CITY OF COLUMBIA

PUBLIC WORKS DEPARTMENT

EVALUATION TO IMPLEMENT COLLECTION OF TRASH USING ROLL CARTS AND AUTOMATED COLLECTION VEHICLES

April 2012

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Executive Summary

Nationwide, the trend in the Solid Waste industry is moving toward automated collections for trash. Both trash and recycling can be collected with automated vehicles. The two have different processing and disposal locations so are evaluated independently. Roll carts can replace black plastic trash bags over a planning and transition period of 12 months without increasing the $15.42/month residential rate.

A one-time expenditure of $5,860,000 is required to implement the program. This will include 10 new collection vehicles and 44,000 roll carts.

The conversion would keep the same number of trash collection routes, but reduce the number of residential operators. The operational cost to implement and operate an automated collection system using carts for trash collection is approximately the same as for the existing bag program.

This report examines replacing the trash bags with reusable containers and replacing manual collection vehicles with automated collection vehicles. There are many advantages to an automated system. The three primary ones are 1) costs are closely related to the amount of trash a resident places at the curb, 2) there is less physical demand on collectors and 3) recycling quantities are increased. The major disadvantages are 1) roll carts limit the amount of waste that can be discarded at any one time, 2) roll carts will remain at the curb after collection and 3) bulky items cannot be collected with carts and will require special collection or other consideration.

Recycling quantities are expected to increase with the implementation roll carts, as much as 25%. This will require future changes to our recycling program. No recycling changes are recommended at this time

It would take approximately 12 months after approval to implement the conversion all at one time, or it could be phased in over several years. The earliest it could be implemented is fiscal year 2013. Implementation can be handled with current staff and will have an overall reduction in manpower, but not budget dollars due to increased equipment and cart expenses. The existing budget is sufficient to cover annual operating costs.

Purpose

This report examines replacing plastic trash bags with carts for residential trash disposal from the curb. It includes the replacement of our manual collection vehicles with automated collection vehicles where the drivers are not required to leave the vehicle. It will examine various cart conversion opportunities such as vehicle and container types, obstacles, benefits and fiscal impact as well as outline an implementation schedule. This report includes comments on our recycling program and identifies related impacts, but does not go into detail. The collection of recyclables with automated equipment will require further analysis and will be closely tied to the outcome of this report.

History

In 1970, Columbia's population was 58,512; currently it is 108,500. There currently are 32,707 residential housing units classified as single family and 9,809 residential units classified as apartments.

It was in the early 1970s when Columbia replaced metal trash containers with plastic bags. At the same time, service went from twice a week collection at each house to once per week curbside collection. It has remained this way for the past 40 years. Recycling collection was added in 1986 and yard waste in 1991. All three, trash, recycling and yard waste were collected utilizing plastic bags. Trash and recyclables remain that way today, while yard waste is no longer collected separately but rather bagged along with the trash.

Current Conditions

All of the 32,707 residential units classified as single family units receive weekly curbside collection of both trash and recyclables. There are 8 daily trash and 6 daily recycling routes. Recycling has 6 daily routes and collects dual-stream recycling (one compartment for fiber and the other for containers). Trash and recycling collections occur weekly from the curb using plastic bags and a limited number of recycling bins.

The 9,809 apartment units that contain 5 or more units per structure have containers rather than bags for trash collection. The majority of these are collected by front-loading collection vehicles, the same type of vehicle used for collection of trash from commercial businesses.

Commercial accounts in residential areas are collected by residential rear-loading collection vehicles. This would have to be changed if different style collection vehicles were implemented for residential accounts.

Medical accommodations are made for residents unable to bring their trash and recyclables to the curb. Collectors pick up trash and recyclables from the house, rather than the curb.

Concentrated housing and parking around the campus area has its own unique trash collection challenges. Narrow streets with parking on both sides make access to the curb for trash collection a challenge.

Columbia's standard manual collection rear-loading trash truck

There are 504 miles of streets and 32,707 single family units or 65 residential units per mile of street. Columbia is divided into five collection areas, one for each day of the week. Route days are shown in Appendix **A.**

The average age of the trash and recycling collection fleet is 5.8 years**.** Residential trash and recycling annual capital equipment replacement dollars have averaged $472,347 over the last 6 years.

Bulky items are collected weekly along with regular trash, with the exception of material banned from landfills. With our bioreactor landfill, yard waste is collected with trash and placed in the landfill. Tires are banned from the landfill and are not collected. White goods are collected curbside with a separate crew and truck by appointment for a fee of $15 each. Last year there were 540 white good pieces collected curbside, previous years were about double that number.

Columbia's curbside recycling vehicle

Residents have weekly curbside collection of recyclables using blue bags for recyclable containers and recyclable fiber receptacles for fibers. In the industry, this is labeled "dual stream," keeping the fibers separate from the containers for collection and processing. All recyclable material is delivered to our dual-stream Material Recovery Facility (MRF) where it is processed and sold.

The 2007 and 2011 Citizen Surveys showed that 94% and 85% of residents responding were 'very satisfied' or 'satisfied' with solid waste services. Solid Waste Services continues to rank one of the highest of all City services provided. The 2007 and 2011 survey results are shown in Appendix **B.**

Recycling Bin Pilot Project

Columbia just completed a recycling bin pilot project. The Curbside Recycling Bin Pilot Grant final report is in Appendix **C.** This report concludes that reusable recycling bins increased recycling by 50%; however, there was also an increased cost for collection and other operational challenges.

Recycling bins from bin pilot project

A survey of residents in the pilot area was very positive. Residents preferred reusable bins over the blue bags by 81%.

Implementation

A. Automated Collection with Roll Carts

Plastic bags for trash and recycling collection can be replaced with reusable containers. Containers or roll cart collection from the curb for residential trash is common in the solid waste industry and it is becoming more popular for recycling, as processing facilities allow for single stream or mixed recyclables.

Typical roll carts

Nearly 1,900 people responded to our September 2, 2011 Roll Cart Survey to the following question: Do you think switching from trash bags to roll carts would improve trash collection? 50.5% said yes and 49.5% said no. Results are shown in Appendix **D**.

A recent survey of other cities using carts shows that carts (normally referred to as roll carts) range in size from 32 to 96 gallons, with 64 gallons being the most common size. In our local area, both Fulton and Jefferson City utilize roll carts for collections. A survey of other cities is included in Appendix **E**. Solid waste fees for roll carts are based on the size of the cart and the number of carts at any one residence. Fees differ when yard waste or recyclables are collected. Roll cart fees are a volume-based system and generally the more trash a resident generates, the higher the fee. The size of the container and number of containers are used to assess fees. For example, fees range from $10.00 to $23.75, both low and high at Loveland, Colorado depending on the level of service**.** Historically, cities with recycling programs that go from an unlimited quantity trash collection to a containerized system such as roll carts see an increase in the amount of recyclables placed at the curb for collection. Cape Girardeau, Missouri has 96-gallon recycling and 64-gallon trash roll carts.

Implementation for cart collection of trash can be accomplished within a 12 month period, but ordinances allowing the change from bags to containers would be required. Existing residential fleet would need to be traded for automated side-loaders. Carts would be bid and ordered, assembled and delivered to individual residences by a contractor. Carts' serial numbers would be assigned to individual addresses and records maintained in a database. The contract for the supply of trash bags would have to be modified. An extensive education campaign would need to be developed and implemented. The simplest of such a collection operation would require 44,000 roll carts and 8 automated collection vehicles and two backup units), excluding bulky item collection.

B. Cart and Vehicle Types

There are different types of collection vehicles that can service carts. The most common is the automated side loader. Automated side loaders come in different sizes, styles, and with varying features. Service can be high-tech using bar codes and scales to track the amount of trash or recyclables a household places at the curb for collections or very basic just emptying the carts. Appendix **F** shows various types of trucks and carts available in the market.

Automated collection vehicle for roll carts

Purchasing 10 solid waste vehicles at once offers the opportunity to explore utilizing alternative fuel sources, such as Compressed Natural Gas (CNG) or methane from the landfill. In addition, there are hybrid collection vehicles being tested in the market utilizing hydraulic assisted starts (for a truck that starts and stops a lot) and these look very promising.

A CNG vehicle costs more than a diesel one. Tax credits are available for a vendor selling to a municipality. An economic analysis has not been performed comparing traditional diesel verses CNG engines in this report.

Roll carts vary in style as well as size. Although there is no industry standard, automated trucks are able to service common roll carts. Carts range in size from 32 to 96 gallons and are very durable. It is not unusual for carts to last 10 - 20 years. Large volume generators can use multiple carts and be billed additional fees. Cart literature is shown in Appendix **F**.

Carts by their very nature are part of a volume-based system where larger generators pay more. Residents are limited to the amount they can dispose of by the size of the cart. In the industry this is called "Pay As You Throw" (PAYT). An article on PAYT is included in Appendix **G.**

C. Compressed Natural Gas Vehicles

CNG vehicles are not new, but require new and different fueling stations that are often very expensive. Their use may also require the redesign of parking and maintenance facilities resulting from their fuel being under pressure. Columbia has received a quote from Clean Energy Company to install a fueling station at no cost to the City if we would guarantee usage of 15,000 gallons per month. If the 15,000 gallon guarantee minimum is not met, the cost per gallon would increase. Ten solid waste vehicles would use approximately 5,000 gallons or about one third of the total gallons needed to economically consider a CNG fueling facility. The remainder would come from City busses and private commitments. See commitment from Clean Energy in Appendix **H.**

Allied Waste Services has purchased automated CNG collection vehicles for Boise Idaho's new program. Allied has installed a CNG station to fuel the trucks and is working on a public fueling facility as well. CNG is becoming more popular in the solid waste industry because collection vehicles generally work within a small radius of their home base and fueling station, making refueling practical.

Utilizing biogas from the landfill to fuel vehicles is beginning to take hold in the solid waste industry as well. Methane from the landfill can power not only electrical generation equipment, but also collection vehicles. CNG and Biogas are very similar, just different energy sources. A

Biogas brochure is shown in Appendix **I**. Columbia has committed its biogas to the generation of electricity and is currently generating 2.1 megawatts expandable to 4.2 megawatts depending on the quantity of gas available. Burns and McDonnell Engineering completed a study in Spring 2011 looking at the available gas from the landfill. The results showed there were sufficient quantities of gas generated from the landfill, at that time, to support a third generator set.

D. Time Line

The earliest this system could be implemented is after October 1, 2012. It could be implemented in phases or all at one time. Implementing the conversion at one time causes the least amount of confusion with our residents. Below is a Gantt chart for implementation tasks starting in fiscal year 2013.

Solid Waste Timeline for Automation

Fiscal Year 2013

Events	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**
Ordinance Change for Automated collection													
Installation of CNG fueling station													
Send out Bids For Trucks													
Send out bids for roll-carts													
Get Bid back for trucks													
Get Bids back for roll-carts													
Contract for trucks													
Order trucks													
Contract for rollcarts cart placement													
Order carts													
Truck Start to Arrive													
Carts start to arrive													
Contract to have the carts put together/Placement													
Deploy roll-carts to residents													
Set up Community Education Meetings													
Meet with the Community													
Set up medical accommodations for residents													
Train employee's on truck automation													
Begin Automated Collection with Roll Carts for trash													

Special Considerations

A. Recycling

Recycling collection method from the curb will remain as is. Quantities are expected to increase if roll carts are implemented. Before roll carts could be utilized for recyclables, processing of the materials needs to be addressed. If a single cart is used, the material becomes single stream and our current Material Recovery Facility (MRF) is a dual stream processing facility. Questions that remain that need to be answered prior to moving forward with automated recycling collection are: Do we close our MRF and deliver all our recyclables to a single stream processing facility in the St. Louis or Kansas City region for processing? Do we provide two carts for recycling to the residents for separate collection? Do we collect fiber and containers with split carts? Do we change our recycling processing facility from a dual stream to a single stream facility? Single stream was previously identified in our long range plan for year 2014. However, unless there is a significant increase in the volume of recyclables it does not appear to be economical to convert to single stream due to the cost of the required infrastructure. The MRF processed 10,388 tons of recyclable materials last year and from market research we would need to process near this amount **each month** to make it economical. Single stream MRFs are found in metro areas or accept materials from far distances to have adequate quantities. An article on conversion from dual stream to single stream is in Appendix **J**. Currently, we transport our recycling screener materials (cross-contaminated rejects) to St. Louis for single stream processing.

The 1997 Black and Veatch Engineering recycling report identified a dirty MRF as a future option for Columbia. A dirty material recovery facility is where all the trash enters a processing facility and recyclables are removed. The remainder is then landfilled or used as RFD (refuse derived fuel) at an energy facility.

February 25, 2011 ended a 12 month grant funded pilot program to look at recycling bins in lieu of bags. Bins more than doubled the quantity of recyclables collected from the same routes, but more man hours were required to collect this material because bins had to be returned to the curb and bags do not. It is undetermined at this time if there will be any changes to the current blue bag recycling program. Final report for the pilot is included in Appendix **C**.

B. Medical Accommodations

Medical accommodations can be made with or without an additional fee for Solid Waste personnel to bring the roll cart to the curb and return it to the resident. Currently there are 267 residents using this collection service.

C. Yard Waste

Since the approval of the landfill's bioreactor permit in April 2009, yard waste is collected with the curbside trash and landfilled. Columbia has a 12 year permit for the bioreactor that started in 2009 and ends in 2021, renewable through MDNR every three years. Residents would be able to place yard waste in their trash cart and if needed, could have an additional cart for yard waste/trash for an additional fee. Bulky item collection vehicles may be required to collect yard

waste during fall leaf season. Mulch drop off sites would continue to be maintained. In addition, compost production and sales will continue at the Compost Facility.

D. White Goods

The collection of white goods from the curb would not change. Residents wishing to recycle unwanted appliances would arrange for collection through the Solid Waste Division and would be billed for this service on their utility bill.

E. Trash Out Early Violations

Trash out early violations would still exist, but consideration would need to be given to carts that remain on the curb after collection. Typically, other cities have instituted a fine for carts that remain at the curb after a designated time. Some communities offer an extra premium fee to retrieve the cart from the house or return it to the house from the curb. This could also be a service offered to our residents with medical conditions who are unable to handle the carts.

F. Bulky Item Collection

Roll carts do not handle bulky items. Bulky items can be handled in several different ways, bi-annual clean ups, weekly/monthly scheduling for special pickup, dumpster service, no pickup at all, etc... Survey of other Cities bulky item collection is shown in Appendix **E**. It is recommended there be a per collection fee charged for bulky items collection if for no other reason, that would be the most economical method for scheduling collections. Scheduling could be accomplished by internet or phone. Included in this evaluation are two bulky item collection trucks and crews to handle items daily that would not fit in a roll cart. This will likely be scale down to 1 bulky collection route after residents become accustom to the system.

Financial

Fiscal year 2012 residential collection includes 21.2 employees and 12 trucks with a budget of $2,643,442. Curbside recycling has a budget of $1,599,337 with 10.1 employees and 9 trucks. Appendix **K** includes the current Solid Waste organizational chart and the budget for 5 previous years for residential trash and recycling. Currently there are 8 two- man residential trash crews or 16 employees (not counting extras) that are dispatched daily. Roll Carts with automated collection would require 8 single man crews, plus 4 container and bulky item collection employees. This would be a net reduction of 4 residential trash employees.

Average expenditures for the past three years for bags covered under the voucher program are $379,360 for trash. The annual six year average expenditure for residential for residential trash collection vehicles is $157,166. The combined total is $536,526 that could be used to offset the cost of implementing the roll cart program

Capital outlay for 10 automated trucks and 44,000 roll carts is $5,860,000. Self-financing is the most attractive option. Making a $1,300,000 down payment from the Utility Reserves, the balance $4,560,000 can be borrowed from the City's designated loan fund at $3% interest over 10 years. An annual payment of $534,571 would be required to service the debt. The maximum

amount that can be borrowed from the designated loan fund would need to be changed, currently it is $2,000,000. Amortization table is shown in Appendix **L**.

Current spending for bags and 6 year average for refuse collection vehicles is $536,526. This will be sufficient to cover the annual loan payment of $534,571.

Lease or lease purchase options are widely used in the industry for either carts, trucks or both. One lease option from First Source Bank for $4,720,000 is shown in Appendix **M**. In addition, Otto Environmental Systems (one of many roll cart manufacturers) has financing, lease, or rental programs for roll carts. Otto's information is also shown in Appendix **M**.

It is anticipated that the reduction in the number of residential collectors will be offset in other areas as solid waste is requesting 8 new positions for fiscal year 2013. Those costs will be shifted to other areas in solid waste. It is also projected that current residential annual operating costs will remain about the same, because there will be additional route vehicles, carts to replace and maintain, and higher maintenance costs for automated trucks.

It is anticipated that recycling quantities will increase with roll cart implementation, which may require additional manpower and equipment, utilizing manpower saved from cart implementation.

Conversion costs were calculated for 33,000 residential units for trash and yard waste collection, with collectors working 8-hour days. The cost calculator from Cascade Engineering for implementing a roll cart collection for trash estimates the monthly residential cost to be $8.30 per household per month. See Appendix **N** for the calculator and parameters. The cost calculator used a default value of 1.7 annual tons of trash per household, but Columbians generated only 0.98 annual tons per household in fiscal year 2011. The calculator was adjusted using the 0.98 tonnage number at the current landfill rate of $38.00 per ton. This monthly fee of $8.30 includes approximately $0.82 per month for bulky item collection.

Columbia's 2011 trash only collection cost per household per month is $9.18. The $9.18 represents only trash and not the other programs supported by our $15.42 per month residential fee, e.g., recycling. Appendix **O** is fiscal year 2011's cost allocation worksheet that is maintained by Solid Waste. This cost allocation breaks down all solid waste functions. Estimated cost to implement roll carts is $8.30 per household per month or about a dollar less than our current cost of $9.18 for trash only collection. The conversion to automated collection and roll carts can be accomplished without raising monthly residential rates for trash and recycling. In addition, requests for additional carts and extra service should have a positive impact on revenues.

Worker's compensation is expected to go down based on other cities' experiences. Risk Management has calculated there would be a savings of approximately 75% in worker's compensation cost for residential collection. Columbia residential trash collection worker's compensation claims for fiscal year 2011 total $131,510. With a 75% reduction, $98,632 would be saved annually. Insurance costs are on a five year cycle and savings have not been factored into this analysis. See email from Risk Management in Appendix **P,** along with historical information from Akron, Ohio following the implementation of their roll cart system.

With a conversion to roll carts and automated truck system, the work force would change. Not only would an automated system allow workers to work longer, it would take fewer workers than the existing system. There would also be the flexibility to move from five 8 hour days to four 10 hour days.

Positives/Negatives

A. Roll Cart Positives

- Can be implemented with no rate increase
- It is essentially a pay as you throw system (PAYT), where residents generating larger amounts of trash would pay more for a larger container or additional containers
- Individual households generating small amounts of trash would only have the base fee charge where larger generators may have two roll carts
- Automated trucks mean employees may be able to work longer hours for fewer days per week and for more years
- A new fleet of trucks allows for utilizing alternative energy like compressed natural gas
- The total cost of workers compensation insurance is reduced
- Animals getting into bags and scattering trash will be eliminated
- Flexible future scheduling is possible, including 10 hour work days that would eliminate the need for residential Saturday collection following city-observed holidays
- Work can be performed during hot and cold weather extremes
- Fewer bags may be used which would result in quicker decomposition in the landfill

B. Roll Cart Negatives

- Carts may remain at the curb after collection and dot the street following collections
- Bulky item collection will require additional equipment and manpower or alternative system set up, e.g. call in to schedule and pay for a bulky item sticker
- Carts will be lost or stolen and be an ongoing maintenance item
- Yard waste collection is more difficult when considering placing limbs in roll carts
- Curbside parking is an issue, especially in East Campus area

- Landfill is only approved to accept yard waste for 12 years then would not be allowed to be co-collected with trash unless the bioreactor technology is adopted federally, requiring additional vehicles

- Residents will continue to use bags they purchase in addition to roll carts

- Carts get dirty and need to be cleaned

Summary

Automated collection with roll carts can replace manually collected black plastic trash bags over a 12 month period of time with no increase in residential monthly rates. The earliest this could be implemented is for fiscal year 2013. Existing ordinances would need to be revised and address fees for early placement of bins and for bins left at the curb line. Implementation can be handled with current staff and will have an overall reduction in manpower, but not budget dollars. Manpower reduction can be handled through attrition or transferring to other sections in the Solid Waste Division. Additional route trucks and higher maintenance costs are expected to offset any reduction in residential manpower costs.

Recommendation

Target fiscal year 2013 to convert from manual trash and yard waste collection to automated collection using roll carts. Recycling collection remains the same until which time recycling quantities justify single stream processing locally, decision is made to add two recycling carts per residence (dual stream), decision is made to transport recyclables to St. Louis or Kansas City rather than processing locally or different style collection vehicles are identified to maintain dual stream.

Power Point Presentation

Power point presentation is available. Copy of presentation is in Appendix **Q**.