**Effectiveness & Efficiency Fund**
**Project # 36**

# Multi-Residential Recycling: Optimizing Recycling Performance by Using a Focused Delivery Framework

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2cg Waste Management Consulting Services Inc.

London CANADA

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## 1.0 Introduction

The City of London (City) has approximately 44,000 multi-residential units (MRU), approximately 39,000 of which are serviced by the City's recycling program. MRUs have separate 360 litre carts for collection of the fiber stream (e.g. newspaper) and the collection of the container stream (e.g. plastics, glass, metal). Old corrugated cardboard (OCC) is to be broken down, bundled and placed beside carts prior to collection.

Recycling promotion and education in the multi-residential sector is often based on a "one size fits all" approach. Often, the result is the inefficient use of resources with little impact on recycling rates. To be more effective, solutions (promotion & education, social marketing, operational measures) need to be tailor-made to the building type, within a manageable operating framework.

A possible new approach to recycling Promotion and Education (P&E) can be developed, by providing the appropriate information to each multi residential building (MRB). Recycling **Performance** and **Barriers** to recycling were scored and then graded (low, medium or high) at each MRB in the City. Performance and Barriers grades were combined for each MRB resulting in a **Matrix** of nine possible MRB types.

Customized **P&E Plans** were developed for each of the nine MRB types to increase Performance by addressing specific Barriers.

The project resulted in the development of a **Template** that can be used by other municipalities to undertake a similar study.

The City, with funding from the Stewardship Ontario Effectiveness and Efficiency Fund, undertook a three phase study:

**Phase 1** Evaluation of recycling **Performance** and **Barriers** to recycling at each MRB and the resultant scoring, and grading into one of 9 MRB types
**Phase 2** Develop a **P&E** plan specific to each category
**Phase 3** Create **Template** that can be used as a diagnostic tool in other municipalities

2cg Inc. (2cg) was retained to assist in undertaking this project on behalf of The City.

## 2.0 Methodology

### 2.1 Phase 1: Performance Levels and Barrier Evaluation

#### 2.1.1 Performance Evaluation

The recycling performance of each MRB with city-serviced recycling programs was evaluated on three collections: November 15–19, 2004; December 13–17, 2004; and January 31–February 4, 2005.

This involved 2cg personnel riding in The City's (as operated by Halton Recycling Ltd.) recycling vehicle and collecting the following information at each collection point:

- Number of fiber and container carts
- Assess fullness of fiber and container carts (¼ , ½, ¾, Full.)
- Estimate weight of OCC
- Any visible contamination, stream mixing or overflowing of carts
- Any other pertinent comments

As part of the study, some densities of full fiber and container carts at a few collection points were undertaken. This involved weighing the contents of full carts and subtracting the weight of the cart. The average density of fibre in a cart was calculated at 168 kg/$m^3$ and for containers a cart 54 kg/$m^3$. Old corrugated cardboard piles were also weighed to determine the average weights of different sized bundles.

It should be noted that in most cases there was one collection point per building (i.e. the collection vehicle collected recyclables from one building). In some cases a collection point serviced more than one building. There were a total of 385 collection points for 548 buildings.

The form used to collect performance data is attached in Appendix 1.

This data was entered into an Access database. Data was transposed to Excel for further analysis. Performance at each collection point was scored in terms of kg recycled/unit/year. Data from the three weeks of performance evaluation were extrapolated to yield an annual assessment of kilograms recycled per MRU. Each collection point was then graded as follows:

- Low = (<90 kg/unit/yr)
- Medium = (91-150 kg/unit/yr)
- High = (>150 kg/unit/yr).

Spreadsheets have been set up so the Performance grading ranges can be easily changed.

### 2.1.2 Barriers Evaluation

Barriers to recycling were identified and evaluated during site visits and interviews conducted by 2cg staff, from December 2004 to February 2005. A total of 362 MRBs (of 548) were visited.

Comprehensive interviews were conducted with building managers and site superintendents. Other data based on 2cg staff observations (e.g. contamination levels, display of posters etc.) were recorded. Interviews were structured around a questionnaire designed to identify potential barriers to recycling in the MRBs.

These visits helped classify and identify different types of barriers to recycling, either suggested by the building manager or superintendents during interviews, or noted by 2cg staff. Typical barriers identified included poor accessibility to recycling bins, lack of interest in recycling, lack of P&E or not enough recycling carts.

Data was entered into an Access database, and was transposed to Excel for further analysis. Points were assigned to the various barriers to recycling as noted in Table 2.

## Table 2. Scoring of Barriers to Recycling

| Scoring Item | Detail | Maximum Score | Comment |
|---|---|---|---|
| **Recycling Area Rating and Staff Support** | The following items were scored (1-5) during site visits:<br>• OCC flattened<br>• Contamination<br>• Stream mixing<br>• Cart accessibility<br>• Loose materials<br>• Overflowing carts<br>• Area clean<br>• Area well lit<br>• Staff-level of active support<br>• Staff support/<br>• enthusiasm for recycling | 50 | A score of 1 represents poor performance; 5 represents best performance.<br><br>(Note: original scoring method was reversed but transposed to above to facilitate easier overall scoring) |
| **Depot Location** | | | |
| **Distance** | If the recycling depot was within 30m of the building it was scored | 5 | Recycling depots within 30m are more convenient |
| **Recycling Area** | The following items were scored:<br>• Indoor Depot<br>• Collection on each floor | 5 | More convenient drop areas should result in greater recycling |
| **Promotion** | | | |
| **Posters** | Buildings displaying a recycling poster | 5 | |
| **Newsletters** | Buildings with a newsletter were scored | 5 | A newsletter can be used to convey recycling information |
| **Brochures** | The following brochure distribution options were assessed<br><br>• Distributed to new rentals<br>• Distributed upon request<br>• Brochure display in common area | 5 | Each of the 3 distribution options scored 1.67 for a maximum score of 5. |
| **Staff Duties** | | | |
| **Staff Duties Score** | The following staff duties as reported by them were scored:<br><br>• Sort materials<br>• Remove contaminants | 25 | The staff duties have the ability to make recycling easier for residents<br><br>Each of the 5 staff activities were scored 5 if they were completed |

| Scoring Item | Detail | Maximum Score | Comment |
|---|---|---|---|
| | • Manage OCC (flatten, breakdown)<br>• Manage cart overflow<br>• Remind tenants | | |
| | | **100** | |

Points were added and used to assign a score out of 100 to each MRB. MRB were graded follows:

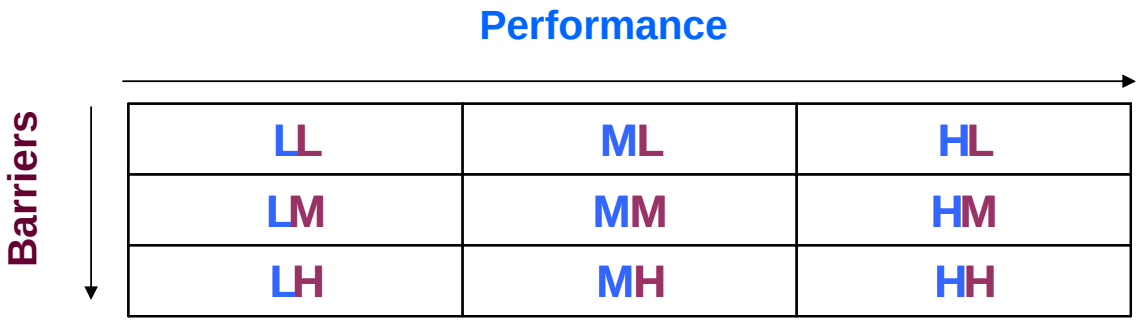
- Low = (0-50 points): many of barriers to recycling and therefore low access.
- Medium = (between 50-80 points): an average amount of barriers to recycling and therefore medium access.
- High = (more than 80 points): little to no barriers to recycling and therefore high access.

Spreadsheets have been set up so the Evaluation grading ranges can be easily changed.

### 2.1.3 Linking Performance and Barriers

The next step involved combining the Performance and Barrier scores assigned to each MRB. A matrix of Performance scores and Barrier scores was developed and is depicted in Figure 1.

**Figure 1. Matrix of Performance and Barrier Scores**




The matrix classifies each building into one of nine categories, for example:

- LL = low Performance score, low Barriers score
- MM = medium Performance score, medium Barriers score
- MH= medium Performance score, high Barriers score

This classification is designed to provide The City with an accurate assessment of the recycling program in each MRB.

Interactive spreadsheets were developed so the Performance and Evaluation grading ranges can be easily changed. This is linked to the spreadsheet linking Performance and Barriers grades to reflect any changes made to Performance and Evaluation grading ranges.

### 2.2 Phase 2: Communication and Education Action Plan Development

Each MRB was graded into one of the nine categories (LM, MM, HM etc.). Using these characteristics as a guide, promotion and communications plans were developed that addressed problems specific to each MRB type. A communications expert was retained to assist in this portion of the project.

### 2.3 Phase 3: Creating a Methodology Template

The methodology used to evaluate MRB recycling Performance and Barriers to recycling was carefully monitored and documented. Step by step instructions on how the Performance and Barrier evaluations were conducted are documented in Appendix 5. These instructions are intended to serve as a guide to other municipalities wanting to undertake a similar study.

## 3.0 Results

### 3.1 Performance Evaluation

Table 3 depicts a summary of the results of the Performance Evaluation. The extrapolation of scale house tickets (i.e. Tickets) indicated an annual average of approximately 77 kg/unit/year. This is similar although marginally higher that the measured annual average of 70 kg/unit/year (i.e. summary of all scale house tickets).

**Table 3. Summary of Performance Evaluation Results**

| | Paper | Containers | OCC | Total | Tickets | Difference |
|---|---|---|---|---|---|---|
| | tonnes | | | | | % |
| Week 1 | 56.59 | 11.36 | 2.76 | 70.71 | 62.1 | 12.18 |
| Week 2 | 53.05 | 10.41 | 3.13 | 66.60 | 58.6 | 12.01 |
| Week 3 | 53.01 | 11.74 | 2.92 | 67.67 | 51.8 | 23.45 |
| Total | **162.65** | **33.51** | **8.81** | **204.97** | **172.50** | |
| Average | **54.22** | **11.17** | **2.94** | **68.32** | **57.50** | **15.84** |
| Extrapolated (t/yr) | 2819.2 | 580.9 | 152.8 | 3552.9 | 2990.0 | |
| Per Unit (kg/unit/yr) | 72.44 | 14.93 | 3.93 | 91.29 | 76.83 | |

There was a consistent overestimation of weights (i.e. Total) during the Performance Evaluation as compared to the City's documented weights (i.e. scale tickets). This overestimation averaged approximately 16%. This can be attributed to a likely overestimation of filled cart densities (i.e. fiber and container carts) and having to visually evaluate the weight of OCC.

A correction factor was used because the Performance evaluation overestimated weights recycled. The correction factor was based on actual City weight tickets. To yield realistic kilogram per unit per year (i.e. kg/unit/yr) results the raw data collected by 2cg was corrected by a factor of 16%. In the future additional waste densities could be refined. It was also challenging to assess the amount of OCC at each collection point. Some corrections were made to estimates. These are documented in Appendix 2.

At each stop quick visual inspections of the carts were conducted. The inspections did not probe into the contents of the carts, instead quick impressions based on the top layer of the cart materials were recorded in the time it took the collection operator to empty the carts. More thorough inspections of the carts were conducted during the Barrier evaluation process. Any contamination, mixing of paper and container streams and overflowing carts were recorded. Results are depicted in Table 4. On average there was contamination of carts at 30% of collection points; mixing of paper and container streams at 22% of collection points and an overflowing cart(s) at 14% of collection points.

**Table 4. Summary of Visual Inspection of Carts on Three Collection Weeks**

| Contamination % | Mixing % | Overflow % |
|---|---|---|
| 8 | 13 | 20 |
| 44 | 25 | 9 |
| 37 | 27 | 13 |
| | | |
| **30** | **22** | **14** |
| | | |
| | | |

Figure 2 depicts the distribution of kg/unit/yr recycled amongst the various collection points.

Each collection point was then graded as Low (<90 kg/unit/yr), Medium (91-150 kg/unit/yr), or High (>150 kg/unit/yr). Figure 3 depicts the distribution of Low, Medium and High performers.

Given that the average recycling per MRU is 70 kg/hshld/yr (based on annual data) the distribution of recycling performance of MRB was unexpected. This is a function of many smaller MRB with high performance (i.e. much greater than 70 kg/unit/yr) and larger (i.e. more units) MRB with poor performance. It appears that larger MRB dampen the overall average performance of all MRB. This requires further investigation.

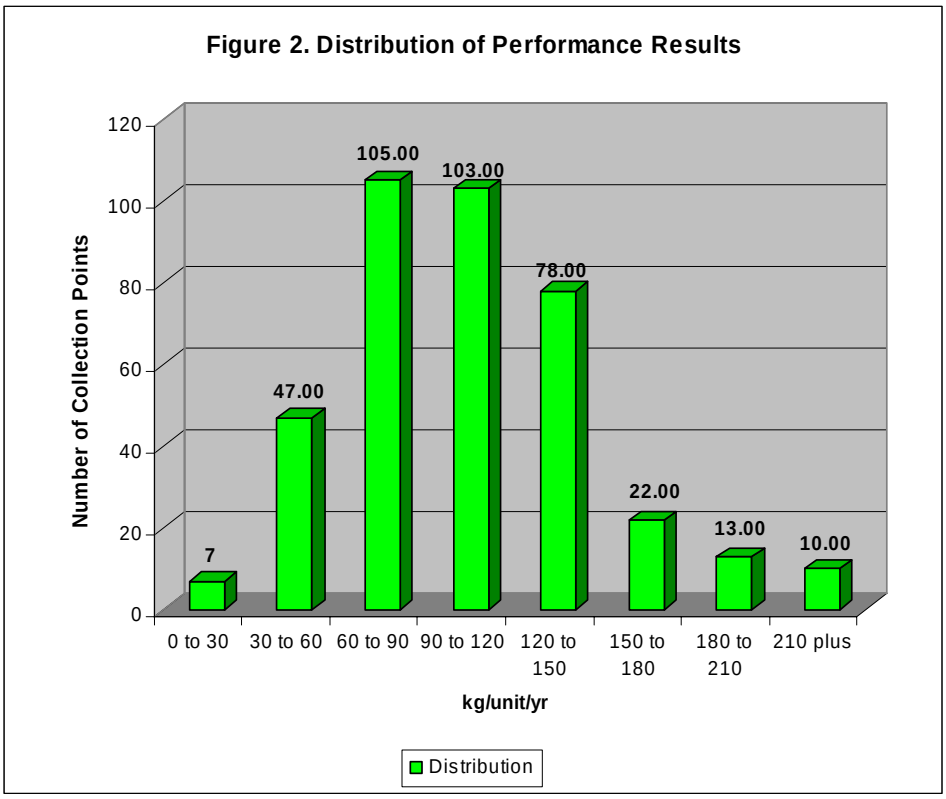


Figure 2. Distribution of Performance Results
Number of Collection Points
120
100
80
60
40
20
0
7
47.00
105.00
103.00
78.00
22.00
13.00
10.00
0 to 30
30 to 60
60 to 90
90 to 120
120 to 150
150 to 180
180 to 210
210 plus
kg/unit/yr
Distribution

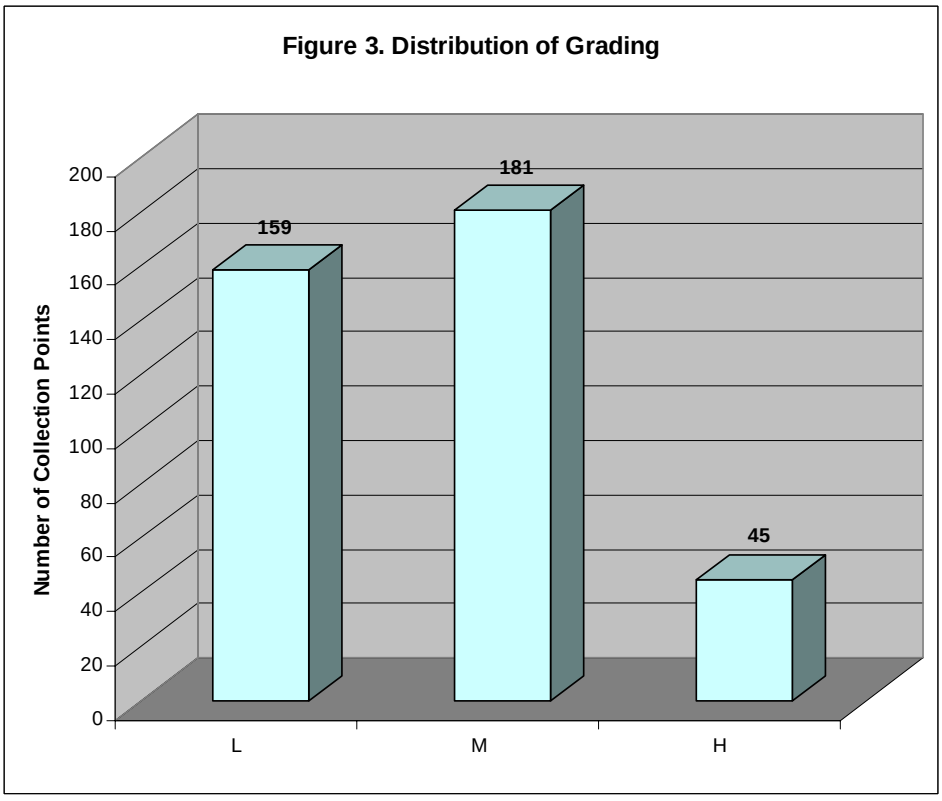


Figure 3. Distribution of Grading
Number of Collection Points
200
180
160
140
120
100
80
60
40
20
0
159
181
45
L
M
H

Raw data is included in Appendix 2. During the Performance evaluation the City's database was upgraded to reflect changes. In particular a number of assigned Route Numbers were changed in consultation with the City. These are summarized and included in Appendix 6.

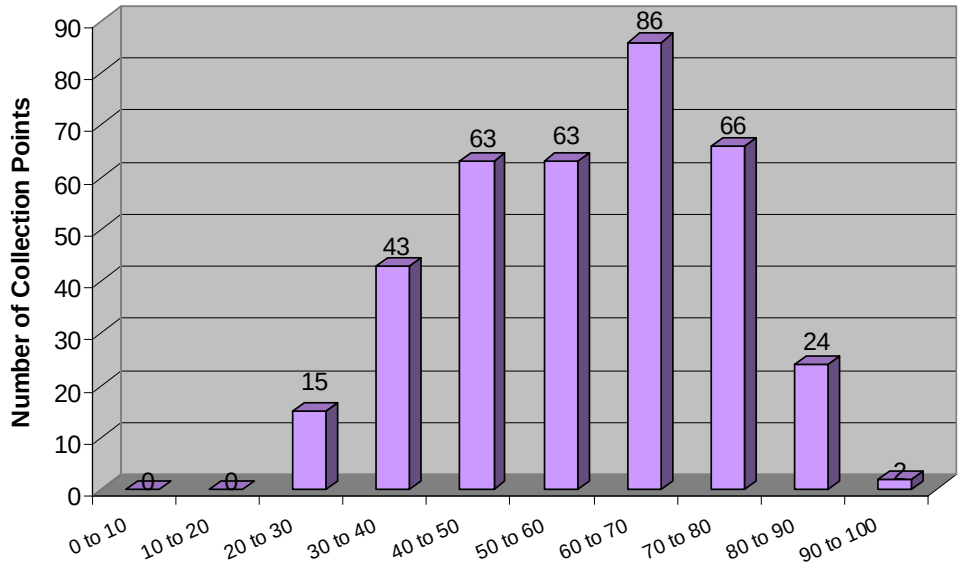
### 3.2 Barriers Evaluation

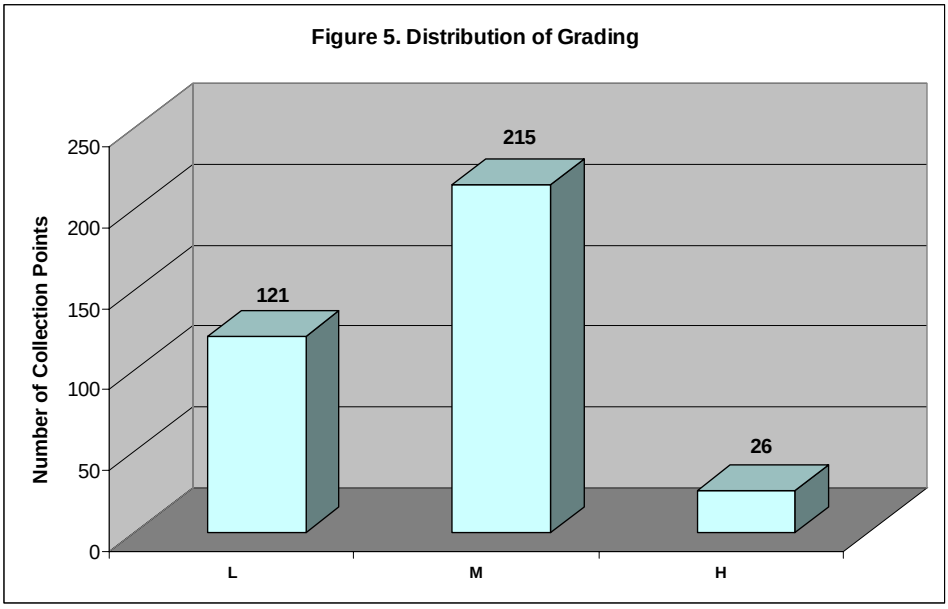
Figure 4 depicts the distribution of Barrier scores for each MRB. Less than 50 points indicates many of barriers to recycling and therefore low access to recycling; 50-80 points indicates an average amount of barriers to recycling and therefore medium access; and greater than 80 points indicates little to no barriers to recycling and therefore high access.

Figure 5 depicts the distribution of grading. Thirty-three per-cent of MRB had low barrier scores which meant there were significant barriers to recycling. Almost 60% of MRB were graded as medium meaning that there were some barriers to recycling. The remaining 12.4% of buildings were graded as high, with few if any barriers to recycling.

Recycling Performance at MRB graded as low or medium could be improved through the development of specific P&E to assist in removing Barriers to recycling.

**Figure 4. Distribution of Barrier Results**





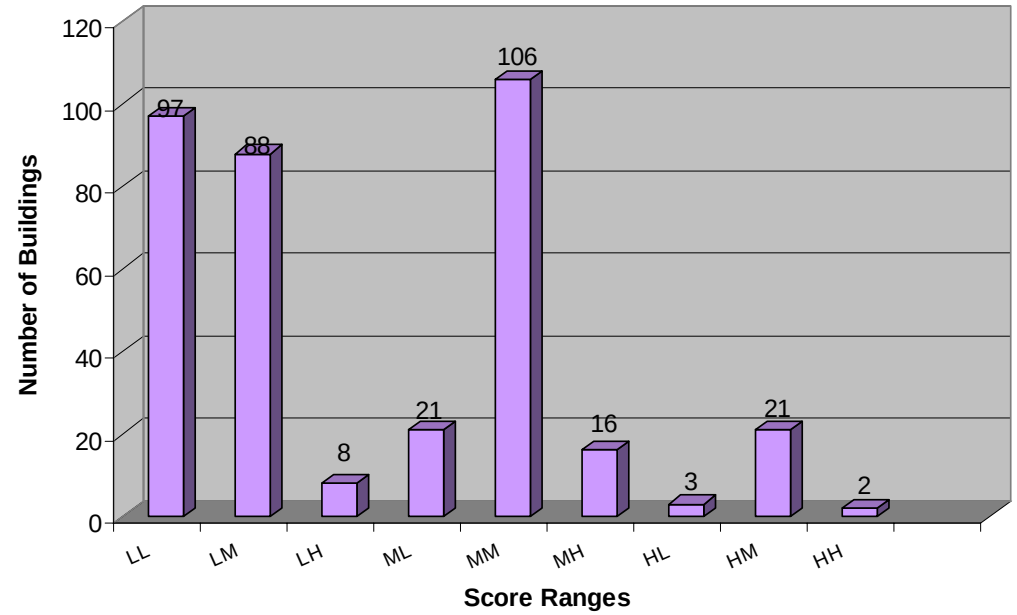

Raw data is included in Appendix 3.

Typically a MRB number (i.e. building number) would be the same as the collection point's Route Number. In some cases buildings shared a collection point and/or recycling depot. Since buildings were individually visited and interviewed (mindful that not all buildings were visited during this study) in these cases they were assigned a unique name by adding a letter at the end of the relevant Route number. For instance if Route Number M01 had the recyclables for two buildings these buildings would be called M01a and M01b. This information is summarized in Appendix 6.

### 3.3 Performance and Barriers Linkage

The MRB grades for Performance and Barriers were combined to form a matrix of nine possible MRB types. Figures 6 and 7 depicts the number of MRBs in each category.

**Figure 6. Distribution of Linked Performance and Barriers Grades**




Note: First letter refers to Performance and second letter to Barriers

**Figure 7. Matrix of Performance and Barriers Grades**

| | | PERFORMANCE | | |
|---|---|---|---|---|
| | | **Low** | **Medium** | **High** |
| BARRIERS | **Low** | **97** | **21** | **3** |
| | **Medium** | **88** | **106** | **21** |
| | **High** | **8** | **16** | **2** |

By way of example 21 collection points (HM) had a high rate of recycling based on performance and a medium level of access to recycling (i.e. medium number of barriers). Similarly 97 collection points (LL) had a low performance and low access to recycling (i.e. many barriers).

Most low performing MRBs had low-medium barrier grades (i.e. some to many barriers). Medium performing MRBs tended to have medium barrier grades. High performers tended to have medium barrier grades.

### 3.4 Communications Strategy

The nine different multi-residential building (MRB) types do not require the same type of P&E. In the past this has been the approach used because no other information was available.

Table 5 depicts the nine MRB types and assigns relevant P&E deliverables that they should receive.

**Table 5. Communications and Educations Deliverables as a Function of MRB Types**

| | LL | LM | LH | ML | MM | MH | HL | HM | HH |
|---|---|---|---|---|---|---|---|---|---|
| **Newsletter** | ★ | ★ | ★ | ★ | ★ | ★ | ★ | ★ | ★ |
| **Target or Star materials (e.g. posters, flyers, decals, stickers)** | ★ | | | ★ | ★ | ★ | X | X | X |
| **Reminders Left by Halton** | ★ | | | ★ | ★ | ★ | X | X | X |
| **In unit messaging** | ★ | ★ | ★ | ★ | ★ | ★ | X | X | X |
| **"unit recyclable container"** | | | ★ | ★ | ★ | ★ | | | |
| **"3 material picture"** | ★ | ★ | ★ | | | | | | |
| **"inside bin labels"** | ★ | ★ | ★ | ★ | ★ | ★ | | | |
| **The Green Award** | | | | | | | ★ | ★ | ★ |

**The "★" marks the areas where proposed specific P&E deliverables will be most effective.**

The LL, ML, MM, MRB types depict the classifications that are probably the "lowest hanging fruit". In other words they are the best candidates for focused P&E that will yield measurable Performance results. These represent unit occupants who are recycling. Some of them need some assistance with barrier removal and some need more

education and encouragement to be more diligent and aware of what is waste and suitable for the landfill and what should be recycled.

The HL, HM, and HH MRB types depict classifications that are quite good at recycling. These people may do more but they should be congratulated and recognized for the effort they now make. With some additional focused P&E Performance could be further improved.

The LL, LM and LH MRB types represent much more of a challenge. The LL and LM MRB types will require assistance removing Barriers and very simple message and achievable goals. The LH MRB type may be a good candidate for hands on education and social marketing endeavors. They have relatively few Barriers and poor Performance.

Some deliverables are audience specific, some are universal. The P&E strategy has incorporated and expanded on several deliverables that are already in use in the multi-residential recycling program.

If the MRB building owners and/or management company staff choose to actively participate and support the program there should an increase in recycling numbers.

Examples of possible specific P&E pieces are included in Appendix 7.

### 3.4.1 Newsletter

The “Recycling On the Rise” newsletter would become a quarterly publication. First edition targeted for distribution in the fall. The front page of the newsletter would highlight both visually and with minimal copy, the “target” recyclable for the upcoming quarter.. Inside the publication a “recycling promotion” campaign specific to the “target material would be outlined.

For example: (based on resident size)

Posters/flyers display materials would be produced and distributed to multi-residential properties or the property management companies.

An outline of the physical locations indicating where the visual reminders should/could be placed in the buildings or complexes would be included. (An obvious choice for these materials is the laundry room).

Stickers for the recycling carts would be distributed to the building superintendents or property managers.

An explanation of the kit and the purpose of each piece would be detailed in the newsletter and duplicated in the package used for distribution.

The publication will also actively seek input from building superintendents, property managers and residents as to useful locations to post the reminder material as well as

creative suggestions for reaching their in-house populations. The following edition of the newsletter will carry responses and suggestions from participants and individual and group efforts will be positively recognized. For the fall edition a specific location, that has already been identified as having a strong recycling commitment or an outstanding presentation of recycling materials, should be highlighted. And should the initial response to the call for user input be low, the second edition should also contain a pre-arranged building as an example.

Edition two of the newsletter will announce the next target material and the formula for education and display material will be followed. A report on the increase in numbers or weight of the "target one" material should be included in the second newsletter even if the data is anecdotal.

Buildings and/or property management companies profiled in the newsletter should receive a letter from the City of London and several extra copies of the publication.

All photos submitted must also be vetted for sign-off, should they include people in the picture. A simple form can be included on the back page of the newsletter that can accompany any building submission.

The newsletter production can continue in a black with one colour format. The 11X17 size is standard and gives the appearance of substantial information, however one may consider revising the size to 8 ½ X 11 to reduce duplication costs. The look of the original newsletter could be maintained.

### 3.4.2 Target or Star Materials

**Posters/flyers/decals/stickers**

The rule for production should be to keep the message simple and consistent and to look for the best possible places for display.

The optimum location is where the product is used and so for example for the large plastic bottle (detergent, bleach etc.) laundry areas are prime locations. Starting with this type of container, one that can be easily identified and much of its use localized, will give the program audience, those charged with taking care of the recycling area/bins/carts and residents who use targeted products, a simple example of how key it is to keep reminders and areas of use or discard connected.

Common areas where bulletin boards are used are also good display locations and for buildings or complexes where laundry facilities are not common, but individualized, the decals for carts or bins will probably be the most useful. As well, the newsletter for residents will be an introduction to the campaign and property managers should be encouraged to include a reminder in any in-house material they provide to tenants or residents. For example, building-newsletters could also carry the message.

### 3.4.3 Halton Recycling Ltd. Distributed Stickers

Halton Recycling Ltd. (i.e. the City's contractor) should be provided with a "Keep up the Good Job" decal. The actual wording or phrase can be developed to keep in line with specific promotions, but the purpose of the decal is quite simply a pat on the back. It is recognition for an outstanding effort to keep carts free from contamination or for the proper procedure for leaving specific materials i.e. cardboard – broken down. (Large cardboard boxes have been identified as a major problem for the driver on collection and contribute to a space issue for buildings).

### 3.4.4 In–Unit Messaging and In-Unit Recycling Container

People are creatures of habit and helping residents develop good recycling habits requires multiple reminders, preferably at the site of product use. If life were a cartoon we could just produce a virtual pop up reminder for every time one finished a newspaper or emptied a can or box. However handy as this reminder might be it is obviously unrealistic. But considering it makes us think about what the next step might be. How do we get reminders to the right place at the right time? Kitchens are obvious choices, as are the Blue Box or recycling cart, although one has probably already made the sort between garbage and recyclables before arriving at the multi-residential recycling area.

In-unit recycling reminders would be semi-permanently affixed to the inside of a kitchen cabinet. This option is of course dependent on the property management company's approval and the appropriateness and esthetics of the reminder. This is another case of keeping a message simple and focusing on specific materials.

A step up from the in-unit reminder is an in-unit recycling container. New homes receive a free Blue Box and instructions as to how and when to participate in curbside collection. Is there a similar program or container provided to new tenants or residents in multi-residential units? The in-unit container could also provide the "visual space" for the reminders and although there is a risk that the container might eventually be lost or misplaced the cost of replacement could be included in a building security deposit. Containers could be provided at cost or a discounted cost to bulk buyers and the unit (one that fits in a standard under the sink cupboard) could be retailed at local stores along with Blue Boxes

### 3.4.5 Three Material Pictorial

The waste audit identified areas where participation in the recycling program was extremely low and the barriers to good recycling high. The challenge to improve or in some cases begin a recycling program is great but not unattainable. Simplicity, patience and repetition are the three keys to success and success means any positive result. It is in these locations and with these residents that a very simple and pictorially based program should be provided.

An on-site visit to each of the locations must also be undertaken as the location of display versus collection point is critical. It may also be that a complete re-assessment of waste management practices may be required and a review is highly recommended prior to any new information being posted at the complexes or delivered to residents or units. Putting up the wrong message or a too complex message or delivering a

message in a flawed manner could jeopardize possible improvement. Better to do nothing than add to the confusion or validate inactivity.

Basically the three picture method would identify two materials that are easily recognized and are universally recycled. For example:

A drink can and a large PET bottle. The graphic would illustrate the can beside the bottle (in as large a format as possible) and underneath the two illustrations would be a Blue Box or Recycling Cart. Text would be minimal - Can - Bottle – Recycle with possibly a large red check mark which would indicate a good act.

The poster or better yet sign would be posted at the recycling area and high enough that vandalism or tagging would be difficult. The garbage collection area would also be signed with a Can – Bottle and underneath a large green garbage bag with a red circle and line drawn diagonally (a standard graphic indicating "not allowed"). This signage would be posted at the garbage drop off area. It would also be made as vandal proof as possible.

It would also be beneficial to develop a reward system for these areas. People understand benefits and if the benefit isn't easily seen or felt then changing their behavior can be more difficult. A group reward or individual recognition for becoming better recyclers would be well received and appreciated. Consideration should be given as to what might be available or appropriate for these sites.

### 3.4.6 Inside Bin Labels

Labels promoting "clean" recycling carts can be applied to the inside of the cart lids. They should be primarily pictorial in nature. Lighting for easy copy reading is unlikely inside a recycling cart and so a good graphic is worth a thousand words. It is most beneficial when encouraging continued good behavior or attempting to encourage good behavior, to provide repetitive and recognizable messaging at the point and time of recycling. A reminder is only helpful and appreciated if it is delivered at the appropriate time.

### 3.4.7 The Green Award

Positive actions deserve recognition and recognition has a great ripple effect. It is proposed the City develop a simple award system that can be instituted within the multi-residential recycling community. The criteria for being nominated and ultimately receiving the award could be developed by the participants and announced in the quarterly Recycling On the Rise Newsletter.

Recipients should be announced at a minimum of every six months and recognized with a letter and a plaque or framed certificate. Recipients of the Green Award should be encouraged to display the designation in building lobbies or common areas.

It is expected the award would be given to specific property managers or superintendents who go above and beyond in the area or improving recycling

opportunities and education for their residents. The award would be a positive message for new tenants or unit owners.

## 4 Conclusions

The evaluation of MRB recycling Performance and Barriers to recycling were linked and resulted in the identification of 9 MRB types. Different P&E deliverables are proposed for each MRB type. In the future it may be possible to develop specific P&E materials for these different MRB types.

The development of these P&E materials is viewed as a first step in improving performance at different types of MRB. It is recommended that further data analysis be undertaken to identify the key barriers linked to low recycling performance and facilitate the development of a full action plan for each MRB type. This could include identifying cost effective strategies such as providing additional recycling carts, increasing collection frequencies of recyclables and changing the location of recycling rooms within MRB. Future work would also include a cost benefit analysis of implementing barrier reduction strategies City wide and explore options to implement financial incentives to increase recycling.