

On-street Recycling Pilot Project Report 2016/2017



In partnership with



INTRODUCTION

As part of its program plan commitment, Recycle BC initiated a pilot project to study the feasibility of packaging and printed paper (PPP) collection in on-street recycling bins. In partnership with the City of Vancouver, Recycle BC conducted a nine-month study for on-street recycling in a densely resident populated area of Vancouver. Recycle BC was interested in studying a community's participation in on-street recycling over a longer test period to determine if collection accuracy and capture rate can be improved over time.

A previous pilot project was conducted in two parts in 2014 and 2015 in the communities of North Vancouver, Penticton and Richmond, which included varied bin designs and shorter in-market timeframes. The results of that pilot study can be viewed in the [Streetscape Pilot Projects 2014/2015 Report](#).

PROJECT OBJECTIVES

The on-street recycling pilot project had the following objectives:

- Increase diversion of solid waste disposed of in the public realm by the city's residents
- Communicate, reinforce and support waste diversion behaviors
- Test opportunities for organics recovery in key locations (City of Vancouver objective)
- Assess adequacy and effectiveness of communication approach (City of Vancouver objective)
- Determine opportunities and challenges with on-street recycling systems to determine the best course of action for future planning
 - Assess overall capture rate, contamination/marketability of resulting streams, and diversion levels achieved;
 - Assess changes due to seasonality and time;
 - Assess operational successes, challenges, and constraints;
 - Gather information to assess feasibility and cost implications of various collection and processing options for a full scale/city-wide program (City of Vancouver objective)
 - Test preferred Recycle BC receptacle design and City of Vancouver design changes from an operational perspective;
 - Balance operational needs with diversion goals; and
 - Align the material sorting streams in the pilot with Recycle BC's existing residential packaging and printed paper collection program by curbside, multi-family and depot collectors.

STREETSCAPE DEFINITION

Streetscape venues, or on-street recycling, as defined in Section 3.3. of the Recycle BC Program Plan, refer to municipal property that is not industrial, commercial or institutional property and comprises the following:

- Sidewalks which are municipal property, which adjoin buildings in an urban commercial area and which are used for pedestrian traffic;
- Plazas or town squares which are municipal property and which are available to the public; and
- Parks which are municipal property.

Streetscape is being tested to determine its success in offering predictability for residents wishing to recycle packaging and printed paper – an accessibility goal for Recycle BC (Section 5.2 of the Recycle BC Program Plan).

PROJECT OVERVIEW

In August 2016, recycling bins were installed along sidewalks in Vancouver's West End, and at Second Beach in Stanley Park, to enable residents and visitors to recycle single-use items such as hot and cold beverage cups and plastic or paper fast food packaging, instead of throwing these recyclable items in the garbage.

- A total of 31 recycling stations were included in the project
- At each recycling station, pedestrians found either three or four bins, allowing people to easily sort garbage and recyclables and, where available, organics:
 - a garbage bin for items that could not be recycled in a recycling station bin and would be disposed of in a landfill;
 - a mixed paper bin to collect materials such as newspapers, flyers, paper bags, and paper take-out containers;
 - a bin for recyclable containers such as hot or cold drink cups, plastic take-out containers, as well as other beverage containers; and
 - an organics bin for food scraps, food-soiled paper containers, and napkins (available in select locations).
- Bins and processing services were provided by Recycle BC; the City provided collection services.
- Auditing was managed by Recycle BC and auditing costs were shared jointly with the City.

Bin Design

Recycle BC worked in partnership with Emily Carr University of Art + Design and Metro Vancouver to design the pilot bins using the basic design selected by Metro Vancouver from an Emily Carr University of Art + Design competition. The City suggested design changes for the 2016-2017 pilot such as the addition of a bin liner and adjustments to the rear of the bins for easier access. Bin frames were steel bent and welded, then colour powder-coated, and finally an anti-graffiti coating was applied to each bin. The bin colours aligned with the colours residents are familiar with for curbside collection containers and multi-family cart decals in the City of Vancouver; yellow for paper and blue for containers.

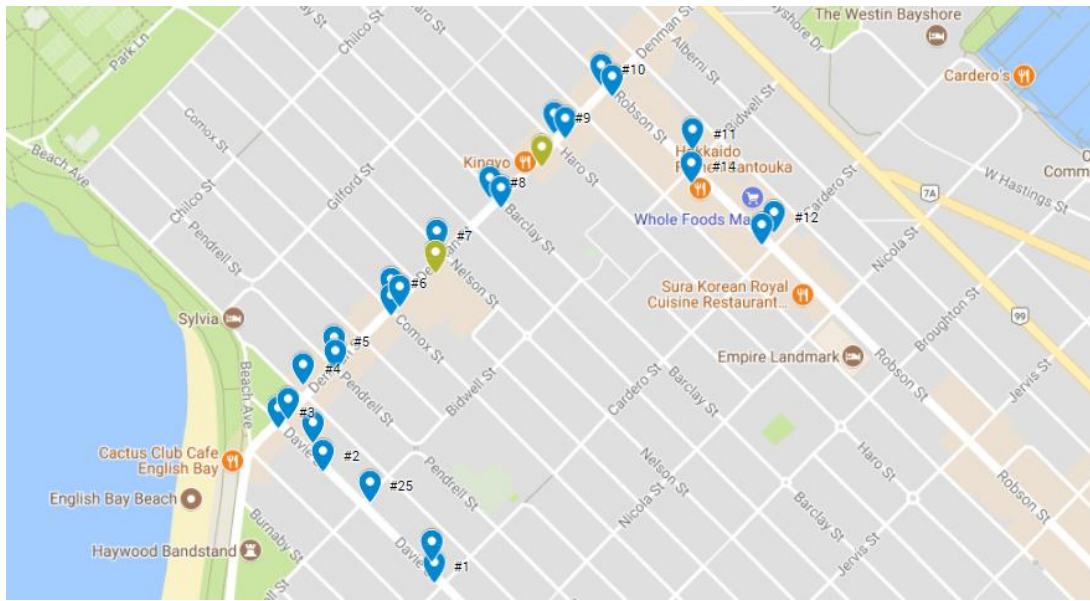


On-street recycling pilot study bins

Coloured plastic bags, which aligned with the bin colour, were placed inside the bin by the City and used to collect the material. The bins were emptied daily by removing the plastic bags, and then replacing them with new ones.

Bin Locations

Of the total 31 recycling stations, 26 were located along Denman Street, Robson and Davie Streets (from Denman to Cardero), and 5 located at Second Beach in Stanley Park. The West End locations are illustrated below.



26 West End bin locations

Timeframe

The duration of the pilot was nine months, from the end of August 2016 to May 2017. The bins will remain in market until the end of 2017, but the data used for this report encompasses only the pilot study period of nine months.

Marketing Support

The pilot project was supported with a media launch and transit shelter ads three times throughout the pilot for four weeks each. The bins were also promoted through a Facebook campaign shortly after launch for two weeks, targeting residents in downtown Vancouver. In addition, posters were made available to local businesses to display in their location.



Transit shelter ad on Denman Street by Pendrell Street

AUDIT METHODOLOGY

Three material audits and behavioral studies were conducted during the pilot in September 2016, January 2017, and May 2017. Each audit was seven days in duration. Information on all material collected during that time and how people used the bins is included in the audit results.

Material Audit

The material audits evaluated collection volume and material composition. For every day of the audit, the contents from each bin were separated into categories and weighed. Staff emptied the contents out of single-use bags, separated the materials into roughly 50 categories, and weighed the materials in each category. Information such as capture rate and sorting accuracy, by stream could therefore be determined.

Behavioural Study

The behavioral study included two components: observational data and an interactive questionnaire. During five of the seven audit days (Monday to Friday), a set of bins was observed for approximately 2 hours, with three sets of bins being observed each day. How residents sorted was noted, and a set of questions was asked of residents using the bins.

RESULTS

Key Highlights

- Sorting performance by residents improved over time.
- Printed paper and deposit containers were the two materials that were most often correctly sorted into the appropriate bin (paper and containers, respectively).
- Paper was more accurately sorted than containers in all three bin stations reviewed.
- Sorting accuracy was generally better in the West End street bins vs. the Stanley Park bins.
- The garbage bins consistently received the most amount of materials (including materials that could have been placed in one of the recycling bins).
- Amounts of residual packaging and printed paper and organics in the garbage stream were similar, if not less, than what is found in the single-family garbage stream in Metro Vancouver in 2016 (City of Vancouver finding).
- The container bin was contaminated with a notable amount of liquid (from recyclable cups and containers that were not completely empty).

- The West End stations received a collective total average of approximately six kg/day, and the Stanley Park stations received an average of approximately three kg/day over the September to May pilot period.
- For all stations, except the West End four-stream stations, the volume of material was lower for the January audit, presumably due to weather and lower pedestrian traffic.
- From a sorting perspective, the bin design was very effective in achieving relatively clean recyclable streams which were able to be effectively processed by the processor.

Detailed Audit Results

Results are broken out into three categories to demonstrate the differences of four different collection container groupings and locations. The four categories include:

West End three-stream stations (n=24), (Paper, Containers, Garbage)

West End four-stream stations (n=2), (Paper, Containers, Organics, Garbage)

Stanley Park four-stream stations (n=4), (Paper, Containers, Organics, Garbage)

(Detailed findings are not shown for the one three-stream station in Stanley Park, but it trended very similar to the Stanley Park four-stream station in all areas.)

The graphic images (decals) of the materials used on the bins to encourage correct sorting were adjusted twice throughout the pilot period, based on findings from previous audit, to help improve sorting.

Capture Rate in Targeted Stream (% of total weight)

The capture rate in targeted stream refers to the amount of a material that was correctly put in the appropriate container out of all of that material collected in all of the streams combined (of total amount of printed paper in all streams, x% was in the correct stream). The results are averaged over the three audit periods.

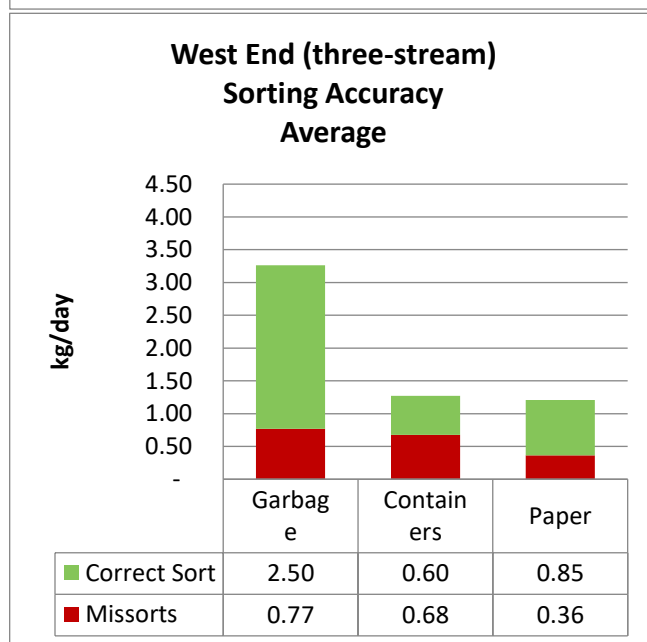
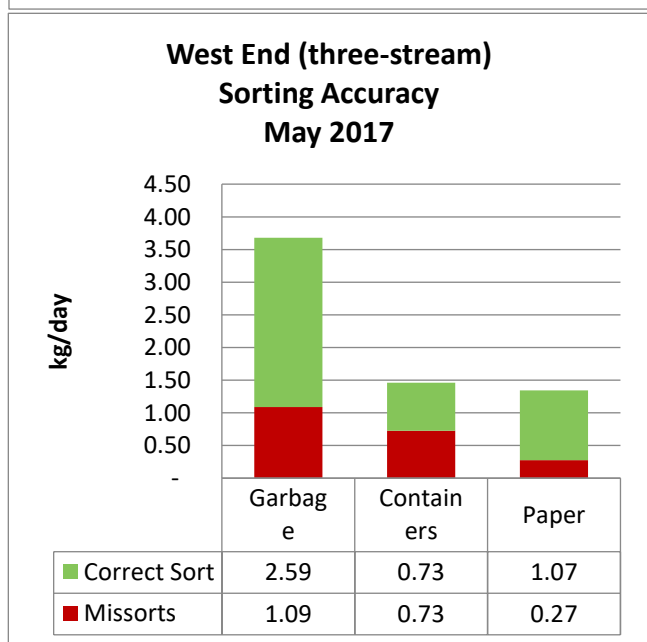
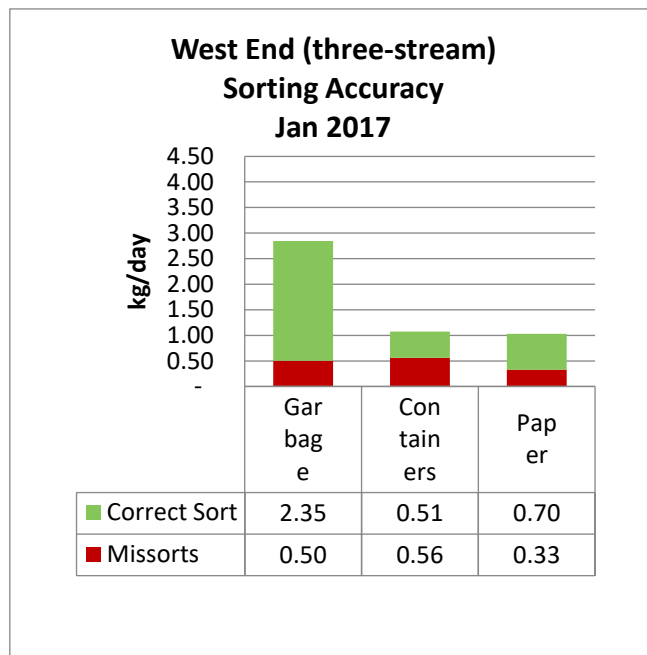
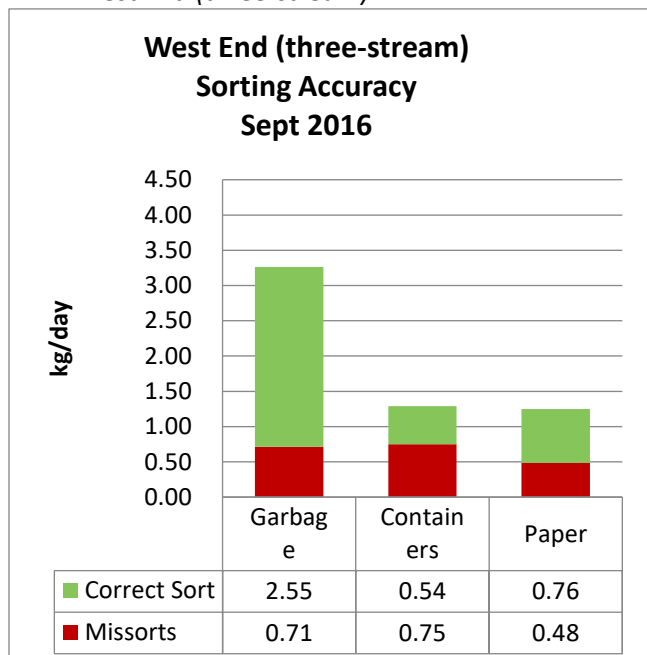
West End (three-stream)		West End (four-stream)		Stanley Park (four-stream)	
Material	Capture Rate in Targeted Stream	Material	Capture Rate in Targeted Stream	Material	Capture Rate in Targeted Stream
Printed Paper	79%	Printed Paper	83%	Printed Paper	86%
Paper Packaging	37%	Paper Packaging	47%	Paper Packaging	63%
Paper Bin Accuracy	70%	Paper Bin Accuracy	81%	Paper Bin Accuracy	58%
Paper Containers	58%	Paper Containers	55%	Paper Containers	66%
Plastic Containers	52%	Plastic Containers	58%	Plastic Containers	65%
Metal Containers	17%	Metal Containers	56%	Metal Containers	68%
Glass (Non-Beverage)	53%	Glass (Non-Beverage)	0%	Glass (Non-Beverage)	100%
Deposit Container	71%	Deposit Container	66%	Deposit Container	76%
Container Bin Accuracy	47%	Container Bin Accuracy	50%	Container Bin Accuracy	49%
Total Capture Rate in Targeted Stream	60%	Organics	46%	Organics	45%
		Organics Bin Accuracy	80%	Organics Bin Accuracy	79%
		Total Capture Rate in Targeted Stream	56%	Total Capture Rate in Targeted Stream	56%

*liquids left in containers are considered to be contamination in the paper and container streams, but considered acceptable if found in the Organics stream

Sorting Accuracy (all material)

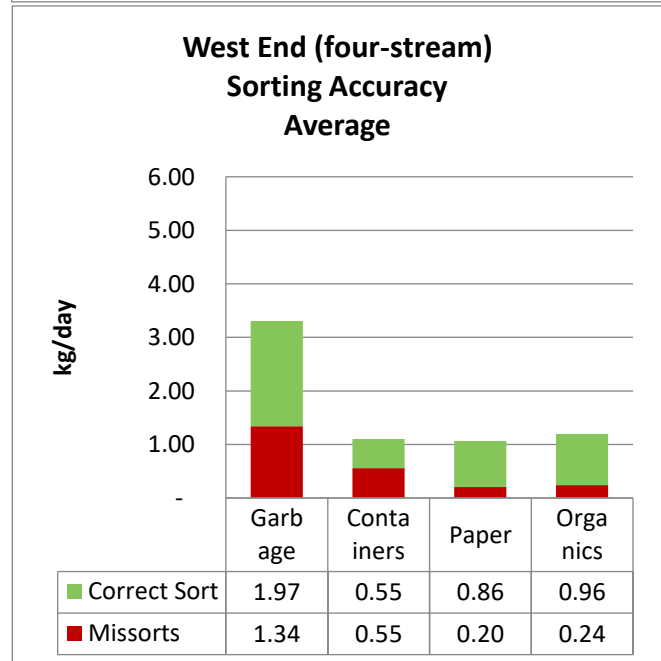
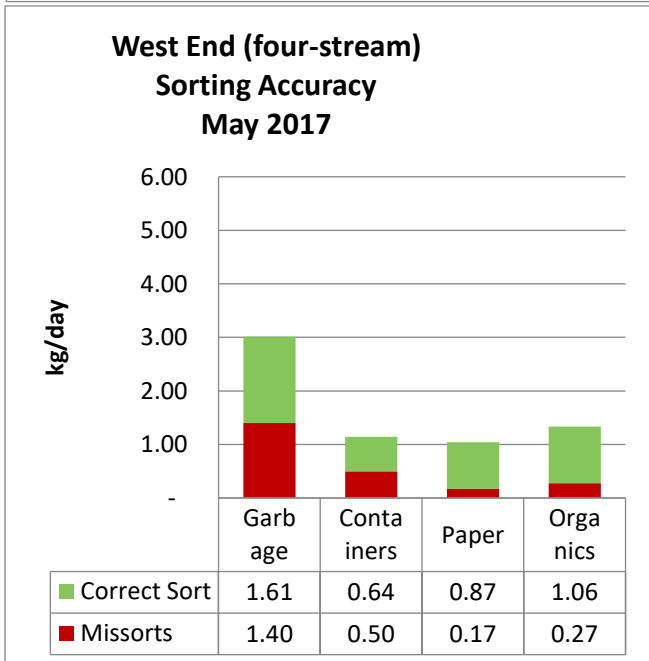
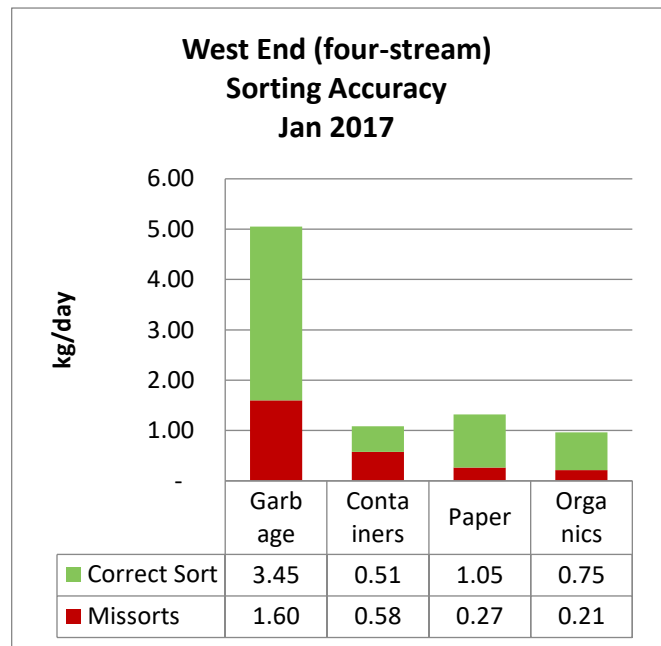
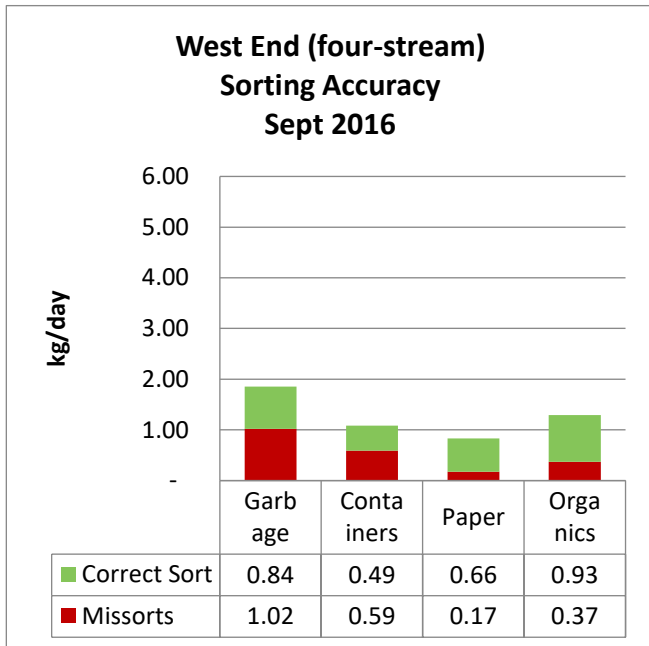
A challenge with on-street recycling bins continues to be accurate sorting. Material was often placed into incorrect bins. The below graphs show the sorting accuracy of each material stream correctly sorted into the appropriate bin for each of the audit periods, showing improved sorting over time. For this project, deposit containers and glass were accepted in the container bins.¹

West End (three-stream)

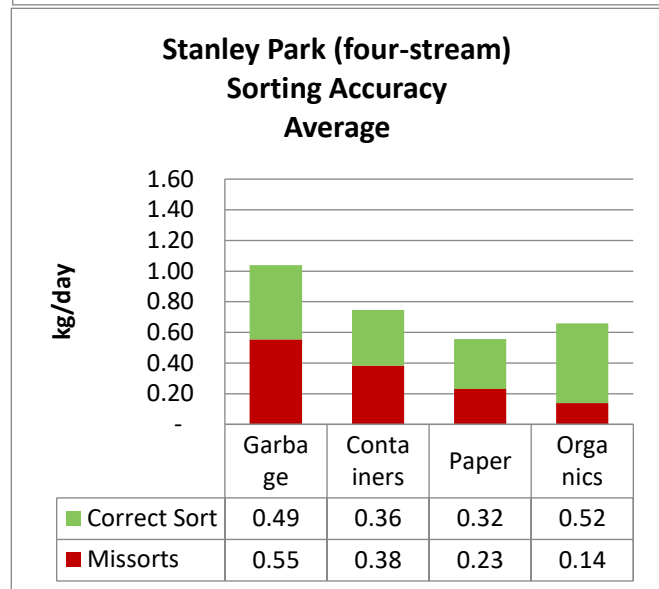
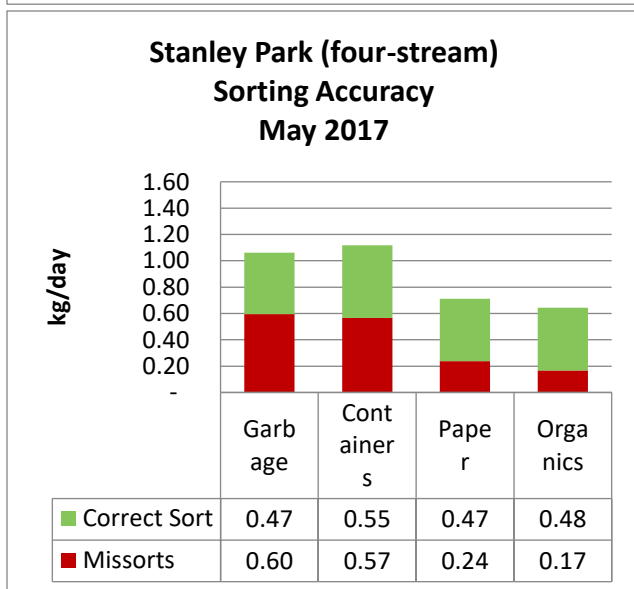
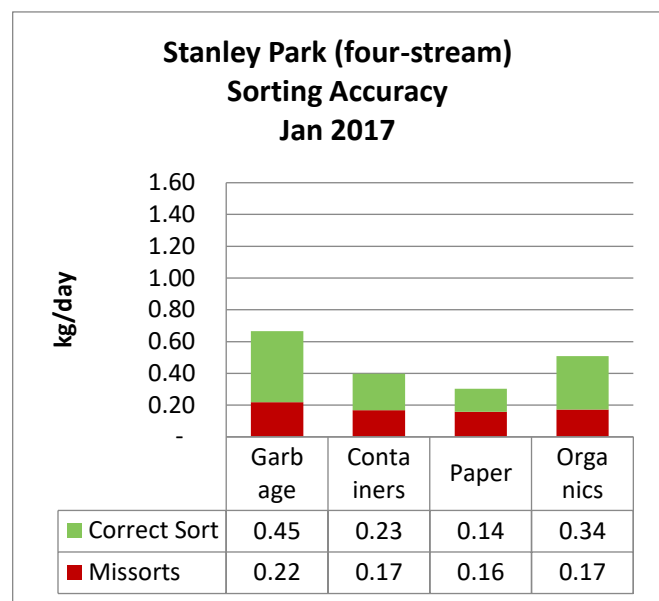
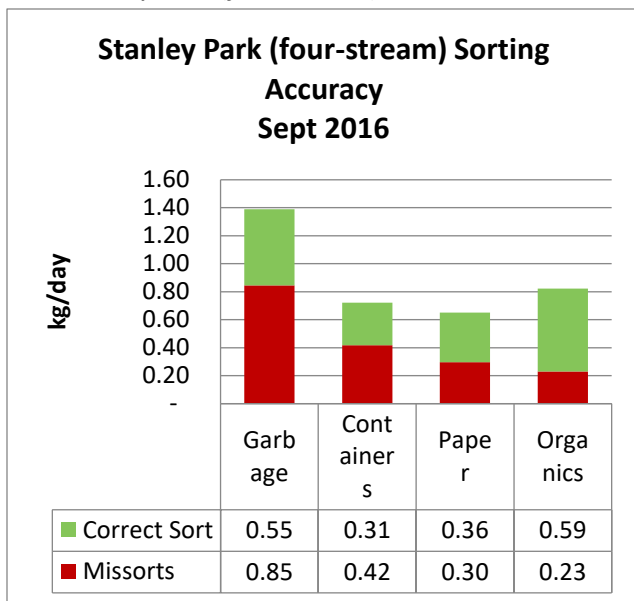


¹ Printed paper and paper packaging were considered accepted materials in the paper stream. Paper containers, plastic containers, metal containers, glass (non-beverage) and deposit containers were accepted in the container stream.

West End (four-stream)



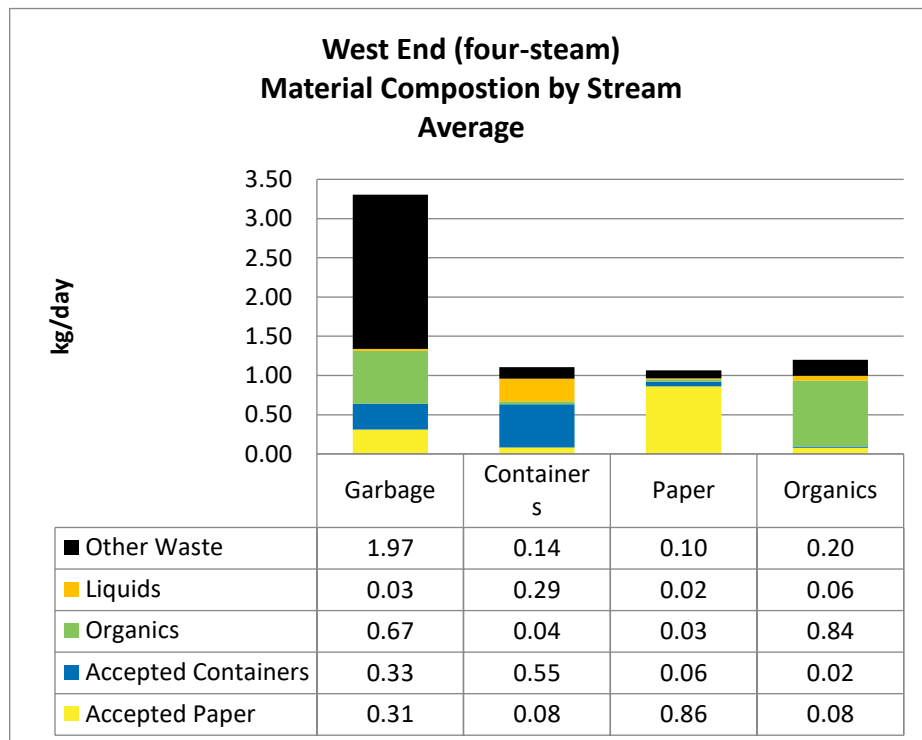
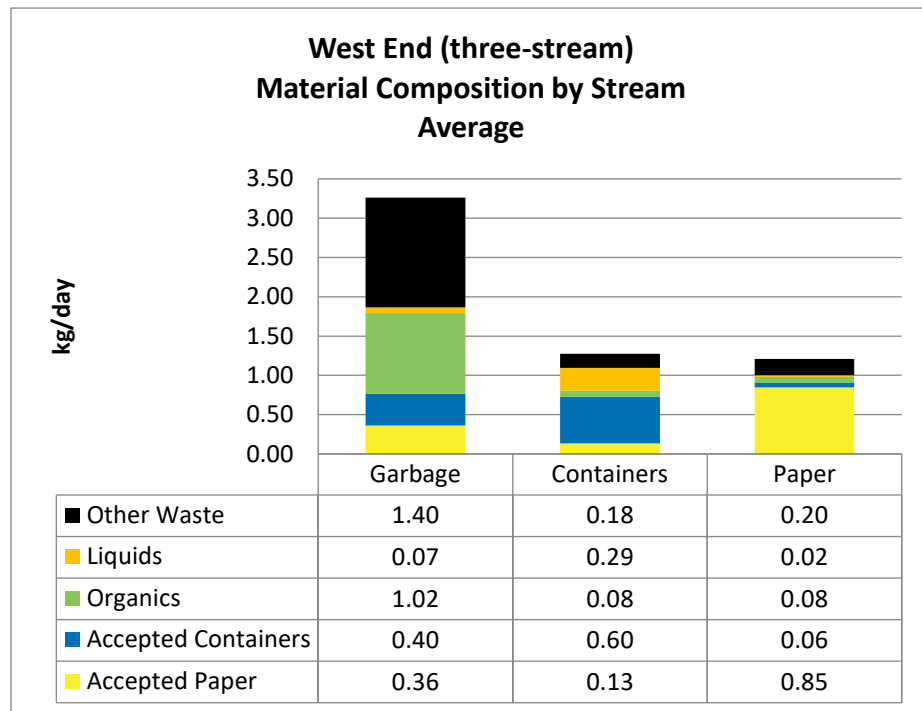
Stanley Park (four-stream)

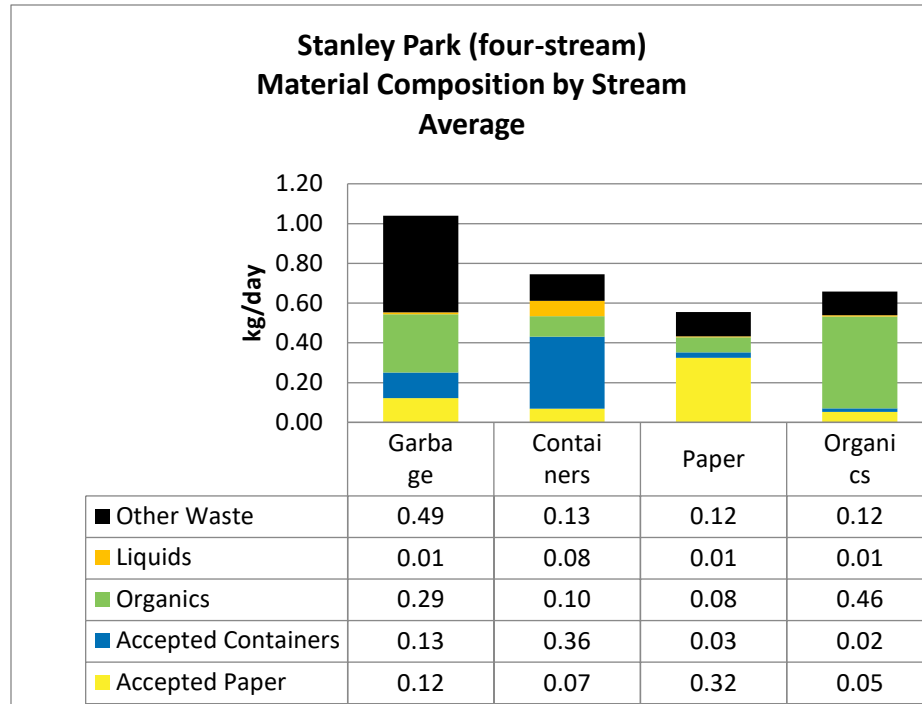


Material Composition by Stream

The materials that were placed in each stream (kg/day) were analyzed, sorted by garbage, containers, paper, organics, and liquids. The garbage bin received the greatest amount of material, and it included items that can be recycled. The 3-stream and 4-stream garbage streams in the West End were comprised of 23% and 19% residual packaging and printed paper respectively. City of Vancouver notes: “while that represents a significant opportunity for increased diversion, it is similar to what is being achieved within the single-family programs across Metro Vancouver, where the residual packaging and printed paper was 22% in 2016.”

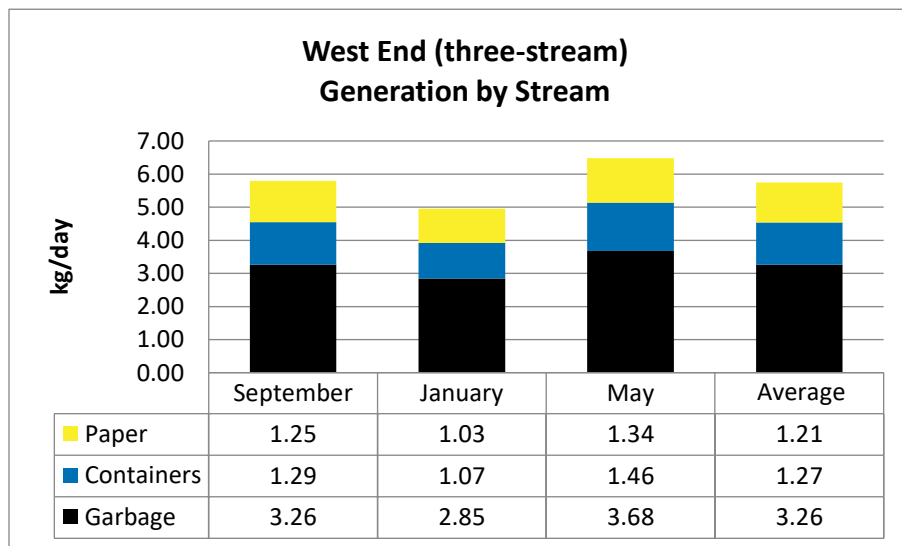
The amount of organics found in the garbage was about 31% and 20% in the 3 stream and 4 stream systems respectively. City of Vancouver notes: “while this does indicate a significant opportunity for increased diversion, it is similar to what is being achieved in the single-family programs across Metro Vancouver, where the residual organics in garbage was about 27%.”

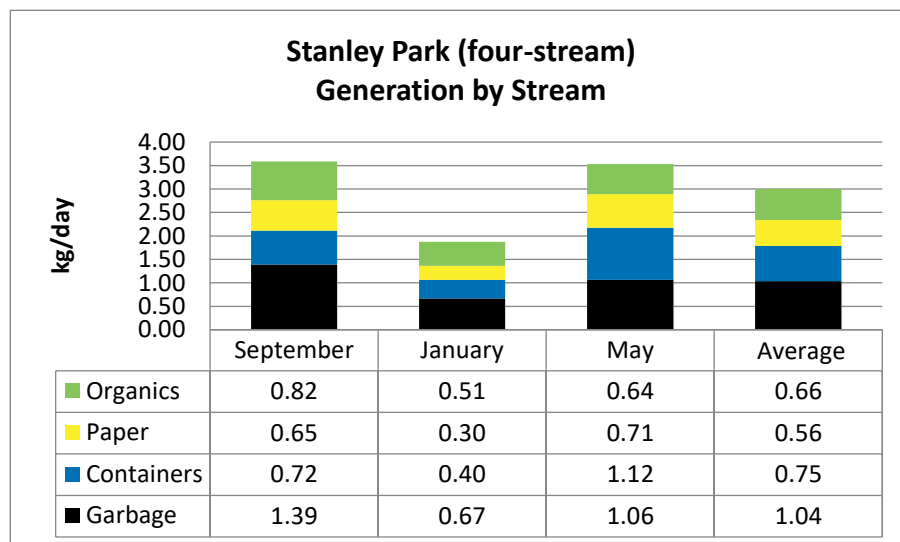
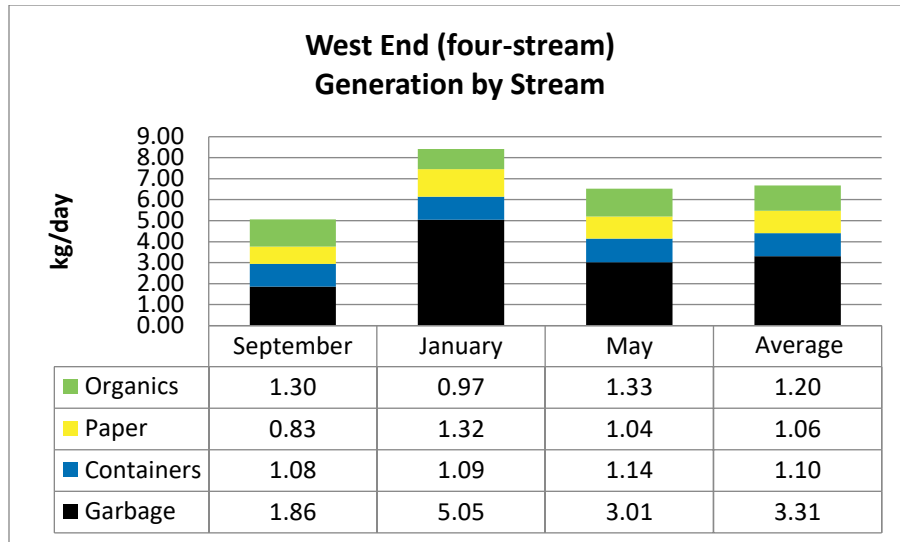




Generation by Stream

The total amount of material (kg/day) fluctuated seasonally with September and May audits showing more overall material for both the West End three-stream bins and the Stanley Park four-stream bins, presumably generated by increased pedestrian traffic in the designated areas. The West End four-stream bins received more overall material in January, specifically more garbage, than the other months.





Behaviour Study Results

Key findings, beyond material composition, from the behavioral studies show awareness of the bins was high, and people used the visual and textual cues on the bins to help them sort their materials. As the audits results showed, the garbage was the bin most commonly misused.

1. Awareness

Residents were asked if this style of bin was familiar to them. For all respondents, 95% were familiar with the bins, suggesting residents had seen the bins prior to this use, and 5% were not (sample size: 266).

2. Bin selection process

There were a number of factors that influenced how residents selected which bin to put their material in. Of the 351 individuals sampled, the following percentages indicated that they sorted their based on:

How sorting was influenced	Percentage
Graphic icons of what should be placed in bin	39%
The colours of the bins	32%
Text descriptions of what should be placed in bin	29%
Observing what materials were already in bin	<1%

(sample size 351)

3. Misused bins

The most frequently misused bin was the garbage bin. Many recyclables were placed in the garbage bin. The most common recyclable items to be placed in the garbage bin were plastic packaging, followed by coffee cups.

Operational Effectiveness

Operationally some challenges were encountered with the bin design. The most significant issue was material getting stuck between the bin and liner, which occurred during collection when material was mounded inside of the bin. The material would then cause the back of the bin to protrude out, creating a gap between the bin and the liner, further aggravating the issue. This material was very difficult to remove, and several bins had to be disassembled, cleaned, and reassembled throughout the course of the pilot. While increasing frequency of servicing could decrease this issue to some extent, this would continue to be problematic during occasional heavy use periods such as during special events, or when crews are unable to service them due to other priorities (e.g. during snow periods). In order to maintain a consistent servicing frequency, different sizes of containers could be considered to address areas of high potential use. There were also issues with the robustness of the bins over time (e.g. warping, sticking of moving parts) which is reflective of the limited lifespan intended for the pilot. In addition, there were issues with the bags sliding down into the bin liners which, although not aesthetically pleasing, was temporarily resolved by securing the bags with elastics.

MATERIAL PROCESSING

The processor received 17.69 metric tonnes of materials from September 2016 to May 2017, an average of 2 tonnes per month. This total tonnage broke up into the following categories after processing:

Mixed Paper: 8.85 metric tonnes

Glass, metal, plastic: 3.54 metric tonnes

Residuals: 5.31 metric tonnes (includes liquids and soiled plastic liner bags)

The material collected from the on-street recycling bins was composed primarily of paper, with smaller quantities of glass, metal, and plastic containers. The processor processed and marketed the paper as a “mixed paper” grade which was sold largely to recycling mills overseas. The beverage containers in the blue bags were processed through the Encorp Return-It system, and the remaining non-deposit containers were sold to various plastic, glass and metal recyclers in BC and the United States.

The material contained a significant amount of contamination in both the blue and yellow bags streams, which needed to be removed and disposed of (this includes liquids in containers and soiled plastic liner bags). In addition there is always a nominal amount of “process loss” residual when any mixed material is processed in a sorting facility which was amplified in this pilot by the amount of liquid. The contaminants and process loss material was disposed of via landfill.

CONCLUSIONS AND OPPORTUNITIES

The bins performed very well and the quality of recyclables generated from the streams was acceptable and able to be processed by the processor. While a number of containers (and to a lesser extent, paper) are still being placed in the garbage stream, the amounts of these recyclables remaining in the garbage are similar to what is found in the single-family residential garbage stream of Metro Vancouver municipalities (as reported by the City of Vancouver). There remains opportunity to improve sorting accuracy across all streams. Most residents relied on the graphic icons to determine where to place their material, however colour of the bins and text descriptions also played roles in helping residents determine bin selection. Sorting improved over time and sorting efficiency would benefit from ongoing promotion and education. Resident education should be a key element to increasing accurate sorting and an improved capture rate, in addition to the bin designs. There were some issues with the bin design from an operational perspective, and those should be addressed if future projects like this occur.

MOVING FORWARD

The pilot project recycling stations will be left in place until the end of 2017 to continue to give residents an opportunity to recycle materials while out of their home, and for Recycle BC and the City of Vancouver to collect additional data. Recycle BC will take the on-street recycling concept to its Consultation in November 2017 to gather additional feedback from other stakeholders. If further projects like this move forward, Recycle BC will use the pilot report findings to make any operational or promotional modifications to the bin design, collection method and educational programming.



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