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Mecklenburg County, NC
Solid Waste Division
Land Use and Environmental
Services (LUESA)
700 N. Tyron Street
Charlotte, NC 28202



**Mecklenburg County
Economic and Environmental
Impacts of Select Changes to the
Source Separation (Recycling)
Ordinance**



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Executive Summary

Findings

- Mecklenburg County government purchased a database of businesses in Mecklenburg County. According to the BusinessWise database, there are 21,214 small businesses with up to 49 employees.
- Forty-three percent of these 21,214 businesses have between 1 and 3 employees, and the vast majority do not generate 16 cubic yards of waste per week, and therefore are not subject to the current Source Separation Ordinance (SSO).
- Based on the Skumatz Economic Research Associates (SERA) and DSM Environmental Services, Inc. (DSM) survey responses, it is estimated that 4900 businesses are currently subject to the SSO at the 16 cubic yard refuse per week threshold.
- DSM's surveys, combined with information provided by the haulers contacted for this analysis indicate that the average business spends between \$73 and \$78 per month on recycling container rental and collection (or between \$876 and \$936 per year) before deducting avoided disposal costs. Thus the total annual cost for recycling at the 16 cubic yard threshold is estimated to range from \$4.3-\$4.6 million (rounded).
- Accounting for avoided collection and disposal costs, the net cost of the current SSO is estimated to be \$1.8 million to the affected businesses (rounded).
- Dropping the cut-off to 8 cubic yards, *and eliminating* the 500 pound per month exemption, is estimated to impact 1700 additional businesses. The impact would be significantly higher except that roughly one-half of these businesses already recycle even though they are exempt from the SSO.
- An estimated 28 percent of businesses impacted by lowering the threshold might elect to self haul their materials, bringing the total number of businesses subscribing for dumpster recycling service down to 1224 businesses.
- Assuming the same range for subscription recycling dumpster service, the increased annual cost is estimated to be \$1-\$1.1 million (rounded).
- Accounting for the avoided collection and disposal costs, the net cost to the affected businesses of reducing the threshold to 8 cubic yards and eliminating the 500 pound exemption is estimated to be \$450,000 to \$550,000 (rounded). However, when additional private hauler driver wages and benefits and associated indirect and induced spending generated by these new wages are included, as well as the value of the recyclables collected, the net economic impact to the County is zero.
- Dropping the cut-off to 8 cubic yards *but keeping* the 500 pound exemption would not make much difference over and above the current SSO ordinance, only affecting an estimated 300 new small businesses.

Recommendations

- DSM recommends lowering the SSO ordinance to 8 cubic yards per week of refuse. Lowering the threshold is relatively insignificant given the number of businesses already recycling below the threshold. The recent conversion to single stream processing in Mecklenburg County makes it significantly easier for businesses to comply with the proposed changes in the ordinance, and the potential availability of the free LUESA paper recycling program provides a low cost option for those businesses most negatively impacted.
- Achieving significant increases in paper recycling associated with lowering the threshold will also require reducing or eliminating the 500 pound per month exemption because otherwise only a small sub-set of business will be required to recycle under the lowered threshold. One option would be to lower the exemption to between 100 and 200 pounds per month to reduce the impact on businesses that generate paper only as an ancillary activity – particularly non-retail and wholesale businesses.
- Adding bottles and cans to the SSO ordinance will not yield large increases in tonnages recycled, but will allow for the recovery of high value aluminum and PET recyclables at minimal economic impact. This is because most recycling processing capacity in Mecklenburg County is now single stream, allowing businesses to simply include bottles and cans in their OCC/paper dumpster.
- As with lowering the SSO threshold to 8 cubic yards, eliminating the temporary site exemption for construction activities would also result in close to a zero economic impact on Mecklenburg County. However given the temporal and cyclical nature of the construction industry, and the impact that the economic recession has had on the construction industry, DSM does not recommend eliminating the temporary site exemption from the SSO ordinance at this time.
- Insufficient data exist to make a recommendation concerning special event recycling. There are clear long-term public education benefits associated with providing recycling at all special events, and additional valuable PET and aluminum, especially, would be recovered. However, there are logistical and cost impacts which must be taken into consideration. It may be that continued education around a voluntary program, together with efforts to encourage partnerships with vendors (e.g. Coke and Pepsi and the major beer distributors) would be sufficient in the short run to accomplish LUESA's goals.

Introduction

The Mecklenburg County Land Use and Environmental Services Agency (LUESA) is interested in promoting additional recycling from businesses that are currently exempt from the ordinance enacted in 2002 requiring businesses that contract for greater than 16 cubic yards of garbage service per week to recycle office paper and corrugated cardboard (with certain exemptions). LUESA¹ contracted with DSM to assess the economic and environmental impacts of the following five potential changes to Mecklenburg County's Source Separation Ordinance (SSO):

- Lowering the current ordinance threshold of 16 cubic yards to 8 cubic yards;
- Adding plastic and aluminum beverage containers to the ordinance either at the existing threshold or at the proposed lower 8 cubic yard threshold;
- Changing the paper recycling requirement from "office paper" to "mixed paper;"
- Eliminating the temporary site location exemption; and/or,
- Revising or eliminating the current 500 pound automatic weight exemption for paper and cardboard.

DSM conducted telephone surveys of 40 randomly selected small retail and wholesale businesses (business types most likely to be generating cardboard and mixed paper) with between 1 and 49 employees to learn: how much waste they generate; the size of their waste container; the monthly cost for container rental and waste disposal; and, whether they recycle, and if so, what materials and at what cost. The complete results of the telephone surveys are presented in Appendix A. The DSM telephone survey form can be found in Appendix B.

As represented in DSM's proposed scope of work to LUESA, the telephone surveys were not designed to be statistically significant, but were designed to augment the earlier SERA mailed survey data², to learn more about the size of business that might be impacted by the proposed changes to the ordinance, and their likely behavior to the change in the SSO ordinance.

DSM compared the telephone survey data with the earlier Skumatz Economic Research and Associates (SERA) survey data; and with DSM's earlier on-site surveys of businesses in Mecklenburg County associated with the pallet and wood waste study. In addition, DSM benchmarked Mecklenburg County against other municipalities with business recycling programs/ordinances to complete our analysis.

DSM also interviewed four refuse haulers / recyclers that operate in Mecklenburg County to better understand current fees for refuse and recycling. DSM asked the haulers about revenue-sharing,

¹ This report uses "LUESA" to refer to County government. Whenever the words "Mecklenburg County" are used it is meant to refer to businesses and the environment within the County as opposed to County government.

² "Recycling Study Targeting Small Businesses in Mecklenburg County Final Report" November 6, 2008, written by Skumatz Economic Research and Associates (SERA)

container sizes available to the clients, monthly fees for refuse and recycling, and whether the hauler would offer the client any discounts if they contracted for recycling service.

Assembling the Necessary Data on Potentially Impacted Businesses

The November 6, 2008 Skumatz Economic Research and Associates (SERA) *“Recycling Study Targeting Small Businesses in Mecklenburg County Final Report”* utilized LUESA’s InfoUSA business database to determine the number of small businesses in Mecklenburg County. The SERA report defined small business as any business with less than 50 employees. The InfoUSA database identified 41,061 businesses in Mecklenburg County with 49 employees or less.³

The SERA report estimated, based on mailed surveys applied to the InfoUSA database of small businesses that the number of businesses potentially impacted by the current Source Separation Ordinance (SSO) was between 13,900 and 18,100 of the 41,061 small businesses dataset. The SERA Report went on to estimate, based on responses to the survey, that if the SSO threshold were lowered to 8 cubic yard per week refuse threshold, as many as 6,900 to 7,100 additional businesses might be impacted; an increase of roughly 17% of total small businesses.

Subsequent to the 2008 SERA report LUESA switched from the InfoUSA database to a new BusinessWise database. DSM was granted access to the BusinessWise database for use on this Project. The BusinessWise database lists 21,214 businesses having 49 employees or less in Mecklenburg County. That means that the BusinessWise database lists 19,847 *fewer* small businesses than the InfoUSA database. This is a significant difference, with potentially significant impacts on the conclusions concerning the proposed changes to the SSO.

According to the BusinessWise website, the BusinessWise database is telephone verified and updated daily. For these reasons, the BusinessWise database is considered to be more accurate than the InfoUSA database. However, because of the large discrepancy between the BusinessWise database and the InfoUSA database utilized in the SERA report, DSM attempted to verify the accuracy of the BusinessWise database using available economic census data.

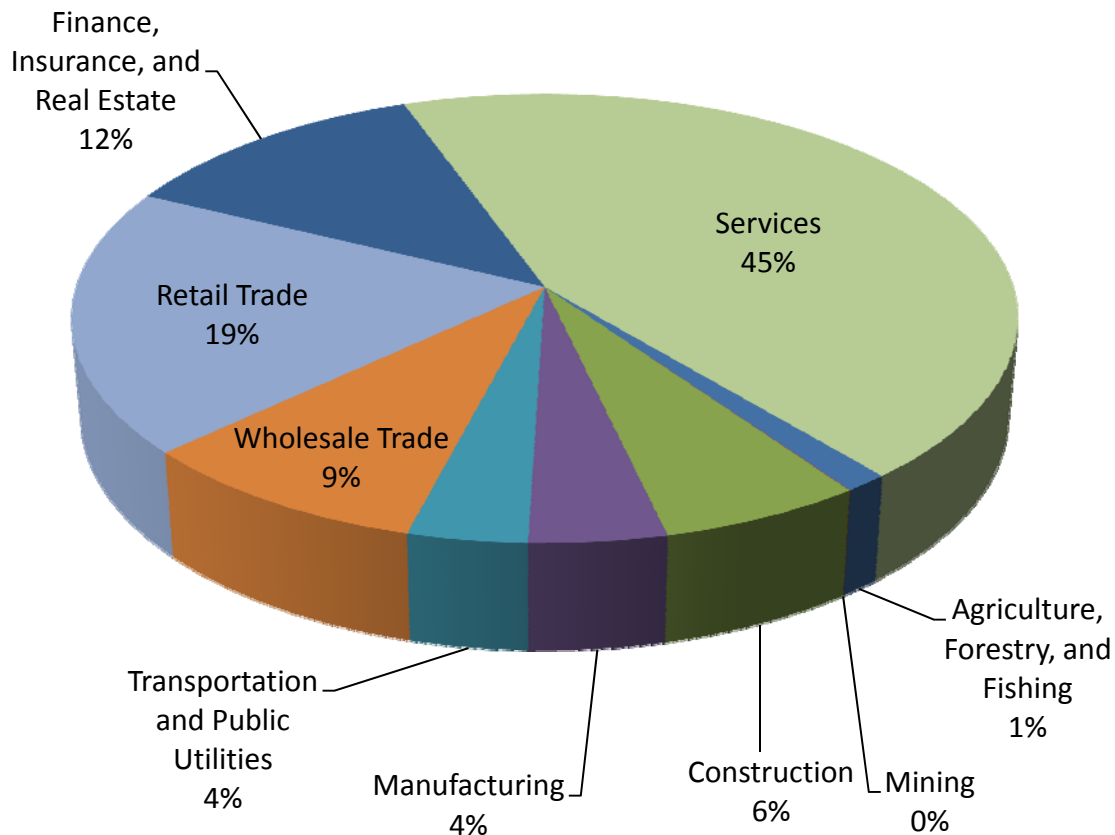
DSM sorted the BusinessWise database into SIC sectors to understand the distribution of the types of small businesses in Mecklenburg County. Table 1 and Figure 1 show the amount and percentage of small businesses per sector.

³ Page 70, Footnote 43 in: *“Recycling Study Targeting Small Businesses in Mecklenburg County Final Report”* November 6, 2008, written by Skumatz Economic Research and Associates (SERA)

Table 1 BusinessWise data per SIC Sector

BusinessWise Data of Mecklenburg County	
SIC SECTOR	# of businesses
A- Agriculture, Forestry, and Fishing	281
B- Mining	5
C- Construction	1,299
D- Manufacturing	875
E- Transportation and Public Utilities	763
F- Wholesale Trade	1,908
G- Retail Trade	4,060
H- Finance, Insurance, and Real Estate	2,602
I- Services	9,421
TOTAL	21,214

Figure 1 Number of Small Businesses in Mecklenburg County per SIC Sector Using BusinessWise



DSM then reviewed the 2007 US Economic Census information as a comparable benchmark to the BusinessWise database. The 2007 US Economic Census (the most recent) reported 19,122 employer establishments for Mecklenburg County. DSM compared some two digit NAICS sectors from the 2007 US Economic Census with similar BusinessWise SIC sectors.⁴ All of the business sectors were not compared because this would require substantial manipulation and grouping of minor SIC sectors to match the two digit NAICS sectors (since many of the sectors are not the same). As illustrated in Table 2, below, the number of businesses per sector is similar when comparing the 2007 US Economic Census to the BusinessWise data.⁵

Table 2 *Comparison between the 2007 US Economic Census and the BusinessWise Database for Selected Business Sectors*

Categories / Sectors Of Businesses in Mecklenburg	2007 Census # of businesses	BusinessWise # of businesses
Arts, entertainment, and recreation	404	351
Manufacturing	890	875
Retail trade	3525	4060
Educational services	277	225
Health care and social assistance	2283	1995

Based on DSM’s comparison of the BusinessWise database to the 2007 Economic Census, DSM recommended to LUESA that the SERA survey data be adjusted to reflect the more accurate BusinessWise database, and that DSM utilize the BusinessWise database as the basis for DSM’s analysis.

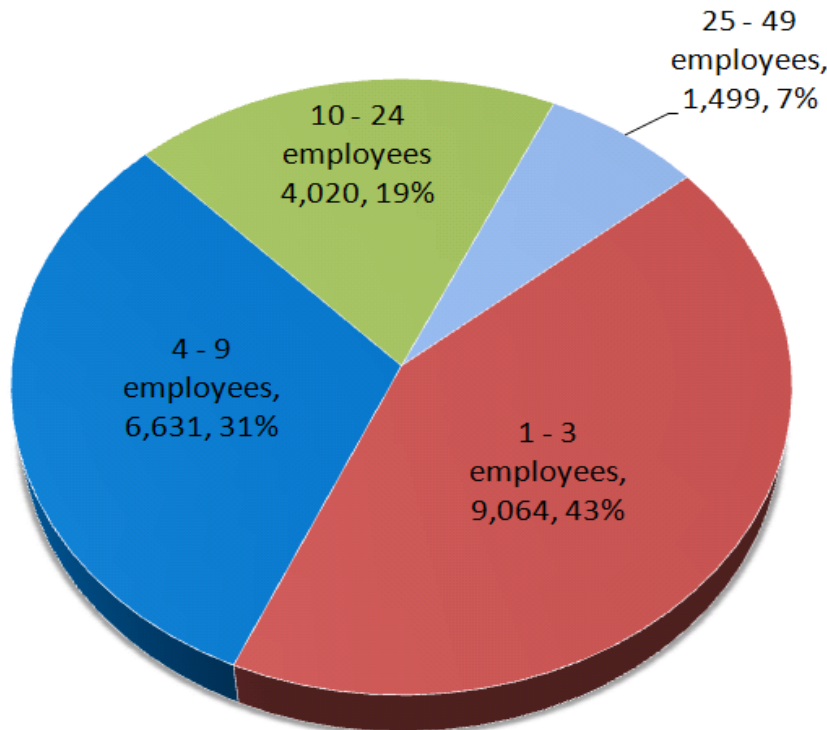
The next step was to determine how to target DSM’s telephone surveys to obtain the best data on the economic impacts of changing the SSO ordinance. DSM reviewed Tables 1.2 and 1.3 of the SERA report to better understand estimated recycling and trash generation in Mecklenburg County based on SERA’s survey results. Dividing the average reported generation of trash and recycling by the average reported number of employees yields an average, per employee, weekly generation coefficient of roughly 0.17 cubic yards per employee per week of trash and 0.13 cubic yards per employee per week of recyclables (Table 3). Multiplying these coefficients by the number of employees (Table 4) the average company with less than three employees would not be included in the SSO ordinance even if the threshold were reduced to 8 cubic yards per week, whereas companies with greater than 50 employees are more likely

⁴ The Economic Census switched from SIC codes to NAICS codes in 2002 to make the sectors compatible with international reporting of businesses by sector.

⁵ It should be noted that the SERA Report presents total businesses with and without employees in Mecklenburg County from the 2002 economic census (Tables 2.4 and 2.5). These totals are 18,570 for businesses with employees and 6,714 businesses without employees, for a total of 25,284, which is much more consistent with the BusinessWise database than the InfoUSA database.

to exceed the minimum threshold under the existing SSO threshold. For this reason, DSM recommended to LUESA that DSM target businesses with between four and 49 employees for DSM’s telephone surveys. This reduced the businesses targeted for surveying by 43 percent (Figure 2, below).

Figure 2 Small Businesses in Mecklenburg County per Employee Size Using BusinessWise Data



It should be noted here that DSM does not know if the generation coefficients derived from the SERA Report are representative of actual generation for all business types in Mecklenburg County. While there are data in the literature on per employee generation of commercial waste, it is DSM’s opinion that commercial generators are too heterogeneous to be accurately characterized by waste characterizations that lump all commercial generators together – especially because a significant portion of waste characterized as “commercial” is in fact multi-family residential waste collected under commercial accounts.

The generation coefficients estimated from the SERA report are, however, consistent with the DSM pallet and wood waste business surveys in Mecklenburg County. For example, per employee wholesale and retail corrugated generation (which is the largest single component of wholesale and retail waste and recycling in most cases) was estimated to be 0.22 cubic yards per week based on DSM’s on-site surveys, which compares favorably with the 0.30 cubic yards per week of refuse and recycling derived from the SERA surveys.

Table 3 *Coefficients of Recycling and Trash per Employee per Week*

	trash in gallons	recycling in gallons	# employees	gals trash/employee/week	gals recycling/employee/week
Avg	493	362	14	35.2	25.9
	trash in cubic yards	recycling in cubic yards	# employees	cu yds trash/employee/week	cu yds recycling/employee/week
Avg	2.44	1.79	14	0.17	0.13

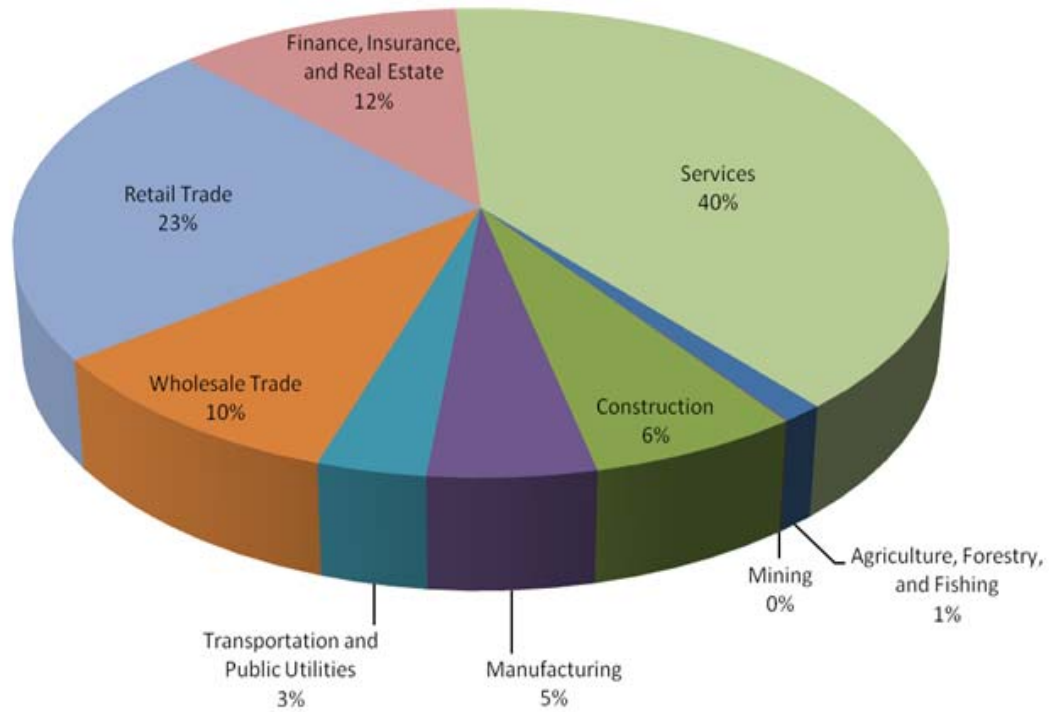
Table 4 *Generation per Size of Business*

BusinessWise Groups	cu yds trash/week	cu yds recycling/week	total generation/week
1-3 employees	0.17 - 0.52 cubic yards	0.13 - 0.38 cubic yards	.30-.90 cubic yards
4-9 employees	0.70 - 1.57 cubic yards	0.51 - 1.15 cubic yards	1.21-2.72 cubic yards
10-24 employees	1.74 - 4.18 cubic yards	1.28 - 3.07 cubic yards	3.02-7.25 cubic yards
25-49 employees	4.36 - 8.54 cubic yards	3.20 - 6.27 cubic yards	7.56-14.81 cubic yards

Finally, the budget and scope of work did not allow for a statistically valid survey effort. Therefore, to ensure that the results would not be unpredictably skewed by a small sample size per sector, DSM chose to survey businesses listed in the BusinessWise database as being either retail or wholesale businesses. As illustrated in Figure 3, these businesses represent 33 percent of businesses with between four and 49 employees in Mecklenburg County, but are likely to be the largest generators of corrugated, the most bulky recyclable, and therefore the most likely to force a business to fall within the SSO threshold.

By choosing to survey only retail and wholesale businesses, a large enough sample could be obtained to increase the reliability of the results; and it insured that DSM would estimate the *maximum* number of businesses impacted at the reduced threshold because other sectors were likely to generate less corrugated waste/recyclables (especially) than the sectors surveyed. Therefore the resulting economic analysis can be considered the worst case impact with respect to reducing the SSO threshold.

Figure 3 *Small Businesses in Mecklenburg County by Business Type with 4-49 Employees using BusinessWise Data*



Analysis of Cost and Benefits

DSM used information from the SERA Report; telephone surveys (both SERA and DSM); the Mecklenburg pallet and wood waste study; information gathered from interviews with four Mecklenburg County haulers; and, benchmarking information from other municipalities to estimate the cost and benefits for each alternative being considered:

- Lowering the current SSO threshold of 16 cubic yards to 8 cubic yards;
- Adding plastic and aluminum beverage containers to the ordinance either at the existing threshold or at the proposed lower 8 cubic yard threshold;
- Changing the paper recycling requirement from “office paper” to “mixed paper;”
- Eliminating the temporary site location exemption; and/or,
- Revising or eliminating the current 500 pound automatic weight exemption for paper and cardboard.

In each case, LUESA was interested in assessing how these proposed changes would impact both recycling and the potentially affected businesses, including:

- Impacts to the businesses which must comply with these revisions,
- Impacts to the existing private solid waste infrastructure including possible job creation impacts,
- Implementation costs to LUESA,
- Economic impacts to the businesses affected in terms of both total impacts and impacts to a typical business and the range of impacts worst to least.

Telephone Surveys of Small Businesses

Tables 5 and 6, along with Figures 4 through 8 summarize the DSM telephone survey responses relevant to this analysis. Of the 40 randomly selected surveys, four businesses used a dumpster greater than eight cubic yards, and another three had their 8 cubic yard or less dumpster pulled more than once per week. This is equivalent to 17.5 percent of the surveyed businesses potentially impacted by a reduction in the SSO threshold from 16 cubic yards per week to 8 cubic yards per week.

This is less than the two-fifths of businesses estimated to be impacted from the SERA mail survey results.⁶ This may be due to the questions asked however, because an additional five businesses surveyed by DSM (14%) stated that their dumpster was pulled more than once per week, but that they shared the dumpster with other tenants in their complex. It is not clear that the mailed survey responses would have revealed the shared service because it was not a separate survey question on the SERA survey and would have to be inferred from other questions/answers.

⁶ It should be noted that the SERA survey had only 16 responses to the question of dumpster size, and only 8 responses to the question of frequency of collection. Thus the DSM survey response is significantly larger in number of responses to the size and frequency question.

Figure 4 illustrates the percent of businesses by employee size surveyed by DSM. Despite DSM’s efforts to survey only businesses with over four employees, 10 percent of the surveys were of businesses with three or fewer employees. Three of these four surveyed businesses reported additional part time or seasonal employees that the BusinessWise database might list as firms with over three employees. As such, DSM believes that there was a good distribution of business size represented by the completed telephone surveys.

Figure 4 Employee Size of Firms Surveyed by DSM

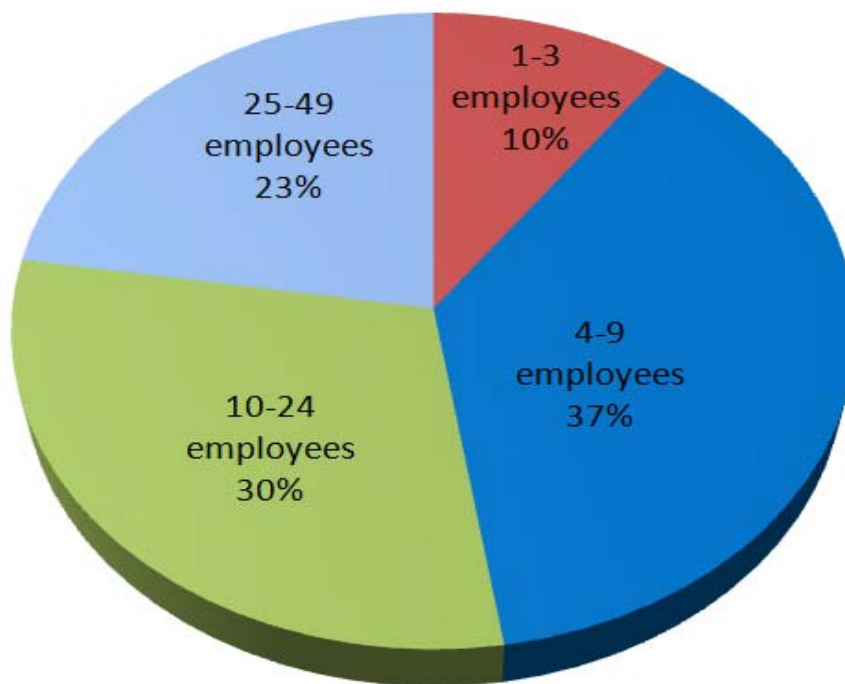


Table 5 summarizes the results of the telephone survey. It is particularly interesting that 53 percent of the surveyed businesses already recycle OCC, even though almost all of them are not currently subject to the SSO ordinance. Only three businesses provided DSM with information about their recycling costs, but those three reported costs ranging from \$53 - \$85 per month, which is roughly one-half of the reported cost for refuse.

Table 5 *Summary of DSM Telephone Survey Results*

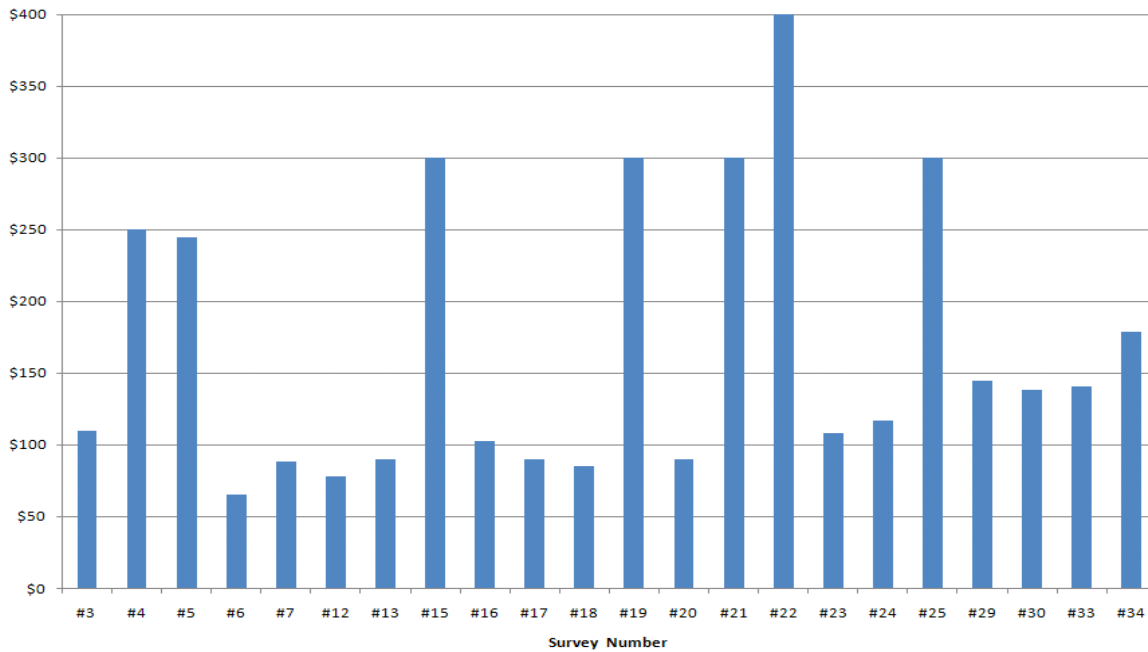
Categories	Retail	Wholesale	Total/Average
# Surveys	20	20	40
Average # Employees	10	18	14
Refuse Dumpster	Bags - 30 CY	2 CY - 40 CY	8 CY (78%)
Refuse Pulled	1x per wk	1x per wk	1x per wk (75%)
Refuse Cost/Month	\$211	\$127	\$169
OCC Recycled	65% recycle	40% recycle	53% recycle
OCC Dumpster	4 CY - Baler	4 CY - 10 CY	8 CY (38%)
OCC Cost/Month	\$83	\$53	\$73
OCC Pulled	1x week - 1x month	1x week - 2x month	1x per wk (25%)
OCC Cubic Yard/Week	2.35	2.51	2.43
OCC Pounds/Month	1420	1261	1341
Paper Cubic Yard/Week	0.51	0.73	0.62
Paper Pounds/Month	889	1260	1074
Paper Recycled	Dumpster/Shred	Dumpster/Shred	Dumpster/Shred
Bottles & Cans CY/Month	0.34	0.17	0.25
Willingness to Drive	13%	30%	28%
Miles One Way	2.70	5.67	4.32

DSM asked businesses if they would be willing to self haul their recycling to a dumpster and if so, how far they would be willing to drive. Their willingness to self haul their recycling is depicted in Table 5 in the category Willingness to Drive. Thirty percent of the wholesale businesses surveyed and 13 percent of retail businesses surveyed were willing to self haul; representing an average of 28 percent for all of the surveys.

Figure 5 presents the results for the 20 respondents who told DSM what they pay for monthly refuse collection. The bar graph illustrates the variability inherent in commercial waste collection contracts. Haulers typically charge customers with heavy garbage, and/or larger volumes and frequent pulls more than clients with lighter garbage and lower volume. However, there are also a number of other factors that influence charges, including: the skill of the business in negotiating the waste collection contract; potential proximity to other accounts under contract to the hauler; and the desire of the hauling company to acquire or maintain a given contract.

As illustrated by Figure 5, the top tier of refuse subscription costs for small businesses ranges from \$245 to \$400 per month. The lower tier of refuse cost has a range of \$65 to \$145 per month.

Figure 5 *Cost of Monthly Refuse Service in Mecklenburg County*



DSM was able to obtain four responses for the monthly cost of recycling service; three responses were for cardboard recycling and one response reported the cost of their metal recycling container. The three costs reported for monthly cardboard recycling were \$53 (for a 10 cubic yard container pulled every two weeks), \$80 (for an 8 cubic yard container pulled once a month) and \$85 (for an 8 cubic yard container shared with one other business pulled once a month). Therefore, the cost for a cubic yard of recycling ranges from a low of \$2.65 per cubic yard to a high of \$10.65 per cubic yard. These reported costs for recycling subscription correspond with the cost information for recycling services obtained when DSM interviewed the four refuse / recycling haulers who indicated that monthly recycling subscription costs anywhere from \$45 per month to \$110 per month depending on the size of the dumpster and the frequency of the pull. For example, using the low end of the telephone survey results, a four yard dumpster pulled once per week would cost \$42.40 (4*\$2.65*4).

Figure 6 illustrates that 59 percent of the small businesses surveyed have their refuse dumpster pulled once a week, 18 percent of businesses have their dumpster pulled more frequently and 17 percent less frequently than once a week. More importantly, Figure 7 illustrates that 53 percent of the retail and wholesale businesses surveyed are already recycling cardboard.

Figure 6 Frequency of Pulling the Refuse Dumpster

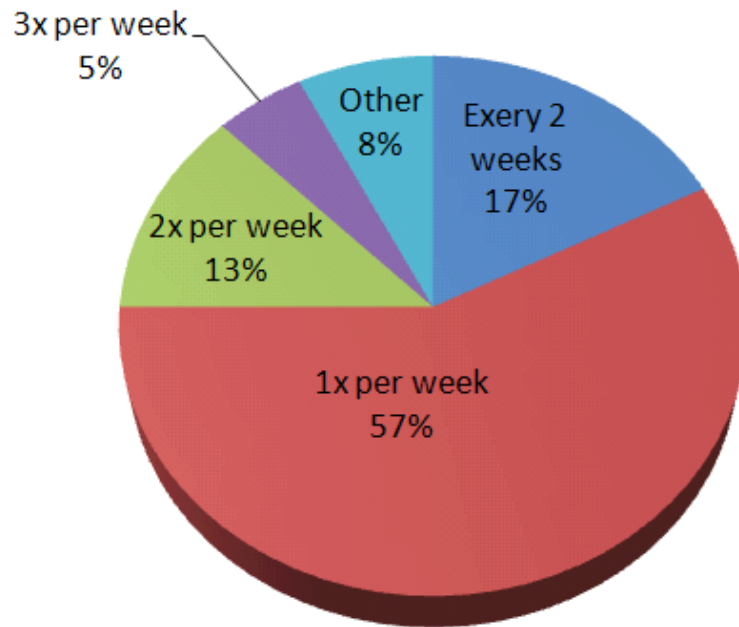


Figure 7 Cardboard Recycling by Surveyed Small Businesses

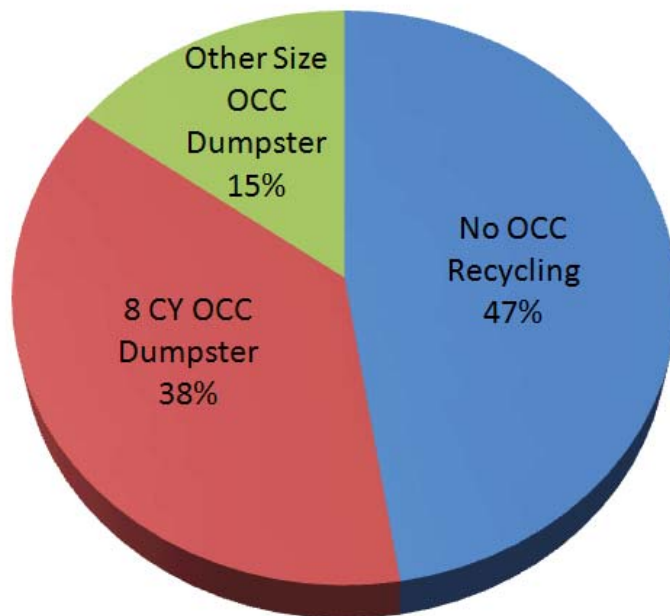


Figure 8 illustrates that of the 53 percent of businesses already recycling cardboard; 25 percent have the cardboard dumpster pulled once a week, 10 percent have the cardboard dumpster pulled every two weeks and 18 percent are baling their cardboard, sharing a cardboard dumpster or getting their cardboard dumpster emptied on another frequency.

Figure 8 *Frequency Small Businesses Recycle Cardboard*

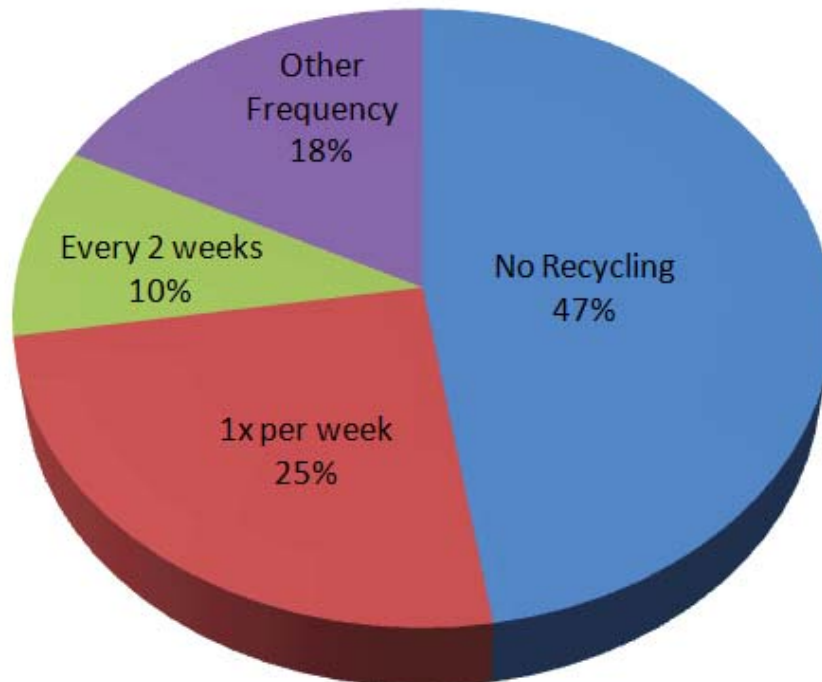
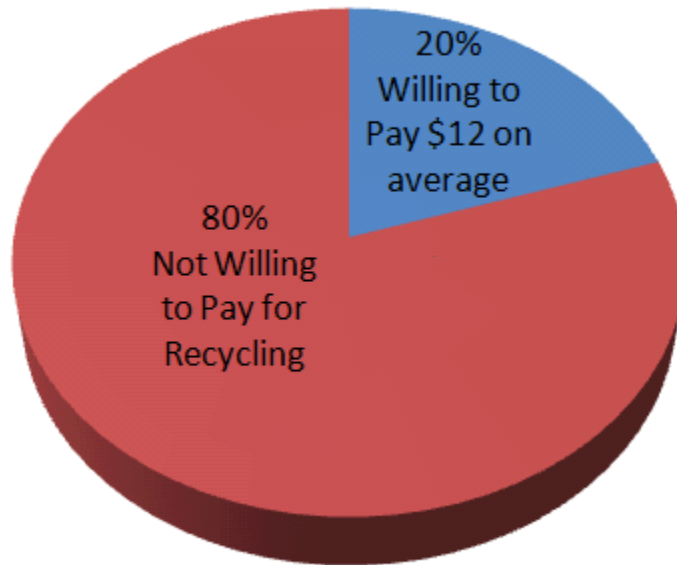


Figure 9 shows that most businesses surveyed that are not currently recycling aren't willing to pay for additional (or any) recycling services. Most of these businesses cited the tough economic conditions that small businesses currently face. For the businesses that were willing to pay for recycling, the average they reported being willing to pay was \$12 a month. Clearly this is below the average of \$73 per month which the few businesses who did report their recycling costs are currently paying for the recycling collection service. It should be noted however that before the economic downturn, the City of Charlotte surveyed small businesses and found that they wanted curbside recycling service, but were also unwilling to pay for it.

Figure 9 *Willingness to Pay for Recycling*



The data presented above from DSM’s telephone surveys was used in combination with the SERA survey data to conduct the required analyses.

Limitations and Use of the SERA Survey Results

DSM’s scope of work assumed that the SERA survey results would form the basis for DSM’s additional research. However, there are three primary differences between the findings of the SERA Report and the DSM findings that ultimately result in lower estimates for the number of businesses potentially impacted by lowering the SSO threshold.

The first, and most significant, is that the SERA report relied on the InfoUSA database provided to SERA by LUESA. As discussed above, the new BusinessWise database provided to DSM by LUESA contains listings for 19,847 *fewer* small businesses than the InfoUSA database. This is such a large difference that it significantly alters the SERA conclusions based on the InfoUSA database.

Second, the SERA Report relied on a relatively small number of survey responses for questions about refuse disposal quantities and collection frequency to determine the number of businesses impacted by the 16 and 8 cubic yard threshold. As stated in Footnote 6, above, only 16 respondents to the SERA questionnaire answered the question about refuse container size, and only eight (one additional response said they did not know) answered the question about the frequency of collection. Thus the 40 telephone surveys completed by DSM significantly increase the sample size of small businesses surveyed.

Third and finally, the DSM survey identified a much higher percent of small businesses that are *already* recycling cardboard and/or paper (53% - see Figure 6 and 7). It is difficult to know whether this is just a difference in the survey results, or whether there has been a significant increase in the number of small businesses recycling now compared to when the SERA survey was completed. Whatever the reason, this significantly reduces the number of businesses potentially impacted by a change in the SSO ordinance, as discussed below.

The right hand column on Table 6 presents the key SERA Report findings. The middle column adjusts the SERA Report findings down to account for the difference between the number of businesses listed in the InfoUSA database and the BusinessWise database. Finally, the third column further reduces the impact based on the results of DSM’s telephone surveys.

Table 6 *Comparison of SERA and DSM Surveys*

Category	SERA Report w/ InfoUSA	SERA Percentages w/ BusinessWise data	DSM Surveys w/ BusinessWise
# of businesses with 1-49 employees in Mecklenburg County	41,061	n/a	21,214
% of total businesses impacted at the 16 Cubic Yard Refuse Threshold	34-44%	34-44%	23%
Total # businesses impacted at the 16 Cubic Yard Refuse Threshold	13,900-18,100	7200-9300	4900
% increase of businesses at the reduced 8 Cubic Yard Refuse Threshold	17%	17%	8%
# of businesses that will increase at the reduced 8 Cubic Yard Refuse Threshold	6900-7100	3600	1700
Total # of businesses impacted at the reduced 8 Cubic Yard Refuse Threshold	20,800-25,200	10,800-12,900	6600
Average # of employees (from the survey respondents)	14	n/a	14
# Surveys that answered the question about Refuse Container	16	n/a	40
# Surveys that answered the Question about Frequency Refuse Collected	9	n/a	40

Calculating the Impact on Businesses that Generate 16 Cubic Yards of Refuse a Week

The SERA report indicated (Table 6) that 34-44 percent of small businesses are impacted at the 16 cubic yard threshold. Applying the SERA report percentages to the new BusinessWise database results in between 7200 and 9300 businesses currently impacted out of a total of 21,214 small businesses. However, roughly 43 percent of these small businesses in Mecklenburg County have between 1-3

employees (Figure 2).⁷ While it is true that some businesses can employ relatively few people while generating significant amounts of refuse and recycling, these businesses are outliers, and not the norm. As a result, these very small businesses should be excluded before applying the SERA report percentages above.

Second, **total generation** of refuse and recycling must be considered when estimating the number of businesses that are impacted by the threshold of 16 cubic yards. Based on DSM’s surveys, a number of businesses that *would be* impacted by the 16 cubic yard threshold are generating *less than* 16 cubic yards a week of refuse because they are in compliance with the current SSO by recycling their cardboard/paper. Table 7 presents the survey responses where **total generation** would indicate the business is currently impacted by the 16 cubic yard threshold. The surveys in Table 7 represent 23 percent of the surveys conducted by DSM.

Table 7 *Surveys of Businesses Impacted at 16 Cubic Yards Threshold*

Survey #	Cu Yd Trash	Trash Pulled	Recycle OCC	Recycle Pulled	lbs OCC/Month	lbs paper/month
21	8	3x per week	4 yd for OCC	1x per week	1950	416
25	8	2x per week	6 yds for OCC	1x per week	2925	1387
1	8	1x per week	8 yd for OCC	1x per week	3900	2773
15	8	2x per week	8 yd for OCC	1x per week	3900	1387
28	8	1x per week	8 yd for OCC	1x per week	3900	1733
32	38	every 2 wks	8 yd for OCC	every 2 wks	1950	2760
36	8	1x per week	8 yd for OCC	1x per week	2600	0
31	8	every 2 wks	Bales the OCC	bales	2167	520
19	48	2x per week	no	n/a	2113	69
Average:					2823	1227

In conclusion, after excluding businesses with less than four employees, and adjusting for total generation (refuse and recycling) from the surveys, DSM estimates that *23 percent* of the small businesses in Mecklenburg County are impacted by the current threshold, for a rounded total of *4900 businesses*.⁸

The surveyed haulers indicated that the fee for subscription recycling ranges from \$45 per month to \$110 per month; depending on the size of the container and frequency of pulling the container. The average cost of recycling service from the survey was \$73 (Table 5). The average of the range of recycling cost (\$45-\$110) is \$78 per month. Thus the total cost to small businesses associated with complying with the existing SSO ordinance is estimated to be approximately \$4.3-\$4.6 million (rounded)

⁷ This is consistent with US Economic Census data which indicate that roughly 50 percent of businesses in the United States have less than 5 employees.

⁸ The actual number is most likely less than 4,900 because DSM surveyed retail and wholesale businesses which are the small business types most likely to be generating significant quantities of OCC and paper.

at the 16 cubic yard threshold based on the average of DSM’s survey data and the average cost reported by the four haulers surveyed.

DSM asked the four haulers they interviewed if adding subscription recycling would save businesses collection costs. They collectively agreed that collection costs could potentially be reduced if the individual business was able to offset their refuse volume by adding a recycling dumpster; switching their current refuse dumpster to a smaller size or reducing the frequency of pickups, both of which would result in a collection cost savings. The haulers indicated that not all businesses would be able to reduce their dumpster size or reduce their frequency of pickup and estimated that maybe half of the businesses installing a recycling dumpster might be able to realize a reduction in collection costs. This is in part due to space restrictions that do not allow for a second dumpster and because some business generate heavy refuse that needs to be pulled regardless of their OCC/paper generation. The haulers collectively estimated that the potential savings might be as much as \$35 per month, but on average would be closer to \$25. Taking this into account, the total cost might be reduced by \$25 per month per business for one-half of the 4900 businesses, totaling \$735,000 in annual savings in collection costs.

In addition, as illustrated in Table 7, the average surveyed business subject to the current SSO ordinance generates roughly two tons per month of OCC and/or paper. There is not a direct relationship between avoided disposal costs and tons diverted because it depends on the negotiated cubic yard charge to each business for refuse collection and disposal. The current average commercial tipping fee for Mecklenburg County is \$37 per ton.⁹ A conservative estimate is that in addition to the collection cost savings reported above that the average business might save an additional \$15 per ton in avoided disposal costs. Therefore, the 4,900 businesses estimated to be impacted by the current SSO collectively save an additional estimated \$1.76 million in avoided disposal costs. Deducting the combined collection cost and avoided disposal cost savings results in a net cost to the impacted small businesses of \$1.8 million.

This net cost does not reflect the value of the recycled OCC and paper to the recycling processors, or mill users, which is also significant. Estimating the total economic value of the existing SSO is beyond DSM’s scope, but is likely to be significant.

Calculating the Number of Businesses Impacted by Reducing the Threshold to 8 Cubic Yards

The assumption would be that roughly 3600 additional businesses could be impacted by lowering the threshold to 8 cubic yards, applying the 17 percent predicted increase from the SERA Report to the 21,214 small businesses in Mecklenburg County identified by the BusinessWise database. DSM’s survey data, however, indicate that many of small businesses that could be impacted are already recycling, and

⁹ The posted gate rate for commercial waste is significantly higher, especially when County fees are included, however according to LUESA, the actual rate for much of the commercial waste averages \$37 per ton.

therefore the actual number of impacted businesses is substantially less than 3600. Figures 7 and 8 illustrate that 53 percent of the businesses DSM surveyed already have a cardboard and/or paper recycling program, and therefore would be in compliance with an ordinance requiring OCC/paper recycling for all businesses with 8 cubic yards or more of refuse.¹⁰ All of the cardboard recycling services identified by the DSM surveys accepted mixed paper in the same container. That means that only 47 percent of the businesses potentially subject to the reduction in the SSO would be impacted, or roughly 1700 (rounded).¹¹

DSM attempted to confirm that our estimate of the number of potentially impacted businesses was realistic based on interviews with four refuse / recycling haulers recommended by LUESA. Collectively, these haulers serve approximately 6200 business customers (30% of all the small businesses). The haulers were asked to estimate the impact of lowering the threshold to 8 cubic yards for the businesses in Mecklenburg County and collectively they estimated that a total of 1500 additional businesses might be impacted, which is consistent with DSM's estimate of 1,700 businesses based on the survey data.

Assuming that the newly impacted businesses would pay similar rates for recycling dumpsters as those reported to DSM, and that 100% of these businesses complied with the ordinance, the gross cost to small businesses of lowering the threshold to 8 cubic yards *and eliminating the 500 lb. exemption* is estimated to be roughly an additional \$1.5-\$1.6 million (rounded) spent by small businesses in Mecklenburg County for subscription cardboard / paper recycling service that are not already subscribing to recycling services.¹²

Based on DSM's surveys, it is likely that some of the businesses might choose to self haul materials in order to avoid further costs. Table 5 illustrates that 28 percent of the businesses surveyed would be willing to drive to deliver recyclables to a LUESA recycling container or to a broker. Total costs (exclusive of self-haul transport costs) would be reduced to \$1-1.1 million (rounded) if 28 percent of the 1700 businesses chose to self haul their recycling in order to be in compliance with the revised SSO at the lowered threshold.

Total costs to the impacted businesses can be reduced by avoided collection and disposal costs. Using the same logic that was applied to the 16 cubic yard threshold, haulers estimate that one -half of the

¹⁰ Note that although SERA surveyed many more businesses, as discussed above, the response rate for many questions was significantly lower than their total number of surveys. Only 9 businesses responded to their question "how often is trash collected?"

¹¹ The DSM surveys identified one business that used a roll off container for recycling metal. None of the businesses surveyed were generating enough cardboard or paper to justify using a roll off container for those recycling services.

¹² This assumes that all of the additional businesses impacted would subscribe for new or additional services rather than self-hauling their recycling and using the numerous free commercial drop boxes, the costs of which are not included in this analysis. The reality is that a small percentage of businesses would not comply, further reducing the total economic impact.

businesses impacted might be able to realize a collection cost savings when adding a recycling dumpster. Assuming an average collection cost savings of \$25 a month for half of the 1224 business that are not self hauling recycling, these businesses would save roughly \$185,000 (rounded) in collection costs. In addition, the average new business that would be impacted is estimated to generate about 1.2 tons of OCC and paper per month. Assuming the same estimated avoided disposal cost of \$15 per ton, results in a further avoided disposal cost savings of roughly \$365,000 (rounded). Therefore, the net cost to the newly impacted business is estimated to be roughly \$450,000 to \$550,000.

The hauling industry would clearly benefit from the proposed changes to the ordinance. The addition of new recycling collection opportunities would create new profit centers for the haulers; which in turn would require more labor hours, and potentially new employees as well as new container rental income. Assuming that labor represents roughly one-quarter of hauler cost, five to seven new jobs would be created with implementation of the change in the SSO ordinance.

The new employees hired to collect recyclables would be a CDL drivers for commercial collection routes. Assuming that each new driver is paid \$50,000 in wages and benefits, the reduction in the threshold of the SSO would result in \$250,000 to \$350,000 in new direct wages in Mecklenburg County as well as roughly \$100,000 in profits to the hauling industry. Assuming an indirect and induced multiplier of 2.0 when applied to wages¹³ the wages and profits associated with the change in the SSO ordinance alone would reduce the total economic impact to Mecklenburg County to zero.

In addition, there would be revenues to the brokers and MRF operators associated with the sale of the new material collected for recycling. The value of the material to the businesses is already calculated in the reduced cost that they received for switching from refuse disposal to recycling. However, the brokers and MRFs add value by cleaning and consolidating the material for shipment to end use markets. For purposes of this analysis, it can be assumed that the brokers and MRF operators add about 20 percent of the value of the collected material, or roughly \$20 per ton, which is equivalent to an additional \$125,000 in net economic value to Mecklenburg County.¹⁴

It should be noted that sufficient MRF processing capacity exists in the County to process the material collected by the haulers, and there is a sufficiently robust private hauling infrastructure so that if any single hauler were unable to provide the necessary recycling service, other haulers would be available to take on additional accounts.

¹³ See for example, 2010 Recycling Economic Information Study Update for Illinois, Final Report, November 2010, prepared by DSM Environmental Services, Inc.

¹⁴ The current value for OCC is significantly higher than \$100 per ton, but a long term average of \$100 per ton for OCC and mixed paper is probably a realistic average.

Eliminating 500 Pound Exemption for Cardboard and Paper

The current SSO states, *“The Source Separation of Corrugated Cardboard by a Business Entity is not required if this material represents less than 500 pounds per month. The Source Separation of Office Paper by a Business Entity is not required if this material represents less than 500 pounds per month.”*

DSM used the telephone survey responses to evaluate the potential elimination of the 500 pound exemption – both on those businesses generating over 16 cubic yards of refuse per week, and those potentially impacted businesses associated with lowering the SSO ordinance to 8 cubic yard per week.

Potential Impact on Businesses Currently Subject to the Existing SSO

A review of Appendix A illustrates that most of the retail and wholesale businesses surveyed are generating over 16 cubic yards of refuse per week and already generate over 500 pounds of cardboard and paper month. The surveyed businesses that do not currently recycle generate sufficient waste to be impacted by the SSO and they do not meet the 500 pound exemption – that is they are currently not in compliance with the existing ordinance.

The real impact of eliminating the 500 pound exemptions, then, would be on larger businesses generating over 16 cubic yards of refuse per week but small quantities of paper and OCC. DSM’s survey data are limited to retail and wholesale sectors, and therefore cannot address the wider impact on other sectors. However, it is DSM’s professional opinion that a small sub-sector of business would be impacted, and that access to the County’s free OCC recycling boxes would be sufficient for most of these businesses. The biggest issue would be enforcement by the County because it would be difficult to know which businesses might be generating sufficient paper to require recycling – in most cases it is likely that these businesses would be generating relatively minor amounts of OCC and paper when compared to the surveyed retail and wholesale sectors.

As stated above, DSM estimates that there are approximately 4900 businesses currently impacted at the 16 cubic yard threshold. According to the survey results presented in Table 7, three of the nine businesses surveyed generate more than 16 cubic yards of refuse per week, but *would be exempt from recycling paper* because they are not generating 500 pounds of paper a month (or more). These three businesses represent 33 percent of the surveyed businesses. Extrapolating to the 4900 businesses currently impacted at the 16 cubic yard threshold, roughly 1600 (rounded) businesses would generate an average of 162 pounds a month of mixed paper. If it is assumed that businesses that generate less than 500 pounds a month of paper are not already recycling the paper, there is the potential for an additional 130 tons of mixed paper to be collected annually if the 500 pound exemption were removed at the 16 cubic yard threshold¹⁵. This is a relatively insignificant change in recycling quantities.

¹⁵ This assumes removing the 500 pound paper and cardboard exemption would take place at the same time office paper changed to a mixed paper. According to Figure 8, 16 percent of recyclable paper (or mixed paper) is office paper; therefore if the change from office paper to mixed paper *does not happen* only 16 percent of the 130 tons

One option, which was not in DSM’s scope, would be to lower the exemption to some de minimis amount – say 100 to 200 pounds per month, which would reduce County enforcement costs and the potential business impacts without significantly impacting on total recycling of paper in the County. The reason this is important is that the impact of the 500 pound exemption *is* significant if the SSO is lowered to 8 cubic yards of refuse per week, as discussed below.

Potential Impact of Eliminating the 500 Pound Exemption While Lowering the Threshold to 8 Cubic Yards per Week of Refuse

In order to be impacted by the reduced threshold, the business must be generating 8-15 cubic yards of refuse a week (generating 16 cubic yards or over would mean they are already impacted by the 16 cubic yard threshold). Businesses that are generating 8-15 cubic yards of refuse a week which are already recycling cardboard would not be impacted by removing the 500 pound exemptions since they are already in compliance with the SSO at the reduced threshold – or if they are not because they are not recycling office paper, they could add office paper to the current recycling dumpster. Therefore, the businesses that are not currently recycling cardboard but are currently subscribing to 8-15 cubic yards of refuse service a week are the subgroup of interest for this question.

DSM compiled the 16 survey responses that fit in this category in Table 8, which displays the pounds of cardboard generated monthly by this subgroup. As illustrated by Table 8, only three businesses not recycling OCC generate over 500 pounds of cardboard a month. On average, businesses surveyed by DSM that generated less than 16 cubic yards of refuse per week generated an average of 328 pounds of cardboard a month, and therefore would be exempt from the reduced SSO ordinance threshold unless the 500 pound minimum was also eliminated.

Table 8 *Businesses in Mecklenburg County with 8 CY Refuse and No Recycling*

Survey #	# Emp.	Refuse Dumpster	Refuse Pulled	Recycle OCC	Pounds OCC/Month
2	37	8 CY	1x per week	no	35
5	5	8 CY	1x per week	no	867
8	4	8 CY	1x per week	no	108
13	3	8 CY	1x per week	no	22
23	5	8 CY	1x per week	no	98
3	22	8 CY	1x per week	no	1302
6	25	8 CY	every 2 wks	no	87
12	6	8 CY	every 2 wks	no	43
14	6	8 CY	1x per week	no	0
18	12	8 CY	1x per week	no	173
20	10	8 CY	1x per week	no	22

might be collected. This would result in a total of 20 tons of additional office paper collected annually by removing the 500 pound exemption at the 16 cubic yard threshold.

26	8	8 CY	1x per week	no	10
29	18	8 CY	1x per week	no	130
16	1	10 CY	1x per week	no	217
22	9	30 CY RO +	every 2 months	no	22
19	35	48 CY RO +	when full*	no	2113
Monthly Average					328

Based on the survey data, the predicted 1700 businesses impacted by lowering the threshold to 8 cubic yards *would be reduced to 19 percent of the 1700, or 300 (rounded) additional businesses* impacted if the weight exemption were allowed to remain intact while lowering the threshold to 8 cubic yards a week. What this means is that dropping the SSO requirement to 8 cubic yards, but keeping the 500 pound exemption effectively eliminates much of the potential increase in recycling associated with the change to the SSO.

There are pros and cons to dropping the exemption. Allowing the 500 pound exemptions for cardboard and paper to stay in place, while lowering the threshold to 8 cubic yards, would result in \$1.2-\$1.3 million (rounded) of annual savings for approximately 1400 businesses that would be exempt from the revised SSO, assuming none of the 1400 businesses would have self hauled the recycling material¹⁶. However, removing the exemption would reduce County costs to administer the exemption (businesses must submit the appropriate paperwork and the County has to review the paperwork for accuracy). More importantly, removing the exemption would significantly increase the amount of cardboard recycled via the SSO and would significantly reduce County compliance enforcement costs because all businesses with 8 cubic yard or greater refuse containers would be subject to the SSO. As presented in Table 15 (Environmental Benefits), reducing the threshold to 8 cubic yards and removing the 500 pound exemption would divert up to an additional 3400 (rounded) tons of cardboard and office paper per year.

Adding Plastic and Aluminum to the Current SSO at 16 Cubic Yards/Week Refuse

Forty-three percent of the businesses DSM surveyed indicated that they were already recycling bottles and cans. Most businesses were recycling beverage containers through a volunteer who takes them home and recycles them through their residential recycling program or brings them to their recycling center. Two additional respondents indicated that they had a subscription service for the collection of their beverage containers. The amount of bottles and cans generated by small businesses tends to be

¹⁶ It is important to note that the selection of survey respondents (retail, wholesale) effects the discussion of 500 lb. exemption. Retail and wholesale businesses typically generate large amounts of OCC but less paper than a typical business located in an office building. Because of the sample size, DSM does not represent the survey data as being statistically valid for all of the businesses in Mecklenburg. The retail and wholesale businesses are a relatively homogenous group as proven by the surveys; therefore a small sample size can fairly accurately depict the status of roughly 1/3 of all businesses in Mecklenburg County. According to LUESA, currently almost all retailers & restaurants qualify for the 500 lb. exemption for office paper.

relatively small unless it is a retail business that sells products packaged in bottles and cans for on-premise consumption such as a pizza restaurant and if the business sells alcohol, they are already required to recycle all beverage containers under State Law.

As a clarification from the DSM survey, the survey question found in Appendix B: “Would you be willing to drive, self-haul, your recyclables to a dumpster located near you if it didn’t cost you anything to recycle? If yes, how far would you be willing to drive? Miles_____” was attempting to establish the percent of businesses that are willing to drive to a public or private recycling center for their recycling needs and if so, how far they are willing to drive as opposed to two prior questions that ask the businesses for the volume of bottles and cans they recycle and how they currently recycle. The 43 percent of the businesses DSM surveyed that indicated they were already recycling bottles and cans were recycling beverage containers through a volunteer who takes them home and recycles them through their residential recycling program or brings them to their recycling center. The question about bottles and cans does not directly correlate with willingness to drive, since the question willingness to drive was essentially asking businesses if they would be willing to drive any additional miles.

Of the approximately 4900 businesses impacted under the 16 cubic yard threshold, DSM estimates, based on DSM’s survey data, that the County could expect to divert 14,700 cubic yards, or 330 (rounded) tons of beverage containers annually by requiring the separation of bottles and cans if all of the businesses complied. However, it is important to note that the DSM surveys were of retail and wholesale businesses. It is likely that the survey data underestimates potential generation and diversion of bottles and cans because the service, finance, and insurance sectors, representing 52 percent of small businesses with more than three employees were not surveyed. At least some percentage of the firms in these sectors has higher employment per cubic yard of waste generated than the retail and wholesale sectors, and therefore would generate higher quantities of bottles and cans.

The amount of bottles and cans generated averaged 50 gallons per month for the businesses surveyed. Businesses that contract with a hauler delivering to a single stream MRF should be able to place their bottles and cans in with their paper. Those that contract with a hauler which does not deliver material to a single stream MRF will find it much more difficult to comply with a requirement to recycle bottles and cans because this small amount of beverage containers probably does not warrant a separate collection service. These businesses might choose to have an employee take them home for recycling, or to drive the bottles and cans home to a recycling facility, which is the standard choice for businesses surveyed who are already recycling beverage containers. Having an employee recycle the containers at home would not impact the economics of the business; depending on whether the business would allow for company time to be spent recycling, driving or for mileage reimbursement. However, there are

negative environmental impacts of driving to the recycling center instead of having the materials picked up through an efficient curbside collection system.¹⁷

Assuming two-thirds of the businesses are collected by haulers using a single stream MRF, there would be no economic impact of adding plastic and aluminum for approximately 3200 (rounded) businesses. Perhaps as many as 50 percent of the remaining 1700 businesses, or 850 businesses would rely on an employee to bring the bottles and cans home to their residential recycling, which would also have no economic impact. The remaining 850 businesses that have to drive to a recycling facility to recycle their bottles and cans would be impacted.

As presented in Table 5, businesses willing to drive to a free recycling center reported that they would be willing to drive an average of 4 miles one way to recycle. Assuming businesses travel to the free recycling center to deliver their bottles and cans only once a month, this would represent 81,600 miles driven annually by 850 businesses. This would cost \$42,000 (rounded) annually at the current IRS mileage rate of \$.51 per mile. There would be 10,200 work hours generated annually recycling bottles and cans assuming that it takes one employee one hour per month to gather the recycling, drive to the recycling center, empty the recycling and return back to work. An annual compensation of \$153,000 is needed to recycle bottles and cans if it is assumed that the hourly wage of an unskilled employee in Mecklenburg County is approximately \$10 and the total compensation (including benefits and time off) for that employee would cost a business \$15 an hour. This represents an estimated total cost to the businesses of \$195,000. However, the total cost to Mecklenburg County would be reduced by the value added associated with recycling these containers. Aluminum and PET containers are high value material worth roughly \$75,000 for the increased recycling of containers.

Adding Plastic and Aluminum to the SSO at 8 Cubic Yards/Week Refuse

From the approximately 1700 additional businesses impacted if the SSO threshold was lowered to 8 cubic yards a week, an additional 5100 cubic yards of beverage containers might be diverted annually by requiring the separation of plastic bottles and aluminum cans (assuming again that all businesses complied). The total impact of lowering the threshold to 8 cubic yards and adding the requirement for businesses to separate aluminum cans and plastic soda bottles would yield a maximum of 19,800 cubic yards or 445 (rounded) tons of beverage containers annually. As stated above, the impact of adding bottles and cans would probably be negligible for all businesses contracting with a hauler who is delivering to a single stream MRF, but could be problematic for a business contracting with a hauler delivering paper to a dual stream MRF or to a paper broker.

¹⁷ "Analysis of Beverage Container Redemption System Options to Increase Municipal Recycling in Rhode Island" prepared for the Rhode Island Resource Recovery Commission by DSM Environmental Services, Inc.

Utilizing the same logic as above, assuming two-thirds of the businesses are collected by haulers using a single stream MRF, there would be no additional cost associated with adding plastic and aluminum for approximately 1100 (rounded) businesses. Perhaps as many as 50 percent of the remaining 600 businesses, or 300 businesses would rely on an employee to bring the bottles and cans home to their residential recycling; also having no cost impact on the business. The remaining 300 businesses that have to drive to a Commercial Recycling Facility to recycle their bottles and cans would be impacted.

Assuming these 300 businesses travel to the free recycling center to deliver their bottles and cans only once a month, 29,000 (rounded) miles would be driven annually by this sub-group of businesses. This would cost \$15,000 (rounded) annually at the current IRS mileage rate of \$.51 per mile. An additional \$54,000 in labor costs to collect and deliver the bottles and cans would also be incurred by these businesses, for a total estimated cost to these businesses of \$69,000.

Interestingly, the total economic impact to Mecklenburg County of requiring separation of bottles and cans is positive, illustrating one of the benefits of the move to single stream processing of materials. This is because most businesses are being served by haulers delivering to single stream MRFs with the capacity to separate bottles and cans from paper allowing these businesses to simply place the bottles and cans in with the recycled corrugated and paper. Thus, the estimated combined cost for those businesses not sending material to single stream MRFs, and therefore required to drive their bottles and cans to a recycling facility at a total cost of \$264,000 is roughly one-half of the economic value of the recycled bottles and cans of roughly \$512,000.

Changing Office Paper to Mixed Paper in the SSO

The current definition of office paper as defined in the Source Separation Ordinance is:

White and colored office paper, computer paper, and copy paper, including those with laser and non-laser printing but excluding ground wood paper (newsprint type), or papers which are contaminated with blood, grease, oil, chemicals, food residue, wax, or any other material which will render the paper not marketable, or which have polyethylene, polystyrene, foil or other non-paper liners. Business entities are encouraged to include other recyclable paper(s) and paper scrap as allowed by the recycler which collects the Business Entity's paper; however, only the types of paper specified above are required by this Ordinance to be separated.

LUESA is considering revising the Ordinance with the following definition:

A mix of papers collected for recycling that includes white and pastel copy and writing paper; white, green-bar, and multi-stripe computer paper; letterhead and envelopes; notepads; advertising booklets, and fliers.

The proposed new definition along with a detailed list of acceptable paper was sent to three recycling companies operating in Mecklenburg County. One company responded that all items on the list would

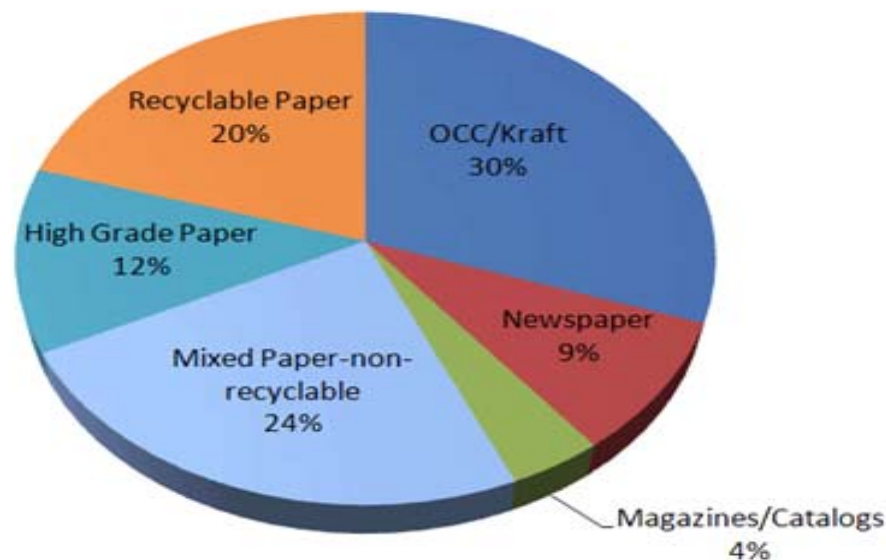
be acceptable. Two recycling companies rejected cellophane and self carbonized paper as acceptable, and one recycler also rejected register tape roll paper, file folders and windowed envelopes. From these results, the County may want to consider revising the definition as follows:

A mix of papers collected for recycling that includes white and pastel copy and writing paper; white, green-bar, and multi-stripe computer paper; letterhead and envelopes; notepads; advertising booklets, and fliers; newspaper; magazines and catalogs; phonebooks and directories; the mixed paper should be free from cellophane and carbonized paper.¹⁸

Of the businesses that DSM surveyed, 53 percent stated that they had some sort of paper recycling program. Most of the businesses that were recycling paper were putting the paper into their cardboard dumpster. The rest of the businesses were shredding the paper due to confidentiality concerns. The shredded paper is generally hauled away by the company that provided the shredding service and is assumed to be recycled. Some of the businesses shredded their own paper and used it for packaging their product.

Figure 10 presents the Mecklenburg County Solid Waste Management Plan estimate of commercial paper composition in Mecklenburg County. As illustrated by Figure 9, roughly 75 percent of the paper disposed from commercial generators would be recyclable under the suggested “revised” language described above.

Figure 10 Paper Categories found in Commercial Waste in Mecklenburg County¹⁹



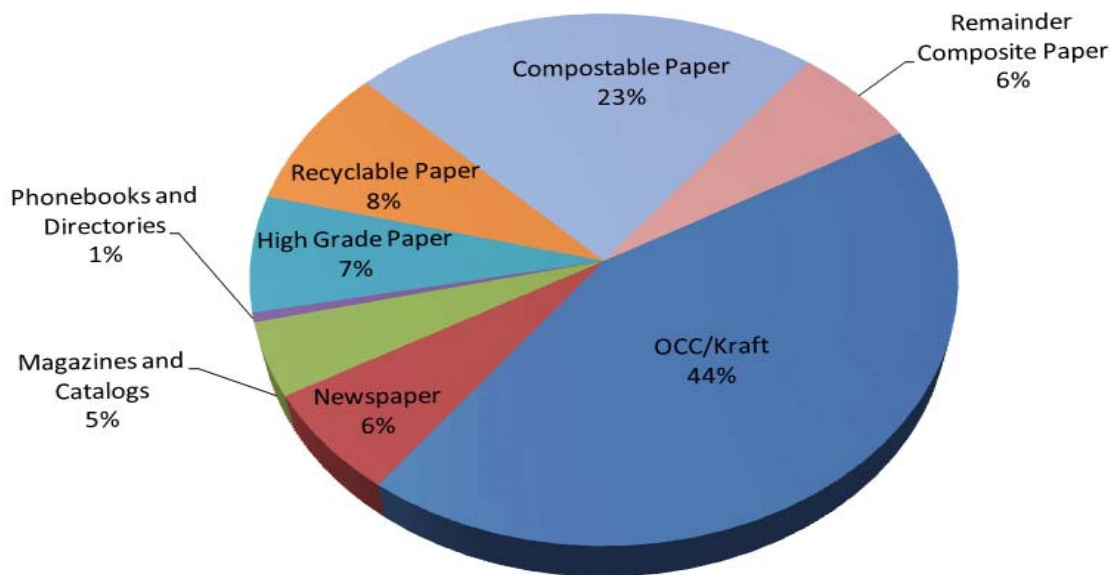
¹⁸ This definition would still leave two paper markets for the mixed material, and it is likely that over time the third market would also accept this material if the other markets were.

¹⁹ RW Beck 2005. Estimates based on comparison of 3 US Cities, 2 of which have similar business sector profiles to Mecklenburg County (based on SIC codes).

The Mecklenburg County SSO requires the separation of office paper. When DSM surveyed businesses in Mecklenburg County and asked them how much mixed paper they produced in a month, the definition of mixed paper included all paper that can be recycled (other than cardboard). The survey question was framed this way because it is difficult for a business to estimate the amount of office paper generated.

Figure 11 below represents the types of paper found in the commercial waste stream of the State of Delaware waste characterization study and is presented as a benchmark comparison to the Mecklenburg County data. As illustrated by Figure 11, roughly 77 percent of the paper disposed from commercial generators would be recyclable under the language described above. The Delaware and Mecklenburg Solid Waste Plan composition of commercial waste paper are essentially the same, indicating that roughly 75-77 percent of the paper is recyclable under the definition presented above, and roughly one-half of the total is cardboard, with the remainder other mixed paper.

Figure 11 Paper Categories found in Commercial Waste in Delaware²⁰



DSM surveyed wholesale and retail businesses which represent approximately 33 percent of small businesses in Mecklenburg County. The generation data provided by our surveys are likely indicative of typical wholesale and retail operations in Mecklenburg County *but not all business types*. DSM is reluctant to use a relatively small sample size of respondents who are primarily providing information on their dumpster size and pull frequency to estimate total OCC, office paper and mixed paper generation.

²⁰ Delaware Solid Waste Authority Statewide Waste Characterization Study, 2006-2007 Final Report October 31, 2007 prepared by DSM Environmental Services, Inc, MSW Consultants and Cascadia Consulting Group, Inc.

To avoid an overestimation of generation data, DSM chose to use EPA national paper generation data to estimate the amounts of OCC, mixed paper and office paper generated by the businesses in Mecklenburg County. The national generation data for OCC, office paper and mixed paper are presented in Table 9 below.

Table 9 Paper Generation Per Capita Estimates from US EPA²¹

2008 Data	Tons Generated	Tons Recovered	Population	Tons Generated/Person	Tons Recovered/Person
US (Annual)	77,420,000	42,940,000	301,621,157	0.26	0.14
Mecklenburg County (Annual)	225,611	125,132	878,961	0.26	0.14
Mecklenburg Commercial (Annual)	97,013	53,807	878,961	0.11	0.06
Mecklenburg (Weekly)	4,339	2,406	878,961	0.0049	0.0027
2008 Data	CY Generated	CY Recovered	# Business	CY Generated/Business	CY Recovered/Business
Mecklenburg (Weekly)	21,693	12,032			
Commercial (Weekly)	9,328	5,174	22,585	0.41	0.23
Recyclable Paper (Weekly)	6,996	3,880	22,585	0.31	0.17
OCC (Weekly)	3,172	1,759	22,585	0.14	0.08
Recyclable Paper - No OCC (Weekly)	3,825	2,121	22,585	0.17	0.09
Office Paper (Weekly)	1,119	621	22,585	0.05	0.03

Table 10 displays the annual cubic yards of paper generated at the 16 and 8 cubic yard thresholds based on the per capita information from Table 9. Lowering the threshold to 8 cubic yards per week of refuse would gain an additional 1700 businesses, generating another 15,000 (rounded) cubic yards of recyclable paper annually (not including cardboard), or 3,000 rounded tons. The combined total mixed paper generation at the 8 cubic yard threshold would be about 58,000 (rounded) cubic yards, or 11,600 tons annually.

Table 10 Mixed Paper Generation at the 16 CY and 8 CY Threshold

Threshold	# of Businesses	AVG Weekly CY Paper	Annual CY Paper
16 Cubic Yards	4900	0.17 mixed – no OCC	43,000
Additional at 8	1700	0.17 mixed – no OCC	15,000
8 Cubic Yards	6600	0.17 mixed paper – no OCC	58,000

The pie chart in Figure 10 illustrates that mixed paper is 75 percent of Mecklenburg paper waste and includes: recyclable paper, newspaper, phonebooks and directories, magazines and catalogs, and high grade paper. Figure 10 also illustrates that high grade office paper accounts for 12 percent of the paper waste in Mecklenburg County²².

²¹ Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2008, United States Environmental Protection Agency; 2008 US Population Estimate is from the US Census Bureau and the 2008 Mecklenburg County Population Estimate is from the NC Office of State Budget and Management.

²² In considering the differences between Delaware and Mecklenburg County, LUESA believes the percentage of office paper is higher than Delaware because Mecklenburg County’s primary business sector is financial.

Table 11 identifies the total cubic yards of *office paper* collected at the 16 and 8 cubic yard thresholds using the per capita information from Table 9.

Subtracting the 17,000 annual cubic yards of *office paper* illustrated in Table 11 from the 58,000 annual cubic yards of *mixed paper* illustrated in Table 10 would result in a loss of 43,000 cubic yards of *recyclable paper* annually by collecting only office paper at the 8 cubic yard threshold.

Table 11 Office Paper Generation at the 16 CY and 8 CY Threshold

Threshold	# of Businesses	AVG Weekly CY Paper	Annual CY Paper
16 Cubic Yards	4900	0.05 office paper	13,000
Additional at 8	1700	0.05 office paper	4,000
8 Cubic Yards	6600	0.05 office paper	17,000

Most of the businesses surveyed reported that their cardboard dumpster also accepts paper. The availability of dumpsters that collect cardboard and paper together was confirmed when DSM interviewed the refuse and recycling haulers.

As previously stated, lowering the threshold to 8 cubic yards of refuse service would result in an additional \$890,000-\$960,000 (rounded) spent annually by small businesses in Mecklenburg County for subscription cardboard / paper recycling service. Assuming the trash threshold is reduced at the same time office paper is changed to mixed paper, the \$890,000-\$962,000 in subscription service fees will account for the majority of cost associated with the increase in paper produced from changing office paper to mixed paper in the SSO. Assuming the trash threshold is not lowered and the County were to change office paper to mixed paper, DSM predicts no or marginal additional cost impacts to the existing 4900 businesses impacted at the 16 cubic yard threshold because those businesses already have a dumpster in place to handle the additional paper.

“Free” Commercial Recycling Centers

Commercial Recycling Centers are promoted during on-site Source Separation Ordinance inspections, on-site Waste Assessments or any “Business Recycling Infoline” (704-432-3200) inquiry regarding business/commercial recycling or waste reduction. The program is designed so that a business that is not required to comply with the Source Separation Ordinance may have the opportunity for an on-site recycling program.

There are requirements involved in sponsoring a Commercial Recycling Center, the most important being that the sponsor allow access to any business or a county resident. The Commercial Recycling Centers are not meant to be used as a personal recycling center for the business that hosts the service. Mecklenburg County businesses and residents are allowed access to *any* Commercial Recycling Center for no charge; under the condition that they self-haul the recyclables themselves. Businesses that utilize

a Commercial Recycling Center are not allowed to pay an outside company or individual to transport the materials to the Commercial Recycling Center.

According to LUESA, “Associated costs to Mecklenburg County are minimal as we piggy-back with the program contracting MSW & Recycling service for CMS schools. Also, we minimize unnecessary service calls to each Commercial Recycling Center by having the sponsor work with us regarding service days.”²³

Figure 2 illustrates that 43 percent of businesses employ 1-3 people and therefore would probably not be able to accommodate a Commercial Recycling Center. Table 12 depicts the 7 businesses that are not currently recycling cardboard but are willing to drive to a free recycling center.

Table 12 *Businesses Not Currently Recycling OCC and Are Willing to Drive*

Survey #	Category	CY trash	Trash Pulled	Recycle OCC	lbs OCC/mth	lbs paper/mth	lbs bot/mth	lbs can/mth	Drive	Miles
2	Retail	8	1x per week	no	35	433	3.6	3.6	yes	0.5
5	Retail	8	1x per week	no	867	277	3.6	3.6	yes	1
6	Wholesale	8	every 2 wks	no	87	3467	1.8	1.8	yes	2
13	Retail	8	1x per week	no	22	693	3.6	3.6	yes	5
18	Wholesale	8	1x per week	no	173	69	1.8	1.8	yes	2
20	Wholesale	8	1x per week	no	22	1387	0.0	0.0	yes	10
23	Retail	8	1x per week	no	98	208	2.7	2.7	yes	2
AVERAGES					186.0	933.5	2.4	2.4		3.2

There were 19 businesses from DSM’s survey that did not have a cardboard recycling program, which is 47 percent of the total surveys (Figure 4). *Of those 19 businesses that were not recycling cardboard*, seven of the 19 businesses that didn’t have an OCC recycling program (or 37 percent of the 19 businesses being surveyed) indicated that they would be willing to drive an average of 3.2 miles one way in order to recycle for free.

However, as previously stated, the Commercial Recycling Center program is targeting businesses that are not subject to the SSO. Therefore, if the SSO ordinance threshold was lowered to 8 cubic yards, six of the seven businesses willing to drive for free recycling drop-off would be impacted by the lower threshold.

DSM believes that only a small percentage of businesses would be willing to *host* a “free” Commercial Recycling Center. The requirement to allow access to other businesses and residents automatically eliminates a number of businesses that rent a small space, or that are worried about public access to their property. Because the program targets businesses that are not impacted by the SSO, the businesses that are targeted are not required to recycle so there is no legal or enforcement incentive to host a Commercial Recycling Center. DSM estimates that about 150 businesses might be willing to accommodate a Commercial Recycling Center rather than drive based on the percentage of survey responses willing to drive and assuming they would also consider hosting a Commercial Recycling Center. However, according to hauler interviews, only about 50 percent (75 businesses) of the 150

²³ The Commercial Recycling Center Program description and associated costs were described by Stewart Espey, Senior Environmental Specialist for Mecklenburg County.

businesses might be able to accommodate the space needed for the Commercial Recycling Center's dumpster and necessary parking for the other businesses that would utilize the recycling center.

If businesses were aware of a Commercial Recycling Center near them, and they were impacted by the SSO, they might choose to utilize the free program in order to be compliant. If the businesses of Mecklenburg County were aware of a Commercial Recycling Center near them and they were not impacted by the SSO, they might still choose to utilize the free service in order to reduce their solid waste cost.

Advertising the availability of existing Commercial Recycling Centers could have a bigger impact on diverting recycling materials than advertising for businesses to host a Commercial Recycling Center. This will especially be the case if the County lowers the threshold to 8 cubic yards per week and eliminates the 500 pound exemption, because this will expose smaller businesses with potentially lower revenues to increased costs.

Advertising the availability of Commercial Recycling Centers might also expose the County to charges of unfair competition from private haulers who would stand to gain from lowering the SSO threshold.

Elimination of the Temporary Site Location Exemption

The SSO states, *Source Separation of Designated Materials generated at a Temporary Service Location is not required.*

The SSO defines a temporary service location as: *a temporary use of land which generates municipal solid waste such as construction of a building, demolition of a building, turkey shoot, outdoor seasonal sales (as defined in the Mecklenburg County Zoning Ordinance), and any other similar use of land which either does not reoccur on the same site (such as construction of a building on a site) or does reoccur, but only sporadically (such as a turkey shoot).*²⁴

Impact on Construction and Demolition Sites

The composition of Construction and demolition (C&D) waste is well documented. DSM analyzed 633 construction and demolition loads of waste as part of the 2007 waste composition study for Delaware²⁵. Approximately 12.1% (137,700 tons) of the overall Delaware waste stream consisted of construction and demolition waste. Figure 12 and Table 13 present an overview of the 633 C&D loads that were characterized. Paper accounted for approximately 2.1 percent of the C&D waste in Delaware, by weight. OCC and Kraft Paper accounted for 1.4 percent of C&D waste and 0.7 percent was other paper.

²⁴ Mecklenburg County Ordinance to Require the Source Separation of Designated Materials from the Municipal Solid Waste Stream for the Purpose of Participation in a Recycling Program.

²⁵ Delaware Solid Waste Authority Statewide Waste Characterization Study, 2006-2007 Final Report October 31, 2007 prepared by DSM Environmental Services, Inc, MSW Consultants and Cascadia Consulting Group, Inc.

Figure 12 Delaware Waste Composition Profile: Construction & Demolition Waste Stream

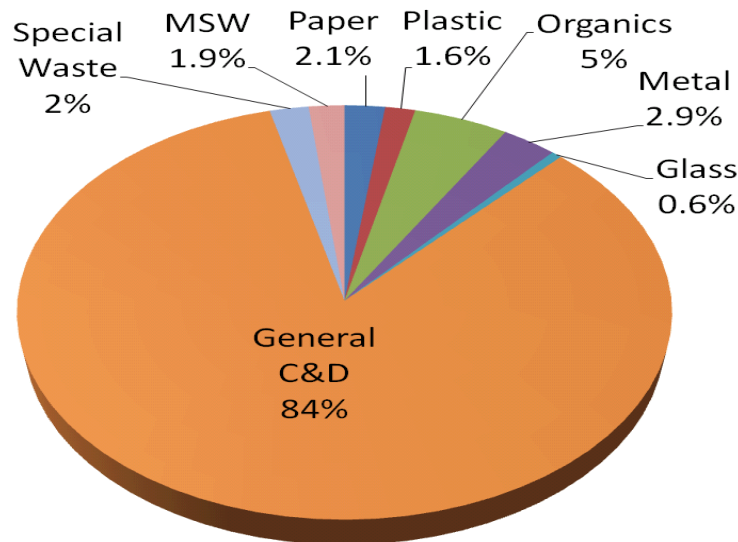


Table 13 Delaware Waste Composition Profile: Construction & Demolition Waste Stream

Material	Est. Mean	+/-	Material	Est. Mean	+/-
Paper	2,900	2.1%	Construction & Demolition	115,688	84.0%
OCC/Kraft	1,912	1.4% 0.2%	Concrete/Brick/Rock	16,055	11.7% 2.9%
R/C and Other Paper	989	0.7% 0.2%	Asphalt Paving	531	0.4% 0.2%
Plastic	2,159	1.6%	Roofing Materials	21,106	15.3% 4.2%
HDPE Buckets	197	0.1% 0.0%	Ceiling Tiles	155	0.1% 0.1%
Clean Recoverable Film	211	0.2% 0.1%	Pallets and Crates	3,410	2.5% 1.3%
R/C and Other Plastic	1,751	1.3% 0.5%	Untreated/Unpainted Lumber	12,892	9.4% 1.3%
Organics	6,832	5.0%	Treated Lumber	3,633	2.6% 1.4%
Yard Waste	1,681	1.2% 0.6%	Painted/Stained Lumber	4,215	3.1% 0.7%
Carpet	793	0.6% 0.2%	Plywood	5,918	4.3% 0.9%
Carpet Padding	223	0.2% 0.0%	Orientated Strand Board (OSB)	6,503	4.7% 1.2%
R/C and Other Organics	4,135	3.0% 2.7%	MDF and Particle Board	1,046	0.8% 0.2%
Metal	3,997	2.9%	Wood Furniture	200	0.1% 0.1%
HVAC Ducting	95	0.1% 0.0%	Other Wood	463	0.3% 0.2%
Other Ferrous	3,105	2.3% 0.5%	Clean Gypsum Board	13,448	9.8% 2.6%
Non-Ferrous	797	0.6% 0.2%	Dirt, Sand, and Gravel	9,434	6.9% 2.3%
Glass	769	0.6%	Insulation	554	0.4% 0.1%
Glass	769	0.6% 0.3%	R/C and Other C&D	16,125	11.7% 1.7%
			Special Waste	2,794	2.0%
			Appliances	505	0.4% 0.2%
			Electronics	344	0.3% 0.2%
			Items with CRTs	73	0.1% 0.0%
			Bulky Items	596	0.4% 0.1%
			Tires	446	0.3% 0.3%
			Lead acid batteries	85	0.1% 0.1%
			Vehicle and Equipment Fluids	7	0.0% 0.0%
			Paint and Paint Related Waste	88	0.1% 0.0%
			Other Hazardous	300	0.2% 0.1%
			Fines/Mixed Residue	351	0.3% 0.2%
			MSW	2,555	1.9%
			Mixed MSW	2,555	1.9% 0.4%
			Total Percent:		100%
			Number of Samples:		633
			Tonnage:		137,695

Similar results were reported by MidAtlantic Solid Waste (MSW) Consultants who conducted an analysis of C&D materials in Mecklenburg County as part of the pallet and wood waste study. MSW Consultants

reported that 3.8 percent of C&D material was OCC and another 0.7 percent was other paper. At the time of the pallet and wood waste study (a period of rapid growth and construction in Mecklenburg County) it was estimated that total C&D generation was 350,000 tons per year²⁶. Multiplying the MSW Consultants estimate of 3.8 percent OCC times total generation of 350,000 tons yields roughly 13,300 tons of OCC at the height of the building boom in the County. Multiplying the Delaware Waste Characterization estimate of 1.4 percent OCC times total generation of 350,000 tons yields roughly 4,900 tons of OCC.

Given the cyclical nature of the construction industry, DSM has assumed that OCC generation from C&D activities will range from 5,000 to 13,000 tons per year depending on the construction year. This is roughly equivalent to between 100,000 and 260,000 un-compacted cubic yards of OCC per year, or between 12,500 and 32,500 8 cubic yard dumpster loads of OCC. Assuming four pulls per month at \$75 per month, total costs to the construction industry associated with recycling 100% of the OCC would range from \$235,000 to \$610,000 per year.

As with lowering the SSO threshold to 8 cubic yards of refuse per month, these costs would be accompanied by economic gains to the hauling and processing industries, and savings associated with avoided disposal costs. In this case it is estimated that between two and four new CDL jobs would be created, representing \$100,000 to \$200,000 in direct wages and another \$100,000 to \$200,000 in indirect and induced wage gains. In addition, the C&D industry would save between \$125,000 and \$325,000 in avoided disposal costs. Thus, the net economic impact would be slightly positive to Mecklenburg County (depending on the markup the C&D industry placed on their additional costs) despite the increased costs to the C&D industry.

Special Event Recycling

It is well documented that special events can generate significant amounts of recyclables, including paper, cardboard and bottles/cans. DSM conducted a detailed study of the potential to recycle litter basket and special event wastes on the National Mall in Washington, DC. DSM was also the Project Manager for a study of special event recycling throughout New England for the Northeast Recycling Council.

In general, there are two types of special events. The first are special events that occur on a regular basis – such as sporting events and car races. The second are more seasonal such as fairs. In both cases significant amounts of OCC and bottles and cans are generated and can be recycled.

For example, bottles and cans represented roughly 20 percent of the volume of material thrown away on the National Mall, and 14.5 percent of material weight thrown away/recycled at seasonal special

²⁶ According to Mecklenburg County's Solid Waste and Recycling web page, "Last year, Mecklenburg County generated over 350,000 tons of construction and demolition waste."

events measured by DSM in the Northeast. OCC represented another 14 percent of the material weight thrown away/recycled at seasonal special events.²⁷

Special events at County parks require a Park and Recreation Department permit in Mecklenburg County. Therefore, it would not be difficult to require as part of the permit that a plan be submitted to recycle OCC and bottles and cans. The current permit application does not require the submission of a waste and recycling plan for the special event. There is an Event Recycling Toolkit offered that provides Clear Stream[®] recycling frames, clear bags, and litter sticks for a \$100 refundable deposit. The County Park and Recreation Department should consider making a waste and recycling plan a mandatory part of the special events permit. For special events, the organizer would simply contract with a private hauler to provide a dumpster for OCC, paper, bottles and cans (a single container if the material is going to a single stream MRF) which all vendors could utilize during set-up and operations. This permit requirement would only address recycling in County Parks. Center City Partners issues permits for special events that take place in an area referred to as "Center City". The Center City Partners should also consider making a waste and recycling plan a mandatory part of their special events permit. However, these two recommendations would not cover all special events in Mecklenburg County so every municipality or quasi-governmental organization that issues a permit for special events on public land could be encouraged to adopt a uniform requirement for a waste and recycling plan.

However, a review of information from the Northeast Recycling Council (NERC) about special event recycling indicates that waste generated per event attendee ranged from 0.22 pounds to 1.25 pounds per person for the six events studied (for an overall average of 0.76 pounds per event attendee).²⁸ Waste sorts were carried out at the six events in the NERC study to depict the types of waste typically generated at special events. As stated above, cardboard averaged about 14 percent of the material generated at the six events in the NERC study which is equal to about 0.11 pounds of cardboard per event attendee. Paper averaged roughly 12 percent of the material generated for three of the six special events studied. The average of materials generated (recycled and disposed) for the six events in the NERC study was 38,000 pounds per event. If it is assumed that Mecklenburg County has an average of 6 large special events per year (two events per month during the warmer months), and that an average of 38,000 pounds or 19 tons of waste per event is generated (of which 14 percent is OCC), then approximately 32,000 pounds or 16 tons (rounded) of OCC could be diverted annually by requiring OCC recycling at special events. If it is assumed that 12 percent of the material generated is mixed recyclable paper, then approximately 27,000 pounds or 13.5 tons (rounded) of mixed paper could be diverted annually by requiring mixed paper recycling at special events. If it is assumed that 14.5 percent of the

²⁷ See for example, *Analysis of Recycling Opportunities for the National Mall, Final Report*, November 4, 2009, prepared for Keep America Beautiful, prepared by DSM Environmental Services, Inc.; and *Best Management Practices for Special Event Generated Waste in Rural Communities*, Produced by the Northeast Recycling Council, Prepared by DSM Environmental Services, Inc.

²⁸ *Best Management Practices Guidebook for Special Event-Generated Waste in Rural Communities*, July 2006, Produced by the Northeast Recycling Council, prepared by DSM Environmental Services, Inc.

materials generated at special events are bottles and cans, then approximately 33,000 pounds or 16.5 tons (rounded) of bottles and cans could be diverted annually by requiring bottle and can recycling at special events. The sum total of additional recycling associated with special events is therefore less than 100 tons per year. For this reason, mandating special event recycling has no significant waste diversion benefit, although it can have citizen education benefits.

There are far too many variables associated with special event recycling to even roughly estimate the economic impact associated with a requirement for all special events to recycle paper and bottles and cans. Each event is different, both in terms of generation and in terms of the way waste and recyclables are or might be handled. An economic analysis would require a detailed breakdown of special event types, waste handling methods, and estimated quantities, all of which are beyond the scope of this analysis.

Mandatory Commercial Recycling Ordinances in Other Communities

Case Study: City of Cambridge, MA

Population

Estimated at 108,771 in 2009

Background

In March 1991, the City Council passed the Mandatory Recycling Ordinance, which requires each owner or occupant of all residential and commercial buildings to implement recycling programs.

Threshold

Mandatory separation of recyclables applies to all building owners or occupants in Cambridge. Commercial establishments are required to separate recycling materials generated on premise which represent greater than 5 percent by weight of the establishment's total refuse. Tenants in commercial buildings are required to recycle materials that represent greater than or equal to 5% by weight of their trash. Landlords are required to total tenants' waste audit figures to submit one building plan. Landlords offering gross lease arrangements must provide centralized storage containers and recycling service for any recyclable material generated in quantities of 5% or more by weight of the refuse of any one tenant. Landlords offering exclusively net lease arrangements must submit the information indicated on the Recycling Plan form and a list of all tenants.

Materials Recycled

- Office Paper
- Newspaper
- Magazines
- Corrugated Cardboard
- Ferrous Cans (steel or tin)
- Aluminum (cans, foil, trays, and containers)

- Glass containers (clear, green and brown)
- Plastic containers (single-resin narrow neck)
- Leaves and yard waste
- Waste Oil
- Storage Batteries
- Scrap Metal
- Wood waste
- Asphalt Pavement, Brick and Concrete
- Batteries (lead-acid)
- Cathode Ray Tubes (TVs and computer monitors)
- Mixed Paper
- Tires (whole)

All materials subject to Massachusetts Waste Bans are considered designated recyclables in addition to the above list.

Enforcement of the Program and Responsibilities

The mandatory recycling program is carried out under the supervision of the Commissioner of the Cambridge Department of Public Works (DPW). Both the business and the landlord of the building housing the business submit a Recycling Plan to the Commissioner of Public Works. The City of Cambridge can request any establishments to submit an updated plan or are supposed to submit an updated plan within 60 days of any changes to the current plan. The recycling haulers and drop-off centers used must be certified by the City of Cambridge Recycling Division as a bona fide recycler.

The Recycling Plans must include:

- A waste audit
- A description of the process by which recyclable materials are to be segregated from the waste, including what materials are to be separated
- Identification of how the recyclables will be collected and transported to market.
- Information on the process used to notify and educate tenants/employees of the recycling requirements

Commercial establishments failing to adhere to any of these requirements will be subject to administrative penalties outlined in Section 8.24.070(J) of the Cambridge Municipal Code.

Case Study: City of Portland, OR

Population

Estimated at 566,143 in 2009

Background

Portland garbage haulers are required to offer recycling collection for designated recyclables as part of their permit requirement. There are also independent recyclers that specialize in various

recyclables. Portland's commercial recycling collection system is not franchised. Commercial customers are allowed to choose among 64 permitted haulers in the city and negotiate rates for service.

Threshold

Any company or person collecting commercial solid waste in the City of Portland must obtain a commercial waste collection permit from the City of Portland Office of Sustainable Development. All permitted commercial waste haulers must offer collection services for recyclables and compostables to all of their solid waste customers and are required to make these recycling services known to its customers. All businesses are required to separate recyclable materials from their waste and set out for recycling a minimum of 50% of their waste, given practical limitations beyond the control of the business.

Materials Recycled

- Aerosol cans
- Aluminum
- Aseptic packaging [drink boxes]
- Corrugated cardboard and kraft paper
- Gable top paper cartons
- Glass bottles and jars, not mixed with any paper recyclable
- Magazines
- Metals: Ferrous and nonferrous scrap
- Newspapers
- Paper: office paper including white and colored ledger and computer
- Paper: scrap paper, may include envelopes, fax paper, blueprints, brochures, and other miscellaneous papers
- Plastic bottles, including milk jugs
- Steel "tin" cans
- Telephone directories
- Yard debris

Enforcement of the Program and Responsibilities

City of Portland's Office of Sustainable Development (OSD) administers the permits and mandatory recycling rules. Collecting solid waste in the City of Portland without a valid permit is considered an infraction. The infraction for collecting solid waste without a valid permit is \$500 for the first day. When a permitted commercial solid waste hauler fails to offer and provide recycling collection it is considered an infraction. The infraction costs \$500 for the first incident, with incident defined as one customer and one instance of the hauler's failure to offer and collect one or more of the required recycling materials. The general contractor is required to ensure materials produced on the job site are recycled for building projects valued at \$50,000 or more. Every business and every general contractor for a building project valued at \$50,000 or more (including both demolition and construction phases) shall complete a City-provided Recycling Plan Form. Failure to implement the required recycling is considered an infraction, \$500 for the first month.

Case Study: City of Gainesville, FL

Population

Estimated at 116,616 in 2009

Background

The City of Gainesville requires all generators of commercial waste and generators of construction and demolition debris to separate designated recycling materials and make them available for recycling. The City of Gainesville requires commercial franchise haulers to obtain a registration certificate for hauling recycling materials.

Threshold

If cardboard, newspaper, office paper, junk mail, shredded paper, metal cans, glass bottles and jar, plastic bottles, jugs, jars and tubs comprise 15% or more of the volume of your business' waste stream, these materials must be recycled.

Materials Recycled

- Corrugated cardboard & pasteboard
- Newspaper, Office paper & junk mail (including shredded paper)
- Metal cans
- Glass bottles & jars
- Plastic bottles, jugs, jars and tubs (#1 thru 7)

Enforcement of the Program and Responsibilities

Registration is required for recycling haulers. The city issues a registration certificate to a commercial franchisee. The city requires the hauler to deliver all recycling materials to a materials dealer that has been certified by the Florida Department of Environmental Protection, the city, or other responsible agency.

The generators of commercial waste and construction and demolition debris must separate the designated recycling materials and make them available for recycling. A generator of commercial waste, generator of construction and demolition debris, or owner of a commercially-collected residential property must produce proof of a valid and current contract with an approved hauler that is registered with the City or produce receipts for delivery of recovered materials to an approved site upon the request of the city manager or designee.

The generator of the commercial waste or the commercial franchisee who fails to separate or collect the recycling materials, except for "*de minimis amounts*", will be subject to a surcharge.

Case Study: Chittenden County Solid Waste District, VT

Population

Estimated at 152,301 in 2009

Background

The Chittenden Solid Waste District (CSWD) is comprised of 18 member towns in the area surrounding Burlington, Vermont. The CSWD Ordinance requires businesses to separate designated recycling from their waste. Businesses must contract with a private hauler for trash and recycling pickup, bring recycling loads greater than one cubic yard to the CSWD Materials Recovery Facility (MRF), or bring loads of less than one cubic yard of recycling to the CSWD drop-off center. The commercial hauler must provide collection of designated recyclables at least once a month to all of their solid waste customers. A commercial hauler may not offer subscription service for trash only unless they obtain an exemption from the solid waste district. Exemptions are available for businesses that collect, process, and market their own recycling materials.

Threshold

All businesses must separate the designated recycling materials from their trash and all haulers must provide recycling collection services.

Materials Recycled

- Glass bottles & jars (food and beverage containers only)
- Metal food and beverage cans and aluminum
- Plastic containers and packaging labeled 1 through 7 (but not plastic bags, plastic wrapping or Styrofoam)
- Mixed paper

Enforcement of the Program and Responsibilities

The Chittenden Solid Waste District administers the ordinance. The infraction for not properly collecting recycling as a hauler or separating recycling as a business is \$500 for each violation plus \$100 for each day the violation continues.

Summary of Benchmarked Communities

The four case studies of mandatory commercial recycling can be divided into three types of approaches:

1. Require all building owners to file recycling plan (Cambridge example)
2. Require businesses to separate designated recyclables from waste and require hauler to provide recycling collection (Portland and CSWD examples)
3. Require anyone who generates commercial waste to separate the waste for recycling (Gainesville example)

There are also differences in the recycling materials collected in the four case studies presented. Two of the case studies, CSWD and Gainesville, list the typical materials received at a MRF as the “designated recycling materials”. Portland adds scrap metal and yard waste to the list of designated recycling materials. Cambridge has the most extensive list of recycling materials and it includes everything found on the Portland list. Cambridge also includes the following as designated recycling: Waste Oil, Storage Batteries, Wood Waste, Asphalt Pavement, Brick and Concrete, Batteries (lead-acid), Cathode Ray Tubes (TVs and computer monitors), Tires (whole) and anything else on the statewide Massachusetts Waste Bans.

Mecklenburg County’s SSO requires businesses to separate the designated recycling: corrugated cardboard and office paper. When comparing the SSO with the four case studies, it most closely resembles the Gainesville example. The SSO is essentially targeting the generators of the waste and requires them to separate the designated recycling for collection.

Environmental Benefits

Table 14 shows the average tons of cardboard, mixed paper, bottles and cans recycled under the various options based on DSM survey results. The average tons of each recycling material was then multiplied by the number of businesses impacted at the existing **baseline 16 cubic yard threshold** (4900), the additional businesses impacted at the 8 cubic yard threshold (1700) and the total businesses impacted at the 8 cubic yard threshold (6600).

Table 14 *Estimated Tons of Recycling Materials Generated in Mecklenburg County²⁹*

Baseline	Threshold / Proposed Change	# Businesses	Tons OCC/Year	Tons Office Paper/Year	Tons Mixed Paper/Year	Tons Bottles/Year	Tons Cans/Year
		1	1.46	0.52	1.76	0.04	0.03
Baseline	16 Cubic Yards	4900	7,156	2,526	8,630	180	148
	8 Cubic Yards	1700	2,483	876	2,994	62	52
	Total Impact at 8 Cubic Yards	6600	9,639	3,402	11,624	242	200
	Temporary Site Exemption (TSE)	1300	9,100	6	21	14	12
	Total Impact at 8 CY + TSE	7900	18,739	3408	11,645	256	212

The GHG emission savings of recycling versus landfilling the materials was estimated using the EPA WARM model (updated by the EPA in August 2010). Table 15 was created using the WARM model and inputting the tons for each material type from Table 14. Table 15 illustrates the environmental benefits to recycling the amounts of cardboard, mixed paper, bottles and cans generated at the two thresholds, the existing **baseline 16 cubic yard threshold** and the reduction to 8 cubic yards, along with the effects

²⁹ Assumes the 500 pound exemptions would be removed for the 1700 businesses impacted at the 8 cubic yard threshold.

of removing the temporary site location exemption. Note that Table 15 presents maximum achievable tonnages assuming that all generators are 100 percent compliant, which is of course highly unlikely.

Implementing all of the recommended alternatives would result in a reduction of 104,300 MTCO₂E, or Greenhouse Gas Emissions. Figure 13 illustrates this positive environmental impact in more familiar terms. Table 15 also allows us to view the environmental impacts while combining the various alternatives considered. As an example, should the County decide to reduce the threshold to 8 cubic yards, change office paper to mixed paper *but not include bottles and cans or remove the temporary site location exemption*, would result in a reduction of 71,992 MTCO₂E.

Table 15 *Reduction in Greenhouse Gas Emissions (MTCO₂E) for Recycling Materials*

Threshold / Proposed Change	# Businesses	Reduction in GHG Emissions				
		OCC	Office Paper	Mixed Paper	Bottles	Cans
Baseline 16 Cubic Yards	4900	-22,758	-10,687	-30,690	-280	-2027
8 Cubic Yards	1700	-7,897	-3,706	-10,647	-97	-703
Total Impact at 8 Cubic Yards	6600	-30,655	-14,393	-41,337	-377	-2730
Temporary Site Exemption	1300	-28,940	-25	-75	-21	-164
Total Impact at 8 CY + TSE	7900	-59,595	-14,418	-41,412	-398	-2894

Figure 13 *Recycling Materials instead of Landfilling Materials for 7900 Businesses*

This is equivalent to...	
Removing annual emissions from	19,103 Passenger Vehicles
Conserving	11,838,763 Gallons of Gasoline
Conserving	43,458,127 Cylinders of Propane Used for Home Barbeques
Conserving	545 Railway Cars of Coal
	0.00553% Annual CO ₂ emissions from the U.S. transportation sector
	0.00435% Annual CO ₂ emissions from the U.S. electricity sector

As stated above, it is highly unlikely that all businesses would comply with the SSO. Realistically, the County might assume that roughly 50 percent of the material would be recycled, cutting the GHG emission savings illustrated in Table 15 in half.

While the savings in GHG emissions are currently of particular importance, there have always been many environmental and ecological benefits associated with recycling that go beyond the GHG savings. Unfortunately, there have been no systematic efforts to quantify these benefits, in part because the benefits are very site and region specific. Cutting rapidly growing yellow pine for example to produce

paper has significantly lower impacts than using old growth timber, as does the age of the paper plant, and the air emission controls required in different regions of the country.

Similarly, data are not even available on the groundwater impacts of producing PET from natural gas recovered in the US using new hydro-fracking techniques. In general, the WARM model, which includes all of the lifecycle energy impacts of producing materials from virgin versus recycled materials can be thought of as a surrogate for the wide range of ecological and environmental impacts associated with mining and extracting raw materials to produce new virgin materials.

Appendix A

Table of Survey Results

Category	SIC	Emp	Private Hauler	CY trash	Trash Pulled	Trash/Wk	\$ Trash	Recycle OCC	OCC Pulled	cy OCC/wk	lbs OCC/wk	lbs OCC/mth	CY paper/wk	lbs paper/wk	lbs paper/mth	\$ Recycle	Recycle?	Other Recycling	CY bottles/mth	CY cans/mth	Pay	Drive	Miles
Retail	5531	6	yes	8	1x per week	6		8 yd for OCC	1x per week	6	900	3900	1.6	640	2773		occ dumpster	no	no	no		no	
Retail	5211	37	yes	8	1x per week	6		no	n/a	0.16	8	35	0.25	100	433		drive to recycling center	paper	0.08	0.08		yes	0.5
Wholesale	5193	22	yes	8	1x per week	6	\$110	no	n/a		300.48	1302	0.05	20	87		occ baler	shred paper	0.40	0.40		no	
Retail	5499	5	yes	8	2x per week*	6	\$250	8 yd for OCC shared	1x per week	6	900	3900	0.16	64	277	\$85	occ dumpster & curbside	bottles/cans	0.08	0.08		no	
Retail	5251	5	yes	8	1x per week	6	\$245	no	n/a	4	200	867	0.16	64	277		drive to recycling center	bottles/cans	0.08	0.08	\$40	yes	1
Wholesale	5047	25	yes	8	every 2 wks	3	\$65	no	n/a	0.4	20	87	2	800	3467		n/a	no	0.04	0.04	\$10	yes	2
Wholesale	5199A	15	yes	8	1x per week	6	\$88	10 yd for OCC	every 2 wks	2.3	345	1495	0.16	64	277	\$53	occ dumpster & shredder	shred paper, bottles/cans	0.08	0.08		yes	5
Retail	5531	4	yes	8	1x per week	6		no	n/a	0.5	25	108	0.8	320	1387		occ sent back on truck	no	no	no		no	
Retail	5651	4	no	8	Mall - shared	2	rent	8 yd for OCC shared	Mall - shared	2	300	1300	0.5	200	867		occ dumpster at Mall	no	no	no		no	
Retail	5661	4	no	8	Mall - shared	3	rent	8 yd for OCC shared	Mall - shared	0.25	37.5	163	0.5	200	867		occ dumpster at Mall	no	no	no		no	
Retail	5941	2	yes	8	every 2 wks	3		8 yd for OCC	every 2 wks	3	450	1950	0.16	64	277		occ dumpster	plastic film at grocery store	no	no		yes	5
Wholesale	5072	6	yes	8	every 2 wks	3	\$78	no	n/a	0.2	10	43	0.2	80	347		n/a	no	0.08	0.08		no	
Retail	5812R	3	yes	8	1x per week	6	\$90	no	n/a	0.1	5	22	0.4	160	693		n/a	no	0.08	0.08	\$5	yes	5
Wholesale	5045	6	no	8	1x per week	1	rent	no	n/a	0	0	0	0.015	6	26		n/a	no	no	no	\$5	no	
Retail	5813	30	yes	8	2x per week	12	\$300	8 yd for OCC	1x per week	6	900	3900	0.8	320	1387		occ dumpster	no	1.00	0.50		no	
Retail	5812R	1	yes	10	1x per week	8	\$103	no	n/a	1	50	217	0.1	40	173		n/a	no	0.10	0.10		no	
Retail	5712	10	yes	8	every 2 wks	3	\$90	8 yd for OCC	every month	2	300	1300	0.08	32	139	\$80	occ dumpster	shred paper every 2 weeks	0.20	0.20		no	
Wholesale	5072	12	yes	8	1x per week	6	\$85	no	n/a	0.8	40	173	0.04	16	69		shred paper & drive	bottles/cans	0.04	0.04		yes	2
Wholesale	5169	35	yes	48	2x per week	20	\$300	no	n/a	9.75	487.5	2113	0.04	16	69		shred paper and use	no	0.04	0.04		no	
Wholesale	5136	10	yes	8	1x per week	6	\$90	no	n/a	0.1	5	22	0.8	320	1387		n/a	no	no	no	\$7	yes	10
Retail	5812C	12	yes	8	3x per week	18	\$300	4 yd for OCC	1x per week	3	450	1950	0.24	96	416		occ & grease dumpster	grease dumpster	no	no		no	
Retail	5211	9	yes	30	every 2 months	3	\$400	no	n/a	0.1	5	22	0	0	0		n/a	bottles/cans for cash	0.04	0.04		no	
Retail	5812C	5	yes	8	1x per week	6	\$108	no	n/a	0.45	22.5	98	0.12	48	208		n/a	no	0.06	0.06	\$5	yes	2
Wholesale	5012	26	yes	8	1x per week	6	\$117	40 yd RO for metal	when full	0.9	135	585	0.3	120	520		40 yd roll off for metal	metal recycling	0.30	0.30		no	
Retail	5812R	30	yes	8	2x per week	12	\$300	6 yds for OCC	1x per week	4.5	675	2925	0.8	320	1387		occ dumpster and glass	glass recycling	0.80	0.80		no	
Wholesale	5013	8	yes	8	1x per week	6		no	n/a		2.31	10	3	1200	5200		n/a	no	0.04	0.04	\$5	no	
Wholesale	5131	16	yes	8	every 2 wks	3	rent	8 yd for OCC	every 2 wks	6	900	3900	1	400	1733		occ & drive to recycle	bottles/cans	0.04	0.04		yes	12
Wholesale	5084	35	yes	8	1x per week	6	rent	8 yd for OCC	1x per week	6	900	3900	1	400	1733		occ & shred paper	shred paper / bottles & cans	0.04	0.04	\$15	yes	3
Wholesale	5099	18	yes	8	1x per week	6	\$145	no	n/a	0.6	30	130	0.6	240	1040		n/a	no	0.04	0.04		no	
Retail	5736	15	yes	8	1x per week	6	\$138	8 yd for OCC	1x per week	2.40	360.00	1560	0.27	107	462		occ dumpster	bottles/cans take home	0.04	0.04		no	
Retail	5719	10	yes	8	every 2 wks	3		Bales the OCC	bales		500	2167	0.3	120	520		occ baler	bottles/cans take home	0.04	0.04		no	
Wholesale	5162	49	yes	38	every 2 wks	10		8 yd for OCC	every 2 wks	3	450	1950	1.59	637	2760		occ dumpster	bottles/cans take home	0.04	0.04		no	
Wholesale	5084	15	yes	6	1x per week	6	\$141	8 yd for OCC shared	shared	4	600	2600	0.32	127	552		shared recycle center	bottles/cans take home	0.04	0.04		no	
Wholesale	5085	7	yes	6	1x per week	5	\$179	no	n/a	0.6	30	130	1.20	480	2080		shred paper and use	bottles/cans take home	0.04	0.04		no	
Retail	5451	3	no	8	2x per week	2	rent	8 yd for OCC	shared	3	450	1950	3	1200	5200		occ and paper	bottles/cans take home	0.04	0.04		no	
Wholesale	5013	6	yes	8	1x per week	6		8 yd for OCC	1x per week	4	600	2600	0	0	0		occ dumpster	no	no	no		no	
Wholesale	5065P	5	yes	8	3x per week	5	rent	no	n/a	0.125	6.25	27	0.125	50	217		n/a	bottles/cans take home	0.04	0.04		no	
Wholesale	5065P	40	yes	4	1x per week	3		8 yd for OCC	1x per week	6	900	3900	0.5	200	867		occ dumpster	bottles/cans take home	0.04	0.04		no	
Retail	5941	7	no	bags	1x per week	0	rent	shared occ baler	bales	0.1	15	65	0.02	6	28		occ baler shared	bottles/cans take home	0.00	0.00		no	
Wholesale	5046	12	yes	2	1x per week	1		4 yd for OCC	1x per week	0.4	60	260	1.6	640	2773		occ dumpster	bottles/cans 96 gallon	0.24	0.00		no	

Appendix B

Business Survey

Date: _____ Time: _____ Call back/email: _____
 Company Name: _____ City: _____
 Phone number: _____ Contact: _____
 Type of Business: _____ SIC Code: _____
 Number of Employees (FTE): _____

My name is John Deming and I work for DSM Environmental Services. We are consultants to the Mecklenburg County Solid Waste and Recycling Department. We are working on a study of the Counties ordinance requiring business to recycle office paper and cardboard, known as the Source Separation Ordinance. Are you familiar with it? (Explain if they are not).

We are surveying businesses in Mecklenburg County in an attempt to figure out what the economic impact would be to businesses if proposed changes to the Ordinance were made. Your participation in the survey will help the County decide whether they should change the existing ordinance or not. I just have a few quick questions to ask you. It shouldn't take more than 5 minutes.

Do you contract with a private hauler to collect your waste? Yes _____ No _____

If yes, did the private hauler mention the Mecklenburg County SSO? Yes _____ No _____

If YES, do you know what size dumpster you have (4 yd, 8yd, 16yd), and how often it is emptied?

Dumpster Size: _____ **# times emptied per month:** _____ **Monthly Fee: \$** _____

If you don't have a dumpster, how is the waste collected? Rolling Cart _____ Plastic Bags _____

Do you have a separate dumpster for recycling?

Yes _____ No _____ **Dumpster Size:** _____ **Monthly Fee: \$** _____

If you don't have a separate dumpster for recycling does your business recycle some other way?
How:

How much cardboard do you think you generate per month? In either **pounds** or **cubic yards**, if you don't know, can you estimate what percent of your waste is cardboard? _____ %.

Is this recycled? Yes ___ No ___

How much paper, other than cardboard, do you generate per month? In either **pounds** or **cubic yards**, if you don't know, what percent of your waste is paper? _____ % . Is this recycled? Yes ___ No ___

How many **plastic bottles**, such as soda pop bottles, do you generate per month?

Recycling bin size _____ filled how often a month _____ or % of trash _____

How many **aluminum cans** do you generate per month?

Recycling bin size _____ filled how often a month _____ or % of trash _____

If you don't currently have recycling, how much more a month would you be willing to spend to have your recyclables picked up?

No more than: \$0 \$5 \$10 \$20 \$30 \$40

Would you be willing to drive, self-haul, your recyclables to a dumpster located near you if it didn't cost you anything to recycle? If yes, how far would you be willing to drive? Miles _____