TORONTO

Maximizing Residential Waste Diversion in Connection with the Mayor's Tower Renewal Pilot Feasibility Study

Project No. MA-09-445-00-MA

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F I N A L R E P O R T

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Project No. MA-09-445-00-MA

May 26, 2010

Eleanor McAteer
Project Director, Tower Renewal
City Manager's Office
100 Queen Street West
Second Floor, Room A20
Toronto, ON
M5H 2N2

Re: Maximizing Residential Waste Diversion in Connection with the Mayor's Tower Renewal Pilot Feasibility Study
Final Report

Dear Ms. McAteer:

On behalf of GENIVAR and Robins Environmental, we are pleased to submit this Final Report for the Feasibility Analysis for Maximizing Residential Waste Diversion in Connection with the Mayor's Tower Renewal Pilot Feasibility Study.

This report represents the main findings and recommendations of the project team, including options for pilot implementation. While potential solutions for improved waste diversion are found in a number of broad areas including technology, building operations, outreach, education, incentives, and compliance, it became clear to the project team that the buildings most successful in diverting waste and reducing disposal costs did so through simple, operational adjustments. The assumption of large expense was not required and the financial gain achieved was significant. Regardless, and despite the progressive volume-based waste levy imposed by the City of Toronto, most building managers in our building set had yet to capitalize on the benefits that waste reduction and free recycling collection have to offer when a charge for waste collection is in effect. Our Final Report supports the implementation of approaches that are easily piloted and could result in significant improvements in waste diversion performance and therefore meaningful savings to building owners and operators.

The GENIVAR/Robins Environmental team would like to thank the many people, too many to name, who assisted us with their time and input as we conducted our research and investigations. Their willingness to share their information and time is reflected in the quality and level of detail we are able to provide. We also appreciate the efforts and guidance provided by the City Reference Team and Tower Renewal staff, who have made a significant contribution to this report.

We look forward to discussing this report with you and your team. In the meantime, should you have any questions or concerns about the Final Report, please feel free to call me at 905.475.7270 ext 214.

Yours truly,
GENIVAR Consultants LP

Phil Jensen, Manager
Solid Waste

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Executive Summary

In the fall of 2009 the Mayor's Tower Renewal Project issued an RFP for *Consulting Services to Conduct a Feasibility Analysis for Maximizing Residential Waste Diversion in Connection with the Mayor's Tower Renewal Pilot Feasibility Study*. GENIVAR Consultants LP along with Robins Environmental were selected to perform the work and engage in an assessment of technologies and approaches to be applied to eleven (11) buildings selected for the pilot project.

There are three main activities associated with this study: data collection and research; stakeholder consultation, and; analysis and evaluation of potential solutions. Potential solutions were identified in the areas of technology, education, outreach, building operations, financial incentives, compliance approaches and other. Thirty-two (32) strategies were eventually identified and included on a "long list" prior to the application of an evaluation process designed to select preferred approaches and then match the preferred strategies to the pilot buildings. Ultimately a total of eight strategies were selected for piloting, with a number of additional common strategies cited to support the pilot activities.

From the outset it was recognized that solutions would be multi-dimensional. While each category of solutions has potential, the support of tenants, superintendents and building managers will be required to succeed. The site visits and consultation undertaken as part of the study support this contention and while the sample size is small it seems evident to the GENIVAR project team that strong management practices and, more directly, a willingness by property managers to actively facilitate waste reduction and recycling in a building, is crucial to success. In the case of Toronto, where a volume based waste levy is in effect and recycling collection is free of charge, the incentive to save money by diverting waste would appear to be obvious but, due either to waste practices (the pooling of waste collection for multiple sites and the allocation of cost by unit) or other challenges, the levy has not yet resulted in action.

This study evolved to focus on recycling as a principal form of waste diversion. There were a number of reasons for this: Toronto's waste levy is a volume based measure and based on volume the recycling stream is a prominent component of waste. In addition, the City offers recycling collection service for free, making this the most obvious target for readily available reductions in the disposal stream. Other streams such as source separated organics may have weight but less volume and, while they are still important components of the waste stream, will have less impact on the disposal levy. Over time the diversion of other waste streams, namely source separated organics, municipal hazardous and special wastes (MHSW), and waste electrical and electronic equipment (WEEE), will help to further reduce the impact of the waste levy. Building managers can further improve waste diversion performance by being diligent with respect to communication about waste reduction options and tenant practices.

The research reviewed for this study suggests that, among other things, language barriers, transience, lack of ownership, inconvenience, material contamination, lack of financial incentives, lack of support by building management and existing infrastructure all conspire to undermine the success of recycling in multi-residential buildings. While these studies are not confined to the building age range specific to the Mayor's Tower Renewal project, namely the 1960's and 70's, the site visits confirmed that the barriers cited in the literature were applicable to the study.

The significant difference between Toronto and most (not all) of the jurisdictions studied is the waste levy which, theoretically, should eliminate the barrier associated with a lack of incentive since the levy provides a financial incentive to recycle and a disincentive to generate waste. Properly recognized, this should also mitigate at least one other barrier, namely the lack of support by building management, which might then be expected to invest to eliminate barriers associated with infrastructure and convenience. Despite this expectation, only two (2) of the eleven (11) buildings in the study had systematically, over the period of time that waste levy billings have been received, reduced their waste disposal costs to the minimum amount for their waste category.

Potential strategies were evaluated against criteria which included usability, tenant acceptance, existing infrastructure, program support, proven technologies or approaches, and other benefits. A number of the

approaches are illustrated in the case studies developed for this report, with one of the pilot buildings serving as a case study.

For most pilot buildings it is easily possible to develop a business case supporting the implementation of a pilot strategy since the range of disposal cost savings to be realized is $15,000 to almost $40,000 annually. In general most buildings can make a quick calculation to arrive at a per unit cost for waste disposal which, when subtracting the minimum available billing for a building in their size category, leads to a savings figure against which costs for waste diversion activities and labour can be budgeted. Targeting the minimum available billing for a building in one's size category is a good start; further savings are possible.

A number of factors were found to be critical to the success of the pilot implementation projects and to waste diversion in multi-residential dwellings in Toronto:

- the impact of the waste collection levy, for a number of reasons, is not fully appreciated within the community of building managers and, therefore, the incentive to recycle and the disincentive to generate waste has not yet been exploited;
- in some cases accountability for waste generation or recycling is not measured or charged by individual building; and
- the individuals most likely to make a difference in this respect are building managers and superintendents.

These findings resulted in the recommendation of a number of broader strategies to be applied to all buildings in the pilot group, including a training program for building managers and staff and institutional support such as information in billings about relative waste diversion performance. These "supporting" activities provide a foundation for the eight building-specific plans outlined in the report, namely:

- door-to-door collection
- floor-to-floor collection
- designated chute times
- tenant incentives
- staff incentives and rewards
- pledges
- community rewards, and
- in-building outreach

These strategies have been matched to the pilot buildings for implementation in Section 7 of this report. A compliance oriented strategy is suggested as a temporary, follow up approach only, and not as a main strategy.

This report was limited by the number of buildings for which waste diversion technologies could be considered. It was necessary to account for infrastructural restrictions, experienced at most of the pilot buildings, along with other factors. The result was that no major technology retrofit solutions were forwarded for implementation. This in no way should be seen as a lack of endorsement of the waste diversion technologies or programs offered by numerous vendors as it is recognized that many of these will be suitable in other building situations, nor should the mention of certain vendors or technologies be considered exhaustive. Some, in fact, will be valuable sources for the equipment required to implement the proposed strategies (such as chute-room bags and bag hangers).

Furthermore, none of the "long list" solutions should be discarded for future consideration by building operators outside this study. Limitations inherent to this work, such as the building age, a fairly narrow demographic range, and an inability to obtain drawings for all buildings, conspired to narrow the

recommended strategies. Other building operators may find justification to employ some of the technological and retrofit solutions not forwarded for the pilot set.

This Project has been delivered with the assistance of Waste Diversion Ontario's Continuous Improvement Fund, a fund financed by Ontario municipalities and stewards of blue box waste in Ontario. Notwithstanding this support, the views expressed are the views of the author(s), and Waste Diversion Ontario and Stewardship Ontario accept no responsibility for these views.

This feasibility study was carried out with assistance from the Green Municipal Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

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1. Introduction

1.1 Context and Background

In the fall of 2009 the Mayor's Tower Renewal Project issued an RFP for *Consulting Services to Conduct a Feasibility Analysis for Maximizing Residential Waste Diversion in Connection with the Mayor's Tower Renewal Pilot Feasibility Study*. GENIVAR Consultants LP along with Robins Environmental were selected to perform the work and engage in an assessment of technologies and approaches to be applied to 11 buildings selected for the pilot project.

In general, multi-residential recycling and waste diversion programs in Toronto and elsewhere face a number of cultural and structural challenges not experienced by curbside programs. The result continues to be poor recycling participation and waste diversion rates from multi-residential buildings, with Toronto experiencing 13-15% waste diversion in a sector that represents possibly more than 50% of Toronto households and in a community that wishes to divert 70% of its waste.

Estimated recycling rates spanned a broad range within the 11 building pilot segment. Five buildings were considered to be performing at a "low" rate thought to be less than 5%, four fell into what was felt to be a typical performance range for Toronto buildings, namely 13-15%, and the remaining two were achieving high estimated rates of diversion, perhaps in excess of 35%

GENIVAR undertook this study in three concurrent stages: 1) research and analysis; 2) stakeholder consultation, and; 3) strategy development for maximizing material recovery at pilot site buildings. The intent is to provide transferable approaches for implementation at the pilot buildings (Phase 2) and, eventually, for implementation across the entire body of buildings subject to the Tower Renewal Project (Phase 3). The GENIVAR approach assumes that outcomes from this project should ultimately be suitable for consideration by all residential towers throughout the City of Toronto, of which the Tower Renewal project is a subset.

From the outset it was recognized that while technical solutions and new technologies will be part of the possible mix of solutions, opportunities with respect to communication, in-unit capacity, promotion and education, building conditions, and tenant engagement must also play a role. The deployment of technological solutions tends to have popular appeal, but without the buy-in and considered input from building staff and tenants, solutions with a single dimension are rarely successful. For this reason it is thought that successful multi-residential waste diversion will require the selection of approaches that are technically and operationally appropriate and that also have the support of building staff, tenants and the municipality. The GENIVAR site visits revealed that the key to success may in fact reside with building managers, even before any technological or structural solutions are considered.

1.2 Toronto's Multi-Residential Waste Management Overview

Almost half of the City of Toronto's population lives in multi-residential buildings. About 5,000 multi-residential buildings (close to 500,000 units) in the City of Toronto receive City garbage and recycling collection services, which represents about 95% of all multi-residential buildings in the City. Many of these buildings were constructed in the 1960's and 1970's representing Toronto's first boom in high rise development.

The City of Toronto provides garbage collection and recycling services to any multi-residential building in the City including apartments, condominiums, townhouse complexes and cooperatives. Multi-residential buildings with fewer than eight units can participate in the City's curbside garbage and waste diversion services. Buildings with eight units or more are required to participate in a bin service. Until recently, buildings were required to use front-end loading bins for garbage collection, typically 3 yd^3 bins that were either compacted or uncompacted, and could choose between 360 litre carts (side loading) or front-end loading bins for recycling services. The City is slowly phasing out the collection of 360 litre carts and focusing its efforts on the front-end loading recycling bins, most of which need to be located outside of the

building. In order to receive garbage collection services, the building owner must participate in a recycling program.

The City of Toronto estimates that in 2008 its multi-residential sector achieved 15% waste diversion, which is well below the single family rate of about 60% diversion (including source separated organics) or about 42% diversion with just the recyclables (excluding source separated organics). While the diversion rate for Toronto's multi-residential sector shows a strong opportunity for improvement, it is in fact, comparable to rates achieved in other urban communities:

- City of Hamilton reports about 19% diversion rate for its multi-residential sector in 2008;
- Region of Peel reports about 13% diversion rate for its multi-residential sector in 2008;
- City of New York reports about 20% diversion rate for its multi-residential sector in 2006;
- City of Chicago reports about 5-6% diversion rate for its multi-residential sector;
- City of Seattle reports about 23% diversion rate for its multi-residential sector.

Based on garbage and recycling weights recorded by the City of Toronto, on average each multi-residential unit generated about 544 kg/unit/year of which garbage generation is 462 kg/unit/year (or 85%) and diversion is 82 kg/unit/year (or 15%). This compares with a series of waste audits conducted by Stewardship Ontario between 2005 and 2007 which reported a total generation rate of 602 kg/unit/year and 12% diversion rate (see Table 1-1).

Table 1-1 Waste Generation and Recycling in Toronto Multi-Residential Buildings

Municipality	Number of Buildings Audited	Total Number of Units	Total Generation (kg/unit/yr)	Disposal (kg/unit/yr)	Recycling (without contamination) (kg/unit/yr)	Diversion Rates
Toronto Weighted Average	15	2,131	601.72	530.16	71.56	12%

These waste audit results preceded the introduction of Toronto's Multi-residential levy program which City staff hope to raise waste diversion from its current 15% to 26%.

1.2.1 Toronto's Multi-Residential Waste Reduction Levy

In July 2008, the City of Toronto introduced its Multi-Unit Waste Reduction Levy program to act as a financial incentive for multi-residential building owners to reduce waste and promote waste diversion. The City implemented the levy to help it achieve its goal of 70% waste diversion by 2010. The program is an "all or nothing approach". In order to receive garbage collection service from the City, the building must participate in the City's waste diversion programs. Buildings that opt out of the garbage collection service are not eligible to receive, for free, the separate recycling service.

The program targets all multi-residential buildings, with eight or more units, receiving front-end bin garbage collection services. City staff developed several iterations of the levy before finally settling on one that most closely approximates the single family variable fee approach.

Under the program, property owners of multi-unit residential buildings will pay a fee based on how much garbage the building generates during the billing period and the number of units in the building. Similar to the single family residents, the new solid waste fee will appear with water fees on a new, combined Toronto Water/Solid Waste utility bill. A credit of $157 per unit will be applied to the multi-residential building and provided to the owner/property manager. The credit – in effect a rebate of the taxes charged

for waste management services - represents the average cost per multi-residential unit for the City to provide waste management and diversion services.[1] There is no fee for recycling or bulky waste collection; buildings that reduce garbage and increase recycling, therefore, will pay less.

Each multi-residential building in the levy program has been classified as producing compacted garbage or producing uncompacted garbage. Building owners are charged for a small, medium, large or extra large bin per unit based on a formula which calculates the number of cubic yards collected (compacted or uncompacted) over a month multiplied by the number of units in the building. For example, if a building sets out a small amount of garbage that is calculated to fit into a small bin size per unit then the building will be charged the small bin fee per unit.

The City has developed a simple program which calculates the volume of garbage generated by the units in a building based on the amount of garbage collected by the City on a monthly basis. In essence, the total volume of garbage collected (measured in cubic yards) is divided by the number of units in the buildings and the number of days measured to generate a sum of yd^3/unit/day. This sum is then re-worked to generate a sum of yd^3/unit/month. The number generated is compared with the range of volumes permitted under each bin size. There is a separate lookup table for compacted garbage and uncompacted garbage. See Table 1-2 for compacted garbage. The uncompacted fees are one third the rate of the compacted fees to reflect a 3:1 compaction ratio.

Table 1-2 Toronto's Multi-Residential Variable Fee Chart

City of Toronto Compacted Lookup Table				
Lookup Table Unit	**yd^3/unit/month**	**yd^3/unit/month**	**Fee Adjustment* $/unit/mo**	**Equivalent Bin Size**
	Lower Limit	**Upper Limit**		
yd^3/unit/month	0.0000	0.0472	-$0.58	**S**
yd^3/unit/month	0.0482	0.0756	$1.50	**M**
yd^3/unit/month	0.0766	0.1511	$4.00	**L**
yd^3/unit/month	0.1521	0.2267	$6.50	**XL**
Additional cubic yard fee**	0.2277	1.0000	$28.67	**XL+**

* the fee adjustment builds in the annual fee rebate

** any waste generated beyond the XL limit of 0.2267/yd^3/unit/month is billed on a purely cubic yard volume; that is, every additional cubic yard of garbage collected is charged $28.67 per yd^3

The approach determines which category the units fall into and as the category increases so too does the fee. See the example below in Table 1-3 for a 100 unit building generating 18 bins of compacted garbage per month (3 yd^3 in size).

Table 1-3 Multi-Unit Calculator Example: 100 Unit Building (18 x 3yd^3 / mo. Garbage)

Multi-Unit Calculator		Based on fee/unit/year
# Units	100	Input
Compacted?	y	Input (y or n)
Total yd^3/month (18 x 3yd^3)	54	Input
yd^3/unit/month	0.1800	Calculated
Equivalent Bin Size	**XL**	Equivalent Bin Size Category Result

[1] The city is unable, at this time, to remove the entire solid waste management program cost from the residential/multi-residential property classes and any property tax reduction on the residential class must be given in proportion to assessed value.

The City determines the fees charged to the building based on the category size that the building falls into. The building is charged the fee adjustment (levy) multiplied by the number of units. In the case of the 100 unit building above, which falls into the XL category for compacted garbage, it will be charged $6.50 x each unit (100) or $650 for the month in question using the cost information above.

If the volume of garbage per unit per month exceeds the XL category upper limit (0.227 yd^3/unit/month for compacted garbage and 0.680 yd^3/unit/month for uncompacted garbage) then the City calculates the volume of garbage that exceeds the upper limit (called excess garbage). This excess garbage is charged on a per cubic yard fee of $28.67/$yd^3$ for compacted garbage and $9.56/$yd^3$ for uncompacted garbage.

Most buildings have only started to receive the levy bills within the last year and are only coming to terms with the financial impacts on their building. The City has not determined the number of buildings that fall into the various levy categories but, according to other sources, the majority of buildings are falling into the XL category.[2]

The program intends to be monitored through a remote metering system. Each bin has a transponder placed on it which will send information electronically (i.e. location, date, container volume) to a central database when each collection takes place. The bins will not be weighed as the Toronto program is not intended to be a weight based system.

The City is considering simplifying the levy fees by eliminating the four bin categories and charging a single compacted fee or uncompacted fee for each cubic yard of garbage generated. This approach will encourage further waste diversion activities since even the smallest incremental change in waste diversion will result in a lower garbage fee.

1.2.2 Challenges Inherent in Promoting Waste Diversion in Toronto's Multi-Residential Buildings

The generally low waste diversion rates experienced by the City of Toronto's multi-residential sector reflect the inherent problems and challenges associated with promoting waste diversion in multi-residential settings.

Achieving high diversion rates is a challenge facing communities with medium and high rise multi-residential buildings that cannot participate in curbside collection programs. A recent survey conducted by the Association of Municipal Recycling Coordinators (AMRC) found that many recycling programs in multi-residential buildings are typically characterized with low capture rates, low participation levels, and high contamination rates.[3] The reasons are multi-fold:

- Language barriers – A multi-residential building can represent a microcosm of the world, with multiple cultures and languages living under one roof. Recycling programs which provide communications in only very few or one language may result in a group of residents not being able to understand what is required of them and thereby not participating in the program.
- Transient nature of tenants – Residency in multi-residential buildings is characterized by a high turn over rate which requires ongoing communications to notify new tenants about recycling program opportunities.
- Lack of Ownership – Garbage disposal is communal in most medium and high rise buildings meaning that no one is accountable for the quantity and quality of waste generated. This

[2] Based on a presentation to Greater Toronto Apartment Association by Waste Solutions Group on September 24, 2008.
[3] Association of Municipal Recycling Coordinators. February 2006. **Development and Review of Baseline Information on Multi-Residential Recycling Programs in Ontario.** Stewardship Ontario E&E Fund Project #18.

situation makes it easier for tenants to overlook their personal responsibility towards reducing waste generation and participating in recycling programs.

- Contamination – Contamination of non-recyclable materials in recycling bins is often cited as a problem in multi-residential buildings which is often attributed to the lack of management support, lack of ownership for the materials, poor communications and language barriers. One report which surveyed recycling coordinators concluded that "once a cart is contaminated, it encourages and accumulates more contamination".[4]

- Inconvenience of program – The majority of medium and high rise buildings provide a convenient garbage disposal system with access to garbage chutes on every floor. Unfortunately, these same buildings lack adequate space to provide convenient recycling systems on every floor and thereby require residents to take their recyclable materials to a less convenient centralized location situated in the building. Lack of adequate storage space within the apartment unit often poses a problem for tenants.

- Lack of financial incentives/disincentives – Most communities do not provide financial incentives encouraging property owners and management to promote recycling programs within their buildings, or disincentives to generating garbage. Waste disposal costs are often paid through property taxes rather than as direct fees that vary according to the amount of waste generated and disposed.

- Lack of support by building management – Most building owners and property managers provide the minimum support for recycling programs, often due to lack of financial incentives and disincentives. To be successful a recycling program requires the proper attention and support of property managers and maintenance staff to make the program as convenient and user friendly as possible.

- Infrastructural challenges – Many multi-residential buildings provide inadequate space to provide for convenient collection programs, such as a multi-chute retrofit or recycling container collection on each floor. Some of these challenges are aggravated by building fire codes and concerns over vandalism.

While the AMRC report did not specifically target buildings that parallel those found within the Mayor's Tower Renewal scope in terms of age (built in the 1960's and 70's) the challenges cited are largely the same. Most, if not all, the noted barriers applied to some degree in this study, but the waste levy system in Toronto is thought to be a significantly different aspect relative to the rest of the Province and could be the key to addressing at least one of the barriers (lack of financial incentive) noted in the AMRC report.

1.3 Toronto's Tower Renewal Pilot Sites

As part of the Tower Renewal Project, 11 multi-residential, high-rise buildings were selected to participate in the project. All participating buildings were constructed in the 1960's or 1970's and are classified as family buildings. Most of the buildings (7 out of 11) belong to the Toronto Community Housing Corporation (TCHC) with the remaining four buildings (Buildings 8 and 9, Building 10 and Building 11) being privately owned and operated. Sites were selected in the four quadrants of the City, north, east, west and south (downtown). The characteristics of each building are provided in Table 1-4.

The list of pilot buildings, which appear in Table 1-4, provided opportunities to examine practices and structures in both private and public housing contexts. All are subject to the waste levy invoiced by the City of Toronto which, in general terms, assigns a value for the waste collected from a building and results in the receipt of an invoice. The per unit cost for waste collection at the selected pilot buildings ranges from $9.80 to $28.10 per month according to City of Toronto billing figures, but the tracking and assignment of waste collection cost figures presents a limitation to the study in that, in some cases, these

[4] Eureka Recycling. June 2004. **Best Practices in Multifamily (Apartment) Recycling**. St. Pauls, Minnesota

figures are combined for a number of buildings within a complex and then allocated back to partner buildings based on residential units. This approach, especially for the Toronto Community Housing Corporation, makes if difficult for individual building operators to quantify their performance and gauge potential progress in the areas of recycling and waste diversion.

Table 1-4 Pilot Building Characteristics

Building Name and location	Building Owner	Year constructed	Building Characteristics	Location in the City
Building 1	TCHC	1964	29 Stories, 719 Units	Downtown Toronto
Building 2	TCHC	1964	21 Stories, 301 Units	Downtown Toronto
Building 3	TCHC	1964	16 Stories, 299 Units	Downtown Toronto
Building 4	TCHC	1964	16 Stories, 300 Units	Downtown Toronto
Building 5	TCHC	1964	16 Stories, 300 Units	Downtown Toronto
Building 6	TCHC	1965	12 Stories, 161 Units	Eastern Toronto
Building 7	TCHC	1965	7 Stories, 103 Units	Eastern Toronto
Building 8	Private	1978	23 Stories, 230 units	Western Toronto
Building 9	Private	1978	23 Stories, 230 units	Western Toronto
Building 10	Private	1969	18 Stories, 192 units	Northern Toronto
Building 11	Private	1968	18 Stories, 139 units	Northern Toronto

The levy system generates revenue for the City based on collection fees for garbage, and promotes waste diversion and recycling by exempting recycling from collection charges. Simply put, the more waste diverted and recycled, the less one pays for garbage collection. A most curious contradiction within the pilot group was that, in at least one case, the opportunity for savings was recognized and translated into progressive action that, over time, led to a steady decrease in waste output and waste collection cost. In most other instances, however, the application of the levy seemed to have little or no bearing on the behaviour of the building management and most certainly was not being translated into waste diversion or recycling behaviours.

Appendix A shows the levies charged to the Tower Renewal pilot buildings based on billing information provided by City of Toronto staff.

When reviewing the Solid Waste Management Fees for Tower Renewal Buildings against the site visit summaries and Table 3-2, Waste Management and Recycling Systems in Each Pilot Building, in Section 3, there are some significant discrepancies between the site observations, and specifically the observed recycling rates, and the cost per unit per month for waste disposal calculated above. More specifically, where it would seem sensible to think that the buildings observed to have the highest recycling rates would therefore have the lowest actual per unit waste management fees levied, this is not necessarily the case according to the billing information. There are a number of reasons why this may be the case.

The demographics for each building differ in a manner that could influence consumption habits and the resulting household waste generation. While some buildings may excel at recycling they may also generate more waste in general, which may explain why, despite the superior recycling rate, waste generation still falls within the mid-range relative to the others. It is possible that higher transience in some buildings – a higher frequency of people moving in and out and discarding items as a result – may also have some bearing, as will family size which was reported differently for subject buildings.

The analysis, however, would also appear to contain some questionable billing amounts as a result of the communal waste approach employed by the Toronto Community Housing Corporation. Two identical buildings in one complex, for instance, are reported to pay identical amounts: the charge is allocated based on units, therefore the amount is the same for the identical buildings. The total for Building 7 is not easily explained and thought to be an anomaly. It would have to be assumed that waste from outside is somehow being charged to this building and there are not a sufficient number of units to dilute the impact.

While this does mean that the figures should be read with caution, the overall principal behind the City of Toronto Waste Levy still applies: the more waste a building diverts the less it *should* pay in waste management fees. The lesson learned in this exercise, however, is that the first and most important aspect of the process is an accurate accounting of waste generation and cost from individual buildings.

2. Data Collection and Research

2.1 Literature Search and Sources

Numerous studies and web sources were consulted to inform the study and provide leads to further discussion. A description of the literature search findings are provided in Section 2.1.2 of this report.

2.1.1 Web Searches

A comprehensive web search was conducted to uncover relevant information or leads on waste diversion strategies being employed to improve waste diversion in multi-residential buildings. Several different search engines were used in the web search as well as a wide range of search terminology. Depending on the location, the terminology for multi-residential buildings varied; for example, in the United States, many communities use the term multi-family (MF), high rise or apartments whereas in Canada, the terms apartment or multi-residential are more commonly used. In Europe, the terms multi-occupancy buildings and apartments are commonly used.

Some key websites included:

- California Integrated Waste Management Association
- Green Building
- Association of Cities – Regions for Recycling and Sustainable Resource Management in Europe
- Recycling and Waste Management News UK
- National Apartment Association (US and Canada)
- Canadian Condominium Institute
- Association of Condominium Managers of Ontario
- Stewardship Ontario's Effectiveness and Efficiency Fund
- Access My Library – library access to over 30 million articles
- Greater Toronto Apartment Association
- Canadian Mortgage and Housing Corporation
- Building Owners and Managers Association (BOMA) of Canada
- New York City – NYCWasteLe$$: Apartment Building Recycling Initiative
- City of Chicago – Recycling Toolkit for multi-residential buildings

2.1.2 Literature Searches

The literature search focused on reports and articles written about leading edge multi-residential diversion strategies by municipalities or property owners in Canada, United States or Europe. Many of the comprehensive reports highlighting innovative waste diversion strategies in multi-residential buildings were written in the late 1990s (e.g. EPA reports and articles). The majority focus on the need to provide comprehensive promotion and education programs and outreach. These reports and articles provided a good source of information from which to conduct further comprehensive web and literature searches.

Several studies, which are summarized below, provided important insight that assisted in developing an understanding of the dynamics within the multi-residential context, especially as relates to waste diversion. While these works treat issues beyond the narrower subset of the 1960's and 70's era buildings, the constraints placed on waste diversion are highly similar and have a direct relationship to those found in the pilot buildings.

Multi-Residential Recycling System Improvements – Residents, Superintendents & Property Managers: Focus Groups & Interviews. January 2007. Informa, E&E Fund Project #199*, January 2007.*

This report, when reviewed against the findings of the project team during the site visits and follow up, provides valuable insight into the three main building-internal players required to make waste diversion and recycling a success: residents, superintendents and property managers. Site visits, in particular, confirmed the critical importance of the role of building staff in facilitating systems and procedures that allow residents to recycle.

Based on a program of focus group discussions with representatives of each of the key groups, findings show that residents in multi-residential settings recognize the value of recycling but face logistical barriers. Recycling tends to be an add-on service with design elements favouring convenience for the building managers and not the tenants (who often live in multi-residential units because they find it convenient). Superintendents, on the other hand, are portrayed as somewhat beleaguered "caught in the middle" individuals who require the support of their property managers to implement programs and changes within their buildings.

A number of recommendations within the Informa report parallel observations of this study, particularly where it has been noted that building personnel are seen to be the key player in making recycling and waste diversion systems work. The need to educate personnel and establish personal accountability for waste generation is noted.

NYC Recycles – More Than a Decade of Outreach Activities by the NYC Department of Sanitation. 1986-1999. New York City Department of Sanitation, Bureau of Waste Prevention, Reuse and Recycling.

New York City has a long history of providing education and outreach with respect to waste management, and as demonstrated in the NYC Recycles document took a strong interest in improving the waste diversion and recycling performance in multi-residential buildings. In particular the City engaged in a high profile education and outreach program in the late 1990's, targeted specifically at building superintendents and property managers. NYC continues to support the activity today with pre-scheduled education sessions.

The initial outreach used local assets – the clubhouse facilities at Yankee and Shea Stadiums – to attract building personnel to the sessions, and an experienced improvisational group to perform recycling related skits and songs to get the message across. Attendees left the session with "goody bags" containing information, videos and building materials like posters and labels to use in their buildings. While this program does not reflect the pilot scale of this study, it does provide insight into supportive approaches that could educate building managers on a broader scale. Since it is apparent that within our pilot group very few managers are actually translating the waste levy into action, the NYC document might be considered as a blueprint for a similar high-profile approach.

Development and Review of Baseline Information on Multi-Residential Recycling Programs in Ontario. February 2006. Prepared by the Association of Municipal Recycling Coordinators for Stewardship Ontario E&E Fund Project #18

A survey was conducted by the Association of Municipal Recycling Coordinators (AMRC) of Ontario communities with multi-residential buildings to determine characteristics of the recycling programs in multi-residential buildings. The report showed that most programs are typically characterized with low capture rates, low participation levels, and high contamination rates.

Metro Vancouver Multi-residential Building Waste Diversion Study. December 2007. Prepared for Metro Vancouver by the Sheltair Group in association with Kelleher Environmental

The consultants were retained to evaluate Metro Vancouver's current approach to managing waste in its multi-residential buildings and to conduct a comprehensive study of related best practices from other jurisdictions, including technologies that improve waste diversion from these buildings. The consultants conducted a series of focus groups with stakeholders groups and developed recommendations to increase solid waste diversion in multi-residential buildings based on the best practices and input from municipal recycling coordinators, city planners, waste haulers and property managers.

The report focuses on the best practices that other communities have used to persuade property owners and managers and waste haulers to promote waste diversion in their buildings. The best practices feature regulatory, economic incentives and disincentives, and promotion and education initiatives that have been undertaken by North American cities. The report touches on technologies and systems being used to help drive recycling.

UK Case Studies of Multi Family Recycling Programs. 2004. Prepared by Recoup

This short fact sheet highlights pilot projects being undertaken throughout the United Kingdom to encourage residents living in flats to participate in recycling programs. The pilots focused on incentive programs, such as rewards to tenants and convenience, trying to ensure that garbage and recycling are equally accessible and convenient.

Recycling in Multifamily Dwellings: A Model for Local Government Recycling and Waste Reduction. September 2001. Prepared by the California Integrated Waste Management Board

This report features 24 innovative programs being undertaken to promote waste diversion in multi-residential buildings in several California jurisdictions. The report provides information on recycling programs and policies to help jurisdictions encourage recycling in their multi-family dwellings and includes examples and highlights from existing efforts across the United States.

Strategies for Record Setting Waste Reduction in Multifamily Dwellings. October 1999. United States Environmental Protection Agency

This report showcases communities such as Seattle, San Jose and St. Paul and individual MF buildings that have achieved high waste diversion rates. The report examines the features of the programs that have enabled the buildings or communities to accomplish their goals.

Movin' On Up – Strategies for Increasing Multifamily Recycling. September 1999. Skumatz Economic Research Associates

This paper examines strategies for improving recycling in multi-residential buildings in the United States focusing on incentives for tenants and haulers, planning requirements and promotion and education.

2.2 Other Jurisdictions

As part of the research phase the project team contacted officials in a number of jurisdictions. Personal interviews were conducted with staff in cities throughout North America which were identified as having innovative multi-residential waste diversion programs or a large segment of their residential population residing in multi-residential buildings, including:

- San Jose, California
- City of San Francisco, California
- San Francisco Apartment Association;
- Los Angeles, California

- Apartment Association of Greater Los Angeles
- Seattle, Washington
- Portland, Oregon
- Canadian Mortgage and Housing Corporation
- Greater Toronto Apartment Association
- Association of Condominium Managers of Ontario
- Chicago, Illinois
- New York City

The intent was to obtain leads to potential technical solutions as well as clarify what type of outreach and promotion is supported by the jurisdiction. The team was also looking for empirical evidence of diversion improvements in the multi-residential sector resulting from local activities and building retrofits or upgrades. The information is summarized below.

2.2.1 New York City, New York

New York has published a number of reports with respect to solid waste management and, while some of these are 10 years old or older, they remain relevant to the issue. As a follow up to the New York research the Director, Bureau of Waste Prevention, Reuse and Recycling for New York City was contacted.

NYC Streets and Sanitation forces assume responsibility for the collection of garbage and recycling from multi-residential buildings. The City enforces, through the issuance of summons, their recycling ordinance but reports that the current fines need to be updated since, for even the largest multi-residential buildings, the fine for non-compliance is $25. It has been the experience of the City that this is not an effective inducement.

Our contact was familiar with some technologies to adapt chutes in a manner that would stream recyclables and garbage separately, but is of the opinion that the outreach and training are the keys to compliance. It was noted that many buildings in New York have chutes without actual chute rooms, meaning that the chute door is located in the hallway. The traditional approach to the management of certain materials like glass (because it is dangerous to drop into a chute especially from the upper floors of a building) and paper and corrugated cardboard (as they clog up the chutes) is to provide separate containers for these materials. Such containers generally can not be placed in a hallway due to fire regulations and are often found in central areas or outside, the main point being that the material can not be placed in the chute.

The City maintains an active outreach and education program for building managers and superintendents, as noted in the literature, and shared the belief that proactive building management is an essential element in a successful multi-residential recycling program. It is thought that solutions should be simple and that a business case is often required that will provide justification for the time and effort expended by building staff to implement and maintain recycling programs.

2.2.2 Chicago, Illinois

The City of Chicago implemented a recycling ordinance that mandates the implementation of a separate recycling system for high-rise buildings. The general approach of the ordinance is similar to the Province of Ontario 3Rs regulations in which buildings of more than six units are classified as an industrial and commercial generator subject to the recycling regulation. In the case of Chicago, the City does not collect waste or recycling for buildings with more than 4 units, which are served by private sector haulers, but has rolled out a recycling toolkit and undertaken an outreach program to gain compliance with the ordinance.

The diversion percentage is assumed to be 5-6% and Chicago is now in the final stages of the first waste audit in over a decade. This includes the material stream from a high rise building. More information may be available from Chicago staff after that work is done.

2.2.3 San Francisco, California

San Francisco has recently implemented its Refuse Collection and Disposal ordinance which requires every residence and business to have three separate color-coded bins for waste: blue for recycling, green for compost and black for trash. In addition, the City uses a variable rate system for charging garbage collection in multi-residential buildings and will terminate collection services if not participating in recycling program. In the future, the City may impose fines that will need to be passed on to tenants for not participating in the waste diversion programs.

San Francisco has a franchise system for its residential collection in which two garbage and recycling service providers provide all residential garbage and recycling services to the entire city. San Francisco regulates residential garbage rates but does not regulate commercial garbage rates. The City determines the rates that can be charged by the services providers using a differential volume based PAYT approach.

While the contact was not aware of innovative technologies being used in individual multi-residential buildings, she mentioned that City staff encourage buildings to close the garbage chutes altogether in order to ensure that garbage collection remains as convenient as recycling and composting. Currently, the contact has seen about ten multi-residential buildings (up to ten storeys) in the City that have decided to close their chutes. The local apartment association has received complaints that the buildings are not reducing their rents to compensate for the reduction in garbage disposal convenience.

City staff also encourage building management to place recycling and organic containers next to the chutes on each floor citing that the cost savings resulting from reduced garbage fees effectively compensates for the extra time required of the superintendents to collect the recyclables and source separated organics from the chute rooms.

2.2.4 San Jose, California

The City of San Jose is the third largest city in California and on the West Coast. Although it has over 3200 multi-residential complexes, most are low or medium rise complexes. The City does not have many high rise multi-residential buildings and, consequently, doesn't have to deal with the chute issue.

Currently, the City of San Jose contracts its garbage and recycling collection services to the private sector and employs a variable rate system for charging garbage collection in multi-residential buildings. Multi-residential buildings subscribe to variable rate container service with rates based on bin size and number of collections per week. In addition, the City has built financial penalties into the collection contract of waste haulers for not maintaining specific diversion rates among its multi-residential customers.

Several years ago, San Jose was looking at mandating recycling in MF buildings through a local solid waste ordinance. Instead, the San Jose Apartment Association offered to pay an additional garbage fee to have the City construct a mixed waste processing facility (dirty MRF) to process the garbage and remove the recyclables. City staff report that the multi-residential sector is achieving 80% recycling with the back end mixed waste processing. The city continues to promote front-end recycling in all its buildings.

While the contact was not aware of any innovative programs or technologies being used in multi-residential buildings in San Jose, in the past, the City has implemented a reward program targeting property managers, who were entered into a draw for trips to Hawaii if they achieved certain city prescribed waste diversion goals, such as improved recycling program signage, monitoring and education to tenants.

The contact recalled attending a conference in which a speaker identified an innovative approach to waste diversion in multi-residential building in either Japan or South Korea which involved designated specific hours of a day for a chute to be dedicated to organic diversion. Unfortunately, further information could not be located by the contact or her staff.

2.2.5 Los Angeles, California

The City of Los Angeles is one of the largest cities in the United States and has been grappling with recycling in its multi-residential sector for several years. Currently, the City provides recycling services to all multi-residential buildings but requires building owners to arrange for garbage collection from the private sector (multi-residential buildings are classified as commercial establishments). This disconnect between garbage and recycling collection services has impacted the manner in which City staff can promote recycling. Consequently, the City is considering taking over garbage collection when its current recycling contract ends in 2013.

While staff were unaware of individual building successes in promoting waste diversion among the tenants, the City is about to embark on an interesting pilot project to encourage recycling among its single family households. The city has partnered with a rewards based recycling company called RecycleBank[5] to test a pilot which would involve rewarding neighbourhoods/communities who participate in recycling by pouring the money earned from the recycling back into the community by improving parks and building playgrounds for children. Individual households would not be rewarded; instead, the community as a whole will be rewarded for participation in the recycling program. Although, the pilot does not include the multi-residential sector it may in the future if proven successful.

2.2.6 Seattle, Washington

The City of Seattle has approximately 10,000 multi-residential buildings containing five or more units and states that overall these buildings are achieving a 23% waste diversion rate. The City of Seattle has introduced a range of initiatives to boost recycling in multi-residential buildings including:

- a variable rate system for charging garbage collection in multi-residential buildings;
- financial rewards and penalties built into collection contract to establish new recycling programs in multi-residential buildings;
- mandatory recycling requirements;
- fines for banned recyclables in the garbage as part of regulation banning recyclables in the garbage;
- introduction of a program called Friends of Recycling which provides $100 rebate to tenants or property managers that take on the role of recycling ambassador for the building;
- requiring that waste hauling contractors provide feedback to each building on an annual basis; and
- requiring building owners to distribute letters (developed by the City) to all tenants that explain recycling requirements and fines that will be added to the account garbage bill if a garbage container has significant amounts of recyclables (more than 10% by volume).

The requirements to provide feedback and to distribute the letters are enforced by City of Seattle staff. The contact shared some initiatives that have been introduced by local multi-residential associations. One

[5] RecycleBank has developed a recycling program that offers rewards to residential customers who participate in the program. Single family households are provided roll out recycling carts containing a radio frequency identification (RFID) chip. Carts are weighed and recorded by a collection truck retrofitted with on-board computerized scales. The weight of the recyclables collected from each home is recorded. Homeowners are provided credits for the amount of recyclables generated. Households can earn monthly RecycleBank Dollars, which can be converted into products and services at participating businesses.

Condominium Association (for Cooperative buildings) had people sign, as part of their contract, a statement saying that they had to recycle and could be fined $25, if the management found recyclables in garbage. The local social housing corporation has introduced a clause in its lease agreements stating that the tenant must recycle.

2.2.7 Portland, Oregon

The City of Portland, Oregon is considered one of the greenest cities in the United States and takes waste diversion very seriously. The City does not directly provide garbage collection and diversion services to any of its residential or commercial establishments, nor does it contract the services. Instead it operates a franchise system for single family residents and an open garbage and recycling system for commercial establishments, including multi-residential buildings. The City requires all commercial waste hauling and recycling haulers to obtain permits, which stipulate recycling program requirements and penalties as part of the permitting process.

One approach the City takes to promote waste diversion in its multi-residential sector is to provide feedback to buildings to decrease contamination problems. City staff determined that contamination could be reduced in medium-sized buildings by providing residents with specific feedback on contamination problems in their building or with more general feedback on the most common types of contamination problems occurring in Portland's multi-family recycling program as a whole. Asking residents to sign a pledge to prepare items in accordance with the City's guidelines also led to a decrease in contamination in medium- sized buildings, defined as buildings with 11-30 units. Unfortunately, this approach did not work in high rise buildings.

In addition, building owners are required to distribute recycling information to tenants at least once a year and within 30 days of a tenant moving in to the building. Those buildings that were found to provide recycling bins on every floor have achieved higher diversion rates.

A new entrepreneurial company in the City offers a unique service to multi-residential building owners. It will send company employees to sort through the building's garbage to remove the recyclables.

2.2.8 General Findings

Large North American cities face the same challenges and obstacles when designing and implementing effective waste diversion programs in the multi-residential sector. Until very recently, these cities have focused their time and energies in developing effective waste diversion programs for the single family residential sector and have essentially neglected the multi-residential sector.

Now that a majority of cities have successfully addressed waste diversion in the single family sector, they are beginning to turn their attention to the multi-residential sector by ensuring that all residents living in multi-residential buildings have access to recycling programs and receive literature and information about the recycling program. Some communities have introduced mandatory recycling regulations that require building owners and garbage collection companies to provide minimal recycling opportunities.

Unfortunately, few interviewed cities have delved into the systemic problems facing multi-residential buildings which are characterized by program inconvenience, lack of personal accountability and lack of understanding. With respect to development of recycling programs targeting the multi-residential sector, the majority of cities appear to lag about 20 years behind the development of curbside recycling programs. At the same time, staff seem reluctant to implement measures that would target tenants with penalties or rewards, but seem to direct their efforts at the property owner/management level.

Some staff identified the importance of connecting garbage collection services with recycling services to provide more effective powers to promote waste diversion by targeting garbage services. Toronto was praised for its levy system and for assuming responsibility for both garbage and recycling services.

2.3 Waste Collection Data

Waste collection data and levy fees charged to the pilot buildings were provided to the project team for the purpose of assessing garbage collection costs. Cost data is the truest measurement tool available to assess waste diversion performance. Efforts were made to determine building performance using volume to weight density conversions, but there are a number of variables that limit the effectiveness of this approach. As critical as it is, there are some limitations to using the waste collection data.

Most notably, while communal waste management systems ostensibly report building waste generation figures, charges are actually assigned by unit based on the amount collected from a shared location. Good or poor waste diversion is masked by the pooling of the waste and recyclables, making it impossible to account for the performance of specific buildings. In at least one case the figures suggest that there are other influences on the waste generation numbers that can not be explained or related to the number of units in the building: the charges assessed to the building are simply too high.

Regardless, the figures were helpful as a guide and the general principles, namely the more material diverted the less the cost, apply. Limitations in the data highlight the need to improve how waste generation in multi-residential buildings is measured and accounted for.

3. Stakeholder Consultation

3.1 Site Visits

A full narrative and performance summary for the site visits appears as Appendix B of this report. The initial visit, conducted at Building 3, included all but one member of the project team. This visit, in addition to being an opportunity to gather the required information from the building manager and make the necessary site observations, was also used to refine the visit approach and coordinate team procedures.

Subsequent visits were conducted by two team members, one with experience in waste diversion in the multi-residential context, and the other representing the building science aspect of the project team. Visits were conducted principally in mid to late November as shown in Table 3-1.

Table 3-1 Site Visits

Building Name and Location	Building Owner	Year Constructed	Building Characteristics	Date of Site Visit
Building 1	TCHC	1964	29 Stories, 719 Units Family Building	November 20th, 2009
Building 2	TCHC	1964	21 Stories, 301 Units	November 20th, 2009
Building 3	TCHC	1964	16 Stories, 299 Units	November 10th , 2009
Building 4	TCHC	1964	16 Stories, 300 Units	November 19th, 2009
Building 5	TCHC	1964	16 Stories, 300 Units	November 19th , 2009
Building 6	TCHC	1965	12 Stories, 161 Units	November 23rd ,2009
Building 7	TCHC	1965	7 Stories, 103 Units	November 23rd , 2009
Buildings 8 and 9	Private	1978	23 Stories, 460 units (230 each tower)	November 20th , 2009
Building 10	Private	1969	18 Stories, 192 units	November 20th, 2009
Building 11	Private	1968	18 Stories, 139 units	December 1st, 2009

3.1.1 Waste Management Overview

All participating buildings receive garbage and recycling services provided by the City of Toronto, which features front-end bin containers. In each instance, the building contains a chute room on every floor which is dedicated to garbage disposal. The chutes lead to a compactor which compacts the garbage. In all cases, but one, the garbage service remains more convenient than the recycling service provided to the tenants.

All buildings use 3 yd^3 bins for recycling which are located outside the building. Some buildings augment the recycling bins by providing recycling collection containers inside the buildings, and in one case, in each of the chute rooms. A further description of the waste management and recycling system in each building is provided in Appendix B and summarized in Table 3-2.

Table 3-2 Waste Management and Recycling Systems in each Pilot Building

Building ID	Garbage	Recycling	Estimated Diversion Rate*
Building 1	- garbage chute on each floor leading to compactor - 15 x 3yd^3 bins of compacted garbage disposed weekly & 2.5 x 3yd^3 bins of loose garbage disposed weekly	- 3 carts (360 litres) placed in the lobby of the building, well maintained and good signage - recyclables from carts manually transferred into recycling bins located outside - 3 x 3yd^3 bins of recyclables collected weekly	Low
Building 2	- garbage chute on each floor leading to compactor - 6 x 3yd^3 bins of compacted garbage disposed weekly & 2 x 3yd^3 bins of loose garbage disposed weekly	- 6 carts (360 litres) placed in the moving rooms of the building, well maintained recyclables from carts manually transferred into recycling bins located outside - 4 x 3yd^3 bins of recyclables collected weekly	Medium
Buildings 3, 4 and 5	- garbage chute on each floor leading to compactor - each building produces 2.5 to 3.5 x 3yd^3 bins of compacted garbage disposed weekly & 2.5 to 4 x 3yd^3 bins of loose garbage disposed weekly	- no recycling is provided inside of the buildings due to concerns about vandalism - all residents must take their recycling to outside bins - each building set out about 3 x 3yd^3 bins of recyclables collected weekly	Medium (all)
Buildings 6 and 7	- garbage chute on each floor leading to compactor - 2 and 7 x 3yd^3 bins of compacted garbage disposed weekly & 2 and 3 x 3yd^3 bins of loose garbage disposed weekly	- no recycling is provided inside of the buildings and poor signage in the buildings - all residents must take their recycling to outside bins - each building has about 2 x 3yd^3 bins of recyclables collected weekly	Low (both)
Buildings 8 and 9	- garbage chute on each floor leading to compactor - 5 x 3yd^3 bins of compacted garbage disposed weekly & 2 x 3yd^3 bins of loose garbage disposed weekly	- no recycling is provided inside of the buildings and poor signage in the buildings - all residents must take their recycling to outside bins - each building has about 2 x 3yd^3 bins of recyclables collected weekly	Low (both)
Building 10	- garbage chute on each floor leading to compactor - 2 x 3yd^3 bins of compacted garbage disposed weekly & no loose bins for garbage provided	- recycling is provided in every chute room using clear plastic bags hung from the wall - excellent promotion and reward program - recyclables from carts manually transferred into recycling bins located outside - 5 x 3yd^3 bins of recyclables collected weekly	High
Building 11	- garbage chute on each floor leading to compactor - 1.5 x 3yd^3 bins of compacted garbage disposed weekly & 2.5 x 3yd^3 bins of loose garbage disposed weekly	- carts placed in the parking lots, well maintained and good signage - recyclables from carts manually transferred into recycling bins located outside - 3.5 x 3yd^3 bins of recyclables collected weekly	High

* There are a number of formulas used to convert material densities into volume, which are required since the levy is a volume based system that collects both compacted and non-compacted material. The formulas lead to slightly different results, however the project team is able to assign a general level of diversion to the terms low, medium and high respectively: less than 5%, around 12 to 15% and 35% or greater.

Many of the buildings fall well below the City average for recycling rates. In 2009, the City of Toronto reported achieving 15% recycling diversion in its multi-residential buildings. Among the Tower Renewal buildings, five buildings were estimated to be achieving less than 5% recycling rate, four buildings were hovering around the City average and two buildings were far exceeding the average recycling rate.

3.1.2 Observations

The two buildings that are achieving high recycling rates were observed to have the following characteristics:

- A very supportive building management and/or building owner;
- Encouraging tenants to recycle through conversations and interactions with tenants;
- An effort to make recycling more convenient by locating recycling in the building or in high traffic areas;
- Understanding the financial impact of the levy on their building costs;
- Going the extra distance to engage and reward tenants; and
- A supportive tenant population.

The four average performers were observed to have the following characteristics:

- Committed superintendents who talk with tenants and try to encourage them to participate in the recycling program;
- In general there was no or poor access to recycling bins inside the building;
- There was inadequate signage in most of the buildings;
- Concerns over safety prevented some from participating in the recycling program which requires them to go outside to the recycling bins;
- New immigrants, who do not speak English, do not understand how the recycling program works and are not adequately informed about the recycling program and their obligations when they sign the lease;
- Many tenants do not know how to recycle; and
- Building management, while aware of waste levy cost implications, were not directly accountable for the cost as a result of a corporate approach where cost is assigned.

The poor performing buildings were observed to have the following characteristics

- Staff do not encourage tenants to recycle;
- Staff do not understand the impact of the levy on the building;
- Reported lack of motivation, apathy among tenants who did not assume any responsibility for recycling, not their problem or concern;
- A feeling of entitlement among tenants that they paid the rent and therefore it was someone else's job to pick up the garbage and recycle it;
- No signage in the building promoting recycling;
- For the most part, conditions in the buildings were poor and did not foster a feeling of pride or responsibility for keeping the building clean and functioning; and

- Tenants are thought not to know how to recycle and it is felt that they do not care to learn.

3.2 Building Management and Tenant Input

A critical component of the site visits was the one-on-one discussions with building management and superintendents about the challenges and possible opportunities in promoting recycling in their buildings. The building management and superintendents tended to fall into one of two categories:

1. Enthusiastic – Those buildings that were achieving the City recycling average or higher had, for the most part, enthusiastic and supportive building management and superintendents. They understood the need to communicate the recycling program to the tenants on a continual basis and to demonstrate through their actions their own commitment to recycling. The superintendents demonstrated a pride in their work and the building and hoped that their actions would encourage others to do the same. Although they understood the inherent challenges involved in getting tenants to recycle (apathy, safety concerns, language barriers, inconvenience, low priority compared with other concerns), they still encouraged participation and pride in the building.
2. Overwhelmed – Those underachieving buildings were characterized by superintendents and property management who felt overwhelmed and burdened with their responsibilities and were challenged in responding to the needs of the tenants and building. The recycling program did not factor into their list of priorities and was considered an additional burden. While staff were co-operative and offered input throughout the site visit, their enthusiasm was tempered by a belief that the lack of motivation among the tenants and lack of pride in the appearance of the building would hamper waste reduction efforts.

3.3 Other Stakeholders

The following stakeholder groups have been contacted as part of this project.

3.3.1 Equipment providers

Metro Group (including Wilkinson Chutes Canada), Waste Solutions Group (WSG)

Both companies are in the business of selling, installing and servicing recycling systems for multi-residential buildings. An example tri-sorter retrofit for a 40-storey building was said to cost in the area of $50,000, with the main expenditures being the installation of new equipment to direct waste to the appropriate container in the chute room, wiring of the chutes to direct the waste, and outreach and training for building staff and tenants. Equipment providers in general have a high degree of contact with the multi-residential community and provide solutions beyond the "big ticket" retrofit solutions. They are often able to provide equipment and know-how for custom-fit solutions and, as noted before, possess backgrounds in outreach and training for staff and residents.

3.3.2 Tenant Representatives

Opportunities to talk to tenant representatives were limited but proved useful. In one case the tenant representative was available for interview at the time of the site visit. The individual in question directly supported the recycling program by coordinating the use of the tenant common area for storage of in-unit containers. This meant that tenants who wanted to drop off recyclables in a centralized, outdoor area did not have to return their in-unit container to their apartment: they could drop off the container, go about their routine and on returning later in the day retrieve their container on the way to their apartment. The tenant representative encouraged recycling and was a source of information, but was not directly trained for this role and had a number of questions about the program and a number of good suggestions to

improve the system. These include: the option to provide one of two types of in-unit containers to residents, either the bag, which can be folded up and placed in a pocket or handbag for people who are dropping recyclables off and leaving, or the rigid plastic "mini" blue box. It was also obvious that there was an inherent flaw in the messaging of the posters where it is noted in English that the material is available in other languages, which may not be evident to people who speak those other languages, but also because the person is required to approach a superintendent or building manager to obtain copies in another language. It was understood that it might be difficult from an administrative point of view to invite anyone to call the City for material, yet the requirement to have a superintendent do this on one's behalf was seen as a barrier. It is thought that an option to allow a designated representative such as a tenant representative to request material might be considered.

3.3.3 Tenant Survey

Members of the project team conducted person-to-person surveys at three of the pilot buildings: Building 2, Building 5 and Building 11. Two of the buildings are Toronto Community Housing buildings (Building 2 and Building 5) and one building was privately owned and operated (Building 11).

Two team members arrived at the buildings in the early evening (5 pm) and waited in the lobby of the building for tenants to arrive home from work. The tenants were told about the City's Tower Renewal recycling project and politely asked if they could take a couple of minutes to answer a survey about recycling in their building. See Appendix C for a copy of the survey.

The survey was designed to expedite easy understanding and limit completion time to a few minutes, recognizing that tenants were often in a rush to get home after work. The team members approached tenants over a two hour period, finishing up around 7 pm.

In total, 72 surveys were completed in all three buildings with the tenants at Building 2 completing 25 surveys, Building 5 completing 21 surveys and Building 11 completing 26 surveys.

It should be noted that some natural bias is built into the survey since those tenants who are most interested in recycling and participate in the existing program are more likely to agree to participate in the survey than those who do not participate in the recycling program.

The survey does not mention every option considered by the team, but does provide some useful insight into the habits, attitudes and perceptions of tenants.

Responses: The majority of responsibility for taking the recyclables to a recycling receptacle is assumed by one of the adults in the household. Almost two-thirds (61%) responded that the household always recycles with about one-third (34%) responding that they sometimes recycle and only 6% responding that they never recycle.

Who puts out the recycling?	
Adults	84%
Children	8%
Both	8%
	100%

How often do you recycle?	
Always	61%
Sometimes	34%
Never	6%
	100%

The survey was divided into two parts. Part 1 delved into the respondents' recycling habits and whether they encountered certain problems when trying to recycle in their building. Part 2 of the survey asked whether the activities listed would help the respondent's household to recycle more. A summary of the responses are provided in Table 3-3 and Table 3-4. A summary of the comments is provided in Appendix C.

Part 1: As shown in Table 3-3, when asked about their recycling habits, most respondents did not feel that finding time to recycle or remembering when and what to recycle was a problem. Only about one-third of the respondents strongly or somewhat agreed that finding time to recycle and knowing how to recycle was a problem for them. However, many more respondents (41%) agreed that the recycling bins were too far away and not convenient to use. The vast majority of respondents understood the benefits of recycling and would often identify the environment or their children as the beneficiaries.

Part 2: As shown in Table 3-4, the three activities that garnered the most favour among the respondents included:

- Placing bins inside the building – 86% strongly or somewhat agreed
- Providing information about the impact on their building (e.g. $ cost for garbage, $ savings from recycling, % diversion) – 88% strongly or somewhat agreed
- Providing collection of recyclables on every floor – 80% strongly or somewhat agreed

There was less positive reception to the idea of allocating specific times to use the garbage chutes for recycling (only 52% strongly or somewhat agreed) and temporarily closing the chutes for not participating in the recycling program (only 32% strongly or somewhat agreed). Many respondents were concerned that temporarily closing the chutes would result in garbage thrown in the halls, or as one person surmised, over the balconies. Anything that interfered with the tenants' ability to discard their garbage down the chute was dismissed.

Table 3-3 Responses to Potential Problems Encountered When Recycling

	Finding time to recycle is a problem.	We forget to recycle.	We don't Know what to recycle.	The recycling bins are too far away / inconvenient.	We don't see how recycling benefits us.
# Responses	70	70	72	70	71
Strongly/Somewhat Agree	33%	36%	35%	41%	16%
Strongly/Somewhat Disagree	67%	64%	65%	59%	84%

Table 3-4 Responses to Potential Activities to Encourage Further Recycling

	Placing bins inside the building.	More posters to remind me to recycle.	Info. about impact on the building.	A reward program.	Collection of recyclables on each floor.	Specific times to use the chute for recycling.	Temporary chute closure.
# Responses	69	70	65	71	51	46	68
Strongly/Somewhat Agree	86%	74%	88%	73%	80%	52%	32%
Strongly/Somewhat Disagree	14%	26%	12%	27%	20%	48%	68%

3.3.4 Associations/Organizations

The Federation of Metro Tenants Associations, Association of Condominium Managers of Ontario, Greater Toronto Apartment Association, MicroSkills

The Federation of Metro Tenants Associations was approached to obtain a better sense of tenant/owner relations throughout Toronto. Staff are often approached to represent tenants when applications for an increase in rent is made, or when issues between the tenant and the landlord arise. In general the dealings of the Federation appear consistent with the findings in most of the pilot buildings, namely that communications are generally poor. It was also noted that some buildings had applied for a rent increase as a result of the waste levy but it was not known whether these buildings had made any effort to improve waste diversion or recycling, in order to reduce the waste levy impact, before applying for the increase. Understandably the Federation is protective of tenant interests and does not agree with measures such as chute closures, but feels that other approaches (such as floor to floor) would be viewed positively. Given the relationship between the Federation and tenants throughout the City it would be prudent to collaborate with the Association at the outset when contemplating outreach and communication plans, and to educate Federation staff (they participate on the City's multi-residential working group) in a manner that will help promote the development of waste diversion and recycling programs throughout the City.

Community MicroSkills Development Centre (MicroSkills) is a multi-cultural, non-profit, community-based organization committed to assisting the unemployed, with priority to women, racial minorities, youth and immigrants. The organization is supported by both public and private funding including The United Way and all three levels of government, and was referred to the project team by a building manager as a link to tenants. MicroSkills was consulted about a potential role within an outreach program as well as to gain a perspective on tenant – management relationships in two of the pilot buildings. While MicroSkills would not be in a position to deliver program-specific information it would be comfortable in their role of getting people to attend sessions. The general direction offered by our contact was that there is a lack of communication and trust between tenants and building managers, and a sense that, for waste diversion to work, a change in the communication style of the building management was required.

3.3.5 Property Management Companies

Homestead Group, Toronto Community Housing, Capreit Home, Minto Condominiums

The property management companies contacted above have demonstrated their commitment to environmental issues and are actively working to reduce the environmental impact of their buildings. Discussions with staff provided insight into the motivators required to develop and maintain a successful recycling program in their buildings. Involving tenants and gaining support of on-site staff is critical to the success of the program. These companies were well aware of the financial impact of the levy program and have taken pro-active measures to reduce the volume of waste requiring disposal thus reducing their operating costs.

3.3.6 Public Sector

City of Toronto Waste Management Department, Members of the Mayor's Tower Renewal Project Team, Waste Diversion Ontario - Continuous Improvement Fund

Members of the Mayor's Tower Renewal Project Team: Where additional insight was required, staff were approached for counsel. For instance, in order to understand some of the management issues at a specific site, staff were asked for their perspective. This proved to be quite valuable as, in the case of the building in question, the historical information clarified the extent of the challenges faced by the building management which, in turn, provides an indication of how much effort may be required to get the building management to understand and prioritize the waste management issue and then act.

City of Toronto Waste Management Staff were consulted for their knowledge of City waste management programs and also to assist the team in gaining a full understanding of the waste collection levy and how it is being applied. Their participation in the study was highly valued and appreciated. Given that waste collection at multi-residential establishments is performed by, and on behalf of, the City, and that the City is striving to meet aggressive waste diversion targets and controls the waste and recycling infrastructure

and levy system, City Staff will be important players in the development and implementation of proposed solutions.

The Continuous Improvement Fund, which is an arm of Waste Diversion Ontario and a co-funder of this study, employs on a part-time basis (full time in 2009) a municipal expert on multi-residential recycling. That individual was consulted on a number of occasions as a source of general information.

3.3.7 Miscellaneous

E.R.A Architects

E.R.A. Architects along with the University of Toronto prepared the Mayor's Tower Renewal Opportunities Book. Since the book makes reference to the European experience with respect to Tower Renewal, E.R.A. was contacted to discuss whether any specific waste related technologies or approaches had been encountered as part of their research. E.R.A was able to provide some information about approaches used in Sweden.

4. Case Studies

A selection of potential case studies has been developed and presented in this chapter. The amount of information available for each potential case study varies considerably. The final selection process will depend on available information and relevance to the final recommendations developed for the pilot buildings. The selection of case studies will be undertaken in consultation with the client.

4.1.1 Reward Program and Floor-to-Floor Collection of Recyclables at Building 10

Building 10 is one of the pilot buildings selected for the study. In this case, the building offers a very suitable example of how to manage waste where a waste collection levy exists, and in fact how to use the levy to leverage waste reduction and recycling activities.

The building owner has made the link between Toronto's garbage levy and the need to promote recycling in the building as a way to reduce the levy payments. The building owner has initiated several innovative practices to encourage participation in the recycling program. It has introduced recycling on every floor by placing clear recycling bags within the chute room thereby making recycling as convenient as garbage. In addition, the building owner has introduced an innovative reward program targeting the children living in the building. Each child receives a card and when the child brings a bag of recyclables to the office, the card is stamped. When 5 stamps are received, the child gets a prize. When ten stamps are received, thus completing the card, the child's name is entered in a draw for an iPod. The building has managed to reduce its garbage by half and is estimated to be achieving a high diversion rate. The incentive system is extended to building staff as well. The property management recognizes cost saving initiatives by sharing the savings with the building by investing in upgrades and improvements. It also supports direct incentives, such as tickets to Raptor's games, for superintendents and staff. The management approach is based on a business plan that recognizes that time and effort – in this case for the daily collection of the clear bags – is required to make recycling an option that is as convenient as garbage disposal, and that this effort is offset by savings in garbage collection costs.

The project team is looking more closely at the Building 10 business case and expects to convert this approach into a business plan example using another of the pilot buildings as an example.

4.1.2 Temporarily Closing the Garbage Chutes, Unknown Building in Toronto

One building superintendent was having problems with litter on one floor of a 12 storey building. After one too many incidences, the superintendent closed down the chutes on all of the floors of the building and posted notices on each floor and at each chute room explaining why the chutes were closed and identified the problem floor. Each tenant on the problem floor received a letter explaining why the chutes were closed and that this would happen again if the problem persisted. Prior to re-opening the chutes a few days later, the superintendent brought in Toronto staff to talk about recycling and distribute totes and recycling information to each tenant. Afterwards, the tenants began to participate in the recycling program increasing the number of full recycling carts set out for collection from two per week to six per week.

4.1.3 Recycling Clause Built into Rental Lease West Village Suites, Hamilton Ontario

Some building management companies are beginning to build recycling responsibilities into the rental lease to ensure that renters participate in the program and to follow through with penalties for not abiding by the signed lease. The lease agreement contains a clause that states that participation in the building's recycling program is mandatory and refusal to participate can result in fines or termination of the lease.

In the case of West Village Suites, a university student private residence, the property owners are promoting their building as a green community for students. The building itself has achieved the highest

rating possible in North America for environmental design and energy efficiency (LEED Platinum). The building has nine stories and 107 units.

All students renting units in the building are required to sign an Environmental Sustainability Pledge (see below) as part of the lease requirements. The importance of participating in the recycling and composting program is further stipulated in the Tenant Guide which states: "Tenants are reminded of their Environmental Sustainability Pledge, signed as part of the lease; tenants are responsible for recycling and composting wherever possible."

West Village Suites

Student Room Rental Lease

Environmental Sustainability Pledge

I, _____, understand that West Village Suites is a symbol for environmental sustainability and healthy living. I agree to adhere to the following in my day-to-day activities throughout the building:

1) Ensure that waste materials are properly separated into garbage, recycling, and compost.

2) Reduce water usage.

3) Reduce electrical usage by turning off lights and equipment (TV, computer) when not in use.

4) Ensure that energy and electricity is conserved by making use of the "all off switch" when all fellow tenants are leaving the suite premises.

_____ _____
Signature of Tenant Date

_____ _____
Accepted by Landlord Date

In addition to the pledge the kitchen area for each student suite (2-5 students per suite) includes a recycling sorting station and an in-unit container for organics. Chute rooms are large and contain ample room for two large recycling carts and an organics cart. Building staff consider the management of waste to be a full time job, and based on their commitment to waste diversion appear to be successful in diverting waste: weekly collection numbers include forty 240-litre blue recycling carts, ten 120-litre green carts for organics, and six non-compacted 3 yd^3 bins of loose waste.

Since there is no compaction, and therefore no weight-to-volume conversion issues, those numbers, can be converted to equal units (cubic yards) and used to establish an estimated diversion rate of almost 44% based on volume - 18 yd^3 of uncompacted waste, 12.56 yd^3 (9600 litres) of recyclables and 1.57 yd^3 (1200 litres) of organics. It should be noted that this estimate is subject to change: observations of the fibre stream revealed that most corrugated and boxboard was not flattened and, as a result, used up a large amount of the available capacity. Efforts by building management to get users to flatten boxes may reduce the volume diversion percentage. It should also be noted that a portion of the capacity is used by a small number of storefront commercial clients, and that waste generated is not solely attributable to student residents.

The building also makes extensive use of security cameras. There are 180 cameras throughout the building and although they are used primarily for security reasons building management consider them to be an aid when it comes to proper use of building facilities, including those provided for waste collection.

4.1.4 Financial Penalty, Blossom Hill Estates, San Jose, California

Blossom Hill tenants take their garbage and recyclables to recycling and garbage bins located adjacent to one another in designated outdoor "corrals". Management at Blossom Hills Estate takes recycling seriously and will issue letters every two months to residents who are not recycling properly. The letters explain how and what the resident should recycle, and where the recycling bins are located. Staff identify violators by physically going through the garbage. Building management has introduced financial penalties for residents who continuously place recyclables in the trash. If the resident does not comply with the recycling requirements he or she is sent a letter and fined US $30. The letter explains the recycling program and gives the resident 90 days to comply in which time the fine is dropped. The complex has achieved 50% diversion rate.[6]

4.1.5 Door-to-Door Collection, Regent Park Pilot, Toronto

The City of Toronto was involved in a series of pilot project in the mid 1990s, testing enhanced diversion options at a number of apartment buildings in the City. One of the enhanced diversion systems tested involved collecting recyclables door-to-door in a 91 unit multi-residential building located in Regent Park. The pilot tested the convenience of collecting recyclables door-to-door to encourage higher participation in the recycling program. In addition, door-to-door collection would provide the greatest control over potential material contamination and storage issues.

The pilot was to be launched in two buildings in Regent Park at 15 Belshaw and 248 Sackville. At the time neither building had a recycling program in place before the pilot was implemented. Due to complications, the pilot was launched only in one building at 15 Belshaw beginning February 1997 and continued for an eight month period. In addition to the collection of Blue Box recyclable materials, the door-to-door collection pilot collected organic food waste, diapers and additional plastics.

Collection staff were hired from a local non-profit community organization. They provided door-to-door collection, distributed multi-lingual instructions and recycling containers, and visited residents explaining how the recycling program worked. In addition, promotional information and instructions were posted in the lobby and hallways. Door-to-door collection was provided three times a week to each apartment resident. Materials were taken to designated containers in a secured area adjacent to the building.

The pilot at 15 Belshaw in Regent Park resulted in a 15% diversion rate for Blue Box recyclable materials reaching a 26% diversion rate when organic food waste, plastics and diapers were added. The cost for the eight month pilot was $17,000 of which:

- In the first three month period $3,500 was used to pay the coordinator's salary and $4,000 was used to pay two collection staff salaries (reported to be close to minimum wage @ $6.85/hour)
- In the remaining months the funding was reduced to $2,800 for the coordinator's salary and $500 for one collection staff;
- Included promotion and education but costs not available.[7]

4.1.6 Outreach, 50 Tuxedo Court, Toronto

Toronto Community Housing has introduced the Tenant Community Animator (TCA) program to promote recycling in its buildings. The TCA is a voluntary position; however, funds are made available for printing

[6] USEPA. October 1999. **Complex Recycling Issues: Strategies for Record-Setting Waste Reduction in Multi-family Dwellings**. EPA-530-F-99-022

[7] Conversation with Paul Chamberland, Manager at Dixon Hall who helped oversee the project.

and supplies. The TCA at 50 Tuxedo Court takes his role very seriously and has initiated a program to encourage tenants to recycle. Over a six month period, the TCA will provide door-to-door recycling pick-up using volunteers. He developed a collection schedule and notifies tenants which day and hour on the day the recyclables will be collected at their door. Each tenant will receive a copy of the schedule. Those tenants who are working will be asked to place their recyclables into bins provided in the mail room.

The door-to-door service is designed to get the tenants involved in recycling by making it as convenient as possible. The service will be provided over a six month period to ensure that the separation of recyclables from the garbage becomes enshrined in their day-to-day activities. This is considered adequate time to train the tenants to automatically participate in the recycling program. After the six month period, the door-to-door service will be eliminated except for tenants with special health needs.

The door-to-door program was developed with the cooperation and support of the superintendent. The TCA has also created posters to educate tenants about the materials that can be recycled.

4.1.7 Community Rewards, San Jose and Los Angeles

One multi-residential building in the City of San Jose has achieved high diversion rates due to the enthusiasm and commitment of the superintendent. In order to improve participation in the recycling program, the superintendent engaged the help of the children living in the building who were taught about the importance of recycling and encouraged to get their parents to recycle. As an added incentive, any savings accrued from reduced disposal costs were promised to be put back into the beautification of the building property. The savings from the recycling program have been put back into the property, with the superintendent and children planting flowers and trees and investing in a new playground.

The City of Los Angeles will embark on a pilot project to promote community pride and beautification through participation in the City's recycling program. The City is partnering with RecycleBank but instead of rewarding each individual resident (single family), the city will reward neighbourhoods/communities by pouring the reward money back into beautification of the community (e.g. renovating local parks and children's playgrounds). This idea could easily be adapted for multi-family complexes in Toronto.

4.1.8 Outreach and Pledges, 44 Willowridge Rd, Toronto

A robust education and outreach program was piloted at a Toronto Community Housing building to improve recycling and reduce contamination levels.

The project focussed on person-to-person contact between the educators and tenants and featured personal visits with each tenant and pledges. The project featured:

- Face to face contact with the tenant
- Educating the tenant about the City's recycling pledge card
- Answering questions and concerns
- Handing out a TCHC recycling bag and a recycling magnet
- Requesting the tenants commit to up to three actions on a pledge card
- Asking them to put their pledge up on their fridge
- Leaving 'sorry we missed you' notes for tenants who were not home with information about the next door to door visit or lobby event where tenants could pick up their bags and information.

The interesting feature about this pilot was the request that tenants fill out a pledge card and commit to three things that they were willing to do. They were then asked to put the pledge on their fridge to act as a prompt and remind them of their pledge to participate in the recycling program.

The survey provided insight into the tenants' recycling behaviour. Many tenants reported that they didn't recycle because they didn't know how to recycle or they didn't know that a recycling program existed in

the building. When asked if they would recycle if shown how, the respondents unanimously reported that they would.

4.1.9 Coupon Reward Program, Maruoka-Cho, Japan

The community of Maruoka-cho, Japan (population 34,000) has installed a series of reverse vending machines in prominent places throughout the community. Residents are encouraged to return their containers and receive points on a special recycling card that is swiped every time the containers are deposited in the vending machine. When the resident has accumulated 500 points, they can redeem the points for gift certificates that can be used in participating stores in the community. The community returned over 1.3 million containers in the first four months of the program.

This program is similar to a reward program operating in the United States by an entrepreneurial company called RecycleBank. The premise behind the program is to reward single family residents for participating in a community's recycling program. Single family households receive a cart (similar to Toronto's recycling cart) that is specially outfitted with a radio frequency identification (RFID) tag registered to the home address. The recycling truck, retrofitted with on-board computerized scales, records the weight of the cart before and after being unloaded of its recyclables from each house. The information is sent to a central location and processed on a home by home basis. RecycleBank rewards the homeowner based on the weight of the recyclables collected. The reward is in the form of credits which can be redeemed as coupon that can be used as cash in participating retailers.

Currently, the RecycleBank program only targets single family households and has not developed a successful program targeting the multi-residential sector. However, the reverse vending machine could possibly be adapted to a system that mirrors the RecycleBank program but targeted multi-family buildings. To date no successful adaptation of the program has been identified.

4.1.10 St. Paul's Outreach and Feedback Program (St. Paul, Minnesota)

Eureka Recycling, a non-profit organization, provides multi-family recycling services at all buildings with eleven units or more in the City of St. Paul (building owners are required to contract garbage collection services with private haulers). The organization has been tracking recycling data on the buildings in the program for more than 17 years, including contact and program histories, information demographics, and tonnage collected. During each collection, the collection crew manually records the number of carts collected and their fullness. This information is later converted to tonnes of material diverted. Each year the organization sends a mailing to property owners describing the amount of materials diverted in their buildings (number of tonnes diverted) and compares it with previous years. The letter congratulates the building for its recycling efforts and provides the tonnages recycled as well as recycling calculator information to show them the environmental impacts of their diversion efforts (e.g. number of trees or energy saved per tonne of material). Eureka uses the EPA's Greenhouse calculator to convert recycling tonnages to greenhouse gas savings. The mailing includes a survey asking property owners about their recycling needs and update contact information. See the figure below for a copy of the letter template used by Eureka.

Eureka's Feedback Letter to Building Owners and Tenants

(DATE)

(FIRST NAME) (LAST NAME)
(ADDRESS 1)
(ADDRESS 2)
(CITY), (STATE) (ZIP)

To our neighbors at **(APARTMENT NAME)**:

(CITY NAME) apartment, public housing, condominium and town home residents recycled over **(NUMBER OF TONS)** tons of material in **(YEAR)**—that's more than **(NUMBER OF POUNDS)** pounds! We are happy to inform you that (**APARTMENT NAME)** contributed much to our collective success by recycling **(NUMBER OF POUNDS) pounds** of materials in **(YEAR)**.

We appreciate your commitment to this program and we want you to know that you have made a difference. The recycling efforts of **(CITY NAME)** residents in **(YEAR)**:

- Saved over **(NUMBER OF TREES)** trees from being cut down
- Reduced greenhouse gas emissions by about **(NUMBER OF METRIC TONS)** metric tons of carbon equivalent (MTCE), equal to the average amount saved by keeping **(NUMBER OF CARS)** cars off the road for a year
- Conserved over **(NUMBER OF BTUs)** BTUs of energy, enough to fill the average energy needs of **(NUMBER OF HOUSEHOLDS)** households for a year

It costs less to create new products from recycled material, so this saves you money as a consumer in the long run. And, by recycling more and producing less garbage at your building, you can reduce your garbage service—and your garbage bill—to save money.

To take advantage of the **FREE** recycling information we offer, please complete the enclosed form and return it postage-free or call our hotline. If you have any questions or concerns about your recycling program, please feel free to call me at **(PHONE NUMBER)**.Thank you for recycling.

Sincerely,

(NAME)
(TITLE)

P.S. We look forward to hearing back from you!

5. Analysis and Evaluation of Potential Solutions

The research, stakeholder consultation and development of case studies resulted in the development of a long list of possible solutions, described below. While the initial intent was to arrive at a number of technical solutions it became apparent that potential solutions are found across a range of considerations, categorized below under a number of headings, that in combination may achieve the desired results. In other words, there is no single solution that in isolation would improve recycling or waste diversion and, further, that without first working to educate building staff, attempts at implementing various technological approaches might in fact be destined to failure. Approaches that were assessed for the purpose of the final report fall under the general headings of Technology, Education, Outreach, Operational, Financial Incentives, Compliance, and Other.

This Section describes the full menu of strategies arising from the research and outlines in general terms the type of analysis and evaluation performed. Section 6 provides specific details about the evaluation approach and related outcomes.

5.1 Potential Solutions by Category

Options listed below will be evaluated against a number of criteria for the purpose of developing recommendations for inclusion in the final report. Each option is briefly explained in this section and discussed in further detail in Section 7.2 if it proceeded to the short list after the evaluation phase.

5.1.1 Technology

Our research resulted in the development of a list of technological or mechanical approaches that might be employed to achieve higher recycling and diversion rates. These include:

1. Tri-sorter technology – a technology that directs waste placed into a chute into one of three containers, where the tenant uses a "pushbutton" system to select which type of waste is being placed in the chute: garbage, recycling or organics (See Appendix D for illustrations).
2. External Chute – involves retrofitting the building to accommodate a recycling chute located outside of the building with access inside of the building (See Appendix D for illustrations).
3. Divided Chute – using the existing chute envelope to construct a divided chute or second chute.
4. Vacuum systems – is a system that uses a series of under ground pipes and suction to move garbage, recyclables and organics from the chutes to an off-site centralized facility for collection (See Appendix D for illustrations).
5. In-Ground Containers – these containers use the underground to store the materials captured through containers located above ground (See Appendix D for illustrations).
6. In Unit Sorting Stations – These in-unit sorting stations are adapted to suit the tighter space characteristics of multi-residential units and involve adapting the existing kitchen, for instance, with a pull-out cabinet that contains separate compartments for recyclables and waste.

5.1.2 Education

City of Toronto staff have expended considerable time and effort to develop educational and promotional material. As a result the project team did not explicitly search out or study other forms of material. In almost any instance where City recycling posters were found they were considered to be useful. The graphic presentation is considered to be one way to overcome the language barriers in the pilot buildings.

The project team witnessed, on several occasions, instances where the graphic representation of acceptable recyclables was recognized and referred to during site visits.

The main point in this regard is to motivate the active use of City-generated program material within buildings by managers, superintendents and tenant groups. City research includes conducting of focus groups to assist with the development and refinement of related promotional material. The research associated with this project indicates that the issue (low waste diversion) is not about the quality of promotional material but about outreach and general communication between building managers and tenants. Well conceived promotional and educational material is available for use to assist in the establishment of multi-residential recycling programs. Of more concern is the lack of internal structure to support an upsurge in the collective desire to recycle that might occur if these promotional materials were used liberally. In some of the pilot buildings, tenants might find that there is little or no capacity to accept recyclables and, after being convinced to recycle, become discouraged.

For the purposes of this study it will be assumed that City staff will continue the process of maintaining and improving the current multi-residential promotion and education (P&E) program, where City-generated material will be available to assist in educating building managers and superintendents. Other P&E options identified; however, include:

7. Simplified Messaging – The site visits and research phases of this study identified a preference for simplified messaging, such as a "bottles, cans, papers" approach. The simplified messaging provides an easy to understand and effective way to help people remember instructions. This approach is especially useful in situations involving multiple languages and high turn over rates, often characteristic of multi-residential buildings.

8. Barometers – This approach involves plotting changes in an activity over time, such as $ savings or $ raised over a period of time. This approach provides visual information to target audience and helps to encourage greater participation in an activity because the barometer measures, plots and displays the progress of the target group over time.

It was also expressed to the project team by a contact working with the Continuous Improvement Fund (who has a mandate to promote multi-residential recycling throughout Ontario) that feedback programs (barometers, levy impacts, recycling performance compared with past performance and/or against other buildings) might also be useful approaches. These initiatives could be used to augment the City's P&E campaign and, therefore, will be introduced into the list of potential diversion strategies.

9. Comparative Recycling Performance – One way to communicate with property managers about their relative performance is to use the billing mechanism in much the same way as other agencies who seek to promote conservation behaviour. Invoices, whether on paper or on-line, would contain performance information based on previous invoices. In this case it might also be prudent to publish a number of benchmark figures or ranges to indicate what the performance expectations are. For instance, the property manager might be told that high-performance waste diversion buildings typically pay at a rate of $6 to $7 per unit per month. The building owner can do a quick calculation, perhaps aided by the inclusion of a formula, to arrive at a comparative figure. For example, using the figure provided in the latest invoice and assuming a monthly billing:

Cost per unit:

SWM Fee/Building Units = $3,580/230 = $15.57 per unit

Potential annual savings if diversion performance improved to $6.50* per unit per month:

Per unit fee - $6.50 x 230 units x 12 months = 15.57 – 6.50 x 230 x 12 = $25,033.20

*$6.50 is the minimum disposal cost available to XL buildings, and has been attained by two buildings in the pilot group.

To facilitate and simplify the process the City might consider developing an online calculator to generate this information. Further, if the number of units in a building is known to the billing administrator the calculation could be made in advance and shared with the property owner as part of the information appearing on the bill. A similar approach has been taken by Ontario Hydro to educate customers about their electricity use and identify opportunities to reduce the use over time. The information can be found at www.torontohydro.com/tou.

5.1.3 Operational

Observations by the project team would suggest that the other main aspect requiring improvement with respect to waste diversion are building operating practices. A stronger understanding of the waste levy system should translate into the development of a business case to justify an investment in waste diversion based on waste collection cost avoidance yet, for all but one of the pilot buildings, this does not appear to be happening at the current time. It is thought that the promotion of cost savings and information about how the levy is applied will encourage building managers to review any number of operational approaches:

10. Contract Clauses – These are clauses that are added to a renter lease that requires tenants to participate in the buildings recycling and waste diversion programs.
11. Temporary Chute Closure – a controversial approach but research shows that such action has been taken in order to put recycling and waste diversion on par with garbage disposal in terms of convenience. The temporary chute closure approach works as a punitive measure to encourage better recycling behaviour by closing the building's chutes for short period of times in an effort to make residents aware of the need to participate in the recycling program.
12. Permanent Chute Closure – While not legally permitted in Toronto at this point in time, some communities permit and encourage building owners and management to close the chutes in order to put recycling and waste diversion on par with garbage disposal in terms of convenience. For both services residents must take material to a designated location. Alternative approaches to achieve the same equality are listed below.
13. Door-to-Door Collection – This approach, and floor-to-floor (below) are other means of making recycling as convenient as, or more convenient than, disposal. Door-to-door approaches are, in effect, the multi-residential equivalent to curbside recycling and are possible to execute but do require that building operators consult local authorities about fire codes.
14. Floor-to-Floor Collection – This approach, well demonstrated by one of the pilot buildings, puts recycling and garbage disposal on equal footing by establishing recycling drop-off opportunities on each floor, often inside the chute room. In the case of Building 10, clear bags are mounted in the chute rooms are removed daily by staff, who bring the material down to the recycling bins.
15. Designated Chute Times – This approach, of designating specific times for allowing recyclables down the chute, and the one that follows, are variations of the same approach in which the existing chute system is used. In this case usage is regulated by time, meaning that tenants would be directed to use the chutes for specific materials (recyclables, organics, garbage) at designated times throughout the week.
16. Recycling Bags in Chutes – This approach requires tenants to place different wastes (recyclables, organics, garbage) in different coloured bags and placed down the chute. The bags are then sorted by building staff into different bins according to colour.
17. Cart Tipper – Mechanical equipment used to transfer recyclables from carts to bins.

Ultimately there are many potential operational approaches and variations of the examples noted above. The first step is to establish accurate accountability for disposal costs and, in the case of buildings in Toronto, understand the significance of the waste levy as an incentive to put a well designed recycling program in place and actively promote it.

Input to the project team that some of the approaches above have been tried and found unsuccessful has been received and noted, but it is understood that in all cases these were not tested at a time when the waste levy was in place. It is strongly suggested that in the levy-based scenario, where all players (the City, building managers, tenants) have a financial stake, and with concerted and well designed outreach and educational support, many of the strategies appearing above are viable even if, in some cases, they were previously and unsuccessfully trialed.

5.1.4 Financial Incentives

The City of Toronto has invoked a waste levy system, a progressive policy that places a cost on waste collection but rewards recycling and waste diversion. Waste levy values for the pilot buildings range depending on the waste generation and diversion at each, but in some cases are significant. The levy makes viable a number of building related investments and incentives to promote diversion.

18. Tenant Incentives/Rewards – rewards would be established for the tenants to encourage participation in the recycling program. The reward program could target the children of the building or adults or both using prizes or coupons as the incentive.

19. Direct Building Accountability – As this implies, the onus of accountability is put directly on the building management. An example of a direct accountability program is the pay-as-you-throw (PAYT) approach which makes the user directly responsible for paying for the amount of garbage sent for disposal. Toronto's levy program is a PAYT program because it requires the property management to pay for the amount of garbage set out for disposal. This approach creates an incentive to increase recycling in order to reduce garbage thereby reducing the garbage fees.

20. Direct Tenant Accountability – As this implies, the onus of accountability is put directly on the tenant and/or the building management. An example of a direct accountability program is the pay-as-you-throw (PAYT) approach which makes the user directly responsible for paying for the amount of garbage sent for disposal. In this situation, the tenant is required to pay for each bag of garbage disposed, a system employed in Europe called the Chamber system (See Appendix D for further description).

21. Building and Community Rewards – Rather than rewarding the individual for participating in the recycling program, the community is rewarded for the building's overall participation in the recycling program, which in the case of multi-residential buildings often takes the form of upgrades to communal areas or tenant facilities.

22. RecycleBank – RecycleBank is a corporate entity that rewards single family residents for participating in a community's recycling program. Recycling carts are outfitted with a radio frequency identification (RFID) tag registered to the home address. The recycling truck, retrofitted with on-board computerized scales, records the weight of the cart before and after being unloaded of its recyclables from each house and the homeowner is rewarded based on the weight of the recyclables collected. The reward is in the form of redeemable coupons that can be used as cash at participating retailers. Currently, the program only targets single family households and has not developed a successful program targeting the multi-residential sector.

23. Staff/Superintendent Reward/Recognition Program – This approach recognizes the effort put in by staff, i.e. superintendents, to promote and maintain and effective and attractive recycling program in the building. The incentive or reward, potentially supported by savings in the waste-levy expense resulting from higher recycling rates, can be tied into recycling participation and recovery rates, with staff receiving higher rewards for achieving higher recycling rates in the building.

5.1.5 Compliance Approaches

During the site visits, and as witnessed in some of the case studies, basic compliance approaches were discussed.

24. Punitive (fines) – Fines could be issued to tenants for not recycling. The fines would be left to the discretion of the property management and would require superintendents to open up the tenant's garbage bag to identify recyclables in the bag. This approach often meets with resistance by tenants and is viewed as a less effective approach than using positive incentives and feedback.

25. Enforcement/Violation Letters – Tenants are sent letters explaining that they have violated their tenant lease by not properly participating in the building's recycling program. In order to be effective, the letter must at some point be accompanied by a fine or threat of a fine.

26. Security Cameras – Security cameras posted at the chutes and recycling bins act as a deterrent to illegal dumping of garbage in the recycling bins and poor recycling habits by showing the tenant that the building management is concerned about recycling and monitoring the situation.

5.1.6 Outreach

One of the more pronounced system deficiencies, although not universally applicable to all pilot buildings, is a lack of recognition by building managers of the impact of the waste levy and also the poor communication between landlords and tenants on the matter of waste diversion. In both cases targeted outreach would assist in the attainment of diversion goals. It was apparent that there is little or no collaboration or communication with respect to the issue, and perhaps even some reluctance to aggressively promote waste diversion and recycling in the building. The project team recognized that, in the absence of meaningful outreach, the implementation of any approach would not gain the required understanding and cooperation of building tenants to work. A number of outreach options are being reviewed:

27. Third Party Community Groups – This approach involves the use of community-based groups to conduct outreach and educate tenants about an issue. Groups of this type, some of which have been contacted for this study, often have a mandate for community outreach. While they are not necessarily the party that would present the technical information, they might be relied on to bring people to events. The support of credible organizations which maintain good relations with tenants would likely benefit waste diversion efforts.

28. The Ambassador Program – A coordinator for this City of Toronto supported initiative by the 3Rs Working Group (3RWG) was hired in the fall of 2009. The program targets the multi-residential sector and will seek to coordinate and grow a network of volunteer leaders throughout the multi-residential community. Volunteers will liaise with City staff, building superintendents and managers, and their neighbours, to promote and educate with respect to waste diversion. From the perspective of this study, a successful and aggressive Ambassador Program is seen as a positive development. Program benefits, such as fostering tenant pride and soliciting input from people who live in the buildings are consistent with the needs identified by the project team. Toronto Community Housing has introduced a similar program through its Tenant Community Animator program.

29. Events – It is sometimes useful to draw attention to a program or campaign by staging an event. This has the potential to add profile to the cause, draw interest from residents, and give cause to collect and contribute the relevant material in the household. The holding of an event, in addition to the promotional value, overcomes some of the barriers inherent in the multi-residential environment: people have the opportunity to see their neighbours participating and elements of anonymity and isolation are temporarily removed. Some specialized materials are ideally suited for event-style collection, such as electronics and certain special wastes although, especially for the latter, formal collection events of this type generally require approval from the Ministry of the Environment.

30. Pledges – The notion of signing a pledge to act was identified as a possible tool to gain commitment to the cause of recycling and waste diversion. "Pledging" is a voluntary act but the act of signing or reciting a pledge, which is a public declaration, is seen as obtaining a commitment to keep ones word.

31. Management Training Workshops – One strategy thought to complement the City's educational efforts involves a program initiated in New York City to train property managers and superintendents (Outlined in Section 2.1.2) about recycling in multi-residential buildings. As noted in that section, it appears that many building managers have as yet to convert the impact of the levy into action. The option of piloting a training program to assist property managers in quantifying the impact and learning about potential cost reduction strategies was forwarded for consideration.

5.1.7 Other

32. Fun Theory – The premise is that behaviours can be successfully changed by making the desired activity fun to do. The Fun Theory website touches on public space recycling (one entry shows the use of a bottle-return arcade) and litter (a sound device triggered by the receptacle door simulates a long drop to the bottom of the bin, similar to a sound effect used in cartoons) and in each case features a custom made application. The Fun Theory award program offers up to € 25,000 for the best judged entry and is supported by Volkswagen.

5.2 Screening Criteria

The project team assessed each of the proposed solutions, the "long list", by applying a list of evaluation criteria against each option. Details concerning how each item was scored, for the purposes of preliminary evaluation, are noted in Section 6.1.1 of this report.

5.2.1 Evaluation Criteria

The criteria used for the initial assessment were felt to be applicable to all situations, regardless of building type:

- Tenant Usability – Ease of use, ease of understanding, convenience
- Tenant Acceptance – Willingness to participate
- Transference Potential – Ability to transfer to most if not all multi-residential buildings and especially those within the Tower Renewal profile in terms of age
- Ease of Infrastructure Enhancements – While building-specific factors will require further assessment relative to a given strategy, it was generally accepted that each strategy could be generally assessed in terms of technical and structural requirements, timely implementation, physical space needed at each floor or in common areas, and ease of retrofitting (physical space, weight, electrical). Discussion of general regulatory and building code issues occurred at this point of the assessment
- Proven Technology or System – Is the technology or system commercially proven, easily available with competitive vendors who can also provide service and support
- Support Requirements of Building Staff – Superintendent and/or building management involvement, extent of operating/maintenance issues for building owner
- Support Requirements of the City – Required by-law amendments, labour and program involvement

Although the diversion potential (namely the relative quantity of material potentially diverted from disposal by the option) and other environmental benefits, were also considered, they eventually fell off the list of criteria due to their redundancy. All strategies were on the list because if properly implemented they would yield waste diversion and environmental and economic benefits. Their relative performance in this respect was thought to depend not so much on the actual strategy but on the commitment with which it is implemented and supported.

Other factors are appropriate when considering for implementation: Aesthetics, appearance, noise, and the potential to blend into the building while remaining visible enough to be identified and understood are important but building specific issues.

Table 5-1 The "Long List" of Potential Approaches

Retrofit Solutions	1	Tri-Sorter
	2	External Chute
	3	Divided Chute
	4	Vacuum Systems
	5	In-Ground/Secure Containers
	6	In Unit Sorting Stations
Communication	7	Simplified Messaging
	8	Barometers
	9	Comparative Recycling Performance
Operational Adjustments	10	Contract Clauses
	11	Temporary Chute Closure
	12	Permanent Chute Closure
	13	Door-To-Door
	14	Floor-To-Floor
	15	Designated Chute Times
	16	Recycling Bags In Chutes
	17	Cart Tipper
Financial Tools And Incentives	18	Tenant Incentives (Prizes, Draws)
	19	Direct Tenant Accountability
	20	Direct Building Accountability
	21	Building and Community Rewards
	22	RecycleBank
	23	Staff Incentives / Superintendent Rewards and Recognition
Compliance Approaches	24	Punitive Fines
	25	Enforcement / Violation Letters
	26	Security Cameras
Outreach	27	Third Party Community Groups
	28	The Ambassador Program
	29	Events
	30	Pledges
Education	31	Manager and Superintendent Workshops
Custom	32	Fun Theory

5.2.2 Cost

The second stage of the evaluation considered cost factors including:

- Capital investment – technology investment
- Ongoing operational costs – labour, maintenance, energy use
- Estimated levy savings – reduced levy resulting from waste diversion

The potential cost impact for the short listed options was considered on a building by building basis. The project team realized, however, that while cost must be recognized, in a levy based system strategies that entail larger capital and operating costs may be considered where an acceptable payback or return on investment can be shown. In the case of some of the poor performing buildings the annual savings available as a result of disposal cost avoidance resulting from successful waste diversion is in the $15,000 to $40,000 range.

6. Development of Solutions for Each Site

6.1 Stage 1 – Suitability as a General Strategy

6.1.1 Scoring Against the Criteria

The project team evaluated items on the long list against a five point scale that was used to assess the positive or negative attributes of the strategy relative to the criteria noted in Section 5.2.1 of this report. The ultimate decision was based on consensus *aided* by the scoring process, which resulted in a full deliberation on each potential strategy. Each strategy was supported by a positive statement or question as noted below in the example case. Project team members were then given the option to answer very positively (+2), positively (+1), neutral or non applicable (0), negatively (-1) or very negatively (-2). Where information was unknown, criteria were assigned a score of zero.

For example, the concept of placing recyclables in a separate colour coded bag and then sending that bag down the chute might be scored as follows:

- Tenant Usability, Is the strategy easy to understand and simple to use? **+2**: This score views the strategy as being very easy to understand. The tools are simple to use (plastic bags) and the system in which they are used is pre-existing (the chutes). Tenants would place recyclables and garbage in separate colour bags and put each down the chute.
- Tenant Acceptance, Is the strategy convenient to use or participate in? **+1**: There are a number of minor issues that might initially cause some resistance by tenants, namely the requirement to bag waste and recyclables in separate colour bags. It's minor but does require cooperation and effort from the tenant, which may or may not obligate them to purchase coloured bags.
- Transference Potential, Can the strategy be transferred to other multi-family buildings? **+2**: Bags are commercially available and all the pilot buildings, and most buildings in general, have chutes. This strategy could be considered for every building in the pilot group and beyond.
- Infrastructure modification, Does the strategy integrate easily into existing building and collection infrastructure? **-1**: In this case, there may be a need to add or modify recycling carts or containers, and perhaps reorganize how they are used, to accommodate the sorting of coloured bags.
- Proven Strategy, Is the strategy backed-up by research or successful application to multi-family buildings? **0**: While there is not a huge body of information on the use of this system, the main components (bags, chutes, rolling bins, etc) are fairly commonplace and this aspect is considered to neither favour nor hinder consideration of this strategy. In general, a positive score was awarded for this attribute if research supported the strategy, and a negative score if research was unfavourable to the strategy. A zero was awarded if there was no strong indication either way.
- Support from Building Staff, Is the strategy convenient to implement, requiring minimal time and effort from staff? **-2**: This is scored as very negative since adoption of this approach would require that the building staff sort the coloured bags in the compaction room, and in fact would be required to do so before compacting non-recyclable waste. This would be considered to be a major barrier to implementation.
- Support from City, Does the strategy require minimal legal, labour or program support from the city? **0**: Although seen as a neutral factor, it should be noted that this score assumes that the City would not object to receiving recyclables that are bagged or that it would make building staff responsible for de-bagging the recyclables prior to collection.

The total of the scores above is **2**, however each team member submitted a score. For this strategy the average score was -1.3 and the scoring range was 4, with scoring variations in specific criteria. Using this

approach the team then met to discuss each strategy, clarify thoughts around their individual scoring, and arrive at a consensus to drop the strategy or move it forward for consideration.

Once all strategies on the list (other than those removed from the list for reasons cited below in Section 6.1.2) were evaluated in this fashion, the project team on the basis of consensus nominated a number of strategies to proceed to the next stage of the evaluation. Figure 6-1 provides a schematic of the evaluation process.

6.1.2 Reducing the Long List

During the process it became apparent that a number of strategies appearing on the "long list" could or should be removed from the evaluation. There were two main reasons why this was so, resulting in two outcomes:

1. They were seen as a supporting practice which could be applied with most, if not all, of the other strategies and, subject to reasonable cost, could readily be put into action. As a result they are included as "supporting practices".
2. The strategy was dropped because it was clearly cost-prohibitive, not appropriate for pilot scale or for single buildings, not well defined, already being done, or would be difficult to implement.

In either case, the strategy did not receive further consideration and was removed from evaluation. This reduced the original "long list" of 32 items to 25 items.

6.1.2.1 Supporting Practices

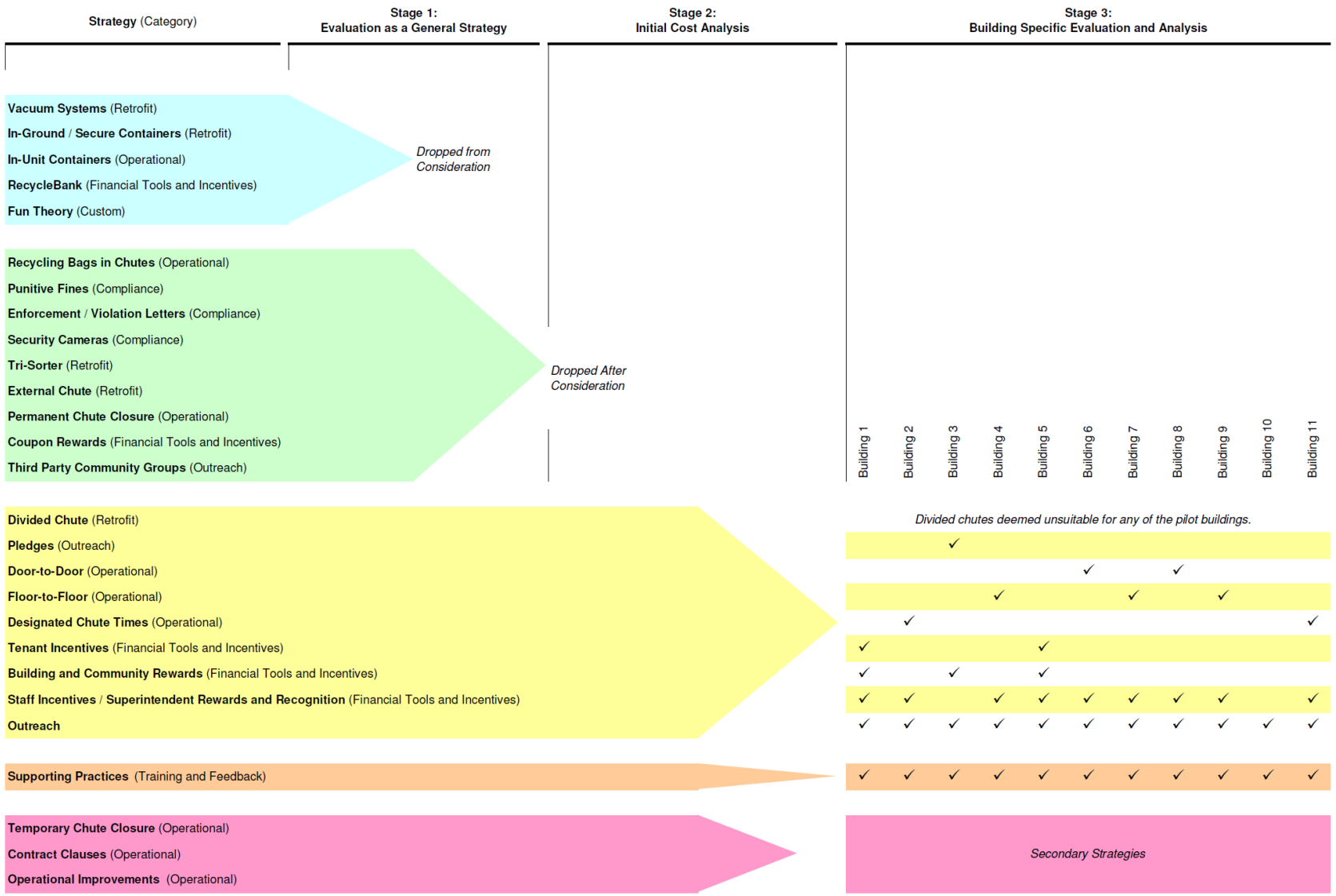
Some options were identified as needing to be addressed as a universal strategy, requiring macro level development and implementation, or for future consideration because the system, while having merit, was not technically available yet in a high rise setting. Items falling into the first category, the supporting practices category, include:

Cart tipper: This strategy represents a number of potential approaches that would make the work of building staff less demanding. It was observed that in cases where the building was required to use 3 yd^3 bins, building staff were manually tipping – that is lifting the cart up to the top of the bin – and dumping recyclables into the bin. This is a physically demanding and somewhat dangerous practice, and with a waste levy in place it was felt that any number of approaches might be cost justified to make the process a bit easier. One such approach would be to install a cart tipper (about $12,000 after installation and training) and another would be to line carts with large plastic bags. Such strategies could be considered to ease the impact and physical strain placed on building staff who find themselves in this position. Cart tippers and related approaches were seen as building management supporting practices that complement or facilitate the waste diversion strategy employed.

Direct accountability: This concept applies to two levels of operations in the multi-residential building: accountability by building managers and accountability by building tenants. With respect to building managers, the project team observed a number of instances where the building's waste generation cost was not properly reported to the property management and/or was not well understood by the building manager. As a result, even in cases where the building received large waste collection bills, there appeared a lack of appreciation between improving the recycling program and reducing the garbage bills. Therefore, an important part of the strategy involves ensuring that property management understand accurately what the waste collection costs are for the building.

For tenants, establishing direct accountability for garbage generation habits is an on-going challenge and one of the key reasons why recycling programs suffer from lack of participation. At a minimum a critical step is to help tenants understand the financial implications of the levy and to become more accountable for the cost. Communities in Europe have started requiring that tenants pay for the amount of garbage they dispose into garbage bins. This pay-as-you-throw system is referred to as the chamber system and requires tenants use swipe cards and pay each time they dispose of their garbage in a garbage bin.

Figure 6-1 Process Schematic for Evaluation of Solutions



Appendix D provides further discussion of the chamber system. Unfortunately, the chamber system has not been adapted to a North American setting involving a chute system.

Management training/workshops: The research and consultation process demonstrated that, with two notable exceptions, building managers were not fully appreciating that strategies exist to mitigate the impact of the levy and, further, that other jurisdictions such as New York City (workshops and ongoing training) and Chicago (waste diversion tool kit) target property managers and superintendents as the players critical to making a difference when it comes to waste diversion. As a result the delivery of a pilot training program for building managers and superintendents is an "umbrella" recommendation to the project, one that might be used to support the specific recommendations of this report while being piloted for further development across the City of Toronto.

6.1.2.2 Dropped from Consideration

Several ideas that were included in the initial "long list" were deemed, for reasons cited earlier, not suitable for consideration. These include:

Vacuum systems: Most notably, these systems are very expensive and generally installed within the context of large complexes. They are inappropriate at a pilot scale and it may be technically impossible to retrofit the technology to an existing building. In addition, the conversion of the standard chute system to a vacuum system offers little more in the way of waste diversion benefit than might otherwise be achieved for far less. All mechanical or technological "retrofit" options studied by the project team included an outreach and training component to optimize the use of the system, meaning that technology alone is not the determining factor for success. The outreach and training that accompany the approach, technological or otherwise, are equally if not more critical to its success.

In-ground and/or specialized outdoor collection containers: While specialised containers might have a place, in the Toronto context where waste collection and recycling is provided by the City or its contractor, it would be impractical to recommend collection containers that require the use of specialized collection vehicles or that can not be universally implemented. In-ground or "deep" containers, for instance, may have public space applications but for many multi-residential buildings in Toronto there is little or no ground which to install. The need to use specialized vehicles which may add cost to the collection system as well as limit collection options when breakdowns occur was also considered.

In-unit containers: These appear on the "long list" but were dropped for a very simple reason: Toronto is already providing, for free, two types of in-unit containers, either in the form of bags or as "mini" blue boxes. As a result it was not necessary to take the evaluation further. It was suggested to the project team, in deliberation with stakeholders during the study, that the rigid policy of offering "either/or" to building operators, as opposed to both options, be relaxed in favour of giving individual tenants a choice of blue box or blue bag to suit their particular needs. It was learned, in fact, that the City does not have a "rigid" policy and that building managers can order a mix if they wish to.

RecycleBank: Because RecycleBank is a corporate entity, the general concepts behind incentives were evaluated instead of the company or its service. In order to consider working with RecycleBank directly, City staff or building managers might want to seek proposals that specify all cost inputs and financial relationships. While, in concept, the RecycleBank approach is consistent with the earlier discussion around direct accountability and incentives, there is a cost associated with the management and measurement of a reward program, as well as issues regarding material ownership, all of which is predicated on whether the building manager wishes to account for waste on the building level or at the tenant level.

Fun Theory: The nature of a "Fun Theory" solution makes it impossible to evaluate since there are as many custom-made possibilities as there is imagination. The concept suggests, however, that building managers with some ingenuity and a bit of drive might be encouraged to fashion their own, interesting and fun-to-use approaches to the problem. Fun Theory is a category of strategies with a common theme: behaviours can be successfully changed by making the desired activity fun to do, and while the concept goes far beyond recycling and waste diversion, it appears that getting people to recycle or properly manage waste is top of mind for several of the entries. The Fun Theory website touches on public space

recycling and litter and for forward thinking recyclers might provide some inspiration. The Fun Theory award program offers up to € 25,000 for the best judged entry and is supported by Volkswagen.

Even though the concept can not be evaluated, the broader concept of Fun Theory is related to the "where there's a will, there's a way" attitude. Understanding how to influence personal and community behaviour may be the key to tackling the frustrating "diminishing return" of waste diversion as the first and most obvious portions of the waste stream are successfully diverted. Beyond a certain point the return on effort can be incremental and the need for innovation and diligence increases.

One example, for which the City of Toronto has been a strong advocate, is the community gardens concept. Community gardens continue to spring up in "nooks and crannies" of green space throughout the City. The benefits derived from community gardens go well beyond the key purpose as a place to grow food and encourage healthier diets. In fact, community gardens provide a meeting place for people to interact and share ideas and stories, a source of green space and beauty and a sense of community and identify.

Toronto Community Housing recognizes that community gardens "help people feel part of a community…because they encourage people to work together, to cooperate and to get to know their neighbours".[8] As part of its Green Works program, Toronto Community Housing has established over 100 community gardens at TCHC buildings.

To ensure the greatest success of a community garden project, TCHC is working with a community food network organization to develop the Toronto Community Food Animators Program, which works with TCHC tenant groups involved in community gardens, kitchens and markets to provide advice and organizing support and initiate training to community food project coordinators. In addition, TCHC has developed a Community Gardening manual which explains the benefits of community gardens and how to plan and develop a community garden within Toronto Community Housing.

When related to the waste diversion goals, the generation of compost from residential organics may contribute to the garden. It should be noted, however, that communication and training on the composting process and how it will be incorporated into the activity must be clear and comprehensive in order to make sure that people know how to participate. Management of compost for gardening purposes requires time and effort. With the right commitment by building managers, such strategies can be considered and weighed against the obvious community and environmental benefits.

6.1.3 The Short List

The short list was reduced to 23 options. See Table 6-1 below. The exercise of determining the short list resulted in some interesting observations:

- Toronto's waste levy has had a positive impact by making most approaches economically feasible, subject to the user's acceptable payback for time, effort and money invested in the approach. In a non-levy jurisdiction the elimination of more costly approaches would be automatic but in Toronto, the levy has made almost all options financially viable.
- There are no "magic" solutions to the challenge of improving waste diversion rates in multi-residential buildings. In all the research, literature and interviews it became very apparent that no single solution stood out above all others. The key to success in many instances was the level of commitment, support and conviction with which a given solution was implemented. This changed the focus of the exercise by putting less emphasis on the actual approach and more emphasis on potential supporting activities needed to promote waste diversion.
- Among the Tower Renewal pilot buildings, the two buildings that had successfully and significantly lowered their disposal costs did so without assuming any major capital or operating costs.

[8] Community Gardening Manual. 2007. Toronto Community Housing Corporation

Following the consensus process, nine options in addition to the support strategies remained for cost analysis and building specific evaluation.

Table 6-1 The "Short List" of Potential Approaches

Retrofit Solutions	1	Tri-Sorter
	2	External Chute
	3	Divided Chute
Communication	7	Simplified Messaging
	8	Barometers
	9	Comparative Recycling Performance
Operational Adjustments	10	Contract Clauses
	11	Temporary Chute Closure
	12	Permanent Chute Closure
	13	Door-To-Door
	14	Floor-To-Floor
	15	Designated Chute Times
	16	Recycling Bags In Chutes
Financial Tools And Incentives	18	Tenant Incentives (Prizes, Draws)
	21	Building and Community Rewards
	23	Staff Incentives / Superintendent Rewards and Recognition
Compliance Approaches	24	Punitive Fines
	25	Enforcement / Violation Letters
	26	Security Cameras
Outreach	27	Third Party Community Groups
	28	The Ambassador Program
	29	Events
	30	Pledges

6.2 Stage 2 – Initial Cost Analysis

The second stage of the evaluation applied the list of options against a simple cost scoring approach: high, medium or low.

During Stage 1 of the evaluation process, most options with significant capital costs were eliminated for reasons other than cost. For the remaining options, it became apparent that those options requiring capital equipment investments were considered no more advantageous in terms of promoting waste diversion, than simpler and more direct operational approaches. The common factor for all strategies, regardless of cost, was that they required training, outreach and communication support to be effective. Discussions with providers of capital equipment tended to support this observation – in most instances, their equipment costs usually included an outreach and training component.

None of the strategies remaining after the Stage 1 evaluation were eliminated at Stage 2. As a result the options that were considered against each building or sets of buildings were usually operational in nature and universally required support in the form of outreach, communication and training.

6.3 Stage 3 – Building Specific Evaluation and Analysis

Characteristics associated with each building – physical, operational, structural, demographic – have been documented as part of this study. These characteristics were evaluated against the preferred solutions to arrive at building-specific solutions which were then coupled to establish a set of best scenarios for implementation on a pilot scale. A scenario was established for each of the pilot buildings.

At this stage the team decided to revisit a number of buildings, based on the available drawings, to investigate further the potential for the divided chute option. This strategy was not dropped after initial consideration because in an appropriate building it has the potential to equalize the convenience of recycling versus disposal at the chute at a reasonable cost considering potential levy savings.

All of the buildings in this study were constructed with a single garbage chute. Opportunities for implementing recycling chutes within the existing chute envelope were investigated at a number of the pilot buildings: information was gathered from available drawings, site visits were conducted and discussions held with building staff. The investigation revealed that none of the pilot buildings would accommodate the straight forward installation of a recycling chute.

It is possible that there are buildings within the City of Toronto that could accommodate a recycling chute, which requires open vertical space accessible from every floor, and exiting into an appropriate space such as the existing compactor room. In some buildings the rectangular chute cavity, inside which the circular chute is installed, is large enough to accommodate two individual chutes. Sufficiently large chute cavities were identified at Buildings 1, 6 and 7. In these cases the presence of pipes in the cavity, or the size and layout of the compactor room made a recycling chute unfeasible.

In other buildings, there may be an unused or abandoned vertical space that could be converted to a recycling chute. Buildings 3, 4 and 5 all formerly housed incinerators in their sub-basements, and the abandoned incinerator exhaust stacks run through a space adjacent to the chute room on each floor. However, the stack is only accessible from the sub-basement which has no elevator or outdoor access. At Building 6, there is an abandoned garbage chute running adjacent to each chute room and exiting into the compactor room. However, the layout of the compactor room would make collection of recycling from this chute highly impractical.

7. Selected Strategies and Pilot Candidates

The evaluation process yielded eight potential strategies for pilot implementation, which were matched to specific buildings. A number of considerations went into the selection of proposed buildings, but with relatively few buildings to choose from, some assignments were made on the basis of contrast between pilot sites, or the available candidates after other matches had been made. In at least one case a single strategy was recommended for the purpose of isolating its effectiveness and for the two well performing buildings the potential to measure additional waste diversion may be limited. More specifically, in a volume based collection system incremental improvements are difficult to detect since volume collection rates may not change until the next full volume increment is reached. (Reducing waste by half of a collection bin will register only if that ½ bin reduction results in one less bin being collected on garbage day. The building is charged for a full bin even if the bin is only partially full)

7.1 Supporting Activities and Strategies

It is felt that two foundational activities are required to support the implementation of the remaining building specific strategies. These activities target the principal agents in the exercise, the property managers and superintendents. The main thrust is to provide the rationale and the know-how required to make changes in their buildings. In both cases the objective of piloting these activities would be to both refine and roll out these activities for the benefit of all stakeholders on an ongoing basis.

7.1.1 Training Workshops for all Building Managers and Superintendents

Results from both the research and consultation process showed that property managers and superintendents are the key players to making a difference when it comes to waste diversion. In order to educate building managers and their staff about the benefits of recycling and waste diversion, and about how they can implement programs in their buildings, the development and delivery of a training session is recommended. The cost for such an activity assumes that two people per pilot building would attend the session, for a total of 22, and that two people deliver the training at a venue provided by the City. To further entice participation transportation and parking could be covered and a continental breakfast, coffee breaks and sandwich lunch provided.

The development of the presentation and discussion may likely borrow from existing materials, but the suggested format is based on adult education programs that rely on teaching strategies beyond a simple lecture style. It is felt that facilitation of discussion groups and possibly a number of basic exercises will help to get the point across. In general the amount of time required to assemble and organize a session of this type (where most if not all information is at hand) is five or six days.

Based on the assumptions above, development costs for a training day by an outside consultant will range from $5,000 to $7,200 depending on the readiness of inputs and involvement by City staff. Delivery costs range from $2,000 to $3,500 depending on whether or not an outside trainer is used for the day and whether or not some expenses are recovered.

The City of Toronto is the recommended host for this activity, possibly in partnership with the Toronto Community Housing Corporation[9]. The former has ambitious waste diversion targets while the latter stands to save a considerable amount of money through successful waste diversion.

7.1.2 Feedback

Feedback will provide property managers with a sense that more needs to be done and is achievable, and the preferred place to do this is on the waste bills, similar to other agencies seeking to promote

[9] In 2007 the Toronto Community Housing Corporation developed and delivered a waste diversion training course. These materials have been reviewed and could serve as a potential model for future training. As they pre-date the waste levy and some of the findings of this report, they would be subject to review and revision.

conservation behaviour. Invoices, whether on paper or on-line, might contain historical and relative performance information. The information can also be made available through a designated website and/or through inserts provided in the monthly garbage bills. Benchmark figures or ranges might be included to indicate what the performance expectations are. For instance, the property manager might be informed:

- that high-performance extra-large waste diversion buildings typically pay the minimum of $6.50 per unit per month for waste disposal
- about per unit disposal cost averages and, more to the point, what annualized savings are available to them based on their current billing
- the reduction in garbage fees and the financial savings to the building over time
- about the building's performance to other similar buildings

This is an approach being employed by Toronto Hydro to educate customers about their electricity use over time and is available online at – www.torontohydro.com/tou.

A "barometer approach" can be used to provide similar information to tenants about the building's recycling performance.

The City of Toronto, as the billing authority, would be responsible for this strategy. No cost has been assigned. If most of the information is already available this activity may be accomplished through fairly simple spreadsheet or billing software manipulations. Further, the City's development of a monitoring and tracking system for the Multi-Unit Residential Volume Based Solid Waste Management Fee program, featuring a passive data transfer system using Radio Frequency Identification ("RFID") technology, has the potential to meet the monitoring and feedback needs of system users.

The metering system uses ultra high frequency (UHF) RFID and a passive data transfer system. UHF RFID tags have been installed on front end garbage bins, front end recycling bins and front end source separated organics bins. When the tags are installed the following information is programmed and linked to the RFID tag: the address; whether the bin is for garbage, recycling, or for organics; the measurements of width, depth and height of the bin; the bin ID number; the Geo ID number; the latitude and longitude, and; and when the data was uploaded or updated. When the bins are picked up the following information will be collected: The RFID number of the bin, the truck ID number, the longitude and latitude, the time and date the bin is collected and the time and date the data is exported to the City's computer system. Each front end loader collection vehicles has been equipped with reader equipment to collect the RFID information during collection and a computer to record and store the information. Reader equipment and computers have also been installed in each of the City's seven transfer stations.

The metering system relies on transfer of information at the point of collection (RFID information transferred to the collection vehicles), at the transfer station (information transferred from the collection vehicle to a computer in the transfer station) and then to a centralized computer system within the City. This is referred to as a passive data transfer system because it does not rely on transfer of information using cellular wireless technology (referred to as a live data transfer system). This approach will not only save the city money (no wireless cellular bills) but ensures greater data transfer security. Furthermore, the software used to convert the RFID data to useful information for billing purposes has been developed specifically for the city and is owned by the City, and not the vendor, which ensures additional cost savings over time and information security.

The City anticipates that testing of the system will the spring of 2010 with the launch of the RFID tracking and monitoring system beginning by January 2011 and the incorporation of the information into the billing system shortly thereafter.

In the interim, the City of Toronto's waste collection contractor for multi-unit dwellings, Miller Waste, is using their run sheets to manually track the number and size of garbage bins set out per location. Miller Waste staff then enters this data into a database and sends the information to Toronto for further

processing and billing by the City's Revenue Services Division. For the near future, customer bills will continue to be based on the manually collected data until the RFID system is fully functional. In the meantime the City has the opportunity to work with progressive building operators to make sure the system meets real-time and billing feedback functions that will help them maximize waste diversion performance.

In general it would benefit both the City and property owners to maintain a dialogue and monitor program progress. Success in recycling and waste diversion may (in some cases already is) necessitate operational adjustments, such as reversing the collection frequency to favour recycling since non-compacted recycling bins take up a large amount of space. Such a reversal would result in more frequent collections of garbage and less frequent collection of garbage. Even simple things, such as consistency of billing periods and simplified messaging and billing approaches are considered helpful to building operators who juggle numerous responsibilities.

7.2 Building Pilots

Eight building-specific strategies are outlined in the following sections.

Labour costs for each strategy have been included at $18 per hour. Actual hourly costs may differ, however, given the opportunity to save waste disposal costs some building operators may consider these hours to be minimal. In effect, the cost avoidance opportunity may result in the assignment of some of the related tasks as priority duties performed, in part or in full, in place of other activities. This may mean that some or all of the hours noted below are not "in addition to" existing operating labour, but in order to present each strategy fairly they are calculated in full and represent a conservative estimate.

Some buildings may have tenant groups that will participate in exchange for support at a rate lower than the labour cost.

Several of the strategies are support programs that are intended to boost participation in the existing recycling and waste diversion program. It is assumed that the building program is in place and that adequate recycling bins are available to users.

7.2.1 Strategy 1: Floor-to-Floor Recycling Collection

Recommended Buildings: Buildings 4, 7 and 9
Summary: This approach makes recycling available in chute rooms on every floor, matching waste disposal for user convenience since the destination for both activities becomes the chute room. One pilot building has successfully implemented floor-to-floor strategy, which over an 18 month period reduced the garbage costs per unit from $24.59 to $6.50 per unit. This equates to an annual savings of over $40,000. Refer to the case study in Section 4.1.1.
Equipment: Large-size clear or transparent plastic bags, hangers or hooks for bags mounted in chute rooms, cart or dolly to collect bags and deliver to recycling bin (most building visited as part of the site visit program were observed to have rolling carts that could be used for this purpose).
Operations: Bags will be hung on a wall adjacent to the chute opening. Building staff remove and replace full recycling bags daily, using a rolling cart to transport them to the central recycling bins and pouring the contents, which must not be bagged, into the bin. **Implementation Steps:** **Step 1:** Purchase the equipment so that the hardware is available and an adequate amount has

been purchased to install in each chute room. Either reusable canvas bags or clear plastic bags are suitable to collect the recyclables. It is always a good rule of thumb to purchase more than you think is necessary. Hardware and bags are readily available and can be purchased at numerous retail outlets

Step 2: Install hooks or hangers for bags in each chute room and explain to superintendents how to operate the program. A collection schedule will be required with some consideration given to weekend collections. Cost figures below assume collection five days per week for labour. An incentive or reward strategy associated with the extra time may help with buy-in by superintendents who will operate and maintain the program. Initiate outreach activities described in detail in Section 7.2.8.

Step 3: Hang bags in chute rooms and install signage. Ensure that adequate signs and posters are hung above the bags and throughout the building.

Step 4: Initiate the outreach and announce the program.

Step 5: Collect full bags and transport daily to recycling bins, and pour contents into the bin. The frequency of collection will depend on participation and the number of units on the floor, and may be adjusted over time.

Step 6: Monitor the program and provide feedback to the tenants (see Section 7.2.8 for follow up activities, if required). Establish a feedback mechanism to enable the tenants to provide constructive criticism and comment about the program. Adjust the program accordingly.

Staff and Tenant Involvement: Staff involvement is required: consider supporting with staff incentives and rewards. Assuming daily collection, there would be an estimated five minutes per floor added to the daily routine and an additional half an hour to transfer the recyclables into the outdoor recycling bin. For the largest of the selected buildings (23 chute rooms) this activity is expected to take about 2.5 hours per day.

Tenant convenience is raised as the floor-to-floor system reduces tenant travel to recycle.

Barriers:

a) Success relies heavily on the involvement of the superintendent to collect the recyclables on every floor in a timely manner. Without their cooperation, the program will result in a messy chute room and disgruntled tenants. Initial reactions by building staff to door-to-door and floor-to-floor approaches tend to be negative and seen as "extra work", but as long as a reliable system is put in place these approaches can also be executed by volunteers (see Section 4.1.6).

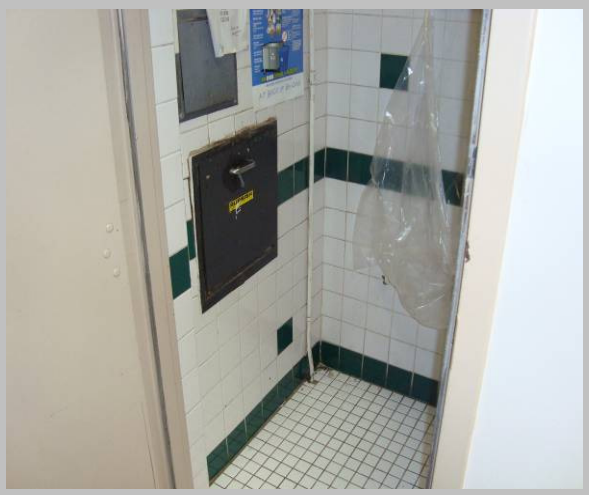
b) Labour cost is a factor as time is required.

Please see section 7.3 re fire safety

Benefits:

a) The building and tenants will benefit by having a convenient recycling program.

b) Cost savings can be shared with



Floor-to-Floor Collection at Building 10

individuals or through building improvements of communal benefit to create incentives for either the building superintendents or community volunteers.	
Outreach Support: This strategy should be supported by an effective outreach program described in Section 7.2.8.	**Source: Waste Reduction Overview, PPT by Doug King, Metro Group – 12, November, 2009**
Estimated Costs: **Hardware:** Bag hanger or hooks, $100 including set up; bags $200 annually (should be reused). **Labour:** $8,560 (Building 4), $5,160 (Building 7) and $11,300 (Building 9).	

7.2.2 Strategy 2: Door-to-Door Recycling Collection

Recommended Buildings: Buildings 6 and 8
Summary: This strategy provides the most convenient recycling service to tenants by collecting recyclables at the tenant's door. It has been attempted in limited settings because it tends to be very time consuming and expensive and, in the past, could not be justified through savings in waste management fees. With Toronto's levy program, the cost to have the superintendent perform the door-to-door collection service may be justified through the reduction in garbage fees.
Equipment: Cart or dolly to collect recyclables from each tenant's door and deliver to recycling bin.
Operations: The approach can vary depending on the fire codes of the municipality. In the case of the City of Toronto, the fire codes prevent containers that could block someone's escape during a fire from being placed in a hallway. With this in mind, the door-to-door service could possibly involve: Notifying tenants of a designated pick up time and asking them to place their bag of recyclables on the door handle of the apartment door or on a hook on the side wall. The superintendent would collect at

each door during the designated recycling time.

Notifying tenants of a designated pick up time and having the superintendent knock on each door during this time to retrieve the tenant's recyclables.

Most buildings already have rolling bins that could be used to collect and transport the bags. The recyclables would be transported to the central recycling bins and the contents transferred into the bin (must not be bagged).

Implementation Steps:

Step 1: **Decide which approach** to employ. Survey tenants and superintendents to determine preferred collection times. Identify who is to collect the recyclables, the superintendent, volunteers or paid tenants. If volunteers, confirm that they are reliable. If it appears that it will take several weeks or months to develop the system in consultation with tenants, consider moving forward with superintendents. Consult with the superintendents to decide whether to use reusable canvas bags or plastic bags inside the collection carts to facilitate easy transfer of the recyclables to the recycling bin.

Step 2: **Purchase equipment** necessary to operate the program. This may include additional totes or bins for the tenants. Ensure that an adequate amount of totes/bins and bags have been purchased. It is always a good rule of thumb to purchase more than you think is necessary.

Step 3: **Train** the superintendents or volunteers how to operate the program. Consider an incentive or reward strategy associated with the time required by the superintendents to properly operate and maintain the program. Initiate outreach activities described in detail in 7.2.8.

Step 4: **Post** the collection schedule a couple of weeks a head of the launch of the program.

Step 5: **Launch** the program and maintain the outreach during and after the program is launched.

Step 6: **Keep to the schedule** The frequency of collection will depend on participation and the number of units on the floor, and may be adjusted over time.

Step 7: **Monitor the program** and provide feedback to the tenants (see Section 7.8 for follow up activities, if required). Establish a feedback mechanism to enable the tenants to provide constructive criticism and comment about the program. Adjust the program accordingly.

Staff and Tenant Involvement: Staff involvement is considered very high and, depending on the building, may need to be supported with staff incentives and rewards. Assuming that staff pick up the recyclables once a week, there would be an additional 30 minutes per floor added to their daily routine and an additional hour to transfer the recyclables into the outdoor recycling bin. For the largest of the selected buildings (23 floors) this activity is expected to take about 13 hours per week.

Tenant involvement, on the other hand, is low as the door to door system is more convenient to use and should reduce tenant recycling time investment.

Barriers:

a) This is one of the more costly strategies.
b) Success relies heavily on the involvement of the superintendent to collect the recyclables at each tenant's apartment in a timely manner. Without their cooperation, the program will result in potentially messy in the halls and disgruntled tenants.

Please see Section 7.3 re fire safety

Benefits:

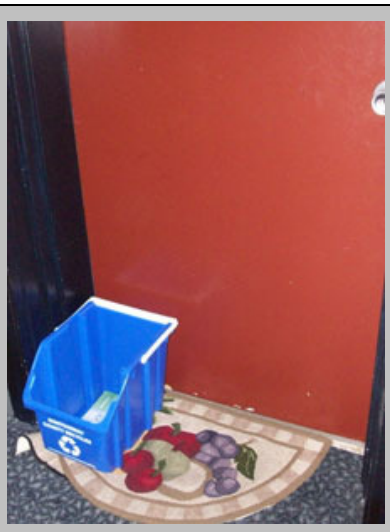
a) Convenience.

b) The opportunity for the superintendent and/or tenant representative or ambassador to use the contact with tenants to fine tune the operations of the recycling program.

Outreach Support: This strategy should be supported by an effective outreach program described in Section 7.2.8. Additional outreach and education programs should not be required.

Estimated Costs:

Labour: $6,600 (Building 6) and $11,700 (Building 8).



Door-to-door collection in Montgomery County

7.2.3 Strategy 3: Designated Chute Times

Recommended Buildings: Buildings 2 and 11

Summary: A regularly assigned time or times during the week would be assigned when tenants could use the chutes for recycling. The principle is similar to the weekly recycling day assigned for single family households. Over time tenants will get in the habit of knowing that certain hours of specified day(s) are for recycling and will use the chutes accordingly.

Equipment: A recycling bin would be attached to the compactor during the designated recycling times and removed once the recycling schedule is over. Signage will be needed for each chute room.

Operations: A time or times dedicated to recycling should accommodate tenant daily routines and it may be preferable to have one short period of time (two hours) dedicated to recycling once or twice a week. Notices for distribution to each tenant, and for posting on the doors and inside each chute room, can then be issued. During the initial start up it will help to put signs on the chute doors during the designated recycling period, informing tenants that the chute is dedicated to recycling for the following hours. At the bottom of the chute, a recycling bin will need to be attached to the compactor to receive the recyclables. Tenants will be told to put the loose recyclables down the chute, with the possible exception of glass. Inclusion of glass in with the recyclables placed down the chute will need to be tested for noise and breakage. At the end of the recycling time, the recycling bin will be removed from

the compactor and replaced with a garbage bin.

Implementation Steps:

Step 1: **Establish the timing** and procedures by working closely with tenants and superintendents to determine:

- Which days and hours to dedicate the chute to recycling;
- How the times correspond with the superintendent's schedule and the bin changing requirements;
- Decide whether to allow glass bottles to go down the chutes with the other loose recyclable items, be prepared to test different options;
- Ensure that the compactor can accommodate the loose recyclables and doesn't interfere with its operation;
- Ensure that the recycling bin can be attached to the compactor and remains closed during compaction;
- Determine that the level of compaction does not affect the City's ability to collect and process the recyclable materials.
- It may take several weeks or months to develop the system in consultation with tenants and superintendents. The City may need to be consulted as well.

Step 2: **Acquire the proper equipment and train superintendents** on how to operate the program. An incentive or reward strategy associated with the extra time required by the superintendents to properly operate and maintain the program may help. Initiate outreach activities described in detail in Section 7.2.8.

Step 3: **Promote the program.** Work with tenant representatives or ambassadors to go door-to-door and/or host meetings to explain the program to tenants. Promote the benefits of the program. Post the schedule a couple of weeks a head of the launch of the program.

Step 4: **Launch the program** and maintain the outreach during and after the program is launched. For the initial start up period, post special signs on the chute doors during the recycling times reminding people that only recyclables can go down the chute and the hours. Make the signs colourful and easy to read. Consider having a tenant from each floor monitor the chute rooms for the first couple of times to educate and remind tenants of the program. Continue with the practice for as long as required until the habit has been entrenched in the tenants.

Step 6: **Maintain the schedule** of switching over the recycling bins and garbage bins from the compactor. Periodic inspection of the recycling bin will determine levels of garbage contamination, which will be in garbage bags and can be pulled out using a hooked device. Record the amount of contamination and provide follow-up if necessary.

Step 7: **Monitor the program and provide feedback** to the tenants. Establish a feedback mechanism to enable the tenants to provide constructive criticism and comment about the program. Adjust the program accordingly.

Staff and Tenant Involvement: The staff involvement required for this strategy is considered relatively high and, depending on the building, may need to be supported with staff incentives and rewards. During the start up of the program, superintendents or tenant representatives or ambassadors will need to post signs on each of the chutes to remind tenants that the chute is receiving recyclables only for the designated time period. Staff will need to monitor the recycling bin regularly to detect and remove unwanted garbage. The time required during the program start up involves 3 minutes per floor

to place notices on each chute and chute door and 30 minutes to switch and monitor the recycling bin. For the largest of the selected buildings (23 chute rooms) this activity is expected to take about 1.5 hours.

Tenant involvement, on the other hand, is low as the system is more convenient to use and should reduce tenant recycling time investment. The system, however, requires tenants to commit to the system and participate at the appropriate times.

Barriers:

a) pilot buildings may need to nurture a sense of commitment from tenants who currently do not appear to support recycling.

b) the success of this system depends on the support of the building management and, in particular, the superintendent(s) who must monitor the recycling bin and switch the recycling bins and garbage bins at the beginning and end of the designated recycling chute times. Without everyone's cooperation, the program could result in a messy chute room and disgruntled tenants.

Benefits:

a) Convenience of on-floor recycling

b) reasonable cost versus some of the other strategies

Outreach Support: This strategy should be supported by an effective outreach program described in Section 7.2.8. Additional outreach and education programs will be required during the program initiation period.

Estimated Costs:

Capital: Magnetized signs for Chutes @ $10.00 ea = $210 for Building 2 and $180 for Building 11

Labour: $2,800 for Building 2, $2,600 for Building 11

A chute times schedule posted over the chute door

7.2.4 Strategy 4: Tenant Incentives

Recommended Buildings: Buildings 1 and 5

Summary: Incentives encourage participation by providing rewards to the tenants. The type of reward offered depends on the characteristics of the building (family, adult or senior building).

Equipment: Equipment is minimal requiring mainly cards and stamps and coupons or prize.

Operations: Tenants will be offered rewards for participating in the building's recycling program. Suggested reward programs include:

- Providing coupons to a local coffee shop, grocery store or other activity for a specified number of totes of recyclables delivered to the property management;
- Providing a "smart card" for the laundry services in the building for a specified number of totes of recyclables delivered to the property management;
- Conducting draws for prizes based on cards that have been stamped for specified number of totes of recyclables delivered to property management (see Section 4.1.1 for a description of Building 10's reward program).

Implementation Steps:

Step 1: **Decide which rewards** will be employed. The type of reward system employed will depend on the characteristics of the building. Talk to tenants and superintendents. Considerations should include:

- Whether the building is a family, adult or senior building;
- Who to target in the building;
- What rewards would be valued;
- Whether to give regular but smaller rewards or larger, less frequent rewards;
- Whether to have a draw with only one winner or distribute the rewards to everyone;
- What budget is available for the rewards.

Step 2: **Establish how activities will be recorded.** Buy the equipment for recording and monitoring the reward program. Purchase the rewards in advance of the program launch. Make sure that there is enough of everything.

Step 3: **Initiate outreach** activities described in detail in Section 7.2.8.

Step 4: **Implement the program** and maintain the education and outreach during and after the program is launched.

Step 6: **Monitor the program** and provide feedback to the tenants (see Section 7.2.8 for follow up activities, if required). Establish a feedback mechanism to enable the tenants to provide constructive criticism and comment about the program. Adjust the program accordingly.

Staff and Tenant Involvement: Staff involvement in this strategy is considered relatively low. The building manager will need to participate in handing out information about the program and managing its operations, which could result in an additional hour or two of work per week.

Tenant involvement, on the other hand, could be much higher depending on the extent to which they wish to participate in the reward program.

Barriers:

a) The degree of participation by the tenants depends on the desirability of the coupon or prize.

b) Some people may not respond to incentives.

c) Follow through is required to ensure that the tenants continue to support the recycling program.

Benefits: Easy to budget and control cost, fun to do.

Outreach Support: This strategy should be supported by an effective outreach program described in Section 7.2.8. Additional outreach and education programs should not be required.

Expected Costs:

Capital: Printed cards/recycling passports: $50 to $100 annually.

Labour: Within existing contingent.

Incentive: Can vary, suggested start is 10% of savings ($3900 for Building 1 and $1,200 for Building 5).

The Official Recycling Passport used at Building 10

7.2.5 Strategy 5: Staff Incentives/Superintendent Rewards and Recognition

Recommended Buildings: all except Buildings 3 and 10 (already in place)

Summary: This recognizes the contribution of superintendents in operating the building's recycling program by providing rewards that are directly linked to the performance of the recycling program and reduced garbage costs. The type of recognition/reward system employed depends on the building management and the responsiveness of the superintendents.

Equipment: Equipment is minimal.

Operations: Superintendents will be offered rewards which are linked to the success of the recycling program. Some examples of recognition programs include:

- Providing gift cards for dinners and/or entertainment;
- Providing group luncheons every six months;
- Offering bonuses on paycheques.

Implementation Steps:

Step 1: **Pick an effective reward system** by discussing with staff (i.e. superintendents). The type of reward system employed will need to balance desires with costs. Considerations should include:

- What rewards would be valued most by the staff(s);

- Who should receive the rewards;
- Whether the rewards need to be shared among staff and how;
- How the rewards are to be administered;
- Whether to give regular but smaller rewards or larger, less frequent rewards;
- Whether to have a draw with only one winner or distribute the rewards to everyone;
- What budget is available for the rewards.

Step 2: **Set the reward level** based on improvements (reductions) in waste disposal costs. Ensure that the staff are aware of the reward/recognition program and understand how it operates and their roles and responsibilities.

Step 3: **Implement the program** and maintain the education of the staff.

Step 4: **Monitor the program** and provide feedback to the staff. Establish a feedback mechanism to enable the staff to provide constructive criticism and comment about the program. Adjust the program accordingly.

Staff and Tenant Involvement: Superintendents should receive training to help them properly educate tenants about the recycling program and increase participation rates. This strategy can be coupled with other strategies requiring higher involvement by superintendents, such as the door-to-door and floor-to-floor collection strategies. The building manager will need to participate by monitoring the program and developing a recognition program in consultation with the superintendent(s).

Tenants are not directly involved in this program, but their support for recycling will determine the extent of the incentive offered to the superintendent.

Barriers:

a) Participation by the superintendents depends on the desirability of reward.

b) Follow through is required to ensure that the superintendents continue to support the recycling program.

Benefits:

a) Easy to budget and control expense.

b) Supports other strategies.

c) Potential to boost morale.

Outreach Support: This strategy should be supported by an effective training program for superintendents such as the one described in Section 7.1.1 – Management Training Workshops. As part of the recognition program, the superintendents will need to champion the recycling program, helping tenants achieve higher

Coffee card used as a reward.

participation and recovery rates.	
Expected Costs: **Incentive:** Can vary, suggested start is 10% of savings.	

7.2.6 Strategy 6: Pledges

Recommended Buildings: Building 3
Summary: One of the key components of social marketing is the use of pledges to engage people in a preferred activity or behaviour and to establish their commitment to the preferred activity or behaviour over a period of time. Pledges work by requiring people to verbally and through written commitment agree to participate in an activity which over time elicits a change in behaviour.
Equipment: Equipment is minimal and may require purchasing of pledge cards, fridge magnets and door stickers.
Operations: A designated outreach person(s) such as a superintendent, tenant representative, ambassador or outside educator receives training to conduct the pledge strategy with tenants. Tenants in each unit in the building are contacted in a face-to-face manner by the outreach person and educated about the building's recycling program, the benefits of recycling and the recycling pledge strategy. It is important to connect with the person(s) in the household responsible for recycling or taking out the garbage. Tenants are asked to pledge to do one to three activities that will improve their recycling behaviour and are required to sign the pledge card. They are provided with a fridge magnet and the signed pledge card and is asked to put them on their fridge as a daily reminder of their commitment. In addition, a sticker is placed on the door for neighbours to see that the tenant supports the building's recycling program. This will act as a visual prompt to others that recycling is important, in a similar way that the blue box acts as a prompt. If the tenant is not home, a note can be left and contact tried at another time. **Implementation Steps:** **Step 1:** Design the pledge program and pledge card. Understand the characteristics of the building, the language needs of the tenants and the best possible pledge activities to achieve success. You may decide to hire an outside community group to develop and implement the pledge program, in which case it is important to work with the organization to ensure that the needs of the tenants are met. Set an implementation schedule. **Step 2:** Print the pledge cards and obtain supporting education and outreach information, including posters, fridge magnets, and door signs/stickers. This may be part of the contract with the hired organization. **Step 3:** Initiate outreach activities described in detail in Section 7.2.8. People involved in delivering

the pledge program should be adequately trained in outreach and effective communication. The most prominent languages spoken in the building should also be spoken by the outreach team.

Step 4: Start Knocking! Go door-to-door. Use the face-to-face interaction to educate tenants about the benefits of recycling and how to recycle. Have information available in a variety of languages that can be given to the tenant. Get agreement to place the pledge card on the refrigerator to act as a reminder to recycle and to place a sticker on the door showing that they believe in recycling and support the program. Maintain the education and outreach during and after the program is launched.

Step 5: Follow up. Work with tenant representatives and/or ambassadors to provide further information and contact with the tenants during and after the pledge program.

Step 6: Monitor the program and provide feedback to the tenants (see Section 7.2.8 for follow up activities, if required). Establish a feedback mechanism to enable the tenants to provide constructive criticism and comment about the program. Adjust the program accordingly.

Staff and Tenant Involvement: The level of involvement by staff depends on the extent to which they become involved in executing the pledge program. At a minimum, property management and superintendent support for the strategy is required.

The time involved by the outreach person(s) is relatively high as they must meet with the tenants in each apartment in the building in order to educate them about the recycling program and obtain the pledge. Each pledge should take about half an hour per unit.

Barriers:

a) Requires trained individuals to execute: To be successful, the strategy must encourage tenants to recycle without making them feel defensive. The degree of participation by the tenants depends on how well the pledge strategy is conducted.

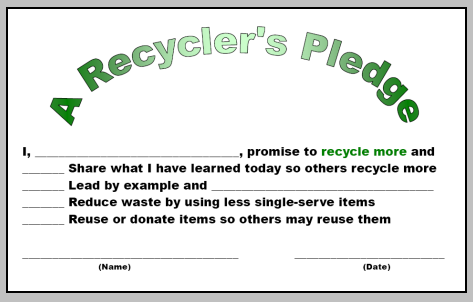
b) The property management and superintendents must support the program by making recycling as convenient as possible and maintaining a clean and safe recycling program.

Benefits:

a) Low cost

b) High engagement of tenants, recycling and waste reduction culture promoted

Outreach Support: This strategy should be supported by an effective outreach program described in Section 7.2.8.



Pledge card used in Waukesha County, Wisconsin to encourage recycling

Expected Costs: **Capital cost:** $300 for fridge magnets and $300 for door stickers, pledge forms photocopied. Labour costs are estimated as part of the outreach program (Section 7.2.8).	

7.2.7 Strategy 7: Community Rewards

Recommended Buildings: Buildings 1, 3 and 5

Summary: The program encourages participation of tenants in the building's recycling program by providing improvements to the building or grounds which is promoted as a community reward *made possible by recycling and waste reduction.* This strategy promotes community pride and cohesion by using savings accrued from reduced garbage levy fees and putting money into community beautification projects.

Equipment: Equipment is minimal.

Operations: Tenants should participate in selecting community beautification projects as a way of achieving further support and buy-in for the recycling program. Community beautification projects may include:

- Construction or renovation of a children's playground;
- Construction or renovation of a youth centre or tenant room or facility;
- Renovation of local parks;
- Development of community gardens;
- Improvement to the appearance of the multi-family building;
- Hosting a summer bbq or event.

Tenants will need to be informed about the community rewards program and the benefit they gain by participating in the recycling program. At the same time, they must receive feedback and be informed about the programs progress. Making the process as transparent as possible is important so that tenants see the positive results of their actions. Posting the monthly results in a common area of the building, using a barometer or performance measurement system, will help to maintain support for the program. Having a tenant representative available to monitor and report on the program's progress is encouraged.

Implementation Steps:

Step 1: **Pick an effective community reward** by consulting with tenants, staff and community groups. The type of reward employed will depend on the characteristics of the building and the neighbourhood. Considerations should include:

- Whether the building is a family, adult or senior building;
- What the needs and priorities are in the community;

- Which need and priority to target for the reward program;
- Identify the community beautification project to reward;
- Establish a method for measuring the success of the program and for determining which proceeds will be set aside for the community beautification project.

Step 2: **Establish recording procedures** and how information about progress will be shared.

Step 3: **Initiate outreach** activities described in detail in Section 7.2.8.

Step 4: **Implement the program** and maintain the education and outreach during and after the program is launched. Refer to Section 7.2.8, for the outreach program implementation.

Step 5: **Monitor the program** and provide feedback to the tenants (see Section 7.2.8 for follow up activities, if required). Establish a feedback mechanism to enable the tenants to provide constructive criticism and comment about the program. Adjust the program accordingly.

Step 6: **Celebrate!** When the goal has been met, establish an event to celebrate the accomplishment and to launch the community beautification project.

Staff and Tenant Involvement: The staff involvement in this strategy is considered relatively low. The building manager will need to participate in handing out information about the program and managing its operations, which could result in an additional hour or two of work per week.

Tenant involvement, on the other hand, could be much higher depending on the extent to which they wish to participate in the reward program.

Barriers: The goal (the community project) must have appeal. The degree of participation by the tenants depends on the desirability of the community reward. It is important that the property management follow through with the rewards to ensure that the tenants continue to support the recycling program.

Benefits: Community Involvement in selecting the project will help to elicit participation and buy-in to the desired waste reduction and recycling behaviours.

Outreach Support: This strategy should be supported by an effective outreach program described in Section 7.2.8.

Expected Costs: Can vary, suggested start is 10% (for larger buildings) to 20% of savings: $3,800 for Building 1, $2,400 each for Buildings 3 and 5).

Potential Building and Community Rewards

7.2.8 Strategy 8: Outreach

Recommended Buildings: All

Summary: The traditional approach to promotion and education relies on dissemination of written information to convey messages to the public and increase awareness for a program or policy. The concern with this traditional approach is that it does not impact behaviour and fails to achieve behaviour modification and attitudinal change. The alternative approach uses an interactive approach to engage and change attitudes and behaviours.

Equipment: Various tools, typically "low tech", are used as part of an outreach program.

Operations: Some of the tools or concepts employed as part of an outreach program (in addition to actions already recommended in this report) could include:

Ambassador Program – a City of Toronto program started in 2009 which relies on building volunteers to act as champions for recycling and work with tenants to encourage further understanding and participation in the building's recycling program. Some cities, such as Seattle, choose to pay a small honorarium in recognition of the ambassador's efforts. Toronto Community Housing has a similar program in place called the Tenant Community Animator.

Barometer – A large barometer is set up in the lobby of the building which shows monthly improvement in recycling rates or reduction in garbage fees. This provides a visual reminder to tenants to participate in the recycling program and shows them the positive impacts of their efforts. The barometer can be tied in with a community reward program. The use of a barometer assumes that feedback from the City (see Section 7.1.2) is timely and up to date.

Simplified messages – Communicating an idea using a simple message that can be easy to remember will help overcome many of the recycling barriers encountered in multi-residential buildings, such as language barriers, transient nature of tenants and poor understanding of the program. Using a simplified message of "Cans, Bottles/Jugs and Paper" reduces the number of items that the tenants must remember and is easy to remember. It is estimated that these three words cover 80% of the recyclable materials that can be placed in the recycling bins. The message can continue to be supported by pictures of the various materials that can be recycled but the message remains clear and simple – "Recycle your cans, bottles/jugs and paper".

Comparative Recycling Performance Feedback – This tool is used to provide information to tenants about the building's recycling performance, such as increases in recycling rates and reduction in garbage fees over time. Letters can be distributed to the tenants and posted in prominent areas of the building.

Events – Events can be held on the property to promote the recycling program – and other waste diversion programs - or to reward the building tenants for their participation. An event enables tenants to see their neighbours also supporting the program and provides an opportunity to disseminate information about the program.

These tools are considered essential to any recycling strategy and should be built into every building's basic recycling routine as an obligatory strategy. For this reason, the outreach strategy is designed to be an integral component of all of the other strategies. The City of Toronto's involvement in development and city-wide implementation of this outreach strategy is essential to its success.

It is felt that the City of Toronto is the stakeholder best suited to take the lead in developing a set of outreach tools which can be used. The City will need to decide whether it provides the tools for free or needs to cover the printing and developmental costs. Once the outreach program and tools are

developed the City will need to notify the building operators, perhaps through the billing process, and encourage their use. The following steps will help multi-residential building management and tenants to implement outreach programs in their buildings to support the launch and encourage ongoing participation in their chosen recycling program.

Implementation Steps:

Step 1: Design an outreach program to meet the needs and characteristics of the tenants. Gather all the supporting materials prior to program launch and install the required components. In particular, where multiple languages are used, material from the City of Toronto may help. Property managers should request the information in as many languages as are spoken in the building in preparation of the program launch. Posters and brochures explaining what is recyclable and custom signs for strategic areas in the building can be prepared in advance, as will be letters introducing the program for distribution to all tenants. A general rule of thumb for promotional material cost is $2 per unit.

Step 2: Prepare for personal contact. Contact with residents is a must, and for maximum effect a door-to-door approach is recommended. Students or seniors living in the building could be hired to conduct the door-to-door outreach in the early evenings and/or weekends. This is also an excellent opportunity to contact and engage community leaders and partners within the building, as they may wish to help. Building managers will want to spend some time with these "ambassadors" to explain the program and discuss other issues that may arise during the outreach. Other options, such as a brief introduction in the rental office or canvassing tenants in the lobby may work if timed correctly. During the face-to-face contact, introductory letters can be handed out with support documents, and a brief orientation to the program given. Building staff should gauge interest of the tenants: some may willingly volunteer to help. Hire 2 people. For the purpose of the cost estimate it is assumed that the outreach team members will spend about 10 minutes per unit at $12/hour.

Step 3: Knock on doors. Launch and maintain the outreach program. Be prepared to show the benefits of the program to the tenants. Monitor the initial response and promote a follow up meeting, such as a tenant BBQ, a morning coffee session or a tea party. This will be an opportunity to report on the program success and field questions, in general reinforcing the new program and clarifying participation issues. About $50 per event, monthly, or $600 annually, can be budgeted for hosted events.

Step 4: Keep reaching out. Continue to report on success and program news. Distribute letters on a regular basis, keep a recycling "barometer" updated in the lobby, and host periodic "coffee sessions" to discuss how things are going. Costs are negligible (photocopying).

Staff and Tenant Involvement: Staff and tenant involvement can be extensive or minimal depending on the level of support provided by the property management. Some outreach tools can involve minimal time investment (such as the barometer) or extensive time investment (such as an event) to implement and maintain. Typically, an ambassador can spend several hours a week helping to promote and maintain the recycling program in the building.

Barriers:

a) Front-end time is needed put into developing an effective strategy. Back-end time is required to monitor and measure performance of the strategy. A successful outreach strategy requires time and commitment by the property management and support staff.

b) The program must be ready to accept the result of successful participation. The property management and superintendents must support the outreach strategy by making recycling as convenient as possible and maintaining a clean, safe and effective recycling program.

c) The "us and them" culture in many of the buildings (not all) will inhibit potential success unless property managers are willing to put aside traditional attitudes and adopt an assertive, positive approach. The same will be required of tenants.

Benefits:

a) The benefit of communication will extend beyond waste reduction and diversion.

b) Outreach is universal and can be applied to any strategy.

Expected Costs: Range shown in Section 7.5 will be based on assumptions above applied to number of units for each building.

7.3 Fire Safety and the Implementation of Strategies 1 and 2

Following the development of the waste diversion strategies and the draft report for this project, the project team investigated issues related to fire safety and specifically fire safety and fire code issues associated with Strategies 1 (Floor to Floor Recycling Collection) and 2 (Door to Door Recycling Collection). In addition to obtaining an opinion from GENIVAR's Senior Code Consultant – Code, Fire and Life Safety, a meeting was held with the District Chiefs, Fire Prevention, for the City of Toronto (East, West, North and South Commands).

Our discussions revealed that there are some potential barriers to the implementation of Strategies 1 and 2. Fire Code and safety issues are discussed below, based on the concerns expressed during our investigation of the issues:

- Regardless of the period of time over which materials are accumulated, fire officials are concerned about the exposure of combustible material and potential for someone to cause these materials to catch fire. Strategies 1 and 2 are premised on regular schedules and procedures that are intended to minimize the exposure but this may not be enough to satisfy Fire Prevention Officers.
- Even when the chute rooms meet fire separation requirements, the prevailing opinion was that the building would be required to install a sprinkler system in the chute room to accommodate Strategy 1 (Floor to Floor). The cost of doing so could be prohibitive, a conservative estimate being $4,500 per floor. Building managers may want to discuss with fire prevention officials what options for fire suppression are acceptable in the context of a single day's worth (or less) of recyclables in the chute room.
- With respect to Strategy 2 (Door to Door) it is clear that the intended approach of setting material out according to an established schedule will not be permitted. A variation on the approach may be required, for instance a schedule will still be used where people are afforded the opportunity to hand over recyclables when staff are on the floor. Based on the prospects of people working various hours and therefore being able to participate at different times, schedules for each floor should reflect at least two very different times of the day in a given week, such as the morning of one day and the afternoon of another.

Should building managers decide not to implement strategies 1 or 2, there are a number of options available:

- Managers could focus efforts on Strategy 3, designated chute times.

- All strategies are based on support activities. Those buildings that decide not to attempt strategies 1 or 2 can shift their efforts and disposal savings to improving their existing programs, including better signage, intensified outreach activity, more attractive recycling areas, and more enticing rewards programs for staff and users.

Strategies 1 and 2, for the purposes of this report, have not been altered based on the input from fire prevention officials: they reflect the case study examples researched as part of this report. Any approach used to accomplish strategies 1 or 2 should be incorporated into the buildings fire plan and submitted for approval. The approval procedure will be the building owners assurance that the approach conforms with the fire code.

7.4 Secondary Strategies

These strategies are presented in a different, narrative format from those above since implementation is evident and simple, and costs low or negligible. They are either "last resorts" (Temporary Chute Closures) or ongoing, easy to implement support strategies (Contract Clauses).

7.4.1 Temporary Chute Closures

For the most part the project team avoided punitive and enforcement style measures as part of a recommended approach, but to leave out such options entirely is to ignore the input of a number of important stakeholders. The overall recommended approach is to take positive actions that entice the desired behaviours, and to use the existing waste levy tool to maximum effect. While progressive approaches take time and effort to communicate and execute it was felt that punitive approaches that are not supported by the strong training and outreach established as part of the more progressive approaches would provide little result. The progressive approaches require that building operators establish working programs in their buildings – meaning programs that offer a convenient, supported and well-promoted option for waste diversion. Only after this is accomplished should there be any consideration of more punitive approaches to the problem of low diversion rates.

Our research showed that such action has been taken in order to put recycling and waste diversion on par with garbage disposal in terms of convenience. Clearly there is an element of conflict between tenants and building staff that will occur as a result, and as a result this approach should be held in reserve as a last resort. There is also a question at this point as to the legality of taking such an action, which we understand is in the process of being resolved.

Temporary chute closures put waste disposal and recycling on equal footing: residents must take material to a designated location. A decision to close chutes, however, should be made only in the context of full outreach and communications support. Residents, especially where there is a "problem" floor or floors, should receive notices explaining why the chutes were closed. The strategy recommended here is temporary, with the maximum duration being a few days. During the closure building staff have a number of activities that will help resolve waste diversion issues, and should use that time to conduct a fairly intense outreach program. They may, for instance, bring in Toronto staff to talk about recycling, distribute totes (this program ends in 2011) and recycling information to each tenant, and use the opportunity to talk to and promote waste diversion with as many tenants as possible.

7.4.2 Contract Clauses

The simple addition of a recycling or waste reduction clause in the rental agreement is a foundational strategy that supports waste diversion in two ways. The first is to draw attention to the fact that there is a recycling program and a focus on waste diversion and reduction. This also presents an opportunity to provide an orientation about the recycling and waste diversion programs. The second is simply to provide the basis for program enforcement, if required. As noted in one of the case studies, some building managers build an environmental or recycling participation pledge into the lease or rental agreement.

7.4.3 Operational Improvements

Making the job of recycling for building staff easier to perform must be considered for the longer term health of any recycling program. There are a number of adjustments than can be made over time to streamline the process, and these may require that the City reconsider certain elements of their program. The project team came across a number of situations where the job might be made a bit easier.

For instance, where 3 yd^3 bins were used building staff were manually lifting the cart up to the top of the bin to dump recyclables. A simple and inexpensive approach would be to line carts with large transparent plastic bags. The use of bags might ease the physical strain placed on building staff but there is still a limitation on the use of bags: they must be dumped out into the container because the City program does not accept bagged material. While tipping is far easier to do using a light plastic bag than a recycling cart, the need to empty the bag as opposed to simply tossing it into the recycling container adds a step to the process. For larger buildings this may discourage staff from promoting the program, and program ambassadors are important players in the overall success of recycling and waste diversion. Given that in some cases pilot buildings were already using bags to collect recyclables, floor-to-floor, the City of Toronto might consider options at the processing facility to enable the use of large transparent plastic bags. The program does accept film plastic, but at the current time is unable to process recyclables that are contained in the large plastic bags envisioned here. While other jurisdictions have installed equipment to accomplish this it is understood that this may not be possible in the short term for the City of Toronto.

For building operators the alternative might be more attractive, namely the installation of a cart tipper. Assuming that they promote and support recycling in their buildings in a manner that achieves maximum waste diversion, the payback in some of the buildings visited is less than 6 months.

7.5 Strategy Cost versus Potential Savings

Table 7-1 below demonstrates the cumulative costs of the strategies selected for each building. Over time, as a culture of waste diversion and recycling takes hold in the buildings, diversion targets and strategies can be adjusted to reflect current conditions.

Table 7-1 Potential Cost Savings from Increased Recycling at Pilot Buildings

	Pledges	Door-to-Door	Floor-to-Floor	Designated Chute Times	Tenant Incentives	Building and Community Rewards	Staff Incentives / Superintendent Rewards and Recognition	Outreach	**Implementation Cost of Selected Strategies**	**Target Waste Category** *	**Potential Cost Savings** (Based on reducing garbage to target category)
Building 1					✓	✓	✓	✓	$19,000	XL	$38,394
Building 2				✓			✓	✓	$6,900	XL	$19,536
Building 3	✓					✓		✓	$4,800	XL	$11,817
Building 4			✓				✓	✓	$12,000	XL	$13,698
Building 5					✓	✓	✓	✓	$6,300	XL	$10,913
Building 6		✓					✓	✓	$9,100	XL	$12,980
Building 7			✓				✓	✓	$8,700	XL	$23,286
Building 8		✓					✓	✓	$15,400	XL	$21,775
Building 9			✓				✓	✓	$16,200	XL	$30,773
Building 10								✓	$1,400	L	$5,760
Building 11				✓			✓	✓	$4,400	L	$4,170

* The "Target Waste Category" is the minimum disposal cost for the category shown, ie XL or L. For Buildings 10 and 11, which have already reached the minimum for their existing category, the next category, or L (Large) is shown.

8. Conclusions and Recommendations

The initial objective of the study was to recommend a number of project ideas for incorporation at the pilot buildings based on an assessment of the feasibility of the project. Inherent in the RFP and contemplated at the beginning of the study, there was an expectation that a list of solutions would include a selection of potential technical upgrades. The research revealed a limited number of pure "technical" solutions, and that much progress can been made using existing or very slightly modified infrastructure, or using this infrastructure (such as garbage chutes) in an innovative way.

Perhaps of greatest importance to the cause of waste diversion is to overcome the apparent lack of accountability for the waste collection levy. The levy gives the City and City residents one of the most powerful financial incentives available to drive change, yet somehow the imposition of the levy is not, with some exceptions, being translated into action in the pilot buildings. Of the pilot buildings visited by the team, only one property manager appeared to understand fully the cost implications of the levy and how to use cost savings as a tool to entice action by providing incentives and sponsoring regular communication with tenants to support waste diversion. A second building has also managed to reduce their waste collection costs to minimum levels. Based on their first waste collection bills from the City of Toronto, these buildings are saving $41,000 and $26,000 annually by recycling.

Other than these two examples the project team found a lack of accountability for waste levy costs, most notably where building waste generation is pooled with others and individual building performance, good or bad, can not be credited to an individual building. There were also cases where buildings received stand-alone waste invoices but a number of management issues, even in cases where the waste bills were very high, relegated waste diversion to a lesser priority. It is possible that these managers simply do not have the time or background to understand the cost implications and the savings to be gained by action.

A number of challenges must be overcome in order to reach the high diversion rates experienced by the top waste diversion examples. There is a need to engage in meaningful outreach and address larger issues, such as the basic relationships between building managers and tenants. Successful recycling, even at the curbside, has always been a function of community good will and cooperation. In multi-residential environments a number of the elements that generate momentum in the curbside community are missing: multi-family family residents operate in relative anonymity, there are no household participation norms established like blue boxes at the curb, and there is no direct household accountability for the cost of waste collection. The overall effect is that managers of multi-residential settings have to work harder and be inventive in order to overcome these deficiencies and gain cooperation.

Successful implementation of the recommended strategies will require the execution of a robust, ongoing and effective program of outreach to solicit understanding and cooperation from tenants. Tenants will be asked to "buy into" community objectives and the benefits of waste diversion, both internal to the building culture and in the broader sense of community.

Recognizing that superintendents play a vital role in the implementation and maintenance of a recycling program, a key to success will be the understanding by property management companies that their superintendents require support and financing to facilitate a recycling plan for their tenants and, further, that in Toronto, a successful recycling and waste diversion program will not only pay for itself but could result in significant savings, savings from which the investment in recycling can be made and easily sustained.

It can be noted too that, while not explicitly applied during the evaluation of strategies for this report, the concept of green jobs creation is inherent to this project, and has two components: the indirect green jobs associated with off-site management of the diverted materials and manufacturing/installation of supporting green technology as well as the direct green jobs associated on-site implementation and management of the waste diversion initiatives.

With respect to indirect green job creation the renowned study prepared by the Institute for Local Self Reliance (ILSR) in 1993 has become the foundation for all North American studies that examine direct and indirect job creation associated with recycling programs. This landmark study concluded that recycling creates more jobs than disposal on a 9 to 1 basis. For every 1 job created by disposing 13,600 tonnes (15,000 tons) of garbage, 9 jobs were created by recycling the same amount of material. Given the size of the Toronto multi-residential sector and the current gap between average performance (13% diversion) and desired outcomes (70% diversion target), there is little doubt that the additional diversion activities could result in more green jobs being created in the recycling market.

This project has its greatest opportunity to generate direct green jobs through hiring of staff to implement the waste diversion strategies and through the engagement of community associations, ambassadors and other community leaders to champion the outreach and program activities. This supports a grass roots job creation approach which can provide greater job opportunities for members of the community who may feel marginalized within society.

8.1 Supporting Activities

These higher-level requirements for understanding and outreach form the basis of the first three recommendations, which are:

8.1.1 Sponsorship of a Management Training Workshop

The research and consultation process demonstrated that, with two notable exceptions, building managers were not fully appreciating that strategies exist to mitigate the impact of the levy. We also learned that other jurisdictions such as New York City (workshops and ongoing training) and Chicago (waste diversion tool kit) target property managers and superintendents as the players critical to making a difference when it comes to waste diversion. As a result the delivery of a pilot training program for building managers and superintendents is recommended. In addition to inviting building managers and their key staff, Toronto Community Housing Corporation may want to attend on a corporate basis.

An agenda for such a training program would include information about the City's waste reduction objectives, the role of the multi-residential community in achieving these objectives, the potential for savings through waste diversion, and potential strategies and their implementation. The pilot group, in return, will be able to provide the feedback required to refine the training for ongoing use by City of Toronto staff.

In order to entice participation by building managers and their staff, results of this report should be offered as an incentive to participate since disposal cost savings up to $38,000 annually are available for reasonable investment.

The City of Toronto is the recommended host for this activity, possibly in partnership with the Toronto Community Housing Corporation. The former has ambitious waste diversion targets while the latter stands to save a considerable amount of money through successful waste diversion.

8.1.2 Feedback

It is felt that communicating with property managers about relative performance is required to provide them with a sense that more needs to be done and is achievable. The place to do this is on the waste invoices, similar to other agencies seeking to promote conservation behaviour. Invoices, whether on paper or on-line, might contain historical and relative performance information.

This type of feedback mechanism will remain as an important feature until such a time as a more direct accountability structure is possible, one that might eventually put residents in multi-residential buildings on equal footing with residents in single-family households. Until then the property manager serves as the key agent for behavioural change and requires the financial information for decision making purposes.

8.2 Building-Specific Waste Diversion Strategies

A total of eight strategies were generated for piloting: door-to-door collection, floor-to-floor collection, designated chute times, incentives, pledges and community rewards, and an outreach only program. These are summarized below; details about implementation and recommended pilot candidates appear in the previous section.

8.2.1 Door-to-Door Collection

The door-to-door strategy provides the most convenient recycling service to tenants by collecting recyclables at the tenant's door. The door-to-door approach is, in effect, the multi-residential equivalent to curbside recycling and is possible to execute but does require that building operators consult local authorities about fire codes. While often considered cost prohibitive to implement and maintain, with Toronto's levy program, the cost to have the superintendent perform the door-to-door collection service may be justified through the reduction in garbage fees.

8.2.2 Floor-to-Floor Collection

This approach, well demonstrated by one of the pilot buildings, puts recycling and garbage disposal on equal footing by establishing recycling drop-off opportunities on each floor, often inside the chute room. In the case of Building 10, clear bags mounted in the chute rooms are removed daily by staff who bring the material down to the recycling bins. The building has experienced significant reduction in its garbage levy resulting from this initiative.

8.2.3 Designated chute times

As with single family recycling programs, this approach offers a regular collection time or times during the week for recycling, using the existing chute. Tenants would be directed to use the chutes for specific materials (recyclables, organics, garbage) at designated times throughout the week. While there was no evidence of this approach being tested within the past decade in any surveyed cities or Toronto based multi-residential buildings, it is seen as an option with merit.

8.2.4 Incentives

Rewards are established for the tenants to encourage participation in the recycling program and for staff who provide the recycling support services. The reward program could target the children of the building or adults or both using prizes or coupons as the incentive.

8.2.5 Superintendent Incentives and Rewards

This recognizes the contribution of superintendents in operating the building's recycling program by providing rewards that are directly linked to the performance of the recycling program and reduced garbage costs. The superintendent reward/recognition program can be designed to augment a more labour intensive recycling strategy, such as door-to-door and floor-to-floor collection services.

8.2.6 Pledges

One of the key components of social marketing is the use of pledges to engage people in a preferred activity or behaviour and to establish their commitment to the preferred activity or behaviour over a period of time. "Pledging" is a voluntary act but the act of signing or reciting a pledge, which is a public declaration, is seen as obtaining a commitment to keep ones word. Pledges work by requiring people to verbally and through written commitment, agree to participate in an activity which over time elicits a change in behaviour.

8.2.7 Community rewards

Rather than rewarding the individual for participating in the recycling program, the community is rewarded for the building's overall participation in the recycling program, which in the case of multi-residential buildings often takes the form of upgrades to communal areas or tenant facilities. The degree of participation by the tenants depends on the desirability of the community reward. This strategy promotes community pride and cohesion by using savings accrued from reduced garbage levy fees and putting money into community beautification projects.

8.2.8 Outreach

The traditional approach to promotion and education relies on dissemination of written information to convey messages to the public and increase awareness for a program or policy. The concern with this traditional approach is that it does not impact behaviour and fails to achieve behaviour modification and attitudinal change. Social marketing provides an alternative approach by using an interactive approach to change attitudes and behaviours. Outreach plays a key component in social marketing by using different tools to engage and change behaviour. There are a number of different tools that can be applied as part of an outreach strategy, including an Ambassador Program, a program "barometer", comparative performance information, simplified messages and events.

8.3 Secondary Strategies

These strategies are characterized as "last resorts" (temporary chute closures) or ongoing, easy to implement support strategies (Contract Clauses).

8.3.1 Temporary Chute Closures

Our research showed that such action has been taken in order to put recycling and waste diversion on par with garbage disposal in terms of convenience. Clearly there is an element of conflict between tenants and building staff that will occur and as a result this approach should be held in reserve as a last resort. There is also a question at this point as to the legality of taking such an action, which we understand is in the process of being resolved.

Temporary chute closures, if required, put both waste disposal and recycling on equal footing: residents must take material to a designated location. This strategy should be considered a "shock tactic" to bring attention to the recycling program, and efforts should be made to resolve whatever issues led to its use as quickly as possible.

Residents should receive notices explaining why the chutes were closed and what actions are being taken. Of particular importance here is to use the opportunity to educate residents that an alternative is in place and, used properly, will eliminate the need to employ a chute closure approach.

8.3.2 Operational Improvements

The opportunities for continuous improvement are limitless, but the project team did see instances where the job of recycling could have been aided by the use of a cart tipper or clear bags to reduce strain. The willingness of City collectors to accept bagged material would also help.

8.4 Other Options for Waste Diversion

While this report has focussed on recycling as a principal form of waste diversion, it is important to note that building managers can improve waste diversion performance by being equally diligent with respect to other wastes and tenant practices.

Since the waste levy, as applied in Toronto, is a volume based measure, it makes sense to divert the recycling stream, which represents a large portion of waste by volume. One example cited in this study, where all waste was collected in loose form (no compaction), 44% of the stream by volume was blue box

recyclables. Other streams may have weight but less volume, such as source separated organics, and while they are still important components of the waste stream they will have less impact on the disposal levy.

In this respect the City of Toronto has rolled out the most potentially effective waste diversion program first, the recycling program. If and when a decision is made to make available to multi-residential buildings the source separated organics program, the same principles to successful waste diversion program management will apply. The overall return may be less but then, if a building has successfully implemented and operated their recycling program, there should be less effort required to make a parallel waste diversion program for organics work.

There are two other residential waste streams that building managers and tenants can work together to divert, but in both cases it is more likely that the availability of City or industry steward sponsored programs will be the recipients of Municipal Household and Special Wastes (MHSW) and Waste Electrical and Electronic Equipment (WEEE). In this case the role for building managers will be to diligently monitor waste streams for these materials and maintain a line of communication that promotes options for tenants. For instance, the Do What You Can website at http://www.dowhatyoucan.ca/mhsw_home.aspx lists 30 private and public locations for Torontonians to bring MHSW, and 32 for WEEE. The site provides extensive lists for each waste type, and as such is a website that property managers and tenants should familiarize themselves with.

Property management companies, property managers and building complex managers may wish to consider event-based programs to divert these types of waste but should consult with City staff prior to taking such a step. They should also be aware of permitting regulations for the accumulation, storage and transportation of quantities of MHSW or WEEE. Although there are many options for MHSW and WEEE disposal, it is possible that operators of some of these industry managed programs may be willing to arrange for special events targeting buildings or building complexes. Operators of these programs are interested in increasing their capture rates and might be convinced to sponsor special events. They note, however, that the arrival of a collection vehicle in itself will not result in success: there is a need to promote such events within target communities in anticipation of the event.

8.5 Contribution to Toronto's Waste Diversion Goals

The last remaining question is this: what might we expect from the Tower Renewal Project and potentially the multi-residential sector in terms of waste diversion if they were to aggressively implement the recommended strategies?

To answer this question we looked back to an earlier stage of the waste levy program development when the City devised a formula for determining permissible garbage disposal rates. The underlying premise was that multi-residential residents should be able to divert recyclables on par with single family residents which, at the time of levy development, was measured to be at a 60% capture rate of available Blue Box materials, specifically fibres and containers.

In developing acceptable garbage disposal rates for the multi-residential sector, the City assumed that each multi-residential unit generated 680 kg per year, excluding bulky goods. Of this, it was assumed that 44% was potentially available blue box materials based on what materials could be accepted in the residential recycling program (680 kg x 44% = 299 kg per year of available blue box material). The 60% capture rate noted previously was then applied to the available blue box materials (299 kg x 60% = ~ 180 kg per year of divertible blue box material). For the purpose of this exercise two capture rate scenarios, 60% and 70%, were used to develop an expectation of what the City might achieve, which is between 26% and 31% diversion rate for recyclables in multi-residential buildings, by weight.

In addition, the City conducted a green bin pilot program which estimated that the multi-residential sector generates approximately 206 kg/unit/year of organics, representing about 30% by weight of the waste stream (assuming a 680 kg/unit/year generation rate). The pilot achieved about 25% capture rate or 52 kg/unit/year diversion. Based on capture rate scenarios of 25% and 40% the City can expect to achieve between 8% and 12% diversion rate for organics.

An effort was also been made to estimate potential diversion rates for other materials such as waste electronics (WEEE), municipal hazardous and special wastes (MHSW), textiles and bulky waste which represent in combination about 5.4% of the multi-residential waste stream. Recovery programs exist for all through either Ontario stewardship plans, local City of Toronto facilities and/or local organizations. Based on capture rates of 60% and 70% it is estimated that diversion of these materials will contribute an extra 3% to 4% of the waste stream.

Five scenarios were developed and are listed in Table 8-1. The scenarios move from lower recovery assumptions to higher recovery for three main waste streams: recyclables, organics and other materials. The capture rate ranges selected here are considered to be realistic and achievable recovery levels for the materials cited. The total potential recovery rate assuming 100% capture of available material in the multi-residential sector, based on the percentages noted above, approaches 80% (44% recyclables, 30% organics, and 5.4% HSW/WEEE). This sets an unrealistically high goal and there is no example or evidence of 100% recovery being achieved, but the number does at least provide program operators with some incentive to look at improvements to the system and to continually monitor progress.

Table 8-1 Waste Diversion Scenarios

Scenario	Diversion	Assumptions
1	Low	Recycling at 60% recovery of available blue box material (provincial average), no organics recovery, and 60% recovery of other recoverable streams
2	Medium-Low	Recycling at 70% recovery of available blue box material, no organics recovery, and 60% recovery of other recoverable streams
3	Medium	Recycling at 70% recovery of available blue box material, organics recovery at 25%, and 60% recovery of other recoverable streams
4	High	Recycling at 70% recovery of available blue box material, organics recovery at 40%, and 60% recovery of other recoverable streams
5	Highest	Recycling at 70% recovery of available blue box material, organics recovery at 40%, and 70% recovery of other recoverable streams

Table 8-2 breaks down each of the five scenarios and uses existing City of Toronto waste availability data to generate potential tonnages per unit that might be diverted from the waste stream, and the resultant diversion rate.

Table 8-3 extrapolates these capture rates to estimate the additional tonnage of material diverted for each scenario if applied only to the 11 pilot sites, to all of the 60's and 70's towers, or to all of Toronto's multi-residential high-rise buildings.

It should be noted that for recycling only (no organics or other materials) a Toronto-wide recovery range of 60 – 70% equates to 91,290 – 106,590 tonnes of recyclables annually. Assuming an estimated current recovery rate of 13% from multi-family residences, this represents an additional 46,206 – 61,506 tonnes of recyclable material for the city of Toronto, which currently markets 166,678 (2008 WDO marketed tonnes reported by the City) tonnes annually. This represents a potential 28 – 37% increase which will require accommodation within the City's recycling infrastructure.

Table 8-2 Summary Table of Waste Diversion Scenarios

Scenario	Waste Stream	Available (kg/unit/yr)	Waste Stream Capture Rate (%)	Annual Capture (kg/unit)	Total Annual Capture (kg/unit)	Diversion Rate (%)
1	Recyclables	299	60	179	202	29.6
	Organics	206	0	0		
	Other	37	60	22		
2	Recyclables	299	70	209	232	34.0
	Organics	206	0	0		
	Other	37	60	22		
3	Recyclables	299	70	209	283	41.6
	Organics	206	25	52		
	Other	37	60	22		
4	Recyclables	299	70	209	314	46.2
	Organics	206	40	82		
	Other	37	60	22		
5	Recyclables	299	70	209	318	46.7
	Organics	206	40	82		
	Other	37	70	26		

Table 8-3 Summary of Impacts of Waste Diversion Scenarios

Scenario	Application	# Units	Annual Diversion (tonnes)	Current Annual diversion @ 13% (tonnes)	Added Annual Diversion (tonnes)
1	Pilot sites	2,974	600	263	337
	All 60's and 70's Towers*	249,145	50,228	22,024	28,203
	Toronto-wide	510,000	102,816	45,084	57,732
2	Pilot sites	2,974	688	263	426
	All 60's and 70's Towers*	249,145	57,677	22,024	35,653
	Toronto-wide	510,000	118,065	45,084	72,981
3	Pilot sites	2,974	842	263	579
	All 60's and 70's Towers*	249,145	70,508	22,024	48,484
	Toronto-wide	510,000	144,330	45,084	99,246
4	Pilot sites	2,974	934	263	671
	All 60's and 70's Towers*	249,145	78,207	22,024	56,182
	Toronto-wide	510,000	160,089	45,084	115,005
5	Pilot sites	2,974	945	263	682
	All 60's and 70's Towers*	249,145	79,128	22,024	57,104
	Toronto-wide	510,000	161,976	45,084	116,892

* Estimated. Sources refer to approximately 1000 of Toronto's 2047 multi-residential buildings as falling under the Tower Renewal profile. The estimated number of units is based on the percentage derived by dividing total buildings into Tower Renewal vintage buildings, and is provided as an estimate only.

Diversion rates for the five scenarios ultimately range from 30 – 47%. It is estimated that the Toronto Tower Renewal pilot buildings alone could divert an additional 337 – 682 tonnes per year. Extrapolating the diversion rates to all of Toronto's estimated 1,000 multi-residential buildings falling under the Tower Renewal Profile could divert an additional 28,203 – 57,104 tonnes per year, while application to all 510,000 multi-residential units in the City of Toronto could achieve an estimated 57,732 – 116,892 tonnes of material diverted annually from landfill.

The last, but not least, of waste diversion strategies is the easiest to overlook but the most important of the 3Rs hierarchy: Reduce. Efforts to pilot the various strategies outlined in this report should be accompanied, within the context of recommended outreach and communication, with information and tips about the benefits and details of how to reduce waste at the source, before it becomes a management issue for tenants and building managers. In this report, the concept of waste reduction is addressed where accountability for waste generation is discussed. Continued efforts to accurately and fairly assess waste disposal costs by building (not an issue for stand-alone private buildings) and at some point by unit will drive waste diversion and reduction behaviours in a manner similar to single family households in Toronto. In an environment where consumption patterns and packaging materials constantly change, it becomes critical to influence personal decision making such that residents are encouraged to make conscious, informed efforts to reduce waste. This is the ultimate strategy required to combat wasteful behaviour. For some building types outside of the Tower Renewal profile, like condominiums, there may in fact be a built-in accountability process through, for example, the establishment of tenant based board of directors and management fees which foster this. For older buildings, however, and especially within the public housing scenario where waste input is consolidated and individual building contributions estimated, there is work to be done to develop a more direct approach that emphasizes personal and household financial accountability for wasteful behaviour to residents in multi-residential settings.

Appendix A

Solid Waste Management Fees for Tower Renewal Buildings

Solid Waste Management Fees for Tower Renewal Buildings

								Potential Savings (if waste in excess of allowable XL amount is eliminated)	
Address	**Billing Date**	**Lift Volume (yd^3)**	**Excess Volume (yd^3)**	**# Days**	**Equ. Bin Size**	**SWM Fee**	**Cost $/unit/ mo**	**$/unit/mo**	**$/yr**
Building 1 (719 Units)	07/1/08-12/30/08	1617	640	182	XL	$46,248.32	$10.75	$4.25	$36,668.75
	12/30/08- 8/4/09	2001	837	217	XL	$57,326.38	$11.18	$4.68	$40,342.56
	8/4/09-8/25/09	189	76	21	XL	$5,414.72	$10.91	$4.41	$38,030.99
	8/25/09-10/6/09	378	153	42	XL	$10,829.17	$10.91	$4.41	$38,028.64
	10/6/09-12/8/09	561	223	63	XL	$16,071.88	$10.79	$4.29	$37,032.86
		Total		525		$135,890.47			
		Average					$10.95	**$4.45**	**$38,394.23**
Building 2 (301 Units)	7/1/08-8/25/09	1767	824	420	XL	$50,594.06	$12.17	$5.67	$20,490.65
	8/25/09-9/1/09	27	11	7	XL	$773.66	$11.17	$4.67	$16,862.84
	9/1/09-10/9/09	138	53	38	XL	$3,953.47	$10.51	$4.01	$14,496.12
	10/9/09-11/24/09	171	68	46	XL	$4,898.97	$10.76	$4.26	$15,394.26
		Total		511		$60,220.16			
		Average					$11.91	**$5.41**	**$19,536.40**
Building 3 (299 Units)	7/1/08-12/30/08	623	216	182	XL	$17,715.99	$9.90	$3.40	$12,207.32
	12/30/08-7/31/09	777	302	213	XL	$22,160.38	$10.58	$4.08	$14,652.36
	7/31/09-9/15/09	258	155	46	XL	$7,371.84	$16.30	$9.80	$35,171.95
	9/15/09-10/20/09	129	0	35	L	$1,380.82	$4.00	$0.00	$0.00
	10/20/09-11/24/09	21	0	35	M	$516.08	$1.50	$0.00	$0.00
	11/24/09-12/8/09	49	17	14	XL	$1,396.67	$10.15	$3.65	$13,091.18
		Total		525		$50,541.78			
		Average					$9.79	**$3.29**	**$11,816.57**
Building 4 (300 Units)	7/1/08-12/30/08	623	209	182	XL	$17,638.42	$9.83	$3.33	$11,973.75
	12/30/08-11/24/09	1197	461	329	XL	$34,298.91	$10.57	$4.07	$14,651.98
		Total		511		$51,937.33			
		Average					$10.31	**$3.81**	**$13,698.09**
Building 5 (300 Units)	12/30/08-7/31/09	777	293	213	XL	$22,160.38	$10.55	$4.05	$14,574.36
	7/31/09-9/15/09	258	154	46	XL	$7,371.84	$16.25	$9.75	$35,093.95
	9/15/09-10/20/09	129	0	35	L	$1,390.03	$4.00	$0.00	$0.00
	10/20/09-11/24/09	644	158	217	XL	$18,431.83	$8.61	$2.11	$7,602.85
	11/24/09-12/8/09	49	17	14	XL	$1,396.64	$10.01	$3.69	$13,277.71
		Total		525		$49,354.08			
		Average					$9.53	**$3.03**	**$10,912.84**

Solid Waste Management Fees for Tower Renewal Buildings (continued)

								Potential Savings (if waste in excess of allowable XL amount is eliminated)	
Address	**Billing Date**	**Lift Volume (yd^3)**	**Excess Volume (yd^3)**	**# Days**	**Equ. Bin Size**	**SWM Fee**	**Cost $/unit/mo**	**$/unit/mo**	**$/yr**
Building 6 (161 Units)	7/1/08-8/30/08	188	97	60	XL	$4,845.41	$15.26	$8.76	$16,918.24
	8/30/08-11/1/08	159	64	63	XL	$3,986.75	$11.96	$5.46	$10,539.84
	11/1/08-1/28/09	237	104	88	XL	$5,998.75	$12.88	$6.38	$12,323.18
	1/28/09-2/25/09	51	9	28	XL	$1,210.77	$8.17	$1.67	$3,225.25
	2/25/09-4/8/09	178	114	42	XL	$4,726.02	$21.26	$14.76	$28,513.36
	4/8/09-5/30/09	161	82	52	XL	$4,148.91	$15.07	$8.57	$16,564.16
	5/30/09-6/3/09	14	8	4	XL	$365.45	$17.26	$10.76	$20,789.31
	6/3/09-8/22/09	244	123	80	XL	$6,276.94	$14.82	$8.32	$16,080.54
	8/22/09-9/2/09	34	17	11	XL	$875.88	$15.04	$8.54	$16,505.29
	9/2/09-11/11/09	180	0	70	XL	$2,408.39	$6.50	$0.00	$0.03
		Total		498		$34,843.27			
		Average					$13.22	**$6.72**	**$12,979.74**
Building 7 (103 Units)	7/1/08-11/1/08	375	282	123	XL	$10,756.67	$25.83	$19.33	$23,886.20
	11/1/08-1/28/09	266	199	88	XL	$7,631.60	$25.61	$19.11	$23,619.80
	1/28/09-4/8/09	263	210	70	XL	$7,547.47	$31.84	$25.34	$31,320.67
	4/8/09-5/30/09	197	158	52	XL	$5,653.37	$32.11	$25.61	$31,648.31
	5/30/09-6/3/09	15	12	4	XL	$430.46	$31.78	$25.28	$31,245.48
	6/3/09-8/22/09	270	209	80	XL	$7,749.19	$28.60	$22.10	$27,321.68
	8/22/09-9/2/09	26	18	11	XL	$746.56	$20.04	$13.54	$16,738.22
	9/2/09-11/11/09	232	72	70	XL	$2,217.76	$9.36	$2.86	$3,530.03
		Total		498		$42,733.08			
		Average					$25.34	**$18.84**	**$23,286.43**
Building 9 (226 Units)	7/1/08-12/31/08	816	507	183	XL	$23,359.72	$17.18	$10.68	$28,963.79
	12/31/08-8/1/09	1018	659	213	XL	$29,173.25	$18.43	$11.93	$32,363.72
	8/1/09-8/29/09	125	78	28	XL	$3,581.95	$17.22	$10.72	$29,065.28
	8/29/09-9/2/09	16	9	4	XL	$458.39	$15.42	$8.92	$24,200.09
	9/2/09-10/31/09	257	157	59	XL	$7,364.69	$16.80	$10.30	$27,933.22
	10/31/09-11/28/09	140	93	28	XL	$4,012.00	$19.28	$12.78	$34,671.29
	11/29/09-12/30/09	160	106	32	XL	$4,585.35	$19.29	$12.79	$34,673.65
		Total		547		$72,535.35			
		Average					$17.85	**$11.35**	**$30,773.10**

Solid Waste Management Fees for Tower Renewal Buildings (continued)

								Potential Savings (if waste in excess of allowable XL amount is eliminated)	
Address	**Billing Date**	**Lift Volume (yd^3)**	**Excess Volume (yd^3)**	**# Days**	**Equ. Bin Size**	**SWM Fee**	**Cost $/unit/mo**	**$/unit/mo**	**$/yr**
Building 8 (230 Units)	7/1/08-12/31/08	572	261	183	XL	$16,363.69	$11.83	$5.33	$14,697.96
	12/31/08-8/1/09	819	457	213	XL	$23,467.79	$14.57	$8.07	$22,274.76
	8/1/09-8/29/09	177	129	28	XL	$5,073.01	$23.96	$17.46	$48,190.31
	8/29/09-9/2/09	15	8	4	XL	$429.71	$14.21	$7.71	$21,271.04
	9/2/09-10/31/09	231	131	59	XL	$6,619.27	$14.84	$8.34	$23,009.72
	10/31/09-11/28/09	129	81	28	XL	$3,696.85	$17.46	$10.96	$30,251.08
	11/29/09-12/30/09	135	81	32	XL	$3,868.51	$15.99	$9.49	$26,185.19
		Total		547		$59,518.83			
		Average					$14.39	**$7.89**	**$21,775.49**
Building 10 (192 Units)	7/1/08-8/30/08	330	239	60	XL	$9,312.94	$24.59	$18.09	$41,677.72
	8/30/08-12/31/08	510	324	123	XL	$14,317.99	$18.44	$11.94	$27,512.34
	12/31/08-1/31/09	66	19	31	XL	$1,823.43	$9.32	$2.82	$6,493.42
	1/31/09-2/28/09	39	0	28	XL	$1,148.84	$6.50	$0.00	$0.00
	2/28/09-4/8/09	51	0	39	XL	$1,600.17	$6.50	$0.00	$0.00
	4/8/09-5/27/09	51	0	49	XL	$2,010.48	$6.50	$0.00	$0.00
	5/27/09-6/3/09	6	0	7	L	$176.75	$4.00	$0.00	$0.00
	6/3/09-8/22/09	87	0	80	XL	$3,282.41	$6.50	$0.00	$0.00
	8/22/09-9/2/09	12	0	11	XL	$451.33	$6.50	$0.00	$0.00
	9/2/09-10/7/09	39	0	35	XL	$1,436.06	$6.50	$0.00	$0.00
	10/7/09-11/7/09	42	0	31	M	$293.52	$1.50	$0.00	$0.00
	11/7/09-12/9/09	33	0	32	XL	$1,312.96	$6.50	$0.00	$0.00
		Total		526		$37,166.88			
		Average					$11.19	**$4.69**	**$10,814.71**
Building 11 (139 Units)	7/1/08-8/29/08	209	148	59	XL	$5,985.18	$22.20	$15.70	$26,184.96
	8/29/08-10/31/08	214	149	63	XL	$6,128.04	$21.29	$14.79	$24,661.72
	10/31/08-12/30/08	130	68	60	XL	$3,720.06	$13.57	$7.07	$11,788.37
	12/30/08-1/30/09	47	15	31	XL	$1,346.13	$9.50	$3.00	$5,007.60
	1/30/09-4/7/09	91	22	67	XL	$2,606.58	$8.51	$2.01	$3,358.03
	4/7/09-5/12/09	42	6	35	XL	$1,202.77	$7.52	$1.02	$1,701.17
	5/12/09-6/2/09	27	5	21	XL	$773.45	$8.06	$1.56	$2,601.30
	6/2/09-7/28/09	57	0	56	XL	$1,663.43	$6.50	$0.00	$0.00
	7/28/09-8/28/09	22	0	31	XL	$920.83	$6.50	$0.00	$0.00
	8/28/09-9/15/09	20	1	18	XL	$572.81	$6.96	$0.46	$773.31
	9/15/09-11/6/09	49	0	52	XL	$1,544.61	$6.50	$0.00	$0.00
	11/6/09-12/8/09	44	11	32	XL	$1,260.45	$8.62	$2.12	$3,535.01
		Total		525		$27,724.34			
		Average					$11.56	**$5.06**	**$8,433.02**

Appendix B

Site Visit Reports

1. Building 1

Pilot Site Building Info

Address	Building 1
Storeys	29
Units	711
Built in	1964
Owner	TCHC

Weekly Set-Out

Compacted Garbage Bins (3 yd^3)	9-10 bins compacted (Monday) 7-8 bins compacted (Thursday)
Loose Garbage Bins (3 yd^3)	2- 3 loose bins per wk
Recycling Bins (3 yd^3)	3 bins per week
Recycling Carts	Used in lobby to collect material then transferred to 3yd^3 bins

1.1 Levy information:

This building falls into the XL levy category.

1.2 Waste Management and Recycling System

- Building 1 has at least 15 bins altogether dedicated to compaction and loose
- one of the bins is always on the compactor with one spare waiting
- the staff replace the bins on the compactor on average twice a day
- The compacted and loose garbage bins are collected by Miller Waste on Mondays and Thursday and the recycling is collected on Wednesdays
- There are four 360 litre carts used for recycling in the lobby of the building by the elevators; and the signage is very good. There appeared to be very little contamination in the carts.
- Outside, beside the building, is an enclosure containing a 3 cubic yard recycling bin in which the recycling in the building is transferred. It requires two staff to lift the 360 litre carts and dump the recyclables into the 3 cubic yd bins. There is concern about worker health and safety with this practice.
- The open, loose (uncompacted) garbage bin is located in the enclosed area – this bin is used for larger items that cannot fit down the chute
- There are several bins for loose garbage which have become dumping grounds for other garbage
- Bulky waste is collected in the enclosed area outside in an enclosed area.

1.3 Observations

- Building 1 is the single largest subsidized housing building in North America and the four buildings comprising Building 1, Building 2, and two others represent the largest social housing complex in North America

- it takes 21 staff to keep the building operational – very clean building
- Very poor recycling rates in the building, despite having recycling carts in the lobby by the elevators
- Recycling carts kept very clean with signage above the carts
- Very little contamination observed in the carts
- No other recycling signage in chute rooms or elsewhere in the building
- Staff report about 10% turn over in the building
- Bins in enclosure outside had lots of garbage in them
- Lots of unbroken down OCC in the recycling bins outside
- Stairwell in building does not have access to an outside wall
- No access to an outside wall from the interior, therefore no possibility for an external chute (Brick Façade)
- No other waste diversion programs (WEEE is set aside in the bulky area, if it isn't shoved down the chute)
- Chute Room approximate dimensions: 840 mm by 890 mm

1.4 Challenges

- Despite the convenience of the recycling carts, the tenants want the carts removed from the lobby stating that they smell
- Biggest challenge is tenant apathy, not my problem, not my concern, let someone else do it (e.g. pick up the garbage from the chute room and floors, shove large items down the chutes – TVs, VCRs, mufflers)
- Majority of tenants cannot be bothered to sort their waste and recycle
- Language is not considered a big barrier
- Building management has tried sending letters to tenants about recycling but no effect (letters written in English) – letters stated that tenant could be charged $300 for not recycling
- Lots of vandalism – throwing large items down the chutes causing damage and breaking doors on chutes

1.5 Opportunities

- All tenants are required to sign a lease contract and have someone explain recycling at the time
- At one time the tenants considered establishing designated recycling times for the chutes but in the end they decided not to pursue (doesn't know why)
- Seniors are very good recyclers in general – work with them
- Wanted to install surveillance cameras on each floor by the chute room but TCHC policy prohibits installation due to privacy issues, unless there is a health and safety concern
- Idea of extra chute still would have a problem to get tenants to participate
- Reward system might work – providing incentives/benefits – but would need to be piloted

2. Building 2

Pilot Site Building Info

Address	Building 2
Storeys	21
Units	325
Built in	1964
Owner	TCHC

Weekly Set-Out

Compacted Garbage Bins (3 yd^3)	12 bins compacted
Loose Garbage Bins (3 yd^3)	2 loose bins per wk
Recycling Bins (3 yd^3)	4 bins per week
Recycling Carts	Used in moving room to collect material then transferred to 3 yd^3 bins

2.1 Levy information

This building falls into the XL levy category.

2.2 Waste Management and Recycling System

- Building 2 has at least 8 bins altogether dedicated to compaction
- one of the bins is always on the compactor with one spare waiting
- The compacted and loose garbage bins are collected by Miller Waste on Mondays and Thursday and the recycling is collected on Wednesdays
- There are numerous (8) 360 litre carts used for recycling in the moving room of the building; however, the signage is very poor. Outside, beside the building, is an enclosure containing a 3 cubic yard recycling bin in which the recycling in the building is transferred. It requires two staff to lift the 360 litre carts and dump the recyclables into the 3 cubic yd bins. There is concern about worker health and safety with this practice.
- The open, loose (uncompacted) garbage bin is located in the enclosed area – this bin is used for larger items that cannot fit down the chute
- Bulky waste is collected in a separate enclosed area outside but because the area is locked, tenants are asked to place the bulky items next to the gate and the staff move the items into the area. This has resulted in illegal dumping.

2.3 Observations

- the four buildings comprising Building 1, Building 2, and two others represent the largest social housing complex in North America
- lots of recycling carts (8) in the moving room and the area is well lighted but poor signage
- no sprinkler in the lobby
- stairwell at either end of building but surrounded by units, no access outside, therefore no possibility for an external chute (Brick Façade)

- illegal dumping occurs, people place bulky items in front of locked fenced bulky waste enclosure
- no literature in chute rooms or elsewhere to promote recycling
- Chute Room approximate dimensions: 550 mm by 790 mm

2.4 Challenges

- staff cite laziness as primary reason for not recycling

2.5 Opportunities

- incentive program would make a difference – such as a free movie pass or coupons to local coffee shop
- trying to increase rents for poor recycling performance would punish those who recycle

3. Building 3

Pilot Site Building Info

Address	Building 3
Storeys	16
Units	299
Built in	1964
Owner	TCHC

Weekly Set-Out

Compacted Garbage Bins (3 yd^3)	7 bins every 2 weeks
Loose Garbage Bins (3 yd^3)	2- 3 loose bins per wk
Recycling Bins (3 yd^3)	3.5 bins per week
Recycling Carts	No carts provided inside the building

3.1 Levy information

This building falls into the XL levy category.

3.2 Waste Management and Recycling System

- collection from Building 3 is combined with collection from three other buildings (Building 4, Building 5 and one other) – one employee collects the compacted bins using a tractor and drags the bins to an enclosed chain link fenced in compound
- at same time the employee moves the full recycling dumpster to a location next to the compound
- one employee travels to every building every day (Monday to Friday) to see if any compacted or full loose bins need to be moved to the compound. Only moves the full bins
- Building 3 has four 3 cubic yard bins altogether
- one of the bins is always on the compactor with one spare waiting

- the bins are removed from the compactor every Tuesday, Thursday and Sunday morning for storage in the communal compound until garbage collection day
- the compacted and loose garbage bins are collected by Miller Waste on Tuesdays and Fridays and the recycling is collected on Wednesdays – all bins from all four buildings are collected at the same time
- Outside , beside the building, is an enclosure containing a 3 cubic yard recycling bin for all recycling in the building – there are no 360 litre carts used for recycling anywhere in the building due to fire regulations and vandalism concerns
- The lid on the recycling bin is at a 45^{o} angle to provide some protection from the elements but otherwise the bin is totally exposed to the weather
- The open, loose (uncompacted) garbage bin is located next to the recycling bin but not in the enclosed area – this bin is used for larger items that cannot fit down the chute
- Bulky waste is taken outside and placed beside the open, recycling bin in the enclosure

3.3 Observations

- City is starting to refuse to pick up garbage bins (loose) if they find too much cardboard in the bins
- There is no moving room in this building
- The building experiences about 12% turn over annually
- The Superintendent will sort out the recyclables from the loose garbage bin
- Staff dedication is important to get tenants to participate in programs, such as recycling
- Staff need to show that they are interested and willing to work in order for tenants to feel like participating
- 285 has lots of elderly and seniors in the building
- lots of illegal dumping in the loose bins – lots of construction & demolition waste
- Chute Room approximate dimensions: 700 mm by 800 mm
- Access could be provided to an external chute across from the existing window across near the elevators.
  - Exterior cladding: brick façade
  - There is a first floor structure that a prospective chute would have to avoid. The chute would require a bend or angle in it, furthermore the second and possibly third floors would not have access to said chute.
  - The bend could cause significant clogging issues, as seen in the current garbage chute.
  - A secondary structure would have to be added at the base to house the recycling. The ground floor structure would have to be changed to account for the existing pipe penetrations and building vents.
  - The site supervisor stated that the current ground floor structure is currently being used by the building, and could not be converted into a recycling collection room. However since significant additions would be required to add an external chute avoiding the existing first floor structure, it may be easier to renovate the first floor. Since an additional structure is required regardless, the recycle collection room could be installed directly below the chute, allowing for a continuous vertical drop servicing all floors, and an addition could be added to the existing structure to account for the lost usable space.
- There was lots of cardboard not broken down in the recycling bin
- The superintendent estimates that at least 25% of the compacted garbage contains recyclables (mostly cardboard, boxboard and containers)

- There is a huge language barrier in the building since there are many new immigrants that do not speak English
- There were no signs posted in the chute room or prominent places promoting recycling
- Each TCHC building has a Community Tenant Representative that is voted and elected by the tenants. The Community Tenant Representative in this building is very active and makes herself available for several hours every day from Monday to Friday in the common community room. She hands out the blue bins to all new tenants and explains the recycling program – she appears to be an integral part of the recycling program in this building
- The building experiences about 12-15% turnover.
- There are lots of textiles thrown down the chutes

3.4 Challenges

- Cannot locate large recycling bins in the lobby and on the floors due to concerns of vandalism and people setting them on fire
- Considered putting bins one each floor but again too much of a fire concern
- education is important since lots of new immigrants in the building
- The prominent attitude among tenants is that they don't care about the garbage; someone else should take care of it
- Poor attendance to tenant meetings (about 10 attend)
- Recycling bins provided to families are too small and the recycling literature is too difficult for new immigrants – need literature in lots of different languages

3.5 Opportunities

- Community Tenant Representatives can be very effective in engaging and educating tenants about recycling
- Community Tenant Representatives meet once a month which could provide an opportunity to become master recyclers and composters
- Opportunity to provide used clothing bins outside for use by the whole community

4. Building 4

Pilot Site Building Info

Address	Building 4
Storeys	16
Units	300
Built in	1964
Owner	TCHC

Weekly Set-Out

Compacted Garbage Bins (3 yd^3)	3 bins every week
Loose Garbage Bins (3 yd^3)	3 loose bins per wk
Recycling Bins (3 yd^3)	3 bins per week
Recycling Carts	No carts provided inside the building

4.1 Levy information

This building falls into the XL levy category.

4.2 Waste Management and Recycling System

- collection from Building 4 is combined with collection from three other buildings (Building 3, 295 Building 5 and one other) – one employee collects the compacted bins using a tractor and drags the bins to an enclosed chain link fenced in compound
- at same time the employee moves the full recycling dumpster to a location next to the compound
- one employees travels to every building every day (Monday to Friday) to see if any compacted or full loose bins need to be moved to the compound. Only moves the full bins
- Building 4 has four 3 cubic yard bins altogether
- one of the bins is always on the compactor with one spare waiting
- the bins are removed from the compactor every Tuesday, Thursday and Sunday morning for storage in the communal compound until garbage collection day
- the compacted and loose garbage bins are collected by Miller Waste on Tuesdays and Fridays and the recycling is collected on Wednesdays – all bins from all four buildings are collected at the same time
- Outside , beside the building, is an enclosure containing a 3 cubic yard recycling bin for all recycling in the building – there are no 360 litre carts used for recycling anywhere in the building due to fire regulations and vandalism concerns
- The lid on the recycling bin is at a 45^o angle to provide some protection from the elements but otherwise the bin is totally exposed to the weather
- The open, loose (uncompacted) garbage bin is located next to the recycling bin in the enclosed area – this bin is used for larger items that cannot fit down the chute
- Bulky waste is left outside beside the open, recycling bin in the enclosure

4.3 Observations

- The building experiences about 13% turn over annually
- lots of illegal dumping in the loose bins – lots of construction & demolition waste
- recycling is poor
- half of the building consists of new immigrants – family building

4.4 Challenges

- lack of education is a big problem – tenants don't know to recycle
- tenants must bring recyclables outside which is very inconvenient and no one monitors

4.5 Opportunities

- The superintendent has posted notices by each elevator and chute room asking tenants to participate in recycling and to report any garbage problems – the notices have made a difference
- The superintendent will be installing cameras on certain floors at the chute rooms for health and safety reasons
- Also planning on installing security cameras at the outside bins area to catch illegal dumpers
- The superintendent takes every opportunity to explain recycling to the tenants and win them over
- Need to improve recycling education and tackle all tenants at once – create synergies and support
- If tenants see super working to keep building clean then will take pride in building and participate in keeping it clean
- Need to have reminders for tenants such as stickers on the unit doors saying that they participate in recycling – need to remind others and have tenants remind one another
- 520 Kingston Rd (TCHC building) – 5 stories – has 2 chutes, very convenient and works well (superintendent contact is John Mills – 416 -791-6370)
- thinks a two chute system would work at Building 4
- Canada post stopped delivering mail for two weeks due to security concerns
- The superintendent tried innovative solution in another private MF building (10+ floors)
- One floor had lots of garbage on floor and in chute – so the superintendent closed all the chutes on all the floors and notified tenants on other floors as to the reason (floor xxx was not cooperating in maintaining a clean chute and floor) – posted a notice by the closed chute and identified the poor performing floor
- Notified everyone on the poor performance floor why the chute was closed
- Re-opened the chutes several days later and had the city make a presentation about recycling and provided literature and totes
- Recycling increased from 2 carts per week to 6 carts per week – tenants even breaking down and bundling OCC
- No problems after that
- Tenant Service Coordinators (TSC)s – first point of contact for new tenants – tenants must sign contract with TSC who inform tenants about rules and policies – but not providing enough information about recycling

- Great initiative to have a clause built into the contract requiring tenant to recycle – then tenant becomes accountable and provides TCHC grounds to enforce poor performance
- Thinks that an incentive program would work well – need to pilot
- Need to involve the tenants

5. Building 5

Pilot Site Building Info

Address	Building 5
Storeys	16
Units	300
Built in	1964
Owner	TCHC

Weekly Set-Out

Compacted Garbage Bins (3 yd^3)	3 bins every week
Loose Garbage Bins (3 yd^3)	3 loose bins per wk
Recycling Bins (3 yd^3)	3 bins per week
Recycling Carts	No carts provided inside the building

5.1 Levy information

This building falls into the XL levy category.

5.2 Waste Management and Recycling System

- collection from Building 5 is combined with collection from three other buildings (Building 3, Building 4 Street and one other) – one employee collects the compacted bins using a tractor and drags the bins to an enclosed chain link fenced in compound
- at same time the employee moves the full recycling dumpster to a location next to the compound
- one employees travels to every building every day (Monday to Friday) to see if any compacted or full loose bins need to be moved to the compound. Only moves the full bins
- Building 5 has four 3 cubic yard bins altogether
- one of the bins is always on the compactor with one spare waiting
- the bins are removed from the compactor every Tuesday, Thursday and Sunday morning for storage in the communal compound until garbage collection day
- the compacted and loose garbage bins are collected by Miller Waste on Tuesdays and Fridays and the recycling is collected on Wednesdays – all bins from all four buildings are collected at the same time

- Outside , beside the building is an enclosure containing a 3 cubic yard recycling bin for all recycling in the building – there are no 360 litre carts used for recycling anywhere in the building due to fire regulations and vandalism concerns
- The lid on the recycling bin is at a 45° angle to provide some protection from the elements but otherwise the bin is totally exposed to the weather
- The open, loose (uncompacted) garbage bin is located next to the recycling bin in the enclosed area – this bin is used for larger items that cannot fit down the chute
- Bulky waste is left outside beside the open, recycling bin in the enclosure

5.3 Observations

- The building experiences about 13% turn over annually
- lots of illegal dumping in the loose bins – lots of construction & demolition waste
- recycling is poor
- half of the building consists of new immigrants – family building
- Chute Room approximate dimensions: 700 mm by 800 mm
- Access could be provided to an external chute across from the existing window across near the elevators.
  - Exterior cladding: brick façade
  - There is a first floor structure that a prospective chute would have to avoid. The chute would require to have a bend or angle in it, furthermore the second and possibly third floors would not have access to said chute.
  - The bend could cause significant clogging issues, as seen in the current garbage chute.
  - A secondary structure would have to be added at the base to house the recycling. The ground floor structure would have to be changed to account for the existing gas meter and building vents.
  - The site supervisor stated that the current ground floor structure is currently being used by the building, and could not be converted into a recycling collection room. However since significant additions would be required to add an external chute avoiding the existing first floor structure, it may be easier to renovate the first floor. Since an additional structure is required regardless, the recycle collection room could be installed directly below the chute, allowing for a continuous vertical drop servicing all floors, and an addition could be added to the existing structure to account for the lost usable space.

5.4 Challenges

- lack of education is a big problem – tenants don't know to recycle
- tenants must bring recyclables outside which is very inconvenient and no one monitors

5.5 Opportunities

- The superintendent has posted notices by each elevator and chute room asking tenants to participate in recycling and to report any garbage problems – the notices have made a difference
- The Superintendent will be installing cameras on certain floors at the chute rooms for health and safety reasons
- Also planning on installing security cameras at the outside bins area to catch illegal dumpers
- The Superintendent takes every opportunity to explain recycling to the tenants and win them over

- Need to improve recycling education and tackle all tenants at once – create synergies and support
- If tenants see super working to keep building clean then will take pride in building and participate in keeping it clean
- Need to have reminders for tenants such as stickers on the unit doors saying that they participate in recycling – need to remind others and have tenants remind one another
- 520 Kingston Rd (TCHC building) – 5 stories – has 2 chutes, very convenient and works well (superintendent contact is John Mills – 416 -791-6370)
- thinks a two chute system would work at Building 5
- Canada post stopped delivering mail for two weeks due to security concerns
- Winston tried innovative solution in another private MF building (10+ floors)
- One floor had lots of garbage on floor and in chute – so Winston closed all the chutes on all the floors and notified tenants on other floors as to the reason (floor xxx was not cooperating in maintaining a clean chute and floor) – posted a notice by the closed chute and identified the poor performing floor
- Notified everyone on the poor performance floor why the chute was closed
- Re-opened the chutes several days later and had the city make a presentation about recycling and provided literature and totes
- Recycling increased from 2 carts per week to 6 carts per week – tenants even breaking down and bundling OCC
- No problems after that
- Tenant Service Coordinators (TSC)s – first point of contact for new tenants – tenants must sign contract with TSC who inform tenants about rules and policies – but not providing enough information about recycling
- Great initiative to have a clause built into the contract requiring tenant to recycle – then tenant becomes accountable and provides TCHC grounds to enforce poor performance
- Thinks that an incentive program would work well – need to pilot
- Need to involve the tenant

6. Building 6 and Building 7

Pilot Site Building Info

Address	Building 7	Building 6
Storeys	7	12
Units	103	161
Built in	1965	1965
Owner	TCHC	TCHC

Weekly Set-Out	Building 7	Building 6
Compacted Garbage Bins (3 yd^3)	4 collected twice weekly	7 collected twice weekly
Loose Garbage Bins (3 yd^3)	2 collected twice weekly	3 collected twice weekly
Recycling Bins (3 yd^3)	2 bins per week underused	2 bins per week underused
Recycling Carts	none	1

6.1 Levy information:

Both buildings fall into the XL levy category.

6.2 Waste Management and Recycling System

- For both buildings the recycling and garbage systems are entirely separate, a floor centralized chute system exists for garbage and the recycling bins are located outside the building in a separate area.
- The recycling bins are located to accommodate pickup: for Building 7 the location is isolated and somewhat remote from the building in a fenced in area. For Building 6 the recycling bins occupy the same area as the waste bins.
- Chute rooms are small and constrained (typical condition). In Building 7 the compactor room is very small and movement is restricted, in Building 6 the compactor room is much larger.
- In-unit recycling containers have been distributed in Building 7 but not Building 6.
- Recycling is promoted to a limited extent in the buildings as TCHC does distribute recycling calendars. A poster hangs in the main office as well.

6.3 Observations

- The recycling areas and bins are signed, but little evidence exists within the buildings or chute rooms that would direct people to recycle
- At Building 7, the chute rooms are beside the elevator shafts and measures approximately 4.5' x 4.5' in size. The drop is a direct straight-drop chute with no elbows or bends, and lands in a compactor room on the ground floor that is approximately 8' x 10' in size. The compactor room fits a maximum of one (1) large size dumpster inside, and is open to the exterior for removal access. At Building 6, the chute room measures approximately 5.5' x 3'. The chute room is approximately 25' x 40' and may fit up to 6 or 7 large bins.
- At Building 7 the recycling area is a distinct and remote location. There is no evidence that the site is controlled or that people fully appreciate what the bins are for. The recycling bins contain recyclables but bulk waste was deposited haphazardly within the fenced in area, making it difficult to approach and use the recycling bins. The bins have recycling signage posted on them but even the signs are difficult to see through the clutter of bulk items.
- Contamination levels in the recycling bins were high, including some bulk waste in the isolated bins for Building 7.
- Recyclables in the garbage were evident.
- Abuses of the chute system were reported and observations confirmed that chute rooms are often stuffed with material, with some bulk material (chair) being placed in the hallway.

- The general condition of the building requires attention
- While there are some indications that there is a recycling program in the building, for the most part there is very little that would indicate to a resident that recycling is an option, and how they might participate
- Management has doubts about the willingness of tenants to participate and about the general level of social consciousness amongst the tenant group
- Management favours a punitive approach to abuses (fines) of the chute and waste system and the use of cameras to support enforcement of the rules

6.4 Challenges

- The site team were told that the tenants lack motivation and may not care all that much about recycling. The advancement of waste diversion at both Buildings 6 and 7 will require inputs of energy and the development of better communication between both parties
- As with other TCHC properties, there does not appear to be direct accountability for payment of waste levies and the impacts on the building budget. Building management doesn't see a direct financial benefit.
- Overall conditions are poor, including litter in the hallways and general sightlines aspects.
- At Building 7, from a technological implementation/ building retrofit standpoint, the expansion of the current chute system for the purpose of increasing the number of individual chutes is not possible due to the restricting sizes of both the chute room and compactor room and their close proximity to the elevator shafts. The chute rooms are nestled into the mid-width of the building and the chutes are not connected to the exterior walls in any way. The same restriction applies to any expansion possibilities at Building 6, despite the compactor room being significantly larger. It is therefore felt that the expansion of the current system to implement a new approach is not possible from a buildings standpoint, even with the inclusion of significant restoration work.

6.5 Opportunities

- While there is a single chute on each floor in Building 7, the large L-shaped floor plan includes elevators and stairwells at either end of the building. The stairwells receive natural light from a fully windowed exterior wall along the entire height of the building.
- The layout and building exterior of Building 7 shows potential for chute additions on either end of the building. There is a stairwell at each end which runs the entire height of the building. These stairwells are very spacious and are bordered on the far size by a continuous, large glass window on the far ends that is approximately 8'-10' in width. The building envelope within the extents of the stairwell's far end consists of aluminum framing and glass, and is therefore easy to retrofit and does not require extensive restoration work as a brick cladded area would. There is enough width for a 3-chute system to be installed, *provided it does not violate any fire code or fire safety regulations pertaining to the stairwell*. Exterior (site) conditions are also favourable since both drops are easily accessible for removal vehicles and do not interfere with the building's front entrance of high-traffic areas. The two ends of the building provide opportunity for two separate chute systems to be installed, thus minimizing the walking distance from suites to the chutes.
- The buildings recycle at a very low level, so potential for additional capture is significant
- While the building manager reports that there are occasional meetings, the development of a recycling and diversion program in both buildings offers an opportunity to engage in meaningful communications and outreach with tenants

7. Buildings 8 and 9

Pilot Site Building Info – sites are physically identical

Address	Buildings 8 and 9
Storeys	23
Units	460 (230 each)
Built in	1978
Owner	Private

Weekly Set-Out

Compacted Garbage Bins (3 yd^3)	5 bins collected twice weekly
Loose Garbage Bins (3 yd^3)	2 loose bins twice weekly
Recycling Bins (3 yd^3)	1 collected weekly, virtually unused
Recycling Carts	1 at Building 9, 3 at Building 8

7.1 Levy information:

Both buildings fall into the XL levy category.

7.2 Waste Management and Recycling System

- For both buildings the recycling and garbage systems are entirely separate, a floor centralized chute system exists for garbage and the recycling bins are located outside the building in a separate area.
- Recycling carts are located behind the building with the rolling bins
- Chute rooms are small and constrained (typical condition)

7.3 Observations

- Little evidence exists within the buildings or chute rooms that would direct people to recycle
- The building attendant in Building 9 noted that building staff recycle when the opportunity arises but the recycling bins are not used by many others
- Recycling bins are not located in natural traffic areas
- Recycling is nearly non-existent and recyclables in the garbage were evident.
- Abuses of the chute system were reported and observations confirmed that chute rooms are often stuffed with material, with some bulk material (chair) being placed in the hallway
- Site contacts indicated that there are numerous cultural and language barriers to be overcome at this building and that the tenant profile is largely new Canadians for which waste diversion and recycling is far down the list in terms of priority. We were told that many large families are housed in the buildings and that many do not have a basic understanding about their new surroundings and country
- Tenants were described principally as low rent renters, lots of kids, on social assistance, and lacking a sense of social responsibility
- The general condition of the buildings require attention

- The chute rooms are beside the elevator shafts and measures approximately 3.5' x 5.5' in size. The drop is a direct straight-drop chute with no elbows or bends, and lands in a compactor room on the ground floor that is approximately 35' x 15' in size. The compactor room is quite large in size, and is open to the exterior for removal access.
- Building 8 has a vacancy level of about 70 units, as the building management limits vacancies to a single building as an efficiency measure.
- A follow up conversation was conducted by telephone with a representative of MicroSkills:
  - Community MicroSkills Development Centre is a multi-cultural, non-profit, community-based organization committed to assisting the unemployed, with priority to women, racial minorities, youth and immigrants. The organization is supported by both public and private funding including The United Way and all three levels of government
  - The organization was referred to the study team by the building management as a link to tenants
  - The mandate for the organization includes Action for Neighbourhood Change (ANC) in which residents are encouraged to take initiative within their community and become stakeholders
  - The organization reports a lack of communication and lack of trust between tenants and building managers
  - While there are challenges to working with some elements of the tenant population, it was felt that the communication style of the building management required change for progress to occur
  - MicroSkills would not be in a position to deliver program-specific information such as that related to the participation in a recycling program, but would be comfortable in their role of getting people to attend sessions. From their perspective, however, they would be reliant on building management to do their part – in other words put the program infrastructure in place – in order to make any efforts at education and outreach successful.

7.4 Challenges

- The building manager was extremely cooperative and supportive, but to date has been unable to expend much effort to promote or facilitate waste diversion or recycling
- The general flavour of the discussion would appear to be supportive but fully reliant on "other people" to make it happen. Discussions regarding tenants were referred to a third party.
- As a privately operated building it would not appear that the garbage levy is registering with decision makers in the desired manner. The financial incentive to recycle is not translating into action
- Overall conditions are poor
- The advancement of waste diversion at both Buildings 8 and 9 will require inputs of energy and the development of better communication between building operators and tenants. Consistent with other findings and literature on the subject, it would appear that communication, outreach and training efforts will be required for staff and tenants alike, and that for waste diversion efforts to be successful it will be necessary to bridge a gap between the parties.
- From a technological implementation/ building retrofit standpoint, the expansion of the current chute system for the purpose of increasing the number of individual chutes is not possible due to the restricting sizes of both the chute room and compactor room and their close proximity to the elevator shafts. The chute rooms are nestled into the mid-width of the building and the chutes are not connected to the exterior walls in any way. Despite the compactor room being significantly large, it is conclusive the expansion of the current system to implement a new approach is not possible from a buildings standpoint, even with the inclusion of significant restoration work.

7.5 Opportunities

- There are possibilities to establish centralized recycling areas in the parking lot areas, in available areas near the elevators. These are natural traffic areas and would require the willingness by staff to move carts to a central collection area on a regular basis.
- The building recycles at a very low level, so potential for additional capture is significant
- The development of a recycling and diversion program in both buildings offers an opportunity to engage in meaningful communications and outreach with tenants
- Building 9 shows slight potential for chute additions on the North end of the building, but is subject to many engineering constraints should a retrofit be undertaken. There is a stairwell at the North end which runs the entire height of the building. These stairwells are very spacious and are bordered on the far size by the brick-clad exterior wall of the building. While the exterior site surroundings are accessible, a retrofit here requires extensive work in removing a portion of the wall and replacing it with a chute, though this is not impossible. There is enough width for a 3-chute system to be installed, *provided it does not violate any fire code or fire safety regulations pertaining to the stairwell*. Exterior (site) conditions are also favourable since it contains an abandoned tennis court area that can be landscaped for truck access. This is somewhat similar to the neighbouring Building 8 building which follows the exact same layout. This aside, the existing chute room may allow for a tri-sorter style technological implantation, since the receiving compactor room is quite large and can accommodate 3 separate dumpsters.
- The possibility exists to engage a third party agency in the development of outreach, a party which has links to the broader community (MicroSkills)

8. Building 10

Pilot Site Building Info

Address	Building 10
Storeys	18
Units	192
Built in	1969
Owner	Private

Weekly Set-Out

Compacted Garbage Bins (3 yd^3)	2 bins collected twice weekly
Loose Garbage Bins (3 yd^3)	none
Recycling Bins (3 yd^3)	5 collected weekly
Recycling Carts	Plastic bags used in chute rooms

8.1 Levy information:

The building falls into the XL levy category.

8.2 Waste Management and Recycling System

- The building offers centralized garbage and recycling on each floor. Garbage is provided for through garbage chutes, while building managers have accommodated recycling by installing a

hanger at the back of the chute room on which a clear bag for recyclables is made available. Building management takes direct responsibility to remove and transport recyclables and replace the clear bag

- Chute rooms are small and constrained (typical condition) but, as noted above, the building management has proactively adapted a working system to accommodate recycling.
- The management promotes recycling at a corporate and building level including sponsoring promotional materials and recycling contests (recycling passport) with prizes, like iPods
- Incentives are also provided to building staff who meet objectives to reduce waste or reduce costs in the building. Building management provide tickets to Raptors games, for instance, and also demonstrate that savings are re-invested in the building through upgrades and repairs. This is a key aspect to gaining the cooperation of building staff.
- The management has established a culture of communication, sponsoring regular coffee meetings and summer barbeques as a communication platform.
- Building managers did not wait for the City supply of in-unit containers, they supplied the units themselves

8.3 Observations

- Recycling materials appear almost 100% clean and very little recyclables are in the waste stream.
- Signage promoting recycling is evident in chute rooms and other common areas
- Building managers are fully supportive of recycling, fully aware of their waste costs and in general operate in a manner that assumes control of situations where cost is at issue. For instance, to control energy costs, tenants take old light bulbs to the building manager to exchange for a new one
- The chute rooms are beside the elevator shafts and measures approximately 2.5' x 3' in size. The drop is a direct straight-drop chute with no elbows or bends, and lands in a compactor room on the ground floor that is approximately 25' x 20' in size. The compactor room is quite large in size, and is open to the exterior for removal access.
- The size of the property management corporation appears to make a difference, most notably in the area of resources available to support waste diversion and outreach in the building. For instance the property manager indicated that there are linguistic challenges ("people here come from everywhere in the world") This was overcome because so many languages are spoken within the company. The company also has a recycling support position to assist with programs.
- While the building manager felt that the building demographics were similar to most multi-cultural situations we have encountered, he felt the family sizes were not as large as claimed by other buildings in the study.

8.4 Challenges

- For this situation it may be difficult to prove whether any technology or operating change will yield results since any improvement over current levels may be marginal.
- From a technological implementation/ building retrofit standpoint, the expansion of the current chute system for the purpose of increasing the number of individual chutes is not possible due to the restricting size of the chute room and its close proximity to the elevator shafts. The chute rooms are nestled into the mid-width of the building and the chutes are not connected to the exterior walls in any way. Despite the compactor room being significantly large, it is conclusive the expansion of the current system to implement a new approach is not possible from a buildings standpoint, even with the inclusion of significant restoration work.

8.5 Opportunities

- Despite the reduced potential to measure impacts, this location would be an ideal place to pilot the functionality of a technology or operational change if one can be found. The building management is in full control and communicates with tenants, so prospects for training and outreach are good.
- This building and building operator may serve as a model
- Diversion beyond recycling might be tested here in cooperation with the building manager, such as green cart SSO

9. Building 11

Pilot Site Building Info

Address	Building 11 (family building)
Storeys	18
Units	139
Built in	1968
Owner	Private

Weekly Set-Out

Compacted Garbage (3 yd^3)	1.5 bins collected weekly
Loose Garbage Bins (3 yd^3)	½ bin per week
Recycling Bins (3 yd^3)	3.5 collected weekly
Recycling Carts	

9.1 Levy information

The building falls into the XL levy category.

9.2 Waste Management and Recycling System

- The building has a dedicated garbage chute on each floor which leads to a compactor
- Several recycling carts are provided in the covered and underground parking garage, all were observed in good condition and with good lighting
- The building management has a surveillance camera focused on the bins outside so they can watch for any illegal dumping activity
- Recycling signage was minimum throughout the building
- Small recycling bins in the party room and in the lobby
- Tenants are good at using the recycling totes provided to them by the city.

9.3 Observations

- Chute rooms are small and constrained but large enough to hold a large recycling bin although no effort has been made to provide them in the chute rooms.

- There is no signage in the chute room promoting recycling
- There were no carts provided in the lobby area or moving room area. One cart was provided in the laundry room.
- Building manager is supportive of recycling, and talks to tenants about recycling when they sign the contract. She will show them where the recycling bins are located. The building manager and superintendent seem to have a good rapport with the tenants.
- This seems to be a well operated building with good, well mannered tenants who understand the need to participate in recycling – management estimates that more than 50% of tenants participate in the recycling program
- There is no access the building exterior (brick façade), therefore no external chute is possible.
- There is a possibility of installing a second chute in the building through the exiting locker rooms. However there are some significant issues that would have to be addressed
- The locker rooms are currently being used by the units and the locker space would have to be greatly decreased.
- The chute would need an area on the ground floor to store the recycling. There may be a possibility of redesigning the ground floor layout to accommodate this. Further investigation would be required to determine the feasibility of this option. With respect to the building layout, no clear opportunities are present for the implementation of an easily accessible multiple-chute system. Barring social/human constraints and chute room constraints, a tri-sorter retrofit of the existing chute is the only likely solution, since the receiving compactor room is quite large and can fit 3 separate compactors.

9.4 Challenges

- When asked about putting a recycling bin in each chute room, the superintendent responded that it would cause him too much work.
- Anything that creates extra work for the superintendent is not wanted, for example closing of the chutes seen as extra work because of the added mess that would be created.

9.5 Opportunities

- The building has experienced problems with tenants not properly recycling pizza boxes so it is not requiring all pizza delivery staff to identify the apartment number on the box so that the tenant can be traced if they try to throw it down the chute.
- Staff were interested in a reward program that targeted children in the building.
- Next to the chute room is a locker room for tenants to store items. There may be an opportunity to add in a chute in the locker room but not sure where it would end up on the main floor.

Appendix C

Tenant Survey and Summary

1. Tenant Surveys

Tenant surveys were conducted in entrance lobbies at Building 5, Building 11 and Building 2. Space was provided at the end of survey for tenants to make comments on what would help them to recycle more. Tenants were encouraged to comment on their building's existing recycling system and recommend any strategies that they felt would increase waste diversion.

1.1 Observations

The brief observations that follow are based on the comments provided in the surveys and conversations with tenants.

- Those surveyed generally felt that recycling was important and that increased participation in their building's recycling program would be a good thing.
- Many of the survey participants did not want recyclables collected or stored inside the building (bins in the building, carts or bags in the chute room) because of concerns about odour and pests.
- Many tenants have difficulty knowing what to recycle and what to dispose of.
- Tenants were less enthusiastic about strategies requiring a high level of cooperation from other tenants (designated chute times or temporary chute closures) because of concerns about garbage and recycling being left in hallways, chute rooms, or thrown over balconies.

1.2 Tenant Comments

Written feedback was provided on 30 of the 73 surveys collected. Comments are listed below.

1. Recycling bins outside each garbage chute
2. Put the bins closer to the apartment.
3. Define what to recycle.
4. I always recycle.
5. More posters / information. Provide information on the negative consequences.
6. I appreciate the blue bins provided in each unit.
7. I don't want to come outside late at night [to take out recycling to bins]. If chutes are closed people will throw garbage on the floor.
8. Place recycling bind outside each garbage chute.
9. Place recycling bins closer to the building.
10. Make more bins available and have them picked up more often.
11. I am a past Etobicoke house resident. I grew up recycling. I only throw non-recyclables and food waste down the chute. A large green bin may help. Multi-language information may help. My Farsi friend has no concept of recycling.
12. Pay-As-You-Throw system would work – like in Europe.
13. Can't think of anything you didn't already mention.
14. More information about what to put and what not to put in bins.
15. More information on what to recycle.
16. More bins on every level [of the building]. Tell us how much recycling really saves or costs in the end.
17. Education.
18. Bigger blue boxes [inside apartments] as we have to make two trips.
19. People need to learn self-help. Do the right thing. Use stickers on the fridge, signs on chutes. I like the idea of options. People need information to make proper decisions.
20. N/A. I recycle all the time.
21. Place the bins indoors.

22. Our building should have recycling bins on each floor, because it's sort of hard to come down to the lobby and put out the recycling.
23. The St. Jamestown youth council could become more involved.
24. A safe and healthy environment.
25. If the garbage chutes would close at certain times for recycling.
26. Nothing.
27. Need to provide door-to-door service. That would work.
28. Need to simplify instructions on what to recycle, and enforce the $300 fine for leaving garbage in the chute room.
29. Tenants are not all participating. They need to know importance to save money and the environment.
30. Don't place bins inside the building because of bugs.

1.3 Survey

A copy of the survey completed by tenants is attached.

Recycling Survey

You are: ☐ Male ☐ Female
Age: ☐ 0 - 20 ☐ 20 - 40 ☐ 40 - 60 ☐ 60 +

How many people live in your apartment?
Adults: _____ Children under 10 years: _____ Children over 10 years: _____

Who puts out the recyclables in your household? ☐ Adults ☐ Children

Does your household recycle? ☐ Always ☐ Sometimes ☐ Never

Which is true for your household? Please check one box per question (☑).

	Strongly Agree	Somewhat Agree	Disagree	Strongly Disagree
Finding time to recycle is a problem	☐	☐	☐	☐
We forget to recycle	☐	☐	☐	☐
We don't know what to recycle	☐	☐	☐	☐
The recycling bins are too far away / not convenient	☐	☐	☐	☐
We don't see how recycling benefits us	☐	☐	☐	☐

What would help your household to recycle more? Please check one box per question (☑).

	Strongly agree	Somewhat Agree	Disagree	Strongly Disagree
Placing recycling bins inside the building	☐	☐	☐	☐
More posters to remind me to recycle	☐	☐	☐	☐
Information about the impact on your building ($ cost for garbage, $ savings from recycling)	☐	☐	☐	☐
A reward program	☐	☐	☐	☐
Collection of recyclables on each floor	☐	☐	☐	☐
Specific times to use the garbage chutes for recycling (eg. Tuesday and Thursday from 4 – 7 pm)	☐	☐	☐	☐
Temporarily closing the garbage chute because tenants are not recycling	☐	☐	☐	☐

Tell us what would help you to recycle more:

Thank you for taking the time to complete this survey.

Appendix D

Additional Information for Selected Candidate Strategies

1. Chamber System (Pay-as-you-Throw) Approach in Europe

In Europe, communities have begun to address opportunities to target multi-residential buildings using a volume based or weight based Pay-as-you-Throw (PAYT) system. This system uses a technology called the chamber system (also referred to as a "waste lock" or "lockhopper" technology). The chamber looks like a chute attached to the top of a container (located outdoors). The user accesses the chamber (chute) using a smart or chip card or an electronic key. The card or key opens the "gate" and the waste is placed in the chamber. When the "gate" is closed the waste drops into the container and the card or key is returned. The amount of waste deposited in the chamber is recorded by volume or weight and the user is then billed or prepaid credits are deducted directly from the card. Some sophisticated chamber systems send radio signals to a waste hauler when the bin is full and needs to be emptied.

It should be noted that European communities are characterized by low and medium rise MF buildings that do not use chute systems within the buildings to collect garbage. Many buildings rely on outdoor collection stations and communal bin to service tenants. This approach lends itself to the chamber system.

The chamber system is attributed to reducing waste sent for disposal by 30 – 50%.[10] However, some communities have installed PAYT chamber systems to a compactor that is accessible by members of the community. These compactor systems tend to service larger housing estates and blocks of flats in the community. The system can be designed as a volume based or a weight based system. The advantages include:

- Pay as you go invoicing using a charge card or pay as you go card
- Reduced transportation costs due to compaction of the waste at a ratio of 5:1
- No smells
- Daily statistics and reports available over the internet
- Automated container level warnings are sent to the company when container needs to be replaced.

This system is being used in a number of European communities including Venice Province, Italy; Laussa, Austria; Wollerau, Switzerland, and Boblingen Germany.

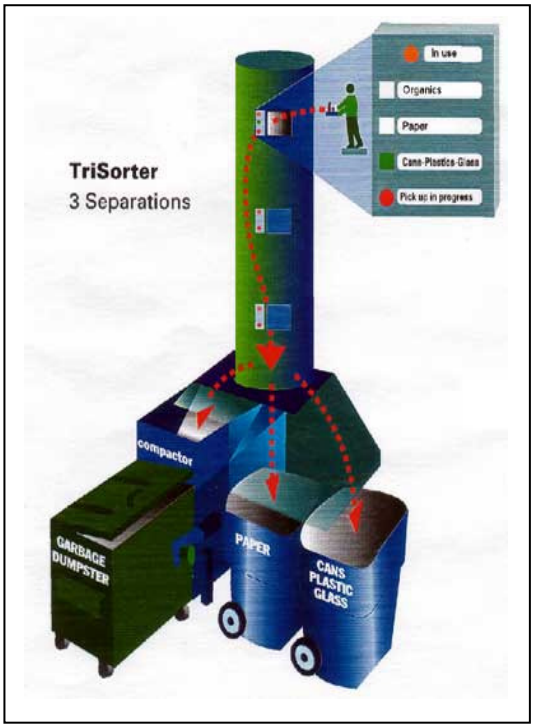
[10] Reichenbach, Jan. March –April, 2005. *Pay as you Throw*. **Waste Management World**

PAYT chamber system attached to a compactor

A large property management company in Boblingen (Germany) uses the compactor system. They use it for multi-family housings ranging from 52 to around 500 units. It is a closed chamber system with a press container. People have cards for identification, the chamber opens when inserting the card. The waste is then put into the chamber, is weighed and then dumped and pressed in the container. Data is saved in the chamber system (computer) and transmitted electronically every night to the supplier company. Data are immediately put into the internet, so the property management has immediate access to the data for the billing. Before they introduced this system in 2001, they ran a number of tests (all based on weight), but they found this system (although rather expensive) the best, since the containers are leak-proof. After introduction, they found a large decrease in organic waste which was collected separately, they had to increase waste containers for bio-waste (increase from 50 to 100%). Illegal dumping is only a minor problem and has not increased significantly since introduction of this system.

2. Tri-Sorter Technology

The single chute – button sorting technology (i.e. Tri Sorter technology) is an innovative system that uses a control panel attached to each chute on every floor of a multi-residential building which diverts different waste streams (recyclables, garbage and organics) into designated bins in the garbage room.

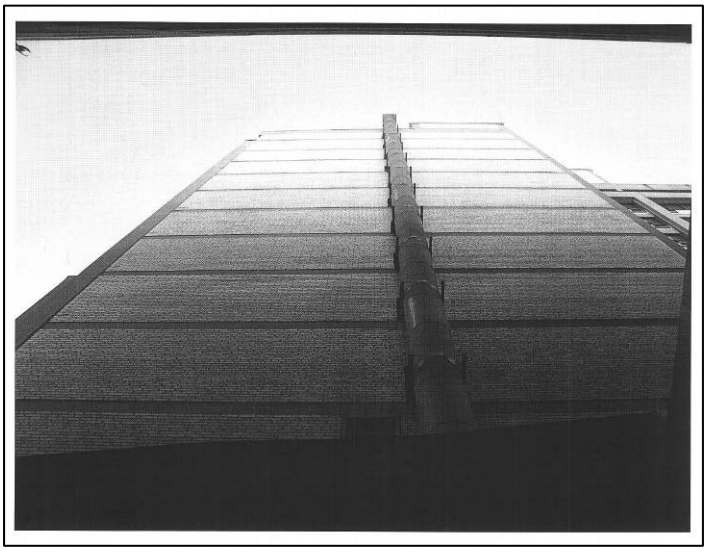


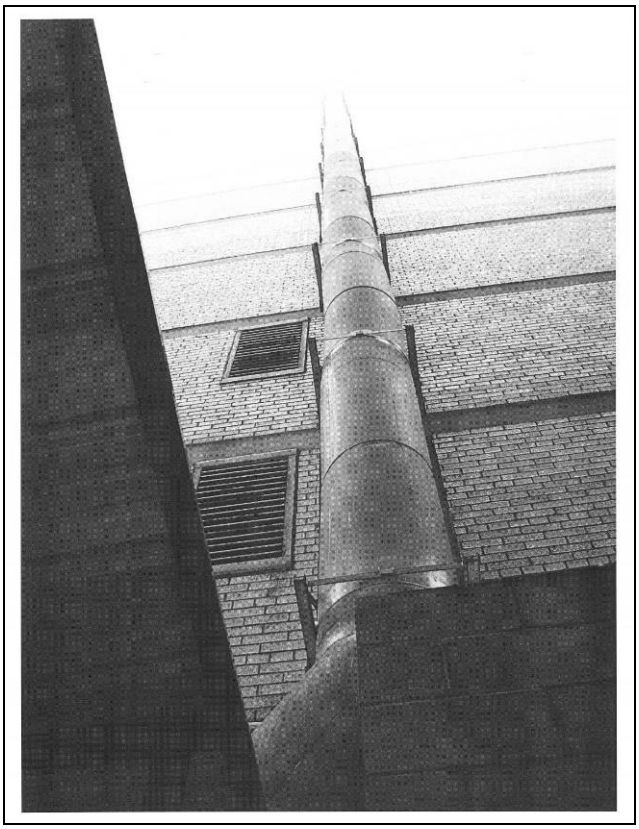
Each chute room is equipped with a control panel connected to a carousel unit in the main garbage room. Each control panel contains a number of buttons, each corresponding with a specific type of material (i.e. one button for garbage, one for recyclables and one for organics). Each chute room also is equipped with a locking mechanism for the chute hopper. When the chute is being used by someone on another floor, the system automatically locks all other chute doors to prevent two different types of material from falling into the same container.

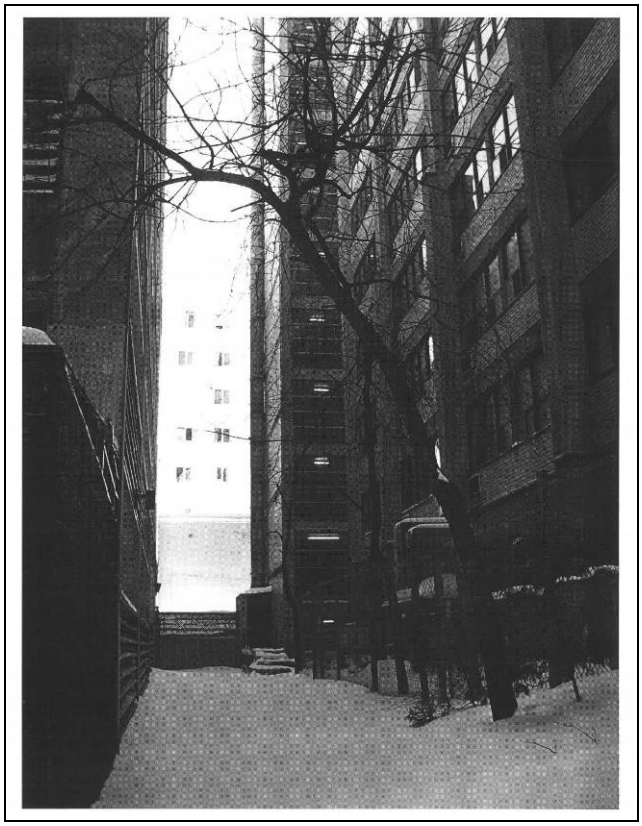
The carousel and collection bins, located in the main floor garbage room, are situated under the opening of the chute. The carousel is a round steel plate that can rotate. By rotating the carousel, the chute is placed under a different bin corresponding to the material being diverted. The carousel's rotation mechanism is activated when a resident pushes a button on the respective control panel.

3. External Chute

In the case of an external chute, the chute is fitted outside the building with access to the chute from within the building.



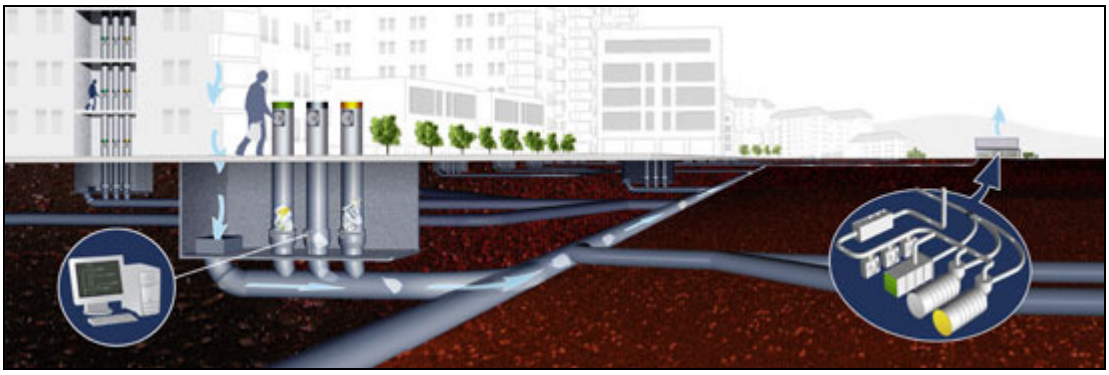




4. Vacuum Collection System

One of the emerging technologies used in the collection and handling of waste and recyclables is the stationary, underground vacuum system which offers a unique management system for disposing of waste and materials. The vacuum system works similarly to a chute system whereby the resident disposes their waste down a chute available on every floor of the multi-family building. It is at this point that the system diverges from a conventional garbage collection system. When garbage is deposited into the chute, it is temporarily stored in a chute until a control system opens a valve in the chute which then pulls the waste through underground pipes into a centralized collection station. The inlets connected to the collection station are automatically emptied at regular intervals. The control system switches on the fans and a vacuum is created in the network of pipes. Then the valve to each selected chute is opened to allow transport air to enter the system and the garbage to be moved through the pipes.

If the system is designed for recyclables and organics as well then each category of material has its own chute in each collection point. All chutes are connected to the same network of pipes, but they are emptied separately. The collection station has a corresponding collection container to the material being collected separately. Transportation from chutes to collection station is fully automatic and controlled by valves and computer. The various categories are kept apart and directed into the correct container.

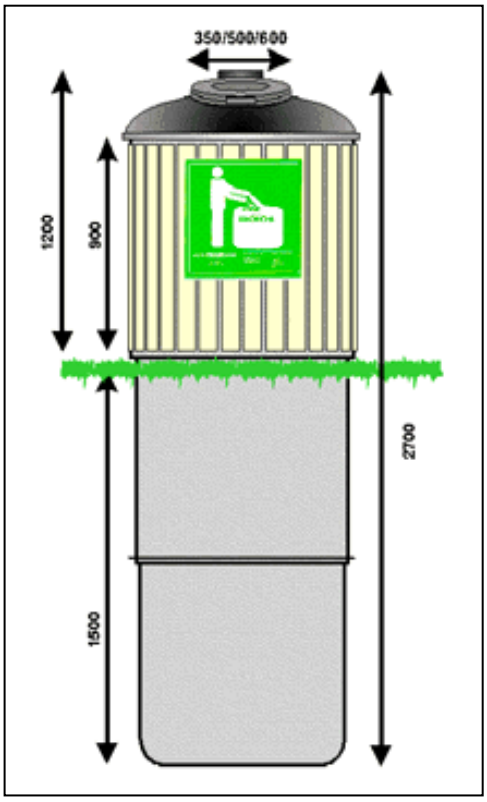


As shown in Spacing Montreal, September 20th, 2008

5. Deep Collection System

The deep container system uses underground storage as its principle advantage over other storage systems. Majority of the container system (60%) is installed below ground with the remaining (40%) located above ground. The above ground unity provides an opening for users to access and place their materials inside. The materials are stored underground until collected. The underground storage provides several advantages:

- It enables a larger storage area to be used because the storage compartment is hidden underground;
- It reduces the number of waste and recyclable collections required due to the large storage capacity;
- It allows for natural compaction by gravity which permits more material to be stored;
- it remains cool underground which eliminates odour and vermin problems.



The main well of the system is often made of a strong plastic (i.e. high-density polyethylene) which is seamless and leak proof. Inside the well is a strong bag made of woven polypropylene which can be lifted out of the well to be emptied. The top of the container can be made of polyethylene or corrugated aluminum (which is graffiti proof) and can have lockable lids for safety purposes. The hole for disposing of the material can come in different sizes to suit the deposit needs of the material (i.e. 6" holes for recyclable cans and bottles to slits for newspapers and cardboard).