

Buncombe County Solid Waste Department

Waste Characterization Study Results

Buncombe County, NC

Buncombe County Solid Waste Department

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1 INTRODUCTION

This report covers the collected data and results of the waste characterization study made at the Buncombe County Transfer Station in North Carolina with an emphasis on highlighting opportunities for waste diversion.

The Buncombe County Solid Waste Department contracted with SCS Engineers to conduct a waste characterization study of residential and commercial waste collected within the County. The study was conducted at the Buncombe County Transfer Station. Samples of waste were collected from residential and commercial routes from the City of Asheville and unincorporated Buncombe County. The Transfer Station services the majority of the County, while some of the north side waste collection goes straight to the County landfill in Alexander.

The first part of the report details the methods and results from the waste characterization study. The second part of the report compares the results to other similar waste characterization studies. The Waste Diversion Study document completes the second task of the study by assessing and analyzing existing waste diversion programs and identifying opportunities for expansion.

CHARACTERIZATION METHOD

Manual Sorting

A total of 45 samples were collected from residential and commercial routes at the Transfer Station, averaging 214 pounds per sample. Waste characterizations were developed for the following waste collection areas and sources:

- Residential Waste from Asheville
- Residential Waste from Buncombe County
- Commercial Waste from Asheville
- Commercial Waste from Buncombe County

Drivers of the sampled trucks were interviewed to determine which route they followed and therefore which waste stream the materials came from.

The samples were evenly distributed across the four streams listed above instead of by waste quantities or population.

Each sample was hand-sorted into 35 material categories. The sorted materials were then weighed in order to calculate the percent composition by weight of each component. Tables and figures presenting these results can be found in **Section 2**.

Table 1 presents each material type by categorical grouping along with examples of each material type (see subsequent pages).



Pictured above: a sample is unbagged and hand-sorted according to material type.

Table 1. Material Categories and Examples

| Material Categories | | Examples | Type |
|---------------------|--------------------------|--|------|
| Paper | Newspaper/Magazines | Newsprint, newspapers, magazines | R |
| | Corrugated Cardboard | Shipping or packing boxes | R |
| | White Office Paper | Copy paper, notebook paper, receipts, envelopes, construction paper | R |
| | Box Board/Paperboard | Soda and beer cases, cereal boxes, frozen food containers | R |
| | Compostable Paper | Soiled/wet paper, paper contaminated with food products such as paper towels | C |
| | Other Paper | Paper with plastic films/non-recyclable coating | ND |
| Plastics | PET Containers | Clear bottles (#1): soda bottles, water bottles, hand soap bottles | R |
| | HDPE Containers | (#2) Opaque white or natural translucent plastic bottles: milk jugs, cleaning products, shampoo bottles, laundry or dish detergent bottles | R |
| | Other Plastic Containers | Bottles, tubs, jars, any food or beverage container such as sour cream tubs | R |
| | Plastic Films | Cling wrap, product packaging | ND |
| | Polystyrene | Styrofoam (#6) packaging, cups, trays | ND |
| | Rigid Plastics | Plastic furniture, bins/crates, buckets; made from a mix of plastics | ND |
| Organics | Food Waste | Excess food scraps, rotted fruits/vegetables, meat & animal parts | C |
| | Yard Waste | Leaves, grass, weeds | C |
| | Textiles | Cloth, rubber, leather; clothing, shoes | O |
| | Wood | Clean lumber, treated/painted lumber | O |
| | Furniture | Couch, chair, wooden table | ND |
| Metals | Aluminum Cans | Soda cans, some aerosol cans | R |
| | Steel Cans | Food containers (canned soup, vegetables, etc.), some aerosol cans | R |
| | Other Ferrous Metals | Pipes, bolts, metal alloys with iron | R |
| | Other Non-Ferrous Metals | Copper wire, brass clasps, aluminum scraps | R |

Recyclable
 Compostable
 Other Divertible
 Non-Divertible

Table 1. Material Categories and Examples (Cont.)

| | Material Categories | Examples | Type |
|----------------------------------|--------------------------------|---|------|
| Inorganics | Glass Containers | Glass bottles, glass Tupperware, glass dishwares | R |
| | Drywall/Sheetrock | Drywall fragments, paneling | ND |
| | Ceiling Tiles | Pieces of ceiling tiling (not drywall), linoleum/vinyl tiles | ND |
| | Electronics | Cell phones, chargers, computers and related equipment | O |
| | Other C&D | Vinyl siding, concrete, bricks, rocks, construction debris, window glass | ND* |
| | Latex Paint | Spray paint, house paint | O |
| Household Hazardous Wastes (HHW) | Batteries | Lithium ion batteries, car batteries, electronic batteries | O |
| | Solvents/Corrosives/Flammables | Gasoline, anti-freeze, motor oil, hair spray/aerosols, nail polish remover; cleaning products: Clorox, Windex, etc. | O |
| | Medical Waste | Needles, disposable masks, used bandages | ND |
| | Other HHW | Light bulbs | ND* |
| Other | Fines | Materials too small and commingled to be separated or recycled: coffee grounds, plastic pieces, straw wrappers, paper clips | ND |
| | Other Uncategorized | General MSW that does not fit into any other category, including wax candles, vacuum bags, ice packs, animal feces, and other small or indistinguishable materials. | ND |

Recyclable
 Compostable
 Other Divertible
 Non-Divertible

The “Other Divertible” category denotes materials that cannot go directly into the recycling bin, but can be recycled in special facilities.

*Clean concrete, bricks, rocks, and fluorescent light bulbs are divertible but were not separated during the sort according to the categories specified in the agreement between SCS and Buncombe County Solid Waste Department.

Bulky/Self-Haul Sort

Some loads that enter the Transfer Station may be too bulky or heavy to move and sort by hand. In order to get an accurate representation of these loads, the contents are visually characterized by volume. The volume of the waste (measured in cubic yards) is then converted to weight with established density factors for each material. The average weight of different types of trash can give insight into how much of each material is coming into the landfill from self-haul and bulky loads—and then how much of it can be diverted from being landfilled.

The composition based on density-adjusted weights is presented in **Table 9** (page 20). **Table 2** describes the categories of the visual characterization and the corresponding diversion status.

Table 2. Bulky Material Categories and Examples

| Bulky Material Categories | Description/Examples | Type |
|---------------------------|---|------|
| Yard Waste | Leaves, grass, weeds | C |
| Shingles | Bulky roofing materials made from asphalt | OD |
| Concrete/Brick/Rock | Large and heavy construction debris from walls and walkways | OD |
| Clean Lumber | Non-treated wood; construction & demolition or yard waste from chopped down trees | OD |
| Painted/Treated Lumber | Wood that has been stained or painted: fencing/C&D | ND |
| Cardboard | Corrugated cardboard boxes for shipping or packing | R |
| Vinyl Siding | C&D: house siding made from vinyl material | ND |
| Dry Wall | C&D: large pieces of drywall/sheetrock | ND |
| Window Glass | Large window panes from C&D | ND |
| Agricultural Waste | Large-scale organic waste: food products and byproducts, animal waste | C |
| Ferrous Metals | Metal alloys with iron (steel piping/large machinery) | R |
| Non-Ferrous Metals | Aluminum, copper, and other metal scraps and debris | R |
| Bagged MSW | Coagulation of waste products that are bagged and too commingled to sort | ND |
| Furniture | Large couches, chairs, tables | ND |

Recyclable
 Compostable
 Other Divertible
 Non-Divertible

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2 RESULTS

The data from the waste characterization is summarized in the following figures and tables. All percentages account for the average composition of the samples calculated from the weight of the waste type divided by the total weight of the sample. The tables contain the variability (standard deviation) of the waste data and a 90 percent confidence interval. This means that based on the data, there is a 90 percent likelihood that the actual average percent composition for each waste category from each respective population is between the lower and upper limits of the interval.

RESIDENTIAL WASTE STREAM

Twenty-two waste deliveries from residential curbside collection in Buncombe County were sampled for manual characterization. The samples, on average, weighed 213 pounds. The goal of this analysis is to identify opportunities for expanded diversion of materials being landfilled.

Overall

Figure 1 displays the overall distribution of residential wastes throughout Buncombe County, with the caveat of missing data from residential areas that deliver their waste straight to the landfill in Alexander, North Carolina. The data is averaged with a 50-50 percent weight between waste collected from the city of Asheville and outside of Asheville. The left chart shows the sampled stream composition by material category; the right chart breaks the categories down by material divertibility.

Figure 1. Overall Residential Waste Stream

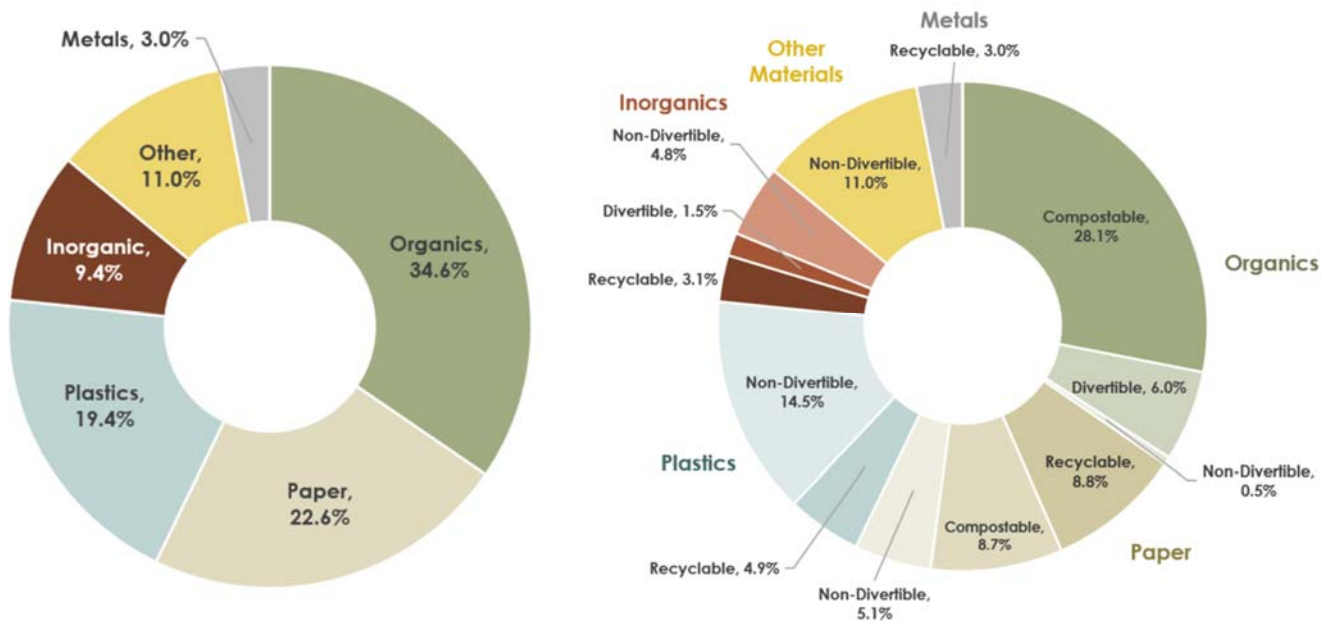


Table 3 (refer to the next page) shows the breakdown of the waste categories for all of Buncombe County based on the collected samples from the Transfer Station. Compostable paper, box board, and cardboard—all of which are divertible—make up a large portion of the Paper category. Organics is a majority food waste by weight, which can be diverted to existing food scrap compost sites.

Table 3. Overall Residential Waste Composition

| MATERIAL | | Mean Composition | Standard Deviation | Confidence Limits | |
|-------------------------|-------------------------------|-----------------------------|-----------------------|-------------------|-------|
| | | | | Lower | Upper |
| RECYCLABLE | | | | | |
| Paper | Newspapers/Magazines | 1.4% | 2.4% | 0.6% | 2.3% |
| | Corrugated Cardboard | 3.2% | 1.6% | 2.6% | 3.8% |
| | White Office Paper | 1.5% | 1.3% | 1.0% | 1.9% |
| | Box Board/Paperboard | 2.7% | 1.8% | 2.1% | 3.4% |
| Plastic | PET Containers | 2.8% | 1.6% | 2.3% | 3.4% |
| | HDPE Containers | 0.9% | 0.5% | 0.7% | 1.1% |
| | Other Plastic Containers | 1.2% | 0.8% | 0.9% | 1.5% |
| Metal | Aluminum Cans | 0.8% | 0.6% | 0.6% | 1.1% |
| | Steel Cans | 0.6% | 0.4% | 0.4% | 0.7% |
| | Ferrous Metals | 1.1% | 1.6% | 0.6% | 1.7% |
| | Other Non-Ferrous Materials | 0.5% | 0.6% | 0.3% | 0.7% |
| Inorganic | Glass Containers | 3.1% | 2.6% | 2.2% | 4.0% |
| | | Total Recyclable | 19.9% | | |
| COMPOSTABLE | | | | | |
| Organic | Food Waste | 22.0% | 5.0% | 20.2% | 23.7% |
| | Yard Waste | 6.1% | 5.1% | 4.3% | 7.9% |
| Paper | Compostable Paper | 8.7% | 2.2% | 7.9% | 9.5% |
| | | Total Compostable | 36.8% | | |
| OTHER DIVERTIBLE | | | | | |
| Inorganic | Electronics | 0.9% | 1.4% | 0.4% | 1.4% |
| | Latex Paints | 0.6% | 1.5% | <0.1% | 1.1% |
| Organic | Cloth | 3.7% | 2.4% | 2.9% | 4.5% |
| | Wood | 2.3% | 2.9% | 1.3% | 3.3% |
| | Rubber | <0.1% | <0.1% | <0.1% | <0.1% |
| | Leather | <0.1% | <0.1% | N/A | N/A |
| HHW | Batteries | <0.1% | <0.1% | <0.1% | <0.1% |
| | Solvents/Corrosive/Flammable | <0.1% | <0.1% | N/A | N/A |
| | | Total Recyclable | 7.5% | | |
| NON-DIVERTIBLE | | | | | |
| Paper | Other Paper | 5.1% | 3.4% | 3.9% | 6.3% |
| Plastic | Plastic Films | 10.0% | 2.7% | 9.1% | 11.0% |
| | Polystyrene | 1.7% | 0.8% | 1.4% | 1.9% |
| | Rigid Plastic | 2.8% | 2.3% | 2.0% | 3.6% |
| Organic | Furniture | 0.5% | 2.4% | <0.1% | 1.3% |
| Inorganic | Other C&D | 4.7% | 4.5% | 3.1% | 6.3% |
| | Drywall/Sheetrock | <0.1% | 0.4% | <0.1% | 0.2% |
| | Ceiling Tiles | <0.1% | <0.1% | N/A | N/A |
| HHW | Medical Waste | <0.1% | <0.1% | N/A | N/A |
| | Other HHW | <0.1% | <0.1% | N/A | N/A |
| Other | Fines | <0.1% | <0.1% | N/A | N/A |
| | Other Uncategorized Materials | 11.0% | 3.1% | 9.9% | 12.3% |
| | | Total Non-Divertible | 35.9% | | |
| TOTAL | | 100.0% | | | |

Composition based on 22 samples

Confidence Limits are calculated at the 90% confidence level.

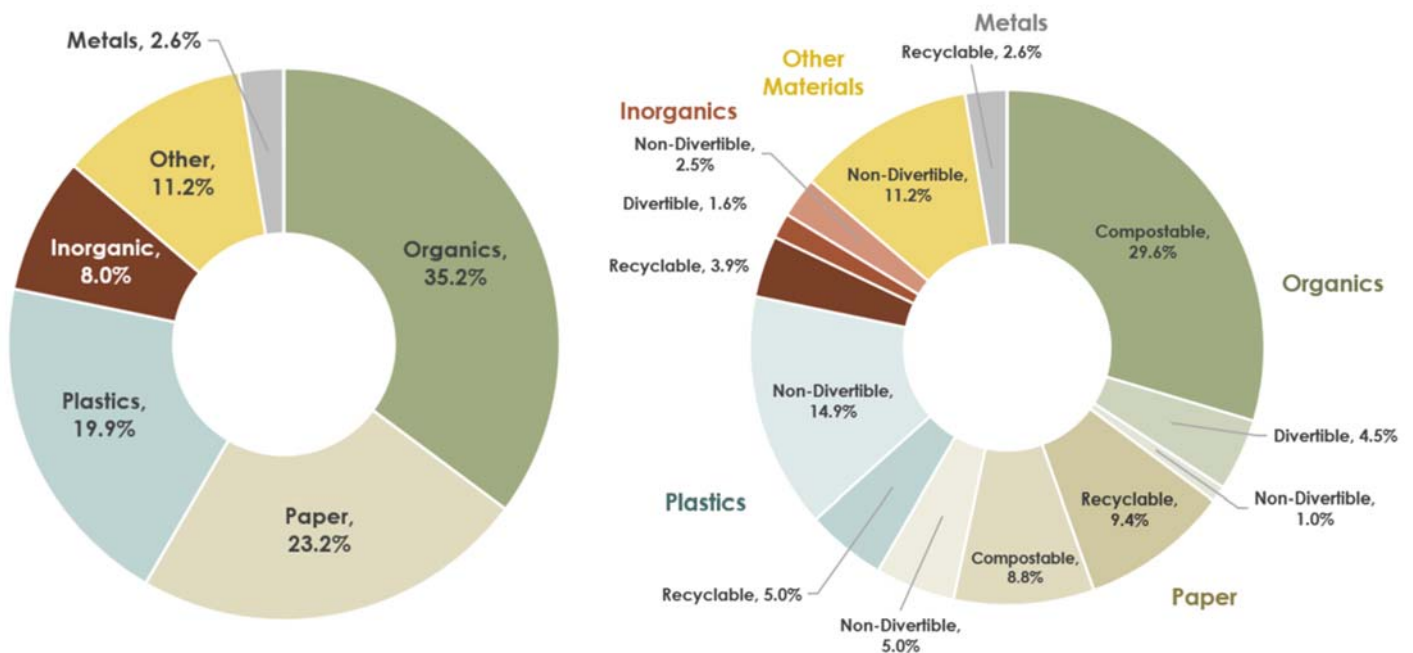
N/A indicates the material was not found while sampling so confidence intervals cannot be calculated.

Unincorporated Buncombe County

Since the City of Asheville encompasses a large portion of the population of Buncombe County, it is important to look at the rest of the county for a reliable statistical representation of the County's waste stream. See **Figure 11** (page 22) for a side-by-side visual comparison of the materials generated from residential and commercial sources within and outside of Asheville (unincorporated areas of the County).

The analysis of Buncombe County's residential waste in **Figure 2** shows a side-by-side breakdown of the material categories. The chart on the left shows the average total proportion of materials in the waste stream while the chart on the right shows the breakdown of each category by divertibility, **Figure 2** shows great potential for waste diversion by expanding composting projects. There are also opportunities for recycling diversion in recyclable paper, totaling to an average of 9.4 percent of the sampled waste stream.

Figure 2. Buncombe County Residential Waste Stream



The residential waste characterization from Buncombe County outside Asheville is further broken down in **Table 4** (refer to the next page). The most significant component of the waste stream from rural residential areas of the County is organic food waste, which can be composted to divert it from the landfill.

Table 4. Buncombe County Residential Waste Composition

| MATERIAL | | Mean Composition | Standard Deviation | Confidence Limits | |
|-----------------------------|-------------------------------|---------------------|-----------------------|-------------------|-------|
| | | | | Lower | Upper |
| RECYCLABLE | | | | | |
| Paper | Newspapers/Magazines | 0.8% | 0.4% | 0.6% | 1.0% |
| | Corrugated Cardboard | 3.8% | 1.8% | 2.9% | 4.7% |
| | White Office Paper | 1.8% | 1.4% | 1.1% | 2.5% |
| | Box Board/Paperboard | 3.0% | 2.5% | 1.7% | 4.2% |
| Plastic | PET Containers | 3.2% | 1.5% | 2.4% | 3.9% |
| | HDPE Containers | 0.8% | 0.6% | 0.5% | 1.1% |
| | Other Plastic Containers | 1.0% | 0.7% | 0.7% | 1.4% |
| Metal | Aluminum Cans | 0.9% | 0.5% | 0.7% | 1.2% |
| | Steel Cans | 0.5% | 0.3% | 0.4% | 0.7% |
| | Ferrous Metals | 0.6% | 1.2% | <0.1% | 1.2% |
| | Other Non-Ferrous Materials | 0.6% | 0.8% | 0.2% | 1.0% |
| Inorganic | Glass Containers | 3.9% | 3.3% | 2.2% | 5.5% |
| Total Recyclable | | 20.8% | | | |
| COMPOSTABLE | | | | | |
| Organic | Food Waste | 22.1% | 5.1% | 19.5% | 24.6% |
| | Yard Waste | 7.5% | 5.8% | 4.7% | 10.4% |
| Paper | Compostable Paper | 8.8% | 2.9% | 7.4% | 10.2% |
| Total Compostable | | 38.5% | | | |
| OTHER DIVERTIBLE | | | | | |
| Inorganic | Electronics | 1.0% | 1.5% | 0.3% | 1.8% |
| | Latex Paints | 0.5% | 1.2% | <0.1% | 1.1% |
| Organic | Cloth | 3.4% | 2.2% | 2.3% | 4.5% |
| | Wood | 1.1% | 1.2% | 0.5% | 1.7% |
| | Rubber | <0.1% | <0.1% | N/A | N/A |
| | Leather | <0.1% | <0.1% | N/A | N/A |
| HHW | Batteries | <0.1% | <0.1% | <0.1% | <0.1% |
| | Solvents/Corrosive/Flammable | <0.1% | <0.1% | N/A | N/A |
| Total Recyclable | | 6.1% | | | |
| NON-DIVERTIBLE | | | | | |
| Paper | Other Paper | 5.0% | 2.8% | 3.6% | 6.4% |
| Plastic | Plastic Films | 10.5% | 2.2% | 9.4% | 11.5% |
| | Polystyrene | 1.7% | 0.8% | 1.4% | 2.1% |
| | Rigid Plastic | 2.7% | 1.8% | 1.8% | 3.5% |
| Organic | Furniture | 1.0% | 3.4% | <0.1% | 2.7% |
| Inorganic | Other C&D | 2.4% | 3.2% | 0.8% | 3.9% |
| | Drywall/Sheetrock | 0.2% | 0.6% | <0.1% | 0.5% |
| | Ceiling Tiles | <0.1% | <0.1% | N/A | N/A |
| HHW | Medical Waste | <0.1% | <0.1% | N/A | N/A |
| | Other HHWs | <0.1% | <0.1% | N/A | N/A |
| Other | Fines | <0.1% | <0.1% | N/A | N/A |
| | Other Uncategorized Materials | 11.2% | 3.9% | 9.2% | 13.1% |
| Total Non-Divertible | | 34.6% | | | |
| TOTAL | | 100.0% | | | |

Composition based on 11 samples

Confidence Limits are calculated at the 90% confidence level.

N/A indicates the material was not found while sampling so confidence intervals cannot be calculated.

Asheville

The residential areas of Asheville are of interest in order to assess how effectively individuals and residences are diverting their waste and utilizing the existing recycling programs. By identifying weaknesses and areas for growth, a plan can be made to expand the recycling program and reduce Buncombe County’s quantity of landfilled waste.

Figure 3 shows the materials entering the Transfer Station from residences in the City of Asheville. The two pie charts display the percentage of each material category found in the sampled waste stream, as well as the breakdown of each category by divertibility. The most significant materials are organics, paper, and plastics, much of which can be diverted through composting and recycling the paper and organic, according to the chart on the right. However, a large majority of plastics are non-recyclable plastic films, and as of right now there is no way to divert these from the waste stream.

Figure 3. Asheville Residential Waste Stream

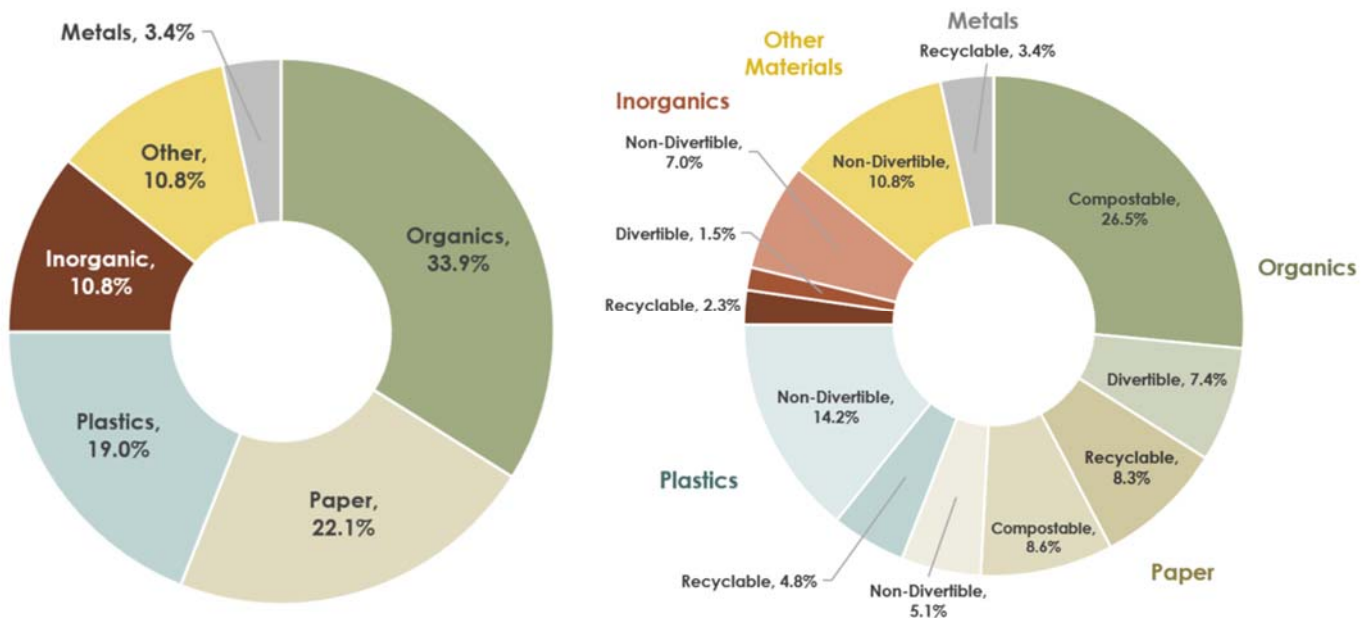


Table 5 breaks down residential waste from Asheville based on the manually characterized samples (see next page). Organics is mostly comprised of compostable food waste and some yard waste that can be diverted through Buncombe’s Drop-Off program for food scraps and yard trimmings.

Table 5. Asheville Residential Waste Composition

| MATERIAL | | Mean Composition | Standard Deviation | Confidence Limits | |
|-------------------------|-------------------------------|-----------------------------|-----------------------|-------------------|-------|
| | | | | Lower | Upper |
| RECYCLABLE | | | | | |
| Paper | Newspapers/Magazines | 2.1% | 3.3% | 0.4% | 3.7% |
| | Corrugated Cardboard | 2.6% | 1.3% | 2.0% | 3.2% |
| | White Office Paper | 1.1% | 1.1% | 0.6% | 1.6% |
| | Box Board/Paperboard | 2.5% | 0.8% | 2.2% | 2.9% |
| Plastic | PET Containers | 2.5% | 1.7% | 1.7% | 3.3% |
| | HDPE Containers | 0.9% | 0.5% | 0.7% | 1.2% |
| | Other Plastic Containers | 1.4% | 1.0% | 0.9% | 1.9% |
| Metal | Aluminum Cans | 0.8% | 0.7% | 0.4% | 1.1% |
| | Steel Cans | 0.6% | 0.4% | 0.4% | 0.8% |
| | Ferrous Metals | 1.6% | 1.8% | 0.7% | 2.5% |
| | Other Non-Ferrous Materials | 0.4% | 0.4% | 0.2% | 0.6% |
| Inorganic | Glass Containers | 2.3% | 1.4% | 1.6% | 3.0% |
| | | Total Recyclable | 18.9% | | |
| COMPOSTABLE | | | | | |
| Organic | Food Waste | 21.9% | 5.1% | 19.3% | 24.4% |
| | Yard Waste | 4.7% | 4.0% | 2.7% | 6.6% |
| Paper | Compostable Paper | 8.6% | 1.4% | 7.9% | 9.3% |
| | | Total Compostable | 35.1% | | |
| OTHER DIVERTIBLE | | | | | |
| Inorganic | Electronics | 0.8% | 1.3% | 0.2% | 1.5% |
| | Latex Paints | 0.7% | 1.8% | <0.1% | 1.6% |
| Organic | Cloth | 4.0% | 2.6% | 2.7% | 5.3% |
| | Wood | 3.4% | 3.6% | 1.6% | 5.2% |
| | Rubber | <0.1% | <0.1% | <0.1% | <0.1% |
| | Leather | <0.1% | <0.1% | N/A | N/A |
| HHW | Batteries | <0.1% | <0.1% | N/A | N/A |
| | Solvents/Corrosive/Flammable | <0.1% | <0.1% | N/A | N/A |
| | | Total Recyclable | 8.9% | | |
| NON-DIVERTIBLE | | | | | |
| Paper | Other Paper | 5.1% | 4.0% | 3.2% | 7.1% |
| Plastic | Plastic Films | 9.6% | 3.3% | 8.0% | 11.2% |
| | Polystyrene | 1.6% | 0.8% | 1.2% | 2.0% |
| | Rigid Plastic | 3.0% | 2.8% | 1.6% | 4.4% |
| Organic | Furniture | <0.1% | <0.1% | N/A | N/A |
| Inorganic | Other C&D | 7.0% | 4.6% | 4.7% | 9.3% |
| | Drywall/Sheetrock | <0.1% | <0.1% | N/A | N/A |
| | Ceiling Tiles | <0.1% | <0.1% | N/A | N/A |
| HHW | Medical Waste | <0.1% | <0.1% | N/A | N/A |
| | Other HHWs | <0.1% | <0.1% | N/A | N/A |
| Other | Fines | <0.1% | <0.1% | N/A | N/A |
| | Other Uncategorized Materials | 10.8% | 2.1% | 9.7% | 11.9% |
| | | Total Non-Divertible | 37.1% | | |
| TOTAL | | | 100.0% | | |

Composition based on 11 samples

Confidence Limits are calculated at the 90% confidence level.

N/A indicates the material was not found while sampling so confidence intervals cannot be calculated.

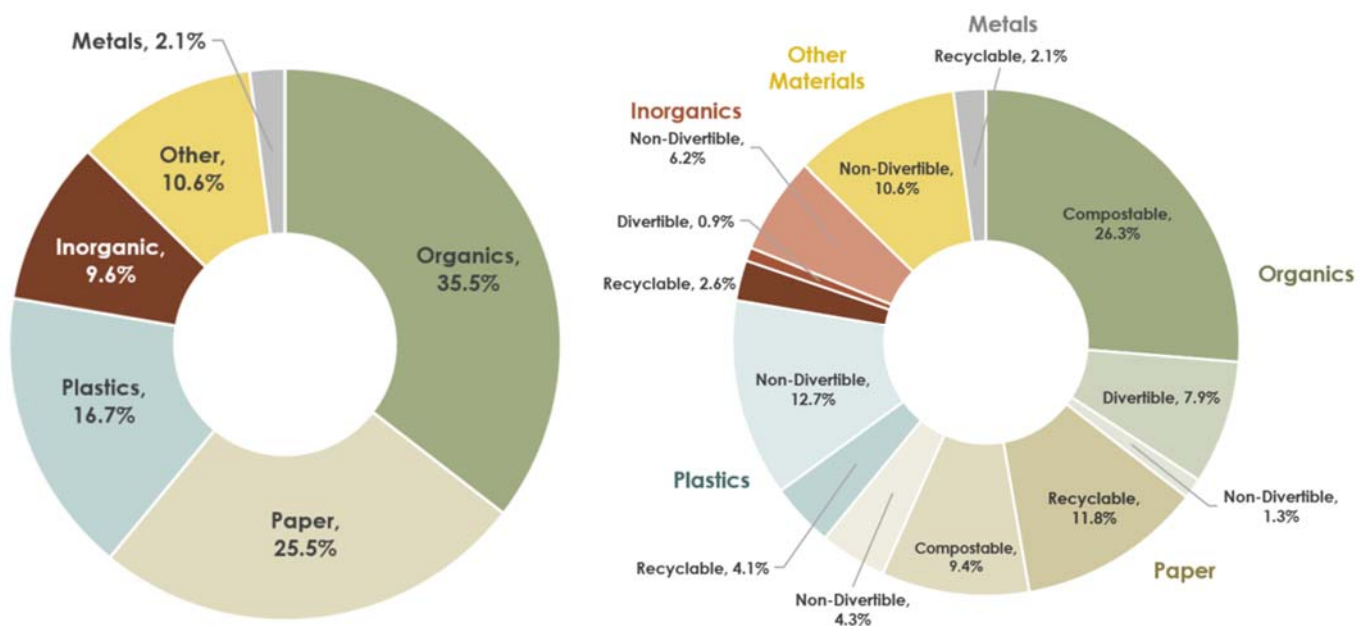
COMMERCIAL WASTE STREAM

Twenty-three waste deliveries of waste from commercial establishments in Buncombe County were sampled for manual characterization. The samples, on average, weighed 215 pounds. Commercial waste is important to examine separately because commercial waste streams are more variable than residential waste. Loads collected from food generators (restaurants, grocery stores, institutional kitchens, etc.) will have higher quantities of food scraps than loads collected from offices and retail establishments.

Overall

Figure 4 displays the overall distribution of commercial wastes throughout Buncombe County with the caveat of missing data from commercial areas that are delivered directly to the landfill in Alexander, North Carolina. The data is averaged with a 50-50 percent distribution between waste collected from the City of Asheville and outside of Asheville. The left chart shows the sampled stream composition by material category, while the chart on the right further breaks the categories down by material divertibility.

Figure 4. Overall Commercial Waste Stream



A breakdown of the waste categories by waste type for the commercial sector of Buncombe County is presented in **Table 6** (refer to the next page). A majority of the organic materials from the commercial waste stream is comprised of food waste. Additionally, a significant portion of commercial paper is corrugated cardboard. This data shows promising opportunity for diversion of these materials from being landfilled.

Table 6. Overall Commercial Waste Composition

| MATERIAL | | Mean Composition | Standard Deviation | Confidence Limits | |
|-----------------------------|-------------------------------|---------------------|-----------------------|-------------------|-------|
| | | | | Lower | Upper |
| RECYCLABLE | | | | | |
| Paper | Newspapers/Magazines | 0.9% | 0.5% | 0.7% | 1.1% |
| | Corrugated Cardboard | 7.0% | 6.2% | 4.9% | 9.2% |
| | White Office Paper | 1.1% | 0.7% | 0.8% | 1.3% |
| | Box Board/Paperboard | 2.8% | 1.9% | 2.1% | 3.4% |
| Plastic | PET Containers | 2.2% | 1.7% | 1.7% | 2.8% |
| | HDPE Containers | 1.0% | 0.8% | 0.8% | 1.3% |
| | Other Plastic Containers | 0.8% | 0.5% | 0.7% | 1.0% |
| Metal | Aluminum Cans | 0.6% | 0.5% | 0.4% | 0.8% |
| | Steel Cans | 0.4% | 0.4% | 0.3% | 0.6% |
| | Ferrous Metals | 0.8% | 1.3% | 0.4% | 1.2% |
| | Other Non-Ferrous Materials | 0.3% | 0.6% | <0.1% | 0.5% |
| Inorganic | Glass Containers | 2.6% | 2.6% | 1.7% | 3.5% |
| Total Recyclable | | 20.5% | | | |
| COMPOSTABLE | | | | | |
| Organic | Food Waste | 24.3% | 15.0% | 19.1% | 29.4% |
| | Yard Waste | 2.0% | 3.6% | 0.8% | 3.2% |
| Paper | Compostable Paper | 9.4% | 2.9% | 8.4% | 10.4% |
| Total Compostable | | 35.7% | | | |
| OTHER DIVERTIBLE | | | | | |
| Inorganic | Electronics | 0.8% | 1.7% | 0.2% | 1.4% |
| | Latex Paints | <0.1% | 0.4% | N/A | N/A |
| Organic | Cloth | 4.0% | 4.9% | 2.4% | 5.7% |
| | Wood | 3.8% | 4.9% | 2.2% | 5.5% |
| | Rubber | <0.1% | <0.1% | N/A | N/A |
| | Leather | <0.1% | <0.1% | N/A | N/A |
| HHW | Batteries | <0.1% | <0.1% | <0.1% | <0.1% |
| | Solvents/Corrosive/Flammable | <0.1% | <0.1% | N/A | N/A |
| Total Recyclable | | 8.8% | | | |
| NON-DIVERTIBLE | | | | | |
| Paper | Other Paper | 4.3% | 2.7% | 3.3% | 5.2% |
| Plastic | Plastic Films | 8.9% | 3.5% | 7.7% | 10.1% |
| | Polystyrene | 1.3% | 0.9% | 1.0% | 1.6% |
| | Rigid Plastic | 2.4% | 1.5% | 1.9% | 3.0% |
| Organic | Furniture | 1.3% | 3.1% | 0.3% | 2.4% |
| Inorganic | Other C&D | 5.0% | 6.8% | 2.6% | 7.3% |
| | Drywall/Sheetrock | 1.1% | 3.2% | <0.1% | 2.2% |
| | Ceiling Tiles | 0.1% | 0.4% | <0.1% | 0.2% |
| HHW | Medical Waste | <0.1% | <0.1% | N/A | N/A |
| | Other HHWs | <0.1% | <0.1% | N/A | N/A |
| Other | Fines | <0.1% | 0.4% | N/A | N/A |
| | Other Uncategorized Materials | 10.5% | 3.7% | 9.3% | 11.8% |
| Total Non-Divertible | | 35.1% | | | |
| TOTAL | | 100.0% | | | |

Composition based on 23 samples

Confidence Limits are calculated at the 90% confidence level.

N/A indicates the material was not found while sampling so confidence intervals cannot be calculated.

Unincorporated Buncombe County

Looking at commercial entities in the rest of Buncombe County is important to get a representation of rural communities and businesses. Summing these samples together give a more reliable statistical representation of the waste going to the Transfer Station. However, part of the representation of the County is missing from the samples due to some routes going directly to the landfill on the north side.

The waste characterization of commercial establishments outside of Asheville is depicted in **Figure 5**. The chart on the left shows the breakdown of material categories, and the chart on the right further breaks those categories down by divertibility potential. Commercial waste from the rest of the County has 10% more organics than commercial waste from Asheville. This data indicates that it is important to target the community—especially commercial entities outside the City of Asheville—with composting programs to reduce organic waste produced in restaurants and grocery stores. The rightmost chart shows that a majority of organic waste is compostable or otherwise divertible.

Figure 5. Buncombe County Commercial Waste Stream

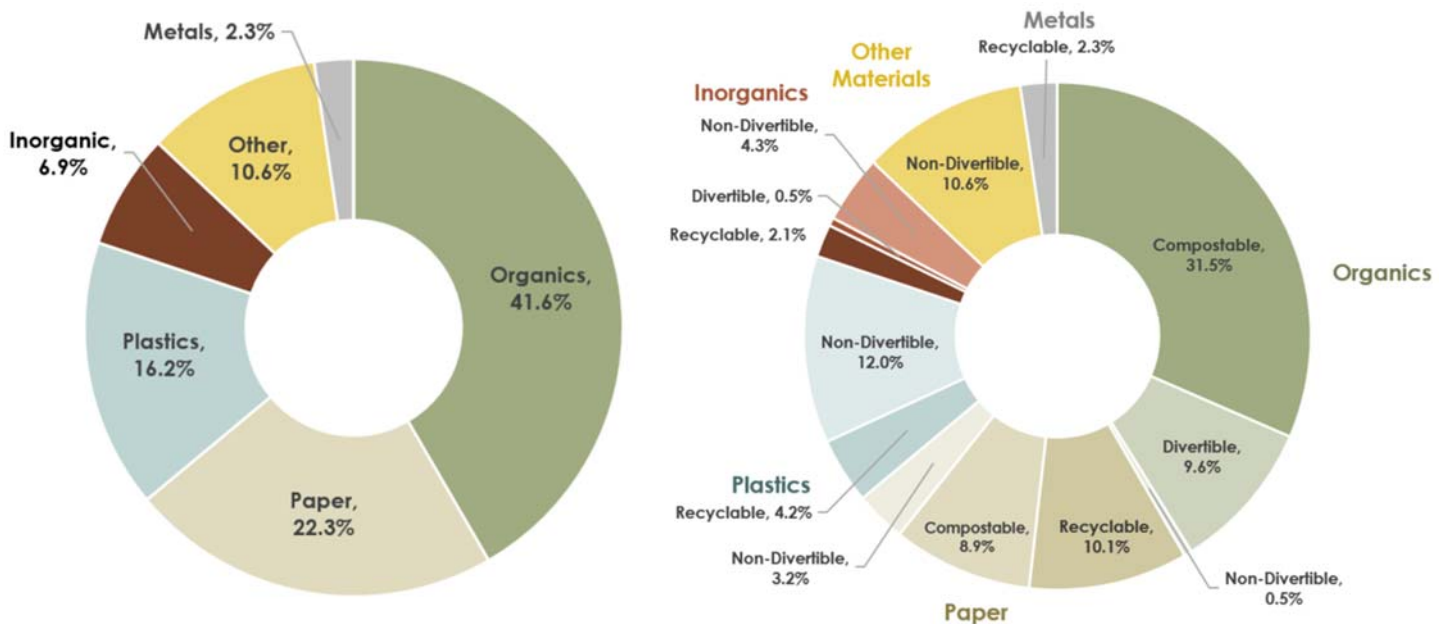


Table 7 gives a more thorough breakdown of the waste materials by waste types, along with their average composition (refer to the next page).

Table 7. Buncombe County Commercial Waste Composition

| MATERIAL | | Mean Composition | Standard Deviation | Confidence Limits | |
|-----------------------------|-------------------------------|---------------------|-----------------------|-------------------|-------|
| | | | | Lower | Upper |
| RECYCLABLE | | | | | |
| Paper | Newspapers/Magazines | 0.9% | 0.6% | 0.6% | 1.3% |
| | Corrugated Cardboard | 4.2% | 2.1% | 3.2% | 5.3% |
| | White Office Paper | 1.3% | 0.9% | 0.8% | 1.8% |
| | Box Board/Paperboard | 3.7% | 2.3% | 2.5% | 4.8% |
| Plastic | PET Containers | 2.6% | 1.9% | 1.7% | 3.6% |
| | HDPE Containers | 0.8% | 0.5% | 0.6% | 1.0% |
| | Other Plastic Containers | 0.8% | 0.5% | 0.5% | 1.0% |
| Metal | Aluminum Cans | 0.7% | 0.6% | 0.5% | 1.0% |
| | Steel Cans | 0.5% | 0.3% | 0.3% | 0.6% |
| | Ferrous Metals | 1.0% | 1.3% | 0.3% | 1.6% |
| | Other Non-Ferrous Materials | 0.2% | 0.2% | <0.1% | 0.3% |
| Inorganic | Glass Containers | 2.1% | 0.9% | 1.6% | 2.6% |
| Total Recyclable | | 18.8% | | | |
| COMPOSTABLE | | | | | |
| Organic | Food Waste | 28.5% | 17.7% | 19.7% | 37.3% |
| | Yard Waste | 3.0% | 4.0% | 1.1% | 5.0% |
| Paper | Compostable Paper | 8.9% | 3.1% | 7.4% | 10.5% |
| Total Compostable | | 40.4% | | | |
| OTHER DIVERTIBLE | | | | | |
| Inorganic | Electronics | 0.5% | 1.0% | <0.1% | 1.0% |
| | Latex Paints | <0.1% | <0.1% | N/A | N/A |
| Organic | Cloth | 6.3% | 6.0% | 3.4% | 9.3% |
| | Wood | 3.3% | 3.7% | 1.4% | 5.1% |
| | Rubber | <0.1% | <0.1% | N/A | N/A |
| | Leather | <0.1% | <0.1% | N/A | N/A |
| HHW | Batteries | <0.1% | <0.1% | <0.1% | <0.1% |
| | Solvents/Corrosive/Flammable | <0.1% | <0.1% | N/A | N/A |
| Total Recyclable | | 10.2% | | | |
| NON-DIVERTIBLE | | | | | |
| Paper | Other Paper | 3.2% | 1.7% | 2.4% | 4.1% |
| Plastic | Plastic Films | 8.3% | 3.7% | 6.5% | 10.2% |
| | Polystyrene | 1.1% | 0.7% | 0.8% | 1.5% |
| | Rigid Plastic | 2.5% | 1.6% | 1.8% | 3.3% |
| Organic | Furniture | 0.5% | 1.6% | <0.1% | 1.3% |
| Inorganic | Other C&D | 2.2% | 2.8% | 0.8% | 3.6% |
| | Drywall/Sheetrock | 2.0% | 4.5% | <0.1% | 4.2% |
| | Ceiling Tiles | 0.1% | 0.5% | <0.1% | 0.4% |
| HHW | Medical Waste | <0.1% | <0.1% | N/A | N/A |
| | Other HHWs | <0.1% | <0.1% | N/A | N/A |
| Other | Fines | <0.1% | <0.1% | N/A | N/A |
| | Other Uncategorized Materials | 10.6% | 4.1% | 8.6% | 12.6% |
| Total Non-Divertible | | 30.6% | | | |
| TOTAL | | 100.0% | | | |

Composition based on 11 samples

Confidence Limits are calculated at the 90% confidence level.

N/A indicates the material was not found while sampling so confidence intervals cannot be calculated.

Asheville

Figure 6 shows the percentages (by weight) of waste materials delivered to the Transfer Station from commercial routes. Similar to residential waste, commercial waste has the highest possibility for reduction in organics, paper, and plastics, according to the chart on the left. The chart on the right shows how each material category can be further diverted from landfills. It also shows that a majority of plastics entering landfills from the sampled commercial waste streams in Asheville are non-divertible plastics, especially plastic films, as shown in the following table.

Figure 6. Asheville Commercial Waste Stream

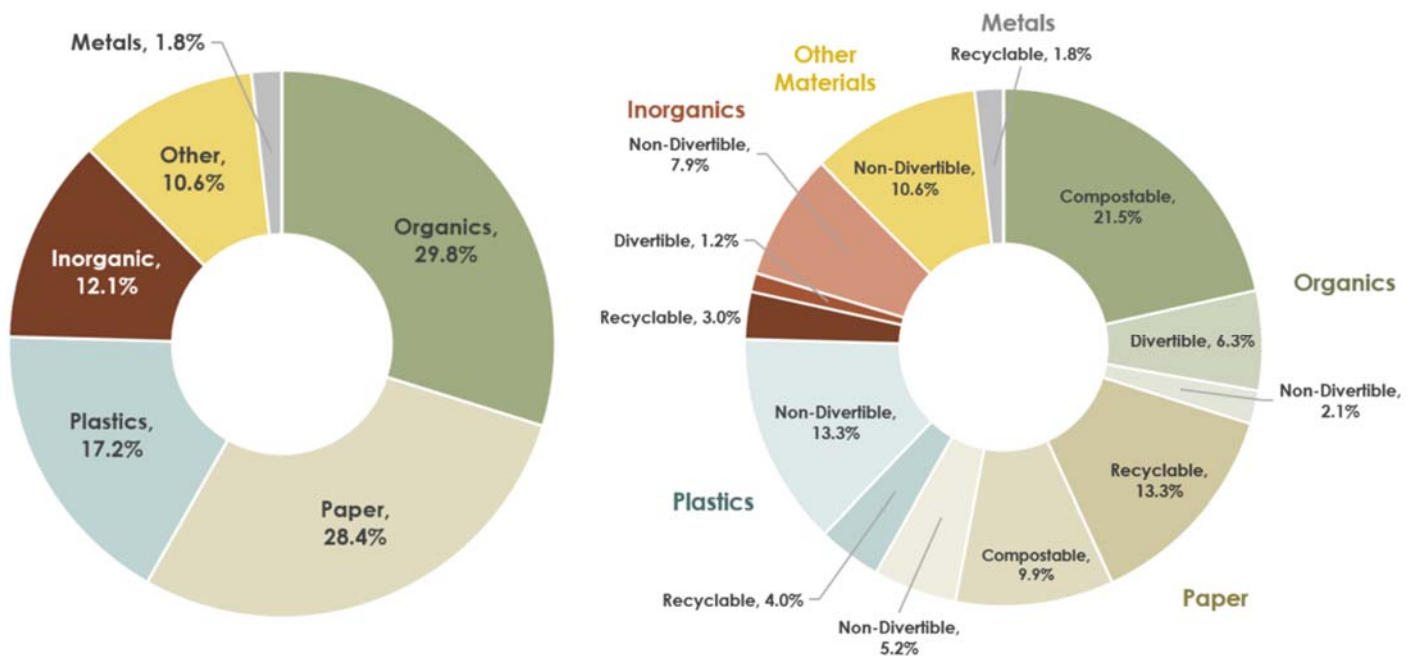


Table 8 shows the breakdown of each category by specific material type (refer to the next page). Paper materials in the commercial loads from Asheville contain a significantly larger proportion of cardboard than residential areas. Targeting commercially-generated cardboard for recycling along with composting increasing quantities of food scraps and compostable paper can reduce the quantity of commercial waste that is landfilled.

Table 8. Asheville Commercial Waste Composition

| MATERIAL | | Mean Composition | Standard Deviation | Confidence Limits | |
|-----------------------------|-------------------------------|---------------------|-----------------------|-------------------|-------|
| | | | | Lower | Upper |
| RECYCLABLE | | | | | |
| Paper | Newspapers/Magazines | 0.9% | 0.3% | 0.7% | 1.0% |
| | Corrugated Cardboard | 9.6% | 7.7% | 5.9% | 13.3% |
| | White Office Paper | 0.9% | 0.4% | 0.7% | 1.1% |
| | Box Board/Paperboard | 1.9% | 0.9% | 1.5% | 2.4% |
| Plastic | PET Containers | 1.8% | 1.3% | 1.2% | 2.5% |
| | HDPE Containers | 1.2% | 0.9% | 0.8% | 1.7% |
| | Other Plastic Containers | 0.9% | 0.5% | 0.7% | 1.1% |
| Metal | Aluminum Cans | 0.4% | 0.4% | 0.2% | 0.6% |
| | Steel Cans | 0.4% | 0.5% | 0.2% | 0.6% |
| | Ferrous Metals | 0.6% | 1.2% | <0.1% | 1.2% |
| | Other Non-Ferrous Materials | 0.4% | 0.7% | <0.1% | 0.7% |
| Inorganic | Glass Containers | 3.0% | 3.4% | 1.4% | 4.6% |
| Total Recyclable | | 22.1% | | | |
| COMPOSTABLE | | | | | |
| Organic | Food Waste | 20.4% | 11.1% | 15.1% | 25.7% |
| | Yard Waste | 1.1% | 3.4% | <0.1% | 2.7% |
| Paper | Compostable Paper | 9.9% | 2.7% | 8.6% | 11.1% |
| Total Compostable | | 31.3% | | | |
| OTHER DIVERTIBLE | | | | | |
| Inorganic | Electronics | 1.0% | 2.0% | <0.1% | 2.0% |
| | Latex Paints | 0.2% | 0.5% | <0.1% | 0.4% |
| Organic | Cloth | 1.9% | 2.9% | 0.5% | 3.3% |
| | Wood | 4.4% | 5.7% | 1.7% | 7.1% |
| | Rubber | <0.1% | <0.1% | N/A | N/A |
| | Leather | <0.1% | <0.1% | N/A | N/A |
| HHW | Batteries | <0.1% | <0.1% | N/A | N/A |
| | Solvents/Corrosive/Flammable | <0.1% | <0.1% | N/A | N/A |
| Total Recyclable | | 7.5% | | | |
| NON-DIVERTIBLE | | | | | |
| Paper | Other Paper | 5.2% | 3.2% | 3.7% | 6.7% |
| Plastic | Plastic Films | 9.4% | 3.4% | 7.7% | 11.0% |
| | Polystyrene | 1.5% | 0.9% | 1.1% | 2.0% |
| | Rigid Plastic | 2.4% | 1.5% | 1.6% | 3.1% |
| Organic | Furniture | 2.1% | 3.8% | 0.3% | 3.9% |
| Inorganic | Other C&D | 7.5% | 8.0% | 3.7% | 11.3% |
| | Drywall/Sheetrock | 0.3% | 1.0% | <0.1% | 0.8% |
| | Ceiling Tiles | <0.1% | 0.3% | <0.1% | 0.2% |
| HHW | Medical Waste | <0.1% | <0.1% | N/A | N/A |
| | Other HHWs | <0.1% | <0.1% | N/A | N/A |
| Other | Fines | 0.2% | 0.5% | <0.1% | 0.4% |
| | Other Uncategorized Materials | 10.5% | 3.4% | 8.9% | 12.1% |
| Total Non-Divertible | | 39.1% | | | |
| TOTAL | | 100.0% | | | |

Composition based on 12 samples

Confidence Limits are calculated at the 90% confidence level.

N/A indicates the material was not found while sampling so confidence intervals cannot be calculated.

OPPORTUNITIES FOR RECYCLING AND COMPOST

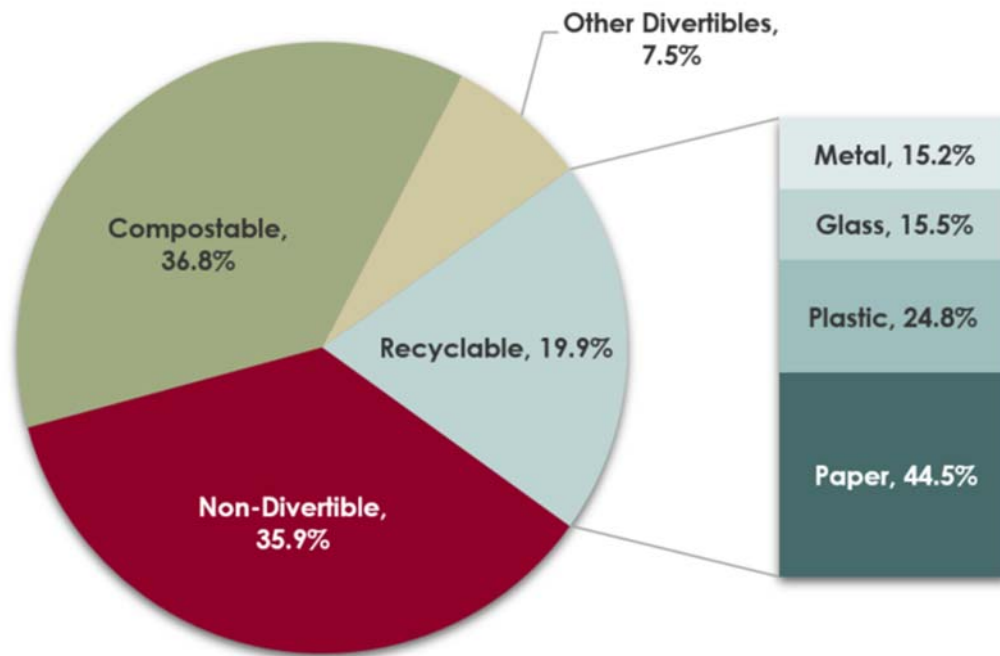
The results from the manual waste characterization sort were categorized under general labels of **recyclables**, **compostables**, **other divertibles**, and **non-divertibles**. The following graphs focus on recyclables and compostables in residential and commercial samples from Buncombe County.

Recycling

Franchised haulers offer curbside pickup to residences for recycling along with the waste for landfill. The County accepts plastic containers and bottles, paper products including cartons and cardboard, cans, as well as glass bottles and jars to be recycled.¹ **Figures 7-8** show the breakdown of recyclables that arrive from waste haulers at the Transfer Station.

Figure 7 shows the percent composition of recyclables from residential routes in Buncombe County. All of these products are accepted by the County and can be diverted from landfills. Paper makes up nearly half of recyclable materials, and another quarter is comprised of plastics.

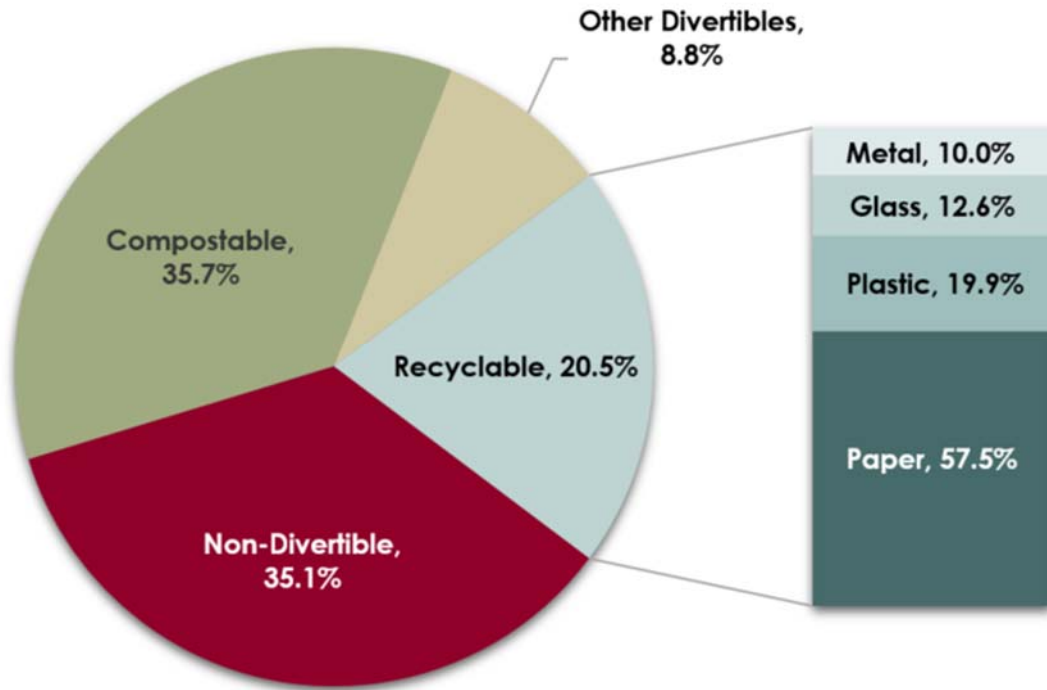
Figure 7. Residential Recyclables in Buncombe County Landfill



1. <https://lotsar.org/wp-content/uploads/2021/07/Recycling-Guide.pdf>

Figure 8 shows the percent composition of recyclables from commercial routes in Buncombe County. Recyclable commercial materials include a larger proportion of paper than recyclable materials from residential routes, totaling to nearly 60 percent.

Figure 8. Commercial Recyclables in Buncombe County Landfill



“Other divertibles,” as outlined in **Figure 1** (page 4), are materials that cannot be recycled at the recycling facility, but may still be diverted from the landfill. Some of these divertibles include clothing that can be donated rather than thrown out if in good condition. Other examples include electronics and some household hazardous wastes (HHW) that can be recycled during specific TV/Paint recycling days. These days can be found on the Buncombe County website under the recycling section, along with what materials are accepted.²

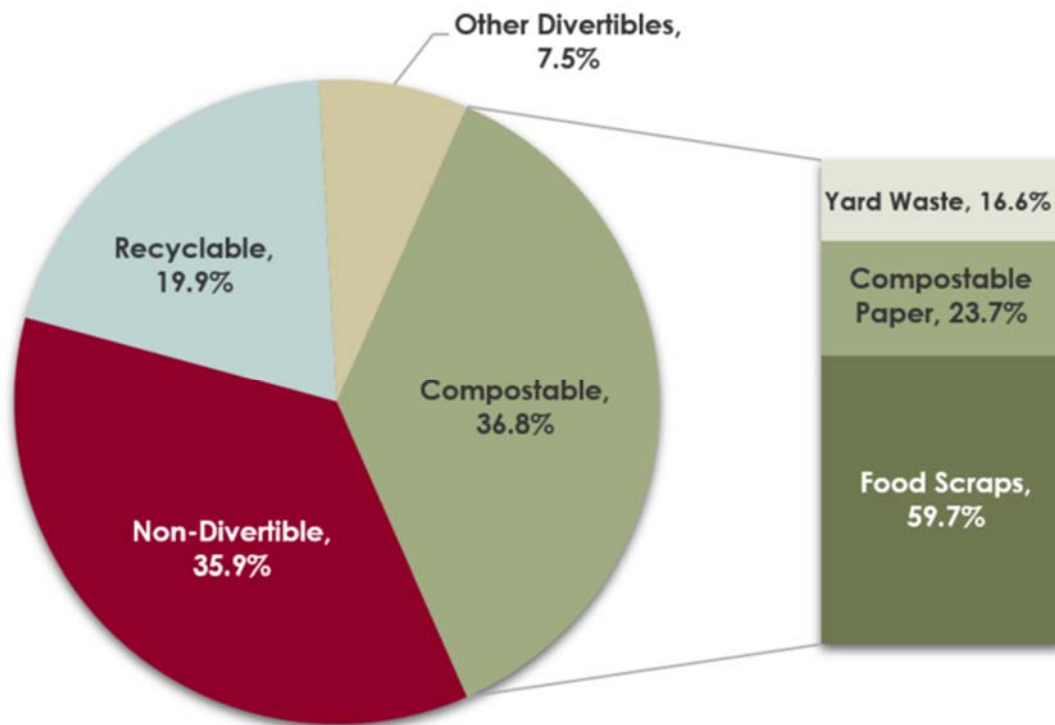
2. <https://www.buncombecounty.org/governing/depts/solid-waste/recycling.aspx#spa-blue-bag-recyclables>

Compost

Buncombe County does not have a commercial composting facility; however, they do encourage residents to compost their own food scraps, compostable paper products, and small yard trimmings. Residents may set up their own backyard compost, or they can drop off accepted compost materials to any of the two drop-off centers located in Asheville and at the Buncombe County Landfill.³ **Figures 9-10** show the breakdown of compostables out of waste streams arriving at the Transfer Station.

Figure 9 shows the percent composition of compostable organics from residential routes in Buncombe County. Over half of these materials are comprised of food scraps. Over 80 percent of residential compostables could be composted at the food scrap drop-offs in the County, not including small yard trimmings that were counted in the yard waste category.

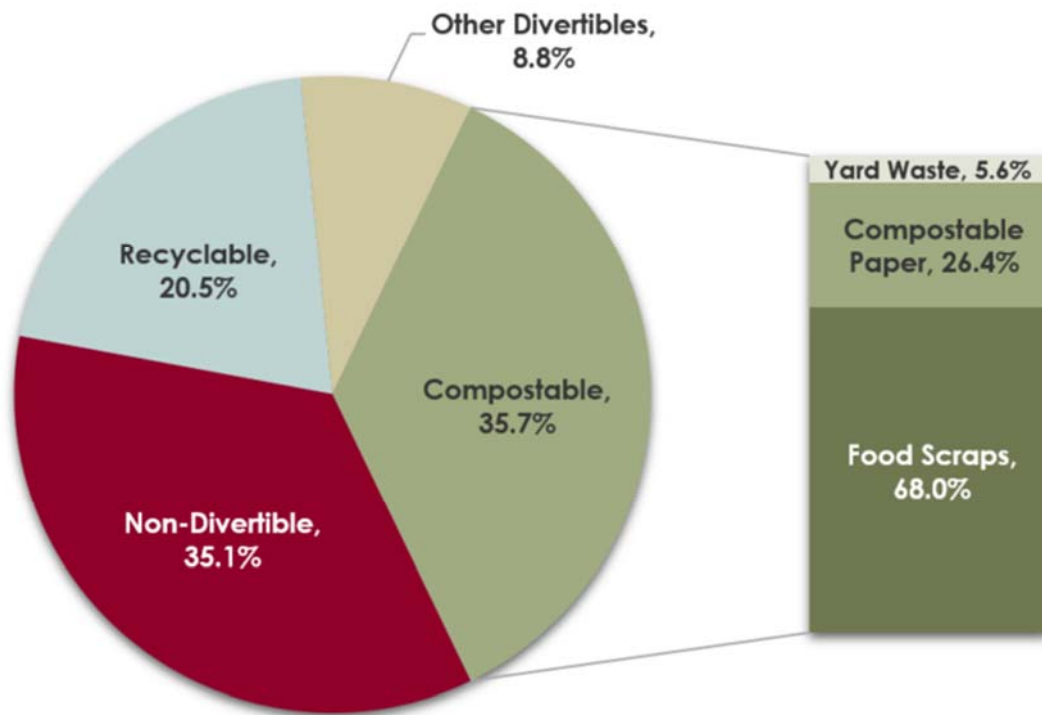
Figure 9. Residential Compostables in Buncombe County Landfill



3. <https://www.ashevillenc.gov/service/backyard-composting/>

Figure 10 shows the percent composition of compostable organics from commercial routes in Buncombe County. Almost 70 percent of these materials are food scraps, making up a higher proportion of commercial compostables than residential. These food scraps may come from restaurants or grocery stores. Currently, there is no clear organics diversion strategy for commercial entities in Buncombe County.

Figure 10. Commercial Compostables in Buncombe County Landfill



The data show that opportunities for expanded diversion in residential areas should target the following waste categories:

- **Compostable organics:** food waste (22.0 percent) and yard waste (6.1 percent)
- **Recyclable paper:** cardboard (3.2 percent) and box board (2.7 percent) and cardboard
- **Compostable paper** (8.7 percent)
- **Recyclable plastics:** PET (2.8 percent), Other Plastic Containers (1.2 percent)

The data shows that commercial establishments should target the following waste categories for diversion:

- **Compostable organics:** food waste (24.3 percent) and cloth (4.0 percent)
- **Recyclable paper:** cardboard (7.0 percent) and box board (2.8 percent)
- **Compostable paper** (9.4 percent)
- **Recyclable plastics:** PET Containers (2.2 percent)

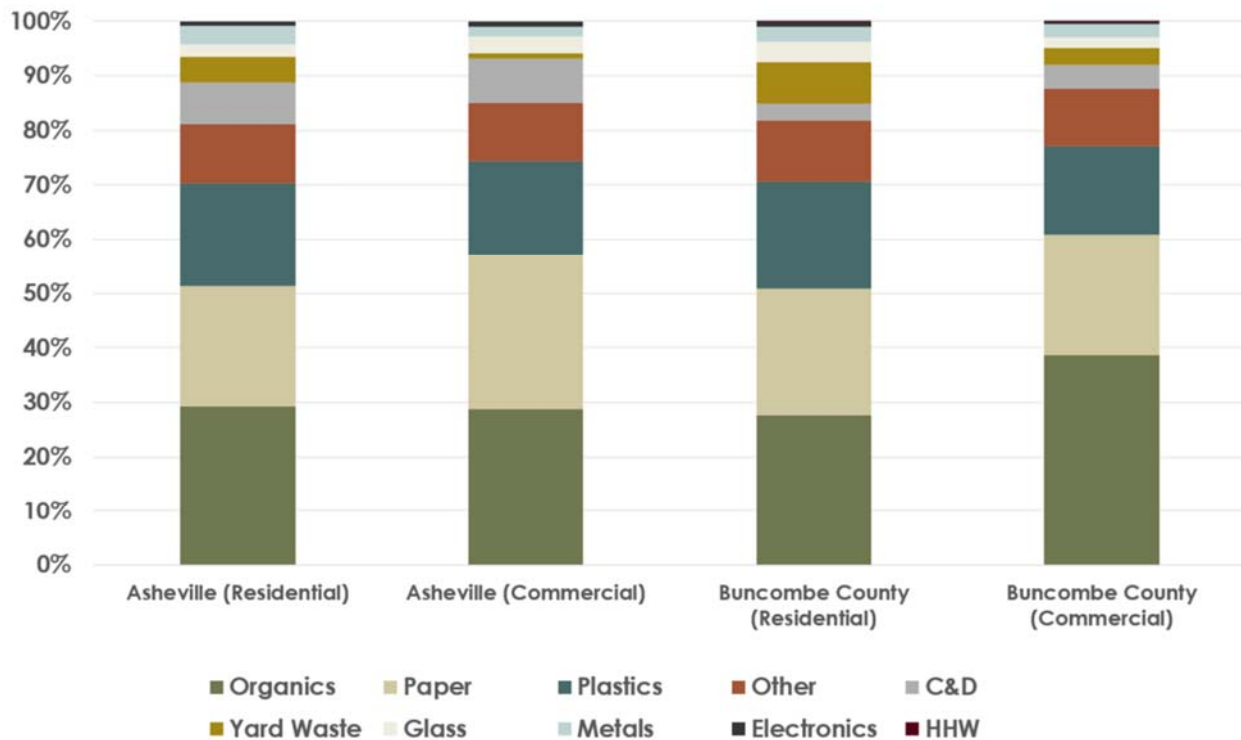
COMPARISON OF SECTORS

Figure 11 compares the percentages of waste types between residential and commercial wastes coming from both within and outside of Asheville. The graph displays the following assertions:

- Organics, paper, and plastics make up over 70 percent of waste across Buncombe County
- Residential groups dispose a higher proportion of plastics and yard waste
- Commercial waste in Asheville comprises the highest proportion of paper
- Commercial waste from outside Asheville comprises the highest proportion of organics
- C&D materials comprise higher portions of the waste stream generated in Asheville

Within the County, there is opportunity for waste diversion through increased composting and recycling. **Section 3** compares the Buncombe County data with other counties' waste distribution along with the implementation of diversion strategies.

Figure 11. Comparison of Waste in Buncombe County v. Asheville



BULKY AND SELF-HAUL LOADS

Loads entering the Transfer Station that are too bulky or complicated to manually sort were visually characterized by an estimate of their composition by volume. 64 samples were broken down into different categories of waste and were given weights based on density factors from the EPA, FEECO, and Tellus. In order to calculate the weight, the density factors were multiplied by the volume of each material in cubic yards. The percent composition was then calculated with the weight of each material divided by the total weight of the load.

Table 9 shows the average percent composition of each material type. Based on the visual characterization, furniture, bagged MSW, lumber, and yard waste comprise a majority of the bulky loads entering the Buncombe County Transfer Station.

Based on annual tonnage data from Fiscal Year 2021, the mean composition by weight has been converted to an estimate of the annual tons entering the landfill per year by category.

Table 9. Bulky and Self-Haul Percent Composition

| Material Components | Mean Composition | Annual Tonnage |
|----------------------------|-------------------------|-----------------------|
| Furniture | 18.8% | 8,874 |
| Bagged MSW | 17.3% | 8,175 |
| Clean Lumber | 15.1% | 7,098 |
| Yard Waste | 12.2% | 5,730 |
| Painted/Treated Lumber | 11.4% | 5,361 |
| Ferrous Metals | 5.6% | 2,631 |
| Cardboard | 5.0% | 2,351 |
| Window Glass | 4.5% | 2,102 |
| Dry Wall | 3.8% | 1,774 |
| Vinyl Siding | 3.4% | 1,600 |
| Non-Ferrous Metals | 1.8% | 827 |
| Concrete/Brick/Rock | 0.9% | 441 |
| Shingles | 0.3% | 157 |
| Agricultural Waste | <0.1% | 0 |
| TOTAL WEIGHT | 100.0% | 47,121 |

Notes: Composition based on 64 samples

Total bulky C&D tonnage based on Fiscal Year 2021

3 COMPARISON TO OTHER COUNTIES

The following table and figure compare the data collected from the Buncombe County characterization sort with similar sorts from Orange County, North Carolina⁴ and Boulder County, Colorado.⁵ These comparisons may be used to compare residential and commercial streams between counties to evaluate the effectiveness of other waste management programs and the potential for further outreach.

The data is broken up into four categories: **recyclables**, **compostables**, **other divertibles**, and **non-divertibles** for residential and commercial streams in the counties.

Orange County, North Carolina has a variety of solid waste management facilities, from landfills to recycling centers to food waste drop-off sites. Unlike Buncombe County, the Orange County solid waste program is funded through tax revenue. The 2017 Waste Composition Study was chosen to compare to Buncombe County because of their proximity and similar conduction of the study.

The Orange County report split their residential stream into two further categories: single-family and multi-family residences. In order to compare the data, data from single-family residential materials are weighted at 46 percent of the total stream and multi-family residential materials are weighted at 14 percent of the total stream, as denoted in the report. This means that the results broke down to 76.7 percent single-family and 23.3 percent multi-family in the residential stream for Orange County. All compositions in the following table and figure total to 100 percent in each column or bar.

Boulder County has been working on a progressive plan to achieve “Zero Waste or Darn Near” by 2025 as of their 2005 plan. Boulder County’s solid waste program is funded through tax revenue. Their 2019 report also examined single-family, multi-family, and commercial refuse streams within the county. The reported data had to be sorted to match this report’s categories, resulting in **Table 10**. It is important to note that Boulder County generates less waste per capita than Buncombe County.

Table 10 shows the breakdown of residential and commercial materials by the four categories. Recyclable materials are fairly consistent in the makeup of streams between counties, but Boulder leads the way with diverting compostables from their stream. The difference in total tons of waste can be seen on the next page, in **Table 11**.

Table 10. Comparing Divertibility of Materials in Other Counties

| | Orange County | | Boulder County | | Buncombe County | |
|-------------------|---------------|------------|----------------|------------|-----------------|------------|
| | Residential | Commercial | Residential | Commercial | Residential | Commercial |
| Recyclables | 21.1% | 21.3% | 22.0% | 25.0% | 19.9% | 20.5% |
| Compostables | 41.0% | 41.3% | 28.1% | 23.7% | 36.8% | 35.7% |
| Other Divertibles | 16.5% | 13.8% | 13.1% | 22.9% | 7.5% | 8.8% |
| Total Divertibles | 78.6% | 76.4% | 63.2% | 71.6% | 64.1% | 64.9% |

4. Orange County Waste Composition Study (2017) by Kessler Consulting, Inc.

5. Boulder County Countywide Waste Composition Study (2019) by MSW Consultants

Figure 12 shows the same breakdown as **Table 10** in a visual percent stacked bar graph. The graph shows that waste from Buncombe County and Boulder County is about 60 percent divertible. Waste from Orange County is about 80 percent divertible. While all counties have consistent compositions of recyclables going to landfills, Boulder County has proportionately less compostables in both residential and commercial streams.

Figure 12. Comparing Divertibility of Materials in Other Counties

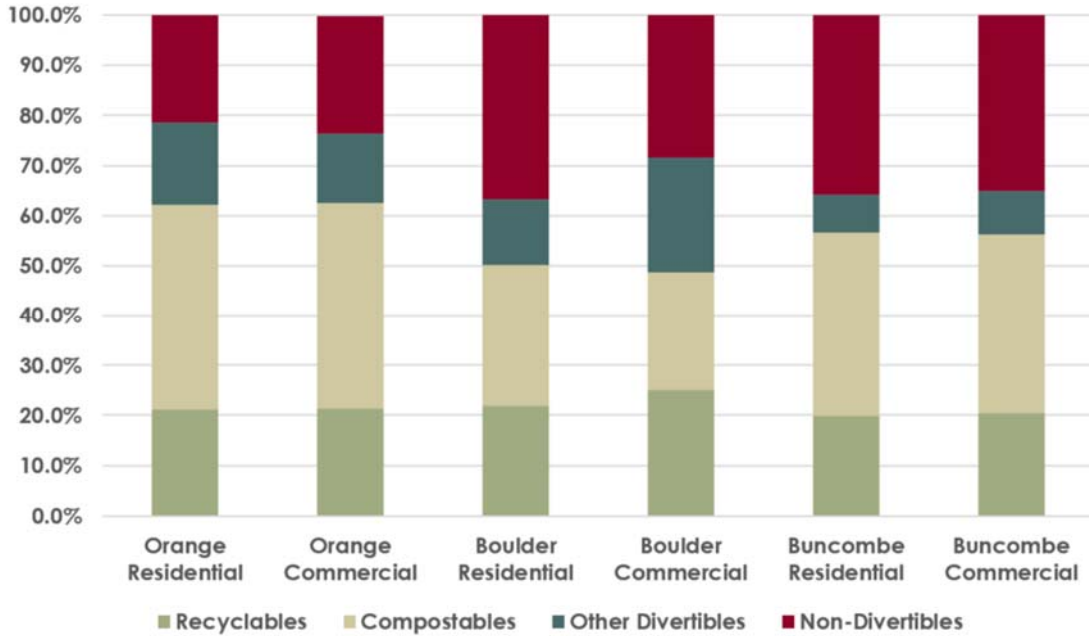


Table 11 displays a comparison between the average composition within each county and the total tons based on MSW tonnage reports from Fiscal Year 2020 for Orange and Buncombe County, and 2018 for Boulder as found in the respective report. Compositions are averaged equally between residential and commercial streams, but are less accurate due to the lack of tonnage data distinguished between streams.

Table 11. Average Composition and Tonnage Comparison

| | Orange County | | Boulder County | | Buncombe County | |
|-------------------|---------------|------------------|----------------|----------------|-----------------|----------------|
| | Composition | Tons | Composition | Tons | Composition | Tons |
| Recyclables | 21.2% | 1,088,384 | 23.5% | 55,041 | 20.2% | 61,515 |
| Compostables | 41.1% | 2,109,663 | 25.9% | 60,662 | 36.2% | 110,553 |
| Other Divertibles | 15.1% | 776,281 | 18.0% | 42,159 | 8.1% | 24,817 |
| Non-Divertibles | 22.5% | 1,152,155 | 32.8% | 76,706 | 35.5% | 108,174 |
| TOTAL | 100% | 5,129,048 | 100% | 234,216 | 100% | 305,059 |



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