboard	506,693	11.8%	16.4%	11.2%	12.5%	5.4%
	3	Office	224,371	5.2%	7.9%	5.1%	5.4%	3.0%
	4	Magazine/ Glossy	104,909	2.4%	5.5%	2.4%	2.5%	2.8%
	5	Polycoated/Aseptic Containers	24,264	0.6%	1.6%	0.6%	0.6%	0.7%
	6	Mixed Paper	188,650	4.4%	6.5%	4.2%	4.6%	4.1%
	7	Non-recyclable Paper	356,927	8.3%	8.2%	7.5%	8.9%	8.1%
Plastic			**532,478**	**12.4%**	**12.8%**	**11.1%**	**14.0%**	**11.7%**
	8	#1 PET Bottles	38,444	0.9%	1.9%	0.9%	0.9%	0.9%
	9	#2 HDPE Bottles	20,938	0.5%	0.6%	0.5%	0.5%	0.9%
	10	#3-#7 Bottles	8,446	0.2%	0.6%	0.2%	0.2%	0.2%
	11	Expanded Polystyrene	38,503	0.9%	2.3%	0.9%	0.9%	0.7%
	12	Film Plastic	228,075	5.3%	6.5%	5.1%	5.5%	3.9%
	13	Other Rigid Plastic	198,072	4.6%	8.2%	4.5%	4.7%	2.6%
Glass			**101,847**	**2.4%**	**5.1%**	**2.0%**	**2.8%**	**16.7%**
	14	Clear Glass	41,298	1.0%	1.4%	0.9%	1.0%	2.1%
	15	Green Glass	15,607	0.4%	1.3%	0.4%	0.4%	0.7%
	16	Amber Glass	20,767	0.5%	1.6%	0.5%	0.5%	1.6%
	17	Non-recyclable Glass	24,175	0.6%	2.7%	0.6%	0.6%	1.0%
Metals			**219,539**	**5.1%**	**9.4%**	**4.5%**	**5.8%**	**12.4%**
	18	Steel Cans	31,841	0.7%	1.2%	0.7%	0.8%	1.3%
	19	Aluminum Cans	17,287	0.4%	0.8%	0.4%	0.4%	1.0%
	20	Other Ferrous	139,956	3.3%	8.9%	3.2%	3.5%	5.1%
	21	Other Aluminum	16,820	0.4%	1.0%	0.4%	0.4%	0.9%
	22	Other Non-Ferrous	13,635	0.3%	1.2%	0.3%	0.3%	1.0%
Organics			**1,348,348**	**31.5%**	**25.4%**	**29.1%**	**34.0%**	**7.8%**
	23	Yard Waste- Grass	13,779	0.3%	1.2%	0.3%	0.3%	4.3%
	24	Yard Waste- Other	92,257	2.2%	8.1%	2.1%	2.3%	6.5%
	25	Wood- Unpainted	349,928	8.2%	20.0%	7.8%	9.2%	8.6%
	26	Wood- Painted	95,302	2.2%	7.9%	2.1%	2.4%	6.6%
	27	Food Waste	506,554	11.8%	15.3%	10.5%	12.9%	10.1%
	28	Textiles	131,046	3.1%	8.4%	2.9%	3.2%	4.8%
	29	Diapers	83,765	2.0%	5.4%	1.9%	2.0%	2.7%
	30	Fines	29,177	0.7%	1.5%	0.7%	0.7%	1.1%
	31	Other Organics	46,540	1.1%	4.3%	1.1%	1.1%	3.0%
Inorganics			**549,370**	**12.8%**	**25.6%**	**11.3%**	**14.6%**	**12.9%**
	32	Electronics	65,994	1.5%	4.7%	1.5%	1.6%	2.7%
	33	Carpet	83,384	1.9%	6.9%	1.9%	2.1%	3.8%
	34	Drywall	49,137	1.1%	7.1%	1.1%	1.2%	3.4%
	35	Other C&D	217,507	5.1%	19.0%	4.8%	5.8%	9.5%
	36	HHW	12,999	0.3%	1.5%	0.3%	0.3%	0.6%
	37	Other Inorganics	81,454	1.9%	6.2%	1.9%	2.0%	4.2%
	38	Furniture	38,894	0.9%	6.2%	0.9%	1.0%	4.5%
		Total	4,287,153	100.0%				

Figure 12

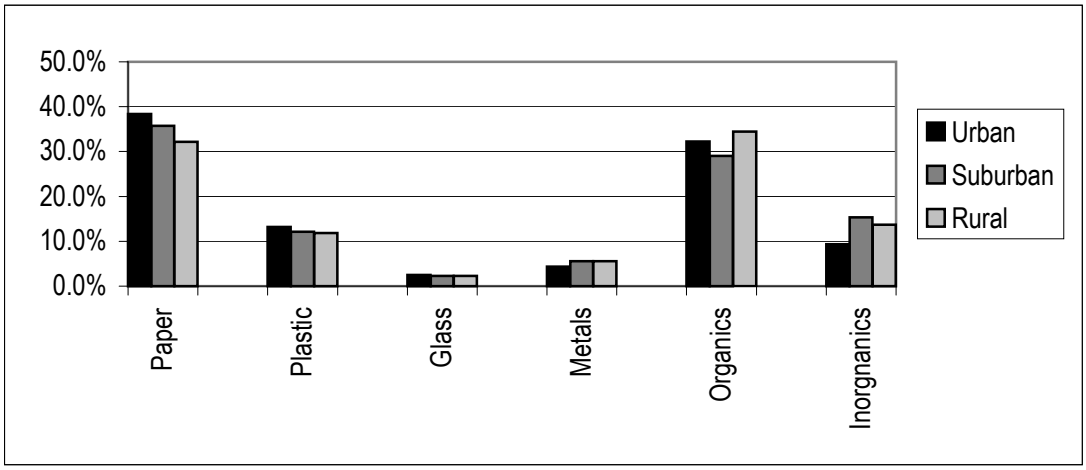
Landfilled Residential Waste Composition Results by Demographic Sector (Weight Percent)



Generator	% Composition			
	Urban	Suburban	Rural	Aggregate
Paper	30.3%	32.4%	29.1%	31.0%
Plastic	9.9%	10.2%	10.9%	10.4%
Glass	3.5%	3.5%	3.7%	3.6%
Metals	5.3%	5.5%	6.4%	5.7%
Organics	39.1%	37.1%	34.4%	36.7%
Other Waste	11.9%	11.3%	15.5%	12.7%
Total	100.0%	100.0%	100.0%	100.0%

Figure 13

Landfilled Commercial Waste Composition Results by Demographic Sector (Weight Percent)



Generator	% Composition			
	Urban	Suburban	Rural	Aggregate
Paper	38.4%	35.7%	32.2%	35.8%
Plastic	13.2%	12.1%	11.8%	12.4%
Glass	2.5%	2.3%	2.3%	2.4%
Metals	4.3%	5.5%	5.6%	5.1%
Organics	32.3%	29.0%	34.4%	31.5%
Other Waste	9.3%	15.3%	13.7%	12.8%
Total	100.0%	100.0%	100.0%	100.0%

Table 5

Landfilled Residential Aggregate MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**30.3%**	**32.4%**	**29.1%**	**31.0%**
	1	Newspaper	4.7%	5.3%	5.2%	5.2%
	2	Corrugated Cardboard	5.2%	5.8%	4.5%	5.3%
	3	Office	2.3%	2.4%	1.9%	2.2%
	4	Magazine/ Glossy	2.4%	3.0%	3.0%	2.9%
	5	Polycoated/Aseptic Containers	0.4%	0.6%	0.4%	0.5%
	6	Mixed Paper	5.2%	5.2%	4.0%	4.8%
	7	Non-recyclable Paper	10.0%	10.1%	10.1%	10.1%
Plastic			**9.9%**	**10.2%**	**10.9%**	**10.4%**
	8	#1 PET Bottles	0.9%	0.9%	1.1%	1.0%
	9	#2 HDPE Bottles	0.8%	0.9%	1.1%	0.9%
	10	#3-#7 Bottles	0.2%	0.2%	0.2%	0.2%
	11	Expanded Polystyrene	0.7%	0.6%	0.6%	0.6%
	12	Film Plastic	4.7%	4.6%	4.7%	4.7%
	13	Other Rigid Plastic	2.6%	3.1%	3.1%	3.0%
Glass			**3.5%**	**3.5%**	**3.7%**	**3.6%**
	14	Clear Glass	2.1%	1.6%	1.8%	1.8%
	15	Green Glass	0.4%	0.5%	0.3%	0.5%
	16	Amber Glass	0.8%	1.1%	0.7%	0.9%
	17	Non-recyclable Glass	0.2%	0.3%	0.9%	0.5%
Metals			**5.3%**	**5.5%**	**6.4%**	**5.7%**
	18	Steel Cans	1.2%	1.2%	1.9%	1.4%
	19	Aluminum Cans	0.5%	0.6%	0.7%	0.6%
	20	Other Ferrous	2.6%	2.9%	2.7%	2.8%
	21	Other Aluminum	0.5%	0.4%	0.6%	0.5%
	22	Other Non-Ferrous	0.4%	0.3%	0.5%	0.4%
Organics			**39.1%**	**37.1%**	**34.4%**	**36.7%**
	23	Yard Waste- Grass	0.8%	3.4%	2.0%	2.5%
	24	Yard Waste- Other	6.7%	6.1%	2.4%	5.1%
	25	Wood- Unpainted	4.8%	2.9%	4.1%	3.6%
	26	Wood- Painted	4.6%	2.0%	2.7%	2.8%
	27	Food Waste	11.4%	12.0%	13.1%	12.2%
	28	Textiles	5.4%	4.4%	3.8%	4.4%
	29	Diapers	2.6%	2.6%	2.8%	2.7%
	30	Fines	1.5%	1.2%	1.2%	1.3%
	31	Other Organics	1.4%	2.5%	2.2%	2.2%
Other			**11.9%**	**11.3%**	**15.5%**	**12.7%**
Waste	32	Electronics	1.4%	1.7%	0.9%	1.4%
	33	Carpet	1.3%	1.7%	1.4%	1.6%
	34	Drywall	1.6%	0.9%	0.8%	1.0%
	35	Other C&D	4.0%	3.0%	7.2%	4.5%
	36	HHW	0.2%	0.3%	0.4%	0.3%
	37	Other Inorganics	1.5%	3.0%	2.4%	2.5%
	38	Furniture	1.9%	0.7%	2.5%	1.5%
		Total	100.0%	100.0%	100.0%	100.0%

Table 6

Landfilled Commercial Aggregate MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**38.4%**	**35.7%**	**32.2%**	**35.8%**
	1	Newspaper	2.9%	3.4%	2.5%	3.0%
	2	Corrugated Cardboard	13.8%	10.6%	11.0%	11.8%
	3	Office	5.5%	5.9%	3.6%	5.2%
	4	Magazine/ Glossy	4.0%	1.7%	1.5%	2.4%
	5	Polycoated/Aseptic Containers	0.6%	0.5%	0.6%	0.6%
	6	Mixed Paper	4.5%	4.3%	4.5%	4.4%
	7	Non-recyclable Paper	7.1%	9.3%	8.5%	8.3%
Plastic			**13.2%**	**12.1%**	**11.8%**	**12.4%**
	8	#1 PET Bottles	1.0%	0.8%	0.8%	0.9%
	9	#2 HDPE Bottles	0.4%	0.5%	0.6%	0.5%
	10	#3-#7 Bottles	0.2%	0.2%	0.1%	0.2%
	11	Expanded Polystyrene	0.9%	1.0%	0.7%	0.9%
	12	Film Plastic	5.0%	5.4%	5.7%	5.3%
	13	Other Rigid Plastic	5.7%	4.1%	3.9%	4.6%
Glass			**2.5%**	**2.3%**	**2.3%**	**2.4%**
	14	Clear Glass	1.0%	0.9%	1.0%	1.0%
	15	Green Glass	0.6%	0.2%	0.3%	0.4%
	16	Amber Glass	0.7%	0.3%	0.5%	0.5%
	17	Non-recyclable Glass	0.3%	0.8%	0.5%	0.6%
Metals			**4.3%**	**5.5%**	**5.6%**	**5.1%**
	18	Steel Cans	0.7%	0.7%	1.0%	0.7%
	19	Aluminum Cans	0.5%	0.3%	0.4%	0.4%
	20	Other Ferrous	2.6%	3.8%	3.4%	3.3%
	21	Other Aluminum	0.3%	0.4%	0.5%	0.4%
	22	Other Non-Ferrous	0.3%	0.4%	0.3%	0.3%
Organics			**32.3%**	**29.0%**	**34.4%**	**31.5%**
	23	Yard Waste- Grass	0.2%	0.3%	0.6%	0.3%
	24	Yard Waste- Other	3.8%	1.7%	0.5%	2.2%
	25	Wood- Unpainted	7.7%	8.1%	9.0%	8.2%
	26	Wood- Painted	1.7%	2.2%	3.0%	2.2%
	27	Food Waste	13.0%	10.0%	13.0%	11.8%
	28	Textiles	2.7%	2.6%	4.4%	3.1%
	29	Diapers	1.5%	2.3%	2.0%	2.0%
	30	Fines	0.7%	0.6%	0.7%	0.7%
	31	Other Organics	1.0%	1.2%	1.2%	1.1%
Inorganics			**9.3%**	**15.3%**	**13.7%**	**12.8%**
	32	Electronics	1.4%	2.2%	0.7%	1.5%
	33	Carpet	1.0%	2.4%	2.6%	1.9%
	34	Drywall	0.9%	1.1%	1.6%	1.1%
	35	Other C&D	2.5%	6.8%	6.0%	5.1%
	36	HHW	0.4%	0.2%	0.3%	0.3%
	37	Other Inorganics	1.1%	2.3%	2.5%	1.9%
	38	Furniture	2.1%	0.3%	0.2%	0.9%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 14
Pennsylvania Aggregate Composition of Bulky Loads (Visual Samples)

Material Group	% Weight
Paper	12.4%
Plastic	2.1%
Glass	1.1%
Metals	7.0%
Organics	37.8%
Inorganics	39.6%
Total	100.0%

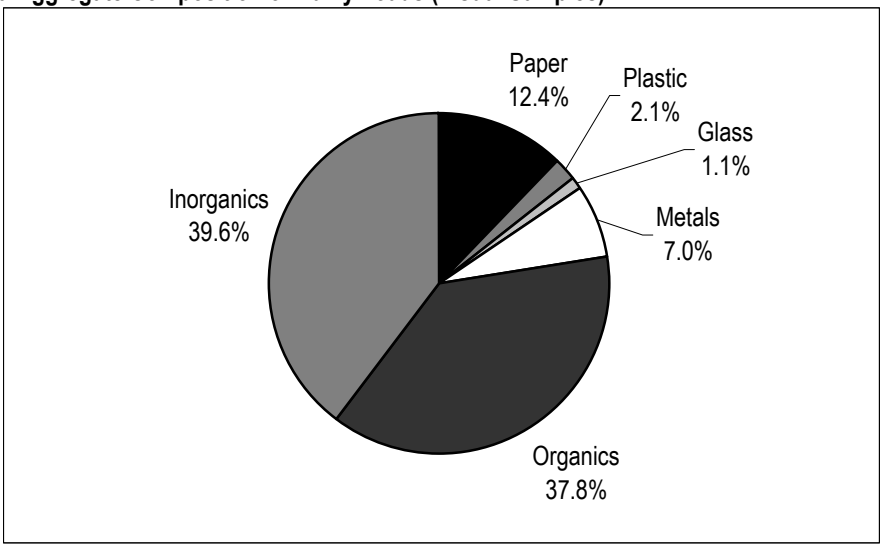
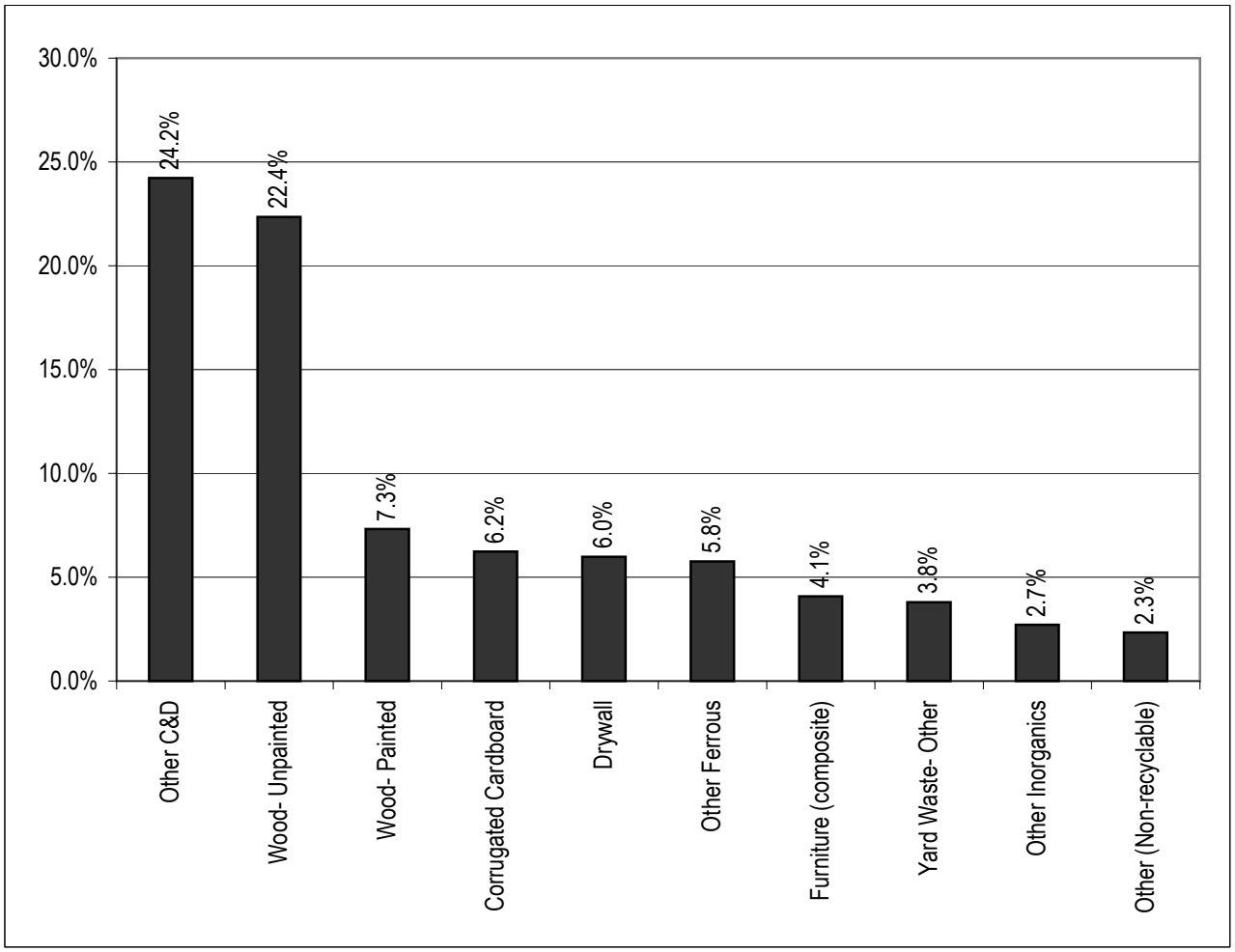


Figure 15
Pennsylvania Top 10 Most Prevalent Bulky Materials



Section 5
PACKAGING ANALYSIS

Introduction

Packaging and packaging materials are believed to make up a large fraction of the disposed MSW in Pennsylvania and across the country. The Pennsylvania legislature has defined packaging as:

> "A container providing a means of marketing, protecting or handling a product, including unit packaging, intermediate packaging, and shipping containers. Includes unsealed receptacles such as carrying cases, crates, cups, pails, rigid foil and other trays, wrappers and wrapping films, bags and tubs. Tin-plated steel, hot-dip and electrolyte galvanized steel, and galvanized wire shall be considered packaging. Includes individual parts of a package such as blocking, bracing, cushioning, weatherproofing, exterior strapping, coatings, closures, inks, labels, dyes, pigments, adhesives, stabilizers, or any other additive."

At the outset of the project, it was intended to devote both field data collection and laboratory analysis to the fraction of the waste stream that is made up of packaging and packaging materials. Specifically, samples of packaging and packaging components were to be tested for containing four hazardous elements: mercury, lead, cadmium and hexavalent chromium. However, data collection was ultimately limited to field sorting of packaging compared to non-packaging materials.

The remainder of this section describes the results of an analysis of packaging vs. non-packaging in the disposed waste stream.

Data Collection Summary

The packaging analysis was performed during the winter season of sorting only. During all six weeks of sorting that took place during the winter season, all physical samples were divided into the 37 targeted material categories, and then split between packaging and non-packaging within each material category. Table 1 summarizes the material categories that were found to include at least some packaging materials.

Table 1 Materials Containing Packaging

Paper	**Metals**
Corrugated Cardboard	Steel Cans
Polycoated/Aseptic Containers	Aluminum Cans
Mixed Paper (Recyclable)	Other Ferrous Metals
Other Paper (Non-recyclable)	Other Aluminum
Plastic	**Glass**
#1 PET Bottles	Clear Glass Containers
#2 HDPE Bottles	Green Glass Containers
#3 - #7 Bottles	Brown Glass Containers
Expanded Polystyrene	**Organics**
Film Plastic	Wood—Unpainted
Other Rigid Plastic	Wood—Painted
Inorganics [none]	

As shown a total of 19 materials were found to contain at least some packaging or packaging components.

Table 2 summarizes the total number of packaging samples that were taken during the winter season of sorting. As shown the packaging samples were distributed across all generating sectors and demographic areas, as well as regionally. However, because the analysis of packaging took place during only one of the seasonal sorts, the distribution of samples across demographic areas and generating sectors was not as consistent as the overall MSW composition results.

Table 2 Packaging Sampling Summary [1]

Generating Sector	Demographic Area			
	Urban	Suburban	Rural	Total
Residential Samples	59	32	51	142
Commercial Samples	46	27	59	132
Self-haul Samples	6	6	12	24
Total Packaging Samples	**111**	**65**	**122**	**298**

[1] Packaging and non-packaging analysis was only performed on physically sorted samples.

Results

This section provides an overview of the composition of packaging vs. non-packaging materials in the waste stream, based on an analysis of the winter season packaging samples. Individual tables and figures are described below, and shown at the end of the section.

Note that results are presented separately for each of the generating sectors—residential, commercial and self-haul. Because it was not possible to obtain representative samples across generating sectors and across demographic areas during a single season of sorting, no attempt has been made to aggregate the composition of packaging. Rather, results are presented separately for residential, commercial and self-haul waste. Additionally, visually surveyed bulky waste loads were excluded from the analysis, due to difficulties in differentiating between packaging and non-packaging in these loads. It is likely that the primary packaging found in bulky waste loads would have been corrugated cardboard.

Packaging in Disposed Residential MSW

The first four figures summarize the incidence of packaging in the residential waste stream. Figure 1 shows a pie chart (and tabular summary) of the composition by major material group of packaging and non-packaging material. As shown, roughly one-quarter of the disposed residential waste stream was found to be made up of packaging.

Figures 2 and 3 present the top five most prevalent packaging and non-packaging materials, respectively. Cardboard is by far the most prevalent packaging material in disposed residential waste, followed by non-recyclable paper, recyclable paper, film plastic and steel cans. Food waste is the most prevalent non-packaging item (as well as the most prevalent material in the disposed residential waste stream).

Figure 4 compares packaging and non-packaging in the disposed residential waste stream by major material group for the urban, suburban and rural demographic areas. The fraction of packaging is comparable across generating sectors, although some variation is evident among different material groups. It is of interest to note that glass, plastic and metal are over one-half packaging, while other categories are primarily non-packaging.

Finally, Table 3 presents slightly more detailed comparisons of packaging and non-packaging residential waste from urban, suburban and rural areas. The table includes the sample mean composition, as well as confidence intervals at a 90 percent level of confidence. A complete description of these statistical measures is provided in Section 4 of this report.

Packaging in Disposed Commercial MSW

A duplicate set of figures and tables are used to illustrate packaging and non-packaging in disposed commercial waste.

Figure 5 shows a pie chart (and tabular summary) of the composition by major material group of packaging and non-packaging material. As shown, there was slightly more packaging in the commercial disposed waste stream compared to the residential stream.

Figures 6 and 7 present the top five most prevalent packaging and non-packaging materials, respectively. Cardboard is once again the most prevalent packaging material, by an even wider margin compared to the residential stream. However, the

remaining materials are significantly different than the residential stream, with plastics and wood appearing instead of paper products.

Figure 8 compares packaging and non-packaging in the disposed commercial waste stream by major material group for the urban, suburban and rural demographic areas. Finally, Table 4 presents a more detailed statistical comparison of packaging and non-packaging commercial waste from urban, suburban and rural areas. A complete description of these statistical measures is provided in Section 4 of this report.

Packaging in Disposed Self-haul MSW

Self-haul waste is typically made up of different materials compared to regularly collected residential and commercial waste collected curbside or from dumpsters. The same figures and tables are used to illustrate the composition of self-haul waste.

Figure 9 shows a pie chart (and tabular summary) of the composition breakdown by major material group of packaging and non-packaging material. As shown, self-haul waste contains the least amount of packaging—not surprising, given that self-haulers are typically transporting larger, bulky items such as attic and basement clean-outs, small renovation debris and the like.

Figures 10 and 11 present the top five most prevalent packaging and non-packaging materials, respectively. Although cardboard is once again the most prevalent packaging material, it does not stand out as much as in the commercial or residential streams.

An insufficient number of samples were obtained to attempt to distinguish packaging composition by demographic area for self-haul loads. Consequently, Figure 12 compares packaging and non-packaging in the disposed self-haul waste stream by major material group for the residential and commercial generating sectors. Table 5 presents a more detailed statistical comparison of packaging and non-packaging self-haul by generating sector. A complete description of these statistical measures is provided in Section 4 of this report.

Conclusion

The results shown here provide insight on the differing fractions of packaging and packaging components in the residential, commercial and self-haul waste streams. This information can be used in future efforts to evaluate or monitor compliance with safe packaging standards within the Commonwealth.

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Section 5

Figure 1

Residential Composition by Material Group

Material Group		Mean (%)	Confidence Interval Lower	Confidence Interval Upper
Paper	Packaging	11.0%	10.1%	12.0%
	Non-packaging	26.5%	24.4%	28.5%
Plastic	Packaging	6.8%	6.3%	7.4%
	Non-packaging	5.2%	4.6%	5.7%
Glass	Packaging	2.8%	2.4%	3.3%
	Non-packaging	0.5%	0.3%	0.6%
Metal	Packaging	2.8%	2.5%	3.2%
	Non-packaging	2.6%	2.0%	3.2%
Organics	Packaging	0.9%	0.6%	1.3%
	Non-packaging	35.7%	33.3%	38.1%
Inorganics	Packaging	0.0%	4.3%	6.2%
	Non-packaging	5.2%	4.3%	6.2%
Total Packaging		24.4%		
Total Non-packaging		75.6%		
Total		100.0%		

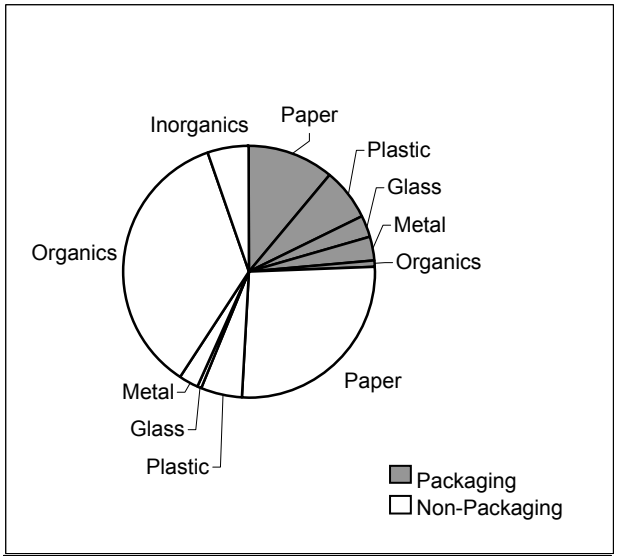


Figure 2

Top 5 Packaging Materials

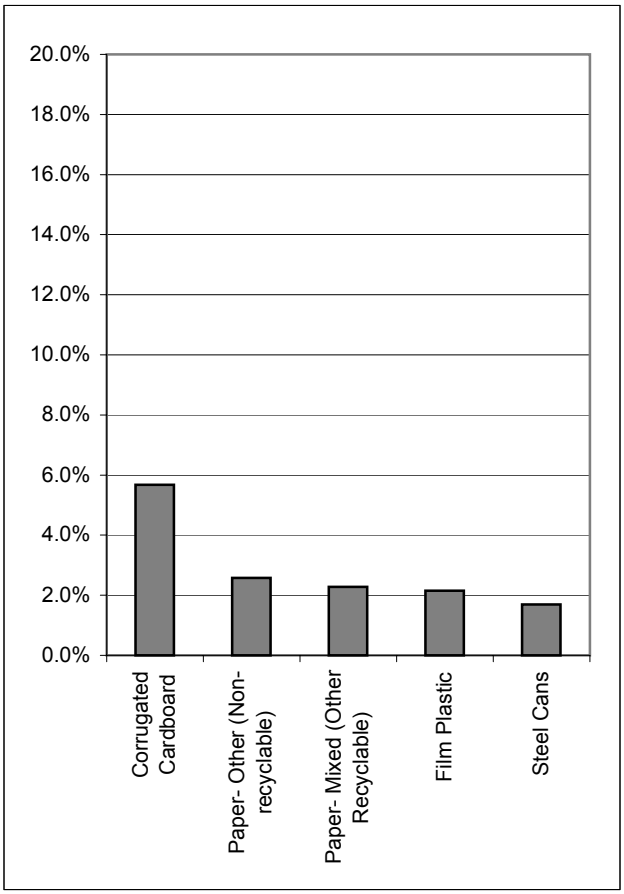


Figure 3

Top 5 Non-packaging Materials

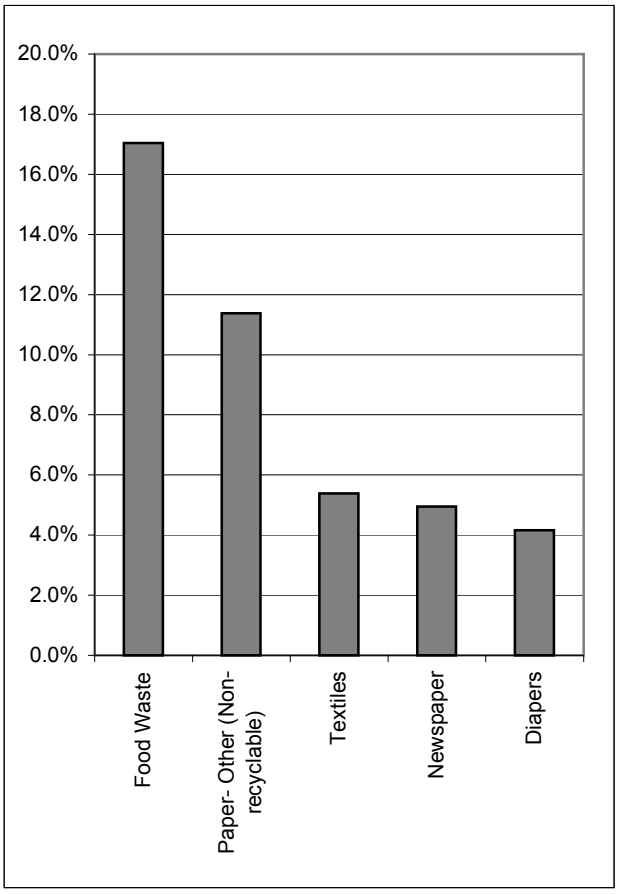


Figure 4
Residential Composition by Demographic Area

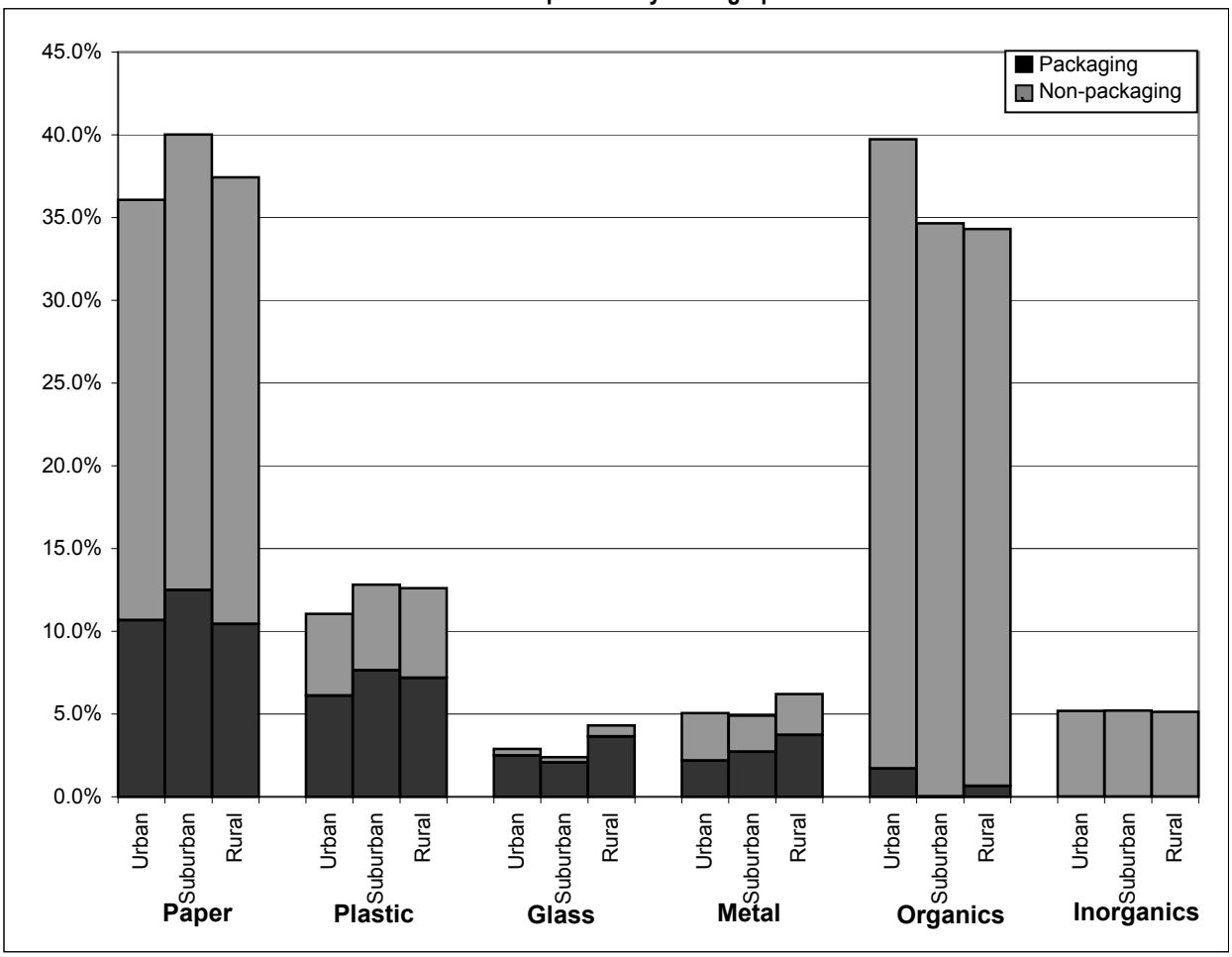


Table 3
Residential Composition by Demographic Area

		Urban			Suburban			Rural		
		Mean	Confidence Interval		Mean	Confidence Interval		Mean	Confidence Interval	
Material Group		(%)	Lower	Upper	(%)	Lower	Upper	(%)	Lower	Upper
Paper	Packaging	10.7%	9.3%	12.1%	12.5%	10.1%	15.1%	10.4%	9.1%	11.9%
	Non-packaging	25.4%	21.9%	29.0%	27.5%	23.6%	31.7%	27.0%	23.9%	30.2%
Plastic	Packaging	6.1%	5.4%	6.8%	7.6%	6.1%	9.4%	7.2%	6.3%	8.1%
	Non-packaging	4.9%	4.2%	5.8%	5.2%	4.4%	6.0%	5.4%	4.3%	6.6%
Glass	Packaging	2.5%	1.9%	3.2%	2.1%	1.4%	2.8%	3.6%	2.8%	4.5%
	Non-packaging	0.4%	0.2%	0.6%	0.3%	0.2%	0.5%	0.7%	0.4%	1.1%
Metal	Packaging	2.2%	1.8%	2.6%	2.7%	2.1%	3.4%	3.7%	3.0%	4.5%
	Non-packaging	2.9%	1.8%	4.2%	2.2%	1.2%	3.4%	2.5%	1.6%	3.5%
Organics	Packaging	1.7%	0.8%	2.9%	0.0%	0.0%	0.0%	0.6%	0.3%	1.1%
	Non-packaging	38.0%	34.4%	41.7%	34.6%	30.1%	39.3%	33.7%	29.3%	38.2%
Inorganics	Packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Non-packaging	5.2%	3.7%	6.9%	5.2%	3.5%	7.2%	5.1%	3.7%	6.8%
Total Packaging		23.2%			24.9%			25.6%		
Total Non-packaging		76.8%			75.1%			74.4%		
Total		100.0%			100.0%			100.0%		

Section 5

Figure 5

Commercial Composition by Material Group

Material Group		Mean (%)	Confidence Interval Lower	Confidence Interval Upper
Paper	Packaging	14.9%	12.6%	17.4%
	Non-packaging	24.9%	21.5%	28.5%
Plastic	Packaging	6.8%	5.8%	7.8%
	Non-packaging	6.4%	5.4%	7.5%
Glass	Packaging	1.6%	1.3%	2.0%
	Non-packaging	0.2%	0.2%	0.3%
Metal	Packaging	1.8%	1.5%	2.2%
	Non-packaging	3.0%	2.2%	3.9%
Organics	Packaging	2.0%	1.3%	2.9%
	Non-packaging	30.3%	26.8%	33.9%
Inorganics	Packaging	0.0%	0.0%	0.0%
	Non-packaging	8.0%	6.0%	10.2%
Total Packaging		27.1%		
Total Non-packaging		72.9%		
Total		100.0%		

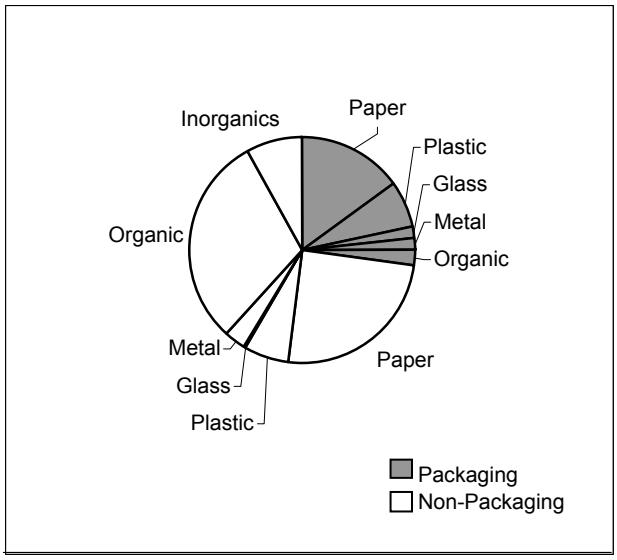


Figure 6

Top 5 Packaging Materials

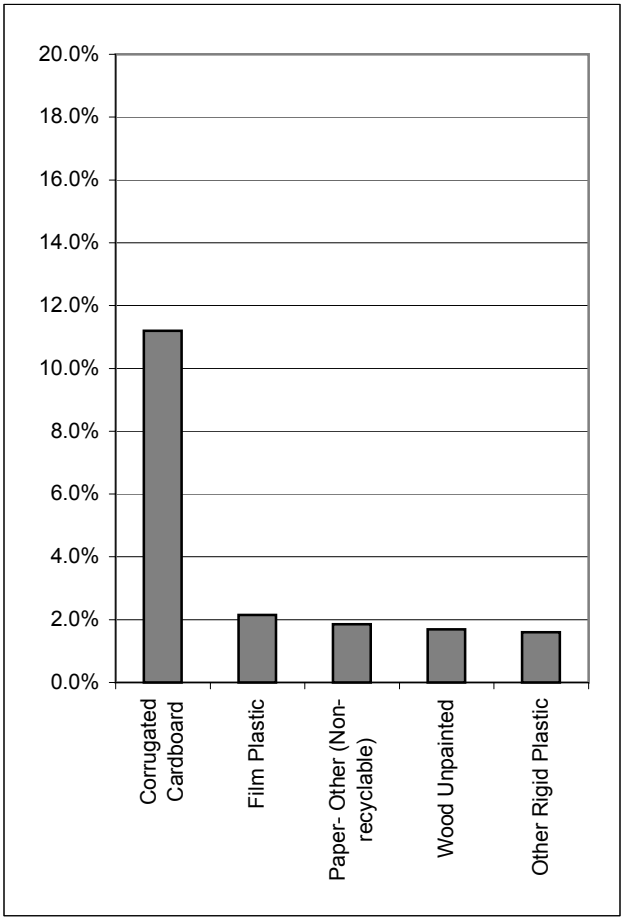


Figure 7

Top 5 Non-packaging Materials

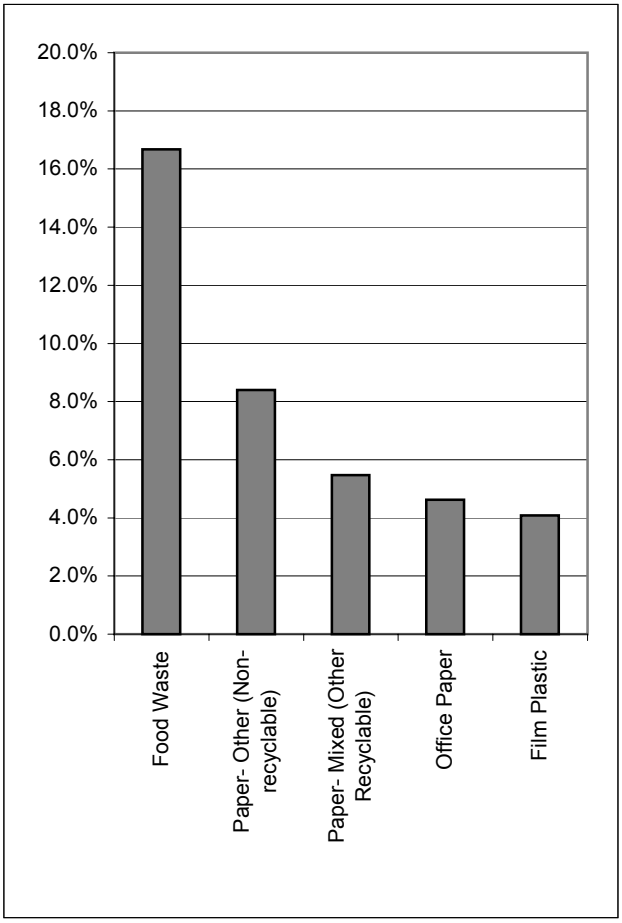


Figure 8
Commercial Composition by Demographic Area

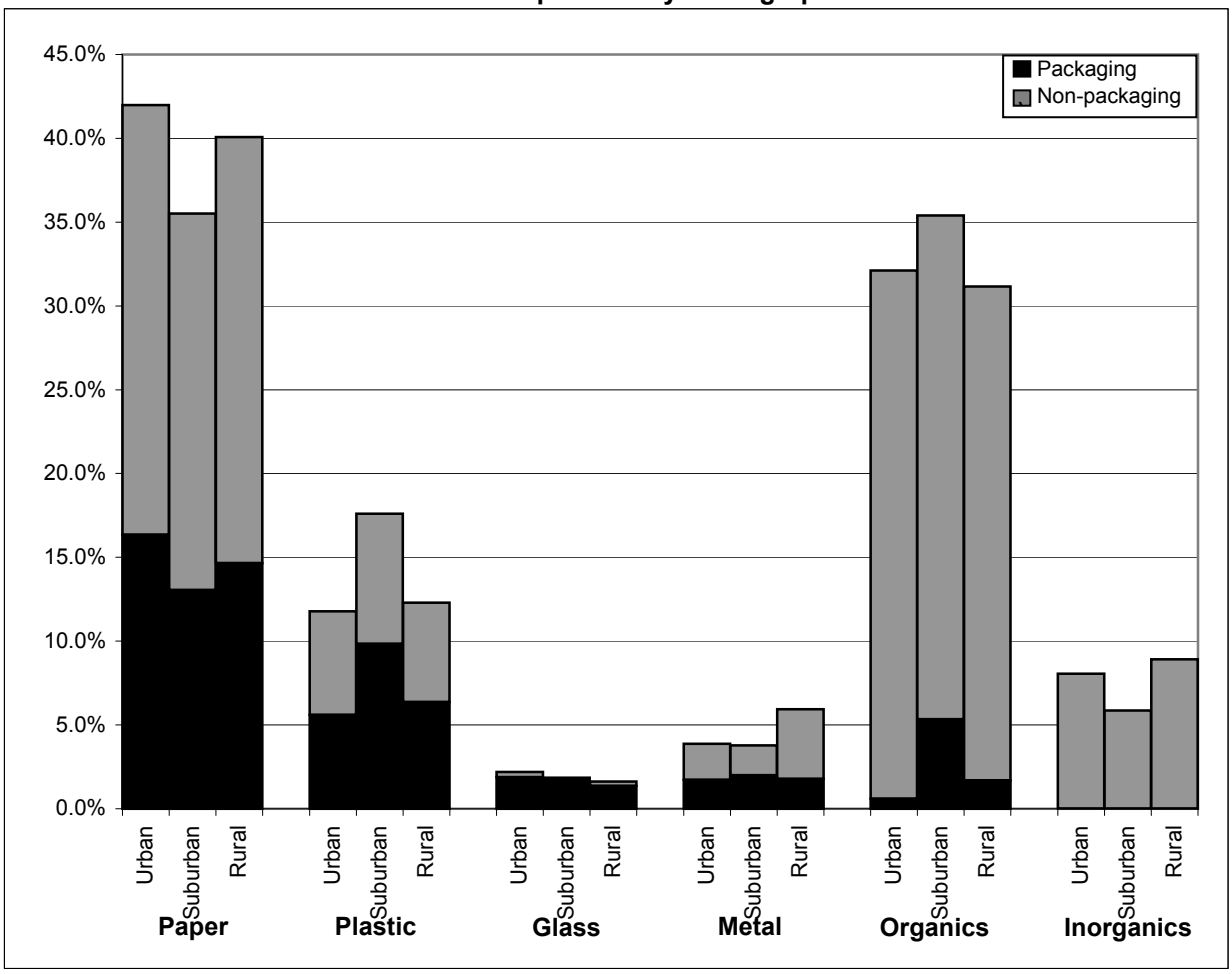


Table 4
Commercial Composition by Demographic Area

		Urban			Suburban			Rural		
		Mean	Confidence Interval		Mean	Confidence Interval		Mean	Confidence Interval	
Material Group		(%)	Lower	Upper	(%)	Lower	Upper	(%)	Lower	Upper
Paper	Packaging	16.4%	12.4%	20.8%	13.0%	9.2%	17.4%	14.7%	11.0%	18.8%
	Non-packaging	25.6%	21.1%	30.4%	22.5%	17.3%	28.1%	25.4%	19.1%	32.3%
Plastic	Packaging	5.6%	4.5%	6.8%	9.8%	7.2%	12.9%	6.4%	4.8%	8.1%
	Non-packaging	6.2%	4.6%	7.9%	7.8%	5.2%	10.8%	5.9%	4.5%	7.6%
Glass	Packaging	1.9%	1.3%	2.6%	1.8%	0.9%	2.9%	1.4%	0.9%	1.9%
	Non-packaging	0.3%	0.2%	0.5%	0.1%	0.0%	0.2%	0.3%	0.1%	0.4%
Metal	Packaging	1.7%	1.3%	2.3%	2.0%	1.3%	2.7%	1.8%	1.2%	2.4%
	Non-packaging	2.1%	1.3%	3.2%	1.8%	0.8%	3.2%	4.2%	2.5%	6.2%
Organics	Packaging	0.6%	0.3%	1.0%	5.3%	1.2%	12.0%	1.7%	0.9%	2.8%
	Non-packaging	31.5%	26.0%	37.3%	30.1%	22.2%	38.5%	29.5%	24.1%	35.2%
Inorganics	Packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Non-packaging	8.1%	5.0%	11.7%	5.9%	2.6%	10.2%	8.9%	5.6%	12.9%
Total Packaging		26.1%			31.9%			25.8%		
Total Non-packaging		73.9%			68.1%			74.2%		
Total		100.0%			100.0%			100.0%		

Figure 9
Self-haul Composition by Material Group

Material Group		Mean (%)	Confidence Interval Lower	Confidence Interval Upper
Paper	Packaging	5.6%	2.8%	9.2%
	Non-packaging	11.4%	5.0%	20.0%
Plastic	Packaging	4.1%	1.9%	7.1%
	Non-packaging	5.3%	2.9%	8.5%
Glass	Packaging	2.1%	0.8%	4.0%
	Non-packaging	2.6%	0.9%	5.2%
Metal	Packaging	1.4%	0.6%	2.6%
	Non-packaging	10.0%	3.6%	19.2%
Organics	Packaging	4.0%	1.2%	8.4%
	Non-packaging	34.8%	26.4%	43.7%
Inorganics	Packaging	0.0%	0.0%	0.0%
	Non-packaging	18.6%	9.8%	29.3%
Total Packaging		17.3%		
Total Non-packaging		82.7%		
Total		100.0%		

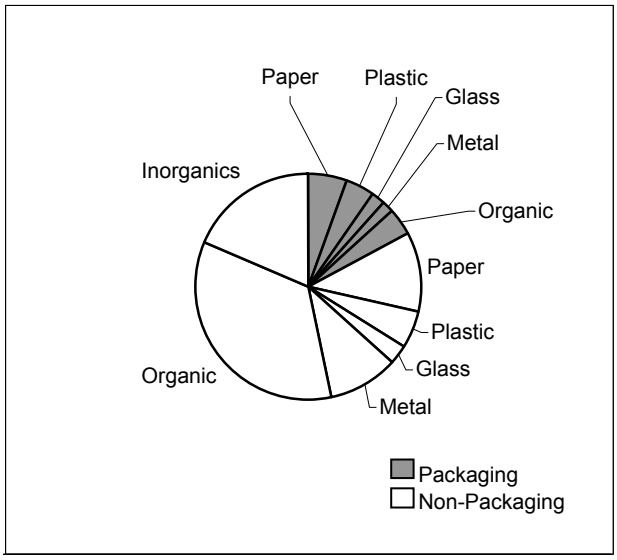


Figure 10
Top 5 Packaging Materials

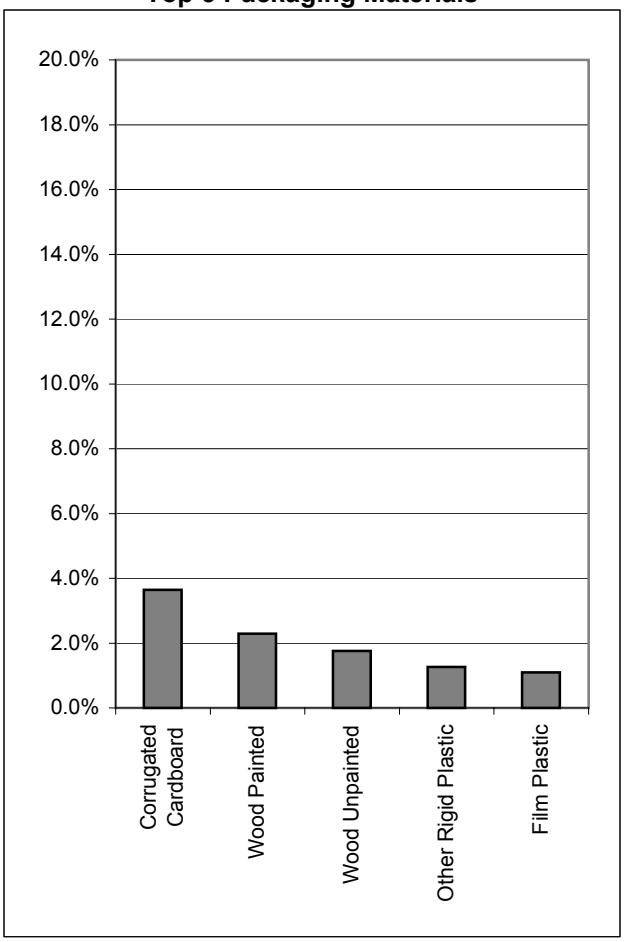


Figure 11
Top 5 Non-packaging Materials

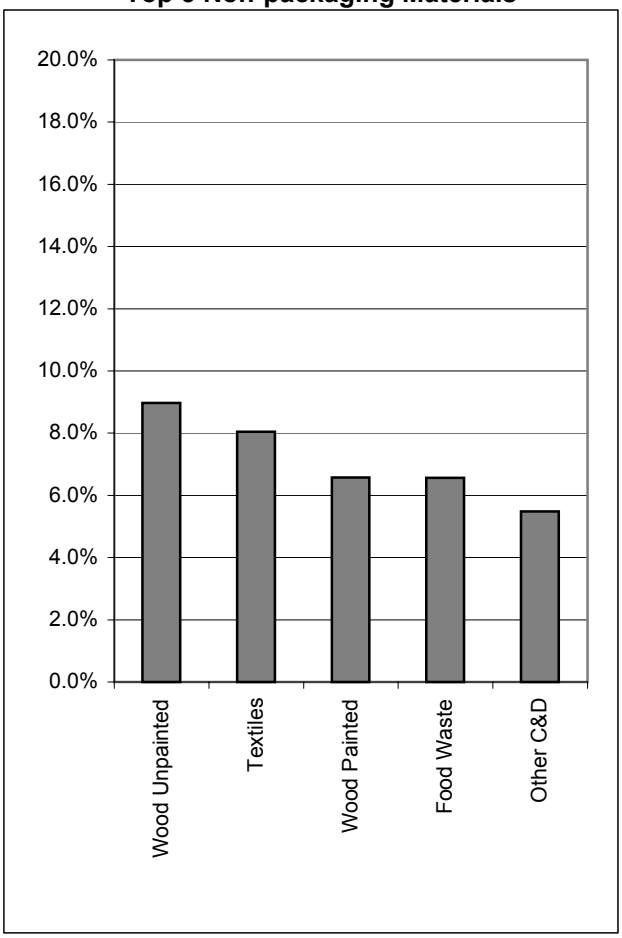


Figure 12
Self-haul Composition by Generator Sector

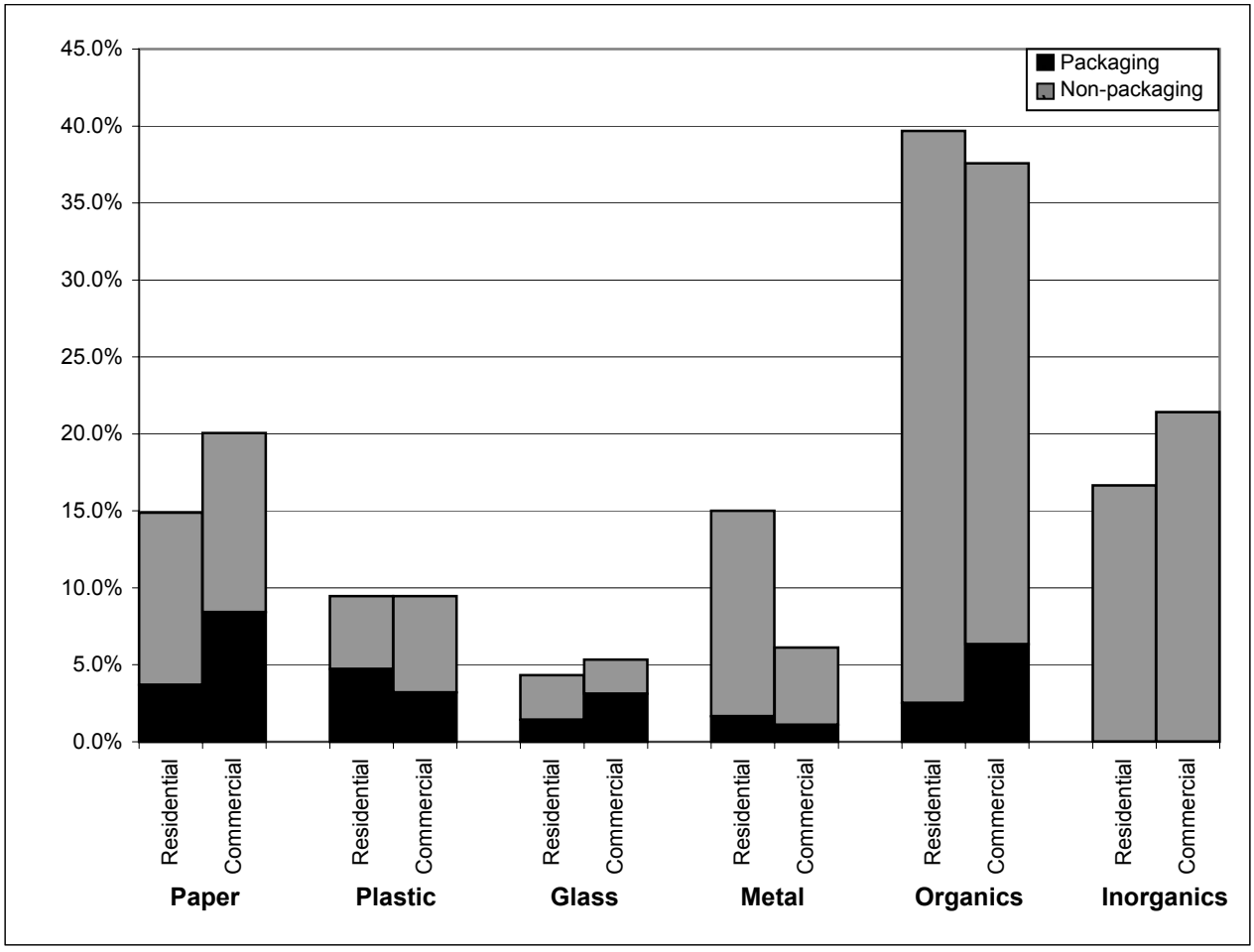


Table 5
Self-haul Composition by Generator Sector

		Residential			Commercial		
		Mean	Confidence Interval		Mean	Confidence Interval	
Material Group		(%)	Lower	Upper	(%)	Lower	Upper
Paper	Packaging	3.7%	1.5%	6.9%	8.4%	2.0%	18.6%
	Non-packaging	11.2%	3.0%	23.7%	11.7%	2.1%	27.5%
Plastic	Packaging	4.7%	1.3%	10.0%	3.2%	0.8%	7.1%
	Non-packaging	4.7%	2.1%	8.4%	6.3%	1.5%	13.9%
Glass	Packaging	1.4%	0.4%	3.2%	3.1%	0.2%	9.0%
	Non-packaging	2.9%	0.7%	6.5%	2.2%	0.0%	7.6%
Metal	Packaging	1.6%	0.4%	3.6%	1.1%	0.2%	2.7%
	Non-packaging	13.4%	2.6%	30.6%	5.0%	1.0%	11.9%
Organics	Packaging	2.5%	0.4%	6.4%	6.3%	0.2%	19.7%
	Non-packaging	37.2%	25.2%	49.9%	31.3%	18.4%	45.8%
Inorganics	Packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Non-packaging	16.7%	7.3%	28.9%	21.4%	4.4%	46.5%
Total Packaging		14.0%			22.1%		
Total Non-packaging		86.0%			77.9%		
Total		100.0%			100.0%		

Section 6
NORTHEAST REGION MSW COMPOSITION

Introduction

DEP manages Pennsylvania's waste stream via a network of six regional offices. An objective of this study was to derive results for each of the regions in the Commonwealth. Aggregate State-wide results are provided in Section 4 of this report. The purpose of this section is to provide detailed results specifically for the Northeast Region. A map of the Northeast region is shown in Figure 1.

Figure 1 Northeast Region Map

Table 1 summarizes the demographic and economic characteristics of the Northeast region.

Table 1 Northeast Region Demographic Summary

	Urban	Suburban	Rural	Total
Communities [1]	6	94	293	**393**
Population [1]	323,762	589,788	710,318	**1,623,868**
Housing Units [1]	132,258	243,830	284,368	**660,457**
Employment [1]	137,870	227,906	121,079	**486,855**

[1] Source: 2001 U.S. Census data provided by DEP
[2] Source: 2001 estimates provided by ESRI-BIS, Arlington, VA, based on U.S. Census data.

Table 2 summarizes the waste that was reported by the Commonwealth's landfills (and incinerators) to have been disposed from each County within the Northeast region in 2001.

Table 2 Northeast Region Waste Disposal Summary [1]

County	MSW Disposed (tons)
Carbon	19,080
Lackawanna	216,453
Lehigh	298,699
Luzerne	217,385
Monroe	96,361
Northampton	208,745
Pike	10,401
Schuylkill	129,015
Susquehanna	19,395
Wayne	53,125
Wyoming	12,930
Total	**1,281,588**

[1] Source: County-level disposal quantity estimates are based on the 2001 DEP landfill disposal database

In order to aggregate the MSW composition data that was collected in this study, it was necessary to develop estimates of waste generation by county within the region. This was performed in the following steps:

1) Surveying urban, suburban, and rural communities across the Commonwealth to compile urban, suburban and rural residential MSW disposal factors (tons of disposed MSW per household per year);
2) Applying the residential generation factors to the total households in the region to estimate total disposed residential waste;
3) Estimating total regional waste disposed based on a statistical analysis of reported county-level waste disposal records relative to county-level population and employment; and
4) Netting out residential waste to calculate disposed commercial waste quantities.

The results of this process are shown in Table 3 for the Northeast Region.

Table 3 Origin of Disposed MSW Northeast Region [1]

	Tons of Waste Disposed			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Residential generators	117,393	274,605	287,148	679,146
Commercial generators	140,386	221,799	240,256	602,442
Total	**257,780**	**496,404**	**527,404**	**1,281,588**

[1] Source: 2001 DEP database of disposed tons as reported by Pennsylvania disposal facilities.

In order to develop composition estimates for each of these demographic areas and generating sectors, field sampling was performed at two waste processing and disposal facilities:

- Keystone Landfill (Dunmore, Lackawanna County); and
- Commonwealth Environmental Systems Landfill (Hegins, Schuylkill County).

Sampling at these facilities was performed across four seasons to account for seasonal variation in MSW composition. Table 4 summarizes the sampling summary for the Northeast Region.

Table 4 Northeast Region Sampling Summary

	Number of Samples			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Physical MSW Samples				
Residential	30	35	32	97
Commercial	27	40	23	90
Subtotal—physical samples	57	75	55	187
Visual Bulk Waste Samples	18	28	21	67
Total Samples	**75**	**103**	**76**	**254**

Regional Aggregate Results

The remainder of this section presents a graphical and tabular summary of the Northeast region's disposed MSW composition. Specific figures and tables are summarized below.

- Figure 2 is a pie chart that shows the percentage composition of major material groups in the aggregate regional waste stream.
- Figure 3 is a bar chart that shows the estimated mean quantities of material disposed (or incinerated) from the region, again by major material group.

- Figure 4 compares the incidence of recyclable materials as targeted in Act 101 that were found to be disposed by residential and commercial generators in the region.
- Figure 5 shows the 10 most prevalent materials being disposed in the region, by weight.
- Table 5 contains a detailed statistical presentation of the aggregate MSW composition in the region. This tabular summary includes the statistical mean composition, as well as the standard deviation, upper and lower confidence intervals, and a "sampling error". The sampling error indicates the width of the confidence intervals relative to the mean. Lower sampling error signifies narrower confidence intervals (and therefore greater certainty of the mean composition shown).
- Figure 6 compares the percentage of disposed MSW landfilled from urban, suburban and rural communities within the region.
- Table 6 compares the mean composition of disposed MSW from urban, suburban and rural communities within the region.

Results by Generating Sector

An objective of the study was to compare and contrast the composition of residential and commercial waste within the region.

- Figure 7 and Figure 8 summarize the percentage of MSW landfilled by major material group for residential generators and commercial generators, respectively.
- Tables 7 and 8, like Table 6, compare the mean composition of urban, suburban, and rural waste. Table 7 focuses on residential generators in the region, while Table 8 shows the same comparison for commercial generators.

Bulky Waste

The State-wide MSW sort primarily targeted residential and commercial compacting vehicles, as well as commercial compacting and open-top roll-offs carrying non-C&D and non-industrial waste. These loads make up the majority of loads entering the Commonwealth's disposal facilities. However, it was expected at the outset of the study that some incoming loads of MSW—primarily those in open-top roll-off vehicles—would contain bulky waste that was not conducive to physical sorting. Therefore, the study methodology allowed for selected visual, volumetric sampling of bulky loads to the extent they were observed during the sampling and sorting process.

- Figure 9 shows the weight percentage composition of bulky items by major material group. Bulky loads were found to include a range of materials, including multi-family move-outs, residential and commercial clean-outs, miscellaneous commercial waste, and some renovation and construction type waste (although pure C&D loads were excluded from the analysis).

- Figure 10 lists the top 10 most prevalent bulky materials disposed during the study.

Self Haul Waste

Self haulers were found to deliver only a small fraction of waste to disposal facilities during the study. Our sampling plan allowed for selected sampling of self-haulers, which include: residential haulers of renovation and/or clean-out waste, and commercial contractors hauling small renovation, construction, land clearing, and/or clean-out type waste. Note that an insufficient number of self-haul samples were obtained to develop region-specific results.

Figure 2
Northeast Region Aggregate MSW Composition

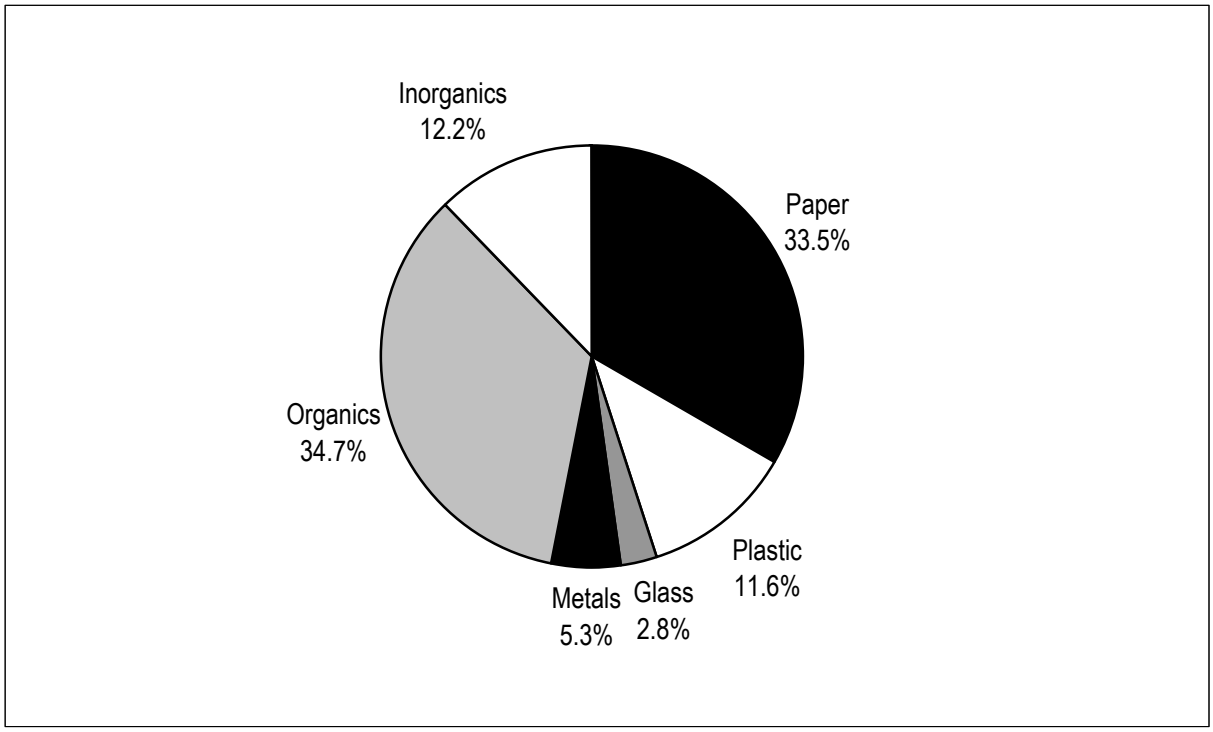


Figure 3
Northeast Region Aggregate MSW Tons Disposed

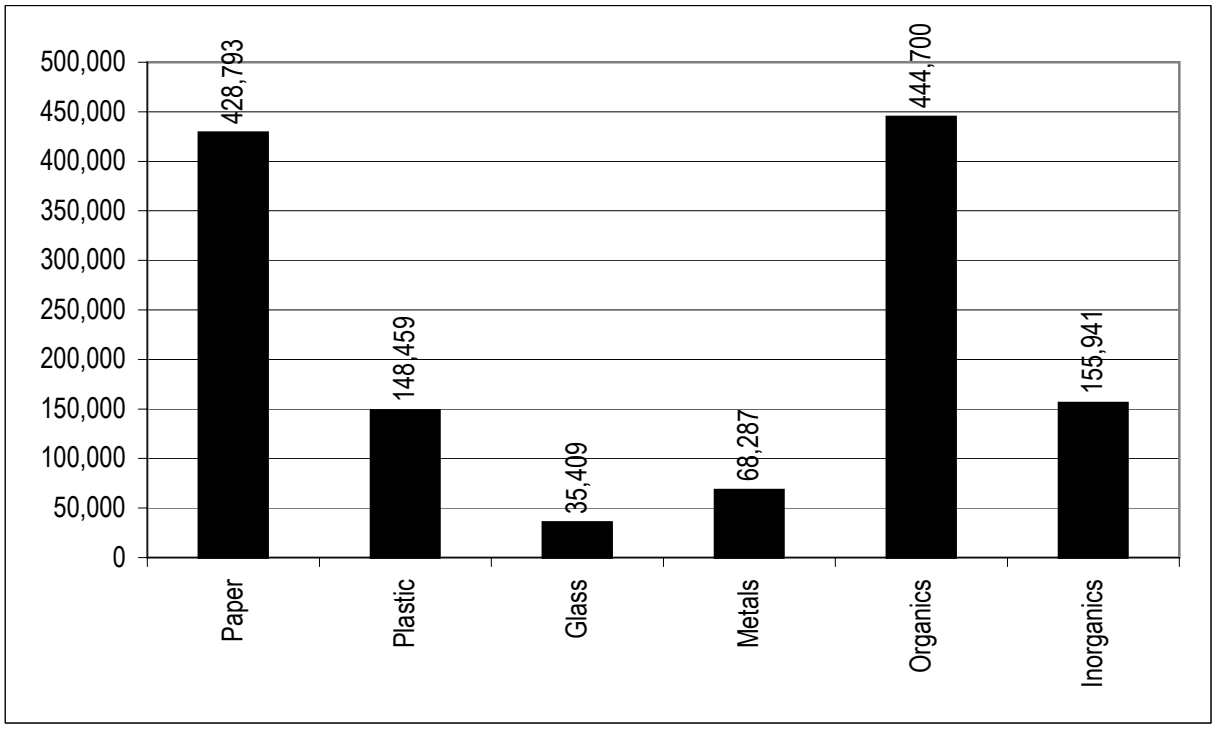


Figure 4

Act 101- Recyclables in Disposed MSW (tons)

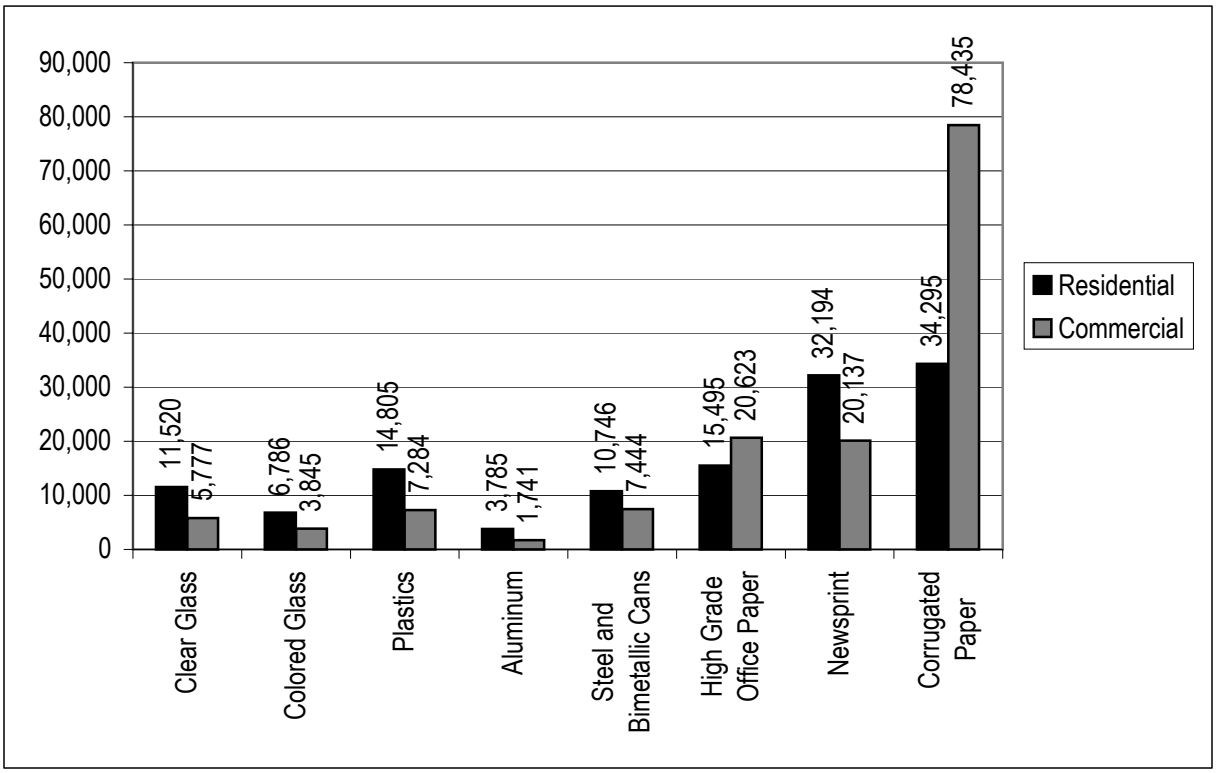


Figure 5

Northeast Region Top 10 Most Prevalent Materials

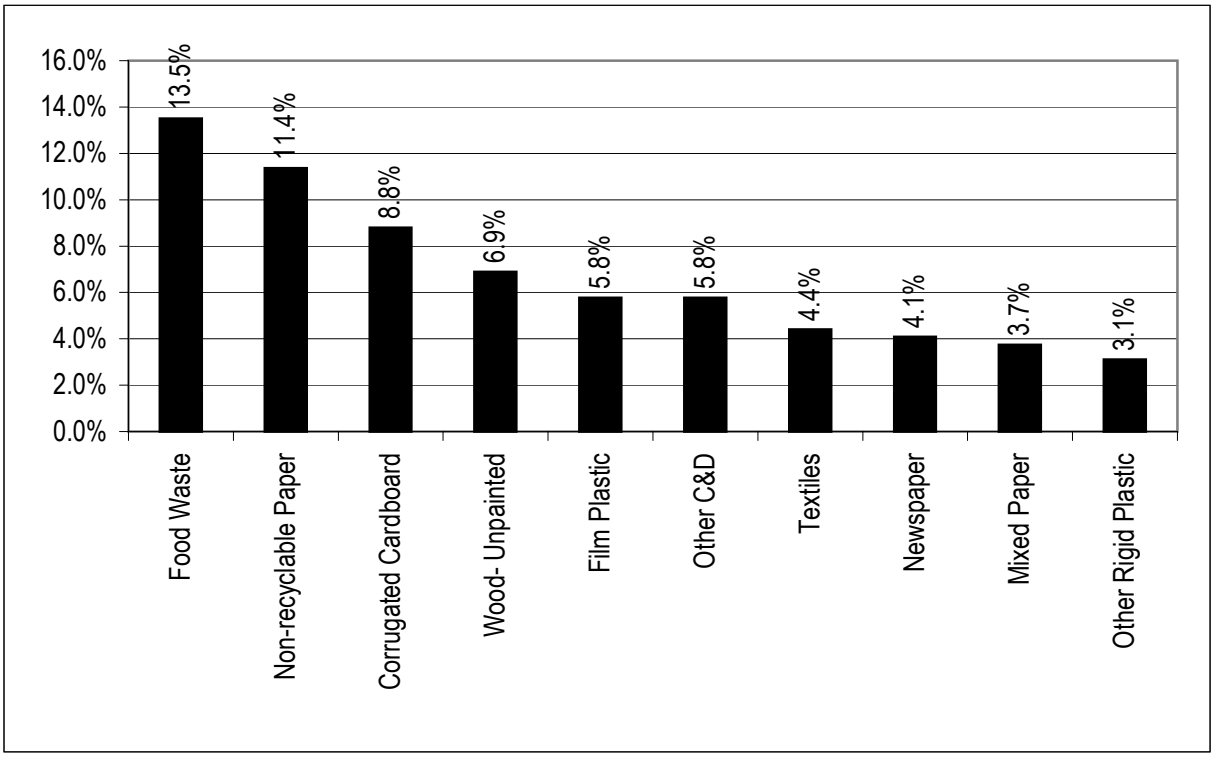


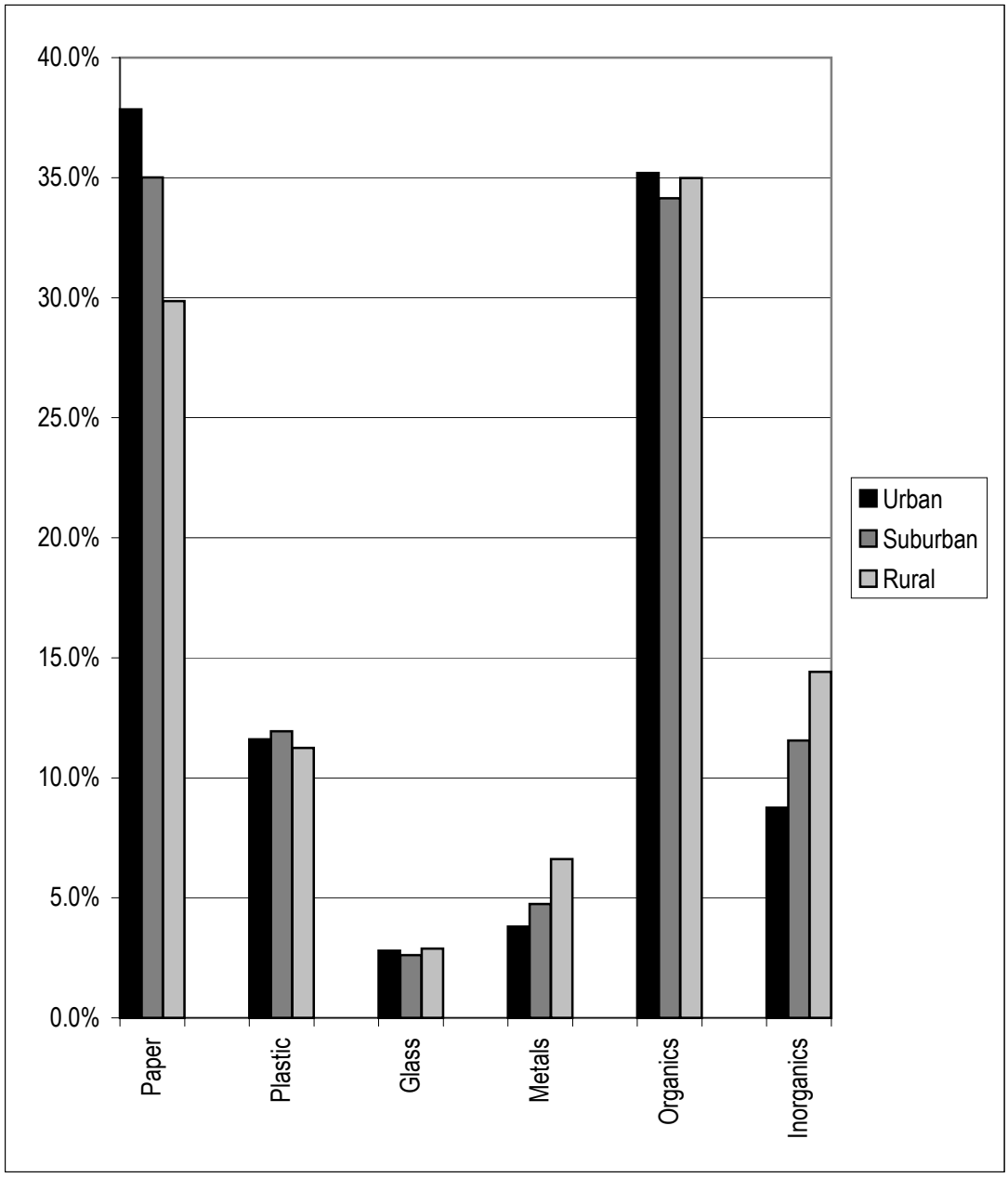
Table 5

Northeast Region Aggregate Landfilled MSW Composition Detail (Weight Percent)

		Material Categories	Tons Disposed	Mean Composition	Standard Deviation	Confidence Interval		Sampling Error
						Lower (%)	Upper (%)	
Paper			**428,793**	**33.5%**	**20.7%**	**30.5%**	**36.7%**	**9.3%**
	1	Newspaper	52,330	4.1%	4.9%	3.5%	4.9%	17.1%
	2	Corrugated Cardboard	112,731	8.8%	14.2%	7.4%	10.7%	18.7%
	3	Office	36,118	2.8%	5.1%	2.4%	3.5%	19.7%
	4	Magazine/ Glossy	25,323	2.0%	2.1%	1.7%	2.4%	18.5%
	5	Polycoated/Aseptic Containers	8,763	0.7%	1.3%	0.6%	0.8%	20.0%
	6	Mixed Paper	48,002	3.7%	4.1%	3.3%	4.4%	15.6%
	7	Non-recyclable Paper	145,526	11.4%	8.6%	10.2%	12.9%	12.0%
Plastic			**148,459**	**11.6%**	**11.4%**	**10.3%**	**13.1%**	**12.3%**
	8	#1 PET Bottles	11,710	0.9%	1.4%	0.8%	1.1%	19.8%
	9	#2 HDPE Bottles	10,379	0.8%	0.8%	0.7%	1.0%	17.7%
	10	#3-#7 Bottles	1,210	0.1%	0.2%	0.1%	0.1%	29.5%
	11	Expanded Polystyrene	11,371	0.9%	1.9%	0.8%	1.1%	18.9%
	12	Film Plastic	73,954	5.8%	6.6%	5.1%	6.7%	13.8%
	13	Other Rigid Plastic	39,835	3.1%	5.3%	2.6%	3.9%	20.5%
Glass			**35,409**	**2.8%**	**3.6%**	**2.4%**	**3.2%**	**16.1%**
	14	Clear Glass	17,297	1.3%	1.6%	1.1%	1.6%	18.3%
	15	Green Glass	3,709	0.3%	0.7%	0.2%	0.4%	27.9%
	16	Amber Glass	6,921	0.5%	1.2%	0.4%	0.7%	27.3%
	17	Non-recyclable Glass	7,482	0.6%	2.1%	0.4%	0.8%	32.9%
Metals			**68,287**	**5.3%**	**6.2%**	**4.6%**	**6.1%**	**13.9%**
	18	Steel Cans	18,190	1.4%	2.0%	1.2%	1.7%	18.7%
	19	Aluminum Cans	5,527	0.4%	0.5%	0.4%	0.5%	16.7%
	20	Other Ferrous	36,486	2.8%	5.7%	2.3%	3.6%	23.5%
	21	Other Aluminum	5,201	0.4%	0.6%	0.3%	0.5%	22.3%
	22	Other Non-Ferrous	2,884	0.2%	0.9%	0.2%	0.3%	35.0%
Organics			**444,700**	**34.7%**	**23.5%**	**31.6%**	**38.0%**	**9.1%**
	23	Yard Waste- Grass	11,941	0.9%	2.1%	0.7%	1.4%	38.5%
	24	Yard Waste- Other	10,393	0.8%	2.2%	0.6%	1.1%	29.2%
	25	Wood- Unpainted	88,364	6.9%	18.2%	5.5%	9.1%	26.3%
	26	Wood- Painted	39,221	3.1%	10.8%	2.4%	4.1%	26.5%
	27	Food Waste	173,103	13.5%	15.0%	11.8%	15.9%	15.3%
	28	Textiles	56,410	4.4%	6.5%	3.6%	5.6%	21.8%
	29	Diapers	30,838	2.4%	3.3%	2.0%	3.0%	19.3%
	30	Fines	13,874	1.1%	1.0%	0.9%	1.3%	15.9%
	31	Other Organics	20,557	1.6%	4.8%	1.3%	2.1%	27.6%
Inorganics			**155,941**	**12.2%**	**24.4%**	**9.9%**	**15.0%**	**21.0%**
	32	Electronics	9,526	0.7%	2.0%	0.6%	1.0%	28.9%
	33	Carpet	16,010	1.2%	3.7%	1.0%	1.7%	29.4%
	34	Drywall	16,377	1.3%	5.2%	1.0%	1.8%	31.5%
	35	Other C&D	73,901	5.8%	19.9%	4.3%	8.1%	32.5%
	36	HHW	2,742	0.2%	0.6%	0.2%	0.3%	28.7%
	37	Other Inorganics	29,445	2.3%	7.4%	1.7%	3.2%	32.2%
	38	Furniture	7,940	0.6%	4.1%	0.4%	1.1%	55.7%
		Total	1,281,588	100.0%				

Figure 6

Landfilled Aggregate Waste Composition Results by Demographic Sector (Weight Percent)



Material Group	Demographic Sector			
	Urban	Suburban	Rural	Aggregate
Paper	37.8%	35.0%	29.9%	33.5%
Plastic	11.6%	11.9%	11.2%	11.6%
Glass	2.8%	2.6%	2.9%	2.8%
Metals	3.8%	4.7%	6.6%	5.3%
Organics	35.2%	34.1%	35.0%	34.7%
Inorganics	8.8%	11.5%	14.4%	12.2%
Total	100.0%	100.0%	100.0%	100.0%

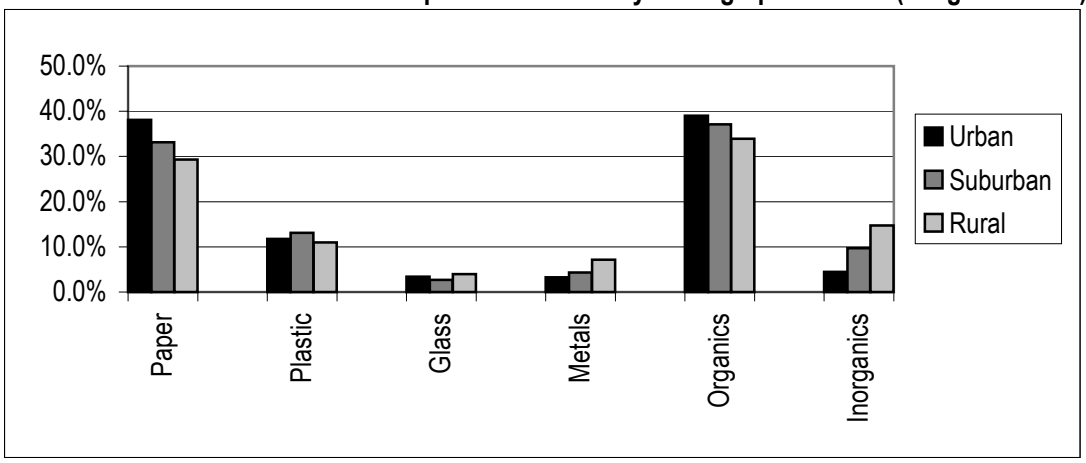
Table 6

Landfilled Aggregate MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**37.8%**	**35.0%**	**29.9%**	**33.5%**
	1	Newspaper	3.8%	4.8%	3.6%	4.1%
	2	Corrugated Cardboard	8.0%	9.7%	8.3%	8.8%
	3	Office	2.7%	3.6%	2.2%	2.8%
	4	Magazine/ Glossy	1.8%	2.1%	2.0%	2.0%
	5	Polycoated/Aseptic Containers	0.6%	0.6%	0.8%	0.7%
	6	Mixed (Other Recyclable)	6.3%	3.5%	2.7%	3.7%
	7	Other (Non-recyclable)	14.7%	10.7%	10.3%	11.4%
Plastic			**11.6%**	**11.9%**	**11.2%**	**11.6%**
	8	#1 PET Bottles	0.9%	0.8%	1.0%	0.9%
	9	#2 HDPE Bottles	0.8%	0.8%	0.8%	0.8%
	10	#3-#7 Bottles	0.1%	0.1%	0.0%	0.1%
	11	Expanded Polystyrene	0.7%	1.0%	0.9%	0.9%
	12	Film Plastic	5.5%	6.5%	5.2%	5.8%
	13	Other Rigid Plastic	3.5%	2.8%	3.2%	3.1%
Glass			**2.8%**	**2.6%**	**2.9%**	**2.8%**
	14	Clear	1.5%	1.1%	1.5%	1.3%
	15	Green	0.3%	0.3%	0.2%	0.3%
	16	Amber	0.6%	0.5%	0.5%	0.5%
	17	Other	0.4%	0.6%	0.6%	0.6%
Metals			**3.8%**	**4.7%**	**6.6%**	**5.3%**
	18	Steel Cans	1.1%	1.2%	1.8%	1.4%
	19	Aluminum Cans	0.5%	0.4%	0.4%	0.4%
	20	Other Ferrous	1.8%	2.5%	3.6%	2.8%
	21	Other Aluminum	0.2%	0.4%	0.5%	0.4%
	22	Other Non-Ferrous	0.2%	0.2%	0.3%	0.2%
Organics			**35.2%**	**34.1%**	**35.0%**	**34.7%**
	23	Yard Waste- Grass	0.2%	1.2%	1.0%	0.9%
	24	Yard Waste- Other	1.1%	0.7%	0.8%	0.8%
	25	Wood- Unpainted	3.5%	7.0%	8.5%	6.9%
	26	Wood- Painted	2.4%	3.5%	3.0%	3.1%
	27	Food Waste	18.3%	12.6%	12.1%	13.5%
	28	Textiles	3.1%	3.9%	5.5%	4.4%
	29	Diapers	3.3%	2.5%	1.9%	2.4%
	30	Fines	1.3%	1.0%	1.1%	1.1%
	31	Other Organics	2.0%	1.8%	1.2%	1.6%
Inorganics			**8.8%**	**11.5%**	**14.4%**	**12.2%**
	32	Brown Goods	0.6%	1.2%	0.3%	0.7%
	33	Carpet	2.1%	1.5%	0.6%	1.2%
	34	Drywall	0.6%	1.8%	1.1%	1.3%
	35	Other C&D	2.5%	4.9%	8.2%	5.8%
	36	HHW	0.3%	0.2%	0.2%	0.2%
	37	Other Inorganics	2.4%	1.8%	2.7%	2.3%
	38	Furniture	0.2%	0.3%	1.1%	0.6%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 7

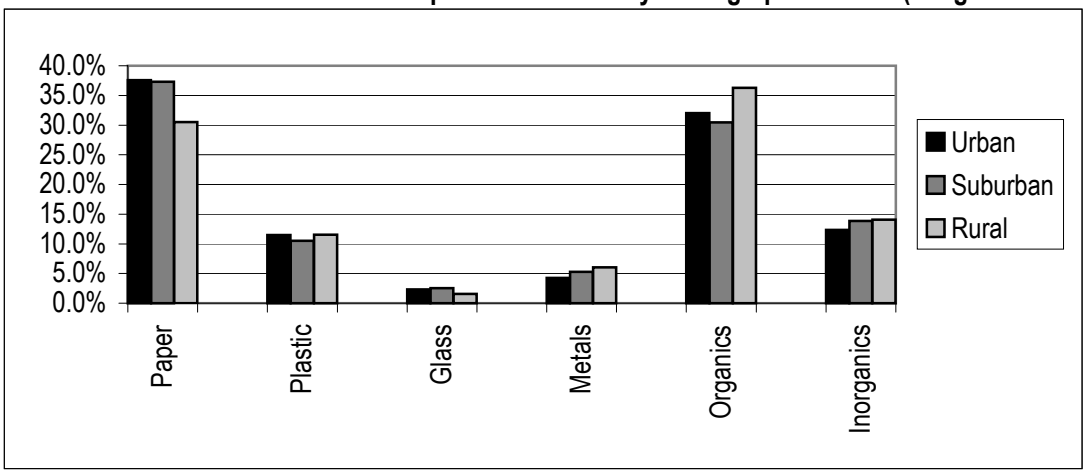
Landfilled Residential MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	38.1%	33.2%	29.3%	32.4%
Plastic	11.7%	13.1%	11.0%	12.0%
Glass	3.4%	2.7%	4.0%	3.4%
Metals	3.3%	4.3%	7.1%	5.3%
Organics	39.0%	37.1%	33.9%	36.1%
Inorganics	4.5%	9.7%	14.7%	10.9%
Total	100.0%	100.0%	100.0%	100.0%

Figure 8

Landfilled Commercial MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	37.6%	37.3%	30.5%	34.7%
Plastic	11.5%	10.5%	11.5%	11.2%
Glass	2.3%	2.5%	1.6%	2.1%
Metals	4.2%	5.3%	6.0%	5.3%
Organics	32.0%	30.5%	36.3%	33.1%
Inorganics	12.3%	13.9%	14.1%	13.6%
Total	100.0%	100.0%	100.0%	100.0%

Table 7

Landfilled Residential MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**38.1%**	**33.2%**	**29.3%**	**32.4%**
	1	Newspaper	4.2%	4.9%	4.8%	4.7%
	2	Corrugated Cardboard	4.1%	5.1%	5.4%	5.0%
	3	Office	1.1%	2.8%	2.2%	2.3%
	4	Magazine/ Glossy	2.2%	2.9%	2.7%	2.7%
	5	Polycoated/Aseptic Containers	0.6%	0.6%	0.6%	0.6%
	6	Mixed (Other Recyclable)	5.6%	4.3%	3.0%	4.0%
	7	Other (Non-recyclable)	20.4%	12.5%	10.6%	13.1%
Plastic			**11.7%**	**13.1%**	**11.0%**	**12.0%**
	8	#1 PET Bottles	1.0%	1.0%	1.4%	1.1%
	9	#2 HDPE Bottles	0.8%	1.1%	1.1%	1.0%
	10	#3-#7 Bottles	0.1%	0.2%	0.1%	0.1%
	11	Expanded Polystyrene	0.9%	1.1%	0.7%	0.9%
	12	Film Plastic	5.8%	6.9%	4.7%	5.8%
	13	Other Rigid Plastic	3.1%	2.8%	3.1%	3.0%
Glass			**3.4%**	**2.7%**	**4.0%**	**3.4%**
	14	Clear	1.7%	1.4%	2.0%	1.7%
	15	Green	0.3%	0.4%	0.3%	0.3%
	16	Amber	0.8%	0.6%	0.8%	0.7%
	17	Other	0.6%	0.4%	1.0%	0.7%
Metals			**3.3%**	**4.3%**	**7.1%**	**5.3%**
	18	Steel Cans	1.3%	1.3%	2.0%	1.6%
	19	Aluminum Cans	0.7%	0.6%	0.5%	0.6%
	20	Other Ferrous	0.8%	1.8%	3.6%	2.4%
	21	Other Aluminum	0.3%	0.4%	0.7%	0.5%
	22	Other Non-Ferrous	0.1%	0.3%	0.4%	0.3%
Organics			**39.0%**	**37.1%**	**33.9%**	**36.1%**
	23	Yard Waste- Grass	0.4%	1.8%	1.9%	1.6%
	24	Yard Waste- Other	1.2%	0.7%	1.2%	1.0%
	25	Wood- Unpainted	0.6%	2.7%	6.9%	4.1%
	26	Wood- Painted	1.8%	2.8%	3.2%	2.8%
	27	Food Waste	21.1%	15.6%	11.5%	14.8%
	28	Textiles	4.1%	5.8%	3.7%	4.6%
	29	Diapers	4.6%	3.6%	2.8%	3.4%
	30	Fines	2.1%	1.1%	1.3%	1.4%
	31	Other Organics	3.0%	2.9%	1.4%	2.3%
Inorganics			**4.5%**	**9.7%**	**14.7%**	**10.9%**
	32	Brown Goods	0.5%	0.9%	0.6%	0.7%
	33	Carpet	0.9%	0.3%	0.6%	0.6%
	34	Drywall	0.2%	0.2%	1.4%	0.7%
	35	Other C&D	0.4%	5.7%	7.5%	5.5%
	36	HHW	0.1%	0.3%	0.2%	0.2%
	37	Other Inorganics	2.3%	1.9%	2.3%	2.1%
	38	Furniture	0.0%	0.4%	2.1%	1.0%
		Total	100.0%	100.0%	100.0%	100.0%

Table 8

Landfilled Commercial MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**37.6%**	**37.3%**	**30.5%**	**34.7%**
	1	Newspaper	3.5%	4.5%	2.2%	3.3%
	2	Corrugated Cardboard	11.2%	15.5%	11.8%	13.0%
	3	Office	4.1%	4.5%	2.1%	3.4%
	4	Magazine/ Glossy	1.5%	1.1%	1.1%	1.2%
	5	Polycoated/Aseptic Containers	0.5%	0.7%	1.0%	0.8%
	6	Mixed (Other Recyclable)	6.9%	2.5%	2.5%	3.5%
	7	Other (Non-recyclable)	9.9%	8.5%	10.0%	9.4%
Plastic			**11.5%**	**10.5%**	**11.5%**	**11.2%**
	8	#1 PET Bottles	0.8%	0.5%	0.7%	0.6%
	9	#2 HDPE Bottles	0.8%	0.4%	0.6%	0.6%
	10	#3-#7 Bottles	0.1%	0.1%	0.0%	0.1%
	11	Expanded Polystyrene	0.5%	0.8%	1.2%	0.9%
	12	Film Plastic	5.3%	6.1%	5.7%	5.8%
	13	Other Rigid Plastic	3.9%	2.7%	3.4%	3.2%
Glass			**2.3%**	**2.5%**	**1.6%**	**2.1%**
	14	Clear	1.3%	0.7%	0.9%	1.0%
	15	Green	0.3%	0.3%	0.2%	0.3%
	16	Amber	0.3%	0.5%	0.3%	0.4%
	17	Other	0.4%	1.0%	0.1%	0.5%
Metals			**4.2%**	**5.3%**	**6.0%**	**5.3%**
	18	Steel Cans	0.9%	1.1%	1.6%	1.2%
	19	Aluminum Cans	0.3%	0.2%	0.4%	0.3%
	20	Other Ferrous	2.7%	3.5%	3.7%	3.4%
	21	Other Aluminum	0.1%	0.5%	0.2%	0.3%
	22	Other Non-Ferrous	0.2%	0.1%	0.1%	0.1%
Organics			**32.0%**	**30.5%**	**36.3%**	**33.1%**
	23	Yard Waste- Grass	0.1%	0.4%	0.0%	0.2%
	24	Yard Waste- Other	1.0%	0.6%	0.4%	0.6%
	25	Wood- Unpainted	5.8%	12.3%	10.3%	10.0%
	26	Wood- Painted	2.8%	4.4%	2.6%	3.3%
	27	Food Waste	15.9%	8.8%	12.7%	12.0%
	28	Textiles	2.3%	1.6%	7.6%	4.2%
	29	Diapers	2.3%	1.2%	0.7%	1.3%
	30	Fines	0.6%	0.8%	0.9%	0.8%
	31	Other Organics	1.2%	0.5%	1.0%	0.9%
Inorganics			**12.3%**	**13.9%**	**14.1%**	**13.6%**
	32	Brown Goods	0.7%	1.6%	0.1%	0.8%
	33	Carpet	3.0%	2.9%	0.7%	2.0%
	34	Drywall	1.1%	3.8%	0.7%	1.9%
	35	Other C&D	4.2%	3.8%	9.1%	6.0%
	36	HHW	0.4%	0.1%	0.3%	0.2%
	37	Other Inorganics	2.5%	1.7%	3.3%	2.5%
	38	Furniture	0.5%	0.1%	0.0%	0.1%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 9

Northeast Region Aggregate Composition of Bulky Loads (Visual Samples)

Material Group	% Weight
Paper	12.2%
Plastic	0.9%
Glass	0.1%
Metals	7.7%
Organics	42.0%
Inorganics	37.3%
Total	100.0%

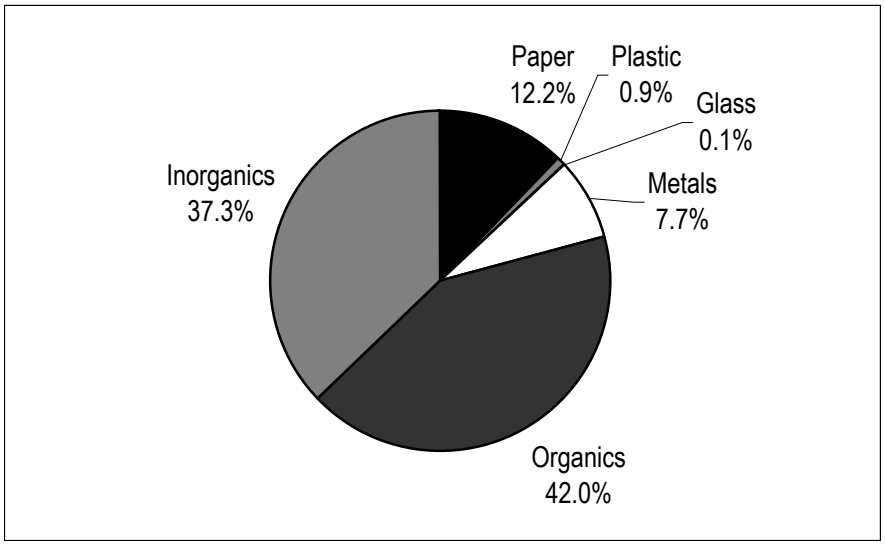
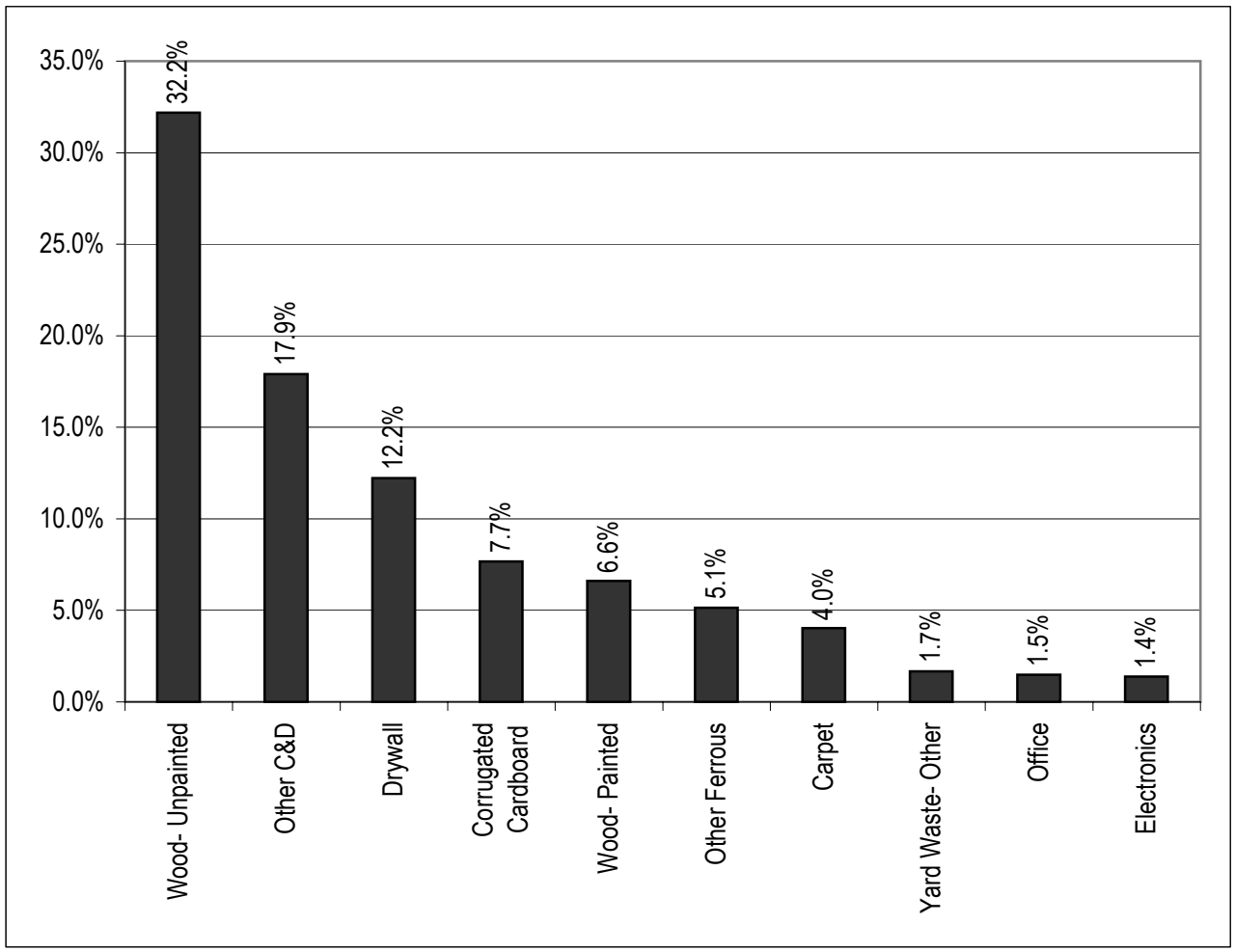


Figure 10

Northeast Region Top 10 Most Prevalent Bulky Materials



Section 7
NORTHCENTRAL REGION MSW COMPOSITION

Introduction

DEP manages Pennsylvania's waste stream via a network of six regional offices. An objective of this study was to derive results for each of the regions in the Commonwealth. Aggregate State-wide results are provided in Section 4 of this report. The purpose of this section is to provide detailed results specifically for the Northcentral Region. A map of the Northcentral region is shown in Figure 1.

Figure 1 Northcentral Region Map

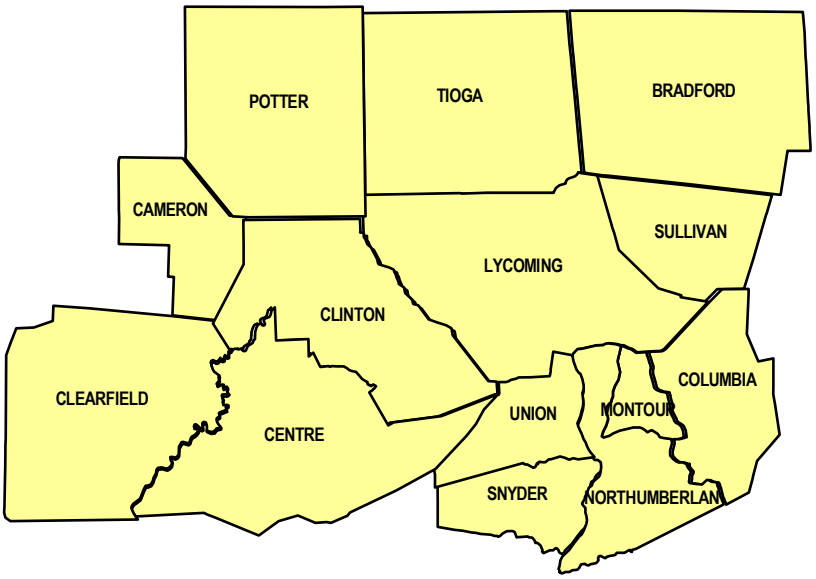


Table 1 summarizes the demographic and economic characteristics of the Northcentral region.

Table 1 Northcentral Region Demographic Summary

	Urban	Suburban	Rural	Total
Communities [1]	2	15	408	425
Population [1]	69,126	107,815	591,014	767,955
Housing Units [1]	28,266	44,479	241,385	314,130
Employment [2]	34,212	48,735	118,387	201,334

[1] Source: 2001 U.S. Census data provided by DEP
[2] Source: 2001 estimates provided by ESRI-BIS, Arlington, VA, based on U.S. Census data.

Table 2 summarizes the waste that was reported by the Commonwealth's landfills (and incinerators) to have been disposed from each County within the Northcentral region in 2001.

Table 2 Northcentral Region Waste Disposal Summary [1]

County	MSW Disposed (tons)
Bradford	17,008
Cameron	3,646
Centre	100,354
Clearfield	52,320
Clinton	23,350
Columbia	47,133
Lycoming	99,014
Montour	9,880
Northumberland	68,900
Potter	115
Snyder	12,534
Sullivan	582
Tioga	11,926
Union	22,421
Total	**469,180**

[1] Source: County-level disposal quantity estimates are based on the 2001 DEP landfill disposal database

In order to aggregate the MSW composition data that was collected in this study, it was necessary to develop estimates of waste generation by county within the region. This was performed in the following steps:

1) Surveying urban, suburban, and rural communities across the Commonwealth to compile urban, suburban and rural residential MSW disposal factors (tons of disposed MSW per household per year);
2) Applying the residential generation factors to the total households in the region to estimate total disposed residential waste;
3) Estimating total regional waste disposed based on a statistical analysis of reported county-level waste disposal records relative to county-level population and employment; and
4) Netting out residential waste to calculate disposed commercial waste quantities.

The results of this process are shown in Table 3 for the Northcentral Region.

Table 3 Northcentral Region Disposed MSW Summary (tons) [1]

	Tons of Waste Disposed			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Residential generators	24,132	48,182	234,449	306,764
Commercial generators	21,044	30,892	110,480	162,416
Total	**45,177**	**79,075**	**344,928**	**469,180**

[1] Source: 2001 DEP database of disposed tons as reported by Pennsylvania disposal facilities.

In order to develop composition estimates for each of these demographic areas and generating sectors, field sampling was performed at two waste processing and disposal facilities:

- Bradford County Landfill (Burlington, Bradford County); and
- Centre County Transfer Station (Bellefonte, Centre County).

Sampling at these facilities was performed across four seasons to account for seasonal variation in MSW composition. Table 4 summarizes the sampling summary for the Northcentral Region.

Table 4 Northcentral Region Sampling Summary

	Number of Samples			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Physical MSW Samples				
Residential	29	25	57	111
Commercial	31	30	21	82
Subtotal—physical samples	60	55	78	193
Visual Bulk Waste Samples	20	20	19	59
Total Samples	**80**	**75**	**97**	**252**

Regional Aggregate Results

The remainder of this section presents a graphical and tabular summary of the Northcentral region's disposed MSW composition. Specific figures and tables are summarized below.

- Figure 2 is a pie chart that shows the percentage composition of major material groups in the aggregate regional waste stream.
- Figure 3 is a bar chart that shows the estimated mean quantities of material disposed (or incinerated) from the region, again by major material group.

- Figure 4 compares the incidence of recyclable materials as targeted in Act 101 that were found to be disposed by residential and commercial generators in the region.
- Figure 5 shows the 10 most prevalent materials being disposed in the region, by weight.
- Table 5 contains a detailed statistical presentation of the aggregate MSW composition in the region. This tabular summary includes the statistical mean composition, as well as the standard deviation, upper and lower confidence intervals, and a "sampling error". The sampling error indicates the width of the confidence intervals relative to the mean. Lower sampling error signifies narrower confidence intervals (and therefore greater certainty of the mean composition shown).
- Figure 6 compares the percentage of disposed MSW landfilled from urban, suburban and rural communities within the region.
- Table 6 compares the mean composition of disposed MSW from urban, suburban and rural communities within the region.

Results by Generating Sector

An objective of the study was to compare and contrast the composition of residential and commercial waste within the region.

- Figure 7 and Figure 8 summarize the percentage of MSW landfilled by major material group for residential generators and commercial generators, respectively.
- Tables 7 and 8, like Table 6, compare the mean composition of urban, suburban, and rural waste. Table 7 focuses on residential generators in the region, while Table 8 shows the same comparison for commercial generators.

Bulky Waste

The State-wide MSW sort primarily targeted residential and commercial compacting vehicles, as well as commercial compacting and open-top roll-offs carrying non-C&D and non-industrial waste. These loads make up the majority of loads entering the Commonwealth's disposal facilities. However, it was expected at the outset of the study that some incoming loads of MSW—primarily those in open-top roll-off vehicles—would contain bulky waste that was not conducive to physical sorting. Therefore, the study methodology allowed for selected visual, volumetric sampling of bulky loads to the extent they were observed during the sampling and sorting process.

- Figure 9 shows the weight percentage composition of bulky items by major material group. Bulky loads were found to include a range of materials, including multi-family move-outs, residential and commercial clean-outs, miscellaneous commercial waste, and some renovation and construction type waste (although pure C&D loads were excluded from the analysis).

- Figure 10 lists the top 10 most prevalent bulky materials disposed during the study.

Self Haul Waste

Self haulers were found to deliver only a small fraction of waste to disposal facilities during the study. Our sampling plan allowed for selected sampling of self-haulers, which include: residential haulers of renovation and/or clean-out waste, and commercial contractors hauling small renovation, construction, land clearing, and/or clean-out type waste. Note that an insufficient number of self-haul samples were obtained to develop region-specific results.

Figure 2
Northcentral Region Aggregate MSW Composition

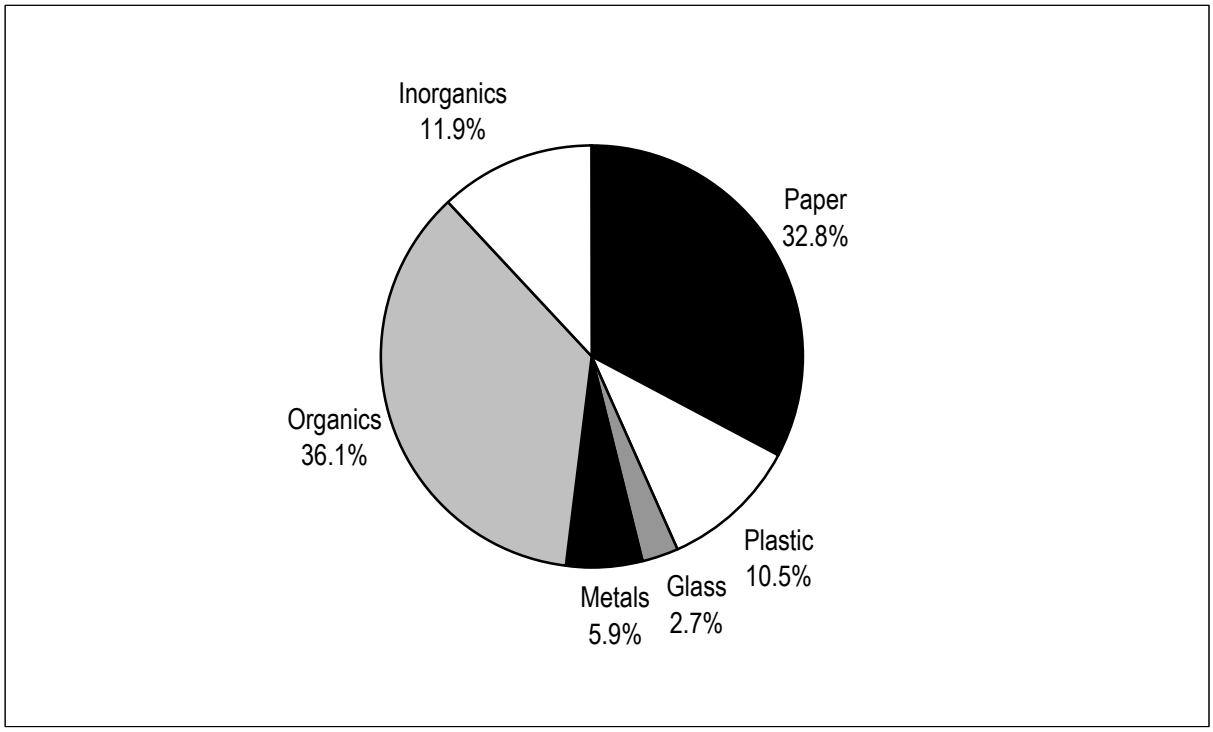


Figure 3
Northcentral Region Aggregate MSW Tons Disposed

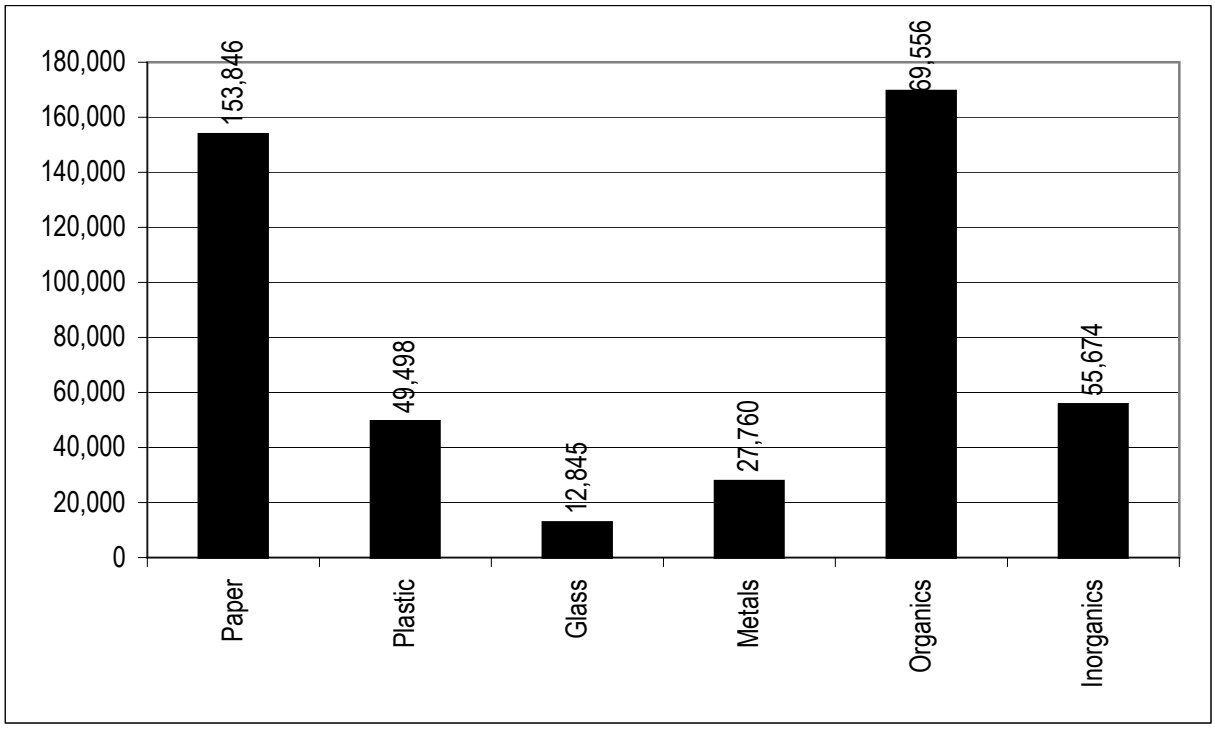


Figure 4

Act 101- Recyclables in Disposed MSW (tons)

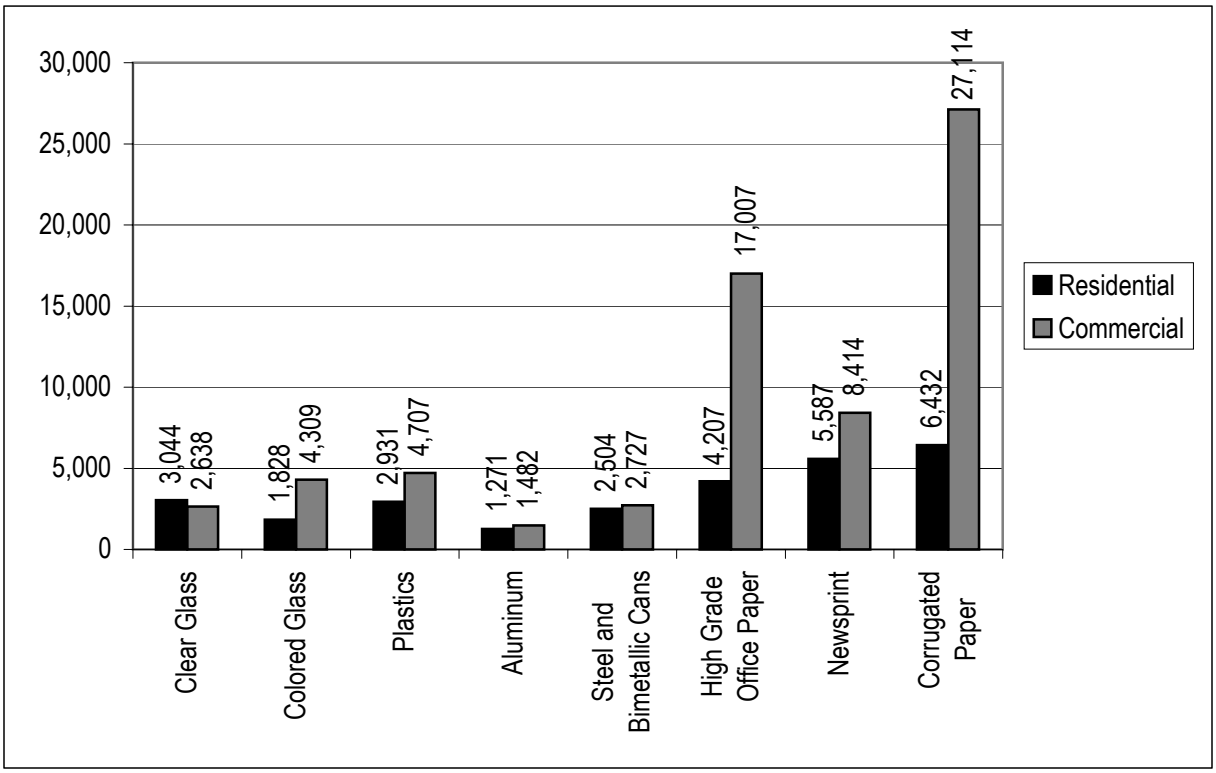


Figure 5

Northcentral Region Top 10 Most Prevalent Materials

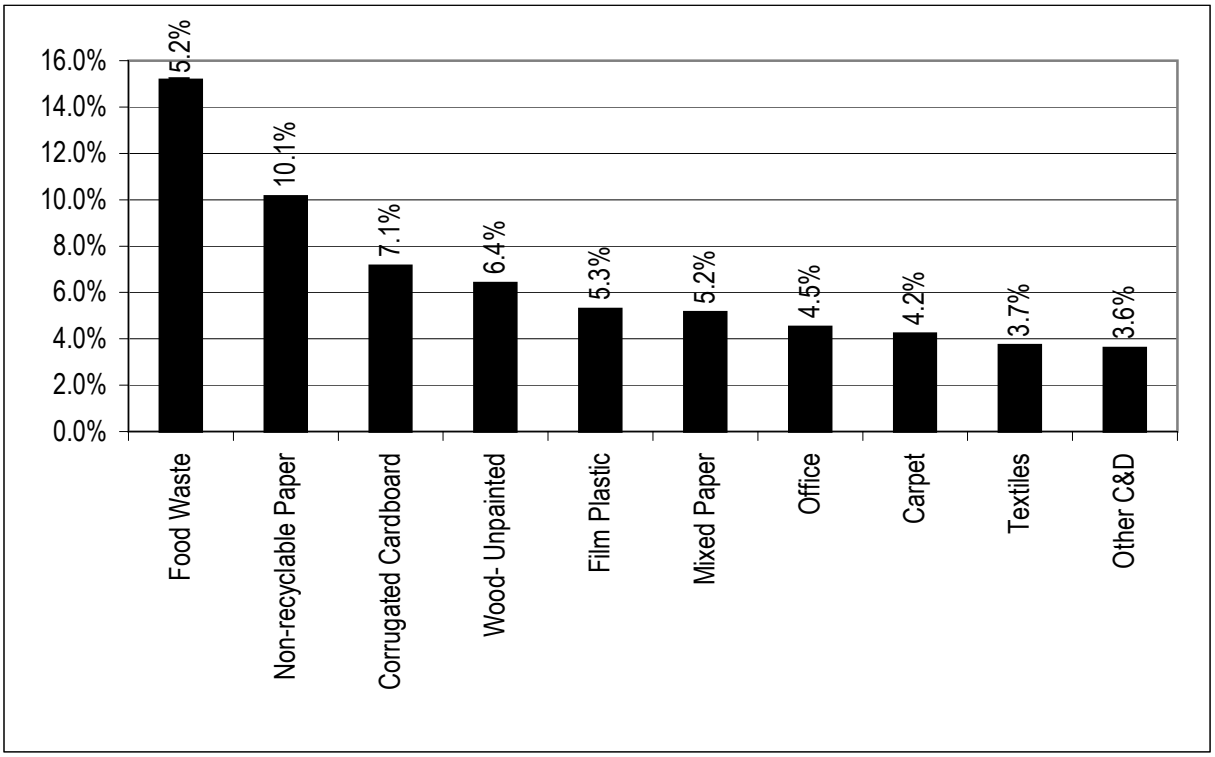


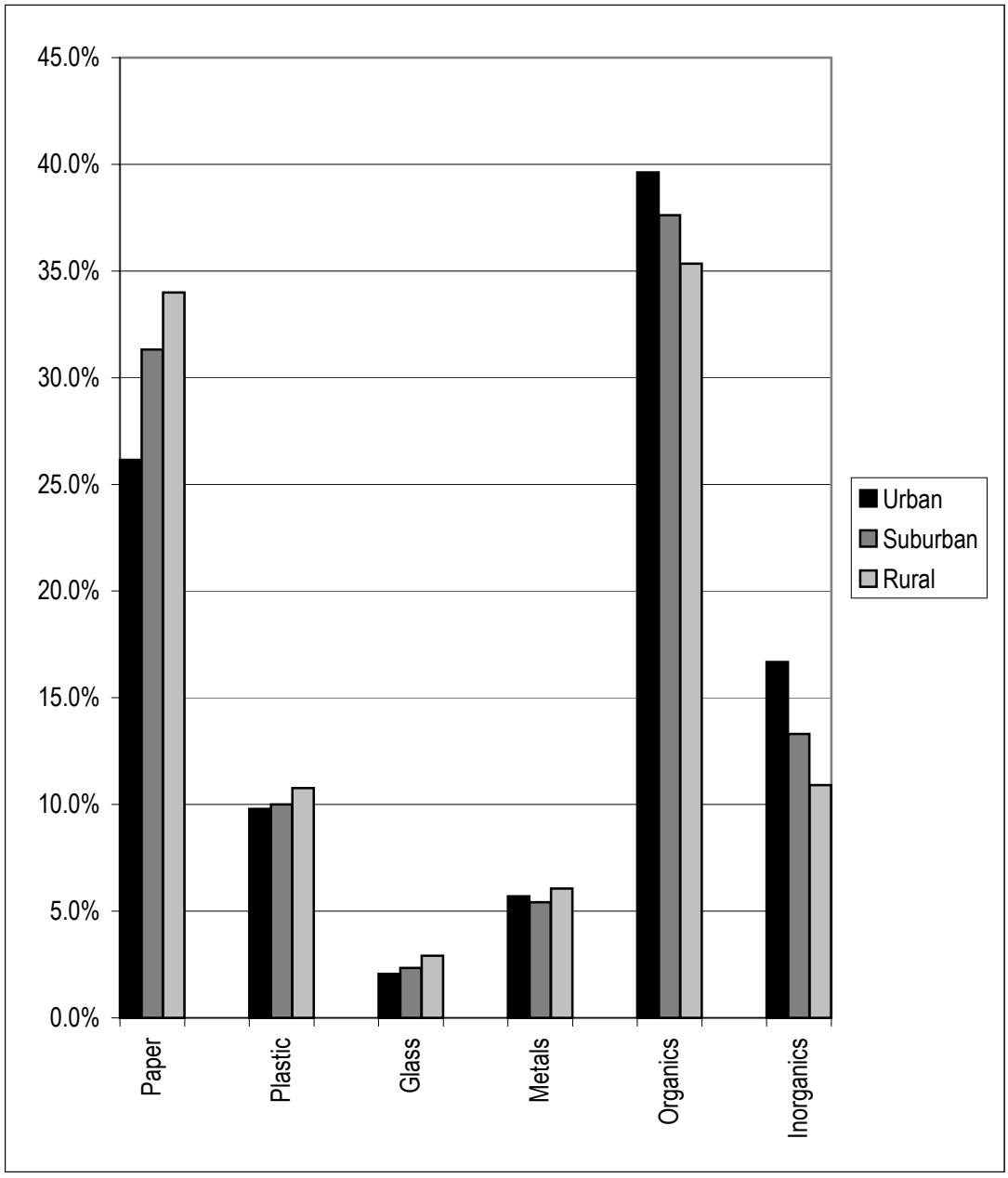
Table 5

Northcentral Region Aggregate Landfilled MSW Composition Detail (Weight Percent)

		Material Categories	Tons Disposed	Mean Composition	Standard Deviation	Confidence Interval		Sampling Error
						Lower (%)	Upper (%)	
Paper			**153,846**	**32.8%**	**18.7%**	**29.3%**	**36.6%**	**11.1%**
	1	Newspaper	14,000	3.0%	3.4%	2.5%	3.7%	19.4%
	2	Corrugated Cardboard	33,546	7.1%	7.5%	5.9%	9.0%	21.7%
	3	Office	21,214	4.5%	5.3%	3.6%	5.9%	25.2%
	4	Magazine/ Glossy	10,904	2.3%	2.6%	2.0%	2.8%	18.9%
	5	Polycoated/Aseptic Containers	2,375	0.5%	0.9%	0.4%	0.6%	23.4%
	6	Mixed Paper	24,225	5.2%	5.4%	4.4%	6.2%	17.7%
	7	Non-recyclable Paper	47,582	10.1%	7.7%	8.8%	12.0%	15.6%
Plastic			**49,498**	**10.5%**	**7.0%**	**9.5%**	**11.7%**	**10.8%**
	8	#1 PET Bottles	4,196	0.9%	0.9%	0.8%	1.1%	18.7%
	9	#2 HDPE Bottles	3,442	0.7%	1.7%	0.6%	0.9%	23.5%
	10	#3-#7 Bottles	531	0.1%	0.4%	0.1%	0.2%	32.0%
	11	Expanded Polystyrene	2,251	0.5%	0.6%	0.4%	0.6%	18.9%
	12	Film Plastic	24,812	5.3%	3.8%	4.6%	6.2%	14.5%
	13	Other Rigid Plastic	14,266	3.0%	3.8%	2.6%	3.6%	16.0%
Glass			**12,845**	**2.7%**	**6.1%**	**2.2%**	**3.4%**	**22.0%**
	14	Clear Glass	5,682	1.2%	2.3%	1.0%	1.5%	23.7%
	15	Green Glass	2,207	0.5%	1.4%	0.3%	0.7%	33.2%
	16	Amber Glass	3,930	0.8%	2.3%	0.6%	1.2%	31.8%
	17	Non-recyclable Glass	1,026	0.2%	2.2%	0.2%	0.3%	39.0%
Metals			**27,760**	**5.9%**	**9.1%**	**5.1%**	**6.9%**	**14.9%**
	18	Steel Cans	5,231	1.1%	1.5%	0.9%	1.4%	20.6%
	19	Aluminum Cans	2,753	0.6%	3.2%	0.4%	0.8%	30.2%
	20	Other Ferrous	13,871	3.0%	7.0%	2.4%	3.8%	24.0%
	21	Other Aluminum	3,959	0.8%	2.2%	0.7%	1.1%	24.5%
	22	Other Non-Ferrous	1,946	0.4%	1.4%	0.3%	0.5%	24.3%
Organics			**169,556**	**36.1%**	**20.4%**	**33.0%**	**39.5%**	**9.0%**
	23	Yard Waste- Grass	6,189	1.3%	3.9%	1.0%	1.9%	35.9%
	24	Yard Waste- Other	8,964	1.9%	5.3%	1.5%	2.5%	27.2%
	25	Wood- Unpainted	30,109	6.4%	15.3%	4.7%	9.1%	33.9%
	26	Wood- Painted	7,129	1.5%	6.1%	1.2%	2.0%	27.1%
	27	Food Waste	71,256	15.2%	13.8%	12.9%	18.3%	17.5%
	28	Textiles	17,518	3.7%	6.8%	3.1%	4.7%	21.3%
	29	Diapers	16,052	3.4%	5.9%	2.7%	4.5%	26.4%
	30	Fines	5,138	1.1%	1.4%	0.9%	1.3%	19.2%
	31	Other Organics	7,202	1.5%	4.1%	1.2%	2.0%	28.1%
Inorganics			**55,674**	**11.9%**	**22.9%**	**9.7%**	**14.5%**	**20.2%**
	32	Electronics	4,610	1.0%	4.6%	0.7%	1.4%	33.7%
	33	Carpet	19,694	4.2%	8.1%	2.8%	6.7%	46.4%
	34	Drywall	5,102	1.1%	6.3%	0.8%	1.5%	30.6%
	35	Other C&D	17,094	3.6%	19.3%	2.7%	5.2%	34.7%
	36	HHW	1,647	0.4%	1.5%	0.3%	0.5%	32.7%
	37	Other Inorganics	6,555	1.4%	2.7%	1.1%	1.8%	24.2%
	38	Furniture	972	0.2%	2.2%	0.1%	0.3%	47.9%
		Total	469,180	100.0%				

Figure 6

Landfilled Aggregate Waste Composition Results by Demographic Sector (Weight Percent)



Material Group	Demographic Sector			
	Urban	Suburban	Rural	Aggregate
Paper	26.1%	31.3%	34.0%	32.8%
Plastic	9.8%	10.0%	10.8%	10.5%
Glass	2.1%	2.3%	2.9%	2.7%
Metals	5.7%	5.4%	6.1%	5.9%
Organics	39.6%	37.6%	35.3%	36.1%
Other Waste	16.7%	13.3%	10.9%	11.9%
Total	100.0%	100.0%	100.0%	100.0%

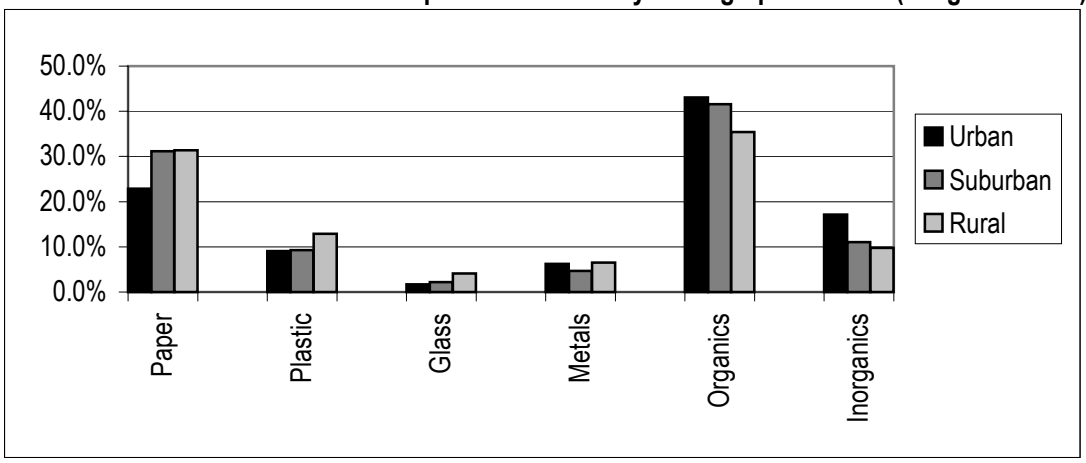
Table 6

Landfilled Aggregate MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**26.1%**	**31.3%**	**34.0%**	**32.8%**
	1	Newspaper	2.1%	2.2%	3.3%	3.0%
	2	Corrugated Cardboard	6.1%	6.8%	7.4%	7.1%
	3	Office	2.5%	2.8%	5.2%	4.5%
	4	Magazine/ Glossy	1.9%	2.9%	2.2%	2.3%
	5	Polycoated/Aseptic Containers	0.3%	0.5%	0.5%	0.5%
	6	Mixed Paper	5.6%	7.2%	4.6%	5.2%
	7	Non-recyclable Paper	7.7%	9.0%	10.7%	10.1%
Plastic			**9.8%**	**10.0%**	**10.8%**	**10.5%**
	8	#1 PET Bottles	0.8%	0.9%	0.9%	0.9%
	9	#2 HDPE Bottles	0.4%	0.5%	0.8%	0.7%
	10	#3-#7 Bottles	0.1%	0.1%	0.1%	0.1%
	11	Expanded Polystyrene	0.4%	0.4%	0.5%	0.5%
	12	Film Plastic	5.0%	5.2%	5.3%	5.3%
	13	Other Rigid Plastic	3.2%	2.9%	3.0%	3.0%
Glass			**2.1%**	**2.3%**	**2.9%**	**2.7%**
	14	Clear Glass	0.9%	1.0%	1.3%	1.2%
	15	Green Glass	0.3%	0.4%	0.5%	0.5%
	16	Amber Glass	0.6%	0.6%	0.9%	0.8%
	17	Non-recyclable Glass	0.2%	0.4%	0.2%	0.2%
Metals			**5.7%**	**5.4%**	**6.1%**	**5.9%**
	18	Steel Cans	0.5%	0.7%	1.3%	1.1%
	19	Aluminum Cans	0.4%	0.4%	0.6%	0.6%
	20	Other Ferrous	2.9%	2.6%	3.0%	3.0%
	21	Other Aluminum	1.0%	0.8%	0.8%	0.8%
	22	Other Non-Ferrous	0.9%	0.8%	0.3%	0.4%
Organics			**39.6%**	**37.6%**	**35.3%**	**36.1%**
	23	Yard Waste- Grass	1.3%	0.8%	1.4%	1.3%
	24	Yard Waste- Other	5.1%	4.8%	0.8%	1.9%
	25	Wood- Unpainted	7.5%	6.1%	6.3%	6.4%
	26	Wood- Painted	3.4%	2.0%	1.2%	1.5%
	27	Food Waste	13.7%	15.3%	15.4%	15.2%
	28	Textiles	4.1%	3.9%	3.6%	3.7%
	29	Diapers	1.9%	1.7%	4.0%	3.4%
	30	Fines	1.5%	1.6%	0.9%	1.1%
	31	Other Organics	1.0%	1.4%	1.6%	1.5%
Inorganics			**16.7%**	**13.3%**	**10.9%**	**11.9%**
	32	Electronics	0.9%	0.8%	1.0%	1.0%
	33	Carpet	3.9%	3.9%	4.3%	4.2%
	34	Drywall	3.9%	2.7%	0.4%	1.1%
	35	Other C&D	6.1%	4.3%	3.2%	3.6%
	36	HHW	0.3%	0.4%	0.3%	0.4%
	37	Other Inorganics	1.6%	1.1%	1.4%	1.4%
	38	Furniture	0.0%	0.1%	0.3%	0.2%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 7

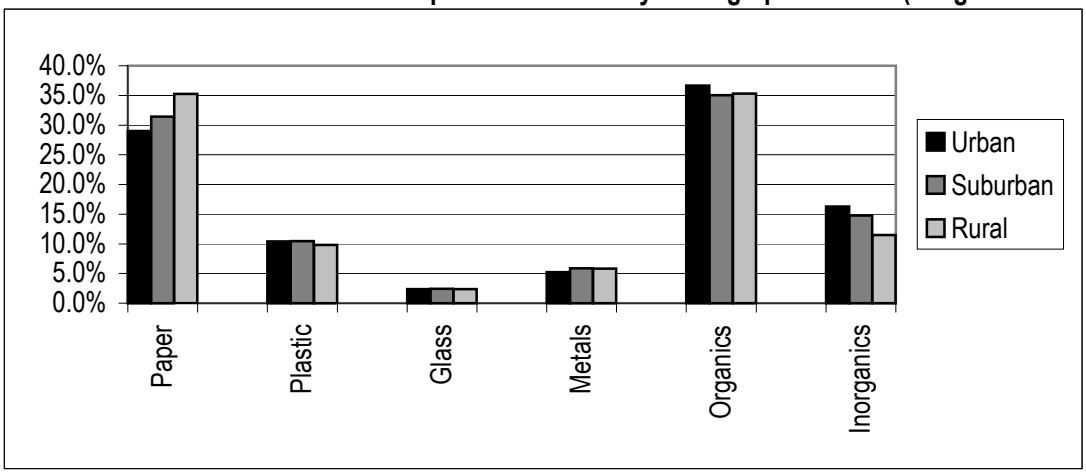
Landfilled Residential MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	22.9%	31.2%	31.4%	30.2%
Plastic	9.1%	9.3%	12.9%	11.7%
Glass	1.7%	2.2%	4.1%	3.4%
Metals	6.2%	4.7%	6.5%	6.2%
Organics	43.0%	41.6%	35.4%	37.6%
Other Waste	17.1%	11.0%	9.7%	10.9%
Total	100.0%	100.0%	100.0%	100.0%

Figure 8

Landfilled Commercial MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	29.0%	31.4%	35.2%	34.2%
Plastic	10.4%	10.4%	9.8%	9.9%
Glass	2.4%	2.4%	2.4%	2.4%
Metals	5.3%	5.9%	5.8%	5.8%
Organics	36.7%	35.1%	35.3%	35.4%
Other Waste	16.3%	14.8%	11.5%	12.4%
Total	100.0%	100.0%	100.0%	100.0%

Table 7

Landfilled Residential MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**22.9%**	**31.2%**	**31.4%**	**30.2%**
	1	Newspaper	1.7%	2.0%	4.2%	3.4%
	2	Corrugated Cardboard	4.9%	3.5%	3.9%	4.0%
	3	Office	2.1%	1.3%	3.0%	2.6%
	4	Magazine/ Glossy	1.6%	4.1%	2.5%	2.7%
	5	Polycoated/Aseptic Containers	0.3%	0.9%	0.5%	0.6%
	6	Mixed Paper	5.0%	8.9%	3.7%	4.9%
	7	Non-recyclable Paper	7.3%	10.4%	13.5%	12.1%
Plastic			**9.1%**	**9.3%**	**12.9%**	**11.7%**
	8	#1 PET Bottles	0.5%	0.6%	1.1%	0.9%
	9	#2 HDPE Bottles	0.3%	0.5%	1.1%	0.9%
	10	#3-#7 Bottles	0.1%	0.2%	0.3%	0.2%
	11	Expanded Polystyrene	0.4%	0.4%	0.8%	0.7%
	12	Film Plastic	4.3%	4.7%	6.9%	6.1%
	13	Other Rigid Plastic	3.5%	2.9%	2.7%	2.9%
Glass			**1.7%**	**2.2%**	**4.1%**	**3.4%**
	14	Clear Glass	0.8%	0.8%	2.4%	1.9%
	15	Green Glass	0.3%	0.3%	0.4%	0.4%
	16	Amber Glass	0.3%	0.3%	0.9%	0.7%
	17	Non-recyclable Glass	0.3%	0.7%	0.4%	0.4%
Metals			**6.2%**	**4.7%**	**6.5%**	**6.2%**
	18	Steel Cans	0.5%	0.9%	1.9%	1.5%
	19	Aluminum Cans	0.3%	0.4%	1.0%	0.8%
	20	Other Ferrous	3.4%	1.9%	2.8%	2.7%
	21	Other Aluminum	1.3%	1.0%	0.5%	0.7%
	22	Other Non-Ferrous	0.8%	0.6%	0.3%	0.4%
Organics			**43.0%**	**41.6%**	**35.4%**	**37.6%**
	23	Yard Waste- Grass	1.8%	0.6%	1.4%	1.3%
	24	Yard Waste- Other	7.8%	7.4%	1.1%	3.2%
	25	Wood- Unpainted	8.0%	7.3%	2.2%	3.9%
	26	Wood- Painted	5.3%	2.8%	1.2%	2.0%
	27	Food Waste	10.2%	12.9%	16.5%	15.0%
	28	Textiles	4.2%	3.8%	4.5%	4.3%
	29	Diapers	3.0%	3.0%	4.3%	3.9%
	30	Fines	1.3%	1.5%	1.4%	1.4%
	31	Other Organics	1.4%	2.4%	2.8%	2.5%
Inorganics			**17.1%**	**11.0%**	**9.7%**	**10.9%**
	32	Electronics	1.2%	0.5%	1.2%	1.1%
	33	Carpet	2.6%	1.2%	0.7%	1.1%
	34	Drywall	2.4%	2.2%	0.9%	1.3%
	35	Other C&D	9.0%	5.4%	3.8%	4.8%
	36	HHW	0.4%	0.8%	0.8%	0.7%
	37	Other Inorganics	1.5%	1.0%	1.8%	1.6%
	38	Furniture	0.0%	0.0%	0.5%	0.4%
		Total	100.0%	100.0%	100.0%	100.0%

Table 8

Landfilled Commercial MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**29.0%**	**31.4%**	**35.2%**	**34.2%**
	1	Newspaper	2.4%	2.4%	2.8%	2.7%
	2	Corrugated Cardboard	7.2%	8.8%	9.0%	8.8%
	3	Office	2.9%	3.7%	6.2%	5.5%
	4	Magazine/ Glossy	2.2%	2.2%	2.1%	2.1%
	5	Polycoated/Aseptic Containers	0.2%	0.2%	0.5%	0.5%
	6	Mixed Paper	6.1%	6.0%	5.1%	5.3%
	7	Non-recyclable Paper	8.0%	8.0%	9.4%	9.1%
Plastic			**10.4%**	**10.4%**	**9.8%**	**9.9%**
	8	#1 PET Bottles	1.0%	1.0%	0.8%	0.9%
	9	#2 HDPE Bottles	0.5%	0.5%	0.7%	0.6%
	10	#3-#7 Bottles	0.0%	0.0%	0.1%	0.1%
	11	Expanded Polystyrene	0.4%	0.4%	0.4%	0.4%
	12	Film Plastic	5.6%	5.6%	4.6%	4.8%
	13	Other Rigid Plastic	2.9%	2.9%	3.2%	3.1%
Glass			**2.4%**	**2.4%**	**2.4%**	**2.4%**
	14	Clear Glass	1.0%	1.0%	0.8%	0.9%
	15	Green Glass	0.4%	0.4%	0.5%	0.5%
	16	Amber Glass	0.8%	0.8%	0.9%	0.9%
	17	Non-recyclable Glass	0.2%	0.2%	0.1%	0.1%
Metals			**5.3%**	**5.9%**	**5.8%**	**5.8%**
	18	Steel Cans	0.6%	0.6%	1.0%	0.9%
	19	Aluminum Cans	0.4%	0.5%	0.5%	0.5%
	20	Other Ferrous	2.5%	3.1%	3.2%	3.1%
	21	Other Aluminum	0.8%	0.7%	1.0%	0.9%
	22	Other Non-Ferrous	1.0%	0.9%	0.2%	0.4%
Organics			**36.7%**	**35.1%**	**35.3%**	**35.4%**
	23	Yard Waste- Grass	0.9%	0.9%	1.5%	1.3%
	24	Yard Waste- Other	2.8%	3.1%	0.7%	1.2%
	25	Wood- Unpainted	7.0%	5.4%	8.3%	7.8%
	26	Wood- Painted	1.8%	1.5%	1.1%	1.2%
	27	Food Waste	16.8%	16.8%	14.8%	15.3%
	28	Textiles	4.0%	4.0%	3.2%	3.4%
	29	Diapers	0.9%	0.9%	3.9%	3.2%
	30	Fines	1.7%	1.7%	0.7%	0.9%
	31	Other Organics	0.7%	0.7%	1.1%	1.0%
Inorganics			**16.3%**	**14.8%**	**11.5%**	**12.4%**
	32	Electronics	0.6%	1.0%	0.9%	0.9%
	33	Carpet	5.0%	5.6%	6.0%	5.9%
	34	Drywall	5.2%	3.0%	0.1%	1.0%
	35	Other C&D	3.6%	3.6%	2.9%	3.0%
	36	HHW	0.2%	0.2%	0.1%	0.1%
	37	Other Inorganics	1.7%	1.2%	1.2%	1.3%
	38	Furniture	0.0%	0.1%	0.1%	0.1%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 9

Northcentral Region Aggregate Composition of Bulky Loads (Visual Samples)

Material Group	% Weight
Paper	12.2%
Plastic	0.9%
Glass	0.1%
Metals	7.7%
Organics	42.0%
Inorganics	37.3%
Total	100.0%

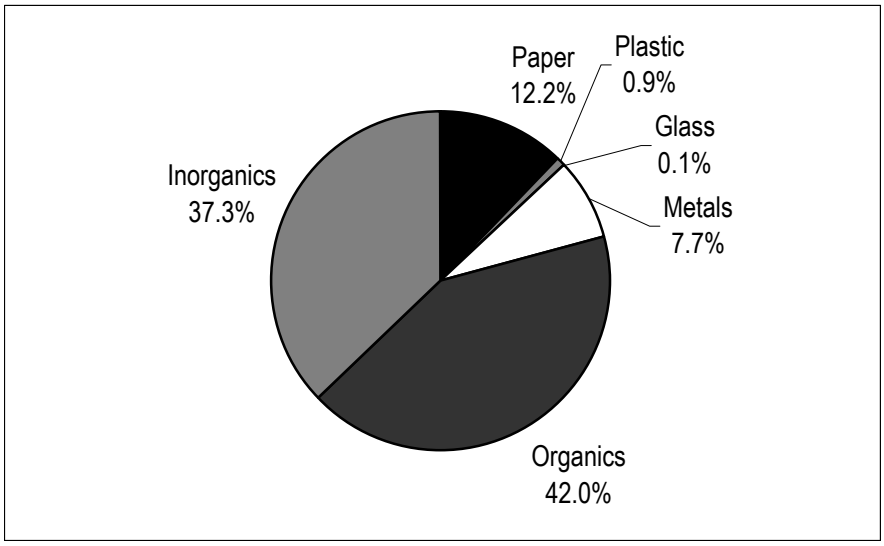
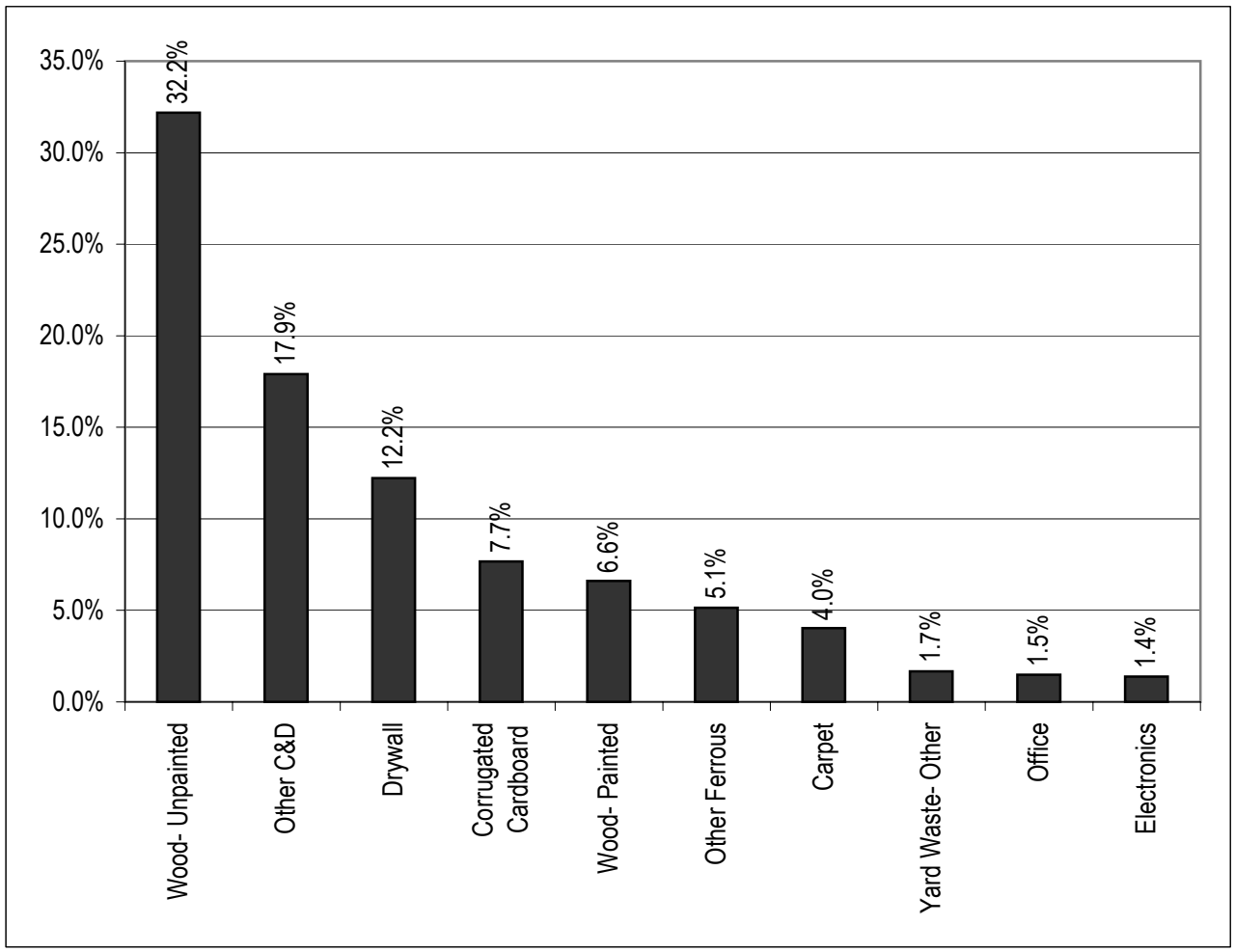


Figure 10

Northcentral Region Top 10 Most Prevalent Bulky Materials



Section 8
NORTHWEST REGION MSW COMPOSITION

Introduction

DEP manages Pennsylvania's waste stream via a network of six regional offices. An objective of this study was to derive results for each of the regions in the Commonwealth. Aggregate State-wide results are provided in Section 4 of this report. The purpose of this section is to provide detailed results specifically for the Northwest Region. A map of the Northwest region is shown in Figure 1.

Figure 1 Northwest Region Map

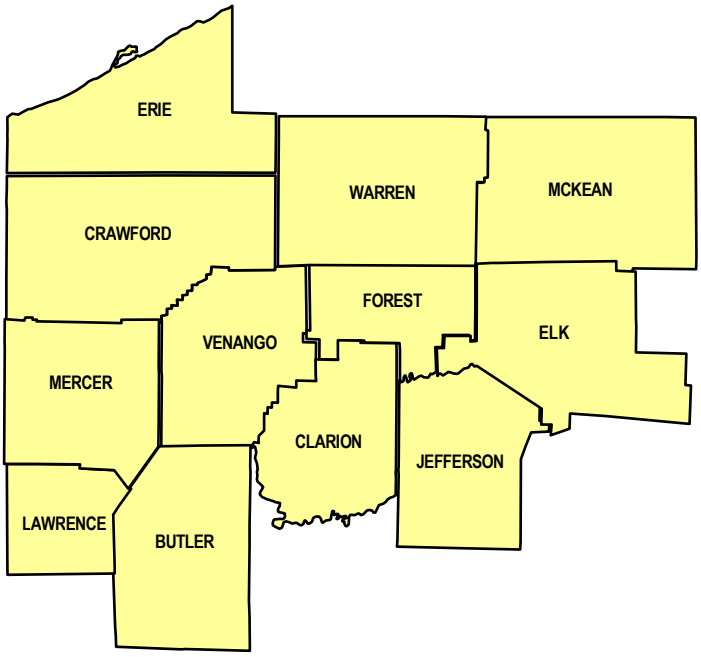


Table 1 summarizes the demographic and economic characteristics of the Northwest region.

Table 1 Northwest Region Demographic Summary

	Urban	Suburban	Rural	Total
Communities [1]	2	26	363	**391**
Population [1]	120,045	251,667	663,635	**1,035,347**
Housing Units [1]	48,013	101,496	267,390	**416,899**
Employment [2]	54,357	122,076	167,848	**344,281**

[1] Source: 2001 U.S. Census data provided by DEP
[2] Source: 2001 estimates provided by ESRI-BIS, Arlington, VA, based on U.S. Census data.

Table 2 summarizes the waste that was reported by the Commonwealth's landfills (and incinerators) to have been disposed from each County within the Northwest region in 2001.

Table 2 Northwest Region Waste Disposal Summary [1]

County	MSW Disposed (tons)
Butler	112,259
Clarion	23,711
Crawford	41,823
Elk	22,909
Erie	189,580
Forest	2,680
Jefferson	24,591
Lawrence	9,702
McKean	36,438
Mercer	20,833
Venango	28,922
Warren	23,696
Total	**537,144**

[1] Source: County-level disposal quantity estimates are based on the 2001 DEP landfill disposal database

In order to aggregate the MSW composition data that was collected in this study, it was necessary to develop estimates of waste generation by county within the region. This was performed in the following steps:

1) Surveying urban, suburban, and rural communities across the Commonwealth to compile urban, suburban and rural residential MSW disposal factors (tons of disposed MSW per household per year);
2) Applying the residential generation factors to the total households in the region to estimate total disposed residential waste;
3) Estimating total regional waste disposed based on a statistical analysis of reported county-level waste disposal records relative to county-level population and employment; and
4) Netting out residential waste to calculate disposed commercial waste quantities.

The results of this process are shown in Table 3 for the Northwest Region.

Table 3 Northwest Region Disposed MSW Summary (tons) [1]

	Tons of Waste Disposed			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Residential generators	38,731	103,882	245,382	387,995
Commercial generators	24,602	33,991	90,555	149,149
Total	**63,333**	**137,874**	**335,937**	**537,144**

[1] Source: 2001 DEP database of disposed tons as reported by Pennsylvania disposal facilities.

In order to develop composition estimates for each of these demographic areas and generating sectors, field sampling was performed at two waste processing and disposal facilities:

- Lake View Landfill (Erie, Erie County); and
- Superior Greentree Landfill (Kersey, Elk County).

Sampling at these facilities was performed across four seasons to account for seasonal variation in MSW composition. Table 4 summarizes the sampling summary for the Northwest Region.

Table 4 Northwest Region Sampling Summary

	Number of Samples			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Physical MSW Samples				
Residential	21	25	57	103
Commercial	23	25	47	95
Subtotal—physical samples	44	50	104	198
Visual Bulk Waste Samples	19	15	40	74
Total Samples	**63**	**65**	**144**	**272**

Regional Aggregate Results

The remainder of this section presents a graphical and tabular summary of the Northwest region's disposed MSW composition. Specific figures and tables are summarized below.

- Figure 2 is a pie chart that shows the percentage composition of major material groups in the aggregate regional waste stream.
- Figure 3 is a bar chart that shows the estimated mean quantities of material disposed (or incinerated) from the region, again by major material group.

- Figure 4 compares the incidence of recyclable materials as targeted in Act 101 that were found to be disposed by residential and commercial generators in the region.
- Figure 5 shows the 10 most prevalent materials being disposed in the region, by weight.
- Table 5 contains a detailed statistical presentation of the aggregate MSW composition in the region. This tabular summary includes the statistical mean composition, as well as the standard deviation, upper and lower confidence intervals, and a "sampling error". The sampling error indicates the width of the confidence intervals relative to the mean. Lower sampling error signifies narrower confidence intervals (and therefore greater certainty of the mean composition shown).
- Figure 6 compares the percentage of disposed MSW landfilled from urban, suburban and rural communities within the region.
- Table 6 compares the mean composition of disposed MSW from urban, suburban and rural communities within the region.

Results by Generating Sector

An objective of the study was to compare and contrast the composition of residential and commercial waste within the region.

- Figure 7 and Figure 8 summarize the percentage of MSW landfilled by major material group for residential generators and commercial generators, respectively.
- Tables 7 and 8, like Table 6, compare the mean composition of urban, suburban, and rural waste. Table 7 focuses on residential generators in the region, while Table 8 shows the same comparison for commercial generators.

Bulky Waste

The State-wide MSW sort primarily targeted residential and commercial compacting vehicles, as well as commercial compacting and open-top roll-offs carrying non-C&D and non-industrial waste. These loads make up the majority of loads entering the Commonwealth's disposal facilities. However, it was expected at the outset of the study that some incoming loads of MSW—primarily those in open-top roll-off vehicles—would contain bulky waste that was not conducive to physical sorting. Therefore, the study methodology allowed for selected visual, volumetric sampling of bulky loads to the extent they were observed during the sampling and sorting process.

- Figure 9 shows the weight percentage composition of bulky items by major material group. Bulky loads were found to include a range of materials, including multi-family move-outs, residential and commercial clean-outs, miscellaneous commercial waste, and some renovation and construction type waste (although pure C&D loads were excluded from the analysis).

- Figure 10 lists the top 10 most prevalent bulky materials disposed during the study.

Self Haul Waste

Self haulers were found to deliver only a small fraction of waste to disposal facilities during the study. Our sampling plan allowed for selected sampling of self-haulers, which include: residential haulers of renovation and/or clean-out waste, and commercial contractors hauling small renovation, construction, land clearing, and/or clean-out type waste. Note that an insufficient number of self-haul samples were obtained to develop region-specific results.

Figure 2
Northwest Region Aggregate MSW Composition

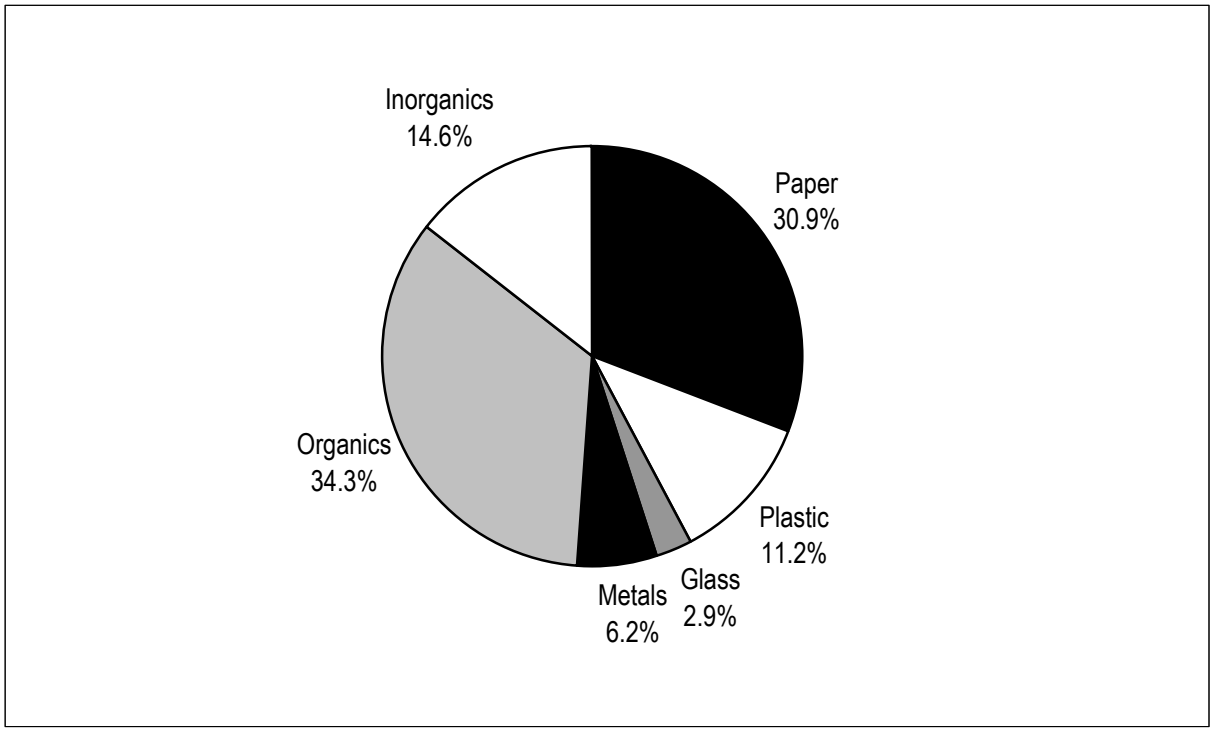


Figure 3
Northwest Region Aggregate MSW Tons Disposed

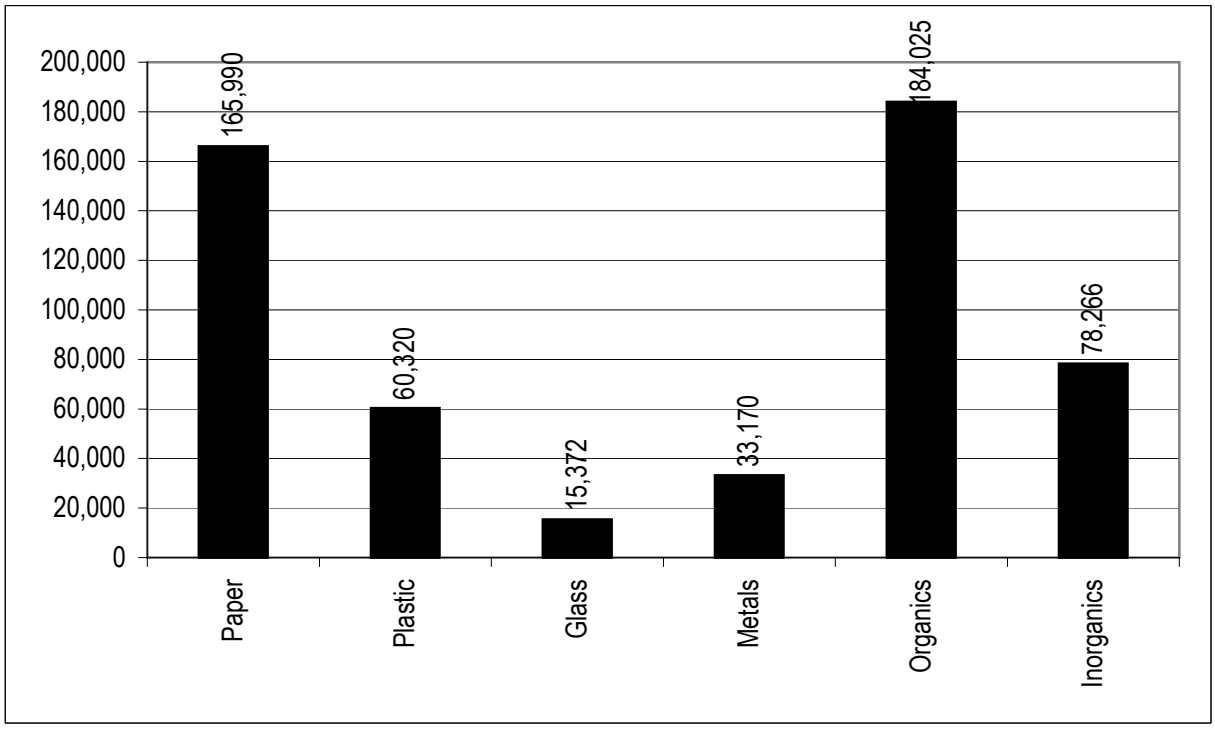


Figure 4

Act 101- Recyclables in Disposed MSW (tons)

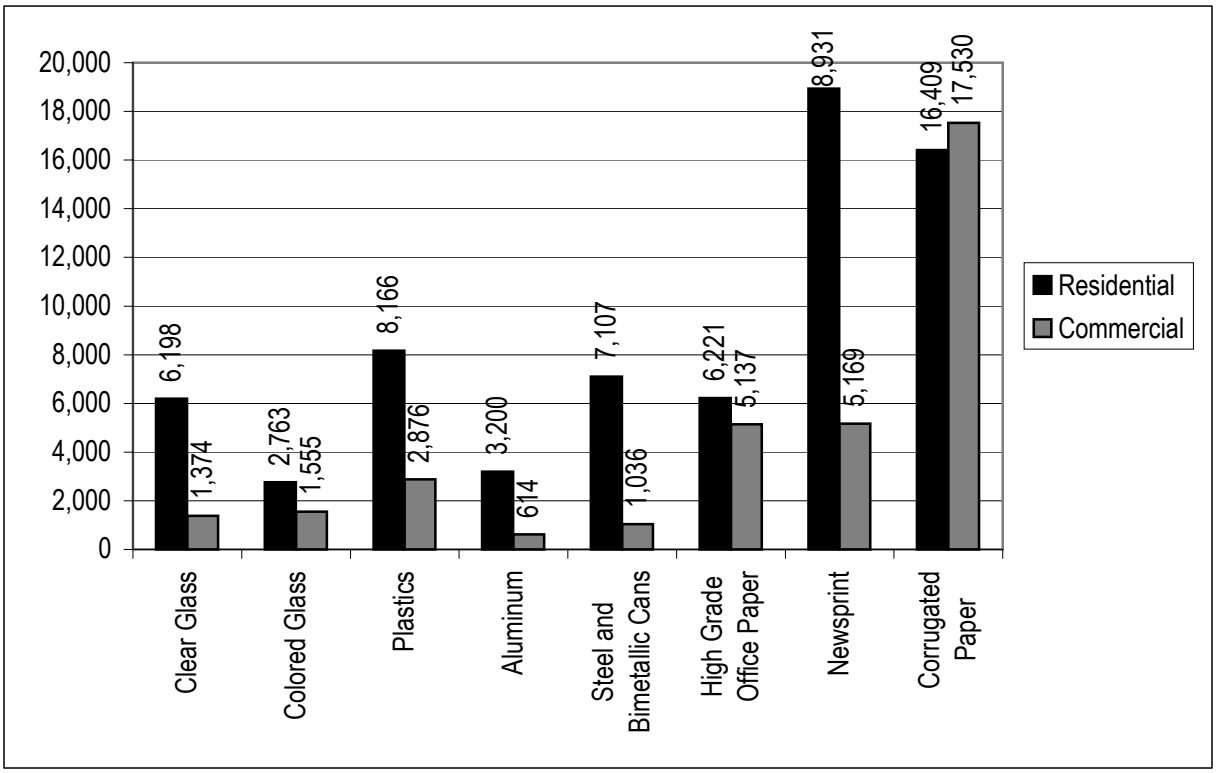


Figure 5

Northwest Region Top 10 Most Prevalent Materials

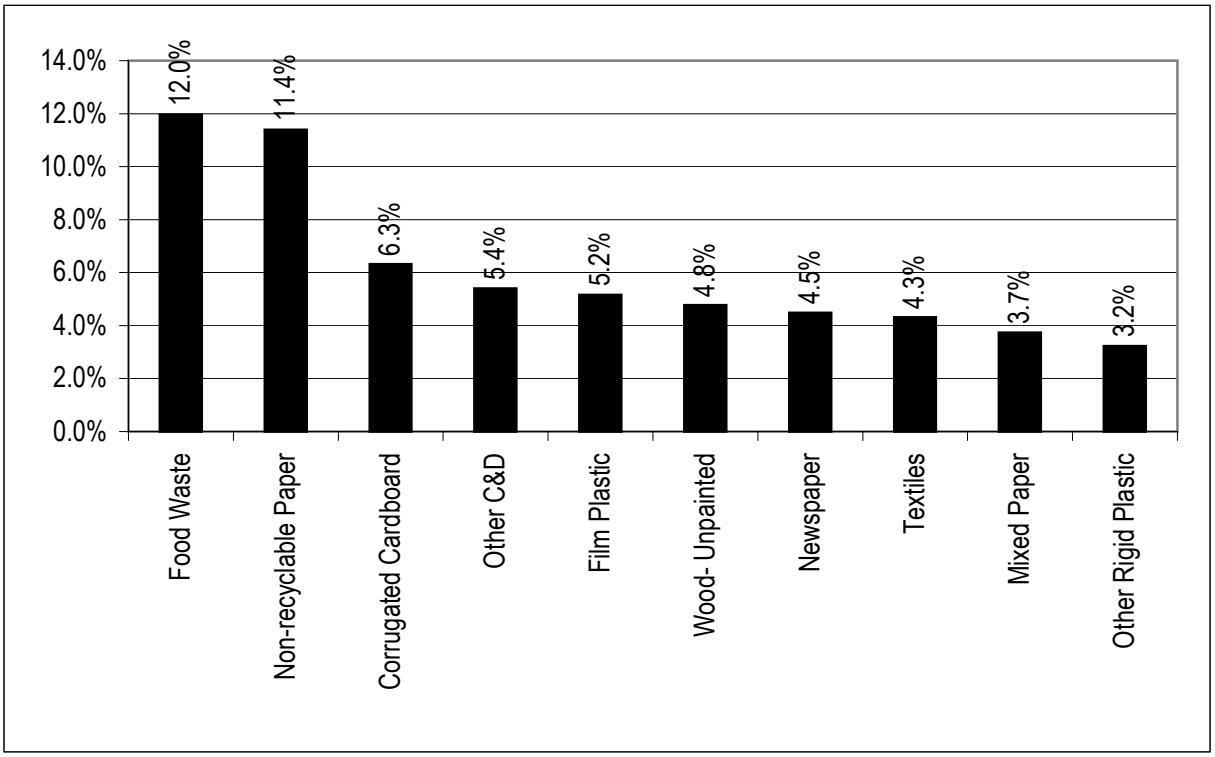


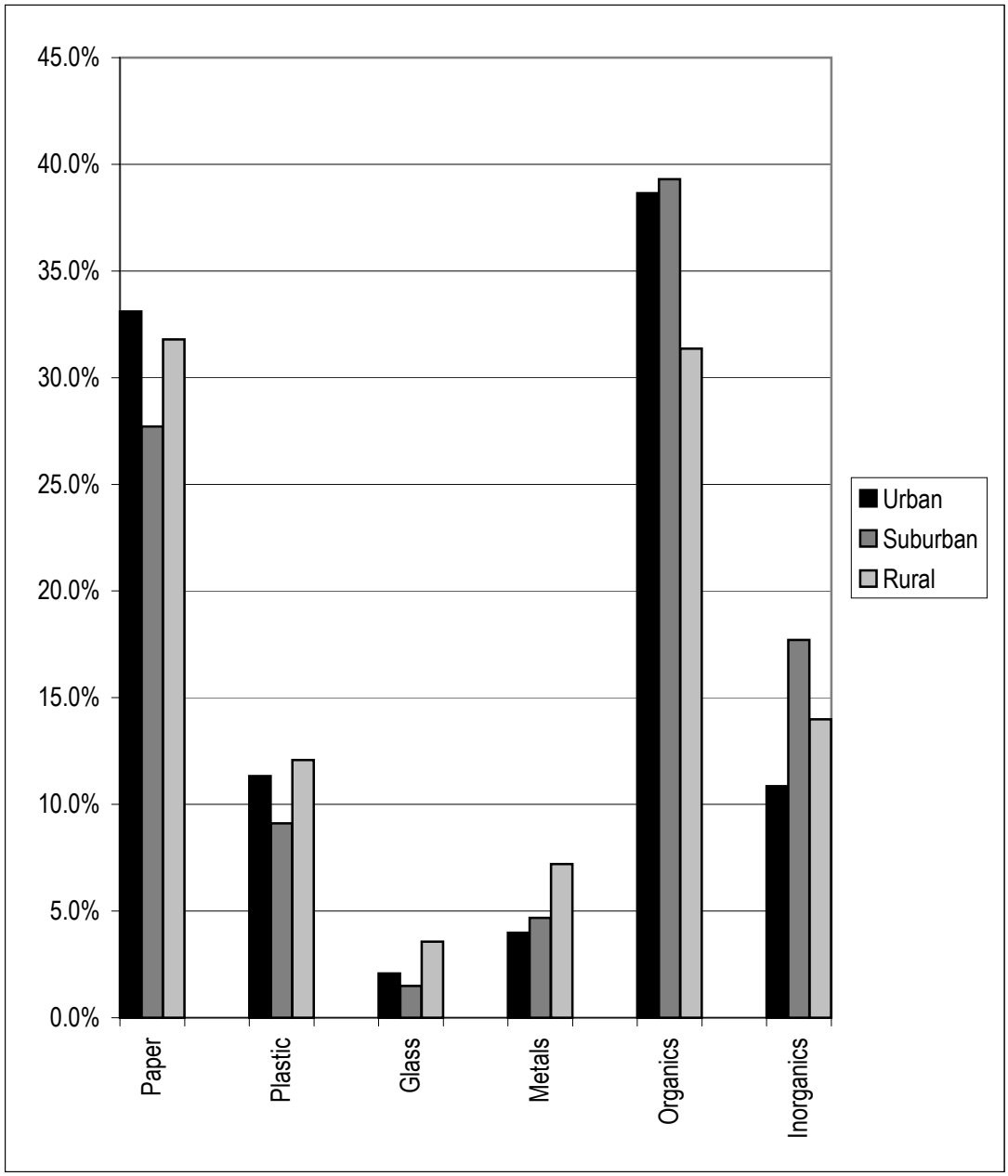
Table 5

Northwest Region Aggregate Landfilled MSW Composition Detail (Weight Percent)

		Material Categories	Tons Disposed	Mean Composition	Standard Deviation	Confidence Interval		Sampling Error
						Lower (%)	Upper (%)	
Paper			**165,990**	**30.9%**	**17.6%**	**28.2%**	**33.7%**	**8.8%**
	1	Newspaper	24,100	4.5%	5.1%	3.8%	5.4%	16.8%
	2	Corrugated Cardboard	33,939	6.3%	6.8%	5.6%	7.3%	13.2%
	3	Office	11,359	2.1%	4.0%	1.8%	2.6%	19.0%
	4	Magazine/ Glossy	14,187	2.6%	3.4%	2.2%	3.2%	18.9%
	5	Polycoated/Aseptic Containers	1,151	0.2%	1.4%	0.2%	0.3%	30.7%
	6	Mixed Paper	20,075	3.7%	4.8%	3.1%	4.6%	19.6%
	7	Non-recyclable Paper	61,179	11.4%	8.7%	10.0%	13.2%	13.9%
Plastic			**60,320**	**11.2%**	**9.3%**	**10.0%**	**12.5%**	**11.2%**
	8	#1 PET Bottles	6,443	1.2%	2.8%	1.0%	1.5%	20.9%
	9	#2 HDPE Bottles	4,598	0.9%	0.8%	0.7%	1.0%	18.6%
	10	#3-#7 Bottles	687	0.1%	0.2%	0.1%	0.2%	29.6%
	11	Expanded Polystyrene	3,556	0.7%	0.7%	0.6%	0.8%	15.4%
	12	Film Plastic	27,687	5.2%	5.7%	4.5%	6.1%	15.8%
	13	Other Rigid Plastic	17,349	3.2%	4.1%	2.8%	3.8%	14.6%
Glass			**15,372**	**2.9%**	**5.8%**	**2.4%**	**3.4%**	**18.0%**
	14	Clear Glass	7,572	1.4%	1.9%	1.2%	1.7%	18.8%
	15	Green Glass	1,331	0.2%	0.6%	0.2%	0.3%	31.7%
	16	Amber Glass	2,987	0.6%	1.2%	0.4%	0.7%	24.4%
	17	Non-recyclable Glass	3,482	0.6%	4.3%	0.4%	1.0%	41.0%
Metals			**33,170**	**6.2%**	**7.8%**	**5.3%**	**7.1%**	**14.2%**
	18	Steel Cans	8,143	1.5%	1.7%	1.3%	1.9%	19.7%
	19	Aluminum Cans	3,814	0.7%	0.8%	0.6%	0.9%	19.4%
	20	Other Ferrous	16,804	3.1%	7.6%	2.5%	4.1%	25.5%
	21	Other Aluminum	2,516	0.5%	1.7%	0.4%	0.6%	28.3%
	22	Other Non-Ferrous	1,893	0.4%	1.0%	0.3%	0.5%	29.7%
Organics			**184,025**	**34.3%**	**19.0%**	**31.6%**	**37.0%**	**7.9%**
	23	Yard Waste- Grass	14,414	2.7%	4.6%	1.7%	4.2%	46.8%
	24	Yard Waste- Other	14,280	2.7%	7.0%	2.0%	3.6%	29.7%
	25	Wood- Unpainted	25,627	4.8%	12.5%	3.9%	6.0%	21.0%
	26	Wood- Painted	12,765	2.4%	7.9%	1.8%	3.2%	28.9%
	27	Food Waste	64,203	12.0%	9.2%	10.5%	13.9%	14.3%
	28	Textiles	23,166	4.3%	6.2%	3.6%	5.3%	19.7%
	29	Diapers	12,045	2.2%	3.2%	1.8%	2.8%	21.9%
	30	Fines	7,137	1.3%	1.9%	1.1%	1.6%	17.0%
	31	Other Organics	10,388	1.9%	3.7%	1.6%	2.4%	22.3%
Inorganics			**78,266**	**14.6%**	**23.6%**	**12.0%**	**17.5%**	**18.8%**
	32	Electronics	6,451	1.2%	3.9%	0.9%	1.6%	29.4%
	33	Carpet	13,955	2.6%	10.8%	1.9%	3.7%	33.8%
	34	Drywall	5,639	1.0%	4.9%	0.8%	1.5%	31.5%
	35	Other C&D	29,023	5.4%	16.3%	4.1%	7.5%	32.1%
	36	HHW	2,362	0.4%	1.2%	0.3%	0.6%	31.2%
	37	Other Inorganics	11,368	2.1%	4.6%	1.7%	2.7%	24.3%
	38	Furniture	9,467	1.8%	10.8%	1.1%	2.9%	50.8%
		Total	537,144	100.0%				

Figure 6

Landfilled Aggregate Waste Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Material Group	Urban	Suburban	Rural	Aggregate
Paper	33.1%	27.7%	31.8%	30.9%
Plastic	11.3%	9.1%	12.1%	11.2%
Glass	2.1%	1.5%	3.6%	2.9%
Metals	4.0%	4.7%	7.2%	6.2%
Organics	38.6%	39.3%	31.4%	34.3%
Other Waste	10.9%	17.7%	14.0%	14.6%
Total	100.0%	100.0%	100.0%	100.0%

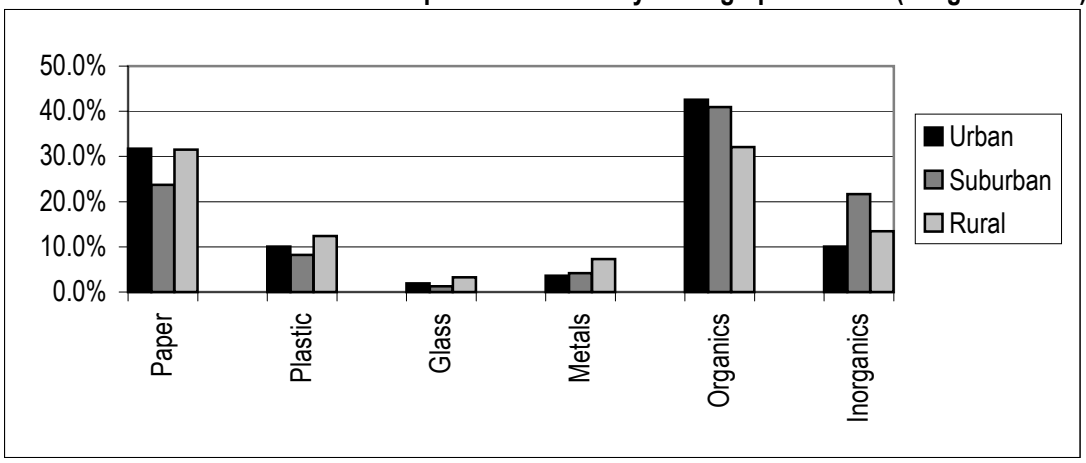
Table 6

Landfilled Aggregate MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**33.1%**	**27.7%**	**31.8%**	**30.9%**
	1	Newspaper	6.2%	3.2%	4.7%	4.5%
	2	Corrugated Cardboard	6.6%	6.2%	6.3%	6.3%
	3	Office	2.3%	1.9%	2.2%	2.1%
	4	Magazine/ Glossy	1.6%	2.3%	3.0%	2.6%
	5	Polycoated/Aseptic Containers	0.1%	0.2%	0.3%	0.2%
	6	Mixed Paper	4.7%	4.6%	3.2%	3.7%
	7	Non-recyclable Paper	11.6%	9.3%	12.2%	11.4%
Plastic			**11.3%**	**9.1%**	**12.1%**	**11.2%**
	8	#1 PET Bottles	0.9%	0.5%	1.5%	1.2%
	9	#2 HDPE Bottles	0.6%	0.4%	1.1%	0.9%
	10	#3-#7 Bottles	0.1%	0.1%	0.2%	0.1%
	11	Expanded Polystyrene	0.6%	0.6%	0.7%	0.7%
	12	Film Plastic	5.1%	4.6%	5.4%	5.2%
	13	Other Rigid Plastic	4.0%	2.8%	3.2%	3.2%
Glass			**2.1%**	**1.5%**	**3.6%**	**2.9%**
	14	Clear Glass	0.9%	0.7%	1.8%	1.4%
	15	Green Glass	0.2%	0.1%	0.3%	0.2%
	16	Amber Glass	0.3%	0.5%	0.6%	0.6%
	17	Non-recyclable Glass	0.7%	0.1%	0.9%	0.6%
Metals			**4.0%**	**4.7%**	**7.2%**	**6.2%**
	18	Steel Cans	1.0%	0.6%	2.0%	1.5%
	19	Aluminum Cans	0.6%	0.4%	0.9%	0.7%
	20	Other Ferrous	1.9%	3.2%	3.3%	3.1%
	21	Other Aluminum	0.3%	0.4%	0.5%	0.5%
	22	Other Non-Ferrous	0.2%	0.1%	0.5%	0.4%
Organics			**38.6%**	**39.3%**	**31.4%**	**34.3%**
	23	Yard Waste- Grass	2.6%	8.3%	0.4%	2.7%
	24	Yard Waste- Other	4.9%	5.2%	1.2%	2.7%
	25	Wood- Unpainted	6.9%	3.6%	4.9%	4.8%
	26	Wood- Painted	4.3%	3.1%	1.7%	2.4%
	27	Food Waste	9.8%	10.3%	13.0%	12.0%
	28	Textiles	4.9%	3.6%	4.5%	4.3%
	29	Diapers	2.5%	2.2%	2.2%	2.2%
	30	Fines	1.3%	0.8%	1.6%	1.3%
	31	Other Organics	1.6%	2.3%	1.9%	1.9%
Inorganics			**10.9%**	**17.7%**	**14.0%**	**14.6%**
	32	Electronics	1.4%	0.9%	1.3%	1.2%
	33	Carpet	1.2%	3.8%	2.4%	2.6%
	34	Drywall	1.3%	1.2%	1.0%	1.0%
	35	Other C&D	2.5%	7.0%	5.3%	5.4%
	36	HHW	0.4%	0.4%	0.5%	0.4%
	37	Other Inorganics	3.7%	1.4%	2.1%	2.1%
	38	Furniture	0.3%	3.1%	1.5%	1.8%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 7

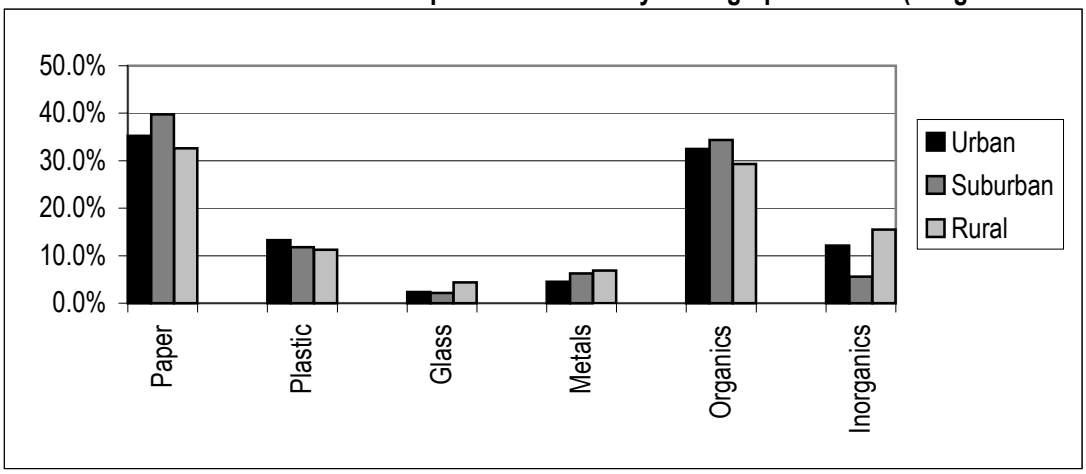
Landfilled Residential MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	31.8%	23.8%	31.5%	29.4%
Plastic	10.1%	8.2%	12.4%	11.0%
Glass	1.9%	1.3%	3.3%	2.6%
Metals	3.6%	4.2%	7.3%	6.1%
Organics	42.6%	40.9%	32.1%	35.5%
Other Waste	10.1%	21.7%	13.4%	15.3%
Total	100.0%	100.0%	100.0%	100.0%

Figure 8

Landfilled Commercial MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	35.2%	39.8%	32.6%	34.7%
Plastic	13.3%	11.8%	11.3%	11.7%
Glass	2.4%	2.2%	4.4%	3.5%
Metals	4.5%	6.3%	6.9%	6.4%
Organics	32.5%	34.4%	29.3%	31.0%
Other Waste	12.1%	5.6%	15.5%	12.7%
Total	100.0%	100.0%	100.0%	100.0%

Table 7

Landfilled Residential MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**31.8%**	**23.8%**	**31.5%**	**29.4%**
	1	Newspaper	7.8%	3.5%	5.0%	4.9%
	2	Corrugated Cardboard	4.2%	3.6%	4.5%	4.2%
	3	Office	2.3%	1.3%	1.6%	1.6%
	4	Magazine/ Glossy	1.7%	2.2%	3.4%	2.9%
	5	Polycoated/Aseptic Containers	0.2%	0.1%	0.2%	0.2%
	6	Mixed Paper	4.2%	4.4%	3.3%	3.7%
	7	Non-recyclable Paper	11.4%	8.6%	13.5%	12.0%
Plastic			**10.1%**	**8.2%**	**12.4%**	**11.0%**
	8	#1 PET Bottles	0.9%	0.5%	1.5%	1.1%
	9	#2 HDPE Bottles	0.8%	0.4%	1.2%	1.0%
	10	#3-#7 Bottles	0.1%	0.1%	0.2%	0.1%
	11	Expanded Polystyrene	0.7%	0.6%	0.7%	0.6%
	12	Film Plastic	4.9%	4.0%	5.8%	5.2%
	13	Other Rigid Plastic	2.7%	2.7%	3.0%	2.9%
Glass			**1.9%**	**1.3%**	**3.3%**	**2.6%**
	14	Clear Glass	0.8%	0.7%	2.1%	1.6%
	15	Green Glass	0.2%	0.1%	0.3%	0.3%
	16	Amber Glass	0.3%	0.3%	0.5%	0.4%
	17	Non-recyclable Glass	0.7%	0.2%	0.3%	0.3%
Metals			**3.6%**	**4.2%**	**7.3%**	**6.1%**
	18	Steel Cans	1.0%	0.6%	2.5%	1.8%
	19	Aluminum Cans	0.8%	0.4%	1.0%	0.8%
	20	Other Ferrous	1.3%	2.7%	2.9%	2.7%
	21	Other Aluminum	0.3%	0.3%	0.5%	0.4%
	22	Other Non-Ferrous	0.2%	0.1%	0.4%	0.3%
Organics			**42.6%**	**40.9%**	**32.1%**	**35.5%**
	23	Yard Waste- Grass	4.0%	11.0%	0.4%	3.6%
	24	Yard Waste- Other	6.7%	6.0%	1.4%	3.1%
	25	Wood- Unpainted	4.3%	1.9%	3.4%	3.1%
	26	Wood- Painted	6.3%	3.3%	1.5%	2.5%
	27	Food Waste	8.9%	9.5%	14.3%	12.5%
	28	Textiles	6.4%	4.5%	4.8%	4.9%
	29	Diapers	2.7%	2.0%	2.7%	2.5%
	30	Fines	1.3%	0.9%	1.7%	1.4%
	31	Other Organics	1.9%	1.9%	1.9%	1.9%
Inorganics			**10.1%**	**21.7%**	**13.4%**	**15.3%**
	32	Electronics	0.8%	1.1%	1.2%	1.1%
	33	Carpet	0.8%	4.2%	2.2%	2.6%
	34	Drywall	1.2%	1.5%	0.5%	0.8%
	35	Other C&D	3.2%	8.9%	4.7%	5.7%
	36	HHW	0.5%	0.4%	0.6%	0.5%
	37	Other Inorganics	3.5%	1.5%	2.4%	2.3%
	38	Furniture	0.0%	4.1%	1.9%	2.3%
		Total	100.0%	100.0%	100.0%	100.0%

Table 8

Landfilled Commercial MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**35.2%**	**39.8%**	**32.6%**	**34.7%**
	1	Newspaper	3.6%	2.2%	3.9%	3.5%
	2	Corrugated Cardboard	10.3%	14.4%	11.2%	11.8%
	3	Office	2.4%	3.5%	3.7%	3.4%
	4	Magazine/ Glossy	1.4%	2.6%	1.8%	1.9%
	5	Polycoated/Aseptic Containers	0.1%	0.3%	0.4%	0.3%
	6	Mixed Paper	5.5%	5.3%	3.0%	4.0%
	7	Non-recyclable Paper	12.0%	11.5%	8.6%	9.8%
Plastic			**13.3%**	**11.8%**	**11.3%**	**11.7%**
	8	#1 PET Bottles	0.7%	0.8%	1.7%	1.3%
	9	#2 HDPE Bottles	0.4%	0.6%	0.6%	0.6%
	10	#3-#7 Bottles	0.0%	0.1%	0.1%	0.1%
	11	Expanded Polystyrene	0.6%	0.9%	0.7%	0.7%
	12	Film Plastic	5.4%	6.4%	4.3%	5.0%
	13	Other Rigid Plastic	6.1%	3.1%	3.8%	4.0%
Glass			**2.4%**	**2.2%**	**4.4%**	**3.5%**
	14	Clear Glass	1.1%	0.6%	1.0%	0.9%
	15	Green Glass	0.2%	0.2%	0.2%	0.2%
	16	Amber Glass	0.5%	1.3%	0.8%	0.9%
	17	Non-recyclable Glass	0.6%	0.1%	2.4%	1.6%
Metals			**4.5%**	**6.3%**	**6.9%**	**6.4%**
	18	Steel Cans	0.9%	0.4%	0.8%	0.7%
	19	Aluminum Cans	0.3%	0.4%	0.5%	0.4%
	20	Other Ferrous	2.8%	4.7%	4.4%	4.2%
	21	Other Aluminum	0.5%	0.6%	0.5%	0.5%
	22	Other Non-Ferrous	0.0%	0.2%	0.8%	0.5%
Organics			**32.5%**	**34.4%**	**29.3%**	**31.0%**
	23	Yard Waste- Grass	0.4%	0.1%	0.3%	0.3%
	24	Yard Waste- Other	2.0%	2.7%	0.7%	1.4%
	25	Wood- Unpainted	10.9%	8.8%	8.8%	9.2%
	26	Wood- Painted	1.2%	2.7%	2.2%	2.1%
	27	Food Waste	11.2%	12.6%	9.6%	10.5%
	28	Textiles	2.5%	1.0%	3.6%	2.8%
	29	Diapers	2.2%	2.7%	1.0%	1.6%
	30	Fines	1.2%	0.4%	1.3%	1.1%
	31	Other Organics	1.0%	3.4%	1.8%	2.0%
Inorganics			**12.1%**	**5.6%**	**15.5%**	**12.7%**
	32	Electronics	2.4%	0.3%	1.5%	1.4%
	33	Carpet	1.9%	2.6%	2.9%	2.7%
	34	Drywall	1.4%	0.2%	2.3%	1.7%
	35	Other C&D	1.3%	1.2%	6.9%	4.7%
	36	HHW	0.2%	0.2%	0.2%	0.2%
	37	Other Inorganics	4.1%	1.1%	1.3%	1.7%
	38	Furniture	0.9%	0.0%	0.3%	0.4%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 9

Northwest Region Aggregate Composition of Bulky Loads (Visual Samples)

Material Group	% Weight
Paper	19.1%
Plastic	9.0%
Glass	7.8%
Metals	2.8%
Organics	30.3%
Inorganics	31.0%
Total	100.0%

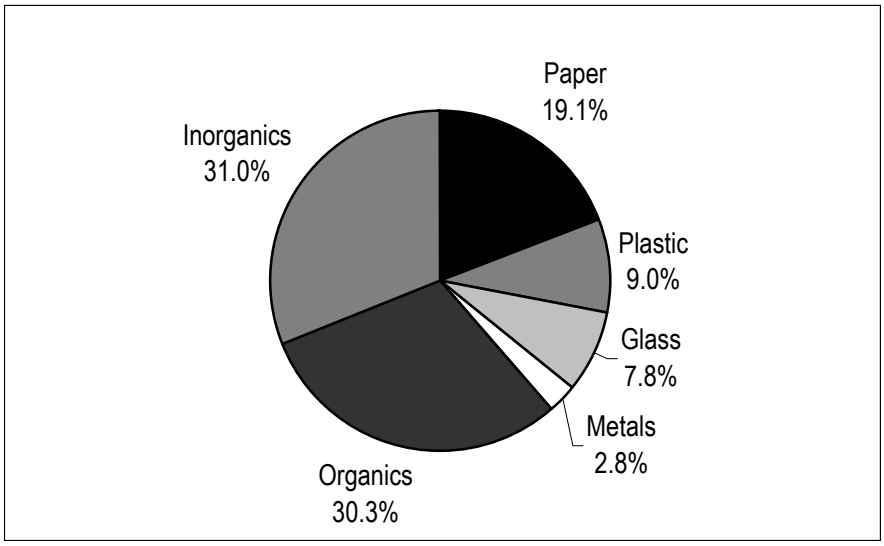
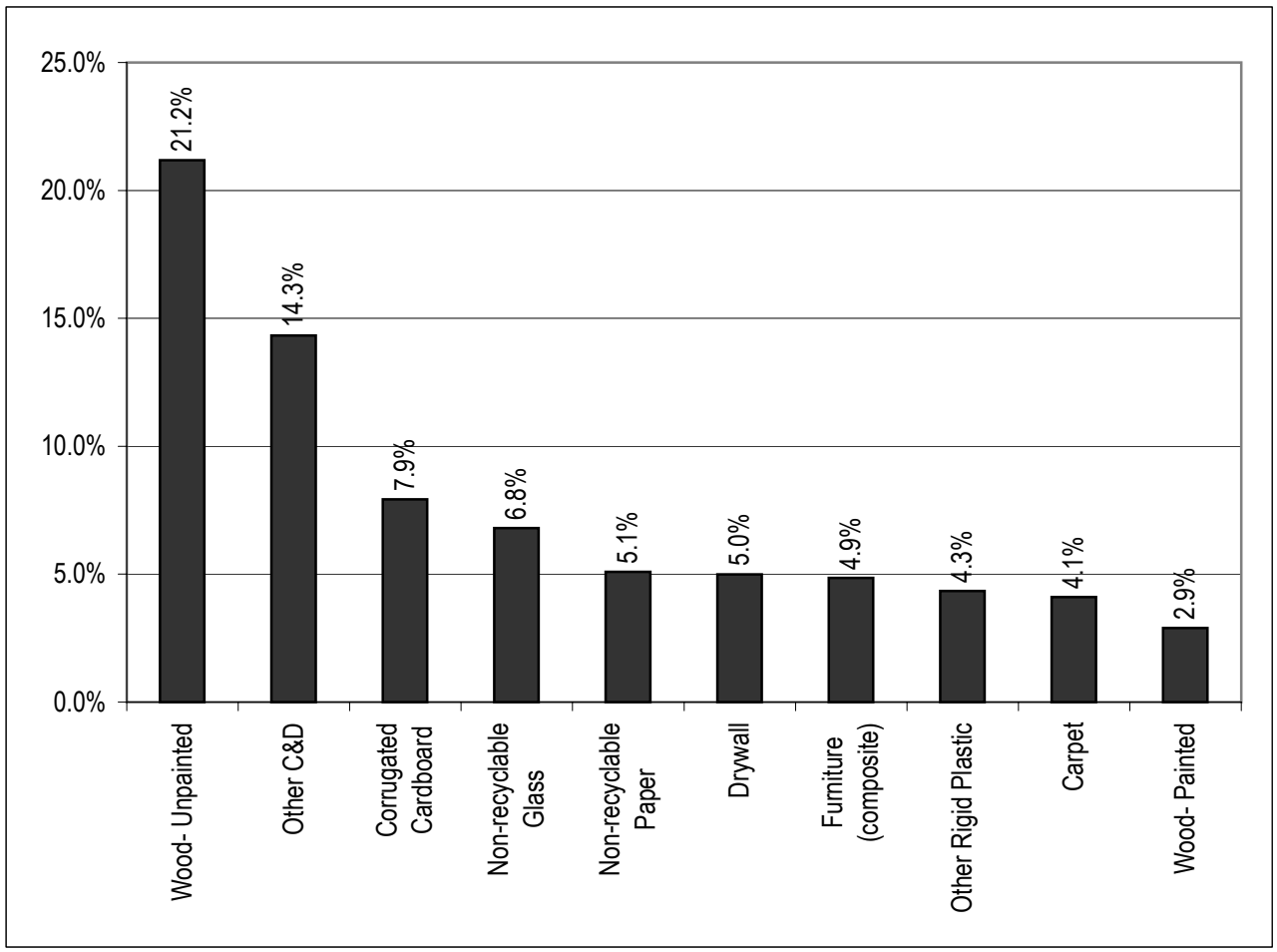


Figure 10

Northwest Region Top 10 Most Prevalent Bulky Materials



Section 9
SOUTHEAST REGION MSW COMPOSITION

Introduction

DEP manages Pennsylvania's waste stream via a network of six regional offices. An objective of this study was to derive results for each of the regions in the Commonwealth. Aggregate State-wide results are provided in Section 4 of this report. The purpose of this section is to provide detailed results specifically for the Southeast Region. A map of the Southeast region is shown in Figure 1.

Figure 1 Southeast Region Map

Table 1 summarizes the demographic and economic characteristics of the Southeast region.

Table 1 Southeast Region Demographic Summary

	Urban	Suburban	Rural	Total
Communities [1]	2	165	72	**239**
Population [1]	1,539,409	2,042,782	267,456	**3,849,647**
Housing Units [1]	620,521	786,844	100,799	**1,508,165**
Employment [2]	465,733	841,068	63,202	**1,370,003**

[1] Source: 2001 U.S. Census data provided by DEP
[2] Source: 2001 estimates provided by ESRI-BIS, Arlington, VA, based on U.S. Census data.

Table 2 summarizes the waste that was reported by the Commonwealth's landfills (and incinerators) to have been disposed from each County within the Southeast region in 2001.

Table 2 Southeast Region Waste Disposal Summary [1]

County	MSW Disposed (tons)
Bucks	347,531
Chester	355,688
Delaware	406,786
Montgomery	673,693
Philadelphia	1,789,033
Total	**3,572,730**

[1] Source: County-level disposal quantity estimates are based on the 2001 DEP landfill disposal database

In order to aggregate the MSW composition data that was collected in this study, it was necessary to develop estimates of waste generation by county within the region. This was performed in the following steps:

1) Surveying urban, suburban, and rural communities across the Commonwealth to compile urban, suburban and rural residential MSW disposal factors (tons of disposed MSW per household per year);
2) Applying the residential generation factors to the total households in the region to estimate total disposed residential waste;
3) Estimating total regional waste disposed based on a statistical analysis of reported county-level waste disposal records relative to county-level population and employment; and
4) Netting out residential waste to calculate disposed commercial waste quantities.

The results of this process are shown in Table 3 for the Southeast Region.

Table 3 Southeast Region Disposed MSW Summary (tons) [1]

	Tons of Waste Disposed			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Residential generators	542,979	873,603	100,343	1,516,925
Commercial generators	1,157,021	803,781	95,004	2,055,806
Total	**1,700,000**	**1,677,384**	**195,346**	**3,572,730**

[1] Source: 2001 DEP database of disposed tons as reported by Pennsylvania disposal facilities.

In order to develop composition estimates for each of these demographic areas and generating sectors, field sampling was performed at two waste processing and disposal facilities:

- TRC Transfer Station (Philadelphia, Philadelphia County);
- Montgomery/Montenay RRF (Conshohocken, Montgomery County); and
- Chester County Landfill (Narvon, Chester County).

Sampling at these facilities was performed across four seasons to account for seasonal variation in MSW composition. Table 4 summarizes the sampling summary for the Southeast Region.

Table 4 Southeast Region Sampling Summary

	Number of Samples			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Physical MSW Samples				
Residential	35	33	35	103
Commercial	35	32	29	96
Subtotal—physical samples	70	65	64	199
Visual Bulk Waste Samples	35	15	23	73
Total Samples	**105**	**80**	**87**	**272**

Regional Aggregate Results

The remainder of this section presents a graphical and tabular summary of the Southeast region's disposed MSW composition. Specific figures and tables are summarized below.

- Figure 2 is a pie chart that shows the percentage composition of major material groups in the aggregate regional waste stream.
- Figure 3 is a bar chart that shows the estimated mean quantities of material disposed (or incinerated) from the region, again by major material group.

- Figure 4 compares the incidence of recyclable materials as targeted in Act 101 that were found to be disposed by residential and commercial generators in the region.
- Figure 5 shows the 10 most prevalent materials being disposed in the region, by weight.
- Table 5 contains a detailed statistical presentation of the aggregate MSW composition in the region. This tabular summary includes the statistical mean composition, as well as the standard deviation, upper and lower confidence intervals, and a "sampling error". The sampling error indicates the width of the confidence intervals relative to the mean. Lower sampling error signifies narrower confidence intervals (and therefore greater certainty of the mean composition shown).
- Figure 6 compares the percentage of disposed MSW landfilled from urban, suburban and rural communities within the region.
- Table 6 compares the mean composition of disposed MSW from urban, suburban and rural communities within the region.

Results by Generating Sector

An objective of the study was to compare and contrast the composition of residential and commercial waste within the region.

- Figure 7 and Figure 8 summarize the percentage of MSW landfilled by major material group for residential generators and commercial generators, respectively.
- Tables 7 and 8, like Table 6, compare the mean composition of urban, suburban, and rural waste. Table 7 focuses on residential generators in the region, while Table 8 shows the same comparison for commercial generators.

Bulky Waste

The State-wide MSW sort primarily targeted residential and commercial compacting vehicles, as well as commercial compacting and open-top roll-offs carrying non-C&D and non-industrial waste. These loads make up the majority of loads entering the Commonwealth's disposal facilities. However, it was expected at the outset of the study that some incoming loads of MSW—primarily those in open-top roll-off vehicles—would contain bulky waste that was not conducive to physical sorting. Therefore, the study methodology allowed for selected visual, volumetric sampling of bulky loads to the extent they were observed during the sampling and sorting process.

- Figure 9 shows the weight percentage composition of bulky items by major material group. Bulky loads were found to include a range of materials, including multi-family move-outs, residential and commercial clean-outs, miscellaneous commercial waste, and some renovation and construction type waste (although pure C&D loads were excluded from the analysis).

- Figure 10 lists the top 10 most prevalent bulky materials disposed during the study.

Self Haul Waste

Self haulers were found to deliver only a small fraction of waste to disposal facilities during the study. Our sampling plan allowed for selected sampling of self-haulers, which include: residential haulers of renovation and/or clean-out waste, and commercial contractors hauling small renovation, construction, land clearing, and/or clean-out type waste. Note that an insufficient number of self-haul samples were obtained to develop region-specific results.

Figure 2
Southeast Region Aggregate MSW Composition

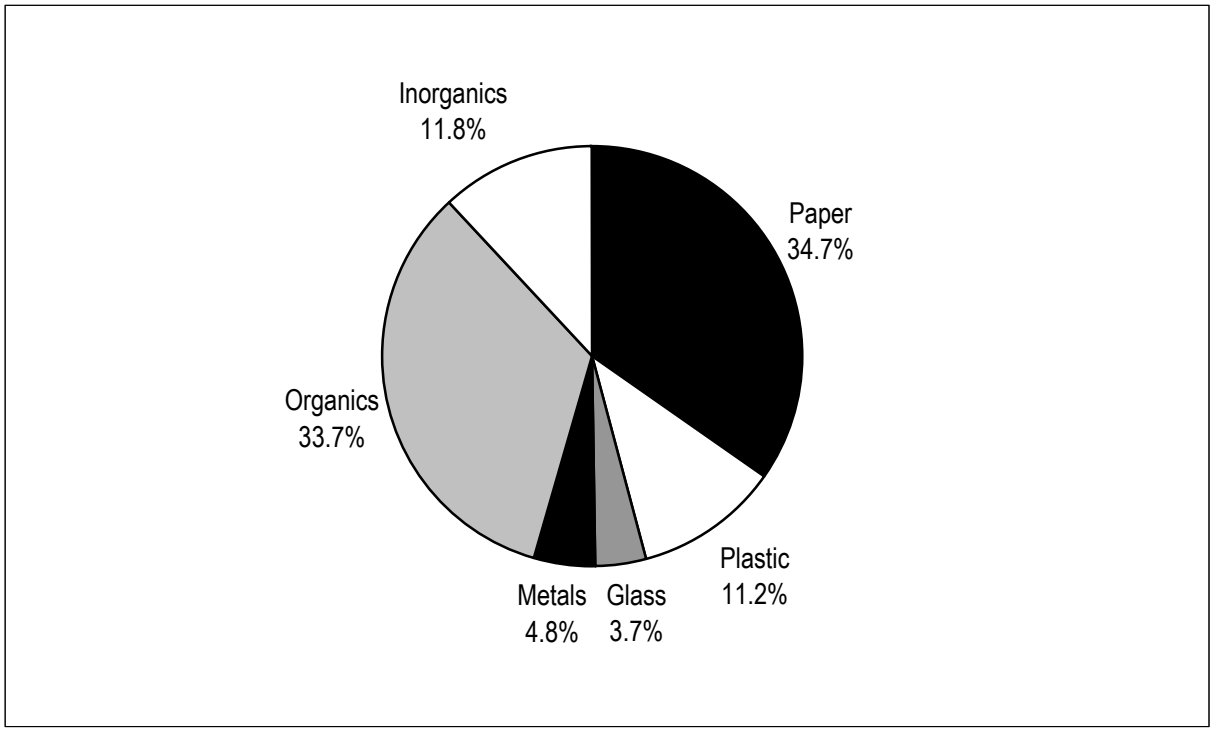


Figure 3
Southeast Region Aggregate MSW Tons Disposed

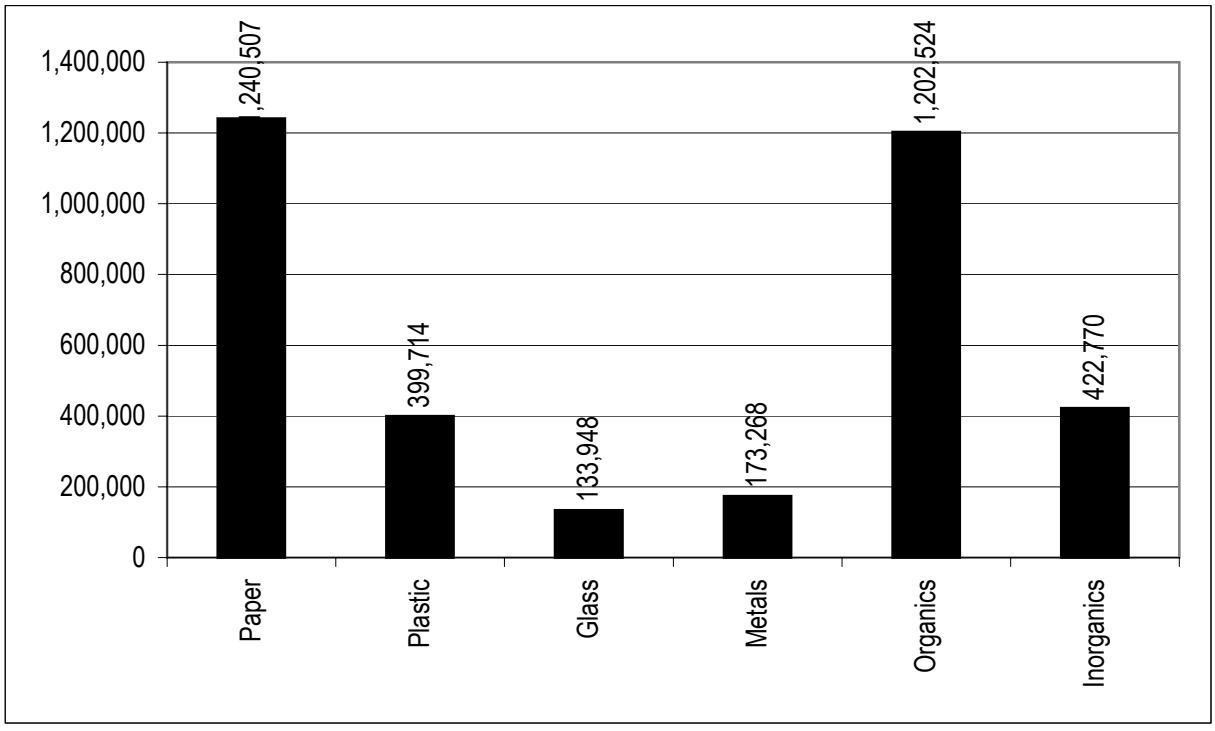


Figure 4

Act 101- Recyclables in Disposed MSW (tons)

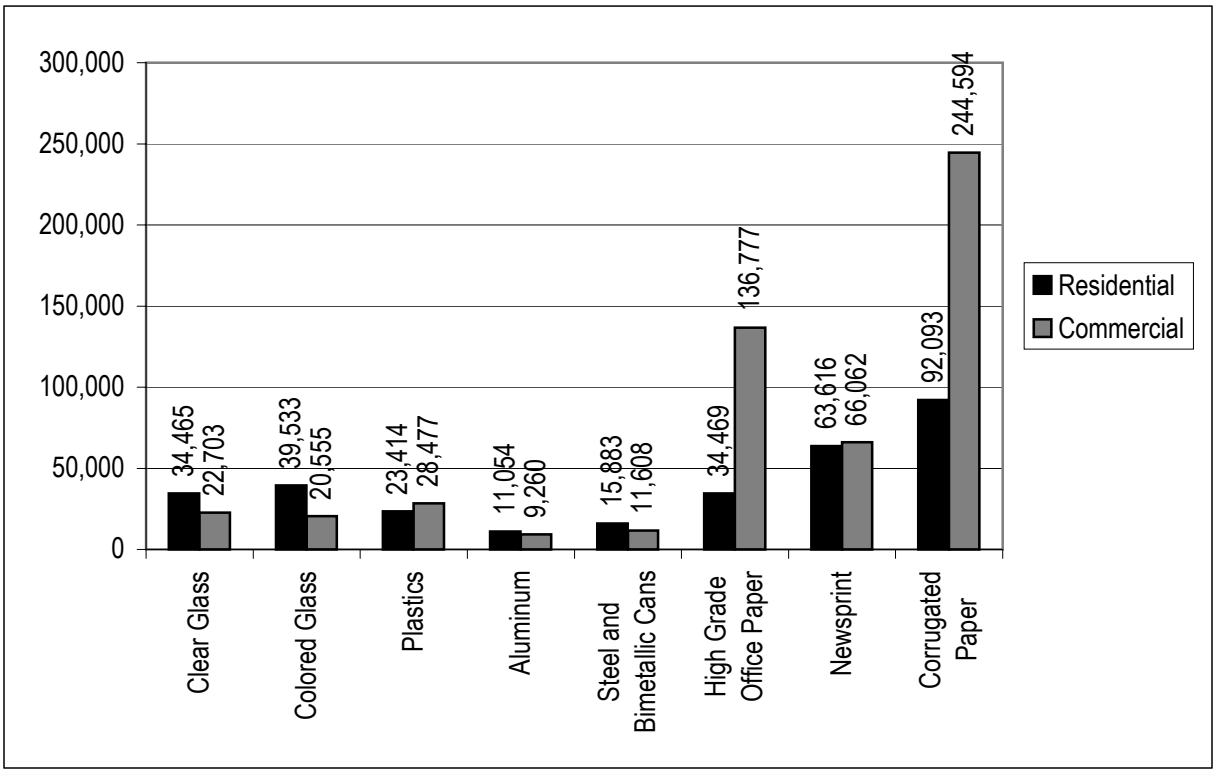


Figure 5

Southeast Region Top 10 Most Prevalent Materials

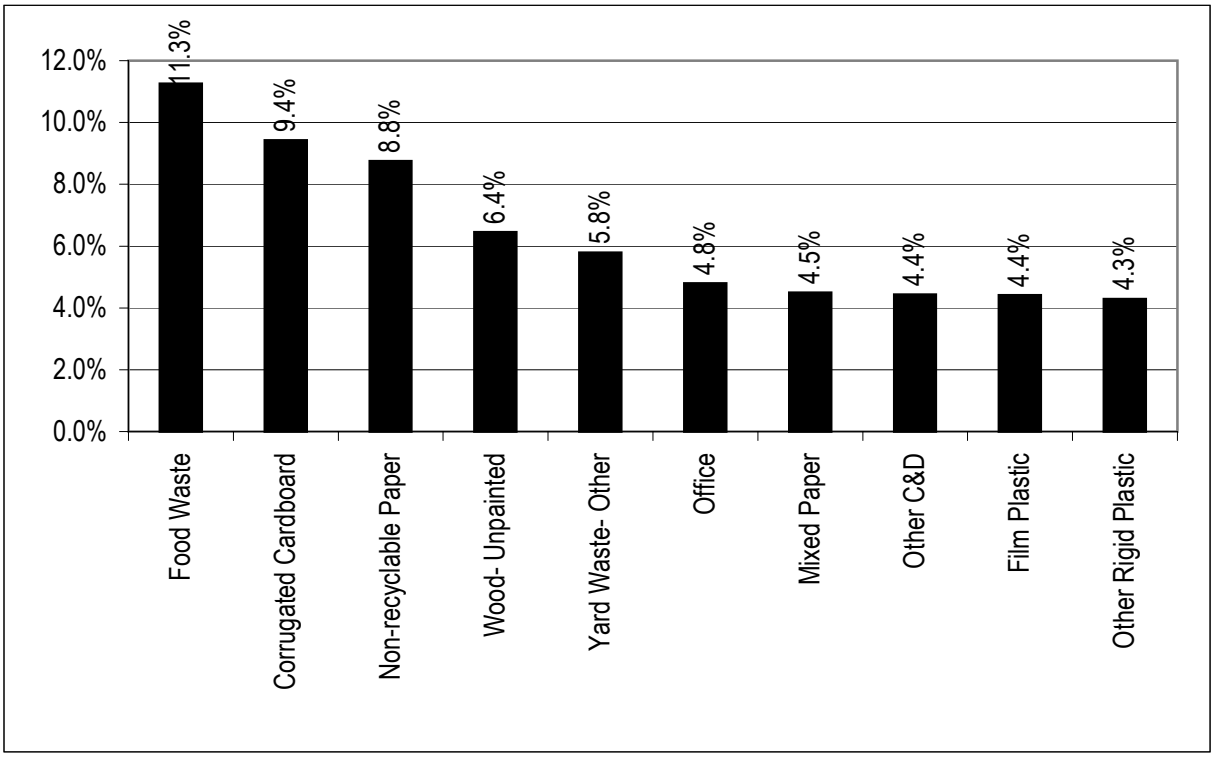


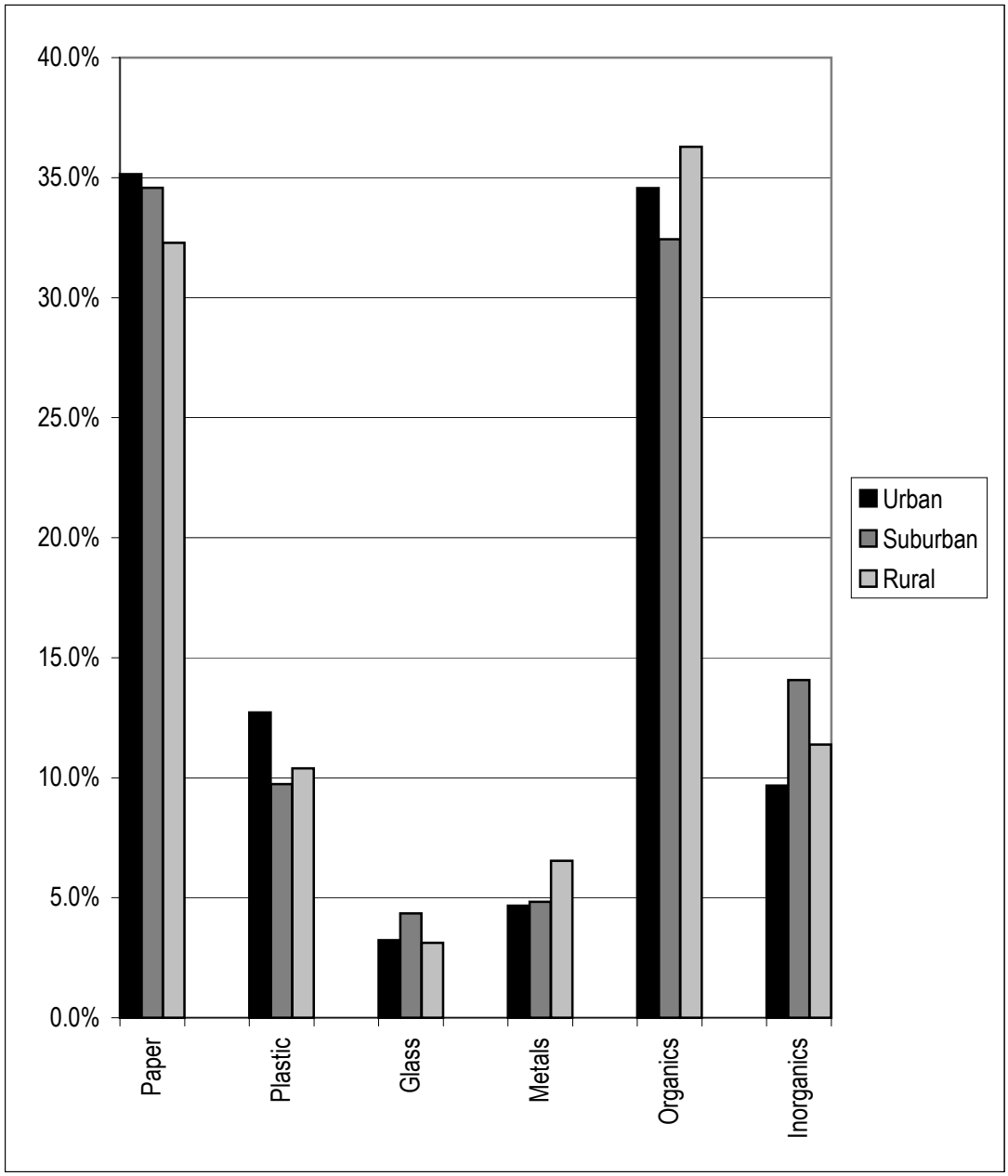
Table 5

Southeast Region Aggregate Landfilled MSW Composition Detail (Weight Percent)

		Material Categories	Tons Disposed	Mean Composition	Standard Deviation	Confidence Interval		Sampling Error
						Lower (%)	Upper (%)	
Paper			**1,240,507**	**34.7%**	**20.4%**	**31.3%**	**38.3%**	**10.0%**
	1	Newspaper	129,677	3.6%	4.4%	3.1%	4.4%	17.2%
	2	Corrugated Cardboard	336,687	9.4%	10.6%	8.0%	11.4%	18.5%
	3	Office	171,246	4.8%	6.5%	3.9%	6.1%	23.2%
	4	Magazine/ Glossy	110,685	3.1%	6.1%	2.4%	4.2%	29.8%
	5	Polycoated/Aseptic Containers	19,081	0.5%	1.4%	0.4%	0.7%	28.5%
	6	Mixed Paper	160,504	4.5%	4.8%	3.9%	5.3%	15.8%
	7	Non-recyclable Paper	312,627	8.8%	7.3%	7.7%	10.2%	14.1%
Plastic			**399,714**	**11.2%**	**9.5%**	**9.7%**	**12.9%**	**14.1%**
	8	#1 PET Bottles	33,081	0.9%	1.5%	0.8%	1.2%	21.0%
	9	#2 HDPE Bottles	18,810	0.5%	0.6%	0.4%	0.6%	18.0%
	10	#3-#7 Bottles	6,806	0.2%	0.5%	0.1%	0.3%	31.5%
	11	Expanded Polystyrene	30,186	0.8%	2.0%	0.7%	1.1%	25.1%
	12	Film Plastic	157,548	4.4%	4.3%	3.8%	5.2%	16.3%
	13	Other Rigid Plastic	153,282	4.3%	6.1%	3.5%	5.4%	22.6%
Glass			**133,948**	**3.7%**	**7.7%**	**3.1%**	**4.6%**	**19.9%**
	14	Clear Glass	57,168	1.6%	2.8%	1.3%	2.0%	19.5%
	15	Green Glass	23,250	0.7%	1.9%	0.5%	0.9%	28.9%
	16	Amber Glass	36,838	1.0%	3.2%	0.7%	1.5%	40.7%
	17	Non-recyclable Glass	16,692	0.5%	1.8%	0.3%	0.7%	34.0%
Metals			**173,268**	**4.8%**	**8.5%**	**4.2%**	**5.7%**	**15.3%**
	18	Steel Cans	27,492	0.8%	0.9%	0.7%	0.9%	17.8%
	19	Aluminum Cans	20,314	0.6%	1.4%	0.4%	0.8%	27.8%
	20	Other Ferrous	99,439	2.8%	7.6%	2.2%	3.6%	24.3%
	21	Other Aluminum	13,068	0.4%	0.9%	0.3%	0.4%	18.9%
	22	Other Non-Ferrous	12,955	0.4%	1.9%	0.3%	0.5%	28.3%
Organics			**1,202,524**	**33.7%**	**21.0%**	**30.8%**	**36.6%**	**8.6%**
	23	Yard Waste- Grass	24,962	0.7%	2.1%	0.4%	1.2%	53.3%
	24	Yard Waste- Other	206,824	5.8%	12.6%	4.4%	7.9%	30.2%
	25	Wood- Unpainted	230,283	6.4%	16.0%	5.1%	8.3%	24.8%
	26	Wood- Painted	66,933	1.9%	6.0%	1.5%	2.5%	27.0%
	27	Food Waste	401,988	11.3%	10.9%	9.6%	13.5%	17.0%
	28	Textiles	125,441	3.5%	7.1%	2.9%	4.4%	21.2%
	29	Diapers	65,878	1.8%	4.2%	1.5%	2.4%	25.1%
	30	Fines	30,539	0.9%	1.5%	0.7%	1.1%	19.3%
	31	Other Organics	49,676	1.4%	3.2%	1.1%	1.9%	30.4%
Inorganics			**422,770**	**11.8%**	**20.1%**	**10.0%**	**14.0%**	**17.0%**
	32	Electronics	69,024	1.9%	5.0%	1.5%	2.6%	30.0%
	33	Carpet	47,922	1.3%	5.0%	1.0%	1.9%	34.2%
	34	Drywall	32,879	0.9%	5.9%	0.7%	1.3%	31.5%
	35	Other C&D	158,232	4.4%	12.4%	3.4%	5.9%	28.6%
	36	HHW	8,367	0.2%	0.6%	0.2%	0.3%	32.2%
	37	Other Inorganics	50,891	1.4%	4.0%	1.1%	1.9%	27.4%
	38	Furniture	55,454	1.6%	7.3%	1.0%	2.4%	43.7%
		Total	3,572,730	100.0%				

Figure 6

Landfilled Aggregate Waste Composition Results by Demographic Sector (Weight Percent)



Material Group	Demographic Sector			
	Urban	Suburban	Rural	Aggregate
Paper	35.1%	34.6%	32.3%	34.7%
Plastic	12.7%	9.7%	10.4%	11.2%
Glass	3.2%	4.3%	3.1%	3.7%
Metals	4.7%	4.8%	6.5%	4.8%
Organics	34.6%	32.4%	36.3%	33.7%
Other Waste	9.7%	14.1%	11.4%	11.8%
Total	100.0%	100.0%	100.0%	100.0%

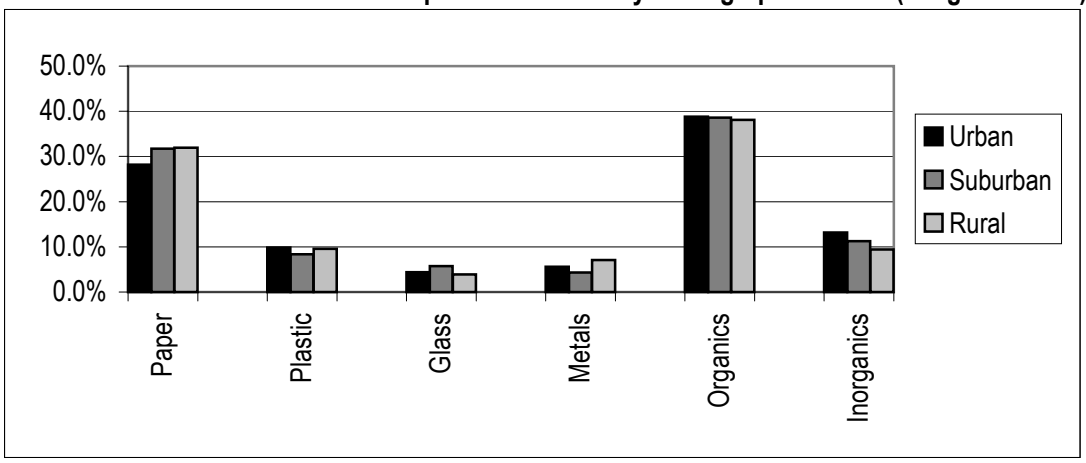
Table 6

Landfilled Aggregate MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**35.1%**	**34.6%**	**32.3%**	**34.7%**
	1	Newspaper	3.1%	4.1%	4.0%	3.6%
	2	Corrugated Cardboard	11.5%	7.6%	7.3%	9.4%
	3	Office	4.7%	5.1%	3.1%	4.8%
	4	Magazine/ Glossy	3.8%	2.4%	2.8%	3.1%
	5	Polycoated/Aseptic Containers	0.5%	0.5%	0.3%	0.5%
	6	Mixed Paper	4.6%	4.5%	4.0%	4.5%
	7	Non-recyclable Paper	6.9%	10.4%	10.7%	8.8%
Plastic			**12.7%**	**9.7%**	**10.4%**	**11.2%**
	8	#1 PET Bottles	1.0%	0.8%	0.8%	0.9%
	9	#2 HDPE Bottles	0.5%	0.6%	0.7%	0.5%
	10	#3-#7 Bottles	0.2%	0.2%	0.1%	0.2%
	11	Expanded Polystyrene	0.9%	0.8%	0.9%	0.8%
	12	Film Plastic	5.0%	3.8%	4.8%	4.4%
	13	Other Rigid Plastic	5.1%	3.6%	3.0%	4.3%
Glass			**3.2%**	**4.3%**	**3.1%**	**3.7%**
	14	Clear Glass	1.6%	1.7%	1.4%	1.6%
	15	Green Glass	0.6%	0.7%	1.0%	0.7%
	16	Amber Glass	0.8%	1.3%	0.4%	1.0%
	17	Non-recyclable Glass	0.3%	0.7%	0.4%	0.5%
Metals			**4.7%**	**4.8%**	**6.5%**	**4.8%**
	18	Steel Cans	0.8%	0.7%	1.0%	0.8%
	19	Aluminum Cans	0.5%	0.6%	0.4%	0.6%
	20	Other Ferrous	2.7%	3.0%	2.2%	2.8%
	21	Other Aluminum	0.4%	0.3%	1.2%	0.4%
	22	Other Non-Ferrous	0.3%	0.3%	1.8%	0.4%
Organics			**34.6%**	**32.4%**	**36.3%**	**33.7%**
	23	Yard Waste- Grass	0.1%	1.3%	0.9%	0.7%
	24	Yard Waste- Other	5.6%	6.3%	3.1%	5.8%
	25	Wood- Unpainted	7.4%	5.6%	5.2%	6.4%
	26	Wood- Painted	2.4%	0.9%	4.9%	1.9%
	27	Food Waste	12.2%	10.1%	12.7%	11.3%
	28	Textiles	3.6%	3.3%	4.4%	3.5%
	29	Diapers	1.6%	2.1%	1.8%	1.8%
	30	Fines	0.8%	0.8%	1.4%	0.9%
	31	Other Organics	0.8%	1.9%	1.9%	1.4%
Inorganics			**9.7%**	**14.1%**	**11.4%**	**11.8%**
	32	Electronics	1.3%	2.7%	1.4%	1.9%
	33	Carpet	0.7%	2.1%	0.8%	1.3%
	34	Drywall	1.0%	0.8%	1.6%	0.9%
	35	Other C&D	3.0%	5.8%	5.6%	4.4%
	36	HHW	0.3%	0.2%	0.5%	0.2%
	37	Other Inorganics	0.6%	2.2%	1.4%	1.4%
	38	Furniture	2.8%	0.4%	0.1%	1.6%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 7

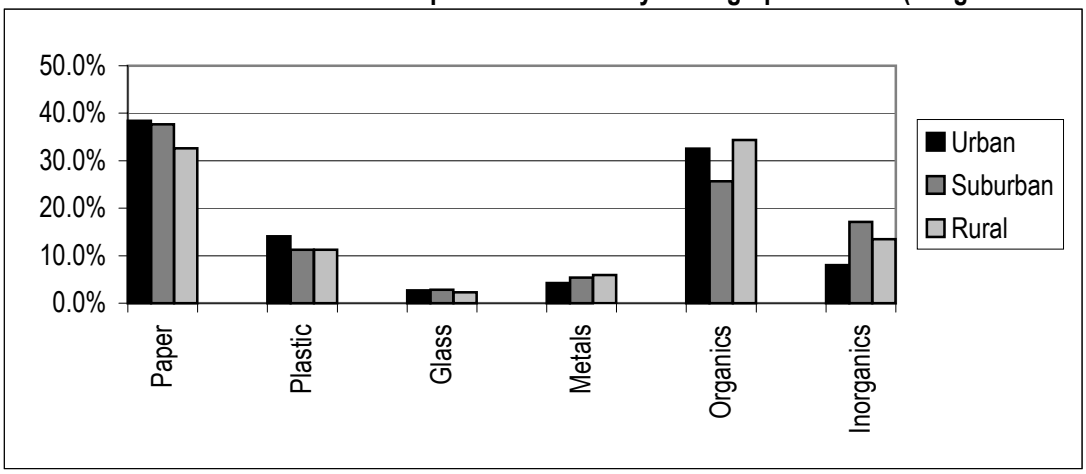
Landfilled Residential MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	28.2%	31.7%	31.9%	30.5%
Plastic	9.8%	8.3%	9.6%	8.9%
Glass	4.4%	5.7%	3.9%	5.1%
Metals	5.6%	4.3%	7.1%	5.0%
Organics	38.8%	38.6%	38.1%	38.7%
Other Waste	13.2%	11.3%	9.4%	11.8%
Total	100.0%	100.0%	100.0%	100.0%

Figure 8

Landfilled Commercial MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	38.4%	37.7%	32.6%	37.9%
Plastic	14.1%	11.3%	11.3%	12.8%
Glass	2.7%	2.9%	2.3%	2.7%
Metals	4.2%	5.4%	6.0%	4.7%
Organics	32.6%	25.7%	34.4%	30.0%
Other Waste	8.0%	17.1%	13.5%	11.8%
Total	100.0%	100.0%	100.0%	100.0%

Table 7

Landfilled Residential MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**28.2%**	**31.7%**	**31.9%**	**30.5%**
	1	Newspaper	4.1%	4.2%	4.4%	4.2%
	2	Corrugated Cardboard	5.6%	6.3%	6.3%	6.1%
	3	Office	2.4%	2.2%	2.1%	2.3%
	4	Magazine/ Glossy	2.0%	3.1%	3.1%	2.7%
	5	Polycoated/Aseptic Containers	0.3%	0.8%	0.2%	0.6%
	6	Mixed Paper	5.5%	5.0%	5.0%	5.2%
	7	Non-recyclable Paper	8.2%	10.1%	10.9%	9.4%
Plastic			**9.8%**	**8.3%**	**9.6%**	**8.9%**
	8	#1 PET Bottles	1.0%	0.8%	0.5%	0.8%
	9	#2 HDPE Bottles	0.8%	0.7%	0.8%	0.7%
	10	#3-#7 Bottles	0.1%	0.2%	0.2%	0.2%
	11	Expanded Polystyrene	0.7%	0.3%	0.8%	0.5%
	12	Film Plastic	4.7%	3.7%	4.2%	4.1%
	13	Other Rigid Plastic	2.5%	2.7%	3.1%	2.6%
Glass			**4.4%**	**5.7%**	**3.9%**	**5.1%**
	14	Clear Glass	2.8%	2.0%	1.6%	2.3%
	15	Green Glass	0.5%	1.1%	1.2%	0.9%
	16	Amber Glass	1.0%	2.4%	0.5%	1.7%
	17	Non-recyclable Glass	0.2%	0.3%	0.6%	0.3%
Metals			**5.6%**	**4.3%**	**7.1%**	**5.0%**
	18	Steel Cans	1.3%	0.9%	1.2%	1.0%
	19	Aluminum Cans	0.5%	0.9%	0.5%	0.7%
	20	Other Ferrous	2.9%	2.2%	1.7%	2.4%
	21	Other Aluminum	0.6%	0.2%	1.2%	0.4%
	22	Other Non-Ferrous	0.3%	0.2%	2.5%	0.4%
Organics			**38.8%**	**38.6%**	**38.1%**	**38.7%**
	23	Yard Waste- Grass	0.2%	2.1%	1.5%	1.4%
	24	Yard Waste- Other	7.7%	10.5%	4.6%	9.1%
	25	Wood- Unpainted	5.7%	3.0%	1.6%	3.9%
	26	Wood- Painted	5.5%	1.3%	5.5%	3.1%
	27	Food Waste	10.1%	11.9%	14.2%	11.4%
	28	Textiles	6.0%	3.7%	4.8%	4.6%
	29	Diapers	2.0%	2.0%	2.4%	2.0%
	30	Fines	1.1%	1.1%	1.5%	1.1%
	31	Other Organics	0.5%	3.0%	1.9%	2.0%
Inorganics			**13.2%**	**11.3%**	**9.4%**	**11.8%**
	32	Electronics	1.1%	2.1%	1.2%	1.7%
	33	Carpet	1.4%	1.7%	1.6%	1.6%
	34	Drywall	1.9%	0.8%	0.9%	1.2%
	35	Other C&D	4.9%	3.0%	3.4%	3.7%
	36	HHW	0.1%	0.1%	0.1%	0.1%
	37	Other Inorganics	0.8%	2.9%	1.9%	2.1%
	38	Furniture	3.0%	0.7%	0.3%	1.5%
		Total	100.0%	100.0%	100.0%	100.0%

Table 8

Landfilled Commercial MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**38.4%**	**37.7%**	**32.6%**	**37.9%**
	1	Newspaper	2.6%	4.0%	3.6%	3.2%
	2	Corrugated Cardboard	14.3%	8.9%	8.4%	11.9%
	3	Office	5.8%	8.2%	4.1%	6.7%
	4	Magazine/ Glossy	4.6%	1.7%	2.4%	3.4%
	5	Polycoated/Aseptic Containers	0.6%	0.3%	0.5%	0.5%
	6	Mixed Paper	4.1%	3.9%	3.0%	4.0%
	7	Non-recyclable Paper	6.4%	10.7%	10.6%	8.2%
Plastic			**14.1%**	**11.3%**	**11.3%**	**12.8%**
	8	#1 PET Bottles	1.0%	0.9%	1.1%	1.0%
	9	#2 HDPE Bottles	0.3%	0.4%	0.5%	0.4%
	10	#3-#7 Bottles	0.3%	0.1%	0.1%	0.2%
	11	Expanded Polystyrene	1.0%	1.2%	1.1%	1.1%
	12	Film Plastic	5.1%	3.9%	5.5%	4.7%
	13	Other Rigid Plastic	6.3%	4.6%	3.0%	5.5%
Glass			**2.7%**	**2.9%**	**2.3%**	**2.7%**
	14	Clear Glass	1.0%	1.2%	1.1%	1.1%
	15	Green Glass	0.6%	0.3%	0.7%	0.5%
	16	Amber Glass	0.7%	0.2%	0.3%	0.5%
	17	Non-recyclable Glass	0.3%	1.1%	0.2%	0.6%
Metals			**4.2%**	**5.4%**	**6.0%**	**4.7%**
	18	Steel Cans	0.6%	0.5%	0.8%	0.6%
	19	Aluminum Cans	0.5%	0.3%	0.3%	0.5%
	20	Other Ferrous	2.5%	3.9%	2.6%	3.1%
	21	Other Aluminum	0.3%	0.3%	1.2%	0.3%
	22	Other Non-Ferrous	0.3%	0.3%	1.1%	0.3%
Organics			**32.6%**	**25.7%**	**34.4%**	**30.0%**
	23	Yard Waste- Grass	0.0%	0.4%	0.3%	0.2%
	24	Yard Waste- Other	4.5%	1.8%	1.5%	3.3%
	25	Wood- Unpainted	8.2%	8.5%	8.9%	8.4%
	26	Wood- Painted	1.0%	0.5%	4.3%	1.0%
	27	Food Waste	13.2%	8.1%	11.1%	11.1%
	28	Textiles	2.5%	2.9%	3.9%	2.7%
	29	Diapers	1.4%	2.2%	1.1%	1.7%
	30	Fines	0.7%	0.5%	1.4%	0.7%
	31	Other Organics	1.0%	0.7%	1.8%	0.9%
Inorganics			**8.0%**	**17.1%**	**13.5%**	**11.8%**
	32	Electronics	1.4%	3.3%	1.5%	2.1%
	33	Carpet	0.4%	2.5%	0.0%	1.2%
	34	Drywall	0.6%	0.7%	2.3%	0.7%
	35	Other C&D	2.1%	8.8%	7.9%	5.0%
	36	HHW	0.3%	0.2%	1.0%	0.3%
	37	Other Inorganics	0.6%	1.5%	0.8%	0.9%
	38	Furniture	2.7%	0.2%	0.0%	1.6%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 9

Southeast Region Aggregate Composition of Bulky Loads (Visual Samples)

Material Group	% Weight
Paper	9.3%
Plastic	1.6%
Glass	1.2%
Metals	8.1%
Organics	38.2%
Inorganics	41.6%
Total	100.0%

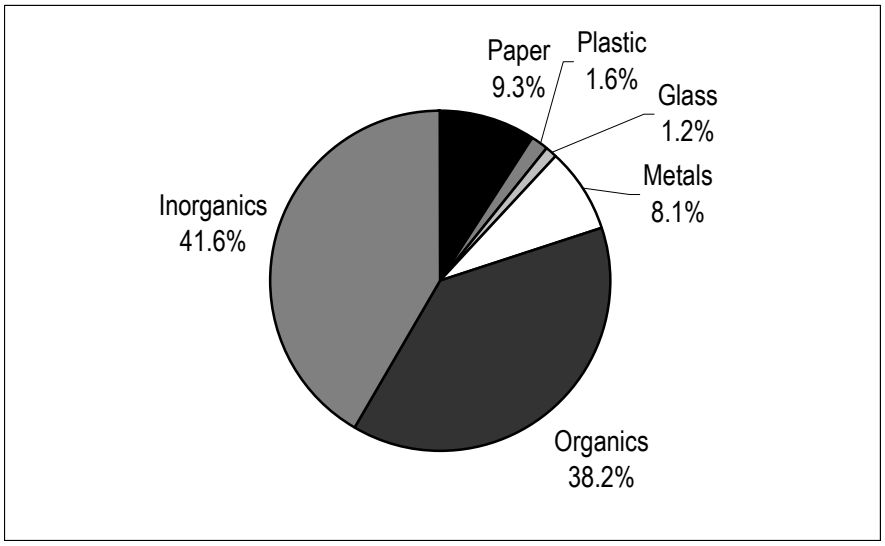
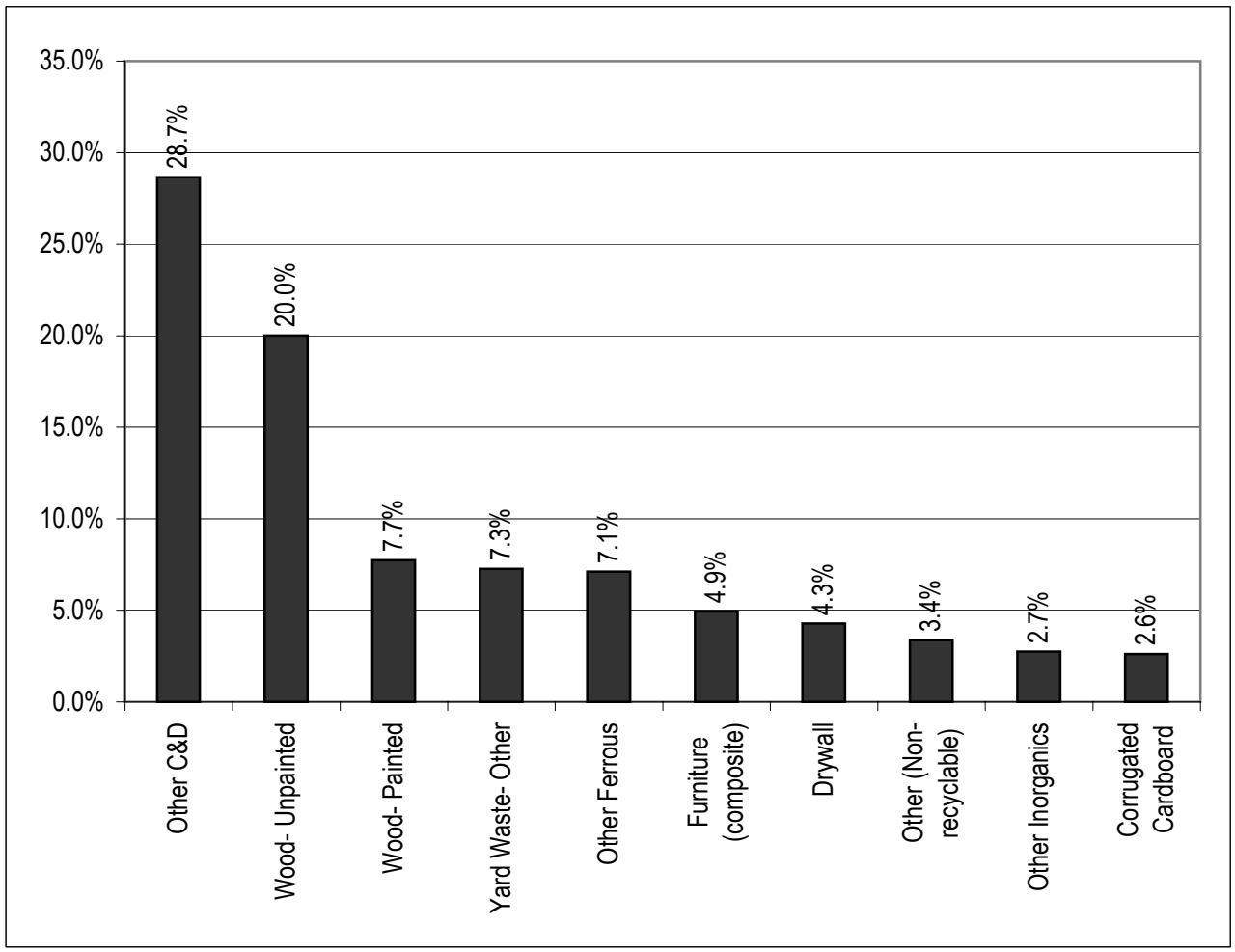


Figure 10

Southeast Region Top 10 Most Prevalent Bulky Materials



Section 10
SOUTHCENTRAL REGION MSW COMPOSITION

Introduction

DEP manages Pennsylvania's waste stream via a network of six regional offices. An objective of this study was to derive results for each of the regions in the Commonwealth. Aggregate State-wide results are provided in Section 4 of this report. The purpose of this section is to provide detailed results specifically for the Southcentral Region. A map of the Southcentral region is shown in Figure 1.

Figure 1 Southcentral Region Map

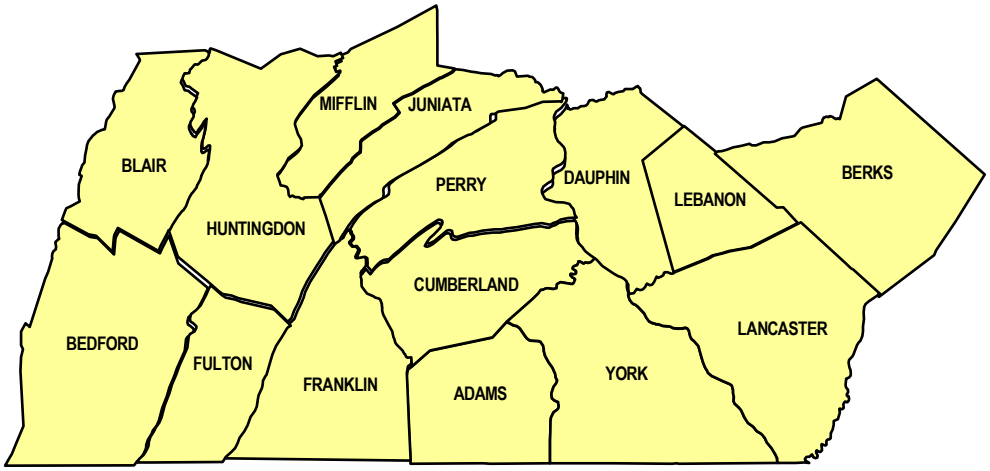


Table 1 summarizes the demographic and economic characteristics of the Southcentral region.

Table 1 Southcentral Region Demographic Summary

	Urban	Suburban	Rural	Total
Communities [1]	5	108	437	**550**
Population [1]	276,890	926,053	1,181,392	**2,384,335**
Housing Units [1]	110,266	369,733	467,418	**947,417**
Employment [2]	145,774	434,103	332,718	**912,595**

[1] Source: 2001 U.S. Census data provided by DEP
[2] Source: 2001 estimates provided by ESRI-BIS, Arlington, VA, based on U.S. Census data.

Table 2 summarizes the waste that was reported by the Commonwealth's landfills (and incinerators) to have been disposed from each County within the Southcentral region in 2001.

Table 2 Southcentral Region Waste Disposal Summary [1]

County	MSW Disposed (tons)
Adams	39,970
Bedford	20,851
Berks	273,437
Blair	124,742
Cumberland	167,209
Dauphin	200,222
Franklin	88,593
Fulton	5,279
Huntingdon	18,602
Juniata	10,250
Lancaster	312,881
Lebanon	70,817
Mifflin	21,690
Perry	13,501
York	268,148
Total	**1,636,192**

[1] Source: County-level disposal quantity estimates are based on the 2001 DEP landfill disposal database

In order to aggregate the MSW composition data that was collected in this study, it was necessary to develop estimates of waste generation by county within the region. This was performed in the following steps:

1) Surveying urban, suburban, and rural communities across the Commonwealth to compile urban, suburban and rural residential MSW disposal factors (tons of disposed MSW per household per year);
2) Applying the residential generation factors to the total households in the region to estimate total disposed residential waste;
3) Estimating total regional waste disposed based on a statistical analysis of reported county-level waste disposal records relative to county-level population and employment; and
4) Netting out residential waste to calculate disposed commercial waste quantities.

The results of this process are shown in Table 3 for the Southcentral Region.

Table 3 Southcentral Region Disposed MSW Summary (tons) [1]

	Tons of Waste Disposed			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Residential generators	99,317	422,542	478,951	1,000,810
Commercial generators	87,603	265,304	282,474	635,382
Total	**186,920**	**687,846**	**761,425**	**1,636,192**

[1] Source: 2001 DEP database of disposed tons as reported by Pennsylvania disposal facilities.

In order to develop composition estimates for each of these demographic areas and generating sectors, field sampling was performed at two waste processing and disposal facilities:

- Lancaster RRF (Lancaster, Lancaster County); and
- Mountain View Landfill (Greencastle, Franklin County).

Sampling at these facilities was performed across four seasons to account for seasonal variation in MSW composition. Table 4 summarizes the sampling summary for the Southcentral Region.

Table 4 Southcentral Region Sampling Summary

	Number of Samples			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Physical MSW Samples				
Residential	38	29	41	108
Commercial	28	33	37	98
Subtotal—physical samples	66	62	78	206
Visual Bulk Waste Samples	28	18	55	101
Total Samples	**94**	**80**	**133**	**307**

Regional Aggregate Results

The remainder of this section presents a graphical and tabular summary of the Southcentral region's disposed MSW composition. Specific figures and tables are summarized below.

- Figure 2 is a pie chart that shows the percentage composition of major material groups in the aggregate regional waste stream.
- Figure 3 is a bar chart that shows the estimated mean quantities of material disposed (or incinerated) from the region, again by major material group.

- Figure 4 compares the incidence of recyclable materials as targeted in Act 101 that were found to be disposed by residential and commercial generators in the region.
- Figure 5 shows the 10 most prevalent materials being disposed in the region, by weight.
- Table 5 contains a detailed statistical presentation of the aggregate MSW composition in the region. This tabular summary includes the statistical mean composition, as well as the standard deviation, upper and lower confidence intervals, and a "sampling error". The sampling error indicates the width of the confidence intervals relative to the mean. Lower sampling error signifies narrower confidence intervals (and therefore greater certainty of the mean composition shown).
- Figure 6 compares the percentage of disposed MSW landfilled from urban, suburban and rural communities within the region.
- Table 6 compares the mean composition of disposed MSW from urban, suburban and rural communities within the region.

Results by Generating Sector

An objective of the study was to compare and contrast the composition of residential and commercial waste within the region.

- Figure 7 and Figure 8 summarize the percentage of MSW landfilled by major material group for residential generators and commercial generators, respectively.
- Tables 7 and 8, like Table 6, compare the mean composition of urban, suburban, and rural waste. Table 7 focuses on residential generators in the region, while Table 8 shows the same comparison for commercial generators.

Bulky Waste

The State-wide MSW sort primarily targeted residential and commercial compacting vehicles, as well as commercial compacting and open-top roll-offs carrying non-C&D and non-industrial waste. These loads make up the majority of loads entering the Commonwealth's disposal facilities. However, it was expected at the outset of the study that some incoming loads of MSW—primarily those in open-top roll-off vehicles—would contain bulky waste that was not conducive to physical sorting. Therefore, the study methodology allowed for selected visual, volumetric sampling of bulky loads to the extent they were observed during the sampling and sorting process.

- Figure 9 shows the weight percentage composition of bulky items by major material group. Bulky loads were found to include a range of materials, including multi-family move-outs, residential and commercial clean-outs, miscellaneous commercial waste, and some renovation and construction type waste (although pure C&D loads were excluded from the analysis).

- Figure 10 lists the top 10 most prevalent bulky materials disposed during the study.

Self Haul Waste

Self haulers were found to deliver only a small fraction of waste to disposal facilities during the study. Our sampling plan allowed for selected sampling of self-haulers, which include: residential haulers of renovation and/or clean-out waste, and commercial contractors hauling small renovation, construction, land clearing, and/or clean-out type waste. Note that an insufficient number of self-haul samples were obtained to develop region-specific results.

Figure 2
Southcentral Region Aggregate MSW Composition

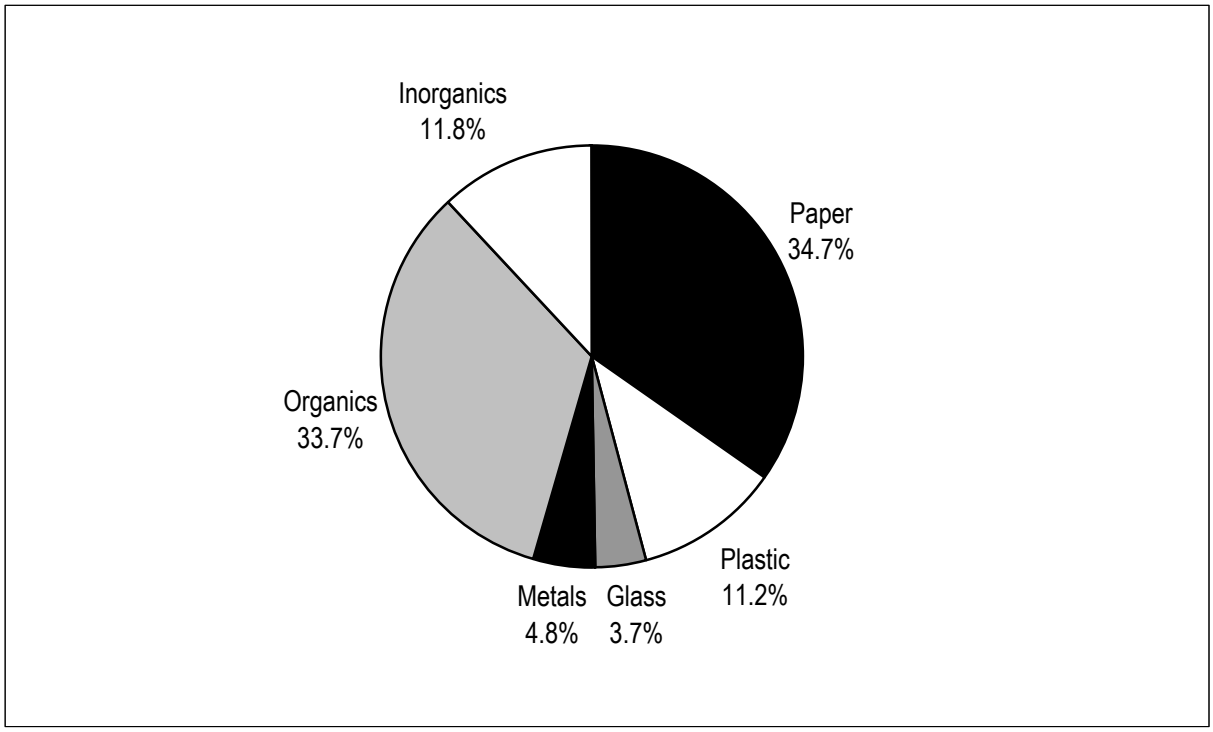


Figure 3
Southcentral Region Aggregate MSW Tons Disposed

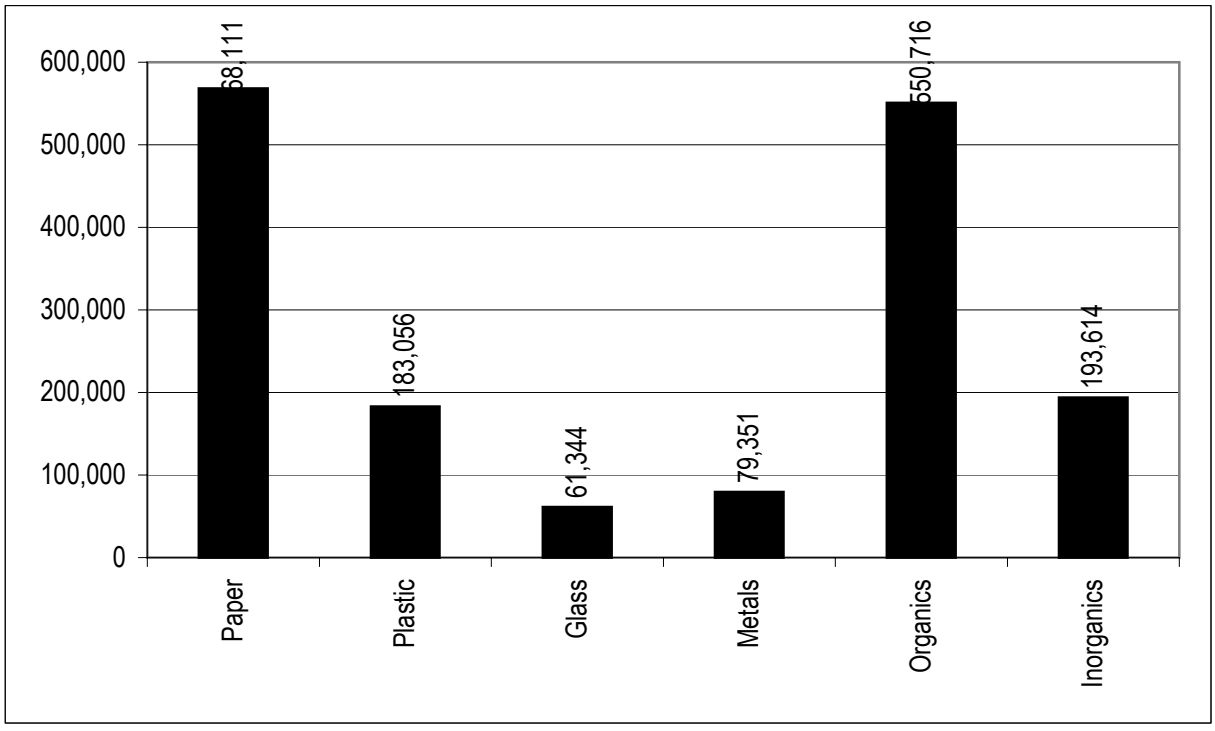


Figure 4

Act 101- Recyclables in Disposed MSW (tons)

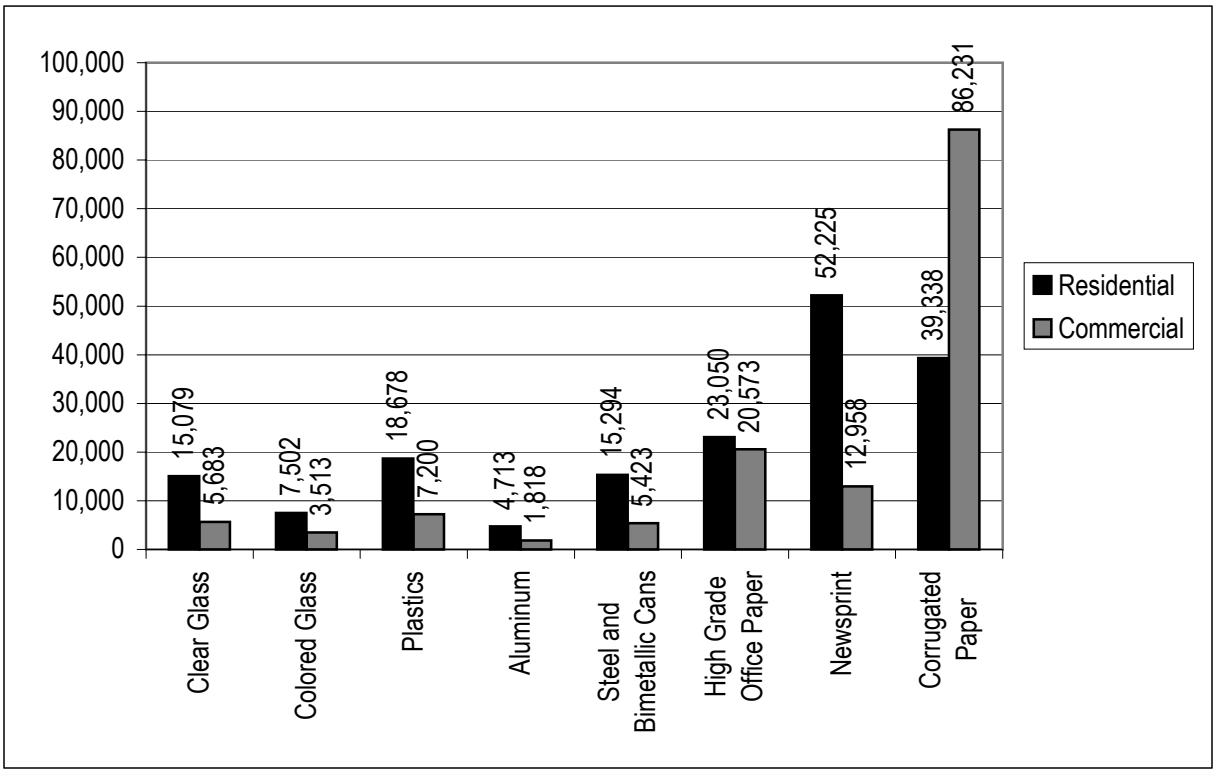


Figure 5

Southcentral Region Top 10 Most Prevalent Materials

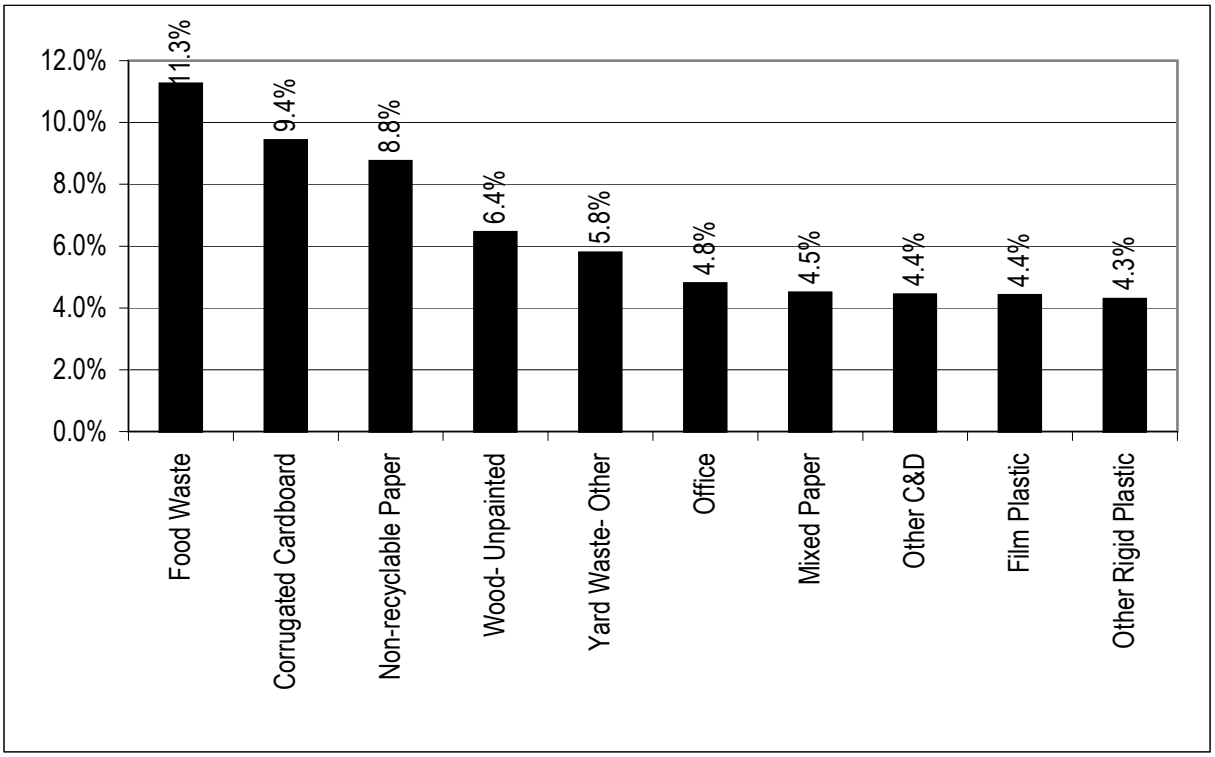


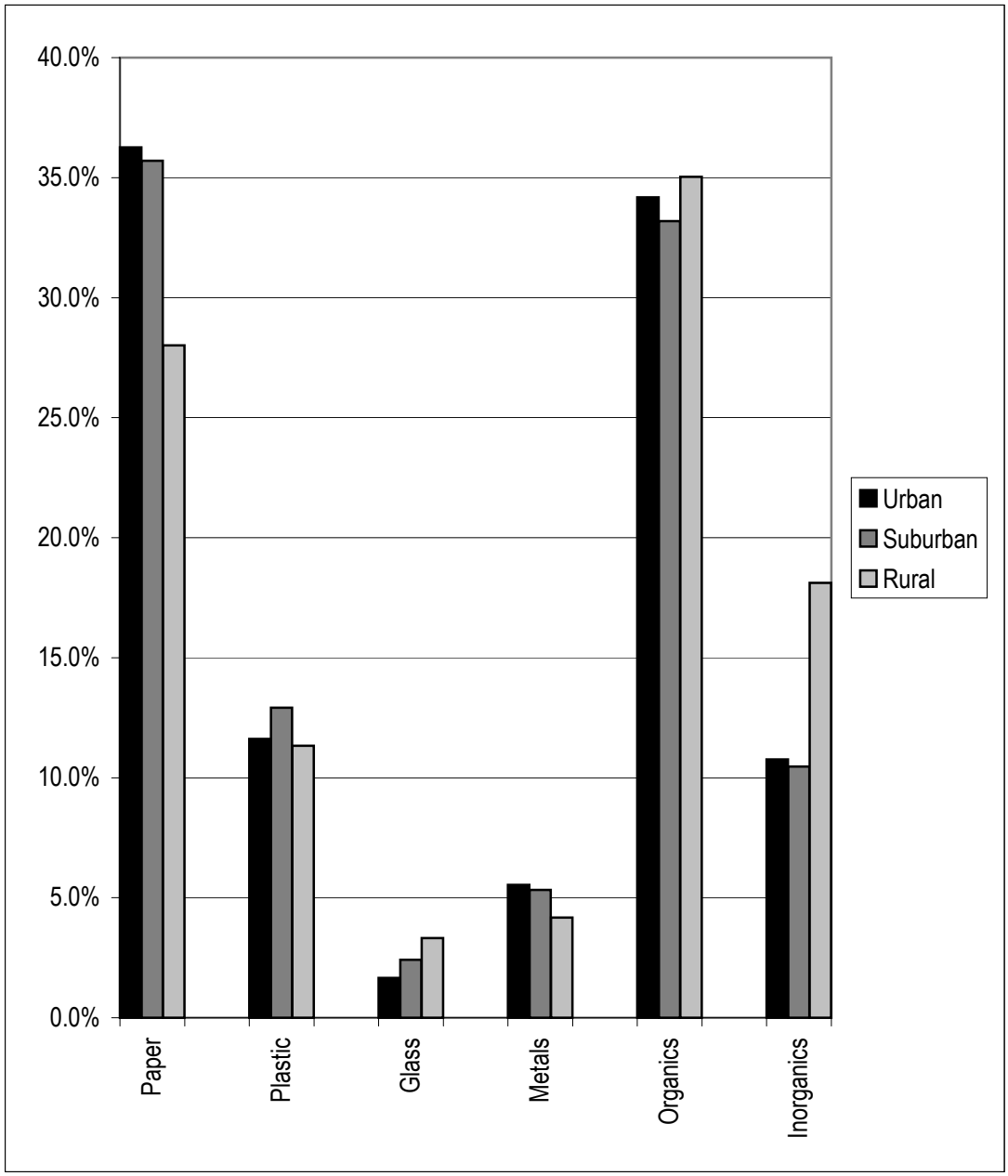
Table 5

Southcentral Region Aggregate Landfilled MSW Composition Detail (Weight Percent)

		Material Categories	Tons Disposed	Mean Composition	Standard Deviation	Confidence Interval		Sampling Error
						Lower (%)	Upper (%)	
Paper			**568,111**	**34.7%**	**19.2%**	**31.7%**	**38.0%**	**9.1%**
	1	Newspaper	59,388	3.6%	3.8%	3.1%	4.3%	16.4%
	2	Corrugated Cardboard	154,192	9.4%	9.4%	8.1%	11.3%	16.7%
	3	Office	78,425	4.8%	6.3%	3.8%	6.3%	26.5%
	4	Magazine/ Glossy	50,690	3.1%	3.0%	2.7%	3.7%	17.0%
	5	Polycoated/Aseptic Containers	8,738	0.5%	1.4%	0.4%	0.7%	20.7%
	6	Mixed Paper	73,505	4.5%	4.6%	4.0%	5.2%	14.0%
	7	Non-recyclable Paper	143,173	8.8%	6.2%	7.8%	10.1%	13.2%
Plastic			**183,056**	**11.2%**	**9.1%**	**10.0%**	**12.5%**	**11.2%**
	8	#1 PET Bottles	15,150	0.9%	0.6%	0.8%	1.1%	15.5%
	9	#2 HDPE Bottles	8,614	0.5%	0.8%	0.5%	0.6%	15.8%
	10	#3-#7 Bottles	3,117	0.2%	0.3%	0.2%	0.2%	24.7%
	11	Expanded Polystyrene	13,824	0.8%	0.9%	0.7%	1.0%	19.2%
	12	Film Plastic	72,152	4.4%	5.5%	3.9%	5.1%	13.9%
	13	Other Rigid Plastic	70,198	4.3%	5.0%	3.7%	5.1%	15.2%
Glass			**61,344**	**3.7%**	**4.0%**	**3.2%**	**4.4%**	**15.9%**
	14	Clear Glass	26,181	1.6%	1.5%	1.4%	1.9%	18.2%
	15	Green Glass	10,648	0.7%	0.5%	0.5%	0.9%	28.1%
	16	Amber Glass	16,871	1.0%	0.7%	0.8%	1.3%	22.0%
	17	Non-recyclable Glass	7,644	0.5%	3.1%	0.4%	0.6%	29.6%
Metals			**79,351**	**4.8%**	**7.8%**	**4.3%**	**5.5%**	**13.2%**
	18	Steel Cans	12,590	0.8%	1.3%	0.7%	0.9%	16.5%
	19	Aluminum Cans	9,303	0.6%	0.4%	0.5%	0.7%	18.3%
	20	Other Ferrous	45,540	2.8%	7.7%	2.3%	3.5%	20.1%
	21	Other Aluminum	5,985	0.4%	1.1%	0.3%	0.5%	20.4%
	22	Other Non-Ferrous	5,933	0.4%	0.4%	0.3%	0.5%	32.2%
Organics			**550,716**	**33.7%**	**23.9%**	**30.8%**	**36.7%**	**8.8%**
	23	Yard Waste- Grass	11,432	0.7%	4.9%	0.5%	1.1%	45.6%
	24	Yard Waste- Other	94,718	5.8%	6.4%	4.6%	7.5%	25.2%
	25	Wood- Unpainted	105,462	6.4%	14.5%	5.2%	8.3%	23.8%
	26	Wood- Painted	30,653	1.9%	14.4%	1.5%	2.5%	27.9%
	27	Food Waste	184,097	11.3%	12.5%	9.9%	13.1%	14.5%
	28	Textiles	57,448	3.5%	5.0%	3.0%	4.2%	17.2%
	29	Diapers	30,170	1.8%	2.7%	1.6%	2.2%	18.8%
	30	Fines	13,986	0.9%	1.2%	0.7%	1.0%	14.9%
	31	Other Organics	22,750	1.4%	7.5%	1.1%	1.8%	23.0%
Inorganics			**193,614**	**11.8%**	**28.8%**	**10.0%**	**13.9%**	**16.7%**
	32	Electronics	31,611	1.9%	3.2%	1.5%	2.6%	27.5%
	33	Carpet	21,947	1.3%	8.9%	0.9%	2.2%	47.6%
	34	Drywall	15,057	0.9%	7.7%	0.7%	1.3%	34.3%
	35	Other C&D	72,465	4.4%	20.5%	3.4%	5.9%	28.9%
	36	HHW	3,832	0.2%	1.5%	0.2%	0.3%	22.7%
	37	Other Inorganics	23,307	1.4%	5.2%	1.2%	1.8%	20.7%
	38	Furniture	25,396	1.6%	11.9%	1.1%	2.3%	38.0%
		Total	1,636,192	100.0%				

Figure 6

Landfilled Aggregate Waste Composition Results by Demographic Sector (Weight Percent)



Material Group	Demographic Sector			
	Urban	Suburban	Rural	Aggregate
Paper	36.3%	35.7%	28.0%	34.7%
Plastic	11.6%	12.9%	11.3%	11.2%
Glass	1.7%	2.4%	3.3%	3.7%
Metals	5.5%	5.3%	4.2%	4.8%
Organics	34.2%	33.2%	35.0%	33.7%
Other Waste	10.8%	10.5%	18.1%	11.8%
Total	100.0%	100.0%	100.0%	100.0%

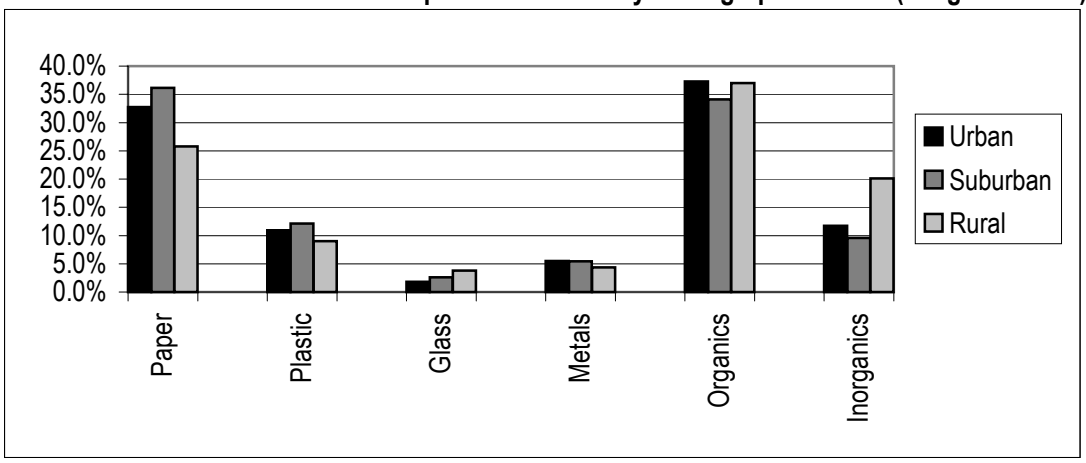
Table 6

Landfilled Aggregate MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**36.3%**	**35.7%**	**28.0%**	**34.7%**
	1	Newspaper	3.5%	4.5%	3.6%	3.6%
	2	Corrugated Cardboard	9.4%	7.4%	7.5%	9.4%
	3	Office	3.9%	3.3%	1.8%	4.8%
	4	Magazine/ Glossy	3.9%	3.5%	2.3%	3.1%
	5	Polycoated/Aseptic Containers	0.8%	0.5%	0.5%	0.5%
	6	Mixed Paper	3.1%	6.6%	5.6%	4.5%
	7	Non-recyclable Paper	11.7%	9.9%	6.8%	8.8%
Plastic			**11.6%**	**12.9%**	**11.3%**	**11.2%**
	8	#1 PET Bottles	0.6%	0.8%	0.7%	0.9%
	9	#2 HDPE Bottles	0.9%	0.9%	0.8%	0.5%
	10	#3-#7 Bottles	0.1%	0.1%	0.2%	0.2%
	11	Expanded Polystyrene	0.5%	0.8%	0.5%	0.8%
	12	Film Plastic	5.7%	6.4%	5.2%	4.4%
	13	Other Rigid Plastic	3.7%	4.0%	3.9%	4.3%
Glass			**1.7%**	**2.4%**	**3.3%**	**3.7%**
	14	Clear Glass	0.8%	1.3%	1.4%	1.6%
	15	Green Glass	0.3%	0.2%	0.2%	0.7%
	16	Amber Glass	0.4%	0.4%	0.5%	1.0%
	17	Non-recyclable Glass	0.2%	0.5%	1.2%	0.5%
Metals			**5.5%**	**5.3%**	**4.2%**	**4.8%**
	18	Steel Cans	0.9%	1.4%	1.3%	0.8%
	19	Aluminum Cans	0.4%	0.5%	0.3%	0.6%
	20	Other Ferrous	3.7%	2.9%	2.0%	2.8%
	21	Other Aluminum	0.3%	0.4%	0.5%	0.4%
	22	Other Non-Ferrous	0.2%	0.1%	0.1%	0.4%
Organics			**34.2%**	**33.2%**	**35.0%**	**33.7%**
	23	Yard Waste- Grass	0.3%	1.0%	1.7%	0.7%
	24	Yard Waste- Other	3.5%	4.1%	2.1%	5.8%
	25	Wood- Unpainted	3.9%	2.9%	6.4%	6.4%
	26	Wood- Painted	1.9%	2.7%	3.2%	1.9%
	27	Food Waste	12.1%	12.7%	13.7%	11.3%
	28	Textiles	4.4%	3.3%	2.8%	3.5%
	29	Diapers	3.7%	2.6%	1.7%	1.8%
	30	Fines	2.3%	1.2%	0.8%	0.9%
	31	Other Organics	2.1%	2.6%	2.7%	1.4%
Inorganics			**10.8%**	**10.5%**	**18.1%**	**11.8%**
	32	Electronics	1.4%	1.3%	0.7%	1.9%
	33	Carpet	1.6%	2.4%	1.8%	1.3%
	34	Drywall	0.2%	1.2%	1.6%	0.9%
	35	Other C&D	3.7%	2.7%	7.9%	4.4%
	36	HHW	1.1%	0.5%	0.3%	0.2%
	37	Other Inorganics	1.6%	1.7%	2.2%	1.4%
	38	Furniture	1.1%	0.7%	3.6%	1.6%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 7

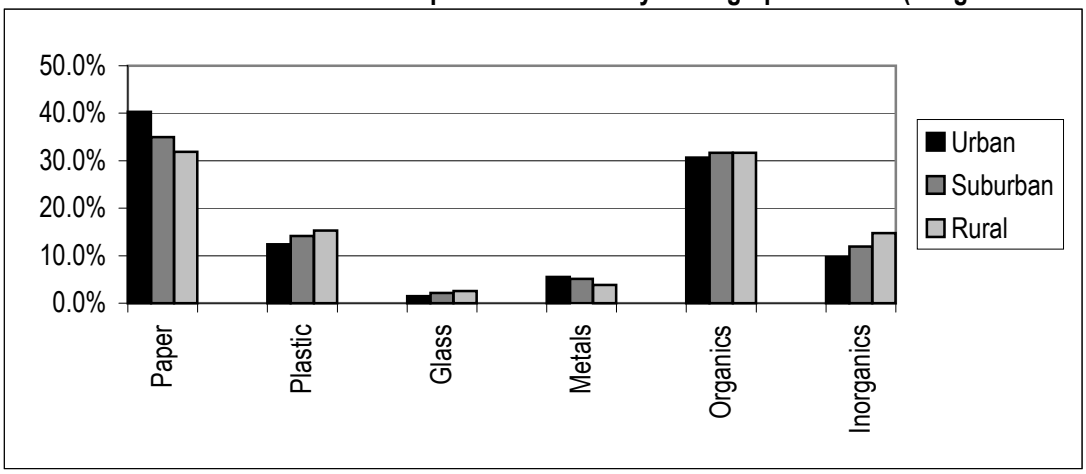
Landfilled Residential MSW Composition Results by Demographic Sector (Weight Percent)



Generator	Demographic Sector			
	Urban	Suburban	Rural	Aggregate
Paper	32.7%	36.2%	25.8%	30.8%
Plastic	10.9%	12.1%	9.0%	10.5%
Glass	1.8%	2.6%	3.8%	3.1%
Metals	5.5%	5.4%	4.4%	4.9%
Organics	37.3%	34.1%	37.0%	35.8%
Other Waste	11.7%	9.6%	20.1%	14.8%
Total	100.0%	100.0%	100.0%	100.0%

Figure 8

Landfilled Commercial MSW Composition Results by Demographic Sector (Weight Percent)



Generator	Demographic Sector			
	Urban	Suburban	Rural	Aggregate
Paper	40.3%	35.0%	31.9%	34.3%
Plastic	12.4%	14.1%	15.3%	14.4%
Glass	1.5%	2.2%	2.5%	2.2%
Metals	5.5%	5.2%	3.9%	4.6%
Organics	30.6%	31.7%	31.7%	31.6%
Other Waste	9.7%	11.9%	14.8%	12.9%
Total	100.0%	100.0%	100.0%	100.0%

Table 7

Landfilled Residential MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**32.7%**	**36.2%**	**25.8%**	**30.8%**
	1	Newspaper	4.2%	6.1%	4.7%	5.2%
	2	Corrugated Cardboard	5.4%	3.9%	3.7%	3.9%
	3	Office	2.7%	3.0%	1.6%	2.3%
	4	Magazine/ Glossy	4.2%	4.3%	3.0%	3.7%
	5	Polycoated/Aseptic Containers	0.5%	0.6%	0.4%	0.5%
	6	Mixed Paper	3.2%	7.5%	5.6%	6.2%
	7	Non-recyclable Paper	12.5%	10.8%	6.8%	9.0%
Plastic			**10.9%**	**12.1%**	**9.0%**	**10.5%**
	8	#1 PET Bottles	0.8%	0.9%	0.8%	0.8%
	9	#2 HDPE Bottles	1.1%	1.1%	1.0%	1.0%
	10	#3-#7 Bottles	0.1%	0.1%	0.2%	0.2%
	11	Expanded Polystyrene	0.5%	0.8%	0.4%	0.6%
	12	Film Plastic	5.5%	5.5%	3.7%	4.6%
	13	Other Rigid Plastic	2.9%	3.8%	2.9%	3.3%
Glass			**1.8%**	**2.6%**	**3.8%**	**3.1%**
	14	Clear Glass	1.1%	1.6%	1.5%	1.5%
	15	Green Glass	0.2%	0.3%	0.2%	0.2%
	16	Amber Glass	0.4%	0.4%	0.6%	0.5%
	17	Non-recyclable Glass	0.2%	0.3%	1.5%	0.8%
Metals			**5.5%**	**5.4%**	**4.4%**	**4.9%**
	18	Steel Cans	1.1%	1.5%	1.6%	1.5%
	19	Aluminum Cans	0.4%	0.6%	0.4%	0.5%
	20	Other Ferrous	3.5%	2.8%	1.6%	2.3%
	21	Other Aluminum	0.4%	0.4%	0.6%	0.5%
	22	Other Non-Ferrous	0.0%	0.0%	0.1%	0.1%
Organics			**37.3%**	**34.1%**	**37.0%**	**35.8%**
	23	Yard Waste- Grass	0.5%	1.7%	2.7%	2.1%
	24	Yard Waste- Other	4.2%	5.2%	3.2%	4.1%
	25	Wood- Unpainted	2.7%	0.8%	4.9%	2.9%
	26	Wood- Painted	2.5%	2.3%	2.9%	2.6%
	27	Food Waste	11.9%	12.4%	13.4%	12.8%
	28	Textiles	5.5%	3.7%	3.0%	3.5%
	29	Diapers	4.3%	3.6%	2.3%	3.0%
	30	Fines	3.0%	1.5%	1.0%	1.4%
	31	Other Organics	2.6%	2.9%	3.7%	3.2%
Inorganics			**11.7%**	**9.6%**	**20.1%**	**14.8%**
	32	Electronics	2.4%	1.6%	1.0%	1.4%
	33	Carpet	0.9%	2.8%	1.3%	1.9%
	34	Drywall	0.1%	1.9%	0.5%	1.0%
	35	Other C&D	4.1%	0.7%	9.3%	5.1%
	36	HHW	0.7%	0.5%	0.4%	0.4%
	37	Other Inorganics	1.9%	1.1%	2.3%	1.7%
	38	Furniture	1.6%	1.0%	5.4%	3.2%
		Total	100.0%	100.0%	100.0%	100.0%

Table 8

Landfilled Commercial MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**40.3%**	**35.0%**	**31.9%**	**34.3%**
	1	Newspaper	2.7%	1.9%	1.9%	2.0%
	2	Corrugated Cardboard	14.1%	13.0%	13.9%	13.6%
	3	Office	5.2%	3.9%	2.0%	3.2%
	4	Magazine/ Glossy	3.5%	2.2%	1.0%	1.8%
	5	Polycoated/Aseptic Containers	1.1%	0.4%	0.7%	0.6%
	6	Mixed Paper	3.0%	5.0%	5.6%	5.0%
	7	Non-recyclable Paper	10.7%	8.6%	6.7%	8.0%
Plastic			**12.4%**	**14.1%**	**15.3%**	**14.4%**
	8	#1 PET Bottles	0.5%	0.6%	0.6%	0.6%
	9	#2 HDPE Bottles	0.7%	0.6%	0.5%	0.6%
	10	#3-#7 Bottles	0.1%	0.1%	0.2%	0.1%
	11	Expanded Polystyrene	0.5%	0.7%	0.7%	0.7%
	12	Film Plastic	6.0%	7.8%	7.8%	7.5%
	13	Other Rigid Plastic	4.7%	4.4%	5.6%	5.0%
Glass			**1.5%**	**2.2%**	**2.5%**	**2.2%**
	14	Clear Glass	0.5%	0.7%	1.2%	0.9%
	15	Green Glass	0.4%	0.1%	0.2%	0.2%
	16	Amber Glass	0.3%	0.4%	0.4%	0.4%
	17	Non-recyclable Glass	0.2%	1.0%	0.8%	0.8%
Metals			**5.5%**	**5.2%**	**3.9%**	**4.6%**
	18	Steel Cans	0.7%	1.1%	0.7%	0.9%
	19	Aluminum Cans	0.4%	0.3%	0.3%	0.3%
	20	Other Ferrous	3.9%	3.1%	2.6%	3.0%
	21	Other Aluminum	0.2%	0.5%	0.3%	0.4%
	22	Other Non-Ferrous	0.4%	0.3%	0.0%	0.2%
Organics			**30.6%**	**31.7%**	**31.7%**	**31.6%**
	23	Yard Waste- Grass	0.0%	0.0%	0.0%	0.0%
	24	Yard Waste- Other	2.8%	2.4%	0.2%	1.5%
	25	Wood- Unpainted	5.2%	6.3%	8.9%	7.3%
	26	Wood- Painted	1.1%	3.3%	3.5%	3.1%
	27	Food Waste	12.2%	13.2%	14.3%	13.6%
	28	Textiles	3.3%	2.5%	2.4%	2.6%
	29	Diapers	3.0%	0.9%	0.8%	1.1%
	30	Fines	1.5%	0.8%	0.4%	0.7%
	31	Other Organics	1.6%	2.2%	1.1%	1.6%
Inorganics			**9.7%**	**11.9%**	**14.8%**	**12.9%**
	32	Electronics	0.3%	0.7%	0.3%	0.5%
	33	Carpet	2.4%	1.7%	2.7%	2.3%
	34	Drywall	0.3%	0.2%	3.5%	1.7%
	35	Other C&D	3.3%	5.9%	5.5%	5.3%
	36	HHW	1.4%	0.5%	0.3%	0.5%
	37	Other Inorganics	1.3%	2.8%	2.0%	2.2%
	38	Furniture	0.6%	0.2%	0.5%	0.4%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 9

Soutcentral Region Aggregate Composition of Bulky Loads (Visual Samples)

Material Group	% Weight
Paper	11.5%
Plastic	4.9%
Glass	1.1%
Metals	4.3%
Organics	36.8%
Inorganics	41.3%
Total	100.0%

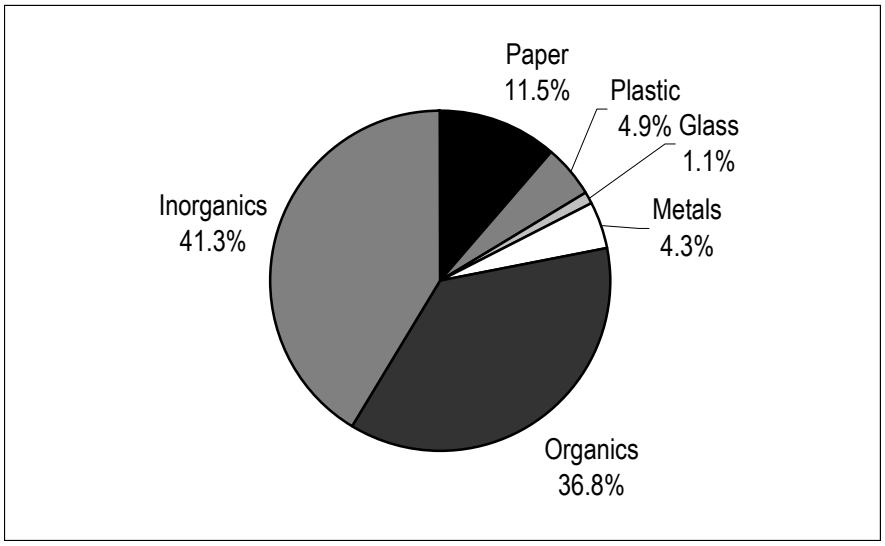
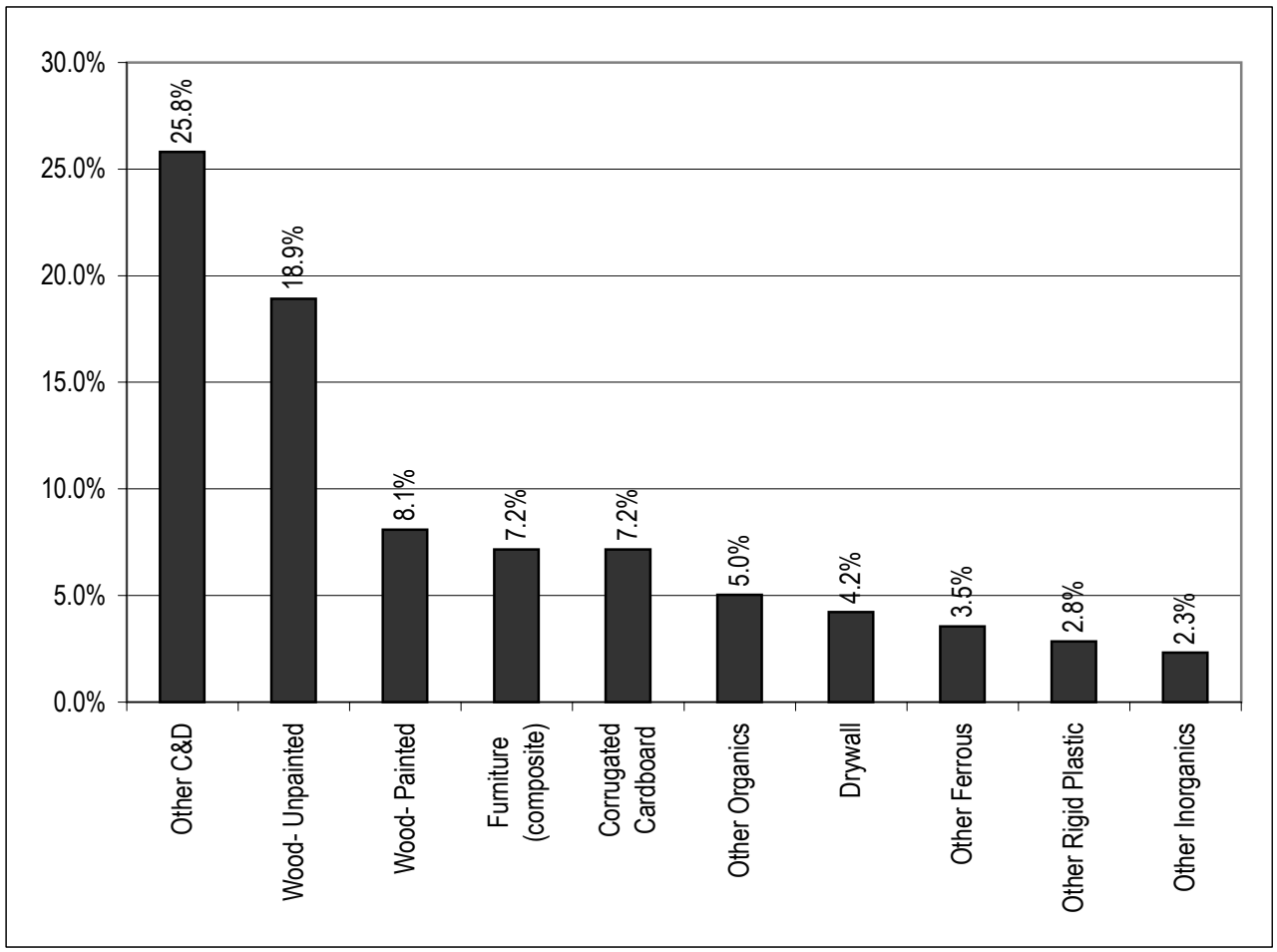


Figure 10

Southcentral Region Top 10 Most Prevalent Bulky Materials



Section 11
SOUTHWEST REGION MSW COMPOSITION

Introduction

DEP manages Pennsylvania's waste stream via a network of six regional offices. An objective of this study was to derive results for each of the regions in the Commonwealth. Aggregate State-wide results are provided in Section 4 of this report. The purpose of this section is to provide detailed results specifically for the Southwest Region. A map of the Southwest region is shown in Figure 1.

Figure 1 Southwest Region Map

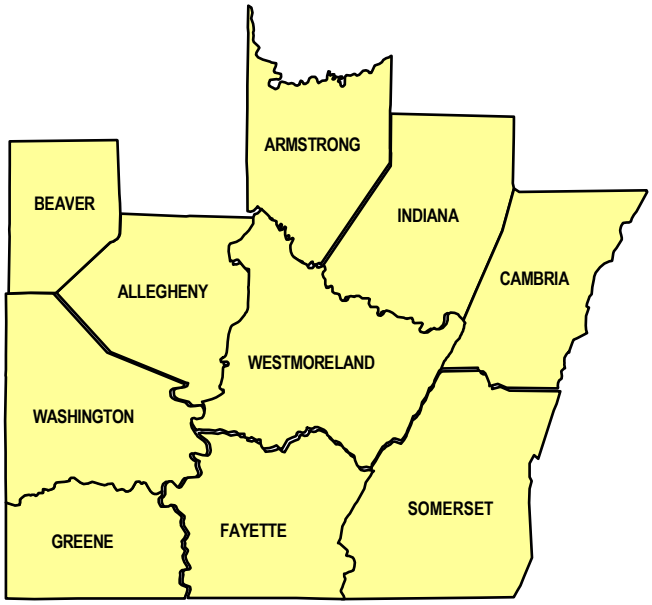


Table 1 summarizes the demographic and economic characteristics of the Southwest region.

Table 1 Southwest Region Demographic Summary

	Urban	Suburban	Rural	Total
Communities [1]	4	254	323	**581**
Population [1]	391,178	1,540,325	688,399	**2,619,902**
Housing Units [1]	168,881	654,008	283,027	**1,105,916**
Employment [2]	220,156	500,628	138,488	**859,272**

[1] Source: 2001 U.S. Census data provided by DEP
[2] Source: 2001 estimates provided by ESRI-BIS, Arlington, VA, based on U.S. Census data.

Table 2 summarizes the waste that was reported by the Commonwealth's landfills (and incinerators) to have been disposed from each County within the Southwest region in 2001.

Table 2 Southwest Region Waste Disposal Summary [1]

County	MSW Disposed (tons)
Allegheny	1,089,305
Armstrong	30,701
Beaver	86,193
Cambria	86,935
Fayette	75,515
Greene	21,741
Indiana	39,388
Somerset	52,743
Washington	138,750
Westmoreland	250,980
Total	**1,872,249**

[1] Source: County-level disposal quantity estimates are based on the 2001 DEP landfill disposal database

In order to aggregate the MSW composition data that was collected in this study, it was necessary to develop estimates of waste generation by county within the region. This was performed in the following steps:

1) Surveying urban, suburban, and rural communities across the Commonwealth to compile urban, suburban and rural residential MSW disposal factors (tons of disposed MSW per household per year);
2) Applying the residential generation factors to the total households in the region to estimate total disposed residential waste;
3) Estimating total regional waste disposed based on a statistical analysis of reported county-level waste disposal records relative to county-level population and employment; and
4) Netting out residential waste to calculate disposed commercial waste quantities.

The results of this process are shown in Table 3 for the Southwest Region.

Table 3 Southwest Region Disposed MSW Summary (tons) [1]

	Tons of Waste Disposed			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Residential generators	152,208	747,890	290,193	1,190,291
Commercial generators	128,887	437,251	115,820	681,959
Total	**281,095**	**1,185,141**	**406,012**	**1,872,249**

[1] Source: 2001 DEP database of disposed tons as reported by Pennsylvania disposal facilities.

In order to develop composition estimates for each of these demographic areas and generating sectors, field sampling was performed at two waste processing and disposal facilities:

- Imperial Landfill (Imperial, Allegheny County); and
- Laurel Highlands Landfill (Vintondale, Cambria County).

Sampling at these facilities was performed across four seasons to account for seasonal variation in MSW composition. Table 4 summarizes the sampling summary for the Southwest Region.

Table 4 Southwest Region Sampling Summary

	Number of Samples			
Waste Generating Sector	**Urban**	**Suburban**	**Rural**	**Total**
Physical MSW Samples				
Residential	35	40	33	108
Commercial	30	39	25	94
Subtotal—physical samples	65	79	58	202
Visual Bulk Waste Samples	16	38	21	75
Total Samples	**81**	**117**	**79**	**277**

Regional Aggregate Results

The remainder of this section presents a graphical and tabular summary of the Southwest region's disposed MSW composition. Specific figures and tables are summarized below.

- Figure 2 is a pie chart that shows the percentage composition of major material groups in the aggregate regional waste stream.
- Figure 3 is a bar chart that shows the estimated mean quantities of material disposed (or incinerated) from the region, again by major material group.

- Figure 4 compares the incidence of recyclable materials as targeted in Act 101 that were found to be disposed by residential and commercial generators in the region.
- Figure 5 shows the 10 most prevalent materials being disposed in the region, by weight.
- Table 5 contains a detailed statistical presentation of the aggregate MSW composition in the region. This tabular summary includes the statistical mean composition, as well as the standard deviation, upper and lower confidence intervals, and a "sampling error". The sampling error indicates the width of the confidence intervals relative to the mean. Lower sampling error signifies narrower confidence intervals (and therefore greater certainty of the mean composition shown).
- Figure 6 compares the percentage of disposed MSW landfilled from urban, suburban and rural communities within the region.
- Table 6 compares the mean composition of disposed MSW from urban, suburban and rural communities within the region.

Results by Generating Sector

An objective of the study was to compare and contrast the composition of residential and commercial waste within the region.

- Figure 7 and Figure 8 summarize the percentage of MSW landfilled by major material group for residential generators and commercial generators, respectively.
- Tables 7 and 8, like Table 6, compare the mean composition of urban, suburban, and rural waste. Table 7 focuses on residential generators in the region, while Table 8 shows the same comparison for commercial generators.

Bulky Waste

The State-wide MSW sort primarily targeted residential and commercial compacting vehicles, as well as commercial compacting and open-top roll-offs carrying non-C&D and non-industrial waste. These loads make up the majority of loads entering the Commonwealth's disposal facilities. However, it was expected at the outset of the study that some incoming loads of MSW—primarily those in open-top roll-off vehicles—would contain bulky waste that was not conducive to physical sorting. Therefore, the study methodology allowed for selected visual, volumetric sampling of bulky loads to the extent they were observed during the sampling and sorting process.

- Figure 9 shows the weight percentage composition of bulky items by major material group. Bulky loads were found to include a range of materials, including multi-family move-outs, residential and commercial clean-outs, miscellaneous commercial waste, and some renovation and construction type waste (although pure C&D loads were excluded from the analysis).

- Figure 10 lists the top 10 most prevalent bulky materials disposed during the study.

Self Haul Waste

Self haulers were found to deliver only a small fraction of waste to disposal facilities during the study. Our sampling plan allowed for selected sampling of self-haulers, which include: residential haulers of renovation and/or clean-out waste, and commercial contractors hauling small renovation, construction, land clearing, and/or clean-out type waste. Note that an insufficient number of self-haul samples were obtained to develop region-specific results.

Figure 2
Southwest Region Aggregate MSW Composition

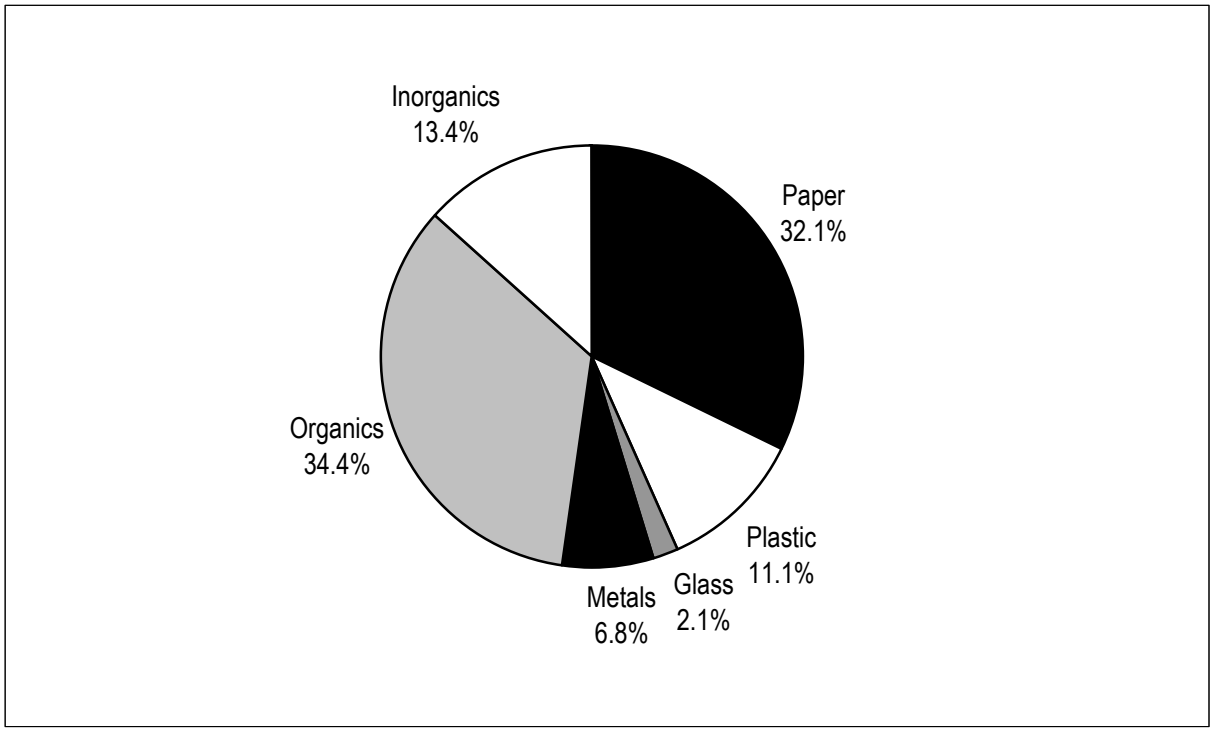


Figure 3
Southwest Region Aggregate MSW Tons Disposed

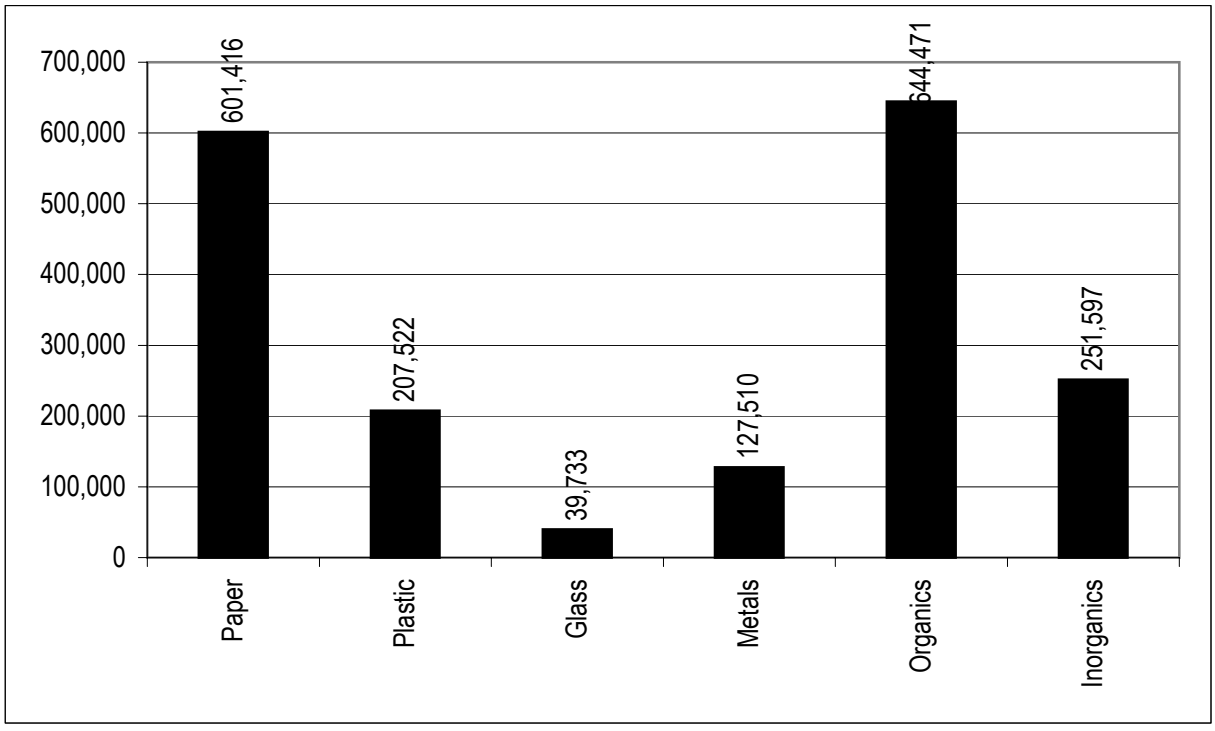


Figure 4

Act 101- Recyclables in Disposed MSW (tons)

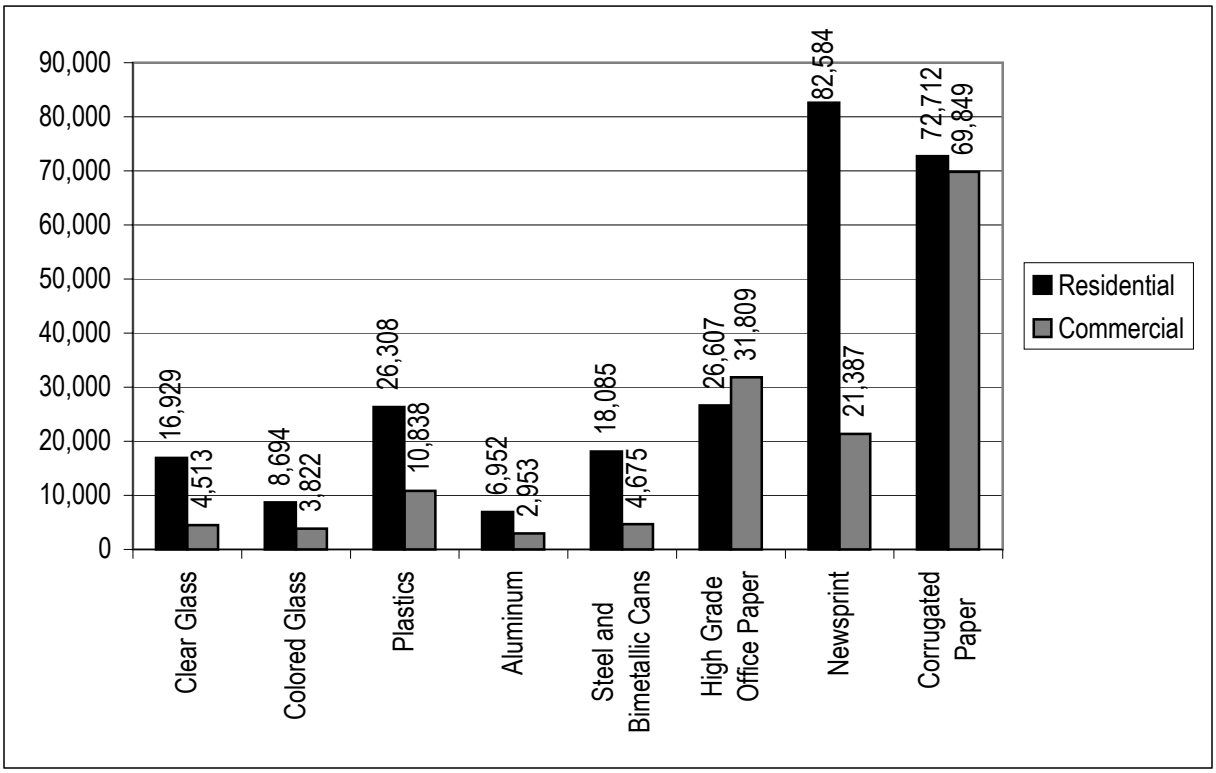


Figure 5

Southwest Region Top 10 Most Prevalent Materials

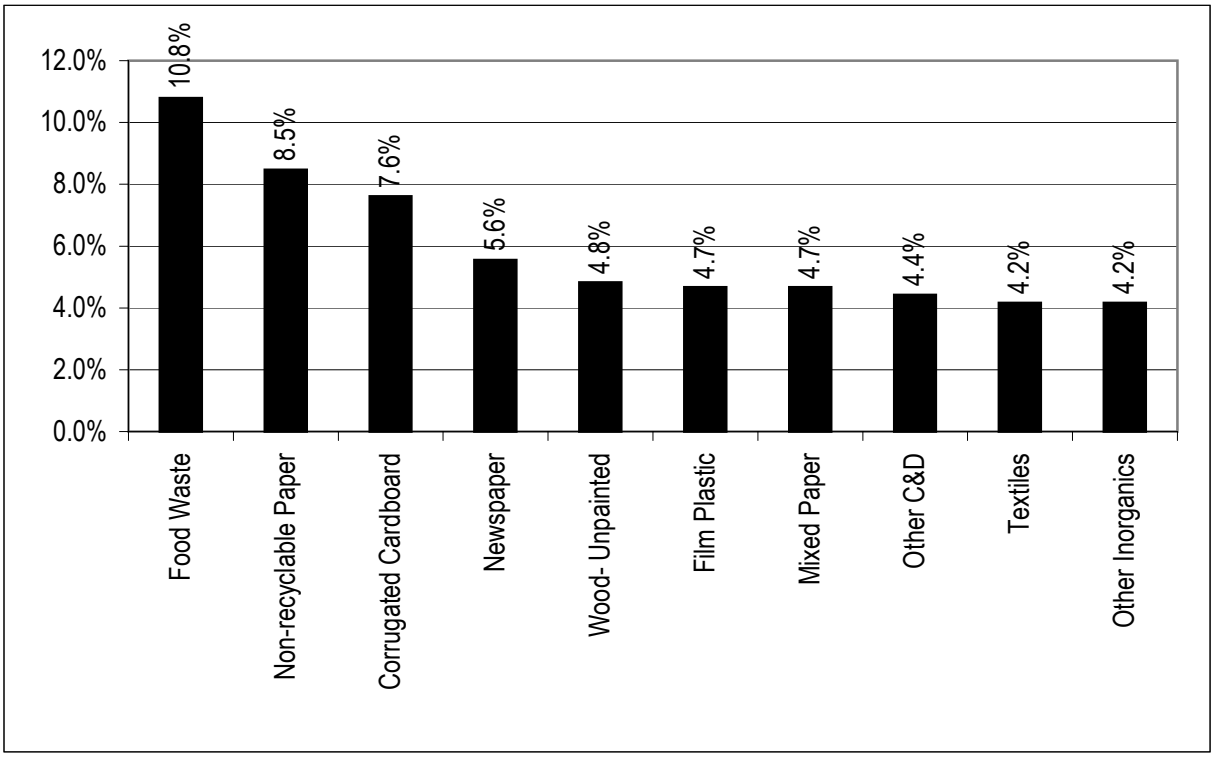


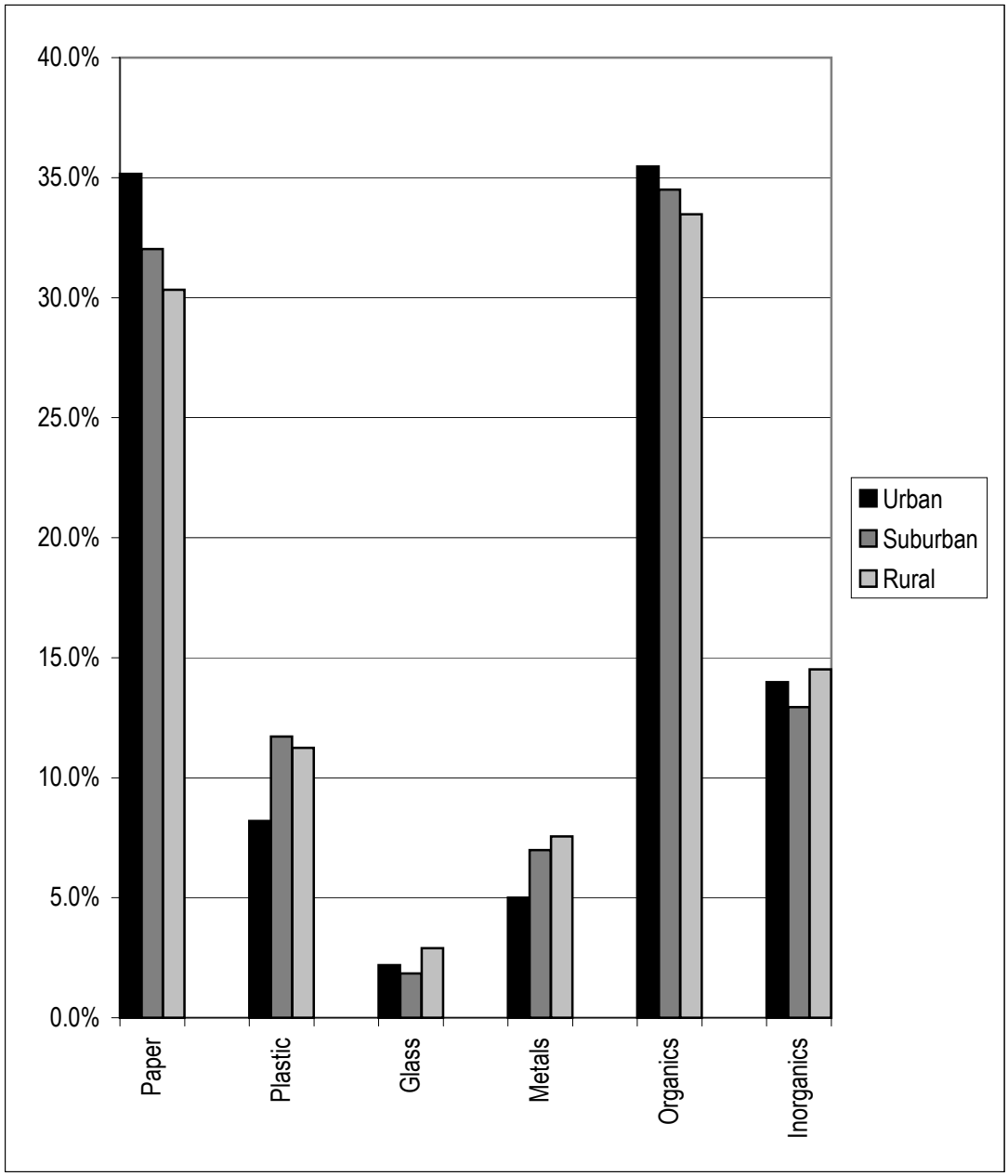
Table 5

Southwest Region Aggregate Landfilled MSW Composition Detail (Weight Percent)

		Material Categories	Tons Disposed	Mean Composition	Standard Deviation	Confidence Interval		Sampling Error
						Lower (%)	Upper (%)	
Paper			**601,416**	**32.1%**	**20.6%**	**29.2%**	**35.3%**	**9.5%**
	1	Newspaper	103,971	5.6%	4.8%	4.8%	6.6%	16.7%
	2	Corrugated Cardboard	142,560	7.6%	11.7%	6.5%	9.1%	17.4%
	3	Office	58,416	3.1%	4.6%	2.6%	3.8%	18.5%
	4	Magazine/ Glossy	41,539	2.2%	3.1%	1.8%	2.7%	20.3%
	5	Polycoated/Aseptic Containers	8,887	0.5%	0.7%	0.4%	0.6%	19.6%
	6	Mixed Paper	87,489	4.7%	6.3%	4.0%	5.6%	16.3%
	7	Non-recyclable Paper	158,554	8.5%	7.8%	7.3%	10.1%	16.7%
Plastic			**207,522**	**11.1%**	**7.7%**	**10.0%**	**12.3%**	**10.5%**
	8	#1 PET Bottles	20,413	1.1%	1.5%	0.9%	1.3%	18.2%
	9	#2 HDPE Bottles	16,733	0.9%	0.8%	0.8%	1.1%	18.3%
	10	#3-#7 Bottles	5,208	0.3%	0.8%	0.2%	0.4%	28.3%
	11	Expanded Polystyrene	13,534	0.7%	0.9%	0.6%	0.9%	18.8%
	12	Film Plastic	87,520	4.7%	4.0%	4.1%	5.5%	14.7%
	13	Other Rigid Plastic	64,114	3.4%	3.7%	3.0%	4.0%	14.4%
Glass			**39,733**	**2.1%**	**2.4%**	**1.8%**	**2.4%**	**14.3%**
	14	Clear Glass	21,442	1.1%	1.3%	1.0%	1.4%	18.7%
	15	Green Glass	4,457	0.2%	0.5%	0.2%	0.3%	27.8%
	16	Amber Glass	8,059	0.4%	1.2%	0.3%	0.6%	26.1%
	17	Non-recyclable Glass	5,775	0.3%	0.9%	0.2%	0.4%	31.2%
Metals			**127,510**	**6.8%**	**11.6%**	**5.8%**	**8.0%**	**16.4%**
	18	Steel Cans	22,759	1.2%	1.4%	1.0%	1.5%	19.9%
	19	Aluminum Cans	9,905	0.5%	1.0%	0.4%	0.6%	18.1%
	20	Other Ferrous	73,469	3.9%	11.1%	3.1%	5.2%	27.3%
	21	Other Aluminum	10,872	0.6%	1.8%	0.5%	0.8%	26.8%
	22	Other Non-Ferrous	10,504	0.6%	1.9%	0.4%	0.8%	31.1%
Organics			**644,471**	**34.4%**	**21.1%**	**31.7%**	**37.3%**	**8.2%**
	23	Yard Waste- Grass	57,833	3.1%	7.8%	2.1%	4.6%	39.9%
	24	Yard Waste- Other	56,154	3.0%	6.2%	2.3%	4.1%	30.3%
	25	Wood- Unpainted	90,281	4.8%	16.3%	3.8%	6.4%	26.7%
	26	Wood- Painted	62,243	3.3%	8.0%	2.8%	4.2%	21.3%
	27	Food Waste	202,064	10.8%	10.9%	9.4%	12.7%	15.1%
	28	Textiles	78,019	4.2%	8.1%	3.5%	5.1%	19.6%
	29	Diapers	55,618	3.0%	5.5%	2.5%	3.7%	21.0%
	30	Fines	16,993	0.9%	0.9%	0.8%	1.1%	19.5%
	31	Other Organics	25,266	1.3%	2.6%	1.1%	1.8%	25.1%
Inorganics			**251,597**	**13.4%**	**23.7%**	**11.4%**	**15.8%**	**16.4%**
	32	Electronics	30,597	1.6%	5.2%	1.3%	2.2%	30.0%
	33	Carpet	32,648	1.7%	6.0%	1.3%	2.4%	30.5%
	34	Drywall	17,989	1.0%	5.9%	0.7%	1.3%	29.0%
	35	Other C&D	82,870	4.4%	15.7%	3.5%	5.8%	25.8%
	36	HHW	5,567	0.3%	2.2%	0.2%	0.4%	32.8%
	37	Other Inorganics	77,924	4.2%	10.7%	3.2%	5.6%	29.6%
	38	Furniture	4,002	0.2%	3.3%	0.1%	0.4%	54.3%
		Total	1,872,249	100.0%				

Figure 6

Landfilled Aggregate Waste Composition Results by Demographic Sector (Weight Percent)



Material Group	Demographic Sector			
	Urban	Suburban	Rural	Aggregate
Paper	35.2%	32.0%	30.3%	32.1%
Plastic	8.2%	11.7%	11.2%	11.1%
Glass	2.2%	1.8%	2.9%	2.1%
Metals	5.0%	7.0%	7.6%	6.8%
Organics	35.5%	34.5%	33.5%	34.4%
Other Waste	14.0%	12.9%	14.5%	13.4%
Total	100.0%	100.0%	100.0%	100.0%

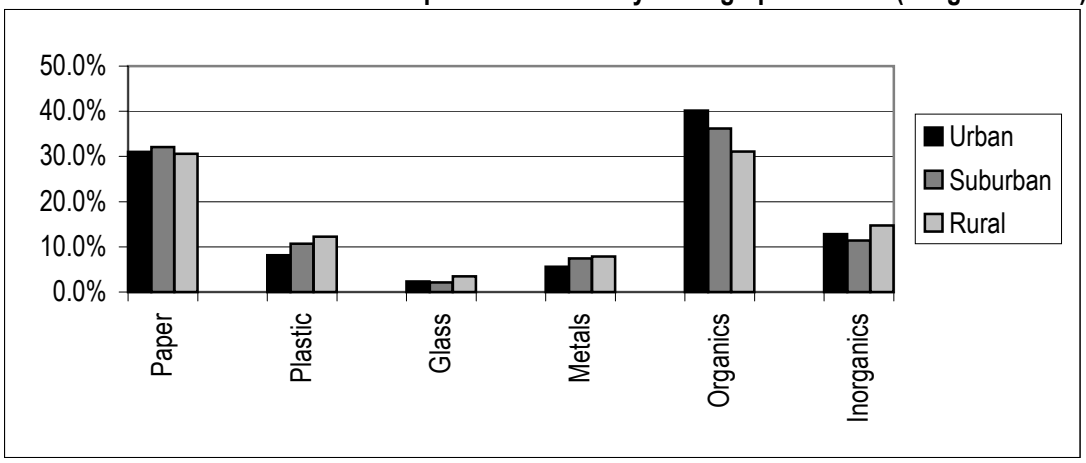
Table 6

Landfilled Aggregate MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**35.2%**	**32.0%**	**30.3%**	**32.1%**
	1	Newspaper	6.2%	5.3%	6.0%	5.6%
	2	Corrugated Cardboard	9.2%	7.9%	5.6%	7.6%
	3	Office	4.3%	3.0%	2.6%	3.1%
	4	Magazine/ Glossy	2.5%	2.1%	2.5%	2.2%
	5	Polycoated/Aseptic Containers	0.5%	0.5%	0.3%	0.5%
	6	Mixed Paper	5.3%	4.7%	4.2%	4.7%
	7	Non-recyclable Paper	7.2%	8.5%	9.2%	8.5%
Plastic			**8.2%**	**11.7%**	**11.2%**	**11.1%**
	8	#1 PET Bottles	1.1%	1.1%	1.1%	1.1%
	9	#2 HDPE Bottles	0.5%	0.9%	1.1%	0.9%
	10	#3-#7 Bottles	0.3%	0.3%	0.1%	0.3%
	11	Expanded Polystyrene	0.4%	0.8%	0.6%	0.7%
	12	Film Plastic	3.2%	5.0%	4.7%	4.7%
	13	Other Rigid Plastic	2.6%	3.6%	3.6%	3.4%
Glass			**2.2%**	**1.8%**	**2.9%**	**2.1%**
	14	Clear Glass	1.2%	1.0%	1.4%	1.1%
	15	Green Glass	0.4%	0.2%	0.3%	0.2%
	16	Amber Glass	0.5%	0.4%	0.6%	0.4%
	17	Non-recyclable Glass	0.1%	0.3%	0.6%	0.3%
Metals			**5.0%**	**7.0%**	**7.6%**	**6.8%**
	18	Steel Cans	1.1%	1.1%	1.8%	1.2%
	19	Aluminum Cans	0.5%	0.5%	0.7%	0.5%
	20	Other Ferrous	2.0%	4.3%	4.1%	3.9%
	21	Other Aluminum	0.7%	0.6%	0.5%	0.6%
	22	Other Non-Ferrous	0.7%	0.6%	0.5%	0.6%
Organics			**35.5%**	**34.5%**	**33.5%**	**34.4%**
	23	Yard Waste- Grass	2.2%	3.5%	2.4%	3.1%
	24	Yard Waste- Other	5.1%	2.7%	2.3%	3.0%
	25	Wood- Unpainted	5.7%	4.9%	3.9%	4.8%
	26	Wood- Painted	5.4%	2.8%	3.5%	3.3%
	27	Food Waste	9.0%	11.0%	11.5%	10.8%
	28	Textiles	4.2%	4.1%	4.3%	4.2%
	29	Diapers	1.5%	3.0%	3.9%	3.0%
	30	Fines	1.0%	0.9%	0.8%	0.9%
	31	Other Organics	1.4%	1.5%	0.8%	1.3%
Inorganics			**14.0%**	**12.9%**	**14.5%**	**13.4%**
	32	Electronics	3.0%	1.6%	0.8%	1.6%
	33	Carpet	1.8%	1.7%	1.7%	1.7%
	34	Drywall	2.7%	0.6%	0.8%	1.0%
	35	Other C&D	3.4%	3.8%	7.0%	4.4%
	36	HHW	0.2%	0.3%	0.3%	0.3%
	37	Other Inorganics	2.8%	4.6%	4.0%	4.2%
	38	Furniture	0.0%	0.3%	0.0%	0.2%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 7

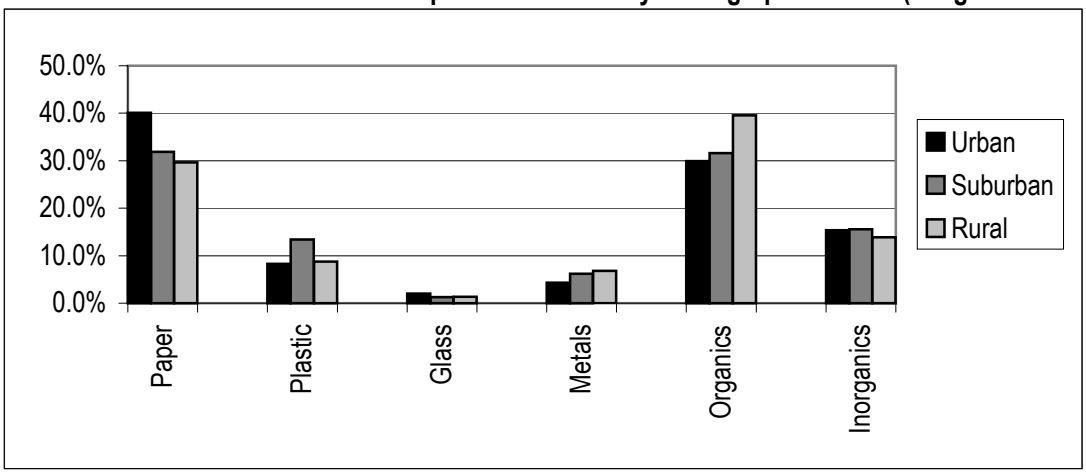
Landfilled Residential MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	31.0%	32.1%	30.6%	31.6%
Plastic	8.1%	10.7%	12.2%	10.8%
Glass	2.4%	2.2%	3.5%	2.5%
Metals	5.6%	7.5%	7.9%	7.3%
Organics	40.1%	36.2%	31.1%	35.4%
Other Waste	12.8%	11.4%	14.7%	12.4%
Total	100.0%	100.0%	100.0%	100.0%

Figure 8

Landfilled Commercial MSW Composition Results by Demographic Sector (Weight Percent)



	Demographic Sector			
Generator	Urban	Suburban	Rural	Aggregate
Paper	40.1%	31.9%	29.6%	33.1%
Plastic	8.3%	13.4%	8.8%	11.7%
Glass	2.0%	1.3%	1.4%	1.4%
Metals	4.3%	6.2%	6.8%	5.9%
Organics	29.9%	31.6%	39.5%	32.7%
Other Waste	15.4%	15.6%	13.9%	15.3%
Total	100.0%	100.0%	100.0%	100.0%

Table 7

Landfilled Residential MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**31.0%**	**32.1%**	**30.6%**	**31.6%**
	1	Newspaper	7.5%	6.6%	7.6%	6.9%
	2	Corrugated Cardboard	4.9%	6.9%	4.6%	6.1%
	3	Office	2.6%	2.4%	1.6%	2.2%
	4	Magazine/ Glossy	3.3%	2.4%	2.9%	2.6%
	5	Polycoated/Aseptic Containers	0.5%	0.4%	0.4%	0.4%
	6	Mixed Paper	5.0%	4.4%	3.0%	4.1%
	7	Non-recyclable Paper	7.2%	9.1%	10.5%	9.2%
Plastic			**8.1%**	**10.7%**	**12.2%**	**10.8%**
	8	#1 PET Bottles	0.9%	1.1%	1.3%	1.1%
	9	#2 HDPE Bottles	0.7%	1.0%	1.3%	1.1%
	10	#3-#7 Bottles	0.4%	0.2%	0.1%	0.2%
	11	Expanded Polystyrene	0.6%	0.7%	0.7%	0.7%
	12	Film Plastic	3.3%	4.3%	5.0%	4.4%
	13	Other Rigid Plastic	2.3%	3.3%	3.8%	3.3%
Glass			**2.4%**	**2.2%**	**3.5%**	**2.5%**
	14	Clear Glass	1.5%	1.3%	1.7%	1.4%
	15	Green Glass	0.2%	0.2%	0.3%	0.2%
	16	Amber Glass	0.6%	0.4%	0.7%	0.5%
	17	Non-recyclable Glass	0.1%	0.3%	0.8%	0.4%
Metals			**5.6%**	**7.5%**	**7.9%**	**7.3%**
	18	Steel Cans	1.1%	1.4%	2.2%	1.5%
	19	Aluminum Cans	0.6%	0.4%	0.9%	0.6%
	20	Other Ferrous	2.4%	4.4%	3.6%	3.9%
	21	Other Aluminum	0.6%	0.7%	0.6%	0.7%
	22	Other Non-Ferrous	0.9%	0.6%	0.5%	0.6%
Organics			**40.1%**	**36.2%**	**31.1%**	**35.4%**
	23	Yard Waste- Grass	2.4%	5.5%	2.8%	4.5%
	24	Yard Waste- Other	8.5%	3.5%	3.1%	4.1%
	25	Wood- Unpainted	5.8%	3.9%	2.4%	3.8%
	26	Wood- Painted	4.2%	2.2%	2.6%	2.6%
	27	Food Waste	9.1%	10.8%	11.5%	10.7%
	28	Textiles	4.1%	5.1%	3.5%	4.6%
	29	Diapers	2.1%	2.4%	3.3%	2.6%
	30	Fines	1.5%	1.2%	1.0%	1.2%
	31	Other Organics	2.5%	1.6%	0.8%	1.5%
Inorganics			**12.8%**	**11.4%**	**14.7%**	**12.4%**
	32	Electronics	2.9%	1.6%	0.8%	1.6%
	33	Carpet	1.7%	1.5%	2.0%	1.6%
	34	Drywall	2.5%	0.4%	0.9%	0.8%
	35	Other C&D	3.1%	2.5%	7.9%	3.9%
	36	HHW	0.1%	0.3%	0.4%	0.3%
	37	Other Inorganics	2.5%	4.9%	2.8%	4.1%
	38	Furniture	0.0%	0.1%	0.0%	0.1%
		Total	100.0%	100.0%	100.0%	100.0%

Table 8

Landfilled Commercial MSW Composition Detail by Demographic Sector (Weight Percent)

		Material Categories	Urban	Suburban	Rural	Aggregate
Paper			**40.1%**	**31.9%**	**29.6%**	**33.1%**
	1	Newspaper	4.6%	3.0%	2.1%	3.1%
	2	Corrugated Cardboard	14.2%	9.7%	7.9%	10.2%
	3	Office	6.3%	4.1%	4.9%	4.7%
	4	Magazine/ Glossy	1.6%	1.5%	1.4%	1.5%
	5	Polycoated/Aseptic Containers	0.4%	0.8%	0.2%	0.6%
	6	Mixed Paper	5.6%	5.3%	7.2%	5.7%
	7	Non-recyclable Paper	7.3%	7.5%	5.9%	7.2%
Plastic			**8.3%**	**13.4%**	**8.8%**	**11.7%**
	8	#1 PET Bottles	1.4%	1.0%	0.5%	1.0%
	9	#2 HDPE Bottles	0.3%	0.7%	0.6%	0.6%
	10	#3-#7 Bottles	0.2%	0.6%	0.1%	0.4%
	11	Expanded Polystyrene	0.3%	1.1%	0.4%	0.8%
	12	Film Plastic	3.1%	6.1%	3.9%	5.2%
	13	Other Rigid Plastic	3.0%	3.9%	3.2%	3.6%
Glass			**2.0%**	**1.3%**	**1.4%**	**1.4%**
	14	Clear Glass	0.9%	0.6%	0.6%	0.7%
	15	Green Glass	0.6%	0.1%	0.2%	0.2%
	16	Amber Glass	0.3%	0.3%	0.2%	0.3%
	17	Non-recyclable Glass	0.1%	0.2%	0.3%	0.2%
Metals			**4.3%**	**6.2%**	**6.8%**	**5.9%**
	18	Steel Cans	1.1%	0.5%	0.8%	0.7%
	19	Aluminum Cans	0.3%	0.5%	0.3%	0.4%
	20	Other Ferrous	1.7%	4.2%	5.3%	3.9%
	21	Other Aluminum	0.9%	0.4%	0.2%	0.4%
	22	Other Non-Ferrous	0.4%	0.5%	0.2%	0.5%
Organics			**29.9%**	**31.6%**	**39.5%**	**32.7%**
	23	Yard Waste- Grass	2.1%	0.0%	1.6%	0.7%
	24	Yard Waste- Other	1.0%	1.4%	0.3%	1.2%
	25	Wood- Unpainted	5.6%	6.7%	7.8%	6.7%
	26	Wood- Painted	6.8%	3.8%	5.8%	4.7%
	27	Food Waste	8.8%	11.4%	11.3%	10.9%
	28	Textiles	4.4%	2.5%	6.3%	3.5%
	29	Diapers	0.7%	3.9%	5.4%	3.6%
	30	Fines	0.5%	0.4%	0.3%	0.4%
	31	Other Organics	0.1%	1.5%	0.7%	1.1%
Inorganics			**15.4%**	**15.6%**	**13.9%**	**15.3%**
	32	Electronics	3.2%	1.6%	0.7%	1.7%
	33	Carpet	2.0%	2.2%	0.9%	2.0%
	34	Drywall	2.9%	1.0%	0.5%	1.2%
	35	Other C&D	3.8%	5.9%	4.8%	5.4%
	36	HHW	0.3%	0.3%	0.1%	0.3%
	37	Other Inorganics	3.1%	3.9%	6.9%	4.3%
	38	Furniture	0.1%	0.7%	0.0%	0.5%
		Total	100.0%	100.0%	100.0%	100.0%

Figure 9

Southwest Region Aggregate Composition of Bulky Loads (Visual Samples)

Material Group	% Weight
Paper	21.2%
Plastic	1.4%
Glass	0.7%
Metals	6.3%
Organics	33.5%
Inorganics	37.0%
Total	100.0%

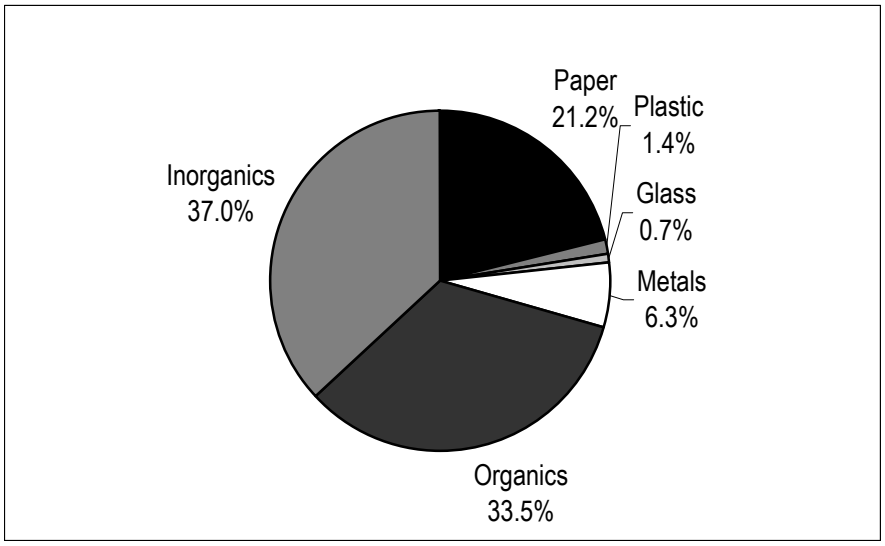
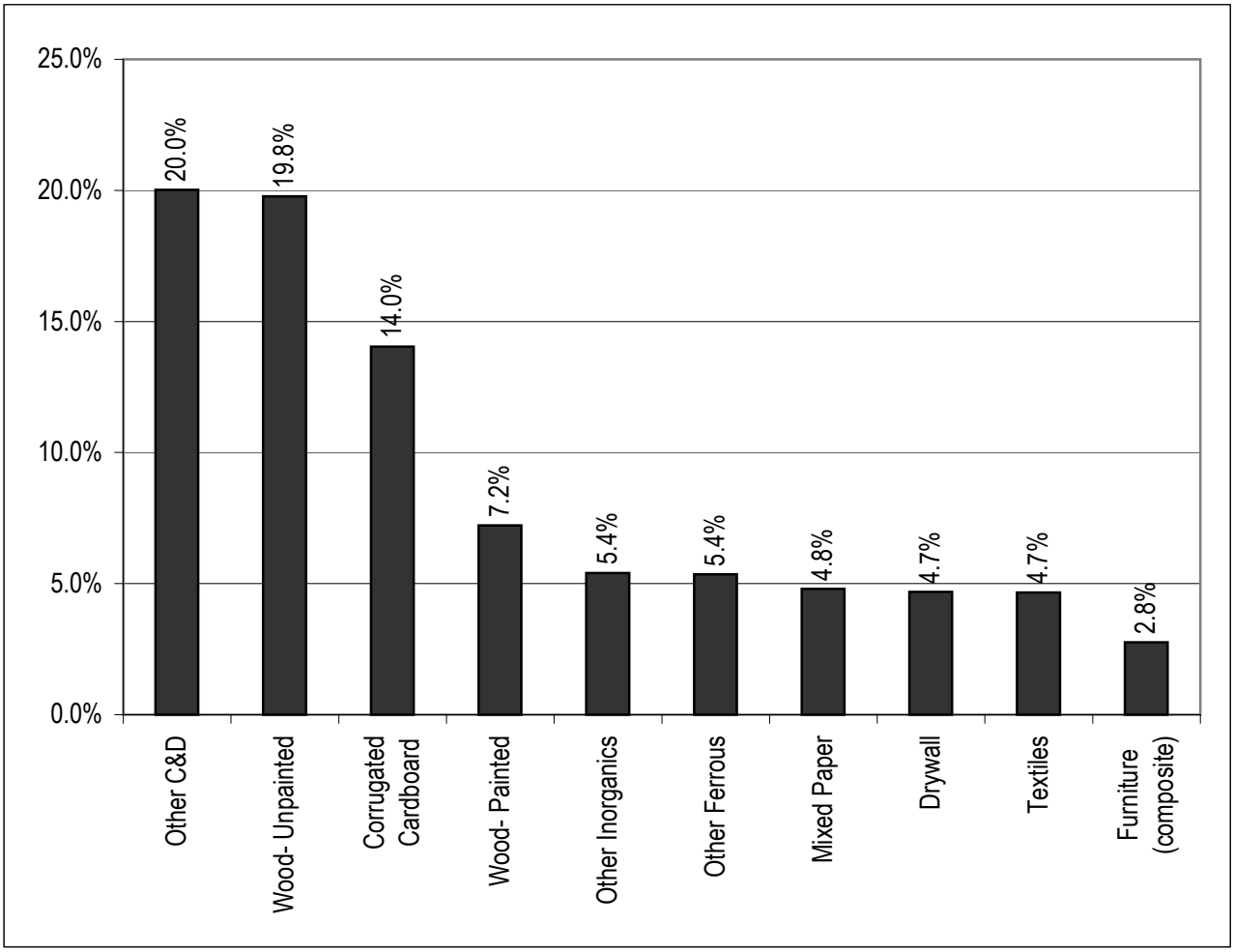


Figure 10

Southwest Region Top 10 Most Prevalent Bulky Materials



APPENDIX A

Appendix A
Pennsylvania Waste Characterization Study
Final Material Definitions 7/10/01

Material Group		Material Category	Material Definition	Packaging	Non-Packaging
Paper	**1**	**Newspaper**	Printed and unprinted ground wood newsprint. This category includes glossy paper inserts included with the newspaper.		✓
	2	**Corrugated Cardboard**	Old Corrugated Cardboard (OCC) and Kraft Paper - Kraft linerboard and containerboard cartons and shipping boxes with corrugated paper medium (excludes wax or plastic coated boxes). Includes Kraft paper bags.	✓	
	3	**Office**	High-grade paper. Bond, rag-content, manila, or stationery grade paper with or without color. Includes ledger, photocopy paper, computer printouts, manila folders, index cards, and envelopes (with and without windows or gummed labels).		✓
	4	**Magazine/ Glossy**	Magazines and catalogs printed on glossy, coated paper stock.		✓
	5	**Polycoated/ Aseptic Containers**	Polycoated gable top beverage cartons (such as milk and orange juice cartons) and aseptic drink boxes. Excludes non-beverage polycoated paperboard boxes.	✓	
	6	**Mixed Paper (Recyclable)**	Low grade recyclable paper. Includes paperboard, phone books, text books, other books and catalogs with groundwood paper; construction paper, junk mail, polycoated cartons and aseptic packages, blue prints, and glossy, coated paper (except magazines and catalogs).	✓	✓
	7	**Other Paper (Non-recyclable)**	Low-grade non-recyclable paper. Includes tissue paper, napkins, paper towels, paper plates, paper food cartons, cigarette packages, waxed paper, wax or plastic coated corrugated boxes, coated FAX paper, and carbon paper, whether or not they are contaminated with fluids or food. Includes all other grades of paper if substantially contaminated with fluids or food waste, including pizza boxes.	✓	✓
Plastic	**8**	**#1 PET Bottles**	Blow molded plastic bottles and jars labeled #1 PET	✓	
	9	**#2 HDPE Bottles**	Blow molded plastic bottles and jars (both natural and pigmented) labeled #2 HDPE	✓	
	10	**#3-#7 Bottles**	Blow molded plastic bottles and jars labeled #3, #4, #5 #6 or #7	✓	
	11	**Expanded Polystyrene**	Food service polystyrene, polystyrene packaging, and "peanuts". Any expanded foam product labeled #6.	✓	
	12	**Film Plastic**	Any film plastic including garbage bags, retail bags, cereal bags, sheet plastic, shrink wrap, tarping, and other non-rigid plastic.	✓	✓
	13	**Other Rigid Plastic**	Includes other thermoformed or injection-molded rigid plastic not captured in the above categories. Includes tubs, trays and containers labeled #1, #2, #3, #4, #5, #6 and #7. Includes all non-container rigid plastics such as plastic pipe, electrical components, automotive components, toys, and foamed plastics.	✓	✓

Appendix A
Pennsylvania Waste Characterization Study
Final Material Definitions 7/10/01

Material Group		Material Category	Material Definition	Packaging	Non-Packaging
Glass	**14**	**Clear**	Recyclable clear beverage and food bottles and jars	✓	
	15	**Green**	Recyclable green beverage and food bottles and jars	✓	
	16	**Amber**	Recyclable amber beverage and food bottles and jars	✓	
	17	**Other**	Flat, pressed and blown glass products such as light bulbs, mirrors, decorative items and fixtures, windows, safety glass, and cooking ware.		✓
Metal	**18**	**Steel Cans**	All coated and tin-free ferrous food and beverage cans. Includes bi-metal cans and non-aerosol spray cans	✓	
	19	**Aluminum Cans**	All aluminum food and beverage containers	✓	
	20	**Other Ferrous**	Ferrous and alloyed ferrous scrap metals from any source except intact white goods, brown goods, and composite bulky goods defined below.	✓	✓
	21	**Other Aluminum**	Foils, trays, siding, sheet	✓	✓
	22	**Other Non-Ferrous**	Copper, brass, pipe, tubing, stainless steel		✓
Organics	**23**	**Yard Waste-Grass**	Grass clippings		✓
	24	**Yard Waste-Other**	Yard waste other than grass clippings such as leaves, garden trimmings, and brush up to 4 inches in diameter		✓
	25	**Wood-Unpainted**	Wood and dimensional lumber construction materials from new construction, remodeling, or demolition, including plywood and shingles if uncontaminated by paint, stain or preservative treatment. Includes easily separable wood from furniture, tools, and other durable products. Excludes preservative treated wood or particleboard, chipboard, or masonite.	✓	✓
	26	**Wood-Painted**	Any wood with paint, stain or preservative treatment. Also includes particleboard, chipboard, and masonite due to their resin content.	✓	✓
	27	**Food Waste**	Putrescible food waste.		✓
	28	**Textiles**	Fabric materials including natural and man-made textile materials made from cottons, wools, silks, nylon, rayon, polyesters, and other materials. This category includes clothing rags, curtains, and other fabric materials. Leather and leather goods are also included such as belts and wallets. Includes all shoes.		✓
	29	**Diapers**	Diapers and adult sanitary products		✓
	30	**Fines**	All particles capable of passing through a 2-inch screen if encountered loose, regardless of material type. Includes small pieces of paper, plastic, broken glass, metal, loose soil, food scraps, bottle caps, and grass clippings.		✓

Appendix A
Pennsylvania Waste Characterization Study
Final Material Definitions 7/10/01

Material Group		Material Category	Material Definition	Packaging	Non-Packaging
	31	**Other Organics**	Organic materials not otherwise categorized, such as natural fibers, manure, cork, hemp rope, wicker products, sawdust, and lint.		✓
Inorganics	32	**Electronics**	Electronic or electrically powered household products fabricated from metals and plastics and not easily separable into individual materials. Examples include hair dryers, radios, stereos, microwave ovens, computers, televisions, and telephones.		✓
	33	**Carpet**	Carpet		✓
	34	**Drywall**	Gypsum-based wallboard, including blueboard for use in the drywall or plaster trades		✓
	35	**Other C&D**	C&D material not otherwise classified such as concrete, brick, asphalt roofing, fiberglass insulation, polyurethane carpet backing, etc.		✓
	36	**HHW**	Wastes resulting from products purchased by the general public for household use or similar commercial use which, because of their quantity, concentration, or physical, chemical, or infections characteristics, may pose a hazard to human health. Examples include paints, solvents, flammable liquids, toxics, corrosives, pesticides and herbicides, batteries, syringes, reactives and explosives. Empty HHW containers are not considered HHW.		✓
	37	**Other Inorganics**	Inorganic material not otherwise classified, such as rock, dirt, sand, and certain manufactured products composed of entirely inorganic materials		✓
	38	**Furniture**	Many of the self-haul and bulky loads contained whole pieces of furniture. This category was only used when performing visual samples of bulky loads. Note that some furniture items may have contained significant organic materials (primarly wood).		✓

Definition of Packaging:

A container providing a means of marketing, protecting or handling a product, including unit packaging, intermediate packaging, and shipping containers. Includes unsealed receptacles such as carrying cases, crates, cups, pails, rigid foil and other trays, wrappers and wrapping films, bags and tubs. Tin-plated steel, hot-dip and electrolyte galvanized steel, and galvanized wire shall be considered packaging. Includes individual parts of a package such as blocking, bracing, cushioning, weatherproofing, exterior strapping, coatings, closures, inks, labels, dyes, pigments, adhesives, stabilizers, or any other additive.

APPENDIX B

Pennsylvania Daily Sampling Summary

Please complete this sheet for both visual and physical samples

Day: _____ **Facility: _____**

Date: _____ **Facility Type: _____ (Landfill, Transfer, or Resource Recovery)**

Weather: _____ (Rain, Dry, or Snow)

Target Truckloads

_____ _____

_____ _____

_____ _____

Sample Number	**Sample Type**	Time of Delivery	Jurisdiction	**Origin Type**	**Generator**	Source	**Hauler (Specify if Self-haul)**	Vehicle Number	Vehicle Type	Ticket #
	Physical or Visual			Urban, Suburban, or Rural	Res Mix, SF, MF, or Comm	ex. Supermarket, Church, School, etc.	Hauler name or "Self haul"		RL, FEL, SL, RO, Pick-up, Car, or Other Truck	

Physical Sample Waste Sort Data Collection Form - Pennsylvania DEP

SAMPLE NUMBER: _____
Date Sampled: _____
Date Sorted: _____
Facility: _____
Truck Number: _____
Crew Chief: _____
Notes: _____
_____

Single-family Residential ____
Multi-family residential ____
Com'l/Inst'l/Ind'l ____
Residential Mix ____

Urban ____
Suburban ____
Rural ____

		Material Categories	Weight(s) (Circle if net weight)
Paper	1	Newspaper	
	2	Corrugated Cardboard	
	3	Office	
	4	Magazine/Glossy	
	5	Polycoated/ Aseptic Containers	
	6	Mixed (Other Recyclable)	
	7	Other (Non-recyclable)	
Plastic	8	#1 PET Bottles	
	9	#2 HDPE Bottles	
	10	#3-#7 Bottles	
	11	Expanded Polystyrene	
	12	Film Plastic	
	13	Other Rigid Plastic	
Glass	14	Clear	
	15	Green	
	16	Amber	
	17	Other	
Metal	18	Steel Cans	
	19	Aluminum Cans	
	20	Other Ferrous	
	21	Other Aluminum	
	22	Other Non-Ferrous	
Organic	23	Yard Waste- Grass	
	24	Yard Waste- Other	
	25	Wood- Unpainted	
	26	Wood- Painted	
	27	Food Waste	
	28	Textiles	
	29	Diapers	
	30	Fines	
	31	Other Organics	
Inorganics	32	Brown Goods	
	33	Carpet	
	34	Drywall	
	35	Other C&D	
	36	HHW	
	37	Other Inorganics	

Visual Sample Waste Sort Data Collection Form-Pennsylvania DEP

SAMPLE NUMBER: _____
Date Sampled: _____
Weight of Load: _____
CY of Truck: _____
Percent full: _____
Truck Number: _____

Notes: _____

Single-family Residential ____
Multi-family residential ____
Com'l/Inst'l/Ind'l ____

Urban ____ Suburban ____ Rural _____

Facility: _____
Field Supervisor: _____

		Material Categories	Percent by Volume
Paper	1	Newspaper	
	2	**Corrugated Cardboard**	
	3	Office	
	4	Magazine/Glossy	
	5	Polycoated/ Aseptic Containers	
	6	Mixed (Other Recyclable)	
	7	Other (Non-recyclable)	
Plastic	8	#1 PET Bottles	
	9	#2 HDPE Bottles	
	10	#3-#7 Bottles	
	11	Expanded Polystyrene	
	12	Film Plastic	
	13	**Other Rigid Plastic**	
Glass	14	Clear	
	15	Green	
	16	Amber	
	17	Other	
Metal	18	Steel Cans	
	19	Aluminum Cans	
	20	**Other Ferrous**	
	21	**Other Aluminum**	
	22	Other Non-Ferrous	
Organic	23	**Yard Waste- Grass**	
	24	**Yard Waste- Other**	
	25	**Wood- Unpainted**	
	26	**Wood- Painted**	
	27	Food Waste	
	28	Textiles	
	29	Diapers	
	30	Fines	
	31	Other Organics	
Inorganics	32	Brown Goods	
	33	**Carpet**	
	34	**Drywall**	
	35	**Other C&D**	
	36	HHW	
	37	Other Inorganics	
Other	38	**Commercial MSW Bagged**	
	39	**Residential MSW Bagged**	
	40	**Furniture (composite materials)**	