City of Winnipeg

Comprehensive Integrated Waste Management Strategy (CIWMS) – 5 Year Review

Executive Summary

April 2019

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1 Introduction and Background

In 2011 the City of Winnipeg Council adopted the Comprehensive Integrated Waste Management Strategy (CIWMS)[1] in an effort to increase diversion rates. Since adopting the CIWMS, the City has made significant improvements and changes to its waste management system and has increased its overall diversion rate to 32.1% (2017) from 18.6% in 2011. To ensure continued progress and success in the City's garbage, recycling and organic waste programs and services outlined in the CIWMS, Council has directed that a five-year review of the CIWMS be undertaken. The City of Winnipeg retained HDR to undertake this review of the CIWMS.

The review builds on the recommendations outlined in the original strategy and addresses several key drivers including;

- Population growth;
- Provincial targets;
- Greenhouse Gas reduction targets;
- Rationalization of Regional Facilities;
- Sustainable directives as outlined in OurWinnipeg;
- Financial Sustainability;
- Developments in local and international recycling markets;
- Resource Recovery opportunities; and,
- Diversion of additional materials such as construction and demolition waste.

The CIWMS review will affirm that the City's diversion targets, programs, services and timelines are on track to result in continued success and will set the City on the best path for the next several years.

1.1 Stated Problem

The review of the City's current waste management system indicated the following key areas that reflect issues or factors driving the review of the current system. Many of the following issues were originally identified in the development of the CIWMS while others have developed since the CIWMS implementation:

- Need for improvements to the scope, effectiveness and efficiency of the City's overall waste diversion system, in order to achieve and sustain higher diversion rates over the short and mid-term.
- Need to increase awareness of waste management programs and the effect of waste management on the local and broader environment across all sectors.
- Need to finance the City's waste management system in an equitable manner that provides sufficient funds for current and future waste management.
- Need to review use of current resources and requirements for future waste management facilities, programs or services.

[1] Also known as the Garbage and Recycling Master Plan (GRMP)

- Management of organics to reach City and Provincial GHG emission reduction targets in a fiscally and environmentally responsible manner.
- Need to develop one or more attainable waste management targets using metrics that are within the City's control to measure success and progress.
- Need to increase recycling in Multi-family Dwellings (MFD).
- Need to update eligibility and provision of services to Municipal Collected Non-Residential (MCNR) customers and other non-residential customers and address funding of these services.
- Consideration of services provided to the MFD and MCNR sectors to increase diversion.
- Need to conserve capacity at the Brady Road Resource Management Facility (BRRMF) and enhance services provided to divert more waste.

1.2 Goals and Objectives

As in the original CIWMS, the City's goals and objectives include promotion of waste reduction and reuse to reduce the quantities of waste requiring disposal. This can be achieved by implementing new programs to reduce waste (e.g. grasscycling) and new programs, facilities and policies designed to increase convenience and promote waste diversion where possible. This could include initiatives designed for curbside collection and at various facilities, including the 4R Depots and BRRMF.

The City should also develop goals and objectives related to management of Industrial, Commercial and Institutional (ICI) and Construction, Renovation and Demolition (CRD) waste which could include provision of diversion opportunities at City facilities, municipal regulations, and enforcement.

The City currently has a goal of achieving a waste diversion target by 2020 of at least 50% of residential waste. As of 2017, the City had achieved approximately 32% diversion, primarily due to programs offered to residents in single family dwellings (SFD) as compared to residents of multi-family dwellings (MFD) and the non-residential sector to whom the City provides collection services.

In order to achieve significantly higher diversion rates, greater diversion of organics, particularly food waste will be required along with higher diversion by residents in MFD. A comprehensive and ongoing promotion and education (P&E) campaign will be required to ensure residents participate in the program in order to achieve the desired participation and capture rates. However, even with good participation and capture rates, it will be difficult for the City to achieve a 50% diversion rate target without significant commitments and investment in the waste management system.

The City will need to ensure that the CIWMS going forward provides a balance of options between:

a) the environment - resulting in increased diversion, reduced disposal and decreased GHG emissions;

b) economic – providing a waste management system at a cost that is sustainable and equitable to stakeholders; and,

c) social – providing a waste management system that meets the fundamental needs of the community.

All three factors are inter-related and must be considered together in both the short and mid-term.

The following table presents goals and objectives from the original CIWMS, updated with information from the review of the CIWMS.

Table 1: CIWMS Update Goals and Objectives

Goals	Objectives
Minimize the generation of waste in Winnipeg	• Implement policies and programs that encourage a decrease in the per capita waste disposal rate. • Support waste reduction and reuse through policies and programs.
Improve and sustain performance of the City's diversion system	• Increase diversion by adding key programs that will divert major material streams (e.g. source separated organics) in a cost effective fashion. • Encourage MFD waste diversion through programs and policies (e.g. design standards). • Secure processing capacity for source separated organics.
Increase participation in the City's waste management plan and engage residential and non-residential sectors in diversion initiatives	• Develop and deliver promotional and educational campaigns, using targeted social marketing approaches designed to reach different audiences. • Continue to adapt to changing methods of accessing information. • Diversion should be the number one priority for residents, with participation in diversion programs reaching in the order of 80% or higher through a combination of incentives and disincentives as well as waste reduction. • The public and the City would continue to view the 4R Depots as centres for diversion and not disposal. • ICI and CRD waste would be viewed as a resource which could be managed at City facilities. • Develop partnerships with non-profits and stewards to manage additional materials collected at the curb or at 4R Depots. • Institute policies to divert waste and enforce as required.
Optimize management of the BRRMF and 4R Depots	• Increase awareness of the value of the BRRMF as a key City resource and asset. • Reconfigure the landfill to minimize the potential environmental impacts of the site and make best use of the current footprint. • Effectively manage landfill odours and reduce the potential for off-site landfill gas migration. • Effectively manage landfill leachate and reduce the potential for impacts on surface water and groundwater. • Protect the ability to continue activities on the landfill property by minimizing the potential for incompatible adjacent land uses and potential for off-site impacts from the landfill. • Optimize the number of recycling and 4R Depots for convenient diversion at a sustainable cost.
Reduce the negative environmental effects of managing the waste generated in the City	• From a lifecycle analysis perspective, consider the direct and indirect effects of managing waste (including GHGs, emissions to air and water, energy and resource consumption) to reduce the environmental footprint of the waste management system. • Reduce the consumption of landfill airspace over the planning periods, through a combination of decreased waste disposal, removal of difficult to manage materials, and other programs/policies that result in increasing the density of residual waste disposal.

Goals	Objectives
Implement a sustainable waste management system that balances the social, environmental and financial considerations of waste management while addressing the long-term needs of City residents (triple bottom line)	• Ensure that an acceptable balance of social, financial and environmental considerations is achieved. • Pursue diversion system options in which the incremental increase in diversion performance is balanced with the potential increase in system costs. • Ensure the current system of funding by industry stewards is fair, equitable and sufficient to cover the City's costs of handling materials. • Advocate for increased funding for additional waste management programs and policies that also help meet the Province's goals and targets. • Ensure all users of the City's waste management programs fund the system appropriately so that current and future costs of waste management are sustainable.
Support the City's Climate Action Plan	• Align the CIWMS update with City Climate Action Plan goals to the extent possible. • Continue to implement programs and services that contribute to reductions in GHGs. • Prioritize actions that focus on diverting recyclable and compostable materials from the waste stream as these efforts result in greater potential for life-cycle GHG emission reductions.

1.3 Overview of 2011 and 2017 Baseline

The City of Winnipeg has made substantial improvements to its waste management system and programs which has contributed to a more consistent level of service to residents, improvements to infrastructure and programming and an increased diversion rate.

Key successes include:

- Expansion of an automated cart system for garbage and recycling to the entire city.
- Expansion of curbside collection of leaf and yard waste city-wide and closure of the Leaf-it drop-off depots.
- Refinements to the Brady Landfill including rebranding the landfill as a Resource Management Facility, installation of a landfill gas collection system, development of a leaf and yard waste composting program, a pilot biosolids composting program and various operational and aesthetic improvements to the site.
- Construction and operation of three 4R Depots.
- An increase in diversion from 18.6% (2011) to 32.1% (2017).
- Reductions in GHG emissions with implementation of the landfill gas system at BRRMF.
- Initiation and/or completion of a number of studies including a financing study, an organics diversion strategy, and a multi-family diversion strategy.

The following table provides a comparison of the services provided before the CIWMS (2009) and post-CIWMS (as of 2017). The City has significantly increased the level of service to all sectors to which they provide waste management services.

Table 2: Comparison of Waste Management Services by Sector

System Component	2009 (Pre CIWMS)	2017 (Post CIWMS)
SFD Residential Collection Services	• Garbage (Bags, Carts, Bins) • Recycling (Blue Boxes) • Call-in Bulky • 175,000 units (est.)	• Garbage, Recycling (Standardized Carts) • Leaf and Yard Waste • Call-in Bulky collection with a per item charge • Annual waste diversion fee per SFD • Fee for extra garbage collection (up to 3 bags) • 192,056 units (est.)[2]
MFD Residential Collection Services	• Garbage (Carts, Bins) • Recycling (Carts, Bins) • Call-in Bulky • 103,000 units (est.)	• Garbage (1.5-4.5 Cubic meter bins and some compactors) • Recycling (Standardized Carts and 2.25 cubic meter bins) • Call-in Bulky Collection with a per item charge • 87,895 units (est.)[3]
Municipal Collected Non-Residential Collection Services (Formally IC&I)	Small commercial Garbage (>600L/week) • Recycling (carts or bins) • Call-in Bulky collection • Less than 500 units (est.) • Charities receive garbage collection at no charge but to receive recycling, need to sign up as a commercial customer.	Charities/Places of Worship and Commercial (< 600L/garbage/per week): • Garbage (240L, or can use larger cart for additional fee) • Recycling (Standardized Carts) • Leaf and Yard Waste • Call-in Bulky Collection with a per item charge • Fee for extra garbage collection (up to 3 bags) • Less than 1200 units • Annual Waste Diversion Fee for commercial properties, fee is waived for charities and places of worship. Charities/Places of Worship and Commercial (600 to 3,000L garbage/per week): • Commercial: Recycling (Standardized Carts/Bins provided at no charge, or can use larger carts for an additional fee) • Charities/Places of Worship: Garbage Collection at no charge, no Recycling collection (Can get recycling collection if they subscribe as a commercial customer).

[2] This number represents the number of units (according to Customer Care & Billing Report – November 27, 2017) that pay the Waste Diversion Fee and receive service from the City. There are approximately 198,000 SFD units according to assessments but this includes various billing exemptions, vacant buildings etc. and is not a reflection of the true number of units serviced.

[3] Based on differing data sources, there are different numbers of MFD. When the CIWMS was implemented in 2011/2012, sign-up forms were sent to all MFD with a request to resubmit information about dwelling units etc. The responses received from MFD along with MCNR and City locations were tracked in a spreadsheet which was used to generate the pickup locations for the front-load collection contracts and provided the base information for the Collection Management System (CMS). The CMS (Source: Dwelling Unit Counts 2018-01-10) indicates there are 87,895 dwelling units at 2,220 properties which is estimated to be +/- 1-3%. Based on assessment only, there are 98,327 dwelling units at 1,999 properties. The difference between the two numbers may be attributed to some buildings receiving private service. The CMS estimates will be used for service purposes and for financial/billing purposes, the assessment estimates will be used to be consistent with the development of the SFD waste diversion fee.

System Component	2009 (Pre CIWMS)	2017 (Post CIWMS)
		• Less than 500 customers

Table 3 provides a comparison of the tonnes of waste managed through various programs in 2009 (pre-CIWMS) and in 2017 (post-CIWMS). The information presented below reflects changes in how waste is managed, for example the tonnage of residential small loads disposed at BRRMF has decreased as that material is now being managed at the Brady 4R Depot, and some backyard composter material most likely has shifted to curbside LYW collection. Overall, the tonnes of waste managed have decreased and the amount diverted has doubled since the majority of the CIWMS recommendations have been implemented.

Table 3: Comparison of 2009 and 2017 Residential Tonnages

Source	2009 (Pre CIWMS) Tonnes	2017 (Post CIWMS) Tonnes
Curbside Residential Garbage	230,916	172,209
Curbside Residential Recyclables	41,665	52,337
Curbside Residential Leaf and Yard Waste	n/a	21,926
Residential Recycling Depots/Public Bins	2,567	1,839
4R Depot (Divertible Material)	n/a	3,412
4R Depot (Garbage)	n/a	12,806
Residential Small Loads Disposed	52,363	included in 4R Depot tonnes
Leaf and Yard Depots/Brady Self-Haul	5,673	6,490
Backyard Composters, Christmas tree chipping	2,264*	851
Scrap Metal/Tires	1,301	765
Total Residential Waste Managed	336,749	272,635
Total Residential Waste Diverted	53,470	87,620
Residential Diversion Rate	15.9%	32.1%

* Sales of subsidized backyard composting units ended in 2011, tonnes estimated on a 10-year moving total.

2 Strategy Recommendations

The following sections provide an overview of the recommended options for the near term (2019-2023) and mid/long term (2024-2028), along with estimated costs, staffing requirements and environmental benefits.

2.1 Reduction and Reuse

Initiatives associated with reduction and reuse should be a priority for the City to promote the importance of resource conservation and reduced environmental impact. This section presents options associated with reduction and reuse, as well as expanded Promotion and Education (P&E) to support these, plus other options placed lower on the waste hierarchy.

Reduction and Reuse - Expanded P&E	
Category	Recommendations
Options	• Increase scope of activities and program expenditures on a per household basis to support new programs. • Includes support for school programs developed by the Province. • Targeted P&E program to divert recyclables and LYW from garbage and promote grasscycling. • Enhance website for use on mobile phones. • Continue to monitor and add to content on website
Implementation	• Ongoing
Estimated Cost	• Capital – No Capital Costs • Operating – Some operating expenses related to staff time and P&E collateral. Approximately $10,000 - $20,000 annually depending on the extent of the P&E campaign required.
Staffing	• Staff time required to develop P&E campaigns. • Likely an additional ½ or more FTE for all reduction/reuse programs.
Environmental Benefits	• Small potential for additional diversion < 1%. However supports waste diversion in the system as a whole.

2.1.1 Backyard and Community Composting and Grasscycling

Backyard composting is typically used by municipalities as a low cost, complementary activity to a curbside organics collection program. Although backyard/community composting is a low cost alternative to manage a portion of the organics stream, it does not have the potential to divert significant amounts of organics and would not meet residents' expectations for a curbside collection program. Backyard/community composting could continue as currently used by City residents as a supplemental organic materials management approach.

Grasscycling refers to the practice of leaving grass clippings on the lawn when mowing, typically through the use of a lawnmower with a mulching blade. Most municipalities provide some information and support for grasscycling on their websites and typically prohibit disposal of grass clippings in garbage to encourage the practice.

The following table provides an overview of backyard/community composting and grasscycling as a waste reduction initiative.

Reduction and Reuse - Backyard and Community Composting and Grasscycling	
Category	Recommendation
Options	• Continue to support and promote backyard and community composting. • Continue to support grasscycling as a waste reduction measure.
Implementation	Near Term • 2019/2020 - consider subsidies for Backyard Composters and mulching blades, • 2019/2020 - develop P&E program and/or partnership with a local organization to manage facilitation and coordination of these programs. Mid-Long Term • 2025/2026 - consider a grass disposal ban

Reduction and Reuse - Backyard and Community Composting and Grasscycling	
Category	Recommendation
Estimated Cost	• Capital – no capital expenses • Operating – some potential for expenses associated with subsidizing Backyard Composters. Regular price for composters is in the range of $80-$120. Subsidy costs could range from $5-$10 for a coupon to $60 - $100 per composter depending on the amount subsidized and the cost of the composter. For grasscycling, it is unlikely that a mulching blade subsidy would be necessary, but a focused education campaign and perhaps mower blade sharpening promotion (e.g. coupons for blade sharpening) would be required. Approximately $75,000 to $150,000 annually would be required to promote backyard composting and implement a grasscycling campaign depending on the extent of subsidies provided. • Potential for significant savings in collection and processing costs for LYW, depending on the uptake for grasscycling. The average lawn generates 140 to 180 kg of grass clippings per 93 m^2, depending on local growing conditions. The average lawn in Canada is 250 m^2[4], and in Manitoba around 80% of households have lawns[5]. If 10% of all SFD in the City practiced grasscycling, over 7,000 tonnes of LYW could be avoided annually.
Staffing	• Some staff time required to support implementation of a BYC/Community Composting program, a grasscycling program and supporting P&E material. • Potential for an additional ½ FTE in the near term, ¼ in the mid-term
Environmental Benefits	• Small potential for additional diversion (~ 1% or more), however supports waste diversion in the system as a whole. • Lower GHG emissions associated with less food and yard waste (including grass) in garbage and less waste managed overall.

2.1.2 Food Waste Reduction

At this time, the City does not have a food waste reduction strategy, and would have to conduct some research with food processors, grocery stores, and organizations such as Winnipeg Harvest or the Winnipeg Food Council to learn how food waste is currently handled and if there is fit/need for a program that the Water and Waste Department could be involved in, compared to other government or other organizations.

Reduction and Reuse - Food Waste Reduction Strategy	
Category	Recommendations
Options	• Collaborate with other organizations to develop a food waste reduction strategy.
Implementation	Near Term • 2019/2020 - Undertake research on resident's attitudes and understanding of food waste. • 2020/2021 - Investigate the feasibility and level of effort required to develop a food waste reduction strategy and license the Love Food Hate Waste (or similar) campaign. • 2020/2021 - Develop a food waste reduction strategy. Mid-Long Term • 2028/2029 - Assess how a food waste reduction strategy can complement a source separated organics program (if implemented).

[4] Lowes Canada, Lawn Care & Maintenance tips.

[5] Statistics Canada, Households and the Environment Survey 2006.

Reduction and Reuse - Food Waste Reduction Strategy	
Category	Recommendations
Estimated Cost	• Capital – no capital expenses • Operating – some operating expenses associated implementation and promotion of a food waste reduction program, for staff time. If the City implements the Love Food Hate Waste campaign specifically, annual licensing fees in the order of $30,000 would be required. Should assume average annual costs of approximately $40,000 to include other City-specific initiatives.
Staffing	• Some staff time required to support implementation of Love Food Hate Waste campaign and potentially development of P&E material. • Some staff time required to administer the Love Food Hate Waste campaign and participate in outreach efforts. • Overall an additional ½ FTE until 2021, dropping to ¼ FTE to maintain in 2022.
Environmental Benefits	• Small potential for additional diversion < 1%. However supports waste diversion in the system as a whole. • Lower GHG emissions associated with less food waste in garbage and less waste managed overall.

2.1.3 Reuse Initiatives

There are many reuse initiatives that the City could support that work towards increasing residents' awareness of the need to reduce and reuse waste as outlined in the following table.

Reduction and Reuse - Reuse Initiatives	
Category	Recommendations
Options	Near Term • Continue to support events such as Giveaway weekends • Continue to investigate opportunities for partnerships with non-profits and other organizations involved with reuse Mid-Long Term • Investigate feasibility of creating a reuse depot at one or more 4R Depots
Implementation	Near Term • Ongoing - Continue to support existing opportunities • Ongoing - Support implementation of reuse initiatives through funding, advertising, staff support • 2019/2020 - Investigate opportunities to partner with other organizations to support reuse events and initiatives. Mid-Long Term • 2024/2025 - Consider a reuse depot at one or more 4R Depots
Estimated Cost	• Capital – no capital expenses unless a dedicated reuse area is developed at a 4R Depot. • Operating – some expenses to support reuse initiatives through grants, space for initiatives, advertising, staff time. The extent of operating costs will depend on the range of reuse initiatives that are implemented. An annual allowance of $50,000 to $75,000 would be a reasonable assumption.

Reduction and Reuse - Reuse Initiatives	
Category	Recommendations
Staffing	• Some staff time required to support implementation of reuse initiatives and development of P&E material. • Some staff time required to participate in reuse initiatives. • Potential for staff time if reuse depot located at 4R Depot. • Assume ½ FTE overall should the City support development of a reuse depot located at a 4R Depot. Only ¼ of an FTE to support the other options.
Environmental Benefits	• Small potential for additional diversion < 1%. However supports waste diversion in the system as a whole. • Lower GHG emissions associated with less waste managed overall.

2.2 Recycling

As the City provides a comprehensive curbside recycling program there are only a few opportunities to examine expanding the range of materials collected at the curb. The real opportunity for an increase in diversion through curbside recycling would be to improve MFD participation and capture[6] rates. The City could also consider curbside collection of textiles and mattresses, in partnership with stewards or third party service providers where applicable. The following table outlines the options to increase recycling.

Recycling	
Category	Recommendations
Options	Near Term • Identify recycling components to be implemented as part of completed MFD Diversion Strategy • Investigate options for collection and recycling of textiles and mattresses • Evaluate use and effectiveness of remaining community recycling depots now that three 4R Depots are in operation • Assess City's options to participate in, support and improve recycling in public spaces Mid-Long Term • Develop MFD Design Guidelines • Assess current acceptable recycling materials being collected, ability of MRF contractor to process and market those materials
Implementation	Near Term • 2019 - Complete MFD diversion strategy and identify recycling components to be implemented • 2019/2020 - Develop a partnership with one or more non-profit agencies to collect and/or manage textiles at the 4R Depots or through existing programs offered by stewards or non-profit agencies • 2019/2020 - Evaluate use and effectiveness of remaining community recycling depots now that three 4R Depots are in operation • 2020 - Evaluate use and effectiveness of mattress recycling pilot

[6] Capture rates refer to the amount of a material diverted as a percent of the total amount generated.

Recycling Category	Recommendations
	• 2021/2022 – Support Public Works with an assessment of the placement, type and number of recycling containers in public spaces, and the appropriate form and level of support from the City to support public space recycling Mid-Long Term • 2024/2025 – Develop Design Guidelines for Waste Management at MFD buildings in consultation with other City departments and stakeholders • 2024/2025 - Assess markets for recycling materials collected in advance of new collection contract and ability of MRF processor to market those materials.
Estimated Cost	Capital Expenses • Depending on how additional materials for diversion are managed, potential for some storage space requirements at 4R Depots or BRRMF (estimated at $150,000). • Capital costs associated with implementation of the MFD diversion strategy will be determined as part of that exercise. Operating • Operating expenses associated with staff time to complete MFD strategy and/or investigate other recycling options. Additional P&E required to support any changes to recycling program. There could be some operational costs associated with management of additional recyclables (textiles, mattresses) which have yet to be determined. • City is currently responsible for collection and processing activities and costs that are not covered by CBCRA funding. The City should identify the extent of the gap for those costs not funded by CBCRA to support discussion with the stewards and/or province.
Staffing	• Staff time required to investigate partnerships, collection of additional materials, conduct and analyze surveys about Recycling Depots, and develop MFD design standards. • Overall 1 FTE Required for the near term, ½ FTE in the mid to long-term
Environmental Benefits	• Some potential for additional diversion – likely < 2%. • GHG emission reduction potential through diversion of more recyclables, including mattresses and textiles.

2.3 Organics Diversion

Organics diversion represents a significant opportunity to increase the City's diversion rates and reduce GHG emissions. It also supports a number of existing recommendations and initiatives from the CIWMS, City strategies/plans such as *OurWinnipeg, A Sustainable Winnipeg, Corporate Waste Strategy* and the *Climate Action Plan*, and the Province's Climate and Green Plan.

Management of organics, primarily consisting of food waste, was investigated in detail as part of the CIWMS review and also through a previous Organics Diversion Strategy conducted in 2016/2017. The following table presents on overview of the recommendations for a pilot and full-scale source separated organics collection program and an organics processing facility. While the table below suggests a start date of 2027 for the start of a full-scale program, the timing could be adjusted depending on the outcome/length of the pilot, decisions made on the procurement approach for processing and availability of processing capacity.

Organics Diversion	
Category	Recommendations
Options	Near Term • Implement pilot program in 2021. • Consider collection of organics at City facilities as part of the pilot program. • Based on the pilot program performance, complete a business case for implementation of a full-scale Source Separated Organics (SSO) program. Mid-Long Term • Pending evaluation of the pilot and policy direction by Council, develop a full-scale SSO program and an organics processing facility. • Collection of organics from City facilities to support City's Climate Change targets. Would likely be best timed for implementation concurrently with a residential curbside program, but could be considered for separate implementation. • If proceeding with a SSO program, provide capacity to process and divert commercial food waste.
Implementation	Near Term • 2019 – Approval for SSO Pilot program • 2019/2020 – Planning for SSO Pilot • 2021/2022 – SSO Pilot (suggested time frame to complete pilot – between 1 to 4 years) • 2021/2022 – Business case for Organics Processing Facility • 2023 –Council decision for city-wide SSO Program • 2023/2024 – Seek Environment Act License approval for composting facility Mid-Long Term • 2023/2027 – Procure, construct, and commission composting facility • 2024/2026 – Procure and deliver carts, kitchen containers, and P&E materials • 2027 – Start of full-scale SSO program for SFD Beyond Mid-Long Term • 2030 – Rollout SSO program to MFD
Estimated Cost	**Pilot** Capital and operating expenses in the first year of the SSO pilot are approximately $175 per participating household, including costs for kitchen and curbside containers, processing, promotion and education and data collection. Ongoing, but lower (approximately $92 per household), costs would be required to maintain the pilot in successive years. Assume 5 routes each with 800 SFD for the pilot (4,000 SFD). Total costs estimated as $700,000 for the first year and $368,000 in subsequent years of pilot. **Full-Scale SSO Program** Capital Expenses • One time roll-out costs in the order of $17 million (carts, kitchen containers, P&E material etc.), • Processing facility costs for a facility capable of managing all types of food waste range in the order of $25 million for an outdoor covered windrow system to $58 million for a fully enclosed facility (+/- 35%) - should the City own and finance the facility. In the event that the City does not have the capital resources, organics processing capacity could be procured through a Design, Build, Own, Operate, Maintain (DBOOM) contract, with financing provided by the private sector.

Organics Diversion	
Category	Recommendations
	• Business case development for a full-scale SSO program could be in the order of $150,000. Operating • Waste audit costs of approximately $15,000 for pilot SSO program areas and $40,000 for SFD pre-SSO Rollout. • Annual operating costs for processing facility have been estimated in the range of $5 million for a City-owned facility. Annual operating costs would be higher for a privately owned and operated facility to allow for the contractor to recover capital investment costs. • Additional annual operating costs for collection of material ($4.6 million for separate collection) which could be reduced with co-collection of SSO and garbage or every other week garbage collection. • Annual costs to manage carts (delivery, replacement, repair, recovery) in the order of $100,000 based on 5% of households requiring cart replacement/repair each year, escalating five years from initial roll-out as the carts get older.
Staffing	• For the Pilot, staff requirements will be the highest in the six months leading up to the rollout and for six months post implementation. Would require 75% or more of a full time intermediate/senior staff person's time. If material is collected by City staff, additional collection staff may be required. • Significant staff time will be required to develop and execute a P&E strategy, particularly at the outset of the rollout of the full-scale program. The level of effort may be determined by the pilot. • For full-scale SSO program, continue positions from short-term (1 FTE to administer pilot program, ½ FTE for P&E support) and increase staff by 2 FTE for the first year of implementation. 1 FTE for enforcement of garbage restrictions.
Environmental Benefits	• Potential additional diversion between 5 and 17%. • Significant GHG emissions reduction potential associated with processing and collection ranging from 15,900 to 46,000 tonnes CO_2e annually, depending on the materials collected and how they are collected (by 2037). • Potential for additional tonnes diverted with implementation of other programs that encourage diversion of additional organics (e.g. pet waste) ranging from approximately 16,000 tonnes to 47,000 tonnes annually (by 2037).

2.4 Resource Recovery

The focus of initiatives related to resource recovery would be on the recovery of materials through non-curbside programs as the City already has a full suite of curbside programs. This could include recovery of materials from public spaces or special events, as well as recovery of additional materials from the 4R Depots. The following table presents an overview of the recommendations for additional resource recovery from the 4R Depots, BRRMF and other City landfills.

Resource Recovery – 4R Depots/BRRMF/Other Landfills	
Category	Recommendation
Options	Near Term • Cooperate with stewards of provincial programs to potentially provide a location at depots to manage various other materials. Responsibility for funding and end-management (e.g. processing, marketing) would rest with Stewards. • Identify a mechanism to allow small commercial generators to utilize 4R Depots.

Resource Recovery – 4R Depots/BRRMF/Other Landfills	
Category	Recommendation
	• Investigate potential for BRRMF to provide disposal capacity to other rural municipalities and Indigenous communities. • Assess the results of the soil fabrication pilot at Summit Landfill. Mid-Long Term • Diversion area and/or processing centre for bulky and CRD materials. • Develop a fourth 4R Depot, if the need has been established. • Consider variable tipping fees. • Work with Province to investigate disposal bans.
Implementation	Near Term • 2019 - Investigate the possibility of accepting additional materials at the 4R Depots • 2020 - Investigate how small commercial generators could use the 4R Depots • 2019/2020 – Evaluate the results of the soil fabrication pilot at Summit and assess viability for biosolids diversion • 2020/2021 - Conduct data gathering exercises on use of depots to support decision on whether a fourth 4R Depot is required • 2021/2022 - Conduct a business case to determine if a fourth 4R Depot is required and the type of material it would accept. • 2022/2023 – Conduct a business case to evaluate the feasibility of a processing/grinding operation for bulky/CRD materials (and wood waste) and/or a diversion area for bulky/ICI/CRD waste. • 2022/2023 – Implement changes to allow small commercial generators to use 4R Depots Mid-Long Term • 2023/2024 – Develop a CRD/Bulky waste processing centre and/or ICI/CRD diversion area at 4R Depot or BRRMF • 2023/2024 –Report to council on fourth 4R Depot • 2024/2025 – Consider variable tipping fees to drive diversion • 2024/2027 - Develop a fourth 4R Depot if a need has been established Long Term • 2028/2029 – Implement potential disposal bans in conjunction with Province
Estimated Cost	Capital Expenses • Potential for significant capital expenses associated with fourth 4R Depot. $4.9 million based on previous 4R Depot costs. Additional capital costs may be incurred depending on the range of materials managed. • Potential for capital costs associated with bulky waste/CRD waste processing centre at the BRRMF. Estimated capital cost of $2 to $3.5 million depending on type of equipment, range of recovered materials and configuration. • Potential for Capital Costs associated with developing an ICI & CRD materials diversion area. Approximately $2 million for development of a level-grade bulk materials management area. • The three-year soil fabrication pilot project is already underway and is funded through capital and operating. Tipping fees ($100/tonne rate, same as the rate for landfill disposal) are recovered internally from the City's Wastewater division for the biosolids directed to this pilot. Operating • Data gathering exercises (primarily staff costs).

Resource Recovery – 4R Depots/BRRMF/Other Landfills	
Category	Recommendation
	• Collection of more materials at existing 4R Depots (costs to be determined based on future market conditions). • Staffing and operation of a fourth 4R Depot (approx. $1.7 million annually based on current expenditures). • Staffing and operating cost (fuel, equipment etc.) for a bulky waste/CRD waste processing centre and/or an ICI/CRD diversion area (cost for 2 to 4 operating staff positions, maintenance contracts for heavy equipment and fuel/electricity requirements: actual cost will depend on the number of operating hours for either or both facilities). • Enforcement of variable tipping fees/disposal bans (primarily staff costs). • Costs for soil fabrication, based on the three year pilot project. Note: implementation of a bulky waste/CRD waste processing centre and/or development and operation of an ICI & CRD materials diversion area could manage commercial materials. Cost recovery mechanisms from this sector would be associated with implementation of these options.
Staffing	• Staff time related to coordinating data gathering, business case. • Potential additional staff required if more materials are managed at existing 4R Depots (2 FTE). • Additional staff required at the BRRMF to manage the CRD/Bulky processing centre and/or an ICI/CRD diversion area (2 to 4 FTE depending on whether one or both facilities are developed). • Additional complement of staff required for a fourth 4R Depot (4 FTE). • Additional staff time needed to implement and enforce potential disposal bans (.5 FTE). • Potential additional operators and technologists to run soil fabrication – number to be determined depending on outcome of pilot. • Overall 8.5 to 10.5 FTE.
Environmental Benefits	• Some potential for additional diversion - likely 3% to 4%. However for some options this would result in the City managing diversion of materials from the ICI and/or CRD sector, that currently are not included in the City's overall waste estimates as the City is not responsible for managing these materials. • Soil fabrication may result in diversion of up to 144,000 m^3 of corporate waste, including 24,000 tonnes of biosolids annually. • GHG emission reduction potential through diversion of additional materials.

2.5 Other Supporting Initiatives

There are a number of other initiatives the City should consider undertaking to support the recommendations discussed above. This includes data-gathering exercises, partnerships, development of alternate performance metrics and garbage disincentives to encourage diversion. The City can encourage participation in diversion programs through tactics such as Pay-as-you-throw (PAYT), or reduced frequency of collection of garbage (i.e. every other week). These are presented in the following table.

Other – Research, Partnerships, Performance Metrics, Garbage Disincentives	
Category	Recommendation
Options	Near Term • Develop business cases for fourth 4R Depot and a full scale SSO program. • Complete an Activity-Based-Costing exercise to determine adequacy of PRO funding. • Investigate potential to develop partnerships with non-profits, environmental groups, neighbouring municipalities, academia and indigenous communities for knowledge sharing, assistance with roll-out of various waste reduction programs and for collection and processing of materials (e.g. from 4R Depots). • Conduct a waste audit on MFD/MCNR and households involved in SSO pilot both before the pilot commences, and once established. • Conduct surveys on visitors to 4R Depots. • Conduct a data collection exercise on the remaining recycling depots. • Investigate partnerships with other City divisions for waste diversion programs. • Introduce new performance metric(s) as part of annual reporting process. • Assess how PAYT may fit into City's financing structure as part of review of financing study. • Develop business case for landfill gas-to-energy. Mid-Long Term • Conduct a waste audit on households participating in a full scale SSO program if approved. • Investigate every other week garbage collection if/when SSO program is implemented. • Investigate potential for developing waste infrastructure in partnership with neighbouring rural municipalities. • Investigate partnerships with other City divisions for waste diversion programs as part of full scale SSO program (if approved).
Implementation	Near Term • 2019 – Adopt a new performance metric (waste disposed per capita). • 2019/2020 – Develop partnerships with non-profits and/or environmental groups to assist with roll-out of waste reduction or recycling programs. • 2020 – Conduct follow up SFD waste audits (5 year update and review). • 2020 – Conduct a waste audit on households participating in pilot SSO study. • 2020 – Conduct a survey on use of community recycling depots. • 2020 – Conduct an Activity Based Costing exercise to determine if the City is being adequately compensated for the management of the various waste streams addressed by Provincial stewards through the Province's WRAP funding. • 2021 – Conduct waste audits on MFD/MCNR waste. • 2021 - Conduct data gathering exercises on use of 4R Depots to support decision on whether a fourth 4R Depot is required. • 2021/2022 – Initiate discussions with neighbouring municipalities to gauge interest in partnerships for waste infrastructure. • 2022 - Conduct a business case to support a fourth 4R Depot and whether it includes provision to accept garbage. • 2022 - Conduct a business case to support development of a full scale SSO program. • 2022/2023 – Conduct a business case to evaluate the feasibility of a CRD/Bulky materials processing centre or diversion area for bulky/CRD waste. • 2022/2023 – Develop a business case for landfill gas-to-energy.

Other – Research, Partnerships, Performance Metrics, Garbage Disincentives	
Category	Recommendation
	• 2022 – Conduct a follow-up waste audit on households participating in pilot SSO study. Mid-Long Term • 2024 – Investigate opportunities for partnerships with other City divisions to participate in full scale SSO program (if approved). • 2026 – SFD waste audit as part of 5 year follow up and pre-SSO implementation. • 2027 – Implement every other week garbage collection with introduction of full scale SSO program (if approved). If not rolled out at the same time, consider 2 to 3 years later once residents are accustomed to the SSO program. • Ongoing – Continue to investigate potential for partnerships.
Estimated Cost	Capital Expenses • Business case development could be in the order of $ 50,000 to $150,000 depending on the focus of the study. Operating • Waste audits could be in the order of $25,000 for the MFD/MCNR audits, and in the order of $30,000 - $50,000 for the SSO households, depending on the length of the audit, number of samples, number of waste streams sampled etc. • Surveys could be conducted with City staff, or through environmental groups and could be in the order of $10,000-$15,000. • The Activity Based Costing exercise(s) could be completed by City staff. • Operating expenses associated with staff time to investigate and develop partnerships. • Potential for cost savings associated with certain garbage disincentives (e.g. alternating week garbage collection).
Staffing	• Staff time related to data gathering and analysis, coordinating waste audits, developing surveys and analyzing results, completing an Activity Based Costing exercise and investigating partnerships. • Overall .75 FTE.
Environmental Benefits	• No direct environmental benefits with the exception of a corporate diversion strategy that would divert more waste and reduce GHG emissions. • Measures indirectly support the environment through knowledge and acquisition of data to support changes to diversion programs. • Additional diversion possible with PAYT or reduced garbage collection frequency. Generally observe ~ 2% increase in diversion associated with these measures alone, but this is hard to quantify when this is implemented along with other major program changes (e.g. curbside SSO). • Assuming an additional 10% capture in organics from garbage from SFD as a result of moving to every other week collection, there is potential for diverting an estimated additional 3,800 to 8,000 tonnes of SSO depending on the type of materials collected, with additional GHG emissions reduction in the order of 2,100 to 6,100 $MTCO_2e$ annually.

2.7 Staffing

The following table presents a summary of the FTE required to support the recommendations in the updated CIWMS.

Table 4: Estimates of Additional FTE Required for CIWMS Recommendations

Category of Activity	Near Term	Mid to Long-Term
Reduction and Reuse - Expanded P&E	0.5 or more FTE	0.5 or more FTE
Reduction and Reuse - Backyard and Community Composting and Grasscycling	0.5 FTE	0.25 FTE to maintain
Reduction and Reuse - Food Waste Reduction Strategy	1 FTE	0.5 FTE to maintain
Reduction and Reuse - Reuse Initiatives	0.25 FTE	0.5 FTE to maintain
Recycling	1 FTE	0.5 FTE to maintain
Organics Diversion	1.5 FTE	3.5 FTE Year 1 of full scale program 2 FTE to maintain
Soil Fabrication (To be determined depending on outcome of pilot)	TBD	TBD
Resource Recovery – 4R Depots adjustments, fourth 4R Depot, Bulky and CRD Processing and/or ICI/CRD diversion area	1 FTE	8.5 to 10.5 FTE depending on which options are implemented
Other – Research, Partnerships, Performance Metrics, Garbage Disincentives	0.75 FTE	0.75 FTE to maintain

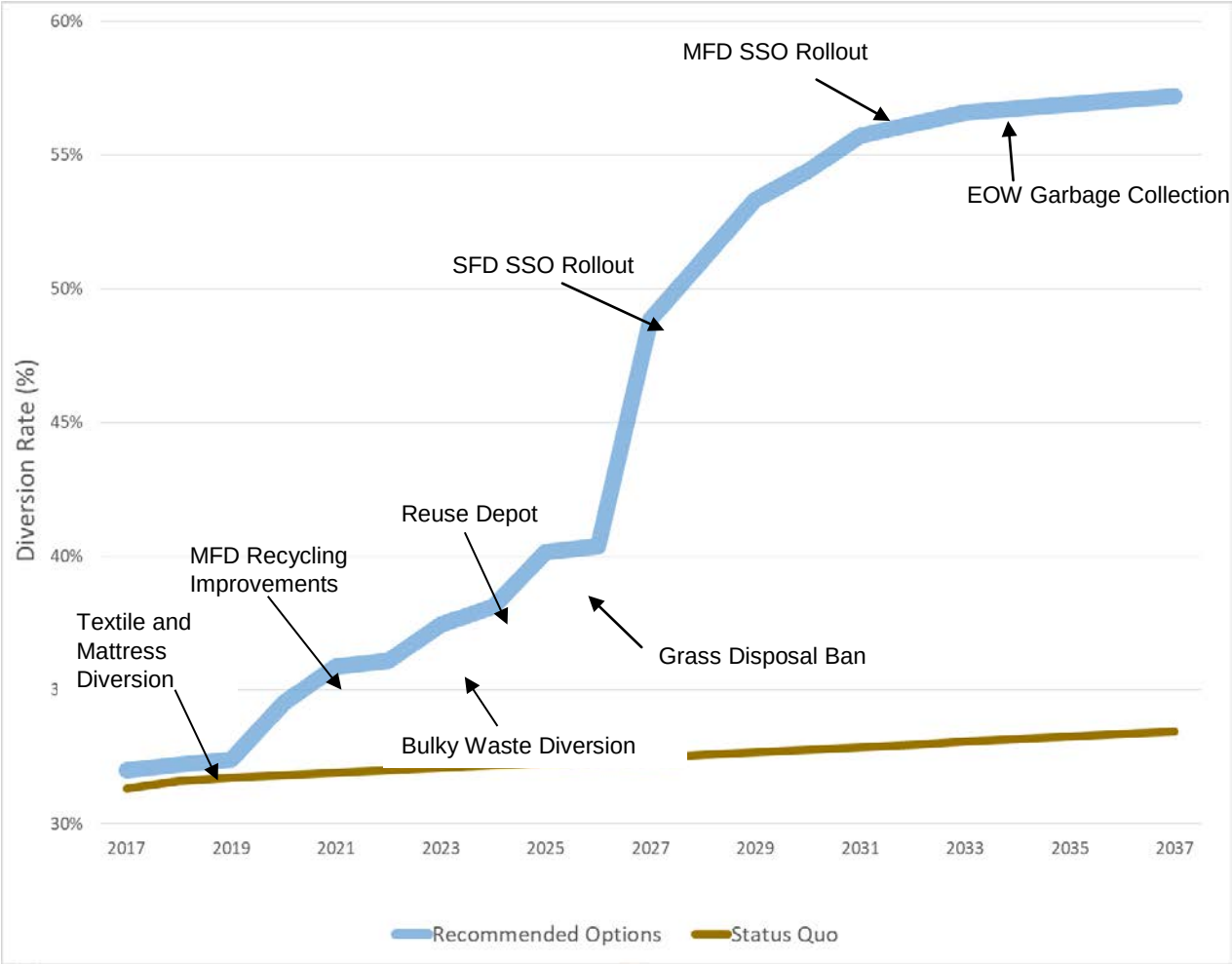
3 Impact of Waste Reduction and Diversion Programs

Figure 1 presents the estimated impact of the recommended diversion programs on the residential diversion rate. As more diversion programs are implemented in accordance with the recommendations set out in Section 2, the City's residential and overall diversion rate for City managed waste (including MCNR) should increase.

It has been assumed that there would be a small annual increase in diversion rates for both the status quo and the new system due to the City's ongoing efforts regarding promotion and education of diversion programs. Reasonable participation and capture rates have been assumed for the recommended diversion programs. The SSO program assumption in these projections is that the City would implement a program that collects all food waste and some compostable paper fibres on a weekly basis beginning with SFD in 2027. A 40% capture rate is assumed for the first year or so of the program, increasing to 60% as the program matures and as residents adapt their behaviours.

Although the implementation plans for the CIWMS update covers the period from 2019-2028, waste projections were modeled over a 20-year period to indicate the overall effect of implementing these recommendations.

Figure 1: Potential Impact of Recommended Diversion Programs on Residential Diversion Rates



GHG emission reductions are associated with all of the noted diversion recommendations, however the scale of the change will vary pending on the amount and types materials diverted. GHG emission reductions are associated with the avoidance of methane emissions from organics being landfill disposed, as well as through the diversion of other materials such as textiles and mattresses.

The US EPA WARM (v14) model was used to estimate the tonnes of CO2e that could be avoided through composting of organics, and recycling of materials like textiles and mattresses.[7]

By 2037, it is estimated that with implementation of all recommended waste reduction, recycling and organics diversion activities, annual GHG emissions could be reduced as follows:

- 31,807 $MTCO_2e$ for a scenario where just vegetative household organics are collected for diversion in the City's SSO program.

[7] As the US EPA WARM model does not have a category for textiles, carpet was used as a surrogate for textile diversion, as well as for the textile/foam component of mattresses.

- 56,507 $MTCO_2e$ for a scenario where all food waste and some compostable paper materials are collected for diversion in the City's SSO program.
- 63,107 $MTCO_2e$ for a scenario where all food waste, some compostable paper and pet wastes are collected for diversion in the City's SSO program.

4 System Costs and Financing Strategy

The City's solid waste budget structure reflects a partial utility model, with a portion of the budget set up as a Solid Waste Utility (Disposal and Diversion) and collection services being tax supported. Two service areas make up the Solid Waste Utility portion of the budget: Solid Waste Disposal; and Recycling and Waste Diversion. Solid Waste Collection remains as a tax supported expenditure. For 2018, Solid Waste Collection comprised approximately 2% of the City's tax supported expenditures.

Based on the review undertaken as part of the CIWMS update, it appears that the Solid Waste Utility is not in a sustainable financial position. It will be difficult for the City to implement the CIWMS update recommendations, or make any other changes to the waste management system until the Utility develops and implements a financial plan that will fund current and future operations.

4.1 Recommended System Cost Adjustments

In Section 2, operating cost estimates have been identified for the recommended improvements to the City's waste diversion programs for the near-term and mid-long term. These operating cost estimates include all costs except those required for the purchase of equipment, the potential cost of improving MFD recycling which will depend on the MFD Diversion Strategy, facilities which have been included in the capital cost estimates, and labour costs. While labour costs were not noted, the potential FTE requirements/adjustments were noted. Additional labour costs would reflect the type of position and pay rates applicable to that type of position. The costs for some program elements that are currently noted in the operating cost estimates, could be allocated to the capital budget at the discretion of the City.

Capital cost estimates are also noted in Section 2. The projected capital costs for the near-term are relatively low, primarily consisting of the business case development for mid-long term infrastructure and capital costs to support the SSO Pilot program. The bulk of additional capital costs projected as an outcome of this CIWMS update are associated with potential infrastructure development for resource recovery and for implementation of a full-scale SSO diversion program (processing infrastructure and organics carts and materials for program roll-out).

Without implementing any major program changes or adjustments to revenue sources, and using conservative budget assumptions, the financial review undertaken as part of the CIWMS indicates that the Solid Waste Utility has potential to be in a deficit position for Recycling and Waste Diversion throughout the near term. For Solid Waste Disposal, it is anticipated that it has the potential to get close to a deficit position towards the end of the near term period (as of 2023). The financial review identified a number of options for consideration by the City for financing the Solid Waste Utility.

It is recommended that the City undertake a broader financing study in 2019 to evaluate sustainable financial plan for solid waste. This could include (but not be limited to):

- For the Solid Waste Disposal component of the Solid Waste Utility:
    - Assessing the effect of potential decreases in the commercial tonnes received at BRRMF and associated decline in tipping fee revenues. Financial adjustments that could offset the effect of this decline include options such as changes to commercial tipping fees and/or the internal tipping fee applied to disposal of residentially collected waste and the City's corporate waste materials.
    - The approach used to determine annual tipping fee increases, as currently annual adjustments are not connected to or reflective of changes to actual disposal costs.
- For the Recycling and Waste Diversion component of the Solid Waste Utility:
    - Adjustments to the Waste Diversion Fee to reflect current diversion program costs and the level of service provided to the single and multi-family residential sectors.
    - Adjustments to the Waste Diversion Fee to reflect the diversion program changes that could be implemented based on the CIWMS recommendations.
    - Cost recovery mechanisms for diversion services that could be extended over time to the non-residential sector based on the CIWMS recommendations.
    - The function of the Waste Diversion Reserve (as discussed further below).
- For Garbage Collection:
    - The implications of transitioning Garbage Collection from a tax supported service to become part of the Solid Waste Utility.
    - The rates charged for collection from MCNR (small commercial, churches and charities).

The financing study should be used to develop a 10-year financial plan, which will account for the programs approved by Council, and the recommended rates that would be brought forward to Council for approval. Overall, based on the current status of the City's capital and operating budget and in the absence of a more detailed financing study, the City will have to look carefully as to how it could implement and fund the CIWMS recommendations.

There are no available sources of funding outside of the Waste Diversion Reserve for new diversion programs, and it is unknown as to whether City Council will consider using this reserve to balance the deficit in the utility.Certain priority programs (such as the SSO program) could be advanced through capital from the Waste Diversion Reserve. This could be used to fund all of the development costs for initiating the program such as staffing, data gathering (e.g. audits/surveys) and public engagement. The Waste Diversion Reserve could be used to fund other program elements such as food waste reduction and textile diversion. There is a limit on available funds in the Waste Diversion Reserve (the anticipated reserve fund

balance is projected as approximately $5.2 million as of January 2019), and replenishment through other funding sources is recommended.

It is anticipated that the operating costs and staffing associated with the CIWMS recommendations would be identified in future operating budgets, such that future budget risks related to the implementation of the plan are identified in the City's annual budget process.

5 Summary and Conclusions

Since the original CIWMS implementation, the City's diversion rate has increased from 18.6% in 2011 to 32.1% in 2017. This is a substantive improvement in diversion rates. The original diversion goal identified in the CIWMS was 50% diversion by 2020. This goal was ambitious, and reflected assumptions that all CIWMS recommendations would be implemented under the defined schedule including SSO collection as of 2017. It also assumed significant improvements in recycling capture rates and participation in the City's diversion system. The City has implemented the majority of the CIWMS recommendations identified for the period from 2012 to 2017, successfully mobilizing limited staff resources and engaging the public. This includes significant waste management system changes such as provision of weekly automated garbage and recycling collection to SFD, and seasonal curbside leaf and yard waste collection. The City has also constructed three 4R Depots and made improvements to the BRRMF.

As of 2018, the City of Winnipeg is one of the only large urban cities in Canada without a source separated organics program. Implementation of a full-scale curbside source separated organics program is the single most important consideration of this CIWMS review as it represents the next major fundamental change to the City's system. Implementation of an SSO program will consume considerable resources, including staff and budget, however it will conserve space at BRRMF, will contribute towards meeting City and Provincial climate change goals and will divert valuable material from landfill.

By 2037, considering population growth and the proposed implementation timeline for the recommended options (and depending on the type of organics collected and participation in the SSO program and other diversion initiatives), there is potential for:

- Reduction in GHG emissions by approximately 32,000 to 63,000 $MTCO_2e$ annually.
- Diversion of approximately 140,000 to 171,000 tonnes of materials annually from residential, MNCR and commercial sources.
- Increase in residential diversion rates from 32 percent to 57 percent.
- Reduction in residential waste disposal rates from 243 kg/capita/year to 151kg/capita/year.
- Diversion of up to 5,000 tonnes of CRD from commercial sources (based on 2017 tonnages).

Winnipeg, like many municipalities in Canada, is faced with multiple competing demands requiring creative allocation of funding. As part of this review, the City's funding approach was reviewed in order to initially assess approaches to equitably finance a system that benefits all residents and to address critical issues associated with existing or pending funding insufficiencies for the Solid Waste Utility portion of the system.

The costs associated with the CIWMS recommendations reflect a recommended increase of approximately 6 to 7 FTE in the near term, and 13.5 to 17 FTE in the mid to long term, to support and maintain the recommended program changes. Over the near term (2019 to 2023), some capital investment is

recommended to undertake supporting studies (business cases) for more significant program changes. An increase in operating costs for waste diversion and recycling is anticipated over the near term, primarily for the recommended program staff resources. Operating and capital cost projections increase over the mid to long term, reflecting capital investment in new diversion infrastructure and new program implementation.

The majority of the projected capital and operating costs associated with implementation of the CIWMS update recommendations are specific to the proposed residential SSO program as follows:

- Pilot SSO study costs of approximately $1.1 million over two years (not including staff support).
- Full scale SSO program rollout costs of around $17 million for carts, kitchen containers and supporting materials.
- Construction of an organics processing facility with potential capital costs in the order of $25 to $58 million (+/- 35%) depending on the technology and scale of the facility developed, assuming that the City chooses to finance and own this facility versus contracting for merchant capacity. Contracting for merchant capacity would eliminate the capital funding requirements, but would increase annual operating costs at a level commensurate with the ability of the contractor to recover their capital costs over the contract term.
- Annual operating expenses for the organics processing facility in the order of $5 million depending on the technology, and assuming that the facility is owned by the City.
- Increased collection costs by in the order of $4.3 to $4.6 million depending on the organic materials being collected, and assuming separate collection of organics. Changes in collection costs could be offset through savings via co-collection approaches and changes to the frequency of collection for garbage.

6 Recommendations

Program recommendations:

- Implement a curbside source separated organics pilot program in 2021 in order to assess the effectiveness of a full-scale program. At minimum, the pilot should be conducted for one year, but a longer pilot would allow for more data to be gathered on different aspects of the program.
- Based on the outcome of the SSO pilot, report back to Council on its results and recommendations along with a financial plan to implement a city-wide SSO program.
- If a city-wide SSO program is recommended, consider options to change collection frequency or collection methods that have the potential to off-set SSO collection costs (e.g. co-collection of garbage and SSO, every other week collection of garbage, alternating week collection of garbage and recycling along with weekly collection of SSO).
- Develop programs to support and encourage reduction and reuse initiatives such as backyard composting, grasscycling, food waste reduction, reuse depots etc.
- Develop programs to divert additional materials such as textiles or mattresses in partnership with community agencies and/or stewardship organizations. This may be done at the 4R Depots and would require additional collection or storage areas.

- Develop a program at the BRRMF to capture and divert more bulky waste, CRD and IC&I waste.
- Conduct a series of data collection exercises to inform future decision making, including regular curbside waste audits and audits pre/post implementation of pilot and full-scale SSO program, surveys of use of recycling and 4R Depots, activity based costing exercises (including exploring level of support from stewards) and businesses cases.
- Conduct public outreach and engagement for programs such as the pilot SSO program, a full scale SSO program (if implemented), food waste reduction, grasscycling, backyard composting, other waste reduction programs, changes/improvements to depots.
- Investigate the need for a fourth 4R Depot through data collection (e.g. surveys, vehicle counts, tracking by postal code etc.).
- Consider enforcement measures to discourage disposal as diversion alternatives are implemented (e.g. design standards for MFD, disposal bans, differential tipping fees, collection of garbage only if participate in diversion programs etc.).
- Review the current waste fee schedule and adjust to allow for separation of commercial and charities/places of worship. Charities should have the same level of service as the commercial sector.

Reporting and Performance Target Recommendations

- Evaluate what the city can realistically achieve in terms of waste diversion and set a corresponding goal such as an overall residential target of 50% waste diversion by 2030 (assuming all recommended programs are implemented including the proposed SSO program), with separate targets for SFD and MFD. This target provides some leeway for organics system performance as it can take a few years for residents to fully adopt a program.
- Adopt an annual waste disposal reduction goal of a reduction of 2 kg per capita annually. Progress towards the per capita waste reduction goal should be tracked both annually and on a 5-year rolling average, to reflect the contribution of market changes and economic trends on waste generation.
- Consider new performance metrics that monitor overall performance of the City's waste management system, such as waste generation per capita, waste disposal per capita, customer satisfaction, and participation.
- Consider adoption of GAP (Generally Accepted Principles)[8] methodology to calculate the waste diversion rate.
- Update the methodology and assumptions for LFG modelling at the BRRMF and apply the updated model in subsequent years.

[8] Refers to Generally Accepted Principles for Calculating Municipal Solid Waste System Flow – A protocol to measure municipal solid waste.

Financial Recommendations

- Undertake a financing study in 2019 to review at minimum:
  - Adjustments to the Waste Diversion User Fee beginning in 2020 to finance the existing waste diversion system as well as recommended program changes.
  - Increasing the commercial tipping fee to offset an anticipated decline in commercial tonnes over the near term.
  - Increasing the internal tipping fee applied to residential garbage and the City's corporate waste to reflect the true cost of disposal.
  - Linking annual tipping fee increases for all materials, to the rate of annual increase in waste disposal costs.
  - Transition of Garbage Collection to a full utility model.
- Develop a business case for the residential SSO program based on the outcome of the proposed organics pilot study, to support the City's future decision on whether to implement a curbside residential SSO program.