



Glass End Markets

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The ReMM Group is pleased to submit this report to The Continuous Improvement Fund (CIF), which summarizes the capacity for curbside glass end markets for Ontario municipal recycling programs.

The report consists of the following sections:

1. Background
2. Objectives
3. Methodology
4. End Markets Overview

1.0 Background

In Ontario, 81,857 tonnes of clear and mixed coloured glass were reported as marketed to end-users in 2017 (RPRA Datacall). The majority of glass generated by Ontario's curbside recycling programs is marketed to NexCycle Industries. The purpose of this study is to identify additional glass end markets that may be able to accept Ontario's curbside generated glass in the event that NexCycle Industries was unable to accept some or all of Ontario's curbside generated glass.

1.1 NexCycle Industries

NexCycle Industries located near Guelph, Ontario, is a division of Strategic Materials, a US company with its head offices in Houston, Texas. The company processes both post-consumer and post-industrial scrap glass from residential curbside collection, deposit return programs and from bottle, plate and automotive manufacturers. Scrap glass is processed into cullet which is then sold back to the glass manufacturing industry to be used a raw material.

2.0 Objectives

The main objectives of this project are:

1. Determine how much total curbside generated glass capacity exists at glass end-users in Ontario, Quebec and freight efficient US states including Michigan, Ohio, Pennsylvania, New York and New Jersey.
2. Determine how much capacity is currently available as well as forecasted to be available over the next 24 months at these end markets for mixed broken glass (MBG).
3. Identify specifications and contract requirements (where applicable) required by these end users.
4. Identify other potential barriers preventing Ontario municipalities to access this capacity.



3.0 Methodology

ReMM used the following methods to identify alternative glass end-markets that could potentially accept curbside glass from Ontario municipalities.

- Contact known sources based on ReMM's experience
- Website searches
- Review industry publications
- Contact relevant organizations or associations
- Phone interviews
- In-person meetings

4.0 End Markets Overview

A table summarizing end markets by region (Ontario, Quebec and US Great Lakes States) is provided below, summarizing the following information:

- a) End market name
- b) Capacity by grade (if specified)
- c) Total capacity

A map of these end markets can be viewed [here](#) and in Appendix A.

The primary focus of the study was to identify capacity for Ontario's mixed broken glass (MBG), as this is the material typically generated by Ontario Material Recovery Facilities (MRF's). Therefore, end markets were questioned about their capacity to accept and process MBG. However, if the end market provided capacity information for clear (flint) glass, this information was recorded in the tables below.



4.1 Ontario, Quebec – Current Total Capacity

Company	Location	Accept Ontario Curbside Glass?	Clear Glass (MT)	Mixed Broken Glass (MT)	Total Annual Capacity (MT)	Notes
2M Resources Inc.	Saint-Jean-sur-Richelieu, QC	No		3,000	3,000	Accepting Quebec curbside glass only at this time;
Canadian Liquid processors	Hamilton, ON	No		Unknown	Unknown	Primarily product de-packaging. Curbside glass is too contaminated for their system.
Curran Recycling	Sarnia, ON	No		Unknown	Unknown	Previously accepted curbside glass for blending in backfill applications. Curbside glass is now too contaminated.
Groupe Bellemare	Sainte-Catherine, QC	No	25,000	25,000	60,000	Accepting Quebec glass only at this time; Accept 10,000 tonnes of coloured glass
Niagara Recycling	Niagara Falls, ON	Yes		7,000	7,000	Processing 5,000 tonnes from Niagara. Testing loads from other Ontario municipalities;
Poraver North America	Innisfil, ON	Yes		18,000	18,000	Accept curbside Ontario processed glass meeting strict specifications (Appendix B)
Tricentris Centre	Lachute, QC	No		32,000	32,000	Accept Quebec glass only
Total			25,000	85,000	120,000	

Note: The total of the Annual Capacity exceeds the detailed grade information, as specific grades were not always provided by sources



4.2 Quebec/Ontario – Forecasted MBG Capacity

Company	Location	Total Future MBG Capacity (MT)	Notes
Niagara Recycling	Niagara Falls, ON	8,000	Ability to increase capacity with capital investment and additional sales.
Poraver North America	Innisfil, ON	Unknown	Could increase capacity based on increased sales.
Tricentris Centre	Lachute, QC	32,000	Will be able to take additional Mixed Broken Glass in the future. Currently at capacity but are investing in their facilities to double the capacity of glass that they can handle.
Veriglass	Montreal, QC	Unknown	Will be able to take curbside glass 6-12 months in the future. Unsure of capacity at this time.
Total		40,000+	



4.3 US States – Michigan, Ohio, Pennsylvania, New York, New Jersey

Company	Location	Can take Ontario Curbside glass?	Clear Glass (MT)	Mixed Broken Glass (MT)	Total Annual Capacity (MT)	Notes
ABCA Glass	Kearny, NJ	No			Not provided	Did not want to disclose capacity at this time. Does not accept curbside glass as it is too contaminated
Carry All Products/Cap Glass	Mt. Pleasant, PA	Yes			Not provided	Did not want to disclose capacity at this time, but are willing to accept MBG from Ontario
Carry All Products/Cap Glass	North Hampton, PA	No			Not provided	Did not want to disclose capacity at this time
Dlubak Glass	Upper Sandusky, OH	No	72,575		72,575	Does not accept curbside glass as it is too contaminated
Glass Recyclers	Dearborn, MI	Yes	90,000		90,000	Will only accept sorted clear/flint glass from curbside; Used to accept Ontario's mixed broken glass – too contaminated.
Hillcrest	Attica, NY	No			Not provided	Currently accept pre-consumer clean glass only for road bead applications
Pace Glass	Jersey City, NJ	No			108,840	Accept curbside glass (flint & MBG) from nearby towns and municipalities;
Rumpke	Dayton, OH	Yes		100,000	100,000	Obligations for the majority of the total capacity. Could take approximately 15,000 tonnes from Ontario. Quality of glass is measured by the amount of fines and Non-Glass Residue (Appendix C)
Total			162,575	100,000	371,415	

Note: The total of the Annual Capacity exceeds the detailed grade information, as specific grades were not always provided by sources



5.0 Summary Findings

The table below provides an overall summary of the reported capacity by the end markets as well as the forecasted future capacity at facilities that may be able to accept Ontario's curbside residential glass.

End Markets	Clear Glass (MT)	Mixed Broken Glass (MT)	Total Annual Capacity (MT)	Notes
Ontario, Quebec	25,000	85,000	120,000	
US States (MI, OH, PA, NY, NJ)	162,575	100,000	371,415	
Forecasted Capacity		40,000+	40,000+	
Total	187,575	225,000+	531,415+	

Note: The total of the Annual Capacity exceeds the detailed grade information, as specific grades were not always provided by sources

Unfortunately, not all of the capacity summarized in the table above is accessible for Ontario generated MBG. The table below prioritizes the MBG markets that are currently available to accept Ontario's glass or could be available to accept Ontario's glass within the next twenty-four months.

The preliminary findings, as summarized in the table below, suggest there is **17,000 tonnes** of capacity for curbside generated glass based on information provided by end markets in Ontario, Quebec, Michigan, Ohio, Pennsylvania, New York and New Jersey. In the next twenty-four months, an additional 40,000 tonnes of capacity is expected to come online, which will total to **57,000 tonnes**. This additional capacity should be able to handle the majority of MBG being generated from Ontario's municipalities.

Company	Location	Current Excess Capacity (MT)	Potential Future Capacity (MT)*	Notes
Carry All Products/Cap Glass	Mt. Pleasant, PA	Not provided	Not provided	Not willing to disclose capacity at this time, but are willing to accept MBG from Canada
Niagara Recycling	Niagara Falls, ON	2,000	8,000	Potential capacity contingent on increased sales of finished product and capital investment for expansion.
Poraver	Innisfil, ON	Possibly displace higher cost material.	TBD	Could expand capacity based on increased sales.
Rumpke	Dayton, OH	15,000		Available excess capacity.
Tricentris	Lachute, QC		32,000	New capacity within 24 months.
Veriglass	QC		TBD	New capacity within 24 months.
Total		17,000+	40,000+	

*Within the next 24 months



5.1 Challenges

As summarized in the tables above, there is, or will be capacity to consume the majority of Ontario's MBG. However, there are some key challenges to access the available end markets.

The primary challenges of marketing Ontario's glass are Distance to End Markets and meeting End Market Specifications:

Distance to End Markets

The majority of glass end markets that may be able to process Ontario's curbside glass are located outside of Ontario. Cost to transport Ontario glass to these end markets may be significant. In addition to the transportation cost, there is likely a processing fee for mixed broken glass which may further make these options cost prohibitive. Therefore, municipal MRF's generally prefer to market glass to facilities located closest to their MRF to minimize their overall cost.

End Market Specifications

Glass end markets require suppliers to provide them with material that is of a quality that can be processed by the current equipment in their facilities. Unfortunately, curbside glass is often contaminated with other materials such as paper and plastic.

5.2 Glass Recycling Initiatives

5.2.1 Quebec

In 2016, [Eco Enterprises Quebec \(EEQ\)](#) launched and financed its Innovative Glass Works Plan, an initiative developed with the goal of recycling 100% of glass collected (120,000 tonnes/year) from curbside bins. EEQ has invested \$12.2 million in this Plan to modernize Quebec sorting centres, support the growth of glass markets and implement pilot projects (EEQ, 2019).

Through the Plan, EEQ tested the performance of equipment installed in five materials recovery facilities in Quebec and collaborated with processors and recyclers located in the Northeastern United States. The main conclusion is that increasing the quality of glass produced by MRF's improves the production capacity for existing processors and recyclers, generates interest in glass market development and encourages end markets to use glass from curbside recycling in their products.

The Plan made several recommendations to ensure that the appropriate equipment is installed in MRF's based on site configuration, market criteria and external factors that affect their operations. The Plan also aims to increase the involvement of municipalities regarding the performance of MRF operations. Lastly, the Plan focused on glass market growth and diversification to increase the amount of curbside glass collected and recycled (EEQ, 2019).

The Innovative Glass Works Plan is working to demonstrate through its pilot projects and investments that there is a solution to recycle 100% of the glass collected from Quebec curbside recycling programs.



5.2.2 United States

The [Glass Recycling Coalition](#) (GRC) was founded in 2016 to bring together a diverse membership of companies and organizations to make glass recycling work. These include glass manufacturers, haulers, processors, materials recovery facilities, capital markets, end markets and brands that use glass to showcase their products.

The GRC works closely with the Glass Recycling Foundation (GRF) to raise and invest over \$1 million in glass recycling projects in 2020 (Paben, 2019). Recently, the GRC launched a free MRF Glass Certification Program to entice facilities to install glass cleanup equipment and implement procedures to produce higher quality material (Paben, 2019). According to a 2018 industry survey in the US, only 27% of MRF's have glass cleanup equipment. The GRC is planning to increase that number by encouraging facilities to get certified and recognizing facilities that are investing in glass cleanup equipment.

5.3 Market Development Opportunities

There are several glass recyclers in Ontario that have, or are, recycling curbside glass including:

- Niagara Recycling
- Canadian Liquid Processors
- Curran Recycling
- Poraver North America

Each of these companies could potentially consume Ontario's curbside glass. However, in each case, the companies are reluctant to accept Ontario's glass due to contamination issues, financial or space constraints. A commitment by the Province of Ontario to invest in market development program similar to Quebec's Glass Works Plan could substantially improve the quality of MRF glass and increase end markets for Ontario's glass.

6.0 Conclusion

The study findings suggest there is existing capacity for a significant portion of Ontario's curbside MBG at markets in Ontario, Ohio and Pennsylvania. Additional capacity for MBG is being developed by some markets in Quebec over the next 24 months.

Though capacity exists, it may be challenging to access due to high freight and processing costs; and difficulty in meeting the end market specifications without some additional investments in glass clean up systems in Ontario MRF's.

These challenges also represent opportunities for Ontario MRF's to work with existing markets to understand specifications and determine cost/benefit of making modifications in Ontario MRF's to meet end market specifications.

There is also a significant opportunity for the Province of Ontario to consider market development initiatives to expand Ontario glass processing and end markets, similar to initiatives undertaken in Quebec.

7.0 Appendices

7.1 Appendix A – Map of Glass Recyclers

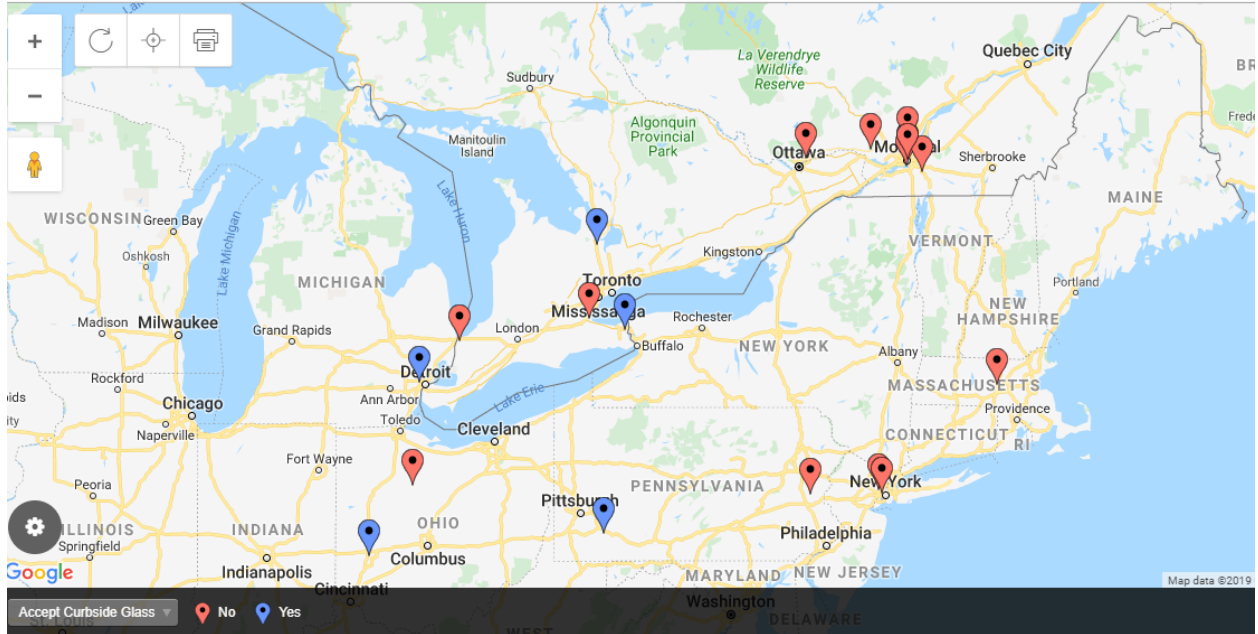


Figure 1: Map showing locations of Glass Recyclers



7.2 Appendix B – Poraver Specifications for Recycled Glass



Soda-lime glass delivered loose in shard form, for outdoor storage

Trade name: Container glass/flat glass

Chemical composition: Soda lime silicate glass

CAS #: Not applicable

Type of Shard

Container Glass	<ul style="list-style-type: none"> • White/brown/green; not separated by colour • The green class content may not exceed 30% • White content > 60
Flat Glass	<ul style="list-style-type: none"> • Crushed or plate • Without foil, not laminated • Largely without cement residues
No technical glass or special glass	<ul style="list-style-type: none"> • Unsuitable due to lead, barium and boron content, e.g. borate glass, picture tube glass, fluorescent tube glass, etc. • Mirror glass without mercury – only in small quantities
Shard size	<ul style="list-style-type: none"> • 0 to 50 mm (larger shard size possible on request)

Max. permissible impurities per unit of weight

Non-ferrous metals	0.15%
FE-metals	0.10%
Lead	0.10%
Ceramic, stone and porcelain	2.50%
Paper	0.50%
Synthetic materials	0.50%
Moisture	4.00%
Loss on ignition	1.00%
	Paper must not be present in a clumped form; the proportion of all organic impurities (paper, plastic, food residues, woody components, etc.) must not exceed 1.0 percent by weight.

Chemical Analysis Values

SiO ₂	70-73%
Na ₂ O	12-13%
CaO	10-12%
MgO	1-3%
K ₂ O	< 1-3%
Al ₂ O ₃	< 2.5%
Fe ₂ O ₃	< 0.5%



7.3 Appendix C – Rumpke Glass Pricing



Undersized

		Glass Matrix				
		0% - 5%	6% - 10%	11% - 15%	16% - 20%	21% - 25%
Non-Glass	0% - 5%	\$7.57	\$2.98	-\$0.28	-\$2.71	-\$4.81
	6% - 10%	\$2.98	-\$0.58	-\$2.92	-\$5.04	-\$8.48
	11% - 15%	-\$0.28	-\$2.92	-\$5.04	-\$8.48	-\$12.86
	16% - 20%	-\$2.71	-\$5.04	-\$8.48	-\$12.86	-\$18.08
	21% - 25%	-\$4.81	-\$8.48	-\$12.86	-\$18.08	-\$24.15

Note: Pricing shown is an estimate. Actual pricing may differ based on negotiations.

8.0 References

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