



The Regional Municipality of Durham Report

To: The Committee of the Whole
From: Commissioner of Works and Acting Commissioner of Finance
Report: #2018-COW-146
Date: June 6, 2018

Subject:

Request for Information #RFI-1158-2017 for Mixed Waste Transfer and Pre-sorting, Organics Processing, and Beneficial Use of By-Products/End Products

Recommendations:

That the Committee of the Whole recommends to Regional Council:

- A) That anaerobic digestion with a mixed waste transfer and pre-sort facility be approved as the preferred technologies for the Regional Municipality of Durham's long-term organics management strategy;
- B) That the development of a Phased Project Implementation Plan be authorized in order to consider the merits of a first phase with a transfer station capable of accommodating pre-sort capabilities;
- C) That future business analysis of a mixed waste pre-sort, and organics processing service delivery approach for a potential long-term organics management solution, be limited to either i) a private sector service contract or ii) a design-build-operate and maintain public-private partnership (P3) contract;
- D) That staff be directed to explore options, including confidential non-binding and procedurally fair discussions with interested partners including Request for Information Respondents, regarding partnerships, joint ventures, public-private partnership, co-ownership, or other forms of participation in order to bring available market and other financial information forward for consideration by Regional Council regarding a potential relationship as part of the long term Organics Management Strategy, and more specifically an anaerobic digestion facility;
- E) That an investigation of the benefits from Regional use of the potential energy and other by-products and environmental attributes be undertaken and compared to those benefits that may be realized through potential business partnerships;

- F) That the following additional technical and financial consulting, assistance and advisory services be retained to assist with continuing due diligence efforts, organics management project scope and characterization, and Regional Council reporting / recommendations with funding from the previously approved Organics Management Project funding:
- a) The award of the next phase of the GHD contract, at a cost not to exceed \$100,000:
 - b) Financial and business advisory services at a cost not to exceed \$75,000; and
 - c) External legal advice at a cost not to exceed \$65,000.
- G) That staff proceed with the procurement of an interim five-year solution to ensure continuous organics processing services for the Regional Municipality of Durham, with contract extensions and/or processing service expansion options which will ensure adequate flexibility for the transition to a new long-term Organics Management Strategy; and
- H) That staff be authorized to apply for the maximum available additional funding under the Green Municipal Fund Program (\$175,000 was received to date to offset study costs) in order to offset costs of recommended additional consulting study noted in Recommendation E), and, to continue to explore other grant funding opportunities.
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Report:

1. Purpose

- 1.1 This report responds to direction by Regional Municipality of Durham (Region) Council in June 2017 through Report #2017-COW-180, to provide an update on the following:

“That Regional Council authorize the Finance Department to initiate a Request for Information (RFI) to identify potential organics management proposals with Works and Finance Department staff to report back to Regional Council with the assessment from the RFI results and an updated business case in 2017.”

2. Background

- 2.1 The following 19 organizations provided responses to RFI-1158-2017:
- StormFisher Ltd, RRT Design and Construction, Hitachi Zosen Inova USA LLC, Engineered Compost Systems and EllisDon (consortium)
 - PurEnergy Inc.

- CCI BioEnergy Inc.
 - Suez Canada Waste Services Inc.
 - 3Wayste North America Technologies Inc.
 - Organic Waste Systems
 - Anaergia Inc.
 - W.S. Nicholls Construction Ltd.
 - Waste Robotics
 - Waste Management Canada Corp.
 - Bio-En Power Inc.
 - Miller Waste Systems Inc.
 - Canada Fibers Ltd.
 - Renewable Carbon Management LLC
 - Walker Environmental
 - Veolia Water Technologies Canada
 - Char Technologies Inc.
 - GM Canada
 - Veridian Corporation and Enbridge Gas Distribution
- 2.2 On March 23, 2018, an information report (#2018-INFO-45) was presented that provided an overview of the three primary organics management methods used in Ontario. On May 2, 2018, an information report (#2018-COW-98) provided an update on the assessment of the RFI responses.
- 2.3 On May 23, 2018, a Special Council Information Session was held to discuss organics management technologies, the current solid waste system in the Region, and other technical information received in response to the RFI.
- Diversion
- 2.4 On January 23, 2008, Regional Municipality of Durham (Region) Council directed that:

“The Region of Durham agrees to continue to support an aggressive residual garbage diversion and recycling program in order to achieve and/or exceed on or before December 2010, a 70 percent diversion recycling rate for the entire Region and that such aggressive programs shall continue beyond 2010.”

- 2.5 This direction was consistent with the waste diversion objectives utilized in the Environmental Assessment (EA) for the Durham York Energy Centre (DYEC) which assumed a 60 per cent diversion rate at the start of commercial operations and projected to reach 70 per cent diversion by 2020. In 2017, the Region achieved a 54 per cent diversion rate.
- 2.6 In March 2009, the Golder Associates Ltd. report “The Regional Municipality of Durham 70 per cent Waste Diversion Study” (Report #2009-WR-5) indicated that the incremental diversion initiatives available were challenging and expensive to implement, and would not achieve the Region’s 70 per cent diversion goal. The subsequent studies and waste composition audits substantiated that the greatest diversion potential from garbage bags and multi-residential waste would be from the organic materials.
- 2.7 Attachment #1 illustrates the Region’s diversion rate and waste composition of the garbage bags.

Growth

- 2.8 The Region is projected to experience significant growth. The multi-residential sector presents an opportunity for a new waste diversion process. Table 1 identifies mixed waste projections as a result of this growth that will require pre-sorting, processing, and disposal.

Table 1: Residual Mixed Waste Projections (tonnes per year)

Year	2017	2021	2026	2031	2036	2041
Single Family (SF)	81,800	89,300	103,000	117,000	126,000	135,000
Multi Residential (MR)	13,800	14,900	17,000	19,400	21,100	22,800
Total	95,600	104,200	120,000	136,400	147,100	157,800

Note: Assumes constant tonnage per household over 2019 to 2041.

DYEC Expansion

- 2.9 The DYEC was permitted to process 140,000 tonnes of waste per year. This capacity is split as 110,000 tonnes for the Region and 30,000 tonnes for the Regional Municipality of York (York). At the planning and design stages, the DYEC capacity was estimated to serve the Region’s waste disposal needs for up to 15 years, based on the population growth, waste generation levels, and diversion rates. Due to higher than expected growth, greater waste generation, and lower diversion rates, the DYEC capacity was exceeded the first year of operations in 2016.

- 2.10 The DYEC is designed with the oversized components necessary to permit an expansion without affecting the ongoing operations (receiving area, pit, auxiliary tanks, and stack). The expansion (to 250,000 tonnes per year) would require a Ministry of the Environment and Climate Change (MOECC) scoped EA and the construction costs to undertake the expansion would be approximately \$200 million. The Power Purchase Agreement (PPA) acknowledges that the DYEC is expandable and that “The Generation Facility will initially have a generating capacity of approximately 20 Megawatts (MW) with future expansions up to a maximum of 45 MW.” In the event that an expansion is implemented, a new schedule in the PPA would be required for an updated per-kilowatt hour (KWh) revenue amount. However, the existing PPA only provides preferred pricing (currently 8.31 cents per KWh) up to the 13.9 MW name-plate capacity, and any additional electricity generation above 13.9 MW is subject to market rates.
- 2.11 The DYEC achieved commercial operations in 2016. In 2017, the Region and York (Owners) needed to bypass waste as a result of insufficient processing capacity to meet the Owners’ disposal needs. The implementation of an updated Organics Management System has been assessed as the only viable option to divert waste from the DYEC and address the need to process the growing volume of waste generated in the Region. Staff evaluation of the current system indicates that without the diversion of organic material from the Region’s waste, the expansion of the DYEC would need to be considered in the near future and preparation of application for an EA amendment should commence in 2019, subject to a business case being prepared. The most current waste generation projections for 2018 indicate that the insufficient DYEC capacity necessitates up to 10,000 tonnes of waste to be landfilled.

Legislation

- 2.12 Meeting the Provincial objectives in the new Waste Free Ontario Act and the Climate Change Mitigation and Low-Carbon Economy Act provides both challenges and opportunities to the Region. In 2016, the Provincial government passed new legislation to support a circular economy through the Resource Recovery and Circular Economy Act (RRCEA). Included in the RRCEA, is a strategy to address organics management through the Organics Action Plan (OAP). The Food and Organic Waste Framework was released in April 2018 and included the OAP which supported a food and organics waste ban with phase-in anticipated to commence by 2022. Further, the OAP prescribes various targets for the recovery of organics from the curbside (70 per cent) and multi-residential dwellings (50 per cent) by 2023 and 2025, respectively. The Provincial framework also emphasizes reduction and reuse of waste as priorities initiatives.
- 2.13 The Waste Diversion Transition Act, 2016, allows the four existing Ontario stewardship programs (Blue Box, Used Tires, Waste Electrical and Electronic Equipment, and Municipal Hazardous and Special Wastes) to eventually wind down and cease operations after new full Extended Producer Responsibility (EPR) regulations are implemented under the RRCEA.

- 2.14 Under full EPR, producers will be required to:
- Assume complete responsibility, financial and operational, for the collection, transfer, and processing of designated wastes including Blue Box materials;
 - Meet stringent recovery rates for designated products and packaging sold in Ontario;
 - Seek new packaging approaches to reduce waste generation; and
 - Educate the public and involve stakeholders in participating in the new Blue Box Program.
- 2.15 The Climate Change Mitigation and Low Carbon Economy Act received Royal Assent on May 18, 2016, with the associated regulations, established Ontario's Cap and Trade program with an effective date of January 1, 2017. The Cap and Trade program presents additional uncertainties as well as potential opportunities related to solid waste management.
- 2.16 Mandatory emitters, have a compliance obligation and are required to remit a total number of emission allowances or related equivalent compliance instruments equal to the carbon dioxide-equivalent (CO₂e) emissions created during the compliance period. Over the initial 2017 to 2020 compliance period, some mandatory emitters, including the DYEC, are receiving free emission allowances under the program with all entities responsible for truing-up their emissions in 2021.
- 2.17 Additional clarity will be required around the creation and possible uses of carbon offsets, as the Province currently proposes that offset credits can only be generated through projects/initiatives that are not already included within regulated sectors (only in non-capped sectors). As discussed in Section 5, it is anticipated that future carbon offset protocols may provide opportunities for Regional participation within solid waste management (organics management and / or digestion). Clear and reliable price signals will be essential to inform project evaluation and associated quantification of offset financial benefits and it is important that the MOECC ensures the proposed organics landfill ban will not eliminate offset opportunities related to potential organics processing.

Organics Management Technology Review

- 2.18 Regional staff have been working on the development of an Organics Management Strategy since 2011. Feasibility studies, waste composition analysis, market capacity scans, and technology review have been undertaken and reported on.
- 2.19 In 2011, Regional Council directed staff to complete a preliminary investigation of Anaerobic Digestion (AD). The resulting report, dated November 29, 2013, concluded that AD is a proven technology that could be implemented, provided

the Region generates sufficient organic waste to support developing its own facility.

- 2.20 In 2014, a Request for Information (RFI) #677-2014 for organics technologies, issued by staff, received 10 responses (reported in the 2015 Annual Solid Waste Management Servicing and Financing Study, Report #2015-J-8) for waste pre-sorting and AD solutions, and confirmed that the Region does generate sufficient organic waste to support the development of its own AD solution.
- 2.21 In response to the Food and Organics Waste Framework, a comprehensive organics management option assessment was completed which confirmed that: mixed waste pre-sorting offers the best solution for capturing and diverting organics and that there is a range of AD processing technologies which could be adopted for the Region's organic waste stream.

Existing Organics Management Merchant Capacity

- 2.22 Recently, both the City of Toronto and the Region of Peel completed an RFP process for securing organic food waste processing capacity through a service contract. Both Toronto and Peel received very limited responses clearly demonstrating that there is no merchant capacity currently available in Ontario, and they have determined that the best option from an economic and environmental point of view is to proceed with a regionally established facility.
- 2.23 However, several Respondents through the Region's recent RFI did indicate a willingness to provide a private sector service delivery contract option including private sector infrastructure build. In such a scenario, any service delivery model (private service contract or public private partnership) would be anticipated to require a guaranteed waste organic feedstock commitment from the Region.

Organics Management Request for Information Responses

- 2.24 At the May 2, 2018, Committee of the Whole meeting, staff brought forward an information report (#2018-INFO-45) that summarized the responses received on the subject RFI. The findings are summarized as follows:
- There is significant interest in participating in the Region's Organic Management Strategy.
 - Anaerobic digestion (AD) was a preferred technology for organics management among many of the Respondents.
 - There is potential for a number of business relationships although further details are needed to assess the viability of such options.
 - There are a variety of service delivery models that Respondents were open to.

- Beneficial use of by-products is viable, subject to assuring end markets for such products.
- Only two Respondents expressed an interest in the beneficial use of by-products and one Respondent proposed a potential partnership for the use of the by-products.
- RFI Respondents identified a number of factors that require further analysis and or clarification, including but not limited to additional mixed waste composition analysis and location of the mixed waste transfer and pre-sorting facility (which impacts capital and haulage costs). The majority of Respondents wanted a facility inside the Region on land provided by the Region.
- The RFI Respondents recommended that the Region should undertake additional organics quality testing on the Organic Fraction of the Mixed Waste (OFMW) from the approved pilot study to assist with determining the most appropriate end use for the end product.
- A 20-year solution (and beyond) was noted by some Respondents as appropriate, while others indicated need for proper sizing and using a phased approach to accommodate changes in tonnages and compositions over time.
- Merchant capacity to accommodate a projected 20 year requirement is not currently available but there is a willingness to provide capacity through a private sector infrastructure build.
- Some Respondents indicated that a site provided by the Region inside the Region is desirable but not necessary.

3. RFI Technology Assessment

- 3.1 The GHD technical memo which supports the following assessment is included at Attachment # 2.

Mixed Waste Transfer and Pre-sort

- 3.2 Ten RFI Respondents expressed an interest in mixed-waste transfer and pre-sorting systems, and six of the ten Respondents provided detailed responses to the technical questions. A number of Respondents indicated that these types of facilities are expandable either physically or operationally.
- 3.3 The majority of Respondents indicated a preference for a facility inside the Region on land provided by the Region. One Respondent has a private mixed waste pre-sorting facility outside of the Region's boundaries with a transfer function within the Region's boundaries and they expressed interest in accepting

the Region's organics.

- 3.4 At the November 28, 2013, Joint Works and Finance and Administration Committee meeting, consideration was given to a proposal to construct a centralized transfer station at the Garrard Road site at an estimated cost of \$7.0 million (Report #2013-J-38: The 2014 Annual Solid Waste Management Servicing and Financing Study). The Committee referred the recommendation back to staff for consideration of options to include more than one transfer site. Subsequently, as part of the 2015 Annual Solid Waste Management Servicing and Financing Study (Report #2015-J-8), the scope was expanded to create a transfer station that incorporated multi-material pre-sort technology.
- 3.5 Mixed waste transfer and pre-sort systems generally receive waste from collection vehicles, the system then opens the garbage bags, removes any hazardous or dangerous materials using equipment or manual sorting, and then utilizes mechanical equipment to remove and sort organics. The mass balance assessment of the anticipated organics recovery from the pre-sort is illustrated in Table 2.

Table 2: Total Projected Recoverable Organic Material (tonnes per year)⁽¹⁾⁽²⁾

Year	2017	2021	2026	2031	2036	2041
Mixed Waste	36,300	39,600	45,600	51,800	55,900	60,000
Source Separated Organics	28,400	31,000	35,900	40,900	44,000	47,200
Total	64,700	70,600	81,500	92,700	99,900	107,200

Notes:

1. Assumes constant tonnage per household over 2019 to 2041.
2. Estimates do not include any additional sources of organics other than what is collected in the Region's current systems.

- 3.6 Once organics are removed from the mixed waste stream, the remaining material is sent through mechanical automated equipment that can sort and remove a variety of additional products: metals, aluminum, fibres, different grades of plastics, and glass. These separated commodities are sent to their respective recyclables' market to reduce the use of raw materials in manufacturing. The estimated mass-balance assessment of the pre-sort for recyclables is illustrated in Table 3.

Table 3: Estimated Recoverable Recyclables from Mixed Waste (tonnes per year) ⁽¹⁾⁽²⁾⁽³⁾

Year	2017	2021	2026	2031	2036	2041
Ferrous Metals*	300	300	400	500	500	500
Non-Ferrous Metals*	500	500	600	700	700	800
Polyethylene Terephthalate (PET)	1000	1,100	1,200	1,400	1,500	1,600
High-density polyethylene (HDPE)	300	300	400	400	400	500
Rigid Mixed Plastic Containers	300	300	400	400	500	500
Total	2,400	2,500	3,000	3,400	3,600	3,900

Notes:

1. Assumes constant tonnage per household over 2019 to 2041.
 2. Ferrous and non-ferrous metals that were previously recovered at the DYEC would be recovered at the Mixed Waste Transfer and Pre-sort Facility once operational.
 3. As part of the 2018 Solid Waste Servicing and Financing Study, Region Council authorized a composition study to be undertaken in 2018 to sample the existing mixed waste stream.
- 3.7 The mixed waste transfer and pre-sort system would divert materials currently processed at the DYEC and create capacity necessary to accommodate the absolute increase in waste garbage created by population growth, higher waste generation rates, and waste composition changes. The diversion rate could also be increased to surpass 70 per cent for waste generated by single family and multi-residential units.
- 3.8 The additional benefits of the mixed waste transfer and pre-sort system in relation to the DYEC operations are as follows:
- Removing organics from the residual waste sent to the DYEC may improve the electricity produced per tonne of waste;
 - Removing metals and glass, which do not contribute to the generation of electricity, will increase the capacity for combustible materials at the DYEC;
 - The pre-sort process will be an additional screening of waste composition and removal, prior to being processed at the DYEC; and,
 - The pre-sort process will produce a more homogeneous refuse-derived fuel, which will be better processed at the DYEC.

- 3.9 The mixed waste transfer and pre-sort system would be considered a standalone facility that could be co-located with an organics processing facility or at a separate site. This could be accommodated through a phased implementation with the mixed waste transfer and pre-sort facility being constructed in advance of the organic processing facility. With a number of Respondents indicating that co-location of the mixed waste transfer and pre-sorting facility and organics processing facility could achieve some cost savings, this is a further consideration to be examined.

Organics Processing

- 3.10 The assessment indicated that the technologies outlined by Respondents through RFI #1158-2017 are either aerobic or anaerobic, and were considered proven with experience through existing reference facilities. The majority of the submissions indicated utilization of AD technology and there were no alternative innovative technologies proposed.
- 3.11 Report #2017-COW-180, dated June 7, 2017, indicated that the mixed waste transfer and pre-sort with the AD technology was best suited to meet the project drivers. AD is a viable and proven technology. As previously reported, there are 14 facilities in North America and 93 facilities in Europe that currently treat Source Separated Organics (SSO) and/or the OFMW by AD processing.
- 3.12 The timeframe that was identified by the Respondents to have an operational AD facility was between 18 months and four years from notice to proceed. In advance of the Region's organics processing contract expiring in 2019, an interim service delivery contract will be necessary to facilitate an organized transition for organics processing up to five years (2023).

4. Financial Implications and Risk Assessment

- 4.1 The following sections provide an overview of the updated preliminary business case based on additional information as received through the RFI process. The cost analysis should still be considered preliminary given there a notable amount of additional information that is still required in addition to continued uncertainty around final regulations related to organics management, energy and carbon markets.

Updated Preliminary Operating and Capital Cost Estimates

- 4.2 This report provides updated, yet still preliminary, cost estimates associated with potentially expanding the Region's organics processing capability to include either an aerobic (in-vessel) or AD organics processing facility, including a facility for transfer and pre-sort of mixed waste:
- The up-front capital costs for transfer/pre-sort and organics processing are estimated at \$160 to \$170 million, including land, for both organics processing options (not including biogas upgrading facility). Sensitivity

analysis suggests that the capital costs could range from \$120 million to \$200 million;

- The facility operating and maintenance costs during the first year of operations are estimated at \$21.3 million to \$21.9 million (including annual lifecycle costs and net of recycling revenues and excluding all other revenues) for AD and in-vessel respectively. This could increase by an additional \$21 million ranging upward to \$26 million per year for debenture financing costs as necessary to finance the initial capital investment (not including biogas capital). This compares to the approximate \$7.6 million expenditure per year related to the Region's existing organics processing arrangement assumed under status quo; and
- Combined annual operating expense and debenture servicing costs would range from \$42.1 million to \$42.8 million in the first year, assuming a \$165 million capital project.

Table 5: Expanded Organics Solutions: Updated Preliminary Capital Cost Estimates

	AD (\$ millions)	In-Vessel ⁽²⁾ (\$ millions)
Land		
Pre-Sort/Transfer Facility	2.3	2.3
Organics Processing Facility	2.3	2.3
Land Sub-Total	4.5	4.5
Capital		
Pre-Sort/Transfer Facility	42.9	42.9
Organics Processing Facility	117.9	117.9
Capital Sub-Total	160.8	160.8
Total Estimated Capital Cost ⁽¹⁾⁽³⁾	165.3	165.3

Notes:

1. Costs expressed as gross costs in nominal/inflated dollars. No debt financing or biogas upgrade capital costs included.
2. Updated costing for in-vessel capital from June 2017 analysis (decline of \$42.2 million) attributed to reduction in assumed cost for capacity.
3. Presented as base capital costs where sensitivity range for pre-sort/transfer and organics processing facility capital ranges from approximately \$120 to \$200 million (not including land).

4.3 As part of this updated June 2018 preliminary analysis, operating and capital cost estimates have been refined as additional information has become available, including, but not limited to:

- Information from RFI-1158-2017 has been used to refine life-cycle costing;
- Contract pricing, escalators and market pricing benchmarks have been updated with most recent data available and the base year for analysis moved to 2018;
- Tonnage assumptions have been updated based on 2017 actuals and include updated household growth projections;
- Revised design tonnage assumptions and related costing for the in-vessel organics processing option to account for processing amendments; and
- Updated information on potential revenues associated with pre-sort and both in-vessel composting and anaerobic digestion systems.

Updated Preliminary Business Case Analysis

- 4.4 Both the AD and in-vessel organics options were further assessed using a business case approach over a 20-year period, which included consideration of:
- Upfront capital and ongoing lifecycle maintenance costs, related to a pre-sort/transfer facility and organics processing facility, based on assumed processing capacity requirements as well as cost of land;
 - Annual operating costs associated with pre-sort/transfer functions and organics processing based on estimated tonnage throughput;
 - The estimated capital and operating costs would be incurred regardless of which service delivery model (i.e. public or private sector participant made the capital and operating investments); and
 - Potential revenues which may offset costs of capital and operating.
- 4.5 Table 6 provides an overview of potential first year operating expenditures for the Status Quo scenario versus the two organics processing options. As indicated, the Status Quo option acknowledges that the 70 per cent diversion target cannot be achieved.

Table 6: Status Quo Compared to Expanded Organics Processing – Annual Preliminary Cost for 2022 First Year of Operations (Nominal Dollars)

	Status Quo (32,100 tonnes) (\$ millions)	AD (72,900 tonnes) (\$ millions)	In-Vessel (72,900 tonnes) (\$ millions)
Pre-Sort/Transfer Costs:			
Annual Pre-Sort Transfer Costs	-	10.3	10.3
Less: Recycling and EPR Revenues	(0.4)	(1.5)	(1.5)
Total Pre-Sort/Transfer Operations	(0.4)	8.7	8.7
Processing Costs:			
Annual Processing Costs	6.6	9.6	9.6
Other Costs (By-product management, disposal) ⁽³⁾	1.4	3.0	3.7
Total Processing and Other Costs	8.0	12.6	13.2
Debt Service Payment	-	20.8	20.8
Net Operating Cost	7.6	42.1	42.8

Notes:

1. Assumes no biogas system capital or operating costs and no leaf and yard waste processing costs. No revenues included for recyclable materials, biogas, and excess capacity sales.
 2. Projected organics tonnages are for the first year of assumed operations (2022). Debenture based on cost sensitivities outlined, could result in annual debt servicing cost upwards of \$26 million.
 3. Includes transfer of residuals for disposal at DYEC and/or landfill, where applicable
- 4.6 Table 7 demonstrates that the AD alternative may achieve the Region's diversion objectives at a minimally-lower net present value cost (\$8.8 million, in 2018 dollars) when compared to in-vessel organics composting over a 20-year period operating. As identified, both options will require significant upfront capital and ongoing operating and debt servicing costs. The primary net cost difference between the AD and in-vessel options is their respective management and disposal of processing digestate/compost. Table 7 also compares a merchant capacity scenario at \$200/tonne of processing capacity.

Table 7: Net Present Value (2018 Dollars) – Preliminary Base Cost Scenario

Total	Anaerobic Digestion	In-Vessel Composting	Merchant Capacity
Base Cost Scenario	\$ (325.7)	\$ (334.5)	\$ (300.20)
High Capital Cost Scenario	\$ (369.3)	\$ (378.1)	\$ (311.81)
Low Capital Cost Scenario	\$ (282.2)	\$ (291.0)	\$ (288.58)

Notes:

1. Net present values based solely on capital cost and do not include any revenues for recyclable material, excess capacity sales, biogas or other by-products. Haulage costs and leaf and yard processing are not included.
2. Capital cost, operating and lifecycle cost for biogas upgrading not included.
3. Merchant capacity scenario assumes \$200/tonne for organics processing. A reduction to \$150/tonne would improve scenario results by \$58 million (2018 dollars).

5. Risk Considerations and Potential Cost Impacts

5.1 Consideration and assessment of potential risks, impacts and mitigation options are important at the pre-approval stage of any project. Given the scale, scope and complexity of an organics management processing system, Regional staff undertook an initial assessment of potential risks, which included:

- Capital construction, lifecycle and operating cost ranges;
- Facility location, scale, sizing and feedstock supply volumes related to household growth and tonnage forecasts;
- Feedstock composition, including the quality or mixture of waste organics, which impacts processing, potential marketable by-product opportunities, and operating costs;
- Location and haulage;
- Potential implications to DYEC operations due to put-or-pay obligations, electricity generation revenues and compliance obligations; and
- Emerging or evolving markets for by-products and environmental attributes, including:
 - Recyclable materials recovered through the pre-sorting processing;
 - Biogas as created through the AD process and its possible end-uses;
 - Digestate or compost created through organics processing; and
 - Creation of compliance-based and/or marketable carbon credits

recognizing GHG emission reductions.

Capital Construction and Operating Costs Sensitivities

- 5.2 As expected, capital and operating costs are the primary cost drivers for the options being examined. A +/-25 per cent change to the design cost-per-tonne to pre-sort/transfer and organics processing infrastructure has a total incremental impact of +/- \$43.6 million (2018 dollars) under either option (not including biogas upgrading capital in AD costs). Similarly, +/-25 per cent change to operating costs for pre-sort/transfer and organics processing has an incremental facility operating impact of +/- \$60.2 million (2018 dollars) under either option.
- 5.3 Costs can be impacted by numerous factors including, but not limited to, variations in technology options, pre-sorting and/or processing capabilities and requirements (i.e. odor control, storage for by-products), capacity sizing, inflationary factors and siting requirements including potential servicing. The range of costs was based on feedback received through the RFI process highlighting uncertainty around project details until such time that more detailed design specifications and costing are developed.

Facility Sizing, Capacity, and Utilization Sensitivity Analysis

- 5.4 Consistent with the June 2017 preliminary business case, this updated analysis assumes 110,000 tonnes of organics processing capacity for both AD and in-vessel options which align closely with the 20 year projected processing requirements (adjustment made to in-vessel sizing for accommodating process amendments). The pre-sort/transfer facility is assumed at 160,000 tonnes of capacity, similar to the June 2017 analysis.
- 5.5 A key risk to the updated business case analysis relates to tonnage projections which are driven by household growth projections. A lower growth scenario (historical average 10-year household growth) would impact the updated preliminary business case in a number of ways:
- Decline in projected SSO and mixed waste tonnage with absolute tonnages in 2041 declining by 17 per cent;
 - Resultant decline in RNG output (under AD option) by approximately one million cubic metres (m³) over a 20-year operating period and gross foregone revenues of \$7 million (2018 dollars) assuming a preferred industry rate of \$21/GJ, or \$0.79/m³(compared to current market rate of approximately \$0.11/m³); and
 - Decline in total digestate/compost tonnage output of 14 per cent with potential foregone revenues where marketable opportunities exist.
- 5.6 Additional risks exist around potential revenue from assumed sales of excess capacity. Some Respondents indicated excess capacity could be filled with

tonnage from other municipalities and the private sector with others suggested not oversizing at all to meet external processing requirements as securing volumes could be a challenge.

Feedstock Composition Sensitivity Analysis

- 5.7 The composition of the incoming feedstocks impacts evaluation of technology options given that organics may vary significantly and preprocessing and processing technologies not suitable for accommodating such inputs can result in facility underperformance.
- 5.8 Technical due diligence around waste composition, design criteria and performance specifications will yield additional information around potential by-product outputs and further work needed to determine, maximize and secure end-use market opportunities for marketable by-products. This can be accomplished through the RFI Respondents recommendation for the Region to undertake additional organics quality testing on the OFMW from the approved pilot study.

Outstanding Information: Location and Haulage/Collection Cost Implications

- 5.9 Given the potential locations for any future facility are unknown at this time, no haulage costs for organics were considered as part of the analysis (only transfer of residual wastes to DYEC and/or disposal to landfill, where applicable). Any future siting considerations for pre-sort/transfer or organics processing will require additional consideration of resultant cost and operational aspects in relation to collection (i.e. Regional collection routes and benefits of centralized location) and disposal of waste (i.e. proximity of organics processing solution being situated near point of disposal for residual wastes, namely DYEC). Further work is required as part of the detailed siting review, as described within the recommendations of the report.

Outstanding Information: Financial Implications on DYEC

- 5.10 Movement to an expanded organics management strategy with pre-sort capability impacts DYEC operations in a number of ways, including, but not limited to:
- There may be implications relating to the DYEC put-or-pay agreement and unused capacity. Under the co-owners agreement, the Region cannot recover the capital value of its DYEC investment and the Region will only receive a net operating fee unless selling its capacity to York. This would need to be considered along with possible terms of capacity commitment, future residue growth and capacity needs, alternative disposal options, potential expansion timing and business case. Total sales of the DYEC excess capacity over the base analysis period for either AD or In-vessel options is estimated at approximately \$2.1 million (2018 dollars), which

assumes full use of excess capacity at the DYEC; and

- Changes in composition of residual mixed waste to DYEC following pre-sort may impact electricity generation and power purchase revenues as well facility GHG emissions and associated compliance obligations of the DYEC under the Cap and Trade program.

Potential End-Product Revenue Opportunities and Challenges

- 5.11 The following end products of gas, heat, electricity, organic by-products, recycling and carbon credits will need to be fully assessed as outstanding information and emerging markets are developed:
- Biogas Production and Options for Utilization, including,
 - Compressed Natural Gas and Fueling of Vehicles;
 - Electricity Generation; and
 - RNG Contract Pricing Options;
 - Other Organics Processing By-Products;
 - Recycling Revenues; and
 - Carbon Offsets and Carbon Markets.
- 5.12 While these by-products may present revenue opportunities, there are a number of challenges associated with them which may not allow the full benefits to be realized. On February 23, 2018, Enbridge issued a Request for Proposals (RFP) for acceptance of RNG into their distribution system. Without a defined project and location, detailed output specifications and approval of Council, the Region was unable to submit a response to that RFP. However, Enbridge has noted that renewable content will play an increasing role in future compliance plans as RNG production facilities are developed and brought into commercial operation (EB-2017-0224) and as such, there may be future opportunities available to the Region under this approach.
- 5.13 Table 8 below highlights three of the key possible groups of by-products, potential opportunities, and challenges and concerns with realizing any revenue benefits. As such, further due diligence to assess the full range of uses, financial, technical, environmental and compliance based implications from a corporate perspective must be undertaken.

Table 8

A) Biogas Production and Options for Utilization

Use/Function	Description/Opportunities	Outstanding Requirements Considerations
Compressed Natural Gas (CNG) for Fueling of Vehicles	<ul style="list-style-type: none"> • Capture of methane and conversion to a high energy fuel • Natural gas currently priced less than gasoline and diesel fuel • Potential for material fuel and GHG emissions avoidance • Possible corporate synergies given fleets often well suited to CNG technologies • Possible grant funding opportunities (i.e. Green Commercial Vehicle Program) 	<ul style="list-style-type: none"> • Regulations and treatment for transportation uses of RNG compared to fossil fuel options not yet established in Canada • Requires consideration of: <ul style="list-style-type: none"> ○ projected outputs and supply availability ○ refueling infrastructure ○ vehicle costs (new or conversions) ○ siting study and approvals ○ feasibility study and business case • Implications regarding possible creation of environmental attributes through fuel displacement
Electricity Generation	<ul style="list-style-type: none"> • Utilization of Combined Heat and Power (CHP) technologies to simultaneously generate electricity and produce heat for other process or heating requirements • Potential to offset site load requirements under a net-metering arrangement • Beyond biogas CHP options can still be examined with natural gas as the primary fuel source 	<ul style="list-style-type: none"> • Requires consideration of: <ul style="list-style-type: none"> ○ sizing to site load requirements and connectivity requirements ○ potential utilization of produced heat ○ unit reliability and efficiency ○ degree of biogas fuel production, consideration of storage, maintenance and staffing requirements ○ Implications regarding possible creation of environmental attributes through fuel displacement • Province has moved away from standard-offer programs for electricity generation including renewable fuel sources but net metering still an option
Renewable Natural Gas (RNG) Supply to Distribution System and/or Contract Pricing Options	<ul style="list-style-type: none"> • Sales of RNG to gas distribution system under contract price • Possible use of RNG to offset usage requirements at other Enbridge-served locations • Possible direct sale of RNG to another Enbridge-served customer • Possible sales of RNG to outside the service area 	<ul style="list-style-type: none"> • At capital cost of \$3-11 million for upgrading facility, biogas option not viable at market rates (~\$0.11/m³). At preferred industry rate of \$21/GJ (\$0.79/m³), biogas option is viable with revenues exceeding costs • Requires consideration of: <ul style="list-style-type: none"> ○ location, projected outputs and possible contractual requirements to produce ○ siting, pipeline connection approvals, utility feasibility study and capacity ○ securing RNG purchase/sales agreement ○ mandatory injection facility through utility and alternative upgrade facility options

Use/Function	Description/Opportunities	Outstanding Requirements / Considerations
		<ul style="list-style-type: none"> ○ possible service and maintenance contract for upgrading facilities

B) Other Organics Processing By-Products

Use/Function	Description/Opportunities	Outstanding Requirements / Considerations
<p>Digestate (AD) and Compost (In-vessel)</p>	<ul style="list-style-type: none"> • AD can generate digestate end-products such as compost or liquid-fertilizer-type • Possible marketable opportunities for SSO-derived compost through In-vessel 	<ul style="list-style-type: none"> • Updated preliminary business case indicated: <ul style="list-style-type: none"> ○ marketable digestate and elimination of disposal cost would improve the AD option by ~\$22.1 million (2018 dollars); and ○ \$10/tonne for SSO-derived compost sales would improve the in-vessel option by ~\$2 million (2018 dollars) • Composted digestate from OFMW generally not suitable for beneficial use per regulations and OFMW-derived compost more contaminated • Digestate/compost outputs/opportunities will rely on: <ul style="list-style-type: none"> ○ process and technology ○ quality of materials ○ throughput tonnages ○ regulations and ability to secure end-markets • Due diligence needed around: <ul style="list-style-type: none"> ○ waste composition ○ design criteria ○ performance specifications ○ securing end-use market opportunities for by-products
<p>Recycling Revenues</p>	<ul style="list-style-type: none"> • Opportunities available for recyclable materials removed through the pre-sorting process 	<ul style="list-style-type: none"> • Mixed waste pre-sort will impact metals recovered at DYEC • Dependent on overall condition of materials and the willingness of markets to accept the materials. • Limited North American experience with recovery/sale of recyclable materials recovered from mixed waste • Determine waste composition/quality through ongoing studies to determine pre-sort equipment

Use/Function	Description/Opportunities	Outstanding Requirements / Considerations
		needs <ul style="list-style-type: none"> Determine and secure end-use market opportunities given changing regulations and market shifts

C) Carbon Offsets and the Carbon Markets

Use/Function	Description/Opportunities	Outstanding Requirements / Considerations
Carbon Credits/Offsets	<ul style="list-style-type: none"> Opportunities for organic waste digestion and organic waste management initiatives Utilization of compliance-based offsets to meet obligations under the Cap and Trade program Can be used as marketable compliance instruments 	<ul style="list-style-type: none"> Protocols still outstanding from the Province Detailed emissions lifecycle analysis and monitoring, quantification and validation processes are required Pursuit of attributes must be assessed versus all other opportunities, including those which may require relinquishing right to attributes (i.e. grants, other contributions) Credits not generally available for reduction/diversion initiatives what are required by mandate or regulation Need to consider value of retaining credits versus transfer in exchange for grants or capital contributions

External Grant Funding Opportunities

5.14 There are a number of funding opportunities which may be available to apply toward the capital costs associated with various proposed organics management strategy initiatives. Most of the available funding programs currently available require detailed project scopes and design, project plans and siting information, summary of permits and approvals and other financial and technical specifications which are still to be determined. Furthermore, funding would generally not cover any increased operating costs associated with such initiatives. Staff will continue to monitor available program funding opportunities which could, subject to future availability and eligibility, assist in funding studies and/or any related capital infrastructure as part of the organics management strategy. It is recommended that Regional staff apply for any further eligible grants, including applying for the maximum available funding under the Green Municipal Fund (\$175,000 was received to date to offset study costs), for study costs.

Further Due Diligence Required on Siting, Capacity, Utilization and Phasing Potential

- 5.15 The RFI Respondents provided varied responses around sizing and capacity, including:
- That organics processing facilities can be built in a modular fashion and are expandable either physically or through non-infrastructure solutions (i.e. additional operational shifts to meet growth needs);
 - While the estimated tonnage assumptions contained in the RFI were considered sufficient and reasonable for RFI purposes, the recommendations around sizing to accommodate organics processing requirements ranged from sizing the processing facility to projected 2041 tonnages down to sizing to accommodate only current SSO and planned OFMW tonnages with ability to expand over time; and
 - Feedstock tonnage requirements for a private sector build of a processing facility would need to be guaranteed by the Region and cover fixed facility costs (put-or-pay contract).
- 5.16 While larger facilities can provide economies of scale (a lower cost-per-design tonne), a smaller facility may provide overall cost savings if the Region were unable to guarantee sufficient quantities of organics tonnages as input feedstocks. A number of Respondents indicated that co-location of the mixed waste transfer and pre-sorting facility and organics processing facility could achieve cost savings. These potential cost efficiencies will be explored as part of the recommended next steps if considering a phased project plan implementation.
- 5.17 Given the risks of around capacity, utilization, and siting (including location) as discussed above, and as outlined through RFI Respondents, a phased implementation may further improve the case for AD if a proper balance in economies of scale and affordability can be determined through siting and right-sizing due diligence. It is recommended that Regional staff conduct additional technical and financial due diligence on capacity requirements, sizing and utilization, with a view to exploring opportunities which could reduce up-front capital, related lifecycle and ongoing operations, and/or accommodate growth. A staged approach may also reduce uncertainties and risk around the current market and regulatory environment and need to secure feedstock commitments under a put-or-pay expectation.
- 5.18 As a first step and as part of a phased implementation strategy, it is recommended that an updated refined analysis for a centralized Regional-owned transfer station be completed, for consideration for construction in the near term. The transfer station would also consider accommodating pre-sort capabilities as part of an integrated solution.

Further Due Diligence on Impacts to DYEC

- 5.19 Given the potential impacts to the DYEC as discussed above, it is recommended that as the organics management strategy advances, further examination around downstream implications to the DYEC be considered and studied, including further consultation with York Region and Covanta, to provide a fulsome view of the impacts of pre-sort/transfer and organics processing on the Region's integrated waste management functions and the broader net program impacts realized as a result.

Further Due Diligence on Quantity and Quality of Feedstock Composition

- 5.20 In addition, due diligence is also recommended to determine the quantity and quality of the Region's mixed waste tonnages (currently underway) as well as to determine whether business partners exist and are willing to commit guaranteed tonnages to an organics processing solution within the Region. It is also important to determine if potential feedstock availability beyond the Region's tonnages could be secured without shared facility ownership/cost at a competitive price to the private sector market while also considering possible downstream DYEC implications as it relates to approval of outside materials (ECA). The RFI Respondents recommended that the Region should undertake additional organics quality testing on the OFMW from the approved pilot study to assist with determining the most appropriate end use for the end product. As identified in the 2018 Solid Waste Management Servicing and Financing Study, the Region is undertaking a mixed waste characterization processing pilot study with Canada Fibers Ltd. to provide key current data which could affect the organics management strategy business case.

Service Delivery: DBOM or Service Contract

- 5.21 The majority of RFI responses indicated that a Design-Build-Operate-Maintain (DBOM) model would be appropriate, although many were open to any preferred Regional approach, subject to appropriate contractual terms and risk balance. Respondents did indicate a willingness to provide a private sector service delivery contract approach including private sector infrastructure build. Any service delivery model (private service contract or public-private (P3) partnership), is likely to require a guaranteed waste feedstock commitment from the Region.
- 5.22 Assuming a DBOM structure, the Region would maintain facility ownership while design, construction, operation and maintenance of the facility is carried out per contractual specifications. This is generally the most widely used method of service delivery for organics processing facilities within the province (also to be used by Simcoe County and Peel Region for new facilities) and the underlying contracts allow for setting project performance and levying securities to ensure appropriate operating quality, monitoring, reporting and environmental standards are met. Furthermore, contractual arrangements which link the performance of

private sector operations to the facility that it designs and builds works to ensure the technical and operating risks are both transferred to the private sector partner.

- 5.23 Under a service contract, the asset is fully owned by the private sector and the Region would enter into a contract for processing for which the Region would commit volumes and be subject to a processing fee and be responsible for haulage and transportation. While the Region would retain the least amount of control over performance, it would also, under this business model, transfer most risk to the private sector.
- 5.24 Based on preliminary review, it is recommended that either DBOM or service contract delivery options be the preferred options, subject to appropriate risk balance, regulatory support and market factors. Given the various challenges and possible risks that may exist under either approach, it is necessary for the Region to secure suitable financial and business advisory services to ensure the development of appropriate contractual financial terms and conditions, commercial securities, risk balance and selection of service delivery parameters.

6. Business Partnership/Relationship

- 6.1 A business partnership may be beneficial in terms of shared financing, business case and/or economic development, depending upon details, shared objectives and the sharing of available benefits, obligations and risks. As indicated through the RFI process, several Respondents indicated a willingness to enter into some form of partnership with the Region as it relates to use of energy by-products although additional details around potential commitments, terms and partnership arrangement were not received.
- 6.2 In addition, the significant capital and operational costs to implement an organics management solution with AD technology creates an opportunity to enter a business partnership/joint venture, subject to suitable contractual terms and distribution of risks. Options for a business partnership/joint venture with a third party should be considered including but not limited to:
- Jointly procure an organics service delivery model;
 - Contribute capital and expertise to the project; and/or
 - Share environmental attributes and/or potential revenue streams arising from the project.
- 6.3 Through a process to be determined, staff will explore options including confidential non-binding and procedurally fair discussions with interested partners including RFI Respondents, with the Region regarding partnerships, joint ventures, P3, co-ownership or other forms of participation in order to bring available market and other financial information forward for consideration by

Regional Council regarding a potential relationship as part of the long term Organics Management strategy, and more specifically in the possible construction of an Anaerobic Digestion facility.

- 6.4 If there is a potential business case for the use of by-products and or carbon credits, then further due diligence must also be undertaken to determine if it would be more beneficial for the Region to retain and realize those benefits from a corporate use perspective, rather than transfer to a potential partner.
- 6.5 In response to part 5 of the RFI, several RFI Respondents indicated an interest in a business partnership/joint venture. Accordingly, the Region requires independent expert technical and financial advice to ensure an objective assessment of the viability, feasibility and definition of potential partnership options that the Region is prepared to consider. This upfront due diligence will also ensure the Region's risks are minimized, functional requirements are achieved, and opportunities and benefits are maximized (i.e. Regional benefits are not compromised by premature selection of a partner).

7. Conclusions

- 7.1 It is recognized that predicted growth and legislative changes will increase costs in a status quo scenario for organics management. In addition, status quo is not sustainable when considering additional factors such as lack of merchant capacity and corporate sustainability goals.
- 7.2 It is recommended that AD be selected as the preferred technology for the management of organic food waste. However, to inform the specific AD technology, output parameters, permitting needs and siting restrictions, the Region may also wish to understand the potential needs or preference of potential business partners. As such, it is recommended that staff research business models and partnership structures with commercial entities and utilities in order to determine the opportunities and related costs to transfer technological, operational and financial risks in organic and / or beneficial end use products and environmental attributes.
- 7.3 The advancements of this mixed waste pre-sort technology have been demonstrated at several existing facilities and may provide the Region with the solution to remove organics from the waste and increase its diversion rate beyond 70 per cent. The transfer mixed waste pre-sort facility could be constructed in advance of an organics processing solution subject to further business case analysis and consideration of RFI responses that indicated the co-location may provide cost and operating efficiencies.
- 7.4 The Food and Organic Waste Framework also sets food and organic waste recovery targets for the industrial, commercial and institutional (IC&I) sector in Ontario. This sector, which includes schools, hospitals, retail establishments and restaurants, will have to meet diversion targets between 50 and 70 per cent by

2025 depending on the size of the establishment. These new organics diversion targets for IC&I may create opportunities for synergies and partnerships for the Region's organic strategy moving forward. However, the Provincial framework also presents a challenge with regards to potential lower household waste generation given the Provincial emphasis on reduction and re use of waste.

- 7.5 The anticipated population growth pressures will create waste that must be either diverted (organics and recyclables) or disposed of. Without an increase in the diversion rate, the disposal capacity will need to be increased. It is evident that the status quo will not meet the Region's long-term waste diversion and management requirements.
- 7.6 The implementation of the mixed waste transfer and pre-sort is anticipated to achieve the 70 per cent diversion through the removal of the organic fraction in the garbage bag and the remaining metals and recyclable plastics.
- 7.7 Removing the black bag organics, metals and recyclable plastics will optimize capacity at the DYEC. Failure to increase the diversion rate to 70 per cent, and beyond, will require the Region to consider further disposal options, including expansion at the DYEC.
- 7.8 The anticipated Provincial legislation may introduce requirements that must be met by the Region. The Region may have to make decisions that ensure the waste management system is capable of meeting the new legislative requirements.
- 7.9 There is no existing merchant capacity to meet the Region's 20-year organic management needs. Several RFI Respondents expressed an interest in building organics management infrastructure but it is likely to require a long-term put or pay commitment.

8. Next Steps

- 8.1 It is recommended that staff continue to further investigate and conduct any necessary additional studies as outlined in this report.
- 8.2 Additional expert technical, financial and legal advisory services are recommended to be retained, as required, to assist with continuing due diligence and to refine the project scope as well as the financial and legal implications associated with the next phase of the strategy.
- 8.3 It is also recommended that staff will explore options including confidential, non-binding and procedurally fair discussions with interested partners including RFI Respondents regarding partnerships, joint ventures, P3, co-ownership or other forms of participation in order to bring available market and other financial information forward for consideration by Regional Council regarding a potential relationship as part of the long term Organics Management Strategy, and more specifically in the possible construction of an Anaerobic Digestion facility.

- 8.4 It is also recommended that staff develop a phased project plan for implementation in order to consider the merits of an early first phase to include a mixed waste transfer station capable of accommodating Pre-sort capabilities in advance of an organics management processing facility.
- 8.5 The procurement of an interim five-year solution is recommended to ensure continuous organics processing services for the Regional Municipality of Durham, with contract extensions and/or processing service expansion options which will ensure adequate flexibility for the transition to a new long-term Organics Management Strategy. Staff will initiate the procurement process to secure organics processing capacity to commence in 2019 and continue to at least 2023.
- 8.6 It is also recommended that staff will proceed to apply for the maximum available additional funding under the Green Municipal Fund program (\$175,000 was received to date to offset study costs) in order to offset costs of additional consulting study and to continue to explore other grant funding opportunities.
- 8.7 Staff will work toward reporting back on the outcomes of these next steps through the 2019 budget process as well as any ancillary reporting that may be required.

9. Attachments

- Attachment #1 Illustration of the Regional Municipality of Durham's Diversion Rates and Black Bag Composition
- Attachment #2 GHD Technical Memo dated May 25, 2018, and titled: RFI Submission Summary for Mixed Waste Transfer and Pre-sorting, Organics Processing and Beneficial use of By-Products/End Products

Respectfully submitted,

Original signed by:

S. Siopis, P.Eng.
Commissioner of Works

Original signed by:

M.E. Simpson, CPA, CMA, MA
Acting Commissioner of Finance

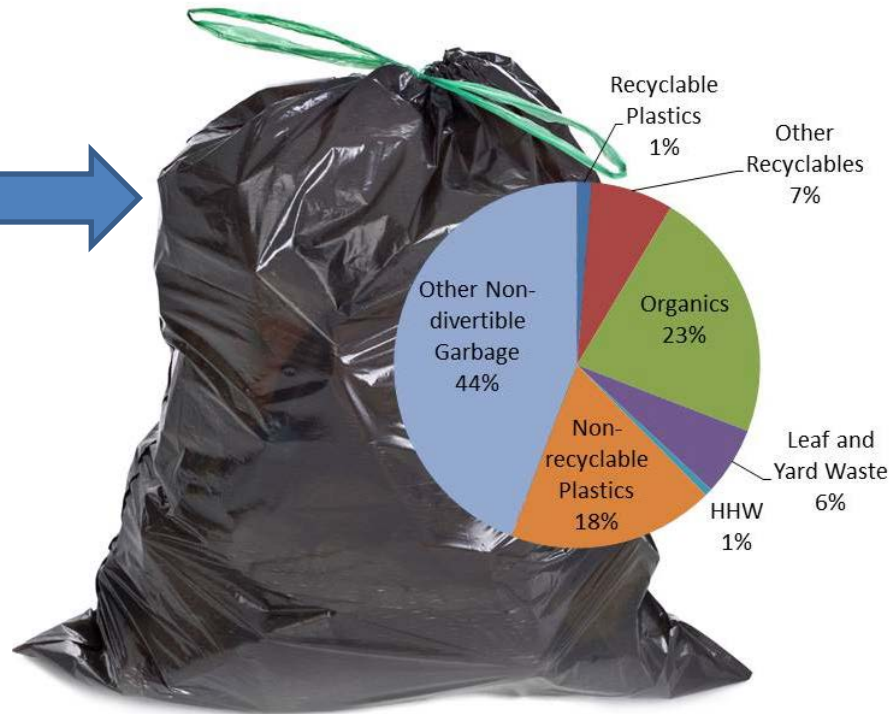
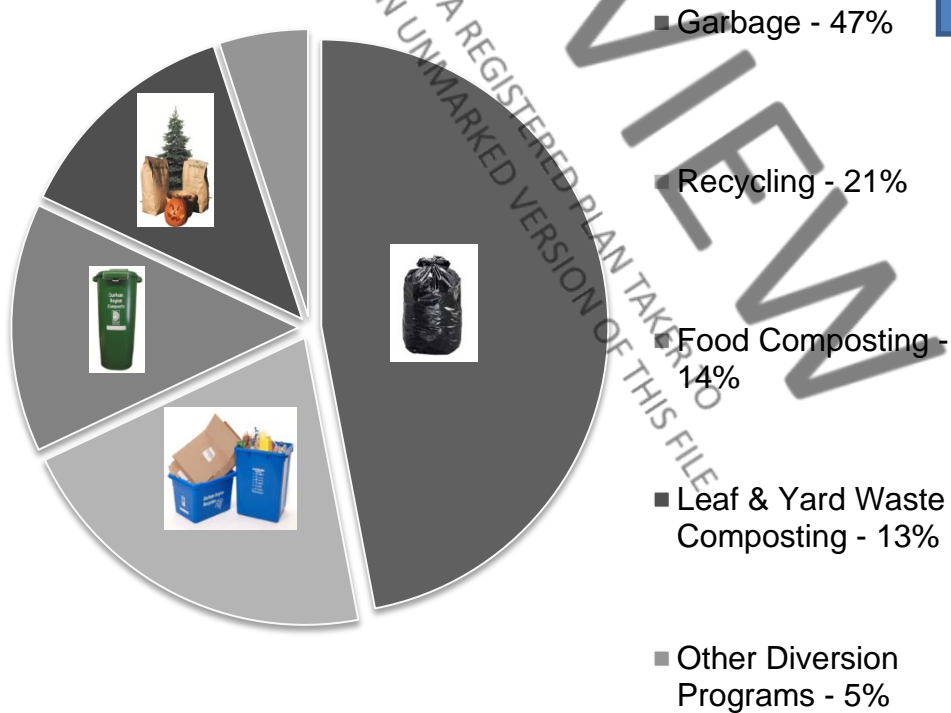
Recommended for Presentation to Committee

Original signed by:

G.H. Cubitt, MSW
Chief Administrative Officer

Durham's Residential Waste - 2017

Tonnes of Residential Waste Managed (2017)



Overall Waste Diversion – 54%



Technical Memorandum

May 25, 2018

To:	Mr. Gioseph Anello, MEng, PEng, PMP Manager of Waste Planning & Technical Services Regional Municipality of Durham	Ref. No.:	11116808
From:	Michael Cant (GHD)/mg/10	Tel:	905-429-4971
Subject:	RFI Submission Summary for Mixed Waste Transfer and Pre-sorting, Organics Processing and Beneficial use of By-Products/End Products.		

1. Introduction

The Region of Durham (Region) released a Request for Information (RFI) on January 18, 2017 titled, Mixed Waste Transfer and Pre-sorting, Organics Processing and Beneficial use of By-Products/End Products.

Given that the Region's existing organics management contracts are ending in 2019 the Region is utilizing the RFI process to gather market information on potential organics management options. The RFI process involves the receipt and investigation of viable options for implementation of a long-term organics management plan and seeks information on cost-effective, proven and innovative technologies and commercial arrangements and/or potential business relationships, which would assist the Region in achieving its objectives, which include:

1. Discovering the options for the cost-effective receipt and transfer of municipal solid wastes (MSW) and organics, as well as operations for mixed waste pre-sorting to enhance organics and recyclable waste diversion from disposal for single family and/or multi-residential households. The transfer and mixed waste pre-sorting facilities may be co-located or in separate locations.
2. Implementing a future long-term organics processing strategy that maximizes system wide investment benefits while minimizing net integrated solid waste management system costs.
3. Obtaining relevant information on end markets, revenues and potential end-destinations for by-product opportunities, including compost/digestate, recovered energy, or other opportunities associated with residues related to enhanced organics diversion and processing options.
4. Meeting all regulatory requirements under the Climate Change Mitigation and Low-carbon Economy Act, 2016 and Waste Free Ontario Act, 2016, including the Waste Diversion Transition Act, 2016, Resource Recovery and Circular Economy Act, 2016 and the proposed Ontario Food and Organic Waste Framework, 2017 and while ensuring compliance, where applicable, with the Ontario Compost Quality Standards.
5. Assessing organic management options based upon an integrated solid waste management system-wide perspective and conduct technical, financial and business case analysis to support



recommendations to Regional Council by the spring of 2018, regarding a strategy for implementation of a sustainable and viable long-term organics management plan.

This memorandum summarizes the technical information in the 19 submissions received on February 1, 2018 through the RFI process.

It should be noted that of the 19 submissions received, 8 Respondents provided detailed responses to the technical and financial questions with the remaining providing various levels of response.

2. Part 1 – Respondent's Company Information

In total 19 submissions were received through the RFI process. Two of the submissions received were consortiums. The remaining 17 submissions received were from a variety of companies including waste management services providers, technology providers, a construction company and by-product/end product users. Of the 19 submissions, 16 are currently operating in Ontario, one in Quebec, one in the USA and one in Europe. The majority of the submissions provided general company information, current organic services provided, existing facility examples, the types of organic material handled, the by-products/end products produced, residual waste generated and odour management solutions. One of the 19 submissions did not provide specific information to the Region's RFI process.

3. Part 2 – Respondents General Information

3.1 Types of Option (s) or Approach (s) Proposed

As part of the RFI process Respondent's were asked to provide their proposed option (s) or approach (s) to meet the Region's objectives. The Respondents could provide information on one or more of the three components which included:

- Mixed Waste Transfer and Pre-Sorting
- Organics Processing
- Beneficial Use of By-Products/End Products

A total of 10 Respondents expressed an interest in Mixed Waste Transfer and Pre-Sorting, Organics Processing and Beneficial Use of By-Products /End Products or a complete organics management approach. One Respondent expressed an interest in providing Mixed Waste Transfer and Pre-Sorting only. Four Respondents expressed an interest in providing Organics Processing and Beneficial Use of By-Products/End Products. Two Respondents expressed an interest in the Beneficial Use of By-Products/End Products only. One Respondent proposed a potential partnership for the use of the By-Products/End Products. 13 Respondents proposed AD as the potential organics processing technology. 3 of the 13 also proposed in-vessel as a potential option with one Respondent proposing in-vessel as their main organics processing technology.



3.2 Time Frames Proposed

The majority of the Respondents indicated that they could provide a 20 year solution to the Region. A number of respondents indicated a minimum term of 10 years depending on the service delivery model and contractual terms and conditions.

3.3 Waste Projections

A majority of the Respondents indicated that the waste projections provided are reasonable and they used them for the potential sizing of the facilities in their response.

A few Respondents indicated the importance of the waste and growth projections for determining facility sizing. The waste and growth projections should be revised to reflect the current 2017 data.

3.4 Intent to Oversize Organics Processing Facility

One Respondent indicated they would oversize the facilities to handle additional Industrial, Commercial and Institutional (IC&I) organics. Two Respondents indicated they would size the facility to the 2041 tonnages. Four Respondents indicated that they could handle IC&I organics but made no commitment to oversize the facility.

A number of respondents indicated that consideration should be given to phasing the development of the facilities with the possibility of some facility and site components being oversized up-front.

3.5 Service Delivery Model

A variety of response were received on the type of service delivery model the Respondents preferred. The majority indicated a preference for the P3 design build or Design Build Operate Maintain (DBOM) depending on appropriate risk balance and contractual terms. A number of respondents indicated they could provide financing. A number of Respondents indicated they would be interested in any of the service delivery models including a willingness to provide a private sector service delivery contract approach with private sector infrastructure build. Respondents indicated an expectation of guaranteed/put-or-pay tonnage commitments from the Region.

4. Part 3 – Respondent's Detailed Information Relating to Areas of Interest

4.1 Mixed Waste Transfer and Pre-Sorting

Of the 10 Respondents that expressed interest in Mixed Waste Transfer and Pre-Sorting, 6 provided detailed responses to the technical questions. The majority of Respondent's wanted a facility inside the Region on land provided by the Region. Two indicated that the Garrard Road lands would be of adequate size to accommodate the facility. One Respondent has a private mixed waste pre-sorting facility outside the Region with a transfer station in the Region. The potential land area required for the facility ranged from 1 ha to 8 ha. The initial capacity of the facility ranged from 96,000 to 200,000 tonnes. A number of Respondents indicated that their facility was expandable either physically or by adding shifts. A number of Respondents provided schematics and mass balances for the system being proposed.



The 6 detailed submissions provided a number of operating reference facilities for the mixed waste pre-sorting technology being proposed.

The timelines proposed for permitting and approvals ranged from 18 months to 4 years. Respondents indicated the schedule could be influenced by a number of factors including: availability of a site, pre-existing approvals on an existing site, regulatory requirements for the permitting of the facilities.

From the review of the RFI responses a number of factors were identified that require further clarification and/or analysis and included the following:

- Additional mixed waste composition analysis would be required in order to develop an accurate mass balance for a mixed waste pre-sorting facility. Some respondents used the composition data provided by the Region while others used their own assumptions on waste composition. The compositional data is used to determine the recyclables and organics that are available in the mixed waste stream.
- The location of the mixed waste transfer and pre-sorting facility has the potential to impact overall capital costs of the facility and the costs to haul waste from the curbside programs to the facility and the transfer of waste to the DYEC and the organics processing facility (if not co-located).
- Cost savings could be realized if mixed waste transfer and pre-sort facility and organics processing facility are located together.
- A majority of the respondents wanted the Region to provide the land for the mixed waste transfer and pre-sorting facility.

4.2 Organics Processing

Of the 14 Respondents that expressed interest in organics processing, 11 provided detailed responses to technical questions. 13 Respondents proposed AD as a potential organics processing technology. 3 of the 13 also proposed composting as a potential organics processing technology. One respondent proposed composting as the potential organics processing technology.

Five of the Respondents indicated that the SSO and OWFM should be processed separately at the organics processing facility. The majority of Respondents wanted a facility inside the Region on land provided by the Region. Some indicated Garrard Road would be large enough for organics processing but not a combined mixed waste transfer and pre-sorting facility and organics processing facility. A number of Respondents indicated that the facility could be adjacent to DYEC. Two proponents indicated the possibility of co-digestion at a Regional Water Pollution Control Plant. One Respondent has an approved facility (still to be constructed) outside the Region and would be interested in accepting the Region's organics. The land size required for the organics processing facility ranged from 2.5 ha to 8 ha.

The initial capacity proposed for the organics processing facility ranged from 61,000 tonnes to 108,000 tonnes. A majority of the Respondents indicated their facility is expandable. A majority of Respondents indicated that diaper, pet waste, etc. could be included in the organics stream. A number of Respondents indicated that the diapers, pet waste, etc. should be left in the mixed waste stream. A number of the Respondents indicated that co-location of the mixed waste transfer and pre-sorting facility and organics processing facility could achieve cost savings. A number of Respondents provided detailed



explanations of their odour control equipment. A number of Respondents provided schematics and mass balances for the organics processing system being proposed.

The timelines proposed for permitting and approvals ranged from 18 months to 4 years.

4.2.1 Technologies Submitted

Of the 13 submissions received for AD the following technology types were proposed:

- Wet AD - 4
- High Solids AD - 1
- Dry AD – 3
- Wet or Dry – 5

Three of the Respondents proposed either AD or composting as the organics processing technology. One respondent proposed composting as their preferred organics processing solution.

The 11 detailed submissions all provided a number of operating reference facilities for the organics processing technology being proposed.

Given that 13 of the 14 respondents provided AD as a solution it appears that the market prefers AD as the organics processing option for the Region's organics.

From the review of the RFI responses a number of factors were identified that require further clarification and/or analysis and included the following:

- The location of the organics processing facility has the potential to impact overall capital costs of the facility and the costs to transfer the organics to the organics processing facility (if not co-located).
- Cost savings could be realized if mixed waste transfer and pre-sort facility and organics processing facility are located together.
- A majority of the respondents wanted the Region to provide the land for the facility.
- A decision on the organics processing technology type should be made in advance of the procurement process.

4.3 By-Product/End-Product Opportunities

4.3.1 Digestate/Compost Opportunities

With in-vessel systems compost would be produced. Those proposing in-vessel composting indicated they could produce high quality compost that could be sold as a product from the Source Separated Organics (SSO). A number of respondents provided examples of facilities that they operated producing high quality compost. Some respondents indicated that the Organic Fraction of Mixed Waste (OFMW)

from the mixed waste pre-sorting facility may be more contaminated and a high quality end product may not be produced.

For those Respondents proposing AD, a digestate would be produced that could be used as a liquid fertilizer, a nutrient rich soil amendment or composted. Examples of facilities producing all three products were provided. One Respondent proposed a technology that would process the digestate into a biochar that could be sold for the cleaning of biogas or a soil amendment product.

Some respondents indicated that the OFMW may be more contaminated and a high quality compost or digestate product may not be produced.

From the review of the RFI responses it was identified that further clarification and/or analysis on the OFMW is required. The following is recommended:

- The Region should undertake additional organics quality testing on the OFMW from the approved pilot study to assist with determining the most appropriate end use for the end-product.

4.3.2 Biogas Utilization Opportunities

Biogas would not be produced by an in-vessel composting system. All the detailed AD submissions indicated that biogas would be produced from the facility. The potential use of the biogas ranged from power and heat recovery to cleaning and upgrading to Renewable Natural Gas (RNG) for injection into the pipeline. Some respondents also indicated that Compressed Natural Gas (CNG) could be produced to power vehicles.

From the review of the RFI responses it was identified that further analysis on the potential uses and revenue streams for the biogas should be explored.

From the review of the RFI responses it was clear that the potential for end-product uses will be a function of the provincial and federal regulations under development for both digestate and biogas use.

5. Pricing

The majority of the pricing provided in the RFI submissions was in the range of the pricing provided in the original financial analysis with some outliers above the high range of pricing. The cost ranges varied depending on the assumptions used by the respondents for facility sizing, technologies, ancillary facilities, storage requirements and by-product/end-product uses. This information should be reviewed by the Region's Project Team and used to update the Financial Analysis. Through the RFI process additional potential revenues from by-products have been identified and should be incorporated into the financial analysis as appropriate.

6. Conclusions

Based on the review of the Respondents submissions the following conclusions are provided:

- The Region has received a variety of potential options and approaches through the RFI process including:



- 10 complete approaches (information provided on all three components)
- 1 Mixed Waste Transfer and Pre-Sorting option with the mixed waste facility outside the Region and the transfer facility inside the Region
- 4 options providing Organics Processing and Beneficial Use of By-Products/End Products
- 2 options for Beneficial Use of By-Products/End Products only
- 1 potential partnership for the use of the By-Products/End Products
- Examples of current operating facilities in the size required by Region have been provided in a number of the responses.
- Significant interest has been expressed by the industry to provide the Region with a long-term organics management options and approaches.
- 8 of the Respondents provided detail responses to the RFI technical and financial questions which will assist the Region in further defining the Business Case for the project.
- Given that 13 of the 14 respondents provided AD as a solution it is appears that the market prefers AD as the organics processing approach for the Region's organics.
- The location of the mixed waste and pre-sorting facility and organics processing facility has the potential to impact overall capital costs of the facility (s) and the costs to transfer by-products and end-products to other facilities (if not co-located).
- Further analysis on the potential uses and revenue streams for the biogas should be undertaken.

7. Recommendations

Based on the review of the Respondents submissions the following recommendations are provided:

- Additional mixed waste composition analysis is required in order to develop an accurate mass balance for a mixed waste processing facility. This compositional data can be used to determine the recyclables and organics that are available in the mixed waste stream.
- The Region should undertake additional quality testing on the OFMW from the approved pilot study to assist with determining the most appropriate end use for the material.
- A decision on organics processing technology should be made in advance of any procurement process.