

Memorandum

Date: 23 September 2021

To: Patty Daley, Cape Cod Commission (CCC)

From: Jeremy Morris and Tom Ramsey, Geosyntec

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Subject: Task 1 – Quantify and Characterize Cape Cod MSW (Final Rev. 2)
MSW Out-Of-State Disposal Cost/Benefit Analysis
Geosyntec Project: ME1979

Consistent with the scope of work submitted to CCC and Barnstable County as approved under Contract No. 500-21-7914A on 12 November 2020, Geosyntec has prepared this revised final technical memorandum (memo) to describe findings from a desk study evaluation of the quantity and characteristics of municipal solid waste (MSW) generated in towns in the Cape Cod and Islands Region of Southeast Massachusetts (hereafter “Cape and Islands”). For the purposes of this evaluation, Cape and Islands towns include:

1. 15 towns in Barnstable County (Barnstable, Bourne, Brewster, Chatham, Dennis, Eastham, Falmouth, Harwich, Mashpee, Orleans, Provincetown, Sandwich, Truro, Wellfleet, and Yarmouth),
2. Six towns on Martha’s Vineyard in Dukes County (Aquinnah, Chilmark, Edgartown, Oak Bluffs, Tisbury, and West Tisbury), and
3. Nantucket in Nantucket County.

Data for evaluation were assembled in collaboration with CCC and Barnstable County following a Request for Information issued by Geosyntec on 7 December 2020, supplemented where necessary with additional publicly available sources of information. This evaluation includes disposed materials only (i.e., materials that eventually end up in a landfill or incinerator) and does not include materials that have been diverted for recycling, reuse, or other non-disposal disposition.

Waste Generation Tonnages (2019)

MSW generation on the Cape and Islands and costs for disposal were evaluated primarily based on data reported by town solid waste managers via MassDEP’s *Re-Trac* system¹. A summary of MSW generation in each town in 2019 is provided in Table 1 below, separated between the three Cape and Island counties.

Table 1: Waste Generation on the Cape and Islands, 2019

Municipality	Households Served (Sticker Holders)	MSW Disposal tons ¹	Bulky Waste Incl.	Municipality	Households Served (Sticker Holders)	MSW Disposal tons ¹	Bulky Waste Incl.
BARNSTABLE COUNTY				DUKES COUNTY			
Barnstable	8,600	8,674.74	N	Aquinnah	230	94.00	N
Bourne	8,135	5,674.70	N	Chilmark	450	123.00	N
Brewster	3,509	1,130.62	N	Edgartown	1,750	2,750.00	N
Chatham	3,160	5,139.54	Y	Oak Bluffs	2,826	732.00	N
Dennis	7,031	3,769.00	N	Tisbury	2,592	1,278.31	N
Eastham	3,759	3,570.38	N	West Tisbury	850	468.00	N
Falmouth	21,000	11,510.33	N	AVERAGE		907.55	
Harwich	5,541	4,490.00	N	SUB-TOTAL	8,698	5,445	
Mashpee	4,464	3,517.00	Y	NANTUCKET COUNTY			
Orleans	3,825	2,476.00	Y	Nantucket ³	8,871	11,397.73	N
Provincetown	2,348	3,025.00	Y	AVERAGE		11,397.73	
Sandwich	5,020	2,783.00	N	SUB-TOTAL	8,871	11,398	
Truro ²	3,348	1,047.98	N				
Wellfleet	3,309	773.87	N				
Yarmouth	9,434	8,428.00	N				
AVERAGE		4,400.68					
SUB-TOTAL	92,483	66,010.16		TOTAL	110,052	82,853	

Notes for Table 1:

1. The scope of work for this project is to help Cape and Island towns understand and plan for their solid waste management needs. Therefore, the data in Table 1 only includes MSW handled within each town’s waste management system (i.e., collected from sticker holders) and does not include the proportion of residential waste that is handled

¹ www.re-trac.com

by others or waste generated by the industrial, commercial, and institutional (ICI) sector.

2. Commercial haulers tip MSW or recyclables at the Truro transfer station; however, tonnages for Truro in Table 1 do not include this additional volume. In 2019, about 576 tons of commercial waste was handled at the transfer station.
3. Reported tonnage for Nantucket is only material processed for on-island recovery or disposal. Non-recyclable and non-compostable (NRNC) waste is shipped to Zero Waste Solutions in Rochester, MA.

Based on the data in Table 1, the towns included in this evaluation served 110,052 households and handled a total of 82,853 tons of MSW for disposal in 2019. This represented service to approximately 67% of the reported 163,419 households on the Cape and Islands.

Waste Generation Tonnages (2020)

Table 1 included data for 2019 as the most recent complete “normal” year for which data were available prior to the COVID-19 pandemic, which significantly altered consumer behavior (i.e., increased online shopping and delivery of goods and food to residences rather than in-person shopping and dining) and increased the number of second homeowners moving to the Cape and Islands as their primary residence. This changed the financial circumstances under which the towns have been conducting their MSW operations.

To consider the potential effects of the pandemic on residential populations and MSW generation rates, town MSW managers were asked by CCC to expedite entry of their 2020 data into *Re-Trac*. A summary of 2020 MSW generation available as of 5 March 2021 is provided in Table 2 overleaf, again separated between the three Cape and Island counties.

Notes for Table 2:

1. Data in Table 2 only includes MSW handled within each town’s waste management system (i.e., collected from sticker holders) and does not include the proportion of residential waste that is handled by others or waste generated by the industrial, commercial, and institutional (ICI) sector.
2. Commercial haulers tip MSW or recyclables at the Truro transfer station; however, tonnages for Truro in Table 2 do not include this additional volume. In 2020, about 736 tons of commercial waste was handled at the transfer station.

- Reported tonnage for Nantucket is only material processed for on-island recovery or disposal. NRNC waste is shipped to Zero Waste Solutions in Rochester, MA. In 2020, NRNC waste shipments totaled 2,087 tons.

Table 2: Waste Generation on the Cape and Islands, 2020

Municipality	Households Served (Sticker Holders)	MSW Disposal tons ¹	Bulky Waste Incl.	Municipality	Households Served (Sticker Holders)	MSW Disposal tons ¹	Bulky Waste Incl.
BARNSTABLE COUNTY				DUKES COUNTY			
Barnstable	9,053	9,367.00	N	Aquinnah	230	96.00	N
Bourne	8,149	6,153.28	N	Chilmark	300	83.00	N
Brewster	3,729	1,191.00	N	Edgartown	1,754	955.00	N
Chatham	5,873	4,687.00		Oak Bluffs	2,831	759.33	N
Dennis	7,004	4,253.00	N	Tisbury	2,511	1,278.00	N
Eastham	3,776	3,596.38		West Tisbury	623	187.00	N
Falmouth	21,000	13,031.79	N	AVERAGE		559.72	
Harwich	5,550	5,158.00	N	SUB-TOTAL	8,249	3,358	
Mashpee	4,624	3,922.00	N	NANTUCKET COUNTY			
Orleans	3,825	1,914.00	N	Nantucket ³	9,293	11,109.75	N
Provincetown	2,556	2,432.00	Y	AVERAGE		11,109.75	
Sandwich	5,000	2,875.00		SUB-TOTAL	9,293	11,110	
Truro ²	1,834	1,047.57	N				
Wellfleet	3,309	1,068.01	N				
Yarmouth	9,778	9,301.00	N				
AVERAGE		4,666.47					
SUB-TOTAL	95,060	69,997.03		TOTAL	112,602	84,465	

Based on comparison of Table 2 with Table 1, Cape and Island towns served 112,602 households in 2020 (about 2,500 more than in 2019) and handled a total of 84,465 tons of MSW for disposal (about 1,600 tons more than in 2019). Data for 2020 represented service to approximately 68% of the reported 164,899 households on the Cape and Islands.

The reported increase in waste generation in 2020 over 2019 was relatively modest, representing a 2.3% increase. Given the unusual circumstances of 2020, it is reasonable to assume that this “snapshot” annual rate of increase does not represent typical year-on-year growth in the MSW disposal stream. As such, Geosyntec investigated trends in population dynamics and MSW generation rates from 2011 to 2019 to project future growth (as presented subsequently in this memo). A conservative value of 85,000 tons will be assumed to represent current MSW generation.

Current Collection and Disposal Systems

A summary of waste collection services, contracts held, and the current destination for MSW disposal is provided in Table 3 below, again separated between the three counties.

Table 3: Waste Collection and Disposal Services on the Cape and Islands

Municipality	Collection Service ³	Transfer Facility ⁴	Hauler ^{1,2}	Disposal Facility ¹
Barnstable			ABC/NBWS	Crapo Hill Landfill
Bourne	Curbside		Bourne	Bourne ISWM Facility
Brewster			Covanta	SEMASS
Chatham			Covanta	SEMASS
Dennis ⁵		Yarmouth RTS	Covanta	SEMASS
Eastham			Covanta	SEMASS
Falmouth	Curbside		Bourne	Bourne IWMS Facility
Harwich			Harwich	SEMASS or Middleboro Landfill
Mashpee			ABC/NBWS	Crapo Hill Landfill
Orleans			ABC/NBWS	Crapo Hill Landfill
Provincetown	Curbside		ABC/NBWS	Crapo Hill Landfill
Sandwich			Covanta	SEMASS
Truro			Truro	SEMASS
Wellfleet			ABC/NBWS	Crapo Hill Landfill
Yarmouth		Yarmouth RTS	Covanta	SEMASS
Aquinnah		Edgartown TS	MVRDRRD	SEMASS
Chilmark		Edgartown TS	MVRDRRD	SEMASS
Edgartown		Edgartown TS	MVRDRRD	SEMASS
Oak Bluffs	Curbside	Oak Bluffs TS	Bruno's	Crapo Hill Landfill
Tisbury		Oak Bluffs TS	Bruno's	Crapo Hill Landfill
West Tisbury		Edgartown TS	MVRDRRD	SEMASS
Nantucket ⁶		Waste Options	Waste Options	Zero Waste or Waste Options

Notes for Table 3:

- Abbreviations as follows: (a) ABC/NBWS = ABC Disposal Service/New Bedford Waste Services, a private waste hauler based in New Bedford, MA (b) Bourne ISWM Facility = Integrated Solid Waste Management Facility operated by the Town of Bourne, comprising a landfill, transfer station and other waste systems; (c) Yarmouth RTS = regional transfer station, with rail and truck transfer capabilities; (d) Edgartown TS = transfer station, operated by Martha's Vineyard Refuse Disposal and Resource Recovery District; (e) Oak Bluffs TS = transfer station operated by Bruno's Rolloff Inc.; (f) Crapo Hill Landfill is located in New Bedford, MA and is operated by the Greater New Bedford Regional Refuse Management District; (g) SEMASS = Southeast Massachusetts Waste-to-Energy Facility located in Rochester, MA and operated by Covanta; (h) Middleboro

Landfill is located in Middleborough, MA and operated by Waste Management, Inc.; (i) Zero Waste is a materials recovery facility (MRF) located in Rochester, MA and operated by Zero Waste Solutions; and (j) Waste Options Inc. manages a landfill, co-composting facility, and other waste management systems on Nantucket.

2. Where ABC/NBWS is listed as the hauler, the presumed disposal facility is Crapo Hill Landfill; however, it is noted that this hauler frequently delivers waste to other off-Cape disposal facilities.
3. Where no collection service is indicated, residents must bring MSW to the town's drop-off facility.
4. Where no transfer facility is indicated, waste is either direct hauled to the disposal facility indicated or is consolidated at a small town-owned transfer facility prior to hauling.
5. Dennis has a contract to use the Yarmouth RTS but often elects to send waste directly to SEMASS.
6. Nantucket handles NRNC waste separately to the rest of the MSW stream. NRNC waste is transferred to Zero Waste. The remainder of the MSW stream is sorted to recover recyclables and processed using a co-composting facility operated by Waste Options. Residuals from the facility are landfilled.

As shown in Table 3, the vast majority of MSW handled by Cape and Island towns is sent for off-Cape disposal at Crapo Hill Landfill, Middleboro Landfill, or SEMASS. No commercial landfills operate on the Cape and Islands, and only Bourne and Nantucket have their own landfills. Geosyntec understands that the municipal authority in Nantucket recently issued a Request for Expressions of Interest to provide MSW management services from December 2025, a component of which is to suggest options for off-island transfer of MSW as alternatives to continuing on-island processing and disposal.

It is also noted that the Upper Cape RTS (UCRTS), located on property owned by Joint Base Cape Cod (JBCC) in Falmouth, has truck and rail transfer capabilities and a permitted capacity of nearly 90,000 tons/year. This facility is currently operated by Cavossa, a private waste company primarily focused on construction and demolition (C&D) waste. As such, none of the Cape and Island towns currently utilizes UCRTS; however, Geosyntec understands that Cavossa's contract will end in December 2022 with a possible extension through December 2025, and that alternative operators/uses for UCRTS may be sought.

Sticker Costs and Trends in Tip Fees

Table 4 overleaf presents current sticker costs in each town (i.e., disposal costs to residents at MSW drop-offs) as well as posted tip fee data for the last five years. Data are grouped by county (note no data were available for Nantucket).

Table 4: Current Sticker Cost and Trends in Tip Fee, 2017-2021

Municipality	Current Sticker Cost ¹ (\$/Year)	Tip Fee 2017 (\$/Ton)	Tip Fee 2018 (\$/Ton)	Tip Fee 2019 (\$/Ton)	Tip Fee 2020 (\$/Ton)	Tip Fee 2021 (\$/Ton)	Annualized Increase ²
Barnstable	\$250.00	\$70.00	\$57.79	\$57.79	\$60.70	\$96.10	7.5%
Bourne	\$30.00						
Brewster	\$50.00	\$63.04	\$63.04	\$66.23	\$67.88	\$69.58	2.1%
Chatham	\$90.00	\$65.00	\$65.00	\$90.00	\$90.00	\$90.00	7.7%
Dennis	\$182.00	\$69.38	\$70.42	\$57.79	\$98.00	\$98.00	8.3%
Eastham ³	\$120.00	\$154.00	\$154.00	\$71.75	\$73.54	\$75.38	
Falmouth ³	\$40.00		\$60.94	\$60.94	\$60.00		
Harwich ⁴	\$160.00			\$57.79	\$90.00	\$94.00	20.9%
Mashpee	\$150.00	\$56.38	\$57.75	\$59.23	\$93.75	\$93.00	13.0%
Orleans	\$125.00	\$58.00	\$59.16	\$59.23	\$91.75	\$96.10	13.1%
Provincetown	\$50.00	\$55.00	\$57.55	\$57.55	\$93.75	\$86.60	11.5%
Sandwich	\$60.00	\$68.30	\$68.30	\$71.75	\$73.54	\$73.54	1.5%
Truro	\$100.00	\$65.00	\$66.00	\$68.50	\$71.75	\$94.50	9.1%
Wellfleet	\$25.00	\$55.00	\$56.38	\$59.23	\$93.75	\$96.10	14.9%
Yarmouth	\$162.00	\$72.17	\$74.32	\$76.38	\$78.27	\$73.51	0.4%
AVERAGE	\$106.27					\$87.42	9.2%
Aquinnah	\$30.00	\$160.00	\$162.00	\$165.00	\$168.00	\$170.00	1.3%
Chilmark	\$30.00	\$160.00	\$162.00	\$165.00	\$95.00	\$170.00	1.3%
Edgartown	\$30.00	\$160.00	\$162.00	\$165.00	\$95.00	\$170.00	1.3%
Oak Bluffs ⁵	\$25.00	\$146.50	\$146.50	\$146.50	\$146.50	\$146.50	0.0%
Tisbury ³	\$35.00		\$146.50	\$146.50			
West Tisbury	\$30.00	\$160.00	\$160.00	\$165.00	\$165.00	\$170.00	1.3%
AVERAGE	\$30.00					\$165.30	1.0%

Notes for Table 4:

1. Sticker cost indicated is the most recent value posted on *Re-Trac*, typically 2019 or 2020.
2. Annualized increase is calculated as the difference in tip fee between 2017 and 2021, pro-rated over a five-year period.

3. Geosyntec could not meaningfully calculate an annualized increase in tip fees for Eastham, Falmouth, or Tisbury. Insufficient data were available from Falmouth and Tisbury, while the reported tip fee at Eastham apparently decreased by about half between 2018 and 2019.
4. Due to limited data availability for Harwich, the annualized increase in tip fee was calculated as the difference between 2019 and 2021, pro-rated over a three-year period.
5. In Oak Bluffs, residents 60 years and older are charged a reduced fee of \$10/year per sticker.

As indicated in Table 4, costs for MSW disposal vary significantly between towns. Sticker costs are significantly higher in Barnstable County than on Martha's Vineyard; however, average tip fees on the island are about twice that of Barnstable County. Overall, tip fees are increasing by an annual average of 9% in Barnstable County and about 1% on Martha's Vineyard.

Projected Waste Disposal Capacity Needs

Official population growth data for the Cape and Islands show that the population declined from about 236,100 in 2010 to 233,900 in 2015 at an annualized rate of about -0.8%. It is projected² that the population will further decrease from about 233,400 in 2020 to about 218,100 in 2035, albeit at a slightly lower annualized rate of between -0.6% and -0.4%. This suggests that future waste generation should be lower than current generation on a total tonnage or volume basis.

Waste generation rates in Cape and Island towns between 2011 and 2019 were evaluated based on data reported by town solid waste managers via *Re-Trac*. With a few exceptions, the reported waste generation rate in all Barnstable County towns decreased by a combined average of about 1,100 tons/year, from 74,893 tons in 2011 to 66,010 tons in 2019. Similarly, the reported waste generation rate on Martha's Vineyard fell by a combined average of about 240 tons/year, from 6,573 tons in 2011 to 5,445 tons in 2019. Insufficient data were available to evaluate trends on Nantucket. Although not presented in detail here, full results from the

² Renski, et al. (2015) "Long-term Population Projections for Massachusetts Regions and Municipalities" U. Mass Amherst Center for Economic Development Technical Reports. 181.
https://scholarworks.umass.edu/ced_techrpts/181

town-by-town calculations of waste generation between 2011 and 2019 are provided in Appendix 1.

In addition to population decreases, it is assumed that active recycling and composting campaigns coupled with a move to pay-as-you-throw (PAYT) pricing for disposal in many towns have helped drive down total and per-capita waste generation in the Cape and Islands. However, given the significant seasonal variation in populations of many towns, and the need for this study to provide conservative estimates of future waste management challenges, it is recommended that a growth rate of zero rather than a declining rate is assumed in analysis of future waste tonnages/volumes.

Waste Composition

Specific waste composition data for the Cape and Islands are not available³, although several relevant studies from Massachusetts and other New England states have been performed in the last ten years. These include the following, listed in reverse chronological order:

1. 2019 Waste Characterization Study in Support of Class II Recycling Program, prepared for Covanta Energy SEMASS, 11 February 2020. *Two-season study (Spring + Fall). Residential + ICI sectors. Provides statistical characterization of waste received at SEMASS from contract communities in 2019, including several Cape and Island towns. Residential sample size = 20.*
2. 2019 Massachusetts 2030 Solid Waste Master Plan, Draft for Public Comment, prepared by Mass DEP, September 2019. *Two-season study (Spring + Fall). Residential + ICI sectors. Includes report titled “Summary Analysis of Municipal Waste Combustor Class II Recycling Program Waste Characterization Studies,” which includes data from Study #1 above as well as five other WTE facilities. Data are not separated between residential and ICI sectors. Unspecified total sample size.*
3. 2018 Vermont Waste Characterization Final Report, prepared for Vermont Dept. of Environmental Conservation Solid Waste Program, 14 December 2018. *Unspecified seasonality. Residential + ICI sectors. Provides statewide survey of mixed MSW based on ASTM D5231-92 (2016). Residential sample size = 95.*

³ Geosyntec understands that some waste sorting studies have been performed on Nantucket; however, studies representing larger, more varied jurisdictions are preferred.

4. 2018 Fact Sheet: Advancing Sustainable Materials Management, prepared by U.S. Environmental Protection Agency, November 2020. *Information used by EPA to measure the success of materials management programs across the country and to characterize the national waste stream. 2018 data. Unspecified sectors and sample sizes.*
5. 2015 Rhode Island Solid Waste Characterization Study Final Report, prepared for Rhode Island Resource Recovery Corp., 31 December 2015. *Four-season study. Residential + ICI sectors. Characterization study of solid waste that is generated within the State of Rhode Island and managed by RIRRC. Residential sample size = 105.*
6. 2015 Statewide Waste Characterization Study Final Report, prepared for Connecticut Dept. of Energy and Environmental Protection, 15 March 2016. *Two-season study (Summer + Fall). Residential + ICI. Statewide study performed as follow up to inaugural study in 2009. Residential sample size = 136.*
7. 2011 Maine Residential Waste Characterization Study, School of Economics Staff Paper #601, prepared by University of Maine School of Economics. *Two-season study (Summer + Fall). Examined trash bags from 17 municipal waste programs representing 11% of state population. Residential only, no bulky waste included. Sample size not specified.*
8. 2011 Massachusetts Waste Characterization Data, Material Category Profiles from Municipal Waste Combustor Class II Recycling Program Waste Characterization Studies, prepared by MassDEP, February and March 2011. *Summary of food waste and compostable paper, cardboard, paper, textiles, and carpet waste from residential and ICI sectors. Based on 2010 disposal of 4.7 million tons statewide comprising 45% residential. Sample size not specified.*

A summary of data from four of the more recent and relevant studies is provided in Table 5 overleaf, separated into major material categories of interest. The “assumed value for analysis” indicated in the table is an average from the four studies in the table, rounded to the nearest 0.5%. This value is recommended for use in any future tasks. After consideration, equal weighting was given to the four studies to make up for the fact that the most relevant study (2019 SE Mass.) has the smallest sample size. The two studies from 2011 were eliminated from Table 5 as being too old and representing an unknown sample size; however, these studies can be reviewed during later study tasks if needed. Data from the 2018 U.S. EPA study provided only broad material categories (i.e., a catchall category of “plastics” rather than a breakdown between different plastic compounds and product types), while data from the 2019 statewide studies reported by MassDEP do not differentiate between residential and ICI sectors. For this

reason, these data were used to benchmark the other studies but are not included in Table 5. Full results from all studies listed above are included in Appendix 1.

Table 5: Summary of Waste Composition Data from Studies in New England, 2015-2019

Study No.	1	3	5	6	Assumed Value for Analysis
Date	2019	2018	2015	2015	
Location	SE Mass.	Vermont	Rhode Island	Connecticut	
Sample Size	20	95	105	136	
Paper (excl. Compostable)	9.3%	7.5%	6.8%	8.3%	8.0%
Cardboard	5.0%	3.9%	4.4%	2.1%	4.0%
Plastic (PET+HDPE)	1.8%	1.6%	1.1%	1.6%	1.5%
Plastic (Other Hard)	3.1%	2.1%	2.3%	1.6%	2.5%
Plastic (Polystyrene)	0.6%	0.5%	0.7%	0.6%	0.5%
Plastic (Soft+Other)	8.1%	8.2%	7.3%	6.9%	7.5%
Metal (Al)	0.6%	0.7%	0.7%	0.6%	1.0%
Metal (Other)	2.7%	2.0%	2.4%	2.3%	2.5%
Glass	4.7%	2.3%	1.6%	2.8%	3.0%
Organics (Food)	12.8%	20.8%	17.0%	20.0%	18.0%
Organics (Other)	5.9%	8.4%	13.2%	10.1%	9.0%
Compostable Paper	9.3%	10.7%	7.3%	9.6%	9.0%
C&D	18.1%	9.9%	8.7%	12.3%	12.0%
Special/HHW	5.8%	0.6%	0.5%	0.8%	2.0%
Electronics	1.1%	1.1%	0.7%	0.4%	1.0%
Tires+Rubber	0.3%	1.2%	0.1%	not reported	0.5%
Textiles+Leather	4.0%	6.1%	7.3%	7.4%	6.0%
Bulky Materials	4.9%	3.3%	7.1%	2.2%	4.0%
Other	1.9%	9.1%	10.8%	10.4%	8.0%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%

Note for Table 5:

- Abbreviations as follows: (a) PET = polyethylene terephthalate, also known as PETE or Plastic #1; (b) HDPE = high density polyethylene, also known as Plastic #2; (c) Al = aluminum; (d) HHW = household hazardous waste.

Overall, grouped within the major categories of waste components, the assumed values for analysis are paper and cardboard (12%), plastics (12%), ferrous and non-ferrous metals (3.5%), glass (3%), compostable organics (36%), C&D waste, primarily wallboard, treated wood, and similar materials from home improvement projects (12%), textiles and leather (6%), and bulky items (4%).

Recovery Potential for Food Waste and Additional Recyclables from Residential Waste

Based on the data in Table 5, in Geosyntec’s opinion the opportunities for recovery of materials from the residential waste stream, and thus reduction in the total quantity of MSW for disposal, are as follows:

1. **Food Waste and Compostables:** Overall, about 36% of the waste stream by mass could theoretically be recovered for composting or anaerobic digestion (AD), representing nearly 30,000 tons of MSW annually. Implementing additional food waste and organics diversion measures on a town-by-town or regional basis could thus significantly reduce long-term reliance on out-of-state disposal.
2. **Paper and Cardboard:** Overall, cardboard comprises about 4% of the waste stream (about 3,300 tons annually). It is likely that additional cardboard could be recovered for the recycled fiber market if additional measures are taken to educate residents on the importance of separating cardboard and keeping it clean and dry. It is unlikely that much of the disposed paper has additional recovery value.
3. **Plastics:** Most of the plastics in the disposal waste stream is low-value film and hard-to-recycle materials, with only 1.5% comprising PET and HDPE. This likely represents the value placed on these high-value plastics under Massachusetts’ bottle bill⁴. As such, it is unlikely that much of the disposed plastics have additional recovery value.
4. **Metals:** Similar to high-value plastics, the data indicate that very few Al cans or other high-value Al materials remain in the waste stream for disposal, again probably reflecting the value of these items under the bottle bill. Other metal items are likely to be dirty food cans or composite materials with little recycle value.
5. **Glass:** Given the general popularity of glass recycling, it is likely that glass items in the waste stream for disposal are dirty or broken/crushed with little recycle value, although crushed glass (cullet) may have reuse value as construction aggregate.
6. **C&D waste:** About 12% of the residential waste stream for disposal is C&D waste, representing over 9,900 tons annually. Depending on the nature of materials included in this material class, which is very broad, some additional recovery potential could be realized. The most effective mechanism for diversion of C&D could be to provide

⁴ <https://www.mass.gov/deposit-bottle-can-recycling>

additional dumpsters for sorting salvageable wood, concrete, and clean soil from other low-value items.

7. Textiles: About 6% of the disposal waste stream (nearly 5,000 tons annually) may comprise textiles, which appears to offer opportunities for additional recovery of this material class. However, given the existence of textiles recycling programs, swap shops, thrift stores, etc. in several Cape and Island towns, it is likely that textiles of good quality are already being recovered such that the disposal stream mainly includes worn, ripped, or stained items. Nonetheless, additional recovery could be examined on a town-by-town basis.

Based on the discussion above, the waste component with the highest potential for increased recovery appears to be food waste and other organics (about 30,000 tons annually) as well as cardboard (over 3,000 tons annually). Some C&D waste components and textiles may offer additional recovery potential.

Additional Recovery Potential for Food Waste from Commercial Sector

It is noted that the discussion of food waste recovery above refers to residential waste and thus would not be subject to MassDEP regulations requiring that large generators of food waste implement recovery systems within certain date thresholds. As such, programs to increase food waste recovery on a town-by-town or regional basis can be planned without regard to the timetable for large generators. Notwithstanding, Geosyntec estimates that over 100 food waste generators on the Cape and Islands with total tonnage of about 12,600 tons/year may be subject to the existing one-ton per week threshold, rising to nearly 230 generators and over 16,800 tons/year under the upcoming half-ton per week threshold. Therefore, significant interest should exist among the ICI sector in implementing food waste processing systems, and Cape and Island towns could work with these generators to develop and operate systems that meet the needs of both the ICI and residential sectors.

Attachments

Attachment 1: Task 1 Waste Analysis (MS Excel)

INCLUDED AS ELECTRONIC ATTACHMENT TO THE PDF FILE