

## **Single Stream and Cart-Based Collection**

### **Introduction**

This document reviews the key considerations involved in moving to single stream and cart based collection programs. Drawing on research and the experience of other municipalities it provides an overview of the potential financial, operational and service implications of switching to single stream, cart-based.

Taken together, a review of these implications indicates that moving to a cart collection system would result in significant investment at a time of uncertainty. The Province may be moving to the producer responsibility model. As a result, Niagara Region would no longer be responsible for providing collection and processing of Blue Box materials. This would be the responsibility of the Blue Box industry stewards. Major program changes at this time would be considered a risk.

Additionally, with recent declines in commodity prices and stricter end market standards, moving to a single stream recycling system could further decrease revenue, as single stream contamination rates have shown to be higher.

Finally, the experience for residents should also be taken into consideration. While, carts do offer greater capacity for materials, their large size requires significant storage space. There can also be challenges with wheeling and properly setting out carts in snowy and icy conditions. Residents with long driveways may find large carts difficult to manage.

### **Costs**

#### **Initial Cost and Annual Maintenance/Replacement**

- Peel Region implemented a three (3)-stream cart collection program in 2016. The final cost for purchase and distribution of the carts was \$35 million, with an estimated annual maintenance and replacement cost of \$1 to \$3 million. This is an initial cost of \$109/household, plus an annual maintenance and replacement of \$3 to \$9/household. The carts were given to households free of charge.
- The City of Guelph phased in a cart-based collection program over three years, starting in 2012. The total cost for implementing the program was approximately \$9,298,530 for a population of 120,000. The total cost per household was \$156. The portion of the cost for purchase and distribution of the carts was \$4,677,839, approximately 50% of the final cost (City of Guelph, Automated Collection System, 2016).

- A CIF Report surveyed municipalities with cart collection and found that the capital costs for the larger carts (360L) are in the range of \$50 to \$60 each, with some of the smaller carts (120 litre) ranging \$30-40 each. In the case of Sault Ste. Marie, each dual/two cart cost about \$75 each. The carts usually come with a ten (10)-year warranty (one municipality reported 13 years) and typically last ten (10) years. Among those municipalities that have purchased the carts, a 'rule of thumb' applied is that the carts are typically amortized over a ten (10)-year period and require a replacement/reserve fund of \$7 per household per year (*CIF Project 888*, Jan. 2016).

### **Material Recovery Facility (MRF) Retrofit**

- Municipalities moving to a single stream, cart-based system require a MRF that is set-up to process the unsorted recyclables arriving at the facility. Niagara Region's current MRF operates for dual stream recycling collection. Switching to a single stream, cart based system would require modification to this facility.
- In 2007, Niagara Region engaged a consultant to review various collection methods, including cart-based collection for all stream. The estimated ten (10) year cost was approximately \$4.6 million higher than under a system without carts (i.e. Blue/Grey Box, Green Bin, kraft bags for leaves, bags/cans for garbage). This reflects a cost of \$1 million (2007 estimate) associated with retrofitting Niagara Region's MRF from the current two-stream operation to a single-stream operation.

### **Collection Costs**

- According to the CIF Project 888 report, the cost of co-collection automated cart collection vehicles is in the range of \$325,000 to \$350,000. In contrast, co-collection manual side loaders can cost \$215,000 to \$255,000.
- In the report, surveyed municipalities suggested the incremental cost per truck for automation ranged between approximately \$60,000/truck to \$73,000/truck.
- Ontario municipalities reporting cart and non-cart based collection costs between the years 2010 to 2014 were compared, as shown in Figure 1 from the CIF Project 888 report (note: costs do not include depot/transfer costs but do include annual capital costs). All of these municipalities had single stream recycling programs (CIF Project 888, Jan. 2016).

Ontario Single Stream Municipalities 2010-2014 (5 years as applicable)	Average Collection Costs per Marketed Tonne	Low (WDO group)	High (WDO group)
Carts - 5 Municipalities	\$235.28	\$156.38 (group 3)	\$311.28 (group 6)
Non-Cart – 12 Municipalities	\$272.08	\$117.72 (group 1)	\$723.21 (group 6)

Figure 1: Comparison of Collection Costs of Cart versus Non-Cart Programs (Table from *CIF Project 888*, 2016)

## Processing Costs

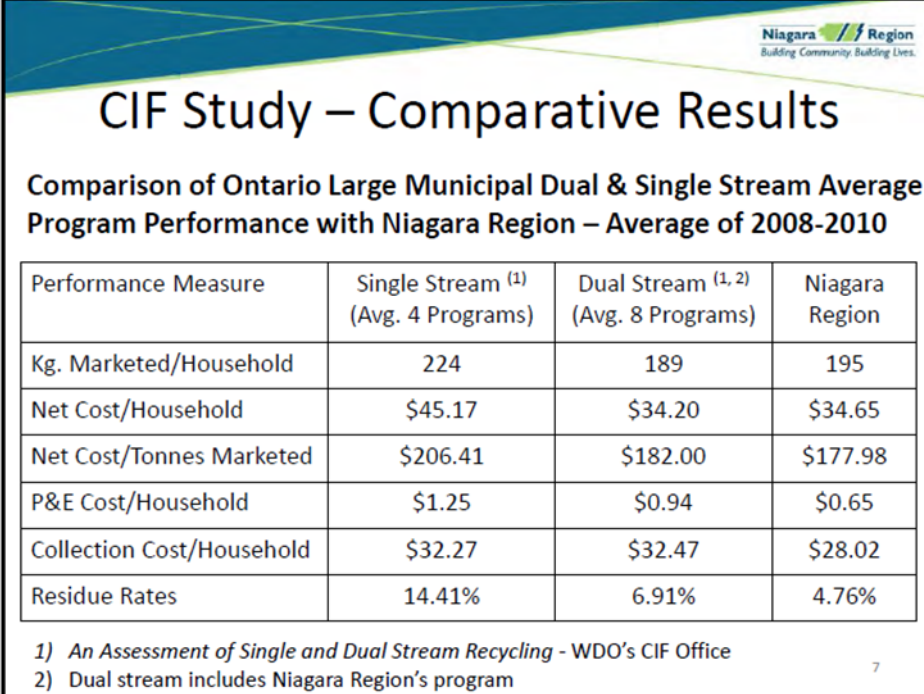
- According to the CIF Project 888 Report, processing costs for cart-based programs are higher than for non-cart based programs. In a comparison of 5 cart-based municipal programs with nine non-cart based municipal programs, the cart-based municipalities have an average cost per marketed tonne of processed recyclables that is roughly 27% higher (\$30.36/tonne) compared to the non-cart based municipal programs. (CIF Project 888, Jan. 2016). Figure 2 below shows average processing costs per marketed tonne for cart and non-cart programs. All programs compared are single-stream.

Ontario Single Stream Municipalities 2010-2014 (5 years as applicable)	Average Processing Costs per marketed tonne	Low (WDO group)	High (WDO group)
Carts - 5 Municipalities	\$142.58	\$85.17 (group 6)	\$254.88 (group 3)
Non-Cart – 9 Municipalities	\$112.12	\$60.66 (group 7)	\$296.22 (group 7)

Figure 2: Comparison of Processing Costs of Cart vs Non-Cart Programs (Table from *CIF Project 888*, 2016)

- Capital and operating costs for single stream processing are generally higher than for dual stream processing. Higher capital investment is required for equipment to separate the co-mingled fibre and container streams at the front end of the plant and for the mechanical and optical sorters required to separate on the processing lines. There are also higher operational costs associated with running this equipment and additional labour required to facilitate sorting.

- A 2015 study of Ontario recycling systems found that single stream recycling, on average, was 28.5% more expensive than multi-stream recycling. While single stream MRFs are capable of processing more tonnes relative to multi-stream MRFs, the difference in processing capacity is insufficient at offsetting additional costs from investments in sorting technology (C. Lakhan, 2015, Comparison of Single and Multi-Stream Recycling Systems in Ontario, Canada).
- An assessment of single and dual stream recycling for Waste Diversion Ontario (WDO), reported that based on the gross processing cost per tonne marketed for large Ontario blue box programs from 2008 to 2010, the cost of dual stream processing is in the order of 14 to 15% lower than the cost of single stream processing (An Assessment of Single and Dual Stream Recycling Including Current Program Performance in Large Ontario Municipalities, 2013). Refer to Figure 3 below for cost comparison.



Performance Measure	Single Stream <sup>(1)</sup> (Avg. 4 Programs)	Dual Stream <sup>(1, 2)</sup> (Avg. 8 Programs)	Niagara Region
Kg. Marketed/Household	224	189	195
Net Cost/Household	\$45.17	\$34.20	\$34.65
Net Cost/Tonnes Marketed	\$206.41	\$182.00	\$177.98
P&E Cost/Household	\$1.25	\$0.94	\$0.65
Collection Cost/Household	\$32.27	\$32.47	\$28.02
Residue Rates	14.41%	6.91%	4.76%

1) An Assessment of Single and Dual Stream Recycling - WDO's CIF Office  
2) Dual stream includes Niagara Region's program

Figure 3: Comparison of Ontario Large Municipal Dual and Single Stream Average Program Performance 2008-2010 (Data from *An Assessment of Single and Dual Stream Recycling*, WDO-CIF)

- Some municipalities are transitioning to two stream collection for cost savings. The Township of Drummond-North Elmsley is transitioning to dual stream recycling with an expected 25% reduction in processing costs compared to the price increase

proposed by the processing contractor to maintain single stream collection  
(<https://thecif.ca/two-stream-collection-as-a-solution-to-troublesome-fiber-markets/>)

## **Staffing Costs**

- Rolling out a cart-based collection program requires additional staff to assist with the transition. Conversion to automated carts is a major program overhaul requiring many months of preparation. The reported range is ten (10) months to five (5) years, with the general trend to be in the realm of years, not months. This includes lead-in, P&E, phone centre training and support, and post-distribution follow-up (CIF Project 888, Jan. 2016).
- For the 2016 rollout of their cart program, Peel Region aimed to hire 21 curbside representatives for delivery support, curbside checks, and field education activities (roughly 1 staff per 15,000 households).

## **Contamination**

- Single stream is a recycling collection method in which all unsorted or commingled recyclable materials are collected in one container at the curb and placed in the collection vehicle in a commingled state until processed at a MRF specially designed for sorting & processing mixed loads of recyclables. In dual or multi-stream recycling, the resident sorts their recyclable materials and places them in different containers (i.e. blue/grey boxes) before they are collected and taken to a MRF. Cart collection systems are predominantly single stream. The CIF Project 888 report recommends single stream for cart collection systems, since providing two carts approximately doubles costs compared to single stream. In addition, alternating weeks for carts can confuse residents.
- Single stream carts have higher residue rates (percentage of rejected material during processing). The higher contamination of materials in single stream carts results in more material being sent to landfills, a decreased value of commodities and difficulties finding end markets (C. Lakhan, 2015, Comparison of Single and Multi-Stream Recycling Systems in Ontario, Canada).
- The Continuous Improvement Fund (CIF) has reported that the average single stream residue rate for Ontario municipalities in 2019 was 30.3%. The average multi-stream residue rate in 2019 was 9.5%, as shown in Figure 4.

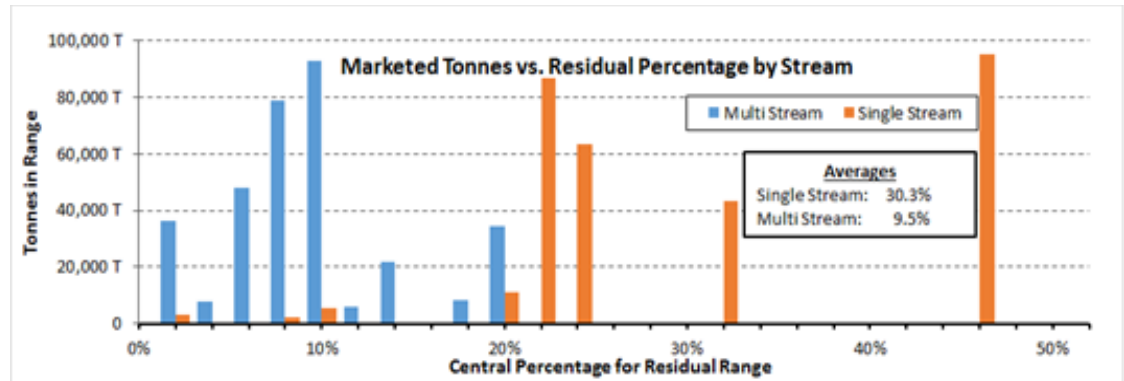


Figure 4: Comparison of Marketed Tonnes vs. Residual Percentage by Stream (CIF, 2019)

- Glass can be particularly problematic, as it is more prone to breakage in single stream systems. Dual stream recycling processing has higher glass recovery rates (WMAC presentation, March 26 2013).
- Paper is also vulnerable to contamination. A study cited An Assessment of Single and Dual Stream Recycling (2013) reported that single-stream material has eight times the yield loss of curbside-sorted material.
- In Peel Region, prior to the implementation of cart-based collection, recycling contamination was over 10% and organics contamination was approximately 3%. After implementation of the cart-based system, contamination rates in curbside recycling carts is over 20% and the contamination in organics carts is over 6%. These contamination rates are comparable to the contamination experienced in other municipalities with cart-based collection systems. (Region of Peel Council Report May 7, 2018)
- In addition to higher annual residue rates, Peel reported the following results after the first quarter of 2016, the first year of transitioning to cart-based collection
  - Residue rates increased by ~2,600 tonnes in Q1 2016 over Q1 2015, with a 22% increase in residue shipped from the MRF
  - Scrap metal increased 76.9%
  - MRF downtime increased to an estimated 380 hours (26 days) of processing to remove non-recyclable materials
  - MRF stoppages increased from 11 per day (pre-carts) to 21 per day, largely to remove home health care waste

- Based on this, by the end of the year Peel would have incurred an additional ~\$490,000 to landfill residue, manage scrap metal and cover processing fee adjustments for increased inbound non-recyclable contamination tonnage.  
(<https://thecif.ca/automated-cart-collection-what-we-have-learned/>)
- Managing the contamination will require a multi-pronged approach. Peel Region plans to use communications, enforcement and the development of a mixed waste processing facility. The mixed waste processing facility will mitigate the impacts of recycling and organics incorrectly placed in the garbage, but not the contamination in the recycling and organics programs. A 6-month resident awareness campaign is being implemented at an estimated cost of \$375,000 (May 7, 2018 Region of Peel Council Report)

## **Other Potential Impacts of Cart-Based Collection**

### **Windblown Litter**

- In Peel Region, based on feedback from Regional and Local Municipal staff and residents, there has been a reduction in windblown litter and improved streetscape aesthetics. (Region of Peel Report WMSAC - 3/2017)

### **Reduced Worker Injuries**

- In Peel Region, in 2015, prior to the cart collection program, 25 injuries were reported by the collection contractor. In 2016, the collection contractors reported 10 injuries. (Region of Peel Report WMSAC -3/2017).
- Safety issues that are reduced through automated systems include:
  - Repetitive strain injuries
  - Exposure to sharps
  - Physical fatigue
  - Direct exposure and risk of injury from unfavourable weather
  - Exposure to traffic risks while working at side and rear of collection vehicles

### **Resident Experience**

- Some potential considerations of cart collection systems include:
  - Convenience
    - Wheeled cart can be easier for some residents to maneuver compared to carrying boxes
  - Long Driveways

- Long Driveways may pose a challenge for some residents.
- Storage Space and Capacity
  - Carts can offer additional storage capacity, which can contribute to increased participation in recycling programs.
  - There may be potential issues for residents with limited space to store carts.
- Street Parking
  - Parked cars can be problematic for cart collection. Some municipalities have areas that cannot be serviced by fully automated cart collection vehicles.
- Narrow Streets and Lanes
  - Narrow streets impact the ability of automated collection vehicles to access carts.
- Weather
  - Snow and ice can create difficulty for wheeling carts as well as create issues with cart placement.
- Excess Waste
  - A system must be in place to manage excess waste that does not fit inside the cart (i.e. collection of extra bags)