

ASSESSMENT OF GARBAGE BY THE POUND (GBTP) SYSTEM OPTIONS FOR THE CITY OF VANCOUVER, WASHINGTON

Final Report

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ORGANIZATION OF REPORT

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I. EXECUTIVE SUMMARY

As it looks at implementing automated/semi-automated residential garbage collection systems, the City of Vancouver, Washington is interested in exploring potential future options to expand recycling and diversion incentives and opportunities for residents. The City has implemented an aggressive set of programs and strategies, including extensive Pay as you Throw (PAYT) or Variable Rate (VR) program options in addition to curbside recycling, yard waste programs, and comprehensive education programs. The City's recycling rate is currently 36% and the diversion rate is 48%. In 2000 the City undertook an extensive citywide can weight study; that study concluded that current volume-based rates already provide reasonably effective incentives to recycle.

The diversion rates are strong, but to continue progress, the City is interested in examining other options to increase diversion in the future. This study assessed the potential of weight-based rates and billing strategies (or "Garbage by the Pound" / GBTP). The GBTP program uses scales on trucks to weigh the waste set out for collection by each household on a weekly basis, and household garbage fees are computed based on the actual pounds disposed – a price incentive that is one step more refined than the existing volume-based PAYT program.

The steps that were undertaken in the study included:

- Selected sample routes and retrofitted one residential rear-loader collection truck.
- Weighed garbage set outs weekly.
- Sent letter to one-third of households explaining the program and encouraging reductions in garbage disposal.
- Prepared summary of household weights and three options for billing – which was mailed in conjunction with a survey
- Prepared and analyzed results of a survey asking for feedback on the program, behaviors, and attitudes
- Analyzed weight results.
- Studied GBTP systems elsewhere, and gathered information on available systems.
- Assessed costs, benefits, and impacts of the potential GBTP system.

A summary of the results follows:

- **Advantages from GBTP:** The GBTP program is perceived by some customers and by some communities as more equitable than PAYT programs -- customers who put out similar amounts of garbage pay similar fees. Under PAYT programs, the same 32-gallon container may contain 16 pounds of garbage at one home, and 68 pounds at another residence. The program is also convenient. One size of container can be used for all residences, saving the need to deliver different sizes of containers. Occasional extra amounts of garbage are convenient to handle under the new system – the materials are just placed in the same container, weighed, and charged. The system also provides stronger incentives to recycle, compost, and source reduce -- because customers only have to divert a pound of garbage to save money, rather than a whole can's worth.

- **Disadvantages from GBTP:** GBTP involves greater data management on the part of the hauling/billing company. Although customers are charged by the pound for the garbage they generate, there is still a need to pay for the cost of driving a truck on route weekly. The GBTP collection method tested in Vancouver was less efficient in terms of collection times and labor as compared to automated collection without GBTP. There were multiple days when the GBTP technology did not log data. GBTP could also lead to variable garbage bills from month to month. However, this variation in bills provides the incentive to keep waste disposal down. Key disadvantages include higher costs from equipment retrofits, billing, and additional cycle time.
- **Equipment Availability:** The study shows that there is currently certified equipment available that can be used with automated or semi-automated collection systems. The automated equipment, manufactured by Filing-LTS, is legal-for-trade, and has been retrofitted on a small scale in pilot test communities in the US. There are also scores of programs that have been operating for upwards of 10 years across Europe and elsewhere using other equipment. However, we were unable to find any full-scale implementations of GBTP in the US or Canada.
- **Reduction in garbage disposed:** We conducted an 11-week pilot test of a GBTP system, weighing the disposed garbage on a weekly basis. More than 250 households on two collection days were included in the study. We selected a random one-third of the homes to receive notice about the program, a note that was meant to encourage them to reduce their disposal (see text of letter in the appendix). The results showed no significant reduction in disposal per household per week compared to the “control” households (those that did not receive a note). The other similar experiment was a pilot test conducted in Seattle several years ago. In that case, households with a mature variable can program (like Vancouver) received mock bills every other week monitoring their weights and computing their potential savings. In the Seattle case, the residents received regular feedback along with dollar computations. The residents in Seattle reduced their disposed tonnage by 15% beyond their standard variable can efficiencies. This 15% was split between shares going to recycling, yard waste diversion, and source reduction. Thus, the additional diversion from the program may be zero, or may be as high as 15%.
- **Acceptance of GBTP:** The feedback from the participant survey showed that about 42% are happy with the current system, and another 42% preferred a GBTP option (the remainder stated they didn’t know). However, a majority of respondents (68%) indicated that they would not be willing to spend additional funds for a GBTP system. Eight percent said they would be willing to spend more for the program – and the amount they were willing to pay was more than the computed incremental cost of the potential GBTP system.
- **Analysis of costs and benefits:** As part of the project, we examined the approximate costs and benefits from the GBTP system for Vancouver. These include estimates of implementation costs¹, on-going costs², and savings³ from the program. Our computations

¹ One-time costs included: one-time equipment-related costs including scale, installation, and truck antenna; per household costs including outreach and radio-frequency (RF) tags to label containers; setting up the billing system and revised rate computations.

² On-going costs included: new billing costs; staffing for customer service and billing issues; additional collection time waiting at each stop for the weighing equipment to cycle; and additional equipment maintenance costs.

³ On-going savings included: reduced inventory and change-out costs from multiple cart sizes; and reduced tonnage disposed at landfill, valued at disposal fee. Another possible source may be bad debt, but there is no reason to assume a change over standard variable can billing.

found that the incremental cost of the program would be about \$0.50 per household per month, and the savings would range from zero up to \$1.70 per household per month. On a “net” basis, the incremental bill changes per household per month would be between an extra \$0.50 to \$0.80 cents to a savings of \$1.20 monthly. This means a change of between 3-7% (extra) to 10% (savings) on the roughly \$12 monthly bill for Vancouver residents.

This analysis provides Vancouver with key information to help determine whether to implement the GBTP system and provide information that will help guide near-term cart and truck decisions to make sure they do not preclude moving to GBTP in the future. The City has strong programs and incentives in place already, leading to impressive recycling and diversion rates. However, the City may be starting to reach limits of what traditional programs can provide in terms of additional diversion. It may be that there are few other options that the City can adopt that can help increase residential diversion and reduction – at least by the levels that have been associated with GBTP. City residents currently pay a few dollars per month to fund a recycling program. The City needs to determine if it wants to increase residential rates by an additional \$0.50-\$0.80 (or about 3-7%) per household per month to have the potential to increase diversion by perhaps a little, but perhaps a lot. The City’s priorities and tradeoffs toward diversion, cost, risk, and policy considerations will need to be weighed in determining whether the GBTP program should be implemented – near term or later – using certified equipment.

II. INTRODUCTION AND PROJECT BACKGROUND

A. Programs and Collection in Vancouver

The City's 40,000 single-family households receive garbage, recycling, and yard waste service from two haulers – Waste Management and Waste Connections. The territory boundaries for the various services overlap, as each firm provides garbage service to a subset of residents, but one holds the contract for all recycling, and the other holds the contract for all yard waste collection. The City is currently working with the haulers to adjust the service so that each firm provides all services for “their” subset of customers. Waste Connections provides collection manually, and is transitioning to fully automated collection for garbage service, Waste Management currently collects garbage with semi-automated side loaders. The haulers handle the billing for the customers.

The City provides one of the best arrays of variable can options for customers, allowing customers a choice of five service levels:

- 20 gallons collected once weekly for \$11.61
- 32 gallons collected either monthly, every other week, or weekly, for \$8.02, \$11.61, and \$14.60 respectively, and
- 64 gallons collected weekly for \$26.57.

All rates are monthly and include recycling. Customers may have more than 64 gallon service at a price of \$11.97 for each additional can per month.

Given the timing for this project, we made the following assumptions for the project. Because we did not want to “tax” the GBTP program with greater than its share of costs, we assumed that the transition to GBTP would happen after the implementation of fully-automated collection for both haulers. Therefore, the increases and decreases in costs for new trucks, containers, and staffing changes to set up fully-automated collection are assumed to have already occurred. – and additional changes required for the GBTP system are included in this report.

B. Purpose of the study

Vancouver is interested in assistance in examining the feasibility of GBTP in the City. Several key areas of interest need to be explored:

- Technology issues: What is the status of equipment and GBTP systems nationally and internationally? What technology changes are coming?
- Acceptance / impact: What impacts will there be on garbage set outs? Is the program well understood and accepted by residents, policy makers and contracted operators?
- Rate / Billing issues: What rate structure can be used to balance revenues and incentives under the GBTP system? Can a billing system be set up to implement GBTP?
- Potential: What are the likely costs, benefits, collection and implementation issues, and impacts to the City? What is the future compatibility with equipment purchased today?

The City hired Skumatz Economic Research Associates (SERA) to assist in studying these questions.

III. GBTP CERTIFICATION AND EXISTING GBTP PROGRAMS

A. Pros and Cons of GBTP

Pay as you Throw (PAYT) or variable rates (VR) systems provide strong and demonstrated incentives for recycling and source reduction. Research indicates that PAYT / VR systems reduce landfill disposal by 17%, with about 1/3 going to increased recycling, 1/3 going to increased yard waste disposal, and 1/3 going to the cheapest of all alternatives – source reduction⁴. Recycling tonnage in communities reportedly increases by an average of about 50%. However, enhancements beyond volume-based PAYT / VR systems have the potential to provide even greater advantages and diversion.

Garbage by the Pound (GBTP)⁵ -- or systems that charge for solid waste service based on the number of pounds set out for collection – provide advantages over PAYT / VR systems. The difficulties associated with PAYT / VR, and the advantages of GBTP systems are summarized in Table III-1 below.

Certainly, volume-based systems like Vancouver’s current program, have several advantages over GBTP systems at this point:

- They are simpler to bill
- They do not require expensive truck retrofits.
- There are more than 5,000⁶ programs in full-scale operation across the US, Canada, and overseas.
- The linear rate structure encourages recycling and waste reduction.

The balance of the advantages and disadvantages are a question for examination. The remainder of the report addresses the potential, costs, and benefits for GBTP enhancements in the City of Vancouver.

Table III-1. PAYT / VR Weaknesses Improved by GBTP Systems

PAYT / VR Weaknesses	GBTP / Weight Based Enhancements
<ul style="list-style-type: none"> • Many volume-based systems base fees on subscription (can size) rather than usage, with customers paying for a set number of cans weekly, whether or not they use or fill them. • The systems do not charge less if the containers are not full, so there are no incentives to reduce set outs below filling the smallest container. 	<ul style="list-style-type: none"> • GBTP offers customers incentives every week of the year and provides fair, informative billing, telling customers what they are paying for. • GBTP charges customers only for the number of pounds of waste put in the container. Putting less in the container provides direct dollar savings – incentivizing all diversion.

⁴ Skumatz, Lisa A., “Measuring Source Reduction: PAYT / VR as an Example”, Skumatz Economic Research Associates, Inc., Superior, CO, 2001; and Skumatz, Lisa A., “Nationwide Diversion Rate Study: Quantitative Effects of Recycling and Green Waste Program Alternatives”, Skumatz Economic Research Associates, Inc. (Seattle, WA / Superior, CO), 1996.

⁵ The system was dubbed “Garbage by the Pound” (or GBTP) by Skumatz for the initial Seattle implementation. We use that shorthand throughout the remainder of the report.

⁶ Skumatz, Lisa A., Ph.D., “Maximizing Vr/Payt Impacts – Policies, Rate Designs And Progress”, *Resource Recycling*, June 2001 and August 2001.

PAYT / VR Weaknesses	GBTP / Weight Based Enhancements
<ul style="list-style-type: none"> • Volume based systems require rate setters to translate between tonnage (the usual basis for costs) and volume (the basis for revenues), leading to uncertainties, compaction incentives, etc. • Many volume-based systems require expensive purchase, delivery, and storage of multiple container sizes (and costly trade outs when customer service needs change). • Customers that reduce their volume without reducing the actual waste disposed receive savings. For example, those with trash compactors may pay less than those without compactors. • Using the smallest can may limit the "surge capacity" which provides customer convenience. 	<ul style="list-style-type: none"> • The system charges based on weight, and no volume translations are needed, reducing revenue risk and simplifying rates computations. • GBTP can provide incentives while using only one size of container – reducing inventory, without requiring a variety of refuse containers and the costs incurred with change outs, etc. It also decreases customer inconvenience in that they don't need to request container size changes. • Compaction does not affect charges, so those with similar weights of garbage pay the same, regardless of volume. • Weight-based systems can also be expanded to charge different amounts for different materials and waste streams. This enhancement can provide strong incentives to reinforce waste diversion efforts. • Weight-based systems have resulted in significant additional landfill disposal reductions beyond PAYT programs, resulting in landfill (and potentially long-term system) savings. • Especially strong data for future disposal, recycling, facility, and system planning.

B. Programs and Pilot Tests of GBTP

Progress in GBTP has occurred in both North America and internationally.

North American Experience: There was quite a flurry of activity in the area of GBTP in the early to mid 1990s in the US. This started with the first jerry-rigged system in Seattle in 1989, and quickly spread to almost two dozen pilot tests across the US and Canada. Systems were certified in the US starting in 1994 and 1995. However, although many programs were fully implemented overseas, we have yet to find one citywide long term program operating for residential collection in the US or Canada.

European / International Experience: Cart identification and weighing systems began to be implemented in Germany about 10-12 years ago. More than 4 million bins (about 20% of all bins in Germany) are reportedly currently equipped with electronic transponders. Fully automated systems are also manufactured in Sweden, using a mini-hopper type system to weigh each cart's waste. SERA's research found that these systems were in place in several scores of communities across Europe. One key factor that no doubt influences their adoption in Europe includes high disposal fees.

Pilot Test System Impacts: There are only a few of these studies that measured or reported the impacts of the programs on garbage and recycling disposal. These are listed below:

- 15% landfill reduction for a program that had previously billed by the can (PAYT) based on Seattle's experience,⁷
- 30-70% reduction in land filled tonnage based on GBTP experience in Sweden and Scandinavia,
- 40% landfill reduction based on Northern Europe / Scandinavian experience,
- 50% impact based on early experience in Germany, and
- 55% impact after adding GBTP with a new recycling program.

The following tables summarize some of the key GBTP systems in North America and internationally.

Table III-2. Communities with Weight-based Residential Collection Programs or Pilot Tests: North American Cities (source: Skumatz Economic Research Associates, Inc., 2001-2002)

City/District	State/Country	Year	Status	Equipment
Seattle	Washington	1989-1990	Test completed No further plans Mock bills provided to customers	Manual residential; Toter semi-automated Residential (bar-code and RFID)
Farmington	Minnesota	1991	Test complete No further plans	GSE Scale (not certified); Semi-automated; Residential (bar-code and RFID)
Mendham Township	New Jersey	1992		Weight-based stickers for bags
Durham	North Carolina	1993	Test completed No further plans	Toter; Semi-automated; Residential (RFID)
Oak Bay	British Columbia	1993	Test completed No further plans	Schaefer (&MCC); Semi-automated; Residential (RFID)
Minneapolis	Minnesota	1993	Small pilot test, completed	Semi-automated
Milwaukee	Wisconsin	1994	Test completed No further plans	Ellis System (not certified); Semi-automated Residential (bar code)
Columbia	South Carolina	1994	Test completed No further plans, mock bills provided.	Toter; Semi-automated; Residential (RFID)
Van Buren County	Tennessee		Drop-off weight-based	Truck scale and small bag scales

⁷ There are arguments for the 15% impact being higher than would occur in a full-scale program, and argument for it potentially being an overstatement. The program operated for 3 months – therefore, it could be argued the program overstated impacts because customers may have “hoarded” waste until after the program was over. Note that customers were not told how long the (ultimately, 3 month) experiment would last, so they would be hoarding for an unknown time. It could be argued the results understated ultimate results because customers only received a “mock” bill – they did not experience real dollars and cents savings. Their reactions to real savings might have been expected to be higher if they actually saved money on their bills. Because these factors work in opposite directions, it seems the 15% figure may be a fairly defensible figure. Note, by coincidence, this 15% tonnage impact figure is very similar to the diversion improvements seen when communities move from fixed bill garbage systems to PAYT systems, as is noted in the discussion in paragraphs that follow.

City/District	State/Country	Year	Status	Equipment
Hampton	Virginia	1995	Completed	LTS (via Cardinal); Fully-automated Residential (RFID)
Fremont County	Iowa	1997	Tested for implementation in 1998; implementation aborted due to sale of hauling company	LTS (Cardinal); Semi-automated Residential (RFID)
Scranton	Iowa	1998?	Tested; also tried 2 streams – recycling and garbage; test only	Filing fully-automated with New Way Sidewinder Arm mounted on Loadall EVOs
Pagedale (St. Louis)	Missouri	1996	Tested in 1998, using “sample bills”, generic for all customers	LTS (&Cardinal); Fully automated Residential (RFID)

Table III-3. Communities with Weight-based Residential Collection Programs or Pilot Tests: Partial List of International Cities (source: Skumatz Economic Research Associates, Inc., 2001-2002)

Communities in State/Country	Year	Status	Equipment
Switzerland	1992	Implemented	Semi-automated Residential
Australia	1992	Pilot	Fully-automated Residential
Austria	1993	Implemented	Semi-automated Residential
Denmark	1993	Implemented	Semi-automated Residential
Sweden	1993	Implemented	Semi-automated Residential
Finland	1995	Implemented	Fully-automated Residential
Germany	1995	Implemented	Semi-automated Residential
Germany		Implemented	Fully-automated Residential
7 communities in Sweden	1994-1997	Implemented	Fully-automated Residential
5 communities in Sweden	1994-1996	Implemented	Fully-automated Residential
Hauler in Sweden	1995	Implemented	Fully-automated Residential
Australia	1995	Pilot	Fully-automated

Communities in State/Country	Year	Status	Equipment
			Residential
Australia	1995	Pilot	Fully-automated Residential
Australia	1997	Pilot	Fully-automated Residential

Commercial Systems: There are several hauling companies in the US using retrofitted weight-based front loader systems on the commercial side. Interestingly, commercial applications have been adopted more readily than residential systems. Advantages that have been cited from the commercial haulers that have implemented systems include:

- Ability to identify high cost / high weight customers and adjust rates accordingly
- Ability to provide a price structure that very closely relates to costs
- Reduced stress on drivers regarding overweight trucks
- Greater driver safety through warning lights
- Data management / information on customers
- Integrated information between drivers and the office
- High technology GPS systems available to be able to identify location, etc.

These systems are being adopted especially for internal information; that is, customers are usually not billed based on actual weights on a week-to-week basis. Rather, the technology is used to identify high user customers and adjust their volume-type weights to better match costs. This still provides the majority of advantages for the haulers, and these systems are being implemented in more and more communities.

C. NIST Certification and Systems Available

National Institute of Standards and Technology (NIST)-managed National Type Evaluation Program (NTEP) certification is required before a system may be considered legal for trade. To be certified legal for trade for residential solid waste, the systems are being asked to conform to Class II level. This class applies to all scales involved in the sale of goods and services, such as produce and supermarket scales. The requirements are generally equivalent to 0.1% accuracy, but depend on the actual increments and capacity of the individual scale. For garbage tippers, this generally falls between 0.5 and 2 pounds accuracy.

NIST / NTEP has issued four certificates for “on-board weighing systems” for non-forklift systems. This includes one certificate issued to Hardy Instruments, Corporation (of San Diego, CA), one to Filing Scale Corporation, and two to LTS Scale Corporation. Filing and LTS are one company and are located in Twinsburg, OH. Filing-LTS provides both semi-automated and fully automated systems. Hardy Instruments indicates they have discontinued their system (although they still provide some service support). The status quo is that one company – Filing-LTS - has developed and has available a certified weighing system.

The Filing-LTS systems can be retrofitted on either semi-automated collection tippers, or on fully automated lifting arms. They discontinued the hopper-type system they had previously used for fully automated installations because of the wear and tear that the opening and closing caused on the scale equipment. Instead, the current method of retrofitting fully automated trucks

involves removing the existing lifter arm, installing the (certified) scale directly onto the truck, and then reattaching the arm to the scale assembly. The system handles containers up to 500 pounds capacity by one-pound increments, and does so with one-tenth percent accuracy, as required.

In particular, the system has been installed and tested using the fully-automated lifting arm⁸ from New Way of Scranton, Iowa – called the “Sidewinder Arm”. This arm mounts to the side of the body (not the frame of the truck). It attaches via six bolts, and can actually be retrofitted to the side of a front loader, or to Heil trucks, or it has also been retrofitted to Lodall “Evos”. However, although the arm can be fitted to many different types of vehicles, clearance can be an issue (either to meet Department of Transportation standards or practical local street / alley clearances). It is estimated that the arm adds 12 inches, and that the scale it is mounted to adds another 8 inches.

The system uses a static weigh approach and requires a five second pause on the lifting and returning tipping motions. The system cycles more slowly than collection arms without the GBTP / scale retrofit by about 4-6 seconds per household, or up to 10 extra seconds in some applications.

The Scranton test provides a useful example. In the test in Scranton, Iowa, the arm and scale were retrofitted on “Evos”. The GBTP retrofit required drivers to stop the system for the “net” weight to be computed. On the way “up”, a dashboard light would turn yellow when the arm gripped the container, and then the driver had to hold the location until the light turned green. On the way “down” after dumping the trash, the driver had to watch for a yellow light and stop the cycle there for several seconds (there was 6-8 inches of give on the position), and then the container could be “dropped” after the light turned green again. Overall, the extra cycle time per home was up to 10 seconds (increasing from about 12 seconds per cycle to about 22 seconds).

This can create a significant reduction in efficiency for fully automated collection.⁹ Six extra seconds of cycle time increase translates to one extra minute for 10 homes, 10 minutes for 100 homes, and 1.5 hours per day for 900 homes. Note that the cost increases associated with this additional cycle time are included in the benefit –cost analysis included in this report.

D. Why Haven’t GBTP Systems Been Adopted in the US?

We interviewed a number of the U.S. pilot test communities to ask for the reasons that they opted not to implement GBTP full-scale. One of the key reasons was that equipment was unreliable. Enthusiasm outpaced certification. Most of the pilot tests were conducted using technology that was still being tested to work out the kinks with an eye with an eye toward ultimate certification. Thus, weights were unreliable; one site (Milwaukee) noted that scales that read zero in the morning were off by the afternoon. Farmington noted that inclines in streets (and the liquid component of the waste in the containers) also affected the weights on the uncertified equipment they tested. One town noted problems with the early bar code readers, and concerns about the large size of the billing database. One town was extremely negative, citing reliability, customer service, cleanliness issues, and effects of extreme weather.

⁸ This lifting arm – installed – costs about \$24,000. However, we have assumed the GBTP system is being retrofitted onto an existing fully-automated system, so the cost of the arm is not included in the benefit-cost analysis included in this report.

⁹ Computations of the impact for Vancouver were derived as follows: 40,000 households time 5-10 extra seconds per stop, valued at \$50 for truck and per hour on the road adds \$144,000 - \$288,000 annually for slower collection for Vancouver.

However, this town is very negative about incentive rates, and remains extremely negative about the mandatory implementation of the variable can program (PAYT), which the state required.

Certified equipment is now available; however, risk and costs (from equipment and cycle times) seems to be the major concerns. For communities putting in fully automated collection to increase efficiency, slowing down the system to allow for cycle times seems counter. Simply put, no U.S. community wants to be the first to implement a GBTP system – although several seem willing to consider being second or third!

E. Technology Changes in the Future

Given the lack of interest to date by US communities, it is unlikely there will be much additional development time spent on systems for certification in the US. There are load cells and other necessary technology pieces out there – and technology has improved since the last GBTP equipment was certified. The industry wisdom seems to be that, until a full in-motion scale for fully-automated systems is certified, there may not be much interest in these systems from communities.

However, most of the firms that build these scale and GBTP systems felt that the substantial development money they had invested to date had not led to projects, and until a system is implemented and greater interest is shown for residential systems by communities and haulers, little change in equipment is likely. This may be a chicken and egg issue – further R&D will be unlikely until communities install equipment, but communities won't be interested until more refined systems are developed. As it stands, the current equipment can be retrofitted and used on many fully-automated systems, assuming street / alley clearance for the automated systems is available.^{10,11}

¹⁰ However, it is important to note that for residential systems, it is rare that 100% of the City can be "fully automated" because of issues with: overhead and alley-width clearance, on-street parking impediments, and other barriers. The GBTP system would be likewise affected.

¹¹ Vancouver has additional questions about fully-automated equipment and containers. SERA staff conducted interviews with manufacturers of fully automated tipping arms, haulers, and cart manufacturers to gather information on the (field) performance of different types of containers. We found truck manufacturers claimed they had fewer complaints about broken or smashed carts from communities / customers using rotational molded carts. Rotational molded carts are thought to be more durable in cold climates as they stay more flexible in low temperatures (injection molded carts are often described as having a nicer outward appearance). For fully-automated collection, other considerations are also of concern. On pricing, Toter has an advantage, but others argue that they have a relatively narrower base than some others, and that may cause problems in wind or on uneven ground. Ameri-Kart received high marks from some interviewees in that they have a more circular gripping surface, which can increase the contact surface area with the gripping arm, allowing a lower gripping pressure, which can increase the lifetime of the cart. The following manufacturers make injection-molded carts (most of which provide 5 year warranties): Otto, Schaefer, Rehrig Pacific, and Waste Management Cascade. Rotational molded containers (which usually have 10 year warranties) are made by Ameri-Kart, Toter, Roto Industries and El Monte (and possibly a Heil corporation). Blow molded carts are manufactured by Zarn and Waste Wheeler. Blow molded carts received lower remarks concerning durability. In making a final decision, Vancouver should also consider the pounds of material used in making the containers, and whether there are local representatives to help with service warranty problems.

IV. VANCOUVER CUSTOMER RESPONSE TO THE GBTP PILOT TEST

A. Survey Approach

Upon completion of the collection and billing phase of the GBTP project, the City and SERA conducted a survey of all participant households to gauge participant opinions, behaviors, and attitudes. Survey questions addressed the following topics:

- GBTP Program – Opinions and preferences for GBTP collection and billing
- Recycling and Waste Reduction – Current and expected disposal behaviors
- Household Information – Family and living characteristics

For questions regarding billing options, participants referred directly to their mock bill (included in the survey mailing). Participants were also asked to share any other (open-ended) comments they had regarding the GBTP experiment.

The survey task consisted of three distinct efforts to contact project participants:

- An initial mailing to all project participants
- A second mailing to non-respondents of the first mailing
- Phone interviews with a portion of non-respondents of the second mailing

The second round of survey mailings and the telephone interviews were necessary to obtain a statistically accurate sample of the GBTP program participants. Overall, 113 participants were contacted by mail and 30 participants were contacted by telephone. Data from the telephone interviews were weighted by a factor of five in the survey analysis to reflect the proportion of program participants who did not return their mail surveys.

In the following discussion of results, households have been categorized with respect to the number of persons per household, the age of the head of the household, and the garbage service level. Subcategories (for example, households with greater than two people) each had a sample size of at least 65 respondents, except for two garbage service level subcategories: households receiving less than 32 gallons of garbage service and households receiving greater than 32 gallons had sample sizes of 28 and 13 respondents, respectively.

B. Survey Findings

1. GBTP Program

Did you notice any changes in your garbage collection during the experiment?

Most participants (86%) did not notice any changes in their garbage collection during the experiment. Of those who did notice a change, only one percent reported “slightly worse service”, and no respondents indicated that service was “much worse”.

Table IV-1. Participant Recognition of Changes in Garbage Collection (P1)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		>=2	>2	<50	>=50	<32	32	>32
Did not notice any changes	86%	92%	82%	84%	90%	95%	88%	60%
Slightly better service	1%	0%	2%	0%	3%	3%	1%	0%
Much better service	2%	0%	4%	1%	4%	0%	1%	20%
Slightly worse service	1%	3%	0%	1%	1%	0%	1%	0%
Much worse service	0%	0%	0%	0%	0%	0%	0%	0%
Don't know	9%	7%	12%	14%	2%	3%	9%	20%

How satisfied are you with the GBTP billing options enclosed with this survey?

The majority of survey residents who were able to rank their satisfaction with the GBTP program were either “very satisfied” (21%) or “moderately satisfied” (16%) with the program. Although only 13% reported dissatisfaction with the program, the majority of these (11%) were “very dissatisfied”, indicating a slight polarization among respondents. Those households with one or two persons, with a household head older than 50 years, and with a service level of less than 32 gallons per week reported being more satisfied with the GBTP program than other respondents.

Table IV-2. Satisfaction with GBTP Billing Options (P2)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Very satisfied	21%	27%	18%	15%	27%	29%	20%	16%
Moderately satisfied	16%	23%	11%	11%	20%	17%	14%	16%
Neither satisfied nor dissatisfied	8%	12%	6%	5%	11%	6%	9%	0%
Moderately dissatisfied	2%	1%	4%	4%	1%	3%	2%	4%
Very dissatisfied	11%	7%	16%	15%	8%	14%	13%	0%
Did not notice the program	14%	23%	8%	13%	15%	20%	15%	0%
Did not know about the program	28%	21%	36%	37%	18%	11%	27%	64%

What did you like and dislike about the GBTP program?

Statements regarding payment / money considerations, especially the statement that residents “don’t have to pay for a full can if they use only part of a can”, received high marks. Approximately one-third of respondents (32%) also thought the GBTP program would provide a “regular reminder to reduce and recycle”. A lesser number of respondents indicated that they like the fact that “no special can sizes are needed” (20%) and that the GBTP collection method is “new and more modern method” (13%).

Smaller households and households with older heads of household reported agreeing with more of the statements than their counterparts. Smaller households, in particular, reported that the program “seems fair” (40%) and that they would “save money” (41%). Households headed by a person over 50 liked the fact that the bill tells them “clearly what they are paying for” (45%) and “gives them a regular reminder to reduce and recycle” (44%). They also reported more often than younger households that they like the fact they “don’t have to pay the same as someone who overstuffs his/her can”. Households that currently receive less than 32 gallons of service per week particularly agreed with the statement that GBTP “would save them money on their bill”.



Respondents also wrote in a number of open-ended statements, most of which were negative. Write-in responses included “don’t like the program / not interested” (6 responses), GBTP “program would increase rates” (2), “satisfied/ like can” (2), and “pay as used” (1).

Table IV-3. Favorable Characteristics of the GBTP Program (P4)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
No special can sizes needed	20%	24%	17%	21%	19%	43%	17%	8%
Don't have to pay for a full can if I only use part	54%	57%	52%	51%	58%	45%	59%	32%
Don't have to pay same as person who overstuffs cans	35%	39%	32%	29%	43%	35%	36%	16%
Tells clearly what I'm paying for	34%	30%	37%	25%	45%	28%	37%	24%
Billing provides a regular reminder to reduce & recycle	32%	35%	28%	22%	44%	30%	32%	24%
Made it easy to monitor the amount of waste I dispose	24%	25%	23%	17%	32%	25%	25%	8%
Would save money on bill	31%	41%	23%	29%	33%	45%	27%	24%
New & more modern method for garbage collection and charges	13%	11%	15%	6%	22%	5%	16%	4%
Seems fair	35%	40%	15%	29%	41%	38%	32%	40%

Respondents were most concerned with equipment and collection staff reliability issues, increased collection costs, and the potential of garbage service theft (i.e. other people putting garbage in containers without permission). They were less concerned with the complexity of the program and with their can being moved to another house. Only seven percent indicated the GBTP system seems like “an invasion of my privacy”. Older households were more concerned in general than the other subgroups of households. Households with more than two persons also were concerned that the GBTP program might add to their garbage costs.

Respondents also included many write-in responses. Many participants stated that the program would increase their rates (8 responses). Other responses receiving either one or two mentions included concerns about rain in the garbage cans / wet garbage, variability in household budgeting, lost jobs, the size of container, the need for locking cans, and billing for neighbors who group garbage.

Table IV-4. Unfavorable Characteristics of the GBTP Program (P5)

GBTP Program 'Dislikes'	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
It is very complex	10%	7%	13%	5%	16%	18%	11%	0%
Can may be moved to other HH	10%	6%	14%	6%	15%	13%	10%	8%
People might put their waste in my can and I'll have to pay extra	30%	34%	26%	25%	35%	25%	29%	28%
Seems like an invasion of privacy	7%	7%	7%	4%	11%	8%	7%	4%
Too much work for collectors	13%	10%	16%	9%	19%	10%	15%	8%
Might add to garb. costs	37%	25%	48%	32%	45%	25%	44%	8%
Collectors might make a mistake weighing the garbage	45%	42%	47%	40%	50%	43%	47%	16%
Equipment might not be reliable	47%	46%	48%	40%	56%	53%	49%	20%

Do you feel the GBTP would provide you with an additional incentive to reduce your waste or recycle more?

The majority of respondents (57%) indicated that the GBTP program would provide them with an incentive to reduce waste / recycle more or that it would if “garbage were really billed this way”. Only 35% indicated it would not provide such an incentive. The great majority (80%) of households that have greater than 32 gallons of service per week reported that the GBTP program would provide an incentive to recycle, whereas a small percentage (18%) of households that receive less than 32 gallons per week thought GBTP would provide an incentive.

Table IV-5. GBTP Waste Reduction and Recycling Incentive (P6)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Yes	43%	42%	44%	46%	40%	18%	43%	80%
Not during exper., but probably if garbage were billed this way	14%	15%	13%	15%	12%	8%	15%	15%
No	35%	34%	36%	35%	35%	58%	35%	5%
Don't know	8%	9%	7%	4%	13%	18%	7%	0%

With which of the following statements concerning billing do you most agree?

Participants responded most favorably to Option #1 with regard to the cost / fairness of the billing method and the understandability of the bill. They also indicated that Option #1 would provide them with the greatest incentive to reduce their waste. Nearly half of respondents also reported Option #2 “makes sense and is easy to understand”, although a greater number indicated “the overall cost of garbage service under Option #2 seems too expensive”. Respondents found Option #3 most difficult to understand. A relatively large number also indicated that Option #3 “seems too expensive” and would provide them with the least incentive to reduce their waste.

Table IV-6. Billing Option Respondent Opinions

Statements (P7 P8 P9)	Option*		
	#1	#2	#3
Option #_ makes sense and is easy to understand	51%	46%	29%
Option #_ is confusing	4%	3%	17%
Option #_ is a fair way to calculate my garbage bill	32%	28%	22%
Option #_ does not seem like a fair billing method to me	9%	18%	16%
The overall cost of garbage service under Option #_ seems fair	38%	25%	25%
The overall cost of garbage service under Option #_ seems too expensive	23%	30%	34%
The overall cost of garbage service under Option #_ seems too inexpensive	1%	5%	1%
Option #_ WOULD give me an incentive to reduce my waste	41%	29%	29%
Option #_ would NOT give me an incentive to reduce my waste	12%	13%	18%

*Table Note: Results not weighted for mail non-respondents. The majority of non-respondents did not have a mock bill to refer to in order to answer these questions.

Participants who indicated the billing options were confusing were asked to include written comments explaining any concerns they had. Option #3 received the majority of the comments. Respondents wrote that Option #3 contained “too many variables” (5 responses) and that they were concerned about the averaging procedure / being compared with others (3). Concerns

about Option #1 and #2 tended to be more general in nature with respondents indicating that the options were “too confusing” or “difficult to understand” or that they came up with a different total for their bill.

Respondents were also asked to offer an explanation if they indicated that the garbage billing option in question did “not seem like a fair billing method to me”. Responses for Options #1 were varied with participants indicating that their garbage had not been weighed properly (2 responses), that they wanted a flat fee (1), or that liked having a base cost (1). Respondents who found Option #2 unfair were mainly concerned that “a light user ends up paying the same flat fee as a heavy user” (5) and that they would have to pay an “extra \$4” or a “base rate plus cost” (2). Responses for Option #3 also tended to be more varied. A few participants had concerns about the averaging procedure (2) for Option #3 and about the fact they would “have to reduce quite a bit to get a break on the price” (2).

Would the following GBTP billing options give you an incentive to reduce your waste?

Respondents were also asked separately whether the three billing options would give them an incentive to reduce their waste. Again, respondents indicated Option #1 would offer the greatest incentive and that Option #3 the least.

Table IV-7. Waste Reduction Incentives by Billing Option

Statements (P7AA P8AA P9AA)	Option*		
	#1	#2	#3
Yes	53%	49%	41%
No	21%	25%	33%
Maybe	19%	20%	15%
Don't Know	6%	7%	11%

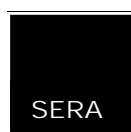
* Table Note: *Results not weighted for mail non-respondents. The majority of main non-respondents did not have a mock bill to refer to in order to answer these questions.

If you had to choose between the GBTP billing options, which would you prefer?

When asked directly which billing option they would prefer, 23% of the residents indicated Option #1, compared with 18% and 14% for Options #2 and #3, respectively. Approximately 37% of the respondents indicated they had no preference. Option #1 was also most popular among all household subgroups except for those households with heads of household younger than 50. This subgroup indicated they preferred Option #2, though only by a few percentage points. Those respondents who answered “Other” indicated that they would prefer the “cheapest” method (2 responses) or that they would like the billing to “stay the same” (2).

Table IV-8. GBTP Billing Option Preferences (P10)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Option #1	23%	21%	25%	19%	28%	41%	22%	4%
Option #2	18%	13%	23%	22%	14%	16%	17%	28%
Option #3	14%	18%	10%	11%	17%	0%	16%	4%
No preference / don't know	37%	30%	42%	41%	31%	43%	33%	64%
Other	8%	17%	0%	7%	9%	0%	11%	0%



If you had to chose between the GBTP program / rate option and the current garbage collection and billing system, which would you prefer?

Residents were split with regard to the type of program they would prefer, with 42% of respondents indicating they like the GBTP program and 42% indicating the current garbage system. Smaller households chose the GBTP program by a margin of 13%, whereas larger households chose the current system. Households with older heads of household also indicated that they slightly prefer the current system. Only four percent of households greater than 32 gallons of service indicated that they would prefer the current system. However, as mentioned earlier, the sample size for this subset was relatively small (13 respondents) and the majority of respondents indicated they had “no preference” or “didn’t know”.

Table IV-9. GBTP vs. Current System Billing Preference (P11)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
GBTP	42%	50%	36%	43%	41%	38%	42%	36%
Current system	42%	37%	47%	40%	48%	46%	48%	4%
No preference / don't know	16%	13%	18%	19%	12%	15%	10%	60%

If the GBTP system were more expensive to run than the current system, would you be willing to spend those additional funds for GBTP?

A majority of respondents (68%) indicated that they would not be willing to spend additional funds for a GBTP system, assuming it cost more to run. Only ten percent indicated unconditionally that they would be willing to spend more funds for the program. Eight percent stated they would spend more for the program, but only if it increased costs by less than a certain amount. These amounts, specified by the respondents, ranged from \$1 to \$10 per month with an average of \$4.90 per month.

Table IV-10. Willingness to Pay Additional Funds for GBTP (P12)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Yes	11%	12%	10%	13%	9%	8%	12%	4%
No	68%	73%	63%	65%	71%	74%	68%	64%
Yes, but only if < a certain amount	8%	7%	9%	8%	7%	5%	9%	8%
Don't know	14%	8%	18%	14%	13%	13%	11%	24%

How important is it to find ways to reduce your garbage bill?

The majority of respondents also stated that it is either “very important” (38%) or “somewhat important” (45%) to find ways to reduce the garbage bill. Only 13% indicated this was “not at all important”. Of all subgroups, households receiving 32 gallons of service per week placed the least importance on reducing garbage fees.

Table IV-11. Importance Placed on Reducing Garbage Bill (P13)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Very important	38%	41%	36%	40%	36%	58%	31%	56%
Somewhat important	45%	44%	45%	42%	48%	34%	47%	40%
Not at all important	13%	10%	14%	13%	12%	5%	16%	4%
Don't know	5%	5%	4%	5%	5%	3%	6%	0%

2. Recycling and Waste Reduction

What recycling, waste reduction, and yard waste methods do you currently use, and what changes would you expect to make if GBTP program were in place?

The great majority of Vancouver residents indicated that they use the City's curbside recycling program. A large number also resell goods or give them to charity. Less than half of residents consciously use purchasing methods, such as buying items with less packaging or buying in bulk, as a way to reduce garbage generation. A much smaller number bring recyclables to private recycling / drop-off centers or the transfer station. Four respondents also wrote in that they "burn paper" or "burn anything" and two commented that they "compost food waste".

Table IV-12. Current Recycling and Waste Reduction Methods Used (RW1)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Mostly all goes in garb. can	24%	25%	23%	28%	19%	11%	23%	65%
Bring some w/ garbage to the transfer station	20%	18%	21%	22%	17%	21%	19%	25%
Use City's curbside recyc.	93%	90%	96%	91%	96%	92%	96%	75%
Use private recycler, buyback, or drop-off recyc.	15%	4%	24%	15%	15%	16%	17%	0%
Resell or donate to charity	66%	57%	74%	63%	71%	55%	70%	65%
Buy goods with less packaging / waste or recyclable packaging	30%	23%	37%	31%	30%	24%	31%	35%
Avoid disposable / non-recyclable or buy longer lasting products	36%	31%	40%	31%	42%	42%	35%	35%
Buy in bulk quantities or buy less / avoid impulse buying	40%	26%	39%	38%	43%	37%	41%	25%

The majority of residents also use the City's curb / alley yard waste program as a means for disposing of yard waste. About a third of residents reported that they compost yard waste. This activity is most common among households with heads of household younger than 50. A lesser number haul yard waste to a disposal center or leave yard waste on the lawn. A few respondents also included write-in answers. These included "chip up at home" (1 response), "garden or burn" (1), and "use on 'on call' basis" (1).

Table IV-13. Current Yard Waste Disposal / Recycling / Composting Methods Used (RW2)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Use City's curb / alley prog.	67%	64%	70%	65%	69%	59%	71%	40%
Haul to transfer station / other site and pay	16%	8%	24%	17%	15%	28%	12%	35%
Compost it in my backyard	34%	38%	31%	45%	21%	54%	30%	40%
Landscaper / gardener take	7%	9%	5%	8%	6%	8%	6%	10%
I leave it on the yard	14%	13%	15%	16%	13%	10%	14%	30%
I don't have any yard waste	4%	6%	2%	6%	2%	3%	5%	0%

In addition, respondents were also asked on the survey what recycling and waste reduction methods they would use if a GBTP program were implemented. However, many respondents did not reply to this portion of the question, thus making accurate comparisons with current recycling habits difficult.

How satisfied are you with the current garbage, recycling, and yard waste program in Vancouver?

The majority of respondents indicated they were either “very satisfied” (58%) or “moderately satisfied” (22%) with the refuse program in Vancouver. Less than one percent responded that they were “very dissatisfied”, and only 1% that they were “somewhat dissatisfied”. Larger households, households with older heads of household, and households receiving 32 gallons of service per week reported being most satisfied with the program. A larger number of smaller households and households with younger heads reported they are “moderately dissatisfied” with the current refuse program.

Most respondents who reported that they were dissatisfied with the current garbage service also included explanations for their dissatisfaction. The most common responses included “charge if no pick-up” / “cost when I don't have a full can” (4 responses) and “mandatory recycling fee” (3). Other responses included “can is small” (2), “doesn't like one big can”, “yard waste” (2), and “other cities give garbage discount with recycling service” (1). The one respondent who indicated he/she was “very dissatisfied” indicated that the service was “too expensive”.

Table IV-14. Satisfaction with Current Vancouver Disposal / Recycling Programs (RW3)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Very Satisfied	58%	50%	65%	55%	63%	48%	64%	36%
Moderately satisfied	22%	20%	24%	21%	25%	23%	23%	12%
Neutral	7%	13%	3%	8%	6%	5%	5%	24%
Moderately dissatisfied	10%	14%	7%	15%	4%	20%	6%	28%
Very dissatisfied	<1%	1%	0%	0%	1%	0%	4%	0%
Don't know / no opinion	1%	2%	1%	1%	1%	5%	4%	0%

Respondents also reported that they are satisfied with the variety of can sizes and garbage rates in the City. Only 16% indicated they were “somewhat dissatisfied” or “very dissatisfied”, whereas 73% stated they were “very satisfied” or “somewhat satisfied”.

Reasons for dissatisfaction with the variety of can sizes and garbage rates included “can is a bad shape” / “odd shape” (4 responses), “too expensive” (3), “can size too small” (2), and “no size between 32 and 64” / “wish there was a medium can” (2). Other responses, such as “doesn’t like automated system”, received only one response each.

Table IV-15. Satisfaction with Current Variety of Can Sizes and Garbage Rates (RW4)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Very Satisfied	40%	42%	38%	31%	51%	55%	40%	17%
Moderately satisfied	33%	27%	38%	37%	29%	18%	38%	17%
Neutral	8%	12%	4%	8%	8%	8%	2%	42%
Moderately dissatisfied	10%	13%	8%	11%	10%	18%	8%	25%
Very dissatisfied	6%	5%	7%	10%	1%	3%	8%	0%
Don't know / no opinion	3%	1%	4%	3%	2%	0%	4%	0%

Do you believe the GBTP program would lead you to reduce a significant amount of your garbage set outs?

Almost half of residents (49%) reported that a GBTP program either will lead them or might lead them to reduce their number of garbage set outs. Larger households and those households with a head of household younger than 50 were more likely than their counterparts to report that such a program would not lead them to reduce their set outs.

Table IV-16. GBTP Reduction Effect on Garbage Set Outs (RW5)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Yes, definitely reduce	8%	9%	6%	3%	13%	5%	8%	4%
Yes, probably reduce	20%	17%	23%	19%	21%	11%	21%	36%
Maybe reduce	21%	29%	15%	20%	23%	21%	15%	56%
No, not reduce	42%	35%	47%	49%	33%	42%	49%	4%
Don't know	9%	10%	8%	8%	10%	21%	7%	0%

3. Household Information

The survey asked respondents specific questions about their homes and households that have been cross-referenced with other survey responses and disposal data. Key demographic data are listed in the following table.

Table IV-17. Demographic and Household Data for Participants

Demographic (HH1 to HH5)	Average / Percent
Bedrooms per household (average)	3.3
Persons per household (average)	3.1
Age of head of household (average)	50
Times per week household eats dinner outside the home (average)	1.4
Households always home / no absences in June or July (percent)	41 %
Households away three or more days in June (percent)	39 %
Households away three or more days in July (percent)	40 %



Respondents were also asked whether they compost or use certain household appliances that may affect refuse generation and disposal. The majority of households (67%) use in-sink garbage disposals on a regular basis as a method to dispose of food items, though only three percent of respondents indicated that they use a trash compactor. A smaller but significant number of households compost yard waste and/or food waste.

Table IV-18. Organic Disposal / Composting Methods Used (HH6)

Category	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
In-sink garbage disposal	67%	66%	68%	60%	76%	60%	71%	44%
Trash compactor	3%	4%	1%	1%	4%	0%	4%	0%
Comp. bin for yard waste	30%	34%	26%	40%	17%	48%	28%	24%
Comp / worms for food waste	13%	20%	7%	11%	15%	28%	12%	0%

4. Additional Comments

Do you have any other comments about the Garbage by the Pound experiment?

A total of 67 respondents took the time to write open-ended comments regarding the experiment. Many comments touched on more than one issue but overall there emerged three main topics or themes. First, a number of residents were concerned that their monthly bill would increase under a GBTP program and for that reason were generally against changing the current system. Interestingly, those with the smallest households – especially one or two people – seemed as concerned with potential cost increases as those with the largest households. Four respondents specifically mentioned that the program would penalize large families and three said that GBTP would cost them more due to having children in diapers. Two senior citizens said it would be difficult for them to pay more per month. Another resident wrote that they already recycle “about all we can” and there would be little incentive to increase recycling, as their monthly bill would go up under GBTP.

Second, a significant number of respondents wrote that they thought GBTP was generally a good idea and would be an incentive - perhaps “force” would be a better word - for them to increase their recycling. Comments were also made that GBTP would cause others - presumably those not currently doing so - to reduce their waste output.

Third, residents were concerned with issues of fairness and technical problems with the system. At least ten residents mentioned that they were very concerned about the accuracy and reliability of the equipment that weighed their garbage. One person wrote that they had “four out of four technical difficulties. Is this really reliable?” Others asked what recourse there might be if errors occurred. There was also some concern about people putting garbage in cans other than their own.

It should also be mentioned that a number of residents questioned the need to change systems or expressed satisfaction with the current program. This was mentioned approximately a dozen times, often in conjunction with other concerns. Other concerns were that the proposed system was too confusing and that some prefer the consistency of a flat monthly fee.

Table IV-19. Additional Comments About the GBTP Program (HH7) (Presented as a percent of total responses for each subcategory)

Comment	All	Persons per HH		Age of Head of HH		Service Level (gallons)		
		<=2	>2	<50	>=50	<32	32	>32
Concerns about cost	28%	32%	22%	33%	19%	23%	31%	25%
Generally in favor of the idea – would encourage waste reduction	24%	18%	30%	26%	19%	23%	24%	38%
Concerns about fairness, accuracy, technical problems	24%	25%	24%	31%	15%	31%	19%	38%
Content with status quo or opposed to changing current system	9%	10%	8%	3%	19%	8%	12%	0%
Too confusing or unnecessarily complex	6%	4%	5%	5%	7%	8%	5%	0%
Other/miscellaneous	9%	10%	8%	3%	15%	8%	12%	0%
Total number of responses that included comments	67	28	37	39	27	13	42	8

(Please see the Appendix for the detailed, verbatim comments from the respondents.)

V. VANCOUVER GBTP IMPACTS AND IMPLEMENTATION ISSUES

In this section, we examine the potential tonnage impacts of GBTP and the various billing and implementation issues that may arise from GBTP.

A. Results from the Pilot Test Weights in Vancouver

We collected weekly data from the pilot test over an 11-week period. The system did not work flawlessly – in fact, the system did not perform for several collection dates, as shown in the Table below.

Table V-1. Dates of Weight Data Collection

Week number	Date of Collection	Day of the Week	Notes
1	5/20/02	Monday	
1	5/23	Thursday	
2	5/30	Thursday	
3	6/6	Thursday	
4	6/10	Monday	
4	6/13	Thursday	
5	6/17	Monday	
5	6/20	Thursday	System not operating
6	6/24	Monday	System not operating
6	6/27	Thursday	System not operating
7	7/1	Monday	System operating only partially
7	7/4	Thursday	System not operating
8	7/8	Monday	
8	7/11	Thursday	System operating only partially
9	7/15	Monday	System not operating
9	7/18	Thursday	
10	7/22	Monday	
10	7/25	Thursday	
11	7/29	Monday	

In the early stages of the project, we discussed the possibility of sending out “mock bills” on an every other week basis. This could provide feedback to which customers could react and allow a measure of the possible impact that a GBTP program might have on waste disposal and diversion. However, the project’s budget was not able to incorporate this activity or incentive. Instead, while most of the households did not know their garbage was being weighed (and thus, we measured their baseline behavior), we did provide notice about the program to some participants.

A randomly selected one-third of the 250 participants received a letter in early June explaining the basics of the program, and attempting to explain the types of financial incentives that would accrue if the GBTP system were in place. This note was meant to provide at least some notice

of the program, and encourage them to reduce their disposal. The letter was a one-time note, not an on-going incentive, and it did not include information about the weight of their waste, any changes, or any specifics about the possible financial implications of changing their disposal behavior. That letter is included as an Appendix to this document.

Reduction in garbage disposed: Throughout the 11-week pilot test of a GBTP system, the GBTP equipment recorded the weights of garbage disposed. More than 250 households on two collection days were weighed.¹² The weight results are shown in the table below.

Table V-2. Computed GBTP Impacts

	1 st 3 weeks of weights (and 90% confidence interval)	Last 3 weeks of weights (and 90% confidence interval)	Pounds difference (at mean)
Test group receiving letter	80.9 (73.8-88.1)	84.3 (74.8-93.8)	+3.4 lbs (-3.5-+10.4)
Control group – no letters	67.8 (60.7-74.8)	74.2 (66.7-81.8)	+6.4 (-1.2 to +14.1)

The results show that average disposal increased for all households over the period. It also demonstrates that the increase was higher for the “control” group than the “test” group (the group that was told about the program). A simple analysis shows that the net reduction from the test group was about 3.0 pounds per household per week (or about 4%). However, when we examine the statistics, we find that the results showed no statistically significant reduction in disposal per household per week compared to the “control” households (those that did not receive a note).¹³

This is a lower impact than that seen in other GBTP pilot tests. The other similar experiment was conducted in Seattle several years ago. In that case, households with a mature variable can program (like Vancouver) received mock bills every other week monitoring their weights and computing their potential savings. In the Seattle case, the residents received more regular feedback along with dollar computations. The residents in Seattle reduced their disposed tonnage by 15% beyond their standard variable can efficiencies. This 15% was split between shares going to recycling, yard waste diversion, and source reduction. Thus, the additional diversion from the program may be zero, or may be as high as 15%.

C. Billing System and Rate Issues

Billing system requirements for a GBTP system are more complicated than those required for a PAYT system. However, the rate structure and data requirements are virtually identical to billing for services like residential water and energy usage.

¹² Note that we did not subtract the weight of the cans from the differences or changes in disposal weights, because customers kept the same containers throughout.

¹³ We examined differences by subgroups, but found no significant differences in these cases either. For those on 32 gallons of service, we found a decrease of 1.2 pounds for the test group, and a decrease of 0.1 for the control group (starting weights for the two groups were 76.2 and 73.3, respectively). For the 64 gallon customers, we found the test group increased use by 24 pounds, compared to a 30.5 pound increase for the control group. However, the starting weights for the two groups were 140.7 and 91.1 pounds, respectively (again, not significantly different).

1. GBTP Billing Requirements

The input data necessary for computing bills under a GBTP system includes:

- A “flat file” including the ID number (from the Radio Frequency or RF tag) and total weight of the garbage container and garbage inside for that household ID number
- A link between the ID number and the address of the household
- A link between the ID number and the weight of the standard garbage can for the size, allowing the bill to be based on the weight of materials collected for disposal – “net” of the container weight.

The first item is the output from the onboard computer, which can be transferred after each route.¹⁴ The second two items are generally retained in the billing system at the base office.

The rate structure for a GBTP system is often structured similarly to water and energy rates. That is, customers’ bills are computed as the sum of several pieces:

- A customer charge, which can be set to cover some percentage of the fixed costs for collection.
- A charge per pound for the “first tier” of usage times the pounds consumed within that tier. Incentives might be provided by making the per-pound rate for this first tier lower than for subsequent tiers. The tier might be from zero pounds for the week up to a maximum of, say 25 pounds (or less) for the week.
- A (potentially higher) charge per pound for any pounds consumed within the “second tier” of pounds collected multiplied times the number of pounds collected from the household that fall within that tier.¹⁵
- Additional fees added for recycling program costs or other services and surcharges.

This structure balances covering fixed costs (customer charge) and yet provides an increasing incentive, penalizing very high disposal levels (higher rates for higher “tiers” or pounds of waste disposed). Although the requirements are not difficult, the system will need to retain data from many weeks to sum up to the bill for monthly, every other month, or quarterly billing.

2. Vancouver Billing System Changes

Some computations by the City indicated that the fixed portion / customer charge might be on the \$3-\$5 per month range, with per-pound fees in the \$0.25 to \$0.35 per pound range.

One other option that the City might consider should GBTP be implemented in the future is a rebate approach whereby each household would pay a predetermined “system” charge for having the convenience of a truck and cart and are allowed some standard weight pick up. Customers who set out less than the standard would have a credit toward their bill and customers who set out more than the standard would pay extra.

The rate options that were used for the pilot test / survey were described in an earlier section and are also described in Appendix C.

¹⁴ Some systems have fed the data to the billing system in real time over a wireless system.

¹⁵ This could be the top tier, or other ranges could also be established.

C. Implementation Issues

Based on interviews we conducted in GBTP communities, we found the following potential implementation issues may arise in Vancouver. Possible strategies to avoid these problems are also noted in the Table.

Table V-2. Potential Implementation Issues for GBTP

Potential Implementation Problems	Avoidance Strategy
<ul style="list-style-type: none"> • Outcry from citizens – especially fears that others would sneak garbage into their trash and be charged for it 	There might be expected to be a slightly higher incidence of this kind of illegal dumping than under PAYT. Consider establishing a policy, perhaps forgiving once and then requiring proof?
<ul style="list-style-type: none"> • Outcry from drivers about longer cycle time for collection to let weight system “read” and settle down. 	Shorten routes or increase hours of pay – or if collection is task based and they generally finished in less than 8 hours, no modifications may be needed.
<ul style="list-style-type: none"> • Data doesn’t record for a collection day 	Must develop a clear policy; one with least dispute may be to only charge the fixed fee for weeks with bad weights. ¹⁶ Other options include charging the average of the last 8 (one billing cycle?) weeks of service weights.
<ul style="list-style-type: none"> • Equipment and training issues 	Do a pilot test first in one area of the city and county, then phase in incrementally in the rest of city. Require very stringent performance statistics of the weighing mechanisms and penalties for non-performance.
<ul style="list-style-type: none"> • Increased call volume from billing questions and complaints 	Train temporary staff, and hire temporary staff to cover customer calls for a period of several months
<ul style="list-style-type: none"> • Billing challenges on weight by residents 	Establish a policy, but weight records should establish a well-documented case.
<ul style="list-style-type: none"> • Confusion by customers 	Extra education on the program, purpose, etc.
<ul style="list-style-type: none"> • Truck maintenance problems 	May need additional trucks for backup to be sure a sufficient number are on the road. May need longer hours for O&M / repair shop. May need significant maintenance contract for early shake out period of new equipment.
<ul style="list-style-type: none"> • Increases in illegal dumping 	Lockable dumpsters for commercial and multi-family dumpsters. Inspect dumped waste for identification and establish / enforce fines for illegal dumping. Potentially establish a hot line or dedicated inspection staff. Clean up illegal dumping immediately to stop attracting additional illegal dumping. Check composition of waste – concerns arise only if the residential portion is large or increases.
<ul style="list-style-type: none"> • Implementation / capacity issues at recycling or yard waste facilities 	Phase in or pilot test will help shake out these issues.
<ul style="list-style-type: none"> • Revenue shortfalls 	Computation of rates should be somewhat simpler since the “stomping” adjustment is not a factor; however, the household recycling and diversion impacts may have been mis-predicted as an input to the rates. Try to keep rates constant for one year if possible and raise rates after that time.

¹⁶ This entails some risk to the hauler’s revenues, but provides an incentive to keep the equipment working.

VI. ESTIMATED BENEFITS AND COSTS

A. Equipment and Other Costs for the GBTP System

Table VI-1 lists the range of system savings and costs arising from GBTP system.

Table VI-1. Sources for Cost Savings and Increases from GBTP

Potential Savings (Reductions in Costs)	Potential Increases in Costs
<ul style="list-style-type: none"> • Garbage collection and disposal costs • Costs for changing out container sizes 	<ul style="list-style-type: none"> • Equipment purchase and maintenance • Container and container identification (ID) • Recycling and yard waste collection and processing costs¹⁷ • Collection time increases waiting for weighing cycle • Billing and customer service costs • Education / outreach costs • Costs for ongoing scale maintenance, calibration, and certification activities

To examine the costs of the GBTP system to Vancouver, we examined equipment, billing, timing, staffing, and other costs. The cost elements for the certified Filing-LTS fully automated system are summarized in Table VI-2. Discussion of additional cost items and assumptions are presented in Section D below.

Table VI-2. Elements of Costs for GBTP Equipment and System

Assumptions		Notes
Number of trucks to be retrofitted	20	<i>Assumes previous conversion to fully-automated</i>
Number of households	40000	
Equipment (assumes Filing LTS system)		
Scale and readout	\$8,000 per truck	
Installation	\$2,500 per truck	
RF antenna rearer	\$3,000 per truck	
Base	\$1,500 per base	
RF tags for containers	\$1.40 per container	<i>To purchase and install RF tags</i>
One time costs		
Setting up billing program	\$15,000 one time	<i>Purchase program, set up</i>
One time incremental education costs	\$0.50 per hh	
Time, Billing, and Other Costs		
Extra time at curb for 5 second cycle time, billed at \$50 loaded per hour	\$144,444 per year To \$288,000 Per year	<i>5 seconds times \$50/hr times hh times weeks Up to 10Seconds = \$288,000</i>
Incr. billing costs annually (assume qtly)	\$0 per hh/yr	<i>No incremental costs once billing system set up</i>

¹⁷ Depends on contractual agreements. .

Extra staff for billing	\$30,000 per year	<i>Assumes 1/3 FTE at each hauler</i>
Summary		
Total equipment cost+1time cost	\$364,000	
Total annual costs	\$174,444 - \$318,444	(higher if 10 seconds Cycle time)
Total incremental cost per hh/mo (amort 5 yrs)	\$0.52 -\$0.82	(assumes 5 yr amort)
Percent increase in bills	4-7%	(assuming \$12 Avg. bill)

The range in costs results from the uncertainty about the increase in cycle time. The estimates are from 5-10 seconds per stop, leading to estimates of the value of the associated street time for equipment and labor of \$144,000-\$288,000 per year.

B. Computation of Potential System Benefits

Table 8 summarizes computations of the benefits from the introduction of the GBTP program, focused on disposal and diversion tonnage shifts. The tonnage impacts from Vancouver's pilot test were small. We believe this is largely due to the fact that customers were not provided individual feedback about their weights or the savings potential. We have included a range of potential benefits in the table below – one with no benefits, and the other using the estimated savings from the Seattle experiment (15%). This program provided fortnightly feedback and mock bills on the GBTP weights and potential rate savings. The average “pre” weights for Vancouver households were 75 pounds, and this is the number we use as the basis for the benefits calculations.

Table VI-3. Computation of Net Tonnage-Related Benefits Attributable to GBTP

Incremental Savings Computations				
Household tons per year (from GBTP)	75 pounds per hh per week <i>from GBTP weights (pre)</i>			
Potential savings	Low Tons (%)	High tons (%)	Value per ton	
garbage disposal cost savings ¹⁸	0%	15%	\$70.00	<i>Assumes \$70/ton for savings</i>
extra tons&costs for recy coll'n/processing ¹⁹	0%	-5%	\$0.00	<i>No change in costs known</i>
extra tons&costs for yw coll'n/processing ²⁰	0%	-5%	\$0.00	<i>No change in costs known</i>
Overall incremental savings/hh/mo	\$0.00	\$1.70		<i>52/12*(sum of pounds*red'n*sav/2000)</i>

Note that in some ways, these benefits are conservative, as there are additional greenhouse gas (GHG) emission and a variety of other environmental benefits from waste diversion due to the program.²¹ However, in other ways, the benefits may be overstated. To the extent that it costs the City more to collect, process, and market the extra recyclables or yard waste that are

¹⁸ This figure is from Skumatz and Van Dusen, “Seattle’s Garbage by the Pound Pilot Test”, 1990.

¹⁹ This figure is rounded from the impacts of PAYT / variable can rates on recycling and yard waste, derived from Skumatz, Lisa A., Ph.D. “Beyond Case Studies -- Nationwide Diversion Rate Study...”, Skumatz Economic Research Associates, Inc. (SERA), 1996 and Skumatz, “Achieving 50% in California...”, SERA, 1999.

²⁰ Ibid.

²¹ The full value of these benefits has not been well-computed in the literature. However, estimates of the GHG benefits have been derived by the consultants, SERA, for other projects. Using emission models and GHG emission values associated with energy utility proceedings, we have identified additional benefits of from \$1 to \$6 for each ton diverted into recycling or source reduction (the GHG emissions continue with yard waste). We assume about 2/3 of the tons would be diverted by recycling or source reduction.

encouraged by the GBTP program, the savings would be reduced for the (estimated) 5% of extra disposal reduction that is diverted to these programs.²²

C. Computations of Net Incremental Costs of GBTP

Table 9 totals the cost elements and the benefits for the two jurisdictions. The assumptions are discussed below.

- **Truck costs:** The truck-retrofit costs are listed in the Table. We assumed that after full automation is installed, there would be 20 trucks to retrofit, and 2 base units and billing systems to implement / maintain.
- **Education:** Only incremental education expenditures for the first year are included in the cost calculations. We assumed that the City has significant on-going education efforts that would be designed to include a great deal of information about this program. However, customers would need extra outreach in the first year to familiarize residents with the system up-front. Incremental costs of \$0.25-\$0.50 per household were added to the computations for the first year.
- **Cart Exchanges:** We assumed there would be no incremental change in the budget for changing out container sizes – even though these costs should fall from current levels to nearly zero because differing cart sizes will no longer be needed to reflect usage (and resulting customer bill) differences. Generally there would be savings in both staff and truck delivery costs and inventory/storage costs.
- **Cart Purchases:** We also assumed no additional one-time or on-going cart purchase costs. We assumed that customers would keep the carts they would be issued as part of the transition to fully automated collection. GBTP systems can use uniform carts; however, since the City will first transition to an automated variable can program, there will be some extra costs because of some loss of economies of scale in purchase price, as well as some additional interim storage and inventory-related costs. These costs are not included.
- **Repairs:** Fully-automated trucks require highly skilled staff to keep them running. No data are available on the costs for maintaining the GBTP equipment, as the equipment has not been installed in a location for an extended time period in actual operating conditions. We made two assumptions: first, that the repair staff assigned to maintain the (future) fully automated trucks would be able to handle most of the basic repairs to the unit and installation after warranty periods, and second, that the incremental costs would be small. We also made a simplifying assumption that the costs would be an offset to the post-GBTP cart exchange and purchase savings that have been excluded from the computations.
- **Billing and Customer Service:** The billing costs and customer service representative (CSR) time are included in the table. We assumed an increase in billing and CSR-related staff of one-third of an FTE for each hauler.

²² About 195 pounds per household per year estimated for each of the programs (75 lbs x 52 weeks x 5% for each program), or about .098 tons per household annually of extra recycling, and a similar amount of extra yard waste diversion.

- **Collection Time:** The GBTP equipment takes longer to cycle at each stop. The impact is approximately 5-10 seconds per stop. The resulting annual impacts are estimated as \$144,000-\$288,000 for the City.

Costs for the European systems are considerably more expensive, estimated at \$20,000-\$35,000 for truck systems (50%-200% more than the US system), so these systems are not used for the comparisons and payback computations.

Table VI-4. Total Net Cost Computations for GBTP²³

Net Impacts per Household per month	Dollar	Approx %	
Low scenario (cost=negative, sav=pos)	(\$0.52-0.82)	-4 to-7%	<i>Assumes avg bill of \$12/hh/mo</i>
High scenario	\$1.18	10%	<i>Assumes avg bill of \$12/hh/mo</i>
Possible savings not included: purchasing one size of container for all households -- lower purchase, inventory, delivery / redelivery charges			
Possible extra costs not included: training, incremental recycling and yard waste costs, And costs for on-going scale maintenance, calibration, and certification.			

Certainly, a number of factors can affect the results of the net costs:

- Higher tipping fees for disposal increases the computation of benefits.
- Lower new billing and customer service staffing needs would reduce the costs.
- Technology improvements that reduce “cycle time” on route (waiting for the GBTP equipment to weigh) would reduce costs.
- Higher diversion impacts associated with the GBTP program would improve the payback.
- Cheaper billing options would decrease costs.

The results indicate that the switch to a GBTP program would require an on-going investment of up to \$0.52 or \$0.82 per household per month – but may actually result in savings, depending on assumed impacts on tonnage.

The GBTP system has several advantages for customers, including: convenience and flexibility for residents; recycling and source reduction incentives, and equity benefits. However, there are several concerns about the GBTP program. First, there is no full-scale program in place in the US currently, so Vancouver would be on the leading edge nationwide – which can be an uncomfortable situation. Second, on an annual basis, the system may cost more than it saves, potentially increasing customer bills.

This analysis provides Vancouver with key information to help determine whether to implement the GBTP system and provide information that will help guide near-term cart and truck decisions to make sure they do not preclude moving to GBTP in the future. The City has strong programs and incentives in place already, leading to impressive recycling and diversion rates. However, the City may be starting to reach limits of what traditional programs can provide in terms of additional diversion. It may be that there are few other options that the City can adopt that can help increase residential diversion and reduction – at least by the levels that have been associated with GBTP. City residents currently pay several dollars per month to fund a recycling program. The City needs to determine if it wants to increase residential rates by an additional \$0.50 to \$0.80 (or about 3-7%) per household per month to have the potential to increase diversion by perhaps a little, but perhaps a lot. The City’s priorities and tradeoffs

²³ Some figures have been rounded.

toward diversion, cost, risk, and policy considerations will need to be weighed in determining whether the GBTP program should be implemented – near term or later – using certified equipment.

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APPENDICES

Appendix A. Verbatims from Survey

Detailed comments about the Garbage by the Pound experiment (HH7)

Primary concern or issue: Cost (19)

Survey Number	Service Level (in gallons)	Persons per household	Age of head of household	Comment
M49 mail	32	2	50-64	"I figure by your wanting to change the system it eventually will lead to an increase in fees so prefer to keep it the way it is."
M61 mail	32	1	65+	"It is wrong paying \$16.43 every two months since I live alone. The litter/garbage I have I recycle all of in I have never put a can on street past 25 years I been here. I'm a senior citizen."
M32 mail	<32	2	65+	"I hope prices stay at an affordable level. Everything keeps going up in price. I am retired and one has to keep digging deeper and deeper. Please make it affordable."
M25 phone	32	2	40-49	Didn't like the container – "way too expensive"
M67 Mail	32	2	40-49	"We are for any ideas if it will save us money."
T124 Mail	32	2	50-64	"I see paying by the pound as a tool to raise the rates down the road. How much are you going to pay me for my time to bring the can out to you? Or take it to the G. Center? It would be cheaper if the city would take it over."
M88 mail	32	2	50-64	"We now can have up to 65 lbs per week @ \$12.40 including 3.6% refuse tax. Under GBTP rate for 12 lbs per week would equal \$12.30. The .11 per pound rate is over a 500% increase over the current rate."
M3 phone	>32	2	25-29	Would like the least expensive system to be used.
T61 mail	Unknown	2	40-49	"Would not want any > costs."
T47 phone	32	3	25-29	Would like it to be as inexpensive and economical as possible.
T36 mail	32	3	30-39	"If the GBTP program would cost more than current system where's the incentive to switch? Where's the benefit then?"
M83 phone	32	3	30-39	Likes a flat fee.
M8 phone	32	4 or 5	25-29	By the pound might be more expensive because of the diapers from the twins.
M18 phone	32	4 or 5	30-39	"I think that it might cost us more because of the diapers now but in the long run we could save money."
T138 mail	32	4 or 5	30-39	"This program is too expensive & unreliable! Plus I feel it punishes people with larger families or small children in diapers."
T24 mail	>32	4 or 5	30-39	"I did not think yard debris was measured by weight – that could have a big impact on how I use that program. 0.065/lbs still seems expensive when compared to dump fees. (assuming the cost for

Survey Number	Service Level (in gallons)	Persons per household	Age of head of household	Comment
				expensive when compared to dump fees – (assuming the cost for collection is extra)."
M126 mail	32	6 or more	40-49	"Never noticed any change in the service. Not too many people have the time to arrive and see how the service has changed. I think in our case this method would be more expensive."
M116 mail	<32	Unknown	Unknown	"I do not feel garbage by the pound is a cost effective way of garbage collection. The current program is effective and not costly. I would not be satisfied with this type of service."
M64 mail	<32	Unknown	40-49	"Very concerned about wet garbage weight. Is it going to cost me extra?"

Primary concern or issue: Generally in favor of the idea – would encourage waste reduction (16)

Survey Number	Service Level (in gallons)	Persons per household	Age of head of household	Comment
M44 Mail	<32	2	40-49	"Good luck. I'm sure you realize you can't please all the people all the time."
M120 phone	<32	2	40-49	"Probably would save money because only puts out one can per month."
T100 mail	32	2	50-64	"Could use more specific recommendations on reducing non-recyclables. Also it would be helpful if stores gave greater emphasis to recyclable products and packaging. 'Garbage by the Pound' seems like an excellent idea."
T108 mail	>32	2	50-64	"Good idea."
M30 mail	>32	2	50-64	"I think it could have merit."
T32 phone	32	3	40-49	"Good idea."
M36 mail	32	3	40-49	"Sounds like it has potential for an incentive to help people be mindful to reduce waste. Hits them in the pocket book!"
T76 mail	<32	4 or 5	30-39	"We already have reduced our garbage to 32 gallons every other week. We recycle a lot (way more than some neighbors). I like this program because it will give them an incentive to reduce waste."
T141 mail	32	4 or 5	30-39	"I feel it would encourage people to reduce or reuse. I know I would work harder to reduce my waste. Thanks."
T22 mail	32	4 or 5	30-39	"Not a bad idea – my personal bill went up but I could see this forcing all to recycle and reuse."
T19 mail	32	4 or 5	40-49	"Glad you're exploring options. It seems all are fair options and promote waste reduction and recycling."
T41 mail	32	4 or 5	40-49	"Good idea! I think it would give a good incentive for people to reduce their waste. How could you keep others from putting their garbage in your can though?"

Survey Number	Service Level (in gallons)	Persons per household	Age of head of household	Comment
				Also would there be a way to dispute an error in weight?"
T130 mail	32	4 or 5	40-49	"Sounds like a good idea! We recycle a lot & would like our bill to reflect this."
T101 mail	32	4 or 5	50-64	"If the recycling program can accept more types of recyclable items the garbage by the pound program may be an incentive for people to recycle more. Will exceptions be made to longer items to dispose, i.e. not by the pound but by the piece? On the other hand this program seems to penalize people with large families."
T35 phone	32	4 or 5	Unknown	"Would probably be better for us because of foam packaging."
T136 phone	>32	6 or more	50-64	"It's good. Forces us to recycle."

Primary concern or issue: Concerns about fairness, accuracy, technical problems (16)

Survey Number	Service Level (in gallons)	Persons per household	Age of head of household	Comment
T112 mail	<32	1	30-39	"This would be great if the equipment worked better than in the test. I'd like to be able to set out the can only when full or partially full & be charged a fair price."
T107 mail	<32	1	40-49	"Need to take care of technical difficulties with the scale system. In 2 month period only 2 weights were recorded for my address."
M9 mail	32	1	30-39	"This questionnaire repeatedly asks if these options would encourage me to reduce my waste. I already recycle household items & yard debris as much as possible – I see no way to reduce more than I already do. I feel this program would be unfair. Heavy waste takes up no more space than light waste. Why should those of us – for example – with cats who have to dispose of litter which is very heavy be penalized? I do not support this program."
T113 mail	<32	2	50-64	"All in all I think GBTP would fairer. I just am concerned people would put garbage in your can the night or morning before pickup."
T132 mail	32	2	50-64	"Interesting – deserves more thought. I worry about equipment breakdowns and technical problems."
M31 mail	>32	2	30-39	"GBTP would work only with equipment that works more than 85%."
M122 mail	Unknown	2	30-39	"I have several concerns about GBTP other than the increased cost. I'll cover a couple. 1) As I explained we already recycle everything possible for the planet's sake not money. 2) I am seriously concerned about people who won't dump their garbage anymore and will keep it in their yard. I would love for people to reduce their waste but in my opinion..."

Survey Number	Service Level (in gallons)	Persons per household	Age of head of household	Comment
T72 phone	32	3	30-39	Didn't work half the time – "Don't like having to use the hauler's scale" – hauler has a monopoly.
T117 mail	32	3	40-49	"We had four out of four technical difficulties. Is this really reliable?"
T79 mail	<32	4 or 5	40-49	"Is not a good system. The equipment does not work, it costs too much to run and will add to the litter problem. I would like a copy of the study report including the raw data or the data spread for all service levels. Option #1 is the best of the three poor choices. GBTP would work only with equipment that works more than 85%."
M38 mail	32	4 or 5	30-39	"I feel I already do quite a bit to reduce my garbage to reduce my costs and for the environment. With a family of five there's not much more time I can spend on this. I do all I can already."
T50 mail	32	4 or 5	30-39	"This system may cause folks to dump in retail dumpsters or private property or in their neighbor's cans."
T54 mail	32	4 or 5	40-49	"I was disappointed that the pilot program didn't record properly. I don't think my results made much sense – it didn't give me enough info to make sense of the project. I'd like to see it run again for a longer period."
T31 mail	32	4 or 5	40-49	"My neighbor who are smaller households always let us put extra trash in their bins. We have lots of barbeques for our neighbors which causes more trash plus charity dinners. Our neighbors are nice and don't care if we share cans. They sometimes need ours especially yard debris in the summer as it comes only every other week. If the plan is revised we will probably not have as many barbeques for neighbors or charity groups."
T127 mail	>32	4 or 5	50-64	"My 6/13/02 date showed 134 pounds which is 4-5 times my average. I suspect it was an erroneous reading by your equipment. I can foresee arguments from customers w/this new system. I don't believe we can significantly reduce our garbage by any means. It is what it is. Both of our kids are leaving home soon so ours will decrease for that reason alone. We recycle about all we can. (Also this skews all your fee calculations for our entire family). In all 3 of your 'GBTP' methods the cost per pound is minimal & most of the fee is the fixed portions. None of them are much of an incentive to reduce usage if that is your goal. If my bill will go up what's the point?"
M24 mail	>32	4 or 5	65+	"This new to me. I feel uncomfortable about the reliability of the weighing equipment."

Primary concern or issue: Content with or opposed to changing the current system (6+)

Survey Number	Service Level (in gallons)	Persons per household	Age of head of household	Comment
T13 mail	32	2	50-64	"From my past experience I've learned that a survey such as this one is probably a waste of time. I know that the City of Vancouver will do what it wants to do when it's time. Public input matters little!"
M48 phone	32	2	65+	Not interested – "back to having man-power" to increase jobs.
T102 mail	32	2	65+	"Unless it helps environmentally why change?"
M4 mail	<32	3	65+	"If this is all City Hall has to do my tax money is going to waste. There should be other programs that deserve this type of attention. Another City Hall bureaucrat program."
T32 phone	32	3	30-39	Likes the current system – will try composting next year.
T53 mail	32	4 or 5	65+	"People in this neighborhood always share garbage & recycling & yard debris extra space if available. I think the garbage by the pound is a bad idea. If people have less garbage they can use a smaller can. I would hire a gardener & have gardener haul away yard debris."

Primary concern or issue: Too confusing or unnecessarily complex (4)

Survey Number	Service Level (in gallons)	Persons per household	Age of head of household	Comment
T85 mail	<32	2	50-64	"Sounds like we would save. However seems like added work & time for hauler! You'd have to trust he weighed correctly and put right information to rightful home – seems too complicated – employees can be rushed & put incorrect info! If no one added their trash to the can & scales were reliable."
T70 mail	32	3	50-64	"Billing too confusing – extra administrative effort & \$\$ to weigh garbage. More room for error & potential overcharging without any good way for customers to validate."
M75 phone	32	6 or more	30-39	Main concern was fluctuations in the amount she'd pay per month. Likes consistency and knowing how much to budget. Said the billing options were hard to understand and would be willing to try if it could be shown to be cheaper.
T135 mail	Unknown	Unknown	40-49	"I recycle as much as I can. Why make it all so confusing? Cover costs and save the customer dollars."

Primary concern or issue: Other/miscellaneous (6)

Survey Number	Service Level (in gallons)	Persons per household	Age of head of household	Comment
T95 mail	<32	2	65+	"Because of the time of my move into this house did not have meaningful test of GBTP."
M7 phone	32	2	65+	Didn't know they were participating.
M81 mail	32	2	65+	"You need more help to answer incoming calls."
T26 phone	32	4 or 5	30-39	"Be nice to have one big recycling bin – glass bin is too small."
T38 mail	32	4 or 5	Unknown	Please see attached letter.
T137 phone	32	6 or more	50-64	Didn't pay attention – "wish she knew what garbage weighed" so she could say which she likes.

Appendix B: Letter To One-Third Of Households

P.O. Box 1995
Vancouver, WA 98668-1995



www.ci.vancouver.wa.us/solidwaste

Solid Waste Services

July 15, 2002

To Selected Residential Garbage Service Customers

RE: Pilot "Garbage by the Pound" Evaluation for Your Address

As you know, Waste Connections and the City of Vancouver are in the process of evaluating the effectiveness of automated garbage service in a portion of your neighborhood. We appreciate the great feedback that we have received on this effort thus far and we are continuing to assess the suitability of the "roll-cart" system and automated trucks for servicing the whole community. **At the same time we are interested in gaining customer input on alternative strategies for billing residential garbage service, which might become feasible with future technological developments.**

Specifically, we will be asking a small number of selected homes to share their opinion of what is known as a "garbage by the pound" user fee billing method. For the next month a special garbage truck equipped with a sophisticated cart weighing system will be collecting garbage from these randomly selected homes, including yours. At the end of the test period, we will send you information on the weekly weight of the garbage that you set out during the months of June and July and information on the "average" amount of garbage set out by other customers at your service level within the test area. This information will provide you with feedback on the weight of garbage you produce during this test period. We will collect data for an additional month or so and then send you a "mock bill" that details, for the two month period, the actual weight of waste your household set out. The "mock bill" will also detail the theoretical difference in your bi-monthly bill between the current rate system and that of billing by the pound, if we were to actually use this system.

I want to emphasize that your inclusion in this special pilot evaluation won't change your actual garbage bill for the test period and won't require that you make any changes in your normal garbage and recycling practices. However, we would appreciate it if you took the time to answer and return a brief survey that we will send you with the "mock bill" two months

from now (this “mock bill” will be mailed to you by the City; you should continue to pay the real garbage service bill that is normally sent to you by Waste Connections). If you are so inclined, you may want to use this opportunity to see if you can challenge yourself to reduce your waste and/or recycle more in order to learn whether or not you might save money under a future “garbage by the pound” user pay billing system.

We do not anticipate that a “garbage by the pound” system will be implemented in the near future in our area; largely because the technology is still under development and is being fine-tuned. However, if we find that our test households are very receptive to the idea of paying by weight rather than by can size or volume (as we all currently do), we would continue to investigate the technology and look for an opportunity to be one of the “early adopters” of such a program. Also, the community interest in this type of program will provide us with helpful information as we look at options for roll-carts (which could be offered city-wide in the near future).

For households that complete the mail survey at the conclusion of the two month long evaluation (early August), the City of Vancouver will provide a \$5.00 credit towards a future garbage bill. In addition, customers who “cut their waste” (for the second month of the evaluation only) will receive an additional credit that is proportional to the reduction in their household’s pounds of garbage compared to the average weight for all sampled households at the same service level during the first month of the evaluation. Though this reduction credit is likely to be slight for most customers (\$0 to \$2.00) we hope that it provides an incentive that will make the evaluation more meaningful. **As noted earlier, no pilot evaluation customers will be asked to pay any more than they pay currently, even if the weight of their garbage goes up during the second month.**

If you have any questions on this pilot “garbage by the pound” evaluation, please don’t hesitate to give me a call. We look forward to learning your thoughts on the program in August.

Sincerely,

Tanya Baker,
Solid Waste Analyst

Appendix C: Explanation of Mock Bills for GBTP Experiment

Understanding Your “Mock Bill”

As you read this “mock bill” please refer to the descriptions below to help you understand how we determined your rate. If there is an asterisk listed instead of a weight measurement, no data was obtained due to technical difficulties. If we did not obtain data, it was not used to determine your average.

If you have any questions about the mock bill, please feel free to call us at 696-8013. Thanks!

Option #1- A set rate for each pound

To calculate your sample bill using this method, we determined the price per pound of garbage for our current garbage system to be 0.11 per pound. Next, we took the total pounds you generated over the test period and determined an average weight for each set out day. (Average weights were used because we were missing data on some days when the scale technology malfunctioned.) Then we multiplied this average weight by the number of set-outs you had for the test period and by 0.11 per pound. This method estimates what you would have paid if we charged 0.11 for every pound you generate.

Option #2 – Flat fee plus set rate for each pound

To calculate your sample bill using this method, we determined the cost of collection services (weekly truck, cart and billing services) and divided this equally among all customers. Each customer pays a share for the garbage service and then a charge for each pound they set out. We determined the flat fee for collection service would be \$4.00 per month and the per pound fee would be 0.065. This method estimates what you would have paid if we charged \$4.00 for collection and 0.065 for each pound set out.

Option #3 – Current rate structure with potential rebate or surcharge

To calculate your sample bill using this method, we compared your average weight per collection to that of all the customers at the same service level. If the weight of your garbage is 25% or more under the average, you receive a 0.14 per pound credit toward your bill. If the weight of your garbage is 25% or more over the average, you receive an additional 0.14 per pound charge.

Appendix D – Questionnaire

“GARBAGE BY THE POUND” PARTICIPANT SURVEY

Please help the City evaluate the “Garbage by the Pound” pilot project. Return the questionnaire in the enclosed prepaid envelope by August 30 to the City of Vancouver Solid Waste Services Department -- and you will receive a \$5 credit toward your garbage bill!

Check the boxes or write in the numbers or answers that apply. We will treat your answers confidentially and we will not disclose information that will identify you personally in any way. The results of this survey will be used for overall conclusions and summaries. Thank you for your help!

Garbage by the Pound (GBTP) Program Summary:

The GBTP program used a scale on the garbage truck to weigh the garbage disposed. Under Garbage by the Pound, your bill could vary based on the number of pounds of garbage thrown away, not the size of your can. Everyone could receive the same can size, and you would only be charged for how much service you used. The City of Vancouver tested this system in a small area of 250 homes for two months this summer – June and July.

ABOUT THE PROGRAM

1. Did you notice any changes in your garbage collection during the experiment (June and July)?

- | | |
|--|---|
| <input type="checkbox"/> Did not notice any changes | <input type="checkbox"/> Noticed changes – slightly worse service |
| <input type="checkbox"/> Noticed changes – slightly better service | <input type="checkbox"/> Noticed changes – much worse service |
| <input type="checkbox"/> Noticed change – much better service | <input type="checkbox"/> Do not know |

2. How satisfied are you with the “Garbage by the Pound” billing options enclosed with this survey?

(please check one answer)

- | | |
|---|---|
| <input type="checkbox"/> Very satisfied | <input type="checkbox"/> Very dissatisfied |
| <input type="checkbox"/> Moderately satisfied | <input type="checkbox"/> Did not notice the program |
| <input type="checkbox"/> Neither satisfied nor dissatisfied | <input type="checkbox"/> Did not know about the program |
| <input type="checkbox"/> Moderately dissatisfied | |



3. How satisfied are you with the “Garbage by the Pound” billing options enclosed with this survey?

(please check one answer)

- | | | | |
|------------------------------|-----------------------------------|-----------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> Somewhat | <input type="checkbox"/> No | <input type="checkbox"/> Did not see/recall materials |
|------------------------------|-----------------------------------|-----------------------------|---|

4. What did you like about the “Garbage by the Pound” program? (check all that apply)

- | | |
|---|--|
| <input type="checkbox"/> No special can sizes needed | <input type="checkbox"/> It made it easy to monitor the amount of waste I dispose |
| <input type="checkbox"/> I don't have to pay for a full can if I only use part of a can | <input type="checkbox"/> I would save money on my bill |
| <input type="checkbox"/> I don't have to pay the same as the person who overstuffs his/her cans | <input type="checkbox"/> It is a new and more modern method for garbage collection and charges |
| <input type="checkbox"/> It tells me clearly what I am paying for | <input type="checkbox"/> It seems fairer |
| <input type="checkbox"/> The billing provides a regular reminder to reduce & recycle | <input type="checkbox"/> Other (please specify) _____ |

5. What do you dislike about the "Garbage by the Pound" program? (check all that apply)

- | | |
|--|---|
| <input type="checkbox"/> It is very complex | <input type="checkbox"/> It is too much work for the collectors |
| <input type="checkbox"/> My can might get moved to another house | <input type="checkbox"/> It might add to garbage collection costs |
| <input type="checkbox"/> People might put their waste in my can and I'll have to pay extra | <input type="checkbox"/> The collectors might make a mistake weighing the garbage |
| <input type="checkbox"/> It seems like an invasion of my privacy | <input type="checkbox"/> The equipment might not be reliable |
| | <input type="checkbox"/> Other (please specify) _____ |

Survey Form «Code»

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6. Do you feel the Garbage by the Pound billing program -- being charged more for more pounds of garbage -- would provide you with an additional incentive to reduce your waste or recycle more? (please check one)

- Yes
- Not during the experiment, but probably would if my garbage were really billed this way
- No
- Don't know



7. Looking at OPTION #1 on the attached "mock bill" sheet -- Which of the following statements concerning the billing do you most agree with? (check all that apply)

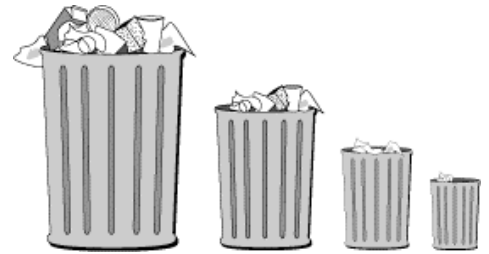
- Option #1 makes sense and is easy to understand
- Option #1 is confusing because _____
- Option #1 is a fair way to calculate my garbage bill
- Option #1 does not seem like a fair billing method because _____
- The overall cost of garbage service under Option #1 seems fair
- The overall cost of garbage service under Option #1 seems too expensive
- Option #1 WOULD give me an incentive to reduce my waste
- Option #1 would NOT give me an incentive to reduce my waste

8. Looking at OPTION #2 on the attached "mock bill" sheet -- Which of the following statements concerning the billing do you most agree with? (check all that apply)

- Option #2 makes sense and is easy to understand
- Option #2 is confusing because _____
- Option #2 is a fair way to calculate my garbage bill
- Option #2 does not seem like a fair billing method because _____
- The overall cost of garbage service under Option #2 seems fair
- The overall cost of garbage service under Option #2 seems too expensive
- Option #2 WOULD give me an incentive to reduce my waste
- Option #2 would NOT give me an incentive to reduce my waste

9. Looking at OPTION #3 on the attached "mock bill" sheet -- Which of the following statements concerning the billing do you most agree with? (check all that apply)

- Option #3 makes sense and is easy to understand
- Option #3 is confusing because _____
- Option #3 is a fair way to calculate my garbage bill
- Option #3 does not seem like a fair billing method because _____
- The overall cost of garbage service under Option #3 seems fair
- The overall cost of garbage service under Option #3 seems too expensive
- Option #3 WOULD give me an incentive to reduce my waste
- Option #3 would NOT give me an incentive to reduce my waste



10. If you had to choose between the "Garbage by the Pound" billing options, which would you prefer? (check one)

- Option 1
- Option 2
- Option 3
- No preference / don't know
- Other (please specify) _____

11. If you had to choose between the "Garbage by the Pound" program / rate option and the current garbage collection and billing system, which would you prefer? (please check one response)

- Garbage by the Pound
- Current system
- No preference/don't know

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12. If the Garbage by the Pound system were more expensive to run than the current system, would you be willing to spend those additional funds for Garbage by the Pound? (check one response)

- Yes
- Yes, but only if it is less than \$_____ per month extra
- No
- Don't know

13. How important is it to find ways to reduce your garbage bill?

- Very important
- Somewhat important
- Not at all important
- Don't know



RECYCLING AND WASTE REDUCTION

1. Please mark the boxes for recycling or waste reduction actions you currently use and what changes you expect you would make if the Garbage by the Pound (GBTP) program were in place. (check all that apply)

<i>Recycling / Reduction method</i>	<i>Currently</i>	<i>If GBTP</i>
Mostly all goes in the garbage can	<input type="checkbox"/>	<input type="checkbox"/>
Bring with some garbage to the transfer station	<input type="checkbox"/>	<input type="checkbox"/>
Use the City's curbside recycling program	<input type="checkbox"/>	<input type="checkbox"/>
Use a private recycler, buyback, or drop-off recycling center	<input type="checkbox"/>	<input type="checkbox"/>
Resell goods or donate goods to charity	<input type="checkbox"/>	<input type="checkbox"/>
Buy goods with less packaging / waste or with recyclable packaging	<input type="checkbox"/>	<input type="checkbox"/>



Avoid disposable or non-recyclable products or buy longer lasting products	<input type="checkbox"/>	<input type="checkbox"/>
Buy in bulk quantities or buy less / avoid impulse buying	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify) _____	<input type="checkbox"/>	<input type="checkbox"/>

2. Please mark the boxes for methods you currently use in getting rid of your yard debris and what changes you expect you would make if the Garbage by the Pound program were in place. (check all that apply)

<i>Yard waste method</i>	<i>Currently</i>	<i>If GBTP</i>
Use city's curb / alley yard waste program	<input type="checkbox"/>	<input type="checkbox"/>
Haul to transfer station or other processing site and pay for disposal	<input type="checkbox"/>	<input type="checkbox"/>
Compost it in my back yard	<input type="checkbox"/>	<input type="checkbox"/>
Have it taken away by landscaper / gardener	<input type="checkbox"/>	<input type="checkbox"/>
I leave it on the yard	<input type="checkbox"/>	<input type="checkbox"/>
I don't have any yard waste	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify) _____	<input type="checkbox"/>	<input type="checkbox"/>

3. How satisfied are you with the current garbage, recycling, and yard waste program in Vancouver?

- Very satisfied
- Somewhat satisfied
- Neutral
- Somewhat dissatisfied → what don't you like? _____
- Very dissatisfied → what don't you like? _____
- Don't know / no opinion

4. How satisfied are you with the variety of can sizes and garbage rates in Vancouver?

- Very satisfied
- Somewhat satisfied
- Neutral
- Somewhat dissatisfied → what don't you like? _____
- Very dissatisfied → what don't you like? _____
- Don't know / no opinion

5. Do you believe the Garbage by the Pound program would lead you to reduce a significant amount of your garbage set outs? (check one)

- Yes, definitely
- Yes, probably
- Maybe
- Maybe
- Don't know

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ABOUT YOUR HOME AND HOUSEHOLD

Your answers to this and all sections of this questionnaire will be kept strictly confidential. Neither you or your answers will be identified personally in any way. We ask these questions only so that we may group your answers with those of other people who have similar characteristics.

1. How many bedrooms does this residence have? ____ bedrooms

2. Including you, how many persons currently live in this residence on a full-time basis?

- One (myself only)
- Two
- Three
- Four or five
- Six or more

3. Approximately what age is the head of household?

- Under 25 years of age
- 25-29
- 40-49
- 50-64



30-39

65 or older

4. During the period of the program (June and July) were there periods when your household was on vacation or away from home for three or more days during the week or weekend? (check all that apply)

Always home / no absences

Away one or more times in July

Away one or more times in June

Don't know

5. Please estimate the number of times per week that your household eats dinner outside the home?

Generally less than once per week

About 2-3 times per week

About once a week

More than 3 times per week

6. Do you use any of the following regularly?

In-sink garbage disposal

Compost bin for yard waste

Trash compactor

Composting or worms for composting food waste

7. Do you have any other comments about the Garbage by the Pound experiment?

THANK YOU FOR YOUR HELP

Please fold the completed survey and return it in the enclosed prepaid envelope. If the envelope is not handy, please mail the questionnaire to: *City of Vancouver Solid Waste Services; PO Box 1995; Vancouver WA 98668*

To get your \$5 billing credit, please write your account name and address in the space below and mail by August 28:

Name: _____

Address: _____



*If you do not wish to fill out your name,
would really appreciate you returning the survey anyway.
We really need your feedback to guide our planning!*

