

City of Portland, Maine

Finance Committee Meeting

Thursday, November 12th, 2015

5:30 p.m., Room 209

AGENDA

1. Solid Waste Discussion – Additional Options
2. FY17 Budget Timeline

1. Finance Committee Meeting Agenda And Backup

Documents: [FC AGENDA AND BACKUP 11-12-15.PDF](#)

2. Additional PAYT Materials

Documents: [ADDITIONAL PAYT MATERIALS.PDF](#)

3. Kessler Report

Documents: [KESSLER REPORT.PDF](#)

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- 1. Solid Waste Discussion – Additional Options**
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To: Jon Jennings, City Manager

From: Mike Murray, City Manager's Office

Copy: Anita LaChance, Deputy City Manager, Brendan T O'Connell, Finance Director

Date: November 12, 2015

RE: **PAYT and Solid Waste Collection Alternatives and Cost Estimates**

Alternative Pay as You Throw (PAYT) Options

Staff has been asked to provide data on the feasibility of implementing a PAYT program that does not include the use of PAYT bags purchased by residents. It was suggested that an alternate variable rate fee system (VRF) might be preferable to the existing City program. There are two types of VRF options – by volume or by weight. The current program maintained by the City is a VRF by volume system where City residents purchase designated bags for solid waste. The program would translate well to a carted collection system as the drivers of the solid waste collection vehicles would easily be able to see if designated bags were being used.

Alternative 1 – PAYT Tags: One additional VRF by volume system which is currently being used by a small number of communities is a PAYT tag program. In a PAYT tag program residents purchase their PAYT tags in much the same manner as PAYT bags. Under this scenario, residents will still be purchasing trash bags of their choice in addition to purchasing the PAYT tags so there is typically no significant reduction in plastic usage. With a PAYT tag system the speed of collection would be reduced and there is also an increased chance of error on the driver's part if he/she is unable to see the attached tags during the dumping of the cart. Communities using the PAYT tag program experience an increased volume of administrative work required to send violation notices and follow up with residents when tags were not used or were not visible to the driver.

Alternative 2 – PAYT by Weight: A second VRF alternative is a weight based collection system, where the cart is weighed during the collection process. Automated side arm loaders are able to give an approximate weight during the dump; the most accurate weight is determined by a scale attached to the tipper unit of a rear loader. The reduced productivity of utilizing rear end loaders for this type of collection will increase labor costs as crews will be working at a slower rate.

Alternative 3 – PAYT by Monthly Fee: Staff was also asked to investigate the feasibility of assessing a monthly fee to residents in lieu of PAYT. In order to implement this type of fee or the weight based fee described above, The City would have two options: 1. Invoice the owners of the properties based on the number of units per building; or 2. Invoice individual tenants for trash removal services. Under the latter scenario, tenants will have to create an account with the City to receive trash service; the city's database will need to expand greatly. Monthly fee estimates under a variety of scenarios are included in Appendix A on page 5.

If it is decided to establish a PAYT program that does not include the current method of PAYT bags, such as a weekly/monthly fee or pay by weight, the following factors need to be considered:

- a. Additional staff will be required to process the monthly billing, track past due accounts and provide customer service – these costs are estimated at \$94,100 annually
- b. Cost of the monthly billing (materials, postage, lockbox) - \$198,250 annually

Additional details on PAYT programs can be found in Appendix B, Appendix C and Appendix D to this memo.

Collection Options & Cost Details – City Operated vs Private Contractor Operated Collections

In addition to the alternative PAYT options presented above this memo also includes cost details for five alternative solid waste and recycling collection options for the City of Portland. These four options include:

- A-1: Current City Operated Program
- A-2: City Operated Program with Carts for All Residents
- A-3: City Operated Program with Carts for Non-Peninsula Residents Only
- A-4: Hybrid Model – Contractor Operated Program with Carts for Non-Peninsula Residents Only;
City Operated Program (no carts) on Peninsula

Appendix A of this memo includes a detailed breakdown of the revenues and expenditures for each of these options.

The four options above were presented to Finance Committee at the October 22, 2015 meeting. At that meeting Staff was asked to estimate costs for a fifth option. This option would include costs of carted solid waste and recycling collection City wide fully by private contractor. This contract would cost the City an estimated \$3.2 - \$3.4M annually. The estimate is based on the following items which would be included in the outsourced contract:

- a. 10 year contract term;
- b. Two 64 gallon carts per customer x 25,000 estimated customers;
- c. Staffing costs – fully borne by contractor
- d. Vehicles, fuel and maintenance costs – fully borne by contractor
- e. Data collection, route / performance enhancement costs - fully borne by contractor
- f. Customer service – fully handled by and costs fully borne by contractor

Additionally, questions were posed about the cost to municipally collect solid waste and recycling. Costs that had not been calculated in the original data above were the purchase of the hardware, software, and yearly licensing fees for data collection. The following budget numbers need to be added into the municipal costs:

- a. Installation of data collection hardware per vehicle: \$12,000
- b. Initial licensing fee for data collection system software: \$25,000
- c. Annual data collection license fee per vehicle: \$1,500
- d. Annual data collection license fee for municipality: \$4,000

Appendix A

11/12/15

City of Portland Solid Waste Collection Alternatives and Cost Estimates

	A-1	A-2	A-3	A-4	A-5
	Current City Operated Program Budget FY16	City Operated Program with Carts for Entire City	City Operated Program with Carts for Non-Peninsula Only	HYBRID - Private Contractor Program for Non-Peninsula with Carts - City Operated on Peninsula (no Carts)	Private Contractor with Carts For Entire City
Net Revenue From PAYT	1,869,685	1,869,685	1,869,685	1,869,685	1,869,685
Salary & Related Expenses	1,019,263	749,485	749,485	599,088	-
Waste Disposal	690,900	690,900	690,901	690,901	-
Private Contractor	-	-	-	1,400,000	3,200,000
Data Collection Software	-	30,500	30,500	-	-
Vehicle Related Expenses	259,507	194,634	194,635	113,377	-
Operating Expenses	1,969,670	1,665,519	1,665,521	2,803,366	3,200,000
Purchase of Carts	-	2,500,000	1,500,000	-	-
CIP: Trucks	265,000	2,565,000	2,565,000	265,000	-
Total Cash Flow Output	364,985	4,860,834	3,860,836	1,198,681	1,330,315

Bag Revenue Impact if Eliminated

Elimination of PAYT (bags)

Bag Revenue	2,040,185
Cost of Bags	(167,500)
Storage of Bags	(3,000)
Net Loss of Bags	<u>1,869,685</u>
*Increase in Disposal Cost	60,983
Cost to the City for Eliminating of Bags	<u>1,930,667.50</u>
Tax rate \$ increase	0.25
Tax rate % increase	1.2%

* Per the Kessler Consulting Report

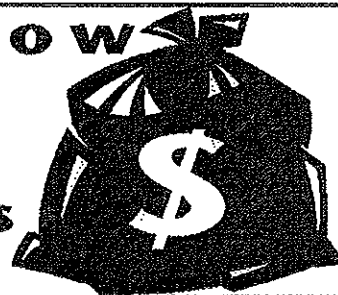
If we eliminate the Pay-As-You-Go Bags, the report indicates that the Recycling Rate will drop by 20%. This yields a cost to the City of \$60,983 (865 tons @ \$70.50) for disposal cost. Total Curbside recycling tons are 4,325 @ 20% equals 865 tons.

PAYT Alternative 3 - PAYT by Monthly Fee - Monthly Fee Estimates under each Scenario

	CS	Billing	Total	Households	Per HH	Per Month
Monthly bill based on offset of PAYT Revenue	\$ 1,869,685	\$ 94,100	\$ 2,162,035	25,000	\$ 86.48	\$ 7.21
Monthly bill based on offset of total A-1 cost	\$ 1,969,670	\$ 94,100	\$ 2,262,020	25,000	\$ 90.48	\$ 7.54
Monthly bill based on offset of total A-2 cost	\$ 1,665,519	\$ 94,100	\$ 1,957,869	25,000	\$ 78.31	\$ 6.53
Monthly bill based on offset of total A-3 cost	\$ 3,200,000	\$ 94,100	\$ 3,492,350	25,000	\$ 139.69	\$ 11.64
Monthly bill based on offset of total A-4 cost	\$ 1,665,521	\$ 94,100	\$ 1,957,871	25,000	\$ 78.31	\$ 6.53
Monthly bill based on offset of total A-5 cost	\$ 2,881,167	\$ 94,100	\$ 3,173,517	25,000	\$ 126.94	\$ 10.58

Pay As You Throw

Implementing volume-based solid waste fees



This is part of a series of Fact Sheets providing information for communities to help increase participation in recycling and solid waste management programs. Each is designed to improve the success and viability of the specific option described. These Fact Sheets were developed by Resource Recycling Systems, Inc. as part of our comprehensive "Guidebook for Residential Recycling and Composting Participation Incentives."

For more information on the guidebook, or to find out how RRSI can help you with your community's implementation of variable-rate fees, please call (734) 996-1361 or e-mail us at <mailto:rrsi@recycle.com>

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Introduction

Variable-rate fee (VRF) systems, also known as Pay-As-You-Throw (PAYT) programs, encourage recycling by tying the cost of waste services directly to the amount of trash a resident produces. Sometimes also referred to as unit pricing systems, variable rate fees may be weight-based or volume-based. Many commercial establishments served by private haulers pay on a volume basis. By contrast, most single-family residences in the United States pay a flat fee, although pay-as-you-throw programs are rapidly increasing in popularity.

Some reasons for selecting a VRF system for residential collection programs include:

- Residents pay for the level of service used.
- Residents are encouraged to reduce the amount of waste produced.

Many communities use variable rates because many residents see it as more fair than a flat fee. Combined with free or low cost recycling service, a pay-as-you-throw program can be an effective way for residents to pay for refuse collection proportionate to their use of the service. When recycling and composting services cost less for the resident than waste collection, variable rates encourage higher material diversion rates.

Variable Rate System Options

There are two major types of variable rate fee systems. The most common are *volume-based* systems in which residents pay more depending on how many and what size of bags or cans of garbage they set out each week. *Weight-based* systems require scales to measure how many pounds of waste residents set out each week.

Volume-Based Variable Rates for Cans & Bags.

Volume-based variable rate may be based on:

- The number or size of cans used. Residents are given standardized can or cart sizes depending on their intended usage level. They also may "subscribe" to one or multiple container collection service.
- The number of bags or tags used. Residents may buy specially-marked bags or tags from municipal offices as they need them. Tags are usually brightly-colored adhesive-backed stickers that residents place on their own trash bag. The bags are usually color-coded or imprinted to distinguish them from other bags.



Some communities have found that can systems are better than bag/tag systems because:

- A community can charge a graduated fee that discourages residents from using more than one or two cans.
- Communities can consolidate solid waste collection and disposal into one monthly bill. Many communities include these charges on water or sewage bills, which saves printing and postage costs.
- Residents seem to prefer can systems, probably because they don't have to buy new materials to participate.
- Standardized cans improve aesthetics.
- Once the system is in place, the revenue stream is relatively stable, compared to bag and tag systems.
- Communities can purchase cans or carts compatible with automatic-loading equipment, reducing the chance of injury to workers.
- Containers are reusable and are less vulnerable to destruction by animals than bags.

Communities that use a bag or tag system report that advantages over a can system include:

- Lower start-up costs.
- More freedom and flexibility in changing level of service.
- No billing system required.
- Easier to understand.

Residents with volume-based systems sometimes become experts at compacting waste, also known as the "stomp factor." For some families the purchase of a trash compactor may be economical.

Over-compaction, however, makes programs less effective and may place collection staff at risk if they are required to lift heavy bags or cans without assistance. For this reason, many communities place a 50- or 60-pound limit on individual bags or cans.

Weight-Based Fees

In the past few years there has been growing interest in weight-based residential rate systems. Advantages of the weight-based rate systems over volume-based systems include:

- Results are more immediate and precise. For either can or bag systems, customers must reduce their waste by an entire can or bag to see any savings.
- Residents are not tied to pre-set levels. For both can and bag systems, customers at the lowest subscription level may not be able to opt for lower service levels, even if they only fill up half a bag or can.
- Residents do not benefit from over-compacting their waste.

The primary disadvantages for the weight-based system is that it is relatively untested, and costly to administer. More precise billing may outweigh these costs, but these systems have not been widely implemented.

Potential Barriers

There are three main barriers to variable rate fee systems:

- Illegal dumping
- Unpredictable revenues
- Administrative complexity.

Illegal Dumping

In some areas, pay-as-you-throw programs may result in the illegal use of commercial and industrial dumpsters and littering. Education and promotion programs must be designed to make it easy for people to understand how to use the variable-rate fees prior to implementation, and to discourage illegal dumping and littering. Communities are also encouraged to pass a no-burn regulation. Many businesses react by placing locks on their

dumpsters to discourage illegal dumping. Most communities that experience illegal dumping report that occurrences taper off after the first few months of program operation.

Predicting Revenues

Variable-rate fee revenues can be unpredictable, particularly for bag or tag systems and weight-based systems. In addition, as the program successfully encourages people to reduce their garbage bills by recycling, composting, and reducing waste, revenues will also decrease. To make sure that the revenues are high enough to support recycling, composting and trash removal programs, communities must carefully plan for the system. Estimates of how much recycling and composting can be achieved and how much more garbage can be diverted must be made so that fees will be sure to cover all services.

Administrative Complexity

Implementation and administration of a variable-rate fee program can be complex and confusing. Extensive planning is necessary to reduce unnecessary program complexity. For example, if your community must develop a billing system, adoption of unit pricing will be much more complex than if the garbage service charges can simply be added to water or other utility bills already being distributed to residents. A comprehensive outreach campaign is key to helping municipal officials and residents adopt a successful program. Communities with successful pay-as-you-throw programs have discovered that educating the community throughout the planning process greatly enhances the acceptance of the new system. It is critical that citizens understand the new costs and savings associated with these systems.

Implementation

Under a variable-rate fee system, residents are charged for disposal based on the weight or volume of waste they put at the curb. In order to implement a variable-rate or unit-based fee, you should determine:

- If the program is feasible given current waste hauling arrangements and available service providers.
- How much it will cost; and
- How accepting the community will be to a program at this time.

In addition, educating residents about the use and benefits of the program is necessary to make sure the program is successfully adopted. The following six step program is designed to lead you through this process.

Step One - Review Current Hauler Arrangements

The first step is to review the waste hauling system arrangements in your community. Answers to these questions will help you determine:

- If a variable rate fee is possible for your community,
- Whether a bag, can, or weight-based system is right for your community; and
- an appropriate time line for implementation.

In areas where haulers will implement and enforce a variable-rate fee program, they must support it. If a hauler representative is not included in your planning process, think about inviting one to join if your answers to these questions indicate that hauler support for the project may be necessary for its successful implementation.

Who Collects Solid Waste?

The first step is to identify who currently provides solid waste collection in your area.

Who Pays for the Service?

The more control the municipality has over the waste hauling in their community, the more flexibility they have in implementing a pay-as-you-throw program. Some communities provide garbage collection service for residents and even some commercial businesses. Other communities grant a contract for waste collection for all residents. Costs for these services are usually covered through the municipality's general fund or are included with water or sewer charges on a regular bill. Residents in some communities contract with private haulers for their individual garbage removal service, and pay the hauler directly. You will need to know who pays for the residential solid waste disposal in your community and also how the fees are collected.

Are Waste Collectors Willing to Participate in a Volume-Based System?

If the community provides collection service, there is probably a lot of flexibility in changing to a variable-rate fee. If the community contracts with a hauler to provide service, the community still has the flexibility to change the system. It may have to wait, however, until the waste collection contract comes up for renewal. That's okay - you can still probably use all the time to plan. If residents pay for collection services individually, the hauler's cooperation is absolutely necessary to implementing a variable-rate fee. In this case, the haulers' choices would also indicate strongly what type is feasible (can-based, bag-based, tag-based, or weight-based VRF).

Step Two - Compare Estimated Service Costs

The next step is to determine how much it will cost to implement each type of variable rate fee system, and then to decide which is most cost-effective for the community. In your calculations you will need to be mindful of some of the following considerations:

- Some variable-rate programs have relatively high start-up costs, but lower annual maintenance costs. For example, a can-based system requires that all residents receive trash containers before the program starts. However, most can-based systems only have a 10-20% can replacement rate per year. In contrast, bag systems require the purchase of bags for each household for each week. The costs for bags are lower than the cost for cans, but bag costs won't decrease over time.

- You will need to determine the service costs associated with each of the systems over a ten-year period including all estimations of equipment costs, administration costs, and operating and disposal costs for tag-based systems, bag-based systems, can-based systems, and weight-based systems.
- You will probably want to include other program costs into the fee structure. For example, your recycling and composting programs will probably be funded from the revenues from your variable-rate fees, as well as any education or household hazardous waste collection programs.
- Many communities are so successful in their efforts to reduce waste that income drops suddenly over the first couple of years. To avoid having to increase costs dramatically, estimate costs for all of waste related programs for Years 1, 5, and 10. Depending on your goals and your expectations for success, you may want to set fees so that they will pay for all services in Year 5.
- For can systems you may also want to charge more for the second can per household than for the first, more for the third than for the second, and still more for the fourth can than for the third to encourage residents to reduce their number of cans.

Resource Recycling Systems, Inc. has several comprehensive worksheets available to assist in the calculation of service costs and to help determine fees. For more information, contact us at (734) 996-1361 or by e-mail at rrsi@recycle.com.

Step 3 - Select a Variable-Rate Fee System

In addition to current hauler arrangements and cost-effectiveness, your selection of a unit-based system also depends on the types of containers currently used by residents. Typically, most single-family residents use plastic garbage bags or garbage cans for waste removal. Multi-family residents who live in apartments with small numbers of units per building frequently use thirty- to ninety-gallon cans for storage. Residents of larger apartment complexes usually place their waste in dumpsters. Based on the information you have compared in estimating your service costs, what variable rate fee is best? But before you finalize your choice based on the numbers, you should ask whether it is really the best system for the majority of residents in your community. You will also need to determine if special ordinances need to be passed based on your current situation and/or if local solid waste millages need adjusting to reflect system changes. Once you have finalized your choice, proceed to Step 4.

Step 4 - Make arrangements with haulers.

Once a decision has been made, you should contact the hauler or haulers that will run the program. The haulers will also help determine what types and sizes of bags, tags, or cans are best, and what other equipment is necessary. Finally, your implementation timeline should be updated to incorporate time for service negotiations, contract changes and/or ordinance implementation.

Step 5 - Educate residents.

Public education for a pay-as-you-throw program should begin before program design is even finalized. Here are a number of points to look out for that may help residents adopt the system more easily:

- ♻️ If residents are not used to paying directly for solid waste service, the concept of the garbage bill will have to be introduced. There will be an adjustment period while residents get used to and accept the change.
- ♻️ Because many residents find a variable rate to be more fair and equitable than a flat-fee system, emphasizing that they will only pay for what they throw away will probably be effective. However, some residents will resist these changes. Educational messages should explain both the benefits and costs to different types of residents.
- ♻️ All recovery options that residents may use at no charge such as recycling and composting programs should be heavily promoted at the same time as the pay-as-you-throw program is introduced.
- ♻️ For can systems, it is necessary to clearly identify the process by which residents trade in their cans for smaller sizes as they reduce waste.
- ♻️ For bag or tag systems, it is necessary to identify where residents can obtain bags or tags. Making bags or tags available at many convenient locations such as grocery stores will also help residents accept the program, and many grocery stores will willingly carry the bags or tags for no charge or a small charge because residents need them.
- ♻️ For weight-based systems, it is necessary to clearly identify how users should attach scannable labels to their waste cans.
- ♻️ For both volume-based can and weight-based systems, educational efforts should include an explanation of resident's trash bills.

It is important that residents understand the way their community's variable-rate fee program works through a pervasive promotion/education campaign. You will probably also come up with community-specific factors that will require additional education support as you go through the process.

Step 6 - Program start-up and implementation.

Your plans should include all the steps necessary to implement a pay-as-you-throw program. Tasks that should be included are:

- ♻️ Purchase of all equipment necessary, including cans, weighing scales and stocks of bags or tags.
- ♻️ Distribution of cans or weight-scanning labels to residents or bags and tags to distribution points.
- ♻️ Billing system development for volume-based can or weight systems.
- ♻️ Education materials development and distribution
- ♻️ Ongoing data tracking to monitor your progress.
- ♻️ Ongoing feedback to community and educational efforts.

- ♻️ Revisit program progress and possible adjustments to the system.

Conclusion

Programs across the country are achieving tremendous results with ambitious material recovery programs. Recovery levels of 35%, 40%, and even 50% are being achieved in communities which have implemented a range of supporting programs, including incentives and regulations. While it is virtually impossible to recycle or compost the entire waste stream, many communities are discovering that efforts at waste prevention, reuse, composting and recycling can pay off.

This Fact Sheet is only a brief overview of how to get started with a variable-rate system for your community. For more information on the "Guidebook for Residential Recycling and Composting Participation Incentives" or to find out how RRSI can help you with your communities implementation of variable-rate fees, please call (734) 996-1361 or e-mail us at rrsi@recycle.com.

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<http://archive.epa.gov/wastes/conserve/tools/payt/web/html/top20.html>
Last updated on 8/29/2015



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Volume- vs. Weight-Based Programs

Communities considering pay-as-you-throw must determine whether they will charge residents for waste management services based on the volume or weight of their trash. The two program types have very different design and equipment requirements.

Most communities charge residents by volume, using either bags or cans (or tags or stickers indicating specific can or bag sizes) as their program's unit of measure. A small number of communities are trying weight-based programs, under which collection crews measure at the curb the amount of waste a household sets out for collection. Solid waste planners need to decide which approach to use, based on overall program goals, budget constraints, and other factors.

Volume-based programs

Under a volume-based system, residents are charged for waste collection based on the number and size of waste containers that they use. In some communities, households are charged directly for waste collection (usually through direct billing) based on the number of bags or cans set out at the curb. Others require their residents to purchase special trash bags, tags, or stickers that include the cost of waste collection in the purchase price. Communities basing their programs on trash volumes typically select a rate structure design that includes one of these two options.

Volume-based systems tend to be significantly less expensive to set up, operate, and administer than weight-based programs. In some communities, simple programs using bags, tags, or stickers have been implemented without requiring a large number of waste management changes or incurring major new expenses. As a result, the vast majority of pay-as-you-throw (PAYT) programs currently are based on volume.

One potential disadvantage of volume-based programs is trash compaction. Since residents pay based on the size of their containers, there is a temptation to try to fit as much trash as possible into each bag or can. This can make the task of picking up trash harder for collection crews. It also may reduce the waste reduction incentive for residents. To address this, many cities and towns have placed a weight limit per bag or can and enforce this limit during curbside collections.

Weight-based programs

Under weight-based systems, waste is weighed at the curb and residents are billed for collection and disposal by the pound. Depending on the equipment used, the program can either require residents to use standard, municipally supplied cans or allow them to



Other Topics

- Implementation Timeline
- Administration and Staffing
- Billing
- Container Options
- Consensus Building (Gaining Public and Political Support)
- Education and Outreach
- Enforcement
- Goal Setting
- Illegal Diversion (Dumping, Burning)
- Legal Issues (Ordinances)
- Monitoring and Evaluation
- Apartment/Multi-Family Housing
- Pilot Programs
- Pricing Systems
- Rate Structure Design
- Recycling and Other Complementary Programs
- Results
- Scheduling Issues
- Special Populations
- Volume- vs. Weight-Based Programs

continue using their own cans. Weight-based systems offer the most direct incentive to reduce waste: every pound of trash that residents prevent, recycle, or compost results in direct savings. In addition, residents often easily understand this type of system and perceive it as fair.



Weight-based systems tend to be more expensive to implement and operate than a volume-based approach. Special equipment is required, including truck-mounted scales for weighing waste and some type of system (for example, bar-coding on waste cans) for recording this information and entering it into a computer. Residents then need to be billed for this service, which may increase a municipality's staffing needs.

As a result, very few communities have fully implemented weight-based PAYT systems. Currently, however, innovations in equipment to weigh and record data are beginning to make these systems more feasible for some communities. For example, bar codes or radio-frequency identification tags are declining in price, scales can weigh cans on an incline or in motion, and computerized data collection and billing systems have been improved.

<http://archive.epa.gov/wastes/conserve/tools/payt/web/html/top1.html>
Last updated on 8/29/2015



Wastes - Resource Conservation - Conservation Tools -

[Pay-As-You-Throw](#) [Wastes](#) [Resource Conservation](#) [Pay-As-You-Throw](#) [Topics](#)
Administration and Staffing

Administration and Staffing

Communities implementing pay-as-you-throw need to consider whether their new program will change their staffing and administrative needs in any way. Some communities will be able to adopt the new program using existing employees and resources. Others may have to implement new accounting systems or add staff to handle the changes.

Planners often begin by carefully assessing the resources they will need to administer pay-as-you-throw (PAYT). Depending upon the scope of the new program, some municipalities will need to make few changes in the way they administer their solid waste collection services. For example, many smaller communities often rely on overtime hours from existing employees to implement the new program.

In some cases, switching to PAYT can result in administrative cost savings. Typically, communities are already performing many of the tasks needed to implement the new program (for example, public education and outreach). Planners can take the opportunity to introduce new, more efficient work patterns in these areas.

In other communities, new administrative and accounting systems may be required, along with the staff to handle changes in billing, tracking costs and revenues, managing operations, and maintaining customer relations. Some larger communities, or those planning more complicated PAYT systems, have found it worthwhile to hire analytical, financial, and customer service staff to handle both the transitional and ongoing requirements of the program. Additional temporary staff and outside expertise have helped to ease the implementation of PAYT in some cases.



Other Topics

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- Volume- vs. Weight-Based Programs

Transforming a solid waste agency into an efficient team capable of handling its new responsibilities requires:

- Anticipating the level of expertise that will be necessary, both for program implementation and ongoing operation.
- Giving funding priority to areas that present the greatest opportunity for savings or pose the greatest risk of financial problems.
- Meeting short-term needs during the transition with temporary help, rather than locking into a level of employment that may prove excessive in the long run.

Planners often break down any needed administrative changes into a series of steps with clear objectives for each. Communities instituting PAYT typically recommend that these changes be scheduled to take place 3 to 6 months before program implementation.

The first step is to define the new responsibilities for the established program. These can include public education and outreach, customer service, operation of complementary programs, monitoring and evaluation, enforcement, establishing a rate structure for the program, and billing to collect revenues. Communities with PAYT usually try to assemble an administrative team with the required expertise, changing staff members' responsibilities as needed.

Managing these new functions requires the agency to have expertise in:

- **Economics.** Agency staff will need to develop their rate structure based on forecasts of revenues, costs, and the use of complementary programs.
- **Financial and logistical management.** Planners will need to bill households or collect revenues from the sale of bags, tags, or stickers. They also will need to manage cash reserves and debt and develop a distribution system for the program's containers.
- **Public relations.** An education and outreach effort will be needed. This includes interaction with the general public, as well as local interest groups, elected officials, and the news media. Customer service representatives may also be needed to field questions from residents.

In particular, communities implementing PAYT will need to consider how they will administer their rate structure design. Administrative staff will be operating a revenue recovery system that will need to pay (partially or entirely) for the work of the solid waste agency, rather than simply spending the agency's budget. This brings additional responsibility for proper pricing and ongoing management of the program's finances.

Container choices also may affect the level of administrative and staffing changes required. For example, the potential time and costs associated with administering a bag-based program (under which the bags may be sold directly to residents through retailers or at municipal offices) may be less significant than a subscription can program requiring planners to bill residents for trash services. There are tradeoffs with any option, however: bag-based programs often require staff time to purchase, store, and sell bags directly or to work with retailers that will be selling them.

Finally, communities with PAYT often recommend that planners prepare existing administrative staff for the changes that will take place under this waste management approach. Emphasizing the positive aspects of the new program can be a good strategy. For solid waste agencies, PAYT involves a reorientation away from traditional collection and disposal services. In its place, the emphasis will be on environmentally preferable practices, including waste prevention, recycling, and composting. The new program also may offer employees opportunities for staff training and development in new areas, such as public relations, financing, and education and outreach.

Additional Resources

For answers to questions about staffing and administration issues, visit [administration and staffing](#) in the Frequent Questions section of this Web site.

WasteZero®

Save Money. Reduce Waste.

A Pathway for Making Portland the
“Greenest City in America”

October 2014

Today's Discussion

1 WasteZero Overview

2 Pay As You Throw (PAYT) in Portland

3 Portland's Risks and Opportunities

4 Looking Ahead

Improving Portland's PAYT Program in the Immediate Term

A Proposal for Partnering to "Make Portland The Greenest City in America"

5 Potential Next Steps

About WasteZero



- Launched with an environmental mission in 1991 to create plastic bags using recycled materials
- Is on a mission to “cut the trash in half”: Leader in helping communities reduce municipal solid waste (often by 50% or more) with next-generation bag-based pay-as-you-throw (PAYT) programs
- Works with hundreds of PAYT programs across the nation
- Has 100% success rate – all programs designed and implemented met or exceeded initial targets
- Provides a range of solutions to help municipalities more effectively manage and reduce waste
- Is proudly “Made in the USA,” manufacturing all program supplies at our plant in Hemingway, SC
- Is a Certified B Corporation

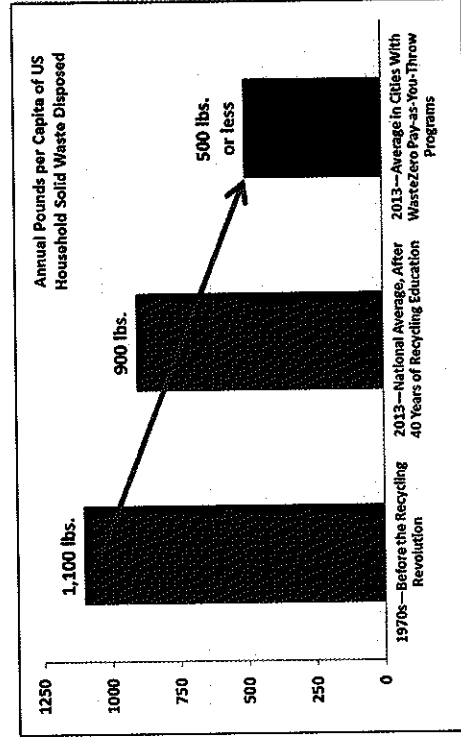
Our waste reduction programs are the most effective available, cutting residential solid waste volumes by an average of 44%.

WasteZero®

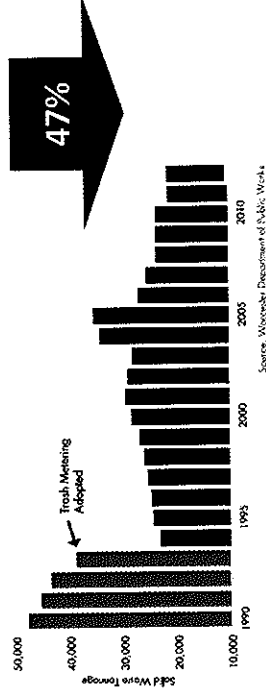
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Powerful Results

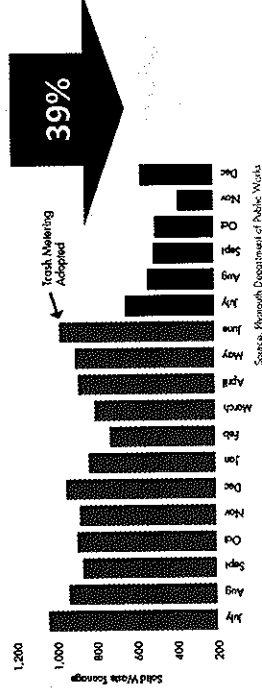
- Average MSW reduction of 44%
- Recycling increases of 75%-100% (or more)
- Significant results within 30-90 days
- Permanent impact
- Effective in cities and towns, regardless of
 - Population size
 - Average income level
 - Numerous demographic factors



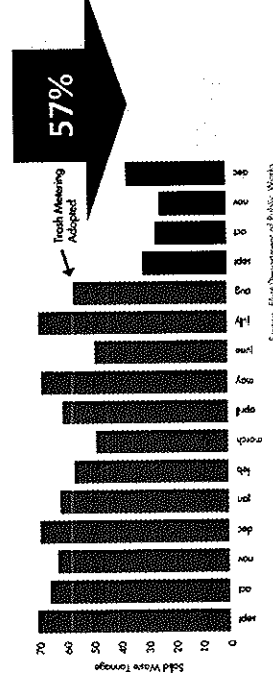
WORCESTER, MASS., SOLID WASTE VOLUME, 1990 - 2012



PLYMOUTH, MA, SOLID WASTE TONNAGE, JULY 2012 - DEC. 2013

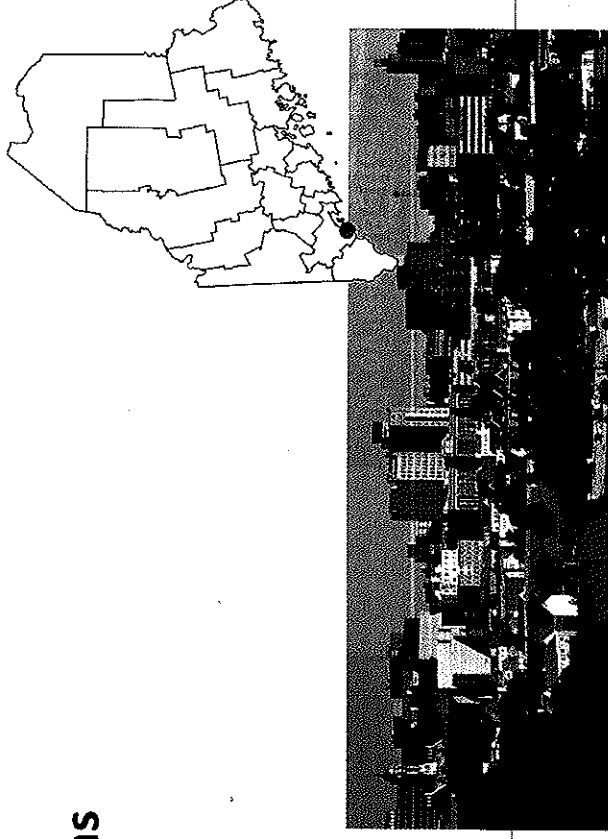


ELIOT, ME, SOLID WASTE TONNAGE, Sept. 2012 - Dec. 2013



PAYT in Portland: Pioneering Success

- **Portland is a pioneer in implementing PAYT, and has demonstrated success**
 - Launched program in 1999
 - Annual pounds per capita of MSW: 427
 - Annual pounds per capita of recycling: 253
- **City staff supports program operations**
 - Retail store distribution
 - Accounting
 - Customer service



PAYT in Portland: Costs, Risks, & Opportunities

Portland's program has been successful, but certain practices expose the City to unnecessary costs and risks. We can help you in the very near term to address a host of issues and opportunities.

1

Reduce Labor & Equipment Costs

- Inventory management
- Retail order management
- Distribution & fulfillment
- Receivables management
- Public communications & customer service

2

Reduce Risks

- Loss or theft of bags (currency equivalent)
- Stock-out risk
- Limited backup / systems redundancy

3

Provide a Better Bag

- Environmental stewardship with the right bag: recycled content and drawstring (using less plastic per gallon of capacity)
- Enhance collection efficiency
- Reduce Litter

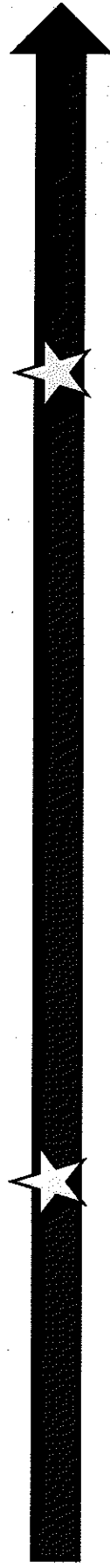
WasteZero is uniquely positioned to help Portland control its costs and reduce its risks, while supplying a bag that uses less virgin content and improves collection efficiency.

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Looking Ahead

Looking ahead, WasteZero sees opportunities to help Portland further reduce waste while also reducing its risk and costs. There are important things that we can accomplish immediately and in the mid to longer term.



Immediate

- Engage with WasteZero on a Retail Store Distribution (RSD) program to
 - Reduce labor and other costs
 - Reduce risk
- Provide a better bag to residents:
 - Drawstring uses less plastic, is preferred by residents, and reduces blowing litter
 - Recycled content saves resources
 - Collection efficiency should improve

Mid to Longer Term

- Embrace the vision of becoming the “Greenest City in America.”
- Take proactive steps to make it happen.

WasteZero can help Portland to do all of these things successfully.

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PAYT in Portland: Budgeting for FY2016



Twist Tie Bags from WZ

- 30"x34" flat top twist tie large bag, 5/sleeve, yellow insert, 25 sleeves/case
- 24"x30" flat top twist tie small bag, 10/sleeve, blue insert, 25 sleeves/case
- Folded bags
- Light Blue, recycled content, made in the US

Twist Tie Bags with RSD

- 30"x34" flat top twist tie large bag, 5/sleeve, yellow insert, 25 sleeves/case
- 24"x30" flat top twist tie small bag, 10/sleeve, blue insert, 25 sleeves/case
- Folded bags
- Light Blue, recycled content, made in the US
- RSD® through WasteZero

Drawstring (DS) Bags with RSD

- 30"x30" drawstring large bag, 5/sleeve, yellow insert, 25 sleeves/case
- 24"x26" drawstring small bag, 10/sleeve, blue insert, 25 sleeves/case
- Folded bags
- Light Blue, recycled content, made in the US
- RSD® through WasteZero

Portland's current bags are 22.5 gallons and 12.8 gallons. The DS bags were sized to equal the capacity of the City's existing bags.

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Path to Being The Greenest City in America



WasteZero can help Portland develop—and follow—a clear path to becoming the “Greenest City in America.” A five-part project, outlined on the following pages, will help Portland achieve some key objectives.

1

Bag Pricing
Review

WasteZero will work with Portland help the city:

2

Program
Benchmarking

3

Problem Solving

4

Program
Enhancements

5

Plan of Action

- Understand how its current PAYT program compares to others, and determine how to maximize its effectiveness
- Identify and evaluate potential solutions to current challenges, such as blowing litter related to recyclables
- Outline the next big steps in waste reduction for Portland: New programs and program enhancements
- Estimate the impact of those enhancements
- Identify and address any potential barriers
- Develop a clear plan for putting improvements and enhancements into action

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Project Components



1 Bag Pricing Review

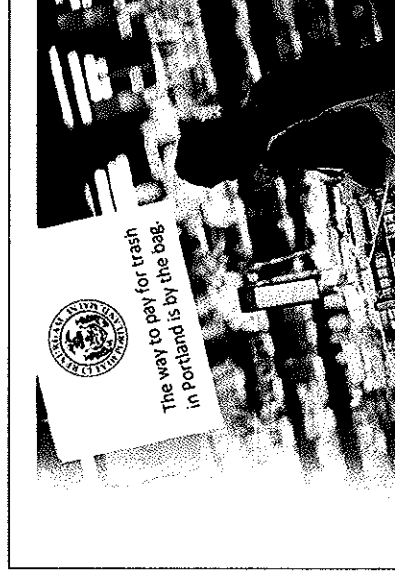
- Benchmark the current retail pricing of Portland's bags against those of other programs in Maine and across New England.
- Understand how well the current pricing meets the solid waste budget needs of the city.
- Estimate the financial and waste reduction impact of 3 pricing scenarios: status quo, meets current needs, meets anticipated needs 3 years in the future.
- Recommend the optimum retail prices for Portland's PAYT bags.

2 Program Benchmarking

3 Problem Solving

4 Program Enhancements

5 Plan of Action



Project Components



- 1 Bag Pricing Review
 - Benchmark the results of Portland's existing PAYT program against other programs across:
 - Maine
 - New England
 - The United States
- 2 Program Benchmarking
 - Use the annual pounds of MSW generated per capita (pounds per capita, or PPC) as the primary unit of measure.
- 3 Problem Solving
 - Assess the causes of major differences in outcomes (identifying the availability of recycling enhancements, education, etc. in other communities).
- 4 Program Enhancements
 - Produce a white paper outlining the results of the benchmarking analysis and critical success factors for "top-tier" PAYT programs.
- 5 Plan of Action
 - Highlight key opportunities for improvement in Portland.

Project Components



- 1 Bag Pricing Review
 - Interview city staff members and monitor trash collection (3-4 days) to gather information on key issues and challenges facing Portland's residential solid waste program.
- 2 Program Benchmarking
 - Focus special attention on a previously identified challenge: blowing litter related to open bin recycling, open bags, etc.
- 3 Problem Solving
 - Assess, at a high level, the cost, likely effectiveness and other impacts of proposed solutions to the blowing litter problem:
 - Recycling carts (working with DPW to identify sections of city where appropriate)
 - Recycling bags
 - Other
 - Recommend solutions
- 4 Program Enhancements
- 5 Plan of Action
 - Outline how Portland could pilot the proposed solutions (high-level pilot program design and action plan).

Project Components



- 1 Bag Pricing Review
- 2 Program Benchmarking
- 3 Problem Solving
- 4 Program Enhancements
- 5 Plan of Action

- Evaluate key opportunities for Portland to take waste reduction to the “next level” and make itself the “Greenest City in America.”

Organics / Composting



Textiles



Hard-to-Recycle Materials



- Outline program design / framework
 - Determine feasibility of co-collection* of organics with MSW and an associated sorting facility
 - Assess availability of local organics processing capabilities
 - Determine bag specifications and other operational items
 - Estimate financial and environmental impact
 - Recommend timing
- Outline program design / framework
 - Identify potential vendors
 - Determine bag specifications and other operational items
 - Estimate financial and environmental impact
 - Recommend timing
- Identify most likely materials:
 - Styrofoam
 - Plastic film
 - Others
 - Evaluate feasibility of each
 - Recommend materials on which to focus efforts
 - Outline program design / framework
 - Identify potential vendors
 - Evaluate financial and environmental impact
 - Recommend timing

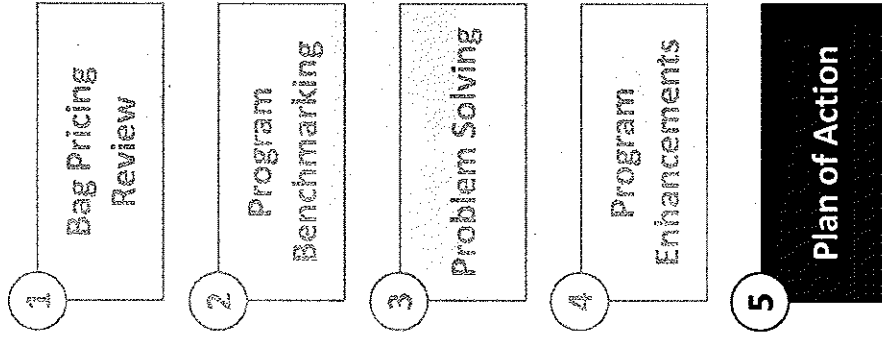
< Free Textiles? collection

*See Appendix (OneRoute®) for details

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Project Components



- Outline the plan of action (POA) that will help Portland become the “Greenest City in America”:
 - Establish a waste reduction goal with the City of Portland: Achieve X% reduction in solid waste by 2018.
 - Develop a high-level implementation plan for all recommended program improvements and enhancements:
 - Timeline and milestones
 - Key deliverables
 - Action items / responsibilities
 - Public communications / rollout plan
 - Overview of a public information resource (Waste Reduction “War Room”) to provide residents with all the information they need to get as close as possible to “zero waste.”

Potential Next Steps

Together, we can make Portland the “Greenest City in America.”

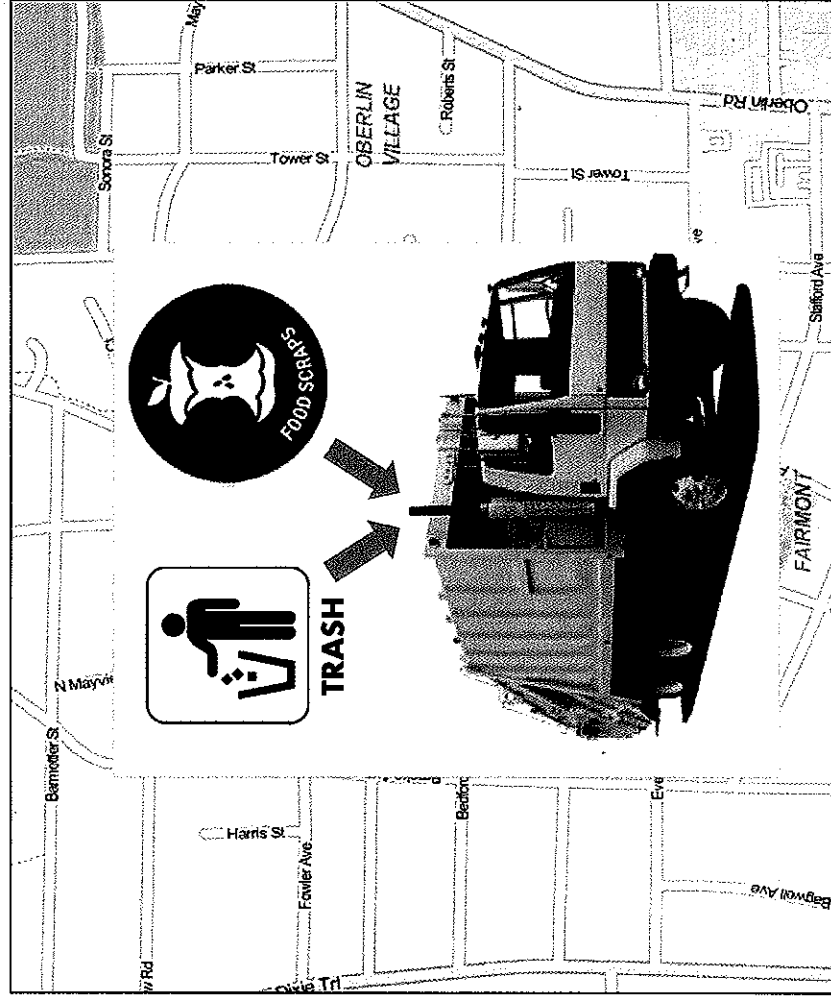
- Answer any initial questions you may have and collect your feedback
- Understand the process for moving this initiative forward
- Identify who else we should meet
- Determine the process for advancing the immediate-term RSD discussion
- Formalize and approve the proposal for the consulting project to dramatically enhance Portland’s waste reduction program.

Thank You!

Appendix OneRoute®

What is OneRoute®?

OneRoute® is a program that helps cities and towns combine multiple routes—such as trash and organics—into one, saving time, money, and wear and tear on equipment, while increasing resident satisfaction.



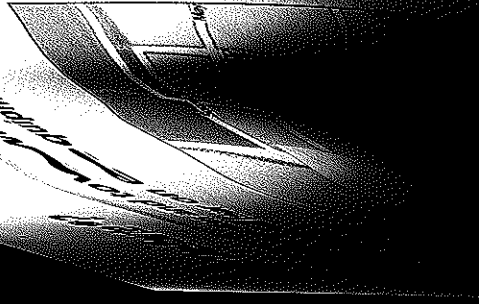
OneRoute®

- Enables trash and organics collection in the same truck.
- Can be used in cities with automated or manual collection.
- Is designed to integrate seamlessly with pay-as-you-throw programs.
- Can significantly enhance collection efficiency

...with combined multiple routes—such as trash and organics—into
multiple routes while increasing resident satisfaction.

OneRoute®

- Enables trash and organics collection in the same truck.
- Can be used in cities with automated or manual collection.
- Is designed to integrate seamlessly with pay-as-you-throw programs.
- Can significantly enhance collection efficiency



Evaluation of Recycling and Solid Waste Collection Services

April 2015



Prepared for:
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Portland, ME 04101

Submitted by:
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Section 1 Introduction

In November 2014, the City of Portland engaged Kessler Consulting, Inc. (KCI) to conduct an evaluation of Portland's recycling and solid waste collection services. KCI's work entailed the following:

- Compilation of available records and data regarding current recycling and solid waste services infrastructure, operations and finances.
- Limited field observation of curbside services to assess potential opportunities to improve efficiency.
- Evaluation of three collection service alternatives:
 - Switching curbside recycling to standardized roll carts.
 - Switching curbside recycling to collection in plastic bags in all or part of the City.
 - Implementing residential curbside organics collection for food scraps and yard waste.
- Assessment of the advantages and disadvantages of privatizing all or part of the City's curbside collection service.

This document presents the results of KCI's evaluation and analysis.

The project scope was limited to Portland's curbside collection services. The City's Riverside Recycling Center and Island collection operations were not included.

Note on format of report: This report is laid out in landscape and large font bulleted text in order to improve readability.

Section 2 Summary of Results and Recommendations

This project assessed Portland's existing curbside recycling and MSW collection services and evaluated three potential alternatives for changing the services provided.

1. Cart-based single stream recycling (SSR) is widely acknowledged to be the most effective and efficient way to maximize residential recycling rates.
2. Source separated organics (SSO) collection is an emerging practice in the U.S. being adopted by communities seeking to further maximize recovery and provide comprehensive service to their customers.
3. Collection of recyclables in plastic bags is practiced by a small number of jurisdictions in the U.S. While bags can improve collection efficiency, they can be less convenient than carts, do not achieve comparable recovery rates, and pose a significant operational challenge to recycling facilities where recyclables must be debagged prior to sorting and processing. The Ecomaine Materials Recovery Facility (MRF) would require substantial capital investment to accommodate bagged recyclables. Consequently, KCI does not recommend further consideration of this alternative.

The project also considered advantages and disadvantages of privatizing the City's curbside collection service.

2.1 Summary of Key Findings

Assessment of Current Operations:

- **Collection Employees Lack Adequate Facilities:** the current facility off Congress Street lacks adequate sanitary facilities, lockers, or wash facilities for employees.
- **Current Collection Operations Are Productive for Manual Rear-load Service:** Based on limited observation, City crews were productive for a manual rear-load collection program.
- **Collection Trucks Have Limited Capacity to Complete Their Routes:** Trucks are at or exceed their maximum payloads in order to complete their routes in a single load.
- **The Task-based Incentive System May Compromise Safety:** It appears that the task-based system encourages fast-paced work that may be compromising worker health and safety. A number of opportunities to reduce risk of physical injury and property damage were observed.
- **High Recycling Participation:** Participation in the recycling service is very high (in excess of 90%), which is likely due to the PAYT-based incentive to reduce blue bag usage.
- **Current Recycling Bins Are Not Large Enough:** Numerous recycling bins placed out for collection were overflowing with excess recyclables, which negatively impacts operations and creates litter.

- Lack of Consistent Recycling Bins: Customer-provided bins do not conform to standard specification (size, strength, and rigidity) which can make it more difficult for collection crews to service them.
- Organics Collection is Already Available: Citywide it appears that approximately 10% of households already subscribe and pay for SSO collection.

Operational Analysis of Alternatives

Cart-based SSR Collection:

- Carts (when compared to bins) provide more capacity, hold larger items, enable a neater street appearance on collection days, keep recyclables dry in inclement weather, and the integrated wheels improve convenience and ease of use.
- 64-gallon cart size is appropriate for weekly collection – larger 95-gallon carts may be too large for some urban settings.
- Semi-automated side loaders provide the flexibility to collect productively in variety of neighborhoods.



Residential SSO Collection:

- Innovative communities are piloting and implementing SSO collection.
- Private service is available in Portland and an estimated 10% of households already subscribe.
- Well-functioning programs can increase a community's overall diversion rate by 15 to 20%.

- Because SSO collection is an emerging trend with limited history, conducting a pilot is in program design and evaluate impacts.
- Residents should be provided with both kitchen bins and curbside carts to help encourage participation and address concerns about separating food waste.
- Extensive public outreach and education and technical assistance is necessary to support successful implementation.
- SSO removes most putrescible waste from MSW and makes it possible to reduce MSW collection frequency to every other week.



Public versus Privatized Collection Service:

- Based on the metrics available to KCI, Portland's existing collection services operate within expected ranges of efficiency and productivity for a two-person rear load truck operation (route size, stops per hour, and tons per crew hour).
- The City-based operations has the capacity to implement operational improvements and new service alternatives if City is able to finance new equipment.
- Privatization of collection services would likely reduce the City's costs through a reduction in work force and operational supervisory staff. However the City would lose ability to directly control quality of service, responsiveness to customers, and oversight of safety and environmental compliance.
- Any privatization initiative would need to carefully consider the complexities given the diversity of services that would be impacted, e.g., Island collection, bulky waste collection, and snow plowing.

Semi-automated Side Loader Trucks:

- Cart-based collection requires trucks equipped to lift carts.

- Portland's Monday, Tuesday and Friday routes are well-suited for automated collection with one-person crews. Wednesday and Thursday routes are suited for either automated or semi-automated collection with one- or two-person crews.
- These trucks provide a single vehicle capable of collecting both carts and bagged refuse, enable one-person crews to provide cart-based collection, reduce the walking and lifting effort required of collection crew workers, and allow helpers to ride in the cab when two person crews are needed.



Information Technology for Collection Operations:

- Trucks equipped with GPS and on-board monitoring systems improve supervisors' "line of sight" in order to utilize resources more effectively and enhance safety.
- Radio Frequency Identification Device (RFID) enabled carts and trucks equipped with RFID readers provide information on operations, services provided, and set-out rates keyed to each customer.
- When integrated this package of information technologies provide a wealth of data to improve collection efficiency, verify service, customize targeted outreach and education, manage assets, and optimize collection routes.

Staff Training and Safety:

- Several health and safety issues were noted during field observations that suggest aspects of the City's employee training and safety program need to be improved.

Incentive System:

- The task system by itself can encourage unsafe behaviors and poor quality of service in order to complete routes as quickly as possible.
- Incentive systems that rely on, or at least incorporate, other forms of recognition and financial reward can help motivate the desired balance of efficiency, quality of service and safety.

Financial Analysis of Collection Scenarios

KCI conducted an operational and financial analysis of four curbside recycling and MSW collection scenarios:

- Current Recycling and MSW Services
- Improved Current Recycling and MSW Services
- Cart-based Single Stream Recycling (SSR) and Current MSW Collection
- Cart-based SSR and Source Separated Organics (SSO) and Reduced Frequency MSW Collection

For modeling purposes, it was assumed that any changes would be implemented in FY2017. Table 1 (see page 8) summarizes the estimated first year (FY2017) financials as well as a 10-year future projection.

Based on the modeling assumptions and cost factors, switching to cart-based SSR collection would be less costly than the current services primarily due to reduced labor costs and tipping fees. However, including the annualized capital costs for more expensive collection trucks and the recycling carts associated with SSD makes the annual cost of SSR greater.

If the City were to increase PAYT fees to help cover the cost of expanded collection services (i.e., cart-based SSR and SSO), a one-time 25% increase is projected to be sufficient to make the cost less than the current service as shown in Table 2 (see page 9).

Table 1: Projected Financials of Collection Scenarios

	Current Service	Improved Current Service	Cart-based SSR	Cart-based SSR & SSO
FY2017:				
Total Revenue	\$1,958,000	\$1,958,000	\$1,719,900	\$1,343,900
Total Operating Expenses	\$3,531,900	\$3,424,200	\$3,172,900	\$3,040,700
Net Annual Cost	\$1,573,900	\$1,466,200	\$1,453,000	\$1,696,800
Total Capital Purchases	\$1,464,500	\$1,687,300	\$2,899,900	\$4,152,800
Annualized Capital Expenses	\$275,100	\$317,000	\$501,000	\$696,100
Net Annual & Annualized Capital Cost	\$1,849,000	\$1,783,200	\$1,954,000	\$2,392,900
FY2017 – FY2026:				
Net Annual Cost:				
Net Present Cost	\$16,495,000	\$15,439,000	\$15,185,000	\$17,378,000
NPC Per Ton	\$133	\$125	\$123	\$140
Net Annual & Annualized Capital Cost:				
Net Present Cost	\$18,871,000	\$18,176,000	\$19,383,000	\$23,143,000
NPC Per Ton	\$152	\$147	\$156	\$187

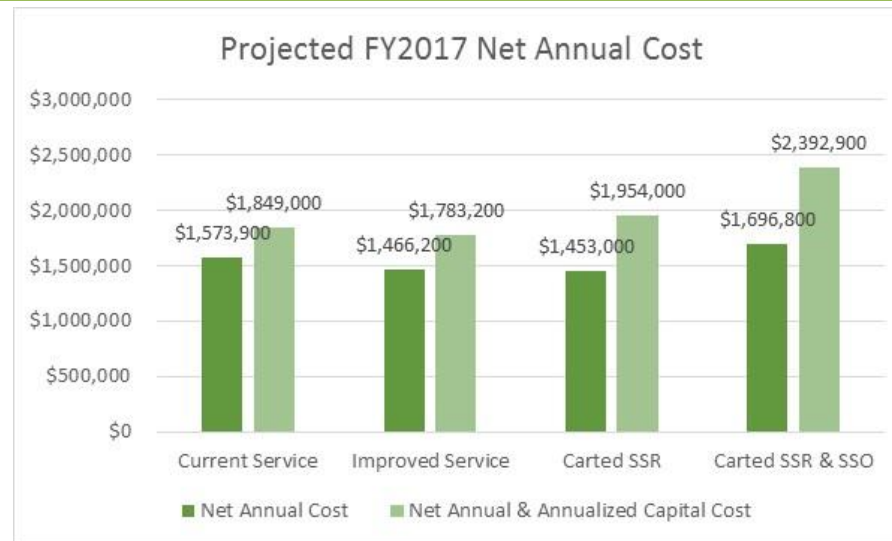
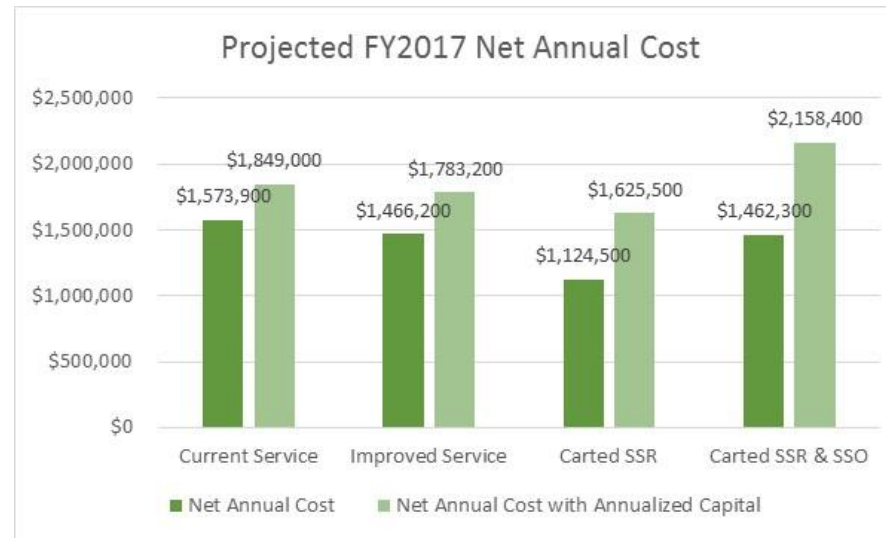


Table 2: Financial Impact of a 25% Increase in PAYT Bag Fees for Cart-based Scenarios

	Current Service	Improved Current Service	Cart-based SSR	Cart-based SSR & SSO
FY2017:				
Total Revenue	\$1,958,000	\$1,958,000	\$2,048,400	\$1,578,400
Total Operating Expenses	\$3,531,900	\$3,424,200	\$3,172,900	\$3,040,700
Net Annual Cost	\$1,573,900	\$1,466,200	\$1,124,500	\$1,462,300
Total Capital Purchases	\$1,464,500	\$1,687,300	\$2,899,900	\$4,152,800
Annualized Capital Expenses	\$275,100	\$317,000	\$501,000	\$696,100
Net Annual & Annualized Capital Cost	\$1,849,000	\$1,783,200	\$1,625,500	\$2,158,400
FY2017 – FY2026:				
Net Annual Cost:				
Net Present Cost	\$16,495,000	\$15,439,000	\$12,234,000	\$15,272,000
NPC Per Ton	\$133	\$125	\$99	\$123
Net Annual & Annualized Capital Cost:				
Net Present Cost	\$18,871,000	\$18,176,000	\$16,432,000	\$21,037,000
NPC Per Ton	\$152	\$147	\$133	\$170



2.2 Summary of Key Recommendations

Upgrade Employee Facilities:

- Upgrade employee facilities to provide at a minimum adequate sanitary and locker facilities and preferably also including employee break and meeting rooms to improve working conditions.

Switch to Cart-based Recycling Collection:

- Portland should convert its curbside single stream recycling to 64-gallon carts while retaining weekly collection frequency.
- Conversion to cart-based collection service should include state-of-the-art information technology: RFID-tagged carts and truck equipped and RFID readers.
- To offset the capital costs associated with cart-based SSR the City should consider a one-time increase in the PAYT bag cost.

Conduct SSO Collection Pilot:

- A one-year SSO collection pilot program in two sections of the City would provide information needed to further evaluate operational and financial feasibility.
- Based on results of the pilot, the City may then decide to design and implement city-wide SSO collection.

Switch to Semi-automated Side-load Trucks:

- Conduct field tests with various types of semi-automated side loaders (SASLs) to confirm ability to operate in automated and semi-automated manner in the operationally diverse Portland neighborhoods.

- If results are positive, the City should consider converting its fleet to SASLs capable of performing both recycling and MSW collection services. The City should also consider retaining one of its current trucks to service difficult-to-collect areas such as dead-ends and very narrow streets.

Switch to Larger Capacity Trucks:

- While keeping within the constraints to operate in Portland’s denser neighborhoods, slightly larger trucks will provide buffer capacity to enable crews to finish their routes in one load.

Incorporate Information Technologies Into Collection Services:

- Portland should incorporate Automatic Vehicle Location (AVL) technology in specifications for new trucks and consider retrofitting existing trucks.
- If and when cart-based collection is implemented for SSR or SSO, carts should include RFID tags and collection trucks should be equipped with RFID readers in order to provide program statistics, assist with customer service, support operational improvements, and manage cart assets.

Staff Training and Safety:

- A more complete review should be undertaken to ensure that all aspects of the City’s training and safety program are in place and functioning properly, including, but not limited to:
 - New employee screening and training.
 - Regularly scheduled safety meetings.
 - Recognition program to reward safe practices.
 - Vehicle safety training specific to each vehicle type.
 - On-the-job “tailgate talks” to review work safety procedures.

- Incident reporting and investigation.
- Policy enforcement such as a repeat offender program and progressive discipline policy.

Incentive System:

- The City should consider developing a more comprehensive incentive system that recognizes and rewards other aspects of worker performance such as:
 - Improving safety.
 - Creativity that results in new and innovative procedures.
 - Excellent customer service.
 - Positive attitudes and being a team player.
 - Mentoring new employees.

Privatization:

- KCI does not perceive a compelling reason to privatize from an operational or cost of service perspective. Efforts should be made to improve current operations and implement new services with City-operated collection, unless the City lacks the financial capacity to capitalize new service in which case privatization may be worth further consideration.
- If the City wants to pursue privatization, KCI recommends that a more in-depth analysis be conducted to identify impacts not only on collection operations, but also consider the needs of displaced workers, disposition of surplus equipment, and the impacts on Public Service administration, Fleet, Human Resource, and union labor agreements. The analysis should also include a survey of jurisdictions with privatized collection service to determine the cost and quality of service.

2.3 Possible Next Steps

If the Portland were to move forward with converting to carted SSR and potentially adding SSO, a number of work tasks would need to be completed. Following is an outline of some of the steps and possible time table for such implementation with a goal of new services starting in FY2017. Given the level of work effort entailed it unlikely that new services could be implemented before that time.

Activity	Timing
Gather information: customer & route counts, set out rates	2015 Q2 – Q3
Conduct customer and route counts and measure recycling set-out rates	2015 Q2 – Q3
Conduct recycling and waste characterization studies	2015 Q2 – Q3
Evaluate and determine whether or not to privatize collection services	2015 Q2 – Q3
Upgrade employee facilities	2015 Q3 – Q4
Implement changes in the safety and training system and incentive program	2015 Q3 – Q4
Conduct field trials of SASL on selected Portland collection routes	2015 Q3
Conduct SSO collection pilot	2015 Q3 – Q4
Develop specifications and procurement documents	2015 Q4
Initiate procurement of carted SSR carts and collection vehicles	2015 Q4
Develop operations plans, e.g., routes and schedules	2016 Q1
Develop an outreach and education plan and program materials	2016 Q1
Distribute SSR carts and initiate outreach and education program	2016 Q2
Initiate carted SSR collection service	2016 Q3

Section 3 Description of Existing Curbside Collection Services

3.1 Profile of Services

Customers:

- All residential single family and a large number of multi-family buildings and municipal buildings.
- An estimated 14,200 single family customers and 1,700 multi-family and municipal buildings served.

Curbside Services Provided by City Crews:

- Weekly curbside collection of recyclables and MSW.
- Seasonal curbside collection of leaves and Christmas trees.
- On-call curbside collection of properly tagged bulky waste.



Recycling Collection Method:

- Citizens place all recyclables out for collection in City & resident-provided bins and bags.
- Recyclables are collected “single stream” with all containers and paper mixed together.

MSW Collection Method:

- Portland has pay-as-you-throw (PAYT) collection.
- City crews only collect MSW placed in official blue bags.
- Residents buy blue bags at various retail outlets.



- A 15-gallon blue bag costs \$1.00; a 30-gallon blue bag costs \$2.00.

3.2 Unique Characteristics of Portland Collection Services

Diversity: Portland is characterized by diverse neighborhoods and street patterns:

- Dense, multi-story, multi-family on the Peninsula.
- Three-story apartments, e.g., University of Southern Maine area.
- Low-rise, single-family residential in North Deering and elsewhere.

Non-uniform Set-outs: Residents put recyclables in a wide variety of bins and containers, e.g., City-provided bins, old plastic file boxes and laundry baskets.

Overflowing Recycling Bins: During limited field observations KCI noted a high percent of overfilled recycling bins with additional materials set beside them, which indicates bins do not provide enough capacity.

Inclement Weather: Winter snow can pose significant challenges, especially on the Peninsula where streets become narrow and residents have limited places to put recyclables and MSW.

KCI Assessment:

- Standardized roll-carts would provide more capacity and reduce the number of containers at curbside.



3.3 Operational Metrics

Table 3: Portland Recycling and Solid Waste Collection Metrics – FY2012-FY2014 Average

	Recycling	MSW
Collection Parameters		
Collection Frequency	1/week	1/week
Days/Week	5/week	5/week
Number of Crews	3	3
Persons/Crew	2	2
Truck Type & Capacity	25-yard rear load	25-yard rear load
Estimated Accounts (Buildings)	14,163 SF 1,697 MF&M	14,163 SF 1,697 MF&M
Tons Per Year Collected	4,310	7,900
Route Calculations		
Average Route Size (Buildings)	1,057	1,057
Average Tons/Crew/Day	5.5	10.1
Average Pounds/Building/Collection	10.5	19.2
Crew Performance Calculations		
Average Work Hours/Week (% of Paid)	1,820 (88%)	1,740 (84%)
Average Buildings/Crew Work Hour	151	158
Average Tons/Crew Work Hour	0.8	1.5

Notes: SF = Single Family (1-4 units); MF&M = Multi-Family & Municipal Buildings.

3.4 Financials

Actual expenditures and revenue for fiscal years 2012 through 2014 were reviewed and compiled. To obtain a complete picture of financials associated with curbside collection services, KCI's analysis included:

- Fund 3114.
- Fleet vehicle purchase, fuel, and maintenance and repair costs for curbside collection.
- Personnel benefits.

Table 4: Collection Services Revenue – FY2012-FY2014

	FY12	FY13	FY14	3-yr Average
PAYT Bag Fees	\$1,591,917	\$1,586,346	\$1,552,217	\$1,576,827
Riverside Recyclables	\$208,856	\$135,803	\$320,554	\$221,738
Other	\$65,362	\$73,062	\$85,276	\$74,567
Total Revenue	\$1,866,135	\$1,795,211	\$1,958,047	\$1,873,131

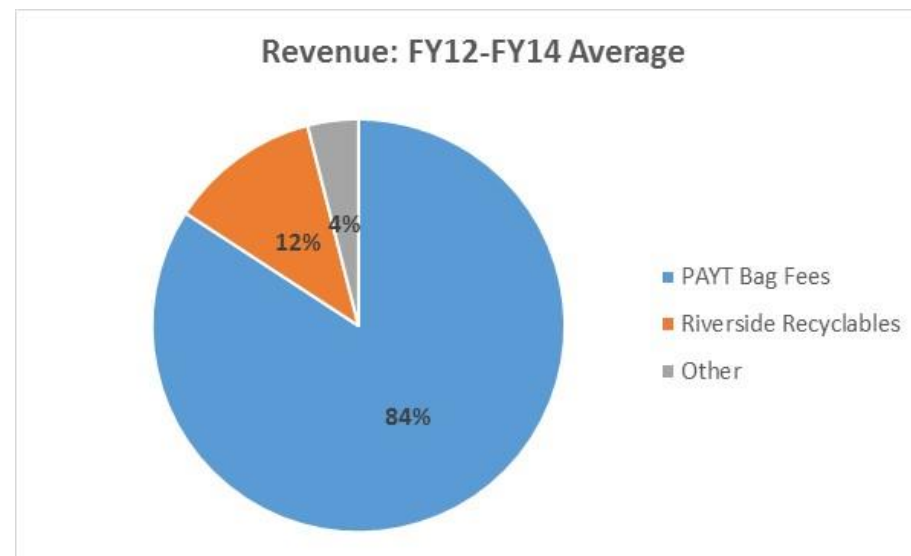
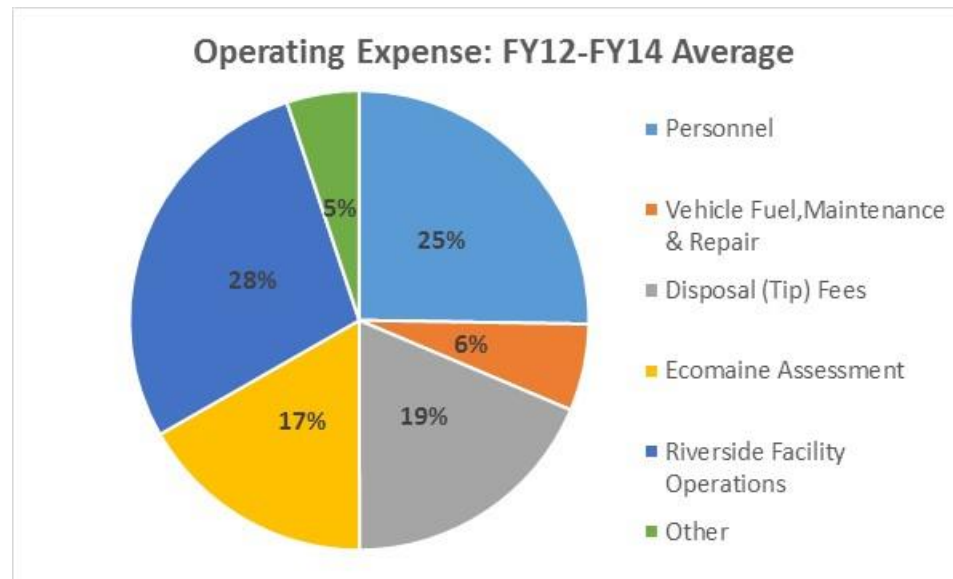


Table 5: Collection Services Expenditures FY2012 – FY2014

	FY12	FY13	FY14	3-yr Average
Personnel	\$929,778	\$1,095,146	\$1,121,582	\$1,048,835
Vehicle Fuel, Maintenance & Repair	\$254,154	\$240,589	\$267,739	\$254,161
Disposal (Tip) Fees	\$830,897	\$825,284	\$661,262	\$772,481
Ecomaine Assessment	\$851,728	\$662,543	\$572,770	\$695,680
Riverside Facility Operations	\$1,248,330	\$1,140,524	\$1,119,192	\$1,169,349
Other	\$224,440	\$215,734	\$195,844	\$212,006
Total Expenses	\$4,339,327	\$4,179,819	\$3,938,388	\$4,152,511



KCI Assessment:

- PAYT is a significant source of revenue helping to finance solid waste services. Service improvements to increase recovery through enhanced recycling or composting would decrease this revenue.
- Expenses have declined in the past three years primarily due to reduced Ecomaine tip fees and assessments.
 - The City's \$70.50 per ton tip fee for MSW disposal at Ecomaine, while relatively low compared to other options in New England, provides a strong avoided cost incentive to increase recovery.
 - Ecomaine recently eliminated an annual assessment that averaged \$696,000 per year over past three years. It also provided a \$200,000 one-time rebate in FY2014.

3.5 Assessment of Current Operations

KCI conducted limited field observations of Portland's curbside collection services over a 2 ½ day period in January 2015. Work activities included:

- Observed recycling and MSW collection crews on various routes to observe routing and collection practices.
- Conducted limited time & motion data recording.
- Conducted limited set-out counts.
- Reviewed morning yard procedures.
- Compiled sample records of daily truck weights.



Lack of Key Program Information

- The City does not have an accurate tally of collection service customers, i.e. the total number of buildings and dwelling units serviced. Nor does it have an accurate tally of customers serviced on each daily collection route.
- The City does not collect data on recycling set-out rates (the percentage of households that set out recyclables on any given week).
- Portland has not conducted a characterization study to determine the composition of recyclables and MSW.
- These data are essential for tracking performance, managing operations, planning service improvements, targeting and refining outreach and education efforts to boost recovery, as well as planning and implementing new services.



Inadequate Employee Facilities:

- The Collection Services facility off Congress Street does not provide proper, basic employee facilities.
- City staff do not have adequate sanitary facilities, lockers, or wash facilities.

Task-Based Incentive System:

- City utilized a task-based incentive system whereby the collection workday is completed when the route is finished and staff is paid for a full shift.
- Recyclable and MSW crews work as teams to complete their routes at approximately the same time.
- Recyclable crews work an average 88% of full-time; MSW crews work an average 84% of full-time.

High Recycling Participation Rate:

- Portland has a high recycling participation rate. Based on limited field observation, weekly set-out rates were approximately 90%, which is likely due to the PAYT-based incentive to reduce blue bag usage.

Overflowing Recycling Bins and Multiple Kinds of Bins:

- Numerous recycling bins placed out for collection were overflowing with excess recyclables. This causes two negative impacts:
 - High potential for litter prior to collection.
 - Increased work effort for the collection crews and spilled materials when collected.
- Customer-provided bins do not conform to standard specification (size, strength, and rigidity) which can make it more difficult for collection crews to service them.
- Customer-provided bins are generally in poor condition which can negatively impact collection.



Large Set-Outs at Multi-Family Buildings:

- Recycling set-outs observed at multi-family buildings consisted of multiple recycling bins – 4 on average and even up to 12 bins.
- These set-outs require numerous trips back and forth from the curb to the truck, and frequently involve both driver and helper, which increases collection time and reduces productivity.

Participation in Private Organics Collection:

- During field observations, KCI made a qualitative assessment of how many households participate in the residential source separated organics (SSO) collection service provided by Garbage to Gardens.
- It appears that approximately 10% of buildings subscribe to this service.

On-Route Collection Performance:

- Overall, crews observed were productive for a manual rear-load collection program in inclement weather.
- By default, rear-load collection trucks require significant walking to and from the curb particularly for the driver when it is necessary to assist the helper with large or clustered set-outs.
- Vehicle routing appeared to double-back over street segments more frequently than what is typically observed in rectilinear street layouts, which may offer an opportunity for route optimization.
- Collection productivity could be improved through the use of technology (see subsequent discussion in Section 5.6).

Table 6: Time & Motion Observations in Parkside Neighborhood

	Recycling	MSW
Bins/Bags Per Stop (Average/Maximum)	4 / 12 bins	5 / 18 bags
Seconds Per Stop (Average/Maximum)	37 / 129 seconds	24 / 73 seconds
Seconds Between Stops (Average/Maximum)	16 / 70 seconds	28 / 201 seconds
On-route Seconds Per Stop (Average)	53 seconds	52 seconds

Collection Trucks at or Beyond Volumetric Capacity:

- Review of daily truck logs and average truck weights over time, indicate that Portland's 25-yard capacity trucks frequently reach their maximum payloads in order to complete their routes in a single load.
- Staff indicated that trucks sometimes need to coordinate remaining capacity and swap route sections to complete their routes as a team, which negatively impacts collection efficiency.

Fast-Paced Work:

- Collection crews were observed working at a fast pace, which may in part be due to an effort to overcome weather-related delays. Fast-paced collection is also encouraged by the task-based incentive system which "rewards" crews for finishing early.
- The consequence of fast-paced work is a tendency to short-cut proper collection and safety practices and increase risks of injury, accidents and property damage. Slips, trips and falls are the more frequency injuries in the solid waste industry.

Improper Collection and Safety Practices:

- Opportunities to reduce risk of physical injury and property damage were observed.
- Reversing truck with a helper on the rear step is a major safety concern. A number of fatalities have occurred in the waste collection industry when a helper has slipped and the driver has backed over his helper. The helper should be on the ground, within mirror eye-sight of the driver, using proper hand signals to direct the driver in reverse.



- Helpers jumping on and off the rear step pose a slip and fall hazard.
- Vehicles zig-zagging across the street center line and crews collecting from both sides of a two-way street increase potential for accident and injury.
- Tossing PAYT bags from the curb into the truck hopper can be a time-saving practice, however it poses the risk of personal injury, damaging personal property and spilled waste from broken bags.



Use of Personal Protective Equipment (PPE):

- Use of proper eye protection was not observed. All employees loading waste or recyclables into rear load vehicle should use eye protection to prevent eye injuries from liquids or solids. Recommended PPE for rear load drivers and helpers include ANSI rated high visibility uniform or vest, work boots with puncture resistant soles, work gloves, and safety glasses. Winter outer garments should not obscure high visibility clothing. Hard hats may be required at disposal sites and employees should be familiar with and comply with disposal site safety policies.

Use of Board in Loading Hopper:

- Recycling crews use a board to “extend” the hopper and prevent spillage during compaction cycles. This indicates that crews are overloading the hopper and should run the compaction cycle more frequently before the hopper is full.
- The board could easily be dislodged during pack cycle and could create a pinch point for helper hands and fingers. It is not properly affixed to vehicle and could easily endanger employees.

KCI Recommendations to Improve Current Operations:

- Obtain current, accurate route-level information regarding the number and type of customers receiving curbside services. This may be accomplished utilizing the City GIS system and mobile applications such as GIS Collector.
- Perform periodic (e.g. annually) set-out counts on sample segments of each route.
- Conduct a recycling and waste characterization study to provide a quantitative basis for program improvements and new program implementation.
- Upgrade employee facilities to provide adequate sanitary and locker facilities.
- Improve compliance with safe collection practices.
- Consider undertaking a detailed time & motion study to establish performance metrics for collection services in various sections of Portland.
- Consider undertaking a route optimization analysis to balance workloads among routes and determine most efficient collection pattern.
- Consider switching to an alternate incentive system that rewards quality and safety as well as productivity, rather than the current task-based incentive that prioritizes speed.

Section 4 Profiles of Other City Collection Services

4.1 Carted Recycling Collection

To provide background and comparative information, KCI identified examples of other cities that provide cart-based single stream recycling (SSR) in dense, urban, multi-family residential neighborhoods.

- Cambridge, MA; East Providence, RI; Lowell, MA; South Portland, ME; and Portland, OR.

General Findings from Other Cities:

- Cities that provide cart-based recycling utilize semi-automated trucks, which are able to collect carts in diverse neighborhoods.
- Semi-automated side loaders provide the greatest flexibility, being able to collect carts in semi-automated mode in neighborhoods where carts need to be wheeled to the truck, as well as in fully-automated mode in neighborhoods where carts are placed curbside without obstructions.
- A comprehensive outreach and education program is essential to help citizens adapt to the carts and learn proper set-out procedures.
- Equipping carts with RFID tags and trucks with RFID readers is recommended.
- 95-gallon carts may be too large for urban neighborhoods where residents have limited space to store carts and sidewalks limit space for setting them out.

- One-person crews are able to operate cart recycling, although a helper can be added in dense neighborhoods to help roll carts to the truck.

Table 7: Profiles of Cart-Based Single Stream Recycling Programs

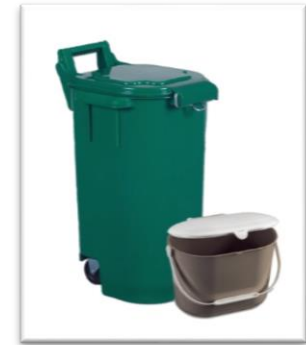
	Cambridge, MA	E. Providence, RI	Lowell, MA	So. Portland, ME	Portland, OR
Single-Family Hhld Served	4,000	n/a	25,000	6,398	151,700
Multi-Family Bldgs Served	6,928	n/a	No	1,544	No
Collection Service Provider					
- Recycling/MSW	Contract/City	Contract/Contract	Contract/Contract	Contract/Contract	Franchise/Franchise
Collection Frequency (per week)					
- Recycling/MSW	1/1	0.5/1	0.5/1	1/1	1/0.5
Container Size					
- Recycling	65, 95-gal	95-gal	96-gal	65-gal	60-gal
- MSW	No carts	No carts	68-gal	35, 65, 95-gal	20, 35, 60, 90-gal
Collection Truck Type					
- Recycling	SASL/SARL	SASL	SASL/SARL	SASL/ASL	SASL/ASL
- MSW	RL	RL	SASL/SARL	SASL	SASL/ASL
Recycling Set-Out Rate	80%	n/a	25%	29%	n/a
Tons/Year					
- Recycling	9,315	4,864	6,013	2,291	491,805
- MSW	14,936	13,729	24,729	5,700	359,056
- Recycling Rate	38%	26%	20%	29%	58%
Program Notes					
- PAYT?	No	No	No	Flat rate	Variable rate
- Year SSR Carts Implemented	2010	2012	2014	2006	2008
- Cart Financing	City Financed	Hauler Provided	City Financed	Hauler Provided	Hauler Provided

Notes: ASL = Automated Side Loader; SASL = Semi-Automated Side Loader; RL = Rear Loader; SARL = Semi-Automated Rear Loader; n/a = Information Not Available.

4.2 Residential Organics Collection

KCI identified examples of other cities that currently operate residential source separated organics (SSO) on a pilot or full-scale basis in communities with dense, urban, multi-family residential neighborhoods.

- Cambridge, MA; New York, NY; Portland, OR; Seattle, WA; and Halifax, NS.



General Findings:

- Providing in-home collection bins and outdoor carts for SSO is critical to maximizing convenience and encouraging participation.
- 10-gallon carts can be sufficient for collecting food scraps, but if yard waste is included then larger carts are required.
- PAYT provides an economic incentive for residents to separate organics.
- Residential SSO collection is not yet widely practiced in the U.S. Communities typically conduct a pilot prior to full-scale implementation to confirm appropriate operational parameters, e.g., container size, expected set-out rates, recovery rates, effective outreach and education methods, etc.
- Reducing MSW collection to every other week in combination with providing weekly SSO collection can be achieved with effective technical support, outreach and education to residents.
- Biodegradable plastic liners help address the “ick” factor for residents, however the bags must be compatible with the organics recycling facility.
- Reliable, cost-effective access to an organics recycling facility is essential but can be challenging.

Table 8: Profiles of Source Separated Organics Collection Programs

	Cambridge, MA	New York, NY	Portland, OR	Seattle, WA	Halifax, NS
Single-Family Hhld Served	4,000	100,000	151,000	145,000	131,000
Multi-Family Bldgs Served	6,928	Included	n/a	100,000	n/a
Yard Waste Included?	No	Yes	Yes	Yes	Yes
Collection Service Provider					
- Recycling	Contract	City	Franchise	Contract	Contract
- SSO/MSW	City/City	City/City	Franchise/Franchise	Contract/Contract	Contract/Contract
Collection Frequency (per week)					
- Recycling/SSO/MSW	1/1/1	1/1/2-3	1/1/0.5	0.5/1/1	1/0.5/0.5
Container Size					
- Recycling	65, 95-gal	No carts	35, 60-gal	60-gal	Blue Bags
- SSO In Home/Curbside	1-gal/12, 21-gal	1-gal/13, 21, 35-gal	1-gal/60-gal	1-gal/13, 32, 90-gal	1-gal/25-gal
- SSO Plastic Liners Allowed?	Yes	No	Yes in 1-gal bin	Yes	Paper only
- MSW	No carts	No carts	20, 35, 60, 90-gal	10,20,30,60,90-gal	No carts
Collection Truck Type					
- Recycling	SASL/SARL	SASL/SARL	SASL	SASL/SARL	ASL/RL
- SSO	RL	SASL/SARL	SASL	SASL/SARL	ASL/RL
- MSW	RL	RL	SASL	SASL/SARL	ASL/RL
Set-Out Rate					
- Recycling/SSO	80%/n/a	50%/n/a	74%/78%	56%/50%	60%/60%
Tons/Year					
- Recycling/SSO	9,315/n/a	n/a	491,800/151,400	407,000	n/a
- MSW	14,936	2,756,000	359,056	317,000	n/a
Program Notes					
- PAYT?	No	No	Variable Rate	Variable Rate	No
- Year SSO Carts Implemented	2010	2013	2011	2006	1998
- SSO Cart Financing	Grant	City Financed	Hauler Provided	Hauler Provided	City Financed

4.3 Bag-Based Recycling Collection

Few examples currently exist of bag-based recycling collection. KCI profiled three major cities in North America: Halifax, NS; Muncie, IN; and Pittsburgh, PA. Information was also obtained regarding the Chicago, IL and Edmonton, AB programs which have converted to cart-based recycling. A few cities also allow a few neighborhoods to use bags while using carts for the majority of customers – Boston being one example.

General Findings:

- Bag-based recycling can increase collection productivity compared to bin-based recycling, but is not as productive as cart-based automated or semi-automated collection.
- Some bag-based programs collected recyclables and MSW at the same time in the same truck, and then subsequently separated the bags of recyclables at transfer stations.
- Bag-based recycling programs in the U.S. have not achieved recovery rates as high as bin-based or cart-based recycling.
- Recyclables must be debagged (either manually or mechanically) and the bags separated prior to subsequent sortation and processing. This requires additional capital investment, resources and operational cost at the MRF.

Program Profiles:

- Halifax, NS:
 - A hybrid collection program that collects recyclable containers (plastic, metal and glass) in blue bags and recyclable paper in clear plastic or paper bags.
 - Recyclables are manually de-bagged on a sorting conveyor.

- Muncie, IN:
 - City provides citizens with vouchers to get free blue bags from retailers.
 - Recyclables are co-collected with MSW in roll carts, so it is not possible to determine participation.

- Pittsburgh, PA:
 - Program has been in operation since the late 1980s.
 - All designated recyclables are collected single stream in blue plastic bags.
 - The same fleet of trucks collect blue bags and MSW in separate loads.
 - Participation rates are reported to average 65% in the blue bag program.
 - The MRF debags recyclables manually; overall residue rate is 15% including bags.
 - The City incurs higher processing costs for its recyclables because they must be de-bagged.

- Chicago, IL:
 - Operated a blue bag program until 2012 when carted single stream recycling was implemented.
 - The program co-collected blue bag recyclables and MSW together in the same truck.
 - Blue bags were then separated out at transfer stations.
 - Bag breakage and subsequent loss and contamination of recyclables was a significant problem.
 - Participation rates in the blue bag programs were very low.

- Edmonton, AB:
 - Previously operated a bag-based recycling collection, but has switched 85% of households to recycling bins and carts.
 - Bags presented a contamination problem at the recycling facility.

Section 5 Assessment of Program Improvement Opportunities

KCI assessed three collection service alternatives for Portland:

- Switching curbside recycling to standardized carts.
- Switching curbside recycling to collection in plastic bags in all or part of the City.
- Implementing residential curbside organics collection for food scraps and yard waste.

In addition, KCI assessed the advantages and disadvantages of privatizing all or part of the City's curbside collection service.

Based on our review of Portland's existing collection services, KCI identified other programs improvement opportunities that the City may wish to consider:

- Conversion of the collection fleet from rear loaders to semi-automated side loaders.
- Increasing the size of the collection fleet from 25 to 28 (or even 31) cubic yard packer bodies.
- Conversion of the collection fleet from diesel fuel to compressed natural gas (CNG).
- Integration of state-of-the-art information technologies in collection trucks and carts.
- Review of the training and safety program.
- Modification of the incentive system.

Each alternative and opportunity is discussed in the following pages outlining advantages and disadvantages, KCI's assessment, and KCI's recommendation.

5.1 Recycling Collection in Carts versus Bins & Bags

Other Communities' Experience Regarding Urban Carted Single Stream Recycling Collection:

- 64-gallon cart size is appropriate; larger 95-gallon carts can be too large for an urban setting.
- 64-gallon carts do not provide sufficient capacity to switch to every other week collection.
- Have semi-automated collection trucks available to serve dense urban areas.
- Educate citizens about proper cart placement away from obstructions when possible.
- RFIS tags and readers are highly recommended to track operations and cart inventory.
- Snow in dense urban areas makes collection more difficult.
- An extra helper can assist with moving carts to truck in crowded areas if necessary.
- A back-up rear-loader can be used to serve specific dead-end and small inaccessible streets.

Advantages of Carts versus Bins or Bags:

- Carts provide more capacity than bins or bags to accommodate all designated recycling.
- Carts eliminate the need for citizens to lift and carry their recycling bins to the curb.
- Carts enable a neater street appearance on collection days with fewer, larger recycling containers, fewer loose items, and less litter potential compared to bins.
- Carts keep recyclables dry in inclement weather.



Disadvantages of Carts versus Bins or Bags:

- Carts represent a significant capital cost which can generally be recouped through higher recycling rates, avoided disposal costs, and increased collection productivity.
- Urban neighborhoods with narrow sidewalks provided limited space for carts during winter.

- Carts reduce collection crews' ability to inspect recyclables before dumping them into the truck.
- Carts increase potential for contamination with non-recyclables.
- Cart transition needs to be proactively managed with outreach & education.

Limitations of Bag-Based Recycling Collection:

- Bag collection can be less expensive than bin collection but is more expensive to process.
- Bag-based programs generally achieve a lower recovery rate than cart-based programs.
- Plastic bags pose operational problems for recycling facilities. Bags must be separated from recyclables and they can get stuck in MRF processing equipment and increase maintenance requirements.
- Ecomaine MRF does not have the ability to debug recyclables and separate plastic bags, which would require significant capital investment to install.

KCI Assessment:

- Bins used in the Portland recycling program do not provide enough capacity for citizens' recyclables; overflowing bins are common.
- Multiple bins placed at the curb require collection crews to make many trips back and forth to the truck.
- Carted single stream recycling is rapidly becoming standard practice for municipal recycling programs to increase recovery.

KCI Recommendation:

- Portland should convert its curbside single stream recycling to 64-gallon carts and retain weekly collection frequency.

5.2 Residential Source Separated Organics Collection

Other Communities' Experience Regarding Source Separated Organics (SSO) Collection:

- Residential SSO collection is expanding in the U.S. *Biocycle* magazine identified 198 communities providing food scrap collection to 2.7 million households.
- Well-functioning programs can increase a community's overall diversion rate by 15% to 20%; Portland, OR saw 37% decrease in MSW after implementing SSO collection.
- Conducting a pilot before implementing a full-scale program is important to refine program design and evaluate impacts on MSW quantities and collection service.
- PAYT provides an incentive to separate organics and thus further reduce PAYT bags usage.
- Providing standardized kitchen bins and curbside carts helps boost participation.
- In-home (kitchen) collection bins are important to address "ick" factor of separate collection.
- Degradable plastic bags must be compatible with and approved by the organics recycling facility.
- Odor complaints have not been identified as a significant issue in other SSO collection programs.
- Several programs have had difficulty securing reliable, cost-effective composting facilities to handle their SSO.
- Extensive public outreach, education and technical assistance is necessary to support successful implementation.

Existing SSO Collection in Portland:

- An estimated 10% of households already subscribe to (and pay for) an SSO collection service provided by Garbage to Gardens (\$14 per month) in Portland.

- The service provides residents with a 6-gallon lidded bucket, weekly collection and replacement of their bucket with a clean one.

Opportunity to Reduce MSW Collection Frequency to Every Other Week:

- SSO collection targets most of the putrescible components of MSW, thereby significantly reducing the quantity and odor potential of remaining MSW.
- Consequently, some communities with SSO collection reduce MSW collection to every other week from weekly because SSR and SSO collection divert such a large fraction of the waste stream.

Advantages of Weekly SSO and Every Other Week MSW Collection:

- Encourages citizens to participate in SSR and SSO collection programs and separate as much material as possible.
- Offers the City potential savings in MSW collection by reducing the number of MSW collection crews needed.
- Reduces waste disposal costs by reducing the amount of MSW disposed at Ecomaine.

Disadvantages of Weekly SSO and Every Other Week MSW Collection:

- Can increase contamination in organics, especially non-designated putrescible waste such as disposable diapers.
- Requires significant outreach and education effort to prepare citizens, address concerns, and manage transition.

Note: In Portland, OR, every other week MSW collection was met with initial resistance, but complaints dropped dramatically after initial weeks of program and extensive outreach, education and technical assistance.

- Requires citizens to find a place to keep their SSO collection cart as well as SSR cart.
- Reduces revenue obtained from sale of PAYT bags.

KCI Assessment:

- Portland is well positioned to implement SSO collection because it already has a transfer and compost facility operator that wants the City's organics and many residents already participate in SSO collection.
- CPRC subsidiary MB Bark recently opened a composting facility in Auburn with significant capacity to accept food residuals, which can provide reliable composting capacity for Portland SSO.
- Existing infrastructure at Riverside facility can be upgraded to serve as an SSO transfer site within the City limits, meaning that collection trucks would not have to travel further than they currently do to Ecomaine.
- The key pieces appear to be in place for Portland to implement residential SSO collection; however, more information is needed before implementing a full-scale program.

KCI Recommendation:

- Conduct a one-year SSO collection pilot program in two sections of the City.
- Based on results of the pilot, the City may then decide to design and implement City-wide SSO collection.

5.3 Public versus Privatized Collection Service

Retaining City-Provided Collection Services:

- Advantages:
 - Direct control of the operations, customer service issues and service quality.
 - Direct oversight of compliance with health and human safety standards.
 - Direct control of public relations issues.

- Control of potential job losses associated with service changes and improvements.
 - Less politically-sensitive.
- Disadvantages:
 - Ongoing personnel management responsibility.
 - Greater exposure to accident and environmental liability.
 - Potentially higher cost than privatized service.
 - Reliance on City budget cycles and capacity to finance new equipment.

Privatization of Collection Services:

- Advantages:
 - Provide access to private sector capital to finance new services and equipment.
 - Potentially lower cost due to operational efficiencies and economies of scale.
 - Transfer responsibility for and financial burden of capital purchases to a third party.
 - Reduce administrative and management responsibility to oversee services and staff.
 - Reduce City exposure to accident and environmental liability.
- Disadvantages:
 - Loss of direct control over quality of service and responsiveness to customers.
 - Risk of job loss or reduced pay and benefits for City employees hired by private service provider.
 - Politically sensitive in communities with history of City-provided services.

KCI Assessment:

- Based on the metrics available to KCI, Portland's collection services operate within expected ranges of efficiency and productivity for a two-person rear load truck operation.

- The City operations has capacity to implement improvements and new services if City is able to finance new equipment.
- Privatization would likely reduce the City's costs through lower pay scales and fewer operational supervisory staff. However, the City would lose direct control of service quality, responsiveness to customers, and safety and environmental compliance.
- Any collection privatization initiative would impact other services provided by the City, e.g., Island collection, bulky waste collection, and snow plowing, which presents a unique level of complexity which would need to be carefully evaluated and planned if privatization would be pursued.
- If it were to proceed with privatization, the City would need to accurately determine the number and type of customers that receive collection services. (*Note: KCI recommends this work be undertaken as part of general operational improvements, regardless of whether privatization is being considered.*)
- The decision whether to privatize or maintain City-provided collection services is, in large measure, a policy decision that should be informed by an in-depth analysis of operational and financial impacts.

KCI Recommendation:

- KCI does not perceive a compelling reason to privatize from an operational or cost-of-service perspective. Efforts should be made to improve current operations and implement new services with City-operated collection, unless the City lacks the financial capacity to capitalize new service. In which case, privatization may be worth further consideration.
- If the City wishes to pursue privatization, KCI recommends that a more in-depth analysis be conducted to identify impacts not only on collection operations, but also Public Service administration, Fleet, Human Resource, and labor agreements. The analysis should also include a survey of jurisdictions with privatized collection service to assess the impact on cost and quality of service.

5.4 Semi-automated Side Loaders versus Rear Loaders

Definitions of Automated, Semi-Automated and Manual Collection:

- Automated collection: A driver remains in the truck cab and operates a lift-arm that grabs a container, unloads it into the truck, and places the container back at the curb.
- Semi-automated collection: A driver (and potentially a helper) leaves the cab, rolls containers to truck-side and then operates a lift-arm that grabs a container, unloads it into the truck, and places it back at the curb.
- Automated and semi-automated collection are integral to converting to collection with roll-carts.



Advantages of Rear Loaders (RLs):

- Flexibility to adapt to the diverse neighborhoods in Portland.
- Flexibility to be used for both recycling and trash services.
- Flexibility to collect materials set out in bags, bins and barrels.

Disadvantages of RLs:

- Require a two-person crew to perform collection in Portland.
- Worker rides on back step nearly the entire time while on-route, which poses continual risk of injury as well as exposure to the elements.
- To assist with collection, the driver must walk from the cab to the curb then to the back of the truck which increases the collection time.

Semi-automated Side Loaders (SASLs):

- SASLs with a drop frame behind the cab can be loaded semi-automatically as well as operated in fully automated mode with the lift-arm.
- The drop frame configuration also has a lower loading height than standard automated side loaders, which translates to better clearance when collecting in constrained spaces (e.g. trees & power lines).
- Automated and semi-automated collection are more efficient (seconds per stop) and productive (pounds per worker per hour) than manual collection in most cases.
- Automated and semi-automated collection have lower incidences of worker injury (e.g. lifting injuries) than manual collection.

KCI Assessment:

- Based on observing residential set-outs in the diversity of Portland neighborhoods, recycling collection could be performed with roll-carts and automated or semi-automated collection.
- Monday, Tuesday and Friday routes are well-suited for automated collection with one-person crew.
- Wednesday and Thursday routes are suited for either automated or semi-automated collection with one- or two-person crews.

KCI Recommendation:

- Conduct field tests with various types of SASLs to confirm ability to operate in automated and semi-automated manner in the diverse Portland neighborhoods.
- If results are positive, the City should consider converting its fleet to SASLs capable of performing both recycling and MSW collection services.

- Retain some existing RLs to serve as spare, back-up collection vehicles and if necessary to service difficult-to-collect areas such as dead-ends and very narrow streets.

5.5 Collection Truck Size

General Findings:

- Portions of Portland (especially the Peninsula) have narrow streets, on-street parking, and tight turning requirements.
- Recycling and trash trucks need to be able to maneuver safely and efficiently in all parts of the city to maintain operational flexibility. Currently, the City utilizes 25-yard rear-loaders.



KCI Assessment:

- Weight tickets show that trash trucks regularly reach the upper threshold of their capacity (11 to 12 tons) to complete their collection routes. Crews regularly coordinate to spread remaining waste among trucks in order to complete their routes.
- Additional growth (e.g. through in-fill development or increased per capita waste generation) could push the trash routes beyond their current capacity.
- Chassis capable of handling larger truck bodies can be customized to various wheelbases and other configurations to improve maneuverability.
- Slightly larger truck bodies can be configured to chassis similar to what's being used currently.

KCI Recommendation:

- The City should perform pilot tests with slightly larger truck capacities (e.g. 28 – 31 yards) to determine suitability to maneuver in constrained areas of Portland, most notably the Peninsula.
- If results are positive, the City should convert its fleet to larger truck bodies that provide additional capacity to handle potential growth.

5.6 Information Technology for Collection Operations

Various forms of information and geo-based technology are being applied to waste collection operations.

Automatic Vehicle Location (AVL) and Vehicle Performance:

- AVL devices can be mounted on collection vehicles to monitor their location in real time.
- AVL provides information directly from a vehicle including vehicle location, speed, stopping time, on-board vehicle computer data, route history, and real-time tracking.
- AVL can be integrated with a vehicle's computer system to monitor critical functions such as starts and stops, use of hydraulic lift-arms and compaction systems, etc.
- AVL technology enables remote management of a mobile workforce to maximize the use of assets, and improve the ability to complete routes on time.
- This increases supervisors' "line of sight" in order to utilize resources more effectively.



Radio Frequency Identification (RFID):

- The two core pieces of hardware are:
 - Small RFID tags with unique identification numbers molded into each collection cart or container.
 - RFID tag readers mounted on each collection vehicle capable of scanning and RFID tags.
- When a tagged container is delivered to a customer, the unique RFID tag is permanently assigned to that customer location.

Integration of GPS and RFID Technologies Offers Numerous Advantages:

- Actual Collection Performance Data: RFID and AVL provide real-time data on collection operations including vehicle location, routing, stops, container lifts (semi-automated and automated), and time factors associated with each activity.
- Service Verification: RFID systems record when a collection vehicle is at a given location and when a cart is serviced.
- Set-Out and Participation Data: RFID tracks actual set-outs and overall participation rates by individual customer address.
- Education and Outreach Support: RFID contributes to targeted outreach and education program efforts. Messaging can be customized by customer or neighborhood.
- Asset Management: Carts are a major capital asset. Without RFID, there is no way to track this asset's whereabouts, or life cycle for warranty purposes.
- Route Optimization: Before RFID, route optimizers used postal addresses to route vehicles along street centerlines using generally available maps. Now, route optimizers can use collection data that includes the latitude and longitude of the actual container placement, making routes more efficient and the optimizer process cleaner and faster.

- Incentives: RFID is being used as the platform for incentive-based recycling programs. Whether it's billing for service or coupon programs, RFID is the meter to manage incentives.

KCI Assessment:

- Integrated GPS and RFID technologies offer numerous opportunities to improve collection efficiency, support customer service, and target outreach and education to maximize program participation.
- It is critical that an accurate container assembly and distribution (A&D) service is carried out as part of program start-up, especially if the containers are RFID equipped.
- A reliable database is the most valuable facet of an RFID system, and its usefulness depends on correctly recording container locations at the time of delivery.

KCI Recommendations:

- Portland should incorporate AVL technology in specifications for new trucks and consider retrofitting existing trucks.
- If and when cart-based collection is implemented for SSR or SSO, carts should include RFID tags and collection trucks should be equipped with RFID readers in order to provide program statistics, assist with customer service, support operational improvements, and manage cart assets.

5.7 Compressed Natural Gas Collection Trucks

General Findings:

- Compressed natural gas (CNG) is less costly than diesel fuel: CNG has averaged approximately 50% of diesel costs recently.

- CNG proponents claimed that CNG trucks have lower engine and powertrain maintenance costs, however the waste collection industry does not yet have long-term experience yet to confirm this.
- CNG has lower GHG and other emissions (Sox, NOx, & particulates) than diesel or gasoline.
- CNG requires a dedicated fueling facility.
- CNG engines have lower power for comparable displacement so larger engines are needed to have comparable load performance as diesel.

KCI Assessment:

- City is in process of purchasing first CNG refuse truck and researched the advantages, disadvantages and requirements for converting to a CNG fleet.

KCI Recommendation:

- If experience with the first truck is positive, the City should proceed with full conversion of Recycling & Trash fleet.

5.8 Staff Training and Safety

General Findings:

- Solid waste collection is one of the most hazardous professions in the U.S. in terms of injuries and fatalities.
- The primary reasons being the use of powerful, specialized equipment, repetitive lifting, and stressful, unpredictable work conditions.
- Injuries and accidents are prevented by having adequate training and safety protocols that ensure compliance with safety standards.

KCI Assessment:

- KCI did not conduct a detailed assessment of the collection staff training program; however based on observations and limited discussion during the field assessment, it appears that opportunities exist to improve staff training and safety.
- During FY2012-FY2014, the City collection service incurred an average \$42,765 per year in workers' compensation claims. Other financial costs include additional overtime expenses for existing employees and additional costs for temporary workers.
- Operational impacts of worker injuries include the potential for reduced crew productivity due to use of less experienced workers, fatigue associated with increased responsibility among existing workers, and increased potential for customer service issues.
- Training, safety protocols, and compliance/enforcement mechanisms are essential.

KCI Recommendations:

- KCI did not perform an in-depth assessment of Portland's training and safety programs, so the following recommendation is offered as a guideline to assess if any aspects may require improvement.
- A more complete review should be undertaken to ensure that all aspects of the City training and safety program are in place and functioning properly, including, but not limited to:
 - New employee screening and training.
 - Regularly scheduled safety meetings.
 - Recognition program to reward safe practices.
 - Vehicle safety training specific to each vehicle type.
 - On-the-job "tailgate talks" to review work safety procedure.
 - Incident reporting and investigation.

- Policy enforcement such as a repeat offender program and a progressive discipline policy.

5.9 Incentive System

General Findings:

- Incentive programs are fundamental to motivating employees and providing structure for accomplishing organizational goals. Incentives are basically financial- or recognition-based, or a combination of both.
- With any program, checks and balances should be put into place to discourage workers from activities that oppose organizational goals and objectives.

KCI Assessment:

- Portland utilizes a task-based incentive system that compensates employees for a full workday, regardless of how many hours are actually spent completing daily tasks.
- The task system has been a standard in the solid waste industry for decades; however, counter-productive behavior is often associated with the task system.
- The task system by itself can encourage unsafe behaviors and poor quality of service by workers trying to complete routes as quickly as possible.
- Incentive systems that rely on, or at least incorporate, other forms of recognition and financial reward can help motivate the desired balance of efficiency, quality of service, and safety.

KCI Recommendation:

- The City should consider developing a more comprehensive incentive system that recognizes and rewards other aspects of worker performance such as: improving safety; creativity that results in

new and innovative procedures; excellent customer service; positive attitudes and being a team player; and mentoring new employees.

5.10 Trends and Practices in Pay-As-You-Throw (PAYT) Programs

Types of PAYT Programs:

PAYT comes in a range of forms depending on jurisdictions' objectives and preferences.

- **Bag, Tag & Sticker Programs:** Generators purchase special color-coded or imprinted plastic bags or stickers for their waste. The predetermined price of each bag or sticker includes some or all of the cost of waste services. Portland is an example of this type of program.
- **Can/Cart Programs:** Generators pay a fixed price based on the size or number of containers they select for their waste service, e.g. 30, 60 or 90 gallons of service. The larger or greater number of waste collection containers used, the more a generator will pay.
- **Hybrid Programs:** Generators pay a fixed amount for a specified maximum volume of waste to be placed out per collection period. Waste placed out for collection that exceeds this amount accrues an additional charge.
- **Weight-Based Programs:** Weight is either determined when generators drop off solid waste or collection vehicles are equipped with technology that can assess the weight of the contents of a container at curbside and charge accordingly.

Impacts of PAYT:

- It is widely acknowledged that PAYT communities discard less MSW than communities without PAYT. Specific information for Ecomaine communities in FY2014 provided in the following table indicates that PAYT communities discard 37% less MSW than non-PAYT communities.

Table 9: Amount of MSW Discarded by Ecomaine Communities (Pounds/Capita/Month)

All PAYT Communities	All Non-PAYT Communities
25.5	40.6
Portland	South Portland
24.4	40.0

- Research by KCI did not identify any communities in New England that have abandoned PAYT in recent years.
- However, based on Table 9, if Portland were to eliminate PAYT and per capita MSW discards equaled South Portland, it would discard an estimated additional 6,010 tons per year.
- If this were to happen, there would be two significant financial consequences in addition to the operational impacts on City collection:
 - Higher costs for disposal: 6,010 at \$70.50 per ton ≈ \$423,700
 - Lost revenue from sale of PAYT bags: \$1,522,000 in FY2014

Section 6 Analysis of Collection Scenarios

KCI conducted an operational and financial analysis of four curbside recycling and MSW collection scenarios:

- Current Recycling and MSW Services
- Improved Current Recycling and MSW Services
- Cart-based Single Stream Recycling (SSR) and Current MSW Collection
- Cart-based SSR and Source Separated Organics (SSO) and Reduced Frequency MSW Collection

The Current Services Scenario provides a baseline against which the three alternate scenarios can be compared to assess operational and financial impacts. Key operational parameters are summarized in the following table. The operational parameters for alternative scenarios are based on key recommendations outlined in Section 4.

Table 10: Basic Features of Four Collection Scenarios Considered

	Current Service		Improved Service		Cart-based SSR		Cart-based SSR & SSO		
	SSR	MSW	SSR	MSW	SSR	MSW	SSR	SSO	MSW
Collection Frequency	W	W	W	W	W	W	W	W	EOW
Collection Container	Current	PAYT Bag	Current	PAYT Bag	64-gal Cart	PAYT Bag	64-gal Cart	10-gal Cart	PAYT Bag
Truck Size, Type, & Fuel	25-yd RL Diesel	25-yd RL Diesel	28-yd RL CNG	28-yd RL CNG	28-yd SASL CNG	28-yd SASL CNG	28-yd SASL CNG	28-yd SASL CNG	28-yd SASL CNG
Crew Size	2	2	2	2	1	2	1	1	2

Notes: W = Weekly; EOW = Every Other Week; RL = Rear Loader; SASL = Semi-Automated Side Loader.

6.1 Description of Scenarios

All four scenarios were based on common parameters with regards to the number of customers served and financial factors as shown in the following table.

Table 11: Common Assumptions and Inputs for All Scenarios

Parameter	Value
Customers/Buildings Served:	
Single Family	14,163
Multi-family & Municipal	1,697
Annual Growth Rate	0%
Financial Projection Factors:	
Interest Rate	4.5%/year
Inflation Rate	2.0%/year
PAYT Bag Fees:	
15-gal Bag	\$1.00
30-gal Bag	\$2.00
Ecomaine:	
MSW Tip Fee	\$70.50/ton
Recyclable Revenue	\$0/ton
Operating Cost Factors:	
Salary & Wages	Current \$/FTE
Benefits	29.6%
Overtime & Temporary Labor	Current \$/FTE
Workers Compensation	Current \$/FTE

Note: FTE = Full Time Equivalent

Increased Recovery Rates:

- Current Scenario and Improved Current Scenario:
 - Same recovery rate as FY2014.
 - 4,364 tons of recyclables and 8,026 tons of MSW.
 - Overall 35% recovery rate.
- Cart-Based SSR:
 - Additional recovery of 65% of designated recyclable materials still present in MSW.
 - Estimated to equal an additional 1,230 tons.
 - Overall 45% recovery rate.
- Cart-Based SSR and SSO:
 - Additional recovery of 65% of designated recyclable materials still present in MSW.
 - Recovery of 65% of food waste, yard waste and compostable paper in MSW.
 - Estimated to equal an additional 1,230 tons of SSR and 1,940 tons of SSO
 - Overall 61% recovery rate.

Increased Collection Truck Size:

- For the three alternative scenarios, KCI has assumed that Portland converts its existing fleet from 25-yard to 28-yard trucks.
- In general, the increased capacity will provide a buffer to reduce operational impact of daily and seasonal fluctuations in quantities of MSW and recyclables.

Conversion to CNG:

- For the three alternative scenarios, KCI has assumed that Portland converts its existing fleet to CNG.

- Based on general industry guidelines, it is estimated that:
 - CNG fuels prices = 50% of diesel fuel.
 - CNG vehicle maintenance costs = 50% of diesel trucks.

Conversion to Semi-Automated Side Loaders:

- For the SSR and SSR & SSO scenarios, KCI has assumed that Portland converts from rear loaders (RLs) to semi-automated side loaders (SASL) because these trucks provide combined ability to collect SSR and SSO carts as well as improve efficiency and safety of manual MSW collection as noted in Section 4.

New Trucks:

- Typical collection fleet replacement schedules are based on seven years of front-line use. The City's current fleet of collection trucks has reached the end of their service life for daily service.
- For all four scenarios, KCI has assumed a new fleet of vehicles is purchased for FY2017 using municipal borrowing/bonding capacity.
- Based on information provided by City staff and truck suppliers, KCI estimated the capital cost for new collection trucks in the following table.

Table 12: New Collection Truck Capital Costs

Truck Type	Capital Cost
25-yd RL Diesel	\$230,000
28-yd RL CNG	\$265,000
28-yd SASL CNG	\$295,000

SSR and SSO Carts:

- Cart vendors generally provide 10-year warranties that include replacement of carts that fail due to normal wear and tear.
- During their service life, some carts will require maintenance and repair. This work may be performed by City personnel or it may be contracted independently through the cart supplier. KCI included the cost of a half-time City employee to cover maintenance & repair costs in the two cart-based scenarios.
- For the SSR and SSR & SSO scenarios, KCI has assumed that new containers are purchased in FY 2017 using municipal borrowing/bonding capacity. Capital cost assumptions are provided in the following table which include RFID tags and assembly and distribution.

Table 13: Collection Cart Capital Costs

Cart Type	Capital Cost
64-gal SSR Cart	\$50
10-gal SSO Cart	\$40
1-gal SSO Kitchen Bin	\$6

Note: Cost includes RFID tags and cart assembly and distribution.

Timing of Implementation:

- For the purpose of the analysis, KCI assumed the three alternate scenarios would be implemented City-wide in FY2017.

6.2 Results of Analysis – Operational Metrics

Table 14: Estimated Operational Metrics for Collection Scenarios

	Current Service		Improved Service		Cart-Based SSR		Cart-based SSR & SSO		
	SSR	MSW	SSR	MSW	SSR	MSW	SSR	SSO	MSW
Customers (Buildings)	15,860	15,860	15,860	15,860	15,860	15,860	15,860	15,860	15,860
Collection Frequency (per week)	1	1	1	1	1	1	1	1	0.5
Number of Crews	3	3	3	3	3	3	3	2	2
Average Route Size	1,057	1,057	1,057	1,057	1,057	1,057	1,057	1,586	793
Tons/Year	4,364	8,026	4,364	8,026	5,595	6,795	5,595	1,944	4,850
Average Tons/Crew/Day	5.6	10.3	5.6	10.3	7.2	8.7	7.2	3.7	9.3
Average Lbs/Building/Collection	11	19	11	19	14	16	14	5	24
Average Building/Crew Work Hour	151	158	151	158	151	151	151	227	113
Average Tons/Crew Work Hour	0.8	1.5	0.8	1.5	1.0	1.2	1.0	0.5	1.3

6.3 Results of Analysis – Financial Metrics

Table 15: Projected Revenue and Expenses for FY2017

	Current Service	Improved Service	Cart-Based SSR	Cart-Based SSR & SSO
Revenue				
PAYT Bag Fees	\$1,552,217	\$1,552,217	\$1,314,107	\$938,075
Other Revenue	\$405,830	\$405,830	\$405,830	\$405,830
Total Revenue	\$1,958,047	\$1,958,047	\$1,719,937	\$1,343,905
Operating Expenses				
Personnel	\$1,190,235	\$1,190,235	\$1,007,371	\$1,007,371
Vehicle Fuel, Maint. & Repair	\$284,127	\$176,372	\$196,637	\$217,973
Disposal (Tip) Fees	\$662,119	\$662,119	\$575,323	\$438,251
Riverside Facility Operations	\$1,187,696	\$1,187,696	\$1,187,696	\$1,187,696
Other	\$207,831	\$207,831	\$205,876	\$189,320
Total Operating Expenses	\$3,532,006	\$3,424,252	\$3,172,902	\$3,040,610
Net Annual Cost	\$1,573,959	\$1,466,205	\$1,452,965	\$1,696,706
Capital Purchases				
Collection Trucks	\$1,464,467	\$1,687,321	\$1,878,338	\$2,191,395
Curbside Roll Carts	\$0	\$0	\$1,021,572	\$1,961,418
Kitchen Organics Bins	\$0	\$0	\$0	\$0
Total Capital Purchases	\$1,464,467	\$1,687,321	\$2,899,910	\$4,152,813
Annualized Capital Expenses	\$275,111	\$316,975	\$500,987	\$696,075
Net Annual & Annualized Capital Cost	\$1,849,070	\$1,783,180	\$1,953,952	\$2,392,780

Table 16: Projected 10-Year Net Present Cost for FY2017-FY2026

	Current Service	Improved Service	Cart-Based SSR	Carted-Based SSR & SSO
Net Annual Cost:				
Net Present Cost	\$16,495,000	\$15,439,000	\$15,185,000	\$17,378,000
NPC Per Ton	\$133	\$125	\$123	\$140
Net Annual & Annualized Capital Cost:				
Net Present Cost	\$18,871,000	\$18,176,000	\$19,383,000	\$23,143,000
NPC Per Ton	\$152	\$147	\$156	\$187

Summary of Financial Results:

- Reduced revenue from sale of PAYT bags associated with increased diversion of SSR and SSO.
- Reduced personnel costs due to smaller crew sizes for semi-automated cart-based SSR and SSO collection.
- Reduced vehicle fuel, maintenance and repair costs associated with conversion to CNG trucks. This is partially offset by higher maintenance and repair costs associated with SASLs which have more extensive hydraulic and mechanical systems than RLs.
- Reduced disposal tip fees associated with increased diversion of SSR and SSO.
- All four scenarios are based on purchasing new fleets of collection trucks in FY2017.
- The cart-based SSR and cart-based SSR & SSO scenarios entail significant capital cost in FY2017 to purchase curbside carts, and in the case of SSO in-home bins as well.
- Annualized capital costs were estimated using 7-year service life for collection trucks and 10-year manufacturer's warranty for collection carts.

6.4 Options for Financing System Improvements

Several options exist for Portland to finance the costs associated with implementing cart-based SSR or SSR and SSO.

Increased PAYT Fees:

- The current rates have been in effect since the PAYT program was implemented along with curbside recycling.
- The PAYT fee was presented to the public as a method to finance the added service of curbside recycling.
- The provision of carts for SSR will increase recycling convenience and capacity to residents, which may provide a good basis for increasing PAYT fees.
- Likewise, the addition of cart-based SSO collection service would be a brand new service that further increases residents' ability to divert waste from disposal. Residents who currently subscribe to private SSO collection pay \$14 per month – the equivalent of 14 15-gallon PAYT bags.
- KCI assessed the financial impact of a 25% increase in PAYT bag costs (see Table 17, following page):
 - \$1.25 per 15-gallon bag.
 - \$2.50 per 30-gallon bag.
- We project that such an increase would enable Portland to implement SSR at lower cost than the current program. SSR & SSO has a lower project net annual cost, however the net annual cost including annualized capital is project to be higher than the current program.

Table 17: Financial Impact of a 25% Increase in PAYT Bag Fees for Cart-Based Scenarios

	Current Service	Improved Service	Cart-based SSR	Carted-based SSR & SSO
FY2017:				
Total Revenue	\$1,958,047	\$1,958,047	\$2,048,464	\$1,578,423
Total Operating Expenses	\$3,532,006	\$3,424,252	\$3,172,902	\$3,040,610
Net Annual Cost	\$1,573,959	\$1,466,205	\$1,124,438	\$1,462,187
Total Capital Purchases	\$1,464,467	\$1,687,321	\$2,899,910	\$4,152,813
Annualized Capital Expenses	\$275,111	\$316,975	\$500,987	\$696,075
Net Annual & Annualized Capital Cost	\$1,849,070	\$1,783,180	\$1,625,425	\$2,158,262
FY2017 – FY2026:				
Net Annual Cost:				
Net Present Cost	\$16,495,000	\$15,439,000	\$12,234,000	\$15,272,000
NPC Per Ton	\$133	\$125	\$99	\$123
Net Annual & Annualized Capital Cost:				
Net Present Cost	\$18,871,000	\$18,176,000	\$16,432,000	\$21,037,000
NPC Per Ton	\$152	\$147	\$133	\$170

Grants to Offset Portion of Cost for Carts:

- The Curbside Value Partnership operates a grant program specifically aimed at helping communities switch to cart-based SSR. The grants can include:
 - Up to \$100,000 toward the purchase of roll-carts for SSR.
 - Up to \$25,000 towards outreach and education.
 - Technical assistance and use of pre-designed outreach and education materials.
- The grants are specific to cart-based SSR and cannot be used for SSO collection.

Lease Financing

- If the City is constrained in its ability to finance the purchase of new trucks, some truck vendors will lease new collection vehicles to the City and provide guaranteed terms for re-purchase.

Privatization:

- If financing the capital cost of new trucks and carts presents a significant barrier to Portland, the City could choose to privatize as part of upgrading to cart-based SSR collection. It could do likewise for cart-based SSO collection.
- The provision of new carts would be included in the service agreement with the private company being responsible for providing the carts and recouping the cost through services fees.
- In such a scenario, the City would need to enter a long term service contract of sufficient length (e.g. five to 10 years) in order to spread out the cost of carts.