Bureau of the Budget and Management Research
Andrew Kleine, Chief

City of Baltimore

Management Research Report

BBMR-14-03

A HANDBOOK FOR FULL COST ACCOUNTING AND ACTIVITY-BASED COSTING USING MIXED REFUSE COLLECTION AS A CASE STUDY

May 2014

The Bureau of the Budget and Management Research is an essential fiscal steward for the City of Baltimore. Our mission is to promote economy and efficiency in the use of City resources and help the Mayor and City agencies achieve positive outcomes for the citizens of Baltimore. We do this by planning for sustainability, exercising fiscal oversight, and performing analysis of resource management and service performance. We value integrity, learning and innovating, excellent customer service, and team spirit.

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BBMR Management Research Project

Full Cost Accounting and Activity Based Costing for Mixed Refuse Collection and Disposal

What BBMR Found

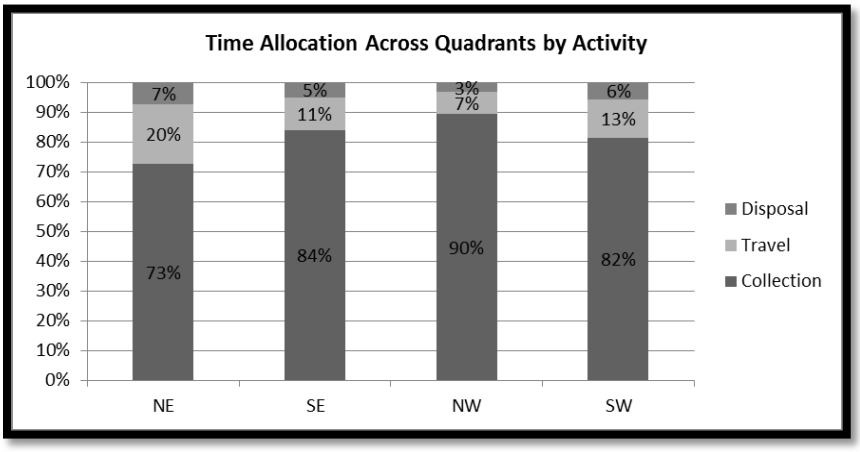
BBMR found that the full costs associated with mixed refuse collection and disposal are not accurately captured within the budgeted Mixed Refuse Collection activity:

Full Cost Accounting Summary	
Full Cost of Mixed Refuse Collection Activity	$25,168,645
Budgeted Cost of Mixed Refuse Collection Activity	$17,323,169
Delta	**$7,845,476**

The full cost of Mixed Refuse Collection and Disposal is $110 per ton of waste managed per year. This is the amount in service fees or assessed taxes per ton of waste disposed required to cover the full cost of Mixed Refuse Collection and Disposal activities. This information can be integrated into a potential Solid Waste Enterprise model for the City.

Cost Per Ton Comparison , Traditional Cash Flow Accounting vs. Full Cost Accounting	
Traditional Cash Flow Accounting	$76
Full Cost Accounting	$110
Delta	**$34**

Additionally, the Activity Based Costing allowed BBMR to identify comparative efficiency of collections, transport, and disposal activities between City Quadrants. As a percentage of time, the Northwest Quadrant spent the least amount of time on transport or disposal activities, delivering the greatest "bang for your buck." This is due to the routing of collection trucks to the Northwest Transfer Station.



Based on the research conducted in this report, BBMR recommends the following actions:

- Conduct a route study to identify potential efficiencies for collection routes based on location and time analyses;
- Create distinct budget activities separate from Mixed Refuse Collection (Recycling Collection, Gateways Collection, and Administrative Support) to better inform direct costs for each activity;
- Explore potential conversion of citizen drop-off center at Bowleys Lane into a transfer station, and related costs;
- Identify alternative funding methods (implementation of Solid Waste Enterprise or Public-Private Partnerships) to support future capital and operating costs.

Why BBMR Did This Study

The Bureau of Budget and Management Research developed this handbook to provide a framework for conducting full-cost accounting and activity based costing.

This handbook will reference technical systems and cost structures established within the City of Baltimore as examples. In this particular case study, we assessed the full cost associated with Mixed Refuse Collection and Disposal, which will inform potential movement to a Solid Waste Enterprise system. The activity based costing will allow for comparison of service provision across Quadrants.

The study will also allow the City to identify potential operational efficiencies, and explore avenues for providing more cost effective service.

To view the full report, including scope and methodology, click on BBMR-14-03

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Bureau of the Budget and Management Research
Andrew Kleine, Chief

Bureau of the Budget and Management Research
100 N. Holliday Street, Baltimore, MD 21202

May 28, 2014

The Honorable Mayor Rawlings-Blake,

The Department of Public Works' mission is to enhance and sustain a healthy quality of life for every citizen and customer by providing efficient management of solid waste services, water, wastewater and stormwater systems, facilities, infrastructure and other assets.

The Waste Removal and Recycling service within the Bureau of Solid Waste is responsible for providing household waste and recycling pick-up to 210,000 households, 290 multi-family dwellings, and commercial businesses across the City through the 1+1 Program.

This management research project was conducted upon your request to prepare a handbook to guide future Full Cost Accounting (FCA) and Activity Based Costing (ABC) studies. The included case study, focusing on Mixed Refuse Collection and Disposal activities, will provide measures and information which may be used to explain costs to citizens more clearly, compare services costs with other jurisdictions, evaluate trends in costs, and inform decision-makers engaging in negotiations with vendors.

The authority to conduct this project comes from the Finance Department's charter mandate to provide measures which might be taken to improve the organization and administration of City government. Key issues examined in this management research project include: 1) the full cost of the Mixed Refuse Collection and Disposal activities, 2) the main cost drivers supporting these activities, 3) analysis of time dedicated to collection, transport, and disposal of waste materials, 4) efficiency analysis of quadrants.

BBMR conducted this management research project from December 2012 to May 2014 in accordance with the standards set forth in the BBMR Project Management Guide and the BBMR Research Protocol. Those standards require that BBMR plans and performs the research project to obtain sufficient and appropriate evidence to provide a basis for the conclusions and recommendations contained in this report. BBMR believes that the evidence obtained provides a reasonable basis for the findings and conclusions in this report and presents a set of recommendations that can be considered for further action.

About This Handbook…

Greeting

As an introduction to this Handbook, we would like readers to review the following statements about waste removal services:

(A) A city can offer waste removal services that achieve 98% customer satisfaction.
(B) A city can offer waste removal services that achieve 98% customer satisfaction and are cost-competitive with private providers.

Now, we're going to ask the reader to put on a few different hats.

- As a citizen of this city, which statement would you rather hear?
- If you were an elected official, which statement would you rather support?
- If you were in charge of an agency, which statement would you rather make?

Municipalities provide citizens with a wide range of services, including fire suppression, police patrol, waste collection, recreational programming and street repair, in order to promote the public welfare. The list of government services has grown over time, and while the amount and quality of service provision has often been a concern for citizens, elected officials, and agency leaders alike, the cost to provide these services is not always well understood. Agency officials may tout that they provide reliable, timely services; yet ignoring costs means exclusion of a fundamental piece of information in evaluation of service provision.

It is not too much to ask governments to provide greater transparency in operations, and demonstrate that tax dollars are being put to efficient use. To this end, we've assembled a Full Cost Accounting and Activity-Based Costing handbook for those interested in improving government decision-making. We hope that this handbook will provide analysts, policy leaders, and fiscal staff with the tools necessary to inform their decisions, from smaller process improvements and improved budgeting and staffing models, to high-level decisions about the role and shape of local government.

How to Approach this Handbook

The Bureau of the Budget and Management Research ("BBMR"), within the Baltimore City Department of Finance ("Finance"), has developed this handbook to provide users with a framework for conducting cost analysis. This handbook will reference technical systems and cost structures established within the City of Baltimore as examples; users should be able to apply the same principles to their own full-cost accounting exercises.

While the Handbook methodology can guide users in development of their specific cost accounting models, the process and information should not be considered comprehensive for other services or

activities within the City of Baltimore. Other services and activities may support a completely different cost structure due to the nature of operations. It will be incumbent upon the user to determine how the methodologies described below can be applied to the particular, unique circumstances.

CHAPTER 1 – Objectives

Development of the Handbook

While many different methodologies may exist for conducting cost analysis for a specific activity, this handbook is available as a tool and a guide for future case studies. It is our hope that this same methodology, with moderate adjustments, can be applied throughout Baltimore City services to serve as a guide for agencies interested in developing their own full costing.

As part of the handbook, the examples and the case study below will focus on residential waste management within the City of Baltimore. Baltimore currently provides waste management services to over 210,000 households, through the City's Bureau of Solid Waste (BSW), within the Department of Public Works (DPW).

Data are collected by the agency detailing route assignments, crew assignments, scheduled service times, and tonnage. Outside of the agency, Finance collects cost information, including details on wages and benefits, vehicle costs, material and supply costs, and other expenses specifically related to the activity.

Significance

By mapping cost data on top of operational information, DPW will be able to calculate a true value for cost per ton of waste managed. This information can be used as a baseline to evaluate and fine tune the service, allowing DPW to improve transparency, compare costs to other jurisdictions, and assess trends in costs. Additionally, leaders can use this information to better inform the direction of policy decisions, and weigh the cost of service provision as a priority versus other municipal services.

CHAPTER 2 – Defining Cost Analysis

There are two methods for cost analysis that will be covered within this report: Full Cost Accounting and Activity-Based Costing.

Definitions

Full Cost Accounting ("FCA") is the means for determining how much it truly costs to support a service or an activity. The U.S. Environmental Protection Agency defines FCA as an "approach for identifying, summing, and reporting […] past and future outlays, overhead costs, and operating costs."[1] FCA entails review of all costs across multiple activities, and does not rely on just the budget, or reported spending within the particular service to inform service cost.

Consider approaching this the same way a business tracks production costs. Businesses generate **output**, an amount of goods or services created over a certain time period. The output itself may be constructed by a production team, yet a number of other units may indirectly contribute to production. The production team requires support from these additional units: a fiscal office tracking costs for wages, raw materials, and equipment; a personnel office responsible for hiring and HR actions; and management to provide direction, oversight, and guidance on the project. All of these separate units have their own costs, and should inform the full cost of production.

Activity-Based Costing ("ABC") assigns a share of the costs to each of the units involved in production. Think of activity-based costing as an extension of full-cost accounting. In full-cost accounting, costs are summed up to an aggregate level; with activity-based costing, the full costs are distributed down to the activity or **component** level. Each component will be identifiable as a portion of the activity. If the FCA provides a figure for all costs of production, then ABC identifies the costs associated with each component of production.

Why FCA and ABC?

In order to understand FCA and ABC, users should recognize several common problems in traditional cash flow accounting. Using a public sector example, imagine two cities that each budget $1 million a year for waste management services. To determine if one city displays greater efficiency, we can review metrics, such as a cost per unit measurement, to provide a comparison. This would be generated by dividing the cost by the output. If City A budgets $1 million for 10,000 tons of waste managed ($100/ton), while City B budgets $1 million for 9,000 tons of waste managed (about $110/ton), the cost per ton appears to favor City A. This simple division of the activity cost over a given amount of output is helpful on the surface, but it has to be well-informed. Cash flow accounting only focuses on the current outlays of cash, whereas FCA identifies all resources used in order to deliver the service, and ABC further

[1] US EPA "Basic Information". Waste-Resource Conservation- Conservation Tools http://www.epa.gov/epawaste/conserve/tools/fca/whatis.htm

breaks this information down to identify how resources are allocated by activity or function. Consider the following questions:

What activities are performed by each service?

Does either service include any additional activities?

What are the administrative costs of providing the service?

Are there any costs of this service not captured in this budget?

It is challenging to answer these questions no matter the level of detail available through traditional cash flow accounting systems.

In order to provide more accurate information on costing, the user will need to think about what costs should to be considered as part of the activity review. For instance, the budget for a service may include persons performing mixed refuse collection, but may not include the management directing the activity, or HR and procurement staff supporting them. In the manufacturing world, services can be divided into two distinct categories: producing departments and supporting departments. **Producing departments** are responsible for the direct provision of a good or service; **supporting departments** perform activities that assist producing departments. In the public sector, we can use the same approach to define activities under our review.

How do we ensure that all costs related to both producing and supporting departments are captured? Before diving into an FCA or ABC analysis, we must understand how to categorize costs, and how these costs should be applied to the service.

Identifying Costs Used in FCA and ABC

This handbook will cover costs that can be separated into the following categories:

- Direct
- Indirect
- Fixed
- Variable
- Avoidable
- Unavoidable (sunk)
- Up-Front
- Operating
- Back-End

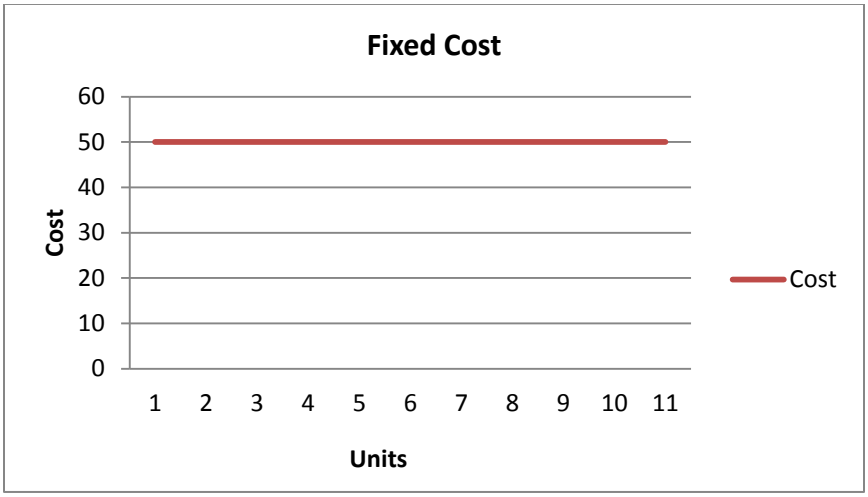
Direct costs can be directly linked to the main activity of the costing exercise. **Indirect costs**, meanwhile, occur outside of the main activity but are partially attributed to the service. Prior to proceeding any further with an FCA or ABC analysis, the complete scope of costs should be fleshed out. It is vital that the user understand the support systems required to maintain this service. These may include, but are not

necessarily limited to: executive direction, accounting, human resources, information technology, outreach, and facilities management. Later in Chapter 5 we will discuss the means for allocating indirect costs, as these may differ based on the structure of the activity.

Direct and indirect costs are not the only ways to classify costs within an activity. Direct and indirect costs do not identify *how* spending within an activity or across activities takes place, such as capacity for service provision. For this reason, we encourage the user to approach costs along another spectrum; that is, identifying costs as either fixed or variable in nature.

Fixed costs are costs that cannot be changed or avoided over the short term; these costs are independent of the level of output. Primary examples of fixed costs would include larger capital developments, such as new landfills, vehicle storage yards, or debt service costs. Despite the inability to avoid these costs in the short term, these costs are not *permanently* fixed, and may increase or decrease based on the need for additional long-term capacity or the completion of debt service payments. For instance, the production of five units of output versus six units of output will have no bearing on the annual debt service payment for a facility.

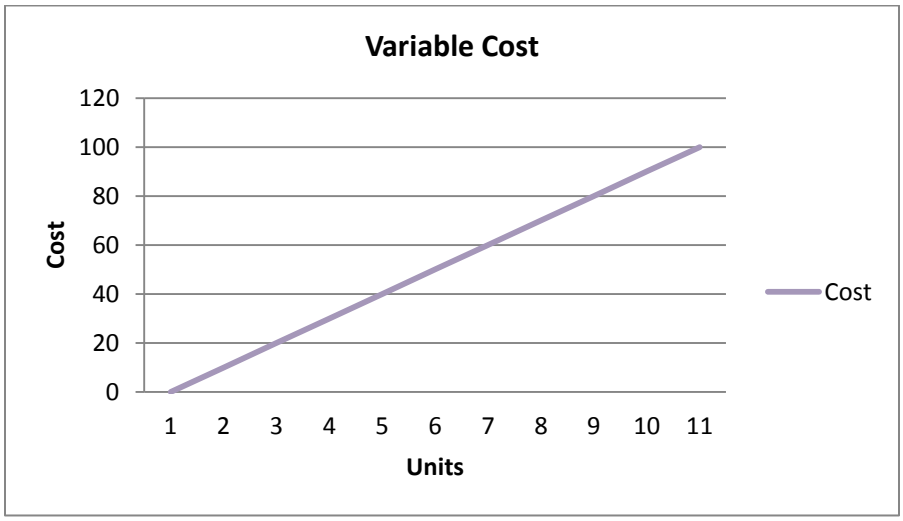
Figure 1: An Example of Fixed Cost



Conversely, **variable costs** are dependent upon the performance of an activity. These costs can be altered or avoided over the short term, though readers should note that cost avoidance may not be *instantly* achievable. Examples include labor, materials and supplies, and most contractual costs. The manager or service provider generally has a direct impact on variable costs.

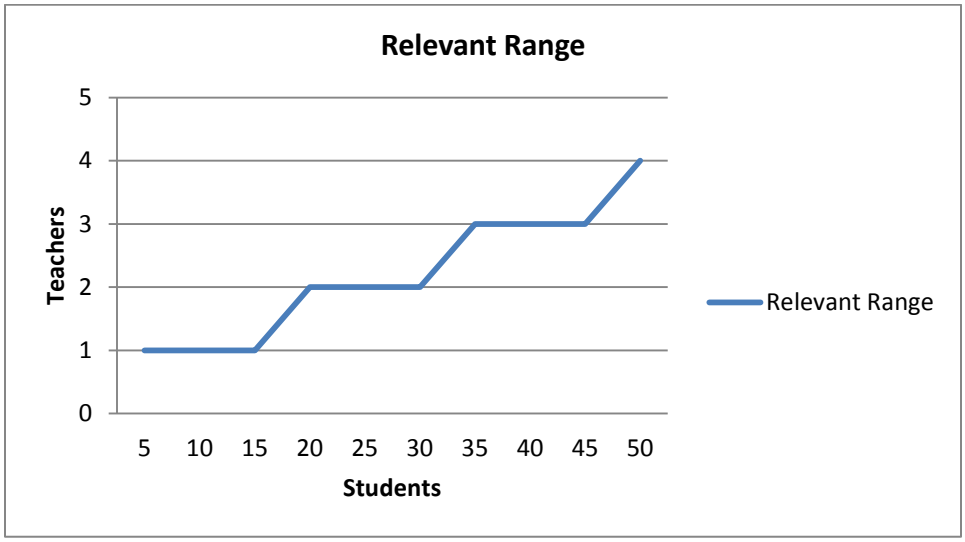
Avoidable costs are those that an agency can eliminate if they stop performing a particular activity. These costs are variable in nature, and are important for any business or organization to consider in operations. For instance, a manager may choose to eliminate a contract with a consultant, or a service provider may decide to decrease temporary labor. **Unavoidable costs** are generally fixed in nature. Regardless of changes to operations, these costs cannot be reduced. An example of this would be overhead costs for central support agencies in local jurisdictions; eliminating an activity will have little to no impact on the cost of providing those services.

Figure 2: An Example of Variable Cost



The **relevant range** relates to the expected cost of an activity over a given range. Costs are fixed over a certain range of output, but after reaching full capacity, adding more units will then increase the cost. For instance, a school may require a teacher for every 15 students enrolled in the class. Costs will be constant for the first 15 students, but at the 16th enrollment, the school will need to hire a second teacher. At this point, the operating cost will increase. With this increased cost, however, there is additional capacity. With the second teacher in place, there is a potential to enroll an additional 14 students to optimize the teacher to student ratio.

Figure 3: An Example of Relevant Range



Costs can also be defined according to phase. Often referred to as “cradle to grave costing” or “life-cycle assessment,” these phases can be separated into three categories: up-front, operating, and back-end

costs. **Up-front costs** are those that must be included for operational start-up, including land, site construction, engineering services, equipment and large capital costs, outreach and education, and permitting. **Operating costs** are those tied to actual day-to-day management of a service, including salaries, benefits, equipment and supplies, and contractual costs; support systems and debt service payments should also be included in operating costs. Note that vehicles may be considered part of this operational cost if they have not been fully depreciated; even then, fully depreciated vehicles may incur maintenance costs. Finally, **back-end costs** consist of all costs related to program conclusion, including site closure, legal expenses, and decommissioning of capital such as buildings and equipment. Personnel-related expenses may be included in back-end costs, such as retirement or pension, if the entity has any outstanding obligations. Additionally, vehicles may also be included in this category if the vehicles are not fully depreciated.

Cost Allocation Methods

For this handbook, the model for cost allocation is based on the Direct Allocation Method described in OMB Circular A-87[2]. The user will need to choose a cost allocation method that best reflects activities performed by the agency. Often, this method is identified through a count of resources employed on behalf of the activity. The following approaches are the most common:

- **Headcount:** This methodology looks at the number of employees dedicated by activity or service, as compared with the total number of employees across all City services.
- **Budget:** This methodology weighs financial resources dedicated by activity or service, and contrasts that figure against total financial resources across the City. The analyst should distinguish among fund sources, and determine whether multiple fund sources should be incorporated for the activity in review. Internal service funds require specific attention – be careful not to double count these costs.
- **Other methodologies: S**ome cost allocation methods should not be calculated on the basis of headcount or budget, but rather on activity performance. Examples of these are included in the figure below:

Figure 4: Examples of Cost Allocation Methods

Activity	Cost Allocation Method
Tracking/monitoring service requests	Number of service requests
Providing transactional support	Number of transactions
Handling customer complaints	Length of time to address complaints

[2] *A-87 Cost Principles for State, Local and Indian Tribal Governments.* Office of Management and Budget, http://www.whitehouse.gov/omb/circulars_a087_2004#e. Revised 05/14/04.

A **cost center** can be a division, segment, or portion of an activity that generates costs. We encourage users to approach and define each cost center through multiple dimensions (indirect or direct, fixed or variable, etc.).

Now that we have the tools to identify costs centers for our FCA and ABC, we will need to establish the scope of the project.

CHAPTER 3 – Identifying the Scope of the Project

Here are the steps the user should take to identify the full scope of the FCA and ABC[3]:

1) **Establish Context (Background):** For a municipal jurisdiction, review background information on the activity or service provided through an agency publication (such as the agency website). A brief history of the agency or agencies will guide the user as to how services have operated in the past, and the mission statement may provide guidance as to how operations will continue into the future. Identify details on the agency's operations – in this particular case, how the mixed refuse is collected, transported, and disposed. The user should map out these functions in relation to the activity in focus.
2) **Inventory Assets:** Full cost calculation requires that every asset used for the activity is documented and accounted for. This includes not only the physical supplies or equipment purchased by the agency for this activity, but a host of other assets, including rental vehicles, buildings, and land. Furthermore, a full list of personnel should be identified, with positions assigned to each budgeted activity.
3) **Define Structure:** In order to determine indirect costs, the user should identify management and support systems that contribute to the activity. List any offices that have direct oversight of the activity, such as a bureau director, as well as any further layers of administration, such as an agency director. Remember that these offices often include more than just the executive, and that the full office supporting costs should be included. Outside of the agency, list each of the supporting departments or other leadership that contributes to performance of this activity.
4) **Gather Financial Data:** Finally, retrieve the most recent available cost data. Work with the Finance Department to understand not only what costs are incurred within the activity, but also throughout the agency and through supporting services. Review revenues as they relate to operations (do not factor in taxes, fees, or other revenues if it does not tie specifically to service financing). Examine the breakdown in costs between personnel and non-personnel costs.

As part of the exercise, the analyst should prepare to retrieve data from each cost center related to this activity, and construct a resource pool template. The **resource pool template** should lay out the allocations, cost drivers, and data ownership. Often, much of the data is captured outside of the accounting and budget systems, so the user should contact the appropriate data owners in advance to ensure that the data is readily available at the start of the project. The resource pool template provides a framework for managing the multiple layers of information, and avoids double counting or missing costs. An example of the resource pool template produced for this report can be found at Table 30.

Note that drivers can include a number of sources of information across different agencies. Mapping out the personnel and services responsible for this data ownership is crucial prior to engaging in the cost allocation exercise.

[3] For similar instruction, consult pages 8-9 of *EPA530-K-96-001: Making Solid (Waste) Decisions with Full Cost Accounting,* at http://www.epa.gov/osw/conserve/tools/fca/docs/primer.pdf

Background on the Bureau of Solid Waste

The Bureau of Solid Waste provides several services for the City of Baltimore to promote City cleanliness and perception of cleanliness for residents, businesses, and visitors, including the following:

- **Public Right-of-Way Cleaning:** Cleaning and sweeping rights of way to prevent accumulation of litter. This includes city-owned streets, lots, and alleys.
- **Vacant and Abandoned Property Cleaning and Boarding:** Property maintenance, such as cleaning and boarding of abandoned vacant buildings, mowing of vacant lots, and rodent control. The City receives 42,000 cleaning and boarding requests annually.
- **Waste Removal and Recycling:** Household, business, and condominium mixed refuse collection, curbside pickup of bulk and seasonal waste items, and recycling pick-up. Services are provided to 210,000 households across the City.
- **Waste Re-Use and Disposal:** Disposal of wastes at the Quarantine Road Landfill, waste to energy conversion in partnership with Baltimore Refuse Energy Company (BRESCO), and landfill maintenance.
- **Solid Waste Administration:** administrative support and direction for the above services.

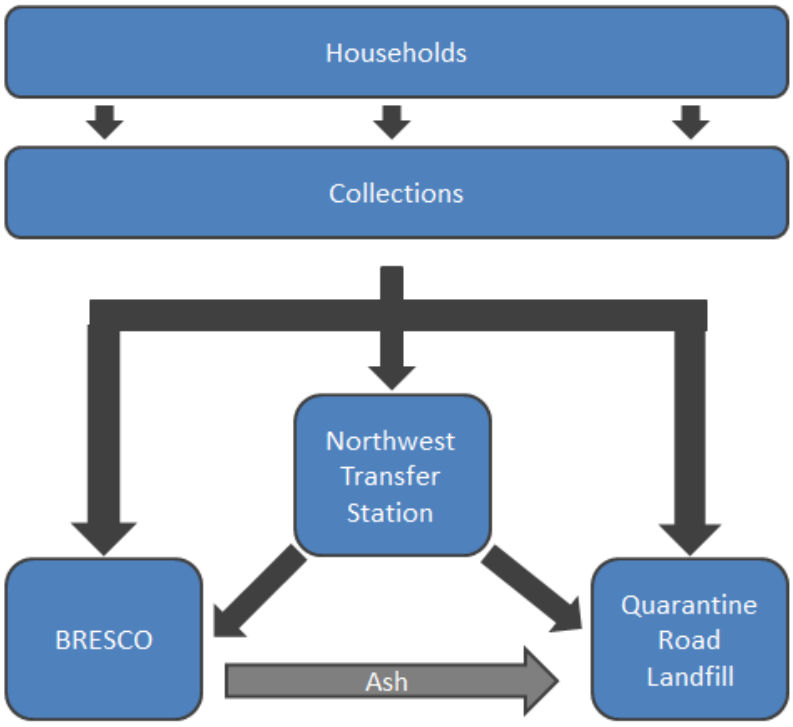
The Waste Removal and Recycling service is composed of several distinct activities: Mixed Refuse Collection, Recycling Administration, Bulk Trash Collection, and Condominium Collections. Refuse is disposed or reused according to government regulations and mandates, through disposal at landfills, recycling programs, and conversion to energy. The long-term goal of the Bureau is to reduce waste volume by diverting more trash to recycling, which extends the projected life cycle of the landfill.

Understanding the Mixed Refuse Collection Process

Mixed Refuse Collection can be broken down into three components: collection, transportation, and disposal. The City implemented a "1+1 Program" for trash and recycling pick-up in July 2009 as a means of streamlining collection operations. As part of the new program, the City provides refuse collection and recycling services to households on a weekly basis, in an effort to improve efficiency while reducing waste disposal and increasing recycling. The City is broken down into four quadrants for collection purposes: Northeast, Northwest, Southeast, and Southwest. Additionally, there is a designated central city district[4]. Once refuse is collected from households, it can be transported to several locations: the BRESCO (Wheelabrator) waste-to-energy incineration facility[5], directly to the Quarantine Road Landfill, or to the City-operated Northwest Transfer Station. The Northwest Transfer Station provides a consolidated, efficient drop-off location for refuse from City collection trucks to later distribute to BRESCO and the Quarantine Road Landfill. The flow chart below illustrates the general process for collections.

[4] See *Appendix*, Exhibit 1 for a map and schedule of Baltimore City's Solid Waste Collection Quadrants
[5] The by-product of incinerated waste material is ash, which is delivered to the Quarantine Landfill.

Figure 5: Process Flow Chart, Mixed Refuse Collection



Eventually, all collected mixed refuse is disposed of at the Quarantine Road Landfill (including incinerated ash from BRESCO). BRESCO charges a tipping fee to all vehicles disposing of waste for incineration. The Quarantine Road Landfill does not charge City solid waste vehicles for disposal, but does charge other entities disposing of refuse directly at the facility.

Mixed Refuse Collection within the Budget

Mixed Refuse Collection is identified as an activity within the Waste Removal and Recycling Service. The budget for the service and activity are as follows:

Table 1: Budget for Mixed Refuse Collection

Service and Activity Description	Fiscal 2013 Budget
Waste Removal and Recycling	$19,373,690
Mixed Refuse Collection Activity	*$17,323,169*

Despite identification of a specific activity for Mixed Refuse Collection, the activity includes functions related to residential trash collection, recycling collection, gateways, and administration. These functions are not broken down into further sub-activities within the budget. As a result, the accounting

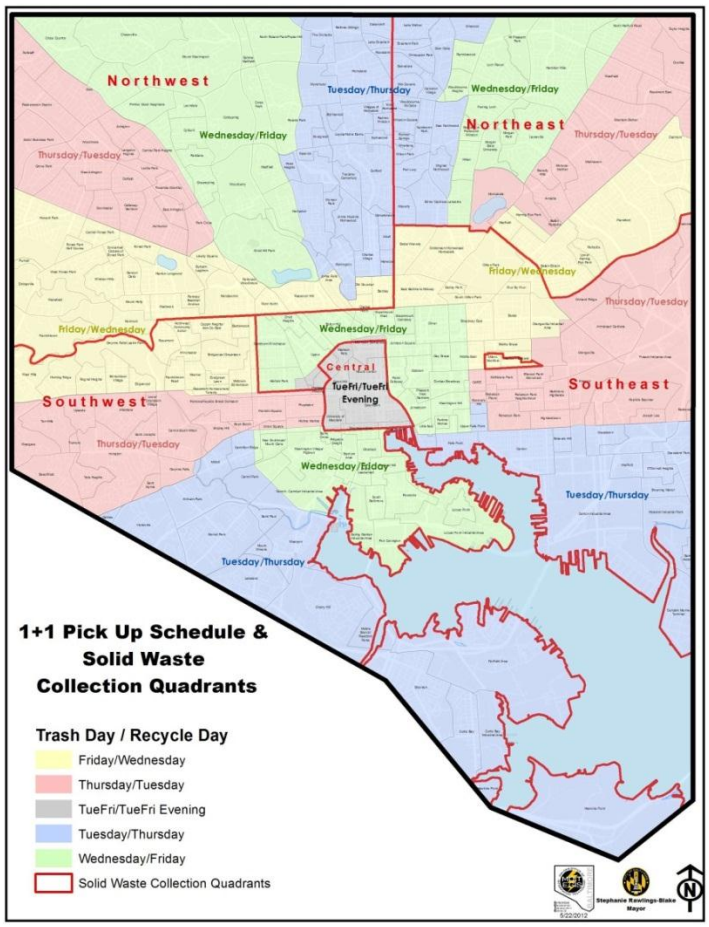
structure does not necessarily produce cost data at this sub-activity level. This topic will be explained in further detail in Chapters 4 and 5. For the purposes of this case study, the residential trash collection will be identified in the analysis as “MRC.”

Quadrants, Operations and Routes

As part of the shift to the 1+1 Program, the City is divided into four quadrants, with each quadrant subdivided into individual routes.

The map below illustrates collection days for residential trash collection and recycling, which operate on a normal Tuesday through Friday schedule (with collection days adjusted for holidays).

Figure 6: Baltimore City 1+1 Collection Schedule



Within each Quadrant, there are eleven routes dedicated to refuse collection, and five routes dedicated to recycling, both occurring on a daily basis. Each route will have a crew of one driver and two laborers assigned to collections; each crew is assigned to the same routes and vehicles each week. In addition to mixed refuse and recycling collections, an additional crew is assigned to gateway collections.

In the event that a normal crew member is unavailable, a seasonal maintenance aide (SMA) will be assigned to fill in. This may take place due to a normal absence or a vacancy at the position.

Given that personnel and vehicles are assigned on the basis of route (and quadrant), direct personnel costs and vehicle costs can be distributed accordingly. This will be discussed further in Chapter 4 in reporting direct costs.

Waste Re-Use and Disposal Activities

Several activities within the Waste Re-Use and Disposal service will factor significantly into the indirect cost of residential trash collection. These activities, as mentioned above in the collections process, include Wheelabrator Disposal (BRESCO), Landfill Operation, Landfill Trust, and Northwest Transfer Station Operation. Each disposal site functions as a cost center for residential trash collection. All refuse disposed of at the Landfill ultimately contributes to operating and long-term capital costs associated with this facility, and must be taken into account.

Assets

A listing of physical assets will assist in the development of an accurate FCA and ABC. Based on a list provided either internally by the agency, or through an external agency (such as General Services), the user should be able to determine which assets contribute to service delivery. In the case of Baltimore City, the Department of General Services has ownership of all vehicle data, which is tracked through the FASTER vehicle system. Vehicles are given unique identifiers and tied to a budget account number. For more detail on capturing vehicle cost related to this activity, see the "Vehicle and Equipment Replacement Cost" section in Chapter 4.

Facilities are assets that may not be captured directly within the scope of the activity budget. Unlike a smaller equipment purchase, the significant cost of a facility often requires the municipality to borrow money and incur debt. **Retirement of debt** occurs when all debt services payments have been completed. The Bureau of Treasury and Debt Management can provide information on debt service payments linked to specific facilities and projects. In the case of Mixed Refuse Collection, the debt service is budgeted separately from the service. Quarantine Road Landfill, the Northwest Transfer Station, and Administration buildings should all be captured as part of the cost allocation. Refer to the "Debt Service" section of Chapter 5 for additional insight on cost allocation.

Finally, while not depreciable or requiring debt service to finance, personnel can be considered an asset. Personnel are often *the* significant driver of costs within a service. As part of the FCA, a full listing of agency positions should be compiled, as these will inform the full cost of the service once the allocation methods have been determined. Position listings outside of the agency are not necessarily required, if the analyst plans to use the budget basis for cost allocation of central support services.

Ash: Asset or Cost?

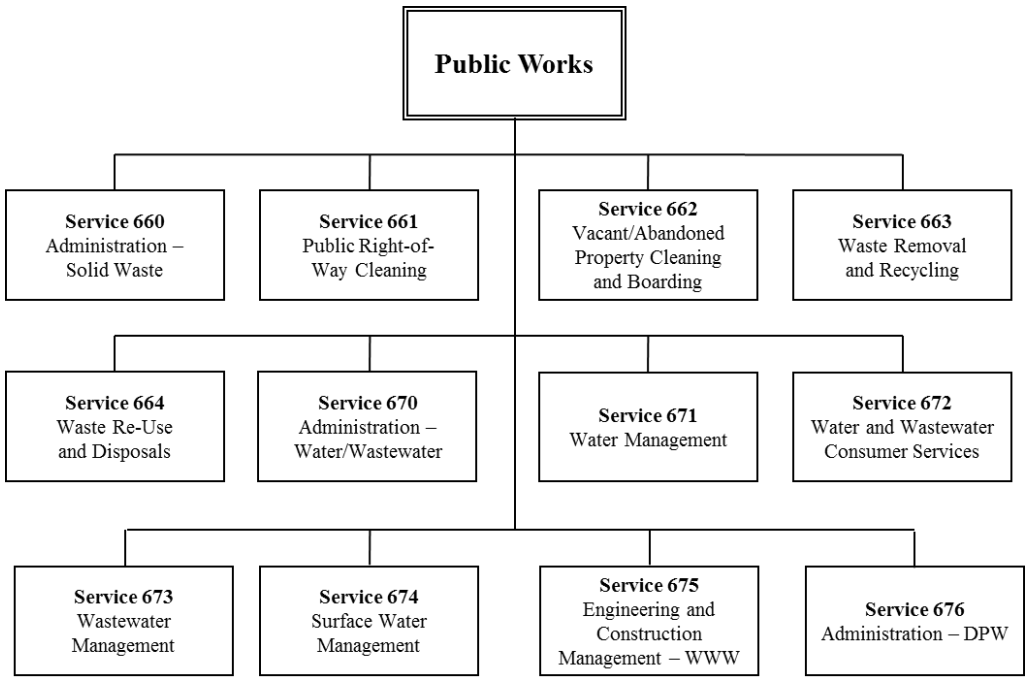
Refuse that is delivered to the BRESCO facility is converted into ash, and delivered to the Quarantine Road Landfill for disposal. For a number of years, ash produced in this manner was used as an alternative daily cover for the Quarantine Road Landfill. However, recent notice from the Maryland Department of the Environment ("MDE") has disallowed the use of ash as a cover. Prior to the MDE decision, ash could have been considered an asset (as it functioned as cover material for the landfill), as

well as a cost (as it contributes to landfill capacity). Without a change to the MDE decision, and for the purposes of this report, ash will not be considered an asset, as it no longer contributes any value as a cover material in landfill operations. Further discussion of the costs of ash will be covered in Chapter 6 and Chapter 8.

Structure

As mentioned briefly in Chapter 1, the City's Bureau of Solid Waste operates within the Department of Public Works. The Department of Public Works contains three major divisions: the Bureau of Solid Waste, the Bureau of Water and Wastewater, and the Surface Water Management service. There are three separate administrative services within Public Works – Solid Waste Administration, Water/Wastewater Administration, and the principal Public Works Administration. The Mixed Refuse Collection activity can be found within Service 663, Waste Removal and Recycling.

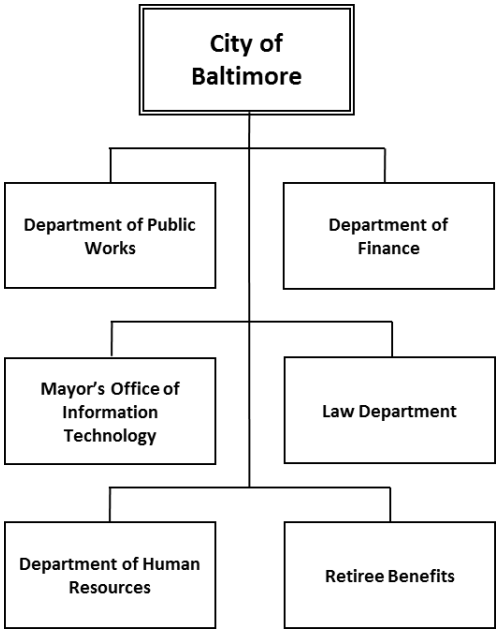
Figure 7: Department of Public Works Organizational Structure



Several agencies outside of Public Works provide support to Mixed Refuse Collection: General Services, Finance, Human Resources, and Law. The Mayor's Office of Information Technology is a separate agency, but a transfer credit is budgeted within DPW to support the cost of IT-related services. Therefore, the cost will be captured within the agency budget. The costs of other supporting services are

not captured within the DPW budget. Consequently, overhead costs related to these services will need to be factored into the cost allocation. In addition, retiree health benefits are centrally budgeted (an indirect cost of the service); this is a back-end cost that should be a part of the FCA and ABC.

Figure 8: City of Baltimore – Public Works and Supporting Agencies



Gathering Financial Data

Financial Data should be obtained through the municipality's primary fiscal agency. Within Baltimore City, the Bureau of Accounting has a general ledger available, and information on appropriation and monthly financials can be obtained through BBMR. Debt Service Data as mentioned above is available through the Bureau of Treasury and Debt Management, and capital data can be provided by the Department of Planning.

Operating expenses are classified according to object: salaries and benefits for personnel; contractual services; materials and supplies; minor and major equipment; and grants, subsidies, and contributions. In a few cases, debt service and capital improvements may also be located within the service operating budget.

Additionally, in a select number of services, there may be revenues generated through performance of an activity. Revenues are required in this analysis only so far as they are a direct result of the activity and can be applied as an offset. General Fund tax revenues should not be factored into any services as part of an FCA or ABC review. The Bureau of Solid Waste generates revenues through the recycling program,

but this activity should be considered separate and distinct; therefore revenues cannot be applied as an offset to the Mixed Refuse Collection and Disposal activities.

Once each of the above steps is completed, the analyst will have the necessary information available to conduct the analysis, and can begin allocating costs to each of the appropriate cost centers.

CHAPTER 4 – Direct Costs

In Chapter 3, we noted that the budget for the MRC activity includes several other functions (Administration, Recycling Collection, and Gateway Collection). While most personnel, equipment, vehicles, and other assets within the activity are specific to the MRC, the same cost centers for the Administration, Recycling Collection, and Gateway Collection functions are also captured within the activity budget. The result is that, from a budget standpoint, no one line item can be incorporated as a true direct cost. However, we will continue to use the term "direct cost" when capturing the cost data directly budgeted within the Mixed Refuse Collection activity.

Cost Allocation for Personnel

DPW has established an organizational chart for each quadrant identifying personnel assigned to specific duties – including crews, supervisors, and administrative personnel. An example of an organizational chart for the NE Quadrant is provided on the following page[6].

[6] For a complete listing of personnel and routes by Quadrant, please see *Appendix*, Exhibit 2.

Figure 9: Northeast Quadrant Personnel Listing

NE Quadrant Personnel Breakdown 07.12.13

	Name	Classification	Job Duties
1	R. L.	Solid Waste Supervisor	Mixed Refuse Supervisor
2	C. D.	Solid Waste Supervisor	Mixed Refuse Supervisor
3	V. E.	Solid Waste Supervisor	Mixed Refuse Supervisor
5	T. W.	Office Supervisor	Office Manger
6	S. C.	Radio Dispatcher	Clerk, Payroll

		Totals	Drivers	Laborers	Classification	Job Duties
7	C. D.	4 Drivers	T. J.		Solid Waste Driver	2202 2305 2407 2505
8			T.Y.		Solid Waste Driver	2201 2306 2408 2502
9			J. D.		Solid Waste Driver	2204 2307 2405 2501
10			A.E.		Solid Waste Driver	2203 2309 2406 2503
11		8 Laborers		S. L.	Seasonal Maintenance Aide	2203 2309 2406 2503
12				B. S.	Solid Waste Worker	2202 2305 2407 2505
13				N. B.	Seasonal Maintenance Aide	2201 2306 2408 2502
14				J. B.	Solid Waste Worker	2204 2307 2405 2501
15				L. B.	Solid Waste Worker	2204 2307 2405 2501
16				K. F.	Solid Waste Worker	2201 2306 2408 2502
17				T. H.	Solid Waste Worker	2203 2309 2406 2503
18				A. B.	Solid Waste Worker	2204 2307 2405 2501
19	V. E.	4 Drivers	K. S.		Solid Waste Driver	2205 2302 2403 2504
20			K. A.		Solid Waste Driver	2206 2303 2401 2508
21			R. S.		Solid Waste Driver	2207 2304 2402 2506
22			C. P.		Motor Vehicle Driver I	2208 2301 2404 2507
23		8 Laborers		A. S.	Solid Waste Worker	2205 2302 2403 2504
24				A. S.	Solid Waste Worker	2205 2302 2403 2504
25				A. T.	Solid Waste Worker	2206 2303 2401 2508
26				L. J.	Solid Waste Worker	2206 2303 2401 2508
27				D. J.	Solid Waste Worker	2207 2304 2402 2506
28				R. N.	Solid Waste Worker	2207 2304 2402 2506
29				A. D.	Solid Waste Worker	2208 2301 2404 2507
30				L. T.	Solid Waste Worker	2208 2301 2404 2507
31	R. L.	3 Drivers	R. G.		Solid Waste Driver	2210 2310 2410 2510
32			M. Y.		Solid Waste Driver	2211 2311 2411 2511
33			D. C.		Solid Waste Driver	2209 2308 2409 2509
34		6 Laborers		W. D.	Solid Waste Worker	2210 2310 2410 2510
35				A. M.	Solid Waste Worker	2210 2310 2410 2510
36				K. T.	Solid Waste Worker	2211 2311 2411 2511
37				A. M.	Seasonal Maintenance Aide	2209 2308 2409 2509
38				R. W.	Solid Waste Worker	2209 2308 2409 2509
39				T. A.	Solid Waste Worker	2211 2311 2411 2511

Based on the employee assigned to each Mixed Refuse Collection crew, we can identify the payroll information and benefits (known as other personnel costs or OPCs) for all of the positions within the activity specific to Mixed Refuse Collection, and present this as a "total compensation" figure. Note that some administrative personnel are captured here as direct costs. Additional detail will be provided in Chapter 8, but for purposes of simplicity, we will consider the stated compensation for each as a direct cost.

Table 2: Personnel Breakdown for Mixed Refuse Collection

Pesonnel Breakdown	# of FTE	Total Compensation
Crew Leader II	1	$23,474
Motor Vehicle Driver I	1	$48,519
Office Assistant II	1	$27,221
Office Assistant III	1	$60,987
Office Supervisor	1	$75,254
Radio Dispatcher	1	$49,634
Solid Waste Asst. Superintenden	1	$48,099
Solid Waste Driver	30	$2,150,925
Solid Waste Superintendent	1	$49,652
Solid Waste Supervisor	3	$832,649
Solid Waste Worker	86	$4,119,045
Solid Waste Worker / CDL	2	$83,795
Superintendent	1	$38,951
Grand Total	**130**	**$7,608,203**

Additionally, we can identify overall Seasonal Maintenance Aide ("SMA") costs and overtime costs dedicated to mixed refuse collection based on actuals. The total personnel costs can be summarized as follows:

Table 3: Direct Personnel Costs for Mixed Refuse Collection

Direct Personnel Costs	Total
Salary + OPCs	$7,608,203
SMA Cost	$525,191
Overtime	$356,533
Total	**$8,489,927**

Cost Allocation for Other Direct Costs

In addition to salary and benefits information, mixed refuse collection has several other direct cost centers associated with this activity. These can be broken down into several distinct categories based on the line item budgets:

- Vehicle costs - including rental, maintenance, and fuel costs;
- Other non-personnel costs - other equipment or supplies; and
- Costs for the Northwest Transfer Station.

Vehicle and Equipment Replacement Costs

The purchase price of vehicles and other equipment is considered a capital outlay. This is an outlay of cash spent to acquire, maintain or upgrade assets. Cash flow accounting systems would capture these costs in the year that assets are purchased. This way, the costs will be overstated during that year, and understated during following years. FCA provides a means for capturing and converting these costs into an annual cost through depreciation. Please note that no depreciation should be recorded for vehicles and equipment that have remained in service longer than their useful life.

In order to apply the straight-line depreciation method, we need the following information:

1. Acquisition cost of each vehicle
2. Useful life-cycle

For example, a load packer (collection truck) that costs $100,000 with a life-cycle of 10 years would have an annual depreciation cost of $10,000. In some cases, organizations finance vehicle replacement costs; the user should include additional interest costs due to financing where applicable.

$$\textbf{Annual Depreciation Cost (straight-line method)} = \frac{\text{Cost}}{\text{Useful Life}}$$

The City of Baltimore's Fleet Management Division keeps all vehicle related data, such as equipment number, model, make, acquisition cost, and life-cycle information in the FASTER database.

Based on the data from FASTER, Mixed Refuse Collections has a total of 63 vehicles[7], with 33% of its fleet fully depreciated. By applying the straight-line depreciation formula to non-depreciated vehicles, we will then know how much Mixed Refuse Collections needs to allocate each year to acquire replacement vehicles. Table 4 shows the summary of vehicles by status and cost.

[7] Source: FASTER Database. A complete list of vehicles, acquisition costs, estimated useful life etc. can be found in *Appendix*, Exhibit 7.

Table 4: Mixed Refuse Collection Fleet by Status, Cost and Count

Status	% of Status	Total Annual Cost	Count of Status
Total	100%	$842,072	63
Non-Depreciated	**67%**	**$617,322**	**42**

In most cases, there may be additional costs charged to each vehicle/piece of equipment whether it is fully-depreciated or not. In this case, Fleet Management charges following fees per vehicle to its customers:

1. $67/vehicle - Asset Management Fee
2. $305/vehicle - Insurance Fee

These costs, considered a charge-back rate, total $372 per vehicle. If Mixed Refuse Collections has 63 vehicles in its Fleet, this fixed cost of $23,436[8] for Asset Management and Insurance should be accounted for each year.

Table 5: Vehicle/Equipment Cost (Annual)

Type	Total Annual Cost
Management and Insurance Fees ($372/vehicle)	$23,436
Rental for non-depreciated vehicles	$617,322
Total	**$640,758**

Vehicle Maintenance and Fuel Costs and Other Equipment Costs

Based on the data captured in the FASTER system, we can identify the maintenance and fuel costs specific to vehicles for Mixed Refuse Collection. For other equipment or supplies (other non-personnel costs), we can identify line item actuals within this activity. A summary of these direct non-personnel costs, including the annual vehicle rental (non-depreciated vehicles) and management and insurance fee costs, is provided below:

Table 6: Direct Non-Personnel Costs for Mixed Refuse Collection

Non-Personnel Costs	Total
331 - Rental	$617,322
335 - Maintenance	$2,593,994
401 - Fuel	$604,958
Management and Insurance Fees	$23,436
Non-Personnel Costs	$459,425
Total	**$4,299,135**

[8] Fixed Cost ($23,436) was calculated by multiplying 63 vehicles by the $372 fee per vehicle.

Northwest Transfer Station

The final direct cost captured in this exercise is for the Northwest Transfer Station ("NWTS"). As this facility serves as a transfer point to the BRESCO incinerator, both the operating costs and capital costs associated with this facility should be identified as direct. Similar to the personnel and non-personnel costs above, we can identify accounting actuals for direct costs below:

Table 7: NWTS Operating and Capital Costs

NWTS Costs	Total
Operating	$868,762
Capital	$216,001
NWTS Total	**$1,084,763**

The following is a summary of the total direct costs of the mixed refuse collection activity:

Table 8: Summary of Direct Costs for Mixed Refuse Collection

Cost Centers	Total Cost
Compensation	
Salary + OPCs	$7,608,203
SMA Cost	$525,191
Overtime	$356,533
Subtotal	*$8,489,927*
Equipment	
331 - Rental	$617,322
335 - Maintenance	$2,593,994
401 - Fuel	$604,958
Management and Insurance Fee	$23,436
Subtotal	*$3,839,710*
Contractual & Supplies	
Non-Personnel Costs	$459,425
Subtotal	*$459,425*
NWTS	
Operating	$868,762
Capital	$216,001
Subtotal	*$1,084,763*
Total Direct Costs	**$13,873,824**

Note the direct costs as compared with the budget for the activity for Fiscal 2013:

Table 9: Direct Costs vs. Budget for Mixed Refuse Collection

Description	Amount
Total Direct Costs for Mixed Refuse Collection	$13,873,824
Mixed Refuse Collection Activity	*$17,323,169*

The direct cost of this function in Fiscal 2013 is 80% of the budget for the Mixed Refuse Collection activity. As mentioned earlier, the activity includes a number of functions in addition to Mixed Refuse Collection – Recycling Collection, Gateway Collection, and Administration. This is the main reason for the discrepancy between budget and actual direct costs. Recommendations in Chapter 11 will include discussion of separating these functions into specific activities to better inform the activity budget and communicate true direct costs for Mixed Refuse Collection.

In addition, the direct costs above do not include departmental or city-wide administration, support services, or other life-cycle costs related to facilities. As part of the FCA, the next step will be identifying methodologies for allocating these indirect costs to fully inform the cost of the Mixed Refuse Collection activity.

CHAPTER 5 – Allocating Indirect Costs

When allocating costs, the following three criteria should receive consideration:

1. Indirect and Overhead Costs
    - FCA captures all indirect and overhead costs, including those that are shared with other agencies. Overhead costs might include legal services, human resources, drug testing, and administrative support etc.
2. Upfront , Operating and Back-end costs
    - Upfront costs may include acquisition of buildings, equipment and landfills.
    - Operating costs include salaries, benefits, materials, supplies, tipping fees, and indirect costs.
    - Back-end costs will be incurred upon completion of an activity or project. Back-end costs may include landfill closure, post-closure, and retirement benefits.
3. Hidden Costs
    - In some cases, services receive equipment without having to pay for it in cash. However, this should be captured in FCA, because that equipment has value.

Through FCA, we will be able to analyze and report all of the above costs associated with Mixed Refuse Collection and Disposal activities, including:

- Administration and overhead
    - Administration services within DPW
    - Overhead costs shared with other agencies
- Debt Service
- Capital Improvement Projects (CIP)
    - NWTS
    - Landfill Development
    - Solid Waste Facility Development
- Collection, transportation and disposal
    - Mixed refuse collection routes
    - NWTS
    - BRESCO and the Quarantine Road Landfill
- Landfill Closure and Post-Closure

Following the FCA, we will distribute the costs through ABC in Chapter 8 down to the specific activity components within Mixed Refuse Collection:

- Full Activity Cost
    - Mixed Refuse Collection
        - Collection
        - Transportation
        - Disposal

Cost Allocation for Shared Services within Department of Public Works

As we mentioned earlier, DPW consists of three major divisions: the Bureau of Solid Waste, the Bureau of Water and Wastewater and the Surface Water Division. Notice that the Department has three administration services providing support for the three major divisions:

1. Administration – Solid Waste
2. Administration – Water & Wastewater[9]
3. Administration – Director's Office

All of the administrative support work related to the residential Mixed Refuse Collection and Disposal activities should be captured either directly or indirectly. In this case, both Solid Waste Administration and Director's Office Administration are indirect cost centers. Solid Waste Administration oversees all solid waste related services including the Mixed Refuse Collection and Disposal activities, while the Director's Office provides administrative oversight for the entire agency. When costs are shared, the analyst must choose an appropriate method to allocate the costs back to the individual activities – in this instance Mixed Refuse Collection and Disposal – as part of determining the total cost.

To determine the full cost of shared services within DPW, we will need to allocate both of the administrative services mentioned above. Let's start by taking a look at Solid Waste Administration.

Cost Allocation for Solid Waste Administration

The Solid Waste Administration service is responsible for administrative functions related to all of the BSW services, including fiscal operation, human resources, and bureau-wide executive direction. Additionally, workers compensation expenses for the bureau are captured within this service. Our objective here is to distribute the cost of administration, first by allocating it to the proper service (Waste Removal and Recycling), and then down to the activity level (Mixed Refuse Collection). Furthermore, costs should be allocated according to function within the Mixed Refuse Collection activity; we do not want to include personnel that fall under other unrelated functions.

The Headcount allocation method is the most common way to determine how to distribute costs of shared services like administration, human resources, etc.[10]. There is a total of 707 full-time positions, including the 16 positions in Solid Waste Administration (Service 660).

Table 10 shows the numbers of budgeted full-time employees (FTE) by service within BSW.

[9] Administration for Water & Wastewater does not factor into the cost of service provision, and therefore should not be included as a cost center for the FCA.

[10] The shared services costs are part of the FCA and must be assigned to the activities through cost allocation from supporting departments to producing departments.

Table 10: Number of FTE by Service - BSW

Agency	Srv #	Service	# of FTE
Public Works	660	Administration - DPW - SW	16
	661	Public Right-of-Way Cleaning	320
	662	Vacant/Abandoned Property Cleaning and Boarding	65
	663	Waste Removal and Recycling	264
	664	Waste Re-Use and Disposal	42
Total			**707**

Here we will need to take the cost of Solid Waste Administration, and allocate it across the remaining four BSW services. Be sure to avoid double counting the cost of the support service; the total FTE positions, 707, should be reduced by the 16 Solid Waste Administration positions.

$$\textbf{Allocation ratio} = \frac{\#\text{ of FTE by Service}}{\text{Total \# of FTE (excluding Solid Waste Admin.)}}$$

Remember that once a shared service's costs have been allocated, no costs should be allocated back to it. Note that the total number of FTEs is reduced to 691 after we remove Solid Waste Administration. Table 11 shows the percentage of FTE by BSW service excluding Solid Waste Administration.

Table 11: Percentage of FTE by Service

Agency	Srv #	Service	# of FTE	% - Allocation
Public Works	661	Public Right-of-Way Cleaning	320	46.31%
	662	Vacant/Abandoned Property Cleaning and Boarding	65	9.41%
	663	Waste Removal and Recycling	264	38.21%
	664	Waste Re-Use and Disposal	42	6.08%
Total			**691**	**100.00%**

Per the table above, 38.21% of administrative costs are allocated down to the Waste Removal and Recycling service. We will need to allocate costs by activity by applying the same methodology. Table 12 shows the breakdown of FTE count by Service and Activity within BSW.

Table 12: Count and Percentage of FTE by Activity within Waste Removal and Recycling

Service	Activity	Total FTE	% - Allocation
Waste Removal and Recycling	Bulk Trash Collection	16	6.06%
	Condominium Collections	8	3.03%
	Mixed Refuse Collection	236	89.39%
	Recycling Administration	4	1.52%
Total		**264**	**100.00%**

As the Mixed Refuse Collection activity accounts for 89.39% of the total FTE headcount, the cost allocated from the service down to the activity should be as follows:

$$(38.21\%) * (89.39\%) = 34.15\%$$

Note that this activity includes personnel for Mixed Refuse Collection, Recycling Collection, and Gateway Collection, as well as administrative personnel specific to these functions. We can derive a percentage of total personnel dedicated specifically to the Mixed Refuse Collection function based on this:

Table 13: Percentage Allocation of FTEs by Function

% Allocation of FTEs	Mixed Refuse	Recycling	Gateway
Activity	63.68%	33.02%	3.30%

$$(34.15\%) * (63.68\%) = 21.75\%$$

Based on the allocation by service and activity, 21.75% of all costs associated with Solid Waste Administration should be applied to Mixed Refuse Collection.

Cost Allocation for Director's Office Administration

There is a total of 66 full-time positions in the Director's Office (Service 676). This service provides leadership and support to the Department of Public Works in the areas of Administrative Direction, Human Resources, Fiscal Management, Technical Support, Contract Administration, Legislative Affairs, Media and Communications, and Safety and Training.

Let's take a look at the allocation for this service using the same methodology employed above. DPW has a total of 2,559 FTEs in Fiscal 2013. Table 14 shows the numbers of FTEs by Bureau.

Table 14: Number of FTE by Bureau

Agency	Bureau	# of FTE	% - Allocation
Public Works	Solid Waste	707	28%
	Water and Wastewater	1,702	67%
	Surface Water	84	3%
	Director's Office	66	3%
Total		**2,559**	**100%**

As stated in the Solid Waste Administration cost allocation, we have to make sure not to double-count the cost of the support services. In this case, we have to back out both of the shared services from the total FTE count (including Director's Office Administration, and for the second time, Solid Waste Administration).

$$\text{Allocation ratio} = \frac{\#\text{ of FTE by Bureau}}{\text{Total \# of FTE (excluding both Admin. services)}}$$

Table 15: Number of FTE by Service (Entire DPW excluding both Administration Offices)

Agency	Bureau	# of FTE	% - Allocation
Public Works	Solid Waste	691	28%
	WWW	1702	69%
	Surface Water	84	3%
Total		**2477**	**100%**

Next, we will need to allocate the costs down to the Mixed Refuse Activity in BSW. We know that any shared cost associated with Solid Waste services needs to be re-allocated by 21.75%.[11]

$$(28\%) * (21.75\%) = 6.17\%$$

Based on our analysis, Mixed Refuse Collection full-cost should include **6.17%** of the Director's Office's cost and **21.75%** of the Solid Waste Administration cost.

Before we move on to the other supporting agencies outside of the Department of Public Works, we should ensure that we used the correct method for cost allocation for the shared services. In some cases, certain activities within a shared service may require a different allocation method.

For instance, DPW utilizes services from the Mayor's Office of Information Technology for its Call Center support. The 311 Call Center provides a universal, standardized, inter-agency call-intake and work order management methodology with a direct linkage to the CitiStat system and process. Participating agencies share a portion of the total cost of 311 Call Center operations; BSW is appropriated funds to pay for its share in its Solid Waste Administration budget.

For this specific line item budget, headcount allocation is not the right method to identify costs related to Call Center reimbursement. We can assume that the proportion of service requests (SRs) linked to Mixed Refuse Collection should be the same proportion used in the cost allocation. Table 16 shows the count of SRs by type (provided via CitiStat).

Table 16: Count of SR by Type

SR Type	Count	%
SW-Citizen Complaint of Employees	1,162	16.93%
SW-Mixed Refuse	**3,425**	**49.91%**
SW-Recycling	2,275	33.15%
Total	**6,862**	**100.00%**

49.91 % of the total line item budget should be allocated based on the SR count.

[11] Refer to detail in Table 3: Count and Percentage of FTE by Activity within Waste Removal and Recycling.

So far we have identified cost allocation methods and cost drivers for shared services within DPW. Table 17 summarizes the findings.

Table 17: Cost Allocation for Shared Services within DPW

Cost Center	Type	Allocation Method	%
Administration - BSW	Indirect	Headcount	21.75%
Administration - Director's Office	Indirect	Headcount	6.17%
One Call Center Reimbursement	Indirect	% of SR's	49.91%

Cost Allocation for Shared Services Outside of DPW

This section focuses on the agencies that provide essential support services for the Mixed Refuse Collection and Disposal activities. There are five Central Support Agencies:

- **Finance**

  The Department of Finance provides a full range of financial services to City agencies: collecting and investing all monies due the City; managing City debt; and executing fiscal policies. The Department of Finance also provides central coordination of accounting, purchasing, budget, and risk management functions.

- **Human Resources**

  The Department of Human Resources advises the Civil Service Commission on rules and regulations governing the selection, appointment, promotion, demotion and discipline of City employees. It also provides comprehensive human resources programs and services including training to attract, develop and retain an organizationally effective workforce.

- **Law**

  The Law Department represents the interests of the City in litigation matters; protects the corporate and financial interests of the City in the negotiation and consummation of contractual, financial, and real estate transactions; defends the City in liability cases; supports collections efforts; and provides legal advice and counsel to the Mayor, City Council and City departments, boards and commissions.

- **CitiStat**

  The Mayor's Office of CitiStat provides an accountability program for City agencies, where strategies are developed and employed and results are measured. CitiStat provides week-to-week tracking of performance, assessment and evaluation, and a forum for discussion of potential management strategies.

- **Retirees' Benefits**

  This service provides funding for the health care benefits of approximately 10,500 retired City employees. These benefits are accrued by employees during their active working years with the City.

The central (shared) costs are part of the FCA and must be assigned to the activities through cost allocation from supporting departments to producing departments. Choosing the right allocation method will result in more accurate costs and more control over the variable costs. However, the chosen method may have to be revised annually to reflect changing conditions. Indirect cost allocation should be kept simple but effective without getting into too much detail. It is very easy to overanalyze indirect cost allocation; the analyst should keep this in mind while conducting any cost allocation.

The budget basis is a common cost driver for allocation of central support agency costs[12]. First, we will need to identify what percentage of the total operating budget is distributed to DPW, and then we can apply that percentage to Central Support agencies. This will allow us to allocate central costs to DPW. In order to do that, we need to gather the most recent financial information.

$$\text{Budget basis} = \frac{\text{DPW General Fund Operating Budget}}{\text{Total General Fund Operating Budget}}$$

Table 18 below provides the operating budget for DPW as a percentage of the total operating budget of the City.

Table 18: Fiscal 2013 General Fund Operating Budget of DPW

Agency	Fiscal 2013 Adopted Budget (General Fund Only)	% - Allocation
Public Works	75,626,587	4.84%
Total Operating Budget	1,562,464,107	**100.00%**

As DPW represents 4.84% of the total General Fund Operating Budget in Fiscal 2013, the next step is to allocate the costs of the Central Support Agencies by this percentage. Therefore, we will take the cost of each of the Central Support Agencies and multiply it by this cost driver rate.

All of these indirect costs must be further allocated to the Mixed Refuse Collection activity. To be consistent we will use the same method, the budget basis. Table 19 shows the budget for the entirety of DPW as well as the Mixed Refuse Collection activity.

Table 19: Mixed Refuse Collection as a percentage of total department budget[13][14]

Service	Activity	Fiscal 2013 Adopted Budget	%
Waste Removal and Recycling	Mixed Refuse Collection	17,323,169	22.91%
Grand Total - DPW		**75,626,587**	**100.00%**

From here, we will use the headcount (FTE) allocation method to further identify the percentage of the activity that is dedicated solely to Mixed Refuse Collection (as opposed to Recycling and Gateways).

[12] The details for budget basis cost allocation can be found in the Cost Allocation Methods section, Chapter 2.
[13] Calculated by dividing the total DPW adopted budget by Mixed Refuse Collection budget. ($17,323,169/$75,626,587 = 22.91%)
[14] For a full budget detail by service and activity, please refer to *Appendix*, Exhibit 3.

$$(22.91\%) * (63.68\%) = 14.59\%$$

4.84% of the supporting agencies cost should be allocated down to DPW; we will then need to multiply those figures by 14.59% in order to calculate the costs related to Mixed Refuse Collection.

Table 20: Cost Driver Allocation to Mixed Refuse Collection Activity for Central Support Agencies

Cost Center	Type	Allocation to DPW	Allocation to Mixed Refuse Collection
Finance	Indirect	4.84%	14.59%
Human Resources	Indirect	4.84%	14.59%
Law	Indirect	4.84%	14.59%
CitiStat	Indirect	4.84%	14.59%

Allocation cost driver:

$$(4.84\%) * (14.59\%) = 0.71\%$$

0.71% of the total cost will need to be allocated to Mixed Refuse Collection.

As previously noted, the costs related to central support agencies are unavoidable fixed costs. These costs, for the most part, cannot be eliminated even if a decision is made to outsource the Mixed Refuse Collection service instead of providing it internally. In other words, this cost may not be reduced by changes in how waste is managed. Please note that Retirees' Health Benefits are calculated based on 5.5% of the employee's actual salary, versus the allocation method identified above.

Table 21 shows the indirect costs related to shared services outside of DPW.

Table 21: Cost Allocation for Shared Services Outside of DPW

Cost Center	Type	Allocation Method	%
Finance	Indirect	Budget Basis	0.71%
Human Resources	Indirect	Budget Basis	0.71%
Law	Indirect	Budget Basis	0.71%
CitiStat	Indirect	Budget Basis	0.71%
Retirees' Benefits	Indirect	Normal Cost	5.5%

Debt Service

Allocating debt service costs is a crucial component of FCA. It allows us to accurately track the operating costs of Mixed Refuse Collection and Disposal activities. We need to allocate debt service and overhead costs carefully among DPW's facilities.

In order to choose the best method of allocation, we need to know where the debt is incurred. In this case, the total debt of $22,180,000[15] is all related to Quarantine Road Landfill improvements. The total debt amount will be retired in 2016. Before we can start allocating debt service to the Mixed Refuse Collection and Disposal activities, we must calculate the ***annualized debt service*** [16]amount by taking the ***straight-line depreciation***[17] method.

$$\textbf{Annualized Debt Service} = \frac{\text{Total Debt}}{\text{Number of years until Debt is retired}}$$

Table 22: Debt Service Schedule

Debt Service	Year Issued	Due Date			
Year	2012	2013	2014	2015	2016
Dollar Amount	$22,180,000	$5,545,000	$5,545,000	$5,545,000	$5,545,000

Based on the analysis above, DPW's annual debt service is $5,545,000. However, not all of this debt is directly linked to Mixed Refuse Collection and Disposal. In order to allocate the actual cost, we need to choose the proper activity cost driver. We can assume that the debt service cost is directly related to the amount of refuse disposed of at the Landfill. Therefore, the allocation method should reflect Mixed Refuse Collection tonnage disposed over the total tonnage disposed at the Landfill. Table 13 shows the following:

1. Total tonnage related to Mixed Refuse Collections activity
    a. Refuse collection
    b. Ash conversion[18] (BRESCO is contractually obligated to dispose of all ash generated at the Incinerator. The calculation includes all MRC related waste disposed of at BRESCO)
2. Total tonnage that goes to Quarantine Road Landfill

Table 23: Quarantine Road Landfill Tonnage Report –2012[19]

	Tonnage	Factor	Total
Residential	24,067	1.00	24,067
Ash (Generated by BRESCO)	134,846	0.52	70,232
Subtotal			94,299
Total Waste Managed at QR Landfill			350,791
Residential Waste as a % of Total			26.88%

[15] Source: Treasury Management – Department of Finance. Please reference *Appendix*, Exhibit 4 for full detail.
[16] The total amount of money required each year to make payments on the principal and interest on debt service
[17] A system of depreciation in which one deducts the same amount every year.
[18] Ash to waste ratio by density is approximately 1.92 based on a recent consultant study. The full study is currently designated as "privileged and confidential" and cannot be included for additional reference at this time.
[19] Source: DPW – Mark Wick – Tonnage Templates – Details can be found in *Appendix*, Exhibit 5.

26.88% of the total tonnage that goes into Landfill comes from the Mixed Refuse Collections. This means we can allocate 26.88% of the annualized debt service to the Mixed Refuse Collection and Disposal activities. Table 14 shows the table for indirect cost related to Debt Service.

Table 24: Cost Allocation for Debt Service

Cost Center	Type	Allocation Method	%
Debt Service	Indirect	Tonnage	26.88%

Capital Improvements

DPW has a number of Capital Improvement Programs (CIP) in place. Capital improvements can be financed on a pay-as-you-go basis, or through debt (as captured in the previous section). Earlier in this handbook, we talked about the importance of capturing capital related costs in FCA. Like every other cost, we need to address the following questions:

- Which CIPs are related to Mixed Refuse Collection activity?
- What is the allocation method?

Table 25 shows the schedule of capital projects for Solid Waste Management[20].

Table 25: Capital Improvement Program for Solid Waste Management

Project No.	ID No.	Description
1	517-010	Eastside Waste Transfer/C&D Processing Facility
2	517-022	Solid Waste Services and Administration Facility
3	517-500	Solid Waste Facility Renovations
4	517-047	Quarantine Road Landfill Expansion
5	517-501	Methane Gas Collection System

Project details:

1. Provide a reliable waste disposal facility in the eastern portion of the city. Provide a construction and demolition processing/recycling facility to save landfill space.
2. Provide sufficient funding for building upgrades and future funding to acquire another facility since the current site is being leased.
3. Create a mega-landfill with the merging of the existing Quarantine Road Landfill and the Millennium Landfill across the road from the Quarantine Road Landfill.

[20] Source: Department of Planning – Capital Improvement Program for Solid Waste Management

4. Renovate various Solid Waste facilities including yards for load packers, administrative areas, locker rooms and restrooms, stairways and walkways, landscaping and paved areas. These improvements will enhance safety and operations at the facilities.
5. Collect methane, a valuable resource from the Quarantine Road Landfill, which will be sold to the United States Coast Guard and used as an alternative energy source.

The table below groups these CIPs by location and dollar amount:

Table 26: Capital Improvements by Activity and $ Value

Capital Improvements	Value
Northwest Transfer Station (NWTS)	$250,000
Landfill Development	$2,220,000
Solid Waste Facility Development	$750,000

Each CIP will be allocated by the following methods:

- Northwest Transfer Station (NWTS) → Tonnage[21]
  - 86.40% of the total tonnage that goes into the NWTS is due to Mixed Refuse Collection
- Landfill Development → Tonnage[22]
  - 26.88% of the total tonnage goes into the Landfill.
- Solid Waste Facility Development → Headcount [23]
  - The Mixed Refuse Collection activity accounts for 21.75% of the total number full-time employees in BSW.

Table 27 shows the table for indirect costs related to Capital Improvement Projects.

Table 27: Summary Table for Indirect Costs

Cost Center	Type	Allocation Method	%
Northwest Transfer Station (NWTS)	Indirect	Budget Basis	86.40%
Landfill Development	Indirect	Tonnage	26.88%
Solid Waste Facility Development	Indirect	Headcount	21.75%

[21] The total tonnage is calculated from the 1+1 Daily Tonnage Report Data. See Appendix Exhibit 8 for a sample report.
[22] Tonnage is chosen because capital improvements are in Quarantine Road Landfill.
[23] Headcount is chosen because this covers all Solid Waste Management facilities (including Mixed Refuse Collection facilities) – the best way would be to use a square footage method, but this information is currently unavailable.

Disposal Costs

Disposal of the City's solid waste is accomplished through integrated operations at the City's Quarantine Road Landfill, at the BRESCO waste to energy facility, and the Northwest Transfer Station (NWTS).

For each of these facilities, the basis of allocation will be total tons of waste managed due to Mixed Refuse Collections:

- Quarantine Road Landfill
    - Allocate the cost of Landfill Operation activity by 26.88%
- BRESCO
    - Allocate the cost of Wheelabrator Disposal activity by 71.89%[24]
- NWTS
    - Allocate the cost of NWTS activity by 86.40%

Landfill Closure/Post-Closure Costs

DPW maintains the Quarantine Road Landfill. Earlier we talked about the development costs of the Landfill under the Capital Improvement Projects section. However, landfill unit closure is required when a landfill is at capacity, or when receipt of waste has stopped. Therefore, outlays for landfill closure and post-closure care are made after its active life. Municipalities often establish trust funds in order to accrue enough funding to maintain closure/post-closure activities.

DPW has allocated $800,000 for its closure/post-closure costs in Landfill Operation activity's operating budget. The life-cycle of a landfill is heavily correlated with the amount of trash that goes into it. As the amount of trash entering a landfill increases, the useful life of the landfill shortens. Each landfill has a capacity and an estimated life-cycle based on its activity. Life-cycle analysis should be revised if there is a sudden drop or increase in the amount of trash that enters the landfill. This may impact the total amount necessary for closure/post-closure activities.

Earlier we calculated that 26.88% of the trash entering the Landfill comes from Mixed Refuse Collections activity. Table 28 shows the cost breakdown by activity.

Table 28: Landfill Trust Cost Allocation by Activity

Activity	% of Tonnage	Landfill Trust
Mixed Refuse Collections	26.88%	$215,054
Landfill Trust	100.00%	$800,000

[24] Details can be found in Exhibit 6: BRESCO Tonnage Report

This is the final step in allocating costs to Mixed Refuse Collection and Disposal activities. Now that we've gone through the process of identifying data sources and developing a reporting procedure, we can calculate Fiscal 2013's FCA report. The table below provides a summary of all indirect cost allocations by cost center.

Table 29: Summary of Allocation Basis

Cost Center	Type	Allocation Method	%/$ Value
Cost Allocation for Shared Services within DPW			
Administration - BSW	Indirect	Headcount	21.75%
Administration - Director's Office	Indirect	Headcount	6.17%
One Call Center Reimbursement	Indirect	% of SR's	49.91%
Cost Allocation for Shared Services Outside of DPW			
Finance	Indirect	Budget Basis	0.71%
Human Resources	Indirect	Budget Basis	0.71%
Law	Indirect	Budget Basis	0.71%
CitiStat	Indirect	Budget Basis	0.71%
Retirees' Benefits	Indirect	Normal Cost	5.5%
Cost Allocation for Debt Service			
Debt Service	Indirect	Tonnage	26.88%
Cost Allocation for Capital Improvement Projects			
Northwest Transfer Station (NWTS)	Indirect	Tonnage	86.40%
Landfill Development	Indirect	Tonnage	26.88%
Solid Waste Facility Development	Indirect	Headcount	21.75%
Cost Allocation for Disposal Costs			
Quarantine Road Landfill	Indirect	Tonnage	26.88%
NWTS	Indirect	Tonnage	86.40%
BRESCO	Indirect	Tonnage	71.89%
Cost Allocation for Landfill Closure/Post-Closure Costs			
Landfill Operation	Indirect	Tonnage	26.88%

CHAPTER 6 – Reporting FCA Data

Overly complicated reporting formats can confuse readers and raise more questions than they answer. Keeping detailed back-up data enables the analyst to respond to more specific inquiries if they arise. Some information can be difficult to interpret. To make things simpler, we will report the full cost of Mixed Refuse Collection and Disposal activity per ton of waste.

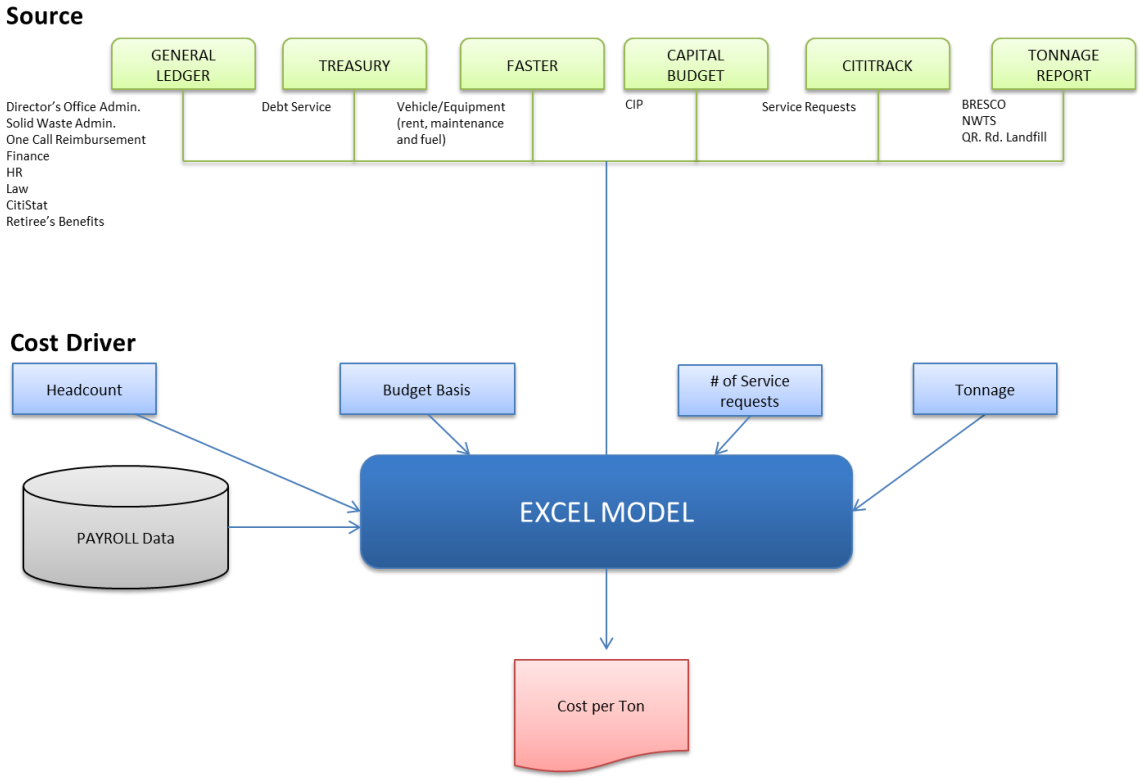
Cost per ton is the full cost divided by the tons of waste managed. In the previous chapter, we've identified all cost centers with the proper cost allocation methods.[25] In order to conduct the FCA, we developed a model for collecting cost data across various systems.

EXCEL Model Review

The EXCEL model will compile all of the cost data, direct and indirect, across different worksheets, and apply previously defined allocation methods to each cost center.

Before we step into examining the detailed forms, let's take a look at how the EXCEL model gathers the required data across multiple systems and computes "Cost per Ton" outcomes. Chart 1 shows the EXCEL Model Flow Chart.

Chart 1: FCA EXCEL Model Flow Chart



[25] See Table 24: Summary of Direct & Indirect Costs by Cost Center and Allocation Method.

Table 30 shows each cost center by cost driver, data owner, individual, and source.

Table 30: Resource Pool (Direct & Indirect Cost Centers)

Cost Center	Cost Driver	Data Owner	Source
BRESCO	Tonnage	DPW	BRESCO Tonnage Report
NWTS	Actuals Data	BBMR	NWTS Tonnage Report
QR. Landfill	Tonnage	DPW	QR Tonnage Report
Landfill Trust/Closure	Tonnage	DPW	QR Tonnage Report / General Ledger
Administration - BSW	Headcount	BBMR	General Ledger
Administration - Director's Office	Headcount	BBMR	General Ledger
One Call Center Reimbursement	% of SR's	CitiStat	CITITRACK
Mixed Refuse Collection	Actuals Data	BBMR	General Ledger
Vehicle / Equipment Replacement	Straight-line Depreciation	DGS Fleet	FASTER Database
Debt Service	Project / Tonnage	Treasury	Solid Waste Debt Report
Capital Improvement Projects (CIP)	Project / Tonnage	Planning	Baltimore Schedule of Capital Projects
Finance	Budget Basis	BBMR	General Ledger
Human Resources	Budget Basis	BBMR	General Ledger
Law	Budget Basis	BBMR	General Ledger
CitiStat	Budget Basis	BBMR	General Ledger
Retirees' Benefits	Budget Basis	BBMR	General Ledger

The following table provides an Annual Cost per Ton report.

Table 31: FCA Report - Cost per Ton

Cost Centers	Total Cost
Compensation	
Salary + OPCs	$7,608,203
SMA Cost	$525,191
Overtime	$356,533
Equipment	
331 - Rental	$617,322
335 - Maintenance	$2,593,994
401 - Fuel	$604,958
Management and Insurance Fee	$23,436
Contractual & Supplies	
Non-Personnel Costs	$459,425
NWTS	
Operating	$868,762
Capital	$216,001
Disposal Costs	
Landill Operation (Quarantine Rd. Landfill)	$1,232,948
Wheelabrator Disposal (Tipping Fee At Bresco)	$5,944,954
Shared Services Within DPW	
Solid Waste Administration	$891,604
One Call Center Reimbursement	$17,486
Director'S Office	$55,223
Shared Services Outside Of DPW (Unavoidable Fixed Costs)	
Finance	$183,782
Human Resources	$50,139
Law	$41,215
M-R: Office Of Citistat Operations	$9,001
M-R: Retirees' Benefits	$273,895
Debt Service	
Annualized Debt Service	$1,490,595
Capital Improvement Projects	
Landfill Development (Quarantine Rd. Landfill)	$725,808
Solid Waste Facility Development	$163,115
Landfill Closure/Post-Closure Costs	
Landfill Trust	$215,054
Full Cost Of Mixed Refuse Collection Activity	**$25,168,645**
Total Tons of Waste Managed	**229,145**
Cost Per Ton	**$110**

FCA Summary by Direct and Indirect Costs

This form is designed to provide a macro level view to full cost accounting. It groups the cost centers under:

1. Direct Costs
2. Indirect Costs

Table 32: Summary of Direct and Indirect Costs

FCA Summary by Direct and Indirect Costs	Total
Direct Costs	$13,873,824
Indirect Costs	$11,294,821
Full Cost of Mixed Refuse Collection and Disposal Activity	$25,168,645

Full Cost Accounting Summary by Outcome –Cost per Ton

The following summarizes the above full cost report on a cost per ton basis:

Table 33: FCA Summary

Full Cost Accounting Summary	Total
Full Cost of Mixed Refuse Collection Activity	$25,168,645
Total Tonnage	229,145
Cost Per Ton	**$110**

CHAPTER 7 – Findings

Based on the FCA report, we calculated that Mixed Refuse Collection and Disposal costs $110 per ton of waste managed per year. This is the amount in service fees and assessed taxes that must be collected per ton of waste disposed to pay for the full costs of Mixed Refuse Collection and Disposal activities. This information can be integrated into a potential solid waste enterprise model for the City, in which the City would need to identify a per-unit pricing schedule for mixed refuse collection.

Cost per ton information should not be the only source when forming management decisions. In order to make such decisions, the analyst will need to examine variable and fixed costs. As discussed earlier, variable costs include primarily operating costs that can be avoided or altered in the short term, whereas fixed costs cannot be avoided. These costs arise from the possession of the Landfill, equipment and basic organizational structure.[26]

Cash Flow Accounting vs. Full Cost Accounting

To recap, let's compare total costs and the cost per ton outcome for both accounting systems:

- Cash Flow Accounting (CFA) - this accounting system identifies current outlays of cash.
- Full Cost Accounting (FCA) - this accounting system identifies all resources used or committed.

Table 34: FCA vs. CFA

Full Cost Accounting Summary	Total
Full Cost of Mixed Refuse Collection Activity	$25,168,645
Budgeted Cost of Mixed Refuse Collection Activity	$17,323,169
Delta	**$7,845,476**

The difference between the two accounting systems is $7,845,645. Additionally, the total tonnage figure identified earlier can be used to illustrate the difference in reporting the cost per ton between the two accounting systems. Note that the budgeted cost also includes additional activities that are not budgeted on a separate activity basis; the amount of $13,873,824 identified earlier in Table 9 more accurately reflects direct costs attributable to Mixed Refuse Collection.

[26] More detailed information can be found in the Cost Allocation for Shared Services Outside of DPW section of this report.

Table 35: Cost per Ton – Cash Flow Accounting

Cash Flow Accounting	Total
Mixed Refuse Collection Activity	$17,323,169
Total Tonnage	229,145
Cost Per Ton	**$76**

Table 36: Comparison Cost per Ton: CFA vs. FCA

CFA vs. FCA	Total
Traditional Costing	$76
Full Cost Accounting	$110
Delta	**$34**

Benefits of FCA

Having completed the FCA report, DPW can now identify what drives the costs by studying each cost center. Comprehensive cost analysis can be found in detailed data collection forms.

Here is a quick recap of FCA benefits:

- Making informed decisions
- Explaining costs to citizens more clearly
- Comparing costs with other jurisdictions
- Evaluating and fine-tuning programs to increase cost-effectiveness
- Negotiating with vendors
- Evaluating trends in costs

FCA's power comes from its ability to identify, summarize, and explain costs to management, policy makers, and ultimately to the citizens. Understanding the costs involved in providing the services gives management the right tools to determine whether the City's costs are competitive with the private sector. This will also allow the City to adopt a stronger negotiating position with vendors.

Through the use of FCA, we are able to demonstrate that the full cost of providing Mixed Refuse Collection and Disposal activities is significantly higher (45%) than costs captured under a Cash Flow Accounting (CFA) system. CFA gives a distorted picture of the actual cost for Mixed Refuse Collection and Disposal activities. CFA systems do not include upfront or backend costs, such as landfill development and post-closure costs.

Limitations of FCA

Let's take a step back and think about the FCA. We have managed to capture the full costs of the activity, but how can we use the information in a valuable manner? Through the FCA, we can explain costs to citizens more clearly, evaluate trends in costs, compare costs with other jurisdictions, and negotiate with vendors.

But if we want to know *how* the money is used, the FCA provides us with an incomplete picture. We not only want to capture how much we're paying for a service, but whether that funding is being used in an effective manner. Government services, much like businesses, should focus on identifying what is valuable to customers. The value to customers of Mixed Refuse Collection lies in the *actual collection* – not in the time it takes to move the refuse to another location, or the waiting in line for disposal (two standard examples of waste are transport and waiting). Lean business theory reinforces these concepts: any resources that are dedicated to processes that do not provide value are wasteful.

This is why we now turn to Activity-Based Costing. If we can separate the service into components, we can demonstrate where resources are dedicated, and identify the primary drivers of waste within the service. In order to complete the ABC for Mixed Refuse Collection, we will need to further allocate full costs into specific Quadrants, and across the following components: Collections, Transport, and Disposal.

CHAPTER 8 – Getting to ABC: Reporting Costs by Quadrant

By layering Quadrant-specific information across the full cost data, we are able to provide an additional level of detail to the full-cost reporting, which can prove valuable for operations. By comparing each of the quadrants, policy makers and managers may be able to identify inefficiencies and improve service provision going forward.

Cost and budget information within the City of Baltimore Mixed Refuse Collection activity is not compiled according to Quadrant. However, based on the availability of operational data, we are able to identify a number of different methodologies that can be used to allocate costs down to the Quadrant level.

Obtaining Quadrant-Specific Data

There are several pieces needed to develop an allocation for each quadrant. As demonstrated in the Resource Pool in Table 30, data must be collected from a number of different sources. In other full-cost accounting exercises, when segmenting costs across different regions or defined sections, the analyst must determine what the appropriate methodology is for distributing cost centers. Depending on the cost center, the analyst may find that evenly distributing costs across sections may be the most practical methodology; in other instances, when data are available, the analyst may be able to parse the information into section-specific cost pools. For example, the City of Baltimore employs a 1+1 collection system that standardizes routes and assigns a specific crew, supervisor, and vehicle for Mixed Refuse Collection. The availability of 1+1 route data, merged with personnel data captured in the budget and HR systems and vehicle data available in the FASTER system, allows us to distribute most costs to a specific sector.

Direct Cost Allocation by Quadrant

Collection Route Personnel Data

Each Quadrant is made up of a fixed number of collection routes, and employs a specific crew and supervisor. All full-time positions are assigned a budgeted salary and benefits. While these costs are not distributed according to Quadrant, each Quadrant has a defined collection staff according to route, and each route is assigned a specific task – mixed refuse collection, recycling collection, or gateway collection. Based on the employee assigned to each Mixed Refuse Collection crew, we can tie budgeted salary information to each position. We will note here that there is no “function” budget specific to mixed refuse collection versus recycling collection, gateways, or to the activity-specific administration. By attaching specific positions to routes, though, costs associated with any one full-time collection employee can be distributed directly to each quadrant.

Other Personnel Data

Some personnel costs cannot be directly distributed by Quadrant according to position number and budgeted salary. There are three types of personnel costs that fall under this category: employee overtime, temporary employees, and full time administrative employees.

Employee Overtime

Overtime data are captured according to individual route and reported to CitiStat in hours. However, overtime is captured in the accounting system in one line item (not by employee). Rates for overtime depend upon the employee's salary. As we have established that each employee is assigned to a specific route and function (mixed refuse collection versus recycling collection), we can identify the amount of overtime dedicated to mixed refuse collection routes, and derive the percentage of overtime for this function versus all functions.

Table 37: Mixed Refuse Collection as a Percentage of Activity Overtime Costs

Cost Center	Hours	Ratio	Cost
Total Overtime	14,925	100.0%	$530,209
Mixed Refuse	10,036	67.2%	$356,533

We can then apply this against the total overtime dollar figure dedicated to this activity, and allocate the cost based on the percentage of overtime hours used across each of the four Quadrants.

Table 38: Mixed Refuse Collection Overtime Allocation by Quadrant

Cost Center	NW	SW	NE	SE	Total
Overtime - Hours	2,359	2,635.5	2,368	2,673.5	10,036
Allocation	23.5%	26.3%	23.6%	26.6%	100.0%
Allocated Cost	$83,804	$93,627	$84,124	$94,977	$356,533

Temporary Employees

Seasonal Maintenance Aides (SMAs) are temporary personnel employed in Mixed Refuse Collection to fill in for vacant positions, employees on leave, or employee no-shows. The Bureau uses a "pool" of SMAs that may be called upon each day to staff a collections crew. While the personnel in these positions are not considered full-time, these salaries are a cost that must be factored into collections. The amount of SMAs dedicated to the activity fluctuates, so the costs associated with these employees must be taken as a one-time snapshot.

The cost of each SMA position is standardized, so we can allocate costs based on the number of SMAs directly employed in each route based on our snapshot. Since we know the number of routes dedicated

to mixed refuse collection (11 of 16 total), we can then allocate the additional "pooled" SMA positions to mixed refuse collection function according to this this factor. Based on the direct SMA employee count and the additional "pooled" positions, we have a new figure which we can identify as a percentage of total SMA positions, and allocate the costs of these positions based on this percentage.

Table 39: SMA Cost by Function and Quadrant

# of SMA's	NE	SE	NW	SW	Grand Total	%	Adjusted SMA Count	Adjusted %	Cost Allocated
Mixed Refuse	3	6	6	2	17	41%	26	63%	$525,191
Recycling	1	0	2	0	3	7%	7	17%	$143,004
Pool	1	3	4	5	13	32%	0	0%	-
Gateway	6	1	1	0	8	20%	8	20%	$161,987
ALL SMA	**11**	**10**	**13**	**7**	**41**	**100%**	**41**	**100%**	$830,181

Note here that SMAs are a less expensive alternative to full-time staff (there are no benefits or longevity increases currently associated with these positions). Therefore, if we were to allocate these positions by Quadrant solely on the basis of our snapshot, we may misrepresent the cost of service provision in any one Quadrant. Therefore, as we cannot anticipate SMA staffing needs by Quadrant, the SMA costs for Mixed Refuse Collection will be distributed evenly across all four Quadrants.

Table 40: MRC SMA Allocation by Quadrant

Cost Center	NE	SE	NW	SW	Total
SMA costs	$131,298	$131,298	$131,298	$131,298	$525,191

Activity-Specific Administrative Costs

As part of our FCA we've allocated indirect costs of departmental administration (both the Director's Office and Solid Waste Administration), but there are some administrative personnel costs that are already captured within the Mixed Refuse Collection activity – so how do we distribute those costs among mixed refuse collection and across Quadrants?

In order to assign a cost allocation for these administrative personnel, we need to once again look at the number of FTEs within each function (administrative services, mixed refuse collection, recycling collection, and gateway collection), and separate out the positions providing administrative support. Then, calculate the number of personnel tied to the three remaining functions, and each function's share as a percentage of the total remaining personnel. Based on these percentages, we can distribute internal administrative personnel costs across each function.

To assign administrative personnel allocated costs by Quadrant, identify the number of personnel assigned to the MRC function. Based on the operational information, we can determine how many of these positions are tied to each route (and thereby each Quadrant). The total number for each Quadrant

can be then translated into a percentage of MRC personnel by Quadrant. We can use this percentage to distribute internal administrative personnel costs.

Table 41: Internal Administrative Personnel Allocated Costs for MRC by Quadrant

Cost Center	NE	SE	NW	SW	Total
Number of MRC FTEs	35	39	38	40	152
Allocation % of Admin Costs	23.0%	25.7%	25.0%	26.3%	100.0%

Note that these costs are normal salaries and benefits for full-time employees, and therefore captured as part of the Full Time Salaries and OPCs line item for each Quadrant.

Non-Personnel Data

Non-personnel items can be grouped into two distinct categories: vehicles and related expenses, and other non-personnel costs (such as supplies or minor equipment). Using similar methodologies to the items personnel items above, we can derive the non-personnel costs associated with each Quadrant.

Vehicle Cost Allocation

In Chapter 3, we mentioned that vehicle assignment, usage, and cost data is tracked through the City FASTER system. Based on the operational information available from the Bureau of Solid Waste, we know that each vehicle is assigned to a specific route (and therefore Quadrant). By linking each vehicle number to a Quadrant, we can easily identify the rental, maintenance and fuel costs associated with each vehicle, and aggregate these figures across each Quadrant.

Table 42: Vehicle Rental, Maintenance, and Fuel Costs by Quadrant

Cost Center	NE	SE	NW	SW	Total
331 - Rental	$292,207	$64,806	$159,509	$100,800	$617,322
335 - Maintenance	$462,714	$708,735	$696,870	$725,675	$2,593,994
401 - Fuel	$142,881	$161,062	$173,873	$127,141	$604,957
Management and Insurance Fee	$8,928	$4,464	$5,208	$4,836	$23,436
Total	$906,730	$939,067	$1,035,460	$958,452	$3,839,709

Other Non-Personnel Cost Allocation

Since the accounting system does not capture expenditures according to Quadrant, other non-personnel expenses (simple office supplies, telephone services, professional services, etc.) cannot be tracked in this manner. While we have pointed to several allocation methods for personnel costs, given that staffing and households serviced are relatively similar across all four Quadrants, the safest assumption in this case is other non-personnel costs should be distributed evenly among all four Quadrants.

Table 43: Other Non-Personnel Costs by Quadrant

Cost Center	NE	SE	NW	SW	Total
Other Non-Personnel Costs	$114,856	$114,856	$114,856	$114,856	$459,425

Northwest Transfer Station Cost Allocation

Part of the Direct Costs of the Mixed Refuse Collection activity is operation of the Northwest Transfer Station (NWTS). This includes not only the operating costs of personnel and equipment, but also the capital costs associated with the facility. The analyst should allocate the NWTS costs by the relevant driver – in this case, total tonnage disposed of at the facility by Quadrant.

Based on the current data set, NWTS only receives collections from the Northwest Quadrant – no other MRC routes are designed to deliver refuse to this facility. Therefore, the full operating and capital costs captured in our earlier Direct Costing are borne by the Northwest Quadrant. This topic will be discussed later in Chapters 11 as part of the Recommendations.

Table 44: Northwest Transfer Station (NWTS) Operating Costs by Quadrant

Cost Center	NE	SE	NW	SW	Total
Operating	$0	$0	$868,762	$0	$868,762
Capital	$0	$0	$216,001	$0	$216,001
NWTS Total	$0	$0	$1,084,763	$0	$1,084,763

At this point, we can summarize the tables above and provide full detail of direct costs associated with each Quadrant:

Table 45: Direct Cost Summary by Quadrant

	NE	SE	NW	SW	Total
Compensation					
Salary + OPCs	$1,789,512	$1,991,067	$1,832,080	$1,995,544	$7,608,203
SMA Cost (25% By Quadrant)	$131,298	$131,298	$131,298	$131,298	$525,191
Overtime	$84,124	$94,977	$83,804	$93,627	$356,533
Total	$2,004,933	$2,217,342	$2,047,182	$2,220,469	$8,489,927
Faster					
331 - Rental	$292,207	$64,806	$159,509	$100,800	$617,322
335 - Maintenance	$462,714	$708,735	$696,870	$725,675	$2,593,994
401 - Fuel	$142,881	$161,062	$173,873	$127,141	$604,958
Management and Insurance Fee	$8,928	$4,464	$5,208	$4,836	$23,436
Total	$906,731	$939,068	$1,035,461	$958,451	$3,839,710
Contractual & Supplies					
Non-Personnel Costs	$114,856	$114,856	$114,856	$114,856	$459,425
Total	$114,856	$114,856	$114,856	$114,856	$459,425
Mixed Refuse Collections Total	$3,026,520	$3,271,266	$3,197,499	$3,293,776	$12,789,062
NWTS					
Operating	$0	$0	$868,762	$0	$868,762
Capital	$0	$0	$216,001	$0	$216,001
NWTS Total	$0	$0	$1,084,763	$0	$1,084,763
Total Direct Costs	$3,026,520	$3,271,266	$4,282,262	$3,293,776	$13,873,824

Indirect Cost Allocation by Quadrant

We want to turn again to indirect costs, but this time we want to distribute these across each Quadrant. Much like the direct cost allocation above, we will need to rely on several different methods for allocating costs, depending on the cost center and driver.

Landfill Operating Cost Allocation

Landfill Operating costs as identified in Chapter 5 are driven by the City's contribution to the landfill (in terms of total volume). With CitiStat tracking tonnage delivered to each facility based on collection route, and the number of stops at each facility, we can identify the average route tonnage delivered according to Quadrant.

Using figures produced in a recent landfill analysis study[27], we can identify the ratio of average volume of a ton of refuse versus the average volume of a ton of ash (produced through BRESCO and delivered to the landfill) as a multiplier:

$$\textbf{Tonnage ratio} = \frac{0.5208 \text{ cubic yards of BRESCO ash}}{1.0 \text{ cubic yards of standard refuse}}$$

Since all refuse delivered to NWTS and BRESCO will produce ash, we can therefore apply the multiplier to all disposals at NTWS and BRESCO by Quadrant.

We have the annual tonnage collected by Quadrant:

Table 46: Annual Tonnage and Allocation by Quadrant

	NE	SE	NW	SW	Total
Annual Tonnage (All disposal sites)	55,551	56,665	58,931	57,998	229,145

For each disposal at either NWTS or BRESCO, the volume multiplier identified above can be applied. The resulting figures can then be identified as a percentage of total volume contributions to the Landfill by Quadrant.

Table 47: Landfill Operation Allocation and Cost by Quadrant

Cost Center	NE	SE	NW	SW	Total
Landfill Operation Allocation	23.71%	27.13%	21.78%	27.38%	100.00%
Landfill Operation (Quarantine Rd. Landfill)	$292,271	$334,521	$268,571	$337,585	$1,232,948

[27] See Appendix Exhibit 9, KCI Technologies Inc.

Please note that after the volume multiplier is applied to each Quadrant total annual tonnage figures, space utilized by each Quadrant changed. Although the NW Quadrant has the highest tonnage, all refuse collected in that quadrant is being incinerated, and therefore contributes to a smaller percentage of the total space utilized at the Landfill.

These allocation percentages inform Landfill Operation, Debt Service, Landfill Development, Solid Waste Facility Development, and Landfill Trust Costs by Quadrant.

Wheelabrator (Tipping Fee) Cost Allocation

In Chapter 3, we mentioned that BRESCO charges the City and private vendors a tipping fee for waste incineration. Similar to the methodology applied above for Landfill Operations, we will focus on the tonnage delivered directly to BRESCO. Here, we can use the BRESCO ledger information to determine the percentage allocation based on total tonnage by Quadrant.

Table 48: MRC Tonnage delivered to BRESCO and Cost Allocation by Quadrant

	NE	SE	NW	SW	Total
BRESCO Tonnage	31,344.70	29,990.40	42,341.57	31,169.65	134,846.32
Allocation %	23.24%	22.24%	31.40%	23.11%	100.0%
Wheelabrator Disposal (Tipping Fee At BRESCO)	$1,381,890	$1,322,183	$1,866,708	$1,374,173	$5,944,954

Other Indirect Cost Allocations

The table below provides the allocation method for additional indirect costs associated with MRC:

Table 49: Other Indirect Costs Allocation Methods

Cost Center	Cost Allocation Method
Admin - Shared Services Within DPW	Headcount[28]
Admin - Shared Services outside of DPW	Headcount
Debt Service/Capital/Landfill Closure Costs	Tonnage[29]
One Call Center Reimbursement	SRs[30]

[28] Table 41: Internal Administrative Personnel Allocated Costs for Mixed Refuse Collection by Quadrant
[29] Table 46: Annual Tonnage and Allocation by Quadrant
[30] The total number of service requests is allocated equally across all four Quadrants.

Table 50: Other Indirect Costs - Allocation by Quadrant

	NE	SE	NW	SW	Total
Shared Services Within DPW					
Solid Waste Administration	$212,287	$212,287	$236,548	$230,483	$891,604
One Call Center Reimbursement	$4,372	$4,372	$4,372	$4,372	$17,486
Director's Office	$12,716	$14,169	$13,806	$14,532	$55,223
Subtotal	*$229,374*	*$230,827*	*$254,725*	*$249,387*	*$964,313*
Shared Services Outside Of DPW (Unavoidable Fixed Costs)					
Finance	$42,318	$47,155	$45,945	$48,364	$183,782
Human Resources	$11,545	$12,865	$12,535	$13,195	$50,139
Law	$9,490	$10,575	$10,304	$10,846	$41,215
M-R: Office Of Citistat Operations	$2,073	$2,310	$2,250	$2,369	$9,001
M-R: Retirees' Benefits	$64,422	$71,678	$65,955	$71,840	$273,895
Subtotal	*$129,849*	*$144,582*	*$136,989*	*$146,613*	*$558,033*
Debt Service					
Annualized Debt Service	$353,347	$404,426	$324,694	$408,129	$1,490,595
Subtotal	*$353,347*	*$404,426*	*$324,694*	*$408,129*	*$1,490,595*
Capital Improvement Projects					
Landfill Development (Quarantine Rd. Landfill)	$172,053	$196,925	$158,102	$198,728	$725,808
Solid Waste Facility Development	$38,666	$44,256	$35,531	$44,661	$163,115
Subtotal	*$210,720*	*$241,181*	*$193,632*	*$243,390*	*$888,923*
Landfill Closure/Post-Closure Costs					
Landfill Trust	$50,979	$58,348	$46,845	$58,883	$215,054
Subtotal	*$50,979*	*$58,348*	*$46,845*	*$58,883*	*$215,054*
Total Indirect Costs	**$923,290**	**$1,021,016**	**$910,041**	**$1,047,518**	**$3,901,865**

Chapter 9 – Reporting Activity Based Costs

ABC and Time Segmentation

As discussed in Chapter 2, the Mixed Refuse Collection activity can be broken down into components:

1. Collections – the portion of the activity that includes all time spent on refuse pick-up (including any time traveling to households along the route);
2. Transport – the portion of the activity comprised of travel from the collection route to the disposal facility; and
3. Disposal – the portion of the activity dedicated to time spent unloading (and, waiting to unload) refuse at the disposal site.

To determine how costs should be allocated across these components, the analyst will need more than financial data or households served – in this case, time or interval data. This data may be captured through automated means, or if necessary, through manual tracking. In Baltimore City, time data is captured for Mixed Refuse Collection through the use of Automatic Vehicle Location (AVL) devices. AVL devices record time outputs based on the vehicle location, and provide detailed start and stop points for each vehicle action. Through tracking of time outputs within a certain geographic boundary (such as the assigned route, or the disposal area), service managers can produce a time segmentation study that delineates collection, transport, and disposal components. An example of the segmentation for a single day is provided below:

Table 51: Time segmentation sample for Northwest Quadrant, (July 2013)

Route Number	Northwest Transfer Station trips	Quarantine Road Landfill trips	BRESCO trips	Travel time from Route Segment 1 to Disposal Facility (in minutes)	Time at Disposal Facility (in minutes)
1301	4	0	0	11	5
1302	4	0	0	10	6
1304	4	0	0	6	6
1306	4	0	0	6	5
1307	4	0	0	10	11

This data can be used to produce an average time per route based on collection, transport, and disposal. Remember that if a route uses multiple disposal facilities, the time segmentation data should identify when each vehicle visits that location. For simplification, if all routes within a quadrant use the same disposal facility, the analyst will not need to parse among locations, and can allocate time spent across each component as a percentage of total time.

Mixed Refuse Collection vehicles were tracked across each quadrant within the City, along with identification of disposal sites visited on each date. Over the course of a month, we were able to track the average route time, stops at each of the disposal facilities, and the total tonnage collected for an average route.

Table 52: Average Daily Route Time, Tonnage, and Disposal Stops by Quadrant

Quadrant	Route Time (Hours)	Average # of stops @ NWTS	Average # of stops @ QR	Average # of stops @ BRESCO	Tonnage
NE	8.75	0.00	0.34	1.68	16.11
SE	8.71	0.00	0.55	1.61	16.07
NW	7.87	2.12	0.00	0.02	17.10
SW	7.89	0.02	0.52	1.67	16.09

By layering the AVL data across the total route time and number of stops at each facility above, we can produce an allocation of time spent on each activity component within each quadrant:

Table 53: Collection, Transport, and Disposal for Each Quadrant as a % of Total Time

Quadrant	% - Collections	% - Travel	% - Disposal
NE	73%	20%	7%
SE	84%	11%	5%
NW	90%	7%	3%
SW	82%	13%	6%

Chapter 10 – Findings

Based on the percentage of total time spent on each component identified in Chapter 9, we can allocate the full costs of the activity down to each Quadrant as a share of Collections, Transport, and Disposal.

Table 54: Activity-Based Costing by Quadrant

	NE	SE	NW	SW	Total
Total Direct Costs	$3,026,520	$3,271,266	$4,282,262	$3,293,776	$13,873,824
Total Indirect Costs	$2,648,430	$2,736,068	$3,092,164	$2,818,159	$11,294,821
Full Cost Of Mixed Refuse Collection Activity	$5,674,950	$6,007,334	$7,374,426	$6,111,935	$25,168,645
Activity Based Cost Allocation					
Collections	$4,121,525	$5,036,502	$6,603,463	$4,983,773	$20,745,263
Travel	$1,144,677	$662,523	$530,908[31]	$782,400	$3,120,508
Disposal	$408,748	$308,309	$240,055	$345,762	$1,302,874

Cost Per Ton

Based on the total tonnage by Quadrant, we can now arrive at the Cost Per Ton, Cost Per Household, and Cost Per Route figures.

Table 55: Number of Households and Routes by Quadrant

	NE	SE	NW	SW	Total
# Of Households	41,174	44,952	44,059	46,949	177,134
# Of Routes	44	45	44	46	179

Table 56: Cost Per Ton, Cost Per Household and Cost Per Route for MRC by Quadrant

	NE	SE	NW	SW	Total
Cost Per Ton	$102	$106	$125	$105	$110
Cost Per Household	$138	$134	$167	$130	$142
Cost Per Route	$128,976	$133,496	$167,601	$132,868	$140,607

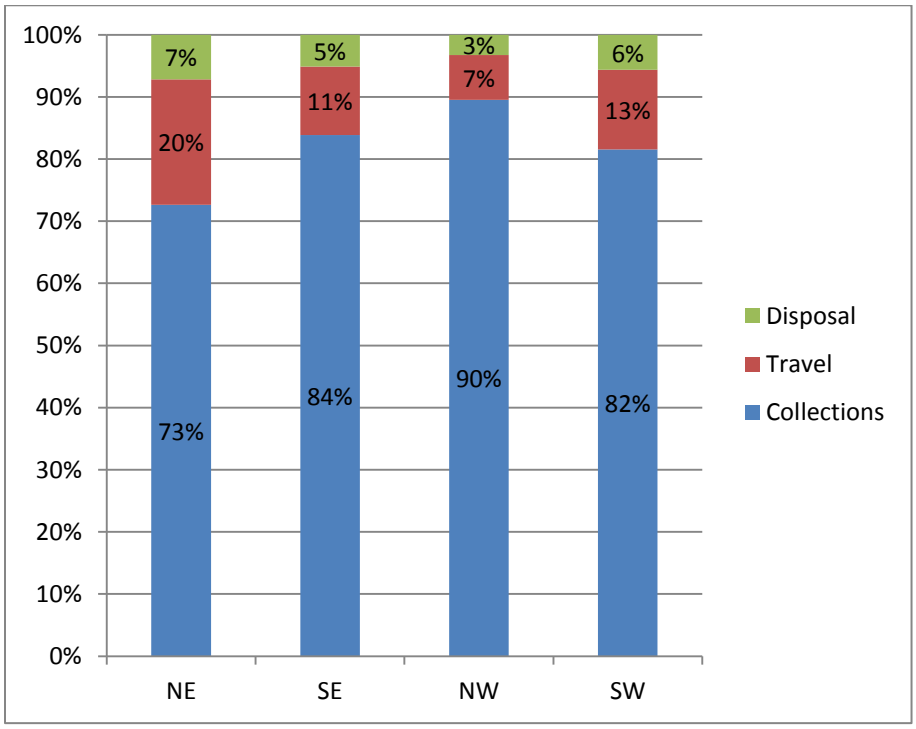
[31] Please note travel costs related to transport from NWTS to BRESCO are captured in the Total Direct Costs section as part of the operating costs of the NWTS.

Reporting on ABC

We now have an allocation for the full costs of MRC, and furthermore, we have derived a cost per ton, cost per household, and cost per route for each Quadrant. From a strict cost per ton standpoint, the Quadrant breakdown appears to indicate that the NW Quadrant is the most inefficient. Since 100% of the full operating and transfer cost of the NWTS are allocated to the NW Quadrant, the Collections cost is much higher.

As stated in Chapter 7, a limitation to FCA is that it doesn't tell us how the money is used; ABC provides this tool through the time segmentation analysis. Given the above cost report, let's approach this from another angle, and look at efficiency on a normalized basis. If each Quadrant spent the same amount on MRC, what percentage of costs would be dedicated to Collections, Transport, and Disposal? The answer is provided earlier in Table 53. The graph below provides a more striking visual representation of costs across each component of MRC on a normalized basis:

Figure 10: Collection, Transport, and Disposal for Each Quadrant as a % of Total Costs



On a per dollar basis, the NW Quadrant spends the highest percentage of time on Collections; this is due to the availability of the NWTS as the primary disposal site. By reducing the distance between the collection routes and the disposal site, NW Quadrant crews can spend a greater percentage of their time collecting mixed refuse, and less time transporting or disposing refuse. From a total dollar standpoint, the travel and disposal costs are identified below to illustrate the comparative inefficiency of operations.

Table 57: Travel and Disposal Costs by Quadrant

	NE	SE	NW	SW	Total
Travel	$1,144,677	$662,523	$530,908	$782,400	$3,120,508
Disposal	$408,748	$308,309	$240,055	$345,762	$1,302,874
Total	$1,553,425	$970,832	$770,963	$1,128,162	$4,423,382

There is potential to reduce inefficiencies if travel and disposal time can be minimized. NWTS has capacity to receive additional volume of mixed refuse, but not all crews would necessarily reduce their transport times by utilizing NWTS instead of BRESCO or the QR Landfill. The recommendations in Chapter 11 will include further discussion of potential re-routing of collection crews.

Chapter 11 – Recommendations

Route Study

AVL analysis showed possible improvements to specific routes in NE, SE and SW Quadrants. As demonstrated in Table 53, NWTS is being utilized only by NW Quadrant collection crews:

Quadrant	Route Time (Hours)	Average # of stops @ NWTS	Average # of stops @ QR	Average # of stops @ BRESCO	Tonnage
NE	8.75	0.00	0.34	1.68	16.11
SE	8.71	0.00	0.55	1.61	16.07
NW	7.87	2.12	0.00	0.02	17.10
SW	7.89	0.02	0.52	1.67	16.09

Remapping current collection routes in other quadrants that are close to NWTS will increase operational efficiencies by reducing travel and disposal times. Additional routes that are not directly adjacent to the NW Quadrant may also benefit from rerouting to the NTWS location.

DPW should also consider institution of a relay method. In this service model, a select number of relay trucks would be stationed at transport mid-points to receive collected refuse, allowing collection vehicles to spend more time servicing routes. Further study would be necessary to establish the efficiencies gained from this model, but it could potentially promote further utilization of the capacity available at NWTS to receive refuse from nearby routes.

Reducing travel and disposal times will lead to more effective collection routes. Collection crews can cover more area (number of households) within the same time frame through consolidation of routes. This has the potential to allow for reduction in the total number of crews. In addition, BSW will be able to decrease the number of collection trucks in its fleet.

The City utilizes three- person crews on two different-sized rear load packer vehicles; one vehicle holds a compacted load of approximately 16 cubic yards of material and the other holds 20 cubic yards of material. The average cost for a collection crew is identified below.

Table 58: Average Costs for Collection Crews

Average Cost of Crew	Cost	Average Cost of Load Packer	Cost
Solid Waste Driver	$55,448	Maintenance	$32,290
Solid Waste Worker	$47,242	Fuel	$7,487
Solid Waste Worker	$47,242	**Total**	**$39,777**
Total	**$149,932**		

In addition, reduction in fleet size should lead to savings in vehicle replacement costs. The purchase price of a load packer is $227,000; these vehicles are on a 10-year replacement cycle. Reduction of one load packer equates to $22,700 in annual savings, based on amortization of the cost of the load packer over its useful life. New, more efficient routes will also reduce the amount of trucks on the road, and decrease the miles traveled annually by the entire fleet. Table 59 below shows the cumulative savings of eliminating one crew over 20 years:

Table 59: 20-Year Savings Schedule for Elimination of a Collection Crew (in Thousands)

	Year									Present
Cost Center	1	2	3	4	5	10	15	20	Total	Value
Personnel (2% Escalation)	$150	$153	$156	$159	$162	$179	$198	$218	$3,643	$173
Equipment (3% Escalation)	$80	$82	$84	$87	$90	$104	$120	$139	$2,138	$102
Fleet Reduction Savings	$45	$47	$48	$50	$51	$59	$69	$80	$1,222	$58
Reduction	**$229**	**$235**	**$240**	**$246**	**$252**	**$283**	**$318**	**$358**	**$5,781**	**$275**

The projected cumulative savings of eliminating one collection crew is $5.78 million over 20 years with a present value of $275,000. Savings can be multiplied if BSW manages to reduce its total crew size even more.

Rerouting and reduction could facilitate the expansion of outreach programs that educate the public on single stream recycling. The City's collection system does not include provisions for collecting Household Hazardous Waste (HHW), and the issue has been identified as a regional need. Baltimore City has a Household Hazardous Waste containment facility at its Northwest Citizen Convenience Center located at 2840 Sisson Street. The facility collects materials from April through October. Savings from re-routing could assist BSW to improve this program. In addition, BSW could also investigate the possibility of constructing a yard waste composting facility to properly recycle all yard waste including leaves.

Administration

Prior to identifying more policy-centric recommendations, the first recommended action is to restructure the activity budget currently identified as Mixed Refuse Collections. The case study above identified separate, distinct functions budgeted within the Mixed Refuse Collections activity: mixed refuse collections (MRC), recycling collections, gateway collections, and administration. However, none of the line items within the budgeted activity could be allocated as a true direct cost for MRC. Activities should reflect distinct functions; otherwise, it is difficult to communicate the cost of the actual activity to citizens, elected officials, agency leaders, and potential third-party vendors or partners. It is recommended that DPW restructure the Waste Removal and Recycling service to reflect the following activities:

Table 60: Recommendation for Revised Budgeted Activities

Current Activities	Recommended Activities
Bulk Trash Collection	Bulk Trash Collection
Condominium Collections	Condominium Collections
Household Hazardous Waste Disposal	Household Hazardous Waste Disposal
Mixed Refuse Collection	Mixed Refuse Collections
Recycling Administration	Recycling Collections
	Gateway Collections
	Administration
	Office of Recycling Planning and Policy

Policy

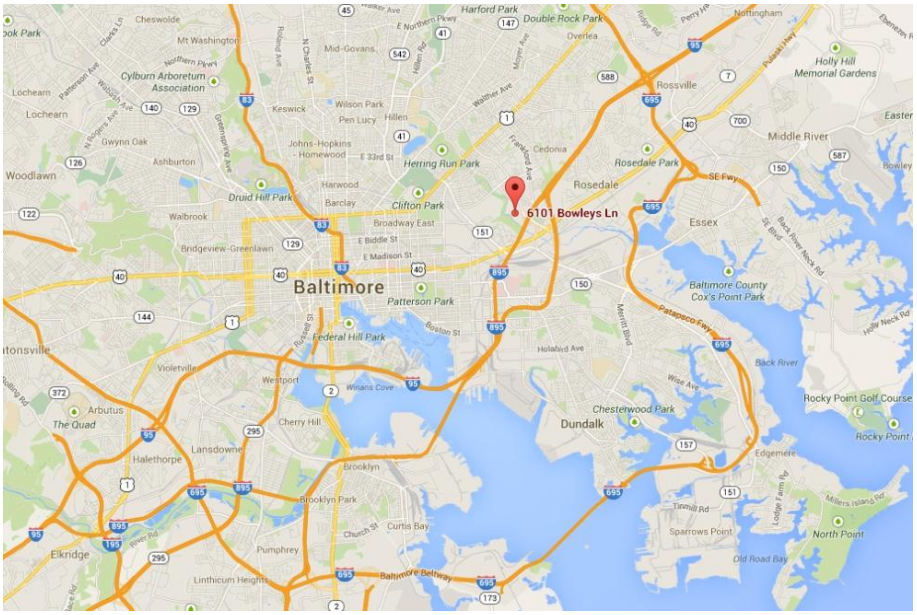
Based on the findings of ABC analysis, we conclude that being close to a disposal site greatly improves the efficiency of the trash collection process by reducing transfer and disposal times. Since building a new landfill is not an option, there are only two ways to advance the current process:

1. Route study (re-route more collection crews to NWTS)
2. Building a new transfer station in NE Quadrant

New Transfer Station

The primary reason for using a transfer station is to reduce the cost of transporting waste to disposal facilities. Savings are achieved by enabling collection crews to spend more time collecting waste and spend less time traveling to and from disposal facilities. In addition, a transfer station also offers an opportunity to function as a convenience center for public use.

The Citizen Drop-off Center at 6101 Bowleys Lane is a full service convenience center that accepts commingled recycling and provides additional and vital disposal capabilities for City residents. Besides general wastes, the full service center accepts commingled goods, tires, scrap metal, white goods, used oil, and electronics. The Bowleys Lane facility is located in the north end of the SE Quadrant, and also serves as a main load packer yard. Location of this facility is very close to two main highways, therefore allowing crews easy access to their daily routes. In addition, the majority of NE Quadrant routes are closer to Bowleys Lane than currently used disposal sites. The map below shows the location of the Bowleys Lane Convenience Center:



Deciding whether a transfer station is feasible depends whether the benefits outweigh the costs. There are a number of costs involved with building a new transfer station that the City needs to bear in mind. Decision makers need to look at planning, designing, building and operating costs against the savings the transfer station might generate from reduced travel and disposal costs.

Costs can be reduced significantly if the City decides to adopt an existing building for reuse as a waste transfer station. The list below summarizes the benefits of using Bowleys Lane as a transfer station:

1. Optimal Location for operations
    - To maximize waste collection efficiency, transfer stations should be located centrally to waste collection routes.
2. Already works as a primary load packer yard for Collections activity
    - The transfer station should have direct and convenient access to truck routes, major arterials, and highways.
3. Reduced capital and operating costs
4. Already has a permit allowing the waste transfer activity

Costs

As discussed earlier, decision makers need to analyze the costs associated with reusing an existing facility as a transfer station. Main cost categories are as follows:

1. Capital Costs
2. Operating Costs

Capital Costs

Several methods are available to finance capital improvement projects (CIP). In this report, we assumed that CIP will be financed by debt service.[32] The table below shows the details of debt service:

Table 61: Annual Rate of Debt Service[33]

Item	Amount
Total Capital Need	$8,000,000
Term	20
Rate	2.50%
Annual Debt Service	**$513,177**

Operating Costs

The operating cost of the new transfer station is based NTWS' operating expenses. The table below shows the details of the NWTS Operating Budget:

Table 62: NWTS Operating Budget

NWTS Operating Budget	Amount
Personnel	$1,134,765
Non-Personnel	$745,916
Total	**$1,880,681**

Savings

As discussed earlier, the projected cumulative savings of eliminating one collection crew is $5.78 million over 20 years with a present value of $275,000. After calculating estimated costs for each cost driver, we conducted a sensitivity analysis to determine the impact of building a new transfer station. The table below shows the Cash Flow Analysis for a 20-year term with 1 crew reduction:

[32] The issuance of debt obligations which are then repaid over several years along with the interest incurred on the borrowings.

[33] CIP amount and terms of debt service are based on estimates provided by DPW and Treasury Management, respectively.

Table 63: 20-Year Term Cash Flow Analysis for Collection Crew Reduction (in Thousands)

	Year								
Cost Center	**1**	**2**	**3**	**4**	**5**	**10**	**15**	**20**	**Total**
Operating Costs									
Reduction	($229)	($235)	($240)	($246)	($252)	($283)	($318)	($358)	($5,781)
Personnel	($150)	($153)	($156)	($159)	($162)	($179)	($198)	($218)	($3,643)
Equipment	($80)	($82)	($84)	($87)	($90)	($104)	($120)	($139)	($2,138)
Fleet Reduction Savings	($45)	($47)	($48)	($50)	($51)	($59)	($69)	($80)	($1,222)
Increase	$1,881	$1,926	$1,972	$2,019	$2,068	$2,329	$2,626	$2,961	$47,615
Personnel	$1,135	$1,157	$1,181	$1,204	$1,228	$1,356	$1,497	$1,653	$27,572
Equipment	$746	$768	$791	$815	$840	$973	$1,128	$1,308	$20,043
Net Change in Operating Costs	$1,651	$1,691	$1,732	$1,773	$1,816	$2,046	$2,307	$2,603	$41,834
Capital Costs									
Debt Service	$513	$513	$513	$513	$513	$513	$513	$513	$10,264
Annaul Cash Flow	$2,164	$2,204	$2,245	$2,286	$2,329	$2,560	$2,821	$3,116	$52,098
Present Value	**$2,481**								

The estimated cost of building and operating an additional transfer station in Bowleys Lane would have an annual cost of $2.48 million.

The table below shows the change in estimated annual cost by reduction in total number of collection crews:

Table 64: Estimated Annual Costs for Additional Transfer Station with Collection Crew Reductions

Reduction in Total # of Crews	Estimated Annual Cost
-	$2,756,114
1	$2,480,848
2	$2,205,582
3	$1,930,317
4	$1,655,051
5	$1,379,786
6	$1,104,520
7	$829,254
8	$553,989
9	$278,723
10	$3,458

Although the estimated annual cost decreases as the City reduces the number of collection crews, the City may find that crew reduction at this magnitude (10 crews) may jeopardize service provision, and therefore will not reach a break-even point for a transfer station in Bowleys Lane based solely on reduction of crews.

Policy decisions related to service levels significantly affect the level of capital investment required in adding another transfer station. Operational alternatives that would require further research would include the following:

1. Public-only operations with all aspects of service provided by the City
    - Solid Waste Enterprise
        - Cost of capital could potentially be recovered from user fees
    - Can the City allocate a portion of the Landfill Development funds if ash can be used as daily cover at the Landfill?
        - BRESCO will take the lead in advocating with MDE to allow the City to use as ash as a daily cover
        - Using ash as daily cover would significantly extend the life of the landfill thus giving the City more time to fully fund the development (expansion) of the landfill.
2. Private-only operation of all aspects of service provided by contractor
    - Public-Private Partnership (PPP) will enable the City to harness the expertise and efficiencies that the private sector can bring to operating a transfer station.
3. Mixed operation of facility
    - Weighing and cashiering functions, transfer facility operation, and hauling of waste to disposal sites could be either public or private.

Glossary

Activity Based Costing: a costing methodology that distributes costs related to production (or a service) across multiple discrete components, based on actual use of resources.

Avoidable costs: costs that an agency can eliminate by halting or discontinuing a particular activity.

Back-end costs: all costs related to programmatic termination or conclusion, including site closure, legal expenses, and decommissioning of capital such as buildings and equipment.

Budget basis (Cost Allocation): a common method for allocation of costs to an activity. The allocation is calculated by dividing the cost of service by the total budget.

Component: a discrete portion or segment of an activity.

Cost center: a division, segment, or portion of an activity that generates costs.

Debt Retirement: the completion of all payments against issued debt.

Direct costs: costs that can be directly linked to the performance of an activity.

Fixed costs: costs independent of the level of production or output. Fixed costs cannot be altered over the short-term.

Full Cost Accounting (FCA): a formal review of all costs that support provision of a service or activity.

Indirect costs: costs that are attributed to an activity but not reflected within the central budget of the activity.

Operating costs: costs that are related to everyday programmatic activities, including salaries, benefits, equipment and supplies, and contractual costs. This should include support systems and debt service payments as well.

Producing department: a department responsible for the direct provision of a good or service.

Relevant range: the expected cost of an activity over a given range. Costs are fixed over a certain range of output, but after reaching full capacity, adding more units will then increase the cost.

Resource pool template: a list of the drivers, allocation method, and data ownership as it relates to each cost center within an activity.

Straight-line depreciation: the annual cost assigned to an asset, which is calculated as the cost of the acquisition over the useful life-cycle.

Supporting department: a department that does not directly provide a good or service, but rather performs activities to assist a producing department.

Credits

Significant information provided through the EPA's Full Cost Accounting for Municipal Solid Waste Management: A Handbook.

Thanks to Valentina Ukwuoma and Mark Wick at Baltimore City Department of Public Works for detail on collection activities and routing, as well as for general support and assistance in defining the scope of this project.

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Appendix

Exhibit 1: Map and Schedule of Baltimore City's Solid Waste Collection Quadrants

Exhibit 2: A full list of Mixed Refuse Collection-associated positions by Quadrant

Exhibit 3: Full budget detail by service and activity within DPW

Exhibit 4: Debt Service Schedule for DPW

Exhibit 5: DPW – Mark Wick – Tonnage Templates for Quarantine Road Landfill

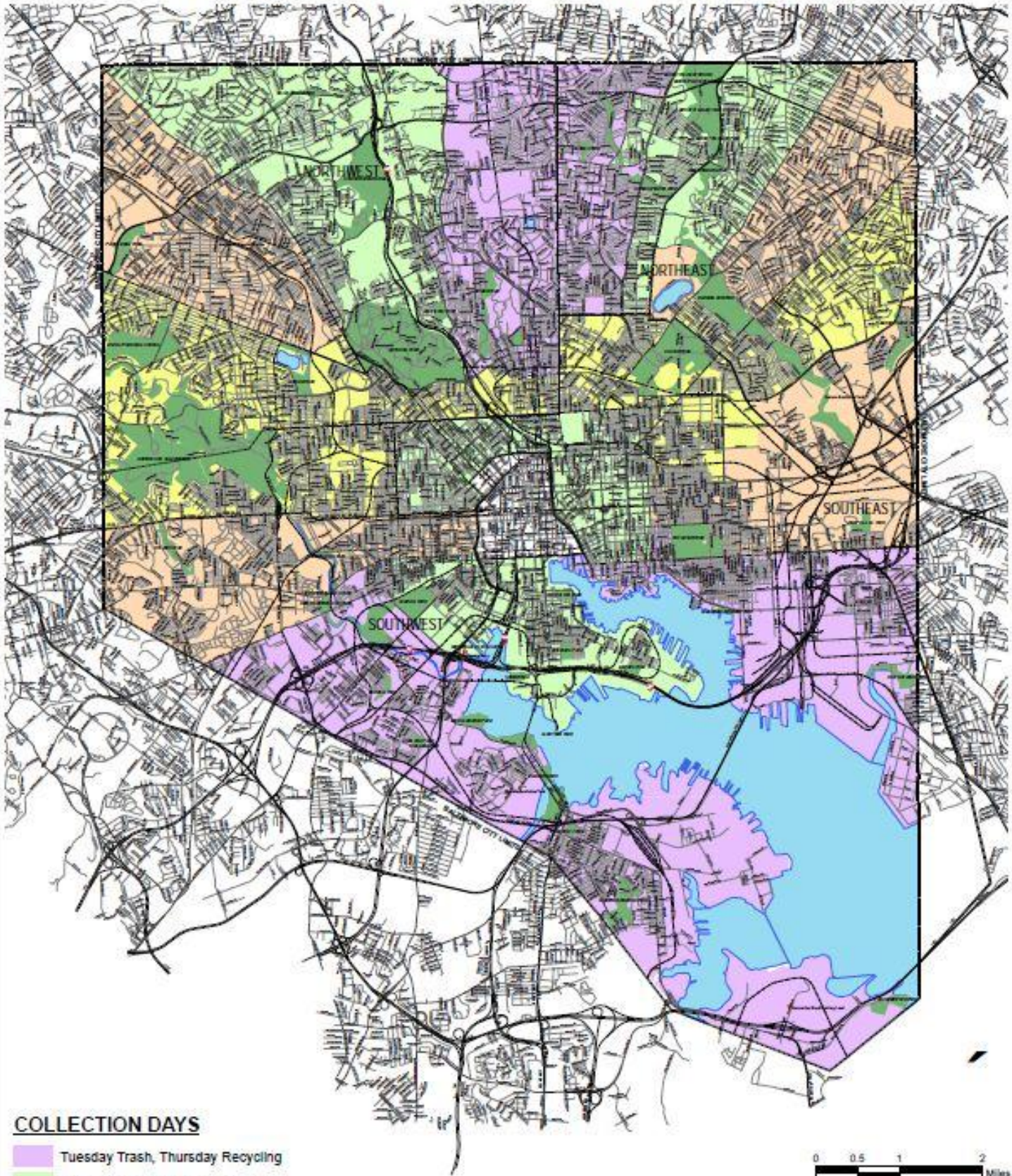
Exhibit 6: DPW – Mark Wick – Tonnage Templates for BRESCO

Exhibit 7: FASTER Database: complete list of vehicles, acquisition costs, estimated useful life for Mixed Refuse Collection

Exhibit 8: Sample Daily Tonnage Reports for 1+1 Routes

Exhibit 1

BALTIMORE COLLECTION DAYS



COLLECTION DAYS

- Tuesday Trash, Thursday Recycling
- Wednesday Trash, Friday Recycling
- Thursday Trash, Tuesday Recycling
- FridayTrash, Wednesday Recycling

0 0.5 1 2 Miles

JUNE 26, 2009

GBB SOLID WASTE MANAGEMENT CONSULTANTS

CZLogix route optimization solutions

FleetRoute

Exhibit 2

NE Quadrant Personnel Breakdown 07.12.13

	Name	Classification	Job Duties
1	R. L.	Solid Waste Supervisor	Mixed Refuse Supervisor
2	C. D.	Solid Waste Supervisor	Mixed Refuse Supervisor
3	V. E.	Solid Waste Supervisor	Mixed Refuse Supervisor
5	T. W.	Office Supervisor	Office Manger
6	S. C.	Radio Dispatcher	Clerk, Payroll

		Totals	Drivers	Laborers	Classification	Job Duties
7	C. D.	4 Drivers	T. J.		Solid Waste Driver	2202 2305 2407 2505
8			T.Y.		Solid Waste Driver	2201 2306 2408 2502
9			J. D.		Solid Waste Driver	2204 2307 2405 2501
10			A.E.		Solid Waste Driver	2203 2309 2406 2503
11		8 Laborers		S. L.	Seasonal Maintenance Aide	2203 2309 2406 2503
12				B. S.	Solid Waste Worker	2202 2305 2407 2505
13				N. B.	Seasonal Maintenance Aide	2201 2306 2408 2502
14				J. B.	Solid Waste Worker	2204 2307 2405 2501
15				L. B.	Solid Waste Worker	2204 2307 2405 2501
16				K. F.	Solid Waste Worker	2201 2306 2408 2502
17				T. H.	Solid Waste Worker	2203 2309 2406 2503
18				A. B.	Solid Waste Worker	2204 2307 2405 2501
19	V. E.	4 Drivers	K. S.		Solid Waste Driver	2205 2302 2403 2504
20			K. A.		Solid Waste Driver	2206 2303 2401 2508
21			R. S.		Solid Waste Driver	2207 2304 2402 2506
22			C. P.		Motor Vehicle Driver I	2208 2301 2404 2507
23		8 Laborers		A. S.	Solid Waste Worker	2205 2302 2403 2504
24				A. S.	Solid Waste Worker	2205 2302 2403 2504
25				A. T.	Solid Waste Worker	2206 2303 2401 2508
26				L. J.	Solid Waste Worker	2206 2303 2401 2508
27				D. J.	Solid Waste Worker	2207 2304 2402 2506
28				R. N.	Solid Waste Worker	2207 2304 2402 2506
29				A. D.	Solid Waste Worker	2208 2301 2404 2507
30				L. T.	Solid Waste Worker	2208 2301 2404 2507
31	R. L.	3 Drivers	R. G.		Solid Waste Driver	2210 2310 2410 2510
32			M. Y.		Solid Waste Driver	2211 2311 2411 2511
33			D. C.		Solid Waste Driver	2209 2308 2409 2509
34		6 Laborers		W. D.	Solid Waste Worker	2210 2310 2410 2510
35				A. M.	Solid Waste Worker	2210 2310 2410 2510
36				K. T.	Solid Waste Worker	2211 2311 2411 2511
37				A. M.	Seasonal Maintenance Aide	2209 2308 2409 2509
38				R. W.	Solid Waste Worker	2209 2308 2409 2509
39				T. A.	Solid Waste Worker	2211 2311 2411 2511

NW Quadrant Personnel Breakdown 07.12.13

	Name	Classification	Job Duties
1	(vacant)	Assistant Superintendent	Superintendent Western District
2	(vacant)	Solid Waste Supervisor	Mixed Refuse Supervisor
3	L. S.	Solid Waste Supervisor	Mixed Refuse Supervisor
4	M. D.	Solid Waste Supervisor	Mixed Refuse Supervisor
5	R. B.	Solid Waste Supervisor	Recycling Supervisor
6	G. S.	Solid Waste Driver	Collection Quality Control coordinator
7	M. J.	Office Supervisor	Office Manager

		Totals	Drivers	Laborers	Classification	Job Duties
8	L. L.	4 Drivers	B. J.		Solid Waste Driver	1203, 1302, 1402, 1504
9			N. R.		Solid Waste Driver	1201, 1307, 1401, 1506
10			R. T.		Solid Waste Driver	1202, 1301, 1403,
11			B. T.		Solid Waste Driver	1204, 1404, 1507
12		8 Laborers		T. G.	Solid Waste Worker	1204, 1301, 1404,
13				T. B.	Solid Waste Worker	1202, 1301, 1403, 1507
14				L. K.	Solid Waste Worker	1204, 1301, 1404,
15				R. R.	Seasonal Maintenance Aide	1204, 1404,
16				H. E.	Solid Waste Worker	1203, 1302, 1402, 1505
17				C. H.	Solid Waste Worker	1202, 1301, 1403, 1507
18				A. C.	Solid Waste Worker	1203, 1302, 1402, 1504
19				P. J.	Solid Waste Worker	1201, 1307, 1401, 1506
20	M. D.	4 Drivers	C. R.		Solid Waste Driver	1205, 1308, 1508
21			S. S.		Seasonal Maintenance Aide	1206, 1309, 1409, 1510
22			F. G.		Solid Waste Driver	1207, 1310, 1407, 1509
23			M. S.		Seasonal Maintenance Aide	1208, 1311, 1408, 1511
24		8 Laborers		M. P.	Solid Waste Worker	1205, 1308, 1508
25				D. M.	Solid Waste Worker	1208, 1311, 1408, 1511
26				T. P.	Solid Waste Worker	1205, 1308, 1508
27				J. H.	Seasonal Maintenance Aide	1206, 1309, 1409, 1510
28				J. R.	Solid Waste Worker	1207, 1310, 1407, 1509
29				C. F.	Seasonal Maintenance Aide	1208, 1311, 1408, 1511
30				A. N.	Solid Waste Worker	1207, 1310, 1407, 1509
31				A. L.	Solid Waste Worker	1206, 1309, 1409, 1510
32	L. S.	4 Drivers	D. S.		Solid Waste Driver	1209, 1305, 1410, 1503
33			R. S.		Solid Waste Driver	1210, 1304, 1411, 1501
34			C. T.		Solid Waste Driver	1211, 1306, 1405, 1502
35			A. B.		Solid Waste Driver	130,314,061,504
36		***8 Laborers***		D. C.	Solid Waste Worker	1209, 1305, 1410, 1503
37				M. G.	Solid Waste Worker	1210, 1304, 1411, 1501
38				A. M.	Solid Waste Worker	1211, 1306, 1405, 1502
39				C. T.	Solid Waste Worker	1210, 1304, 1411, 1501
40				E. C.	Solid Waste Worker	1211, 1306, 1405, 1502
41				T. L.	Solid Waste Worker	1209, 1305, 1410, 1503
42				J. B.	Solid Waste Worker	1303, 1406, 1504
43				A. B.	Seasonal Maintenance Aide	130,314,061,504

SE Quadrant Personnel Breakdown 07.12.13

	Name	Classification	Job Duties
1	J. R.	Solid Waste Superintendent	Eastern District Superintendent
2	G. T.	Solid Waste Asst. Superintendent	Eastern District Assistant Superintendent
3	M. H.	Solid Waste Supervisor	Mixed Refuse Supervisor
4	D. M.	Solid Waste Supervisor	Mixed Refuse Supervisor
5	G. M.	Solid Waste Supervisor	Mixed Refuse Supervisor
7	R. B.	Office Assistant III	Clerical, Payroll
8	D. B.	Radio Dispatcher	Office Aid

		Totals	Drivers	Laborers	Classification	Routes/Job Duties
9	M. H.	4 Drivers	A. M.		Solid Waste Worker / CDL	4202, 4305, 4406, 4509
10			L. D.		Solid Waste Driver	4201, 4307, 4405, 4506
11			K. W.		Solid Waste Driver	4203, 4306, 4407, 4507
12			E. H.		Solid Waste Driver	4204, 4304, 4408, 4505
13		8 Laborers		D. C.	Solid Waste Worker	4204, 4304, 4408, 4505
14				M. R.	Solid Waste Worker	4201, 4307, 4405, 4506
15				M. B.	Solid Waste Worker	4202, 4305, 4406, 4509
16				R. W.	Solid Waste Worker	4202, 4305, 4406, 4509
17				R. S.	Solid Waste Worker	4203, 4306, 4407, 4507
18				J. H.	Solid Waste Worker	4203, 4306, 4407, 4507
19				C. R.	Solid Waste Worker	4204, 4304, 4408, 4505
20				K. H.	Solid Waste Worker	4201, 4307, 4405, 4506
21	G. M.	3 Drivers	R. J.		Solid Waste Driver	4205, 4301, 4411, 4501
22			S. B.		Solid Waste Driver	4207, 4303, 4410, 4502
23			D. N.		Solid Waste Worker / CDL	4206, 4302, 4409, 4503
24		6 Laborers		S. M.	Seasonal Maintenance Aide	4206, 4302, 4409, 4503
25				K. R.	Seasonal Maintenance Aide	4207, 4303, 4410, 4502
26				D. C.	Solid Waste Worker	4205, 4301, 4411, 4501
27				C. B.	Seasonal Maintenance Aide	4205, 4301, 4411, 4501
28				D. B.	Solid Waste Worker	4207, 4303, 4410, 4502
29				E. F.	Solid Waste Worker	4206, 4302, 4409, 4503
30	D. M.	5 Drivers	R. N.		Solid Waste Driver	4208, 4308, 4402, 4504
31			K. M.		Solid Waste Driver	4209, 4309, 4403, 4511
32			C. S.		Solid Waste Worker	4402B
33			I. D.		Solid Waste Driver	4210, 4310, 4401, 4510
34			R. T.		Solid Waste Driver	4210, 4310, 4401, 4510
35		10 Laborers		A. T.	Seasonal Maintenance Aide	4208, 4308, 4402, 4504
36				S. H.	Seasonal Maintenance Aide	4402B
37				A. M.	Seasonal Maintenance Aide	4402B
38				J. L.	Solid Waste Worker	4209, 4309, 4403, 4511
39				D. M.	Solid Waste Worker	4208, 4308, 4402, 4504
40				M. W.	Solid Waste Worker	4208, 4308, 4402, 4504
41				A. T.	Solid Waste Worker	4209, 4309, 4403, 4511
42				W. T.	Solid Waste Worker	4210, 4310, 4401, 4510
43				R. P.	Solid Waste Worker	4210, 4310, 4401, 4510
44				A. R.	Solid Waste Worker	4209, 4309, 4403, 4511

SW Quadrant Personnel Breakdown *07.12.13*

	Name	Classification	Job Duties
1	W. N.	Superintendent	Superintendent Western District
2	D. G.	Solid Waste Supervisor	Mixed Refuse Supervisor
3	M. R.	Solid Waste Supervisor	Mixed Refuse Supervisor
4	T. L.	Solid Waste Supervisor	Mixed Refuse Supervisor
7	T. A.	Office Assistant II	Office
8	T. C.	Office Assistant III	Office

		Totals	Drivers	Laborers	Classification	Job Duties
9	D. G.	3 Drivers	H. H.		Solid Waste Driver	3209-3303-3409-3509
10			D. J.		Solid Waste Driver	3210-3302-3403-3510
11			L. D.		Solid Waste Driver	3211-3301-3411-3511
12		6 Laborers		T. P.	Seasonal Maintenance Aide	3209-3303-3409-3509
13				C. B.	Solid Waste Worker	3209-3303-3409-3509
14				R. H.	Solid Waste Worker	3210-3302-3403-3510
15				K. E.	Solid Waste Worker	3210-3302-3403-3510
16				G. M.	Solid Waste Worker	3211-3301-3411-3511
17				R. D.	Solid Waste Worker	3211-3301-3411-3511
18	M. R.	4 Drivers	T. T.		Solid Waste Driver	3205-3307-3405-3505
19			A. M.		Solid Waste Worker	3206-3305-3406-3506
20			A. D.		Solid Waste Driver	3207-3311-3407-3507
21			A. A.		Solid Waste Driver	3208-3304-3408-3508
22		8 Laborers		T. S.	Solid Waste Worker	3206-3305-3406-3506
23				D. W.	Solid Waste Worker	3205-3307-3405-3505
24				A. H.	Solid Waste Worker	3206-3305-3406-3506
25				R. S.	Solid Waste Worker	3208-3304-3408-3508
26				T. C.	Solid Waste Worker	3207-3311-3407-3507
27				M. H.	Solid Waste Worker	3207-3311-3407-3507
28				R. C.	Solid Waste Worker	3208-3304-3408-3508
29				G. R.	Solid Waste Worker	3205-3307-3405-3505
30	T. L.	4 Drivers	S. P.		Solid Waste Driver	3201-3306-3401-3503
31			K. C.		Solid Waste Driver	3203-3309-3410-3501
32			M. A.		Solid Waste Driver	3204-3308-3404-3504
33			F. G.		Solid Waste Worker	3202-3310-3402-3502
34		8 Laborers		B. E.	Solid Waste Worker	3201-3306-3401-3503
35				D. W.	Solid Waste Worker	*3201-3306-3401-3503*
36				K. P.	Solid Waste Worker	3202-3310-3402-3502
37				P. S.	Seasonal Maintenance Aide	3202-3310-3402-3502
38				M. R.	Solid Waste Worker	3203-3309-3410-3501
39				A. B.	Solid Waste Worker	3203-3309-3410-3501
40				M. N.	Solid Waste Worker	3204-3308-3404-3504
41				R. W.	Solid Waste Worker	3204-3308-3404-3504

Exhibit 3

Fiscal 2013 Adopted Budget
Department of Public Works - All Funds

Service #	Service Description	Activity #	Activity Description	Total
660	Administration - DPW - SW	1	Administration - DPW - SW	$1,855,524
		56	Workers' Compensation Expenses	$2,728,605
661	Public Right-of-Way Cleaning	3	Marine Operations	$1,285,802
		8	Cleaning of Business Districts	$1,882,122
		13	Street & Alley Cleaning	$17,150,196
		14	Mechanical Sweeping Operation	$3,576,983
		22	Graffiti Removal	$565,636
662	Vacant/Abandoned Property Cleaning and Boarding	1	Vacant/Abandoned Property Cleaning and Boarding	$3,241,648
		2	Rat Control	$767,189
663	Waste Removal and Recycling	6	Mixed Refuse Collection	$17,323,169
		7	Recycling Administration	$650,118
		9	Bulk Trash Collection	$1,047,822
		10	Condominium Collections	$352,581
664	Waste Re-Use and Disposal	4	Wheelabrator Disposal	$9,362,000
		7	Landfill Operation	$5,554,269
		8	Landfill Trust	$800,000
		12	Northwest Transfer Station Operation	$1,809,391
670	Administration - DPW - WWW	1	DPW Overhead	$4,138,980
		2	City Overhead	$13,908,836
		3	Administration	$16,811,843
		56	Workers' Compensation Expenses	$2,786,266
671	Water Management	1	Baltimore City Operations & Maintenance - Eastside	$4,946,457
		2	Baltimore City Operations & Maintenance - Westside	$3,993,693
		3	Baltimore County Operations & Maintenance - Eastside	$4,136,455
		4	Baltimore County Operations & Maintenance - Westside	$3,249,256
		5	Chlorinator Stations	$2,226,195
		6	Reservoirs and Tanks Operations and Maintenance	$358,000
		7	Water Conservation - Baltimore City	$1,415,769
		8	Water Conservation - Baltimore County	$1,344,237
		9	Water Facilities Administration	$770,520
		10	Water Filtration Plants	$21,816,026
		11	Water Maintenance Administration	$4,884,305
		12	Water Paving Cuts	$4,370,873
		13	Water Pumping Stations	$13,878,562
		14	Water Quality Control	$1,926,513
		15	Water Storeroom & Yards Operations & Maintenance	$1,845,857
		16	Watershed Maintenance, Natural Resources & Security	$3,495,704
		17	Watershed Safety	$1,043,629
		26	Transfers	($85,000)
672	Water and Wastewater Consumer Services	1	Meter Operations City	$3,557,174
		2	Meter Operations County	$3,397,718
		3	Meter Operations Administration	$1,371,998
		4	Utility Billing	$7,606,321
		5	Work Control Center	$891,240
		6	Communication Center	$626,950
		26	Transfers	($150,000)
673	Wastewater Management	1	Back River WWTP Maintenance	$14,798,032
		2	Backriver Wastewater Treatment Plant	$33,924,708
		3	Computer Services/Process Control	$510,253
		4	Inflow and Infiltration	$3,746,738
		5	Laboratory Services	$3,320,740
		6	Maintenance & Repair of Sanitary Systems	$12,455,435
		7	Patapsco Wastewater Treatment Plant	$23,083,035
		8	Patapsco WWTP Maintenance	$8,909,397
		9	Pollution Control	$2,102,529
		10	Wastewater Facilities Administration	$1,342,690
		11	Wastewater Pumping Stations	$3,834,075
		12	Wastewater Pumping Stations Maintenance	$1,606,469
674	Surface Water Management	1	Maintenance & Repair of Stormwater Systems	$3,451,555
		2	Waterway Maintenance	$650,119
		3	Water Quality Monitoring and Inspections	$1,959,684
		4	Watershed Liaison	$90,062
		5	Surface Water Engineering	$1,458,142
		6	Administration	$247,035
		7	Flood Warning	$35,000
		26	Transfers	($630,601)
675	Engineering and Construction Management - Water and Wastewater	1	Wastewater Engineering	$2,743,302
		2	Wastewater Facilities Engineering	$1,313,877
		3	Wastewater Facilities Inspection	$1,393,906
		4	Wastewater Utility Inspection	$1,673,217
		5	Water Engineering	$1,475,148
		6	Water Facilities Engineering	$751,228
		7	Water Facilities Inspection	$2,205,609
		8	Water Utility Inspection	$665,894
		9	Utility Debit Service - Wastewater	$65,946,753
		10	Utility Debt Service - Water	$42,474,048
		11	Wastewater Analyzers	$828,668
		26	Transfers	($8,993,174)
676	Administration - DPW	1	Administration	$1,252,180
		2	Human Resources	$363,076
		3	Fiscal Administration	$367,599
		5	Computer Services	$1,373,454
		6	Boards & Commissions	$358,123
		8	Contract Administration	$1,171,681
		10	Legislative Affairs	$233,173
		11	Media & Communications	$714,049
		12	Safety, Training, Emergency Mgmt and Security (STEMS)	$1,128,079
		26	Transfers	($5,668,976)
		56	Workers Compensation Expenses	$15,133
Total				**$431,198,576**

Exhibit 4

Bureau of Treasury Management
Schedule of Outstanding Debt - Solid Waste

Type of Financing	Year Issued	Project	Balance FY 2007	Fy 2008 Interest	Fy 2008 Principal	Balance FY 2008	Fy 2009 Interest	Fy 2009 Principal	Balance FY 2009	Fy 2010 Interest	Fy 2010 Principal	Balance as of 06/30/10	Fy 2011 Interest	Fy 2011 Principal	Balance as of 06/30/11	Fy 2012 Interest	Fy 2012 Principal	Balance as of 06/30/2012
Go Bonds	1989-A	Solid Waste Facilites	330,700.00	20,580.00	73,400.00	257,300.00	15,235.50	79,300.00	178,000.00	9,464.00	85,600.00	92,400.00	3,234.00	92,400.00	0.00			0.00
Go Bonds	1995-A (CAB)	Solid Waste Facilites	92,750.00	16,757.32	15,490.00	77,260.00	17,848.89	14,606.00	62,654.00	21,430.28	15,597.00	47,057.00	29,154.94	18,946.00	28,111.00	48,287.97	28,111.00	0.00
COPS/IDA	2005	Cell #6 Phase II Add. #33	7,312,000.00	559,400.00	629,000.00	6,683,000.00	508,960.00	642,000.00	6,041,000.00	456,680.00	665,000.00	5,376,000.00	402,520.00	689,000.00	4,687,000.00	346,400.00	714,000.00	3,973,000.00
COPS/IDA	2006	Cell #6 Phase II Add. #34	3,500,000.00	268,200.00	295,000.00	3,205,000.00	244,000.00	310,000.00	2,895,000.00	218,760.00	321,000.00	2,574,000.00	192,720.00	330,000.00	2,244,000.00	165,920.00	340,000.00	1,904,000.00
COPS/IDA	2007	Cell #6 Phase II Add. #38	1,873,000.00	149,840.00	0.00	1,873,000.00	149,840.00	157,000.00	1,716,000.00	137,280.00	166,000.00	1,550,000.00	124,000.00	172,000.00	1,378,000.00	110,240.00	186,000.00	1,192,000.00
COPS/IDA	2008	Cell #6 Phase II Add. #39	0.00	0.00	0.00	4,500,000.00	216,500.00		4,500,000.00	343,200.00	420,000.00	4,080,000.00	308,000.00	460,000.00	3,620,000.00	269,200.00	510,000.00	3,110,000.00
Lease	2007	Landfill Equipment Sch. #4	908,910.12	35,097.40	213,587.38	695,322.74	26,250.78	222,434.00	472,888.74	17,037.73	231,647.05	241,241.69	7,443.09	241,241.69	0.00			0.00
	Total		**$14,017,360.12**	**$1,049,874.72**	**$1,226,477.38**	**$17,290,882.74**	**$1,178,635.17**	**$1,425,340.00**	**$15,865,542.74**	**$1,203,852.01**	**$1,904,844.05**	**$13,960,698.69**	**$1,067,072.03**	**$2,003,587.69**	**$11,957,111.00**	**$940,047.97**	**$1,778,111.00**	**$10,179,000.00**

Type of Financing	Year Issued	Project	Balance as of 06/30/2012	Fy 2013 Interest	Fy 2013 Principal	Balance as of 06/30/2013	Fy 2014 Interest	Fy 2014 Principal	Balance as of 06/30/2014	Fy 2015 Interest	Fy 2015 Principal	Balance as of 06/30/2015
Go Bonds	1989-A	Solid Waste Facilites	0.00			0.00			0.00			0.00
Go Bonds	1995-A (CAB)	Solid Waste Facilites	0.00			0.00			0.00			0.00
COPS/IDA	2005	Cell #6 Phase II Add. #33	3,973,000.00	288,280.00	739,000.00	3,234,000.00	228,080.00	766,000.00	2,468,000.00	165,680.00	794,000.00	1,674,000.00
COPS/IDA	2006	Cell #6 Phase II Add. #34	1,904,000.00	138,080.00	356000	1,548,000.00	109,040.00	370,000.00	1,178,000.00	78,920.00	383,000.00	795,000.00
COPS/IDA	2007	Cell #6 Phase II Add. #38	1,192,000.00	95,360.00	192000	1,000,000.00	80,000.00	220,000.00	780,000.00	62,400.00	240,000.00	540,000.00
COPS/IDA	2008	Cell #6 Phase II Add. #39	3,110,000.00	227,200.00	540000	2,570,000.00	182,000.00	590,000.00	1,980,000.00	133,200.00	630,000.00	1,350,000.00
Lease	2007	Landfill Equipment Sch. #4	0.00			0.00			0.00			0.00
	Total		**$10,179,000.00**	**$748,920.00**	**$1,827,000.00**	**$8,352,000.00**	**$599,120.00**	**$1,946,000.00**	**$6,406,000.00**	**$440,200.00**	**$2,047,000.00**	**$4,359,000.00**

Type of Financing	Year Issued	Project	Balance as of 06/30/2015	Fy 2016 Interest	Fy 2016 Principal	Balance as of 06/30/2016	Fy 2017 Interest	Fy 2017 Principal	Balance as of 6/30/2017
Go Bonds	1989-A	Solid Waste Facilites	0.00			0.00			0.00
Go Bonds	1995-A (CAB)	Solid Waste Facilites	0.00			0.00			0.00
COPS/IDA	2005	Cell #6 Phase II Add. #33	1,674,000.00	101,040.00	822,000.00	852,000.00	68,160.00	852,000.00	0.00
COPS/IDA	2006	Cell #6 Phase II Add. #34	795,000.00	47,800.00	395,000.00	400,000.00	16,000.00	400,000.00	0.00
COPS/IDA	2007	Cell #6 Phase II Add. #38	540,000.00	43,200.00	260,000.00	280,000.00	22,400.00	280,000.00	0.00
COPS/IDA	2008	Cell #6 Phase II Add. #39	1,350,000.00	81,600.00	660,000.00	690,000.00	27,600.00	690,000.00	0.00
Lease	2007	Landfill Equipment Sch. #4	0.00			0.00			0.00
	Total		**$4,359,000.00**	**$273,640.00**	**$2,137,000.00**	**$2,222,000.00**	**$134,160.00**	**$2,222,000.00**	**$0.00**

Exhibit 5

QUARANTINE ROAD LANDFILL
MONTHLY TONNAGE REPORT

JANUARY 2012

	Rolloff	City Mixed Refuse	City Street Dirt	Sweepers	City Public Use	E-Cycling Electronics	Harford Co.Tires [RECYCLED]	Public Agencies Charge	City Combined	Private Haulers	BRESCO Ash	Transportation	Charities	Zoo Manure	Wastewater Gritscreen	Harford County ASH	Small Haulers	Small Haulers over 7000 lbs	Special Cleanups	EBDI Waste	White Goods	Charities ~ 100 Ton	Water Wstewater	Evic. Chattel from Landlords	
	(9)	(10)	(12)	(13)	(14)	(15)	(16)	(18)	(19)	(20)	(22)	(24)	(25)	(27)	(32)	(34)	(40)	(45)	(50)	(55)	(60)	(75)	(77)	(90)	TOTALS
1-Jan																									0.00
2-Jan																									0.00
3-Jan	5.95	137.62	0.00	0.00	26.77	0.00	0.00	12.79	0.00	42.58		44.24	0.47	0.00	56.30	146.50	18.19	10.07	0.00	0.00	0.00	25.94	35.47	0.00	562.89
4-Jan	2.86	122.57	29.53	0.00	17.24	0.00	0.00	15.52	0.00	29.18		52.45	1.27	0.00	70.84	192.43	14.58	7.61	0.00	0.00	0.00	32.07	55.97	0.00	644.12
5-Jan	9.89	265.59	0.00	0.00	12.02	0.00	0.00	27.77	0.00	33.86		100.15	1.02	0.00	26.86	228.78	18.23	5.96	0.00	0.00	0.00	23.43	57.13	0.00	810.69
6-Jan	2.91	179.98	0.00	0.00	12.92	0.00	0.00	11.07	0.00	16.94		84.39	1.05	0.00	72.11	241.27	20.72	15.32	0.00	0.00	0.00	14.40	27.69	0.00	700.77
7-Jan	0.00	0.00	0.00	0.00	33.46	0.00	0.00	0.00	0.00	10.02		10.79	0.78	0.00	0.00	104.59	16.61	7.19	0.00	0.00	0.00	4.46	0.00	0.00	187.90
8-Jan																									0.00
9-Jan	3.16	0.00	1.49	0.00	15.72	0.00	0.00	12.45	0.00	12.53		100.25	8.09	0.00	27.75	228.08	14.19	6.86	0.00	0.00	1.18	29.69	95.07	0.00	556.51
10-Jan	0.00	144.01	5.52	0.00	26.52	0.00	0.00	13.10	0.00	27.98		165.20	0.68	0.00	39.42	139.52	20.58	3.13	0.00	0.00	0.00	24.55	73.29	0.00	683.50
11-Jan	0.00	42.47	1.18	0.00	16.53	0.00	0.00	15.49	0.00	46.04		138.77	1.39	0.00	56.35	201.06	21.47	8.82	0.00	0.00	0.00	12.55	85.43	0.00	647.55
12-Jan	3.69	20.47	7.72	0.00	8.37	0.00	0.00	24.83	0.00	14.38		130.93	1.11	0.00	42.44	0.00	12.95	3.81	0.00	0.00	0.00	16.15	143.18	0.00	430.03
13-Jan	6.57	43.25	4.62	0.00	12.77	3.70	0.00	18.67	0.00	12.23		139.36	0.38	0.00	20.37	0.00	15.37	7.57	0.00	0.00	0.00	20.17	78.55	0.00	383.58
14-Jan	0.00	0.00	0.00	0.00	20.94	0.00	0.00	4.18	0.00	9.73		1.01	0.63	0.00	0.00	57.42	16.69	4.84	0.00	0.00	0.00	4.87	4.40	0.00	124.71
15-Jan																									0.00
16-Jan																									0.00
17-Jan	4.61	59.06	1.49	0.00	21.08	0.00	2.33	19.57	0.00	28.23		178.89	0.00	0.00	48.82	49.73	16.17	9.88	0.00	0.00	0.00	35.77	153.06	0.00	628.69
18-Jan	2.89	35.78	7.14	0.00	12.61	0.00	0.00	25.17	0.00	16.55		199.49	1.83	0.00	24.42	139.45	18.45	3.81	0.00	0.00	0.00	28.19	82.07	0.00	597.85
19-Jan	8.77	89.11	2.41	0.00	10.62	0.00	0.00	26.33	0.00	22.66		170.61	2.33	0.00	10.52	107.37	19.73	12.02	0.00	0.00	0.00	34.20	74.15	0.00	590.83
20-Jan	8.87	121.33	4.92	0.00	15.18	0.00	0.00	12.98	0.00	14.99		84.68	0.00	0.00	16.67	192.54	13.99	8.77	0.00	0.00	0.00	12.55	63.35	0.00	570.82
21-Jan	0.00	0.00	0.00	0.00	11.35	0.00	0.00	0.00	0.00	2.73		0.00	0.00	0.00	0.00	0.00	2.77	2.04	0.00	0.00	0.00	6.20	5.04	0.00	30.13
22-Jan																									0.00
23-Jan	0.00	0.00	0.00	0.00	14.15	0.00	0.00	4.78	0.00	10.26		39.01	0.38	0.00	26.33	0.00	8.79	2.43	0.00	0.00	0.00	25.21	89.24	0.00	220.58
24-Jan	0.00	144.29	3.70	0.00	14.90	0.00	0.00	13.39	0.00	17.01		108.90	7.23	0.00	25.72	0.00	15.90	2.24	0.00	0.00	0.00	25.41	68.01	0.00	446.70
25-Jan	2.71	84.51	0.00	0.00	15.42	0.00	0.00	10.08	0.00	16.66		125.45	1.65	0.00	24.46	173.55	19.62	12.59	0.00	0.00	0.00	30.87	110.81	0.00	628.38
26-Jan	8.99	87.05	0.51	0.00	13.55	0.00	0.00	7.67	0.00	27.07		174.87	0.48	0.00	1.67	145.42	14.44	2.98	0.00	0.00	0.00	19.90	115.43	0.00	620.03
27-Jan	0.00	13.80	0.00	0.00	4.43	0.00	4.29	22.21	0.00	12.03		134.60	1.75	0.00	27.14	0.00	9.70	9.52	0.00	0.00	0.00	16.55	40.48	0.00	296.50
28-Jan	0.00	0.00	0.00	0.00	28.15	0.00	0.00	0.00	0.00	9.25		0.00	0.00	0.00	0.00	0.00	16.21	9.46	0.00	0.00	0.00	7.19	0.00	0.00	70.26
29-Jan																									0.00
30-Jan	2.82	0.00	4.53	0.00	20.81	0.00	0.00	13.79	0.00	24.66		76.29	10.11	0.00	25.01	121.91	11.34	8.21	0.00	0.00	0.00	43.43	239.35	0.00	602.26
31-Jan	8.58	197.67	2.76	0.00	8.70	0.00	0.00	6.88	0.00	30.75	16,249.18	86.13	0.57	0.00	29.26	190.61	18.35	6.86	0.00	0.00	0.00	25.57	79.62	0.00	16,941.49
TOTALS	83.27	1,788.56	77.52	0.00	394.21	3.70	6.62	318.72	0.00	488.32	16,249.18	2,346.46	43.20	0.00	672.46	2,660.23	375.04	171.99	0.00	0.00	1.18	519.32	1,776.79	0.00	**27,976.77**

TOTAL TONNAGE:	***27,976.77***

TOTAL MSW RESIDENTIAI	***8,383.40***
TOTAL MSW COMMERCIAI	
TOTAL MSW ASH	***18,909.41***
ELECTRONICS RECYLCINC	***3.70***
SCRAP METAL	***1.18***
SCRAP TIRES	***6.62***
TOTAL SEWAGE SLUDGE	***672.46***

Exhibit 6

WHEELABRATOR BALTIMORE TONNAGE REPORT - January 2012

	Routine Services				Special Services						NWTS	BSW	Other City Agencies					
January 2012	EASTERN	NORTHEAST	WESTERN	NORTHWEST	EASTERN MAINTENANCE	CENTRAL/ PRATT STREET	INNER HARBOR	WESTERN MAINTENANCE	DOWN UNDER	PROPERTY MANAGEMENT	NWTS	Bureau of Solid Waste	EDUCATION	RECREATION & PARKS	TRANSPORTATION MAINTENANCE	WASTE & WATER	DOWNTOWN PARTNERSHIP	
1-Jan	0.35	0.00	1.37	0.00	0.00	2.66	0.00	0.00	0.00	0.00	0.00	4.38	0.00	0.00	0.00	0.00	0.00	4.38
2-Jan	0.00	2.74	6.25	0.00	0.00	0.00	0.00	0.00	3.58	0.00	0.00	12.57	0.00	1.01	0.00	0.00	0.00	13.58
3-Jan	40.95	226.96	132.70	152.45	2.40	1.37	26.25	1.52	83.18	20.81	16.66	705.25	0.00	6.09	74.26	0.00	3.04	788.64
4-Jan	49.88	183.29	110.01	187.29	1.01	22.46	18.76	1.44	43.44	6.03	0.00	623.61	3.60	13.07	52.71	0.00	1.11	694.10
5-Jan	49.82	170.17	86.09	153.80	4.28	6.80	9.30	1.61	60.52	13.27	19.84	575.50	0.00	14.02	44.20	0.00	1.34	635.06
6-Jan	30.64	187.36	110.79	210.89	8.52	8.85	9.22	3.62	65.96	28.22	79.96	744.03	0.00	0.41	61.84	0.00	0.00	806.28
7-Jan	0.00	22.82	4.15	35.22	0.00	1.45	0.00	0.00	39.07	6.29	36.72	145.72	0.00	1.86	0.00	0.00	0.00	147.58
8-Jan	0.00	0.00	2.87	0.00	0.00	48.26	0.37	0.00	0.00	0.00	0.00	51.50	0.00	0.00	0.00	0.00	2.64	54.14
9-Jan	2.58	34.18	33.09	103.48	0.00	17.05	5.46	4.09	63.60	11.17	0.00	274.70	1.18	0.00	3.38	0.00	1.83	281.09
10-Jan	18.80	146.84	141.68	139.65	3.32	9.88	22.91	7.53	63.10	22.17	0.00	575.88	1.41	7.19	65.76	0.00	0.00	650.24
11-Jan	28.29	234.94	112.28	199.87	2.63	19.42	13.75	2.08	55.44	19.68	25.63	714.01	0.00	0.00	66.21	0.00	0.00	780.22
12-Jan	36.30	203.58	166.86	215.25	4.11	10.93	16.10	1.87	36.40	14.26	16.94	722.60	0.00	0.00	60.61	0.00	2.33	785.54
13-Jan	25.14	291.00	166.52	112.86	16.08	17.43	18.10	3.94	54.70	17.81	55.63	779.21	0.00	14.23	65.50	0.00	0.00	858.94
14-Jan	0.00	116.47	10.29	32.94	0.00	2.36	0.00	0.00	21.11	2.02	38.97	224.16	0.00	0.00	0.00	0.00	0.00	224.16
15-Jan	0.00	17.60	3.88	0.00	0.00	27.50	0.00	0.00	0.00	0.00	0.00	48.98	0.00	0.00	0.00	0.00	2.26	51.24
16-Jan	0.00	39.20	10.36	0.00	1.34	1.04	0.00	0.00	0.00	0.00	0.00	51.94	0.00	0.00	0.00	0.00	0.00	51.94
17-Jan	34.33	253.28	109.37	179.86	22.75	10.49	22.84	4.14	42.76	18.47	28.05	726.34	0.00	14.32	62.39	0.00	2.83	805.88
18-Jan	19.82	238.24	104.53	151.96	15.69	6.96	14.58	1.41	33.51	13.86	17.57	618.13	0.00	2.48	45.32	0.00	0.58	666.51
19-Jan	30.97	197.17	106.63	176.20	20.53	4.04	27.22	2.84	32.02	13.71	35.83	647.16	0.00	1.83	30.44	0.00	1.51	680.94
20-Jan	37.27	187.61	93.55	145.57	15.61	13.70	24.68	7.91	48.97	5.02	43.39	623.28	0.00	0.00	26.57	0.00	0.00	649.85
21-Jan	0.00	36.86	4.05	79.52	1.23	0.00	0.00	0.00	25.65	1.86	66.20	215.37	0.00	0.00	0.00	0.00	0.00	215.37
22-Jan	0.00	0.00	2.30	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	3.02	0.00	0.00	0.00	0.00	0.00	3.02
23-Jan	26.38	30.55	20.51	39.19	5.62	19.52	0.00	1.95	29.24	15.44	9.42	197.82	0.00	0.00	0.00	0.00	1.68	199.50
24-Jan	51.68	147.45	40.30	125.51	3.35	8.17	18.20	5.80	67.67	10.38	8.38	486.89	0.00	7.86	53.98	0.00	1.35	550.08
25-Jan	37.57	177.20	87.45	163.27	1.74	9.10	3.18	12.49	54.43	13.11	35.16	594.70	1.74	0.00	62.42	0.00	1.19	660.05
26-Jan	37.44	205.55	104.00	145.00	1.29	2.52	17.42	12.62	63.50	9.11	52.20	650.65	10.73	2.53	59.02	0.00	1.10	724.03
27-Jan	23.75	203.48	140.75	183.50	3.13	21.27	17.16	4.64	54.07	11.03	36.66	699.44	14.73	20.08	46.36	0.00	0.00	780.61
28-Jan	13.64	43.89	6.69	53.92	0.00	1.21	0.00	0.00	28.02	0.00	50.53	197.90	0.00	0.00	1.77	0.00	0.00	199.67
29-Jan	1.41	0.00	2.66	0.00	0.00	30.75	0.00	0.00	0.00	0.00	0.00	34.82	0.00	0.00	0.00	0.00	0.00	34.82
30-Jan	35.28	12.87	19.69	76.79	5.50	9.53	0.00	4.60	88.27	4.76	20.89	278.18	0.00	1.66	0.00	0.00	2.80	282.64
31-Jan	44.72	143.73	37.04	121.22	5.55	11.91	20.43	3.62	57.71	12.75	12.06	470.74	0.00	1.10	54.26	0.00	0.00	526.10
Tonnage Totals	677.01	3,755.03	1,978.71	3,185.21	145.68	347.35	305.93	89.72	1,215.92	291.23	706.69	12,698.48	33.39	109.74	937.00	0.00	27.59	13,806.20

TOTAL TONNAGE: 13,806.20

Equip#	Dept	Dept Description	Make	Model	Year	AcqCost	LifeExp (Months)	Date in Service	ExpDate	#of Months in Service	#Months Remaining until Depreciation	Straight Line Depreciation	Cost as of April 2013	Status
3127	77-01	Solid Waste NW Sisson St	UD	LOADPACKER	2012	$ 138,288.00	96	06/11/12	06/11/20	11	85	$ 17,286	$ 14,405	Non-Depreciated
3128	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	06/11/12	06/11/20	11	85	$ 17,286	$ 14,405	Non-Depreciated
3129	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	06/11/12	06/11/20	11	85	$ 17,286	$ 14,405	Non-Depreciated
3133	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	07/27/12	07/27/20	10	86	$ 17,286	$ 14,405	Non-Depreciated
3142	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2007	$ 104,865.40	96	07/20/07	07/20/15	70	26	$ 13,108	$ 10,923	Non-Depreciated
3143	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2007	$ 104,865.40	96	07/20/07	07/20/15	70	26	$ 13,108	$ 10,923	Non-Depreciated
3144	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2007	$ 104,865.40	96	07/30/07	07/30/15	70	26	$ 13,108	$ 10,923	Non-Depreciated
3145	77-03	Solid Waste SW Reedbird Ave	MITSUBISHI	LOADPACKER	2007	$ 104,865.40	96	07/30/07	07/30/15	70	26	$ 13,108	$ 10,923	Non-Depreciated
3147	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2007	$ 104,865.40	96	08/23/07	08/23/15	69	27	$ 13,108	$ 10,923	Non-Depreciated
3149	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2007	$ 104,865.48	96	10/02/07	10/02/15	67	29	$ 13,108	$ 10,923	Non-Depreciated
3152	77-01	Solid Waste NW Sisson St	MITSUBISHI	LOADPACKER	2005	$ 101,925.48	96	01/17/06	01/17/14	88	8	$ 12,741	$ 10,617	Non-Depreciated
3154	77-01	Solid Waste NW Sisson St	MITSUBISHI	LOADPACKER	2005	$ 101,925.48	96	01/19/06	01/19/14	88	8	$ 12,741	$ 10,617	Non-Depreciated
3157	77-01	Solid Waste NW Sisson St	MITSUBISHI	LOADPACKER	2005	$ 101,925.48	96	01/24/06	01/24/14	88	8	$ 12,741	$ 10,617	Non-Depreciated
3159	77-01	Solid Waste NW Sisson St	MITSUBISHI	LOADPACKER	2005	$ 101,925.48	96	02/01/06	02/01/14	87	9	$ 12,741	$ 10,617	Non-Depreciated
3160	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2005	$ 101,925.48	96	02/09/06	02/09/14	87	9	$ 12,741	$ 10,617	Non-Depreciated
3161	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2005	$ 101,925.48	96	03/15/06	03/15/14	86	10	$ 12,741	$ 10,617	Non-Depreciated
3166	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2007	$ 101,925.48	96	10/18/06	10/18/14	79	17	$ 12,741	$ 10,617	Non-Depreciated
3168	77-03	Solid Waste SW Reedbird Ave	MITSUBISHI	LOADPACKER	2005	$ 101,925.48	96	10/17/06	10/17/14	79	17	$ 12,741	$ 10,617	Non-Depreciated
3170	77-03	Solid Waste SW Reedbird Ave	MITSUBISHI	LOADPACKER	2006	$ 101,925.48	96	10/17/06	10/17/14	79	17	$ 12,741	$ 10,617	Non-Depreciated
3171	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2007	$ 101,925.48	96	12/07/06	12/07/14	77	19	$ 12,741	$ 10,617	Non-Depreciated
3174	77-01	Solid Waste NW Sisson St	MITSUBISHI	LOADPACKER	2007	$ 101,925.48	96	12/07/06	12/07/14	77	19	$ 12,741	$ 10,617	Non-Depreciated
3177	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2007	$ 101,925.48	96	01/24/07	01/24/15	76	20	$ 12,741	$ 10,617	Non-Depreciated
3179	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2007	$ 101,925.48	96	01/24/07	01/24/15	76	20	$ 12,741	$ 10,617	Non-Depreciated
3180	77-01	Solid Waste NW Sisson St	MITSUBISHI	LOADPACKER	2007	$ 101,925.48	96	01/24/07	01/24/15	76	20	$ 12,741	$ 10,617	Non-Depreciated
3181	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2007	$ 104,865.48	96	04/15/08	04/15/16	61	35	$ 13,108	$ 10,923	Non-Depreciated
3182	77-03	Solid Waste SW Reedbird Ave	MITSUBISHI	LOADPACKER	2007	$ 104,865.48	96	04/17/08	04/17/16	61	35	$ 13,108	$ 10,923	Non-Depreciated
3183	77-01	Solid Waste NW Sisson St	MITSUBISHI	LOADPACKER	2008	$ 111,365.48	96	07/30/08	07/30/16	58	38	$ 13,921	$ 11,601	Non-Depreciated
3184	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	10/12/11	10/12/19	19	77	$ 17,286	$ 14,405	Non-Depreciated
3185	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	10/31/11	10/31/19	19	77	$ 17,286	$ 14,405	Non-Depreciated
3186	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	10/31/11	10/31/19	19	77	$ 17,286	$ 14,405	Non-Depreciated
3187	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	12/02/11	12/02/19	17	79	$ 17,286	$ 14,405	Non-Depreciated
3188	77-01	Solid Waste NW Sisson St	UD	LOADPACKER	2012	$ 138,288.00	96	01/10/12	01/10/20	16	80	$ 17,286	$ 14,405	Non-Depreciated
3189	77-01	Solid Waste NW Sisson St	UD	LOADPACKER	2012	$ 138,288.00	96	01/11/12	01/11/20	16	80	$ 17,286	$ 14,405	Non-Depreciated
3191	77-01	Solid Waste NW Sisson St	UD	LOADPACKER	2012	$ 138,288.00	96	01/12/12	01/12/20	16	80	$ 17,286	$ 14,405	Non-Depreciated
3192	77-03	Solid Waste SW Reedbird Ave	UD	LOADPACKER	2012	$ 138,288.00	96	01/12/12	01/12/20	16	80	$ 17,286	$ 14,405	Non-Depreciated
3193	77-03	Solid Waste SW Reedbird Ave	UD	LOADPACKER	2012	$ 138,288.00	96	01/19/12	01/19/20	16	80	$ 17,286	$ 14,405	Non-Depreciated
3194	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	04/11/12	04/11/20	13	83	$ 17,286	$ 14,405	Non-Depreciated
3195	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	04/11/12	04/11/20	13	83	$ 17,286	$ 14,405	Non-Depreciated
3197	77-05	Solid Waste 111 KANE ST	UD	LOADPACKER	2012	$ 138,288.00	96	04/18/12	04/18/20	13	83	$ 17,286	$ 14,405	Non-Depreciated
3198	77-02	Solid Waste NE Bowleys Ln	UD	LOADPACKER	2012	$ 138,288.00	96	05/14/12	05/14/20	12	84	$ 17,286	$ 14,405	Non-Depreciated
3324	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2005	$ 91,978.88	96	03/22/05	03/22/13	98	0	$ 11,497	$ 9,581	Fully Depreciated
3326	77-03	Solid Waste SW Reedbird Ave	MITSUBISHI	LOADPACKER	2005	$ 91,978.88	96	04/28/05	04/28/13	97	0	$ 11,497	$ 9,581	Fully Depreciated
3327	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2005	$ 91,978.88	96	04/28/05	04/28/13	97	0	$ 11,497	$ 9,581	Fully Depreciated
3411	77-05	Solid Waste 111 KANE ST	MITSUBISHI	LOADPACKER	2007	$ 74,667.00	84	06/27/08	06/27/15	59	37	$ 10,667	$ 8,889	Non-Depreciated
3412	77-05	Solid Waste 111 KANE ST	MITSUBISHI	LOADPACKER	2007	$ 74,667.00	84	06/27/08	06/27/15	59	37	$ 10,667	$ 8,889	Non-Depreciated
3414	77-05	Solid Waste 111 KANE ST	MITSUBISHI	LOADPACKER	2007	$ 74,667.00	84	06/27/08	06/27/15	59	37	$ 10,667	$ 8,889	Non-Depreciated
3434	77-05	Solid Waste 111 KANE ST	MITSUBISHI	LOADPACKER 8YD	2007	$ 74,667.00	84	07/09/08	07/09/15	58	38	$ 10,667	$ 8,889	Non-Depreciated
3500	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	01/09/02	01/09/10	136	0	$ 10,218	$ 8,515	Fully Depreciated
3503	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	01/09/02	01/09/10	136	0	$ 10,218	$ 8,515	Fully Depreciated
3514	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	01/22/02	01/22/10	136	0	$ 10,218	$ 8,515	Fully Depreciated
3522	77-03	Solid Waste SW Reedbird Ave	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,931.28	96	01/29/02	01/29/10	136	0	$ 10,241	$ 8,535	Fully Depreciated
3527	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	01/29/02	01/29/10	136	0	$ 10,218	$ 8,515	Fully Depreciated
3538	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	01/29/02	01/29/10	136	0	$ 10,218	$ 8,515	Fully Depreciated
3540	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	01/29/02	01/29/10	136	0	$ 10,218	$ 8,515	Fully Depreciated
3545	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	01/29/02	01/29/10	136	0	$ 10,218	$ 8,515	Fully Depreciated
3547	77-03	Solid Waste SW Reedbird Ave	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	01/29/02	01/29/10	136	0	$ 10,218	$ 8,515	Fully Depreciated
3548	77-03	Solid Waste SW Reedbird Ave	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	01/29/02	01/29/10	136	0	$ 10,218	$ 8,515	Fully Depreciated
3551	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 82,068.79	96	02/04/02	02/04/10	135	0	$ 10,259	$ 8,549	Fully Depreciated

Exhibit 7

Equip#	Dept	Dept Description	Make	Model	Year	AcqCost	LifeExp (Months)	Date in Service	ExpDate	#of Months in Service	#Months Remaining until Depreciation	Straight Line Depreciation	Cost as of April 2013	Status
3553	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	02/04/02	02/04/10	135	0	$ 10,218	$ 8,515	Fully Depreciated
3559	77-01	Solid Waste NW Sisson St	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	02/04/02	02/04/10	135	0	$ 10,218	$ 8,515	Fully Depreciated
3563	77-05	Solid Waste 111 KANE ST	FREIGHTLINER/LE	LOADPACKER	2002	$ 81,742.00	96	02/04/02	02/04/10	135	0	$ 10,218	$ 8,515	Fully Depreciated
3569	77-05	Solid Waste 111 KANE ST	FREIGHTLINER	LOADPACKER	2003	$ 81,632.00	96	07/17/02	07/17/10	130	0	$ 10,204	$ 8,503	Fully Depreciated
3800	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2003	$ 90,067.01	96	08/20/03	08/20/11	117	0	$ 11,258	$ 9,382	Fully Depreciated
3807	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2004	$ 87,478.88	96	10/17/03	10/17/11	115	0	$ 10,935	$ 9,112	Fully Depreciated
3811	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2004	$ 87,478.88	96	10/30/03	10/30/11	115	0	$ 10,935	$ 9,112	Fully Depreciated
3821	77-02	Solid Waste NE Bowleys Ln	FREIGHTLINER/LE	LOADPACKER	2001	$ 81,632.00	96	12/11/00	12/11/08	149	0	$ 10,204	$ 8,503	Fully Depreciated
3823	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2004	$ 87,478.88	96	12/02/03	12/02/11	113	0	$ 10,935	$ 9,112	Fully Depreciated
3845	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2004	$ 87,478.88	96	12/02/03	12/02/11	113	0	$ 10,935	$ 9,112	Fully Depreciated
3851	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2004	$ 87,478.88	96	12/31/03	12/31/11	113	0	$ 10,935	$ 9,112	Fully Depreciated
3852	77-03	Solid Waste SW Reedbird Ave	MITSUBISHI	LOADPACKER	2004	$ 87,478.88	96	02/05/04	02/05/12	111	0	$ 10,935	$ 9,112	Fully Depreciated
3859	77-01	Solid Waste NW Sisson St	MITSUBISHI	LOADPACKER	2004	$ 58,918.00	96	04/12/04	04/12/12	109	0	$ 7,365	$ 6,137	Fully Depreciated
3869	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2008	$ 116,240.00	96	04/23/09	04/23/17	49	47	$ 14,530	$ 12,108	Non-Depreciated
3872	77-03	Solid Waste SW Reedbird Ave	MITSUBISHI	LOADPACKER	2005	$ 91,978.88	96	02/02/05	02/02/13	99	0	$ 11,497	$ 9,581	Fully Depreciated
3873	77-02	Solid Waste NE Bowleys Ln	FREIGHTLINER/LE	LOADPACKER	2001	$ 81,742.00	96	12/14/00	12/14/08	149	0	$ 10,218	$ 8,515	Fully Depreciated
3880	77-03	Solid Waste SW Reedbird Ave	MITSUBISHI	LOADPACKER	2008	$ 116,240.00	96	04/27/09	04/27/17	49	47	$ 14,530	$ 12,108	Non-Depreciated
3892	77-01	Solid Waste NW Sisson St	MITSUBISHI	LOADPACKER	2005	$ 91,978.88	96	03/22/05	03/22/13	98	0	$ 11,497	$ 9,581	Fully Depreciated
3893	77-02	Solid Waste NE Bowleys Ln	MITSUBISHI	LOADPACKER	2008	$ 116,240.00	96	04/30/09	04/30/17	49	47	$ 14,530	$ 12,108	Non-Depreciated
3899	77-04	Solid Waste SE	MITSUBISHI	LOADPACKER	2005	$ 91,978.88	96	03/22/05	03/22/13	98	0	$ 11,497	$ 9,581	Fully Depreciated
3909	77-02	Solid Waste NE Bowleys Ln	FREIGHTLINER/LE	LOADPACKER	2001	$ 81,742.00	96	12/26/00	12/26/08	149	0	$ 10,218	$ 8,515	Fully Depreciated

Exhibit 8

Daily Route Data ~ Northeast Quadrant 1.26.13 through 2.1.13

	29-Jan Tuesday								30-Jan Wednesday								31-Jan Thursday								1-Feb Friday								Average Daily Route Time	Total Tonnage
	Route	Crew	Vehicle	Route Time	SRs	OT per Person	Disposal Site	Tonnage	Route	Crew	Vehicle	Route Time	SRs	OT per Person	Disposal Site	Tonnage	Route	Crew	Vehicle	Route Time	SRs	OT per Person	Disposal Site	Tonnage	Route	Crew	Vehicle	Route Time	SRs	OT per Person	Disposal Site	Tonnage		
DIX	2201	Tony Yarborough(SWD)					RESCO	7.13	2305	Tracy Bostic(SWD)					RESCO	6.63	2405	James Durant(SWD)					RESCO	8.36	2501	James Durant(SWD)					RESCO	8.90		
		Antoine Vines(SWW)	3184	8.50			RESCO	3.55		Levone Brown(SWW)	3198	8.00			RESCO	5.73		Andre McLean (SWT)	3869	7.00			RESCO	3.54		Andre McLean (SWT)	3869	8.50			RESCO	6.41	8.00	50.25
		Keith Finecey(SWW)								Allen Brewer(SWW)								Greg Griffin								James Branch(SWW)								
	2202	Akeem Louis(SWT)					QR	6.83	2306	Tony Yarborough(SWD)					RESCO	8.18	2406	Draytin Fuller (SWD)					RESCO	5.87	2502	Tony Yarborough(SWD)					RESCO	9.12		
		Levone Brown(SWW)	3164	9.50			QR	5.20		Keith fiencey(SWW)	3184	7.50			RESCO	4.42		Sean Lee (SWT)	3324	6.50			RESCO	4.56		Antoine Vines(SWW)	3184	7.50			RESCO	5.31	7.75	49.49
		Allen Brewer(SWW)								Antoine Vines(SWW)								Troy Harrison (SWT)								Keith Finecey(SWW)								
	2203	Draytin Fuller(SWD)					RESCO	5.08	2307	James Durant(SWD)					RESCO	5.90	2407	Tracy Bostic(SWD)					RESCO	7.92	2503	Draytin Fuller(SWD)					RESCO	9.31		
		Sean Lee (SWT)	3324	7.50			RESCO	5.64		Andre McLean(SWW)	3869	7.50			RESCO	5.10		Levone Brown(SWW)	3164	7.50			RESCO	3.09		Sean Lee (SWT)	3324	8.00			RESCO	5.63	7.63	47.67
		Troy Harrison(SWW)								James Branch(SWW)								Allen Brewer (SWW)								Troy Harrison (SWT)								
	2204	James Durant (SWD)					RESCO	7.99	2309	Draytin Fuller(SWD)					RESCO	8.66	2408	Tony Yarborough(SWD)					RESCO	8.17	2505	Tracy Bostic(SWD)					RESCO	7.30		
		James Branch (SWW)	3869	9.50			RESCO	4.75		Sean Lee(SWT)	3324	7.50			RESCO	3.01		Keith Finecey(SWW)	3184	7.50			RESCO	3.63		Levone Brown(SWW)	3164	8.50			RESCO	6.16	8.25	49.67
		Raymond Wright(SWW)								Troy Harrison(SWW)								Antoine Vines(SWW)								Allen Brewer (SWW)								
	EXTRA								EXTRA								EXTRA								EXTRA									
				8.75	0	0.00		46.17				7.63	0	0.00		47.63				7.13	0	0.00		45.14				8.13	0	0.00		58.14	7.91	197.08
ELLIS	2205	Kirk Stoehr(SWD)					RESCO	7.59	2301	Clifton Parrott (SWD)					RESCO	6.55	2401	Kristen Anderson (SWD)					RESCO	8.39	2504	Kirk Stoehr(SWD)					RESCO	8.30		
		Alvin Spriggs(SWW)	3177	8.00			RESCO	3.94		Larry Johnson (SWT)	3144	8.00			RESCO	5.29		Allen Durant(SWW)	3128	7.50			RESCO	4.13		Alvin Spriggs(SWW)	3177	6.50			RESCO	4.91	7.50	49.10
		Leroy Taylor(SWW)								Andre Smith (SWW)								Andre Thompson (SWW)								Leroy Taylor(SWW)								
	2206	Calvin Smith(SWD)					RESCO	6.98	2302	Kirk Stoehr(SWD)					RESCO	7.96	2402	Rodney Smith (SWD)					RESCO	6.04	2506	Rodney Smith(SWD)					RESCO	6.55		
		Andre Thompson(SWW)	3128	8.50			RESCO	6.41		Alvin Spriggs(SWW)	3177	8.00			RESCO	4.93		Jamal Colbert(SWT)	3185	7.00			RESCO	4.88		Jamal Colbert(SWT)	3185	7.00			RESCO	5.92	7.63	49.67
		Allen Durant(SWW)								Leroy Taylor(SWW)								Donald Johnson(SWW)								Donald Johnson(SWW)								
	2207	Rodney Smith (SWD)					RESCO	6.69	2303	Kirsten Anderson (SWD)					RESCO	7.31	2403	Kirk Stoehr(SWD)					RESCO	8.68	2507	Clifton Parrott(SWD)					RESCO	7.08		
		Larry Taylor(SWT)	3185	8.50			RESCO	5.24		Gary Crum(SWT)	3128	7.00			RESCO	5.31		Alvin Spriggs(SWW)	3177	7.00			RESCO	3.24		Andre Smith(SWW)	3166	6.00			RESCO	4.25	7.13	47.80
		Donald Johnson(SWW)								Vernon Williams(SWT)								Leroy Taylor(SWW)								Larry Jackson (SWW)								
	2208	Clifton Parrott (SWD)					RESCO	6.31	2304	Rodney Smith (SWD)					RESCO	6.84	2404	Clifton Parrott (SWD)					RESCO	5.92	2508	Kristen Anderson (SWD)					RESCO	7.92		
		Larry Jackson (SWW)	3802	8.00			RESCO	5.88		Jamal Colbert (SWT)	3185	8.00			RESCO	4.44		Andre Smith(SWW)	3144	7.00			RESCO	4.48		Allen Durant(SWW)	3128	6.00			RESCO	2.28	7.25	44.07
		Andre Smith (SWW)								Donald Johnson(SWW)								Larry Jackson (SWW)								Girard Scott (SWTD)								
	EXTRA								EXTRA								EXTRA								EXTRA									
				8.25	0	0.00		49.04				7.75	0	0.00		48.63				7.13	0	0.00		45.76				6.38	0	0.00		47.21	7.38	190.64
LEE	2209	Denise Carney(SWD)					RESCO	6.26	2308	Denise Carney(SWD)					RESCO	6.86	2409	Denise Carney(SWD)					RESCO	8.21	2509	Denise Carney(SWD)					RESCO	8.31		
		Richard Winder(SWW)	3161	9.00			RESCO	5.40		Richard Winder (SWW)	3161	8.00			RESCO	4.23		Richard Winder(SWW)	3161	9.50			RESCO	4.12		Richard Winder (SWW)	3199	8.00			RESCO	2.37	8.63	45.76
		William Diggs(SWW)								William Diggs (SWW)								William Diggs (SWW)								William Diggs (SWT)								
	2210	Robin Ghee(SWD)					RESCO	7.47	2310	Robin Ghee(SWD)					RESCO	6.76	2410	Robin Ghee(SWD)					RESCO	6.36	2510	Robin Ghee(SWD)					RESCO	7.58		
		Andre McBride(SWT)	3160	7.50			RESCO	4.23		Byron Scribner(SWW)	3160	8.50			RESCO	5.08		Andre McBride(SWW)	3160	7.00			RESCO	5.50		Andre McBride(SWT)	3160	8.00			RESCO	3.56	7.75	46.54
		Byron Scribner(SWW)								Andre McBride(SWT)								Byron Scribner (SWW)								Byron Scribner (SWW)								
	2211	Melvin Young(SWD)					RESCO	7.59	2311	Melvin Young(SWD)					RESCO	8.18	2411	Melvin Young(SWD)					RESCO	6.89	2511	Melvin Young(SWD)					RESCO	7.79		
		Timothy Adams (SWT)	3195	8.00			RESCO	4.41		Vernon Williams(SWT)	3195	8.50			RESCO	2.26		Keith Thompason (SWW)	3195	8.00			RESCO	4.49		Keith Thompson(SWW)	3195	8.00			RESCO	2.76	8.13	44.37
		Keith Thompson (SWW)								Keith Thompson(SWW)								Vernon Williams(SWW)								Vernon Williams(SWT)								
	EXTRA								EXTRA								EXTRA								EXTRA									
				8.17	0	0.00		35.36				8.33	0	0.00		33.37				8.17	0	0.00		35.57				8.00	0	0.00		32.37	8.17	136.67