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The Regional Municipality of Durham Report

To: Regional Council
From: Commissioner of Works
Report: #2019-WR-5
Date: March 27, 2019

Subject:

Results of the 2018 Residential Garbage Composition Study Undertaken by Canada Fibers Limited

Recommendation:

That this study, summarizing the results of the 2018 Residential Garbage Composition Study completed with Canada Fibers Limited, be received for information.

Report:

1. Purpose

- 1.1 At the direction of Regional Municipality of Durham (Region) Council, this report provides the results of the 2018 Canada Fibers Limited Garbage Composition Study (Study) to address deferred Recommendation c) of the 2019 Solid Waste Servicing and Financing Study (Report #2019-COW-03).
- 1.2 This report also advises Regional Council that the results of this Study confirm the data of previously used studies in the preliminary analysis, and that the organics in the Region's garbage is suitable for anaerobic digestion. The data will be used to further inform, refine and update the anaerobic digestion business case, as necessary, along with updating other inputs for the business case analysis.

2. Background

- 2.1 At its meeting of January 17, 2018, Regional Council approved the 2018 Solid Waste Management Servicing and Financing Study (Report #2018-COW-11),

authorizing staff to enter into a sole source contract with Canada Fibers Limited.

2.2 The objective of this Study was threefold:

- a) Demonstrate the reliability of mixed waste processing to consistently recover digester and composting-ready organics, valuable metals and rigid plastics for recycling;
- b) Provide informational value to assist in future decisions on the viability of mixed waste processing to aid in increasing diversion; and
- c) Understand whether garbage originating from single-family residential homes has the same or different diversion potential than garbage originating in multi-residential dwellings.

2.3 Study results will also be used to update previous Regional garbage composition studies and to verify the quantity and quality of organic garbage in the Region's garbage stream available for anaerobic digestion.

2.4 The Study sampled garbage that would have otherwise by-passed the Durham York Energy Centre (DYEC) to landfill. Garbage from the Region's single-family and multi-residential sectors was sampled separately.

2.5 This was the largest and most comprehensive garbage composition study ever conducted by the Region. Garbage from across the Region was analyzed. In total, 3,583 tonnes of the Region's residential garbage was processed through the Canada Fibers Limited's mixed garbage processing facility from May 28, 2018, to August 17, 2018, at a rate of about 350 tonnes per week.

2.6 While Regional Council approval allowed for up to 10,000 tonnes of garbage to be processed in this Study, 3,583 tonnes of by-pass garbage available from the DYEC during the study period was processed.

2.7 The garbage was processed at the Canada Fibers Limited Dongara Facility in the City of Vaughan. The process involved shredding all incoming material to de-bag the garbage before sorting it into five fractions.

2.8 After reviewing the detail that the five fractions would provide, staff determined that further detail was needed to maximize the value of the Study's results. To that end, AET Group Inc. (AET) was subcontracted to manually sort and analyze the five main streams into 21 material categories. Samples from every incoming load of garbage was also sampled into 21 material categories to determine a

mass balance at the Dongara Facility.

- 2.9 The organics from this process also underwent laboratory analysis to determine their suitability to generate biogas. The sampling protocol and the sample size ensured that the results obtained were statistically representative of the Region's overall garbage composition.

3. Study Results (Quantity)

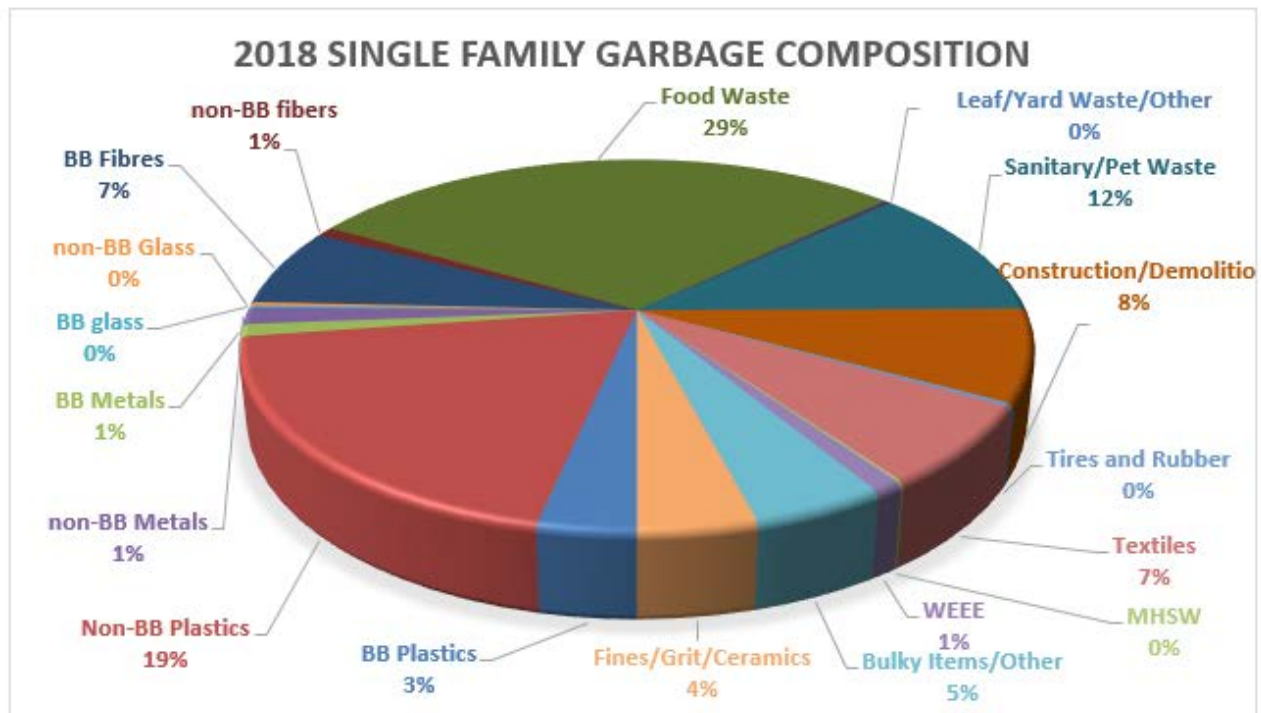
- 3.1 The following summarizes the single-family and the multi-residential garbage compositions. Additional composition details are provided below in Chart 1 for single-family households and in Chart 2 for multi-residential dwellings (apartments/condos).

3.2 Single-Family Garbage Composition (What is in the garbage bag?):

- a) The Study confirmed that approximately 29 per cent of materials disposed of in the garbage is food waste. Additional materials found in the garbage that could be explored further for potential processing with anaerobic digestion included sanitary products and pet waste (12 per cent) and soiled paper (eight per cent). In total, up to about 49 per cent of the garbage was organics that could be processed using anaerobic digestion, if sanitary products and pet garbage are to also to be processed using anaerobic digestion
- b) About 11 per cent of garbage sampled was Blue Box recyclables. Recyclable papers comprised seven per cent of this fraction (which is included as part of the 49 per cent potential organics above), while four per cent was lighter-weight recyclable plastics, metal containers and glass.
- c) "Non-Recyclable Plastics" such as plastic film, rigid plastics, polystyrene, single-use plastics, etc. comprised 19 per cent of the garbage stream.
- d) Household hazardous garbage and garbage electronic and electrical equipment made up about one per cent of the garbage stream.
- e) Finally, this garbage stream included about 12 per cent non-combustible garbage such as concrete, rubble, ceramics/porcelain, grit and glass.

3.3 Chart 1 below provides a graphical representation of the detailed single-family garbage composition.

Chart 1: 2018 Single-family Garbage Composition



Note: Reference to 0% in Chart 1 denotes that the material category comprises less than 0.05 per cent of the total material composition.

3.4 Multi-Residential Garbage Composition

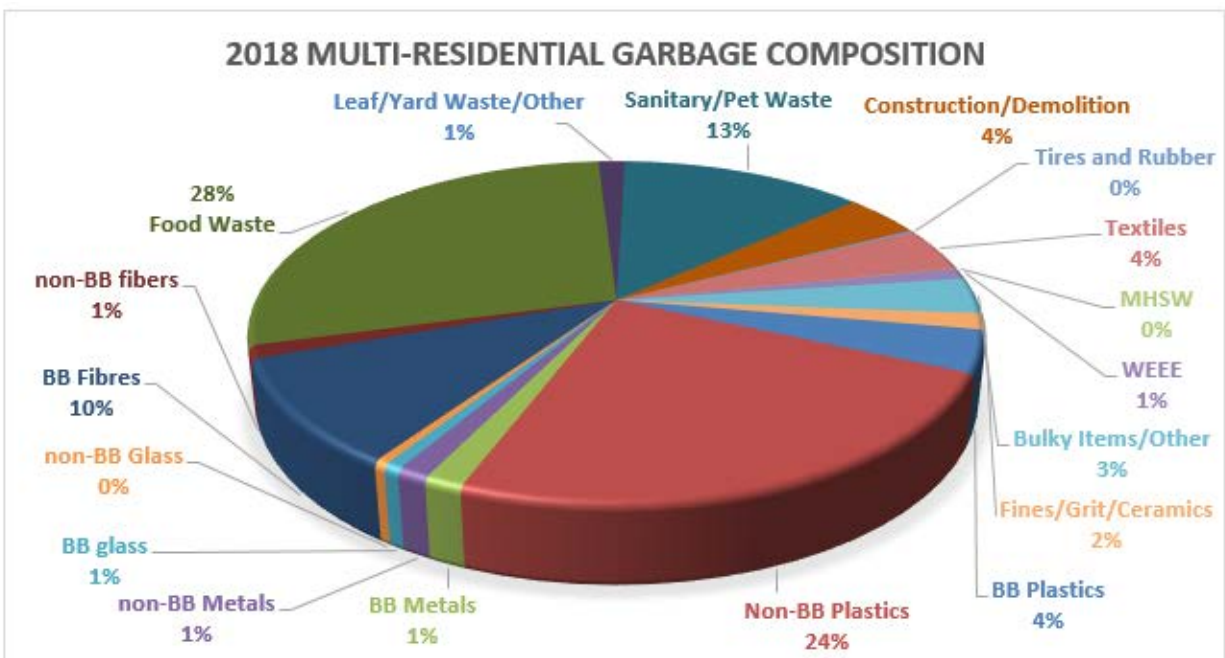
- a) About 28 per cent of the multi-residential garbage stream was food waste. Another 13 per cent was sanitary products and pet waste. Soiled paper made up another 10 per cent for a potential total of up to 51 per cent of organics in the multi-residential garbage stream that could be processed using anaerobic digestion
- b) The multi-residential garbage contained about 16 per cent Blue Box materials of which 10 per cent was paper fibers and six per cent was plastic, glass and metal containers.
- c) “Non-Recyclable Plastics” such as plastic film, rigid plastics, polystyrene, single-use plastics, etc. made up 24 per cent of the multi-residential garbage.
- d) Household hazardous garbage and garbage electronic and electrical

equipment made up to one per cent of the multi-residential garbage.

- e) Finally, the multi-residential garbage stream included about six per cent non-combustible garbage such as concrete, rubble, ceramics/porcelain, grit and non-blue box glass.

- 3.5 Chart 2 below provides a graphical representation of the composition of multi-residential garbage.

Chart 2: 2018 Multi-Residential Garbage Composition



Note: Reference to 0% in Chart 2 denotes that the material category comprises less than 0.05 per cent of the total material composition.

4. Study Results (Quality of Organics)

- 4.1 Biomethane Concentration - Typical average methane concentrations of biogas in organics from garbage range from 50 per cent to 75 per cent. The organics recovered from the Region's garbage were analyzed for their biomethane concentration and returned results between 62 and 63 per cent.
- 4.2 Contamination - The Dongara Facility used in this Study shreds all incoming material to de-bag it before sorting it. The shredders reduce materials for mechanical separation which resulted in some glass and grit being found in the organics. The captured organics were, otherwise, quite clean and suitable for

anaerobic digestion. Modern pre-sorting facilities utilize specialized bag breaking and automated sorting technology to open garbage bags with the lowest impact on their contents which minimizes contaminants in the organics allowing maximum recovery from the organics stream.

5. Past Regional Studies/Garbage Audits

- 5.1 Table 1 below compares the results of the Study to the Region's 2011 Big Blue and 2013 Multi-residential garbage audits. The 2018 Study identified that non-recyclable plastics in the garbage stream have increased significantly in the five to seven years since the 2011 and 2013 studies relative to the other material streams.

Table 1: Results of the 2018 Canada Fibers Limited Garbage Composition Study Versus Results of the Region's 2011 Big Blue and 2013 Multi-Residential Garbage Audits

Material	2011 Single Family Audit	2013 Multi-Residential Audit	2018 Study Single-Family	2018 Study Multi-Residential
Blue Box Paper	6%	12%	7%	10%
Blue Box Plastics (PET, PP, HDPE)	1%	2%	2%	4%
Non-Blue Box Plastics (cups, lids, bags, toys, furniture, other)	16%	6%	19%	24%
Blue Box Ferrous Metals	0%	1%	0%	1%
Blue Box Non-Ferrous Metals	1%	1%	1%	1%
Non-Blue Box Metals	2%	1%	1%	1%
Glass	1%	1%	1%	1%
MHSW	1%	0%	0%	0%
Other Non-Recyclables	25%	27%	27%	15%
Organic Fraction	47%	49%	42%	43%
Total	100%	100%	100%	100%

Note: Reference to 0% in Table 1 denotes that the material category comprises less than 0.05 per cent of the total material composition.

6. Financial

- 6.1 The Study was funded from the 2018 Solid Waste Management Operating Budget which included an allocation of \$1,310,000 for the Study and all by-pass waste. The total cost to complete the Study was approximately \$980,000. The 2018 total cost for the Study and by-pass tonnes was \$1.4 million. The total tonnes by-passed in 2018 was approximately 10,240 (including the Study tonnes).
- 6.2 The Study cost included:
- Canada Fibers Limited's costs for their staff time to secure and operate the Dongara Facility exclusively for the Region's Study, and to cover arrangements for disposition of the material after the Study;
 - Haulage of Regional garbage to the Dongara Facility, in the City of Vaughan, and;
 - The expanded scope of the Study (as outlined in Section 2.8 of this report) to have all labour, time and materials for AET to handle, sort and analyze the garbage into 21 material categories, the laboratory analysis, final reporting and project management.

7. Conclusion

- 7.1 This study identified 21 constituent components within the Region's garbage and confirmed that the garbage stream has sufficient organics in both quantity and quality to make anaerobic digestion viable in the Region.
- 7.2 Both single-family and multi-residential garbage streams contained non-combustible materials such as glass, concrete and rubble, ceramics and porcelain, and grit.
- 7.3 A modern anaerobic digestion facility with mixed garbage pre-sorting facility utilizes specialized bag breaking and automated sorting technology to open garbage bags with minimal impact on their contents which allows for the removal of materials from the garbage stream, freeing up valuable processing capacity at the DYEC.
- 7.4 The 2018 Canada Fibers Limited Garbage Composition Study was the largest study of its kind undertaken by the Region.

- 7.5 The results confirm that the organics in the Region's garbage stream meet the requirements for anaerobic digestion processing in both quantity and quality.
- 7.6 This report has been reviewed by the Finance Department.
- 7.7 For additional information, please contact Craig Bartlett, Manager, Waste Operations, at 905-668-7711, extension 3561.

Respectfully submitted,

Original signed by:

Susan Siopis, P.Eng.
Commissioner of Works

Recommended for Presentation to Committee

Original signed by:

Elaine Baxter-Trahair
Chief Administrative Officer