Appendix A
An Illustration Of Using FCA For MSW Management

A simplified example might help to illustrate how FCA can be used to report the costs of MSW management. Readers unfamiliar with these concepts might find more realistic examples too complex and distracting. Some of the many factors omitted from this illustration are addressed throughout this *Handbook*.

Assume that Anytown, located in Anystate, USA, generates 200,000 tons of MSW per year, which is managed using a strategy of (1) collecting 20,000 tons of source-separated materials for recycling (10 percent recycling rate) and (2) landfilling the remaining 180,000 tons of collected mixed waste plus 2,000 tons of residues from source-separated materials that were not in fact recyclable. Anytown sells 18,000 tons of recyclables (i.e., the 20,000 tons collected minus the 2,000 tons of residue) for $450,000. Applying an FCA approach similar to that presented in this *Handbook*, Anytown produces a full cost report as follows:

Full Cost	$20,700,000
By-Product Revenues	(450,000)
Net Cost	$20,250,000

Anytown is considering whether to change its MSW strategy. Because Anystate requires communities to prepare FCA reports, Anytown is able to locate two other similar communities using different strategies. The communities—Othertown and Compostville—have similar populations and demographics.

Othertown also generates 200,000 tons of MSW per year. It collects 60,000 tons of source-separated waste for recycling (30 percent recycling rate) per year, much more than Anytown, and directly landfills the remaining 140,000 tons of mixed waste plus 6,000 tons of residues from the source-separated materials. Othertown sells 54,000 tons of recyclables for $1,566,000. The full cost picture for Othertown looks as follows:

Full Cost	$21,330,000
By-Product Revenues	($1,566,000)
Net Cost	$19,764,000

Othertown is managing its solid waste at a total cost somewhat less than Anytown (i.e., about 2.4 percent less); the savings is $486,000 (i.e., $20,250,000 minus $19,764,000).

Compostville has similar demographics to Anytown and Othertown and likely generates the same amount of waste (200,000 tons per year). It has implemented a program for encouraging backyard composting as well as curbside collection of yard trimmings for composting by a vendor. Backyard composting is believed to have reduced the total amount of solid waste collected by 5 percent from 200,000 to 190,000 tons per year, including 60,000 tons of source-separated waste for recycling, 20,000 tons of yard trimmings for composting, and 110,000 tons of mixed waste for direct disposal. Of the 60,000 tons of source-separated waste, 6,000 tons end up as nonrecyclable residue for disposal in the landfill together with 1,000 tons of residue from the composting facility, and the 110,000 tons of mixed waste, for a total of 117,000 tons of waste landfilled. Revenues from the sale of recyclables and compost are nearly $2 million. The FCA report for Compostville looks as follows:

Full Cost	$20,360,000
By-Product Revenues	($1,966,000)
Net Costs	$18,394,000

Compared to Anytown, Compostville saves $1,856,000 in costs, which is over 9 percent of Anytown's cost.

Having completed its FCA report and located similar communities where MSW management costs less, Anytown is now able to scrutinize its costs more closely to identify potential cost savings. There is no guarantee that Anytown will reduce its MSW costs by adopting the strategies used in Othertown or Compostville, because there are many factors that can affect the cost of solid waste management. These factors include population density, waste streams handled, available technology, prevailing labor rates, productivity, service mix (e.g., frequency and type of collection), proximity of MSW facilities, and economies of scale. In addition, a community might have other goals to consider besides cost minimization. However, FCA can provide useful information for solid waste managers and their communities that, with further analysis, can support sound management and planning.

In addition to comparing the "bottom line" full costs of MSW management in the three communities, the data presented earlier can be presented on a "*net cost per ton*" basis for each community as follows. Recall that the total tons of waste processed will be greater than the tons received/collected to the extent that waste received/collected for recycling, composting, or WTE results in residues that must also be landfilled (i.e., handled twice). This is illustrated in the following chart:

Tons of Waste Handled By Path and Activity

Place	Recycling		Composting		Landfilling		Total	
	Path	Activity	Path	Activity	Path	Activity	Path	Activity
Anytown	20,000	20,000	0	0	180,000	182,000	200,000	202,000
Othertown	60,000	60,000	0	0	140,000	146,000	200,000	206,000
Compostville	60,000	60,000	20,000	20,000	110,000	117,000	190,000	197,000

Although the full cost for the entire MSW system is the same, whether reported by activities or paths, the cost per ton will vary, depending on whether the total cost for the community is divided by (1) the tons received/collected for processing or (2) the tons actually processed. This example employs the latter approach. Chapter 5 discusses use of the cost per ton and other ways to report FCA data.

Because 10 percent (i.e., 2,000 tons) of the source-separated materials taken for recycling end up being disposed of in the landfill, Anytown handles a total of 202,000 tons per year. Taking into account the revenues from the sale of the recyclables, the net cost per ton is $100.25 ($20,250,000 ÷ 202,000). Othertown handles 206,000 tons of MSW per year because 10 percent of the 60,000 tons of source-separated materials end up being landfilled (6,000 tons of residue + 60,000 tons of source-separated material + 140,000 tons of mixed waste = 206,000). Othertown's net cost per ton is $95.94, which is nearly 4.3 percent less than the net cost per ton in Anytown. Compostville's net cost per ton is $93.37 ($18,394,000 ÷ 197,000 tons). These results are summarized below:

	Anytown	Othertown	Compostville
Full Cost	$20,700,000	$21,330,000	$20,360,000
By-Product Revenues	(450,000)	(1,566,000)	(1,966,000)
Net Cost	$20,250,000	$19,764,000	$18,394,000
Percent Cost Difference		(2.4%)	(9.1%)
Tons Handled	202,000	206,000	197,000
Net Cost per Ton	$100.25	$95.94	$93.37
Percent Cost Difference		(4.3%)	(7.4%)

This table shows that, in terms of net total cost differential, Compostville has a substantial advantage over Othertown, when they are both compared to Anytown. On a net cost per ton basis, however, Compostville and Othertown

are much closer together. Because there are many factors that can affect costs, this type of comparison across communities might have limited value. To make better use of the data, further disaggregation is needed. For example, the FCA numbers can be disaggregated to correspond with MSW activities or paths; then unit costs (i.e., costs per ton) can be calculated as follows:

Anytown

	Recycling Path	Landfilling Path	Total
Full Cost	$2,700,000	$18,000,000	$20,700,000
Tons/Year	20,000	180,000	202,000
Cost/Ton	$135	$100	$102.48
By-Product Revenues/Ton	$25	0	-
By-Product Revenues	($450,000)	0	($450,000)
Net Cost	$2,250,000	$18,000,000	$20,250,000
Net Cost/Ton	$112.50	$100	$100.25

The cost per ton of recycling MSW in Anytown is significantly greater than its cost per ton of landfilling, even when by-product revenues are taken into account, as they should be. Note that this FCA information does not indicate whether Anytown's costs have been optimized nor whether Anytown should change its program. The FCA data simply describe the existing situation.

Othertown

	Recycling Path	Landfilling Path	Total
Full Cost	$6,630,000	$14,700,000	$21,330,000
Tons/Year	60,000	140,000	206,000
Cost/Ton	$110.50	$105	$103.54
By-Product Revenues/Ton	$29	0	-
By-Product Revenues	($1,566,000)	0	($1,566,000)
Net Cost	$5,064,000	$14,700,000	$19,764,000
Net Cost/Ton	$84.40	$105	$95.94

Othertown's FCA report reveals that its cost per ton for recycling is substantially less than its cost per ton for landfilling. Again, this does not mean that Othertown has optimized its MSW costs, nor do the FCA numbers indicate whether or how Othertown should change its program.

Compostville				
	Recycling Path	Composting Path	Landfilling Path	Total
Full Cost	$6,654,360	$1,709,060	$11,996,580	$20,360,000
Tons/Year	60,000	20,000	110,000	197,000
Cost/Ton	$110.91	$85.45	$109.06	$103.35
By-Product Revenues/Ton	$29	$20	0	-
By-Product Revenues	($1,566,000)	($400,000)	0	($1,966,000)
Net Cost	$5,088,360	$1,309,060	$11,996,580	$18,394,000
Net Cost/Ton	$84.81	$65.43	$109.06	$93.37

Compostville has reported that its cost per ton for MSW composting is lower than its cost per ton for recycling and landfilling. If Compostville received no by-product revenues from the sale of compost, then MSW recycling would cost a small amount less per ton than composting (i.e., $84.81 for recycling vs. $84.45 for composting). As with the communities above, these FCA numbers simply document current costs and do not indicate whether or how costs could be reduced.

As noted in Chapter 5, and discussed at more length in Chapter 2, comparisons can be made either in terms of MSW activities or paths. This illustration is based on MSW paths; this means that the paths include their fair share of waste collection, transfer, and transport activity costs as well as disposal activity costs for recycling and composting residues. As a result, each community's total tons of waste processed per year is greater than the tons of waste entering its component paths, because both recycling and composting generate residues that are landfilled. Exhibit A-1 illustrates how the costs of MSW activities can be used to build up the costs of MSW paths. The exhibit illustrates the costs for the fictitious community of Compostville.

What can be learned from comparing these net cost per ton numbers across the three communities? Recycling costs $84.40 per ton in Othertown and $84.81 in Compostville but $112.50 per ton in Anytown. Why? Similarly, Anytown receives $25 per ton in by-product revenues while Othertown and Compostville receive $29 per ton. Why? Are there economies of scale at work in recyclables sales? Or could the communities be collecting different materials? Could Othertown be closer to purchasers of recyclables, thus reducing transport costs? How do the communities compare in terms of overhead? Labor costs? Answering these questions will require further disaggregation of costs and analysis. FCA can identify costs, cost differentials, and, ultimately, cost drivers, giving local officials the ability to formulate good questions and develop answers.

Exhibit A-1

Hypothetical Illustration of FCA for MSW Paths
(in thousands of dollars)

	Recycling Path	Composting Path	WTE Path	Landfilling Path	Total
Activity Costs					
Collection	2,750	600	0	4,237	7,587
Transfer Station(s)	200	0	0	400	600
Transport	384	0	0	725	1,109
Facility	1,040	489	0	4,030	5,559
Residuals Disposal	280	47	0		327
Education/Outreach	600	224	0	25	849
Overhead Costs	1,400	349	0	2,580	4,329
Total Costs	6,654	1,709	0	11,997	20,360
By-Product Revenues *(subtract)*	(1,566)	(400)	(0)	(0)	(1,966)
Net Costs	5,088	1,309	0	11,997	18,394
Tons Received *(divide)*	60,000	20,000	0	110,000	197,000
Net Cost Per Ton	$84.81	$65.43	0	$109.06	$93.37

Using FCA, a community can determine the full costs of solid waste management, as well as its component costs, and can identify what drives the costs. For example, note that the full cost of composting is only $65.43 per ton in Compostville, including public education and outreach activities; on the other hand, Compostville's cost per ton for landfilling is actually 9 percent higher than in Anytown. In fact, a large portion of the bottom-line savings realized by Compostville comes from diverting 5 percent (10,000 tons) of the waste stream into backyard composting. Without FCA to begin to level the playing field, comparisons across systems are probably misleading at best. With FCA, one can, bearing in mind differences in technological configuration, desired service levels, and waste streams handled, get some idea whether someone might have found a better way.

Full Cost Accounting Glossary

Account is a financial record of cash movements, collecting specific types of outlays or inflows of financial resources.

Accounting basis is an accounting concept that refers to when expenditures, expenses, and related liabilities are recognized in accounts and reported in financial statements; it relates exclusively to timing on either the cash or accrual method.

Accrual basis accounting recognizes (i.e., accrues) costs as services are provided, or as events and circumstances occur that have cash consequences, regardless of when cash outlays are made.

Amortization is a method of determining the annual costs associated with obligations for future outlays (e.g., the reduction of debt by regular payments sufficient to retire the debt by maturity).

Assessed revenues are derived from taxes or fees assessed in a manner that is unrelated to the level of service provided, as when property taxes or flat fees are used to fund solid waste management activities.

Avoided cost refers to the reduction in the costs of one MSW activity or path that results from use of a different MSW activity or path; typically, avoided cost means the reduction in the costs of collecting, transferring, transporting, and landfilling MSW that results from source reduction, recycling, composting, or waste-to-energy.

Avoided replacement cost is the net cost that a local government expects to pay for land disposal when a new landfill or landfill contract becomes necessary.

Back-end costs include expenditures to properly wrap-up operations and take proper care of landfills and other MSW facilities at the end of and after their useful lives; the costs of post-employment health and retirement benefits for MSW workers fall in this category.

By-product revenues are generated from the sale of marketable products created as a by-product of solid waste management, such as recyclables, compost, energy from waste, and landfill gas.

Capital outlay means an outlay of cash to acquire a resource that will be used in MSW operations over more than one year. Capital outlays (past, present, and future) must be converted into annual costs for full cost accounting purposes.

Cash flow accounting, also known as cash basis accounting or general fund accounting, is a system where cash outlays are recorded as they are actually paid out for goods and services.

Contingent costs are defined in this *Handbook* to mean the costs of remediating unknown or future releases of pollutants, such as leaks from municipal landfills, as well as the liability costs of compensating for as yet undiscovered or future damage to the property or persons of parties who are affected adversely by MSW activities.

Cost means the dollar value of resources used for MSW management.

Cost center is any solid waste management activity that receives separate attention through an account or group of accounts.

Depreciation is a method of allocating the costs of capital outlays over the useful life of the resource, which is the period of time during which the resource is expected to provide services.

Direct costs are costs that are clearly and exclusively associated with solid waste management.

Enterprise funds are mechanisms used by local governments for activities that can be financed and operated like a private business.

Environmental costs, as defined in this *Handbook*, include environmental degradation that cannot be easily remedied or measured, is difficult to value, and is not subject to legal liability; these costs are often termed environmental "externalities." See also "property damage liability" and "natural resources liability."

Fixed costs include interest, depreciation, and amortization for past or future landfill capital outlays and other costs (e.g., security) that cannot be reduced quickly in response to lower waste disposal tonnage.

Flow of current financial resources, an accounting term, is the measurement focus of most government funds, including the general fund, debt service funds, and enterprise funds. This focus records accruals for expenditure transactions which have occurred by year end that are normally expected to result in cash disbursement early enough in the following year to require the use of available expendable financial resources reported at year end.

Flow of economic resources, an accounting term, is the measurement focus used in the corporate sphere and for certain types of government funds to measure economic resources, claims to those resources, and the effects of transactions, events, and circumstances. This focus includes depreciation of fixed assets and amortization of liabilities.

Full cost accounting is a systematic approach for identifying, summing, and reporting the actual costs of solid waste management, taking into account past and future outlays, oversight and support service (overhead) costs, and operating costs.

Future outlay means an expenditure of cash in the future that is obligated by current or prior activities.

GAAFR is the *Governmental Accounting, Auditing and Financial Reporting Handbook*, published by the Government Finance Officers Association, that provides detailed professional guidance to finance officials and auditors on the application of GAAP; the GAAFR is not itself GAAP.

GAAP means Generally Accepted Accounting Principles, which consist of the rules, procedures, and conventions that define accepted accounting practices at a given time. GAAP includes broad guidelines as well as detailed procedures and practices. Much of GAAP is issued in codified form by GASB.

GASB refers to the Government Accounting Standards Board, an independent body responsible for setting accounting standards (i.e., GAAP) for activities and transactions of state and local governments. GASB was established in 1984 to succeed the National Council on Governmental Accounting.

General fund accounting — see cash flow accounting.

Hidden costs, as used in this *Handbook*, refer to the costs of activities or resources that appear to be free.

Indirect costs are costs that are not exclusively related to solid waste management but that relate to more than one local government activity. Such indirect costs for solid waste management (and other local government activities) can include accounting and payroll, personnel, legal, purchasing, data processing, records management, and executive oversight (e.g., the mayor's salary and office expenses).

Integrated solid waste management incorporates several different approaches for handling the entire MSW stream. Using a combination of approaches allows each type of waste to be managed according to environmental and economic considerations, with priority going to source reduction, reuse, and recycling, while reserving landfills as the least desirable waste management method. See also "waste management hierarchy."

Measurement focus is an accounting convention that determines: (1) whether a government's operating statement presents information on the flow of financial resources or on the flow of economic resources, and (2) which liabilities (and assets) are included on a government's balance sheet and where they are reported.

Modified accrual basis of accounting refers to the accrual basis of accounting adapted to the government fund focus on the flow of current financial resources; this means that costs will be recognized when the lability is incurred and will be liquidated with current resources.

Natural resources damage liability refers to the types of damage to property held in public trust that can be compensated through the legal system.

Net cost of a solid waste management activity or path is its full cost minus its by-product revenues. The net cost divided by the tons of waste managed yields the net cost per ton for that activity or path.

Net cost per household indicates the amount of service fees and assessed taxes that must be collected on average from each household to pay for the full costs of solid waste management, after taking into account any by-product revenues. The net cost per household equals the net costs per year divided by total households served.

Net cost per ton is the best common denominator for comparing the current costs of solid waste management activities or paths within or across local government jurisdictions.

Operating costs are regularly recurring costs of resources that are used over a relatively short period of time (i.e., less than 1 year) in order to support ongoing MSW operations.

Outlay is an expenditure of cash.

Overhead costs are the management and support costs of running the solid waste program.

Personal injury liability refers to the types of damage to individuals that can be compensated through the legal system.

Property damage liability refers to the types of damage to private property that can be compensated through the legal system.

Routine cash outlays for solid waste management activities are the same as the operating costs of those activities.

Service revenues are derived from fees charged for the amount of MSW services used, such as unit pricing for solid waste collection and tipping fees for waste disposal.

Social costs are defined in this *Handbook* as impacts on human beings, their property, and welfare that cannot be compensated through the legal system; also termed "social externalities."

Societal costs is a term sometimes used to encompass both environmental and social externalities.

Transfer revenues are funds provided by local, state, or federal governments, whether as grants or some form of revenue sharing.

Unit pricing charges solid waste generators (e.g., primarily households) based on how much they throw away. Also called "variable rate pricing" and "pay-as-you-throw."

Up-front costs reflect the initial investments and expenses necessary to start an MSW activity or path.

Variable costs of land disposal include costs of operation and maintenance and other costs that can be reduced quickly in response to lower waste disposal tonnage.

Waste management hierarchy emphasizes a preferred order of management approaches: first, source reduction; second, recycling; third, waste combustion with energy recovery; and finally, landfilling.

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