



TECHNICAL MEMORANDUM

DATE: September 1, 2017

TO: David Andrews, Town Manager

FROM: Lisa Lammert, Senior Consultant

SUBJ: **Residential Solid Waste Study – Executive Summary**

PROJ #: 192-00.00

The Town of Carrboro, NC (Town) requested Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study (Study). The Study includes an assessment of the Town's Solid Waste Management Division (Division) and its existing system. The purpose and intent for the Study was to progress toward a long-term goal of Zero Waste, evaluate options to reduce residential solid waste disposal, and assess collection methods and schedules to reduce the Town's carbon footprint.

KCI conducted several tasks that resulted in individual technical memorandums presenting the observations, findings, and recommendations by task. This memorandum is designed to summarize and integrate the tasks into an executive summary of the Study.

The following tasks were requested in the Town's Request for Proposals (RFP) scope of work:

- Task 1 – Public Participation
- Task 2 – Assessment of Current Waste Programs
- Task 3 – Waste Characterization Study
- Task 4 – Waste Collection Route Study
- Task 5 – Organics Collection Options Assessment
- Task 6 – Preliminary Plan for Residential Source Separated Pilot Program
- Task 7 – Final Product
- Task 8 – Pay-As-You-Throw Assessment

Five technical memorandums (TMs) were developed addressing these tasks. For cohesiveness, Task 2 and Task 4 were combined into a single TM as was Task 5 and Task 6. The five TM's are attached to this executive summary for convenience.

Current Residential Solid Waste Collection Program

The Town currently provides collection services for garbage, yard waste, and bulk waste via the Public Works Department. Services are paid for through the General Fund. Orange County (County) provides recyclables collection services, which is paid for through property taxes.

The Town's current residential solid waste collection program is as follows:

- Garbage – automated curbside service once per week in 95-gallon carts
- Yard Waste – automated and manual curbside service twice per month; seasonal loose leaf collection every-other-week (EOW) (November – February)¹
- Bulk Waste – once per week service on the same day as garbage collection and on-call service; limited items at no charge, others for a fee
- Recycling – automated curbside service once per week in 95-gallon carts collected by the County

The County does not collect the Town's recyclables separately from non-Town recyclables. As a result the Town's recycling rate cannot be determined.

Residential Waste Composition

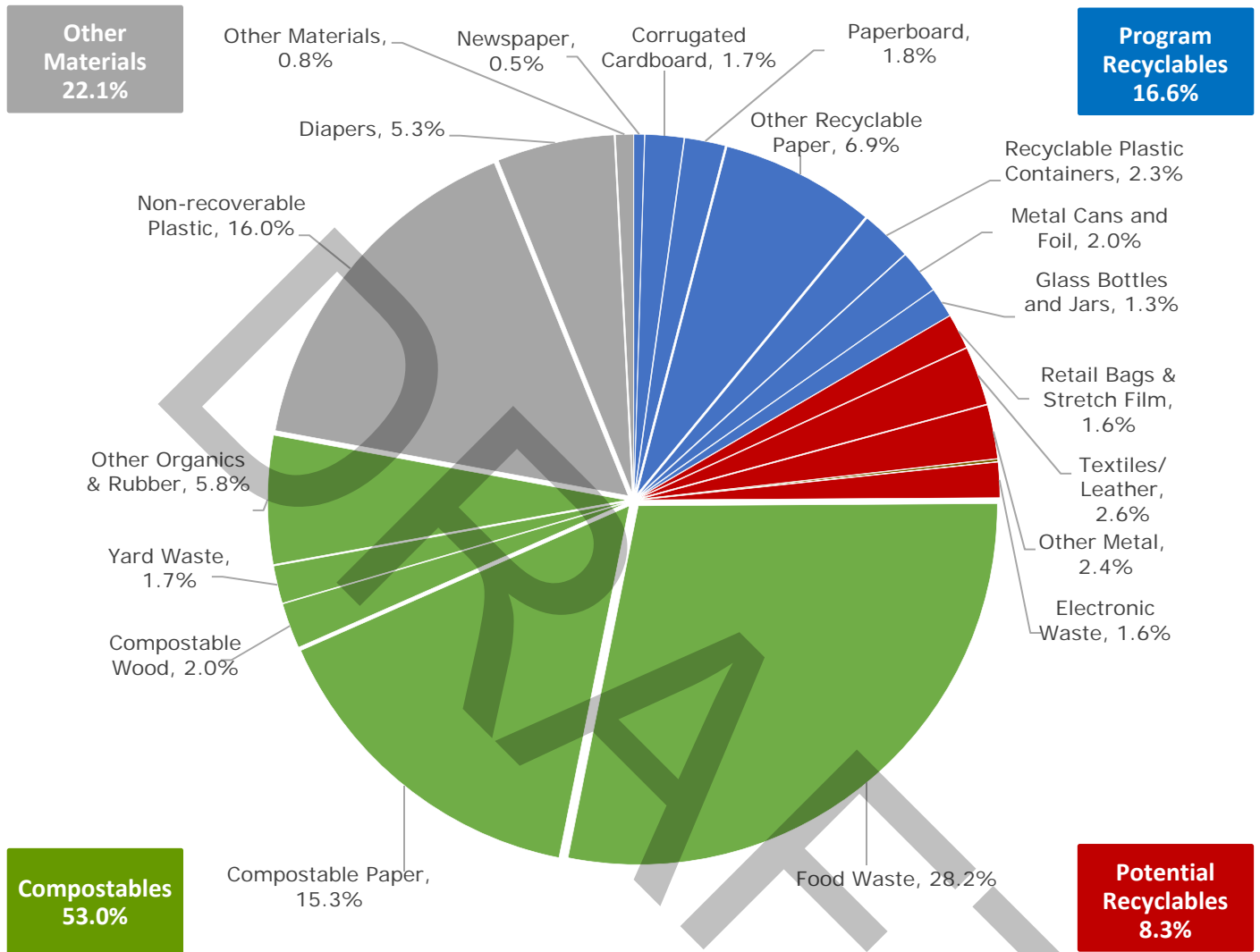
KCI conducted a residential waste composition study (WCS) October 24-28, 2016. We developed a methodology that modeled after the County's previous waste composition studies in order to maintain continuity with the previous study results.

The results of the WCS identified that the Town's residents are actively diverting recyclables, yard waste, and textiles as those categories are much smaller than typical. As a result, the Town has a much higher percentage of organics, which is comprised of food waste, compostable paper, and small amounts of compostable wood, yard waste, and other organics and rubber. Figure 1 provides the detailed results of the Town's residential WCS.

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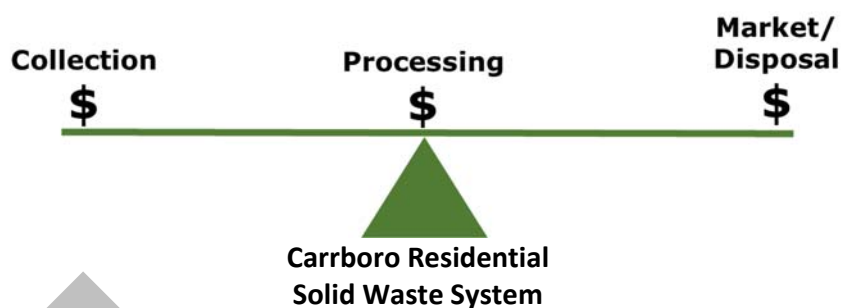
¹ Seasonal loose leaf collection is conducted by the Landscaping Division and is not included in this Study.

Figure 1: Composition of Single-Family Residential Waste Disposed (% by weight)



Residential Cost of Services

Collection, processing, and marketing/disposal are interrelated elements of a materials management system (see Figure 2). All three elements have a cost and are critical to maintaining a balanced, sustainable management system. Changes to one of these elements will impact the others; therefore, the model links all three elements to ensure implications to the overall materials management system are factored in.

Figure 2: Balancing the Business Components of Materials Management

KCI conducted a cost of services analysis of the Town's current residential collection program. The Division's expenses were allocated across residential and commercial lines of business. Residential expenses were further allocated into three residential collection services provided by the Division: Garbage, yard waste, and bulk waste. KCI worked with Division and Finance staff to identify direct expenses and develop an appropriate methodology for allocating indirect expenses. The assignment of collection routes, fleet, and full-time employees to the three collection services was used for allocation. Disposal costs were calculated based on actual disposal log reports and totals by Division truck type. A summary of the cost of service follows.

Table 1: Residential Cost of Services

FY2016	Collection Cost per Ton	Disposal Cost per Ton	Annual Tons	Est. Annual Cost per Household
Garbage	\$100.93	\$41.00	2,547.22	\$82.41
Yard Waste	\$289.41	\$18.00	859.59	\$60.23
Bulk Waste	\$220.47	\$41.00	224.86	\$13.40
Average/Total	\$188.50		3,631.67	\$156.05

The estimated cost per household per month for solid waste collection services is \$13.00, which is a relatively reasonable cost for the services that the Town provides. However, the Town's cost for services for collection comprises 81 percent of total solid waste expenditures with disposal making up the remaining 19 percent. Typically collection costs range from 50-70 percent of a materials management system, which is primarily dependent on the cost of disposal that can vary widely. The Town's disposal costs are moderate, reflecting a higher than average cost for collection.

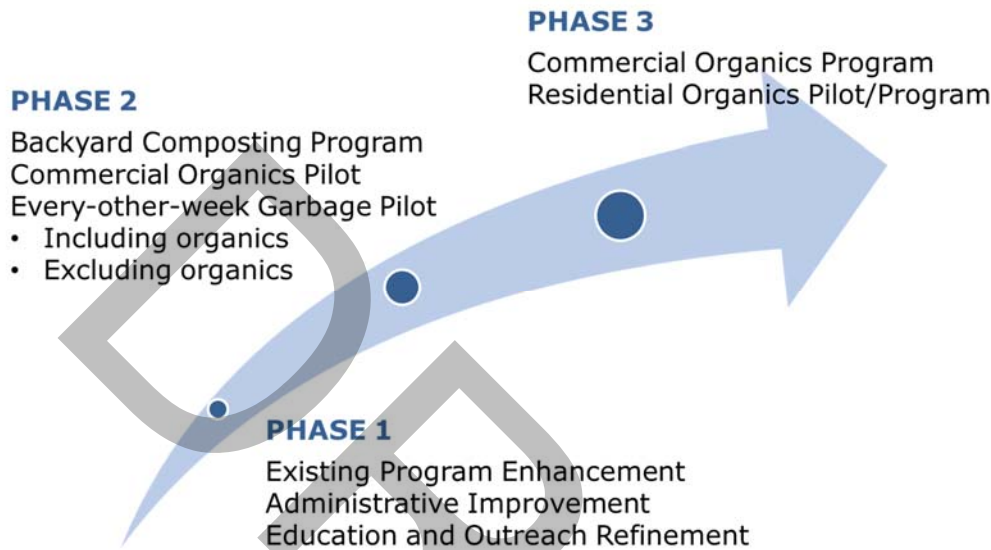
Findings and Recommendations

KCI presented a variety of recommendations within the TMs to help the Town achieve its goals and objectives based on the purposes and intent of the Study. A summary of findings and recommendations are presented in this executive summary, more details can be found in the individual TMs.

The recommendations are provided in a phased-in approach (see Figure 3), identifying enhancements that could be implemented immediately and others that may require building upon

previous activities. Depending on the Town's desire and resources available, Phase 1 and some of Phase 2 recommendations could be implemented together.

Figure 3: Recommendations for Improved Solid Waste Management



Phase 1 Recommendations

➤ Garbage Collection

Garbage collection is a uniform program with a clear schedule and low collection cost. Residents surveyed were overwhelmingly pleased and described the Town's garbage services as "great" or "good" (92 percent).

KCI recommends that the Town enhance its garbage program to encourage diversion and lower collection costs by incorporating:

- Increased rate for customers utilizing more than one roll cart for garbage
- Alternative setout requirements, such as artery or one-sided collection, for hard-to-service areas to streamline collection, alleviate collection congestion, and provide a safer environment for staff and residents

➤ Yard Waste Collection

Yard waste collection is a non-uniform program with multiple options and multiple collection vehicles, and collection vehicles are not aligned with the collection method employed. Residents surveyed were less pleased with the Town's yard waste services with only 66 percent describing them as "great" or "good." One area of frustration was that the schedule was confusing and reported missed services. Yard waste is the most expensive collection service.

KCI recommends that the Town enhance its yard waste program to lower collection costs, reduce Greenhouse Gas (GHG) emissions with streamlined routes, and increase quality of service as follows:

- Cart yard waste
- Use the hybrid vehicle
- Route yard waste outside of the cart, as needed
- Charge for all yard waste collected outside of the cart

The Town could purchase brand new garbage carts for all residents and repurpose the existing garbage carts as yard waste carts. A fully carted program would allow the Division to utilize the hybrid collection vehicle, which is currently underutilized and remains parked two days per week. A carted program will also eliminate the need for collection staff to exit the vehicle to debug yard waste. Piles of yard waste outside of the cart could be routed for the claw truck and collected the following day. Of the six injuries reported between 2013 and 2016, all but one occurred while the driver was outside of the vehicle to manually collect yard waste.

By enhancing the yard waste program to an on-call program for piles of yard waste, collections could be routed to reduce time driving streets looking for large setouts. The reduced time on route will not only reduce collection costs but will reduce GHG emissions.

➤ **Bulk Waste Collection**

Similar to yard waste, bulk waste collection is a non-uniform program with an unclear fee structure and inefficient routing. While some customers may place bulk waste out on their trash collection day, others may place items at the curb for on-call collection. Division staff might bypass one pile of bulk waste because it requires a fee to stop next door because that pile of bulk waste is comprised of “free” items. Bulk waste is the second most expensive collection program.

KCI recommends that the Town enhance its bulk waste program to help lower collection costs and reduce GHG emissions with streamlined routes by incorporating:

- On-call service only
- Route collection, as needed
- Charge for all bulk waste

Similar to the on-call yard waste recommendations, by enhancing the bulk waste program to an on-call program, collections could be routed to reduce time driving streets looking for setouts. The reduced time on route will not only reduce collection costs but will reduce GHG emissions.

➤ **Operation Administration**

KCI observed an experienced staff of eight full-time employees with an average of 14.5 years with the Town. The Division appears to foster a culture of happiness and cooperative work ethics among its employees. The Division demonstrated effective communication and cooperation among the front line staff and the supervisor. Drivers are cross-trained, which is an industry best practice but, despite the best efforts in many organizations, is never actually implemented.

KCI reviewed the fleet replacement schedule and found it inconsistent with industry standards. The best replacement policies evaluate utilization and mitigate the increased maintenance, repair, and fuel costs incurred by older vehicles. Several of the administrative processes and procedures were manual and/or inefficient. Utilizing technology, where appropriate, will improve efficiency and mitigate human error. Although the Division does promote safety, solid waste safety meetings are not regularly scheduled.

KCI recommends the following enhancements to assist staff in conducting effective and efficient work.

- Revamp education and outreach
- Promote a collection reminder app for customers that find schedules confusing
- Revisit the fleet vehicle replacement policy
- Revise back office processes and procedures
- Schedule weekly safety meetings

➤ **Education and Outreach Refinement**

The education and outreach (E&O) on the Town website should inform residents of the existing collection program, encourage diversion, and provide resources as appropriate. E&O should include multiple touchpoints using multiple methods for the widest reach. Appropriate E&O is critical to the successful implementation of program enhancements, pilot programs, or new programs.

Phase 2 Recommendations

➤ **Backyard Composting Program**

In an effort to build upon existing diversion efforts and encourage more, KCI recommends the Town promote a residential backyard composting program. Of the residents surveyed, 42 percent already do some form of backyard composting consisting of food scraps and/or leaves and small yard debris. The Town may want to consider conducting workshops to teach residents about composting and provide kitchen pails/bins and/or backyard composters for a fee.

➤ **Commercial Organics Pilot**

Commercial organics programs address the largest generators. Although the Town's commercial collection program was not part of the scope, a commercial organics program could provide significant diversion opportunity. The County WCS indicated that 23 percent of the Town's commercial waste is food waste. The town has four organics processors in the local area for delivery of the feedstock. A pilot study with a select group of generators would provide the Town with important information for the development of a full-scale commercial organics program.

➤ **EOW Garbage Pilot**

Removing organics from the residential waste stream will mitigate one of the major concerns regarding EOW garbage collection. A pilot study could be conducted in tandem

with the residential organics pilot, or once a full-scale residential organics program has been implemented. The EOW garbage collection pilot could also include curbside organics. Should the Town decide to implement a carted yard waste program, the infrastructure will already be in place and require minimal additional resources.

Phase 3 Recommendations

➤ **Commercial Organics Program**

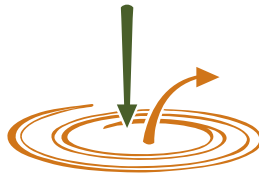
Based on the results of the commercial organics pilot study, the Town may want to implement a full-scale commercial organics program.

➤ **Residential Organics Pilot/Program**

Should a residential organics pilot not be conducted in tandem with the EOW garbage collection pilot, a stand-alone residential curbside organics pilot study could be conducted with a select group of residents. Based on the results of a residential organics pilot study, the Town may want to implement a full-scale residential organics program.

Next Steps

On September 19, 2017, Mitch Kessler, President of KCI, will make a presentation of the Study to the Board of Aldermen in the Board Chambers. The presentation will align with this executive summary and encourage further discussion regarding the Town's goals and objectives as they pertain to residential solid waste collection. At that time, Town staff will seek to obtain board approval to accept the Study and obtain board direction in prioritizing the next steps for implementation. It has been a pleasure assisting the Town in this important project and KCI would be happy for the opportunity to assist the Town with the implementation of any, or all, of the recommended program enhancements, pilot studies, and new programs.



kessler consulting inc.
innovative waste solutions

TECHNICAL MEMORANDUM

TO: David Andrews, Town Manager
Town of Carrboro

FROM: Shane Barrett, Consultant

SUBJ: **Technical Memorandum #1: Residential Waste Composition Study Results**

PROJ #: 192-00.00

Purpose and Background

This technical memorandum provides the results of the Residential Waste Composition Study (WCS) conducted by Kessler Consulting, Inc. (KCI) for the Town of Carrboro (Town). The objective of the WCS is to provide the Town with reliable information regarding the types and percentages of materials, including potentially recyclable materials, currently disposed of by its single-family residents. This information will assist the Town in developing future programs, including more focused and cost-effective resource management and recycling systems.

Fieldwork for the WCS was conducted concurrently with a similar study KCI was conducting for Orange County (County), thereby leveraging the resources already mobilized by KCI. Fieldwork took place at the City of Durham (City) Transfer Station during the week of October 24-28, 2016.

Methodology

KCI developed a methodology that was modelled after the County's previous waste composition studies in order to maintain continuity with the previous study results. KCI provided a Study Supervisor, Sorting Supervisor, additional labor to assist with sorting activities, all sorting equipment, and safety gear. The City provided the services of a loader and operator to pull samples at the direction of the Study Supervisor and remove waste upon completion of sorting activities.

During the week of October 24-28, 2016, KCI pulled a representative sample of at least 200 pounds from each of the Town's six weekly single-family residential routes (noted as automated side loader routes #1-#6). All samples were manually sorted into 40 material categories, which are defined in Attachment A. This list of material categories was developed taking into consideration the types of recyclables included in the Town's recycling program, as well as the County's previous studies.

Recyclables accepted by the Town include the following:

- Cardboard
- Newspaper
- Mixed paper
- Narrow-neck plastic containers
- Plastic tubs #2, #4, and #5
- Glass bottles and jars
- Aseptic and gable-top containers
- Aluminum cans and foil
- Steel cans and containers

Following the field work, data was analyzed as outlined in the *ASTM Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (D5231-92; reapproved 2008)* to determine the percentage, by weight, of each material category. In addition to the weighted average, the 90 percent confidence interval was calculated for each material category. The confidence interval indicates that, with a 90 percent level of confidence, the actual arithmetic mean (the arithmetic mean obtained if an infinite number of samples were sorted) is within the upper and lower limits shown. This provides an understanding of how much variation occurred in the quantity of that material category in the samples sorted. Generally, the more homogeneous the waste stream and the greater the number of samples sorted, the higher the level of accuracy achieved and the narrower the margin between the upper and lower bounds of the confidence interval.

WCS Results

Unless otherwise stated, all results presented in this section are expressed in percentage by weight. The percentages included in the tables and figures are the mean values for each material category.

The tables and figures provided at the end of this memorandum present the results of the Winter 2016 sorting event as listed below.

- Single-family residential waste results are provided in Figure 1 and Table 1. Table 1 summarizes the materials in the Town's single-family residential waste stream that offer the greatest potential for diversion through increased recycling or composting. Individual sample results provided in Attachment B.
- Table 2 provides a comparison of the Town's single-family residential waste stream to the countywide single-family residential results from the County's current and previous studies.

Comparisons with the previous studies demonstrate changes in the waste stream over time. For example, the percentage of newspapers and magazines has declined, reflecting the trend toward electronic news media and the commensurate downsizing of printed newspapers. It likely also reflects recycling efforts within the County. The percentage of glass containers has also declined, reflecting the trend toward replacing some types of glass with plastic packaging.

Results of the Town's residential waste composition revealed opportunities to increase waste diversion. Some of the key opportunities are as follows:

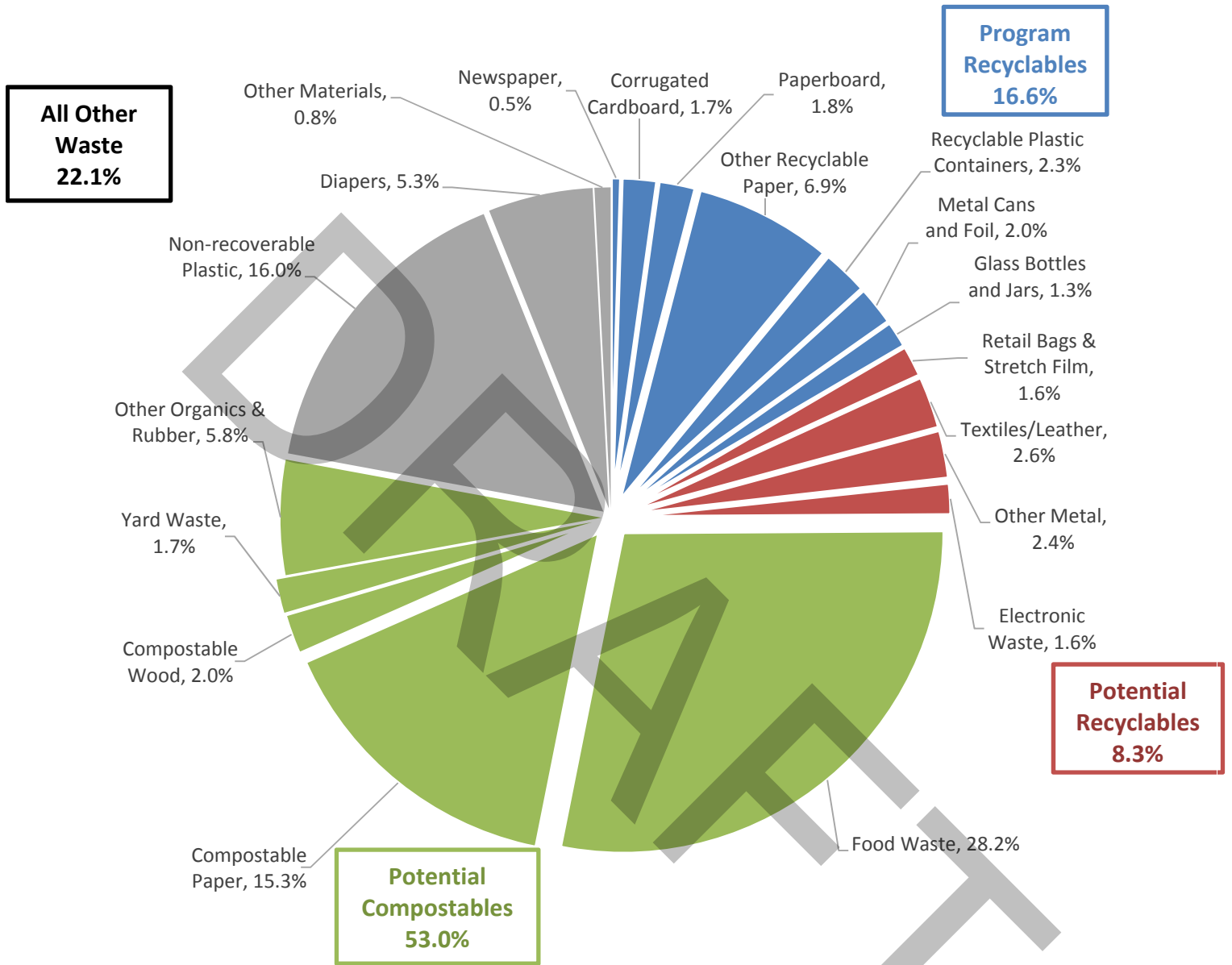
- Nearly 17 percent of the single-family residential waste stream consists of recyclables that are currently accepted in the Town's single stream recycling program (10.9% recyclable paper and 5.6% recyclable containers).
- Organic waste is the largest component of the single-family waste stream at over 53 percent of all materials disposed. Food waste makes up the largest component at 28.2 percent, followed by low-grade (compostable) paper at 15.3 percent.
- Just over 8 percent of the Town's single-family waste stream is comprised of materials that have the potential to be recycled or reused. These materials include textiles, other metals, electronic waste, and retail bags, all of which are accepted at the County's waste and recycling centers.

In all, nearly 78 percent of the Town's waste stream consists of recyclable or compostable materials. While it is unrealistic to believe that all of these materials can be diverted from disposal, results of this study demonstrate the existence of substantial opportunities for increased diversion through enhanced recycling and composting programs. Results of this study will assist the Town in benchmarking its current waste diversion programs, as well as in designing and implementing future programs or program enhancements that target materials offering the greatest waste diversion opportunities.

KCI appreciates the opportunity to assist the Town with this project and to provide current and accurate composition data for use in future planning decisions. We look forward to assisting the Town with the remaining items of our scope to enhance the overall performance of its solid waste management system.

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FIGURE 1: Composition of Single-Family Residential Waste Disposed (% by weight)



Note: For the purpose of this figure, the following categories have been combined:

- Other Recyclable Paper includes the categories of Magazines, Phone Books, Other Books, White Ledger, Mixed Recyclable Paper, and Aseptic Containers.
- Recyclable Plastic Containers includes the categories of All Plastic Bottles and Dairy Plastic Containers.
- Metal Cans and Foil includes the categories of Steel/Tin Cans, Aluminum Cans, Aerosol Cans, and Aluminum Foil.
- Other Metals includes the categories of Other Ferrous Metals and Other Non-Ferrous Metals.
- Recoverable Hazardous Waste includes the categories of Lead Acid Batteries, Dry Cell Batteries, Oil Filters, and Other Hazardous Wastes.
- Compostable Paper includes the categories of Waxy Cardboard and Low Grade Paper.
- Compostable Wood includes the categories of Wood Pallets, Wood Lumber, and Stumps/Branches.
- Non-recoverable Plastic includes the categories of Plastic Film, Mixed Plastic Containers, and All Other Plastics.
- Other Materials includes the categories of Other Glass, Painted/Treated Wood, Brick/Concrete/Dirt, and Infectious Waste.

Table 1: Composition of Single-Family Residential Waste (% by weight)

Material Categories		Weighted Average	Standard Deviation	90% Confidence Interval	
				Lower	Upper
1	Newspaper	0.5%	0.5%	0.1%	0.9%
2	Glossy Magazines	0.6%	0.8%	0.0%	1.3%
3	Corrugated Cardboard	1.7%	1.3%	0.7%	2.8%
5	Phone Books	0.0%	0.0%	0.0%	0.0%
6	Paperboard	1.8%	0.7%	1.3%	2.4%
7	Other Books	0.0%	0.1%	0.0%	0.1%
8	White Ledger	0.7%	0.6%	0.2%	1.2%
9	Mixed Recyclable Paper	5.4%	2.9%	3.1%	7.8%
40	Aseptic Containers	0.2%	0.1%	0.1%	0.3%
11	All Plastic Bottles	1.5%	1.2%	0.5%	2.4%
13A	Dairy Plastic Containers	0.8%	0.4%	0.5%	1.2%
19	Tin/Steel Cans	0.4%	0.3%	0.1%	0.7%
20	Aerosol Cans	0.4%	0.4%	0.1%	0.7%
22	Aluminum Cans	0.4%	0.2%	0.3%	0.6%
23	Aluminum Foil	0.7%	0.3%	0.4%	1.0%
25	Glass Bottles and Jars	1.3%	0.8%	0.7%	2.0%
	Total Program Recyclables	16.6%			
12B	Retail Bags & Stretch Film	1.6%	0.5%	1.2%	2.0%
16	Textiles/Leather	2.6%	1.3%	1.5%	3.7%
21	Other Ferrous	1.9%	2.6%	-0.2%	4.0%
24	Other Non-Ferrous	0.5%	0.8%	-0.1%	1.2%
33	Lead Acid Batteries	0.0%	0.0%	0.0%	0.0%
34	Dry Cell Batteries	0.1%	0.1%	0.0%	0.2%
35	Oil Filters	0.0%	0.0%	0.0%	0.0%
36	Other Hazardous Waste	0.0%	0.0%	0.0%	0.0%
38	Reusable Waste	0.0%	0.0%	0.0%	0.0%
39	Electronic Waste	1.6%	1.9%	0.0%	3.2%
	Total Potential Recyclables	8.3%			
4	Waxy Cardboard	0.0%	0.0%	0.0%	0.0%
15	Food Waste	28.2%	4.8%	24.3%	32.2%
10	Low-Grade Paper	15.3%	6.1%	10.3%	20.2%
18	Other Organics & Rubber	5.8%	6.8%	0.2%	11.4%
27	Wood Pallets	0.0%	0.0%	0.0%	0.0%
28	Wood Lumber	1.1%	0.7%	0.5%	1.6%
30	Stumps/Branches	1.0%	2.5%	-1.1%	3.0%
32	Yard Waste	1.7%	3.3%	-1.0%	4.4%
	Total Potential Compostables	53.0%			
12A	Plastic Film	8.8%	3.2%	6.2%	11.4%
13B	Mixed Plastic Containers	0.6%	0.5%	0.2%	1.0%
14	All Other Plastics	6.6%	2.8%	4.3%	9.0%
17	Diapers	5.3%	1.8%	3.8%	6.8%
26	Other Glass	0.3%	0.3%	0.0%	0.5%
29	Painted/Treated Wood	0.5%	0.7%	0.0%	1.1%
31	Brick/Concrete/Dirt	0.0%	0.0%	0.0%	0.0%
37	Infectious Waste	0.0%	0.0%	0.0%	0.0%
	Total All Other Waste	22.1%			
	TOTALS	100.0%			

Note: Columns may not appear to calculate correctly due to rounding.

Table 2: Comparison of Single-Family Residential Waste Results (% by weight)

Material Categories		2016 Carrboro	2016 Countywide	2010 Countywide	2005 Countywide	2000 Countywide	1995 Countywide
1	Newspaper	0.5%	1.1%	1.4%	4.9%	4.8%	5.3%
2	Glossy Magazines	0.6%	1.3%	1.7%	4.7%	4.4%	6.1%
3	Corrugated Cardboard	1.7%	1.8%	1.8%	2.4%	4.7%	4.5%
5	Phone Books	0.0%	0.0%	0.2%	0.2%	0.3%	n/a
6	Paperboard	1.8%	2.9%	2.8%	3.6%	5.1%	n/a
7	Other Books	0.0%	0.2%	0.3%	<0.1%	0.4%	n/a
8	White Ledger	0.7%	1.5%	0.8%	1.9%	2.0%	n/a
9	Mixed Recyclable Paper	5.4%	4.3%	4.0%	3.3%	4.5%	1.7%
40	Aseptic Containers	0.2%	0.3%	* included with Low Grade Paper			
11	All Plastic Bottles	1.5%	2.7%	2.2%	2.4%	2.9%	2.6%
13A	Dairy Plastic Containers	0.8%	1.5%	2.6%	1.0%	2.7%	0.7%
19	Tin/Steel Cans	0.4%	1.0%	1.1%	1.4%	1.8%	2.7%
20	Aerosol Cans	0.4%	0.5%	0.7%	0.7%	0.9%	n/a
22	Aluminum Cans	0.4%	0.5%	0.7%	0.7%	1.0%	0.8%
23	Aluminum Foil	0.7%	0.5%	0.7%	0.7%	0.9%	n/a
25	Glass Bottles and Jars	1.3%	2.7%	3.4%	4.3%	4.3%	5.8%
Total Program Recyclables		16.6%	22.7%	24.4%	32.2%	40.7%	30.2%
12B	Retail Bags & Stretch Film	1.6%	1.7%	* included with Plastic Film			
16	Textiles/Leather	2.6%	5.4%	6.3%	5.1%	5.4%	3.3%
21	Other Ferrous	1.9%	1.0%	2.0%	1.3%	2.0%	2.9%
24	Other Non-Ferrous	0.5%	0.4%	0.7%	<0.1%	0.2%	n/a
33	Lead Acid Batteries	0.0%	0.0%	<0.1%	<0.1%	<0.1%	n/a
34	Dry Cell Batteries	0.1%	0.1%	<0.1%	0.2%	0.2%	n/a
35	Oil Filters	0.0%	0.0%	<0.1%	<0.1%	<0.1%	n/a
36	Other Hazardous Waste	0.0%	0.1%	<0.1%	0.4%	0.6%	0.3%
38	Reusable Waste	0.0%	0.4%	<0.1%	<0.1%	<0.1%	n/a
39	Electronic Waste	1.6%	0.6%	1.4%	1.4%	0.9%	n/a
Total Potential Recyclables		8.3%	9.8%	10.4%	8.4%	9.3%	6.5%
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10	Low-Grade Paper	15.3%	13.8%	9.2%	13.1%	9.0%	24.6%
18	Other Organics & Rubber	5.8%	3.2%	4.7%	1.3%	4.6%	8.3%
27	Wood Pallets	0.0%	0.2%	<0.1%	<0.1%	0.2%	n/a
28	Wood Lumber	1.1%	0.8%	2.8%	2.3%	1.3%	1.9%
30	Stumps/Branches	1.0%	0.1%	<0.1%	<0.1%	<0.1%	n/a
32	Yard Waste	1.7%	2.7%	2.6%	1.8%	0.9%	1.0%
Total Potential Compostables		53.0%	46.0%	40.5%	41.4%	35.0%	47.0%
12A	Plastic Film	8.8%	6.0%	7.9%	5.6%	5.7%	4.3%
13B	Mixed Plastic Containers	0.6%	0.5%	* included with All Other Plastics			
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26	Other Glass	0.3%	0.4%	0.2%	0.2%	0.8%	0.5%
29	Painted/Treated Wood	0.5%	0.6%	2.7%	<0.1%	<0.1%	1.1%
31	Brick/Concrete/Dirt	0.0%	0.6%	3.0%	2.2%	0.7%	2.6%
37	Infectious Waste	0.0%	0.2%	0.4%	<0.1%	n/a	<0.1%
Total All Other Waste		22.1%	21.4%	25.0%	18.3%	15.3%	16.4%
TOTALS		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Columns may not appear to calculate correctly due to rounding.

ATTACHMENT A - MATERIAL CATEGORIES

#	Material Categories	Definitions
1	Newspaper	Newspaper (loose or tied) including other paper normally distributed inside newspaper such as ads, flyers, etc. Newspaper found inside plastic sleeve will be removed from plastic and sorted accordingly.
2	Glossy Magazines	Periodicals and journals.
3	Corrugated Cardboard	Brown "cardboard" boxes with a wavy core (no plastic liners or packaging Styrofoam®). Does not include small pieces of Cardboard within shrink-wrap plastic such as that from a case of bottled water.
4	Waxy Cardboard	Wax-coated cardboard.
5	Phone Books	Phone books
6	Paperboard	Paperboard and chipboard such as cereal boxes, shoeboxes, and 12-pack carrier stock.
7	Other Books	Paperback novels and manuals.
8	White Ledger	Copy paper and computer printouts.
9	Mixed Recyclable Paper	Recyclable paper not identified above such as junk mail, colored paper, etc.
10	Low-Grade Paper	Non-recyclable paper such as tissues, paper towels, hardback books, paper cups, plates, and containers, cigarette packs, and heavily soiled paper.
11	All Plastic Bottles	All narrow-neck bottles irrespective of resin code (meaning neck smaller than base).
12A	Plastic Film	Loose and bagged plastic bags, garbage bags, re-sealable bags, floral wrap (generally), potato chip bags and other multi-laminates. Includes mylar bags and balloons.
12B	Retail Bags & Stretch Film	Retail and grocery bags, point-of-sale bags, newspaper bags, toilet paper overwrap, dry cleaning bags, air pillows, and bubble wrap, Ziploc® bags, and plastic stretch film.
13A	Dairy Plastic Containers (SPI #2, 4, and 5)	Also includes wide-mouthed tubs and containers labeled HDPE #2, LDPE #4 or PP #5, including lids. Examples include yogurt cups, margarine tubs, Cool Whip® tubs, and other non-bottle HDPE items. ALL DAIRY PRODUCTS.
13B	Mixed Plastic Containers	Clear and colored plastic items labeled PET #1 such as clamshell containers, frozen food trays, and disposable cups. All other plastic cups and containers, irrespective of resin type, not categorized above.
14	All Other Plastic	Consists of non-container rigid plastic items such as plastic drums, crates, buckets, baskets, toys, refuse totes, lawn furniture, laundry baskets, and other large plastic items. Does not include electronic toys. Container and non-container Styrofoam® such as clamshell containers, packaging peanuts, foam sheeting, and other packaging. Any plastic materials not categorized above, such as straws, utensils, deodorant cases, toothpaste tubes, tooth brushes, broom heads, etc.
15	Food Waste	Meat, vegetable, and bread waste. Includes coffee grinds and tea bags.
16	Textiles/Leather	Clothing apparel, rags, leather, blankets, curtains, shoes, wallets, purses, belts, and scrap leather.
17	Diapers	All child and adult diapers and incontinence aids. Feminine hygiene products.

ATTACHMENT A - MATERIAL CATEGORIES (cont.)

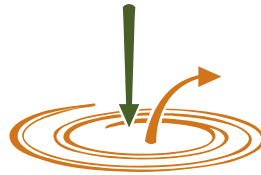
#	Material Categories	Definitions
18	Other Organics & Rubber	Organics such as hair, pet waste, and rubber.
19	Tin/Steel Cans	Tin and steel cans such as canned food and pet food cans.
20	Aerosol Cans	Aerosol spray cans such as cooking spray, paint cans, and air fresheners.
21	Other Ferrous	Household appliances such as refrigerators, stoves, and salvageable items such as machinery. Steel, clothes hangers, sheet metal products, pipes, miscellaneous metal scraps, and other magnetic metal items.
22	Aluminum Cans	Aluminum soft drink, beer, and some pet food cans (i.e., cat food).
23	Aluminum Foil	Aluminum foil and catering trays.
24	Other Non-Ferrous	Scrap aluminum, aluminum foil and catering trays, and other non-magnetic metal, copper wiring and tubing, and brass fixtures.
25	Glass Bottles and Jars	Clear, brown, and green glass bottles and containers.
26	Other Glass	Windowpanes, mirrors, ceramics, and drinking glasses.
27	Wood Pallets	Forklift pallets.
28	Wood Lumber	Dimensional lumber such as plywood sections, 2x4s, particleboard, and other clean wood waste.
29	Painted/Treated Wood	Treated and/or painted lumber, pallets, and dimensional lumber. Also includes treated/painted wood furniture including chairs, cabinets, dressers, etc.
30	Stumps/Branches	Large yard waste such as tree stumps and large limbs/branches.
31	Brick/Concrete/Dirt	Construction and demolition debris that includes concrete, carpet, drywall, insulation, and roofing materials.
32	Yard Waste	Shrub and brush prunings, household bedding plants, weeds, leaves, grass clippings, and other landscaping and gardening wastes.
33	Lead Acid Batteries	Car, motorcycle, boat, and other deep cell batteries.
34	Dry Cell Batteries	Household batteries including AA, AAA, C, D, 9-volt, and button types.
35	Oil Filters	Motor oil filters.
36	Other Hazardous Waste	Paint, solvent, pesticides, motor oil, and fluorescent lights
37	Infectious Waste	Un-sterilized medical waste, including needles, syringes, and medical tubing.
38	Reusable Waste	Reusable items such as binders, toys, and other such durable products.
39	Electronic Waste	Electronic devices such as televisions, computers, cell phones, cordless telephones, PDA, handheld devices, rechargeable batteries, etc.
40	Aseptic Containers	Gable-top cartons, aseptic juice boxes, and other similar containers made of coated paperboard.

ATTACHMENT B – INDIVIDUAL SAMPLE RESULTS

Load information		Wednesday Truck 808	Wednesday Truck 807	Thursday Truck 807	Thursday Truck 808	Friday Truck 808	Friday Truck 807	Weighted Average
	Material Categories	1	2	3	4	5	6	
1	Newspaper	0.0%	1.1%	0.0%	0.3%	0.6%	0.8%	0.5%
2	Glossy Magazines	0.0%	1.4%	0.0%	0.0%	0.6%	1.8%	0.6%
3	Corrugated Cardboard	0.3%	2.3%	1.4%	3.0%	0.4%	3.3%	1.7%
4	Waxy Cardboard	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5	Phone Books	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6	Paperboard	2.2%	1.5%	2.8%	1.2%	1.1%	2.1%	1.8%
7	Other Books	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
8	White Ledger	0.0%	1.5%	0.0%	0.6%	0.8%	1.2%	0.7%
9	Mixed Recyclable Paper	3.4%	7.3%	9.2%	7.2%	2.1%	3.3%	5.4%
10	Low-Grade Paper	18.7%	11.9%	14.5%	10.7%	25.6%	9.6%	15.3%
11	All Plastic Bottles	1.0%	3.2%	0.0%	1.7%	0.8%	2.3%	1.5%
12A	Plastic Film	8.3%	5.0%	13.6%	9.0%	10.5%	5.7%	8.8%
12B	Retail Bags & Stretch Film	1.5%	1.5%	1.3%	1.4%	2.6%	1.1%	1.6%
13A	Dairy Plastic Containers	0.3%	1.4%	1.1%	0.9%	0.7%	0.7%	0.8%
13B	Mixed Plastic Containers	0.0%	0.7%	0.2%	1.5%	0.6%	0.6%	0.6%
14	All Other Plastics	10.0%	7.8%	4.6%	7.2%	7.9%	2.0%	6.6%
15	Food Waste	27.8%	33.0%	23.4%	31.4%	21.8%	32.4%	28.2%
16	Textiles/Leather	4.4%	3.3%	2.9%	2.0%	2.4%	0.5%	2.6%
17	Diapers	4.8%	5.8%	3.6%	4.8%	4.1%	8.8%	5.3%
18	Other Organics/Rubber	2.2%	2.2%	18.6%	1.3%	8.2%	1.6%	5.8%
19	Tin/Steel Cans	0.4%	0.8%	0.0%	0.5%	0.1%	0.7%	0.4%
20	Aerosol Cans	0.2%	1.0%	0.1%	0.9%	0.2%	0.2%	0.4%
21	Other Ferrous	7.0%	0.8%	0.0%	1.1%	1.5%	0.6%	1.9%
22	Aluminum Cans	0.3%	0.5%	0.3%	0.4%	0.3%	0.7%	0.4%
23	Aluminum Foil	0.5%	0.3%	1.1%	0.8%	1.0%	0.6%	0.7%
24	Other Non-Ferrous	0.0%	0.7%	0.0%	0.0%	2.0%	0.4%	0.5%
25	Glass Bottles and Jars	2.4%	0.7%	0.2%	1.7%	1.2%	1.8%	1.3%
26	Other Glass	0.1%	0.4%	0.0%	0.8%	0.0%	0.2%	0.3%
27	Wood Pallets	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
28	Wood Lumber	1.1%	0.6%	1.1%	1.7%	0.0%	1.7%	1.1%
29	Painted/Treated Wood	1.6%	0.0%	0.0%	0.4%	0.0%	1.2%	0.5%
30	Stumps/Branches	0.0%	0.0%	0.0%	6.1%	0.0%	0.0%	1.0%
31	Brick/Concrete/Dirt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
32	Yard Waste	0.7%	1.1%	0.0%	0.3%	0.0%	8.3%	1.7%
33	Lead Acid Batteries	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
34	Dry Cell Batteries	0.0%	0.2%	0.0%	0.2%	0.0%	0.3%	0.1%
35	Oil Filters	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
36	Other Hazardous Waste	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
37	Infectious Waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
38	Reusable Waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
39	Electronic Waste	0.1%	1.4%	0.0%	0.6%	2.7%	5.0%	1.6%
40	Aseptic Containers	0.3%	0.3%	0.0%	0.2%	0.2%	0.3%	0.2%
	TOTALS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

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kessler consulting inc.
innovative waste solutions

TECHNICAL MEMORANDUM

TO: David Andrews, Town Manager
Town of Carrboro

FROM: Jeux Brown, Consultant

SUBJ: **Technical Memorandum #2: Assessment of Current Waste Programs and Waste Collection Route Study**

PROJ #: 192-00.00

The Town of Carrboro, NC (Town) requested Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study. Task 2 of this study is an assessment of the Town's Solid Waste Management Division (Division) and its existing system. The purpose of this technical memorandum is to provide the results and findings of this assessment.

1. Introduction

The operational assessment was conducted in three parts: 1) advance data request and review, 2) physical site visit, and 3) follow-up analysis of data and observations.

In advance of the site visit, KCI developed a request for information from Division staff. The information was used to conduct various preliminary analyses and stress tests in order for KCI to better understand the breadth and width of the Division's scope of services. A portion of the data was received prior to site visits. However, a large portion of data could not be obtained until KCI was on site, working directly with staff. Data requested was typical of other assessments KCI has conducted and the Division's cooperation in its completion was greatly appreciated.

2. Organization

Division front line staff consists of eight full-time equivalent (FTE) employees, which are detailed in Table 1. The average years of service for current Division employees is fourteen and a half years. This level of tenure is a valuable asset as employees have Town-specific experience and knowledge. The Division appears to foster a culture of happiness and cooperative work ethics among its employees. High morale and job satisfaction have had a large payoff for the organization; positive employees are more dedicated, safer, and produce better results. The Division demonstrated effective communication and cooperation among the front line staff and the Supervisor.

The administration staff includes the Public Works Director as well as an Administrative Assistant (AA). Both positions are involved in the day-to-day activities of the entire Public Works Department. The AA spends approximately 70 percent of her day on Division tasks. All incoming calls from residents and businesses are answered by the AA, who works with the Solid Waste Supervisor (SWS) to ensure that requests and concerns are addressed in a timely manner. The SWS coordinates all daily activities performed by collection staff (Drivers).

The Town has a unique situation in that most Drivers are cross trained in commercial, residential, and bulky collection. This is considered an industry best practice that, despite the best efforts in many organizations, is never actually implemented. Having a team of drivers who have route knowledge beyond that of their assigned route is invaluable and the Division has managed to ensure that Drivers learn other routes and remain motivated despite the repetitive nature of waste and recyclables collection. It is highly recommended that this practice continues and is expanded as needed.

Table 1: Division of Labor

Department	FTEs	Average Service Years
Administrative Assistant	1	11
Supervisor	1	22
Commercial	1	11
Residential	5*	13
Totals	8	14.25

*1 FTE is under Landscaping Department but works full time in Solid Waste; 1 position is open.

3. Residential Collection Services

The Division provides a comprehensive collection service for its residents. Materials are collected Monday through Friday. Curbside carted service is provided to residential customers for garbage once a week. A selection of acceptable bulky items can also be collected each week when placed curbside. Yard waste service is available approximately every two weeks. Residents can place their yard waste at the curb for pickup, or they can purchase a 95 gallon cart at town hall. Recycling collection is provided by Orange County. Loose leaf collection is performed for residents November through February by the Landscaping Division and will not be addressed in this memo.

The Division staff is engaged with the community in a positive manner and provides excellent customer service from administration down to the Drivers. Staff appears to go above and beyond to provide the best possible service to the residents and businesses in Town. If there is a reason materials are not collected, Drivers are proactive in addressing the customer either verbally or by leaving a door hanger or cart tag indicating the reason why collection did not occur. In addition, if the reason for non-collection is due to the resident setting out an item or pile of debris that must be paid for in advance, Drivers inform the SWS. The SWS will then call the resident to discuss the price of collection. Table 2 summarizes the Town's types and number of routes operating daily to better visualize the distribution of assets across the collection days.

Table 2: Residential Route Matrix

Route Type	Number of Operating Routes							Weekly Routes
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	
Residential Garbage	0	0	2	2	2	n/a	n/a	6
Residential Yard Waste ¹	2	2	0	0	0	n/a	n/a	4
Residential Bulk Yard Waste ²	.80	.80	.80	.80	.80	n/a	n/a	4
Residential Bulk Trash ³	.20	.20	.20	.20	.20	n/a	n/a	1

¹Consists of two routes, however in the busy months 4-5 vehicles are utilized.

^{2 & 3}Vehicle/Driver routed to collect bulk yard waste 80 percent of each day and bulk trash 20 percent of each day.

3.1. Residential Garbage

Residential garbage collection is provided to approximately 4,400 homes on Wednesday, Thursday, and Friday each week. The Town divides each service day into two routes. Garbage is fully automated and collected in Town issued roll carts. Carts are available for residents to purchase at Town Hall for \$48.18 per cart, and there is not a limit to the number of carts a resident can purchase. There is no additional collection charge associated with having more than one cart per household.

KCI conducted route audits in February 2017. Table 3 illustrates the information gathered during ride along audits of two routes. Set out rates between 68 and 70 percent were lower than expected since the Town only offers once a week service. However, the tonnage is comparable to the historical February average tonnage provided in disposal reports. The average for February tonnage over the past three years is 7.80 on Wednesdays and 8.20 on Thursdays. Town recycling data was gathered from Orange County. The average recycling set out rate during fiscal year (FY) 2015-2016 was 43 percent with approximately 77 percent of the population participating throughout the year. This indicates that residents are not filling their cart to capacity each week. Setout rates also declined by 7 percent from the previous fiscal year, and participation dropped by 12 percent. As indicated in KCI's Waste Composition Study technical memo, nearly 17 percent of the waste stream consisted of recyclables that are accepted by Orange County. Despite the Town not being involved in the collection of recycling, it can choose to enhance education and outreach in order to reduce the tonnage generated by residents.

In conjunction with ride along route audits, a Cart Capacity Study (Study) was also conducted. The Study found that approximately 81 percent of all carts surveyed were either not at the curb or were less than 50 percent full. The details of this study will be addressed in the next section.

Figure 1: Proper Residential Cart Placement



Table 3: Residential Route Audit Metrics*

Route	Scheduled Homes	Set Out	Not Out	Total Collection Time	Disposal Time	Disposal Weight	Set Out Rate	Pounds per Household
Wednesday	860	586	274	5.25	1.50	8.06	68%	27.51
Thursday	868	611	257	5.25	1.5	8.46	70%	27.69

*Routes include an unspecified number of commercial carts as these are not recorded on route sheets.

Many of the neighborhoods serviced contain tight cul-de-sacs, dead ends, and narrow roads which have several homes. On several streets, such as private ones, Drivers needed to pull down the street to service homes on the right side of the street, then exit the street and return to service the remaining homes on the opposite side due to lack of room to turn around. As noted in Figures 2 and 3, 102 Laurel Avenue has six homes. This is a one lane road which can only be serviced by entering twice or requiring the Driver to get out to move carts to one side of the street. During route audits several residents needed to wait for the Driver to complete servicing the street before they could exit as the Division vehicle blocks the road. Streets such as this would be safer for the residents as well as the Drivers if carts were brought to the curb at the entrance of Laurel Avenue. Several similar situations were observed where one-sided street collection would be beneficial for safety and productivity.

Figure 3: 102 Laurel Avenue

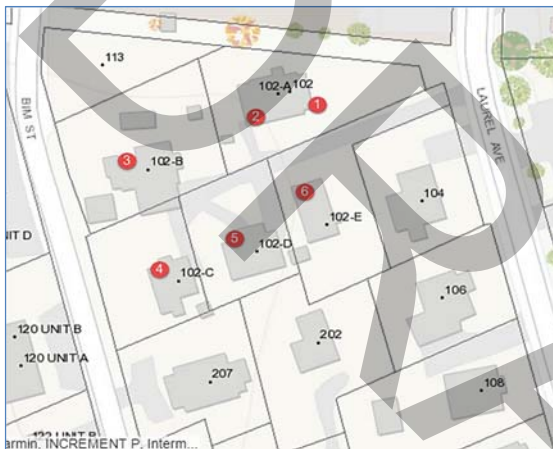


Figure 2: 102 Laurel Ave. Street View



The Town expressed interest in decreasing the number of collection days. Possibilities include collection every-other-week (EOW) and every ten days (ETD). Servicing ETD collection would be difficult to manage and keep residents apprised of their service days. Adding in non-collection holidays, schedule shifts due to snow and ice, and heavy yard waste pickup during certain times of year, we feel this would be a difficult schedule to manage. It would also require an annual calendar to be maintained and supplied to residents each year. Due to these issues we will not be analyzing or recommending ETD collection.

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Utilizing FY 2015-2016 actual tonnage KCI determined average per route tonnage, illustrated in Table 4, for the current routes as well as EOW service. The potential tonnage for EOW service would need to be divided into two disposal trips if the Town continued service with only two vehicles per day. However, there is a one and a half hour turn around to drive to and from the disposal facility and dispose of garbage, which would require the Drivers to work additional hours to complete routes if only utilizing two collection vehicles. Further analysis will be needed to determine the feasibility of EOW service. Increased diversion could alleviate some of the tonnage in the garbage. There are a number of possibilities to pilot EOW collection which will be explored as part of Task 6.

Table 4: Fiscal Year 2015-2016 Residential Garbage Tonnage

Month	Current Average Tons/Route	Estimated Average Tons/Route EOW
July	9.39	18.78
August	7.26	14.53
September	7.96	15.92
October	7.84	15.68
November	7.38	14.77
December	9.79	19.58
January	7.82	15.65
February	7.02	14.03
March	8.26	16.53
April	8.11	16.22
May	7.80	15.60
June	9.41	18.82

Recommendations

- Through the public participation surveys that will be created:
 - Ask residents about their willingness to move their carts to one side of the street for expedited, safer collection which would reduce emissions and vehicle time on their streets, reduce collection costs, and improve service.
 - Ask residents if they are interested in participating in a pilot for EOW service.
 - Explore option for residents to move carts to curbside on the main street for service on roads that are difficult to service, such as 102 Laurel Avenue, shown in Figures 2 and 3.

3.2. Residential Yard Waste

Residents receive yard waste service approximately twice per month per household. The Town is divided into four quadrants and Division staff rotates through two quadrants on Mondays and two quadrants on Tuesdays to collect yard waste. Two automated side load (ASL) collection vehicles and two Drivers are regularly scheduled to collect curbside yard waste. An additional Driver is scheduled in a bulk claw load (BCL) vehicle to service large piles of yard waste Monday through Friday. Throughout the months when yard waste is more abundant additional Drivers within the Division, and at times from other Public Works divisions are utilized to complete service on Wednesdays, and sometimes Thursdays as well. The Division has enough vehicles

that are not in daily use to cover the additional service.

Despite ASLs being utilized for the curbside collection the majority of debris is manually loaded into the trucks because it is not required by the Town to be containerized. Residents can choose to dispose of their yard waste in the following ways:

- A Town issued, resident purchased, 95 gallon roll-out yard waste cart.
- Up to eight plastic bags per collection day.
- Unlimited paper yard waste bags.
- A container of the residents' choice, filled with uncontaminated yard waste.
- Limbs up to three feet long and four inches in diameter in piles.

Drivers are also instructed to pick up any piles of yard debris and limbs that will take less than ten minutes for one Driver to collect. While on route, Drivers were stopping to service piles that were small enough to fit into a shoebox.

The variety of options available to residents to set out yard waste proves difficult for collection. Approximately 700 homes use Town carts, or approximately 15% of the population serviced¹. All other collection options require Drivers to get out of the vehicle in order to service the residence. When residents use plastic bags these are emptied by the collection staff and left at the curb as they are not acceptable at the disposal facility; paper bags can become wet if there is rain or excessive moisture in the air; personal yard waste containers are difficult to identify as yard waste only. Most importantly, the Town's hybrid vehicle is not utilized for yard waste collection because the hopper is too high for a Driver to manually load materials. This leaves the Town's most energy efficient vehicle dormant for two days a week.

Large set outs that would require more than ten minutes time for one person to collect have a fee assessed prior to collection. The SWS determines the fee, notifies the resident, and a Driver is dispatched in the claw truck within two business days after the resident makes the payment at Town Hall.

Figure 4: Manual Yard Waste Collection



¹ Solid Waste Containers- Town of Carrboro December 2016 file provided by Town.

Curbside yard waste routes follow approximately the same routes as residential garbage. However, the route audit revealed that the majority of homeowners did not set out yard waste, as summarized in Table 5.

Table 5: Yard Waste Route Audit

Route Hours	Count of Homes ¹	Bagged Yards ²	Loose Yards	Carted Yards	Christmas Trees ³	Total Yards	Miles Driven	Avg. yards/ Hour	Avg. yards/ Set Out	Avg. yards/ Mile
4	26	3.50	4.88	4.50	4.00	16.88	14.00	0.24	0.65	0.83

¹Homes with yard waste set out

²Bag = .25 yards

³Christmas trees = 1 yard each

Time is spent each day driving up and down streets looking for yard waste. During the route audit KCI found that 96 percent of homes on the route did not place out yard waste, of the 4 percent that did, 69 percent set out a half yard or less. The yard waste carts offered by the Town are approximately half a yard. Tonnage was not determined during the audit because the truck was not filled and therefore not emptied. Historical disposal reports indicate much higher yard waste collection than witnessed while on audits. However, ASL vehicles traditionally do not make disposal trips on Mondays². The majority of debris collected and disposed of is in the claw truck, indicating that current ASL utilization could be reduced.

While on route the Driver was required to get out of the truck for all but eight homes to manually load loose yard waste into the hopper of the vehicle. Large limbs that were not cut down to the required 3 foot allowance required the Driver to manually break down limbs or leave them behind with a tag indicating why debris was not collected. Despite Drivers wearing proper Personal Protective Equipment (PPE) such as gloves, safety glasses, and ear plugs at times, injuries can still occur. The risk of injuries increases with manual collection and decreases with automation. Injury reports received from the Town for the past four years show a total of six injuries, five of which occurred while the Driver was outside of the vehicle collecting yard waste.

Carted yard waste would allow the town to utilize its fully automated vehicles, including the hybrid vehicle, to reduce time on route, keep Drivers safe and in the vehicle, and eliminate unsightly debris curbside. Yard waste contained in carts would also eliminate the need for Drivers to empty plastic bags as well as keep the debris free from snow and water which can add weight. In addition, requiring yard waste to be carted would allow the Division to route only those homes that utilize the service, increasing route efficiency.

²Town supplied disposal data for 36 months indicates ASL vehicles made Monday disposal trips 4 percent of the time, or 7 total trips. The BCL vehicle made Monday disposal trips 66 percent of the time, or 104 total trips.

Table 6 illustrates the actual tonnage from three fiscal years. February is traditionally the lightest month for yard waste, which correlates to the low set out during the route audit. The number of residents placing out yard waste is not tracked on a daily basis; therefore the household count was used to determine the average pounds per household in the historical data.

Table 6: Fiscal Year Yard Waste Tonnages*

Month	FY 2013-14	FY 2014-15	FY 2015-16
July	140.07	72.21	119.82
August	95.12	28.1	88.56
September	77.93	81.55	64.36
October	81.55	75.97	77.79
November	32.21	58.97	48.52
December	44.9	61.53	52.45
January	53.89	48.96	38.61
February	46.92	28.68	35.07
March	102.19	130.04	92.84
April	122.49	100.58	68.69
May	112.92	100.72	95.65
June	91.09	96.08	77.23
Annual Totals	1,001.28	883.39	859.59

*Combined yard waste from automated side load home collection and bulky large pile collection.

Recommendations

- Require yard waste to be carted for regular collection.
- Pilot carted yard waste service with every other week collection.
- Create a route for carted yard waste collection.
- Require all non-carted yard waste to be called-in for service with a fee attached.
- Begin utilization of Town's hybrid vehicle for yard waste collection.

3.3. Residential Bulky Waste

The Town offers the collection of bulky materials as part of its residential service. Table 7 details the monthly tonnage collected over the past three FYs. A limited list of acceptable materials is picked up for free, with a disposal cost to the Town of \$41 dollars per ton. Items are placed curbside on the same day the resident receives garbage service. As residents do not need to call for the service of these items, the bulky route follows the same route as the garbage route, looking for bulky items. It was difficult to determine average hours spent on route due to data entry errors in the Town's reporting system, PubWorks®. For example, there were duplicate data entries for the same day which doubled tonnage and hours worked. Additional information will be discussed on this topic in section 3.5 Work Orders.

Large items that are not acceptable as part of the included service can still be picked up for a fee. Residents make a payment at Town Hall, per item. The Division collects the items within two business days after payment is received.

Proactive measures are taken by Drivers on garbage and yard waste routes by calling the SWS in order to report bulky materials that may not have been called in by residents. Examples of items called-in were:

- Couches discarded along the side of the road instead of curbside in front of a home
- Unacceptable items such as large televisions
- Small piles of bulky material next to garbage carts
- A pile of mattresses curbside

Bulky collection service would be more efficient and cost effective if residents were required to call in for the collection of all items. This would allow the Division to plan a route for collection, which would better utilize the Driver and vehicle time. Education and Outreach would need to be updated in order to convey new rules to all residents. While data collection for bulky trash is challenging because the location and the material may not be consistent, there are a variety of options to collect the data. Some jurisdictions utilize their 311 systems both telephonically and via the Internet while others utilize on board computer (OBC) systems for solid waste drivers to record bulky trash set outs in order to schedule future pickups. An administrative person in the office tracks the incoming data and produces a sequenced route for future collection.

Table 7: Bulky Waste Disposal Tonnage

Month	FY 2013-14	FY 2014-15	FY 2015-16
July	15.43	10.71	20.76
August	17.82	n/a	24.99
September	10.8	21.55	20.51
October	9.25	19.06	26.32
November	3.08	9.47	22.28
December	23.91	6.76	17.36
January	8.72	7.87	6.50
February	4.90	5.92	9.71
March	12.39	10.87	15.66
April	12.65	20.02	13.91
May	19.83	22.38	25.89
June	13.69	27.49	20.97
TOTALS	152.47	162.1	224.86

Recommendations

- Convert bulky collection service to on-call service and require residents to request service. Residents could be directed to utilize the Town's online request tracker form, which allows photos to be attached, and allows administrative staff to schedule pickups. Residents without online access could call-in requests to administrative staff.
- Utilize OBC to log bulky set outs via driver input. This would allow office staff to route bulky collection for the same day or the following day.

- Create work orders for all bulky collection and route Drivers to collect in one area per day per week.

3.4. Daily Reporting

Currently Drivers fill out two forms detailing their daily activities: Daily Worksheet and Roll-Out Container Route Report. Much of the information contained on these different forms is repetitive and could be combined. The data is entered into PubWorks® for reporting purposes. Due to the heavy workload in administration, reports have been backlogged for several months. In an effort to improve the process, Drivers are currently being trained to enter this information directly into PubWorks® at the end of each shift.

The Town has a powerful reporting tool in PubWorks®, if utilized properly. Reports from PubWorks® could provide the Town with standard industry reporting metrics such as hours of service, equipment hours, disposal trends, and tonnage. Reports can be viewed easily on a daily basis. However, KCI found inconsistencies in the historical tonnage and hours in the PubWorks® system and would not recommend using the data for future comparisons unless data is cleansed.

Recommendations

- Combine current Driver paperwork into one form that mirrors the PubWorks® data entry screens to facilitate more accurate data entry.
- Conduct daily or weekly quality control reviews of reports for accuracy as the data is compiled in the annual report to the state.

3.5. Work Orders

Currently work orders are hand written and kept on file. There is currently not an easy way to report on the amount of work orders completed by Division staff for a given time period. PubWorks® has the capability for entering and tracking work orders. Entering all work orders into an electronic system would allow for better tracking of how much the bulky and large yard waste services are being utilized by residents.

Recommendations

- Investigate the cost of adding the work order module to the current system for enhanced tracking and reporting capabilities.

4. Safety

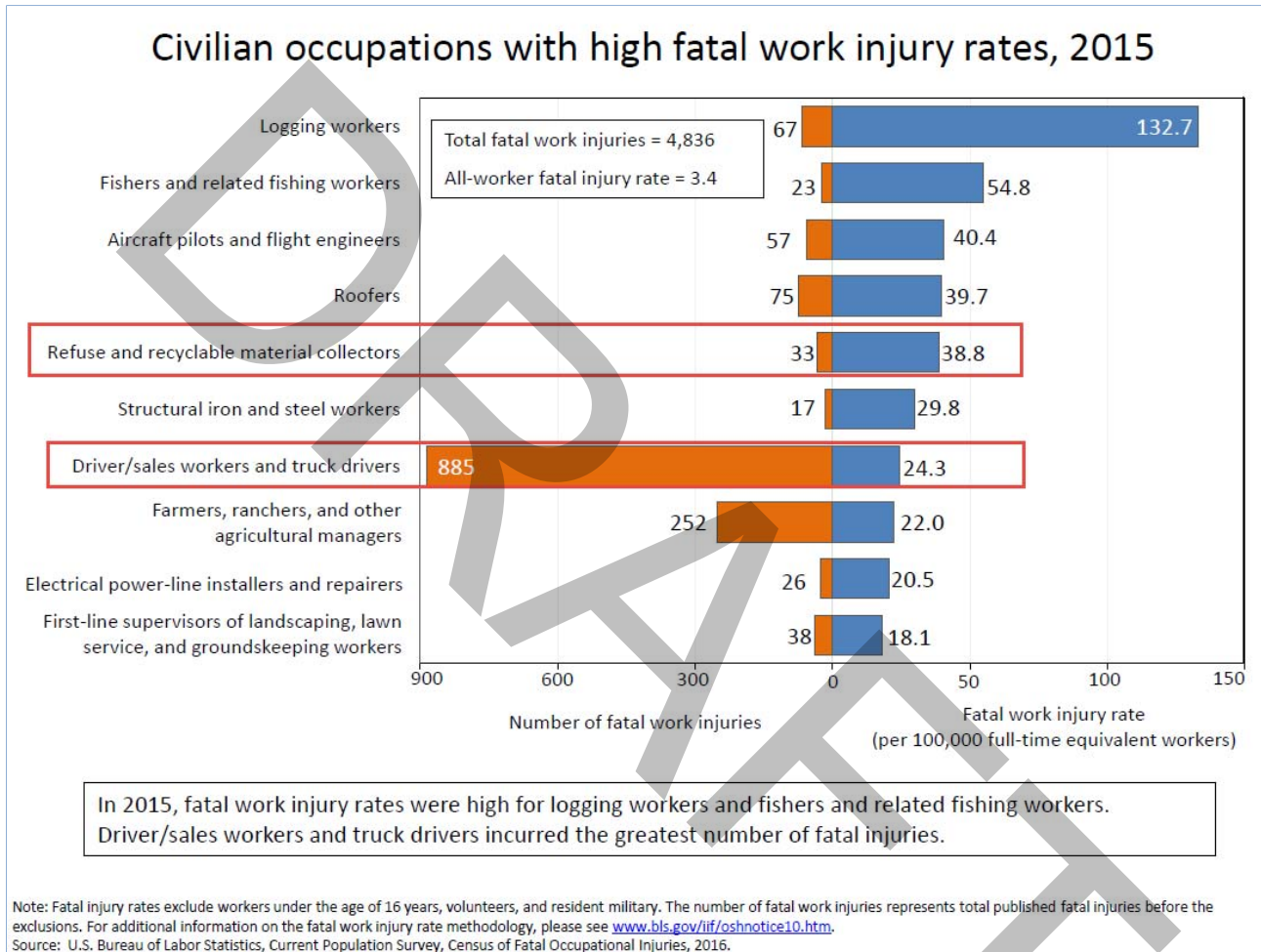
The Division has impressive safety statistics, reporting very low accident and injury rates. The Division reported only two vehicle accidents between 2013 and 2016, both resulting in minor damage to equipment. Six injuries were reported during the same timeframe. All but one injury occurred while the Driver was out of the vehicle to manually collect yard waste.

Drivers have a clean, safe environment in which to begin and end their days, as well as take breaks, attend safety meetings, and fill out their daily paperwork.

Formal safety meetings are not scheduled or run by the Division. Human Resources plans safety meetings for all Town employees, but they are not directly related to solid waste. However, the SWS meets with each Driver daily to discuss any safety or route issues that occurred during service. In addition, the SWS periodically covers important safety topics with all collection staff.

The Solid Waste Association of North America as well as the Bureau of Labor Statistics (BLS) has continually identified solid waste industry employees to be in one of the top ten most dangerous occupations in the country. The BLS lists refuse and recyclable collectors as the fifth most dangerous job in the country. Drivers are listed as seventh, as illustrated in Figure 5: Bureau of Labor Statistics 2015 Data. Due to the inherent danger of the Division tasks, safety should be a daily focus.

Figure 5: Bureau of Labor Statistics 2015 Data



Despite the lack of an organized safety program, a high level of adherence to safety was observed while on site and during ride-alongs with staff. All field employees were wearing and/or carried PPE such as high-visibility vests or jackets, steel-toed boots, work gloves, safety glasses, and hard hats. Unlike industry trends to work as quickly as possible to complete the assigned daily tasks, observations proved Town staff took their time, adhered to common safety measures when driving and collecting, and utilized proper PPE when handling debris and manually loading yard waste into the vehicles.

Even with the evident safety culture and low number of accidents and injuries, a focus on safety that is solid waste driven is recommended. The importance of safety should be communicated frequently and consistently, with scheduled meetings focused on safety associated specifically to solid waste collection. Posters, signs, and videos also assist as constant reminders throughout the day. A variety of topics, specific to solid waste collection, should be covered throughout the year such as backing, lifting, awareness of surroundings, disposal facility precautions, cleaning behind the blade, and weather-related collection safety.

Recommendations

- Conduct weekly safety meetings covering solid waste focused topics.

5. Fleet Services

The Division has a well maintained fleet comprised of eleven pieces of equipment including one administration and ten collection vehicles. During staff interviews it was found that vehicles receive maintenance in a timely manner and the Division maintains a good working relationship with Fleet Maintenance. Of the Division's collection vehicles, seven are considered frontline units, one is considered a spare, and two are out of service rotation. The types of vehicles the Town uses are ASL, BCL, and Front End Loaders (FEL). Table 8 provides key metrics of the vehicle fleet. There are spare vehicles, which can be utilized if an ASL or FEL is out of service. However, there is not a spare Division vehicle if the BCL is out of service.

Table 8: In-Service Collection Vehicle Fleet Metrics

Vehicle Type & Number	Vehicle Manufacturer	Use	Purchase Price	Lifecycle Operating Cost	Lifecycle Costs-Repairs (to date)	Age	Useful Life (Years)	Useful Life (Years)	Total Cost Per Mile	Fuel Cost Per Mile
							Industry Standard	Town Standard		
Residential Vehicles										
ASL-800	Freightliner	Spare	\$204,250	\$215,596	\$136,329	10	7-9	12	\$3.22	\$1.19
ASL-801	Freightliner	Front Line	\$209,014	\$195,728	\$111,536	10	7-9	12	\$3.24	\$1.39
ASL-802	Freightliner	Front Line	\$249,371	\$170,920	\$97,764	8	7-9	12	\$3.06	\$1.31
ASL-807*	Autocar	Front Line	\$401,898	\$8,313	\$3,739	2	7-9	12	\$0.87	\$0.48
ASL-808	Autocar	Front Line	\$298,957	\$9,671	\$2,942	2	7-9	12	\$0.85	\$0.59
BCL-805	Freightliner	Front Line	\$103,058	\$61,113	\$31,106	5	10-12	12	\$1.25	\$0.61
Commercial Vehicles										
FEL-804	Autocar	Front Line	\$218,453	\$169,387	\$101,214	7	8-10	12	\$2.52	\$1.01
FEL-806	Autocar	Front Line	\$231,000	\$93,183	\$42,920	4	8-10	12	\$1.67	\$0.90

*Hydraulic Diesel Hybrid vehicle; partially funded by a grant

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In April of 2015 the Town received the Clean Fuel Advanced Technology Grant to fund the purchase of a hybrid collection vehicle which combines the use of diesel and hydrostatic drive technology. This new collection vehicle consumes an average of 48 percent less fuel than normal diesel vehicles.

Currently the average age of the Division's fleet is 6.4 years. Two residential vehicles are ten years old and operate at an average cost of \$3.23 per mile³, as opposed to the other vehicles which operate at an average cost of approximately \$1.59 per mile⁴.

The Town has a vehicle replacement policy that schedules the replacement of all solid waste vehicles at 12 years. This policy does not take engine hours into account, which is a more accurate measure of vehicle activity. The additional evaluation criteria for replacement are as follows:

1. Year of Vehicle: One (1) point is assigned for each year of chronological age past life expectancy, based on "in-service date" of the vehicle.
2. Mileage: One (1) point is assigned for each 5,000 miles of operation over 125,000 miles.
3. General Overall Condition: This category takes into consideration the condition of the body, rust, interior condition, vehicular accident status, anticipated repairs, etc. A scale from one (1) to five (5) is used, with five (5) being extremely poor condition.
4. Maintenance Cost: Points are assigned on a scale of one (1) to five (5) based on the total cost factor. The maintenance cost figure includes all repair and maintenance costs minus any costs associated with accident repairs. A five (5) would be equal to 100% or more of the original purchase price, while a one (1) would be equal to 20% of the original purchase price.

In general, KCI recommends a replacement schedule of 8-10 years for FEL vehicles and 7-9 years for ASL vehicles. Prior to replacing any vehicle, the unit should be reviewed to determine if maintenance expenses are tracking as planned. If a unit falls below the average spending for similar vehicle types, the useful life might be extended. On the other hand, high maintenance expenses are an indicator that a unit might need to be replaced sooner than planned. Should the situation of early replacement arise, an examination of vehicle procurement specifications, warranty, and driver misuse and abuse should be conducted to prevent a reoccurrence.

Solid waste drivers are required by the U.S. Department of Transportation to complete a Daily Vehicle Inspection Report for every vehicle driven each shift. This document indicates that the driver has conducted both a pre- and post-trip safety inspection of the vehicle and authorizes that the vehicle is safe to operate. KCI reviewed the Town's Daily Truck/Equipment Check Out Sheet which Drivers are required to fill out and hand in daily. While the Town does have a form in place, a more robust policy could assist the Division in heading off small problems before they manifest into larger issues. One key function missing in the process is a post-trip inspection. Issues are often found during this end of day inspection.

Figure 6: Hybrid Vehicle



³ Includes ASL-800 and ASL-801 which are ten years old.

⁴ Includes ASL-802 which is eight years old and ASL-807 and ASL-808 which are two years old.

Recommendations

- Revise the Vehicle Replacement Policy with input from the Fleet Maintenance Supervisor.
- Expand driver inspections to include post-trip inspections.

6. Cost of Service (COS) Analysis

KCI compiled and reviewed Town provided data pertinent to the development of a cost of service (COS) analysis. The Division's financial and operational data, discussions with Division and Finance staff, and actual expenses for the past three fiscal years were used in allocating expenses across the residential and commercial lines of business (LOB). The scope of this project focused the COS analysis on residential services and therefore further allocated residential expenses into the three residential collection services provided by the Division: garbage, yard waste and bulky waste. Because only one year of residential customer counts were available, the current residential customer count was used for all three years.

In order to allocate residential services, KCI utilized the percentage of weekly routes, fleet, and full time employees assigned to the three different residential services. Table 9 illustrates these allocations.

Table 9: Collection Allocation*

Line of Business	Weekly Routes		Fleet		Full Time Employees (FTE)	
	Count	Percentage	Count	Percentage	Count	Percentage
Residential Garbage	6	30%	2	29%	2.2	32%
Residential Yard Waste	8	40%	2	29%	2.6	37%
Residential Bulky	1	5%	1	14%	0.8	11%
Commercial Garbage	5	25%	2	29%	1.3	19%
Totals	20	100%	7	100%	6.9	100%

*Employees are allocated by percentage of time spent on each service. Public Works Director and Administrative assistance only spend a portion of time allocated to solid waste.

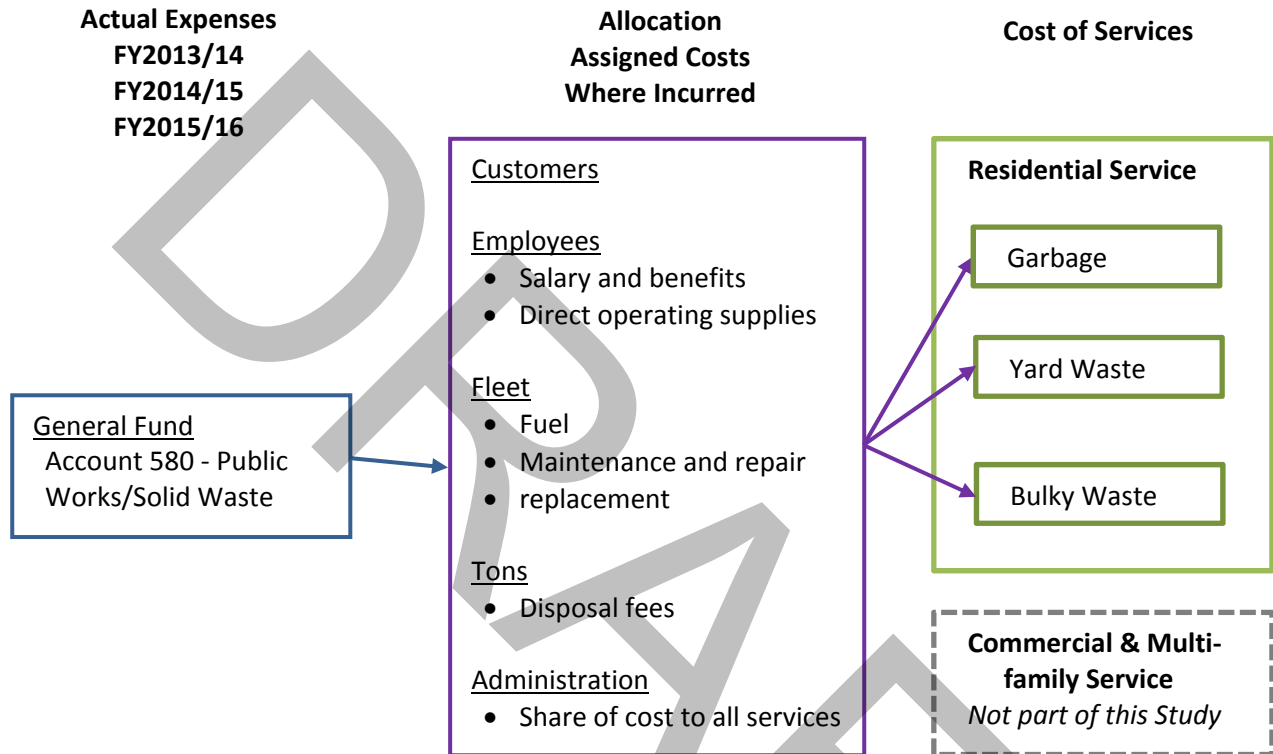
- Line items within the general fund were allocated using the percentages in Table 9 in the following manner:
 - Salaries, benefits, and direct operating supplies were allocated based on FTE.
 - Vehicle maintenance & repairs were allocated based on fleet.
 - Fuel was allocated based on weekly routes.
 - Yard waste cart expenses were assigned to residential yard waste.
 - Garbage carts that were purchased for resale were assigned to residential garbage.
 - Remaining accounts, which were indirect expenses spanning all services were considered administrative and were allocated based on the total service costs.
- Disposal cost totals are not an allocation. Annual disposal fees were calculated based on actual disposal log reports and totals by division truck type. Any difference between total calculated disposal costs and actual expenses are related to non-Division disposal costs such as Landscaping and Streets Division activities.

The Division does not have a designated fund for planned purchases of replacement vehicles. Fleet vehicles are purchased outright and reflected in expenditures rather than being depreciated over the life of the unit. To determine an average fleet replacement cost for the COS model, KCI estimated the total replacement cost of the entire fleet to account for purchase anomalies and straight-lined the total value by twelve years (current programmed average life expectancy of fleet vehicles) to determine an

estimated capital replacement cost. The estimated annual replacement cost was then allocated based on the use of the vehicle.

The estimated cost of service was compiled by adding the estimated collection and disposal cost for each service. A graphic representation of the allocation methodology used is presented in Figure 7.

Figure 7: Cost Allocation Methodology



The annual cost per household per service was determined by the estimated cost of service divided by the number of households serviced. The cost per household is illustrated in Table 10.

Table 10: Residential Annual Average Cost per Household

Allocation Category	Residential Garbage	Residential Yard Waste	Residential Bulky Waste	Average Annual Cost
FY 2015-16 Collection	\$58.60	\$56.71	\$11.30	\$126.61
FY 2015-16 Disposal	\$23.81	\$3.53	\$2.10	\$29.43
FY 2015-16 Total	\$82.41	\$60.23	\$13.40	\$156.05
FY 2014-15 Collection	\$61.54	\$60.90	\$11.80	\$134.24
FY 2014-15 Disposal	\$22.85	\$3.62	\$1.51	\$27.99
FY 2014-15 Total	\$84.39	\$64.52	\$13.32	\$162.23
FY 2013-14 Collection	\$58.13	\$56.84	\$11.00	\$125.96
FY 2013-14 Disposal	\$23.57	\$4.11	\$1.42	\$29.11
FY 2013-14 Total	\$81.70	\$60.95	\$12.42	\$155.07

Note: Columns may not appear to calculate correctly due to rounding.

In addition, the Town requested a cost per ton for each residential service. The average cost per ton is illustrated in Table 11.

Table 11: Residential Average Cost per Ton

Allocation Category Per Ton	Residential Garbage	Residential Yard Waste	Residential Bulky Waste
FY 2015-16 Collection	\$100.93	\$289.41	\$220.48
FY 2015-16 Disposal	\$41.00	\$18.00	\$41.00
FY 2015-16 Total	\$141.93	\$307.41	\$261.48
FY 2014-15 Collection	\$110.44	\$302.41	\$319.43
FY 2014-15 Disposal	\$41.00	\$18.00	\$41.00
FY 2014-15 Total	\$151.44	\$320.41	\$360.43
FY 2013-14 Collection	\$101.09	\$249.04	\$316.38
FY 2013-14 Disposal	\$41.00	\$18.00	\$41.00
FY 2013-14 Total	\$142.09	\$267.04	\$357.38

Findings

The COS analysis calculates an estimate for the annual cost for each residential service offered by the Division. Because COS is affected by either operational costs or disposal costs, the COS model is an effective tool to help make financial-based decisions when improving operational efficiency in order to reduce expenditures, as well as identifying disposal market opportunities and/or limitations. Due to the fact that there is not a stand-alone residential fee for solid waste service and disposal, KCI cannot compare the COS to current rates. Following are the key findings:

- Almost 19 percent of the Town's costs are associated with disposal, and 81 percent is attributed to collection.
- The average annual cost per household \$156.05, or \$13.00 per month, which is based on anecdotal data and our industry experience, is reasonable.

7. Conclusion

The Division's solid waste operation is a well-run, cohesive operation. Employee morale is high as demonstrated through the longevity of the current staff. A mutual respect among the community and the Division was witnessed while on site. The Division has developed and implemented a number of best practices such as cross-training, detailed driver paperwork, data entry of metrics into PubWorks®, and encouraging Drivers to be safe. The Division's equipment is in good working order, and there are enough vehicles to complete each day's tasks. Route optimization, scheduled bulky waste collection, and carted, subscription yard waste could all increase efficiencies in the Town's program. As noted throughout the memo, there are areas where KCI believes the Division could improve, which could be achieved incrementally. A list of these recommendations is attached in Appendix A. KCI is available to assist with any of these items or any additional technical assistance the Division may require.

APPENDIX A Recommendations

Compilation of Recommendations from Solid Waste Assessment-Current System.

Residential Garbage

- Through the public participation surveys that will be created:
 - Ask residents about their willingness to move their carts to one side of the street for expedited, safer collection, which would reduce emissions and vehicle time on their streets, reduce collection costs, and improve service.
 - Ask residents if they are interested in participating in a pilot for every other week service.
 - Explore option for residents to move carts curbside for service on roads that are difficult to service, such as 102 Laurel Avenue, shown in Figures 2 and 3.

Residential Yard Waste

- Require yard waste to be carted for regular collection.
- Pilot carted yard waste service with every other week collection.
- Create a route for carted yard waste collection.
- Require all non-carted yard waste to be called in for service with a fee attached.
- Begin utilization of Town's hybrid vehicle for yard waste collection.

Residential Bulky Waste

- Convert bulky collection service to on-call service requiring residents to request service. Residents could be directed to utilize the Town's online request tracker forms, which allows photos to be attached, and allows administrative staff to schedule pickups. Residents without online access could call in requests to administrative staff.
- Utilize OBC to log bulky set outs via driver input. This would allow office staff to route bulky collection for the same day or the following day.
- Create work orders for all bulky collection and route Driver to collect in one area per day per week.

Daily Reporting

- Combine current Driver paperwork into one form that mirrors the PubWorks® data entry screens to facilitate more accurate data entry.
- Conduct daily or weekly quality control reviews of reports for accuracy as the data is compiled in the annual report to the state.

Work Orders

- Investigate the cost of adding the work order module to its current system for enhanced tracking and reporting capabilities.

Safety

- Conduct weekly safety meetings covering solid waste focused topics.

Fleet Services

- Revise the Vehicle Replacement Policy with input from the Fleet Maintenance Supervisor.
- Expand driver inspections to include post-trip inspections.

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Town of Carrboro
Cost of Service Detail

Background detail for Tables 10 and 11

DISPOSAL COSTS						
Data and Equations	Actual	Town Residential Home Count	ASL ¹ & BCL ² Vehicles only	(Disposal x Tons)	(Tons/HH)	(Disposal Fees/HH)
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Disposal Fees FY 2015-16	Average Annual Tons per HH	Average Annual Disposal Cost Per HH
Residential Garbage	\$ 41.00	4387	2547.22	\$104,436.02	0.58	\$23.81
Residential Yard Waste	\$ 18.00	4387	859.59	\$15,472.62	0.20	\$3.53
Residential Bulky	\$ 41.00	4387	224.86	\$9,219.26	0.05	\$2.10
Totals			3631.67	\$129,127.90	0.83	\$29.43
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Disposal Fees FY 2014-15	Average Annual Tons per HH	Average Annual Cost per household
Residential Garbage	\$ 41.00	4387	2444.74	\$100,234.34	0.56	\$22.85
Residential Yard Waste	\$ 18.00	4387	883.39	\$15,901.02	0.20	\$3.62
Residential Bulky	\$ 41.00	4387	162.10	\$6,646.10	0.04	\$1.51
Totals			3490.23	\$122,781.46	0.80	\$27.99
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Disposal Fees FY 2013-14	Average Annual Tons per HH	Average Annual Cost per household
Residential Garbage	\$ 41.00	4387	2522.43	\$103,419.63	0.57	\$23.57
Residential Yard Waste	\$ 18.00	4387	1001.28	\$18,023.04	0.23	\$4.11
Residential Bulky	\$ 41.00	4387	152.47	\$6,251.27	0.03	\$1.42
Totals			3676.18	\$127,693.94	0.84	\$29.11

¹ASL=Automatic Side Loader

²BCL=Bulk Claw Loader

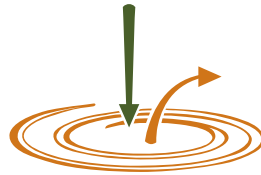
COLLECTION COSTS						
Data and Equations	Actual	Town Residential Home Count	ASL ¹ & BCL ² Vehicles only	Allocated Expenditures	(Allocated Expenditures/Tons)	(Allocated Expenditures/HH)
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Collection Costs FY 2015-16	Average Collection Cost per Ton	Average Annual Cost per HH
Residential Garbage	\$ 41.00	4387	2547.22	\$257,095.69	\$100.93	\$58.60
Residential Yard Waste	\$ 18.00	4387	859.59	\$248,771.90	\$289.41	\$56.71
Residential Bulky Waste	\$ 41.00	4387	224.86	\$49,577.35	\$220.48	\$11.30
Totals			3631.67	\$555,444.94		\$126.61
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Collection Costs FY 2014-15	Average Collection Cost per Ton	Average Annual Cost per HH
Residential Garbage	\$ 41.00	4387	2444.74	\$269,987.34	\$110.44	\$61.54
Residential Yard Waste	\$ 18.00	4387	883.39	\$267,148.25	\$302.41	\$60.90
Residential Bulky Waste	\$ 41.00	4387	162.10	\$51,779.44	\$319.43	\$11.80
Totals			3490.23	\$588,915.03		\$134.24
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Collection Costs FY 2013-14	Average Collection Cost per Ton	Average Annual Cost per HH
Residential Garbage	\$ 41.00	4387	2522.43	\$255,004.19	\$101.09	\$58.13
Residential Yard Waste	\$ 18.00	4387	1001.28	\$249,354.14	\$249.04	\$56.84
Residential Bulky Waste	\$ 41.00	4387	152.47	\$48,238.08	\$316.38	\$11.00
Totals			3676.18	\$552,596.41		\$125.96

¹ASL=Automatic Side Loader

²BCL=Bulk Claw Loader

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kessler consulting inc.
innovative waste solutions

TECHNICAL MEMORANDUM

TO: David Andrews, Town Manager
Town of Carrboro

FROM: Shane Barrett, Consultant

SUBJ: **Technical Memorandum #3: Organics Collection Options Assessment and Preliminary Plan for Residential Source Separated Organics Pilot Program**

PROJ #: 192-00.00

Introduction

The Town of Carrboro, NC (Town) contracted Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study. Task 5 of this study is an assessment of organic collection options for developing a framework for the city to collect residential curbside organics. Task 6 of this study is the development of a preliminary plan for piloting residential curbside organics. This technical memorandum summarizes the results of these two tasks.

Profiles of Existing Residential Organics Collection Programs

In order to develop the curbside organics pilot for the Town, KCI reviewed six on-point municipalities with residential curbside organics collection. Unfortunately, no communities were found in the Southeast that currently collect residential food waste; therefore, cities across the country are profiled. All of these municipalities collect organics and yard waste together in roll carts. While some municipalities, especially in the Northeast, collect organics only in small roll carts or bins, they were not included in these profiles because Carrboro collects some of its residential yard waste in carts and these programs would not be comparable, as they often do not have carted yard waste collection.

- **Portland, Oregon:** Portland collects curbside organic materials from single-family and small multi-family (2-4 units) residential properties on a weekly basis using 60-gallon roll carts. Accepted organic materials include all food waste, food-soiled or compostable paper (e.g., napkins and paper towels), and yard waste. Certified compostable bags are allowed to line carts or in-home collection containers; however, other compostable plastics are not allowed. The city also collects food waste from multi-family and commercial properties, but not compostable paper or yard waste. Organic materials collected in the residential program are sent to a compost facility that can handle the non-food materials, while commercial food waste is sent to



either an anaerobic digestion facility or another compost facility that processes only food waste. By implementing organics collection, the city was able to transition to every-other-week or every-four-week collection of garbage. In addition, Portland has a pay-as-you-throw (PAYT) rate schedule to incentivize recycling and composting. The city uses franchised haulers to provide residential collection services. Residents do not have a separate fee for composting and recycling, but the cost is included in a single rate based on the container size and collection frequency of the garbage service. Portland Metro reported a 59.8 percent diversion rate in 2014, which includes waste-to-energy incineration.¹ The residential curbside program collected an average of 1,089 pounds of organics per household in 2015, compared to 815 pounds of garbage and 776 pounds of recyclables per household in the same year.²

- **Austin, TX:** In December 2012, Austin implemented a residential curbside organics collection pilot at 7,500 households as part of its Master Plan to reach zero waste (90 percent diversion) by 2040. The pilot currently encompasses approximately 14,000 households after adding 6,500 households in February 2014. Organics, including all types of food waste, compostable paper, and yard waste, are collected weekly in 96-gallon roll carts. The city does not accept any compostable plastics, including compostable bags, but encourages participants to line kitchen collection bins with paper and layer food waste with paper and yard waste in the cart to keep the containers clean. Austin also has a PAYT rate schedule, which incentivizes organics diversion. In FY 2015, the pilot collected 4,219 tons of organics,³ which equates to approximately 600 pounds per household per year.
- **Seattle, Washington:** In 2014, Seattle banned food waste and food-soiled paper from residential and commercial garbage, in addition to a 1989 ban on yard waste. All residential properties in the city are required to have weekly curbside collection of organic waste, with an exception for approved backyard composting. Collection service is provided by its two franchise haulers. The haulers offer 13-, 32-, and 96-gallon organics collection carts for \$5.65, \$8.50, and \$10.85 per month, respectively. Accepted materials include all food waste, food-soiled paper, yard waste, compostable bags, and other certified compostable plastics. Initially, the city was to impose a \$1 fine on single-family residential households that were found to have more than 10% food waste in their garbage containers upon visual inspection; however, the fine was suspended in early 2015. In 2015, the city reported a recycling rate of 58.0 percent overall and 74.3 percent for the single family residential sector.⁴ Over 162,000 tons of organic material was composted in 2016, 91,375 tons of which were collected from single family and multi-family properties.⁵ The city had 146,204 single family and 5,010 multi-family properties signed up for the program as of December 2016. This equates to 1,208 pounds of organics per property per year.

¹ Oregon Department of Environmental Quality, *2015 Oregon Material Recovery and Waste Generation Rates Report*, 2015 (<http://www.deq.state.or.us/lq/pubs/docs/sw/2015MRWGratesReport.pdf>).

² City of Portland, *Residential Curbside Collection Service Rate Study for Rates Effective July 1, 2015*, 2015 (<https://www.portlandoregon.gov/bps/article/404493>).

³ Beniot, Erin, Records Analyst, Austin Resource Recovery, email communication.

⁴ Seattle Public Utilities, *2015 Recycling Rate Report*, 2015 (http://www.seattle.gov/Util/cs/groups/public/@spu/@garbage/documents/webcontent/1_052510.pdf).

⁵ Seattle Public Utilities, *Organics Report, 4th Quarter 2016*, 2016 (http://www.seattle.gov/Util/cs/groups/public/@spu/@garbage/documents/webcontent/1_051719.pdf).

- San Francisco, CA** – At 80 percent, San Francisco claims one of the highest diversion rates in the country. The city mandates recycling and composting for all residential and commercial properties. While mandatory composting has been required since 2009, the city has been collecting food waste for composting since a 1997 pilot, through its franchise hauler, Recology. For single-family residences, organics, including food waste, food-soiled paper, yard waste, and certified compostable bags and other plastics, are collected weekly in 32-gallon roll carts at a cost of \$2.06 per month. The city has a PAYT rate structure, but is currently piloting a pay-per-set out pilot for garbage carts to further encourage recycling and composting.
- Princeton, NJ** – In 2011, Princeton started a three-month residential curbside organics collection pilot that has since become permanent. The program is voluntary and participants pay an annual fee of \$65 to receive weekly collection of organic waste in either 20- or 32-gallon rolls carts. All food waste, compostable paper, and yard waste are accepted in the carts, as are certified compostable bags. The city provides all participants with kitchen collection bins and bags to line these bins. As of January 2016, approximately 1,200 customers participate in this voluntary program,⁶ which represents approximately 12 percent of Princeton’s households. In 2015, the program collected 483 tons of organics,⁶ which equates to approximately 800 pounds per participating household.
- Denver, CO** – Denver began curbside collection of organics in 2008 as a pilot program in select areas of the city. In 2010, the program became fee based and has been expanding its service area since. In 2016, the city provided service to 9,545 households along five collection routes⁷. In 2017, the City plans to expand to 11 routes, doubling eligible households to 160,000; the city anticipates about 20,000 additional subscriptions with the expansion⁸. The city charges subscribers \$29.25 per quarter (\$9.75 per month) for organics collection service. However, the city also does not have Pay-as-you-throw for trash collection. This could explain the low participation rate, where less than 20 percent of eligible households are anticipated to be subscribed after the 2017 expansion. Organic material (including food waste, yard waste, compostable paper products, and other Biodegradable Products Institute (BPI) certified compostable bags and products) is collected weekly in 65- or 95-gallon carts. In 2016, the city estimates 5,567 tons of organics were collected or approximately 1,166 pounds per household⁷.



Existing Organics Infrastructure in Orange County

Currently a number of organics collection and processing activities are occurring in Carrboro and the surrounding area.

⁶ Pellichero, Janet, Recycling Coordinator, City of Princeton, NJ, telephone interview.

⁷ Denver Recycles, *2016 Annual Report*, 2016.

(https://www.denvergov.org/content/dam/denvergov/Portals/709/documents/DR_AnnualReport_2016_Final.pdf).

⁸ Murray, Jon. *Denver Post*, “See where Denver is expanding curbside composting pickup and finishing trash cart conversions”, March 16, 2017. (<http://www.denverpost.com/2017/03/16/denver-curbside-compost-pickup-trash/>).

Collection Services

- **Orange County drop-offs** – Orange County Solid Waste Management maintains two food waste drop off locations. One is located at the Carrboro Farmer’s Market on Saturdays and one at the Walnut Grove Convenience Center. The drop offs accept all food waste (including meat, bones and dairy) and compostable paper products. Approximately 1,000 and 1,500 pounds of food waste are collected each month from the Farmers’ Market and Walnut Grove, respectively. All food waste is collected by Brooks Contractor and transported to their composting facility in Goldston.
- **CompostNOW** – CompostNOW is a private organics collection service provider based out of Raleigh. They provide subscription-based service to home and businesses in the Research Triangle area, including Carrboro. The service provides residential subscribers with up to two 5-gallon buckets for collecting food waste and other compostable materials (including compostable paper and BPI-certified compostable products). The buckets are collected weekly at the door and replaced with a clean one. They will also provide subscribers with finished compost should they wish. The cost for residential subscription is \$25 per month for up to two buckets and \$5 more per month for each additional bucket. CompostNOW also provides weekly service for offices and restaurants/cafes. All material is delivered to Brooks Contractor’s facility.
- **FoodFWD** – FoodFWD is a private organics collection service provider based in Durham. They primarily collect organics from commercial properties and special events using roll carts. Starting in April 2017, the company began a subscription-based residential drop off facility. The first facility is at Durham’s Central Park, but they plan to expand into Orange County. The cost to subscribe to the program is \$15 per month. For this cost, FoodFWD will provide a four-gallon collection bucket, compostable liners, and access to the drop-off containers. Collected material is delivered to Brooks Contractor’s facility.

Organics Processing

- **Brooks Contractor** – As stated above, Brooks Contractor is the primary composting partner for organics collection services in the research triangle area, including Orange County. The company owns a Class 3 permitted composting facility in Goldston. The site is approximately 38 miles from Carrboro (measured from the Public Works Department). Class 3 facilities are permitted to accept yard waste, manures, agricultural waste, and pre- and post-consumer food waste. They also accept certified compostable products. According to reports to the North Carolina Department of Environmental Quality (DEQ), the facility processed 57,231 tons of material in FY 2014-15, 9,342 tons of which were food waste⁹. This was 76 percent of its permitted capacity. In addition to composting, Brooks Contractor also collects organics from large food waste generators (grocery stores, schools, restaurants, etc.) using dumpsters and roll carts, including several locations in Orange County. Brooks also accepts food waste, food-soiled paper, and certified compostable bags from North Carolina State University.
- **McGill Regional Composting Facility** – McGill Regional Composting Facility, located in New Hill, is a large Class 4 commercial composting facility. The site is approximately 23 miles from Carrboro (measured from the Public Works Department). The facility is currently composting yard waste, food waste, biosolids, manures, and other organic materials. They also accept certified compostable products. In FY 2014-15, the facility composted 82,131 tons of material,

⁹Jorge Montezuma, “Organics Recycling in North Carolina,” *BioCycle* (September 2016): 36. (<https://www.biocycle.net/2016/09/15/organics-recycling-north-carolina/>).

including 1,231 tons of food waste.⁹ This was 54% of its permitted capacity. McGill has collection service using tractor-trailer trucks, but commercial haulers can self-haul to the facility.

- **Full Circle Recycling** – Full Circle Recycling is an anaerobic digestion facility in Zebulon. They receive food waste; however, because of the process used (i.e. yard waste would not be able to be digested with this type of digester), the food waste could not receive yard waste and food waste mixed together. This would not be an option for Carrboro’s curbside organics program.
- **Orange County Water and Sewer Authority (OWASA)** – OWASA has an anaerobic digester for treatment of its biosolids. Food waste could be incorporated into this type of anaerobic digester, but could not be included with yard waste. This option would not be appropriate for Carrboro’s curbside organics program.

Residential Curbside Organics Collection Framework and Overview

Based on the above research, KCI proposes a general framework for the collection of organics. This framework is based on evaluating other curbside programs, existing organics infrastructure in the region, and the Best Management Practices in Food Scraps Programs¹⁰.

- The Town would collect organics, which would include yard waste, food waste, non-recyclable compostable paper, and certified compostable products (if accepted by chosen processor), in a single 64- or 95-gallon roll cart. Smaller carts may be offered to households that do not generate a significant amount of yard waste, such as townhomes. The yard waste carts that are currently offered to residents would be acceptable. Implementation of full-scale organics collection would need to occur after full conversion to yard waste carts, as recommended by KCI in the Operations Assessment Technical Memorandum.
- The Town would use its existing automated side loader (ASL) trucks to collect the material weekly. The two current routes, two days per week may be sufficient, but will depend largely on participation and material collected. Additional routes may be needed depending on participation rates. Since only carts would be collected on these routes, the Town’s hybrid ASL could be used for one of these routes each day.
- The potential diversion rate achievable by curbside collection, depends on three main factors: 1) amount of municipal solid waste (MSW) that is compostable (waste composition), 2) the number of residents that use a cart for organics (participation rate), and 3) the amount of organics collected from each participant (capture rate).
 - The waste composition study conducted by KCI in 2016, indicated about 47 percent of the MSW stream is potentially compostable (this is excluding other organics & rubber, which was predominantly pet waste, a material not accepted in most curbside programs). According to the city’s tonnage reports, 2,547 tons of MSW were generated from the single-family residents in FY 2015-16. This means that about 1,200 tons of this material is potentially compostable or 546 pounds per household per year.
 - Participation is difficult to estimate, but currently about 15 percent of households (about 700 households) participate in the carted yard waste service. Should the Town require carted yard waste as the universal yard waste collection method, the number of households with yard waste carts would increase substantially. However, this does not equate to the participation rate in food waste and compostable paper collection. Not all households may

¹⁰Freeman, Juri and Skumatz, Lisa, Econservation Institute, *Best Management Practices in Food Scraps Programs*. (http://www.foodscrapsrecovery.com/EPA_FoodWasteReport_EI_Region5_v11_Final.pdf)

- place these materials in the yard waste cart. A number of factors impact participation rate, including outreach and education and residential rate structure. Materials outlining the benefits of the organics program and proper participation (i.e., what can be placed in the cart) must be provided to residents. In addition, most programs offer residents an economic incentive to participate. Municipalities with the most successful programs have a PAYT rate structure. This creates incentive for diverting material from the MSW cart into the organics cart because the household may be able to downgrade to a smaller and less expensive cart. Given that Carrboro does not have a PAYT system the participation rate may possibly be around 60 percent, dependent on whether a transition to yard waste carts is carried out. A discussion of PAYT programs will be provided in Technical Memorandum #4.
- The third factor that affects diversion is the capture rate. Even if a household participates in the program, they will not be diverting all compostable material to the organics collection. Informing the household of all possible compostable materials is critical in achieving high capture rates, especially for compostable paper or other less commonly composted materials. Convenience and “yuck” factors also play a role in the capture rate. The resident may be willing to put cornhusks or banana peels in the cart, but not raw meat trimmings or spoiled food. Providing effective kitchen containers with compostable liners can make it more convenient and cleaner for the household. Educating about ways to reduce the “yuck” factor, such as chilling or freezing food waste, especially during the summer, can help as well. Conservatively, a 60 percent capture rate from participants could be assumed.
 - Based on these gross assumptions, an estimated 430 tons or 17 percent of MSW could be diverted to organics collection. This assumes a citywide residential program with 60 percent participation and a 60 percent capture rate. This does not include any yard waste that is currently collected.
- Organics collection will have additional costs associated with it, as outlined below. These costs are discussed in further detail later in this memo in relation to pilot costs.
 - Additional time and mileage to transport the material to the composting facility.
 - Potentially higher tip fee compared to the current yard waste tip fee. However, this will reduce the tip fee paid for MSW.
 - Purchase of additional yard waste carts (unless the city maintains the current practice of residents purchasing their own carts)
 - Purchase of any kitchen containers or compostable bags for use by residents.
 - Development of outreach and education materials.

Preliminary Plan for Residential Organics Collection

This section outlines a preliminary plan for a curbside residential organics collection pilot based on the general framework outlined above.

- Hold discussions with both Brooks Contractor and McGill Compost to development an agreement for processing the collected organics. Both facilities have capacity and accept materials that would be collected in the pilot: yard waste, post-consumer food waste, compostable paper products, and certified compostable products. Brooks Contractor has an existing relationship with Orange County, which may facilitate working with them. However, McGill Compost is approximately 20 minutes closer to Carrboro. The Town would need to negotiate a tip fee with each facility, which could help in making a determination. The facility would need to understand that this is only a pilot, material may have higher contamination due

to first time participants. The Town and the facility should agree upon an acceptable level of contamination prior to the pilot.

- Develop a route to collect organics only from existing yard waste carts. These would need to be separate from loose, bagged, or canned yard waste collection. This would also allow the Town to use the hybrid automated side loader (ASL) truck since the driver would not need to manually load any material. Currently, the city has approximately 700 residents that have yard waste carts. These residents would be ideal participants for an organics collection pilot because 1) they already have carts that could be used for organics and 2) they have shown a commitment to yard waste collection, giving them buy-in to a pilot program.
- Prior to informing participants about the pilot, implement the new route for collecting from the carted yard waste residents and collect tonnage data from this route. This would allow the Town to establish baseline data for carted yard waste.
- Distribute outreach and education materials to each of the participants clearly describing the purpose of the pilot, what materials can and cannot be placed in their carts, kitchen collection procedures, and set out and cleaning procedures. KCI can provide assistance to the Town in developing this material should the Town move forward with this pilot. A strong outreach and education program is vital to a successful organics program. It will increase the amount of material collected in the program and decrease contamination or unacceptable materials.
 - Materials accepted: All yard waste the participants are currently placing in their yard waste carts, cooked and raw food (fruits, vegetables, bread, meat, bones, trimmings, spoiled or rotted food), compostable paper products (paper towels, napkins, tissues, uncoated paper plates, food-soiled paper, pizza boxes), certified compost products (paper and plastic products certified by BPI or meeting ASTM D6400 or D6868 standards).
 - Materials not accepted: plastic bags/film, pet waste/cat litter, any non-certified plastics or lined paper, expanded polystyrene, aluminum foil, and other inorganic materials. The list of acceptable and unacceptable materials should be verified with the composting facility before distributing to participants.
 - The Town may decide to provide kitchen containers, as some municipalities currently do. This would be an additional cost to the Town, but may encourage higher participation and recovery. Alternatively, participants could be encouraged to use their own containers, examples include a coffee can, large yogurt tub or cat litter bucket.
 - Set-out instructions would be identical to current procedures, but all carts would be collected on a single day.
 - To keep carts clean, paper bags or certified compostable plastic bags could be used to line kitchen containers. These liners could be provided by the Town or participants could be told examples of which brands to use based on the list of certified compostable products. However, these bags would be an added cost to either the Town or participant. Participants should be encouraged to layer food waste with yard waste as an additional cleanliness measure. Instructions for clean carts (soap and water) should also be provided to participants.
- Collect carts weekly curbside using one of the Town's ASL trucks. The hybrid ASL would be an ideal solution because manual loading would not be required and the compost facility is a further distance than the current yard waste disposal site.

- The expected tonnage will depend on how active the participants are in diverting additional organics in their yard waste carts. The quality of the education and outreach material provided to the participants will play a critical role in this. Below, are calculated rough estimates of expected tonnage for the pilot:
 - Based on the examples of other municipal curbside organics programs given above, the tons of organics annually collected ranged from 600 to 1200 pounds per household or about 11.5 to 23.1 pounds per household per week. Using these numbers as an assumption, this would equate to about 4 to 8 tons of organics per week during the pilot. The amount collected during the Town's pilot may be less than other established programs.
 - As discussed above, the WCS conducted by KCI in 2016 indicated that about 47 percent of the Town's residential waste is compostable. This equates to approximately 11.8 pounds per household per week, using the FY 2015-16 average of 22.4 pounds of MSW per household per week. The pilot will likely have a high participation and capture rate because the participants have already made the commitment to buy the yard waste cart. Assuming an 85 percent participation rate among the 700 households and a 75 percent capture rate from the participating residents, the pilot would collect about 6.7 pounds of additional organics per household per week. This is in addition to the yard waste currently collected. Based on FY 2015-16 data, an average of 2.8 pounds of yard waste per household per week were collected by the ASL truck. However, this number may not be representative of residents with yard waste carts as the ASL currently collects material from all residents (carted and loose). Nevertheless, this would mean that an estimated 9.5 pounds of total organics per household per week would be collected, averaged across all 700 households. This equates to 3.3 tons of organics per week.
 - One unknown factor is backyard composting. If the 700 residents practice backyard composting to a greater extent than the average household, the amount of organics that would be in the MSW stream and potentially collected in the pilot would be lower, assuming they continue to compost at home.
- Based on this tonnage estimate, the ASL would have sufficient capacity to collect material from all 700 households in a single load. The ASL would drive to the compost facility and tip its load at the completion of the weekly pilot route.
- We recommend the duration of the pilot to be at least 6 months to obtain reliable data and measure any seasonal changes in collection tonnage.

Preliminary Cost Estimates for the Pilot.

- Because the pilot would be using currently available collection equipment and staff, the additional cost to collect is minimal. Additional time and fuel costs would be needed to drive the extra distance to the compost facility rather than the Orange County Solid Waste Facility for yard waste disposal, approximately 7 miles (measured from the Public Works Department). However, by being able to use the Town's hybrid truck for the collection, the fuel usage would be partially offset. Furthermore by diverting organics from MSW, the amount of MSW that must be delivered to Waste Industries Transfer Station in Durham would be reduced. This could potentially reduce the number of trips the Town's trucks make to dispose of MSW, especially once the program is full scale.

- The compost facility would charge a tip fee for the organics. This could be negotiated during the planning phase of the pilot. DEQ reported an average tip fee of \$24.33 for private composting facilities¹¹. This is slightly higher than the \$18 per ton tip fee the Town is paying to yard waste processing at the Orange County Landfill and significantly less than the \$44 per ton MSW tip fee. Assuming the tonnage numbers calculated above for the pilot (1 ton of yard waste per week and 2 tons of additional organics per week), the total tip fee could be around \$35 per week less for the pilot.
- Development and production of outreach and education materials would be another cost to the pilot. As with any outreach program, budgets range and depend largely on the funds available. At a minimum, each home should receive an information packet mailed or delivered to each pilot home.
- An optional cost would be for providing kitchen containers and compostable liners. The containers could range from \$10-\$20, and liners could be around \$0.20 each or \$10 for a 6-month supply (2 per week). This would be an estimated \$20-\$30 per household for the pilot or \$14,000 - \$21,000 total. However, lower costs may be able to be negotiated with a supplier, especially for a pilot project. While these costs are optional, providing the supplies could significantly improve participation. The Town should also consider whether they would be able to provide these supplies in a full-scale program, as providing them for the pilot may set the expectation of the same for a full-scale program. If they are not provided in a full-scale program, the diversion rates measured in the pilot may not be able to be achieved once full scale.

Data Tracking and Monitoring

Collecting data throughout the pilot will be critical in evaluating its success and making a determination as to whether to move to full-scale. Some of the important metrics to measure include:

- The Town will need to record the weekly tonnage of material collected. This will simply be a matter of recording the scale tickets at the composting facility.
- Tonnage of yard waste and MSW streams will also need to be tracked to see the impact the pilot has on these.
- Throughout the pilot, the Town will need to measure the set-out rates for the participants. This will help to measure the true participation rate in the pilot.
- Town staff or drivers would need to monitor contamination in the organics carts. This will help the Town to evaluate their education material. If contamination becomes particularly problematic (i.e. exceeds the agreed upon level of contamination) the material may be rejected from the compost facility. Refinement to the education materials may be required during the pilot.
- A waste composition study should be conducted at least once during the pilot targeting the participants. This will measure the amount and types of organics that remain in the MSW stream.

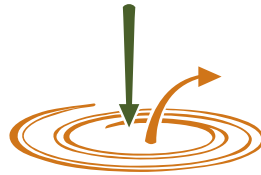
¹¹North Carolina Department of Environmental Quality, *NC Organics Recycling Study: Materials Managed 2011-2015 & Food Recovered 2015, 2016*. (<https://ncdenr.s3.amazonaws.com/s3fs-public/Environmental%20Assistance%20and%20Customer%20Service/Composting/NC%20Organics%20Recycling%20Study%202016.pdf>)

- A survey of participants should also be conducted towards the end of the pilot for the Town to receive their feedback and make any changes to facilitate collection on the residents' side.

Next Steps

Upon the Town's review of this Technical Memorandum, KCI will discuss these recommendations with the Town. Should the Town decide to move forward with a pilot and wish to contract with KCI to provide assistance throughout the pilot, KCI will develop a scope for preparing a more detailed pilot implementation plan.

DRAFT



kessler consulting inc.
innovative waste solutions

TECHNICAL MEMORANDUM

TO: David Andrews, Town Manager
Town of Carrboro

FROM: Shane Barrett, Consultant

SUBJ: **Technical Memorandum #4: Pay-as-You-Throw Assessment and Pilot Discussion**

PROJ #: 192-00.00

Introduction

The Town of Carrboro, NC (Town) requested Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study that included several tasks. Task 8 of this study is an assessment of pay-as-you-throw programs. The purpose of this technical memorandum is to provide the findings of this assessment and discuss the pilot program option(s) identified for the Town as a result of the recent cart audit, route study, and organics assessment that were also included in the Residential Solid Waste Study.

Pay-As-You-Throw

In a variable rate, or pay-as-you-throw (PAYT) program, customers are charged for waste collection and disposal based on how much – or how little – waste they generate. PAYT breaks with the traditional fixed or flat fee for waste collection services by treating trash services like other utilities – customers pay only for what they use. In many instances, the cost of waste collection is hidden; therefore, residential users do not have an apparent reason to limit their disposal habits. If a customer's action directly affects the cost of their service, they are more likely to limit their usage, and take advantage of available waste reduction opportunities including source reduction, reuse, recycling, and composting.

There are two systems for determining how much waste is generated by residents in a PAYT program: weight-based systems and volume-based systems.

- Weight-based systems are more common for drop-off locations where incoming waste can be weighed on permanent scales. Curbside weight-based systems require on-vehicle scales to weigh materials as they are collected at each residential household. These systems are much less common for curbside collection due to the difficulty and expense of maintaining and certifying the accuracy of the on-board scales, which must comply with governmental standards¹. While there are weight-based PAYT programs in existence, most are found within the European Union. As on-vehicle scale technologies advance, weight-based PAYT programs may grow in popularity.
- Volume-based systems are based on a given container size and are much more common in the

¹ The Weights and Measures Division, within the National Institute of Standards and Technology promotes uniformity in U.S. weights and measures laws, regulations, and standards to achieve equity between buyers and sellers in the marketplace.

United States. Volume-based systems include a variety of methods to determine how much (i.e., volume) waste a residential user generates. These systems include:

- Pre-paid Bags – Residents purchase specific bags at government offices and/or local stores, which are priced by the jurisdiction to fund collection and disposal operations. In these systems, only garbage placed within these bags is collected by sanitation workers or accepted at local disposal locations. Bags are typically no larger than 20 or 30 gallons in capacity to ensure that residents who generate less waste pay less.
- Pre-paid Tags/Stickers – A variation of the pre-paid bag system, in which tags or stickers are purchased by residents and placed on their personal bins or loose trash bags for collections.
- Containers – Container systems typically include government issued containers, where the rate is based on the size of the container chosen and/or the number of times a can is serviced.
 - In a single can system, residents are provided with one container and are charged only when that container is serviced. Single can systems have grown in popularity with the use of Radio Frequency Identification (RFID), which automates the billing process.
 - In a variable can system, governments offer different sized containers and residents choose the size and number of containers needed for their household. Carts are typically offered in 35, 64, and 96-gallon sizes, which correlate to most automated cart options. Each container is offered at an increasing rate structure to incentivize waste diversion and the use of smaller containers. The frequency of service is set by the jurisdiction and residents pay the monthly fee regardless of the number of times the cart is serviced during the month.

Regardless of the approach chosen, research has shown that PAYT programs encourage residents to pay closer attention to the amount of waste they generate.

Advantages to PAYT systems include:

- Raises residential awareness of solid waste issues
- Provides residents with control over waste expenses
- Incentivizes recycling and composting programs
- Successful in encouraging waste diversion

Potential barriers to PAYT systems include:

- Litter and illegal dumping worries
- Low income households
- System accounting
- New and expanded education and outreach
- Language barrier issues

Profiles of Existing PAYT Programs

- Bloomington, Indiana: The City of Bloomington (City) is unique among the jurisdictions reviewed, in that they are currently transitioning from a sticker system to variable cart sizes. The City provides waste services to roughly 15,000 households from Monday through Thursday. Under the old system, a solid waste sticker was required for each regular trash bin (that meets city code standards) placed out for pickup at the cost of \$2 per bin. Two solid waste stickers were required for bulky items and appliances. Yard waste bags required a yard waste sticker to be placed on them at the cost of \$1 each. Recycling services were provided free of charge.

On average, the City's annual Sanitation Department budget, generated through sticker sales, was unable to cover the cost of services. The City's general fund was needed to supplement the Department with approximately \$1 million per year.

Under the new system, each resident will receive their choice of three solid waste cart sizes, 96, 64, or 35 gallon and their similar choice of a recycling cart. Recycling services will switch to weekly collection. New monthly fees² will be determined based on the size of the solid waste cart chosen. Actual prices will be known once cart selections are made; however, estimates range from:

- 35-gallon: \$4.82-\$6.51
- 64-gallon: \$8.60-\$11.61
- 96-gallon: \$13.72-\$18.52

Additional fees will be assessed for bulky item pick-up, additional cart service request, cart exchanges, late fees, and yard waste collection.

- Gainesville, Florida: The City of Gainesville (Gainesville) has one of the most mature programs in the Southeast having had a successful PAYT program since 1994. In their first year, garbage collection decreased by 18 percent and recyclables recovery increased by 25 percent, resulting in a savings of \$186,000 to the residential sector. When residents move into a new home in (Gainesville), they have a 30-day window to exchange the current cart for their chosen size. After the grace period, a resident can move to a smaller cart at no charge or pay a \$12.75 exchange fee to move to a larger cart. Solid waste collection is once-per-week and four cart sizes are offered:

- Mini Cart: \$16.75 (approximately 15-gallon)
- 35-gallon: \$21.75
- 64-gallon: \$27.00
- 96-gallon: \$33.50

Weekly recycling service (dual stream bin program), bulk item, and yard waste (that is free of plastic bags) collection is also included in the above rates. Yard waste that is bagged requires a special request and associated fee. The City also sells "official" yellow bags for excess waste that will not fit inside the cart.

- Highland Park, Illinois: The City of Highland Park contracts with Lakeshore Recycling Systems (Lakeshore) to offer collections services. Lakeshore offers weekly and bi-weekly collection; however, residents are only charged when they actually put their carts to the curb for collection service. In this RFID program that started August 1, 2016, volume-based customers no longer have to buy stickers for curbside pickup. RFID technology allows Lakeshore to track the number of times a garbage cart is collected each month and bill customers accordingly.
 - Base Fee: \$5.68/month (paid by all households) with the following options:
 - 35 or 65-gallon Twice Weekly Curbside Subscription: \$40.29
 - 35 or 65-gallon Once Weekly Curbside Subscription: \$22.29
 - 35-gallon Curbside Volume-Based: \$2.50 per service (35-gallon only)
 - Refuse Sticker: \$2.50 utilized for excess waste
 - 95 -Gallon Container: extra \$5 per month to above subscription fees

² New rates reflect the City's wishes to continue to supplement the Sanitation Department with approximately \$1 million per year from the General Fund.

The above fees also include once weekly single stream recycling; however, only the subscription options include weekly curbside recycling of mixed organic waste (food scrap/landscape/low grade paper), which is available from April 1 to December 15. Volume-based customers must purchase refuse stickers for the collection of organics. All options include weekly bulk waste collection.

- Hendersonville, North Carolina: The City of Hendersonville (City) offers weekly solid waste and recycling collection using variable sized collection containers. To encourage recycling, the City charges more for those residents that do not choose to request a free recycling cart. Current rates for solid waste:
 - 96-gallon container (non-recycler): \$22.00
 - 96-gallon container (actively recycles): \$18.50
 - 32-gallon container (non-recycler): \$20.00
 - 32-gallon container (actively recycles): \$16.25

The City also offers weekly curbside yard waste, bulky waste and appliance collection; however, the City requests that residents call ahead to notify collection crews. In addition, the City offers loose leaf collection between October and December.

- Aberdeen, Maryland: The City of Aberdeen (Aberdeen) is in its 15th year of a PAYT sticker program. In 1992, before the program, Aberdeen averaged 314 tons of waste and 37 tons of recyclables per month. In 2006, the Aberdeen averaged 264 tons of waste and 85 tons of recyclables, despite a growth from 3,520 homes to 4,182 homes. Aberdeen sells pre-paid stickers at six local retailers and City Hall.

Aberdeen provides weekly waste and recycling collection service and twice per month yard waste and bulky collection. Pre-paid stickers are required on all resident-owned waste collection containers. Stickers can also be placed on electronics and will be collected curbside. Aberdeen is unique in that collection costs are included in its tax base, and the stickers are used to fund disposal tipping fees, which are currently \$50 per ton. Stickers currently cost \$1.00 and cover up to 32-gallons or 40 pounds.

Advantages and Disadvantages of Each PAYT Systems

Weight Based System

Advantages:

- True PAYT, residents are only charged for what they actually dispose.
- Residents realize immediate savings from waste diversion.

Disadvantages:

- High equipment demands to maintain and calibrate on-vehicle scales.
- Higher initial costs.

Pre-paid Bags and Stickers

Advantages:

- Easy for residents to understand
- Low implementation costs

Disadvantages:

- Uncertain revenues as residents purchase on an as-needed basis.

- Bags can rip and/or stickers can fall off.
- Maintaining bag/sticker inventories and controlling flow of funds from resellers.
- Not compatible with automated collection systems.

Variable Can System

Advantages:

- Constant revenue stream
- Can be integrated with automated collection

Disadvantages:

- Need method to deal with excess waste.
- Higher initial costs.
- Higher administrative costs for distribution of carts and billing.

Single Can System

Advantages:

- Can be integrated with automated collection.

Disadvantages:

- Higher initial costs for RFID equipment
- Need method to deal with excess waste.
- Higher administrative costs and need for ongoing RFID technology subscriptions.

Applicability to Carrboro: Currently, the Town's Solid Waste Management Division is funded by the Town's General Fund, via Account 580 for Public Works/Solid Waste. Because solid waste is not billed directly to residents, and residents do not see a monthly bill, it will be difficult to implement a PAYT program requiring residents to pay for a service they had not actively paid for in the past. A solution could be to offer a basic level service (e.g., every-other-week collection) paid for by the general fund and offer a PAYT option for additional services at an additional rate. The applicability of each system to Carrboro is as follows:

- **Weight-Based System:** As on-vehicle scale technology advances, a weight-based program may be implementable in Carrboro. The Town currently has the infrastructure in place (i.e., automated carts and collection) and would only need on-vehicle scales and the corresponding billing system to implement a weight-based PAYT program. While initial expenses may be higher than other options, the Town should monitor industry advances with on-vehicle scales.
- **Pre-paid stickers or bags:** Not a viable option for the Town due to the use of automated collection vehicles and cart-based collection of solid waste.
- **Variable Can System:** With the use of automated vehicles and carts in place, Carrboro could offer its residents additional container sizes and develop a rate schedule that incentivizes waste diversion.
- **Single Can System:** With the addition of RFID technology, the Town could implement PAYT with current containers outfitted with low-cost RFID tags. On-vehicle RFID readers require initial capital and technology subscriptions must be maintained, but with only two to four vehicles to retrofit with RFID technology; the overall cost may not be considered excessive.

Program Recommendations for the Town of Carrboro

Utilizing the results of the Town's Route Audit, Cart Study, Source Segregated Organics Assessment and the PAYT research summarized herein, KCI offers the following pilot program recommendation.

Every Other Week Collection with Carted Source Separated Organics and PAYT Options

A residential cart study was conducted in February to measure the volume of waste in carts placed curbside for collection. The study revealed that 71.8 percent of all carts placed at the curb for service were less than 50 percent full. Nearly half of those carts (34.3 percent of all carts audited) contained less than 25 percent waste by volume. This means that just 28.2 percent of residents generate more waste than could be contained in their waste cart for a two-week period. This number drops to just 19.2 percent when assuming that those residents who did not have their carts placed curbside for service, had the capacity available to wait until the next collection cycle. Full results of the residential cart study can be found in Attachment A.

In Technical Memorandum #2, KCI reviewed average per route tonnage for the current residential routes and calculated the tonnage in an every other week (EOW) service scenario. It was determined, at the time that the estimated tonnage for EOW service would need to be divided into two disposal trips due to truck capacity, if the Town continued to service all residents with the same six weekly routes (i.e., two vehicles, three days per week). However, due to the 1-1/2-hour turn around to drive to and from the disposal facility and dispose of garbage, drivers would be required to work additional hours to complete routes at the current waste generation rate. PAYT incentivizes waste diversion over disposal, which may alleviate the need for second trips.

In Technical Memorandum #3, KCI estimated that an established source separated organics (SSO) program could recover an additional 6.7 pounds of SSO per household per week. This equates to approximately five tons per route over a two-week period, which lowers the average tons per route EOW to a level that can be feasibly collected in a single load; therefore, eliminating the need for a second trip to the disposal facility and saving at least 12 staff hours each week. Table 1 depicts the following:

- The current average tons per route for the Town's residential ASL routes.
- The estimated tons per route if the Town went to EOW collection with no other changes. In this scenario, a second trip to the disposal facility is needed due to the high volume of waste.
- The estimated average tons per route, with EOW collection and weekly SSO collection. In this scenario, a single trip to the disposal facility is feasible.
- The estimated average tonnage of yard waste and SSO tonnage to be collected along the weekly SSO route.

Table 1: Residential Route Tonnage

Month	Current Average Tons/Route	Estimated Average Tons/Route EOW (Current Avg. x 2)	Estimated Average Tons/Route EOW with Weekly SSO Route	Current Average ASL Yard Waste Tons/Route Plus Estimated SSO Tonnage
July	9.39	18.78	13.76	12.84
August	7.26	14.53	9.51	5.56
September	7.96	15.92	10.90	5.57
October	7.84	15.68	10.66	6.35
November	7.38	14.77	9.75	4.75
December	9.79	19.58	14.56	5.22
January	7.82	15.65	10.63	5.61
February	7.02	14.03	9.01	2.79
March	8.26	16.53	11.51	9.31
April	8.11	16.22	11.20	9.81
May	7.80	15.60	10.58	8.98
June	9.41	18.82	13.80	7.55

In the proposed collection system:

- The Town would collect SSO, which would include yard waste, food waste, non-recyclable compostable paper, and certified compostable products (if accepted by chosen processor), in a single 64- or 95-gallon roll cart. Smaller carts may be offered to households that do not generate a significant amount of yard waste, such as townhomes. The yard waste carts that are currently offered to residents would be acceptable. Implementation of full-scale organics collection would need to occur after full conversion to yard waste carts, as recommended by KCI in the Operations Assessment Technical Memorandum #2.
- The Town would use its existing automated side loader (ASL) trucks to collect the SSO material weekly, which would offer greatly increased efficiencies over the current yard waste collection operations. The two current routes, two days per week may be sufficient, but will depend largely on participation and material collected. KCI envisions adding two additional routes as needed depending on participation rates. Because only carts would be collected on these routes, the Town's hybrid ASL could be used for one of these routes each day, maximizing the use of this vehicle.
- The Town would move solid waste pickup to every other week collection. This shift in frequency would reduce the number of garbage routes from six routes per week to three routes per week. All of which could be serviced by the Town's hybrid collection vehicle. SSO routes would increase from the four current yard waste routes to six so that each home would receive weekly SSO collection.

Table 2 depicts the current number of garbage and yard waste routes as well as the number of routes needed in the proposed collection system.

Table 2: Residential Route Matrix

Route Type	Current Number of Operating Routes							Weekly Routes
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	
Residential Garbage	0	0	2	2	2	n/a	n/a	6
Residential Yard Waste ¹	2	2	0	0	0	n/a	n/a	4

¹Consists of two routes, however in the busy months 4-5 vehicles are utilized.

Route Type	Proposed Number of Operating Routes							Weekly Routes
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	
Residential Garbage ¹	0	0	1	1	1	n/a	n/a	3
Residential SSO	3	3	0	0	0	n/a	n/a	4

¹Every other week collection cycle allows the hybrid vehicle to service all garbage routes.

Greenhouse Gas Reductions

With the reduction of three garbage routes per week and the availability of the Town's hybrid vehicle to work five days per week, the total greenhouse gas (GHG) emissions of the Town's collection service is expected to be reduced. Table 3, below, shows the calculated weekly and annual GHG emissions, represented as carbon dioxide equivalent (CO₂e) for the current and proposed collection programs. GHG emissions are calculated using the methodology recommended by the EPA's Center for Corporate Climate Leadership's *GHG Inventory Guidance: Direct Emissions from Mobile Sources*³ for diesel medium- and heavy-duty trucks.

Please note: these are rough estimates using current route data, average fuel economies of the current fleet, and default emission factors. They do not account for gains or losses in fuel economy in collecting more or less weight on each route, nor do they account for any mileage savings through route efficiency that could be accomplished through carted SSO collection (i.e. driving fewer miles to collect only from locations with carts).

Table 3: Greenhouse Gas Emission Estimates

Route Type	Weekly Routes	Weekly miles ¹	Weekly fuel consumption (gal) ²	Weekly GHG emissions (tons CO ₂ e)	Annual GHG emissions (tons CO ₂ e)	Percent Reduction
Current Collection						
Residential Garbage	6	420	162.2	1.8	95.0	
Residential Yard Waste	4	300	134.3	1.5	78.6	
Totals				3.3	173.6	
Proposed Collection						
Residential Garbage	3	210	68.2	0.8	39.9	37%
Residential SSO	6	420	170.8	1.9	100.0	3%
Totals				2.7	139.9	19.4%

¹ Weekly miles are assuming a round-trip route distance for collection and disposal of 70 miles for garbage and 75 miles for yard waste/SSO.

² Weekly fuel consumption is based on the average lifetime fuel economy of the Town's four ASL trucks and the lifetime fuel economy of the Town's hybrid ASL, as reported on December 13, 2016.

³ Available from: https://www.epa.gov/sites/production/files/2016-03/documents/mobileemissions_3_2016.pdf

Converting the collection of yard waste to carts, which will allow the use of the hybrid truck on one of the routes and adding two diesel routes to offer weekly SSO collection, will increase GHG emissions; however these increases are offset by the reduction of weekly garbage routes. Collecting SSO in addition to yard waste with these trucks will allow every other week garbage collection with the hybrid truck, and could reduce GHG emissions by 58 percent for collection of garbage, and a total of 19 percent for both services.

PAYT Options

Municipalities with the most successful SSO programs have a PAYT rate structure. This creates incentives for diverting material from the garbage cart into the organics cart because the household may be able to downgrade to a smaller and less expensive garbage cart. The Town could switch to EOW collection and implement a variable or single container PAYT rate structure. A variable can system would require the Town to offer carts of various sizes, while a single can system would require the initiation of RFID technology. Both systems would provide an economic incentive to increase SSO diversion.

After a switch to EOW garbage collection, another PAYT option would be to charge residents an additional fee for additional trips per week. Offering twice-weekly collection at an added expense would also incentivize waste diversion while simultaneously providing a high level of service should certain residents elect to participate.

Pilot Program Discussion

Approximately 700 residents have already elected to participate in the carted yard waste collection program. These volunteers would be a likely group to participate in the pilot because of their willingness to engage in segregated, carted yard waste collection. The advantage of piloting the program with current yard waste cart subscriptions is the elimination of the purchase and distribution of carts for SSO. The disadvantage is that pilot participants will be spread across the Town and collection efficiencies will not be fully realized due to the excess route travel. Conversely, the selection of a new pilot will require initial cart expenses, but collection efficiencies will match those expected in a Town-wide program. The following list outlines the initial steps to pilot program implementation.

- Identify a Processor: Hold discussions with both Brooks Contractor and McGill Compost to development an agreement for processing the collected organics. Both facilities have capacity and accept materials that will be collected in the pilot: yard waste, post-consumer food waste, compostable paper products, and certified compostable products.
- Develop a Pilot Route: Route existing yard waste carts for maximum ASL efficiency. Currently, the Town has approximately 700 residents who have yard waste carts. These residents would be ideal participants for an organics collection pilot because 1) they already have carts that could be used for organics and 2) they have shown a commitment to yard waste collection.
- Establish a Baseline: Prior to informing participants about the pilot implement the new route for collecting garbage and yard waste from the carted yard waste residents and collect tonnage data from this route. This will allow the Town to establish baseline data for carted yard waste.
- Educate Pilot Participants: Distribute outreach and education materials to each of the participants clearly describing the purpose of the pilot, what materials can and cannot be placed in their carts, kitchen collection procedures, and setout and cleaning procedures. KCI can provide assistance to the Town in developing this material should the Town move forward with this pilot. A strong outreach and education program is vital to a successful organics program. It

will increase the amount of material collected in the program and decrease contamination or unacceptable materials.

At a minimum, outreach materials should include the following:

- Materials accepted
 - Materials not accepted
 - Set-out instructions
 - Program contact information
- **Initiate Pilot:** Collect garbage carts EOW and SSO carts weekly curbside using one of the Town's ASL trucks. The hybrid ASL would be an ideal solution because manual loading would not be required and the compost facility is a further distance than the current yard waste disposal site. Fuel consumption should also be tracked to identify the GHG savings of the new route with the hybrid.
 - **Track Tonnage and Setout Rates:** The expected tonnage will depend on how active the participants are in diverting additional organics in their yard waste carts. The quality of the education and outreach materials provided to the participants will play a critical role in driving program participation and material diversion tonnage. Throughout the pilot, the Town will need to measure the setout rates for the participants to understand who is and is not utilizing the new program. Education and outreach materials can be directed to those residents not participating.

We recommend the duration of the pilot to be at least six months to obtain reliable data and measure any seasonal changes in collection tonnage.

Next Steps

Upon the Town's review of this Technical Memorandum, KCI will discuss these recommendations with the Town. A public input survey is currently being developed to gather resident feedback in an SSO pilot program. The results of this survey, along with a full summary of the Residential Solid Waste Study will be compiled into a Final Report, which will be completed once the survey is finalized. KCI has experience designing, implementing, and monitoring many pilot programs and is available to provide assistance should the Town decide to move forward with its own SSO pilot program.

ATTACHMENT A

RESULT OF THE TOWN'S CART STUDY

Purpose:

The Town of Carrboro requested a cart audit to evaluate the fullness or capacity of municipal trashcans on pickup day. Understanding how much waste was present in the average trashcan on service day provides the town with valuable information on which future program decisions can be made.

Methodology:

To determine the average volume of waste present in trashcans on collection day, KCI worked with Town staff to conduct the cart audit to determine the actual volume of waste placed curbside for collection. While onsite for the residential route audit, KCI rode with Town staff through representative neighborhoods and streets quickly looking in each trashcan placed curbside for service that day. During the audit, KCI recorded the address, whether a trashcan was placed curbside for collection, and if so, how much garbage was present. The audit included 756 homes and 515 visual trashcan observations.

The following capacity levels were recorded during the audit:

- No cart placed curbside.
- Less than 10 percent, i.e., one small bag of garbage.
- 25 percent, approximately one quarter full.
- 50 percent, approximately half full.
- 75 percent, approximately three quarters full.
- 100 percent, at or near cart capacity.
- More than 100 percent overflowing cart or two cans totaling more than 100 percent.

Results:

The table below presents the raw data from the cart audit. Overall, 32 percent of the homes included did not have carts placed curbside for collection, meaning these residents either forgot to place their carts curbside or they felt service was unnecessary on the day of the audit. To understand how these homes affect the data, the results were analyzed to include and exclude the number of homes that did not have carts placed curbside.

Table 1: Cart Audit Data

Trashcan Fullness	All Homes Audited		Only Audited Trashcans	
	Count	Percent	Count	Percent
Not set out	241	31.9%		
Less than 10%	46	6.1%	46	8.9%
Approximately 25%	131	17.3%	131	25.4%
Approximately 50%	193	25.5%	193	37.5%
Approximately 75%	62	8.2%	62	12.0%
At or near capacity (100%)	77	10.2%	77	15.0%
More than 100%	6	0.8%	6	1.2%
Totals	756	100.0%	515	100.0%

Results of the cart audit reveal:

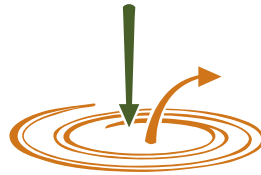
- Approximately 32 percent of homes audited did not place carts curbside, although the reasons for this are unknown.

- Approximately 23 to 34 percent of the Town's trashcans were one quarter full or less.
- Approximately 25 to 37 percent of the Town's trashcans are approximately half-full on collection day.
- Approximately 8 to 12 percent of the Town's trashcans are approximately three quarters-full on collection day.
- Only 11 to 16 percent of the Town's trashcans are at or over capacity on collection day.

Findings:

- When assuming that carts that were not set-out also contained very little waste, it is estimated that 80.8 percent of homes' audited set-out carts that were less than half full. Of the carts actually audited, 71.8 percent were less than half full.
- Overall, only 28.2 percent of carts audited would not have the capacity for every other week collection.

DRAFT



kessler consulting inc.
innovative waste solutions

TECHNICAL MEMORANDUM

TO: David Andrews, Town Manager
Town of Carrboro

FROM: Shane Barrett, Consultant

SUBJ: **Technical Memorandum #5: Public Participation Survey Results**

PROJ #: 192-00.00

Introduction

The Town of Carrboro, NC (Town) contracted Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study. Task 1 of this study was to garner feedback from residents regarding current waste services and potential changes to the Town's programs. During the initial stages of this study, it was decided to move the survey to the end of the project to allow the project team to identify which pilot options should be included in the survey.

Survey Methodology

KCI developed the survey instrument for review by Town staff. Once finalized, staff uploaded the survey onto an online survey website and disseminated the survey to Town residents via social media and the Town's email distribution list. Survey details were also provided to local media. The survey was open for three weeks between June 30 and July 23, 2017, during which time 137 responses were received. Four responses were removed from the survey analysis. Two respondents stated that they did not receive waste services from the Town of Carrboro and two respondents stated that they had commercial waste services. The responses received represent a three percent return rate for households receiving waste services provided by the Town.

Survey Results

1. Do you receive garbage collection services provided by the Town of Carrboro?

Yes	97.08%	133
No*	2.92%	4
	Answered	137
	Skipped	0

** The four respondents that do not receive garbage services provided by the Town were removed from the following survey results.*

2. Please choose the answer that best represents your home:

Single family standalone home	82.71%	110
Single family town home	8.27%	11
Multi-family duplex, triplex, etc.	9.02%	12
Answered		133
Skipped		0

3. How many persons occupy your home on average:

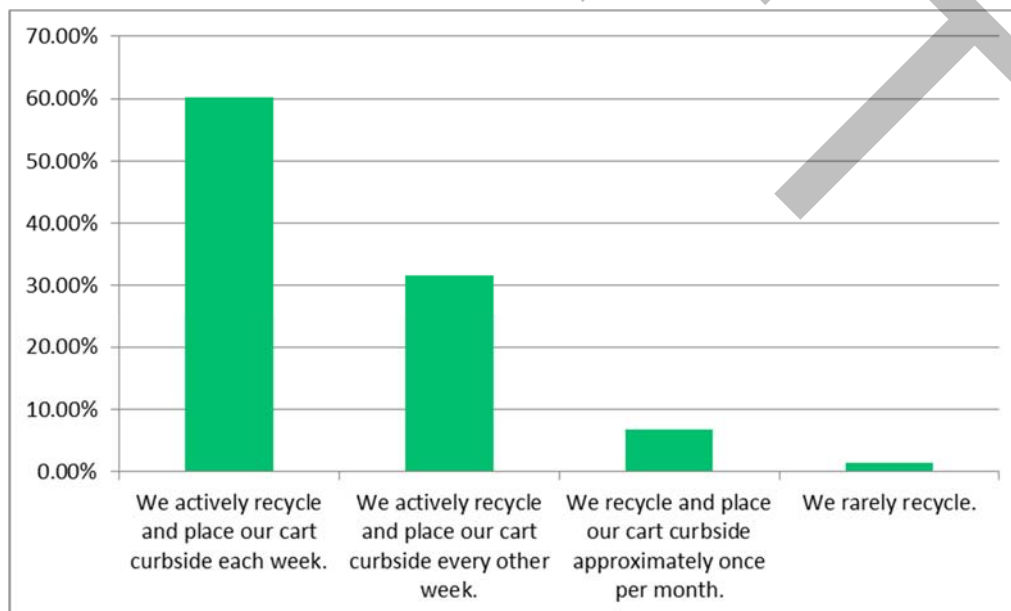
1-2 persons	51.88%	69
3-4 persons	41.35%	55
More than 4 persons	6.77%	9
Answered		133
Skipped		0

4. Do you have a recycling cart (provided by Orange County) for your home?

Yes	96.99%	129
No	3.01%	4
Answered		133
Skipped		0

5. Which of the following best describes your recycling practices?

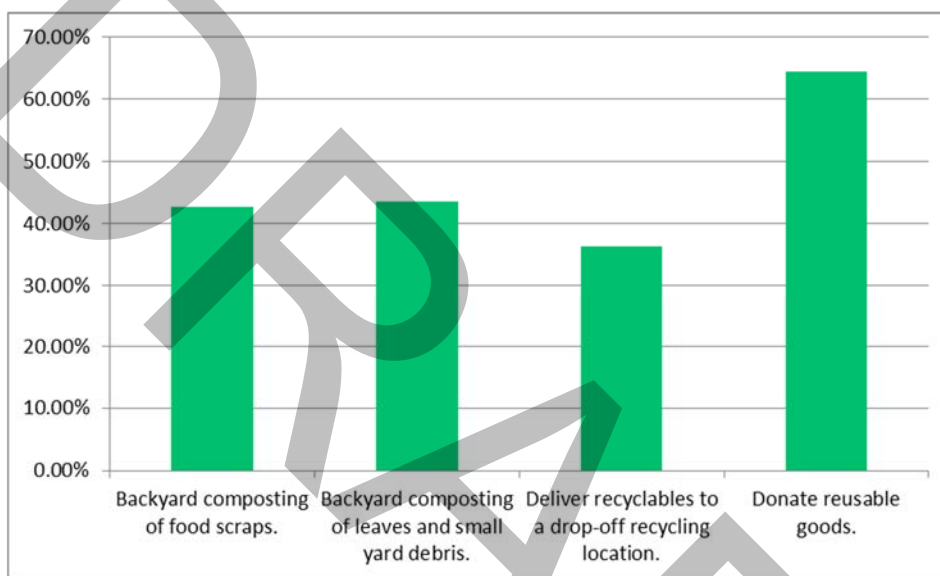
We actively recycle and place our cart curbside each week.	60.15%	80
We actively recycle and place our cart curbside every other week.	31.58%	42
We recycle and place our cart curbside approximately once per month.	6.77%	9
We rarely recycle.	1.50%	2
Answered		133
Skipped		0



6. Do you actively participate in any of the following waste diversion practices? If you complete more than one, please use the other box to express that.

Backyard composting of food scraps.	42.74%	53
Backyard composting of leaves and small yard debris.	43.55%	54
Deliver recyclables to a drop-off recycling location.	36.29%	45
Donate reusable goods.	64.52%	80
Other (please specify)	<i>incorporated into above</i>	
Answered		124
Skipped		9

Note: All "Other" responses contained more than one of the above choices; therefore, responses were analyzed and collated as appropriate.



7. How would you rate the garbage services provided by the Town of Carrboro?

Great, excellent service and excellent customer service.	60.63%	77
Good, quality service and quality customer service.	31.50%	40
Okay, neither good nor poor service.	3.15%	4
Needs improvement, service and customer service could be better.	4.72%	6
Answered		127
Skipped		6

Of the six respondents that stated the Town's services needed improvement:

- Three respondents expressed issues with cart placement following service, such as open lids, tipped over carts, and being left in bike lanes.
- Three respondents mentioned missed collections, though one respondent stated their cart was blocked by a neighbor's car and another respondent stated that they are in a commercial district and received service following a call to the Town.
- Two respondents mentioned litter being left in the neighborhood following collection.

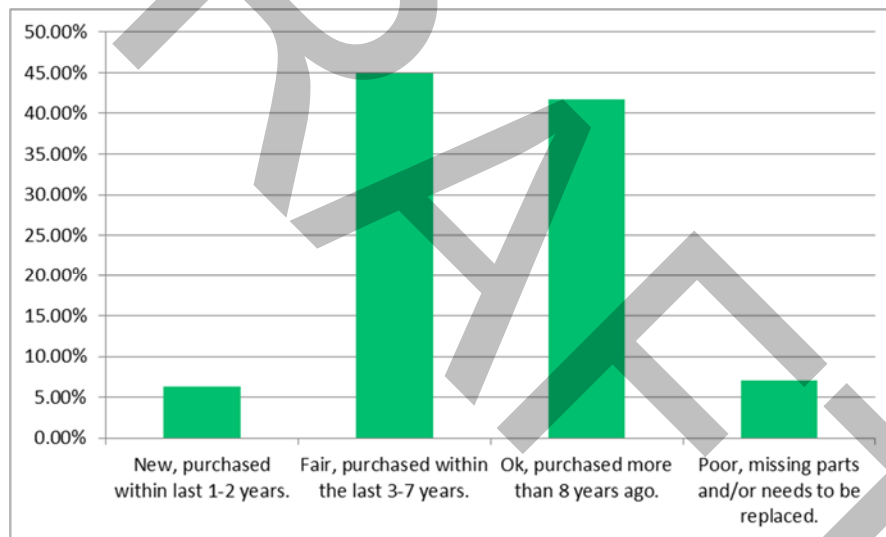
8. How many garbage carts (not including yard waste or recycling carts) do you have for your home?

1	88.98%	113
2	8.66%	11
More than 2	2.36%	3
Answered		127
Skipped		6

9. How would rate the condition of your garbage cart? (If you have more than one cart, please rate the oldest cart.)

New, purchased within last 1-2 years.	6.30%	8
Fair, purchased within the last 3-7 years.	44.88%	57
Ok, purchased more than 8 years ago.	41.73%	53
Poor, missing parts and/or needs to be replaced.	7.09%	9
Answered		127
Skipped		6

Note: Responses were limited to the 127 residents stating that they have at least one garbage cart.



10. How often do you place your garbage cart curbside for collection?

Every week (this includes carts that are left at the curb).	77.17%	98
Every other week.	14.96%	19
Once per month.	7.87%	10
Answered		127
Skipped		6

Note: Responses were limited to the 127 residents stating that they have at least one garbage cart.

11. Please choose the statement that best reflects your garbage collection habits:

I place my cart curbside every week, and it is usually full.	14.96%	19
I place my cart curbside every week, regardless of fullness.	54.33%	69
I place my cart curbside, only when it is more than half full.	25.20%	32
I place my cart curbside, only when it is completely full.	5.51%	7
Answered		127
Skipped		6

Note: Responses were limited to the 127 residents stating that they have at least one garbage cart.

12. Would you consider a switch to every other week collection service for garbage?

Yes	44.09%	56
No, please explain:	55.91%	71
Answered		127
Skipped		6

Of the 71 respondents that stated they would not consider a switch to every other week collection service for garbage:

- Forty-two percent (30 respondents) expressed concerns over odors resulting from every other week collection.
- Forty-one percent (28 respondents) expressed concerns over whether they would have the cart capacity for every other week collection.
- Ten percent (7 respondents) stated that they did not want every other week collection without further explanation.
- Seven percent (5 respondents) stated that they might be open to the possibility of every other week collection.

13. How would you describe garbage collection day on your street?

Collection vehicles can easily service my home and my neighbors' homes travelling up one side of the street and down the other side.	77.95%	99
Collection vehicles have a little difficulty servicing my home, because I live on a cul-de-sac that has a tight turning radius for the vehicle.	14.96%	19
Collection vehicles have difficulty servicing my street and I routinely see vehicles driving in reverse.	7.09%	9
Answered		127
Skipped		6

14. How would you rate the yard waste services (i.e., carts, loose piles, bulk piles, and leaf collection) provided by the Town of Carrboro?

Great, excellent service and excellent customer service.	37.40%	46
Good, quality service and quality customer service.	28.46%	35
Okay, neither good nor poor service.	16.26%	20
Needs improvement, service and customer service could be better.	17.89%	22
	Answered	123
	Skipped	10

Of the 22 respondents that stated the Town’s yard waste services needs improvement:

- Fifty-nine percent (13 respondents) expressed confusion over the yard waste collection schedule and difficulty in knowing when services are scheduled.
- Thirty-two percent (7 respondents) expressed concerns over missed collections and piles of loose material remaining at the curb.
- Four percent (1 respondent) stated that a cart was damaged by Town collection staff.
- Four percent (1 respondent) stated a complaint with customer service.

15. How many yard waste carts (not including garbage or recycling carts) do you have for your home?

0	65.85%	81
1	30.08%	37
2 or more	4.07%	5
	Answered	123
	Skipped	10

16. How would rate the condition of your yard waste cart? (If you have more than one cart, please rate the oldest cart.)

New, purchased within last 1-2 years.	28.57%	12
Fair, purchased within the last 3-7 years.	47.62%	20
Ok, purchased more than 8 years ago.	19.05%	8
Poor, missing parts and/or needs to be replaced.	4.76%	2
	Answered	42
	Skipped	91

Note: Responses were limited to the 42 residents stating that they have at least one yard waste cart.

17. How often do you place your yard waste cart curbside for collection?

Every week (this includes carts that are left at the curb).	4.76%	2
Every other week.	33.33%	14
Once per month.	61.90%	26
<i>Note: Responses were limited to the 42 residents stating that they have at least one yard waste cart.</i>	Answered	42
	Skipped	91

18. Please choose the statement that best reflects your yard waste cart collection habits:

I place my cart curbside every week, and it is usually full.	5.13%	2
I place my cart curbside every week, regardless of fullness.	2.56%	1
I place my cart curbside, only when it is more than half full.	43.59%	17
I place my cart curbside, only when it is completely full.	48.72%	19
<i>Note: Responses were limited to the 42 residents stating that they have at least one yard waste cart.</i>	Answered	39
	Skipped	94

19. How often do you put loose yard waste at the curb for collection?

Never, all of my yard waste goes into my yard waste cart.	15.31%	15
Only when my yard waste cart is full.	23.47%	23
Every week, I do not have a yard waste cart.	7.14%	7
Every other week, I do not have a yard waste cart.	7.14%	7
Once per month, I do not have a yard waste cart.	46.94%	46
	Answered	98
	Skipped	35

20. Pay-as-you-Throw – Many communities have implemented pay-as-you-throw programs that utilize a variety of methods to calculate solid waste fees based on the amount of waste disposed, for example, some communities utilize different sized carts, where the larger carts cost more than the smaller carts. Please choose the statement that best reflects your thoughts on pay-as-you-throw waste collection:

Very interested	14.41%	17
Interested	37.29%	44
Hesitant	24.58%	29
Against	23.73%	28
	Answered	118
	Skipped	15

Survey Findings

- Of the 133 respondents that receive solid waste services provided by the Town of Carrboro, the majority (83 percent) live in single-family standalone homes.
- A majority of the Town's residents actively recycle. Ninety-two percent of respondents place their recycling carts curbside at least every other week. Fewer than 2 percent of respondents rarely recycle.
- There is an interest in waste reduction beyond curbside recycling. Respondents also utilize the following waste diversion options:
 - Donate reusable goods (65 percent)
 - Backyard composting of food scraps (43 percent)
 - Backyard composting of leaves and small yard debris (44 percent)
 - Deliver recyclables to drop-off recycling locations (36 percent)
- Overall, Town residents are happy with the services provided by the Town.
 - Ninety-two percent of respondents rated the Town's garbage services as good or great. Explanations for low ratings included issues with:
 - Cart placement after service, such as open lids, tipped over carts, and carts being left in bike lanes.
 - Missed collections.
 - Litter left in neighborhood following collection service.
 - Sixty-six percent of respondents rated the Town's yard waste services as good or great. Explanations for low ratings included issues with:
 - Confusion over the yard waste collection schedule.
 - Missed collections and loose materials remaining at curb.
- Most respondents have purchased at least one garbage cart (98 percent), but only 34 percent have purchased a yard waste cart.
 - Of the garbage carts in use, only half (51 percent) are considered in new or fair condition, the remaining carts are more than 8 years old.
 - Of the yard waste carts in use, 76 percent are considered in new or fair condition.
- The majority of respondents (77 percent) place their garbage carts at the curb for service every week. Twenty-three percent place their carts curbside only once or twice per month.
 - Of those residents that place their garbage carts curbside every week, half (54 percent) place it curbside regardless of how full their cart is.
 - Only thirty percent of respondents place their garbage carts curbside only when the cart is more than half full.
- The majority of respondents (62 percent) place their yard waste carts curbside only once per month. A third of respondents place their carts curbside every other week.
 - Ninety-three percent of respondents only place their yard waste carts curbside when they are more than half full.

- Only 3 percent of respondents place their yard waste carts curbside regardless of how full they are.
- When asked about collection services on their streets, 78 percent of respondents stated that collection vehicles can easily service their street, 15 percent stated that collection vehicles have difficulty serving their street due to living on a cul-de-sacs, and 7 percent stated they routinely see collection vehicles driving in reverse on their street.
- When asked to consider a switch to every other week garbage service, 44 percent of respondents were open to the idea of every other week collection service. Of those that were not open to the idea, the following issues were expressed:
 - Forty-two percent (30 respondents) expressed concerns over odors resulting from every other week collection.
 - Forty-one percent (28 respondents) expressed concerns over whether they would have the cart capacity for every other week collection.
 - Ten percent (7 respondents) stated that they did not want every other week collection without further explanation.
 - Seven percent (5 respondents) stated that they might be open to the possibility of every other week collection.
- When asked about pay-as-you-throw as an option to increase waste diversion, 51 percent of respondents were interested or very interested and 49 percent of respondents were hesitant or against the idea.

Garnering public sentiment is important when evaluating changes to public programs. The results of this survey, along with the results of the Residential Solid Waste Study will aid the Town in the evaluation and implementation of potential waste diversion programs and policies. The survey provides the Town with public sentiment regarding the services provided by the Town as well as feelings toward every other week collection and pay-as-you-throw.