



North Carolina Waste Characterization Study

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PREPARED BY RRS

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Study Overview and Purpose

STUDY OBJECTIVES

The North Carolina Department of Environmental Quality (DEQ), through its Division of Environmental Assistance and Customer Service (DEACS), is undertaking a Statewide Materials Management Optimization Study to support long-term waste reduction, landfill waste diversion, and recycling improvements. [Resource Recycling Systems \(RRS\)](#) was selected by DEQ to conduct the study, which is funded by a grant from the U.S. Environmental Protection Agency's Solid Waste Infrastructure for Recycling (SWIFR) program and aligns with national goals to increase the recycling rate to 50% and reduce food waste by 50%, both by 2030. The Statewide Materials Management Optimization Study will provide insights that support DEQ's ongoing work to expand the circular economy and improve waste reduction and recycling infrastructure in accordance with the state's [10-Year Solid Waste and Materials Management Plan](#)¹.

DEQ maintains extensive datasets on local government recycling programs and permitted solid waste facilities. However, statewide data gaps exist regarding private sector recycling and the composition of landfilled waste. Addressing these gaps is critical to understanding where materials originate, how they are managed, and where system inefficiencies or opportunities for increased diversion exist.



Figure 1. Waste Sort at Watauga County Transfer Station, May 21, 2025

As part of the overall Statewide Materials Management Optimization Study, RRS was tasked with conducting a multi-season Waste Characterization Study (Study) at three disposal facilities located across different regions of the state. The purpose of this Waste Characterization Study is to provide a snapshot of waste composition reflective of multiple geographic regions, waste generation sectors, and seasons. It helps identify what portion of the landfilled waste stream could have been diverted via existing recycling and composting practices while also assisting the state in assessing whether residents and businesses are adhering to existing regulatory landfill disposal bans. The results will inform strategic planning and policy development, guiding North Carolina's efforts to build a more efficient, resilient, and sustainable materials management system.

Background

North Carolina is a geographically and demographically diverse state spanning from the Appalachian Mountains in the west, the densely populated Piedmont region, and extending into the Coastal Plain in the east. According to the [U.S. Census Bureau](#)², North Carolina's resident population at the 2020 decennial census was 10,439,388. Since 2010, annual population estimates indicate continued growth, with recent figures showing the state's population reached more than 11 million residents in 2024, reflecting an increase of approximately 605,000 people since 2020. This population gain was among the largest in the nation for the [2023-2024 period](#)³.

With the [U.S. Environmental Protection Agency \(EPA\)](#)⁴ estimating per-capita municipal solid waste generation in the U.S. at 4.9 pounds per person per day, this rapid population growth has contributed to increasing solid waste management challenges for the State of North Carolina. Its counties are tasked with managing waste in a safe, efficient, and environmentally responsible manner. The 2024-2034 North Carolina Solid Waste and Materials Management Plan found that two of the state's largest regional landfills, which collectively accept about 25% of the state's waste, are projected to reach capacity within the next decade. Given dwindling landfill capacity and rapid population growth, the Plan states that, "Efficient and effective diversion of recyclable materials is the best strategy to minimize the long-term environmental liabilities of landfills and to respond to the growing difficulty of siting new disposal facilities."

Population growth has occurred across a mix of community contexts. The [North Carolina Office of State Budget and Management](#)⁵ estimates show that approximately 42% of the population lives outside of incorporated municipal boundaries, indicating a substantial rural and unincorporated component alongside dense urban and suburban centers.



Figure 2. Data Collection and Waste Sort at Greensboro Transfer Station, June 5, 2025

The state's economic geography similarly reflects diversity: large metropolitan regions (e.g., Charlotte, Raleigh-Durham, and Greensboro-Winston-Salem) anchor urban growth and innovation, while rural and small-town communities remain prominent, particularly in eastern and western counties where farming and tourism are major sectors. Population growth maps and tract changes from the [University of North Carolina Demography](#)⁶ project demonstrate widespread regional variability from 2010–2020, but an overall trend of residents moving from rural areas to more densely populated metro and suburban areas.

North Carolina's solid waste management framework combines state regulatory oversight with services provided by both local governments and private waste management and recycling companies. The Division of Waste Management (DWM) Solid Waste Section of DEQ administers and enforces state laws governing the safe management of non-hazardous solid waste in accordance with [Article 9 of Chapter 130A of the North Carolina General Statutes](#)⁷ and related [administrative rules \(15A NCAC 13B\)](#)⁸. This regulatory structure covers municipal solid waste (MSW), construction and demolition (C&D) debris, industrial waste, scrap tires, compostable materials, and other non-hazardous waste types, includes guidance, permitting, compliance monitoring, and enforcement activities.

State solid waste policy emphasizes a hierarchy of waste management practices, beginning with waste reduction and reuse, followed by recycling and composting, and environmentally protective disposal, to maximize material recovery and minimize landfilling. Local governments and private sector haulers implement curbside collection, recycling programs, and disposal services across municipalities and counties. Many jurisdictions operate or contract for landfill disposal, transfer stations, drop-off sites, and specialized recovery programs for materials such as electronics and household hazardous waste. This combination of statewide regulation and locally tailored service provision shapes the generation, collection, and processing patterns that underlie statewide waste characterization analyses.

Methodology

This section presents a summary of the data collection methods and calculation procedures used in this Study, which was conducted in the spring and fall of 2025.

LOCATIONS, EQUIPMENT, AND LABOR

The objectives of the Study included sampling of MSW across the state's geographic regions and in different seasons to capture sampling data reflective of seasonal variability and diverse waste generator types from urban, suburban, and rural settings. The Study involved a two-season (spring-April/May and fall-Oct./Nov. of 2025) residential and commercial waste analysis at three North Carolina disposal sites, for a total of six separate sampling events. With assistance from the DWM and DEACS, the Study selected a set of three disposal facilities to represent the cross-section of geographically located

disposal sites in the western, central, and eastern parts of the state. Figure 3 illustrates the three sampling locations used for waste sort activities. In the western region of the state, sampling occurred at the Watauga County Transfer Station. In the central region of the state, sampling occurred at the City of Greensboro Transfer Station. In the eastern region of the state, sampling occurred at Tuscarora Landfill, operated by the Coastal Regional Solid Waste Management Authority.

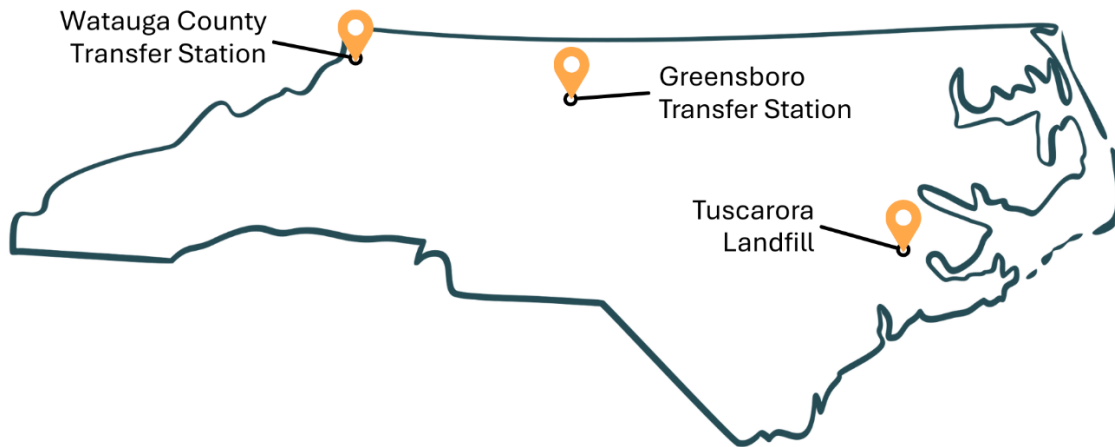


Figure 3. Map of Sampling Locations for NC Waste Composition Study, 2025

Sampling event dates are summarized in Table 1 below.

Table 1. Sampling Locations and Dates, NC Waste Composition Study, 2025

Sampling Location	Spring Sampling Dates	Fall Sampling Dates
Tuscarora Landfill	April 21-24, 2025	October 7 -9, 2025
Watauga County Transfer Station	May 20 -22, 2025	September 9 -11, 2025
Greensboro Transfer Station	June 4- 6, 2025	October 28 - 30, 2025

Prior to the execution of the Study, a formal Work Plan was approved by DEQ describing the scope required to provide a comprehensive and accurate waste composition of disposed MSW. The approved Work Plan encompassed details of the locations for the waste sort, coordination with facilities, data collection methodology and quality control, sort staff, allocation of waste samples, list of equipment, contacts, and a Health and Safety Plan. The Work Plan also detailed the analysis method that would be used to determine the waste composition profiles.

The Project Team requested information to determine the relative mix of waste sectors that are disposed of at each facility. From this information, the Project Team worked with DEQ staff and disposal site facility staff to construct a sampling plan for the selection of waste hauling vehicles at each site with the goal of ensuring samples were obtained from different waste generation routes (i.e., residential versus commercial, incorporated municipalities versus unincorporated county). The sampling plan was

developed to comply with the industry standards for conducting waste characterization studies and the American Society for Testing and Materials (ASTM) standard D5231 for sample size. All work was completed in general accordance with the approved Work Plan. A summary of the sampling plan is provided in Appendix 2: Summary of Targeted Samples.

GENERATOR SECTORS AND SORTING EVENTS

The Study assessed waste samples generated from residential and commercial collection routes as well as transfer trailer loads containing mixed residential and commercial waste. The data obtained from these distinct waste streams were evaluated both separately and combined to determine differences in residential versus commercial waste composition as well as an overall combined composition of MSW being disposed of in North Carolina landfills.

- **Residential Waste** – Waste collected primarily from single-family residential dwellings that receive curbside collection service as well as from municipal drop-off convenience centers.
- **Commercial Waste** – Waste from institutional and commercial sources, such as shopping centers, office buildings, schools, restaurants, and retail. It also includes apartment buildings and multifamily housing in buildings where four or more housing units are located.
- **Mixed Residential and Commercial Waste** – Waste collected from a mix of residential dwellings, institutional, and commercial sources.

MATERIAL CATEGORIES

During the sampling event, materials were categorized into eight categories- Paper, Plastics, Inorganics, Metal, Organics, Construction and Demolition and Bulky Waste (C&D), Household Hazardous Waste (HHW), and Other. Materials within these categories were further separated into 41 individual material types as agreed upon by DEQ and RRS.

While conducting the spring sampling events, RRS staff observed a large amount of diapers and pet waste, consisting of heavy cat litter, which was being counted in the “other landfill” material category. To improve the clarity of the overall study, before conducting the fall sampling events RRS added another material type consisting of “pet waste and diapers” to bring the total to 42 individual material types given how much of these materials were observed in the spring sampling process. The addition of the new “pet waste and diapers” material category improved the study’s accuracy by helping to parse out a portion of the “other landfill” waste into a more clearly defined material type to provide DEQ a higher level of detail regarding the materials comprising the “other landfill” material category. It is important to acknowledge a significant portion of the “other landfill” material category from the spring sampling events was comprised of diapers and pet waste although an exact composition estimate cannot be provided for the spring as is provided for the fall waste sorts when the additional material

category was utilized. A full list of material types and definitions are provided in the Appendix 1: Material List & Definitions.

SAMPLING AND SORTING PROCEDURES

The Project Team selected waste trucks to target for sampling with input from the host disposal sites and in accordance with the approved sampling plan to ensure an appropriate mix of residential and commercial loads as well as loads from incorporated municipal collection routes and unincorporated county collection routes. Targeted vehicles were tipped in a designated safe location, and samples were collected from a randomly selected portion of each tipped waste pile. Random sampling is performed by having the equipment operator take a geometric “slice” out of the sample waste pile such that material and bags from the top of the pile down to the bottom of the “slice” are collected and weighed.

Waste material naturally stratifies during collection, compaction, and transporting, so it is essential that each sample captures all material from the ground up to the top of the sample pile to ensure smaller material that settles near the bottom is captured and measured in the study. In accordance with ASTM standards, the waste samples consisted of approximately 200-300 pounds of waste with some samples being slightly under or above this targeted sample weight. Figure 4 shows materials being unloaded for a waste sort at the Watauga County Transfer Station.

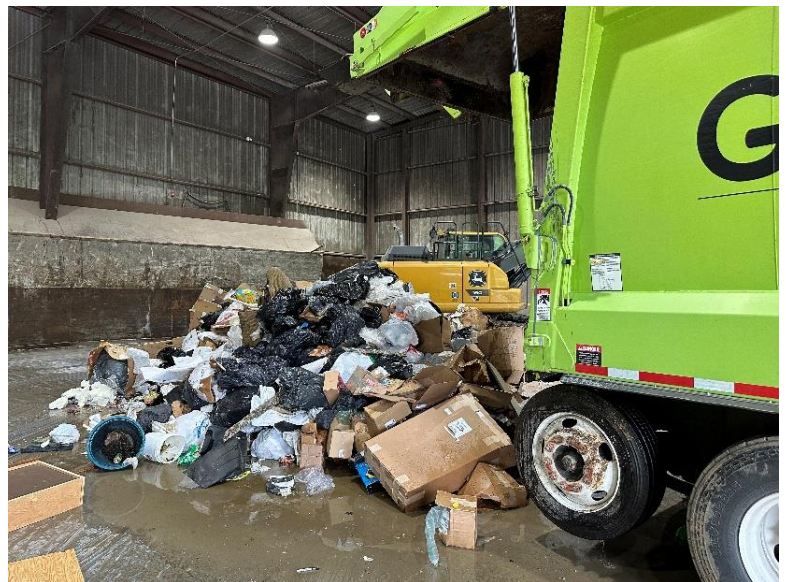


Figure 4. Waste Truck Dumping Materials for Waste Sort, Watauga County Transfer Station, May 21, 2025

A total of 175 samples were collected throughout the entire Study, consisting of 100 residential, 65 commercial, and 10 mixed loads that contained commingled residential and commercial waste. Sorting sampled waste into the approved material types was performed by hand. Sorters received training on the material types after reviewing the Health and Safety Plan. The sorting team set up and labeled buckets for each material type, taking note of respective bucket tare weights.

Waste material was sorted on tables with pallets and fastened wire screening designed to simulate segregation of fines 0.5 inches or less. Figure 5 shows the steps of sorting each sample. At the conclusion of each sample, fines were removed from the screen, and all materials from the ground and

sorting tables were separated into respective material types. Pictures depicting categorized materials were taken, and weights were recorded while the next sample was being prepared.

Waste sample sorting process:

STEP 1



Material is sorted on tables with pallets and fastened wire screen to capture fines.

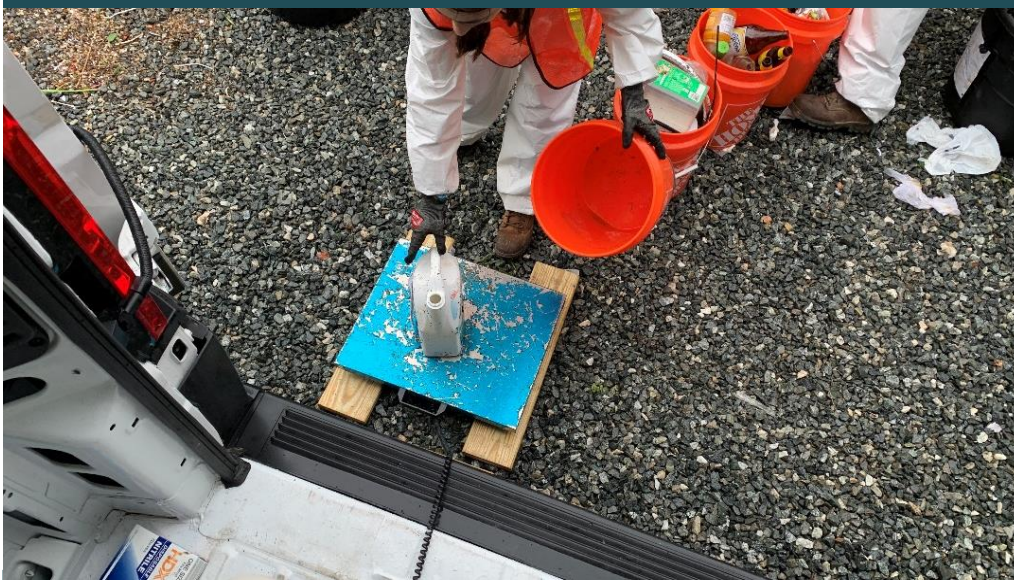
STEP 2



Samples are hand sorted to separate material by category.

STEP 3

Buckets are labeled for each material category.

STEP 4

Buckets are weighed and recorded for each material before the next sample is sorted.

Figure 5. Step by Step Process of Sorting a Waste Sample, 2025

ANALYTICAL PROCEDURES

Following completion of the sampling events, RRS calculated the weighted average for each material type across residential, commercial, or mixed source waste types. Weighted averages were used instead of a standard average (arithmetic mean) to provide a more accurate analysis of the data sets given the total weight in pounds sampled across residential, commercial, and mixed loads differed. The weighted average better accounts for the weight in pounds difference in total sampled materials in relation to each generator type (i.e., residential versus commercial versus mixed loads). From there, percentages by material type were calculated and then confidence intervals were generated.

Data analysis adhered to industry-accepted statistical sampling practices, as described in the ASTM Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (D5231-92; reapproved 2008). Where applicable, 95% confidence intervals were calculated for each material category using a standard statistical *t*-test.

Results

INTRODUCTION TO RESULTS

Results from the waste characterization study are organized into the following sections:

- Single Family Residential Waste Composition
- Commercial Waste Composition
- Mixed Waste Composition (Residential & Commercial)
- Overall Waste Composition

For waste characterization analysis, materials were organized into six broad material categories based on potential diversion opportunities.

RECYCLABLE PAPER

Paper and fiber materials that are commonly accepted in recycling programs within the state.

- Corrugated Cardboard
- Mixed Recyclable Paper

RECYCLABLE CONTAINERS

Containers that are commonly accepted in recycling programs within the state.

- #1 PET Bottles and Jars
- #2 HDPE Containers
- #5 Polypropylene
- Aluminum Cans (including foil and trays)
- Aseptic/Gable Polycoated Containers
- Glass Bottles and Jars
- Steel Cans

OTHER RECYCLABLES

Materials that are not commonly accepted in many curbside residential single stream recyclable programs, but which have the potential to be recycled via community drop-off recycling facilities and commercial recycling programs.

- Antifreeze
- Bagged Shredded Paper*
- Bulky Rigid Plastic
- Computer Equipment
- Household Batteries
- Latex Paint
- Lead-Acid Batteries
- Lithium-Ion Batteries
- Other Non-Ferrous Metal
- Other Electronics
- Other Ferrous Metal
- Other HHW
- Recyclable Plastic Film
- Televisions
- Textiles
- Tires
- Used Oil/Filters
- White Goods

* Bagged shredded paper is not always accepted for recycling at single-stream material recovery facilities; however, shredded paper can be recycled in some office paper recycling programs.

POTENTIAL RECYCLABLE

Materials that have the potential to be recovered or recycled but are not currently targeted for recycling in most curbside or drop-off recycling programs. Some of these materials would require drop-off recycling, source-separation, and/or additional processing to recover (e.g., mattresses, C&D, expanded polystyrene foam), while others could be accepted in curbside programs (e.g., PET clamshell containers, plastic cups).

- #6 Expanded Polystyrene (EPS)
- C&D
- Mattresses
- Other Recyclable PET Containers & Packaging

COMPOSTABLES*

Materials that could be composted in a commercial composting facility. These materials require proper source-separation to avoid contaminants and inorganic material.

- Food Waste
- Yard Waste
- Pallets and Clean Wood Waste
- Compostable Paper

*Compostable Plastics (e.g., cutlery and food service ware) were not sorted as a distinct material and were classified as All Other Plastics in the landfill category for this study.

LANDFILL

Materials that are not recyclable with traditional recycling technology or which are not typically targeted for inclusion in curbside recycling collection programs.

- All Other Plastics (non-recyclable)
- Fines
- Furniture
- Other Glass
- Other Landfill Other Paper (non-recyclable and non-compostable)
- Pet Waste and Diapers

Waste Composition Results

SINGLE-FAMILY RESIDENTIAL WASTE

Figure 6 depicts the weighted average single-family residential waste by potential management category.

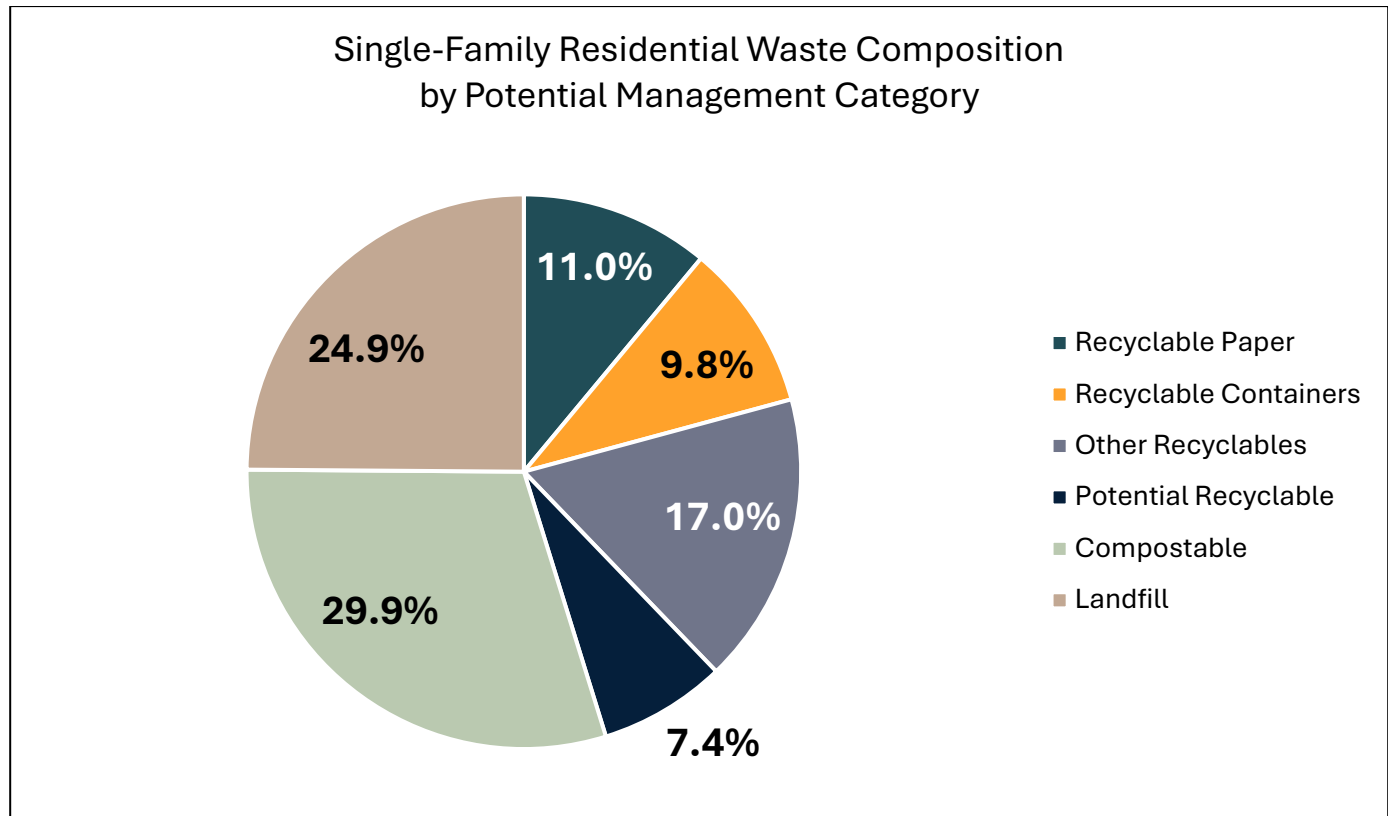


Figure 6. Single-Family Residential Waste Composition

Key findings from the single-family residential waste sampling results are below.

- Almost 38% of the single-family residential waste is currently accepted in recycling programs, with 11% being recyclable paper. Recyclable containers were found to make up almost 10% of the single-family residential waste. Other recyclables make up 17% of the single-family residential waste.
- About 7% of the single-family residential waste is potentially recyclables, with C&D making up over 6% of the waste stream.
- About 30% of the single-family residential waste was compostable materials, with food making up almost 23% of the single-family residential waste.
- About 25% of the single-family residential waste was categorized as “Landfill” due to a lack of existing or potential diversion opportunities.

Table 2 includes the weighted average with 95% confidence interval for each material category measured.

Table 2. Single-Family Residential Waste Composition

MATERIAL CATEGORY	MATERIAL TYPE	WEIGHTED AVERAGE	95% CONFIDENCE INTERVAL – LOWER BOUND	95% CONFIDENCE INTERVAL – UPPER BOUND
Recyclable Paper	Corrugated Cardboard	4.8%	3.6%	6.1%
Recyclable Paper	Mixed Recyclable Paper	6.2%	5.3%	7.2%
Recyclable Paper	Total	11.0%	Not Applicable	Not Applicable
Recyclable Containers	#1 PET bottles and jars	2.2%	1.8%	2.5%
Recyclable Containers	#2 HDPE Containers	0.9%	0.7%	1.1%
Recyclable Containers	#5 Polypropylene	0.8%	0.6%	1.0%
Recyclable Containers	Aluminum Cans, foil, and trays	1.3%	1.0%	1.6%
Recyclable Containers	Aseptic/Gable Polycoated Containers	0.2%	0.1%	0.3%
Recyclable Containers	Recyclable Glass Bottles and Jars	3.6%	2.7%	4.5%
Recyclable Containers	Steel Cans	0.8%	0.0%	2.6%
Recyclable Containers	Total	9.8%	Not Applicable	Not Applicable
Other Recyclables	Antifreeze	0.0%	0.0%	0.0%
Other Recyclables	Bagged Shredded Paper	0.2%	0.0%	0.4%
Other Recyclables	Bulky Rigid Plastic	1.1%	0.6%	1.7%
Other Recyclables	Computer Equipment	0.1%	0.0%	0.3%
Other Recyclables	Household Batteries	0.0%	0.0%	0.1%
Other Recyclables	Latex Paint	0.1%	0.0%	0.2%
Other Recyclables	Lead-Acid Batteries	0.1%	0.0%	0.2%
Other Recyclables	Lithium-Ion Batteries	0.0%	0.0%	0.0%
Other Recyclables	Non-Ferrous	0.8%	0.0%	1.7%
Other Recyclables	Other Ferrous	1.1%	0.2%	2.0%
Other Recyclables	Other Electronics	1.1%	0.4%	1.7%

MATERIAL CATEGORY	MATERIAL TYPE	WEIGHTED AVERAGE	95% CONFIDENCE INTERVAL – LOWER BOUND	95% CONFIDENCE INTERVAL – UPPER BOUND
Other Recyclables	Other HHW	0.1%	0.0%	0.2%
Other Recyclables	Other Textiles	7.2%	5.6%	8.8%
Other Recyclables	Recyclable Plastic Film	5.1%	4.3%	5.9%
Other Recyclables	Televisions	0.0%	0.0%	0.1%
Other Recyclables	Tires	0.0%	0.0%	0.0%
Other Recyclables	Used Oil/Filters	0.0%	0.0%	0.0%
Other Recyclables	White Goods	0.0%	0.0%	0.1%
Other Recyclables	Total	17.0%	Not Applicable	Not Applicable
Potential Recyclable	#6 Expanded EPS	0.8%	0.6%	1.0%
Potential Recyclable	C&D	6.4%	2.7%	10.0%
Potential Recyclable	Mattresses	0.0%	0.0%	0.0%
Potential Recyclable	Other Recyclable PET Containers & Packaging	0.2%	0.2%	0.3%
Potential Recyclable	Total	7.4%	Not Applicable	Not Applicable
Compostable	Compostable Paper	3.1%	2.5%	3.7%
Compostable	Food Waste	22.7%	19.1%	26.2%
Compostable	Pallets and Clean Wood Waste	0.6%	0.0%	1.4%
Compostable	Yard Waste	3.5%	0.9%	6.0%
Compostable	Total	29.9%	Not Applicable	Not Applicable
Landfill	All Other Plastics (non-recyclable)	1.0%	0.7%	1.3%
Landfill	Fines	1.6%	1.2%	2.0%
Landfill	Furniture	2.0%	0.2%	3.7%
Landfill	Other Glass	0.2%	0.0%	0.5%
Landfill	Other Paper (non-recyclable and non-compostable)	0.8%	0.5%	1.2%
Landfill	Pet Waste and Diapers	3.1%	1.5%	4.6%
Landfill	Other Landfill	16.2%	12.1%	20.4%
Landfill	Total	24.9%	Not Applicable	Not Applicable

COMMERCIAL WASTE COMPOSITION

Commercial waste includes waste from institutional and commercial sources, such as shopping centers, office buildings, schools, restaurants, and retail. It also includes apartment buildings and all multifamily housing in buildings where four or more housing units are located.

Figure 7 depicts the weighted average composition of commercial waste by potential management category.

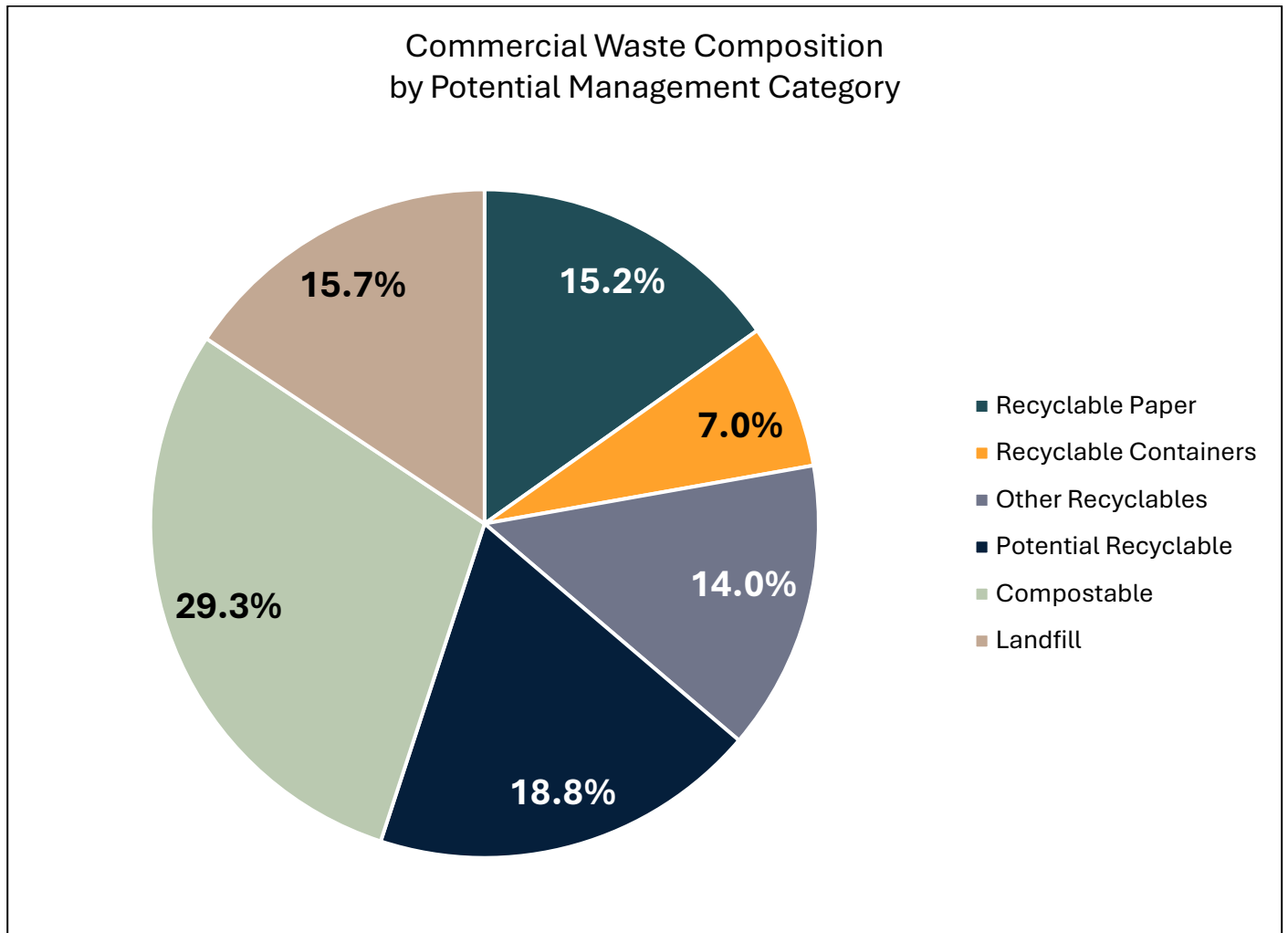


Figure 7. Commercial Waste Composition by Potential Management Category

Key findings from the commercial waste sampling results are below.

- Over 36% of the commercial waste is currently accepted in recycling collection programs, with over 15% of the waste stream being recyclable paper. Recyclable containers were found to make up about 7% of the commercial waste. Other recyclables make up 14% of the commercial waste stream.

- About 19% of the commercial waste is potentially recyclable materials, with C&D making up almost 17% of the waste stream.
- About 29% of the commercial waste was compostable materials, with food making up about 21% of the commercial waste.
- About 16% of the commercial waste was determined to be other items not applicable to any diversion processes.

Table 3 includes the weighted average with 95% confidence interval for each material category measured.

Table 3. Commercial Waste Stream Composition

MATERIAL CATEGORY	MATERIAL TYPE	WEIGHTED AVERAGE	95% CONFIDENCE INTERVAL - LOWER BOUND	95% CONFIDENCE INTERVAL - UPPER BOUND
Recyclable Paper	Corrugated Cardboard	10.0%	4.9%	15.0%
Recyclable Paper	Mixed Recyclable Paper	5.2%	3.5%	6.9%
Recyclable Paper	Total	15.2%	Not Applicable	Not Applicable
Recyclable Containers	#1 PET bottles and jars	1.8%	1.1%	2.4%
Recyclable Containers	#2 HDPE Containers	0.6%	0.2%	1.0%
Recyclable Containers	#5 Polypropylene	0.6%	0.3%	0.9%
Recyclable Containers	Aluminum Cans, foil, and trays	0.8%	0.5%	1.1%
Recyclable Containers	Aseptic/Gable Polycoated Containers	0.6%	0.0%	1.4%
Recyclable Containers	Recyclable Glass Bottles and Jars	2.0%	1.2%	2.8%
Recyclable Containers	Steel Cans	0.7%	0.0%	4.8%
Recyclable Containers	Total	7.0%	Not Applicable	Not Applicable
Other Recyclables	Antifreeze	0.1%	0.0%	0.2%
Other Recyclables	Bagged Shredded Paper	0.3%	0.0%	0.9%
Other Recyclables	Bulky Rigid Plastic	1.3%	0.0%	2.7%
Other Recyclables	Computer Equipment	0.2%	0.0%	1.1%
Other Recyclables	Household Batteries	0.0%	0.0%	0.1%
Other Recyclables	Latex Paint	0.2%	0.0%	0.8%
Other Recyclables	Lead-Acid Batteries	0.0%	0.0%	0.0%
Other Recyclables	Lithium-Ion Batteries	0.0%	0.0%	0.0%
Other Recyclables	Non-Ferrous	0.8%	0.0%	2.6%
Other Recyclables	Other Ferrous	0.6%	0.0%	1.4%
Other Recyclables	Other Electronics	0.9%	0.0%	1.7%

MATERIAL CATEGORY	MATERIAL TYPE	WEIGHTED AVERAGE	95% CONFIDENCE INTERVAL - LOWER BOUND	95% CONFIDENCE INTERVAL - UPPER BOUND
Other Recyclables	Other HHW	0.1%	0.0%	0.3%
Other Recyclables	Other Textiles	4.9%	1.4%	8.4%
Other Recyclables	Recyclable Plastic Film	4.5%	2.9%	6.1%
Other Recyclables	Televisions	0.1%	0.0%	0.4%
Other Recyclables	Tires	0.0%	0.0%	0.1%
Other Recyclables	Used Oil/Filters	0.0%	0.0%	0.0%
Other Recyclables	White Goods	0.0%	0.0%	0.1%
Other Recyclables	Total	14.0%	Not Applicable	Not Applicable
Potential Recyclable	#6 Expanded EPS	1.1%	0.3%	2.0%
Potential Recyclable	C&D	16.8%	2.8%	30.9%
Potential Recyclable	Mattresses	0.7%	0.0%	2.9%
Potential Recyclable	Other Recyclable PET Containers & Packaging	0.2%	0.1%	0.3%
Potential Recyclable	Total	18.8%	Not Applicable	Not Applicable
Compostable	Compostable Paper	2.4%	1.2%	3.6%
Compostable	Food Waste	21.2%	12.7%	29.7%
Compostable	Pallets and Clean Wood Waste	4.6%	0.0%	10.2%
Compostable	Yard Waste	1.2%	0.0%	2.9%
Compostable	Total	29.3%	Not Applicable	Not Applicable
Landfill	All Other Plastics (non-recyclable)	0.7%	0.3%	1.2%
Landfill	Fines	2.5%	0.6%	4.4%
Landfill	Furniture	1.4%	0.0%	4.9%
Landfill	Other Glass	0.3%	0.0%	0.6%
Landfill	Other Paper (non-recyclable and non-compostable)	1.0%	0.0%	2.2%
Landfill	Pet Waste and Diapers	1.4%	0.0%	4.3%
Landfill	Other Landfill	8.4%	4.2%	12.6%
Landfill	Total	15.7%	Not Applicable	Not Applicable

MIXED RESIDENTIAL AND COMMERCIAL WASTE COMPOSITION

Mixed residential and commercial waste includes waste collected from a mix of residential dwellings, institutional and commercial sources. Figure 8 depicts the weighted average composition of mixed residential and commercial waste by potential management category.

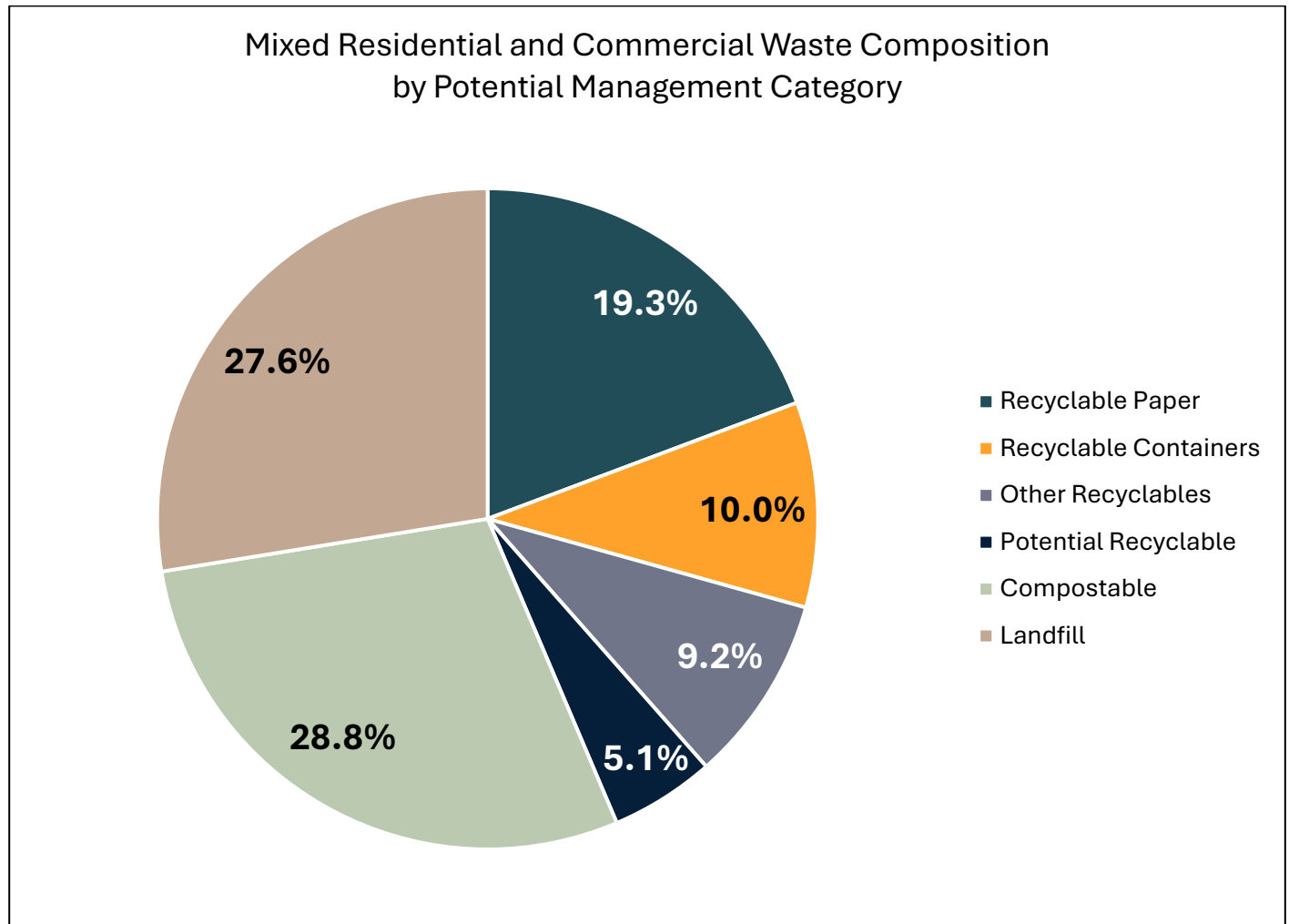


Figure 8. Mixed Residential and Commercial Waste Composition by Potential Management Category

Key findings from the mixed residential and commercial waste sampling results are below.

- Over 38% of the mixed residential and commercial waste is currently accepted in recycling collection programs, with almost 20% of the waste stream being recyclable paper. Recyclable containers were found to make up 10% of the mixed residential and commercial waste and other recyclables make up about 9%.

- About 5% of the mixed residential and commercial waste is potentially recyclable materials, with C&D making up about 4%.
- About 29% of the mixed residential and commercial waste was compostable materials, with food making up about 21% of the mixed residential and commercial waste.
- About 28% of the mixed residential and commercial waste was determined to be other items not applicable to any diversion processes.

Table 4 provides the weighted average for each material category measured. Confidence intervals were not determined for this data set due to the inability to quantify how much of each mixed load was comprised of residential versus commercial waste.

Table 4. Mixed Residential and Commercial Waste Composition

MATERIAL CATEGORY	MATERIAL TYPE	WEIGHTED AVERAGE
Recyclable Paper	Corrugated Cardboard	11.1%
Recyclable Paper	Mixed Recyclable Paper	8.2%
Recyclable Paper	Total	19.3%
Recyclable Containers	#1 PET bottles and jars	2.1%
Recyclable Containers	#2 HDPE Containers	0.8%
Recyclable Containers	#5 Polypropylene	0.8%
Recyclable Containers	Aluminum Cans, foil, and trays	1.3%
Recyclable Containers	Aseptic/Gable Polycoated Containers	0.3%
Recyclable Containers	Recyclable Glass Bottles and Jars	3.5%
Recyclable Containers	Steel Cans	1.3%
Recyclable Containers	Total	10.0%
Other Recyclables	Antifreeze	0.0%
Other Recyclables	Bagged Shredded Paper	0.2%
Other Recyclables	Bulky Rigid Plastic	0.2%
Other Recyclables	Computer Equipment	0.0%
Other Recyclables	Household Batteries	0.3%
Other Recyclables	Latex Paint	0.0%
Other Recyclables	Lead-Acid Batteries	0.0%
Other Recyclables	Lithium-Ion Batteries	0.0%
Other Recyclables	Non-Ferrous	0.1%
Other Recyclables	Other Electronics	0.5%
Other Recyclables	Other Ferrous	1.1%
Other Recyclables	Other HHW	0.0%
Other Recyclables	Other Textiles	3.6%
Other Recyclables	Recyclable Plastic Film	3.2%
Other Recyclables	Televisions	0.0%
Other Recyclables	Tires	0.0%
Other Recyclables	Used Oil/Filters	0.0%
Other Recyclables	White Goods	0.0%

MATERIAL CATEGORY	MATERIAL TYPE	WEIGHTED AVERAGE
Other Recyclables	Total	9.2%
Potential Recyclable	#6 Expanded EPS	0.7%
Potential Recyclable	C&D	3.9%
Potential Recyclable	Mattresses	0.0%
Potential Recyclable	Other Recyclable PET Containers & Packaging	0.5%
Potential Recyclable	Total	5.1%
Compostable	Compostable Paper	2.0%
Compostable	Food Waste	21.7%
Compostable	Pallets and Clean Wood Waste	0.2%
Compostable	Yard Waste	4.9%
Compostable	Total	28.8%
Landfill	All Other Plastics (non-recyclable)	0.7%
Landfill	Fines	1.6%
Landfill	Furniture	0.5%
Landfill	Other Glass	0.1%
Landfill	Other Paper (non-recyclable and non-compostable)	0.5%
Landfill	Pet Waste and Diapers	0.4%
Landfill	Other Landfill	23.7%
Landfill	Total	27.6%

OVERALL WASTE COMPOSITION (RESIDENTIAL & COMMERCIAL)

Figure 9 details the overall composition of residential and commercial waste by material category.

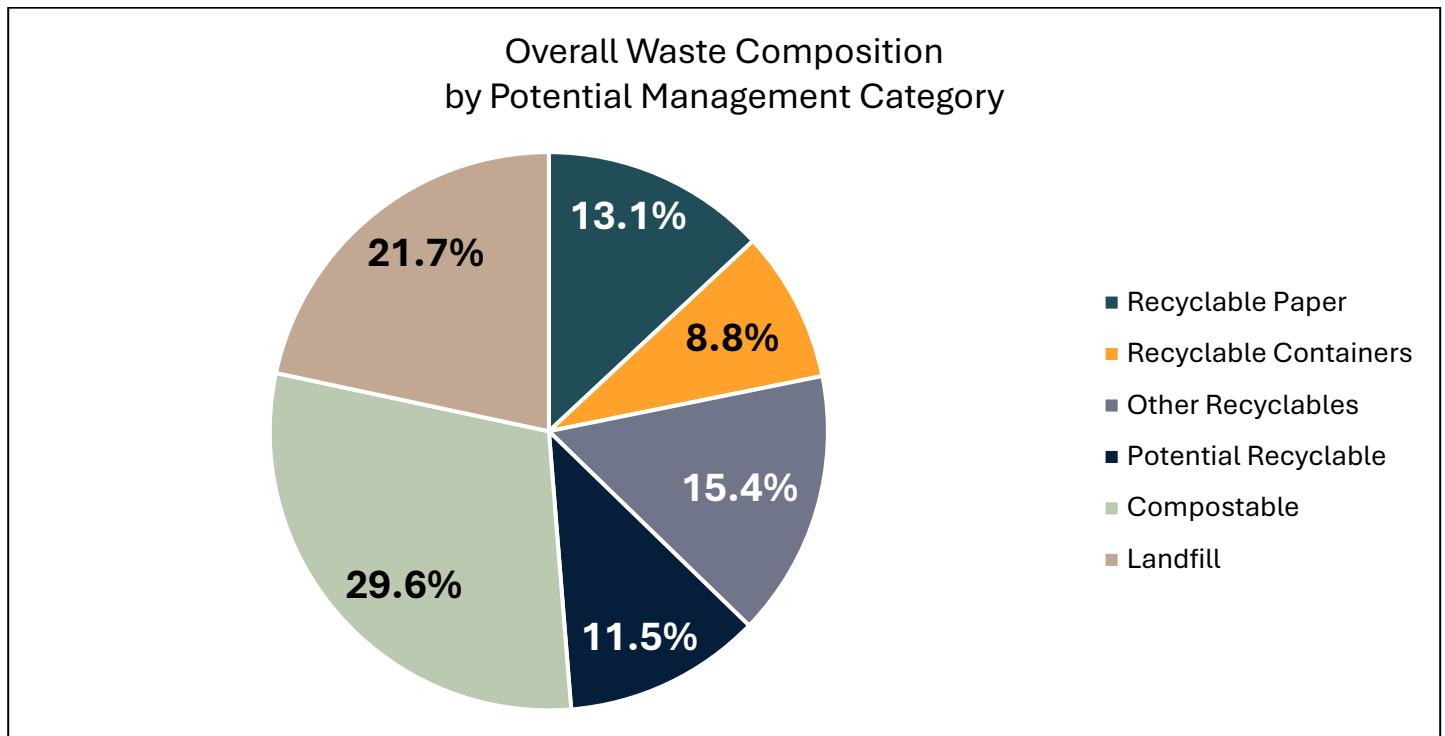


Figure 9. Overall Waste Composition by Potential Management Category

Key findings from the overall waste composition results are below.

- Almost 67% of the overall waste stream studied could be potentially diverted through recycling or composting programs (Recyclable Paper at 13.1%, Recyclable Containers at 8.8%, Other Recyclables at 15.4%, and Compostable at 29.6%) with up to 78.4% being potentially diverted if including the additional 11.5% of Potential Recyclables. It is important to caveat such high diversion potential requires nearly 100% capture of divertible materials with zero material loss from processing waste streams, which is not realistic. However, the high rate of potential diversion highlights there is still significant room for improvement in increasing the state's overall recycling rate with readily available and proven technology and approaches.
- Over 37% of the overall waste composition is currently accepted in recycling collection programs, with over 13% of this being recyclable paper. Recyclable containers were found to make up 8.8% of the overall waste composition and Other Recyclables make up 15.4%.
- Over 11% of the overall waste composition is Potentially Recyclable materials, with C&D making up over 10%.

- About 30% of the overall waste composition was Compostable materials, with food making up about 22% of waste.
- Almost 22% of the overall waste composition was determined to be Other Landfill items not applicable to any readily available diversion processes.

Table 5 summarizes the residential, commercial, mixed, and total waste compositions.

Table 5. Overall Waste Composition

MATERIAL CATEGORY	MATERIAL TYPE	RESIDENTIAL	COMMERCIAL	MIXED	WEIGHTED AVERAGE
Recyclable Paper	Corrugated Cardboard	4.8%	10.0%	11.1%	7.1%
Recyclable Paper	Mixed Recyclable Paper	6.2%	5.2%	8.2%	6.0%
Recyclable Paper	Total	11.0%	15.2%	19.3%	13.1%
Recyclable Containers	#1 PET bottles and jars	2.2%	1.8%	2.1%	2.0%
Recyclable Containers	#2 HDPE Containers	0.9%	0.6%	0.8%	0.8%
Recyclable Containers	#5 Polypropylene	0.8%	0.6%	0.8%	0.7%
Recyclable Containers	Aluminum Cans, foil, and trays	1.3%	0.8%	1.3%	1.1%
Recyclable Containers	Aseptic/Gable Polycoated Containers	0.2%	0.6%	0.3%	0.4%
Recyclable Containers	Recyclable Glass Bottles and Jars	3.6%	2.0%	3.5%	3.0%
Recyclable Containers	Steel Cans	0.8%	0.7%	1.3%	0.8%
Recyclable Containers	Total	9.8%	7.0%	10.0%	8.8%
Other Recyclables	Antifreeze	0.0%	0.1%	0.0%	0.0%
Other Recyclables	Bagged Shredded Paper	0.2%	0.3%	0.2%	0.2%
Other Recyclables	Bulky Rigid Plastic	1.1%	1.3%	0.2%	1.1%
Other Recyclables	Computer Equipment	0.1%	0.2%	0.0%	0.1%
Other Recyclables	Household Batteries	0.0%	0.0%	0.3%	0.1%
Other Recyclables	Latex Paint	0.1%	0.2%	0.0%	0.1%
Other Recyclables	Lead-Acid Batteries	0.1%	0.0%	0.0%	0.0%
Other Recyclables	Lithium-Ion Batteries	0.0%	0.0%	0.0%	0.0%

MATERIAL CATEGORY	MATERIAL TYPE	RESIDENTIAL	COMMERCIAL	MIXED	WEIGHTED AVERAGE
Other Recyclables	Non-Ferrous	0.8%	0.8%	0.1%	0.7%
Other Recyclables	Other Ferrous	1.1%	0.6%	1.1%	0.9%
Other Recyclables	Other Electronics	1.1%	0.9%	0.5%	1.0%
Other Recyclables	Other HHW	0.1%	0.1%	0.0%	0.1%
Other Recyclables	Other Textiles	7.2%	4.9%	3.6%	6.1%
Other Recyclables	Recyclable Plastic Film	5.1%	4.5%	3.2%	4.8%
Other Recyclables	Televisions	0.0%	0.1%	0.0%	0.0%
Other Recyclables	Tires	0.0%	0.0%	0.0%	0.0%
Other Recyclables	Used Oil/Filters	0.0%	0.0%	0.0%	0.0%
Other Recyclables	White Goods	0.0%	0.0%	0.0%	0.0%
Other Recyclables	Total	17.0%	14.0%	9.2%	15.4%
Potential Recyclable	#6 Expanded EPS	0.8%	1.1%	0.7%	0.9%
Potential Recyclable	C&D	6.4%	16.8%	3.9%	10.1%
Potential Recyclable	Mattresses	0.0%	0.7%	0.0%	0.2%
Potential Recyclable	Other Recyclable PET Containers & Packaging	0.2%	0.2%	0.5%	0.2%
Potential Recyclable	Total	7.4%	18.8%	5.1%	11.5%
Compostable	Compostable Paper	3.1%	2.4%	2.0%	2.8%
Compostable	Food Waste	22.7%	21.2%	21.7%	22.1%
Compostable	Pallets and Clean Wood Waste	0.6%	4.6%	0.2%	2.1%
Compostable	Yard Waste	3.5%	1.2%	4.9%	2.7%
Compostable	Total	29.9%	29.3%	28.8%	29.6%
Landfill	All Other Plastics (non-recyclable)	1.0%	0.7%	0.7%	0.9%
Landfill	Fines	1.6%	2.5%	1.6%	1.9%
Landfill	Furniture	2.0%	1.4%	0.5%	1.7%
Landfill	Other Glass	0.2%	0.3%	0.1%	0.2%
Landfill	Other Paper (non-recyclable and non-compostable)	0.8%	1.0%	0.5%	0.9%
Landfill	Pet Waste and Diapers	3.1%	1.4%	0.4%	2.3%
Landfill	Other Landfill	16.2%	8.4%	23.7%	13.8%
Landfill	Total	24.9%	15.7%	27.6%	21.7%

CONSTRUCTION AND DEMOLITION (C&D) DEBRIS

Per [North Carolina General Statute 130A⁹](#) and [North Carolina Administrative Code Title 15A Subchapter 13B⁸](#), high volumes of C&D debris materials are required to be disposed of in certified C&D landfills if not recycled. These landfills accept the majority of C&D material generated in the state from construction companies and large-scale projects; however, the scope of this Study did not include waste sampling from C&D landfills. C&D that enters the MSW stream, as seen in the waste composition results, is typically from self-haul residential generators and is not representative of the overall C&D disposal.

C&D disposal as measured during the MSW characterization study was about 10% of the total MSW waste stream. As part of the overall Statewide Materials Management Optimization Study, the Project Team will be conducting a materials market assessment focused on C&D waste to assist the state in evaluating regional markets for recovered C&D materials and identify gaps in access to recycling and end markets.

This deeper dive into the C&D recovery marketplace will provide an overview of additional C&D tonnage disposed of in permitted C&D landfills. The materials market assessment will also identify opportunities and make recommendations to improve recycling and material recovery outcomes.

ESTIMATED MATTRESS WASTE COMPOSITION

It is difficult to accurately identify what portion of the municipal solid waste (MSW) stream is comprised of discarded mattresses utilizing traditional waste composition studies. Mattress sampling is challenging due to their bulky size compared to other material categories making these items less conducive to the sorting process associated with pulling random 200-pound samples of waste from targeted trucks for hand sorting into the respective material categories. This can lead to mattresses being either under or overrepresented as a portion of the waste stream, with mattresses often not being observed or captured in samples at all or alternately being overly represented as a portion of the weight when being captured in targeted samples.

To help provide more accurate waste composition data, a desktop analysis was conducted to supplement field sorting results. A combination of industry interviews, trade association publications, and annual disposal and sales data was used to calculate the estimated weight in tons and the percentage of North Carolina's total MSW stream by weight.



Figure 10. Mattresses at the Watauga County Transfer Station, May 21, 2025

During the process of conducting the Study, only one commercial waste sample out of the 175 total samples taken included mattresses, with the sample weight being used to estimate mattresses accounting for approximately 0.2% of NC’s overall MSW. This composition percentage finding aligns with the desktop analysis, which estimates mattresses comprising between 0.13% to 0.19% of NC’s total MSW. Table 6 below estimates the number of mattresses thrown away each year in the United States and North Carolina based on daily discard reports and annual sales.

Table 6. Estimated Annual Mattress Disposal

SCOPE	METHOD	ESTIMATED ANNUAL MATTRESSES DISPOSED (MILLIONS OF UNITS)	ESTIMATED PER CAPITA (MATTRESSES PER PERSON PER YEAR)	ESTIMATED ANNUAL TONS DISPOSED	ESTIMATED PERCENT OF NC MSW BY WEIGHT
U.S.	Discard proxy (Mattress Recycling Council ~50,000/day) ¹⁰	18.25	0.054	502,000	N/A
U.S.	Sales proxy (ISPA 2023 shipments) ¹¹	25.9	0.076	712,000	N/A
NC	Discard proxy (scaled from U.S. Mattress Recycling Council) ¹⁰	0.59	0.054	16,200	0.13%
NC	Sales proxy (scaled from U.S. ISPA) ¹¹	0.84	0.076	23,100	0.19%

ITEMS BANNED FROM DISPOSAL IN NC LANDFILLS

The North Carolina General Assembly, via [Statute 130A-309.10⁹](#), has established landfill disposal bans on a variety of materials in an effort to promote increased recycling, help conserve valuable disposal capacity, and to reduce the toxicity and the environmental risk associated with disposal of certain items. The State enforces the statutory disposal bans through a combination of efforts by the North Carolina DWM and local governments who often manage direct enforcement at municipal-owned disposal facilities. Enforcement involves monitoring waste entering disposal sites and educating offending waste generators about the statutory requirements as well as penalizing offending waste generators through citations or fines when appropriate. Despite such disposal bans being in effect, there remains a gap in knowledge and compliance with waste generators leading to some banned materials still being landfilled in violation of state law.

Table 7 below lists which materials are banned from landfill disposal in NC along with the associated Waste Characterization Study results for those material types. Collectively, banned materials accounted for 8.8% of the weighted average of the waste composition.

Table 7. Prevalence of Materials Banned from Disposal in North Carolina

BANNED MATERIAL	CHARACTERIZATION SORT CATEGORY	RESIDENTIAL COMPOSITION	COMMERCIAL COMPOSITION	MIXED COMPOSITION	TOTAL WEIGHTED AVERAGE
Aluminum Cans	Aluminum Cans (including foil and trays)	1.3%	0.8%	1.3%	1.1%
ABC Beverage Containers ¹	NA	NA	NA	NA	NA
Plastic Bottles and Containers	#1 PET bottles and jars, #2 HDPE Containers	3.1%	2.4%	2.9%	2.8%
Discarded Computer Equipment	Computer Equipment	0.1%	0.2%	0.0%	0.1%
Lead-acid Batteries ²	Lead-Acid Batteries	0.1%	0.0%	0.0%	0.0%
Lithium-ion Batteries ³	Lithium-Ion Batteries	0.0%	0.0%	0.0%	0.0%
Antifreeze	Antifreeze	0.0%	0.1%	0.0%	0.0%
Used Oil	Used Oil/Filters	0.0%	0.0%	0.0%	0.0%
Motor Vehicle Oil Filters	Used Oil/Filters	0.0%	0.0%	0.0%	0.0%
Fluorescent Lights and Thermostats ⁴	NA	NA	NA	NA	NA
Oyster Shells ⁴	NA	NA	NA	NA	NA

BANNED MATERIAL	CHARACTERIZATION SORT CATEGORY	RESIDENTIAL COMPOSITION	COMMERCIAL COMPOSITION	MIXED COMPOSITION	TOTAL WEIGHTED AVERAGE
Televisions	Televisions	0.0%	0.1%	0.0%	0.0%
Whole Scrap Tires	Tires	0.0%	0.0%	0.0%	0.0%
White Goods	White Goods	0.0%	0.0%	0.0%	0.0%
Wooden Pallets	Pallets and Clean Wood Waste	0.6%	4.6%	0.2%	2.1%
Yard Trash	Yard Waste	3.5%	1.2%	4.9%	2.7%
TOTAL	NA	8.7%	9.4%	8%	8.8%

¹ North Carolina General Statutes § 18B -1006.1 require holders of certain Alcohol Beverage Commission (ABC) on-premise permits to recycle beverage containers generated on-site. Because project staff could not determine where materials delivered to sorting locations were generated, ABC beverage containers were not included as a distinct sorting category.

²A total of 2 sampled loads were found to contain a Lead-Acid Battery.

³Beginning December 1, 2026, Lithium-ion batteries will be banned from landfill disposal ([G.S. 130A-309.10](#)). A total of 21 sampled loads were found to contain a Lithium battery. The weight of the Lithium batteries sampled is not significant enough to register as a percentage.

⁴Solar panels, fluorescent lights and thermostats (banned from disposal in construction and demolition debris landfills) and oyster shells were also not included as distinct sorting categories.

DESKTOP ANALYSIS OF OTHER NORTH CAROLINA MUNICIPAL WASTE COMPOSITION STUDY DATA

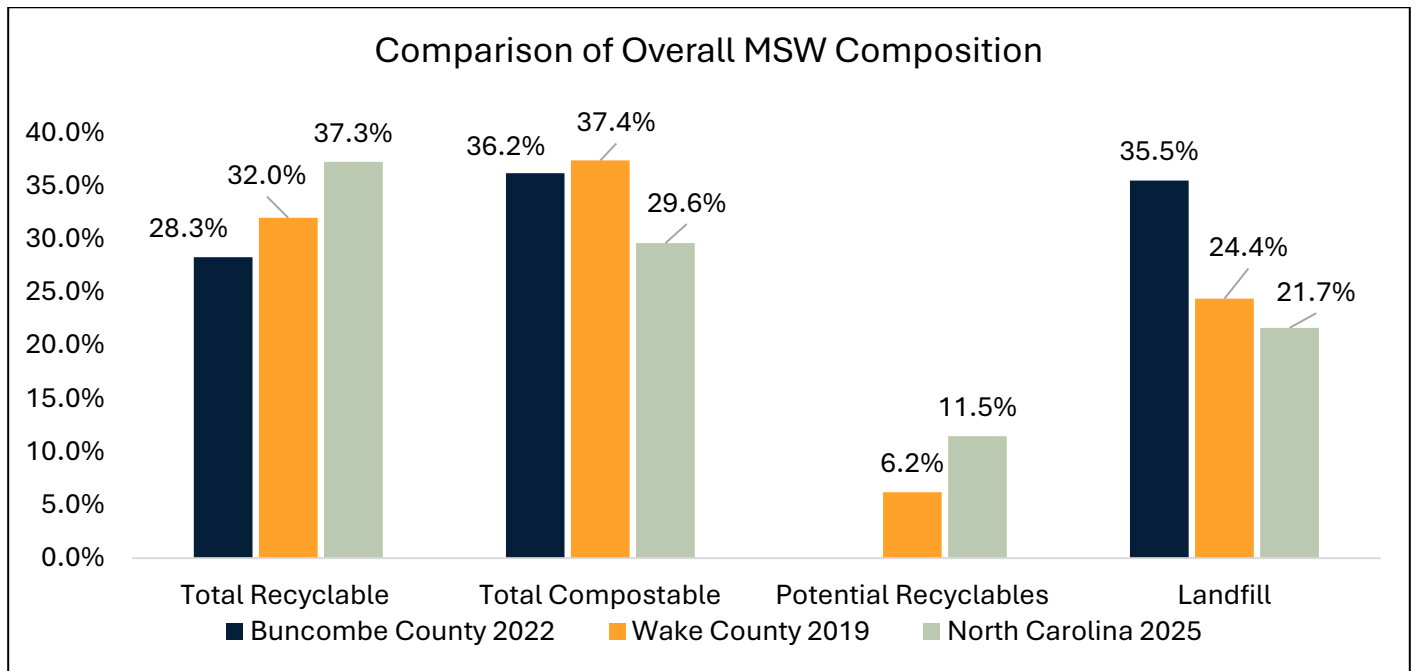
To compliment the waste characterization study analysis, DEQ requested that the Project Team perform a desktop analysis to review key findings from other recently completed municipal waste characterization studies conducted within the state to identify any predominant trends and/or common conclusions across the various studies.

Any conclusions derived from this desktop-level comparison should be viewed as indicative rather than definitive, as the underlying studies differ in methodology, study period, geographic setting, material definitions and categories, and seasonal considerations.

Kessler Consulting Inc. conducted a waste characterization study for Wake County, North Carolina in spring 2019 and published the results in their July 2019 report. A total of 42 loads of MSW generated by single-family residential and commercial generators and waste collected at the County's convenience centers were sorted into 50 material categories during the six-day sorting event.

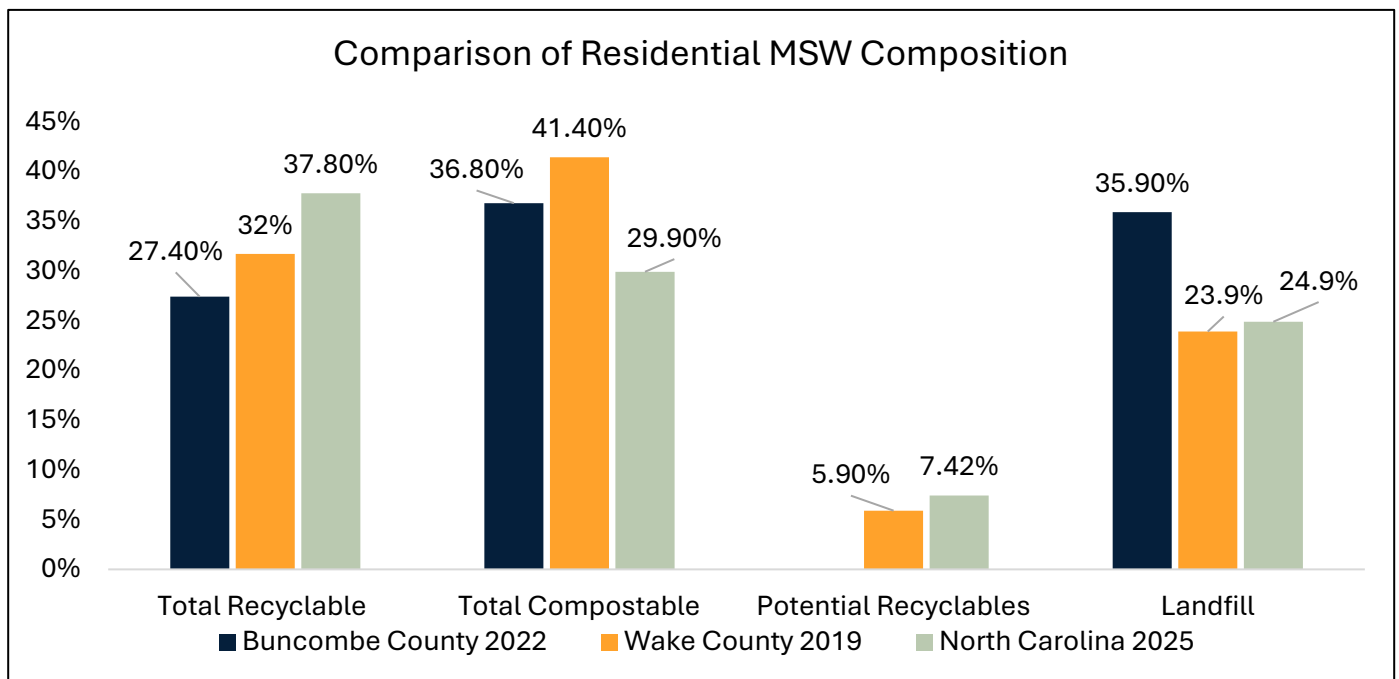
SCS Engineers conducted a waste characterization study for Buncombe County, North Carolina and published the results in their September 2022 report. A total of 45 loads of MSW delivered to Buncombe County Transfer Station collected from residential and commercial generators were sorted into 35 material categories during the sorting event.

Figure 11 compares municipal solid waste composition across Buncombe County (2022), Wake County (2019), and North Carolina statewide (2025). All three waste characterizations show compostable materials as the largest category (30–37%), closely followed by recyclables (28–37%), indicating consistent opportunities for increased diversion of organics and recyclables across the state. Figure 12 and Figure 13 compare the three waste characterizations' residential and commercial MSW compositions. Note that Buncombe County's waste characterization did not identify materials that are potential recyclables.



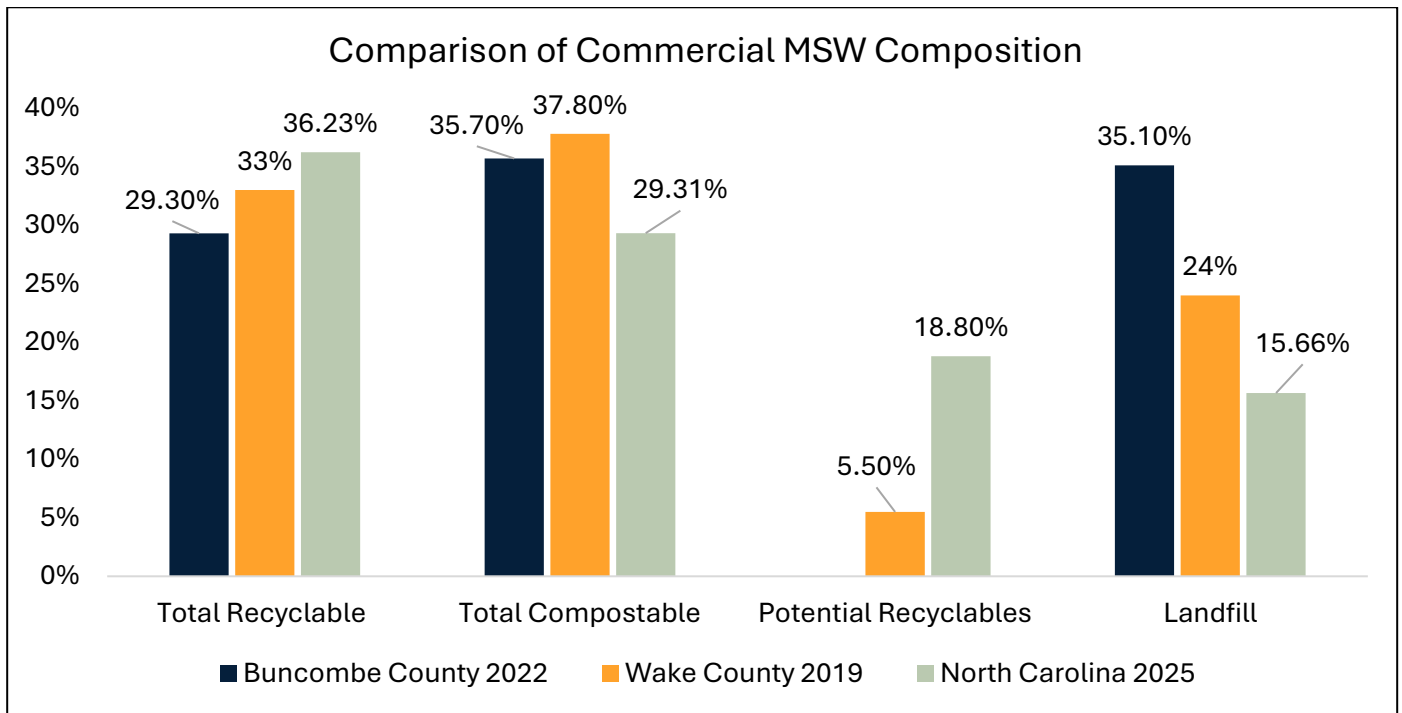
Buncombe County’s waste characterization study did not include a sort category that labeled material as potential recyclables.

Figure 11. Comparison of Overall MSW Composition



Buncombe County’s waste characterization study did not include a sort category that labeled material as potential recyclables.

Figure 12. Comparison of Residential MSW Composition



Buncombe County’s waste characterization study did not include a sort category that labeled material as potential recyclables.

Figure 13. Comparison of Commercial MSW Composition



What the Waste Characterization Study Reveals

Residential and Commercial MSW Composition

37%

Already
Recyclable

10%

C&D
Materials

6%

Textiles
in MSW

29%

Compostable
Materials

22%

Food Waste
in MSW

12%

Potentially
Recyclable

Conclusions and Recommendations

OPPORTUNITIES AND RECOMMENDATIONS TO INCREASE RECYCLING AND WASTE DIVERSION FROM LANDFILLS

This Study presents data and analysis on the composition of various waste streams in North Carolina to assess the performance of existing waste diversion programs and to identify opportunities to expand programs or policies that divert additional materials from landfill disposal.

The following recommendations are based on the waste composition data presented in this report:

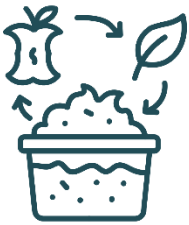


Improve Access to Recycling and Recycling Behavior

By weight, 20.8% of residential municipal solid waste (MSW) and 22.2% of commercial MSW was comprised of Recyclable Paper and Recyclable Containers and could have been successfully recycled in existing recycling programs. The Study found that an additional 17% of residential waste and 14% of commercial waste was comprised of Other Recyclables that are often targeted for recovery via drop-off convenience centers. In order for meaningful gains in recycling rates to improve, people must have access to participate in recycling programs, knowledge to feel empowered to make the correct decision as to whether an item should be recycled or discarded, and motivation to change their behavior to increase their recycling habits whether that be at home, work, or on-the-go. North Carolina should identify ways to increase recycling access, especially for multi-family residents to divert more materials from the landfill. [The Recycling Partnership's 2024 State of Recycling Report](#)¹² found that only 15% of multifamily residents in North Carolina have access to recycling, highlighting a significant gap between access provided to single-family residents.

Targeted public education and outreach efforts should continue to inform residents and businesses about proper recycling practices to increase capture rates while also decreasing the amount of non-recyclable materials that contaminate recycling material streams. To influence recycling behavior and increase commercial recycling, DEQ could consider a campaign to promote recycling of cardboard, which comprised 10% of the commercial landfilled waste sampled as part of this Study, and the largest portion of readily recyclable material in the commercial waste stream. To improve residential recycling behavior, educational efforts such as [DEQ's RecycleRight outreach campaign](#)¹³, also play a role in helping to increase public awareness and support for recycling, however

finding ways to partner with municipalities to support more direct engagement with residents is often more impactful. Numerous jurisdictions across the county have seen meaningful improvement in increasing recycling participation and reducing recycling contamination via “[feet on the street](#)”¹⁴ style cart tagging initiatives which provide direct feedback to residents on residential curbside collection routes by tagging recycling carts that are too contaminated to be collected. This level of direct community engagement draws attention to the recycling program and can increase participation and trust in the recycling system.



Prioritize Diversion of Compostable Materials

Compostable materials, including compostable paper, food waste, and yard debris, account for 29.9% of residential MSW and 29.3% of commercial MSW. Residential MSW contains significantly more yard trash than commercial MSW, but the vast majority of compostable materials is comprised of food waste making up 22.7% of the residential and 21.2% of the commercial waste stream. Nationwide, interest in composting and other organics processing technologies continues to grow. The State of North Carolina and its local governments have substantial potential to divert compostable materials from disposal and should further evaluate developing programs, facilities, and technologies that support organic material processing and recovery. Recent programs such as the [Food Waste Reduction Grant](#)¹⁵ open to both local government and private businesses are critical to reduce the amount of food waste disposed in landfills by expanding food donation networks and composting operations. DEQ should continue to track the number of composting facilities and local government food scrap drop-off programs to quantify the impact these initiatives are having and help build more support for growing food waste recovery efforts while playing a key role in helping to facilitate information sharing among municipal programs.



Expand Textile Recycling Programs

Textiles make up 7.2% of residential MSW and nearly 5% of commercial MSW by weight, comprising the largest percentage of materials in the Other Recyclables category. Expanding access to textile recycling at drop-off convenience centers coupled with campaigns to help promote the social and environmental benefits of donating and thrifting textiles can help to increase the convenience of recycling textiles while also encouraging behavior change to reduce textile waste generation.

North Carolina could also consider strategic partnerships and investments in expanding commercial textile recycling infrastructure such as [The Appalachian Regional Commission’s award of a \\$10 million Appalachian Regional Initiative for Stronger Economies\) grant](#)¹⁶ to The Industrial Commons of Morganton, NC, for the construction of a 40,000 square-foot textile upcycling manufacturing hub. Another example of a commercial scale project designed to increase the sustainability of the textile industry by recycling waste materials into fibers for new textiles, is the National Science Foundation (NSF) and North Carolina State University partnership to launch the [North Carolina Textile Innovation and Sustainability Engine](#)¹⁷, also being led by The Industrial Commons non-profit organization. The state could play an important role in helping to develop, fund, or promote such innovative partnerships while also assisting with connecting local municipal textile recycling programs to regional partners to enhance collaboration towards common waste reduction and recycling goals.

Develop Policies and Programs to Divert C&D and Bulky Waste



C&D materials as measured during the Study comprised 16.8% of the commercial waste stream and 6.4% of the residential. The State of the State Recycling Report Fiscal Year 2023-2024 identified 43 local government C&D recycling programs operating in the state. North Carolina should consider policies and investments that increase access to C&D recycling programs in other portions of the state. Encouraging investments in more C&D recycling efforts at the state’s existing C&D landfills could also yield significant material recovery. In parallel the state should consider ways to support expanding market demand for recycled C&D materials, given access to stable end markets is a key driver of increased C&D recycling. Strategic investments in developing more C&D recycling access while supporting end market development in the state’s rapidly growing metropolitan areas would yield the best return on investment due to the larger volumes of C&D waste being generated in high growth areas. As part of the overall Statewide Materials Management Optimization Study, the Project Team will be further conducting a materials market assessment focused on C&D materials to assist the state in evaluating regional markets for recovered C&D materials and identify existing gaps in access to recycling and end markets. The materials market assessment will also identify opportunities and make recommendations to improve recycling and material recovery outcomes.



Continue Conducting Waste Characterization Studies

Waste characterization studies have provided state and local governments with critical insights into evolving waste stream composition that supports informed decision-making related to waste reduction, resource recovery, and economic development. North Carolina should continue to perform waste characterization studies on a periodic basis to monitor changes in the waste stream and refine programs and policies accordingly. Comparing future waste composition data to the findings in this report can also help identify trends and shifts in waste generation patterns over time.

In addition to the waste composition results presented in this report, DEQ, through its consultant RRS, will develop updated materials market assessments for a wide range of materials including PET, HDPE, and PP plastics, C&D materials, and Lithium-ion batteries as part of the Statewide Materials Management Optimization Study. The materials market assessments will also identify opportunities and make recommendations to improve recycling and material recovery outcomes.

DEQ will also be performing a recycling optimization analysis that will incorporate data from this report, recycling market assessments, statewide MRF surveys, and other solid waste annual reporting data. This additional data will help identify opportunities for material management optimization, including location-specific investments, opportunities to right-size facilities, and determining favorable relationships for hub-and-spoke recovery networks.

Appendix 1: Material List & Definitions

DEQ and RRS have agreed on the following 41 material categories (Table 8) to be sorted and weighed for every sample:

Table 8. Material List and Definitions, 2025

MATERIAL CATEGORY	RESULTS CATEGORY	MATERIAL	DEFINITION
Plastic	Recyclable Containers	#1 PET bottles and jars	Clear or colored PET bottles or jars. The plastic resin number "1" is visible in the center of the triangular recycling symbol and may also bear the letters "PETE" or "PET." Includes soda bottles, water bottles, peanut butter jars, and some oil/dressing bottles
Plastic	Recyclable Containers	#2 HDPE Containers	Natural and colored HDPE bottles with the number "2" in the recycling symbol. Includes laundry detergent bottles, milk jugs, and shampoo bottles
Plastic	Recyclable Containers	#5 Polypropylene	Plastic packaging with the number "5" on them. Food containers, yogurt cups, deli containers, and cleaning product bottles are included. Large #5 items are NOT included; they are categorized under "bulky rigids"
Plastic	Other Recyclables	Bulky Rigid Plastic	Large plastic items often designed for more than one use such as toys, plastic storage containers, laundry hampers, buckets, nursery pots, outdoor bins/furniture, 5-gallon buckets, etc.
Plastic	Other Recyclables	Recyclable Plastic Film	Soft plastic bags, film, and wrapping that is designed to hold or cover things such as grocery bags, plastic wrapping/shrink wrap, bubble wrap, Amazon or equivalent plastic delivery pouches, and plastic bags (e.g., produce bags, sandwich bags, retail plastic bags)
Plastic	Potential Recyclable	Other Recyclable PET Containers & Packaging	Non-bottle PET #1 containers such as clamshells, cups, tubs, lids, plastic egg cartons, and trays
Plastic	Potential Recyclable	#6 Expanded EPS	#6 foam
Plastic	Landfill	All Other Plastics (non-recyclable)	Plastic items and packaging not described in other plastic categories such as but not limited to trash bags, hybrid delivery pouches with plastic and paper mix, snack bags, pouches, single-use plastics (e.g., straws, utensils, lids)

MATERIAL CATEGORY	RESULTS CATEGORY	MATERIAL	DEFINITION
Paper	Recyclable Paper	Corrugated Cardboard	<i>Corrugated boxes with a wavy center layer sandwiched between two outer layers without wax coating on the inside or outside. Examples include shipping and moving boxes, sheets and pieces of boxes, and pizza boxes (relatively unsoiled). Does not include chipboard (i.e., wood chips/shavings pressed together)</i>
Paper	Recyclable Paper	Mixed Recyclable Paper	<i>Includes magazines, printer paper, cereal boxes, fast food/take-out paper containers, paper board, molded packaging, newspaper, phone books and directories, junk mail, envelopes, brightly colored ledger paper and other dry paper, manila folders, and index cards. Mixed Recyclable Paper may be combined with minor amounts of other materials such as wax or glues</i>
Paper	Recyclable Containers	Aseptic/Gable Polycoated Containers	<i>Aseptic cartons with multi-layered packaging that contain shelf-stable food products such as juices, soups, and milks, and gable top cartons including items such as milk, juice, and egg substitutes. Rigid food and beverage cartons are usually paper based, may be any shape, and may include a plastic pour spout as part of the carton</i>
Paper	Other Recyclables	Bagged Shredded Paper	<i>Bags of shredded paper</i>
Paper	Compostable	Compostable Paper	<i>Paper material objects that are soiled or compostable such as paper towels, napkins, plain or uncoated paper plates, waxed cardboard, and tissues.</i>
Paper	Landfill	Other Paper (non-recyclable and non-compostable)	<i>Paper materials not described in other fiber categories</i>
Other	Other Recyclables	Tires	<i>Tires and tire shreds from vehicles and other machinery</i>
Other	Potential Recyclable	Mattresses	<i>Mattresses</i>
Other	Landfill	Furniture	<i>Furniture that does not include mattresses</i>
Other	Landfill	Fines	<i>Small material that has fallen through the sorting screens and comprises items less than 2 in length or width</i>
Other	Landfill	Other Landfill	<i>Other items not listed elsewhere and not applicable to a recycling or composting process</i>
Other	Landfill	Pet Waste and Diapers	<i>Bagged and unbagged pet waste, cat litter, and diapers (This material category was added to the fall waste sorting events to provide more detailed information within the "Other Landfill" material type.)</i>

MATERIAL CATEGORY	RESULTS CATEGORY	MATERIAL	DEFINITION
Organics	Other Recyclables	Textiles	<i>Fabrics, leathers, and cloth materials, either natural or synthetic (e.g., clothing, rags, leather, rugs, tablecloths, curtains, stuffed animals, shoes, or other cloth materials)</i>
Organics	Compostable	Yard Waste	<i>Plant materials, including woody materials, from any public or private landscape. Examples include leaves, grass clippings, plants, brush and branch trimmings</i>
Organics	Compostable	Food Waste	<i>Includes food material capable of being composted. This type includes materials resulting from the processing, storage, preparation, cooking, handling or consumption of food and materials from industrial, commercial or residential sources. Examples include discarded meat scraps, dairy products, eggshells, fruit or vegetable peels, and other food items from homes, stores, and restaurants</i>
Metal	Recyclable Containers	Steel Cans	<i>Rigid containers made mainly of steel, such as items that will stick to a magnet and may be tin-coated. This subtype is used to store food, beverages, paint, and a variety of other household and consumer products (e.g., food and beverage cans/containers, empty aerosol cans)</i>
Metal	Recyclable Containers	Aluminum Cans (including foil and trays)	<i>Aluminum cans, foil, pie plates, and trays</i>
Metal	Other Recyclables	Other Ferrous	<i>Ferrous metal items that are not steel cans and do not belong in other categories</i>
Metal	Other Recyclables	Other Non-Ferrous	<i>Non-Ferrous metal items that are not aluminum cans, foil, or trays, and do not belong in other categories</i>
Metal	Other Recyclables	White Goods	<i>White goods (e.g., refrigerators, freezers, air conditioners, microwaves) that may contain hazardous materials like refrigerants, oils, and chemicals that can harm the environment</i>
Inorganics	Recyclable Containers	Recyclable Glass Bottles and Jars	<i>Glass bottles and jars</i>
Inorganics	Other Recyclables	Computer Equipment	<i>Computer equipment</i>
Inorganics	Other Recyclables	Televisions	<i>Televisions</i>
Inorganics	Other Recyclables	Other Electronics	<i>Electronic items not defined by other categories</i>
Inorganics	Landfill	Other Glass	<i>Glass not originating from bottles or jars (e.g., windows, mirrors, drinking glasses, Pyrex glass containers)</i>
HHW	Other Recyclables	Used Oil/Filters	<i>Used oil/filters from automotive and other equipment</i>

MATERIAL CATEGORY	RESULTS CATEGORY	MATERIAL	DEFINITION
HHW	Other Recyclables	Lead-Acid Batteries	<i>Lead-acid batteries</i>
HHW	Other Recyclables	Lithium-Ion Batteries	<i>Lithium-ion batteries</i>
HHW	Other Recyclables	Antifreeze	<i>Antifreeze</i>
HHW	Other Recyclables	Other HHW	<i>Other hazardous household waste items which, if improperly put in the solid waste stream, may present handling problems or other hazards that are not included in another category including various paints, pesticides, fluorescent bulbs, CFLs, medical waste, thinners, and solvents</i>
HHW	Other Recyclables	Household Batteries	<i>Household batteries</i>
HHW	Other Recyclables	Latex Paint	<i>Latex paint and container or receptacle</i>
C&D	Compostable	Pallets and Clean Wood Waste	<i>Wood that is untreated including lumber, pallets, and bulky wood waste. This is wood that does not have any adhesives, paint, stain, fire retardants, pesticides, or preservatives</i>
C&D	Potential Recyclable	C&D	<i>Includes drywall (i.e., sheets of gypsum sandwiched between paper layers), treated lumber, carpet, carpet padding, aggregates, insulation, bricks, and concrete</i>

Appendix 2: Summary of Targeted Samples

Table 9 below summarizes the samples obtained as part of the Study.

Table 9. Summary of Targeted Samples, 2025

SITE LOCATION AND SEASON	RESIDENTIAL SAMPLES	COMMERCIAL SAMPLES	MIXED SAMPLES (RESIDENTIAL & COMMERCIAL)	DROP-OFF CONVENIENCE CENTER SAMPLES	TOTAL SAMPLES BY SORTING EVENT
Tuscarora Landfill (April 21-24, 2025)	14	14	1	0	29
Watauga County Transfer Station (May 20-22, 2025)	19	5	6	0	30
Greensboro Transfer Station (June 4-6, 2025)	16	10	0	0	26
Tuscarora Landfill (Oct. 7-9, 2025)	17	11	1	1	30
Watauga County Transfer Station (Sept. 9-11, 2025)	13	11	2	4	30
Greensboro Transfer Station (Oct. 28-30, 2025)	16	14	0	0	30
Total Samples by Generator Type	95	65	10	5	175

GLOSSARY

Commercial Waste – Commercial waste refers to trash collected from businesses and institutions including office buildings, schools, and retail establishments. For the purposes of the waste characterization study, it includes waste generated from multifamily housing.

Construction and Demolition Debris (C&D)- Construction and demolition materials consist of the debris generated during the construction, renovation and demolition of buildings, roads, and bridges.

Department of Environmental Quality (DEQ)- The North Carolina Department of Environmental Quality.

Diversion –The process of reducing the amount of waste sent to disposal by recovering materials for reuse, recycling, composting, or other beneficial purposes.

Division of Environmental Assistance and Customer Service (DEACS)- The Division of Environmental Assistance and Customer Service within the North Carolina Department of Environmental Quality.

Division of Waste Management (DWM)- The Division of Waste Management within the North Carolina Department of Environmental Quality.

Multifamily housing – Refers to residential units in multi-level buildings, such as apartment buildings, which may or may not include commercial on the ground level.

Municipal Solid Waste (MSW) – Waste generated by residential and commercial establishments.

Single Family Residential – Trash collected curbside from single family detached and attached housing (e.g., townhomes).

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