

Full Cost Accounted
Annual Average Unit Cost Trends
In Montgomery County
Solid Waste Management

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Volume I: Report

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INTRODUCTION AND PURPOSE

The purpose of this report is to aid in:

- (A) *Trend analysis with respect to the cost-effectiveness* of the County’s various solid waste management activities, and
- (B) *Communicating with the public* about the cost of those activities.

There is a parable about a frog becoming boiled slowly, in a lidless pot of water. As the heat is turned up, so the story goes, the frog doesn’t jump out because, being cold-blooded, it does not sense the threatening change in temperature.¹ Trend analysis with respect to cost seeks to sense increases and decreases, over time, in the actual expenses of an organization. By comparing costs experienced from one time period to the next it provides a type of internal benchmarking. To be meaningful, annual expenses in such a time series must be defined consistently with respect to the scope of business activities to which they relate, and to be more meaningful, they can be normalized to a measure that is well understood to drive those expenses. In solid waste management, that cost-driving measure is “tonnage.”

Not infrequently, the County’s Division of Solid Waste Services (DSWS) receives a question such as, “*What does it cost to recycle, or to dispose of, a ton of trash?*” Solid waste, it must be noted, is not a homogeneous substance, like water, but rather is comprised of many different types of materials—virtually every substance in our culture. Consequently, managing solid waste encompasses a great variety of activities. The annual expenses of conducting those activities can be meaningfully normalized to the annual tonnage managed by each activity. The resulting parameters represent activity-based measures of cost performance in the form of “annual average unit costs”. A time series of such consistently defined unit costs can aid in identifying increases and decreases in the cost-effectiveness of the County’s management activities. Moreover, if the expenses associated with each activity are uniformly defined in a manner respecting full-cost accounting, then the approach can help communicate with the public accurately about the costs of County solid waste management.

This report derives a set of *Annual Average Unit Costs* defined so as to encompass all County solid waste management expenses for fiscal years 1997 through 2005. To be precise, the meaning of “Annual Average Unit Cost” is defined in the following fashion:

The term:	Refers to:
“ <i>Annual</i> ”	...the fact that each result is calculated on the basis of an entire year (a reference County <i>fiscal year</i> , July 1 through June 30).
“ <i>Average</i> ”	...the fact that both numerator and denominator values are measured over the same full (fiscal) year period—yielding, for a particular management activity, the cost for managing the <i>average</i> ton during that year.
“ <i>Unit</i> ”	...one <i>ton</i> (e.g. the costs of the activity are normalize to the <i>tonnage</i> of solid waste managed by the activity during the year).
“ <i>Cost</i> ”	...the County’s <i>full cost accounting expense</i> of conducting a defined scope of activity.

¹ Peter Senge, *The Fifth Discipline, The Art and Practice of the Learning Organization*, Doubleday, 1990.

ANALYTICAL APPROACH AND METHODS

SOLID WASTE MANAGEMENT ACTIVITIES—A COGENT SET FOR UNIT COSTS

As has been noted, the County conducts a variety of solid waste management activities. At the same time, it is desired to derive unit costs in terms of tonnage managed and full cost accounting (e.g. such that all County costs are recognized). For the purposes of this report, therefore, it is necessary, to parse the County's full scope of solid waste management activities into a cogent set of activities, and the costs and tonnage of each activity in that set must be as distinct, yet traceable, as available cost-accounting and tonnage records practically allow. That is, for each activity, both the full cost data associated with the activity, and the necessary tonnage data, must be available and discreetly associable. Applying those principles yielded the following inclusive set:

- County Refuse Collection
- Convenience Centers (Beauty Spots)
- Hazardous Waste Disposal, Residential and Commercial
- Transfer Station Disposal Operations
- Rail Transport of Processible Waste to Dickerson
- Waste-to-Energy Processing at the RRF
- Landfilling
- Vacuum Leaf Collection
- Waste Reduction and Recycling Only Facilitated by the County
- Recycling Drop-Off and Ferrous Recovery Activities at the Transfer Station
- Curbside Collection of Recyclable Materials
- Transport of Leaves and Grass to the Composting Facility
- Composting of Leaves and Grass
- Brush to Mulch Operations
- Residential Mixed Paper (RMP) Processing
- Processing of Commingled Containers at the Materials Recovery Facility (MRF)
- Enforcement Chargebacks
- Activities Attributed to Past or Future Year Tons

While the above titles may be descriptive, the specific scope of each activity is defined in the "Results" section of the report. The discussion of each activity there also indicates what costs are included and what tonnages are used to normalize the annual expenses to yield each annual average unit cost result. Complete details are available in Volume II of this report.

ACCOUNTING PRINCIPLES

Full Cost Accounting: Montgomery County manages solid waste under accounting standards and practices that isolate all of its solid waste management costs from the costs of other County enterprises and general government functions. That cost-isolation enables full cost accounting² wherein costs that would otherwise be blended-in with general government functions are, instead, fully recognized as solid waste management costs. Such costs as administration, use of shared buildings and shared equipment, overhead and indirect costs can be substantial, and failing to recognize them as solid waste management costs would not serve the purpose of accurately communicating about the costs of solid waste management. Therefore, this analysis takes full advantage of the cost-isolation detail available in the County's accounting system and presents the measures in terms of full cost.

Generally Accepted Accounting Principles: To enable meaningful year-to-year comparisons, this analysis is prepared on the basis of generally accepted accounting principles (GAAP) rather than a budgetary (cash) basis. The GAAP presentation basis is very useful, for example, because in GAAP, the cost of a capital asset is reported as its depreciation expense over its useful life rather than as single-year expenditure. A budgetary presentation would confound trend analysis. This report does deviate from the County's application of GAAP in one instance. This is with respect to the purchase of the recycling bins and carts that the County distributed to homes in its curbside recycling collection service districts. Since each cart is priced at substantially less than that County capital asset criterion, their purchase, even in bulk quantities, does not meet the capital asset criterion, and in the County books, they are fully expensed in the year purchased. In reality, those bins and carts generally last ten years, and their bulk purchase amounts have varied widely, especially in recent years. Therefore, their expense is treated in the manner of depreciation for the purposes of this report.

Tie to Audited County Financial Statements: Placing the analysis on a GAAP basis also helps the analysis to be "tied" directly to the Statement of Revenues and Expenses contained in the County's audited Comprehensive Annual Financial Reports (CAFR). Readers interested in cash-basis expenditure detail, their budget-to GAAP reconciliation, or cross-walks to each year's CAFR Statement of Revenues and Expenses, are referred to Volume II of this report, Appendix 1.

Accounting of Tonnages: Each autumn, Montgomery County conducts an accounting of all solid waste flows that occurred during the preceding County fiscal year. The results are posted on the County website at www.montgomerycountymd.gov/solidwaste. (The interested reader may go to that link and click on "DSWS News" and then chose the link to the desired detail.) The tonnages used in the denominators of each Annual Average Unit Cost measure in this report derive from that same accounting and are shown in Volume II of this report, Appendix 6.

² The use of the term "full-cost accounting" here refers to County costs and is not intended to connote the inclusion of non-County costs, such as the costs of businesses or homeowners to hire collection companies in areas not served by County collection services. Such analysis is beyond the scope or purpose of this study.

Relationship to Program Measures Published in “Montgomery Measures Up!”³

Costs and tonnage are not the only parameters of interest to managers and citizens. For a broader set of performance-measurement information—including measures of service quality, other measures of efficiency and outcome—the interested reader is referred to the annual County publication, Montgomery Measures Up!. That publication is organized by budgetary programs. Program Measures contained in Montgomery Measures Up! obey the unified format prescribed for the purpose of that County-wide publication. Solid waste Program Measures contained in that report cover approximately 75% of the County’s annual solid waste management expenditures. In that publication, however, activities are defined in terms of Budgetary Programs. Also, Program Measure costs are generally presented on a budgetary basis (e.g. not GAAP) and do not include all administrative costs nor any indirect costs. Readers interested simply in the cash-basis expenditures of any Budgetary Program of a Solid Waste Fund will find that information in Volume II of this report, Appendix 1.

³ <http://www.montgomerycountymd.gov/ombtml.asp?url=/content/omb/fy05/mmuappr/index.asp>

COST BREAKOUTS

It can be useful to distinguish different types of expenses. In the context of a time series, in particular, such breakouts can elucidate sources or contributions to overall cost trends. Thus, to enrich the potential usefulness of this analysis, several different types of expenses are distinguished in the presentation of results. Those brake-outs are as follows:

- Interest and Depreciation on Fixed Assets,
- Debt Service (of a third party contractor giving rise to County operating expense),
- Chargebacks (from other units of government),
- Allocated Administrative Expenses,
- Other Operating Expenses, and
- Revenues and Credits.

Interest and Depreciation Expenses of the County: The County may purchase a capital asset⁴ in one of two ways—either by an outlay of sufficient capital in one year (capital outlay), or by financing the purchase, such that it pays out debt service (scheduled principal and interest) over multiple-years. In both cases, GAAP accounting assures appropriate recognition of the resulting expenses over multiple years rather than in the year acquired. In 1993, the County sold Solid Waste Revenue Bonds in order to finance many of its solid waste assets, and these bonds were subsequently re-financed to take advantage of lower interest rates available in 2003. On a cash basis, the County experiences payments of scheduled principal and interest. In GAAP, the acquired asset is depreciated (a payout for borrowed principal is not a GAAP expense, depreciation taking its place) and interest payments are expressed on an accrual basis rather than on the basis of cash paid out during the accounting period. Depreciation and interest expenses resulting from County solid waste bond issues are allocated among the activities in this report consistent with the usage records of the bond proceeds. In the case of any capital outlay, cash is traded for an asset, and the asset is then “expensed”, for GAAP purposes, over the useful life of the item purchased. For safeguarding purposes as well as accounting, DSWS tracks the location and use of each of its capital assets, and in cooperation with the Department of Finance, DSWS also maintains a schedule of depreciation for those assets. Those tools provide the basis for properly attributing County depreciation expense to each unit cost measure. For details, the reader is referred to Volume II of this report, Appendix 3.

Debt Service (of a Third Party Contractor Giving Rise to County Operating Expense): Montgomery County’s Solid Waste Disposal System includes the Montgomery County Resource Recovery Facility (RRF). This facility, also known as a Waste-to-Energy Facility, is owned, for accounting purposes, by a third party—the Northeast Maryland Waste Disposal Authority (the Authority). The capacity of that facility is 100% dedicated to and controlled by Montgomery County, however, the Authority (not the County) issued bonds to finance its construction. The County may become owner of the RRF when the Authority’s bonds are paid off, in April 2016, but because it is not the owner during that period, the capital cost of that facility is not depreciated as a County expense. For services provided by the Authority, including dedicated use of the RRF, the County pays the Authority in a manner that enables Authority to pay off the bonds it issued for the County facility. In effect, part of the annual operating costs that the County pays for use of the RRF, represent the net debt service of the

⁴ The County defines a “capital” asset as one costing at least \$5,000 and expected to last more than 1 year. Such an asset is straight-line expensed over its useful life (e.g. a capital item costing \$50,000 and expected to last 5 years is expensed \$10,000 per year.

Authority (scheduled principle and interest, less all investment earnings of trustee accounts). Therefore, it is of interest, for the purposes of this report, to give a break-out to that portion of County operating costs resulting from that third party debt service.

Allocated Administrative Expenses: Expenses tracked in County budgetary programs entitled “Administration”, “Revenue Analysis and System Evaluation”, and “Automation” are not directly associated with specific tonnage-based activities. Nevertheless, commitment to full-cost accounting requires an attribution, or distributed association, of those administrative costs among each tonnage-related activity. Reasoning that the costs of administering the Division arise from the need to manage people, those administrative expenses were distributed among the sixteen Annual Average Unit Cost activities in proportion to the work years budgeted in each non-administrative budgetary program. For the full derivation of that allocation, the reader is referred to Volume II of this report, Appendix 2. To make the Results section of this report more meaningful, those allocated administrative expenses are given a distinct color breakout in the bar graph displayed there.

Chargebacks: These are expenses of other County agencies which, for various reasons, are charged to the Solid Waste Fund. The chargeback from the Office of County Attorney is distributed among the 16 measures in the same fashion as allocated administrative expenses discussed above. Other chargebacks are for scopes of services directly related to DSWS budgetary programs, and thus, are readily associated with the 16 tonnage-related measures. For specific attribution of these costs among the Annual Average Unit Cost Measures, see Volume II, Appendix 4.

Other Operating Expenses: This represents the total of all expenses associated with an activity, less the above-noted breakouts.

Revenues and Credits: Some solid waste management activities generate revenue to the County (e.g. sales of recyclable materials from the County recycling center). In some cases in which the County has contracted facility operation to a third party, the scope of work includes marketing a product with the stipulation that sales benefit the County in the form of lowered operating costs billed to the County. In this case, the benefit is referred to as a “credit” against operating expense. Few solid waste activities generate revenue or credit, but in cases that do (e.g. certain processing activities), the benefit is recognized within the derivation of the Unit Cost measure for the activity most proximate to the generation of the revenue or credit. In the bar graphs in the Results section, these credits appear as negative values (e.g. plot below the zero index line). For details on the values of revenues and credits see Volume II, Appendix 5.

The full derivation of each Annual Average Unit Cost measure is shown in the Volume II, Appendix 4. Following the section presents the resulting Annual Average Unit Costs.

Results

The inclusive set of eighteen solid waste management activities was identified previously. In this section, one page is dedicated to the concise description of each activity and is accompanied, an adjoining page, by a set of bar graphs illustrating the numerical results and their derivation. In all cases total historical expenses are illustrated including breakouts of expense component contributions as defined above.

Sixteen of the activities were normalized to the annual tonnages managed by those activities, yielding Annual Average Unit Costs. For each of those 16 activities, a second set of bar graph shows the annual tonnages managed each year by the activity, and a third bar graph shows the unit costs when the annual expenses are normalized to those annual tonnages. Thus, for all but two activities, each page of text is accompanied by three time series bar graphs each, depicting: (a) annual activity expense (with component breakouts), (b) annual tonnage managed by the activity, and (c) the resulting Annual Average Unit Costs (\$/ton).

Two of the activities—“Enforcement Chargebacks” and “Expenses Attributed to Past or Future Year Tons”—cannot be meaningfully normalized to any tonnage. The annual expenses of activities are presented for accounting completeness (e.g. to assure that all solid waste management expenses are recognized). While only total annual expenses are shown, for these last two activities, it is informative to observe their cost trends in raw expense.

For each activity, the results are presented in time-series fashion, and the linear regression best-fit trend for the entire nine-year period appears as a distinctive black dashed line. Since the value of money changes with time (e.g. inflation), it is necessary, as with any time series involving money, to recognize that changing value. Economists sometimes introduce the concept of “nominal dollars”, converting each year’s expenditures into inflation-adjusted results. For the purposes of this report, and its graphical presentation of results, that abstraction is avoided. Rather, each year’s actual expenses are presented in terms of each year’s dollar values (e.g. unadjusted for inflation) and each graphical result includes a continuous red-colored curve showing the annual value of the in Consumer Price Index⁵.

Discussion and results for each activity begin on the following page.

For the complete derivation, including ties to each of the annual audited financial statements, and for details as to the basis for allocation of expenses among the sixteen unit cost measures (as was necessary, for example with respect to administrative costs), the reader is referred to the preceding discussion and to the full appendices in Volume II.

Warning: These Results Are Not Useful For “What If” Analysis

People sometimes ask, “*What happens to County costs if a certain type of waste is shifted from trash can to recycling bin?*” The unit costs derived in this report cannot be used to forecast how County costs might change in response to shifts in tonnage from one activity to another. Readers interested in that type of analysis are referred to the companion report “Montgomery County Solid Waste Management System FY07 Marginal Costs”, available at: www.montgomerycountymd.gov/solidwaste/references

⁵ All urban consumers, Washington-Baltimore statistical area, as of January 1 of each year, not seasonally adjusted,

County Refuse Collection

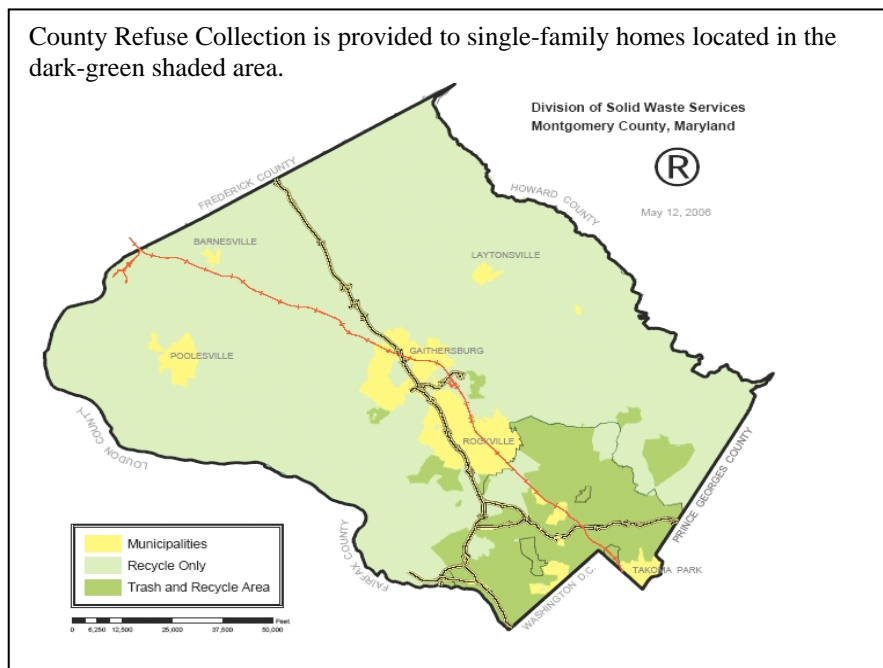
This measure encompasses all solid waste management activities involved in providing curbside collection of waste set out for disposal from single-family homes in the County's Refuse Collection District; all costs associated with the County's refuse collection service are included in this measure. The service includes once-per-week collection of regular household refuse set out for disposal, plus up to five bulk pick-ups per year of non-metallic items, per home served.



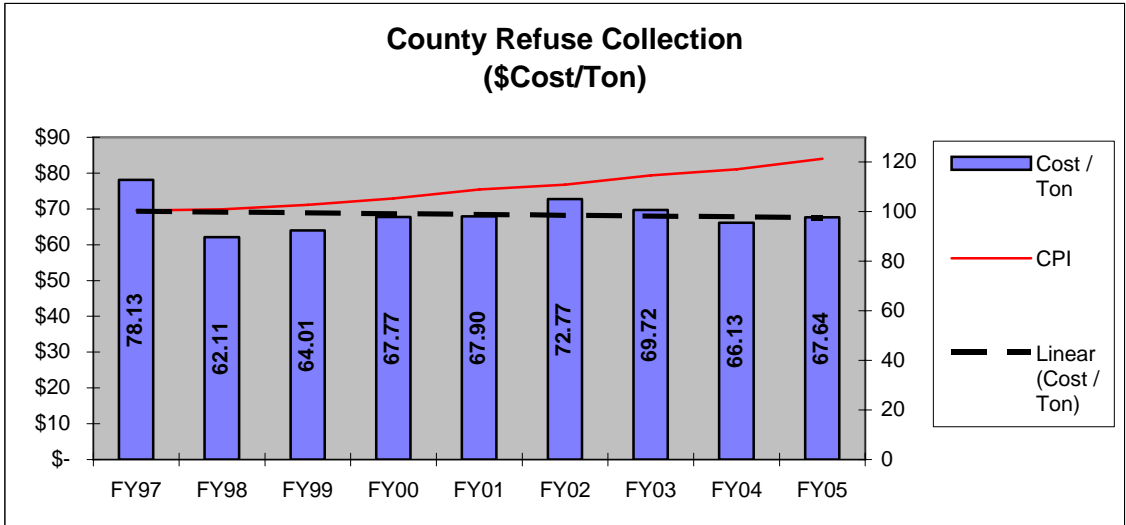
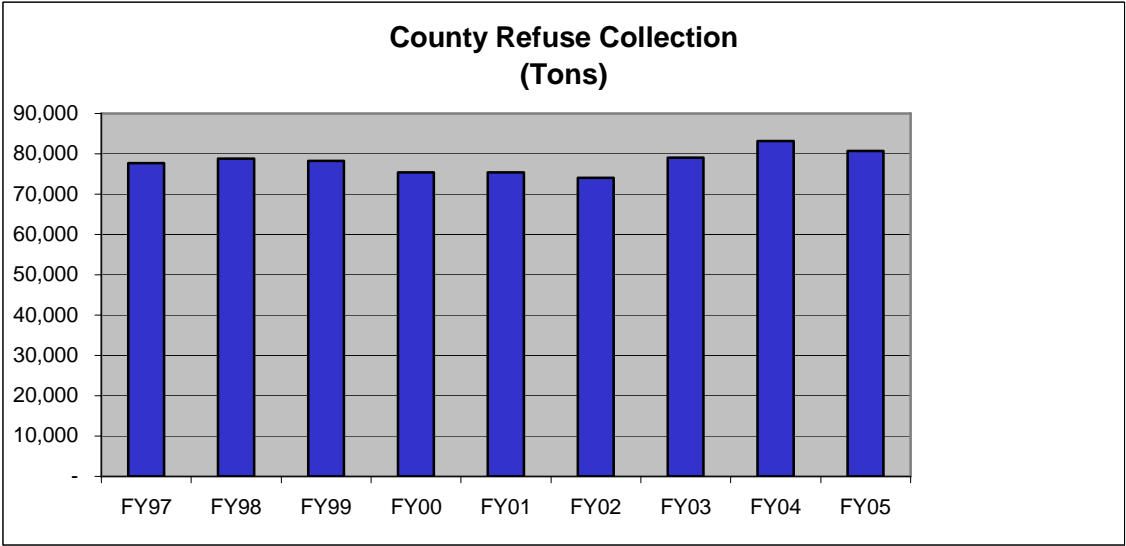
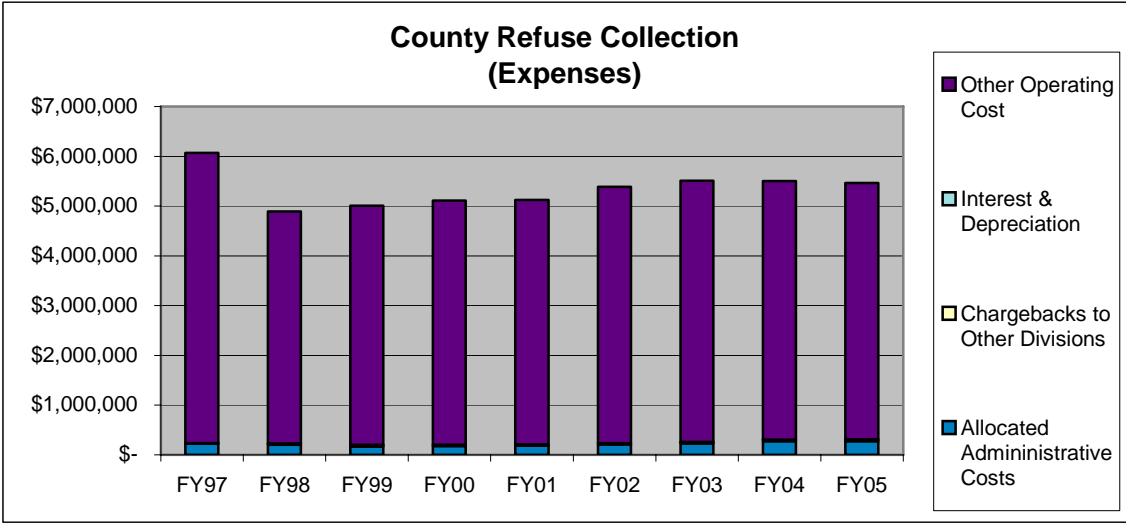
All waste so collected is delivered to the County Transfer Station.

Costs encompassed within this measure do not include any County costs of operations inside the Transfer Station. (See measure, entitled "Transfer Station Disposal Operations".) In as much as the County uses private-sector contractors to perform the collection, it is those contract costs that dominate this measure. Other cost components include: County personnel of the Refuse Collection Program, including managers and route/contract inspectors, allocated administrative costs, charges from other Divisions of County government (for certain kinds of enforcement), and small amounts of interest and depreciation.

County Refuse Collection is provided to single-family homes located in the dark-green shaded area.



County Refuse Collection is provided only to single-family homes located in the "Refuse Collection District" located in the southern portion of the County. In FY05, that was about 86,000 homes.

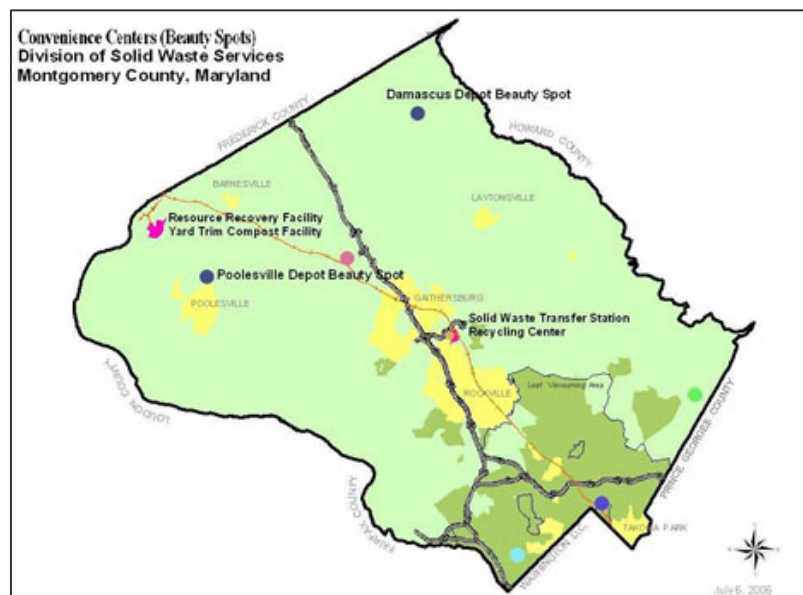


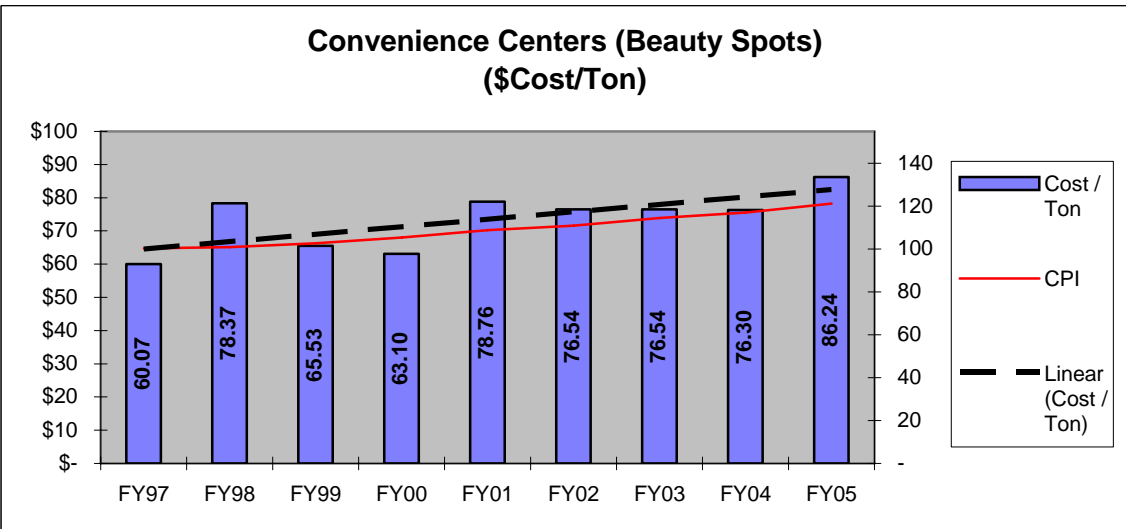
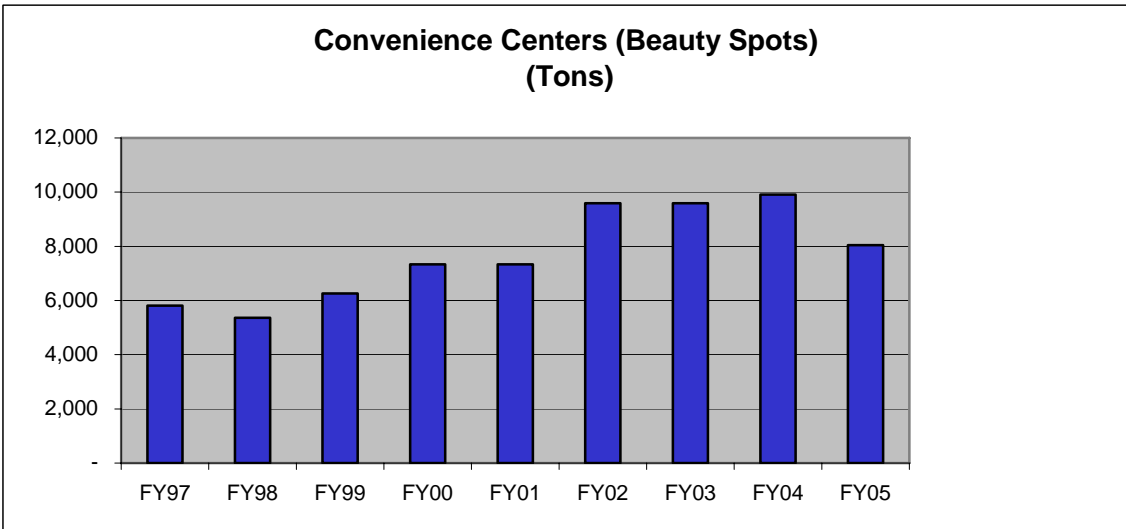
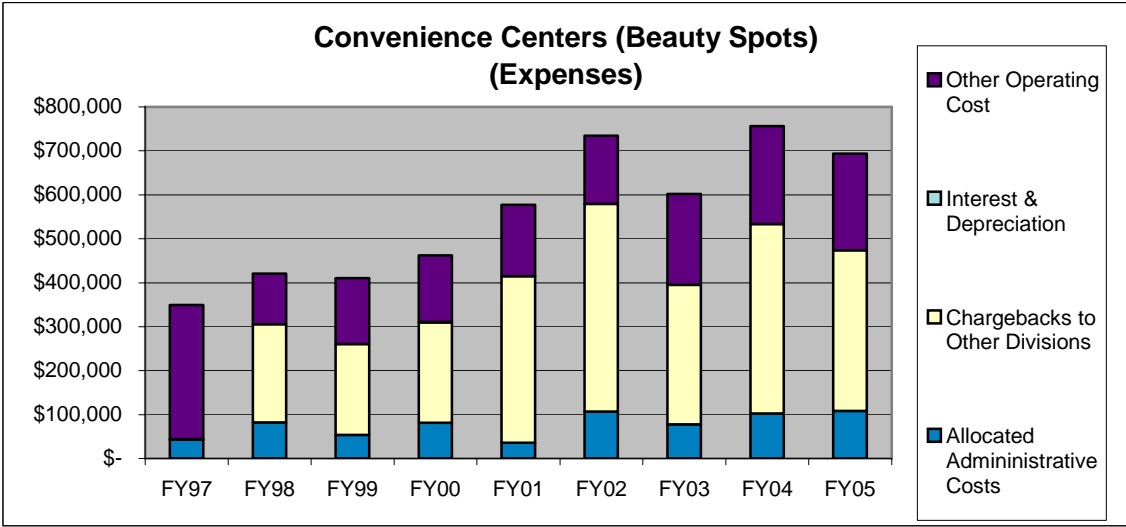
Convenience Centers (“Beauty Spots”)

This measure encompasses those solid waste management activities involved in providing the two Convenience Centers (also known as “Beauty Spots”, “Satellite Drop-Off Sites” or just “Satellite Sites”). The term “Beauty Spot” connotes the theory that operating these sites helps to limit the temptation to litter roadways with bulky waste. Restrictions apply; only residential waste is allowed and no regular household garbage. (Residents in the outlying parts of the County do not receive County Refuse Collection and must contract with private-sector collectors, the latter tending to charge substantial extra fees for bulky waste collection.) Another purpose of these sites is to provide convenience to residents located farther from the County’s Transfer Station. The two sites are located in Damascus and Poolesville. Costs in this measure tend to be dominated by those of staffing the centers and subcontractor costs required for transporting this waste to the County’s Transfer Station. For the most part, County staffing over the years has been provided by a sister agency to the DSWS as reflected in the “chargeback” component in the expense bar graphs.



There are two “Beauty Spots” in the County: One in Damascus, convenient to residents in the northern part of the County, and the other in Poolesville, more convenient to those in the west. Other residents find the Transfer Station more convenient.





Hazardous Waste Disposal Residential and Commercial

This activity includes the County's cost to accept, store and dispose of materials received as a result of the special household and small business hazardous waste collection programs.

Tonnages dropped consistently for several years as the County educated participants that latex paint is not hazardous. Some of the total tonnage attributed to this activity is *estimated*, the amounts being too small to be weighed using the County's truck scales, and are based on the number of outgoing units, such as drums or pallets.



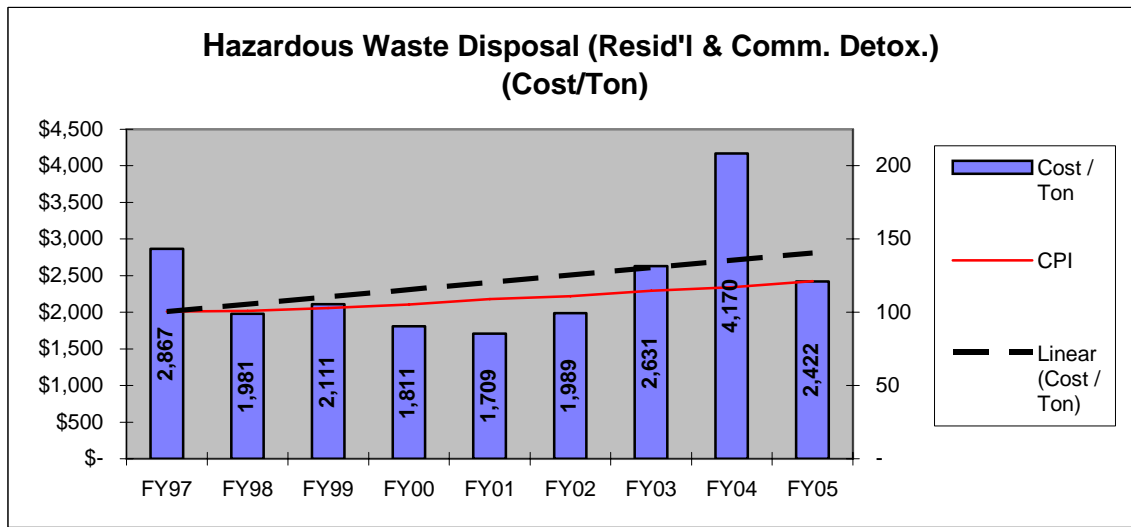
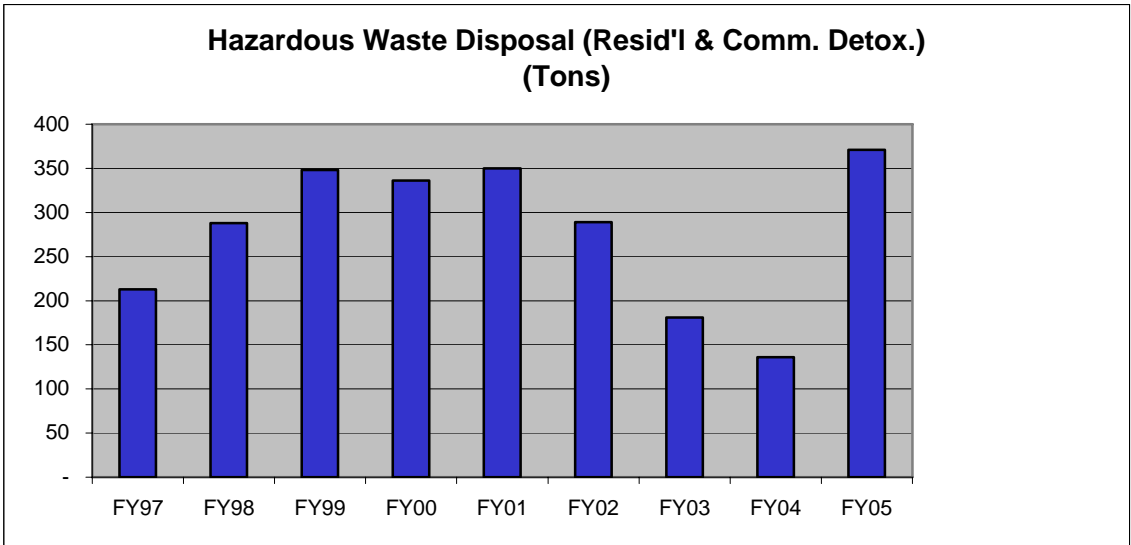
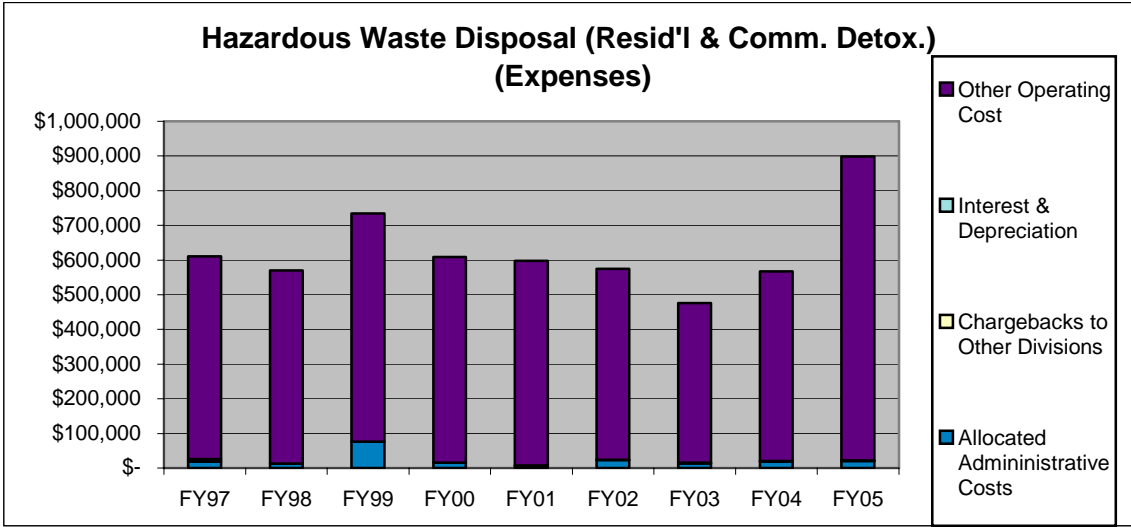
Expenditures increased in FY05 as the programs were offered on a more frequent basis. Beginning in FY05, the Household



Hazardous Waste receiving area at the Transfer Station was staffed from 9:00 AM to 5:00 PM, Thursday through Sunday. Businesses that generate less than 220 lbs. of hazardous waste per calendar month may register and utilize an associated ECOWISE program. ECOWISE collections are held from 1:00 p.m. to 5:00 p.m. at the Shady Grove Solid Waste Transfer Station on the second Wednesday of every month, rain or shine, but users must pay the contractor directly according to a posted schedule of company costs, which fees and costs are not included in County expenses.

Annual Average Unit costs are high relative to other waste management activities. However, it should be noted, that the purpose of these special collection programs is to manage a special type of waste, and in so doing, to reduce the overall "toxicity" or hazardous nature of the waste stream that the County must manage.





Transfer Station Disposal Operations

The County owns and operates a Transfer Station located just south of Gaithersburg at Shady Grove Road and Route 355. The primary purpose of a Transfer Station is to receive “disposal waste” from collection trucks and prepare that waste for efficient transportation to more distant locations. At the County’s Transfer

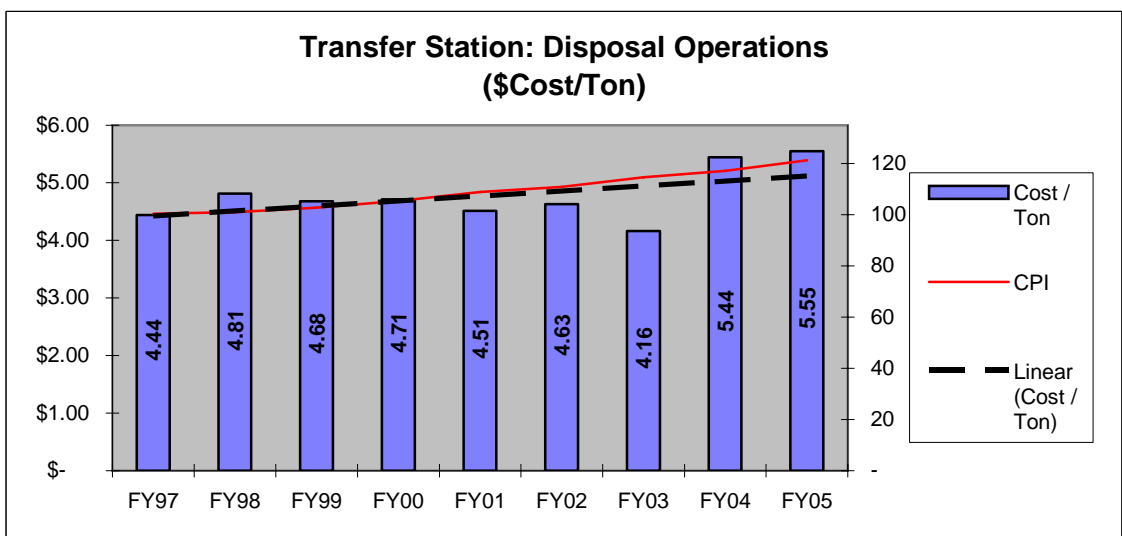
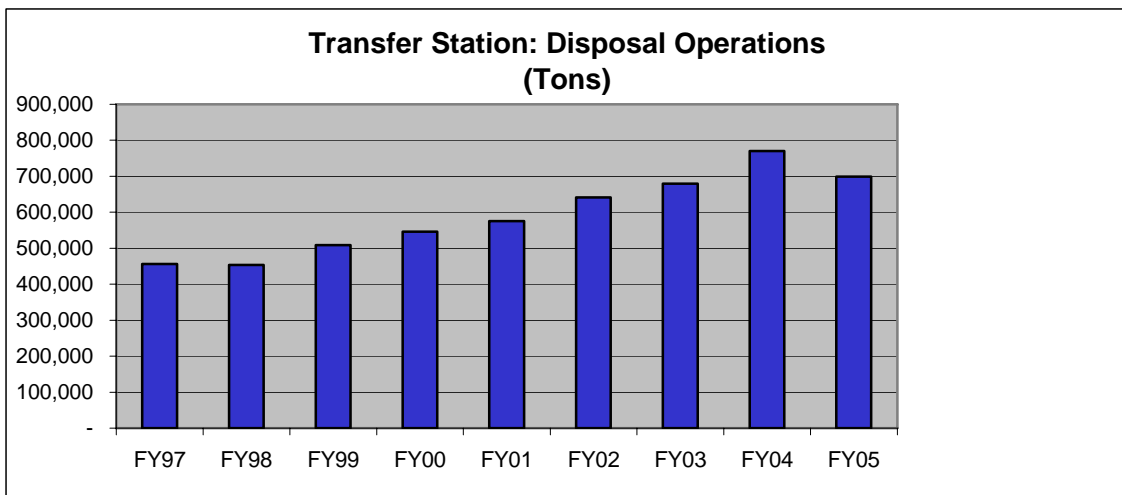
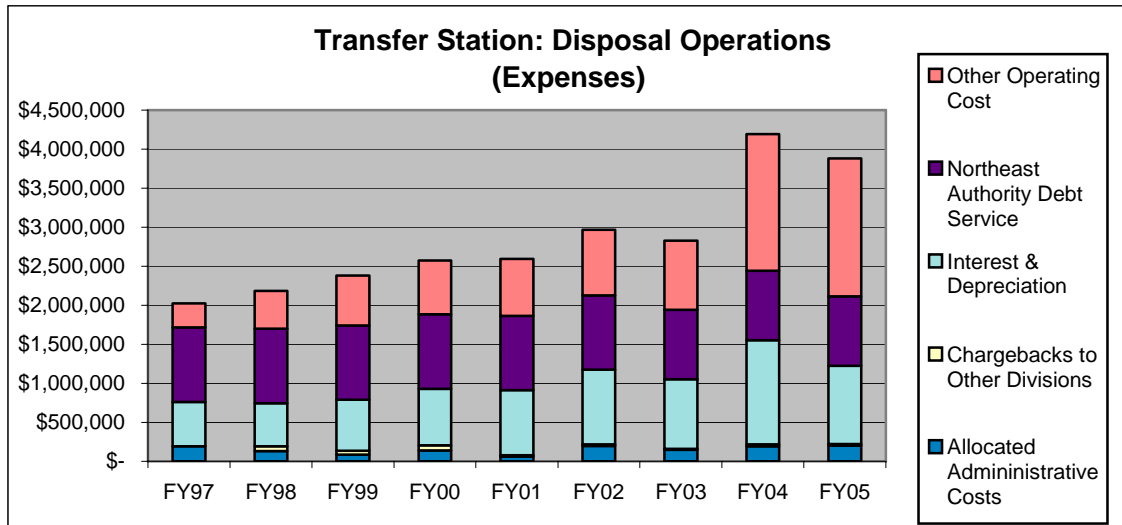


Station, these activities include: (1) operation of truck scales for proper tonnage data capture and billing involving approximately 400,000 transactions per year, (2) operation of a public unloading facility (PUF) to help citizens to drop off small loads, (3) compaction of the waste, and (4) out-loading for shipment via rail transport and long-haul transfer trailer. Waste that is “processable” (acceptable for processing at the County’s waste-to-energy facility) leaves the Transfer Station by rail and non-processible waste is loaded into over-the-road transfer trailers.

With notable exceptions, the costs encompassed by this measure include those of all activities conducted within the Transfer Station, with respect to waste delivered for disposal. Exceptions result from the fact that certain activities are performed at the Transfer Station by the County’s waste-to-energy contractor (Covanta, Inc.). For example, Covanta employees operate and maintain loaders on the tipping floor, the associated compactors, and the gantry crane used to place containers filled with waste onto railcars and build-up each day’s train. Covanta employs about 47 full-time equivalents located at the Transfer Station. For County contract purposes, the County’s costs for Covanta activities carried out at the Transfer Station are not isolated from those of waste-to-energy processing. Thus, the values of the unit cost measure derived here for “Transfer Station Disposal Operations” are understated, and likewise, the unit costs derived for “Waste-to-Energy Processing” (discussed subsequently) are overstated. This does not necessarily, however, hinder the usefulness of these measures for multi-year trend analysis as these measures are uniformly defined year-to-year.

It should be noted that within the physical bounds of the Transfer Station, several recycling activities take place, including the operation of an electromagnet on the tipping floor and a citizen drop-off for recyclables. For the most part, the County’s costs for these recycling activities that take place at the Transfer Station are conducted by subcontractors, enabling their cost-isolation and exclusion from this measure for separate treatment. (See separate measures below for “Brush-to-Mulch” and “Recycling Drop-Off” activities.)

The annual tonnage used to calculate the Annual Average Unit Costs for Transfer Station Disposal Operations is the sum of all tons loaded on rail to the RRF, all outgoing non-processibles (tons not processible at the WTE facility), plus any “by-pass” (e.g. any tons that were of a type processible at the WTE facility, but for any reason landfilled instead).

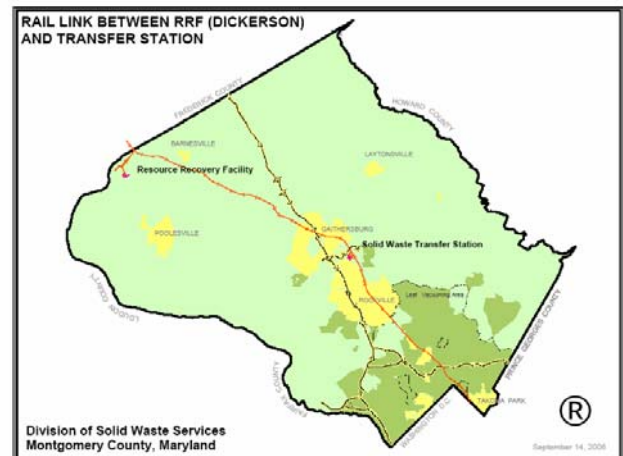


Rail Transport of Processible Waste to Dickerson

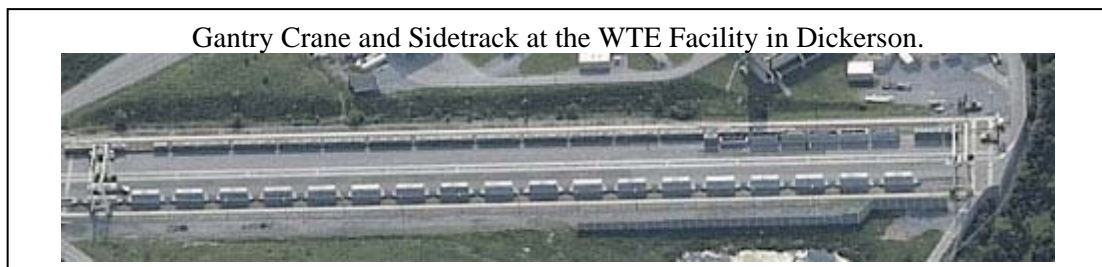
In order to assure the reliable movement of waste from its centrally-located Transfer Station to its Waste-to-Energy (WTE) facility located in Dickerson Maryland, and yet minimize truck traffic on County roads, Montgomery County pioneered the development of a solid waste rail transport system. The County developed specialized stackable waste containers and rail cars. The rail transport component of the County's Solid Waste Management System avoids over 25,000 truck trips per year from the Transfer Station to the WTE Facility.



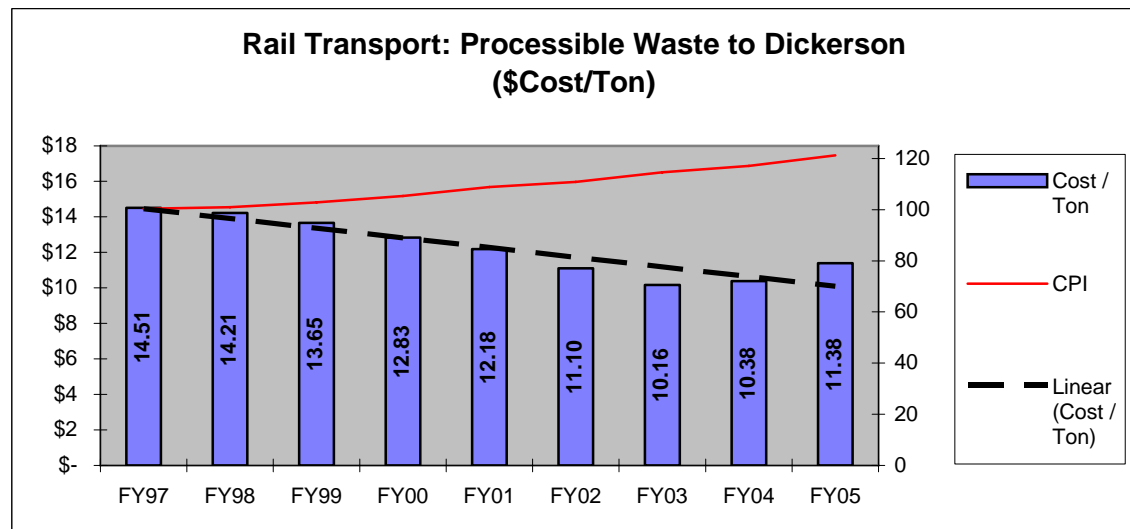
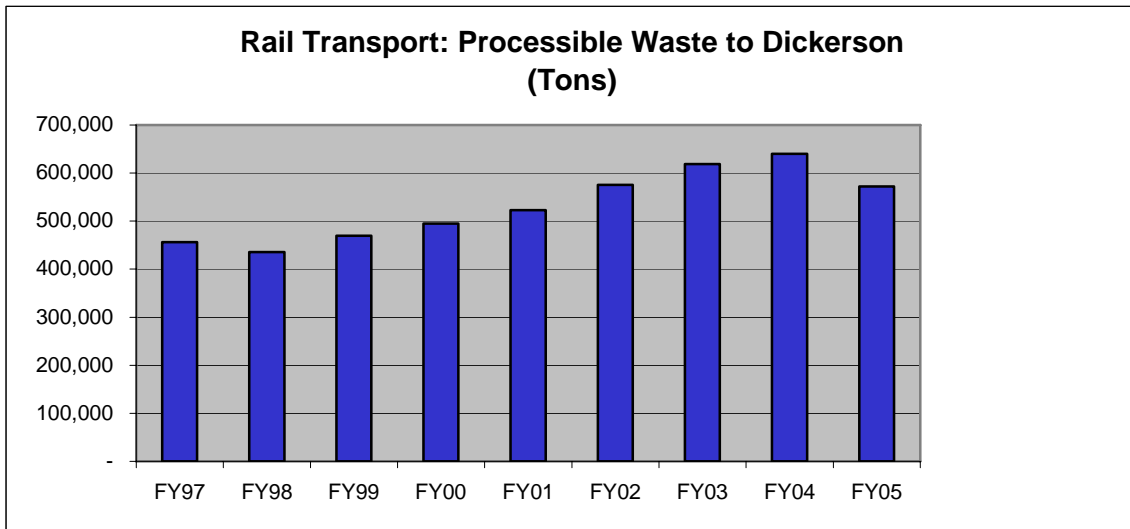
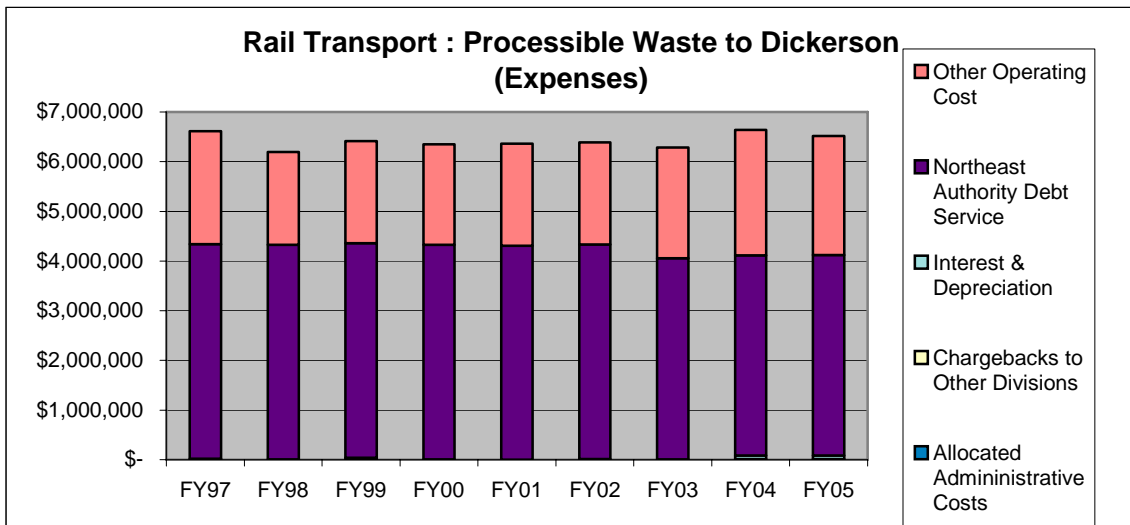
The Rail Component of the County system includes these special containers, rail cars, side track, rail yards and overhead gantry-based on-loading and off-loading facilities at each end of the system. This Annual Average Unit Cost measure includes all County costs resulting from the 20-year debt financing of the initial Rail Component plus depreciation on containers and cars that have been added over time, as well as the annual operating cost specific to moving each day's waste from the County's Transfer Station to its Waste-to-Energy facility. The actual movement of each day's



waste-laden train of railcars is carried out by a subcontractor, CSX, Inc., on tracks owned by CSX. (The waste is moved during off-peak hours, so as to not conflict with commuter traffic.) The County pays for this transportation within the scope of its Waste-to-Energy operating Service Agreement, but contract-required invoice back-up detail enables cost isolation and separate tracking of those CSX charges. The tonnage used in the denominator of this measure, is the annual tonnage loaded on rail during the subject fiscal period.⁶



⁶ This annual tonnage figure may differ from that reported as “processed” (e.g. burned) at the RRF due to changes in pit inventory and tons on rail overnight at the beginning and end of a fiscal year.



Waste-to-Energy Processing at the RRF

The scope of this measure includes all County expenses attributable to the processing of waste at the County's Waste-to-Energy Facility located in Dickerson, Maryland. This facility is also known as the "Montgomery County Resource Recovery Facility" (RRF). It is designed to be able to process most types of solid waste delivered for disposal to the County's Transfer Station. Processing at this facility results in:



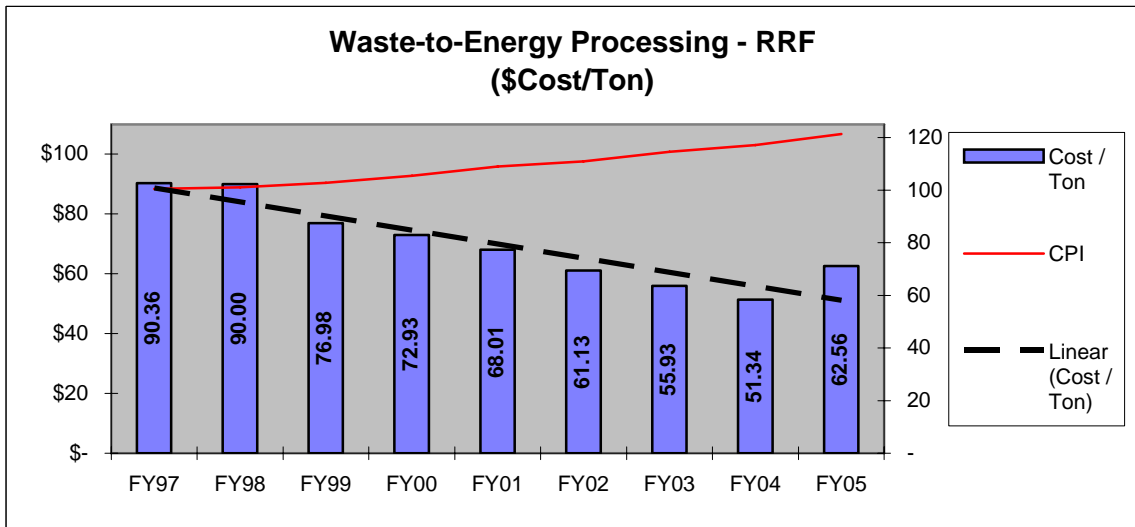
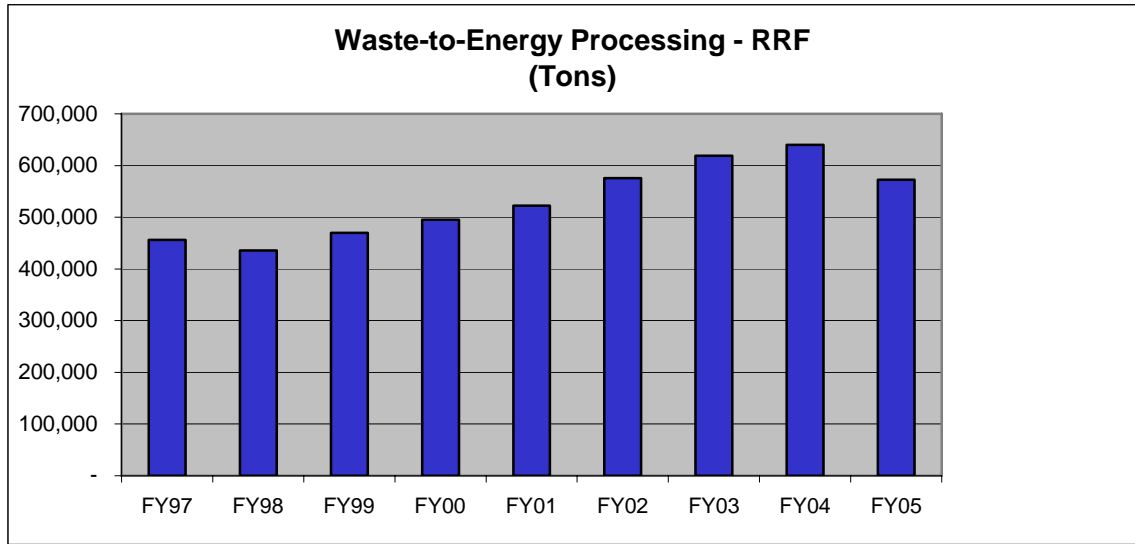
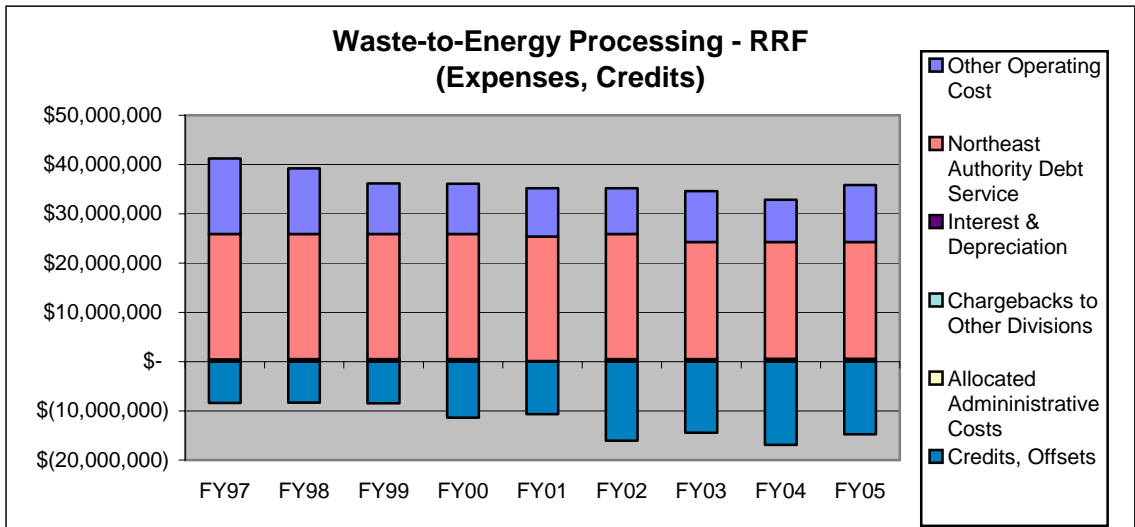
- Volume reduction, and weight reduction, of the waste via controlled combustion,
- Conversion of the recovered energy into electricity for sale, and
- Recovery of ferrous materials.

Weight reduction achieved is about 70%, useful energy recovery exceeds 575 Kwh/ton processed, and ferrous recovery exceeds 80% of all ferrous metals greater than 1" in diameter. The facility is owned, for IRS rule purposes, by the Northeast Maryland Waste Disposal Authority (the Authority)—the State entity that provided financing for its construction on behalf of the County. Contractual control of the facility, however, including all processing capacity is dedicated to the County. It is a modern facility, involving relatively sophisticated technology, and is operated for the County under a long-term Service Agreement through the Authority, by Covanta Energy, Inc..

The scope of Covanta's work under that Service Agreement includes certain substantial Transfer Station operations, the County costs of which have not been isolated here from those of WTE Processing. These include managing the Transfer Station tipping floor and compacting processible waste into special containers for rail transport. (Typically, Covanta assigns approximately 47 workers to its operations of the Transfer Station.) Thus, the expenses included in this measure inexorably include not just County expenses attributable to WTE operation, but also the cost of Transfer Station operations performed by Covanta.⁷ Tonnage used to calculate unit costs for this measure are the same as in the previous measure—tons loaded on rail and sent to the WTE facility.

As can be seen in the bar graphs, the majority of the County's expense for this activity is comprised of the net debt service of the Authority, which amount is scheduled and billed to the County through the Service Agreement. The facility was refinanced in FY03 to take advantage of lower interest rates, lowering that component of County expense. Sales of electricity and recovered ferrous provide large off-set credits against operating costs otherwise billable to the County. The trend toward lower Annual Average Units Costs of this activity is mostly due to better utilization of fixed costs and higher ferrous and electricity sales.

⁷ Because of this, the unit costs reported here for "Waste-to-Energy Processing at the RRF" are somewhat higher than they otherwise would be if those Covanta Transfer Station operations were isolated and attributed to the unit cost measure for "Transfer Station Disposal Operations". Likewise, the numerical values of the unit cost "Transfer Station Disposal Operations", discussed previously, are lower than they otherwise would be.



Landfilling

Waste reduction and recycling activities divert solid waste from disposal, and the County's Waste-to-Energy (Resource Recovery Facility) further reduces the volume and tonnage of solid waste needing to be disposed. Ultimately, however, some materials have to be landfilled every year. This Landfilling Average Annual Unit Cost measure encompasses the County's expenses for all activities involved in landfilling the year's tonnage. It does not encompass costs, or tons associated with maintenance of, closed landfills owned by the County (e.g. prior year tons).⁸ Thus, tonnages used in the

denominator of this measure, include all tons of ash residue remaining after processing at the County's RRF plus all non-processible wastes requiring disposal.

Allied Truck Leaving the Transfer Station,
Headed for Brunswick, VA



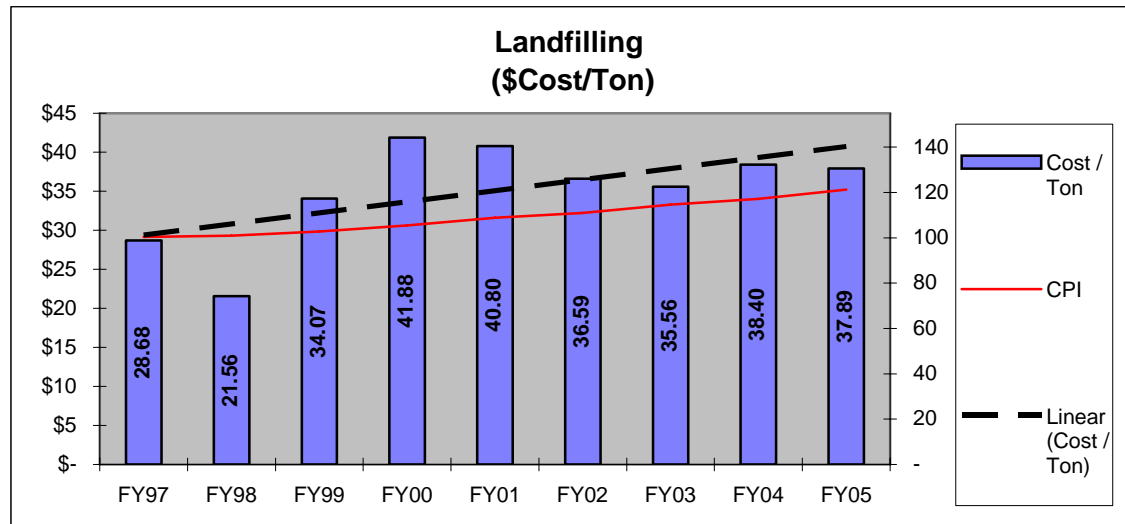
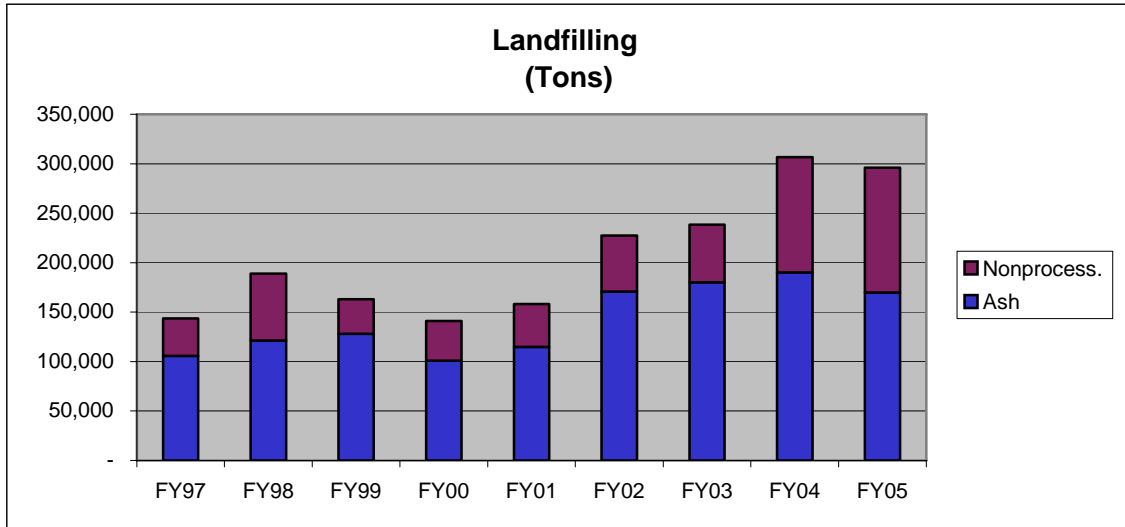
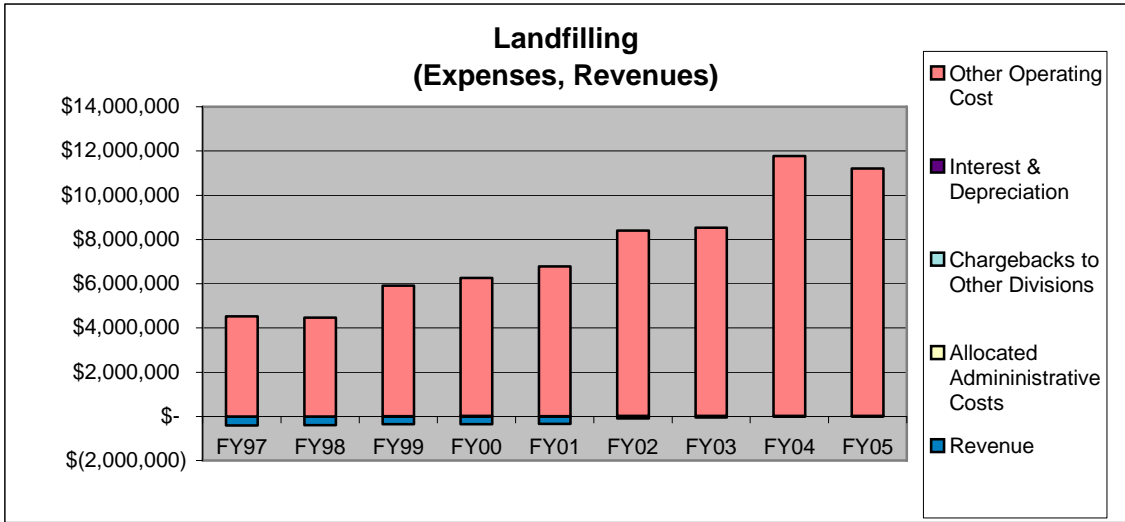
In a sense, it can be difficult to place a proper value on the use of a landfill. Landfilling is at the bottom of the waste management hierarchy, and the availability of airspace permitted for use as a landfill is a jealously guarded "resource" in any jurisdiction. Since October of 1998, the County satisfied its need for landfilling via a long-term "Out-of-County Haul" contract, the scope of which includes transportation from the County Transfer Station to an out-of-County privately-owned landfill, disposal at that landfill in cells dedicated exclusively to Montgomery County waste including all costs of post closure care.

Montgomery County RRF Ash Being Dumped In The Montgomery-
County Dedicated Landfill Cell At The Waste Management, Inc.
Landfill in Brunswick, VA.



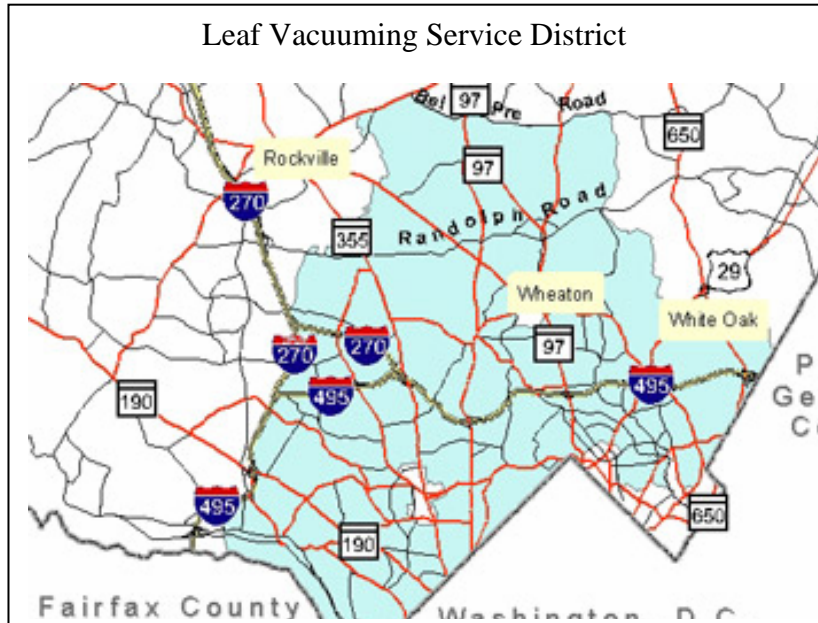
The resulting numerical value of this unit cost measure is dominated by the parameters of that "Out-of-County Haul" contract. Consistent with the full-cost accounting methodology of this work, this measure also includes all applicable administrative and indirect costs. It is useful to note that the per-ton contract costs for handling *residue* under the County's Out-of-County Haul Contract, is the same as the per ton cost for handling *non-processible* waste.

⁸ See measure entitled "Expenses Attributed to Past and Future Year Tons", discussed near the end of this report.



Vacuum Leaf Collection

In certain areas of the County (the Leaf Vacuuming Collection District), the Operations Division of the Department of Public Works and Transportation, performs a specialized collection of autumn leaves. Residents in this area may sweep leaves to the street curbside, and the County will then sweep up the leaves using special vacuuming equipment. Individual streets are posted to inform residents of the days when this will occur, and each street generally receives two sweeps each fall. The leaves that are collected constitute a solid waste that must be managed, thus this is considered a solid waste management activity.

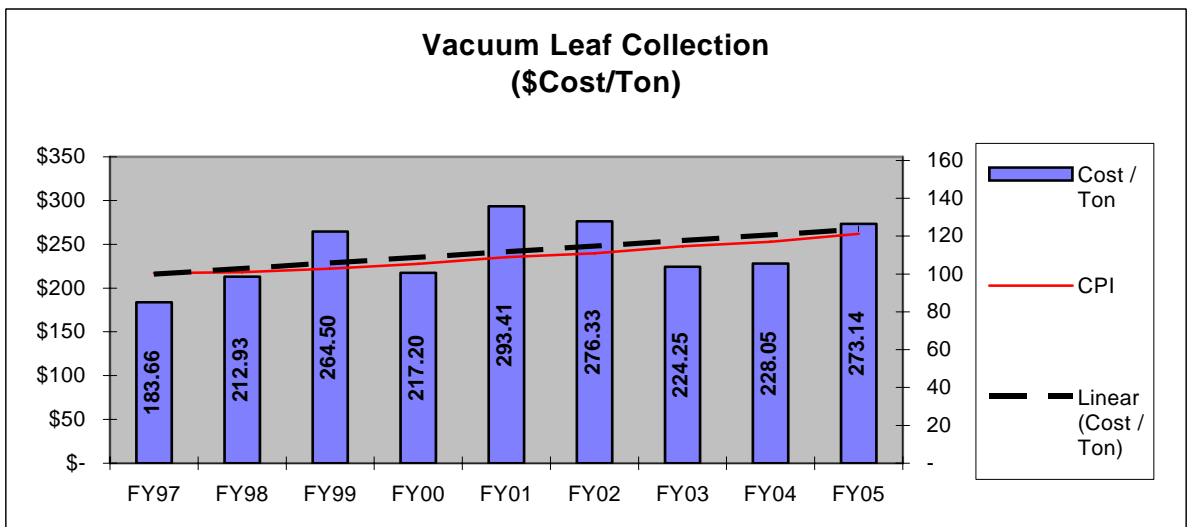
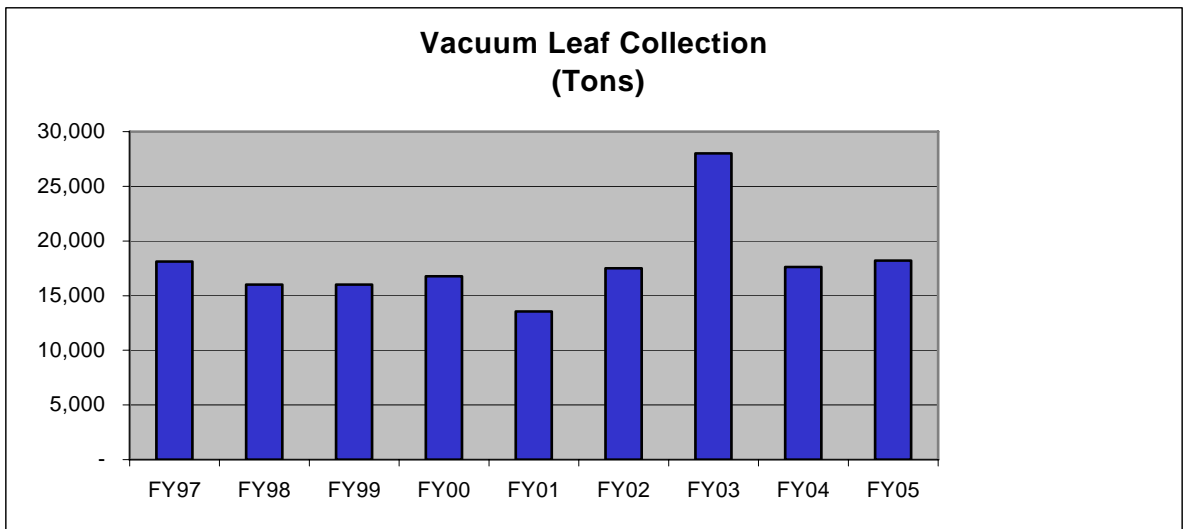
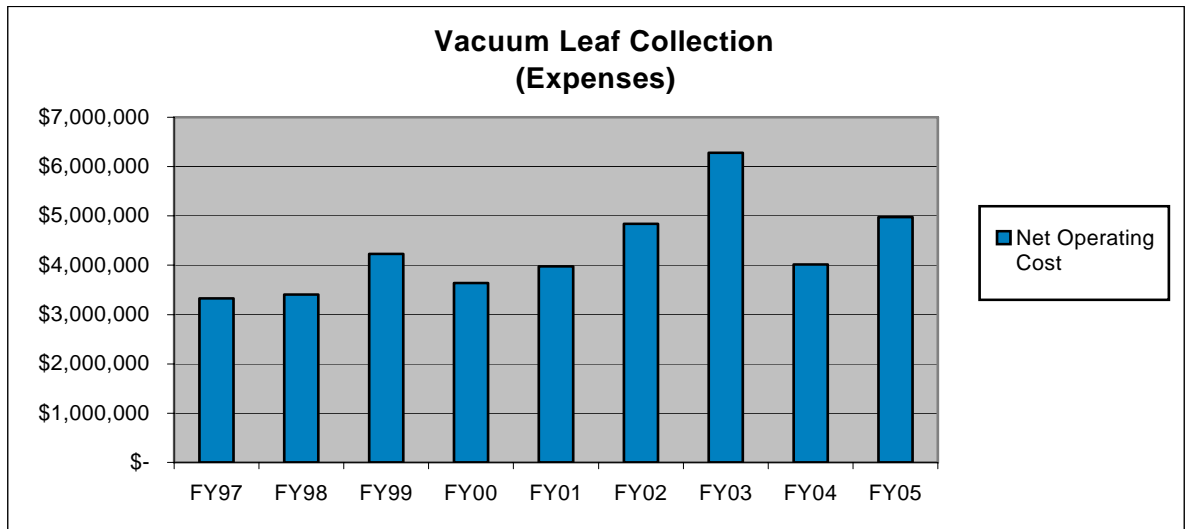


Once collected, the leaves are transported in dump trucks to one of two centralized locations—one at Brookville and the other at the Shady Grove Transfer Station. From both of those locations, the leaves are then transported to County’s yard trim composting facility along with other yard trim. However, costs included in this Average Annual Unit Cost Measure, include only those of conducting the leaf vacuuming service through delivery to



Brookville and the other at the Shady Grove Transfer Station. The costs included in this measure do not include those of transporting leaves from those centralized locations to the composting facility, nor does it include the cost of subsequent composting the leaves (those costs are included in the measure entitled “Composting of Leaves and Grass and Product Marketing”, discussed below).

With respect to the accompanying bar graph, it should be noted that a particularly intensive period of snow fall during the November-December collection period complicating collection during FY03 (with leaf collections extending into March that year). This underscores the effects that weather can have on both expenses and tonnage, and suggests caution against inferring meaning from other than long term trends.



Waste Reduction and Recycling Only Facilitated by the County

The County conducts a variety of activities to encourage, facilitate or enforce waste reduction and recycling, and not all waste reduction and recycling that occurs necessarily involves the use of County facilities or County equipment. In fact, a substantial amount of waste reduction and recycling takes place almost exclusively at the hands of private companies and/or private individuals (e.g. backyard composting by



from the “Outreach and Education” and “Support for Volunteers” Programs. The measure also includes allocations for administrative expenses associated with those budgetary programs, plus a chargeback from the Department of Environment for its work in education and outreach for promoting grasscycling and backyard composting).

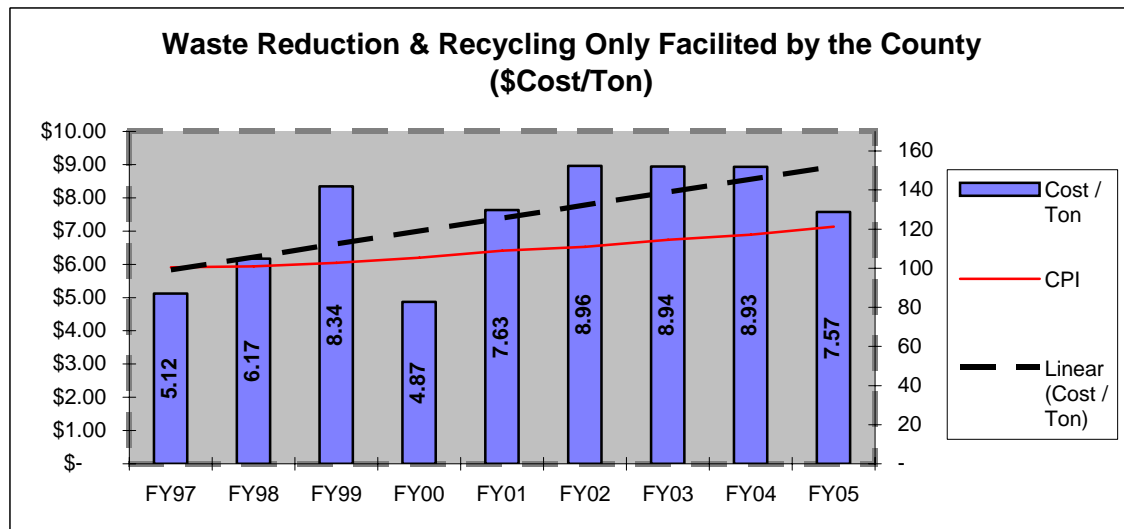
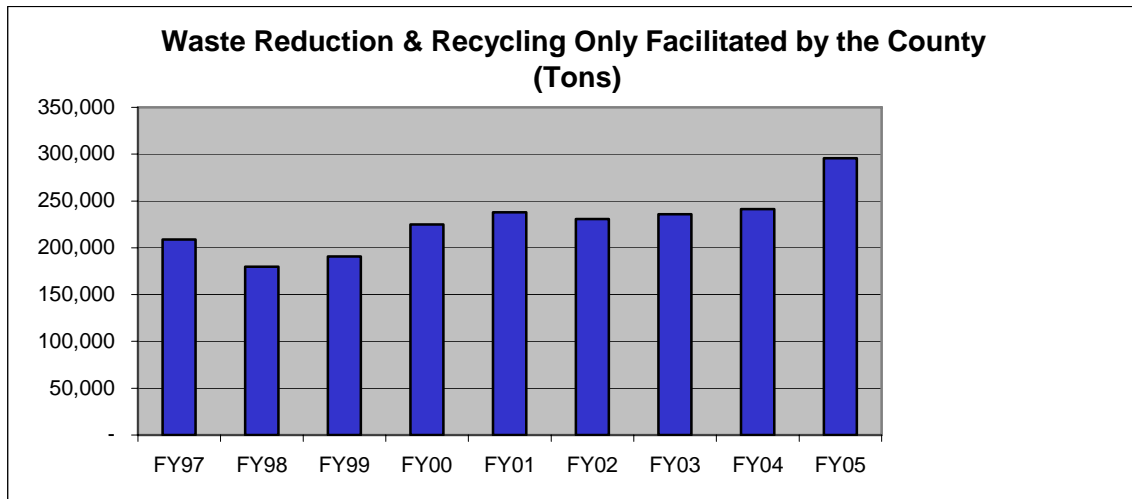
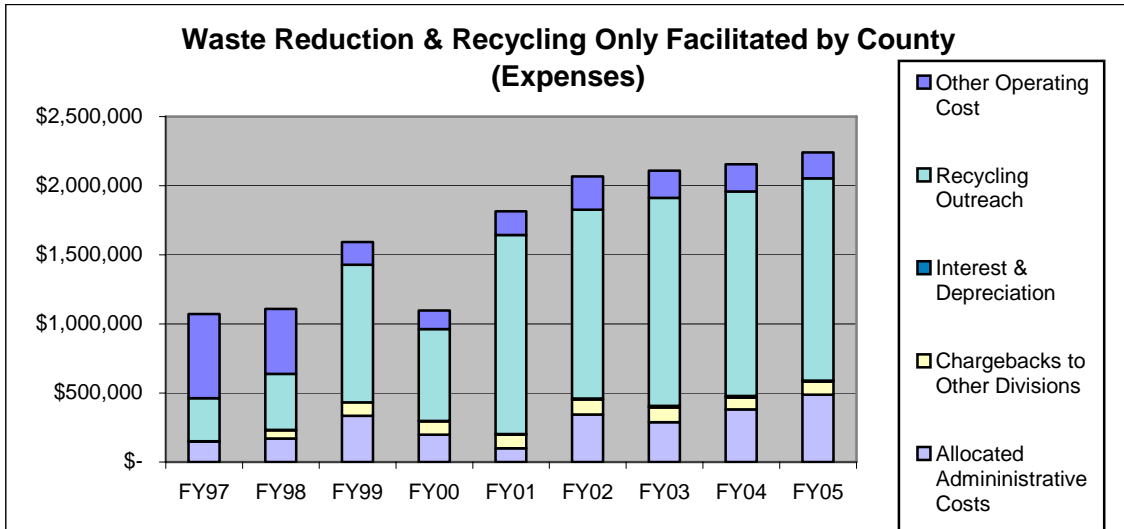


The small amount of depreciation attributed to

this measure is due to the use of motor vehicles and automation systems used in the above-named programs.



The tonnages used in the denominator to calculate the Annual Average Unit Cost of this activity are as contained in the County’s annual county-wide materials flow accounting. (See “Materials Flow Diagram” posted on the DSWS website in where a link provided in connection with the recycling rate calculation at www.montgomerycountymd.gov/solidwaste).



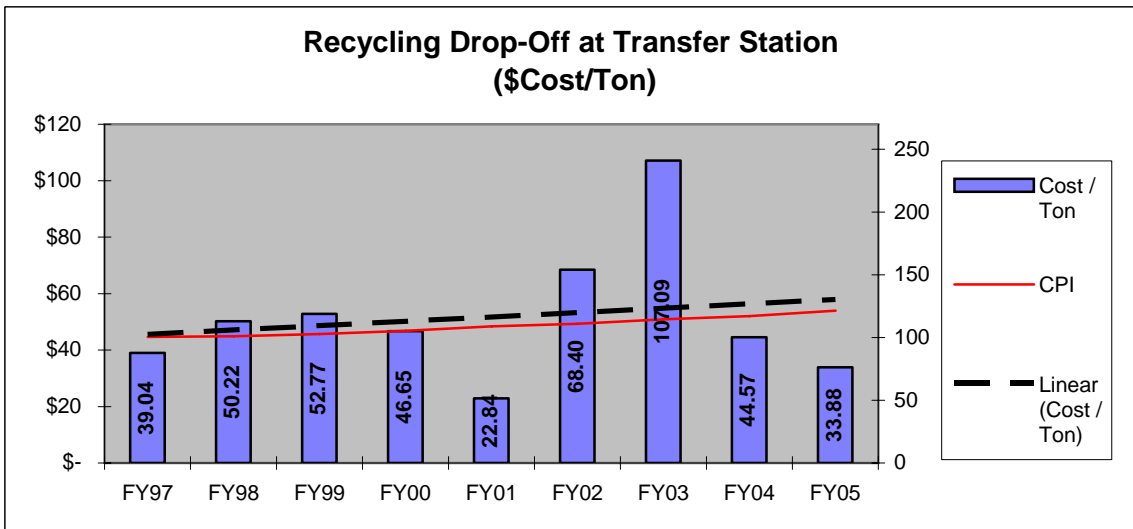
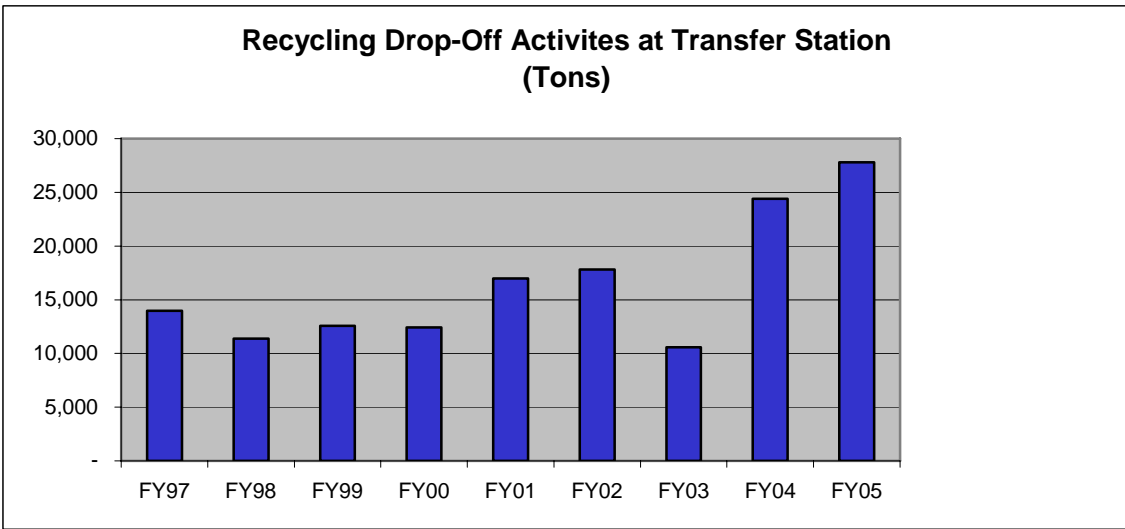
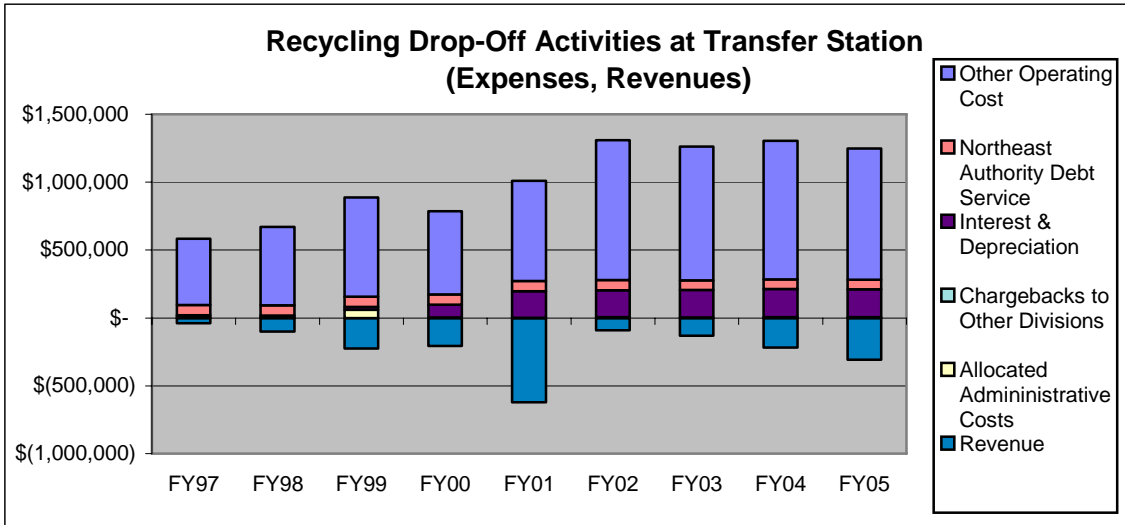
Recycling Drop-Off and Ferrous Recovery Activities at Transfer Station

Montgomery County recycles a wide array of materials through its Citizen “Drop-Off” Facility located within the grounds of its Shady Grove Road Transfer Station. Most of the tonnage of these dropped-off materials are paper and commingled containers which are transported immediately next door to the County’s Material Recovery Facility (MRF) for processing. However, dropped-off materials also include: automobile batteries, computers, donated building supplies, mattresses, propane cylinders, textiles, tires, used oil, and white goods. Buyers or users of these materials are found, generally at a cost to the County, to assure their recycling. Scrap metal and textiles, however, yield substantial revenue from buyers who accept these two types of material at the Transfer Station. In November of 2000 (FY01), the County began operating a 10KW electromagnet on the tipping floor of the Transfer Station to recover bulky ferrous material from waste delivered for disposal. The magnet is operated via a crane, and requires manual operation, which expense is recognized in this measure. The revenue enhancement and other benefits are thought well worth that cost. Although ferrous is also recovered by magnet from the RRF residue, recovery of bulky ferrous at the front-end is beneficial to the County for a number of reasons, including that it eliminates the cost of transporting it to the RRF, increases the electricity generation rate per pound of waste processed at the RRF, maximizes unit sales price for the ferrous so recovered, and reduces wear and tear on County compactors.



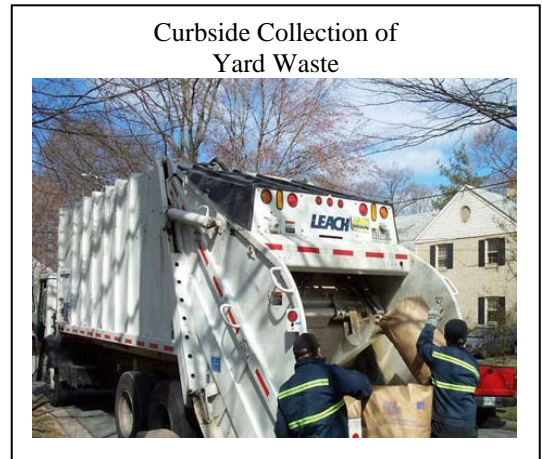
Expenses captured in this measure include all those required to manage the County’s Recycling Drop-Off Center and, beginning in FY2001, bulky ferrous recovery from the tipping floor. Revenues credited to this measure are those from textiles and white goods dropped off including ferrous recovered by magnet from the tipping floor. The annual tonnage used to normalize these expenses, is the total of those types of tonnage noted above which tonnages pass through the Drop-Off Center or are recovered from the tipping floor of the Transfer Station by magnet. Neither expenses nor revenues associated with the subsequent processing of commingled containers and paper are included in this measure (see separate measures for commingled containers and paper.) Likewise, revenues from white goods that are collected by County curbside collection contractors are not credited to this measure but rather to the curbside collection activity, which activity gives rise to those tons and is discussed next.





Curbside Collection of Recyclable Materials

This measure includes all County expenses associated with the County's Curbside Recycling Collection service. This service is provided to all single-family⁹ homes located outside of any of its municipalities. The service includes year-round curbside collection of all materials that are banned from disposal which residents must separately set out for recycling collection. For this purpose the County provides weekly collections for: (1) yard waste (bagged leaves and grass) and brush including branches up to 4" diameter; (2) all forms of paper that are clean and dry, and (3) commingled (e.g. "mixed") containers comprised of:



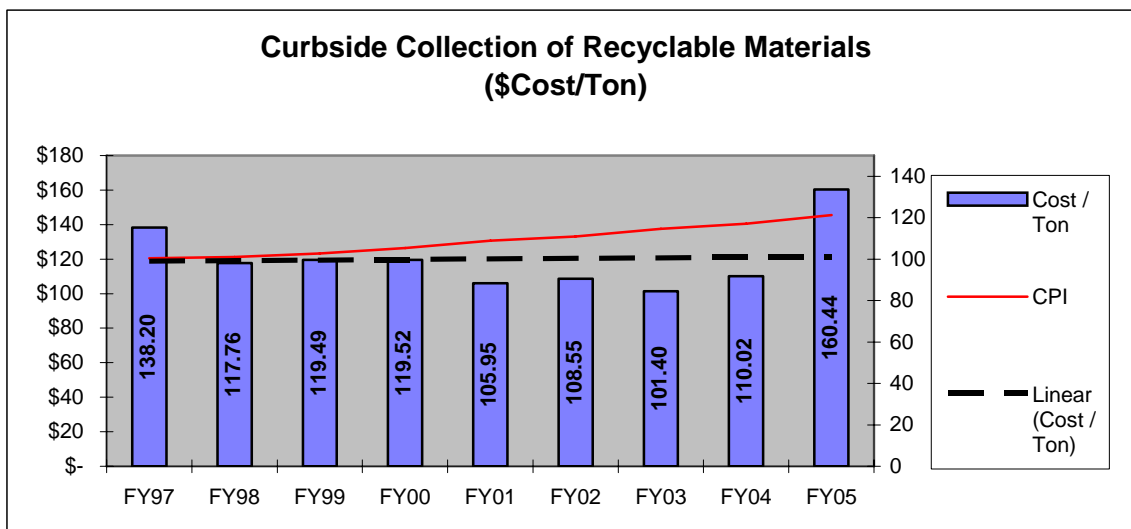
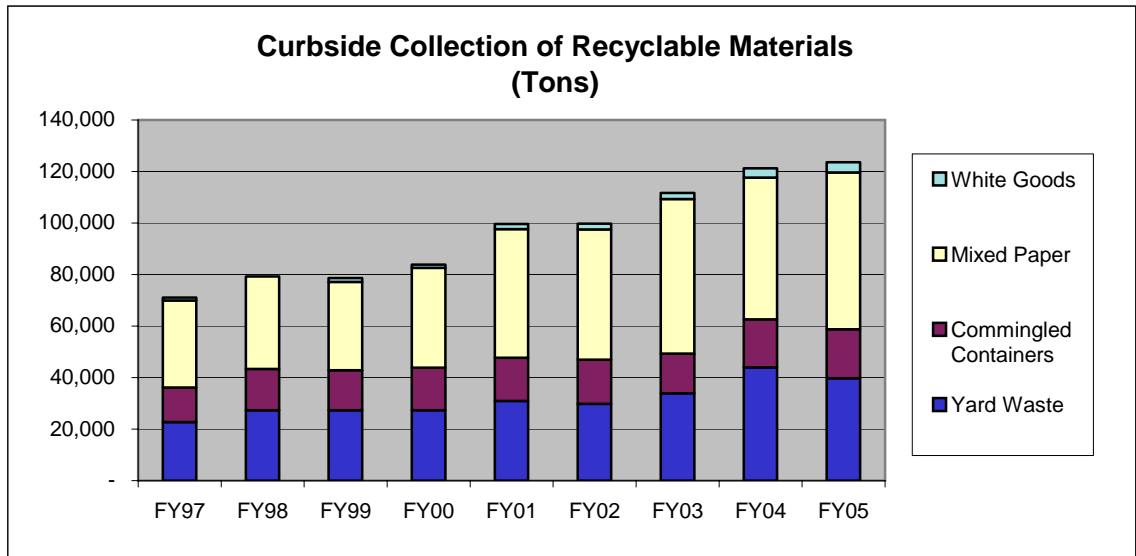
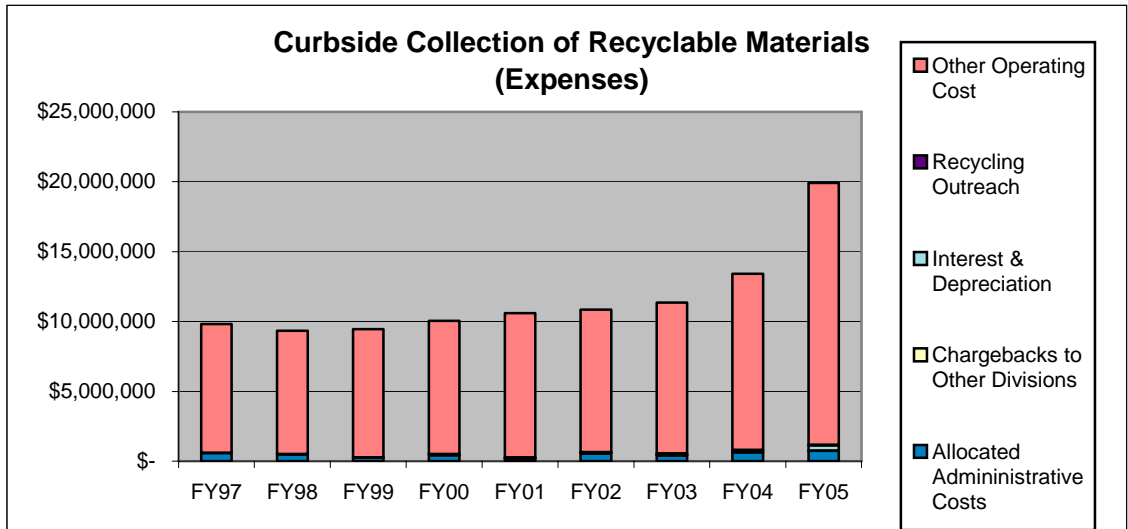
ferrous (bi-metal) food cans, aluminum cans and foil, all glass jars and bottles, and all narrow-necked plastic containers other than those that contained oil, antifreeze or household hazardous waste. In addition, this service includes "on-call" next-day collection for white goods (bulky appliances largely comprised of sheet metal). Yard waste and brush are collected in traditional compacting-type vehicle. Mixed paper and commingled containers are collected using a new type of compacting truck—one that has two separate compacting

chambers which keeps the paper separate from containers—but allows for differential compaction to each side yet a single-trip to collect both containers and paper. Both paper/container and yard waste collection trucks visit each home once per week all year long. In areas where the County also provides refuse collection, this recycling collection is scheduled to take place on the same day as refuse collection. County purchases of curbside recycling bins have varied widely: \$59, \$41, \$78, \$138, \$109, \$66, and \$85 thousand for FY97 through FY03, respectively, and then \$829 thousand in FY04, and \$4.228 million in FY05. For the purpose of trend analysis, these recycling bins have been expensed in the manner of depreciation, expensing those investments using an estimated 10-year useful life which period corresponds to the supplier's guarantee.

The scope of this measure includes collection from curbside and delivery to the County Recycling Center only. It does not include costs for processing the collected materials; separate measures are developed to address the different types of processing and marketing activities that the County must carry out in order to recycle these materials.

It should be noted that the County has contracted for collection services on the basis of five year contracts, with cost per service unit indexed to CPI, but otherwise fixed, and allowing the County two added years at its option. This accounts for rather steady expenditures from FY97 through most of FY03. However, all collection contracts have been re-bid recently with revised pricing having taken effect during FY04 and FY05, which accounts for the upswing in recycling collection costs near the end of the study period.

⁹ Includes all townhouses and all multi-family dwellings in buildings comprised of six or fewer dwellings.



Transport of Leaves and Grass to the Composting Facility

The County's Yard Waste Composting Facility is located in Dickerson, Maryland—not a central location relative to collection. Whether collected by vacuum truck or curbside collection service, all leaves and grass to be composted at the Composting Facility must be transported there from either the County's centrally-located Transfer Station, or, in the case of some vacuumed leaves, from the Brookville Depot which is located in the eastern part of the County. The scope of this

Ground Yard Waste Being Loaded At the Transfer Station Into A Walking-Floor Transfer Trailer for Transport to the Compost Facility



Unloading At the Compost Facility



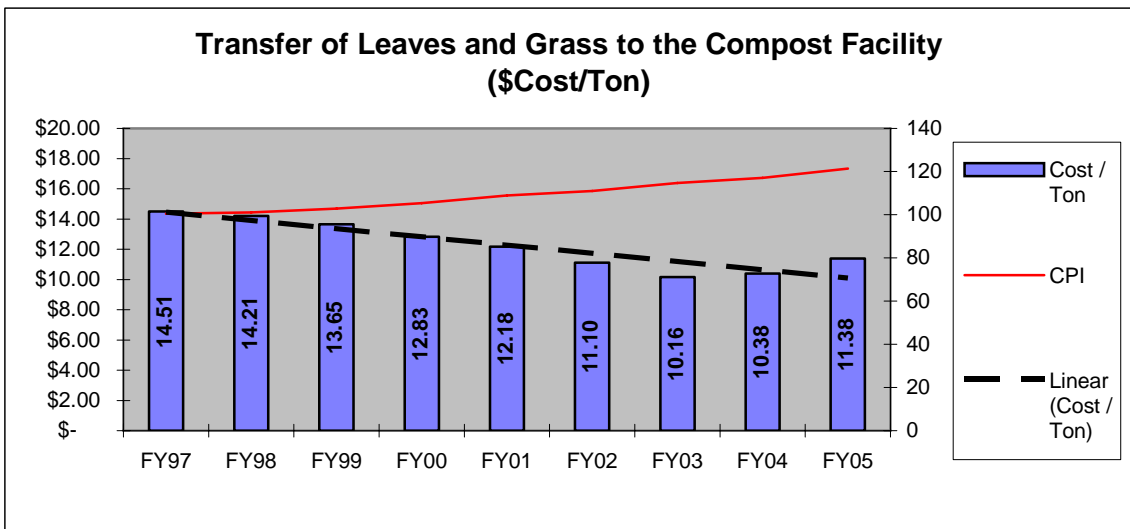
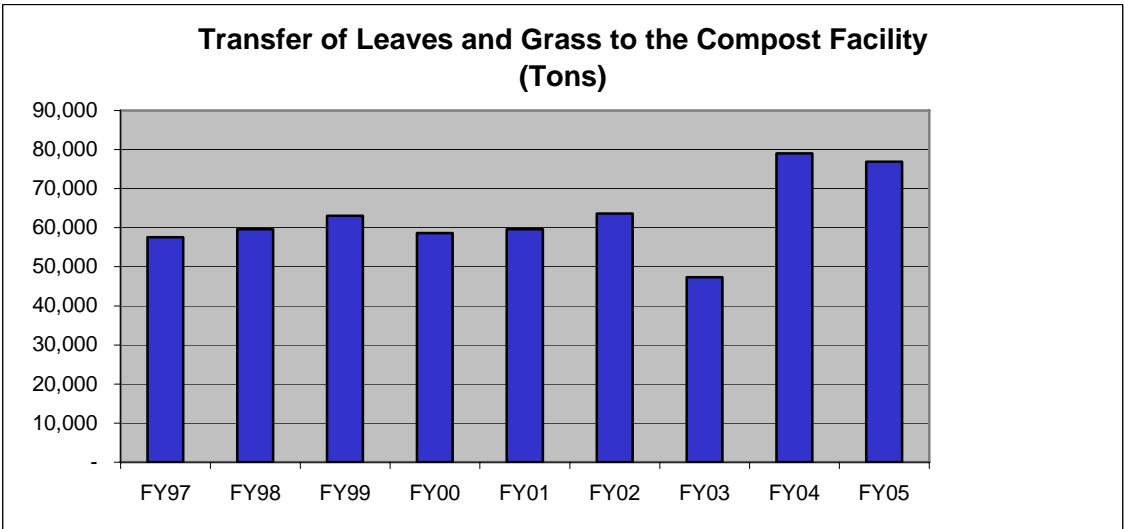
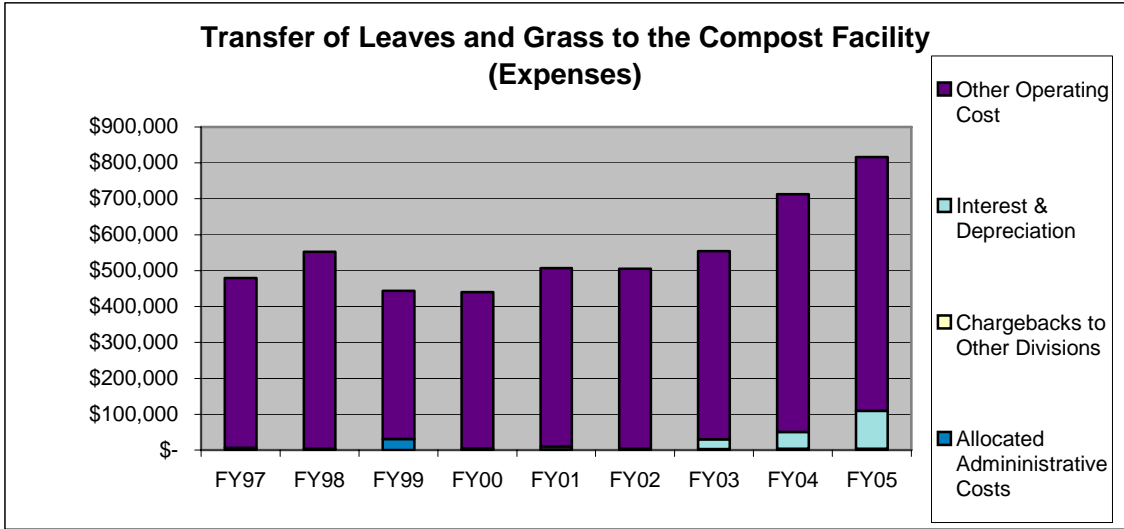
Special Yard Waste Rail Off-Loading at the Compost Facility Using a Tipping Chassis



measure is limited to the expense of this specialized transportation function. The function is achieved by multiple contract services involving 18-wheel transfer trailer, and, in the case of yard waste leaving the Transfer Station, also partly by rail link to the Dickerson site employing special cars and mobile tipping chassis.

When the train can accommodate it, transport of yardwaste by rail is more economic than trucking, and truck traffic is a concern to the residents in the facility area. In FY03, the County purchased five more rail cars and ten additional rail containers specially designed to transport yard waste.

To calculate the Annual Average Unit Cost, the annual expense of this activity is normalized to the total tonnage delivered to the County's Dickerson Compost Facility during the period according to the scale records at that facility.



Composting of Leaves and Grass

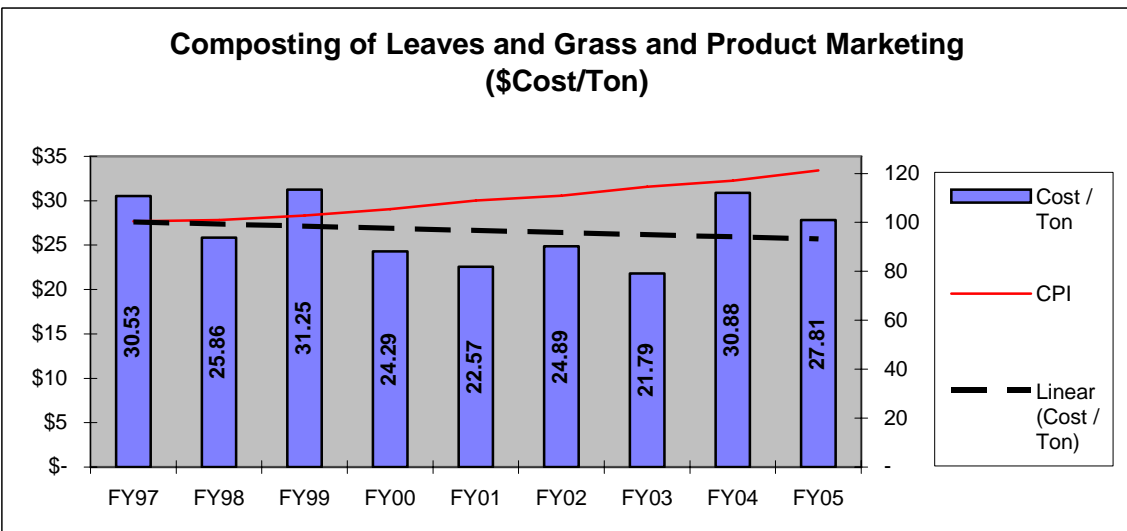
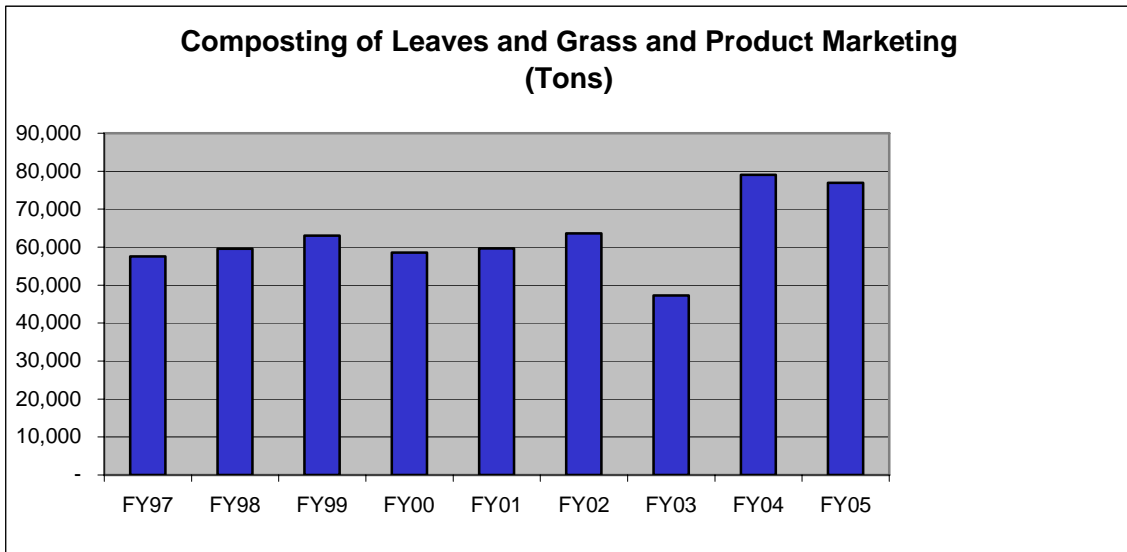
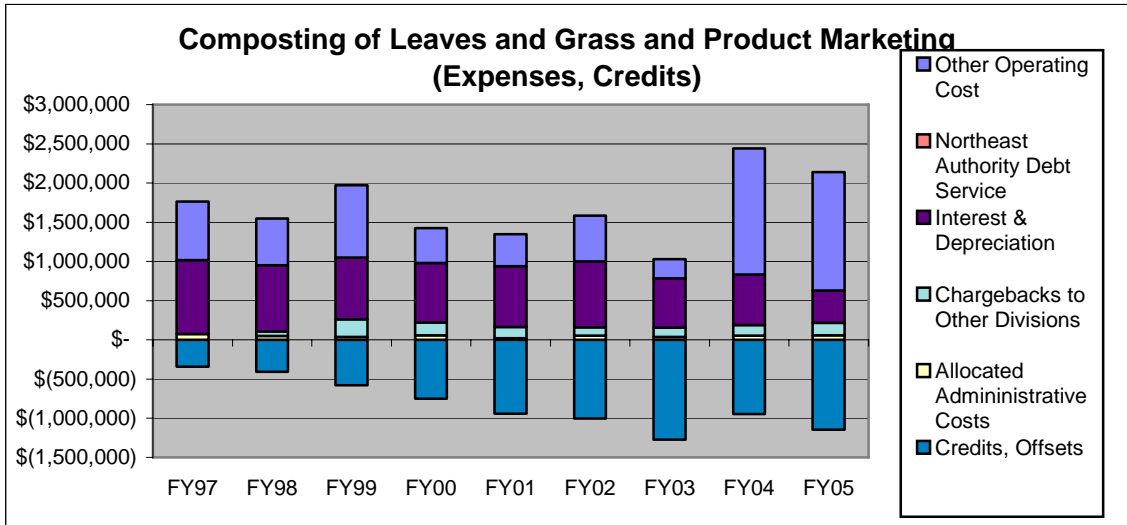
Yard waste composting is a key component of the County's recycling infrastructure. The scope of activities captured by this measure includes the grinding of leaves and grass received at the Transfer Station, which leaves and grass will be composted, loading of that material for transport to the Compost Facility, the actual composting of that material at the County's Yard Trim Composting Facility (Composting Facility) located in Dickerson, Maryland,



and the marketing of the compost products. This measure does not include the activity, at the Transfer Station, of separating woody waste (e.g. brush) from incoming yard waste, nor does it encompass transportation of the ground-up leaves and grass from the Transfer Station to the Composting Facility. (The separating-out of brush is covered under “Brush-to-Mulch Operations” discussed in the next section, and the transportation of ground leaves and grass was the subject of the “Transport of Leaves and Grass to the Composting Facility” measure discussed in the previous section.) The principle expenses encompassed by this Composting measure are those of contractor operations. Operating expenses also include some interest expense (as a portion of the proceeds of the County's Solid Waste Revenue Bonds were used for Compost facility improvements) and depreciation of Composting Program capital assets, chargebacks for environmental monitoring performed by the Department of Environment, and minor allocated administrative costs.

With respect to County Compost operating expenses, it is important to recognize that the sales of compost product represent revenues to the third-party operating contractor (e.g. are not booked as revenue to the County) but, rather, are netted-out of the operating expenses chargeable to the County by that contractor. Thus, those third-party revenues represent credits against operating costs, and appear in the accompanying bar graphs as negative values (below the zero-index). The County operating expense is net of those sales credits.

Delivery of yard waste to the County's Dickerson Composting Facility has been restricted, by agreement with the Sugarloaf Citizen's Association, to 77,000 tons per fiscal year. During years in which that allowance has been insufficient, the County located backup composting capacity at out-of-County locations. For example, during FY04, the County received 79,051 tons of leaves and grass requiring composting. Any County expense involved in securing that backup composting capacity is included in this measure. The annual tonnages used to normalize the County's total annual composting expense, is the sum of deliveries to the Dickerson Compost Facility during the fiscal year plus any tonnage delivered to back-up composting facilities.



Brush to Mulch Operations

As noted above, woody yard trim material (e.g. brush) is not amenable to composting. The County's experience, however, is that this material can be recycled, if processed to form a desirable mulch product and distributed to locations sufficiently convenient to County residents. The County recycling center, located next to the Transfer Station, is convenient to many residents. Therefore, the grounds of the County Recycling Center contain a fenced-off area designated as a "Mulch Preserves" location, from which residents may come and self-load the product into their vehicles. Typically, distribution to a few additional locations around the County is also required to assure that the material is recycled. County processing includes grinding using a heavy-duty tub-grinder equipped with a 3" screen. The scope of this measure includes all County expenses attributable to these activities: the separation of brush from other incoming yard waste, processing into a mulch product, and distribution of the product to various locations, termed "County Mulch Preserves" as needed.

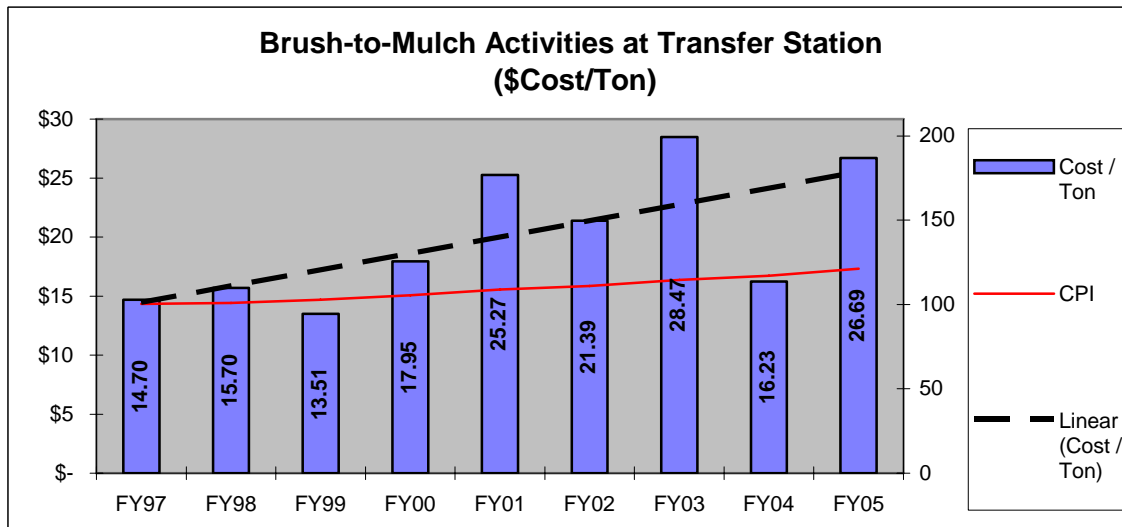
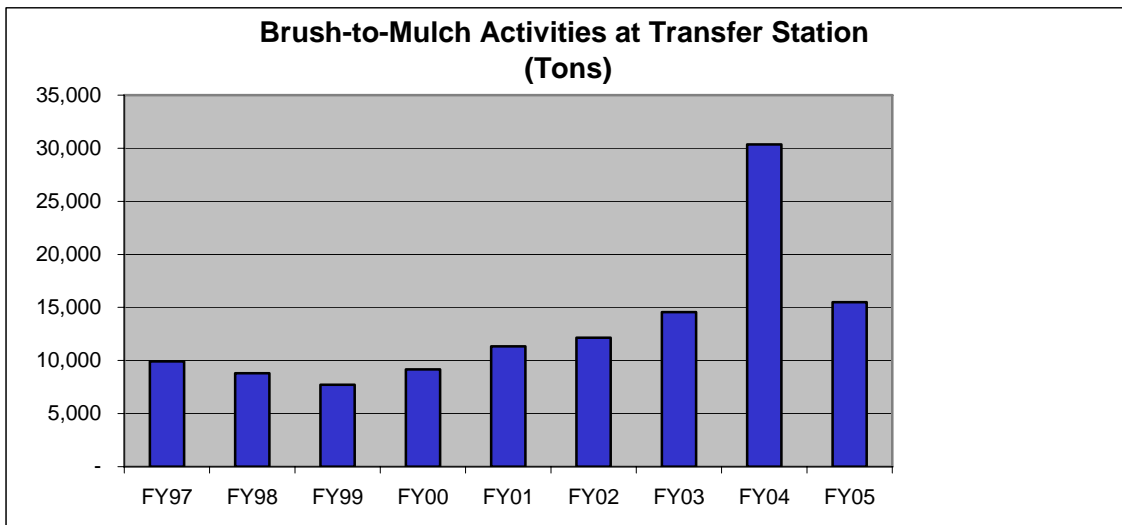
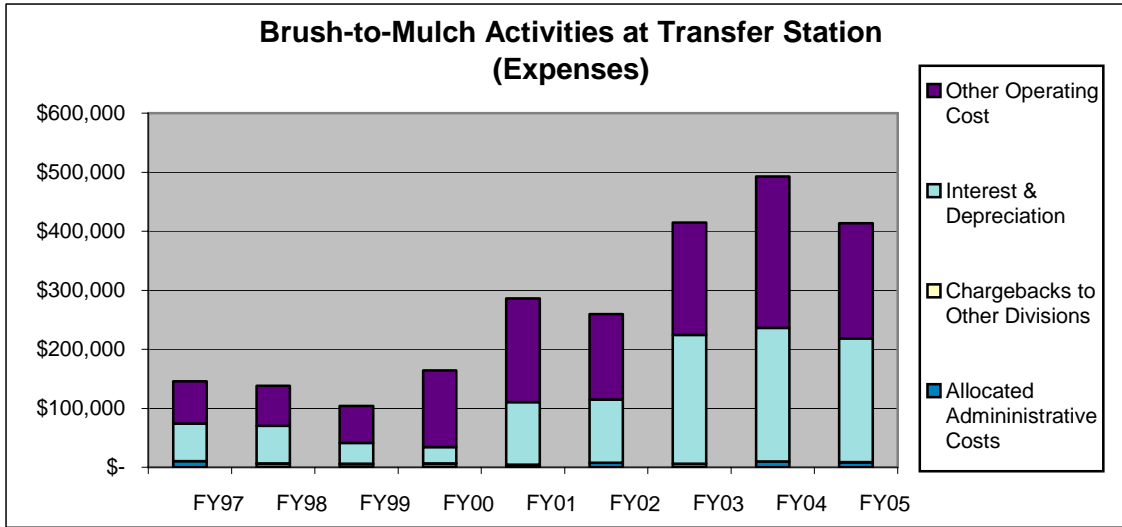


The County's truck scale system separately records, as "outgoing mulch", all such tons moved to the Mulch Preserve location at the Transfer Station, as well as to any other Mulch Preserve location around the County.

Thus, this measure encompasses, for each fiscal year, all expenses attributable to the brush-to-mulch operations, normalized to the total tons of outgoing mulch during the period. Expenses are dominated by contractor operating costs and depreciation of County equipment used for these activities. Weather can contribute substantially to annual tonnage variation. For example, the tonnage spike evident in FY04 is a largely attributed Tropical Storm Isabelle, which occurred in September, 2003. The jump in interest and depreciation expense in FY01 resulted from the purchase of a high-powered tub grinder to enable handling heavier limbs and stumps. The sizable increase in that same expense category from FY02 to FY03 is due to a purchase of another powerful tub grinder in FY03 with planned a useful life of 5 years. Another factor contributing to the year-to-year variation in expenses of this activity is the distance to which the product must be distributed in order to make it convenient enough to residents, such that it is taken and use.

Residents Help Themselves to County Mulch





Residential Mixed Paper (RMP) Processing

Under current County rules, any type of paper that is clean and dry, is not only recyclable, it is *banned* from disposal in Montgomery County. If generated at a residence, this type of material is termed “Residential Mixed Paper” (RMP), and the County includes this type of material in its curbside collection service which service is the subject of a unit cost measures already discussed above (see “Curbside Collection of Recyclable Materials”). The processing of that paper that is the subject of the unit cost measure derived here.

Over a period from 1997 to 2001, the County transitioned from accepting magazines and phone books at its drop-off center, to conducting various pilots for mixed paper collections, to County-wide collection of mixed paper, to the current County-wide ban on the disposal of all forms of clean, dry paper. One very important step, along that evolution, was the creation of an assured outlet for all the RMP that might be collected by the County.

Secondary materials markets determine what types of materials are recyclable. Should a jurisdiction choose to commit resources to the separate collection for recycling of a new material type, it is important to assure that adequate processing capacity exists. There are essentially two ways to assure processing capacity for a new type of material: (1) build it with County capital outlay, or (2) secure private sector processing capacity via multi-year agreement. Montgomery County chose the latter, and in 1998 entered into an agreement with Office Paper Systems, Inc. (OPS) that assured the existence of sufficient dedicated capacity for accepting, processing and recycling the RMP that the County intended to collect.

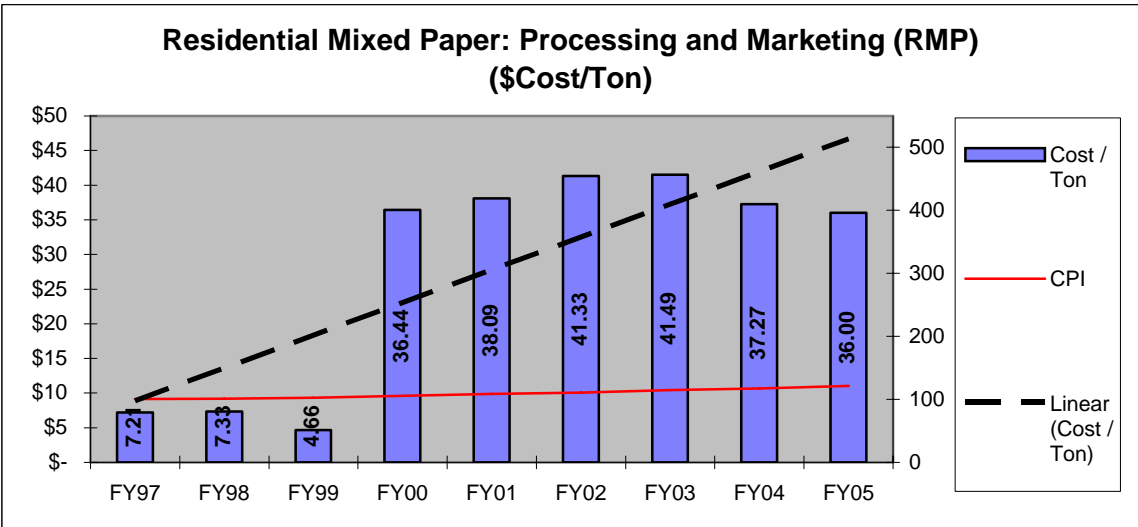
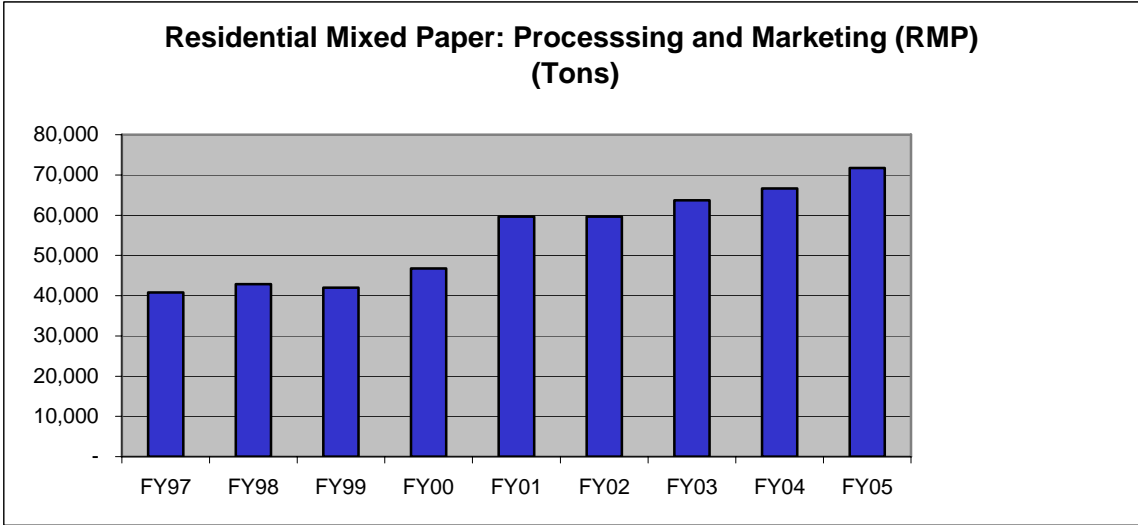
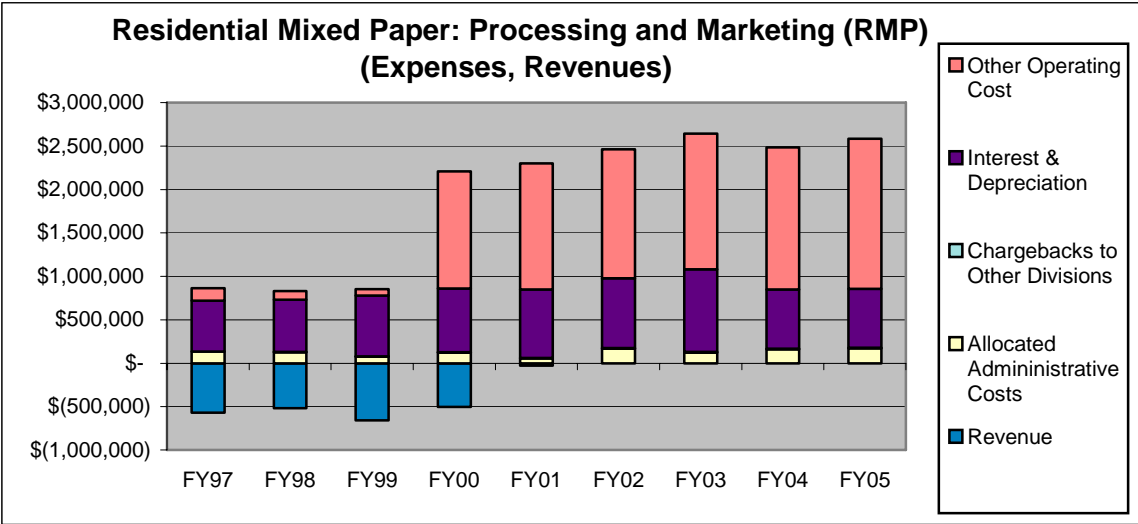
The expenses contained in this Unit Cost measure represent those of the budgetary program where that OPS contract resides, plus the costs of managing that contract, plus depreciation associated with County paper acceptance and transfer systems, plus minor associated indirect costs. The associated tonnage is that of the total RMP collected in the County during the fiscal period. The number of tons of RMP collected each year has increased dramatically. Total residential paper collected changed from about 48,000 tons during FY00 to over 71,000 tons in FY05. Thus, the declining unit cost trend line, exhibits a more and more efficient use of a necessarily committed processing expense. Beginning in FY03, the unit cost bar graph exhibits an overall declining trend. This is largely due to an important element of the County’s processing which commits the County to pay a certain base cost, for any tonnage up to 90,000 tons per year, which base cost escalates at 75 percent of increase in the CPI. Such a put-or-pay condition is not unusual in a contract, the purpose of which is to secure new and needed processing capacity. No revenue is returned to the County under this contract; the contractor keeps what revenue it can get for the paper it processes. By this contracting approach, the County also shielded itself from the risk of having to sell paper into a then-unstable secondary materials market.

Paper Transfer Operation at County Acceptance Facility



Picking Line at the Paper Processing Contractor’s Facility





Processing of Commingled Containers at the Materials Recovery Facility (MRF)

This activity captures the cost of processing and marketing container materials of the type that County single-family residents are required to place in their blue bins at curbside. These materials—glass bottles and jars, aluminum cans and aluminum foil, ferrous and bimetal cans, and narrow-necked plastic containers—are all processed at the County's Material



Recovery Facility (MRF) which is located next to the County's Transfer Station. Glass bottles are sorted by color and accepted FOB at the MRF by recycling buyers. Aluminum cans are segregated, baled and sold at top dollar, as is aluminum foil separately baled and sold as a separate grade, as are ferrous and bimetal cans. The plastic containers are now sorted by type, baled, and shipped to plastics buyers (previous to FY03, all acceptable plastics were sold mixed yielding less than ideal prices).



The MRF receives these materials from the Drop-Off center discussed above, from the County's own Curbside Recycling Collection activities, from municipalities, and from private haulers collecting these materials from multi-family or non-residential properties. The tonnage used to

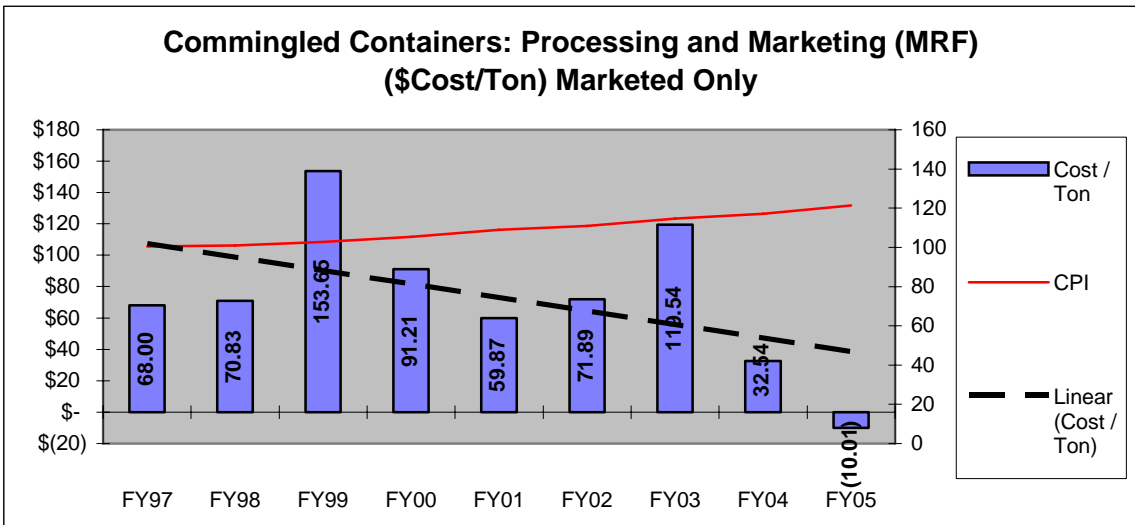
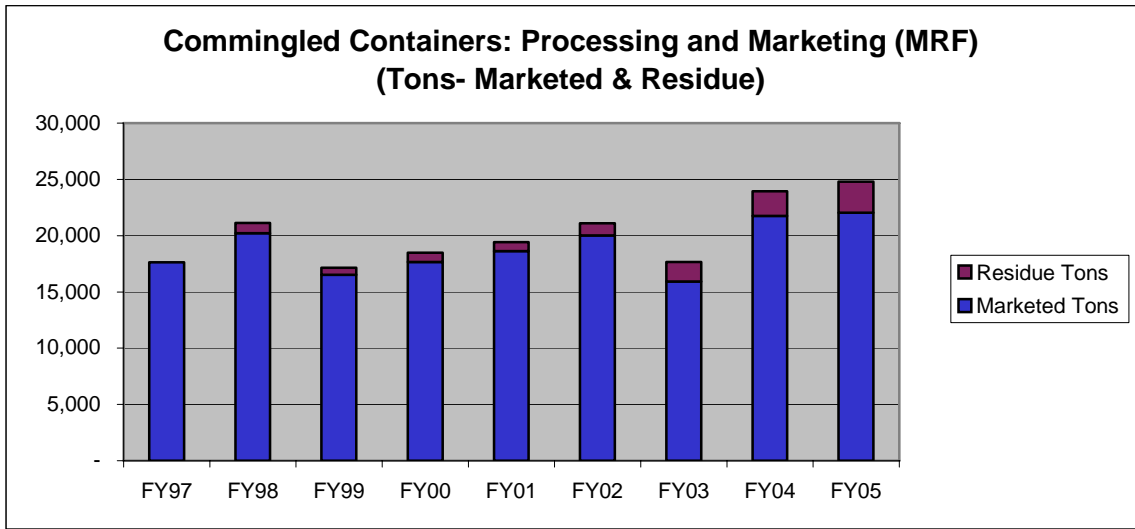
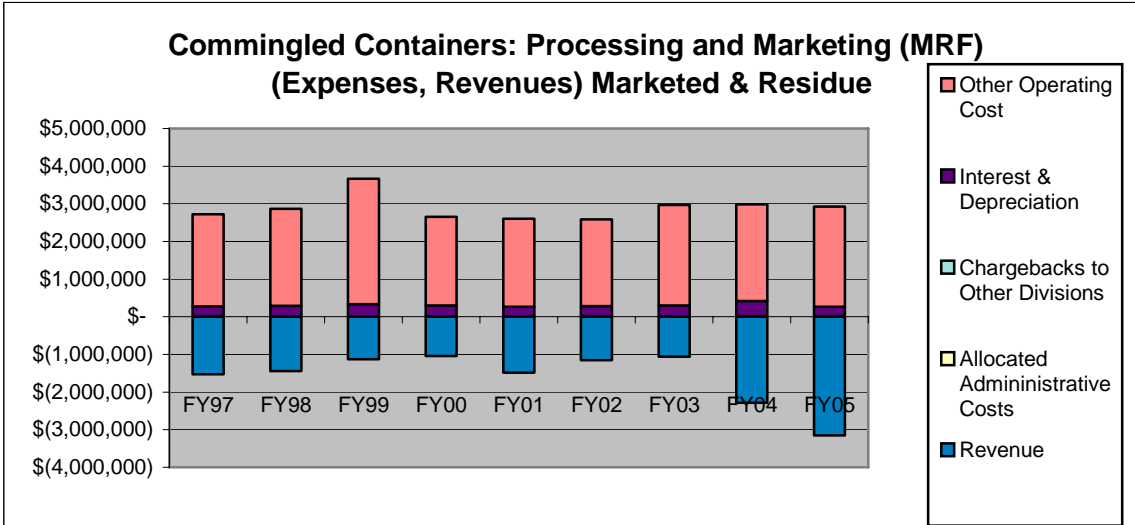
normalize the expenses of this activity include all container materials recycled through the MRF, as measured on an *outgoing* basis, and not including residue which is returned to the Transfer Station for disposal rather than being recycled. The largest expense for this activity

is for contract operation of the facility. Expenses include interest on County bonds used to refinance initial MRF construction. During FY02-03 the facility underwent extensive capital investment in processing enhancements to improve separation efficiency, especially for plastics (photo inset at right), as well as overall plant reliability. Thus, depreciation expense increases in those years. The County receives all revenues generated from the sale of materials recycled through this facility. In FY05, those revenues more than offset the full-

Plastic Container Picking Line



cost expense of the processing activity, resulting in a *negative* Annual Average Unit Cost. Incoming materials necessarily include some non-recyclable materials (residue). Therefore, Unit Costs results are expressed both in terms of tons actually recycled and in terms of tons processed (e.g. recycled plus residue).



Average Unit Cost Per Ton Incoming to the MRF (Recycled Plus Residue Tons):
 67.79 148.01 87.23 56.10 68.15 107.82 29.53 (8.90)

Enforcement Chargebacks

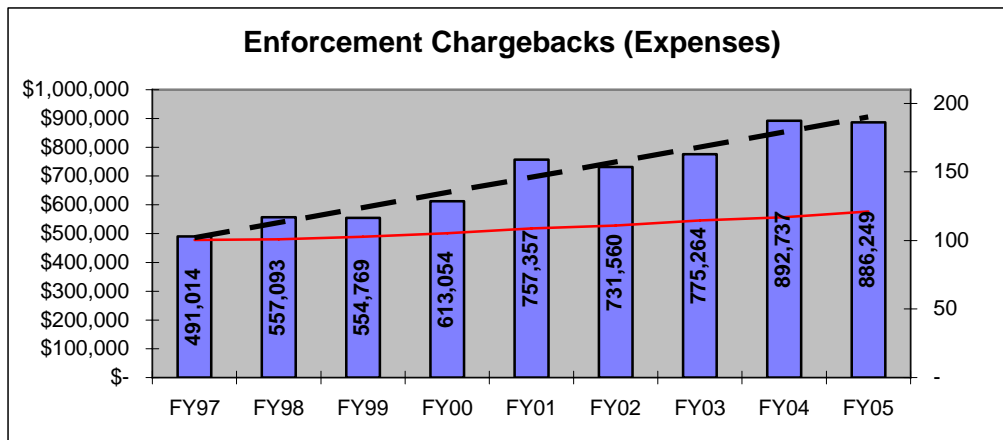
The Department of Housing and Community Affairs (DHCA), together with the Department of Environmental Protection (DEP), provide a variety of solid waste enforcement support activities. For the study period, the County’s costs for these activities has been budgeted in the “Solid Waste Enforcement Program”, which budgetary program is comprised entirely of the chargebacks to these two agencies, plus associated indirect costs (transfers from the Disposal Fund to the General Fund) in proportion to the work years budgeted within those chargebacks.

DHCA activities, under this program, include staff response to citizen complaints dealing with: storage and removal of solid waste; illegal solid waste dumping activities in the County; storage of unregistered vehicles on private property throughout the County; storage of inoperable vehicles on private property; improper screening of dumpsters, particularly those in shopping areas (see picture inset); and control and regulation of weeds throughout the County. The DHCA program also includes a “Clean or Lien” component, which, when necessary, pays for the removal of dangerous or unsightly trash, perimeter grass, and weeds on properties which the owners have failed to maintain as required.



Under this chargeback, the Department of Environmental Protection (DEP) conducts a variety of other environmental compliance activities not directly associated with any particular solid waste facility. (The DEP provides environmental monitoring and compliance activities directly related to County solid waste facilities under other chargebacks; expenses for those DEP chargebacks are allocated in association with Unit Cost Measures already derived.)

Since these DHCA and DEP expenses cannot be attributable to the management of any particular solid waste tonnage flow, they cannot be normalized to tonnage to create a meaningful Annual Average Unit Cost measure. This report’s commitment to full cost accounting, however requires their recognition, and the associated graph plots raw expense (in \$000) per year for the study period.



Expenses Attributed to Past or Future Year Tons

Finally, there are current year solid waste management activities that arise from the need to manage past or future year tons. These include the ongoing monitoring and maintenance of the County's closed landfills (Gude and Oaks), and the maintenance of land held in reserve by the County (Site 2) for possible future landfilling. Again, for the purposes of a full accounting of costs, these costs also must be recognized.

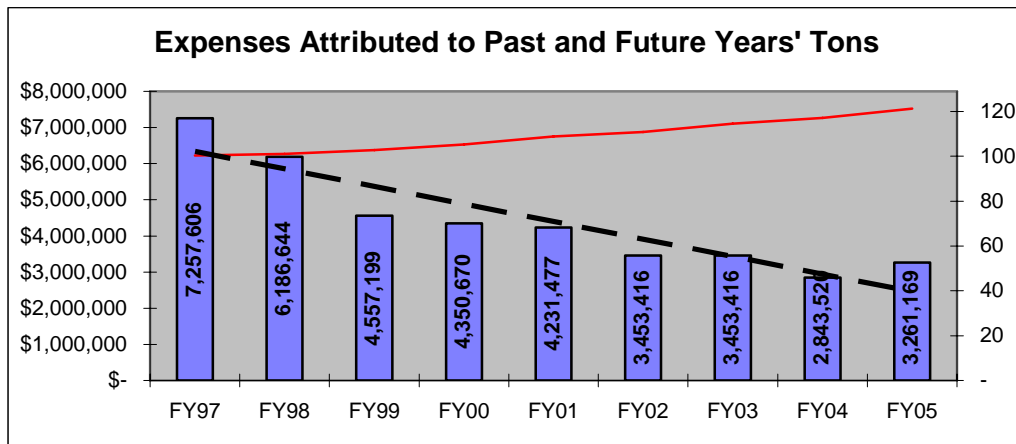
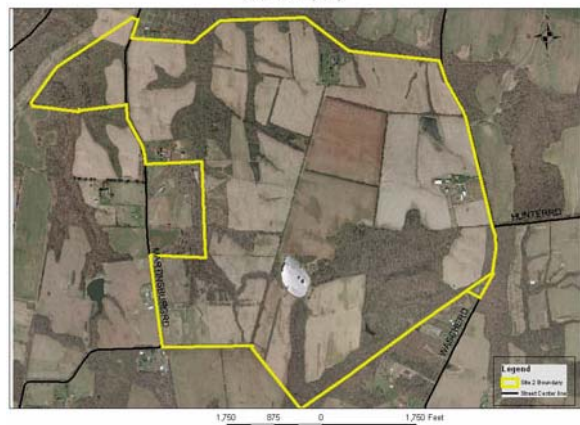
The Oaks Landfill ceased accepting waste on October 20, 1997. The Gude Landfill closed prior to the study period. The cost of maintaining these closed landfills is an ongoing obligation of the County.

Since these expenses do not relate to any current year tonnages, they cannot be meaningfully normalized to any current year tonnage. Therefore, they are presented in time-series fashion in raw form as total expenses attributed to the maintenance of these three sites.

Maintenance Being Performed On The Gas Flare System at The Oaks Landfill



Aerial Ortho of Site 2 Showing Property Boundary



Summary

This report has provided an activity-based full-cost accounting of solid waste management in Montgomery County for the nine-year period FY1997 through FY2005. The annual costs of all but two major County solid waste management activities have been normalized to the annual tonnage of material managed by each activity, yielding broad trend lines in terms of the annual average unit costs of those activities.

This unit cost approach has proven useful for internal benchmarking and for tracking an important type of cost-performance. While both annual expenditures and solid waste tonnages can be influenced by the vagaries of weather and other externalities, the analytical approach demonstrated here has yielded some clear long-term trends. Unit costs for those solid waste management activities comprising about 70% of total annual solid waste management expenses have tended to substantially beat inflation, but long term trends in other activities indicate some continued challenges.

The range of activities involved in Montgomery County's integrated solid waste management system is broad, but adherence to full-cost accounting, together with an activity-based approach, makes possible a meaningful type of communication about the actual costs of solid waste management. It is hoped that this report's detailed analytical approach, yet unified overall presentation, has provided a basis upon which to communicate to interested public about the full cost of solid waste management at any desired level of detail. This, Volume I, is directed toward general readers for that purpose. Volume II contains raw data, ties to the audited financial statements, and provides full derivation of the results.