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November 1995 • NREL/TP-430-8131

Integrated Solid Waste Management of Palm Beach County, Florida

National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, Colorado 80401

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A national laboratory of the U.S. Department of Energy
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Under Contract No. DE-AC36-83CH10093

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NREL technical monitor: Philip Shepherd

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Abstract

The subject document reports the results of an in-depth investigation of the fiscal year 1992 cost of the Palm Beach County, Florida integrated municipal solid waste management system (IMSWMS), the energy consumed to operate the system, and the environmental performance requirements for each of the system's waste-processing and disposal facilities.

Actual data from records kept by participants is reported in this document. Every effort was made to minimize the use of assumptions, and no attempt is made to interpret the data reported. Analytical approaches are documented so that interested analysts may perform manipulation or further analysis of the data. As such, the report is a reference document for MSW management professionals who are interested in the actual costs and energy consumption for a one-year period, of an operating IMSWMS.

The report is organized into two main parts. The first part represents the Executive Summary and Case Study portion of the report. The Executive Summary provides a basic description of the study area and selected economic and energy information. Within the Case Study are detailed descriptions of each component operating during the study period; the quantities of solid waste collected, processed and marketed within the study boundaries, the cost of managing municipal solid waste in Palm Beach County; an energy usage analysis; and finally a review of federal, state and local environmental requirement compliance; a reference section and a glossary of terms.

The second part of the report focuses on a more detailed discourse on the above topics. In addition, the methodology used to determine the economic costs and energy consumption of the system components is found in the second portion of this report. The methodology created for this project will be helpful for those professionals who wish to break out the costs of their own integrated systems.

Other reports in the series include a Synopsis of Results and Methodologies which presents the principal findings from the case studies and case studies of the each of the six IMSWM systems evaluated in this program. In addition to Palm Beach County, Florida, the following systems participated in the evaluation: Minneapolis/Hennepin County, Minnesota; Scottsdale, Arizona; Seattle, Washington; Sevierville, Tennessee; and Springfield, Massachusetts.

Key Words

Case Study
Composting
Cost Analysis
Energy Analysis
Energy Recovery
Environmental Requirements: solid waste management
Integrated Municipal Solid Waste Management
Landfilling
Materials Recovery
Municipal Solid Waste
Palm Beach County, Florida
Recycling
Resource Recovery
Solid Waste
SWANA
Solid Waste Authority of Palm Beach County
Waste-to-energy

Foreword

This case study report is one of six developed for the following integrated municipal solid waste management systems:

- Minneapolis (Hennepin County), Minnesota; NREL/TP430-20473
- Palm Beach County, Florida; NREL/TP430-8131
- Scottsdale, Arizona; NREL/TP430-7977
- Seattle, Washington; NREL/TP430-8129
- Sevierville, Tennessee; NREL/TP430-8136
- Springfield, Massachusetts; NREL/TP430-8137

All the reports, including a summary report (NREL/TP430-20471), are available through the National Renewable Energy Laboratory, 1617 Cole Boulevard, Golden, Colorado, 80401, or call (303)275-4363.

The authors are extremely grateful for the support and cooperation of the six systems managers and participants in those six systems. Without their assistance, this effort would not have been possible.

Funding for the conduct of the case studies and the development of the six reports was provided by the American Plastics Council and the United States Department of Energy's National Renewable Energy Laboratory.

In conducting the studies, the authors experienced considerable difficulty in gathering economic and energy information. In municipal solid waste management, no standard accounting methods exist. Further, local governments by tradition and practice maintain their financial records in a variety of ways to serve their own specific needs. The lack of a standard accounting procedure in the United States, and of standard definitions of solid waste, made the collection and analysis of the economic data a challenge. The methods for developing the cost information for this effort will be helpful to those with responsibilities for planning and implementing integrated municipal solid waste management systems. Also, the six sets of cost data will be useful for guiding other systems managers in their planning, cost accounting, and measuring of performance.

The development of the energy information represents a major step forward in analyzing integrated municipal solid waste management systems. The information in the six studies and the analytical methodology will be extremely useful to integrated municipal solid waste management systems planners, decision makers, and managers in the future.

Finally, as might be expected, the environmental regulatory information is limited. Although landfill and combustion facilities are under well-defined regulations, other portions of integrated municipal solid waste systems are not. The end result of these limitations is that the information presented on conformance with environmental requirements is sketchy for systems that do not include combustion.

A final caution to the readers of these reports is to not attempt to try to compare one system against the other. The authors **deliberately** did not do so for the very sound reason that it is ill-advised to attempt to compare systems that:

- are geographically different,
- are politically different,
- are structurally different in providing municipal solid waste services,

- are at different stages of development, and
- face different regulatory requirements.

Rather, readers of these reports are encouraged to examine and analyze (using the techniques and analytical methods of the six studies) their own geographical, political, structure, stage of development, and regulatory status and then assess those findings against six other sets of data to see how they can best make the best decisions for their systems.

Acknowledgements

SWANA is especially grateful for the assistance and support of many individuals and organizations who contributed information for this Palm Beach Case Study. From the Solid Waste authority of Palm Beach County: Donald Lockhart, executive Director; Mark Hammond, Managing Director; John Booth, Director of Engineering; Daniel Pellowitz, Cost Accountant; Sharon Riggs, Director of Finance; Linda Hodgkins, Public Affairs; Kathleen Duzan, Operations Contract Management; David Gregory, Hazardous Waste Services; Robert Worobel, Plant Engineer; Andrew Germanowicz, Purchasing Services and Asset Management; Kathleen Kelley, Director of Recycling; Suzanne Redmond, Recycling; and Sherry Weinschenk, Recycling. From various cities within Palm Beach County: Lake Worth - Herbert Lund, Director, Department of Public Works; Gary King, Supervisor; and Anne Sims, Finance. Judy Passett, Boca Raton; Charles Omelia, North Palm Beach Director of Public Works. Boynton Beach - Scott Miller, City Manager; Bob Eichorst, Director, Public Works, and Mary Munro. From Lake Park - Tim Howard, Director of Public Works. From the Florida Department of Environmental Regulations Richard McElveen, Division of Air Resources Management. From various other organizations and private firms in the area - Doug McCoy, Waste Management of Palm Beach; Jimmie Conigliane, D.V.Carting, Inc.; Scott Harder, DUS Consultants; and Stuart Dickson, University of Florida.

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Executive Summary

Introduction

The following summary provides a review of the key findings of this case study. Readers are advised to read the *condensed* Palm Beach Case Study, which follows this section, to fully understand how the economic, energy, and environmental results were developed. In addition, all data collected and analyzed during this study are available in the in-depth Palm Beach Case Study, with Appendices A through E.

Each integrated municipal solid waste management (IMSWM) system is unique due to geography, climate, customs, politics, and time. However, readers may benefit from the findings of this study *and* the study techniques and methodology in order to develop actual economic, energy, and environmental facts about their own IMSWM systems. Because each system is unique, readers are cautioned not to compare the findings of this particular study with other systems.

Background

Palm Beach County (the "county") is located along the southeast coast of Florida. The county is bounded on the east by the Atlantic Ocean, on the south by Broward County, on the north by Martin County, and on the west by Hendry County. It has the largest land area of any county in Florida, extending 45 miles on the north-south axis and 53 miles on the east-west axis. The 1992 population is estimated at 897,000. There were approximately 471,000 dwelling units throughout the county, about 50% of which were single-family homes.

During fiscal year FY 1992, about 1.10 million tons of solid waste were received by the Palm Beach County IMSWM system. The Solid Waste Authority of Palm Beach County (SWA) is responsible for the processing and disposal of all county-generated waste delivered to the IMSWM system.

Overview of the Palm Beach County IMSWM System

The SWA was created in 1975 by the State Legislature under the Palm Beach County Solid Waste Act, Chapter 75-473, Laws of Florida (the Act). The Act gave the SWA the power to construct and operate solid waste disposal facilities and to require that all municipal solid waste (MSW) collected by public and/or private agencies from any municipality or unincorporated area of the county be transported to SWA-designated processing and disposal facilities.

The county's IMSWM system in FY 1992 consisted of the following integrated system components:

- Separate collection of garbage, trash, and recyclables by municipalities, private sanitation firms under contract to or franchised by municipalities, and the SWA
- Four transfer stations located throughout the county, at two of which household hazardous waste (HHW) drop-off sites are located
- A refuse-derived fuel resource recovery facility (the RRF)
- A ferrous metals processing facility
- A materials recovery facility (the MRF)

- A yard waste/sludge composting facility
- An HHW drop-off and storage facility
- A landfill for the disposal of garbage, RRF ash and residue, MRF residue, and some other wastes (the Class I landfill
- A landfill for the disposal of trash, construction/demolition debris, and some other wastes (the Class III landfill).

The RRF, MRF, compost facility, ferrous metals processing facility, HHW drop-off and storage facility, and both landfills are located at the 1300-acre North County Regional Resource Recovery Facility Complex (the North County Complex).

Collection

There are 37 municipalities and unincorporated areas within the county. Collection of MSW is performed by the SWA, individual municipalities, or private service providers under contract to or franchised by municipalities, commercial establishments, or the SWA. In addition, some individuals and commercial establishments deliver their own MSW, which is referred to as "self-hauling."

Transfer

Seventy six percent of all MSW generated with the county in FY 1992 was delivered to the North County Complex by the Division of Transport Services. This division operates four transfer stations, that are open 312 days per year.

Processing Facilities

The RRF receives, processes, and combusts garbage generated in the county at a rate of approximately 2000 tons per day (TPD), 6 days per week.

The ferrous metals processing facility processes ferrous metals recovered from the RRF, white goods from the landfills, and ferrous metals materials recovered from the MRF into marketable, #2 grade materials.

The MRF began operations in July 1991; it processes an average 250 TPD of recyclable materials and has a 500 TPD capacity if operated on two shifts.

The composting facility began operations in September 1991. In FY 1992, it processed 30 to 50 TPD of combined yard waste and wastewater residuals (sludge).

Household Hazardous Waste Facilities

The HHW collection and storage facility at the North County Complex completed its first year of operation in June 1991. It receives HHW Wednesday through Friday and on the second Saturday of each month. Two other facilities in the county operate on less frequent schedules.

Landfills

The SWA has reduced its landfill space consumption by more than half through the implementation of its IMSWM System. The North County Complex Class I and III Landfills are open 312 days per year and maintain 24-hour operation in support of the RRF.

Definitions

Solid waste is categorized in Palm Beach as including garbage/trash, recyclables, and "other wastes" such as sewage sludge, asbestos, demolition debris, fill material, land-clearing debris, tires, and miscellaneous wastes. These other wastes are not commonly defined as MSW.

ANALYZED MSW—That portion of the total MSW stream for which the associated management net costs are known, or at a minimum, can be reasonably estimated. The reason for limiting the types of MSW included in Analyzed MSW is that only that portion of MSW should be considered for which sufficient data were available to draw defensible conclusions regarding the allocation of cost to the tons of MSW managed. Consequently, the types of MSW included in Analyzed MSW will vary between IMSWM systems.

GARBAGE—Garbage is all MSW exclusive of source-separated trash, recyclables, yard waste, household hazardous waste, and bulky waste.

PROGRAM INCREMENTAL COSTS (OR SAVINGS)—Determined for MSW management components (or programs) of each IMSWM system by calculating the system cost of MSW management, first with the inclusion of a specific program, and then calculating the cost of MSW management without that program. Landfilling is considered the basic program that is not considered optional. Therefore, the program incremental cost is the difference between the cost of managing MSW with the inclusion of a particular program and the cost of managing MSW without that program.

RECYCLABLES—Materials that still have useful physical or chemical properties after serving their usefulness for a given individual or firm, and can, therefore, be reused or recycled for the same or other purposes.

Key Findings

Discussion of Costs

Of the approximately 1.1 million tons of solid waste managed within the county, about 700,000 tons were analyzed ("Analyzed MSW") to determine the cost of the county's IMSWM System. *The cost to manage the remaining wastes is excluded because those "Other Wastes" are not defined as MSW.*

Overall Program Costs

The total FY 1992 net cost to manage about 700,000 tons of Analyzed MSW was $101 million, or $144 per ton. The total net cost is broken down and shown in rounded numbers below.

Table ES-1. Cost of Program Elements

Category	Tonnage	Total Cost	Total Cost Per Ton
Garbage/Trash	614,000	$82 million	$134
Recyclables	85,800	$19 million	$218
TOTAL	699,800	$101 million	$144

Collection accounts for 54% of the total cost of the Palm Beach County System, while general and administrative (G & A) expense is 8%, landfill is 4%, the RRF is 23%, the MRF is 2%, transfer and haul is 5%, and other expenses are 4% of the total cost.

Program Incremental Costs

The incremental cost for each of the resource recovery programs, i.e., the cost (or savings) associated with *adding* the resource recovery program to the IMSWM System, is the difference between the cost of managing all the MSW with the inclusion of a particular program and the cost of managing all the MSW without that program. The program incremental cost (or savings) is, therefore, a measure of the impact of any particular program on the cost of managing all MSW. A major objective of this case study was to clarify the differences between the average cost per ton and the actual incremental cost. The methodology for calculating incremental costs is described in the detailed Palm Beach Case Study and Appendices.

The FY 1992 Palm Beach County system includes two facilities that were intended to divert MSW from landfills—the RRF and the curbside collection/MRF program. The program incremental cost (or savings) of each of the resource recovery programs is displayed in rounded numbers in Table 2.

Table ES-2. Incremental Cost of Program Elements

Program	Tonnage	Incremental Cost (Savings)	
		Dollars	$ Per Ton
RRF	438,000	$1.5 million	$35
MRF/Curbside Collection	61,500	$10 million	$164

In addition to the incremental cost or savings that can be attributed to each of the resource recovery programs, each program contributes energy or materials to the economy and reduces the use of available landfill space.

Energy Usage Analysis

The primary forms of energy used within Palm Beach County's IMSWM System are transportation fuels for collection, haul to market, and facility vehicles, and electricity used in the RRF, ferrous metals processing facility, MRF, and maintenance and administration buildings. Energy consumed in the use of recovered materials to make new products is excluded because it is beyond the IMSWM boundary. However, because many manufacturing processes that use recovered materials use less energy than do

virgin material processes (especially recycling aluminum), this exclusion may understate the overall energy efficiency of recycling. This case study did not attempt to consider all aspects of the life cycle of products in the MSW stream; other studies may take these aspects into consideration.

Energy usage data were collected from the SWA and from municipalities. Some engineering estimates were made to supplement the data received. Data on energy consumption for the Palm Beach County IMSWM system were analyzed, yielding estimates for the equivalent diesel gallons per ton shown in Table 3.

Environmental Regulatory Framework

Environmental regulations for the elements of an MSWM system are directed primarily at the facilities that serve such a system. For the most part, these facilities will be one or more of the following:

- transfer station
- materials recovery facility
- compost facility
- waste-to-energy facility
- sanitary landfill.

In the State of Florida, the authority for regulating solid waste management and protecting against negative environmental consequences of such management activities is granted within the Florida Resource Recovery and Management Act of 1976, as amended. The law is administered by the Florida Department of Environmental Regulations (FDER). The law directs FDER to "plan for and regulate the storage, collection, transportation, separation, processing, recycling, and disposal of solid waste in order to protect the public safety, health, and welfare, to enhance the environment for the people of the state, and to recover resources which have the potential for further use, and to assure that the final irreducible residue is disposed of in a manner which enhances the environment." The law also establishes goals for reducing the amount of MSW prior to final disposal, specifically that the amount of solid waste that would have been disposed of in the absence of reduction and recycling efforts undertaken within the county be reduced by at least 30% by the end of 1994.

Individual permits, granted by local jurisdiction and pertinent to such issues as wastewater, surface water, and storage tanks are required. The South Florida Water Management District provides review for the water quality and quantity impacts arising from the operations of solid waste management facilities. In addition, the Palm Beach County Public Health Unit monitors the health impacts arising from these facilities.

Many federal environmental laws apply to the facilities operated by the SWA, including the Clean Air Act, the Clean Water Act, the Safe Drinking Water Act, and the Resource Conservation and Recovery Act. Other regulatory agencies with permitting oversight of solid waste management facilities include the Federal Aviation Administration, regarding stack height; the Federal Energy Regulatory Commission, regarding generation of electric power; and the U. S. Army Corps of Engineers, regarding wetlands.

All of the IMSWM system facilities located at the North County Complex (the RRF, the Class I and III Landfills, the MRF, and the ferrous metals processing facility) except the composting facility were permitted under either the original power plant site certification or under modifications, or were approved for construction by the FDER. In FY 1992, all SWA facilities were operated in compliance with permit conditions.

TABLE 3: ENERGY CONSUMED TO COLLECT GARBAGE, TRASH, AND RECYCLABLES (FY92)

VARIABLES	GARBAGE	TRASH	GARBAGE/ TRASH	RECYCLABLES
Tons Collected	139,291	51,270	190,561	16,137
Diesel Fuel Consumed (gallons)	242,232	84,813	327,045	46,365
Total Miles	645,639	394,008	1,039,647	238,084
Miles per Gallon	2.67	4.65	3.18	5.13
Gallons per Ton	1.74	1.65	1.72	2.87

Source: Boca Raton, Computer Printouts of Fleet Informantion and Vehicle Information provided by Waste Management of Palm Beach.

Introduction to Condensed Report

Palm Beach County (the County) is located along the southeast coast of Florida, as shown in Figure 1, and encompasses an area of 2,063 square miles. It is bounded on the east by the Atlantic Ocean, on the south by Broward County, on the north by Martin County, and on the west by Hendry County. The County has the largest land area of any county in Florida, extending along the Atlantic coast a distance of approximately 45 miles on the north-south axis, and a distance of 53 miles on the east-west axis. In 1992, approximately 897,000 people resided in about 471,000 dwelling units throughout the County, about 50 percent of which were single-family homes.

During fiscal year 1992 (FY 1992), approximately 1.10 million tons of solid waste were received by the Palm Beach County integrated municipal solid waste management system (IMSWM System). The Solid Waste Authority of Palm Beach County (the Authority or SWA) is responsible for the processing and disposal of all County-generated waste delivered to the IMSWM System.

The County's Integrated Municipal Solid Waste Management System

System Overview

The Authority was created in 1975 by the State Legislature under the Palm Beach County Solid Waste Act, Chapter 75-473, Laws of Florida (the Act). The Act gave the Authority the power to construct and operate solid waste disposal facilities and to require that all municipal solid waste collected by public and/or private agencies from any municipality or unincorporated area of the County be transported to Authority-designated processing and disposal facilities.

The Authority developed a Comprehensive Solid Waste Management Plan for the County that specifies short-term and long-range strategies for the processing and disposal of the County's solid waste. The Comprehensive Plan, as adopted, outlines a system that could ultimately include: (1) two major resource recovery facilities and adjacent sanitary landfills; (2) a network of transfer stations and related transport equipment; (3) recycling facilities: (4) compost facilities; and (5) other ancillary facilities. Most of the planned facilities are operational, with the exception of a second resource recovery facility and associated landfills, development of which is not being considered at this time.

In February 1989, the Authority authorized the development of a County-wide recycling program. The current residential collection program includes:

- approximately 95 percent (280,000 homes) participation in a multi-material curbside collection program in 37 municipalities and the unincorporated areas; and

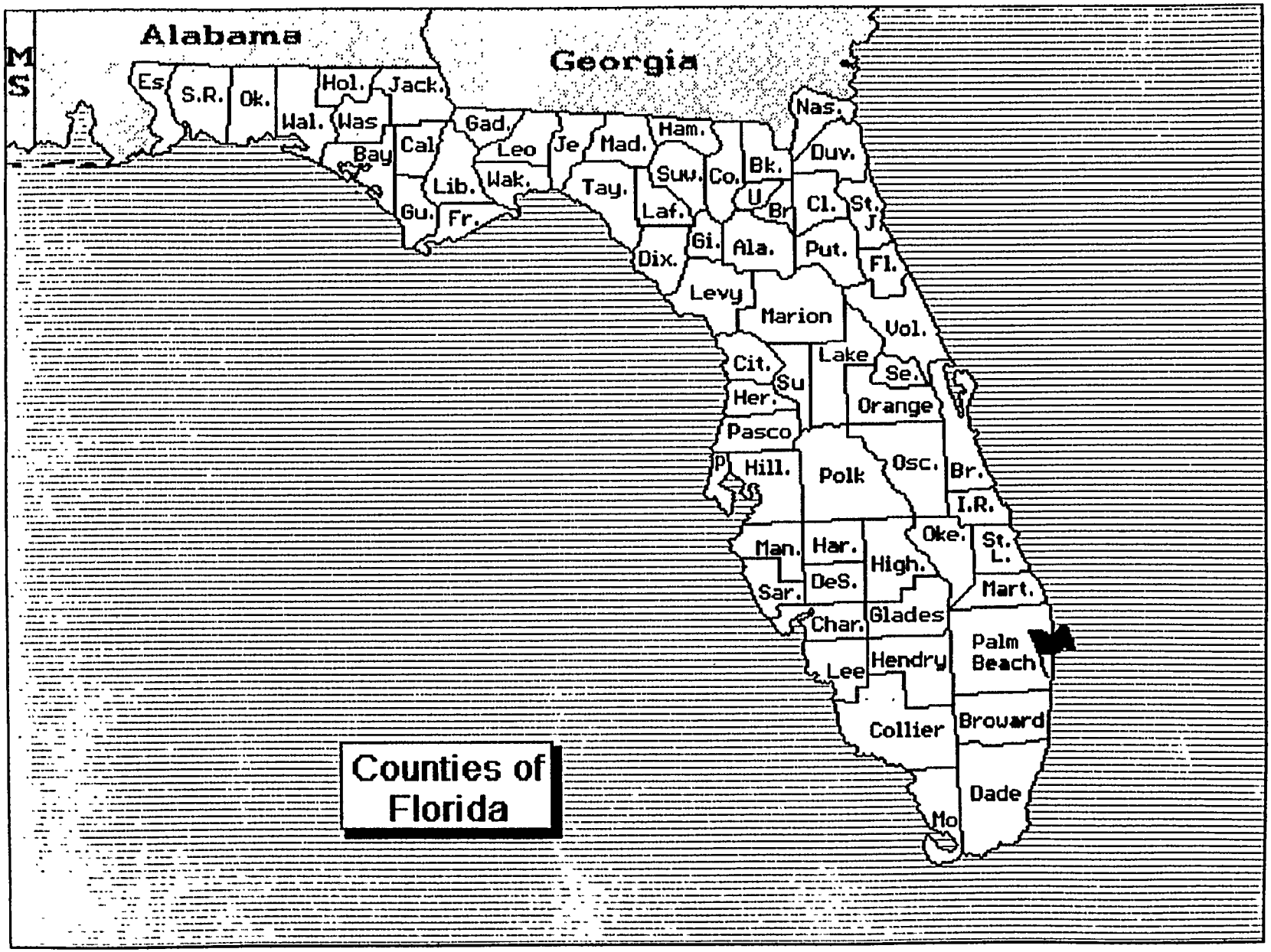
- approximately 75 percent (140,000 multi-family homes) participation in multi-material containerized collection programs throughout the County.

The commercial collection program currently in operation includes:

- complimentary waste audits available to businesses throughout the County;

FIGURE 1

PALM BEACH COUNTY LOCATION



- citywide commercial collection programs provided in Boynton Beach and Lake Worth; and
- office paper collection programs implemented in 50 governmental agencies, 17 municipal offices, and over 5,000 private businesses.

The County's IMSWM System in FY 1992 consisted of the following integrated system components:

- separate collection of garbage, trash, and recyclables by municipalities, private sanitation firms under contract to or franchised by municipalities, and the Authority;
- four transfer stations located throughout the County, at two of which household hazardous waste (HHW) drop-off sites are located;
- a refuse-derived fuel (RDF) resource recovery facility (the RRF);
- a ferrous metals processing facility;
- a materials recovery facility (the MRF);
- a yard waste/sludge composting facility;
- an HHW drop-off and storage facility;
- a landfill for the disposal of garbage, RRF ash and residue, MRF residue, and some Other Wastes (the Class I Landfill); and
- a landfill for the disposal of trash, construction/demolition debris, and some Other Wastes (the Class III Landfill).

The RRF, MRF, compost facility, ferrous metals processing facility, HHW drop-off and storage facility, and both landfills are located at the 1,300-acre North County Regional Resource Recovery Facility complex (the North County Complex). The locations of the facilities that constitute the Palm Beach County IMSWM System are shown in Figure 2. A site plan of the North County Complex is provided in Figure 3. As previously stated, the Authority is responsible for processing and disposing of all municipal solid waste (MSW) and Other Waste delivered to the County's IMSWM System. As referred to herein, MSW includes: garbage (balance of MSW after accounting for trash, recyclables, and HHW); trash (yard waste, bulky waste, and other inorganic waste that is not recovered for recycling, which is set out and collected separately); recyclable materials [glass, plastic (PET and HDPE), and aluminum containers; newspaper; old corrugated cardboard; and Kraft paper]; and HHW. Other Waste, as referred to herein, comprises sludge, asbestos, construction and demolition (C&D) debris, clean and unclean fill, land-clearing debris, and miscellaneous materials.

FIGURE 2

IMSWM SYSTEM COMPONENTS LOCATION

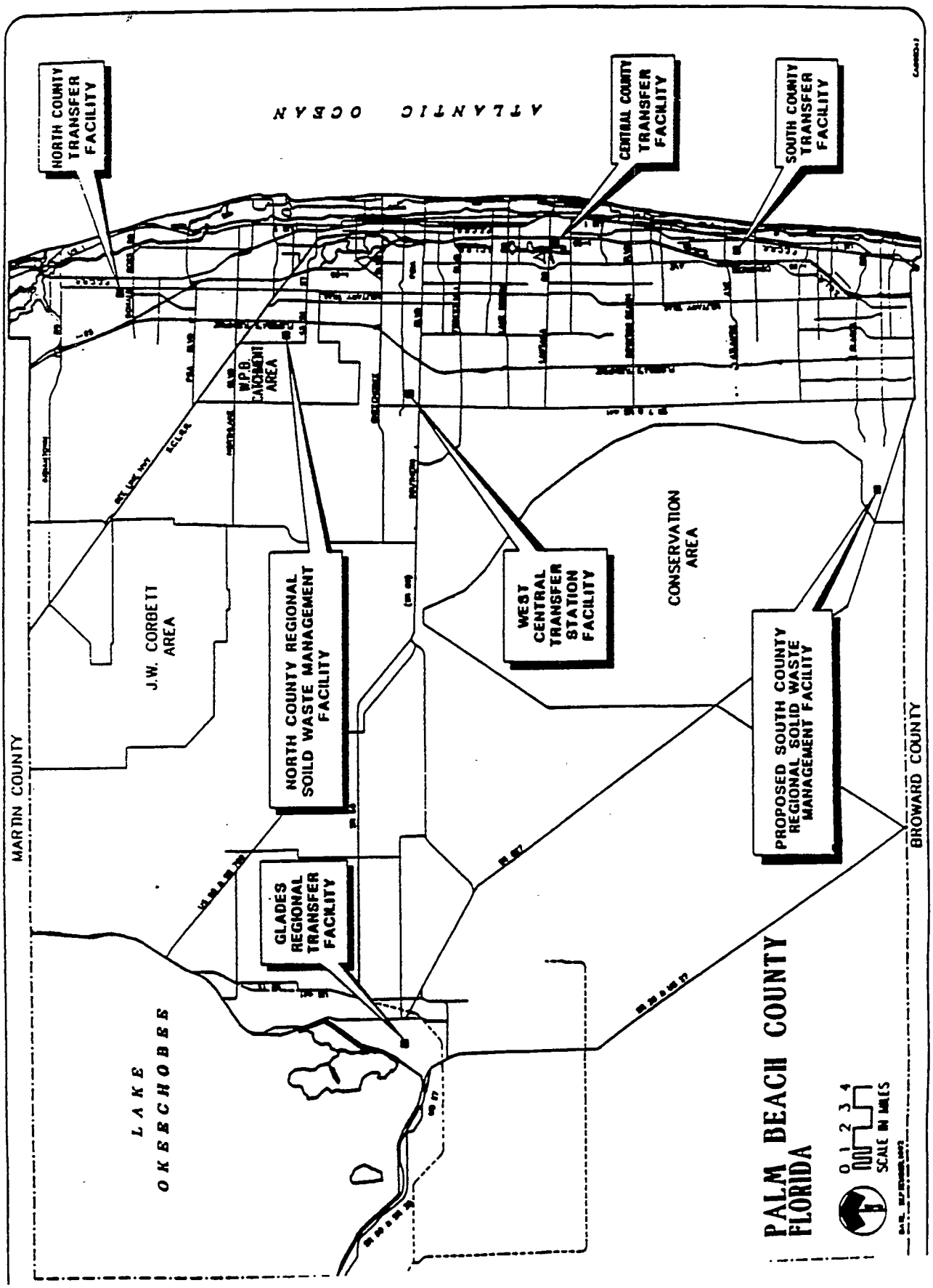
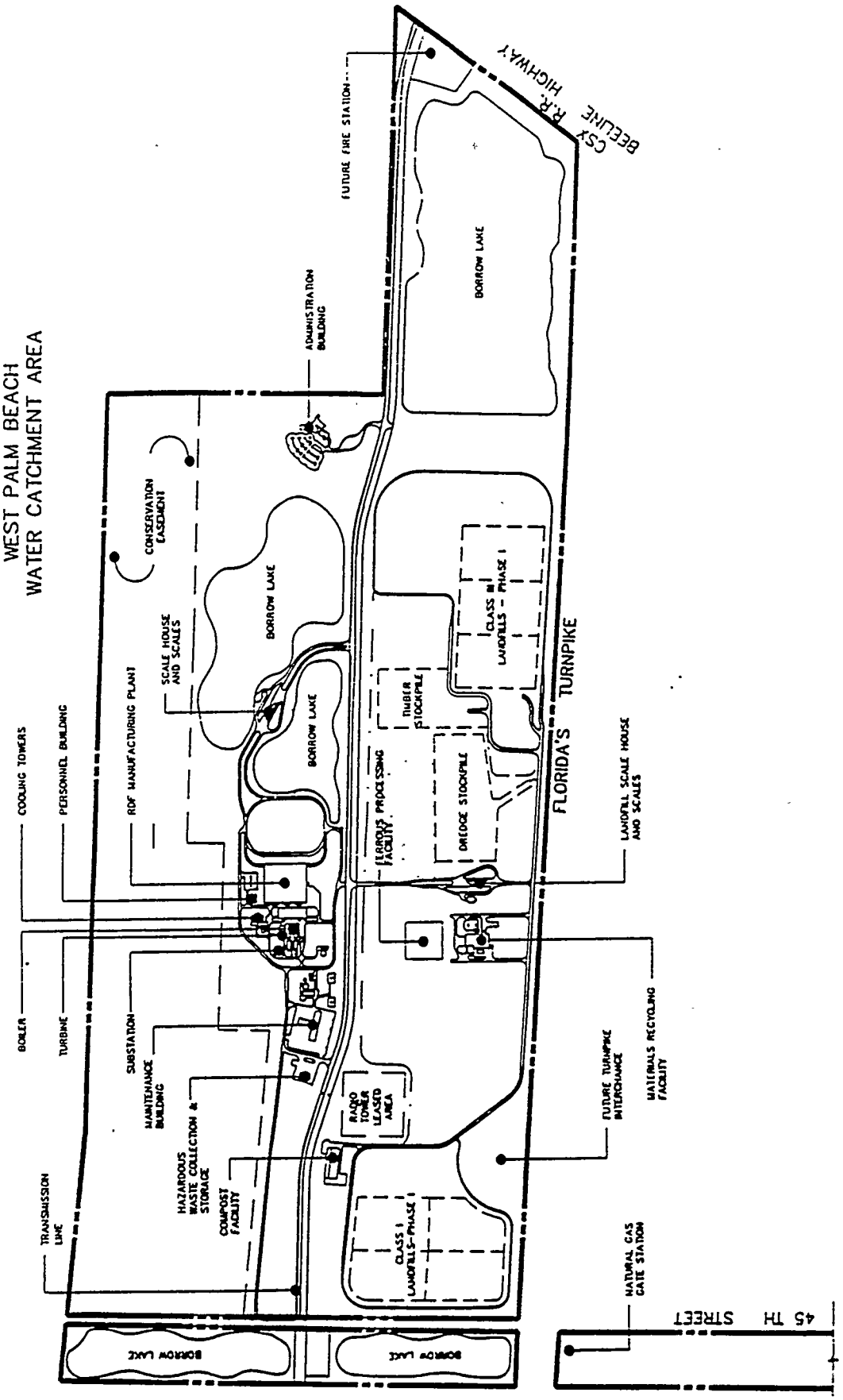


FIGURE 3

NORTH COUNTY COMPLEX SITE PLAN



System Component Descriptions

Collection

Collection of MSW within the County is performed by the Authority; individual municipalities; or private haulers under contract to or franchised by municipalities, commercial establishments, or the Authority. Table 1 lists the 37 municipalities and unincorporated areas within the County and indicates whether municipal, private, or Authority collection occurs within each. In addition, some individuals and commercial establishments deliver their own MSW, which is referred to as "self-hauling."

The Authority has recommended that the following minimum standards be utilized by local governments in the collection and transport of waste:

- at least bi-weekly collection of residential garbage;
- provision of a scheduled program of trash collection;
- at least once-per-week collection of commercial waste; and
- provision of subscription for collection service to residences and commercial businesses.

Each component of MSW, i.e., garbage, trash, and recyclable materials, is set out and collected separately.

Transfer System

Seventy-six percent of all MSW (64 percent of all waste) generated within the County was delivered to the Authority's North County Complex by the Division of Transport Services. This division operates four transfer stations, which are open 312 days per year.

The North County Transfer Station is located in the Jupiter area. The facility utilizes four gravity top-loading bays, each with a capacity of 60 tons per hour. This facility receives MSW and serves as a drop-off center for used oil, vehicle batteries, and propane gas cylinders. The transfer haul fleet consists of diesel tractors and 75- and 100-cubic-yard trailers. The South County Transfer Station is located in Delray Beach. The facility has a capacity of 1,000 TPD and utilizes two push pits, stationary compactors, and two top-loading pits to handle both top-loading and compactor transfer trailers. The transfer haul fleet consists of diesel tractors and 75- and 100-cubic-yard trailers.

The Glades Regional Transfer Station is located in Belle Glade and has a capacity of 200 TPD. The transfer station utilizes gravity top-load design and is constructed of reinforced concrete, concrete block, and steel. The transfer haul fleet consists of three diesel tractors, each equipped with a 100-cubic-yard trailer.

The Central County Transfer Station is located in Lantana. The station has a rated capacity of 1,000 TPD and utilizes two push pits, stationary compactors, and two top-loading pits to handle both top-loading and compactor transfer trailers. The transfer haul fleet consists of diesel tractors and 75-and 100-cubic-yard trailers.

TABLE1: MUNICIPAL, PRIVATE, AND SWA COLLECTION BY MUNICIPALITY IN PALM BEACH COUNTY IN FY92

MUNICIPALITY	POPULATION 1990	POPULATION 1992	GARBAGE/ TRASH	RECYCLABLES
Atlantis	1,653	1,653	Municipal (1)	Municipal (1)
Belle Glade	16,177	16,105	Municipal	SWA
Boca Raton	61,492	63,224	Municipal	Municipal
Boynton Beach	46,284	48,144	Municipal	Municipal
Briny Breezes	400	395	Private	Private
Cloud Lake	121	121	Private	Private
Delray Beach	47,181	48,181	Private	Private
Glen Ridge	207	211	Private	Private
Golf	184	190	Private	Private
Golfview	153	153	Private	Private
Greenacres City	18,683	19,442	Private	Private
Gulf Stream	690	703	Private	Private
Haverhill	1,058	1,154	Private	Private
Highland Beach	3,209	3,234	Private	Private
Hypoluxo	807	1,117	Private	Private
Juno Beach	2,121	2,185	Private	Private
Jupiter	24,907	25,898	Private	Private
Jupiter Inletn Colony	405	406	Private	Private
Lake Clarke Shores	3,364	3,613	Private	Private
Lake Park	6,704	6,639	Municipal	Municipal
Lake Worth	28,564	28,387	Municipal	SWA
Lantana	8,392	8,396	Municipal	Municipal
Manalapan	312	321	Private	Private
Mangonia Park	1,453	1,411	Private	Private
North Palm Beach	11,343	11,747	Municipal	Municipal
Ocean Ridge	1,570	1,593	Private	Private
Pahokee	6,822	6,871	Municipal	SWA
Palm Beach	9,814	9,819	Municipal	Municipal
Palm Beach Gardens	22,965	27,553	Private	Private
Palm Beach Shores	1,035	1,031	Private	Private
Palm Springs	9,763	9,706	Municipal	Municipal
Riviera Beach	27,644	27,128	Municipal	Municipal
Royal Palm Beach	15,532	16,462	Private	Private
South Bay	3,558	3,448	Private	SWA
South Palm Beach	1,480	1,483	Private	Private
Tequesta	4,499	4,503	Private	Private
West Palm Beach	67,643	68,270	Municipal	SWA
Unincorporated(3)	405,329	425,888	SWA (2)	SWA (2)

SOURCES:

1. SWA, "Palm Beach County Solid Waste Services, Municipal and Unicorporated", undated.
2. Bureau of the Census, "Population and Housing Unit Counts, Florida", 1990 Census of Population and Housing, U.S. Department of Commerce, Issued April 1993.
3. University of Florida, "1992 Florida Estimates of Population", Table 1 -- Estimates of Population by County and Municipality in Florida," April 1, 1992, page 21.

NOTES:

1. The Town of Lantana collects garbage/trash and recyclables for the City of Atlantis.
2. The SWA contracts with private haulers for collection in the unicorporated areas.
3. In FY92 seven (7) collection districts were defined by the SWA in the unincorporated areas.

Processing Facilities

The IMSWM System processing facilities located at the North County Complex are the RRF, the ferrous metals processing facility, the MRF, and the compost facility. These processing facilities are described below.

Resource Recovery Facility

The Authority owns and operates, under a long-term agreement with the joint venture of Babcock and Wilcox and Bechtel Company (Palm Beach Energy Associates), the 2,000-ton-per-day (TPD) RRF. The facility has demonstrated the capability to process 686,000 tons per year (TPY) of garbage. Residue from the facility goes to the Class I Landfill and consists of ash (bottom and fly), RDF process residue, and nonprocessible waste. The RRF is equipped with tire-shredding equipment and an oversized-bulky-waste shredder. Both ferrous metals and aluminum are recovered from the waste stream prior to combustion in the RRF; ferrous metals are also recovered from the ash.

The RRF receives, processes, and combusts approximately 2,000 TPD, six days per week, of garbage generated in the County. Three processing lines in the mixed-waste processing plant (i.e., RDF plant) produce fuel for the two boilers in the combustion plant. The system can produce up to 1,600 TPD of RDF. The steam from the two boilers supplies the turbine-generator located in the electric generating plant.

The mixed-waste processing plant consists of three 1,000-TPD processing lines, an oversized bulky waste (OBW) line, and a tire-shredding line. The processing lines are designed to recover ferrous metals material and aluminum; remove glass, grit, dirt, and stones from the incoming MSW stream; and produce the RDF. Two lines are designed to handle the day-to-day operations, and the third provides built-in redundancy. A process flow diagram of each MSW processing line is shown in Figure 4.

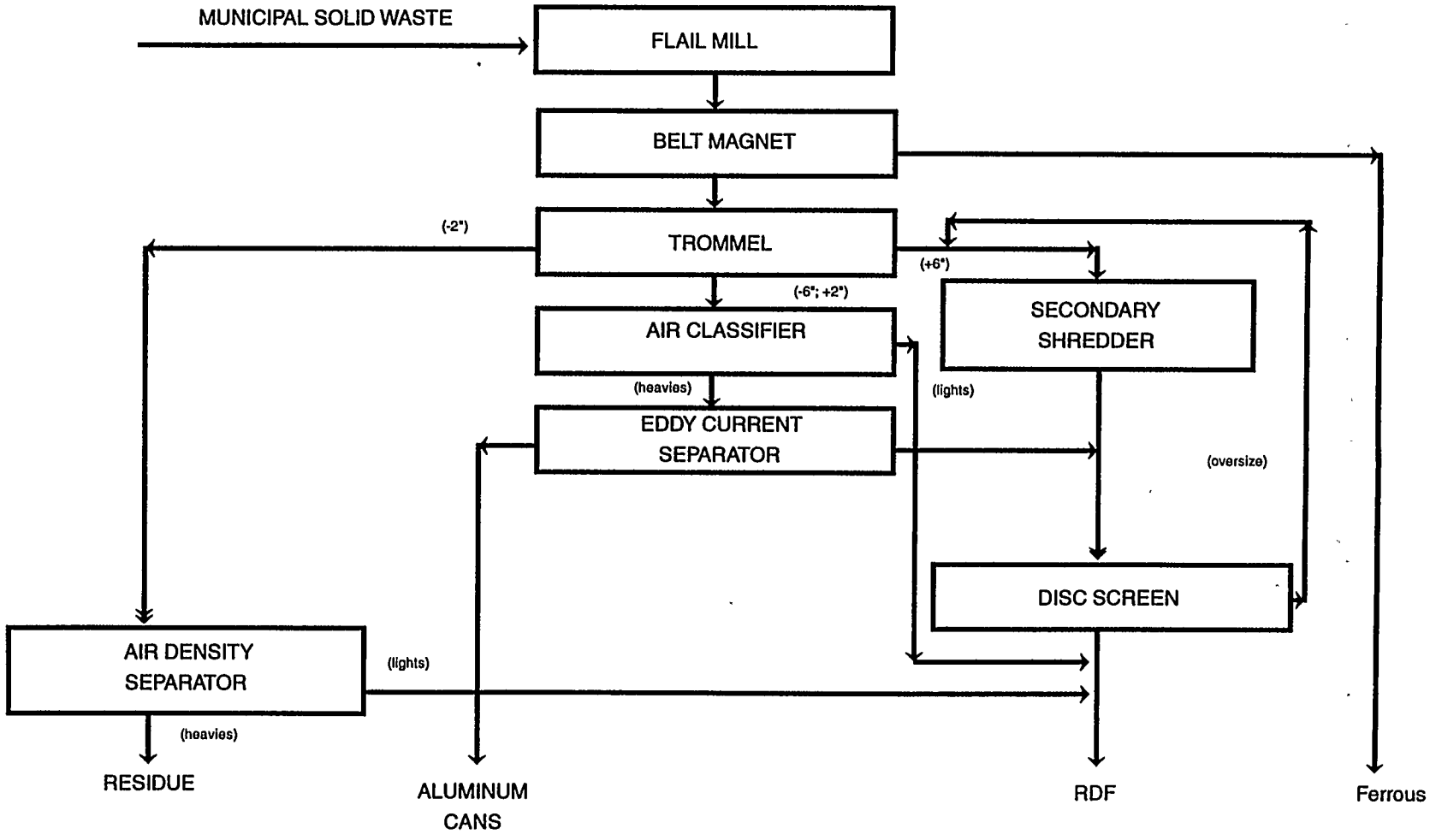
Ferrous Metals Processing Facility

The ferrous metals processing facility was designed and constructed by the David J. Joseph Company under a contract with the Authority. Commercial operations began in September 1992. The facility processes ferrous metals recovered from the RRF, white goods from the Landfills, and ferrous metals recovered from the MRF into marketable, #2 grade. The recovered densified ferrous metals is transported by rail shipments for reuse in steel manufacturing plants in Florida and the Southeast.

Materials Recovery Facility

The 38,000-square-foot MRF began commercial operations in July 1991. The $6.2-million facility was designed and constructed by Resource Recycling Technologies and is currently operated by RRT. The MRF processes an average 250 TPD of recyclable materials and has a 500-TPD capacity if operated on two shifts. Materials accepted for processing include: aluminum cans, newspaper and its corresponding inserts, brown paper (Kraft) bags, office paper, glass containers (all colors), and plastic containers consisting of high-density polyethylene (HDPE) and polyethylene terephthalate (PET). The recyclable material is delivered source-separated from other MSW into either of two categories: mixed paper, or commingled containers (i.e., glass, metal, and plastic bottles and cans). The MRF houses two processing lines: one for the mixed paper, the other for the commingled materials. The commingled materials line is further divided into an aluminum and plastics subsystem and a glass subsystem, as shown in Figure 5.

FIGURE 4: RRF MIXED-WASTE PROCESSING LINES



Source: "RDF-fired plant aims for high efficiency, low emissions," POWER, April 1990

FIGURE 5: MRF PROCESS FLOW DIAGRAM

PAPER PROCESSING SUBSYSTEM

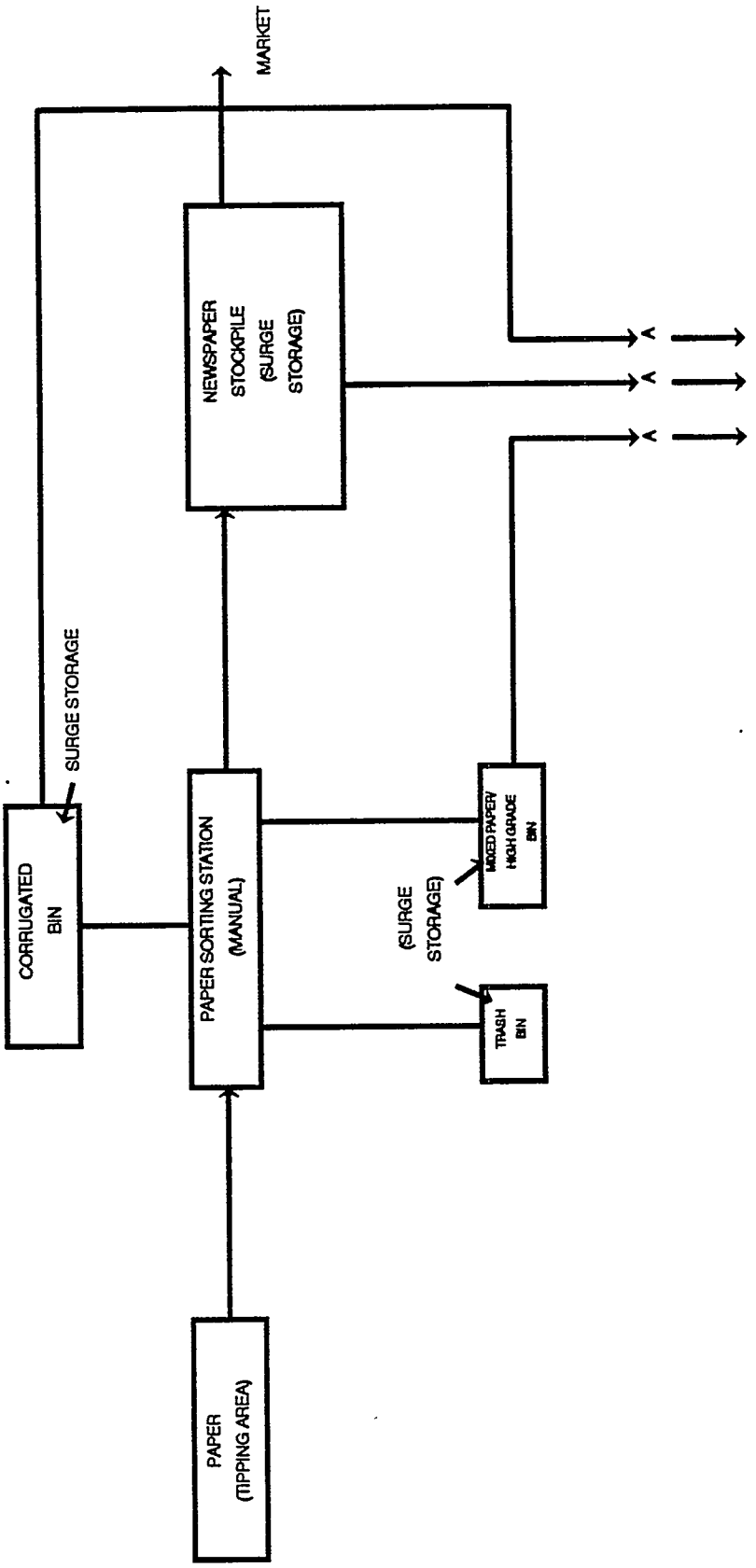


FIGURE 5: MRF PROCESS FLOW DIAGRAM (continued)

ALUMINIUM AND PLASTICS PROCESSING SUBSYSTEM

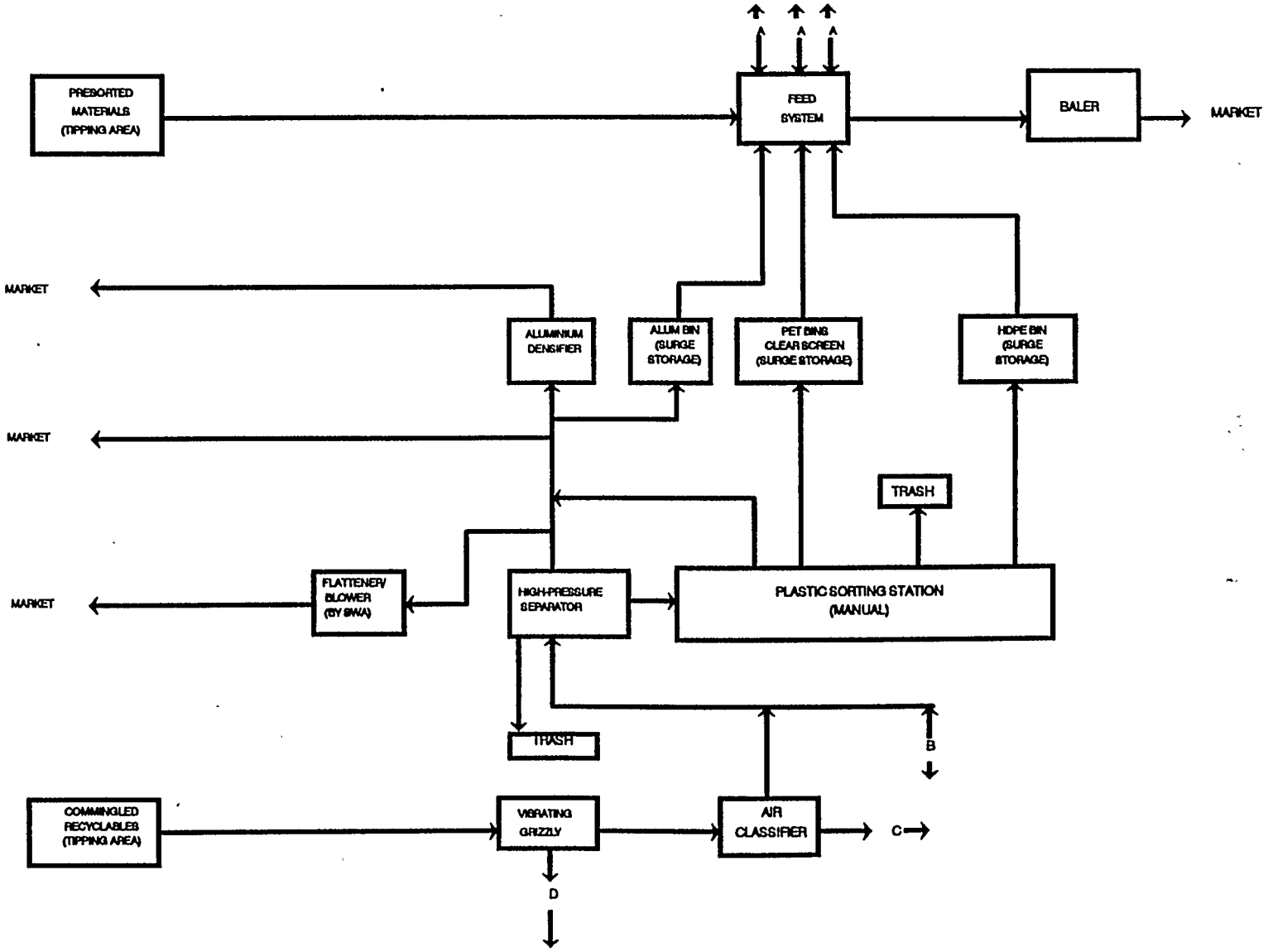
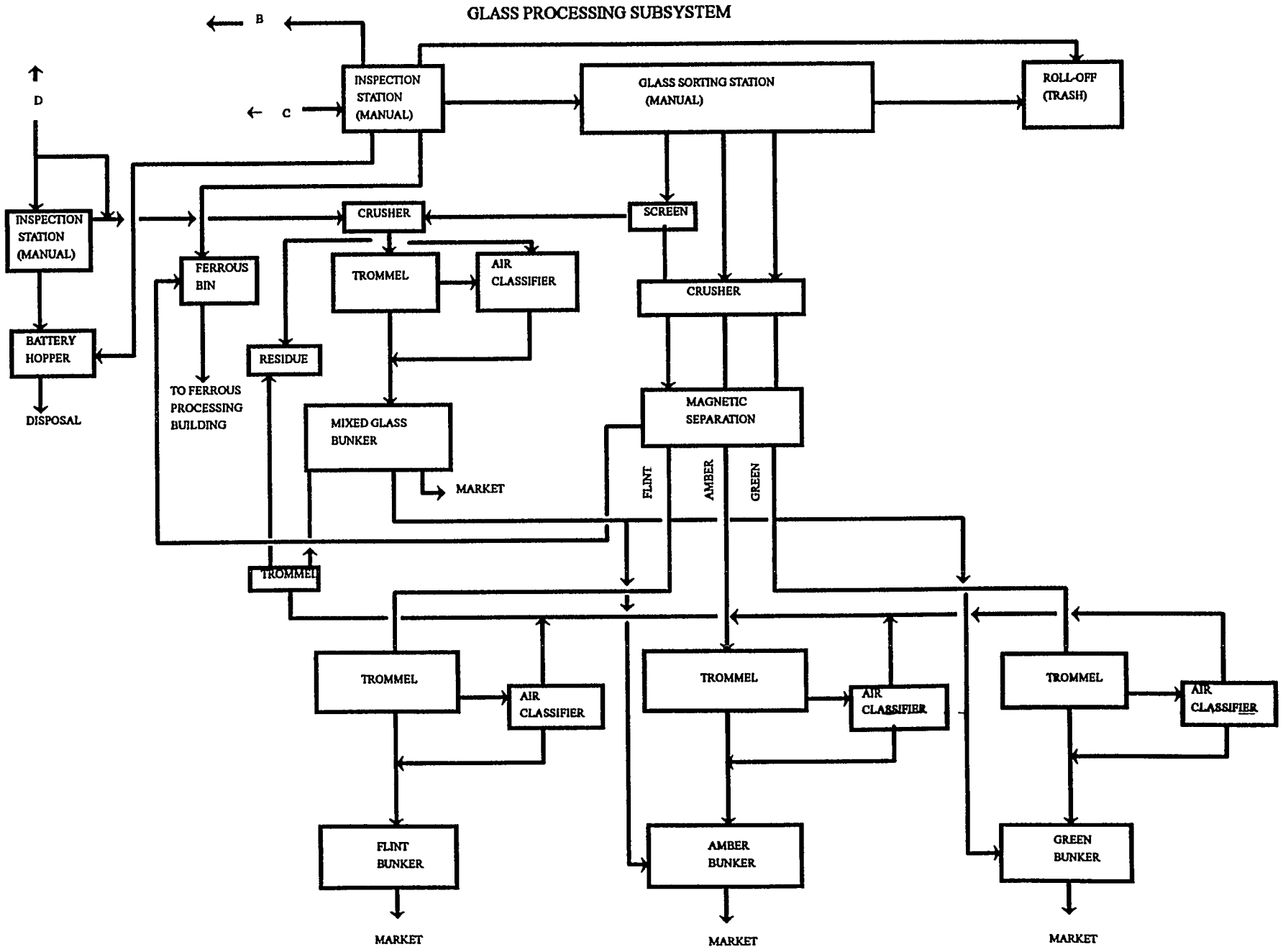


FIGURE 5: MRF PROCESS FLOW DIAGRAM (continued)



Compost Facility

The 14,000-square-foot composting facility began operations in September 1991. The facility processes 30 to 50 TPD of combined yard waste and wastewater residuals (sludge) with automatic, computer-controlled equipment. The compost produced is rated Class AA by the Florida Department of Environmental Regulation (DER), which translates into a product with widespread application and limited restrictions on use in the horticultural industry within the County.

The facility houses four in-vessel processing bays, with plans for expansion to 36 bays in 1993. The expanded facility will process 144 TPD of vegetative wastes and 192 TPD of sludge from the County and city facilities.

The process is a forced-air, agitated-bed, aerobic system of composting. Composting is completed under controlled aerobic conditions in concrete bays. The individual bays are open at the top, but are sheltered in a weatherproof building that protects the operation and permits year-round operation. The system is modular -- each concrete bay is a separate composting unit with individual controls. Figure 6 is a flow diagram of the system.

Household Hazardous Waste Facilities

The HHW collection and storage facility at the North County Complex completed its first year of operation in June 1991. The facility is located in a 2,500-square-foot building. The facility receives wastes from Wednesday through Friday and on the second Saturday of each month. The Authority recycles close to 50 percent of the HHW it receives.

The Delray Beach HHW facility at the South County Transfer Station began operations in June of 1991. The facility receives waste by appointment on the third Saturday of each month.

The Belle Glade HHW facility at the Glades Regional Transfer Station receives wastes quarterly, on the last Saturday of each quarter.

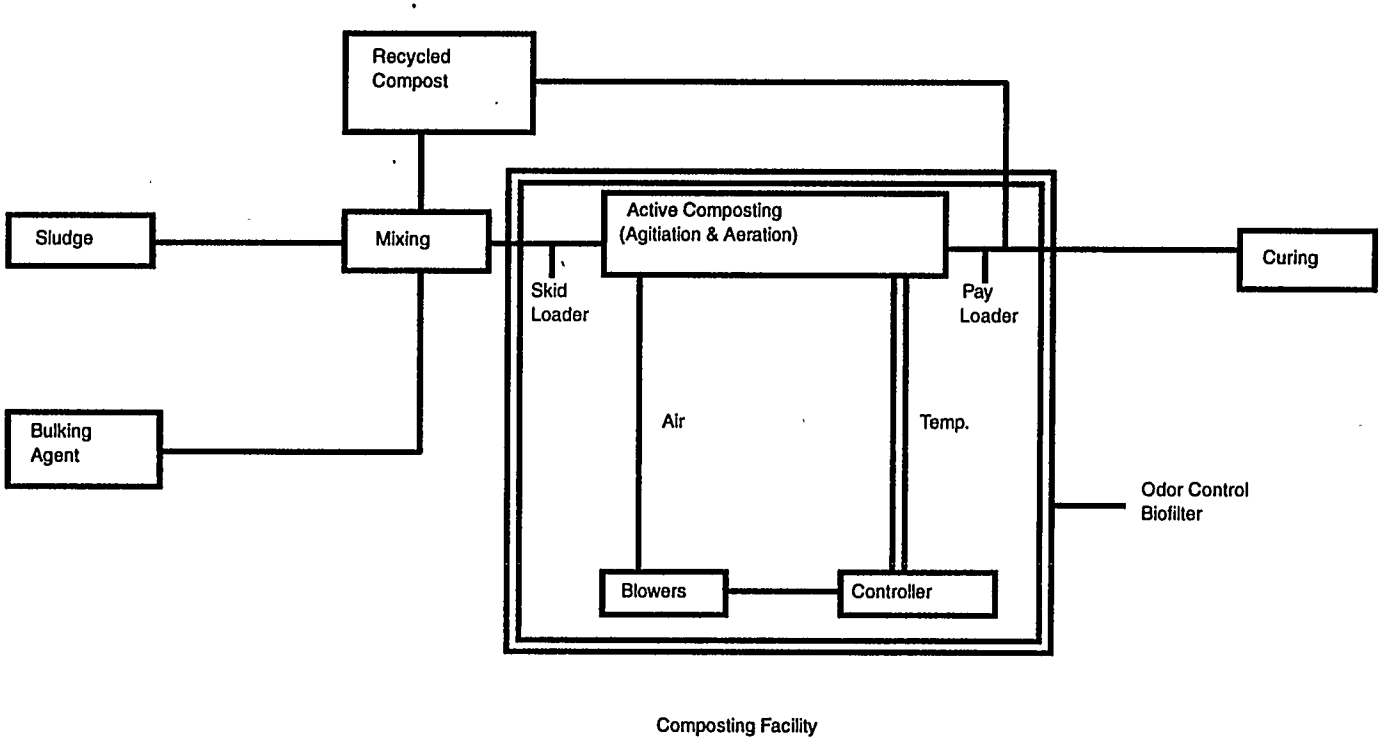
Landfills

The Authority has reduced its landfill space consumption by more than half through the implementation of its IMSWM System, which emphasizes energy and materials recovery. Current programs to recover recyclable materials include curbside collection programs, with recovered materials processed at the MRF; ferrous metals recovery from the RRF and Class III Landfill, with processing taking place at the ferrous metals processing facility; and recovery of nonferrous metals from the RRF. In addition, the Authority is recycling yard wastes, wood, and C&D debris in its Class III Landfill area.

The North County Complex Class I and III Landfills are open 312 days per year and maintain 24-hour operations in support of the RRF. The Class I Landfill has a permitted size of 201.19 acres, with a total volume capacity of 16,286,000 cubic yards. A total of 39 acres of double-lined Class I Landfill is operational at the North County Complex, with a volume capacity of 1,950,000 cubic yards. The Class I Landfill receives ash from the RRF, nonprocessible material from the RRF, any garbage not processed at the RRF, and some special wastes such as treated bio-hazardous materials.

The Class III Landfill has a permitted size of 104.39 acres and a volume capacity of 9,214,000 cubic yards. A total of 34 acres of single-lined Class III Landfill are operational at the North County Complex, with a volume capacity of 1,845,000 cubic yards.

Figure 6: Sludge Composting Facility Process Flow Diagram



In order to reduce the volume and amount of materials being placed in the Class III Landfill, the Authority has installed volume reduction and recycling equipment designed to (1) increase densities and compaction rates; (2) allow the recycling of ferrous metals, C&D debris, and wood wastes; and (3) provide processible waste that can be incinerated at the RRF when capacity is available.

MSW and Other Waste Collected, Processed, and/or Disposed of in Palm Beach County

A total of approximately 1.10 million tons of waste material was processed or disposed of by the Authority in FY 1992. Of this amount about 79 percent was garbage/trash and 6 percent was recyclables. The remaining 15 percent included sewage sludge, asbestos, C&D debris, fill material, land clearing debris, tires, and miscellaneous wastes, collectively referred to as "Other Waste." Table 2 summarizes the tonnage collected, processed, and disposed of throughout the County in FY 1992. A waste flow and resource recovery diagram of the waste stream processed through the Authority's IMSWM System is depicted in Figure 7.

Collection and Transfer of MSW

MSW is collected by municipalities, private collection companies, and the Authority. Based on the Customer Tonnage Reports prepared by the Authority, a total of 17 municipal customers delivered garbage/trash and 8 delivered recyclables to Authority facilities in FY 1992, as shown in Table 3. A total of nine private firms delivered MSW to Authority facilities. The balance of the waste stream was collected by either the Authority or small haulers/businesses that were not specifically identified in the Customer Tonnage Reports (i.e., "self-hauled" waste). Of the approximately 880,000 tons of MSW collected by either municipalities or private firms, approximately 35 percent was collected by municipalities.

Approximately, 717,000 tons, or 77 percent, of the MSW (i.e., garbage/trash and recyclables) collected in the County were delivered to one of the four transfer stations operated by the Authority. Table 4 shows that about 93 percent of the tonnage transferred through these facilities was garbage/trash and about 7 percent was recyclables. Except for a small amount of recyclables and HHW that were delivered to drop-off sites throughout the County, the balance of the MSW was hauled directly to the North County Complex, where it was delivered to the MRF, RRF, landfill, or HHW facility.

North County Regional Resource Recovery Facility

The RRF received 724,923 tons of garbage in FY 1992. About 80 percent was delivered from the transfer stations; 0.5 percent was delivered from the MRF; and the remainder was delivered directly to the RRF. Of this amount, 24,073 tons were deemed unprocessible and diverted to the Class I Landfill. The remaining 700,870 tons were processed to produce refuse-derived fuel (RDF) and to recover metals. A total of 134,003 tons of residue, composed primarily of glass, grit, stones, and grass clippings, was generated from the processing operation at the RRF. The residue was disposed of in the Class I Landfill.

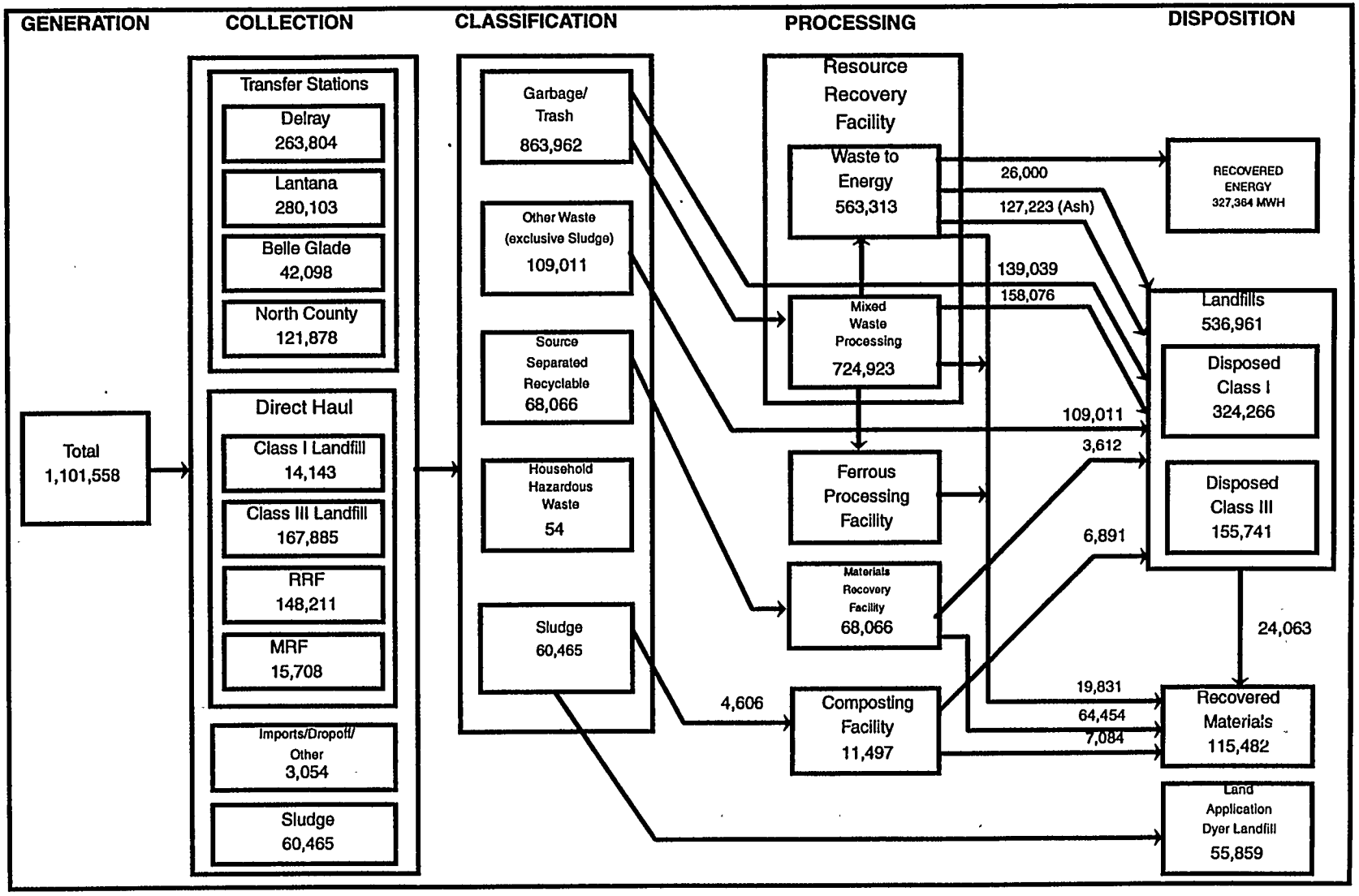
A reported 30,084 tons of ferrous metals and 1,154 tons of aluminum were recovered at the RRF. However, the poor quality of the recovered ferrous metals made the sale of this material difficult. Including both pre- and post-combustion recovered ferrous metal, only 18,726 tons were sold in FY 1992. In addition to the RDF produced at the RRF, approximately 18,800 tons of shredded waste from the landfill was diverted to the RRF as a recovered fuel. This material was delivered directly to the RDF storage facility, and thus is referred to by the Authority as "back door" waste. Ash generated at the RRF

TABLE 2: MSW AND OTHER WASTES COLLECTED, PROCESSED, AND/OR DISPOSED OF IN PALM BEACH IN FY92

WASTE TYPE	PERCENT	TONS
MSW		
GARBAGE/TRASH		
City Collected	26.7	294,381
Contrator Collected	47.7	525,080
Self Hauled	4.0	44,501
Subtotal Garbage/Trash	78.4	863,962
RECYCLABLES		
City Collected	1.1	12,300
Contrator Collected	4.3	47,844
SWA Collected	0.4	4,760
Self Hauled/Drop Off/Imported	0.3	3,162
Subtotal Recyclables	6.2	68,066
HOUSEHOLD HAZARDOUS WASTI	0.0	192
OTHER WASTES		
Sludge	5.5	60,465
Asbestos	0.1	1,092
C&D Debris	6.9	75,519
Fill	0.7	7,549
Land Clearing Debris	0.9	10,423
Tires	0.4	4,288
Miscellaneous	0.9	10,140
Subtotal Other Wastes	15.4	169,476
TOTALS	100	1,101,696

SOURCE: SWA, "Customer Tonnage Reports for 10/01/92 through 09/30/92",
Office of Recycling, Public Affairs, and Contract Management.

FIGURE 7 : WASTE FLOW AND RESOURCE RECOVERY DIAGRAM
PALM BEACH COUNTY FY92



Footnotes:

1. Input of waste to RRF and Compost Facility do not equal output due to moisture gain/loss and thermal or biolotical destruction.

2 Some unkown quantity tires (I e., other waste) are delivered to the RRF for shredding into a fuel The flow chart assumes tires are first delivered to the landfill and diverted to the RRF

TABLE 3: SOURCE AND TONNAGE OF MSW IN PALM BEACH COUNTY WASTE (FY92)

SOURCE	GARBAGE	TRASH	YARD WASTE	SUBTOTAL	RECYCLABLES	TOTAL
CITY COLLECTED						
Atlantis & Lantana	4,002	3,764	16	7,782	676	8,458
Belle Glade	10,255	5,246	425	15,926	0	15,926
Boca Raton	32,261	11,947	473	44,681	6,289	50,970
Boynton Beach	36,442	12,609	56	49,107	1,917	51,024
Green Acres	7	3,447	446	3,900	0	3,900
Lake Park	7,459	689	3	8,151	572	8,723
Lake Worth	13,511	5,784	4	19,299	0	19,299
Mangoni Park	0	444	156	600	0	600
North Palm Beach	9,631	337	37	10,005	754	10,759
Pahokee	3,750	952	0	4,702	0	4,702
Palm Beach	8,770	595	1,649	11,014	623	11,637
Palm Beach Gardens	158	260	0	418	0	418
Palm Springs	3,104	2,424	156	5,684	708	6,392
Riviera Beach	18,823	12,319	10	31,152	761	31,913
West Palm Beach	55,928	25,300	374	81,602	0	81,602
West Palm DPW	0	350	8	358	0	358
Subtotal	204,101	86,467	3,813	294,381	12,300	306,681
CONTRACTOR COLLECTED						
BFI	3,055	572	7	3,634	0	3,634
County Sanitation	131,568	10,133	1,551	143,252	13,406	156,658
D&V Carting	16,421	2,634	38	19,093	2,496	21,589
Florida Sanitation	9,365	1,891	10	11,266	141	11,407
Humpty Dumster	10	534	30	574	0	574
Nichols	33,573	1,970	1,092	36,635	3,417	40,052
S. Florida Sanitation	8,368	658	21	9,047	204	9,251
Sunburst Sanitation	50,737	897	260	51,894	5,985	57,879
Waste Management	223,495	26,158	32	249,685	22,195	271,880
Subtotal	476,592	45,447	3,041	525,080	47,844	572,924
TOTAL TONS	680,693	131,914	6,854	819,461	60,144	879,605

SOURCE: SWA, "Customer Tonnage Reports for 10/01/92 Through 09/30/92", Office of Recycling, Public Affairs, and Contract Management.

TABLE 4: TONNAGE TRANSFERED THROUGH

TRANSFER STATION	GARBAGE/ TRASH	RECYCLABLES	TOTAL
North County (Juniper)	114,232	7,646	121,878
West County (Belle Glade)	42,098	0	42,098
South County (Delray)	239,008	24,796	263,804
Central County (Lantana)	272,320	16,557	288,877
Total Tonnage	667,658	48,999	716,657
Percent	93.2	6.8	100.0

SOURCE: SWA, "Transfer Station Monthly Statistics Reports," October 1991 through Septembe

amounted to 127,312 tons. Approximately 89 tons of ferrous metals were extracted from the ash. The remaining 127,223 tons of ash were disposed of across the street at the Authority's Class I Landfill.

Materials Recovery Facility

The Authority reports that 68,066 tons of source-separated recyclables were accepted at the MRF in FY 1992. Of this amount, 65,065 tons were collected by municipalities, private firms, or the Authority from sources within the County; 1,325 tons were imported from neighboring Martin and Broward counties; and 1,164 tons were collected from drop-off sites and by other miscellaneous means. A total of 64,454 tons of these recyclable materials were recovered and sold. The balance of 3,612 tons, consisting primarily of combustible residue, was delivered to the RRF.

A breakdown of the recovered recyclable commodities processed at the MRF and sold is provided in Table 5. As shown in Figure 8, about three-quarters, by weight, of the materials sold was paper products, primarily newspaper. Paper products, however, only generate about 37 percent of the revenues received from the materials recovered from the MRF. Although the aluminum represents less than two percent, by weight, of the material recovered at the MRF, it generated about 48 percent of the revenues.

Sludge Composting Facility

In FY 1992 the composting facility processed 4,606 tons of sludge. An additional 6,890 tons of mulch were used in the process as a bulking agent. The mulch was produced at the Authority's Class III Landfill from yard waste. A total of 7,084 tons of marketable compost material was produced by the composting facility.

Household Hazardous Waste

About 192 tons of HHW were collected by the Authority in FY 1992. About 30 percent of this material was sent to an outside processor. The remaining tonnage was recovered for reprocessing by the Authority. About 51 percent, or 98 tons, of the HHW was recycled.

North County Complex Landfills

About 536,960 tons of waste were delivered to both North County Complex Landfills in FY 1992. Of this amount, about 480,000 tons (753,000 cubic yards) were disposed of in the Landfills. Table 6 provides the composition of the materials disposed of in the Landfills on both weight and volumetric bases.

The balance of waste delivered to the Landfills, or 56,955 tons, was recovered as usable materials and diverted from the Landfills. The types of materials recovered are mulch, metals, tires, road material, fill material, and RRF fuel. The quantities of materials recovered are provided in Table 7. Also included in this table are the quantities of materials recovered from the MRF and RRF, to provide a complete categorization of the materials recovered from the waste stream and processed through the County's IMSWM System.

Recovered Materials Markets

About 64,454 tons of materials recovered from the MRF were sold to various outlets. Table 8 provides a list of the markets for each material.

TABLE 5: MATERIALS RECOVERED AND SOLD FROM THE MRF IN FY92

TYPE OF MATERIAL	TONS	PERCENT
Paper	47,607	73.9
Corrugated/Kraft	1,689	2.6
Glass	11,766	18.3
Plastic	2,278	3.5
Aluminum	1,114	1.7
Ferrous/Scrap	0	0.0
Total	64,454	100.0

SOURCE: SWA, "Shipments of Recycled Materials", Nov. 4, 1992.

FIGURE 8: MATERIALS RECOVERED AND SOLD FROM THE MRF IN FY92

(Percent by Weight)

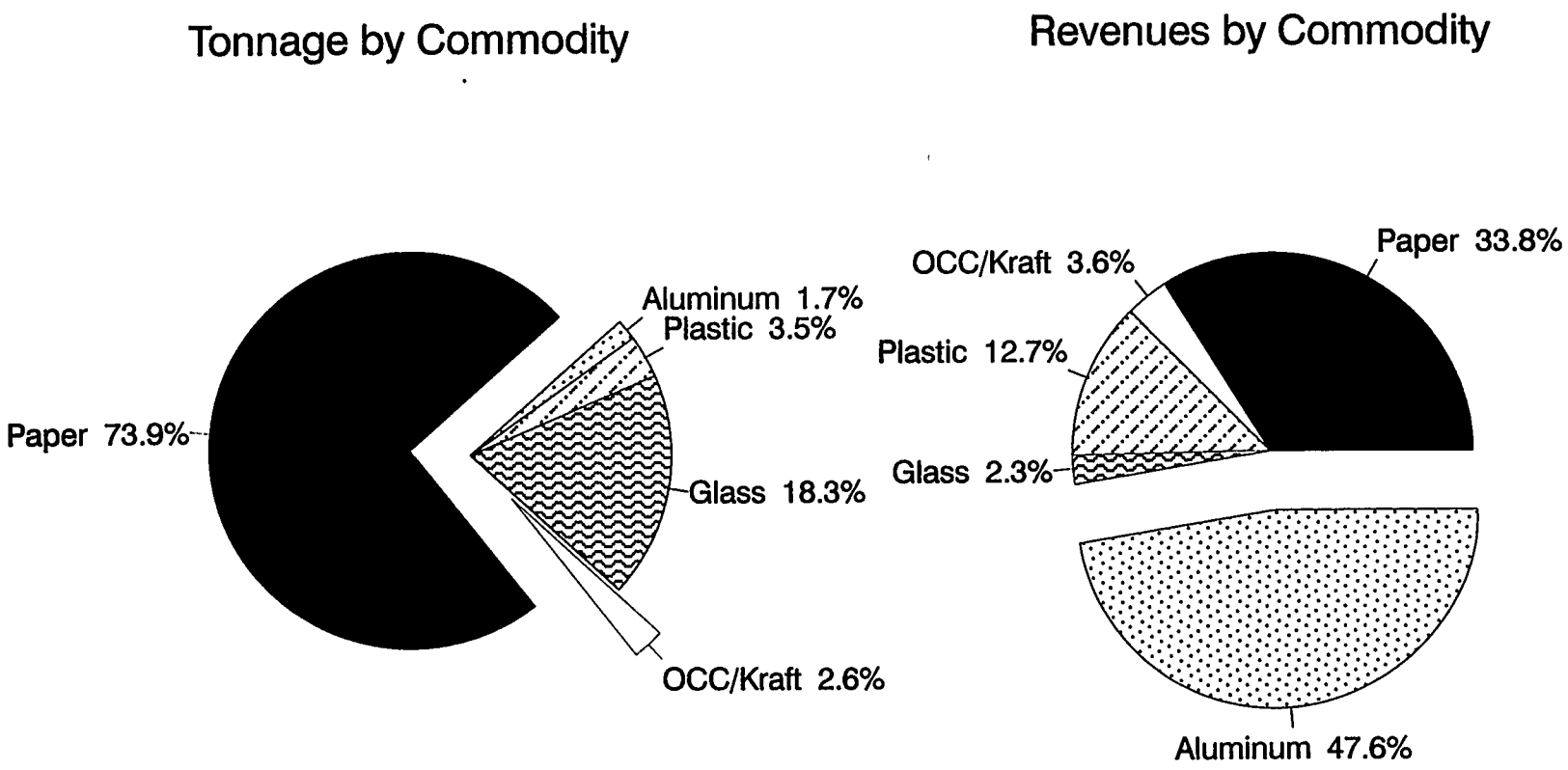


TABLE 6: TONNAGE AND VOLUME DISPOSED OF AT NC LANDFILLS (FY92)

WASTE TYPE	TONNAGE	PERCENT	VOLUME	PERCENT
Garbage	35,355	7.4	45,787	6.1
Trash	72,391	15.1	170,335	22.6
MRF Residue	0	0.0	0	0.0
RRF Unprocessible	24,073	5.0	31,176	4.1
RRF Residue	134,003	27.9	173,544	23.1
RRF Ash	127,223	26.5	127,223	16.9
Other Wastes	86,962	18.1	204,620	27.2
Total Tonnage	480,006	100.0	752,686	100.0

SOURCES:

1. SWA: "North County Landfill Disposal Cost Summary for Year Ended September 30, 1992."
2. Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System" SWA, March 1993.

TABLE 7: TYPES AND AMOUNT OF MATERIALS SOLD OR OTHERWISE DIVERTED

TYPES OF MATERIAL	SOURCE	TOTAL WASTE STREAM (tons)	ANALYZED PORTION OF WASTE STREAM (tons)
Curbside Recyclables	MRF	64,454	61,612
Yard Waste (Mulch)	Landfill	14,567	4,626
White Goods	Landfill	4,034	2,967
Tires	Landfill/RRF	645	0
Compost	Landfill/Sludge	7,084	2,188
Road Material	Landfill	3,717	0
Fill	Landfill	8,273	0
RRF Fuel	Landfill	1,829	0
Metals	RRF	19,881	14,622
Total		141,484	86,015

NOTE: 6,891 tons of mulch was diverted from the landfill for use in the sludge composting facility.

SOURCES:

1. SWA, "Monthly Recycling Statistics Reports," Office of Recycling, Public Affairs, and Contract Management, Oct., 1991 through Sept., 1992.
2. Pellowitz, Dan, "the Estimated costs of the Components of the Authority's Integrated Solid Waste Management System, SWA, March 1993.
3. SWA, "Shipments of Recycled Materials," Recycled Tonnage & Detailed FE+Scrap Shipments, undated.
4. SWA, "Draft NCRRRF Monthly Report," September, 1992.

TABLE 8: MARKETS FOR SELECTED RECOVERED MATERIALS SOLD IN FY92

RECOVERED MATERIALS	VENDOR	VENDOR FACILITY	TONNAGE	TONS REJECTED
ALUMINUM				
	American Natl Can	Greensboro, GA	1,177	None
		"Alcoa", TN		
	Reynolds Aluminum	Sheffield, AL		None
Subtotal			1,177	
GLASS				
Aggregate	Florida Glass	Manatee County, FL	4,718	None
Amber	Florida Glass	Duval County, FL	421	None
Flint	Florida Glass		1,157	
Green	Florida Glass		927	
Mixed	Florida Glass		1,160	
Subtotal			8,383	
PAPER				
Corrugated	Harmon Associates	Riverwood Int'l, Macon GA	1,584	None
Kraft bags	Jefferson-Smurfit		24	
Mixed	Harmon Associates	Fort Howard Paper, Savannah, GA	1,741	None
News #8	Wm. Goodman	Port of Miami, FL	44,553	
	Jefferson Smurfit			
	Miami Waste Paper			
	Paper Recycling			
	Perry Koplik			
	Harmon Associates	Port of Miami, FL		
	Harmon Associates	Fort Howard Paper, Savannah, GA		None
Phone Books	US Gypsum		327	
Subtotal			48,556	
PLASTICS				
HDPE/PET	Wellman	Wellman, Johnsonville, SC	572	None
Mixed HDPE	Plastics Mtl Group		967	
	Wellman	Wellman,Johnsonville, SC		None
	Quantum	Quantum, Heath, OH		
Natural HDPE			270	
PET	Global		85	
PET/3-7			71	
PET/Clear	WTE		229	
	Global			
PET/Green	MA Industries		61	
Subtotal			2,255	
TOTAL			60,371	

TABLE 8 (Cont.): MARKETS FOR RECOVERED MATERIALS SOLD IN FY92

RECOVERED MATERIALS	VENDOR	DISTANCE TO VENDOR (miles)	MODE OF TRANSPORT	REMANUFATURE REUSE	COMMENTS
ALUMINUM					
	American Natl Can	543	Transfer Trailer (20-23 tons)	Can Sheet	
		760			
	Reynolds Aluminum	796	Transfer Trailer (20-23 tons)	Can Sheet	
Subtotal					
GLASS					
Aggregate	Florida Glass	200	Transfer Trailer	Bottles/Jars	
Amber	Florida Glass	200			
Flint	Florida Glass				
Green	Florida Glass				
Mixed	Florida Glass				
Subtotal					
PAPER					
Corrugated	Harmon Associates	506	Transfer Trailer (22 tons)	Liner Board	
Kraft bags	Jefferson-Smurfit				
Mixed	Harmon Associates	413	Transfer Trailer (22 tons)	Tissue, Towels, Napkins	
News #8	Wm. Goodman	60	Transfer Trailer	Newsprint	Shipped in bales to Far East, Europe
	Jefferson Smurfit				
	Miami Waste Paper				
	Paper Recycling				
	Perry Koplik				
	Harmon Associates	60	Transfer Trailer		
	Harmon Associates	413	Transfer Trailer	Tissue, Towels, Napkins	
Phone Books	US Gypsum				
Subtotal					
PLASTICS					
HDPE/PET	Wellman	900	Transfer Trailer (33,000 lbs)	Polyester Fiber: Carpetting, Stuffing	
Mixed HDPE	Plastics Mtl Group				
	Wellman	900	Transfer Trailer (33,000 lbs)	Pellets for Containers	
	Quantum		Transfer Trailer (40,000 lbs)	Resin: Bottles, Plastic Film(Overwrap)	
Natural HDPE					
PET	Global				
PET/3-7					
PET/Clear	WTE				
	Global				
PET/Green	MA Industries				
Subtotal					
TOTAL					

Cost of MSW Management in Palm Beach County

Summary of Results

Of the approximately 1.10 million tons of waste that were delivered to the IMSWM System facilities, the cost of collecting approximately 700,000 tons of MSW (Analyzed MSW) were estimated. The costs of managing the remaining tonnages were reported selectively.

Overall Program Costs

The total FY 1992 gross cost of managing the approximately 700,000 tons of Analyzed MSW was about $109 million, or approximately $156 per ton. The cost net of revenues received from recovered energy and recyclables was about $101 million, or approximately $144 per ton. These costs break down to, in rounded numbers:

Category	Tonnage (tons)	Cost ($ millions)		Cost Per Ton	
		Gross	Net	Gross	Net
Garbage/Trash	614,000	$ 89	$ 82	$145	$134
Recyclables	85,800	$ 21	$ 19	$240	$218
Total/Average	700,000	$109	$101	$156	$144

Figure 9 depicts the components of the $110 million gross cost of managing Analyzed MSW. The two most significant contributors to gross cost are collection (54 percent), and the Resource Recovery Facility (23 percent).

Figure 10 shows the allocation of costs to each of the key function areas (i.e., collection, transfer, processing, landfilling, G&A, etc.) for managing garbage/trash and recyclables. Note that collection costs exceed 50 percent of total cost for both waste streams and, in the case of recyclables, they exceed 60 percent of the total cost to manage that component. With transfer and haul costs included, gross collection costs amount to almost 60 percent of the outlays for managing the Analyzed MSW.

The cost of managing 192 tons of HHW processed in FY 1992 was about $725,000 (excluding collection), or approximately $3,800 per ton.

For the three facility components of the Palm Beach IMSWM System (i.e., the Resource Recovery Facility, the MRF, and the North County Landfills), the net costs to process and/or dispose of the waste received were, in rounded numbers:

Facility	Tonnage (tons)	Net Cost ($ millions)	Net Cost/Ton
RRF	744,000	$29.3	$39
MRF	68,000	$ 0.9	$14
Landfills	537,000	$ 7.5	$14

FIGURE 9: ALLOCATION OF TOTAL COSTS FOR IMSWM SYSTEM IN FY92

Allocation by Functional Area
(Cost to Manage 700,000 tons of Analyzed MSW)

GROSS COST: $109,470,000

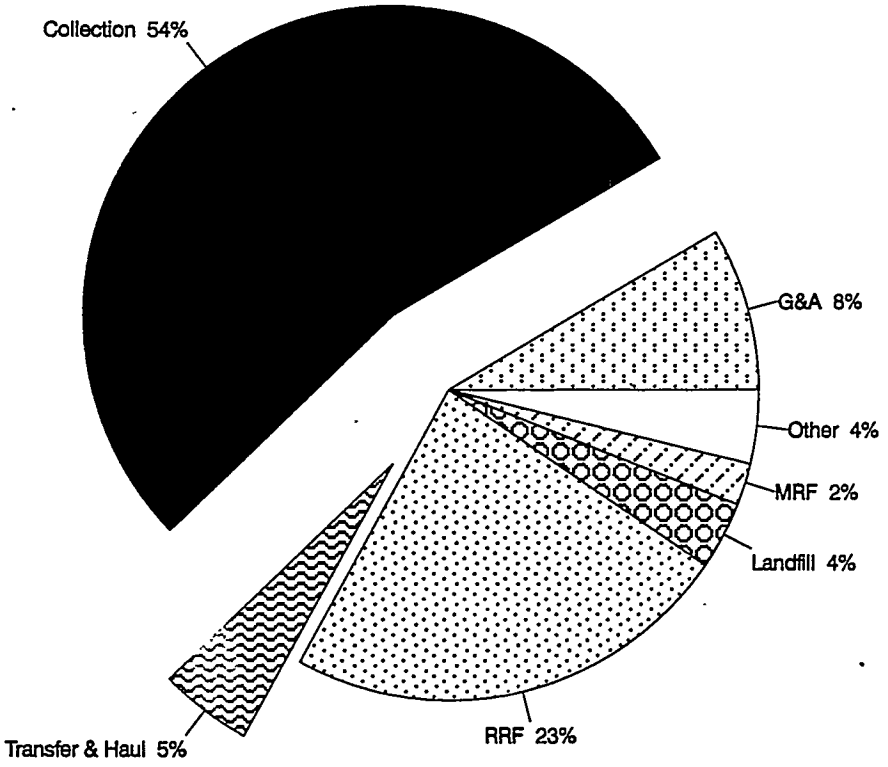
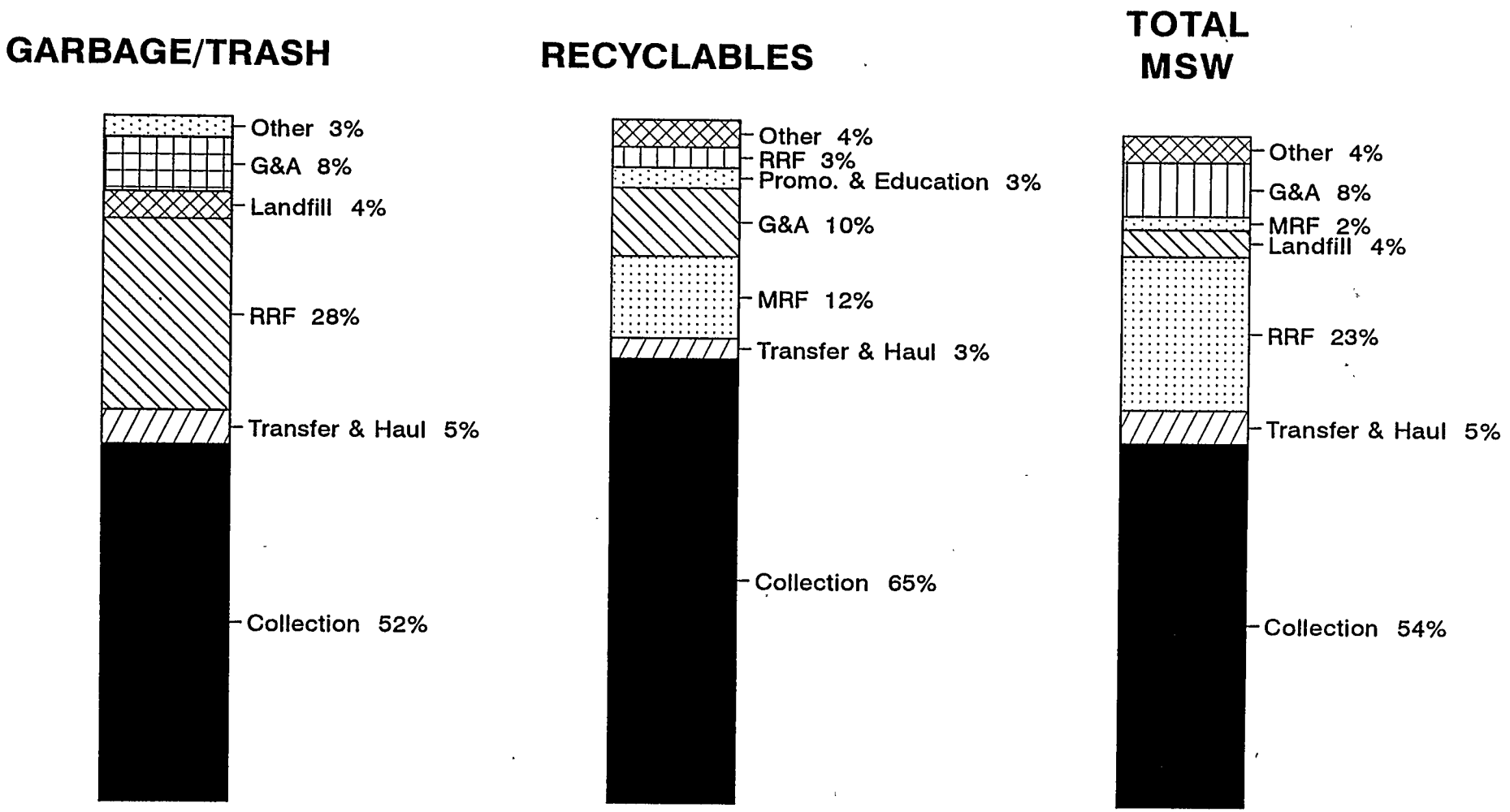


FIGURE 10: ALLOCATION OF COSTS TO MANAGE MSW IN PALM BEACH

Allocation by Functional Area



Program Incremental Costs

The Palm Beach IMSWM System includes two facilities that were intended to divert MSW from landfills--the Resource Recovery Facility and the curbside collection/MRF program. The incremental cost for each of these components, i.e., the cost (or savings) associated with adding the component to the IMSWM System, is the difference between the cost of managing all of the Analyzed MSW with and without the inclusion of that component. The Program Incremental Cost (or Savings) is, therefore, the most appropriate measure of the impact of any particular program on the cost of managing MSW. The FY 1992 Program Incremental Cost (Savings) for each of the added system components was, in rounded numbers:

Component	Analyzed MSW Tonnage Processed	Incremental Cost	
		Total	Per Ton
RRF	438,000	$ 1.5 million	$ 35
MRF/Curbside Collection	61,500	$10 million	$164

In addition to the incremental cost that can be attributed to each of these system components, they contribute energy and/or materials to the economy and reduce the utilization of landfill space. The attributes are summarized in Table 9.

Energy Usage Analysis

Summary of Results

Energy is consumed in the County to collect and transport waste; operate equipment in the RRF, ferrous metals processing facility, and MRF; operate rolling stock used in the RRF, MRF, and Landfills; and operate and maintain ancillary facilities such as the maintenance and administration building.

Energy usage data was collected from the SWA and from municipalities. Engineering estimates were made to supplement the data received. First, the total quantity of energy consumed (e.g., MWh, gallons of diesel fuel, Btus of natural gas) was determined for each activity or facility. The data on energy consumed to collect, haul, and process garbage/trash were combined with information on the energy consumption of rolling stock at the transfer stations, RRF, MRF, and landfills to obtain an estimate of the energy consumed per ton of garbage/trash and recyclables managed by the Palm Beach County IMSWM System.

In FY 1992, the Palm Beach County IMSWM System configuration resulted in the consumption of the equivalent of over 4 million gallons of diesel fuel, exclusive of the energy consumed to haul recycles to their markets and of the energy produced from the Resource Recovery Facility. Table 10 converts the energy usage to equivalent gallons of diesel fuel to manage each ton of garbage/trash and recyclables.

The average amount of energy consumed per ton to manage the 863,962 tons of garbage/trash was about 4.8 equivalent gallons of diesel fuel (0.68 million Btus). For each ton of garbage/trash collected, about 11 equivalent gallons of diesel fuel (1.55 million Btus) were generated, resulting in a net generation of about 6.2 equivalent gallons per ton (0.87 million Btus).

TABLE 9

INCREMENTAL COST AND EFFECTIVENESS OF RESOURCE RECOVERY PROGRAMS IN PALM BEACH COUNTY, FL (FY92)

RESOURCE RECOVERY PROGRAM	TONS MANAGED	TOTAL INCREMENTAL COST	AVERAGE INCREMENTAL COST	EFFECTIVENESS		
				ENERGY GENERATED (a), (b)	MATERIALS RECOVERED	LANDFILL VOLUME REDUCTION
Waste-to-Energy	438,000	$15.3 Million	$35/Ton $20/CuYd	198,000 MWh Electricity	12,000 Tons Metal	1.0 Million Cubic Yards
Curbside Recycling	61,500	$10.1 Million	$164/Ton $76/CuYd		47,000 Tons Paper	108,000 Cubic Yards
					11,200 Tons Glass	14,300 Cubic Yards
					2,170 Tons Plastic	6,670 Cubic Yards
					1,060 Tons Alum.	3,760 Cubic Yards
					61,500 Total	133,000 Cubic Yards

(a) Any energy conserved from the re-manufacturing or re-use of recovered materials was not estimated as part of this study.
(b) The energy generated from a WTE facility is less than the energy conserved.

TABLE 10: ENERGY CONSUMED TO COLLECT GARBAGE, TRASH, AND RECYCLABLES (FY92)

VARIABLES	GARBAGE	TRASH	GARBAGE/ TRASH	RECYCLABLES
Tons Collected	139,291	51,270	190,561	16,137
Diesel Fuel Consumed (gallons)	242,232	84,813	327,045	46,365
Total Miles	645,639	394,008	1,039,647	238,084
Miles per Gallon	2.67	4.65	3.18	5.13
Gallons per Ton	1.74	1.65	1.72	2.87

Source: Boca Raton, Computer Printouts of Fleet Informantion and Vehicle Information provided by Waste Management of Palm Beach.

The average energy consumed per ton to collect and process curbside-collected recyclables was about 3.9 equivalent gallons of diesel fuel. The energy consumed to haul the recovered materials to market ranged from 1.3 to 19.0 equivalent gallons per ton, depending on the distance traveled. From the data in Table 10, it can be seen that hauling recycled materials long distances can significantly increase the energy consumed to manage recyclables.

The difference in the transfer vehicle energy consumption between garbage/trash and recyclables reflects the difference in their bulk densities. On average, each load of garbage/trash weighed about 19.8 tons, whereas each load of recyclables weighed 17.4 tons.

Environmental Regulations and Permitting Requirements

The costs of compliance with the environmental regulations and permit requirements discussed in this section are reflected in the costs and energy consumption levels reported in this Case Study.

Overview of Federal Environmental Legislation and Regulations

Embodied in many federal environmental laws is an implicit federal-state partnership whereby the federal government sets the agenda and standards for pollution abatement while the states carry out the day-to-day activities of implementation and enforcement.

The Clean Air Act, most recently amended in 1990, established programs for protecting public health and the environment from exposure to toxic air pollutants. The Clean Water Act, most recently amended in 1987, is the principal federal law protecting the nation's waterways from pollution. The Safe Drinking Water Act, most recently amended in 1988, established programs for protecting public drinking water systems from harmful contaminants. The Resource Conservation and Recovery Act (RCRA) of 1976, most recently amended in 1992, is the main piece of federal legislation addressing landfill disposal regulation.

In February 1991, the U.S. Environmental Protection Agency (EPA) issued final rules for municipal waste combustors in response to the Clean Air Act. These rules, commonly referred to as the New Source Performance Standards (NSPS), apply to municipal waste combustors with capacities of 250 tons per day or greater, and whose construction, reconstruction, or modification commenced after December 20, 1989. The NSPS establish maximum emission levels for new or extensively modified major stationary sources. These emission levels were determined by "best adequately demonstrated" continuous control technology analysis and are presented in Table 11. In addition to the NSPS, the EPA also proposed emissions limitations for existing (i.e., constructed, reconstructed, or modified prior to December 20, 1989) municipal waste combustors.

The owner/operator of a proposed municipal waste combustor must apply for a Prevention of Significant Deterioration (PSD) permit and conduct a Best Available Control Technology (BACT) analysis to determine the applicable level of emissions control. BACT analysis evaluates the energy, environmental, and economic impacts of various alternative control technologies. The PSD permit requirements reflect the principle which holds that areas where the air quality is better than required by the national ambient air quality standards (NAAQS) established for six criteria pollutants (ozone, sulfur, dioxide, NO_x, carbon monoxide, lead, and particulates) should be protected from significant new air pollution, even if the NAAQS would not be violated by a proposed new source. Areas not meeting NAAQS are called nonattainment areas and are subject to more stringent control requirements determined by "reasonable available control technology" (RACT).

TABLE 11

NEW SOURCE PERFORMANCE STANDARDS

POLLUTANT	EMISSION LIMIT[1]	TECHNOLOGY BASIS[4]	MONITORING
Dioxins and Furans	30 ng/dscm	GCP, SD/FF	Annual Stack Test[2]
Particulate Matter	34 mg/dscm	FF	Annual Stack Test[2]
Opacity	10%	FF	CEMS, 6-min. avg.
Sulfur Dioxide	30 ppm or 80% reduction	SD/FF	CEMS, 24-hr. avg.
Hydrogen Chloride	25 ppm or 95% reduction	SD/FF	Annual Stack Test[2]
Nitrogen Oxides	180 ppmv[3]	SNCR	CEMS, 24-hr. avg.
Carbon Monoxide:			
Modular	50 ppmv	GCP	CEMS, 4-hr. avg.
Massburn	100 ppmv	GCP	CEMS, 4-hrs. avg.
Massburn/Rotary	100 ppmv	GCP	CEMS, 24-hr. avg.
Fluidized Bed	100 ppmv	GCP	CEMS, 4-hr. avg.
RDF/Full-Dedicated	150 ppmv	GCP	CEMS, 24-hr. avg.
RDF/Co-Fired	150 ppmv	GCP	CEMS, 4-hr. avg.

Source: Federal Register, "Standards of Performance for New Stationary Sources: Municipal Waste Combustors," Vol. 56, No. 28, 1991.

1 All emission limits are dry basis corrected to 7% O_2.

2 In the case of small plants (less than 250 TPD), if compliance is demonstrated for two consecutive years, the facility need only conduct testing every third year. If a non-compliant result occurs, another two years of consecutive testing must be done before the facility can switch back to the three-year cycle.

3 The NO_x standard applies to large plants only; small plants are exempt.

4 Good Combustion Practice (GCP); Spray Dryer (SD); Fabric Filter (FF); Selective Non-Catalytic Converter (SNCR).

Emissions from municipal waste combustors, in addition to meeting allowable limits, must also be monitored by the facility owner/operator. Monitoring requirements for existing facilities include continuous emissions monitoring for carbon monoxide and sulfur dioxide. Annual stack testing must be conducted for particulate matter, dioxin/furans, hydrogen chloride, and opacity.

Pursuant to the Clean Water Act, a solid waste management facility cannot cause a discharge of pollutants that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES) into United States waters. The states are responsible for establishing water quality standards and are authorized to issue discharge permits. The NPDES permit requires the source to attain technology-based effluent limits, "best practicable control technology" (BPT), and "best available technology" (BAT). The initial BPT limitations focus on regulating discharges of conventional pollutants such as bacteria and oxygen-consuming materials. The BAT limitations emphasize controlling toxic pollutants such as heavy metals, pesticides, and other organic chemicals. Table 12 provides a listing of the pollutants regulated under the NPDES.

A separate permit is required to dispose of dredge or fill material into the waters, including wetlands. The U.S. Army Corps of Engineers administers this permit program. Other regulations promulgated under the Clean Water Act include guidelines for using and disposing of sewage sludge.

Pursuant to the Safe Drinking Water Act, a facility or practice cannot contaminate an underground drinking water source beyond the solid waste management facility boundary or beyond an alternate boundary. Table 13 provides the maximum contaminant levels as promulgated under this Act. The primary enforcement responsibility lies with the states, provided they adopt regulations as stringent as the federal requirements, develop adequate procedures for enforcement, maintain records, and create plans providing emergency water supplies.

Pursuant to RCRA, criteria were established to determine which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on public health or the environment. The objective of these criteria is to mitigate adverse effects through the protection of floodplains, endangered species, surface water, and groundwater. These criteria also provide guidelines for sludge utilization and disposal under the Clean Water Act.

Subtitle D of RCRA primarily addresses non-hazardous waste, whereas Subtitle C of RCRA addresses hazardous waste disposal. In October 1991, the EPA promulgated revised Subtitle D regulations applicable to municipal solid waste landfills, with an effective date of October 1993. In general, the new regulations require liners, leachate collection, groundwater monitoring, and corrective action at municipal landfills.[1]

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[1]On October 1, 1993, the Federal criteria for MSW landfills under subtitle D of RCRA were amended to extend the date of compliance for small landfills to April 9, 1994, and by delaying the effective date of subpart G, Financial Assurance, to April 9, 1995, for all MSW landfills. In addition, the MSW landfill criteria were amended by removing the exemption from the groundwater monitoring requirements and by delaying the date for compliance with all requirements of the MSW landfill criteria for two years for owners and operators of MSW landfill units in arid and remote areas that meet the qualifications of the small landfill exception in the MSW landfill criteria. (Federal Register, "Solid Waste Disposal Facility Criteria; Delay of Compliance and Effective Dates," Vol. 58, No. 189, pages 51536-51548, 1993.)

TABLE 12

POLLUTANTS REGULATED BY THE NPDES PERMIT PROGRAM

OXYGEN DEMAND: Biochemical Oxygen Demand Chemical Oxygen Demand Total Oxygen Demands Total Organic Carbon Other	METALS: Aluminum Cobalt Iron Vanadium
SOLIDS: Total Suspended Solids (Residues) Total Dissolved Solids (Residues) Other	METALS (ALL FORMS) Other metals not specifically listed under Group 1
NUTRIENTS: Inorganic Phosphorus Compounds Inorganic Nitrogen Compounds Other	INORGANIC Cyanide Total Residual Chlorine
DETERGENTS AND OILS: MBAS NTA Oil and Grease Other Detergents or Algicides	MINERALS: Calcium Chloride Fluoride Magnesium Sodium Potassium Sulfur Sulfate Total Alkalinity Total Hardness Other Minerals

Source: 40 CFR, EPA, Part 123--"Appendix A - Criteria for Reporting in the NPDES Programs."

TABLE 13

MAXIMUM CONTAMINANT LEVELS PROMULGATED UNDER THE SAFE DRINKING WATER ACT

CHEMICAL	MCL (mg/l)
Arsenic	0.05
Barium	1.0
Benzene	0.005
Cadmium	0.01
Carbon Tetrachloride	0.005
Chromium (Hexavalent)	0.05
2,4-Dichlorophenoxy Acetic Acid	0.1
1,4-Dichlorobenzene	0.075
1,2-Dichloroethabe	0.005
1,1-Cichloroethylene	0.007
Endrin	0.0002
Fluoride	4.0
Lindane	0.004
Lead	0.05
Mercury	0.002
Methoxyclor	0.1
Nitrate	10.0
Selenium	0.01
Silver	0.05
Toxaphene	0.005
1,1,1-Trichloroethane	0.2
Trichloroethylene	0.005
2,4,5-Trichlorophenoxy Acetic Acid	0.01
Vinyl Chloride	0.002

Source: 40 CFR, EPA, Part 257 - "Criteria for Classification of Solid Waste Disposal Facilities and Practices."

The management of ash from municipal waste combustors is also governed by regulations established pursuant to RCRA. Much controversy surrounds the toxicity of incinerator ash and whether it should be classified as a hazardous waste under Subtitle C of RCRA, as a non-hazardous waste under Subtitle D of RCRA, or as a special waste. In 1991, the EPA began requiring the use of the Toxic Characteristic Leaching Procedure (TCLP) to determine the toxicity of ash. During FY 1992, municipal waste combustor ash was regulated under Subtitle D as a "special waste" that required special handling regardless of the TCLP results concerning toxicity. In the absence of sufficient federal guidance on municipal waste combustor ash disposal, some states took the lead in developing requirements and rules.[2]

Other federal regulatory agencies with permitting oversight of solid waste management facilities include: the Federal Aviation Administration (FAA), which reviews processing plants that require tall emission stacks, and the Federal Energy Regulatory Commission (FERC), which reviews processing plants that generate electric power.

Overview of State and Local Environmental Regulations

In 1976, the State created the Florida Resource Recovery and Management Act (the Act), whose public purpose is "to enhance the beauty and quality of our environment; conserve and recycled our natural resources; prevent the spread the disease and the creation of nuisances; protect the public health, safety, and welfare; and provide a coordinated statewide resource recovery and management program." The Florida Department of Environmental Regulations (DER) is responsible for the execution and enforcement of the provisions of the Act as contained in Florida Administrative Code (FAC), Title 17, Department of Environmental Regulations, Chapter 17-701-Solid Waste Management Facilities (referred to as the General Requirements). The Act directs the DER "to plan for and regulate the storage, collection, transportation, separation, processing, recycling and disposal of solid waste in order to protect the public safety, health and welfare, to enhance the environment for the people of the state, and to recover resources which have the potential for further use, and to assure that the final irreducible residue is disposed of in a manner which enhances the environment."

The Act also directs the DER to develop and implement a hazardous waste management program. The 1983 amendments to the Act provide directions and funds for establishing a cooperative hazardous waste management program among local, regional, and State levels of government.

The Act also establishes goals for reducing the amount of MSW prior to its final disposal or incineration at a solid waste disposal facility. The goals provide that the amount of solid waste that would have been disposed of in the absence of reduction and recycling efforts undertaken within the County and the municipalities within its boundaries be reduced by at least 30 percent by the end of 1994. In determining whether the established reduction goals have been achieved, no more than one-half of the goal may be met with reductions in yard trash, white goods, construction and demolition debris, and tires.

Individual permits, usually granted by local jurisdictions and pertinent to such issues as wastewater, surface water, and storage tanks are also required. The South Florida Water Management District provides review for the water quality and quantity impacts arising from the operations of solid waste management

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[2]On May 2, 1994, the U.S. Supreme Court ruled that ash from municipal waste combustors is not exempt from the Subtitle C requirements of RCRA as is MSW. Under RCRA, regular testing of ash, principally for toxic metals, lead, and cadmium, will be required. Ash deemed to be hazardous must be disposed of in licensed hazardous waste disposal facilities that protect groundwater.

facilities. In addition, the Palm Beach County Public Health Unit monitors the health impacts arising from these facilities.

Integrated Municipal Solid Waste Management System Facilities: Permit Requirements Summary

All of the IMSWM System facilities located at the North County Complex (the RRF, the Class I and III Landfills, the MRF, and the ferrous metals processing facility) except the composting facility were permitted under either the original Power Plant Site Certification or under modifications thereto, or were approved for construction by the FDER. Table 14 provides a summary of original permit approval or latest renewal dates for the IMSWM System facilities.

Solid Waste Transfer Stations

The Authority operates the four transfer stations under general permit conditions. These four transfer stations are listed below along with their initial operating dates and current permit expiration dates. Pursuant to the general permit conditions, a permittee's use of a general permit is limited to five years.

Transfer Station	Initial Operating Date	Permit Expiration Date
North County	1991	August 1996
South County	1986	September 1994
Glades Regional	1981	May 1997
Central County	1988	December 1996

In accordance with the General Requirements, the transfer stations provide the operational appurtenances necessary to maintain a clean and orderly operation. They have effective barriers designed to prevent unauthorized entry and dumping. The stations also provide fire protection and fire-fighting equipment to ensure the safety of employees and provisions to deal with accidental burning of solid waste within the stations. They also have adequate communications capabilities to summon emergency services, and they are staffed with employees trained in the safe operation of all equipment.

North County Regional Resource Recovery Facility

The Authority received Power Plant Site Certification for the RRF from DER in March 1986. The PSD permit was issued by the U.S. EPA in November 1986. These permits established the performance criteria for the air pollution control, wastewater treatment, and other environmental control systems applicable to the RRF and the Landfills.

Table 15 summarizes the Site Certification emissions requirements and the levels achieved by the RRF during testing in March and July of 1992.

Materials Recovery Facility and Ferrous Metals Processing Facility

The MRF and the ferrous metals processing facility were issued permits to construct and operate, in the form of modifications to the Power Plant Site Certification. Neither the MRF nor the ferrous metals processing facility are subject to the General Requirements. Each of these recyclable materials recovery facilities is classified as a Facility for Processing Recyclable Materials, because they each receive curbside- and otherwise-collected materials that have been diverted from the waste stream and which are therefore no longer considered MSW by definition.

TABLE 14

SUMMARY OF ENVIRONMENTAL REVIEWS AND PERMITS FOR THE FACILITIES OF THE IMSWM SYSTEM

APPROVAL/RENEWAL DATE	REVIEW AGENCY	DESCRIPTION OF PERMIT
April 1985	Federal Energy Regulatory Commission	North County Complex: Certification for Small Power Production Facility
November 1985	Palm Beach County Commissioners	North County Complex: Special Exception Zoning Permit
March 1986/January 1992	DER	North County Complex: Power Plant Site Certification (PA 84-20)
October 1986	Army Corps of Engineers	North County Complex: Permit to Fill Wetlands
November 1986	U.S. Environmental Protection Agency	North County Complex: Prevention of Significant Deterioration (PSD)
September 1989	DER	South County Transfer Station: Permit to Operate (Renewal)
February 1990	South Florida Water Management District	North County Transfer Station: Stormwater Discharge Permit
February 1990	DER	North County Complex: Injection Wells: Permit to Construct and Operate (Modification to PA 84-20)
August 1990	DER	MRF: Permit to Construct and Operate (Modification to PA 84-20)
March 1991	DER	Compost Facility: Approval to Construct and Operate
August 1991	DER	North County Transfer Station: Permit to Operate
December 1991	DER	Central County Transfer Station: Permit to Operate (Renewal)
January 1992	DER	North County Complex: Modified PSD
April 1992	DER	Ferrous Processing Facility: Permit to Construct and Operate (Modification to PA 84-20)
May 1992	DER	Glades Regional Transfer Station: Permit to Operate (Renewal)
July 1992	South Florida Water Management District	North County Complex: Landfill-Storwater Discharge Permit

TABLE 15

FACILITY EMISSIONS TEST RESULTS
NORTH COUNTY REGIONAL RESOURCE RECOVERY FACILITY

PARAMETER	MODIFIED PERMIT LIMIT	TEST RESULTS LIMIT[1]
Particulate Matter	.015 grains/dscf	.0036 grains/dscf
Sulfur Dioxide	70% removal or 30 ppm	94% removal or 6.3 ppm
Nitrogen Oxides	.48 lbs/MMBtu	.374 lbs/MMBtu
Carbon Monoxide	400 ppmv, 1-hr avg.	42 ppmv
Lead	.0004 lbs/MMBtu	.000227 lbs/MMBtu
Mercury	.00024 lbs/MMBtu	.0000159 lbs/MMBtu
Hydrogen Fluoride	.0032 lbs/MMBtu	.0000689 lbs/MMBtu
Beryllium	.00000073 lbs/MMBtu	.00000049 lbs/MMBtu
Volatile Organic	.016 lbs/MMBtu	.002 lbs/MMBtu
Acid Gases (Total)	90% Removal	98% Removal
Dioxins/Furans		
Unit No. 1	60 ng/dscf	15.2 ng/dscf[1]
Unit No. 2	60 ng/dscf	10.7 ng/dscf[2]

Source: From Official Statement Relating to $58,510,000 Solid Waste Authority of Palm Beach County, Refunding and Improvement Revenue Bonds, series 1992.

NOTES:

(1) Stack air emissions test, March 3 through March 11, 1992.

(2) Unit No. 2 exceeded the dioxin/furans limit during the March 1992 compliance testing. Pursuant to a DER request in a Warning Letter (June 12, 1992), Unit No. 2 was retested on July 1 and 2, 1992. The retest results were within permit limits.

Composting Facility

The Authority received approval from the DER to construct and operate a 2.3- to 3.0-TPD composting facility. This was not a construction and operation permit, per se, and consequently no permit conditions apply. Rather, the DER issued a letter of approval for construction and operation to occur pursuant to the General Requirements.

The Authority is responsible for assuring the compliance of each batch of compost processed with the applicable standards. The Authority is required to submit quarterly residual analysis and shipping and sales reports to the DER.

Class AA compost must meet federal stabilization standards, as outlined in "Processes to Further Reduce Pathogens," in addition to the following chemical criteria:

Parameter	Maximum Allowable Concentration
Cadmium	≤30 mg/kg dry weight
Copper	≤900 mg/kg dry weight
Lead	≤1,000 mg/kg dry weight
Nickel	≤100 mg/kg dry weight
Zinc	≤1,800 mg/kg dry weight

Manufacturers of Class AA compost must provide users with the following residuals analysis information: total nitrogen; total phosphorous; total potassium; and the recommended application rate.

Household Hazardous Waste Facility

The HHW facility is exempt from federal and State regulations as a treatment, storage, or disposal facility because: (1) it accepts only household or conditionally exempt hazardous waste, and (2) it is operated as part of an MSW disposal system. Transport of the material for disposal (out of state) is handled through the manifest system prescribed by federal Subtitle C (RCRA) regulations governing the transportation of hazardous materials.

Class I and Class III Landfills

The Class I and Class III Landfills at the North County Complex were originally permitted under the Power Plant Site Certification. This certification exempts the landfills from the permitting requirements of the General Requirements. In accordance with the Conditions of Certification:

- the landfills must comply with current operating criteria;
- the operator must provide pre-construction and post-construction notification to DER of new landfill cells; and
- the operator must demonstrate how compliance with new or revised regulations will be achieved every five years.

The DER defines Class I landfills as those that receive an average of 20 tons per day or more of solid waste, which includes general, non-hazardous household, commercial, industrial, and agricultural wastes.

(Combustion ash from the RRF is disposed of in the Class I Landfill.) Class III landfills are those which receive trash and/or yard waste.

In accordance with the General Requirements and consistent with RCRA Subtitle D requirements, the Class I Landfill consists of the construction of a double bottom liner system, leachate collection and pumping system, leachate treatment and disposal facilities, and borrow lakes for cover material. The Class III Landfill consists of the construction of a single bottom liner system, leachate collection and pumping system, and borrow lakes for cover material. The leachate effluent from each Landfill was in compliance with the maximum allowable concentration values during FY 1992. The Class I Landfill also collects and flares methane gas.

Appendix A

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Appendix B

Glossary of Terms

ALLOCATED COST ($/year):	That portion of the Total Cost that is expended or apportioned to a specific activity such as the management of garbage, trash, recyclables, yard waste, or household hazardous waste.
ANALYZED MSW:	Portion of the MSW stream for which the cost of collecting, transferring, hauling, processing, combusting, marketing, and/or disposing of such waste is known or can be reasonably estimated.
AVERAGE COST ($/ton):	Total of Allocated Cost divided by the tonsof MSW, garbage, trash, recyclables, or yard waste, as appropriate.
AVERAGE PROGRAM INCREMENTAL COST (SAVINGS) ($/ton):	The Program Incremental Cost divided by the number of tons of materials diverted from the landfill by the program.
BULKY WASTE:	Oversized items, including white goods and furniture, that have been separated from the MSW stream for separate collection.
COMMERCIAL MSW:	Municipal solid waste that is generated by sources other than households, including businesses (e.g., offices, restaurants, retail stores, and industry); institutions (e.g., schools and government establishments); and public areas (e.g., train stations, airports, and litter from roadside).
GARBAGE:	Garbage is all MSW exclusive of source-separated trash, recyclables, yard waste, household hazardous waste, and bulky waste.

HAZARDOUS WASTE:	Waste which because of its quantity, concentration, or physical, chemical, or infectious characteristics, may pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed and is defined as such in accordance with federal and State laws. Does not include Household Hazardous Waste.
HOUSEHOLD HAZARDOUS WASTES (HHW):	Materials that are separated from Residential MSW as household hazardous wastes for separate collection and treatment. Such materials may include paints and solvents, pesticides, herbicides, and propane tanks.
INTEGRATED SOLID WASTE MANAGEMENT:	A practice of using several (i.e., two or more) alternative waste management techniques to treat, process, and/or dispose of the Municipal Solid Waste stream. Alternative waste management techniques include source reduction, recycling, composting, combusting, and landfilling.
MARGINAL COST (SAVINGS) ($/ton):	The cost (savings) of managing an additional ton of MSW, garbage, trash, recyclables, or yard waste.
MARGINAL COST (SAVINGS) OF SUBSTITUTION ($/ton):	The net cost (savings) of managing an additional ton of recyclables or yard waste less the savings (cost) of managing one less ton of garbage.
MATERIALS RECOVERY:	A term describing the extraction and utilization of materials from a waste stream.
MUNICIPAL SOLID WASTE (MSW):	Non-hazardous solid wastes generated by households; commercial and business establishments, institutions, and light industry; it excludes industrial process wastes, agricultural wastes, mining wastes, construction and demolition debris, offal, sludges, and ashes, except ashes derived from the combustion of MSW. In practice, specific definitions vary across jurisdictions.

PROGRAM INCREMENTAL COST (SAVINGS) ($/year):	The difference between the cost of managing MSW with or without a particular program (e.g., curbside collection, processing, and marketing of recyclables.)
RECOVERED MATERIALS:	Recyclable materials that are recovered from MSW and may also include some contamination.
RECYCLABLE MATERIALS OR RECYCLABLES:	Materials that still have useful physical or chemical properties after serving their usefulness for a given individual or firm and can, therefore, be reused or recycled for the same or other purposes.
RECYCLE:	To convert discarded materials into useful products through reuse and remanufacturing.
RESIDENTIAL MSW:	Municipal solid waste that is generated by households.
RESIDUE:	That portion of processed MSW that is ultimately disposed of in a landfill.
RESOURCE RECOVERY:	A term describing the extraction and utilization of energy or materials from a waste stream.
SECONDARY MATERIAL:	A material that is used in place of a primary or raw material in manufacturing a product; often handled by dealers and brokers in "secondary markets."
SELF-HAUL:	The delivery of MSW or other wastes to an integrated municipal solid waste management system by a private firm or individual that is not under contract to a municipality, authority, utility, or other public entity responsible for municipal solid waste management to make such deliveries.

TOTAL NET COST OR TOTAL COST ($/year):	The aggregate of all expenditures incurred to manage municipal solid waste, inclusive of general and administrative, planning, capital, collection, processing, transfer and haul, marketing, promotion and education, and disposal costs, less any revenues derived from resource recovery activities.
YARD WASTE:	Vegetative material that is segregated from the MSW stream for separate collection and/or processing, including grass, prunings, plants, and small tree limbs, but excluding tree stumps, land-clearing debris, and other large vegetative matter.
TRASH:	Combination of yard waste, bulky waste, vehicle tires, and other debris consisting of paper, cardboard, cloth, glass, and other similar materials exclusive of kitchen and table food waste, and animal or vegetative waste that is attendant with or results from the storage, preparation, cooking, or handling of food material.
WHITE GOODS:	That portion of bulky waste which consists of large appliances, such as refrigerators, stoves, washing machines, and dryers.

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1. Introduction

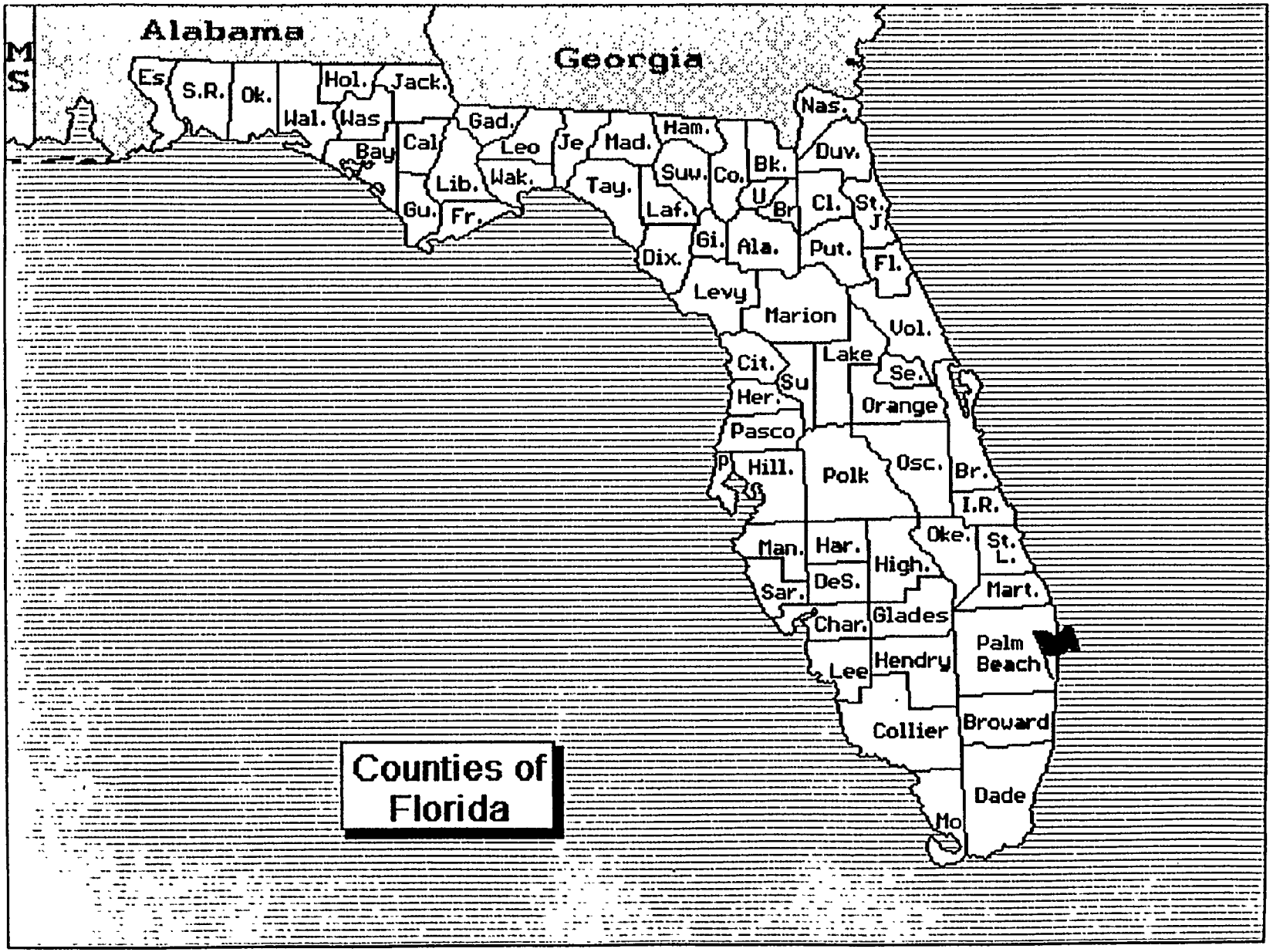
Palm Beach County (the County) is located along the southeast coast of Florida, as shown in Figure 1-1, and encompasses an area of 2,063 square miles. It is bounded on the east by the Atlantic Ocean, on the south by Broward County, on the north by Martin County, and on the west by Hendry County. The County has the largest land area of any county in Florida, extending along the Atlantic coast a distance of approximately 45 miles on the north-south axis, and a distance of 53 miles on the east-west axis. In 1992, approximately 897,000 people resided in about 471,000 dwelling units throughout the County, about 50 percent of which were single-family homes.

The economic base of the County has been dependent on the real estate and construction industries associated with producing housing for the County's increasing population. Agriculture is also an important industry in the rural, western area of the County, which produces winter vegetables, citrus, sugar cane, flowers, and ornamental plants.

During fiscal year 1992 (FY 1992), approximately 1.10 million tons of solid waste were received by the Palm Beach County integrated municipal solid waste management system (IMSWM System). The Solid Waste Authority of Palm Beach County (the Authority or SWA) is responsible for the processing and disposal of all County-generated waste delivered to the IMSWM System.

FIGURE 1-1

PALM BEACH COUNTY LOCATION



2. The County's Integrated Municipal Solid Waste Management System

2.1 System Development History

The Authority was created in 1975 by the State Legislature under the Palm Beach County Solid Waste Act, Chapter 75-473, Laws of Florida (the Act). The legislative intent was to form a County-wide authority to assume responsibility for the coordinated management of solid waste in order to meet the expanding needs and requirements within the County relative to safe and sanitary processing and disposal of solid waste, and to require municipalities and the County to plan and develop an adequate solid waste collection system.

The Act gave the Authority the power to construct and operate solid waste disposal facilities and to require that all municipal solid waste collected by public and/or private agencies from any municipality or unincorporated area of the County be transported to Authority-designated processing and disposal facilities. Although the Act does not preclude public or private agencies from operating Authority-permitted transfer stations, the Act provides that MSW transferred or transported from such Authority-permitted transfer stations shall be delivered to Authority-designated processing and disposal facilities.

The Authority developed a Comprehensive Solid Waste Management Plan for the County that specifies short-term and long-range strategies for the processing and disposal of the County's solid waste. The Comprehensive Plan, as adopted, outlines a system that could ultimately include: (1) two major resource recovery facilities and adjacent sanitary landfills; (2) a network of transfer stations and related transport equipment; (3) recycling facilities: (4) compost facilities; and (5) other ancillary facilities.[1] Most of the planned facilities are operational, with the exception of a second resource recovery facility and associated landfills, development of which is not being considered at this time.

In February 1989, the Authority authorized the development of a County-wide recycling program. The current residential collection program includes:

- approximately 95 percent (280,000 homes) participation in a multi-material curbside collection program in 37 municipalities and the unincorporated areas; and
- approximately 75 percent (140,000 multi-family homes) participation in multi-material containerized collection programs throughout the County.

The commercial collection program currently in operation includes:

- complimentary waste audits available to businesses throughout the County;
- citywide commercial collection programs provided in Boynton Beach and Lake Worth; and

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[1] Schnelle, J., "Comprehensive Solid Waste Management Plan, Resource Recovery and Recycling Program for the Solid Waste Authority of Palm Beach County," Environmental Management & Engineering, June 1, 1988.

- office paper collection programs implemented in 50 governmental agencies, 17 municipal offices, and over 5,000 private businesses.

2.2 System Overview

The County's IMSWM System in FY 1992 consisted of the following integrated system components:

- separate collection of garbage, trash, and recyclables by municipalities, private sanitation firms under contract to or franchised by municipalities, and the Authority;
- four transfer stations located throughout the County, at two of which household hazardous waste (HHW) drop-off sites are located;
- a refuse-derived fuel (RDF) resource recovery facility (the RRF);
- a ferrous processing facility;
- a materials recovery facility (the MRF);
- a yard waste/sludge composting facility;
- an HHW drop-off and storage facility;
- a landfill for the disposal of garbage, RRF ash and residue, MRF residue, and some Other Wastes (the Class I Landfill); and
- a landfill for the disposal of trash, construction/demolition debris, and some Other Wastes (the Class III Landfill).

The RRF, MRF, compost facility, ferrous processing facility, HHW drop-off and storage facility, and both landfills are located at the 1,300-acre North County Regional Resource Recovery Facility complex (the North County Complex). During FY 1992 the County was constructing the West Central transfer station and owned and maintained a site for a proposed South County regional solid waste facility (the South County Site). The locations of the facilities that constitute the Palm Beach County IMSWM System are shown in Figure 2-1. A site plan of the North County Complex is provided in Figure 2-2.

As previously stated, the Authority is responsible for processing and disposing of all municipal solid waste (MSW) and Other Waste delivered to the County's IMSWM System. As referred to herein, MSW includes: garbage (balance of MSW after accounting for trash, recyclables, and HHW); trash (yard waste, bulky waste, and other inorganic waste that is not recovered for recycling, which is set out and collected separately); recyclable materials [glass, plastic (PET and HDPE), and aluminum containers; newspaper; old corrugated cardboard; and Kraft paper]; and

FIGURE 2-1

IMSWM SYSTEM COMPONENTS LOCATION

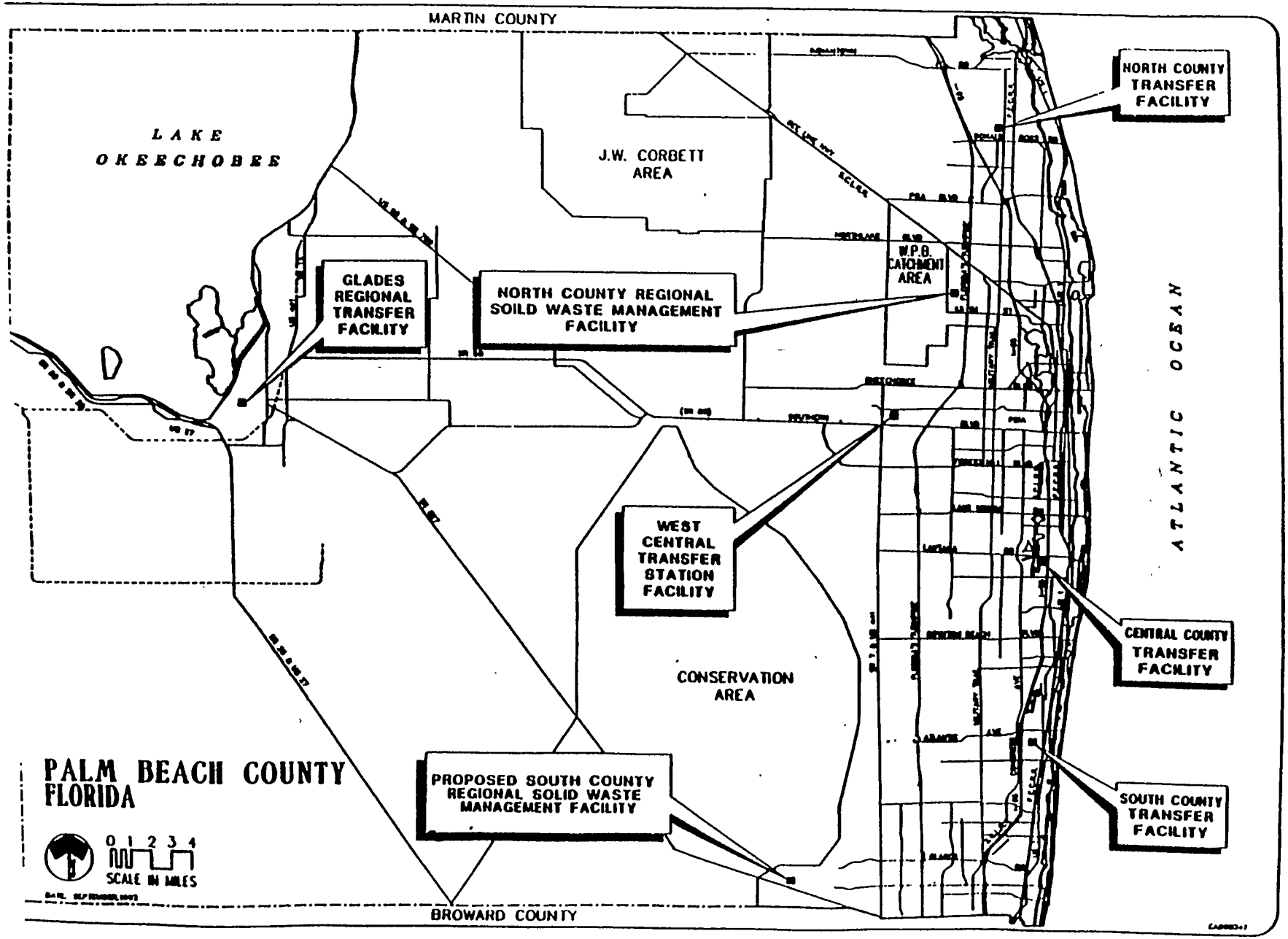
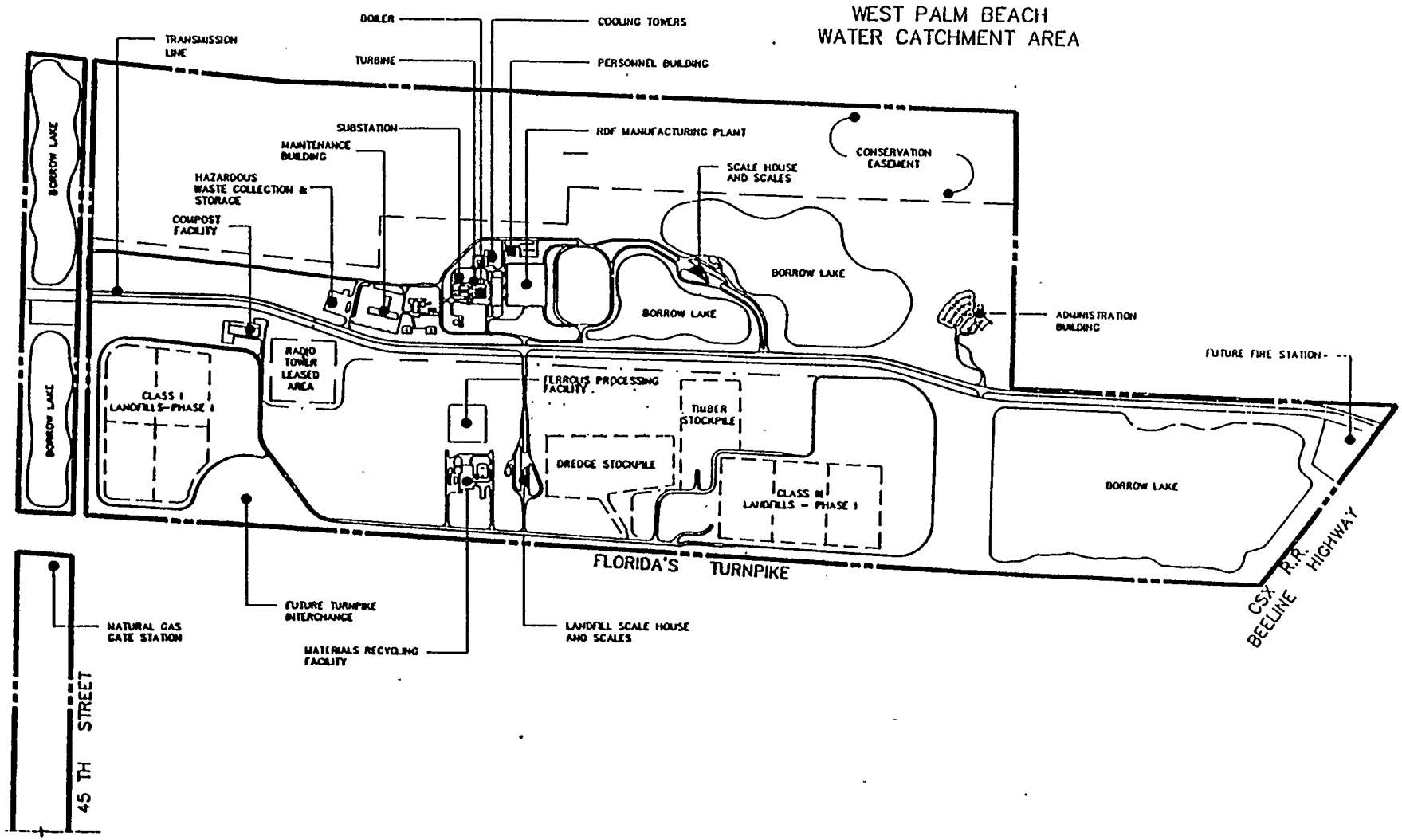


FIGURE 2-2

NORTH COUNTY COMPLEX SITE PLAN



HHW.[2] Other Waste, as referred to herein, comprises sludge, asbestos, construction and demolition (C&D) debris, clean and unclean fill, land-clearing debris, tires, and miscellaneous materials. Figure 2-3 is a visual representation of these waste definitions. The reader is advised to peruse the Glossary of Terms in Appendix A for a more detailed definition of the terms used in this document.

Detailed descriptions of these IMSWM System facilities follow. Plans for a second resource recovery facility to service the southern end of the County have been put on hold. The Authority may pursue the development of landfills and recycling facilities at the 1,650-acre South County site, which it purchased for the purpose of expanding the IMSWM System as necessary. Prior to operation commencement of the North County landfills, MSW was disposed of at the Dyer and Lantana landfills, which were closed in 1989 and 1988, respectively.

2.3 System Component Descriptions

2.3.1 Collection

Collection of MSW within the County is performed by the Authority; individual municipalities; or private haulers under contract to or franchised by municipalities, commercial establishments, or the Authority. Table 2-1 lists the 37 municipalities and unincorporated areas within the County and indicates whether municipal, private, or Authority collection occurs within each. In addition, some individuals and commercial establishments deliver their own MSW, which is referred to as "self-hauling."

The Authority has recommended that the following minimum standards be utilized by local governments in the collection and transport of waste:

- at least bi-weekly collection of residential garbage;
- provision of a scheduled program of trash collection;
- at least once-per-week collection of commercial waste; and
- provision of subscription for collection service to residences and commercial businesses.

Each component of MSW, i.e., garbage, trash, and recyclable materials, is set out and collected separately.

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[2] In FY92, some municipalities made separate collections of source- separated vegetative waste, i.e., yard waste. Some of the yard waste was diverted to a mulching facility located in Riviera Beach. Because such separation was not required of all municipalities, any source-separated yard waste delivered to the County's IMSWM System is included in the garbage/trash tonnage. The portion of the yard waste delivered to the IMSWM System that is recovered as mulch or is composted is classified as recyclables recovered from the garbage/trash.

FIGURE 2-3: DEFINITIONS OF MSW AND OTHER WASTE

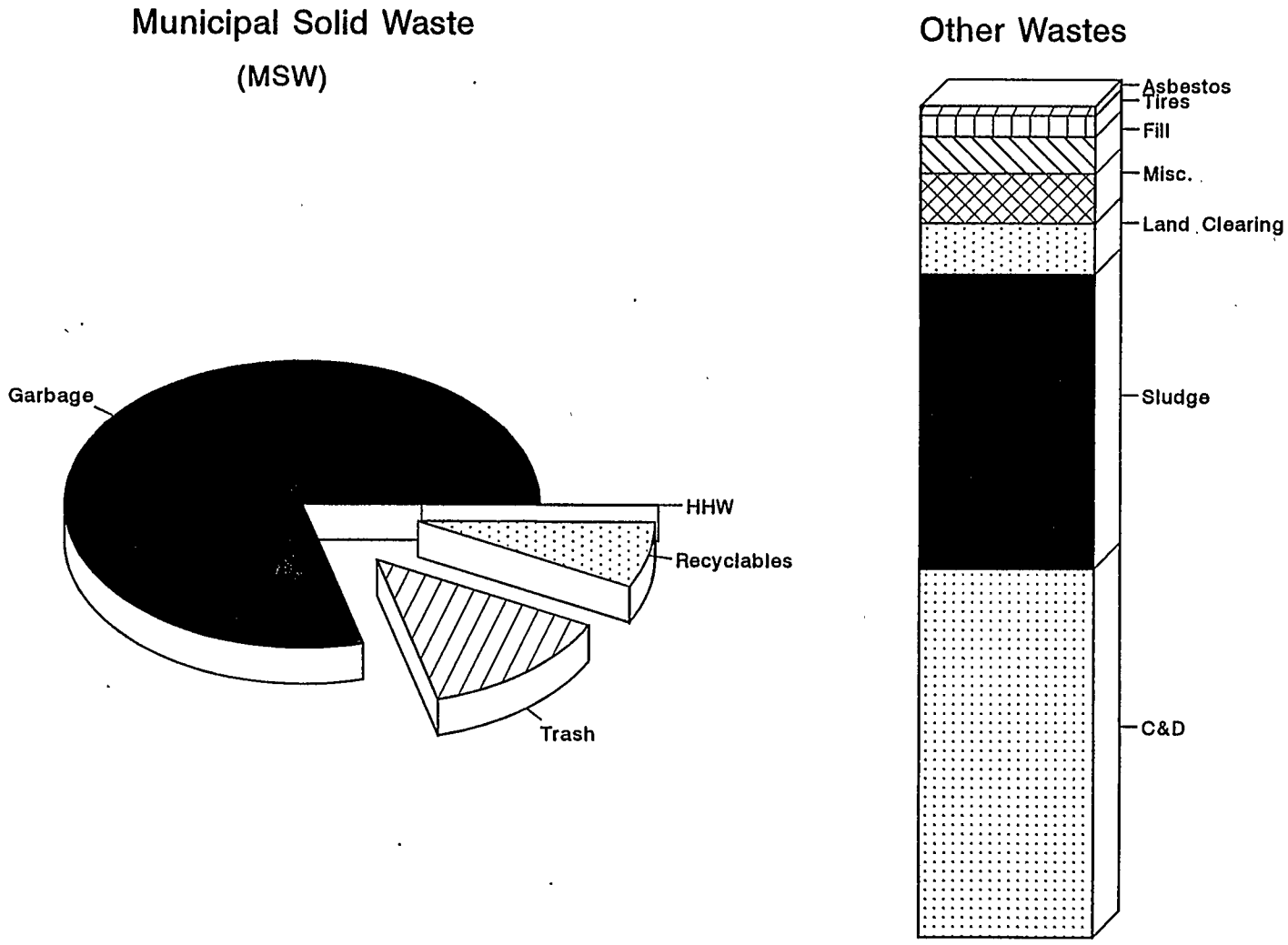


TABLE 2-1: MUNICIPAL, PRIVATE, AND SWA COLLECTION BY MUNICIPALITY IN PALM BEACH COUNTY IN FY92

MUNICIPALITY	POPULATION 1990	POPULATION 1992	GARBAGE/ TRASH	RECYCLABLES
Atlantis	1,653	1,653	Municipal (1)	Municipal (1)
Belle Glade	16,177	16,105	Municipal	SWA
Boca Raton	61,492	63,224	Municipal	Municipal
Boynton Beach	46,284	48,144	Municipal	Municipal
Briny Breezes	400	395	Private	Private
Cloud Lake	121	121	Private	Private
Delray Beach	47,181	48,181	Private	Private
Glen Ridge	207	211	Private	Private
Golf	184	190	Private	Private
Golfview	153	153	Private	Private
Greenacres City	18,683	19,442	Private	Private
Gulf Stream	690	703	Private	Private
Haverhill	1,058	1,154	Private	Private
Highland Beach	3,209	3,234	Private	Private
Hypoluxo	807	1,117	Private	Private
Juno Beach	2,121	2,185	Private	Private
Jupiter	24,907	25,898	Private	Private
Jupiter Inletn Colony	405	406	Private	Private
Lake Clarke Shores	3,364	3,613	Private	Private
Lake Park	6,704	6,639	Municipal	Municipal
Lake Worth	28,564	28,387	Municipal	SWA
Lantana	8,392	8,396	Municipal	Municipal
Manalapan	312	321	Private	Private
Mangonia Park	1,453	1,411	Private	Private
North Palm Beach	11,343	11,747	Municipal	Municipal
Ocean Ridge	1,570	1,593	Private	Private
Pahokee	6,822	6,871	Municipal	SWA
Palm Beach	9,814	9,819	Municipal	Municipal
Palm Beach Gardens	22,965	27,553	Private	Private
Palm Beach Shores	1,035	1,031	Private	Private
Palm Springs	9,763	9,706	Municipal	Municipal
Riviera Beach	27,644	27,128	Municipal	Municipal
Royal Palm Beach	15,532	16,462	Private	Private
South Bay	3,558	3,448	Private	SWA
South Palm Beach	1,480	1,483	Private	Private
Tequesta	4,499	4,503	Private	Private
West Palm Beach	67,643	68,270	Municipal	SWA
Unincorporated(3)	405,329	425,888	SWA (2)	SWA (2)

SOURCES:

1. SWA, "Palm Beach County Solid Waste Services, Municipal and Unicorporated", undated.
2. Bureau of the Census, "Population and Housing Unit Counts, Florida", 1990 Census of Population and Housing, U.S. Department of Commerce, Issued April 1993.
3. University of Florida, "1992 Florida Estimates of Population", Table 1 -- Estimates of Population by County and Municipality in Florida," April 1, 1992, page 21.

NOTES:

1. The Town of Lantana collects garbage/trash and recyclables for the City of Atlantis.
2. The SWA contracts with private haulers for collection in the unicorporated areas.
3. In FY92 seven (7) collection districts were defined by the SWA in the unincorporated areas.

2.3.2 Transfer System

Seventy-six percent of all MSW (64 percent of all waste) generated within the County was delivered to the Authority's North County Complex by the Division of Transport Services. This division operates four transfer stations, which are open 312 days per year. Most traffic generated by the transfer stations consists of trips to and from the transfer stations and the RRF, as well as trips directly associated with the transfer station service area. Almost two-thirds of the truck traffic to the transfer stations consists of small pick-up vehicles, landscape management firms, and private individuals.

The North County Transfer Station, located in the Jupiter area, began operations in August 1991. The facility is located on 20 acres situated north of Donald Ross Road and west of Military Trail in the unincorporated area of the County. The facility utilizes four gravity top-loading bays, each with a capacity of 60 tons per hour. This facility receives MSW and serves as a drop-off center for used oil, vehicle batteries, and propane gas cylinders. The transfer haul fleet consists of diesel tractors and 75- and 100-cubic-yard trailers.

The South County Transfer Station, located in Delray Beach, was placed in service in February 1986. The property is owned by the City of Delray Beach and is leased to the Authority for 40 years. The facility has a capacity of 1,000 TPD and utilizes two push pits, stationary compactors, and two top-loading pits to handle both top-loading and compactor transfer trailers. Weigh scales located in a separate scale house are used for measuring incoming waste flow. The transfer haul fleet consists of diesel tractors and 75- and 100-cubic-yard trailers.

The Glades Regional Transfer Station, located in Belle Glade, has a capacity of 200 TPD. Construction of the Glades Regional Transfer facility was completed in 1981. The Authority has a 50-year lease from the City of Belle Glade, which expires in 2027. The transfer station utilizes gravity top-load design and is constructed of reinforced concrete, concrete block, and steel. A weigh scale is used for measuring incoming waste. The transfer haul fleet consists of three diesel tractors, each equipped with a 100-cubic-yard trailer.

The Central County Transfer Station, located in Lantana, is owned by the Authority. The station has a rated capacity of 1,000 TPD and utilizes two push pits, stationary compactors, and two top-loading pits to handle both top-loading and compactor transfer trailers. Weigh scales located in a separate scale house are used for measuring incoming waste flow. The transfer haul fleet consists of diesel tractors and 75-and 100-cubic-yard trailers.

Construction of the West Central Transfer Station, located in the Wellington area, began in April 1991. Operation began in October 1993, therefore, this transfer station was not part of the IMSWM System in FY 1992.

2.3.3 Processing Facilities

The IMSWM System processing facilities located at the North County Complex are the RRF, the ferrous processing facility, the MRF, and the compost facility. These processing facilities are described in detail below.

2.3.3.1 Resource Recovery Facility

The Authority owns and operates, under a long-term agreement with the joint venture of Babcock and Wilcox and Bechtel Company (Palm Beach Energy Associates), the 2,000-ton-per-day (TPD) RRF. The facility has demonstrated the capability to process 686,000 tons per year (TPY) of garbage. Residue from the facility goes to the Class I Landfill and consists of ash (bottom and fly), RDF process residue, and nonprocessible waste. The RRF is equipped with tire-shredding equipment and an oversized-bulky-waste shredder. Both ferrous metal and aluminum are recovered from the waste stream prior to combustion in the RRF; ferrous metals are also recovered from the ash.

The RRF receives, processes, and combusts approximately 2,000 TPD, six days per week, of garbage generated in the County. Three processing lines in the mixed-waste processing plant (i.e., RDF plant) produce fuel for the two boilers in the combustion plant. The system can produce up to 1,600 TPD of RDF, based on an 83-percent yield. The steam from the two boilers supplies the turbine-generator located in the electric generating plant.

The mixed-waste processing plant consists of three 1,000-TPD processing lines, an oversized bulky waste (OBW) line, and a tire-shredding line. The processing lines are designed to recover ferrous material and aluminum; remove glass, grit, dirt, and stones from the incoming MSW stream; and produce the RDF. Two lines are designed to handle the day-to-day operations, and the third provides built-in redundancy. The extra line can also accommodate a future boiler and turbine generator. A process flow diagram of each MSW processing line is shown in Figure 2-4.

The mixed-waste processing plant utilizes a two-stage visual inspection procedure ahead of the processing line. Front-end loaders spread incoming waste on the tipping floor, and two spotters walk through the material to pull out oversized and hazardous materials. Then the front-end loader makes a second pass over the waste, pushing it onto the steel pan apron conveyors that feed the flail-mill infeed conveyors. At this stage, nonprocessible waste is removed by means of a grapple crane.

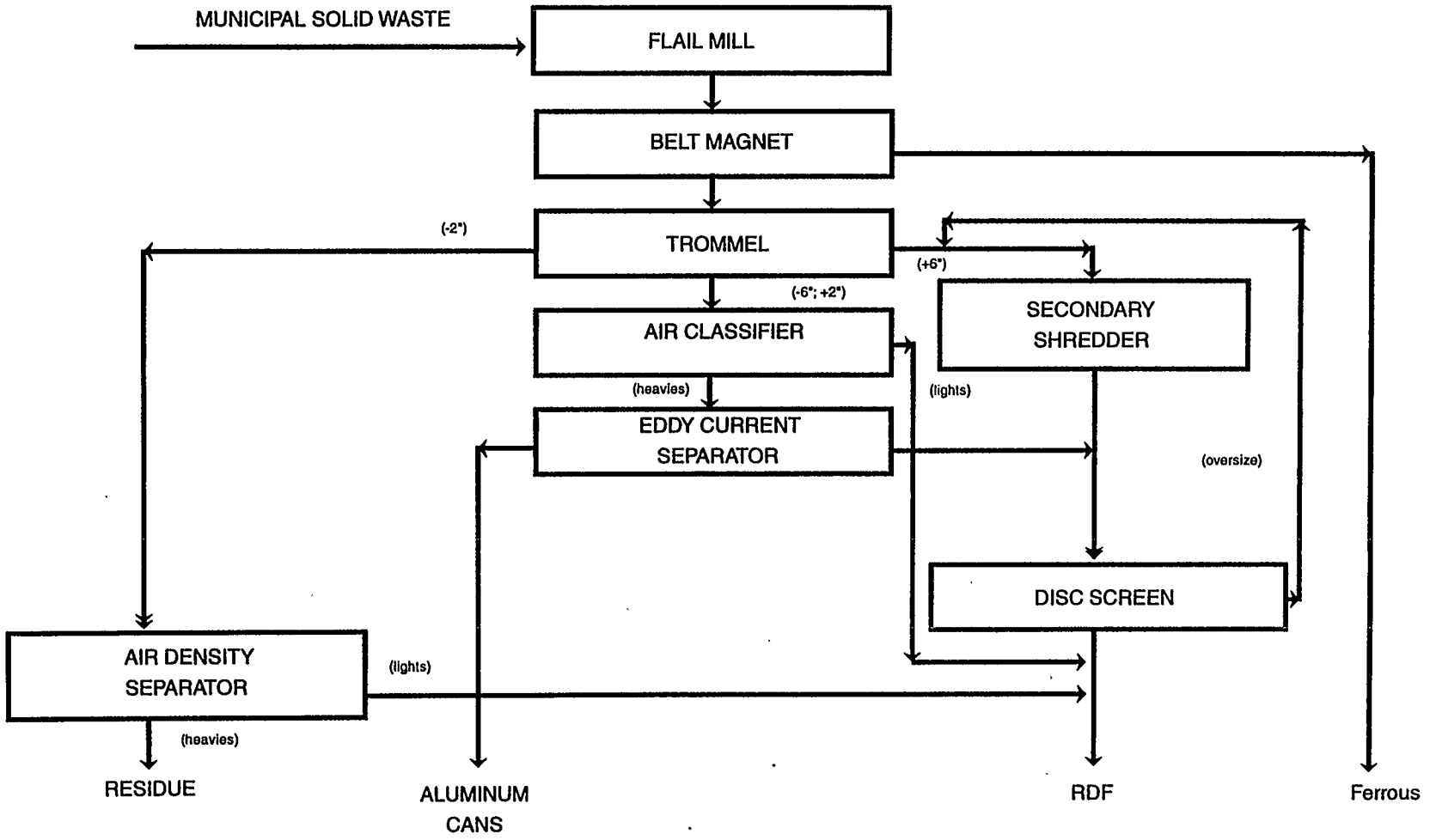
The flail mill tears open the plastic garbage bags, shreds the refuse, and breaks glass bottles into pieces two inches in size or less, thus reducing larger items in the refuse stream to an easily conveyed size while avoiding an undesirable fine grind.

Ferrous metal is then extracted from the coarsely shredded MSW in each line by a single-stage overhead magnet. Recovered metal is conveyed to a ferrous storage area, from where it is further processed through the OBW mill to remove tramp materials, such as paper, plastics, and textiles.

After ferrous removal, shredded waste from the flail mill is fed into a 10-foot round by 60-foot long rotating trommel screen which:

- removes glass, sand, grit, dirt, and nonferrous metal of less than 2 inches in size;
- removes the minus-6-inch fraction, which contains most of the aluminum cans; and

FIGURE 2-4: RRF MIXED-WASTE PROCESSING LINES



Source: "RDF-fired plant aims for high efficiency, low emissions," POWER, April 1990

- produces a high-fuel-value, low ash, oversize (i.e., greater than 6 inch) fraction.

Dimensions of the screen openings can be varied, if necessary, to fine-tune the processing system, thus assuring efficient recovery of combustibles consistent with low ash content. The trommel is fully enclosed for noise and dust control and is equipped with a water sprinkler system for fire protection.

The boilers require a nominal minus-4-inch RDF fraction, part of which is provided directly by the trommel undersize material, and part by shredding the trommel oversize material in a horizontal secondary shredder. A disc screen controls RDF particle size, recycling oversize material to the secondary shredder.

The undersize material passes over an air-density separator, which removes dense particles from less dense materials by a combination of vibration and air sweeping. Glass, stones, grit, dirt, and other nonferrous metals are removed from the combustibles.

To enhance the conditions for aluminum can recovery, an air classifier processes the plus-2-inch/minus-6-inch trommel undersize fraction. It removes the light organic portion of the stream, thus allowing the aluminum cans to be recovered more efficiently by either mechanical separation (i.e., eddy current separator) or hand-picking.

The OBW shredder, a 1000-hp horizontal hammermill, shreds ferrous metal recovered by the RDF processing lines, white goods, and OBW. After passing through the OBW shredder, ferrous metal is separated from extraneous materials and nonferrous metals by an overhead, single-stage magnet. Starting in September 1992, the recovered ferrous was transported across the street to the ferrous-processing facility for further benefication.

A shear mill designed specifically for shredding tires handles 500 passenger-vehicle tires per hour. The mill has a rotary screen classifier for recycling the shredded-tire fraction that exceeds 2 inches in size, thus delivering a material of 2 inches by 2 inches or less to the RDF conveying system.

Each of the three RDF processing, OBW, and tire-shredding lines has independent controls. During operation, each piece of equipment is sequentially controlled by a programmable logic controller. In the event of equipment malfunction, all components upstream of the failure (except the shredder) shut down immediately. Once the equipment malfunction is rectified, the system is restarted in sequence, beginning at the outage and proceeding to the front end.

RDF from each of the processing lines is conveyed to a 3000-ton capacity storage building adjacent to the processing building. From storage, the RDF is conveyed to the combustion plant, where it is fed directly either (1) to the boiler, with the excess dropping to the building floor from a shuttle conveyor to form a storage pile, or (2) to the shuttle conveyor to form a storage pile. When not being fed directly to the boiler, RDF is retrieved from the storage pile by front-end loaders.

The RDF is fed onto the boiler's traveling grate stoker. In addition to providing a platform on which the refuse can be burned and the ash conveyed away, the grate serves as a means to introduce part of the combustion air to the furnace. The balance of the combustion air is injected through overfire air ports above the grate.

Fuel feed into the boiler must be uniform to maintain stable boiler load and an adequate cover of ash on the stoker grate. The ash bed is needed to (1) protect the grate from overheating, and (2) catch any aluminum remaining in the RDF. The steam produced in the two boilers operates a turbine generator with a capacity of 61.3 MW for the production of electricity.

The air pollution control (APC) system for each boiler consists of a spray-dryer/absorber for acid gas control, followed by a high-efficiency ESP for particulate control. The cleaned flue gas is exhausted through the 250-foot stack.

Bottom ash from each boiler is discharged to one of two water bath de-ashers. The bottom ash is dewatered as it moves up the inclined end of the de-asher and discharges onto the bottom ash transfer conveyor, which moves the material to the ash building. Here, the bottom ash is mixed with fly ash at truck loadout. The bottom/fly ash mixture is hauled to the adjacent Class I Landfill.

2.3.3.2 Ferrous Processing Facility

The ferrous processing facility, located at the North County Complex, was designed and constructed by the David J. Joseph Company under a contract with the Authority. Commercial operations began in September 1992. The facility is owned and operated by the Joseph Company under a 10-year agreement. The facility processes ferrous recovered from the RRF, white goods from the Landfills, and ferrous recovered from the MRF into marketable, #2 grade. In a full year, the facility is expected to process 30,000 TPY through a Thyssen Henschel grinder with a capacity of 9 tons per hour and an air classification system to remove the tramp material. The recovered densified ferrous is transported by rail shipments for reuse in steel manufacturing plants in Florida and the Southeast.

2.3.3.3 Materials Recovery Facility

The 38,000-square-foot MRF, located on six acres at the North County Complex, began commercial operations in July 1991. The $6.2-million facility was designed and constructed by Resource Recycling Technologies and is currently operated by RRT under a five-year contract with the Authority.

The MRF processes an average 250 TPD of recyclable materials and has a 500-TPD capacity if operated on two shifts. Materials accepted for processing include: aluminum cans, newspaper and its corresponding inserts, brown paper (Kraft) bags, office paper, glass containers (all colors), and plastic containers consisting of high-density polyethylene (HDPE) and polyethylene terephthalate (PET).

The recyclable material is delivered source-separated from other MSW into either of two categories: mixed paper, or commingled containers (i.e., glass, metal, and plastic bottles and cans). The MRF houses two processing lines: one for the mixed paper, the other for the commingled materials. The commingled materials line is further divided into an aluminum and plastics subsystem and a glass subsystem, as shown in Figure 2-5. A description of the process follows.

FIGURE 2-5: MRF PROCESS FLOW DIAGRAM

PAPER PROCESSING SUBSYSTEM

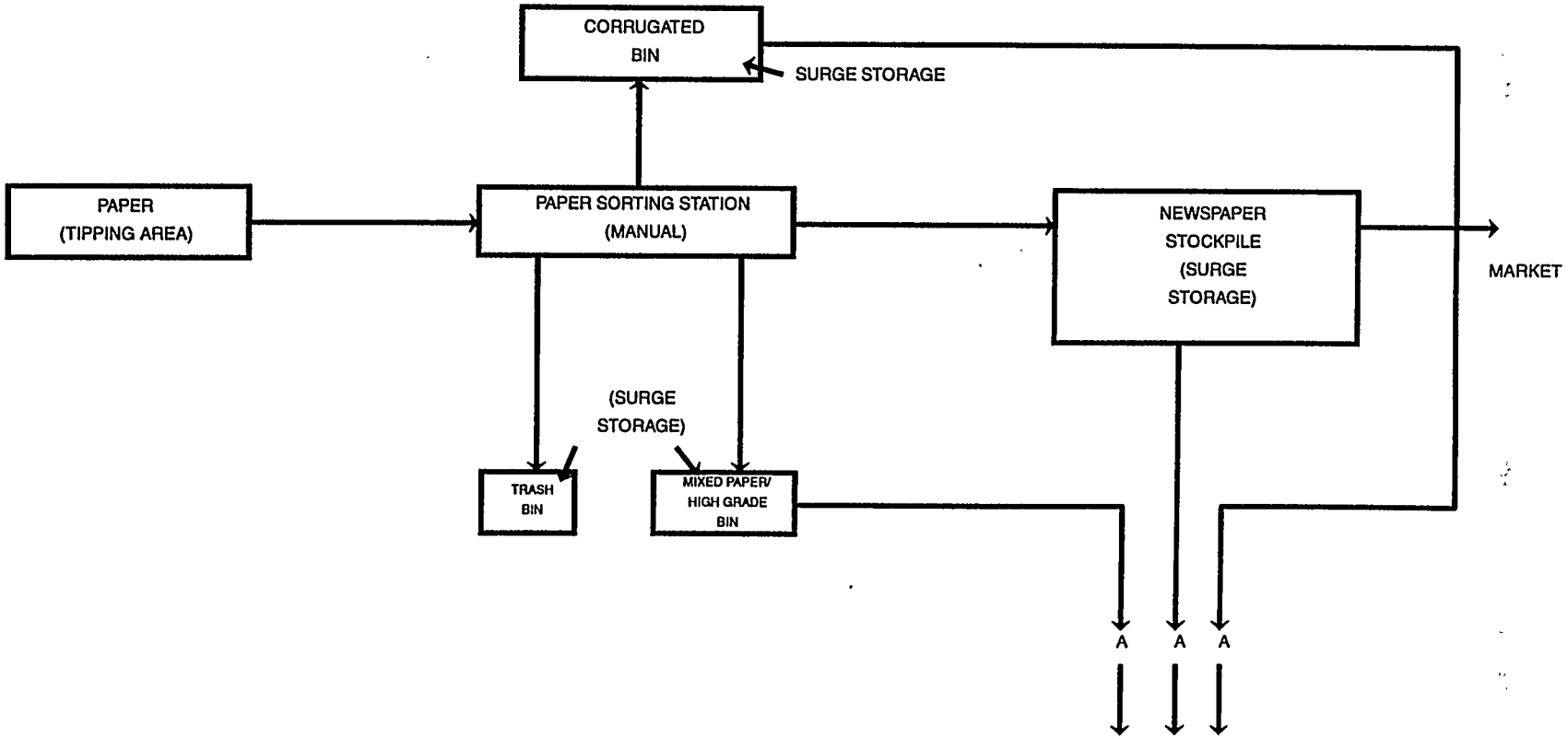


FIGURE 2.5: MRF PROCESS FLOW DIAGRAM (continued)

ALUMINIUM AND PLASTICS PROCESSING SUBSYSTEM

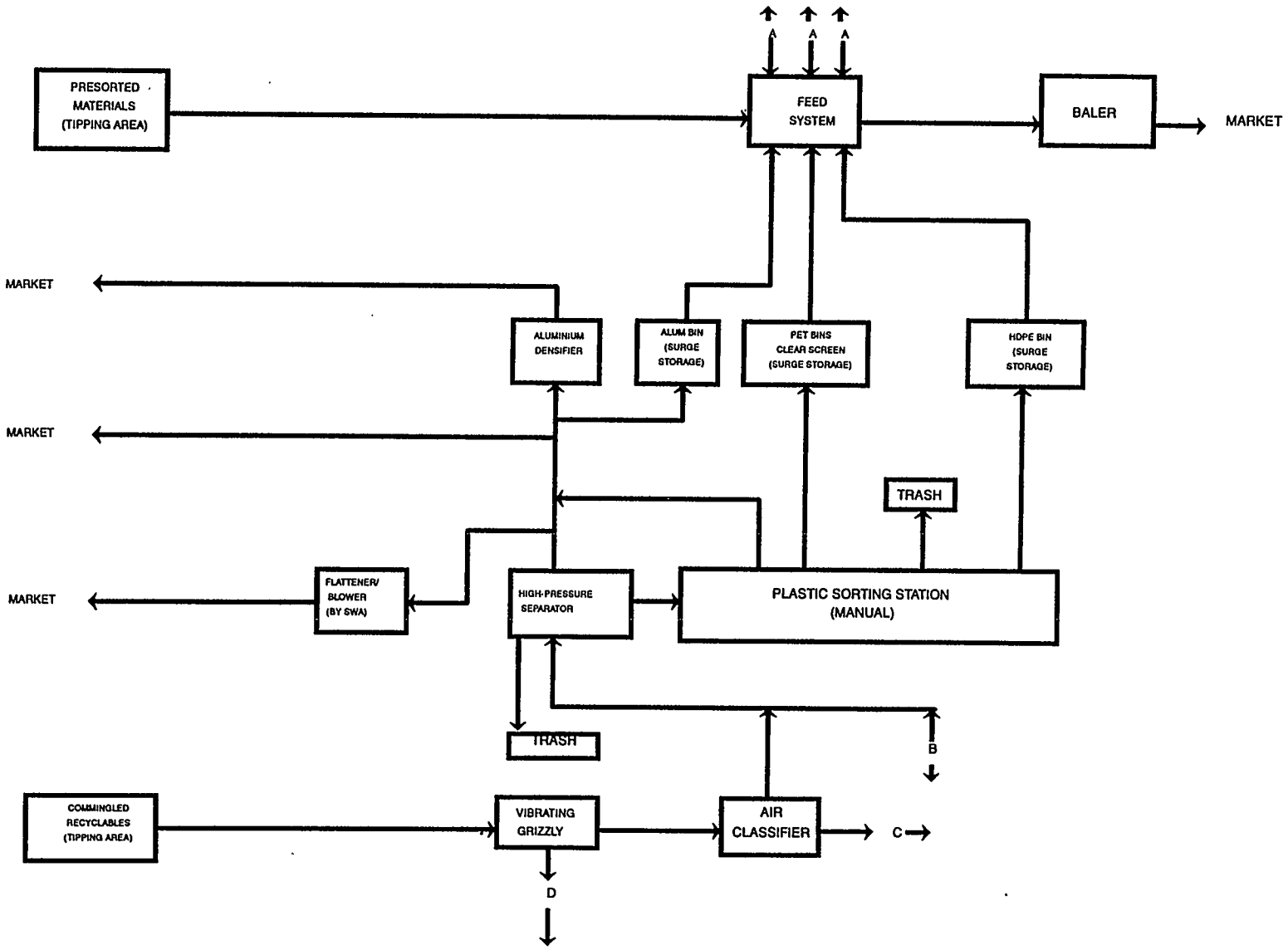
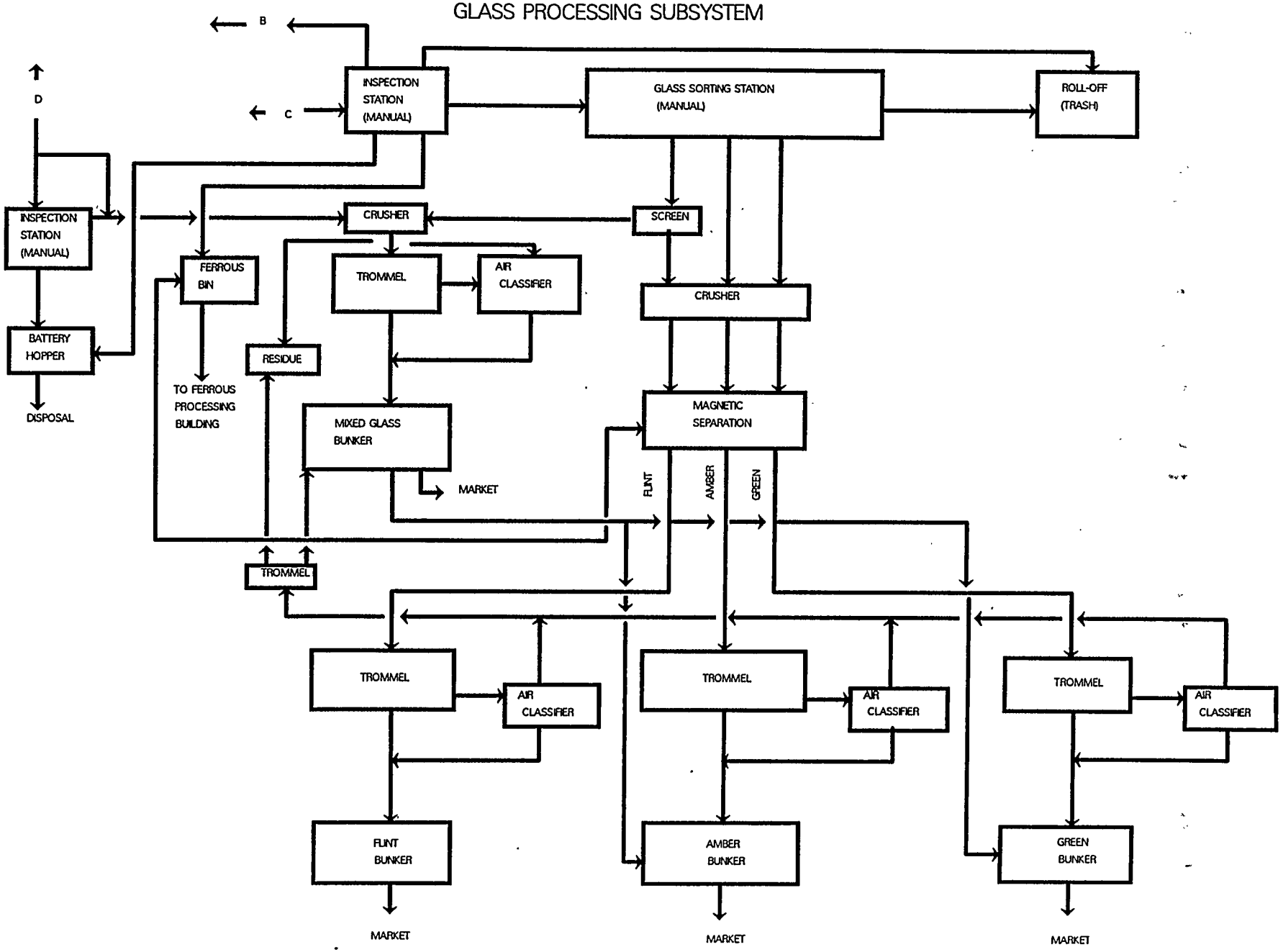


FIGURE 2.5: MRF PROCESS FLOW DIAGRAM (continued)

GLASS PROCESSING SUBSYSTEM



All incoming recycling vehicles entering after weighing in at the RRF scale facility proceed directly to the tipping area. After discharging their contents, the vehicles exit the site. If not previously recorded, the tare weight is established by the scales as the vehicles exit.

Mixed paper deposited on the tipping floor by collection trucks is pushed onto a 20-foot-long section of in-ground conveyor using a skid-steer loader. Sorters positioned on each side of the sorting conveyor manually remove mixed paper, corrugated, high grades, and contaminants from the belt and place them into chutes leading to storage bins located below the sort platform. The remaining newspaper is then deposited automatically into the newspaper stockpile area.

Quantities of mixed paper, newspaper, corrugated cardboard, and high-grade papers accumulate below the sort platform. These materials are pushed by the skid-steer loader onto the ground feed conveyor for baling. Baled paper is stacked and stored indoors for later shipment by tractor trailer. Hoppers for high grade paper are located under the chutes in the mixed paper bin.

Commingled recyclables are dumped by collection vehicles onto the tipping floor. A skid steer loader pushes the material into the processing system receiving pit. This pit creates a surge capacity for the system which allows the line's feed rate and the loader's feed rate to act independently of each other. A box belt conveyor transports the material out of the pit onto the elevated processing area. The commingled recyclables are then processed by a vibrating grizzly screen designed to remove broken glass that cannot be efficiently sorted. The remaining containers are processed by the automatic air classifier sorter, whereby the lighter plastic and aluminum materials are separated from the remaining heavy glass to their own processing subsystems. The heavier glass bottles and large broken glass pieces are deposited onto a wide inspection conveyor belt for manual sorting of any light material (aluminum or plastic) that bypassed the air classifiers and any tramp material.

After the visual inspection station, the glass is transferred to a sorting conveyor located in the enclosed sort room, where amber and green bottles are separated manually from the mixed glass stream, leaving clear glass.

The color-separated glass is then processed through a glass crusher for volume reduction, is magnetically separated, and is then conveyed to a trommel/air classification system. The furnace-ready cullet is conveyed to bunkers, where it is loaded into dump trailers for delivery to the markets. The mixed, broken glass separated by the vibrating grizzly at the discharge of the feed conveyor is also conveyed to an outdoor storage bunker. Included in the process is a crusher/trommel system as well as air classification for mixed broken glass for the purpose of screening out large contaminants that passed through the vibrating grizzly, thereby beneficiating the mixed glass stream into a product acceptable to markets.

The automatically separated aluminum and plastic containers are conveyed to a nonferrous separator for automatic separation of aluminum from the mixed stream and are discharged directly to an aluminum can densifier below the separator or to the storage bin.

The remaining material, consisting of plastic and small amounts of aluminum, is conveyed to the enclosed plastic sort room where the remaining aluminum is manually removed and deposited into the densifier below. The PET containers are sorted manually from the conveyor and discharged through chutes to a PET storage bin below the sort room. The remaining HDPE is discharged

directly to an HDPE bin below.

The aluminum, PET, and HDPE bins are constructed of 8-feet-high walls. Each bin is equipped with a slide-gate door for discharging material to the in-round baler feed conveyor. The loader stationed in the processing area pushes the material onto the conveyor for automatic baling. Plastic bales are stacked and stored by forklift for later load-out into a tractor trailer for shipment.

Ferrous is automatically removed by magnetic head pulleys in the glass benefication subsystem and by the non-ferrous separator in the aluminum/plastic subsystem. Magnetic head pulleys are located on the can densifier and the can flattener. The ferrous material is collected for later delivery to the ferrous processing facility.

2.3.3.4 Compost Facility

The 14,000-square-foot, $1.5-million composting facility began operations in September 1991. The facility processes 30 to 50 TPD of combined yard waste and wastewater residuals (sludge) with automatic, computer-controlled equipment. The compost produced is rated Class AA by the Florida Department of Environmental Regulation (DER), which translates into a product with widespread application and limited restrictions on use in the horticultural industry within the County.

The facility houses four in-vessel processing bays, with plans for expansion to 36 bays in 1993. The expanded facility will process 144 TPD of vegetative wastes and 192 TPD of sludge from the County and city facilities.

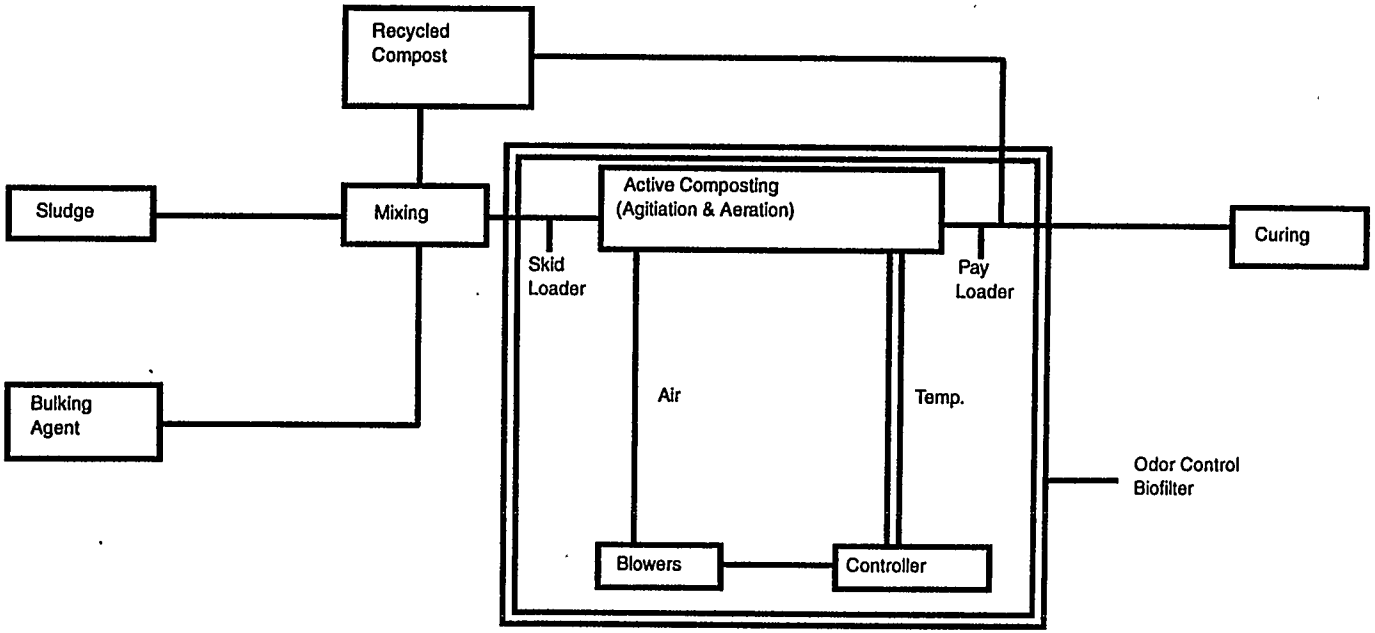
The process is a forced-air, agitated-bed, aerobic system of composting. Composting is completed under controlled aerobic conditions in concrete bays. The individual bays are open at the top, but are sheltered in a weatherproof building that protects the operation and permits year-round operation.

The system is modular; each concrete bay is a separate composting unit with individual controls. A single bay can handle about 3.8 wet tons of sludge per day (0.6 dry tons), assuming an average of 15-percent dry solids. Sludge is deposited inside the building at the front (loading) end of the bays, where it is mixed with an appropriate bulking agent (see Figure 2-6). Materials used as bulking agents may include sawdust, compost, shredded leaves/mulch, wood chips from waste brush or clean construction wood waste, and shredded paper. This mixture is then loaded in the bay where it is agitated, aerated, and composted as it is slowly conveyed through the bay. An agitator/mixer machine mixes and moves the material down the bay at a rate of 12 feet per day, which makes that space available to load new waste each day.

The agitator/mixer, which is operated automatically, has a movable, toothed drum and conveyor. When the machine reaches the front of the bay, a trip switch activates controls to raise the drum/conveyor units, and the machine moves to the next bay, proceeds to the finishing end, lowers the drum and conveyor, and repeats the process. Because of the automatic control, an operator is not required while this unit is working.

Compost remains in the bays for a minimum of 21 days. A 21-day retention time is obtained if

Figure 2-6: Sludge Composting Facility Process Flow Diagram



compost is moved through the bays by operation of the agitator once a day, seven days per week. The retention time can be increased or reduced by operating the machine less or more frequently. Because each bay is a separate unit, the retention time of each bay can be adjusted daily if necessary.

Temperature and ventilation controls maintain aerobic conditions and appropriate temperatures during the composting process. A series of blowers are mounted at intervals along the sides of the outer bays. They are controlled by timers or by an automatic feedback system for forced aeration. The airflow is upward from the bottom of the bay via a system of perforated pipes. Each blower is independently controlled, allowing for temperature management during each stage of the process.

The dry stable compost is collected at the finishing end of the bays where it is tested for bacteria, nutrients and trace metals, prior to shipment or reuse as a bulking agent. About four days' output of finished compost can be stored within the composting building without interrupting operation of the agitating machine. Space is also provided within the mixing end of the building for storage of recycled compost or other bulking agents.

2.3.4 Household Hazardous Waste Facilities

The HHW collection and storage facility at the North County Complex completed its first year of operation in June 1991. The facility is located in a 2,500-square-foot building located adjacent to the Authority's Maintenance Facility at the North County Complex site. The facility opened in May 1990 for collection of HHW and recycling of batteries, used oil, and latex paint. The facility receives wastes from Wednesday through Friday and on the second Saturday of each month. The Authority recycles close to 50 percent of the HHW it receives.

The Delray Beach HHW facility at the South County Transfer Station began operations in June of 1991. The facility receives waste by appointment on the third Saturday of each month.

The Belle Glade HHW facility at the Glades Regional Transfer Station receives wastes quarterly, on the last Saturday of each quarter.

2.3.5 Landfills

The Authority has reduced its landfill space consumption by more than half through the implementation of its IMSWM System, which emphasizes energy and materials recovery. Current programs to recover recyclable materials include curbside collection programs, with recovered materials processed at the MRF; ferrous recovery from the RRF and Class III Landfill, with processing taking place at the ferrous processing facility; and recovery of nonferrous metals from the RRF. In addition, the Authority is recycling yard wastes, wood, and C&D debris in its Class III Landfill area.

The North County Complex Class I and III Landfills are open 312 days per year and maintain 24-hour operations in support of the RRF. The Class I Landfill has a permitted size of 201.19 acres, with a total volume capacity of 16,286,000 cubic yards. Two 10-acre cells were originally constructed in 1989. In 1990, two additional cells, consisting of a total of 19 acres, were constructed. A total of 39 acres of double-lined Class I Landfill is operational at the North

County Complex, with a volume capacity of 1,950,000 cubic yards. The Class I Landfill receives ash from the RRF, nonprocessible material from the RRF, any garbage not processed at the RRF, and some special wastes such as treated bio-hazardous materials.

The Class III Landfill has a permitted size of 104.39 acres and a volume capacity of 9,214,000 cubic yards. Two 11-acre cells were originally constructed in 1989. In 1991, one additional cell of 12 acres was constructed. A total of 34 acres of single-lined Class III Landfill are operational at the North County Complex, with a volume capacity of 1,845,000 cubic yards. In May 1992, construction began on a fifth cell consisting of eight acres.

The Authority estimates that at current consumption trends, the existing Class I Landfill capacity will be exhausted by 2013, and that the existing Class III Landfill capacity will be exhausted by 2006. These projections assume a continued aggressive recycling and waste minimization program and a projected annual population growth of 1.82 percent. The Authority is evaluating proposals for additional disposal capacity to meet its long-term needs.

In order to reduce the volume and amount of materials being placed in the Class III Landfill, the Authority has installed volume reduction and recycling equipment designed to (1) increase densities and compaction rates; (2) allow the recycling of ferrous metals, C&D debris, and wood wastes; and (3) provide processible waste that can be incinerated at the RRF when capacity is available.

The waste-reduction facility consists of two processing systems. The first system consists of the removal of white goods and the removal of large bulky ferrous materials for processing at the ferrous processing facility. This system recovers approximately 15 TPD. The second process system consists of a mechanical recycling/separation system consisting of mechanical screens, conveyors, floatation tank, and hand-sorting to recover lumber, vegetative material, rock and dirt, ferrous, corrugated cardboard, and plastics from the incoming yard waste and trash. The facility began commercial operations in October 1992. The facility can process up to 400 TPD.

Dredging of approximately 240 acres of manmade lakes within the North County Complex initially facilitated the Dyer Landfill closure operation. The current dredging operation provides fill material for the construction of additional landfill cells, roadway construction throughout the complex, and the base course for the compost stockpile area.

The Dyer Boulevard Landfill closed in 1989. The closure process, including grading and installation of a PVC cap, was completed in 1992. A gas recovery system with an active blower and flare is operating. The Authority is investigating the economic feasibility of developing a landfill-gas-to-energy recovery system.

TABLE 3-1: MSW AND OTHER WASTES COLLECTED, PROCESSED AND/OR DISPOSED OF IN PALM BEACH IN FY92

WASTE TYPE	PERCENT	TONS
MSW		
GARBAGE/TRASH		
City Collected	26.7	294,381
Contrator Collected	47.7	525,080
Self Hauled	4.0	44,501
Subtotal Garbage/Trash	78.4	863,962
RECYCLABLES		
City Collected	1.1	12,300
Contrator Collected	4.3	47,844
SWA Collected	0.4	4,760
Self Hauled/Drop Off/Imported	0.3	3,162
Subtotal Recyclables	6.2	68,066
HOUSEHOLD HAZARDOUS WASTE	0.0	192
OTHER WASTES		
Sludge	5.5	60,465
Asbestos	0.1	1,092
C&D Debris	6.9	75,519
Fill	0.7	7,549
Land Clearing Debris	0.9	10,423
Tires	0.4	4,288
Miscellaneous	0.9	10,140
Subtotal Other Wastes	15.4	169,476
TOTALS	100	1,101,696

SOURCE: SWA, "Customer Tonnage Reports for 10/01/92 through 09/30/92", Office of Recycling, Public Affairs, and Contract Management.

3. MSW AND Other Waste Collected, Processed, and/or Disposed of in Palm Beach County

A total of approximately 1.10 million tons of waste material was processed or disposed of by the Authority in FY 1992.[3] Of this amount about 79 percent was garbage/trash[4] and 6 percent was recyclables. The remaining 15 percent included sewage sludge, asbestos, C&D debris, fill material, land clearing debris, tires, and miscellaneous wastes, collectively referred to as "Other Waste." Table 3-1 summarizes the tonnage collected, processed, and disposed of throughout the County in FY 1992. A waste flow and resource recovery diagram of the waste stream processed through the Authority's IMSWM System is depicted in Figure 3-1.

In Sections 3.1 through 3.6, the types and quantities of waste collected, processed, and\or disposed of in Palm Beach County during FY 1992 are presented in more detail. A portion of this waste stream, for which some of the detailed cost analyses was performed, is defined in Section 4.

3.1 Collection and Transfer of MSW

MSW is collected by municipalities, private collection companies, and the Authority. Based on the Customer Tonnage Reports prepared by the Authority, a total of 17 municipal customers delivered garbage/trash and 8 delivered recyclables to Authority facilities in FY 1992, as shown in Table 3-2. A total of nine private firms delivered MSW to Authority facilities. The balance of the waste stream was collected by either the Authority or small haulers/businesses that were not specifically identified in the Customer Tonnage Reports (i.e., "self-hauled" waste). Of the approximately 880,000 tons of MSW collected by either municipalities or private firms, approximately 35 percent was collected by municipalities.

Approximately, 717,000 tons, or 77 percent, of the MSW (i.e., garbage/trash and recyclables) collected in the County were delivered to one of the four transfer stations operated by the Authority. Table 3-3 shows that about 93 percent of the tonnage transferred through these facilities was garbage/trash and about 7 percent was recyclables. Except for a small amount of recyclables and HHW that were delivered to drop-off sites throughout the County, the balance of the MSW was hauled directly to the North County Complex, where it was delivered to the MRF, RRF, landfill, or HHW facility.

Both the West and South County transfer stations have HHW drop-off areas located at the transfer station sites. The HHW activities are operated independently of the transfer operation. The transfer station tonnage data provided in this section is exclusive of any HHW collected at these facilities.

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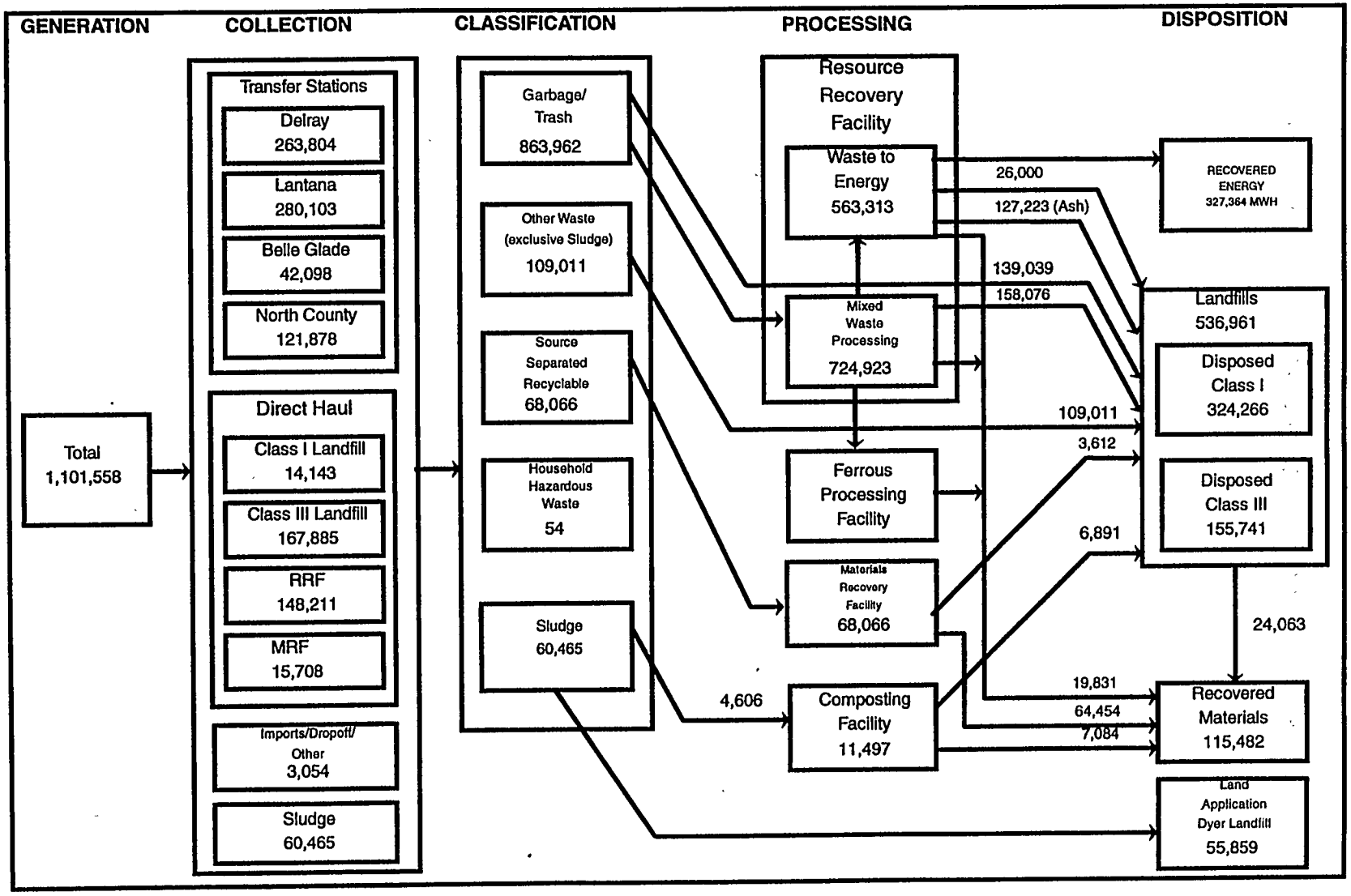
[3] The SWA published a number of reports that provide the tons of waste processed through its ISWM System and within each System component. Some of these reports are inconsistent with each other. The sources selected for use in this study were selected for completeness and consistency.

[4] Garbage/trash includes yard waste and bulky wastes.

FIGURE 3-1: WASTE FLOW AND RESOURCE RECOVERY DIAGRAM PALM BEACH COUNTY FY92



Footnotes:

1. Input of waste to RRF and Compost Facility do not equal output due to moisture gain/loss and thermal or biolofical destruction
2. Some unkown quantity tires (i e , other waste) are delivered to the RRF for shredding into a fuel The flow chart assumes tires are first delivered to the landfill and diverted to the RRF.

TABLE 3-2: SOURCE AND TONNAGE OF MSW IN PALM BEACH COUNTY WASTE (FY92)

SOURCE	GARBAGE	TRASH	YARD WASTE	SUBTOTAL	RECYCLABLES	TOTAL
CITY COLLECTED						
Atlantis & Lantana	4,002	3,764	16	7,782	676	8,458
Belle Glade	10,255	5,246	425	15,926	0	15,926
Boca Raton	32,261	11,947	473	44,681	6,289	50,970
Boynton Beach	36,442	12,609	56	49,107	1,917	51,024
Green Acres	7	3,447	446	3,900	0	3,900
Lake Park	7,459	689	3	8,151	572	8,723
Lake Worth	13,511	5,784	4	19,299	0	19,299
Mangoni Park	0	444	156	600	0	600
North Palm Beach	9,631	337	37	10,005	754	10,759
Pahokee	3,750	952	0	4,702	0	4,702
Palm Beach	8,770	595	1,649	11,014	623	11,637
Palm Beach Gardens	158	260	0	418	0	418
Palm Springs	3,104	2,424	156	5,684	708	6,392
Riviera Beach	18,823	12,319	10	31,152	761	31,913
West Palm Beach	55,928	25,300	374	81,602	0	81,602
West Palm DPW	0	350	8	358	0	358
Subtotal	204,101	86,467	3,813	294,381	12,300	306,681
CONTRACTOR COLLECTED						
BFI	3,055	572	7	3,634	0	3,634
County Sanitation	131,568	10,133	1,551	143,252	13,406	156,658
D&V Carting	16,421	2,634	38	19,093	2,496	21,589
Florida Sanitation	9,365	1,891	10	11,266	141	11,407
Humpty Dumster	10	534	30	574	0	574
Nichols	33,573	1,970	1,092	36,635	3,417	40,052
S. Florida Sanitation	8,368	658	21	9,047	204	9,251
Sunburst Sanitation	50,737	897	260	51,894	5,985	57,879
Waste Management	223,495	26,158	32	249,685	22,195	271,880
Subtotal	476,592	45,447	3,041	525,080	47,844	572,924
TOTAL TONS	680,693	131,914	6,854	819,461	60,144	879,605

SOURCE: SWA, "Customer Tonnage Reports for 10/01/92 Through 09/30/92", Office of Recycling, Public Affairs, and Contract Management.

TABLE 3-3: TONNAGE TRANSFERED THROUGH

TRANSFER STATION	GARBAGE/ TRASH	RECYCLABLES	TOTAL
North County (Juniper)	114,232	7,646	121,878
West County (Belle Glade)	42,098	0	42,098
South County (Delray)	239,008	24,796	263,804
Central County (Lantana)	272,320	16,557	288,877
Total Tonnage	667,658	48,999	716,657
Percent	93.2	6.8	100.0

SOURCE: SWA, "Transfer Station Monthly Statistics Reports," October 1991 through September 1992.

3.2 North County Regional Resource Recovery Facility

The RRF received 724,923 tons of garbage in FY 1992. About 80 percent was delivered from the transfer stations; 0.5 percent was delivered from the MRF; and the remainder was delivered directly to the RRF. Of this amount, 24,073 tons were deemed unprocessible and diverted to the Class I Landfill. The remaining 700,870 tons were processed to produce refuse-derived fuel (RDF) and to recover metals. A total of 134,003 tons of residue, composed primarily of glass, grit, stones, and grass clippings, was generated from the processing operation at the RRF. The residue was disposed of in the Class I Landfill.[5]

A reported 30,084 tons of ferrous metals and 1,154 tons of aluminum were recovered at the RRF. However, the poor quality of the recovered ferrous metals made the sale of this material difficult. Including both pre- and post-combustion recovered ferrous metal, only 18,726 tons were sold in FY 1992.[6]

Partially in response to the need to improve the quality of the ferrous metals recovered from the RRF, the Authority contracted with the David J. Joseph Company to design and construct the ferrous processing facility. This facility did not become fully operational until the last month of FY 1992. In the future, this ferrous benefication facility should result in more of the ferrous metals recovered from the RRF being sold. Even if the facility does not perform up to expectations, the Joseph Company has guaranteed the Authority a market for the ferrous product.

In addition to the RDF produced at the RRF, approximately 18,800 tons of shredded waste from the landfill was diverted to the RRF as a recovered fuel.[7] This material was delivered directly to the RDF storage facility, and thus is referred to by the Authority as "back door" waste.

Ash generated at the RRF amounted to 127,312 tons. Approximately 89 tons of ferrous metals were extracted from the ash. The remaining 127,223 tons of ash were disposed of across the street at the Authority's Class I Landfill.

3.3 Materials Recovery Facility

The Authority reports that 68,066 tons of source-separated recyclables were accepted at the MRF in FY 1992. Of this amount, 65,065 tons were collected by municipalities, private firms, or the Authority from sources within the County; 1,325 tons were imported from neighboring Martin and Broward counties; and 1,164 tons were collected from drop-off sites and by other miscellaneous

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[5] SWA, "Draft NCRRRF Monthly Report," September 1992, page 5.

[6] SWA, "Shipments of Recycled Material," Part III, Detailed Fe+Scrap Shipments, undated.

[7] The exact tonnage is unknown because the SWA did not weigh this material when it was delivered to the RRF. This estimate was obtained from Pellowitz, Dan, "The Estimated Cost of the Components of the Authority's Integrated Solid Waste Management System," March 1993, page 3.

means.[8,9] A total of 64,454 tons of these recyclable materials were recovered and sold.[10] The balance of 3,612 tons, consisting primarily of combustible residue, was delivered to the RRF.

A breakdown of the recovered recyclable commodities processed at the MRF and sold is provided in Table 3-4. As shown in Figure 3-2, about three-quarters, by weight, of the materials sold was paper products, primarily newspaper. Paper products, however, only generate about 37 percent of the revenues received from the materials recovered from the MRF (see Figure 3-2). Although the aluminum represents less than two percent, by weight, of the material recovered at the MRF, it generated about 48 percent of the revenues.[11]

About 97 percent of the materials sold, revenues received, and residue disposed of is attributable to MSW generated in Palm Beach County. The other 3 percent is attributable to the recyclable materials that were imported from other counties.

3.4 Sludge Composting Facility

The Authority's composting facility has been operational since September 1991. In FY 1992 the composting facility processed 4,606 tons of sludge. An additional 6,890 tons of mulch were used in the process as a bulking agent. The mulch was produced at the Authority's Class III Landfill from yard waste. A total of 7,084 tons of marketable compost material was produced by the composting facility.[12]

Based on the success of this operation, the Authority has recently entered into a contract with International Process Systems, Incorporated (IPS), a Wheelabrator Technologies subsidiary, to expand the composting facility to a design capacity of 120,000 TPY (about 53 percent sludge, at 12- to 15-percent solids, and 47 percent vegetation, by weight). The full-scale facility is expected to produce about 70,000 tons of compost per year.

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[8] SWA, "Recycling, Contract Management, and Public Affairs Statistics Report," September 1992, page 10.

[9] Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System," March 1993, page 9.

[10] SWA, "Shipments of Recycled Materials," Part I, Total Revenue and Tonnage, November 4, 1992.

[11] As indicated in Section 3.6.2, aluminum (and other non-ferrous metals) is also recovered at the RRF. The operator of the RRF is responsible for marketing this material and keeps all of the revenues derived therefrom.

[12] SWA, facsimile transmitted from P. Dyer, Division of Engineering, March 2, 1993.

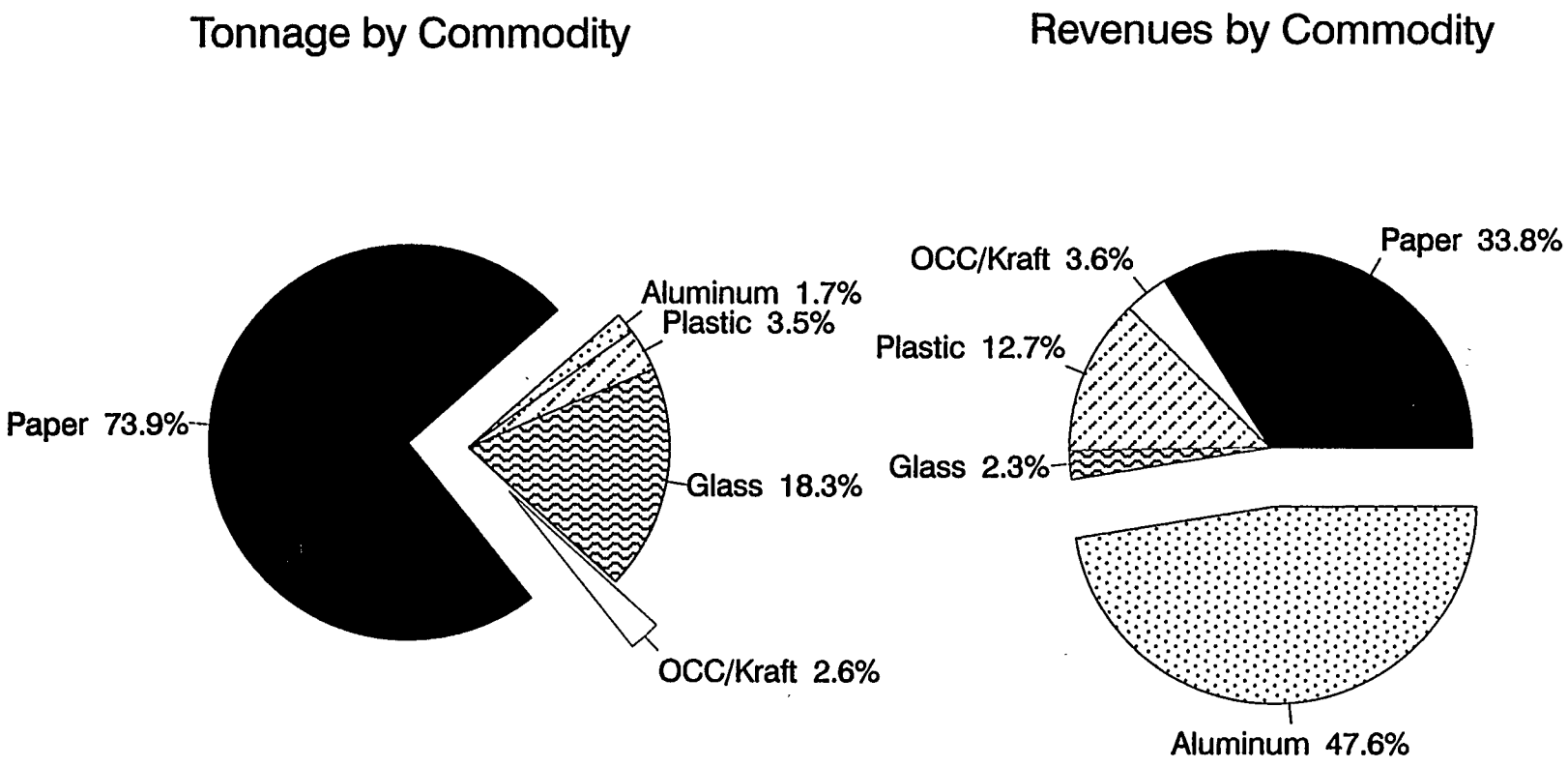
TABLE 3-4: MATERIALS RECOVERED AND SOLD FROM THE MRF AND SOLD OR USED - - FY 92

TYPE OF MATERIAL	TONS	PERCENT
Paper	47,607	73.9
Corrugated/Kraft	1,689	2.6
Glass	11,766	18.3
Plastic	2,278	3.5
Aluminum	1,114	1.7
Ferrous/Scrap	0	0.0
Total	64,454	100.0

SOURCE: SWA, "Shipments of Recycled Materials", Nov. 4, 1992.

FIGURE 3-2: MATERIALS RECOVERED AND SOLD FROM THE MRF IN FY92

(Percent by Weight)



3.5 Household Hazardous Waste

About 192 tons of HHW were collected by the Authority in FY 1992.[13] About 30 percent of this material was sent to an outside processor. The remaining tonnage was recovered for reprocessing by the Authority.[14] About 51 percent, or 98 tons, of the HHW was recycled.

3.6 North County Complex Landfills

The Authority operates and maintains two landfills at its North County Complex, the Class I and Class III Landfills. The Class I Landfill accepts garbage; rejects, residue, and ash from the RRF; and residue from the MRF. The Class III Landfill accepts mostly trash, bulky materials, and other wastes. Sludge accepted by the Authority in FY 1992 was either processed at the sludge composting facility or land-applied at the closed Dyer landfill.

About 536,960 tons of waste were delivered to both Landfills in FY 1992. Of this amount, about 480,000 tons (753,000 cubic yards) were disposed of in the Landfills. Table 3-5 provides the composition of the materials disposed of in the Landfills on both weight and volumetric bases. The conversion to cubic yards is based on aerial photographic data and reflects the actual consumption of landfill space, for each ton of material so disposed. (These densities are provided in Table 3-6 along with estimates of the densities of various wastes as transported in various vehicles.)

The balance of waste delivered to the Landfills, or 56,955 tons, was recovered as usable materials and diverted from the Landfills. The types of materials recovered are mulch, metals, tires, road material, fill material, and RRF fuel. The quantities of materials recovered are provided in Table 3-7. Also included in this table are the quantities of materials recovered from the MRF and RRF, to provide a complete categorization of the materials recovered from the waste stream and processed through the County's IMSWM System.

3.7 Recovered Materials Markets

About 64,454 tons of materials recovered from the MRF were sold to various outlets.[15,16] A telephone survey has been conducted to track the materials from the MRF to their remanufacturing points, when applicable. About 94 percent of the materials recovered from the MRF was accounted for through this survey. (Only about 71 percent of the recovered glass was sold to the markets contacted in this survey. The balance of this glass [mixed] appears to have been used by the Authority for applications within the IMSWM System.) Markets were contacted

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[13] See Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System," March 1993, page 35.

[14] SWA, correspondence and supplemental material provided by D. Gregory, Division of Hazardous Waste Services, March 2, 1993.

[15] SWA, "Material Report," February 15, 1993.

[16] SWA, "Company Report," February 15, 1993.

TABLE 3-5: TONNAGE AND VOLUME DISPOSED OF AT NC LANDFILLS (FY92)

WASTE TYPE	TONNAGE	PERCENT	VOLUME	PERCENT
Garbage	35,355	7.4	45,787	6.1
Trash	72,391	15.1	170,335	22.6
MRF Residue	0	0.0	0	0.0
RRF Unprocessible	24,073	5.0	31,176	4.1
RRF Residue	134,003	27.9	173,544	23.1
RRF Ash	127,223	26.5	127,223	16.9
Other Wastes	86,962	18.1	204,620	27.2
Total Tonnage	480,006	100.0	752,686	100.0

SOURCES:

1. SWA: "North County Landfill Disposal Cost Summary for Year Ended September 30, 1992."
2. Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System" SWA, March 1993.

TABLE 3-6: DENSITIES OF VARIOUS TYPES OF WASTE AND MATERIAL AS DISPOSED OF IN THE LANDFILL OR TRANSPORTED IN VEHICLES (cubic yards per ton)

TYPE OF WASTE/MATERIAL	LANDFILL	VEHICLES	BASIS FOR CALCULATING VEHICLE DENSITIES
Garbage	1.30	5.00	400 lbs/cuyd (350 to 400 loose)
Trash	2.35	8.00	250 lbs/cuyd
Garbage/Trash	2.16	5.66	Weighted Average of Garbage and Trash
Recyclables		5.78	Weighted Average ONP and Comingled Containers
RRF Unprocessible	1.30	5.66	Assume same as Garbage/Trash
RRF Residue	1.30	2.22	900 lbs/cuyd
RRF Ash	1.00	1.00	2000 lbs/cuyd
MRF Residue	1.30	2.22	Assumed same as RRF Residue
Other	2.35	8.00	Assume same as Trash (Class III)
HHW		4.00	Assume 500 lbs/cuyd
Fe/Al		3.31	Calculated
Sludge		3.56	62.4 lbs/cuft
Comingles Containers		11.11	180 lbs/cuyd (140 to 220)
ONP		4.21	475 lbs/cuyd
Corrugated/Kraft		5.71	350 lbs/cuyd (300 to 400)
High Grade Office		5.71	350 lbs/cuyd
Ferrous Cans		2.82	20% 150 lbs/cuyd - 80% 850 lbs/cuyd
Aluminum Cans		13.33	20% 50 lbs/cuyd - 80% 175 lbs/cuyd

NOTES:

1. Landfill densities are based on aerial photo analysis of SWA landfill and includes volume of cover material.
2. Density used for garbage, RRF Unprocessible, and RRF Residue is average of density for all materials disposed of in the Class I Landfill adjusted for amount of ash which was used as landfill cover.

TABLE 3-7: TYPES AND AMOUNT OF MATERIALS SOLD OR OTHERWISE DIVERTED

TYPES OF MATERIAL	SOURCE	TOTAL WASTE STREAM (tons)	ANALYSED PORTION OF WASTE STREAM (tons)
Curbside Recyclables	MRF	64,454	61,612
Yard Waste (Mulch)	Landfill	14,567	4,626
White Goods	Landfill	4,034	2,967
Tires	Landfill/RRF	645	0
Compost	Landfill/Sludge	7,084	2,188
Road Material	Landfill	3,717	0
Fill	Landfill	8,273	0
RRF Fuel	Landfill	18,829	0
Metals	RRF	19,881	14,622
Total		141,484	86,016

NOTE: 6,891 tons of mulch was diverted from the landfill for use in the sludge composting facility.

SOURCES:

1. SWA, "Monthly Recycling Statistics Reports," Office of Recycling, Public Affairs, and Contract Management, Oct., 1991 through Sept., 1992.
2. Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System," SWA, March 1993.
3. SWA, "Shipments of Recycled Materials," Recycled Tonnage & Detailed FE+Scrap Shipments, undated.
4. SWA, "Draft NCRRRF Monthly Report," September, 1992.

to determine: the end use of the material; the distance traveled from the MRF to the processing or remanufacturing destination; the mode of transport; and the consistency of the quality of the recovered recyclables. Table 3-8[17] provides the findings of the survey, by material. A summary of these findings follows.

Recovered aluminum was marketed to three firms: ALCOA, American National Can, and Reynolds Recycling. The aluminum was transported via tractor-trailer trucks, with an average load of 20 to 23 tons, to one of three mills located in Greensboro, Georgia (5443 miles from Palm Beach County); Alcoa, Tennessee (760 miles); and Sheffield, Alabama (796 miles). The recovered aluminum was used in the manufacture of can sheet.

Recovered glass was predominantly marketed to two firms: F&A Trucking and Florida Glass Reclaiming. F&A Trucking purchased mixed glass only, and Florida Glass Reclaiming purchased several glass materials: mixed, amber, flint, and green. Florida Glass Reclaiming transported the recovered materials via tractor-trailer trucks to one of its two jar and bottle manufacturing facilities located in Manatee County, Florida (200 miles from Palm Beach County) and Duval County, Florida (200 miles).

The number of outlets for recovered paper varied with the grade of the recovered material. Corrugated paper was purchased by Harmon Associates for use at Riverwood International, located in Macon, Georgia (506 miles from Palm Beach County). The corrugated paper was transported via transfer-trailer trucks to this liner board manufacturing facility. Mixed paper was also brokered to Harmon Associates, which shipped the material to Fort Howard Paper, of Savannah, Georgia (413 miles), where it was used in the manufacture of tissue products such as towels, tissues, and napkins.

Newspaper was marketed to several firms. Most of the recovered newspaper was exported through the Port of Miami (60 miles from Palm Beach County) to points in the Far East and Europe. Harmon Associates also directed newspaper to the Fort Howard Paper tissue manufacturing facility in Savannah, Georgia.

Recovered phone books were purchased by US Gypsum Corp., of Jacksonville, Florida, for the manufacture of construction products.

Recovered plastics found numerous outlets Both HDPE and PET plastics were marketed to Wellman, of Johnsonville, South Carolina (900 miles), where they were used in the manufacturing of polyester fiber utilized in carpeting and pillow stuffing. Mixed HDPE pellets were used by both Wellman and Quantum, of Heath, Ohio, as resin for containers and plastic overwrap.

Prior to the start-up of the ferrous processing facility, a portion of the ferrous metals recovered at the RRF was shipped to Miami River Recycling in Miami, Florida. The balance was landfilled. Subsequently, the ferrous was shipped about 250 miles by rail to Florida Steel in Tampa.

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[17] The quantities of recovered materials reported in Table 3-8 are slightly different from those reported in Table 3-4. These differences may reflect year-end reconsolidations, variations in the accuracy of scales, and/or moisture gain/loss.

TABLE 3-8: MARKETS FOR SELECTED RECOVERED MATERIALS SOLD IN FY92

RECOVERED MATERIALS	VENDOR	VENDOR FACILITY	TONNAGE	TONS REJECTED
ALUMINUM				
	American Natl Can	Greensboro, GA	1,177	None
		"Alcoa", TN		
	Reynolds Aluminum	Sheffield, AL		None
Subtotal			1,177	
GLASS				
Aggregate	Florida Glass	Manatee County, FL	4,718	None
Amber	Florida Glass	Duval County, FL	421	None
Flint	Florida Glass		1,157	
Green	Florida Glass		927	
Mixed	Florida Glass		1,160	
Subtotal			8,383	
PAPER				
Corrugated	Harmon Associates	Riverwood Int'l, Macon GA	1,584	None
Kraft bags	Jefferson-Smurfit		24	
Mixed	Harmon Associates	Fort Howard Paper, Savannah, GA	1,741	None
News #8	Wm. Goodman	Port of Miami, FL	44,553	
	Jefferson Smurfit			
	Miami Waste Paper			
	Paper Recycling			
	Perry Koplik			
	Harmon Associates	Port of Miami, FL		
	Harmon Associates	Fort Howard Paper, Savannah, GA		None
Phone Books	US Gypsum		327	
Subtotal			48,556	
PLASTICS				
HDPE/PET	Wellman	Wellman, Johnsonville, SC	572	None
Mixed HDPE	Plastics Mtl Group		967	
	Wellman	Wellman,Johnsonville, SC		None
	Quantum	Quantum, Heath, OH		
Natural HDPE			270	
PET	Global		85	
PET/3-7			71	
PET/Clear	WTE		229	
	Global			
PET/Green	MA Industries		61	
Subtotal			2,255	
TOTAL			60,371	

TABLE 3-8 (Cont.): MARKETS FOR RECOVERED MATERIALS SOLD IN FY92

RECOVERED MATERIAL	VENDOR	DISTANCE TO VENDOR (miles)	MODE OF TRANSPORT	REMANUFATURE REUSE	COMMENTS
ALUMINUM					
	American Natl Can	543	Transfer Trailer (20-23 tons)	Can Sheet	
		760			
	Reynolds Aluminum	796	Transfer Trailer (20-23 tons)	Can Sheet	
Subtotal					
GLASS					
Aggregate	Florida Glass	200	Transfer Trailer	Bottles/Jars	
Amber	Florida Glass	200			
Flint	Florida Glass				
Green	Florida Glass				
Mixed	Florida Glass				
Subtotal					
PAPER					
Corrugated	Harmon Associates	506	Transfer Trailer (22 tons)	Liner Board	
Kraft bags	Jefferson-Smurfit				
Mixed	Harmon Associates	413	Transfer Trailer (22 tons)	Tissue, Towels, Napkins	
News #8	Wm. Goodman	60	Transfer Trailer	Newsprint	Shipped in bales to Far East, Europe
	Jefferson Smurfit				
	Miami Waste Paper				
	Paper Recycling				
	Perry Koplik				
	Harmon Associates	60	Transfer Trailer		
	Harmon Associates	413	Transfer Trailer	Tissue, Towels, Napkins	
Phone Books	US Gypsum				
Subtotal					
PLASTICS					
HDPE/PET	Wellman	900	Transfer Trailer (33,000 lbs)	Polyester Fiber: Carpetting, Stuffing	
Mixed HDPE	Plastics Mtl Group				
	Wellman	900	Transfer Trailer (33,000 lbs)	Pellets for Containers	
	Quantum		Transfer Trailer (40,000 lbs)	Resin: Bottles, Plastic Film (Overwrap)	
Natural HDPE					
PET	Global				
PET/3-7					
PET/Clear	WTE				
	Global				
PET/Green	MA Industries				
Subtotal					
TOTAL					

4. Cost of MSW Management in Palm Beach County

4.1 Summary of Results

Of the approximately 1.10 million tons of waste that were delivered to the IMSWM System facilities, the cost of collecting approximately 700,000 tons of MSW (Analyzed MSW) were estimated. The costs of managing the remaining tonnages were reported selectively.

4.1.1 Overall Program Costs

The total FY 1992 gross cost of managing the approximately 700,000 tons of Analyzed MSW was about $109 million, or approximately $156 per ton. The cost net of revenues received from recovered energy and recyclables was about $101 million, or approximately $144 per ton. These costs break down to, in rounded numbers:

CATEGORY	TONNAGE (tons)	COST ($ millions)		COST PER TON	
		Gross	Net	Gross	Net
Garbage/Trash	614,000	$ 89	$ 82	$145	$134
Recyclables	85,800	$ 21	$ 19	$240	$218
TOTAL/AVERAGE	700,000	$109	$101	$156	$144

Figure 4-1 depicts the components of the $110 million gross cost of managing Analyzed MSW. The two most significant contributors to gross cost are collection (54 percent), and the Resource Recovery Facility (23 percent).

Figure 4-2 shows the allocation of costs to each of the key function areas (i.e., collection, transfer, processing, landfilling, G&A, etc.) for managing garbage/trash and recyclables. Note that collection costs exceed 50 percent of total cost for both waste streams and, in the case of recyclables, they exceed 60 percent of the total cost to manage that component. With transfer and haul costs included, gross collection costs amount to almost 60 percent of the outlays for managing the Analyzed MSW.

The cost of managing 192 tons of HHW processed in FY 1992 was about $725,000 (excluding collection), or approximately $3,800 per ton.

For the three facility components of the Palm Beach IMSWM System (i.e., the Resource Recovery Facility, the MRF, and the North County Landfills), the net costs to process and/or dispose of the waste received were, in rounded numbers:

FIGURE 4-1 ALLOCATION OF TOTAL COSTS FOR IMSWM SYSTEM IN FY92

Allocation by Functional Area
(Cost to Manage 700,000 tons of Analyzed MSW)

GROSS COST: $109,470,000

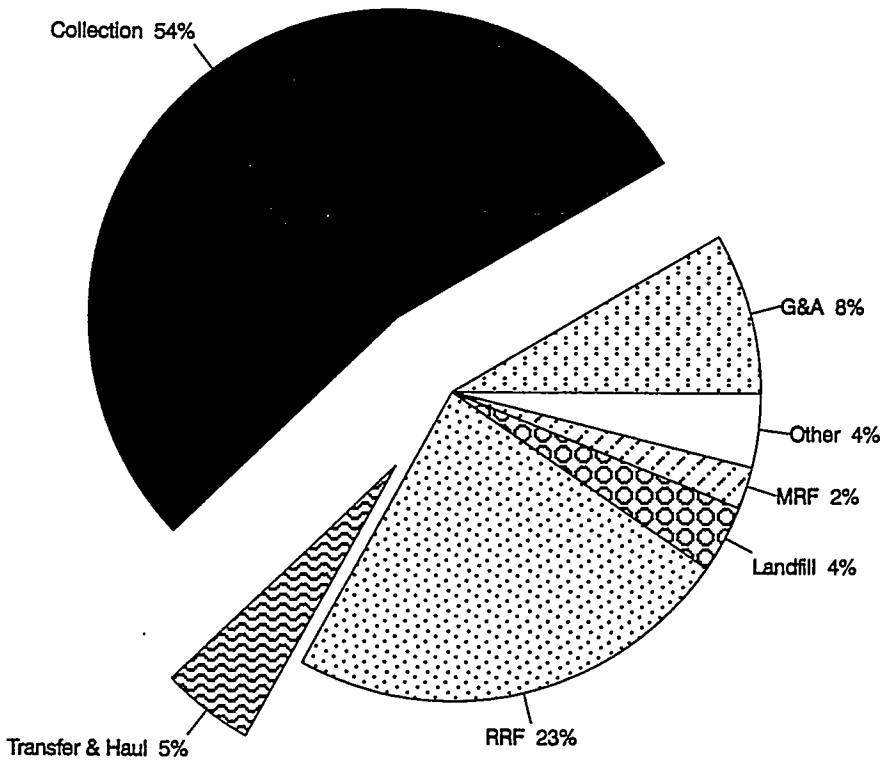
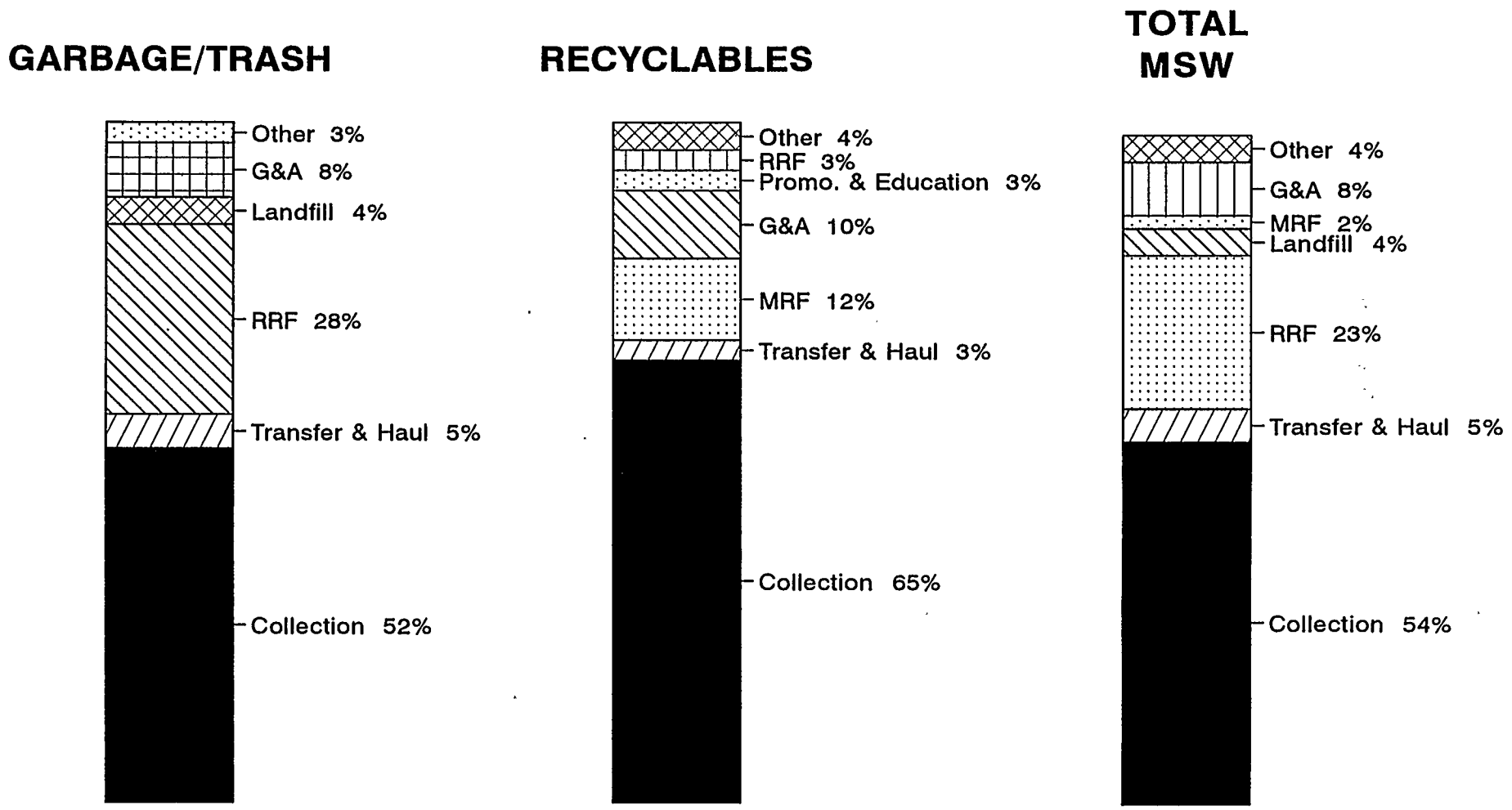


FIGURE 4-2: ALLOCATION OF COSTS TO MANAGE MSW IN PALM BEACH

Allocation by Functional Area



FACILITY	TONNAGE (tons)	NET COST ($ millions)	NET COST/TON
RRF	744,000	$29.3	$39
MRF	68,000	$ 0.9	$14
Landfills	537,000	$ 7.5	$14

4.1.2 Program Incremental Costs

The Palm Beach IMSWM System includes two facilities that were intended to divert MSW from landfills -- the Resource Recovery Facility and the curbside collection/MRF program. The incremental cost for each of these components, i.e., the cost (or savings) associated with adding the component to the IMSWM System, is the difference between the cost of managing all of the Analyzed MSW with and without the inclusion of that component. The Program Incremental Cost (or Savings) is, therefore, the most appropriate measure of the impact of any particular program on the cost of managing MSW. The FY 1992 Program Incremental Cost (Savings) for each of the added system components was, in rounded numbers:

COMPONENT	ANALYZED MSW TONNAGE PROCESSED	INCREMENTAL COST	
		Total	Per Ton
RRF	438,000	$ 1.5 million	$ 35
MRF/Curbside Collection	61,500	$10 million	$164

In addition to the incremental cost that can be attributed to each of these system components, they contribute energy and/or materials to the economy and reduce the utilization of landfill space. The attributes are summarized in Table 4-1.

The sections that follow, and their supporting Appendices, provide the detail behind these overall results. Section 4.2 defines that portion of the waste stream for which collection costs are known, i.e., "Analyzed MSW." Section 4.3 presents the total cost incurred for the IMSWM System in FY 1992. Both the total costs of managing the approximately 700,000 tons of Analyzed MSW and the costs incurred by the Authority to process, market, and/or dispose of the approximately 1.10 million tons of waste that were delivered to the IMSWM System are presented. In Sections 4.4 and 4.5, these costs are allocated by function area and type of MSW. Program incremental costs are provided in Section 4.6.

4.2 Appointment of Waste Stream

Only a portion of the waste is included in some of the economic analyses presented in this section. The reasons for limiting the tonnage in the analyses are: (1) to limit the study to the

TABLE 4-1

INCREMENTAL COST AND EFFECTIVENESS OF RESOURCE RECOVERY PROGRAMS IN PALM BEACH COUNTY, FL (FY92)

RESOURCE RECOVERY PROGRAM	TONS MANAGED	TOTAL INCREMENTAL COST	AVERAGE INCREMENTAL COST	EFFECTIVENESS		
				ENERGY GENERATED (a), (b)	MATERIALS RECOVERED	LANDFILL VOLUME REDUCTION
Waste-to-Energy	438,000	$15.3 Million	$35/Ton $20/CuYd	98,000 MWh Electricit	12,000 Tons Metal	1.0 Million Cubic Yards
Curbside Recycling	61,500	$10.1 Million	$164/Ton $76/CuYd		47,000 Tons Paper	108,000 Cubic Yards
					11,200 Tons Glass	14,300 Cubic Yards
					2,170 Tons Plastic	6,670 Cubic Yards
					1,060 Tons Alum.	3,760 Cubic Yards
					61,500 Total	133,000 Cubic Yards

(a) Any energy conserved from the re-manufacturing or re-use of recovered materials was not estimated as part of this study.
(b) The energy generated from a WTE facility is less than the energy conserved.

management of MSW, and (2) to include only that portion of the MSW stream for which the total cost of collecting, transferring, hauling, processing, marketing, and disposing is known. A detailed discussion of the methodology used to determine costs and the data used to conduct the associated economic analyses are presented in Appendix C.

The definition of MSW used in this report excludes such wastes as sludge, C&D, tires, and other types of wastes that are disposed of at the Authority facilities. Both the costs and quantity (approximately 169,500 tons) associated with these other wastes are excluded from the analysis.

Because the transferring, hauling, processing, and disposing of the garbage/trash is exclusively performed or administered by the Authority, a complete accounting of the costs of these activities is possible. However, collection services are also provided by municipalities and private firms. Of particular concern is the collection of commercial MSW and residential MSW from some multi-family dwellings, which is performed by private firms pursuant to commercial rather than municipal accounts. Because the number of customers served is large, the types of services provided are numerous, the charges for these services are highly variable, and the business arrangements between the customer and the sanitation companies are often confidential, an estimate of the collection cost for that portion of the MSW stream was not included as part of this study.

For the above-stated reasons, only 341,000 of the 525,100 tons of contractor-collected garbage/trash is included in some cost analyses. This tonnage represents the tons of garbage/trash that are: (1) generated by residential and commercial establishments; (2) collected by private firms; and (3) paid for through contracts with municipalities and a private collection company. (Please refer to Appendix D for details on how this tonnage figure was estimated).

Similarly, because the collection costs of all self-hauled and imported wastes are unknown, these wastes are excluded from some of the cost analyses.

Household hazardous waste is also self-hauled (to the HHW drop-off facilities) and as such is also excluded from some of the cost analyses. However, the costs of running the HHW program and facilities are provided as a separate analysis.

Recyclable materials that are collected by private firms from commercial establishments are typically not brought to the Authority's IMSWM System for processing and marketing. Rather, such materials are usually collected and marketed as a purely private endeavor. Although some commercial recyclables were brought to the Authority's facilities, this analysis assumes that all of the material brought to the MRF were collected as part of the residential curbside/container program and the commercial recycling programs sponsored by the Authority in Boynton Beach and Lake Worth, or were collected at drop-off sites. Therefore, all of the contractor-collected recyclables are included in the analysis.

Notwithstanding the need to limit some of the economic analyses to a portion of the MSW stream, any cost analyses that do not include a collection component, such as the determination of the costs of operating and maintaining various facilities within the IMSWM System, include all of the MSW processed in or disposed of at the facility being analyzed.

The cost analyses from which a portion of the waste stream is excluded are those that include

collection costs. Consequently, a valid comparison of costs can be made. Failure to exclude a portion of the waste stream and any associated costs attributed to that portion of the waste stream would bias the results and could lead to misleading conclusions.

Table 4-2 shows the portion of the waste stream for which collection costs are estimated and as such are included in the cost analyses that include collection costs. This portion of the waste stream, referred to in the table as "Analyzed MSW," represents about 64 percent of the total waste stream and 75 percent of the MSW stream processed or disposed of through the Authority's IMSWM System.

Whenever a portion of the MSW stream is excluded from an analysis performed in this Section 4.2 because the collection costs are unknown, the associated transfer, haul, processing, marketing and/or disposal costs are also excluded from the analysis. Consequently, the cost comparisons are valid and include all the costs required to manage the MSW stream from the time it is picked up at the curb until it is sold, used, or disposed of in the landfills.

4.3 Total Costs of MSW Management

The total net cost of collecting, processing, combusting, marketing recovered materials, and disposing of the approximately 700,000 tons of Analyzed MSW, in FY 1992 was approximately $101 million. This represents an average cost of $144 per ton. Gross costs amounted to $109 million. These expenses were offset by revenues earned from the sale of electricity and recovered materials, which amounted to about $8.3 million.

As shown in Figure 4-3, about $74.1 million, or 68 percent, of the gross cost was incurred by the Authority, while the balance was incurred directly by taxpayers, residences and businesses for the collection of MSW, including the costs incurred to purchase or lease bags and containers. Furthermore, of the gross costs, $85.9 million (about 78 percent) was for operating and maintenance (O&M) costs, and $23.6 million (about 22 percent) was for capital costs.

The costs presented above are those incurred for the portion of the waste stream constituting MSW and for which collection costs could be reasonably estimated. The Authority incurred a total cost of $89.3 million in FY 1992 and processed, marketed, or disposed of approximately 1.10 million tons of waste. About $65.8 million of this cost, or 74 percent, is attributed to the management of the 700,000 tons of Analyzed MSW discussed above.

The balance of $23.5 million (i.e., $89.3 million minus $65.8 million) includes the costs incurred to: (1) manage the 169,000 tons of Other Wastes (e.g., sewage sludge, C&D debris, and tires); (2) manage the approximately 232,000 tons of self-hauled, imported, and other MSW for which collection costs are not known; (3) manage the 192 tons of HHW; and (4) develop the new West Central Transfer Station, close the Dyer and Lantana landfills, and purchase, maintain, and develop the South County site. These latter expenses are appropriately allocated to the cost of managing waste generated prior to or after FY 1992.

The following subsections summarize the derivation of the total costs presented in this Section.

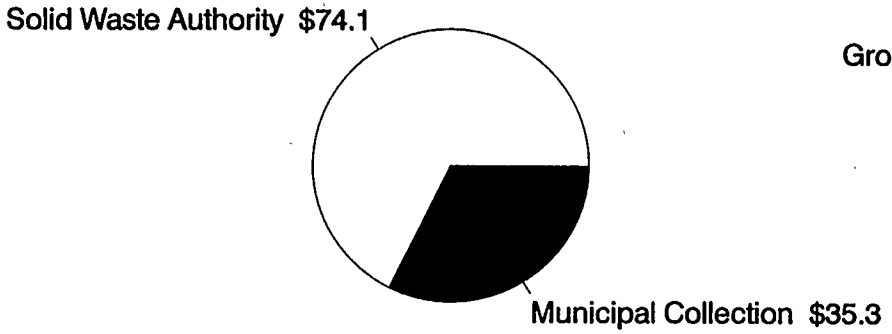
TABLE 4-2: PORTION OF WASTE STREAM FOR WHICH COLLECTION COSTS ARE ESTIMATED

WASTE TYPE	TOTAL WASTE STREAM (tons)	ANALYZED MSW (tons)
GARBAGE/TRASH		
City Collected	294,381	294,381
Contrator Collected	525,080	341,000
Self Hauled	44,501	0
Subtotal Garbage/Trash	863,962	635,381
RECYCLABLES		
City Collected	12,300	12,300
Contrator Collected	47,844	47,844
SWA Collected	4,760	4,760
Self Hauled/Drop Off/Imported	3,162	0
Subtotal Recyclables	68,066	64,904
HOUSEHOLD HAZARDOUS WASTE	192	0
OTHER WASTES		
Sludge	60,465	0
Asbestos	1,092	0
C&D Debris	75,519	0
Fill	7,549	0
Land Clearing	10,423	0
Tires	4,288	0
Miscellaneous	10,140	0
Subtotal Other Wastes	169,476	0
TOTALS	1,101,696	700,285

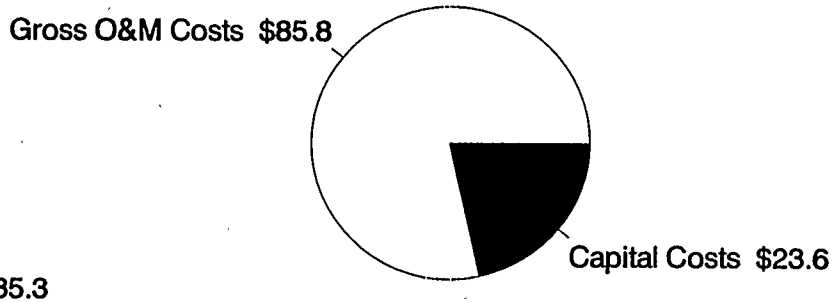
SOURCE: SWA, "Customer Tonnage Reports for 10/01/92 through 09/30/92," Office of Recycling, Public Affairs, and Contract Management.

FIGURE 4-3: TOTAL IMSWM SYSTEM COST
(GROSS COST OF $109 AND NET COST OF $101 MILLION)
(Values are in Millions of Dollars)

AUTHORITY versus MUNICIPAL COLLECTION COSTS



O&M versus CAPITAL COSTS



Costs for managing approximatly 700,000 tons of Analyzed MSW

4.3.1 Authority-Reported Costs

The Authority's revenues and expenses for FY 1992 are provided in Table 4-3. In FY 1992 the Authority had Operating Revenues of just over $113 million, Operating Expenses of just over $77 million, and Other Non-Operating Expenses of just under $31 million, resulting in a Net Income of about $5 million.

By far the largest source of Operating Revenues (i.e., 76.6 percent) is the non-ad valorem assessments charged directly to the owners of residential and commercial property. The residential assessment is charged in lieu of the payment of tip fees for residential tonnage delivered to the Authority's IMSWM System. Commercial establishments are assessed a base facility charge that is included in their property tax bills. In addition, commercial customers pay a usage charge, or tip fee, for each ton of waste delivered to the IMSWM System. The tip fees charged for commercial tonnage represent 12.8 percent of the Operating Revenues received in FY 1992. The revenues received from the municipal recycling program (i.e., fees charged pursuant to interlocal agreements executed between the Authority and the municipalities of West Palm Beach, Lake Worth, Belle Glade, Pahokee, and South Bay, respectively, for the collection of recyclables) and the franchise fees paid by haulers to the Authority for the right to collect MSW in unincorporated areas account for an additional 1.2 percent of the Operating Revenues. In total, the residential assessments, commercial tip fees, municipal recycling program fees, franchise fees, and other miscellaneous revenues account for 90.6 percent of the FY 1992 Operating Revenues. The balance of the Operating Revenues was obtained from the sale of recovered materials and electricity.

A distinction is made in this analysis between the revenues derived from the assessments and fees (i.e., prices charged for services) and those derived from the sale of materials and electricity. Because the purpose of this analysis is to determine the costs of the IMSWM System and not the prices or fees charge by the Authority, assessments and fees are excluded from the analysis. Materials and electricity sales revenues are obtained as a result of the resource recovery activities performed by the Authority (i.e., recycling and waste-to-energy). When determining the costs of resource recovery activities, it is customary to use net costs; that is, the electricity and material sales revenues are treated as offsets to the costs of resource recovery activities. This is the procedure used in this analysis.

Non-Operating Revenues consist of interest income, grants, insurance proceeds, and miscellaneous income. Except for interest income, these revenues are treated similarly to assessments and fees. That is, they affect the prices charged by the Authority, and not costs.

Interest income is derived from a number of invested funds. The largest portion is interest earned on invested revenues from the pre-payment of assessments and fees, and arbitrage interest earned on invested bond proceeds. In this analysis, the interest earned on pre-payments of assessments and fees and other miscellaneous interest earnings are treated in the same way as assessments and fees, whereas interest on the bond proceeds are used to offset the interest payments made on these bonds. The interest earned on bond proceeds is assumed to be the $3.1 million of interest received from the Construction and Debt Service Funds established pursuant to the Indenture of

TABLE 4-3: STATEMENT OF REVENUES AND EXPENSES
Year Ending September 30, 1992

	AS REPORTED	REPORTED COSTS	ADJUSTED COSTS
OPERATING REVENUES			
Assessments	$86,835,669		
Tipping Fees	14,533,877		
Electrical Generating Revenues	8,651,723	$8,651,723	$8,768,435
Recycling Revenues	1,971,923	1,971,923	1,971,923
Municipal Recycling Program	862,580		
Franchise Fees	492,968		
Other Revenues	32,166		
	113,380,906	10,623,646	10,740,358
OPERATING EXPENSES			
Personal Services	14,660,059	14,660,059	14,660,059
Franchise Hauler Contract Payments	19,951,609	19,951,609	19,951,609
Conrtact Payments to Plant Operator	13,529,280	13,529,280	13,529,280
Depreciation and Amortization	15,306,149	15,306,149	0
Capital Cost			32,575,911
Contractual Services	5,823,891	5,823,891	5,823,891
Repair & Maintenance	2,366,084	2,366,084	2,366,084
Other Expenses	5,683,502	5,683,502	5,800,214
	77,320,574	77,320,574	94,707,048
OPERATING INCOME (EXPENSE)	36,060,332	(66,696,928)	(83,966,690)
NON-OPERATING REVENUES (EXPENSES)			
Interest Income (Bond Proceeds)	3,060,710	3,060,710	0
Interest Income (Other)	3,165,158		
Grant Revenue	2,020,826		
Insurance Proceeds	32,977		
Miscellaneous Income	116,333		
Interest/Lease Expenses	(34,107,750)	(34,107,750)	(34,129)
Landsite Expenses	(5,259,484)	(5,259,484)	(5,259,484)
	(30,971,230)	(36,306,524)	(5,293,613)
NET INCOME (EXPENSE)	$5,089,102	($103,003,452)	($89,260,303)

Source: "Comprehensive Annual Financial Report, SOLID WASTE AUTHORITY of Palm Beach County, Florida, Fiscal Year Ending September 30, 1992."

Note: Interest Income on Bond Proceeds is assumed to be the earnings on the construction and Debt Service funds as reported in SWA, "Combining Schedule of Revenue and Expenses by Fund", September 30, 1992 (Final).

Trust for the issuance of bonds to finance various capital expenditures of the Authority.[18,19]

The Landsite expenses shown in Table 4-3 "include the cost to design and construct landfill 'cells' on property permitted and approved as a landfill site. The design and construction costs for each cell are charged to expenses as incurred because historically the landfill cells have a useful life of less than one year. Landsite expenses also include accruals for landfill closure costs, based on total landfill closure costs estimated by the Authority's independent engineers, amortized over the remaining useful life of the landfill site."[20]

Based on the treatment of revenues and expenses in this analysis, the reported total cost to the Authority for the management of MSW in FY 1992 was about $103 million, as shown in Table 4-3.

4.3.2 Adjustments to the Authority's Reported Costs

The costs as reported by the Authority follow accounting principles and do not necessarily reflect economic costs as defined in this analysis. The adjustments made to these reported costs are discussed in this section.

For the purposes of this analysis, two adjustments were made to the reported costs. In addition, the reported depreciation and amortization cost and the net interest cost have been replaced by an annualized capital cost based on the purchase price, expected useful life of the Authority's capital assets, and the cost of capital.[21]

The electricity generated at the RRF is used for in-plant needs (approximately 61,200 MWh) and for Authority electricity needs (exclusive of the RRF) at the North County Complex (approximately 3,600 MWh). The excess electricity is sold to Florida Power & Light (FP&L). The Authority pays the operator an amount equal to the share of electrical revenues it would have received had all of the net electricity (i.e., gross electricity generation less in-plant usage) been

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[18] SWA, "Combining Schedule of Revenue and Expenses by Fund -- September 30, 1992 (Final)."

[19] From 1978 through September 30, 1992, the SWA issued five series of revenue bonds to finance the acquisition and construction of its IMSWM System. These bond issues require the SWA to establish a "Construction Fund, a Debt Service Reserve Account within the Debt Service Fund, an Operating Revenue Fund, a Renewal and Replacement Fund, a Capital Improvement Fund and a General Reserve Fund, all of which Funds and Accounts must be applied to the payment of Bonds or any parity indebtedness of the Authority under certain conditions as set forth in the Indenture." ("Solid Waste Authority of Palm Beach County Refunding and Improvement Revenue Bonds, Series 1992", November 1, 1992, page vi.)

[20] SWA,"Comprehensive Annual Financial Report," Fiscal Year Ending September 30, 1992, page 22.

[21] See Appendix D for a detailed discussion of the approach used in this analysis to calculate capital costs.

sold to FP&L. Thus, the operator is indifferent as to whether electricity is sold to FP&L or to the Authority. Through this arrangement the Authority "purchases" electricity at the rate FP&L pays for electricity generated by the RRF rather than at the higher commercial rate it would have paid had it purchased all its electricity from FP&L.

The reported $8.65 million Electricity Generating Revenues are only those received from FP&L. Moreover, the reported Other Expenses for the Authority do not account for the value of the electricity generated at the RRF and used by the Authority. The adjustments made to account for this arrangement are: (1) increasing the electricity revenues, assuming all of the electricity net of in-plant usage was purchased by FP&L; and (2) increasing Other Expenses by this same amount to account for the Authority's use of RRF-generated electricity. The net result of these adjustments is that the total cost remains unchanged, but the allocation of costs becomes different. Specifically, an estimated $116,712 is added to the Electricity Generating Revenues, and the same amount is added to Other Expenses.

Of far more consequence is the treatment of capital expenses. A capital expense is the purchase of an asset or service with a useful life of greater than one year. Capital expenses are often reported as capital outlays, i.e., the actual payment made during the year, or are depreciated/amortized; for example, the capital outlay is divided by the useful life of the asset.[22]

Capital assets may be purchased with cash, financed, or both combined. If financed, interest payments on borrowed funds are reported as interest expenses. Although either approach is appropriate for generating the financial statements of non-profit organizations, neither is appropriate for estimating economic costs. The reporting of capital outlays does not recognize that the capital asset will be used over several years; therefore, its costs should be spread over several years. The depreciation and amortization plus interest approach does not adequately account for assets purchased with cash, i.e., it does not account for the time value of money. On the other hand, if a capital asset is financed, the interest payment in any year is highly dependent on the age of the debt and the repayment schedule, i.e., interest payments may vary significantly over the life of an asset.

The approach used in this analysis is to "annualize" capital expenses over the useful life of the assets assuming a 7-percent cost of capital. The cost of capital reflects the value of invested funds to the Authority. If the Authority pays cash for an asset, this approach assumes an additional imputed annual cost of 7 percent (i.e., the cost of capital) for the investment in the asset. If the asset is financed with borrowed funds, the analysis substitutes an imputed cost of 7 percent for the actual interest expenses. Using this approach, the capital cost is the same regardless of the sources of funds used to purchase the asset, the repayment schedule of borrowed funds, or the age of the asset during its useful life. This approach is similar to methods used by private firms when making investment and borrowing decisions.[23]

An exception to the use of this methodology is the method used to calculate the capital cost of the North County landfills. To calculate the capital cost of the landfills, the cost of acquiring and

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[22] The Authority uses the latter approach of reporting.

[23] Refer to Appendix D for a detailed discussion for determining capital costs.

developing them is divided by their volumetric capacity to obtain a cost per cubic yard of capacity. This value is then increased by 7 percent per year (i.e., the cost of capital) to account for the investment made in the landfill over time. Finally, the cost per cubic yard is multiplied by the actual volume of landfill space consumed in FY 1992 to obtain the annual capital cost of the landfills.

This procedure is used because the capital cost of a landfill in any year is correlated to the level of consumption of the landfill capacity rather than the age of the landfill. The consumption approach specifically takes into account the various consumption rates of garbage/trash, ash, etc.

As Table 4-3 shows, the Authority reported a total Depreciation and Amortization expense of $15.3 million and a net interest expense of borrowed funds of $31.0 million (i.e., $34.1 million minus $3.1 million). This is a combined cost of $46.3 million. Anualizing the Authority's capital expenses, exclusive of the North County landfills, using a cost of capital of 7 percent, and adding this to the value of the landfill space actually consumed, results in a FY 1992 capital cost of $32.6 million.

The total adjusted cost to the Authority in FY 1992 is $89.3 million, as shown in Table 4-3. The interest expense reported by the Authority includes a $34,100 lease expense, which is treated as an operating expense in this analysis.

As discussed earlier, about $65.8 million of this amount is attributed to the management of approximately 700,000 tons of Analyzed MSW. Generally, the following procedure was used to derive this cost: If possible, specific expenses were classified as being "applicable" or "not applicable" to this 700,000 tons. For example, costs associated with the development of the new West Central transfer station or South County site were classified as being "not applicable." For activities such as the RRF and MRF, costs associated with self-hauled, imported, or other MSW not included in the 700,000 tons for which collection costs could be estimated, were estimated by multiplying the total costs by the percentage of tons excluded from the analysis. Similarly, except for landfill costs, the cost associated with Other Wastes were allocated based on tonnage. Landfill costs were allocated based upon the volume consumed by each type of waste disposed of in the landfills.[24]

4.3.3 Estimating Municipal Collection Costs

The costs of collection for the 37 municipalities that collect their own garbage/trash and/or recyclables or contract with private haulers to collect garbage/trash and/or recyclables are not included in the Authority's costs. In order to determine the total cost of managing MSW in the County, it is necessary to estimate the cost of collection for these 37 municipalities.

4.3.3.1 Municipalities That Collect Their Own MSW

Six of the 13 municipalities that collect their own garbage/trash and/or recyclables were contacted to obtain detailed financial and collection activity information. Five of the six municipalities

[24] For a more detailed account of the allocation methodology, refer to footnotes on the tables provided in Appendix B.

contacted responded to this request. They are Boca Raton, Boynton Beach, Lake Park, Lake Worth, and North Palm Beach. Lake Worth only collects garbage/trash (the Authority collects recyclables in Lake Worth), while the others collect both garbage/trash and recyclables within their respective jurisdictions.

The five municipalities in the sample that collect their own garbage/trash represent, together, 53 percent of the 1992 County population and 46 percent of the garbage/trash collected in the 13 municipalities that collect their own garbage/trash. Similarly, the four municipalities in the sample that collect their own recyclables represent, together, 70 percent of the 1992 County population and 78 percent of the recyclables collected in the nine municipalities that collect their own recyclables.

To estimate the total cost of collection for these municipalities, the following activities were performed: (1) collection costs were calculated from the financial data provided by these five municipalities; (2) a regression analysis was performed to estimate the relationship between tonnage collected and costs; and (3) the total cost for all 13 municipalities was estimated using the regression equations.[25]

Using this methodology, the total annual cost in FY 1992 for those municipalities that collect their own garbage/trash is estimated to be about $22.6 million. The average cost per ton for collecting garbage/trash is estimated to be about $77. Similarly, the estimated total annual cost in FY 1992 incurred by those municipalities that collect their own recyclables is about $2.16 million, or about $176 per ton.

4.3.3.2 Municipalities That Contract for the Collection of MSW

There are 23 municipalities within Palm Beach County that contracted with private firms for the collection of garbage/trash and recyclables within their jurisdictions during FY 1992. Another municipality, South Bay, contracted with a private firm for the collection of garbage/trash.[26]

Palm Beach County municipalities that contract for private collection typically give the hauler an exclusive franchise to collect garbage/trash and recyclables from residences and businesses located within their jurisdictions. Residential customers are defined differently from one municipality to another. Larger apartment buildings and condominiums (e.g., those with five or more units) are often treated the same as commercial establishments contractually. The type of collection service, e.g., backyard collection versus curbside/alley collection, and/or the frequency of collection, also varies among municipalities.

Other than price, the principal contractual difference that distinguishes residential from commercial customers is the method by which each is billed. Municipalities are typically billed for residential customers, while individual bills are sent to each commercial customer, including the larger

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[25] See Appendix C for more details on the procedures and data used to estimate municipal collection costs.

[26] The SWA collects recyclables in South Bay.

residential building owners.[27] Because of the inherent limitations to obtaining the costs incurred by the numerous commercial customers, only the costs incurred by municipalities for residential collection are estimated in this study.[28]

For residential customers, the contractor usually charges a collection fee for each occupied dwelling unit, expressed as dollars per occupied unit per month ($/unit/mo). This fee is multiplied by the number of occupied units served in each month, to obtain the total monthly collection cost to be billed to the municipality. For long-term contracts (e.g., five years) this fee is usually escalated based on the annual rate of change in the consumer price index. Some municipalities are charged different rates for single- and multi-family residences. Finally, some municipalities pay the contractor a minimum fixed amount each month and a per-unit fee.[29]

The methodology for estimating the total collection costs for the 24 municipalities that contract for collection services consists of five steps, as follows: (1) for a sample of eight of these municipalities, total costs are determined along with the number of occupied units served; (2) the average cost per occupied unit is calculated for the eight municipalities in the sample; (3) the percentage of occupied units served is estimated for the municipalities in the sample; (4) the total number of occupied units serviced in the 24 municipalities is estimated by multiplying the percentage of occupied units served in the sample municipalities, as determined in step 3 above, by the total number of occupied units in the 24 municipalities; and (5) the total number of occupied units served, as determine in step 4 above, is multiplied by the average cost per occupied unit, as calculated in step 2 above, to obtain the total collection cost estimate. Occupied units include those that are occupied by full-time residence as well as those that are seasonally occupied.[30]

The annual cost in FY 1992 to the 24 municipalities that contract for the collection of garbage/trash is estimated to be $4.31 million, or about $6.10 per occupied unit per month. The annual cost in FY 1992 to the 23 municipalities that contract for the collection of recyclables is estimated to be $1.37 million, or about $1.96 per occupied unit per month.

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[27] Prices for variously sized containers are often set within the contractors' franchise agreements for some multi-family residences and commercial establishments. In other agreements the contractor may negotiate collection rates with commercial establishments, subject to dispute resolutions procedures established by the municipality.

[28] See Appendix E for a detailed discussion of the methodology used to estimate the tons of residential MSW collected by private firms pursuant to municipal contracts.

[29] This information was obtained by reviewing the collection service contracts and franchise agreements of various County municipalities. Please refer to the references at the end of this report for specific citations.

[30] See Appendix C for a more detailed discussion of the methodology and data used to estimate the cost of collection to municipalities that contract with private haulers for MSW collection service.

4.3.3.3 Total Estimated Municipal Collection Costs

Combining the results for collection of garbage/trash and recyclables for municipalities that collect their own MSW and those that contract for collection services results in a total collection cost estimate of $30.4 million, i.e., $22.6 million plus $4.31 million for garbage/trash and $2.16 million plus $1.37 million for recyclables.

4.3.4 Bags, Cans, and Containers

Because the bins used for collecting recyclables are included in the Authority and municipal collection costs, the cost incurred by homeowners to purchase bags, cans, and containers must also be included in the analysis. The annual cost of using bags, cans, and containers is estimated by multiplying the tons of garbage collected by the cost per ton of using bags, cans, and containers. Only garbage is considered, because trash is usually too bulky for bags, cans, or containers. Dwellings with four or fewer units and mobile homes are assumed to use bags and/or cans, whereas multi-family apartments and condominiums are assumed to use containers, with some individuals using plastic bags prior to depositing them in those containers.

For this analysis, it is assumed that 70 percent of residents who live in dwellings with four or fewer units, including mobile homes, use trash cans; that residents of multi-family homes use containers; and that about 65 percent of all residents use plastics bags.[31] The other assumptions used to estimate the costs of using bags, cans, and containers are:

- the average bulk density of garbage in a 30-gallon (i.e., 0.149 cubic yard) plastic bag or can is 150 pounds per cubic yard;
- the average cost of a 30-gallon plastic bag is about $0.13;
- a 30-gallon trash can costs about $20, has a 10-year useful life, and is used twice a week; and
- the cost of capital is 7 percent.

Using these assumptions, the costs of using plastic bags, cans, and containers are about $11.70, $2.50, and $1.10 per ton of garbage collected, respectively. Taking into consideration the mix of housing units in the County and the above assumptions, the average cost of bags, cans, and containers is about $9.30 per ton of garbage collected.

The resulting total cost of bags, cans, and containers is estimated to be $4.8 million: $1.9 million in municipalities that collect their own garbage; $0.80 million in municipalities that contract for collection; and $2.1 million in the unincorporated areas of the County.

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[31] Some people use both plastic bags and either trash cans or containers. The percentages used here are approximations based on conversations with staff members of the Authority and private haulers.

4.3.5 Combined Authority, Municipal Collection, and Container Costs

When added together, the $65.8 million collection cost incurred by the Authority, the $30.4 million cost incurred by municipalities that collect, or contract for collection of, MSW, and the $4.8 million for the purchase and/or lease of bags, cans, and containers result in the $101 million total net cost to manage the 700,000 tons of Analyzed MSW in Palm Beach County in FY 1992.

4.4 Allocation of Costs by Functional Area

Within this section the $109 million gross cost ($101 million net cost) of managing 700,000 tons of Analyzed MSW in FY 1992 is allocated among the functional areas of G&A, collection, transfer and haul, resource recovery, material recovery, landfill, and other.[32] Also presented are the costs incurred for the RRF, MRF, and landfills for all the waste processed or disposed of in each facility.

The results of the functional allocation are presented in Figures 4-4 and 4-5.[33] Approximately 32 percent of the gross cost is attributed to municipal collection, including the public's cost of purchasing or leasing of bags, cans, or containers. The remaining 68 percent is incurred by the Authority and passed on to its customers.[34] Figure 4-4 shows the allocation by function of the costs borne by the Authority.

One of the reasons for limiting the analysis to only the 700,000 tons of Analyzed MSW (for which collection costs were estimated) is to determine the relative importance of the costs of collection to the overall economics of MSW management. About 54 percent of the cost of managing the 700,000 tons of Analyzed MSW is attributed to collection. Fifty-nine (59) percent of the total cost is attributed to collecting, transferring, and hauling MSW.

Of the $58.8 million spent on collection, about $53.5 million (or about 91 percent) comprised O&M expenses and $5.3 million comprised capital costs.[35] This clearly illustrates the labor-intensive nature of collection. Approximately, $30.4 million (or about 52 percent) was borne directly by municipalities; $4.8 million was borne by households to purchase or lease bags, cans, and containers; and the balance was borne by the Authority. Capital costs consist primarily of the cost of collection vehicles.

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[32] For more details on the allocation procedure used, refer to Appendix B.

[33] Functional allocations are based on gross costs. The allocations are the same for net costs if it is assumed that revenues are allocated proportionally across all functions.

[34] The costs presented do not include any excess revenues that the Authority may have realized, i.e., revenues that exceed expenses. These are treated in this analysis as transfer payments and not costs.

[35] The capital cost incurred by private firms that collect MSW in the County is unknown. The nine percent capital cost figure is based on the capital cost portion of the collection cost of municipalities that collect their own MSW.

The transfer and haul operations cost about $5.4 million. About 53 percent of this cost comprised O&M expenses, and 47 percent comprised capital costs. The capital costs included the cost of the transfer stations, tractors, and trailers.

In total, the collection, transfer, and haul cost was about $64.2 million: 88 percent O&M costs, and 12 percent capital costs. The gross cost of the RRF represents 23 percent of the total cost of the County's IMSWM System. Because most of the metals processed at the ferrous metal processing facility came from the RRF, the cost of that facility is included in the cost of the RRF. This cost, however, reflects about one month of full-scale operations in FY 1992.

Of the $25.7-million gross cost of the RRF, about 48 percent was O&M costs, and 52 percent was capital costs. These costs were offset by revenues of approximately $6.7 million, yielding a net cost of $19.0 million.

General and Administrative (G&A) costs represent about 8 percent of the total gross cost. These costs include costs of the Executive Director's office, financial services such as accounting and billing, contract services, engineering services, purchasing, and personnel. About 86 percent of the $9.2 million G&A cost was for O&M expenses, and 14 percent was for capital costs. The capital costs include the costs associated with the administration building, land, billing software, equipment, and furnishings.

The landfill cost is only 4 percent of the gross cost of managing the 700,000 tons of Analyzed MSW. This cost includes 87 percent of the cost of the dredging operations. This is the percentage of dredge material recovered in FY 1992 that was used in the North County Complex landfills. The total landfill cost was $3.9 million, about 65 percent O&M costs and 45 percent capital costs. The capital costs associated with the landfill include land, development, and equipment costs, including the cost of equipment used to recover material, e.g., tub grinder, tire cutters, and magnet. In addition, the cost allocated to the landfill includes the costs of disposing of the residue and ash from the RRF and MRF. Later in this section a portion of these landfill costs will be allocated to the RRF and MRF in order to calculate the total costs of processing MSW in both facilities.

The cost of the MRF represents only about 2 percent of the gross cost of the IMSWM System. About 54 percent of the gross cost of the MRF comprised O&M costs, and 46 percent comprised capital costs. These costs were offset by the revenues received from the sale of the recovered materials, yielding a net cost of about $725,000. The capital costs include the cost of land, the facility, and equipment.

Other costs, representing 4 percent of the total, include facility, grounds, vehicle, and utility maintenance; and promotion, education, and public relations expenses.

The results presented above are summarized in Figure 4-5. The costs allocated to each facility, i.e., transfer stations, RRF, MRF, and landfills, represent the costs attributed to the 700,000 tons of Analyzed MSW. Moreover, the cost of disposing of the residue and ash are allocated to the cost of the landfill and not the RRF or MRF. In the following subsections, the total costs for all the waste processed at the RRF and MRF and waste disposed of at the North County landfills are presented.

FIGURE 4-4: TOTAL IMSWM SYSTEM COSTS BY FUNCTION (FY92)

Solid Waste Authority and Municipal Costs

(Cost to Manage 700,000 tons of Analyzed MSW)

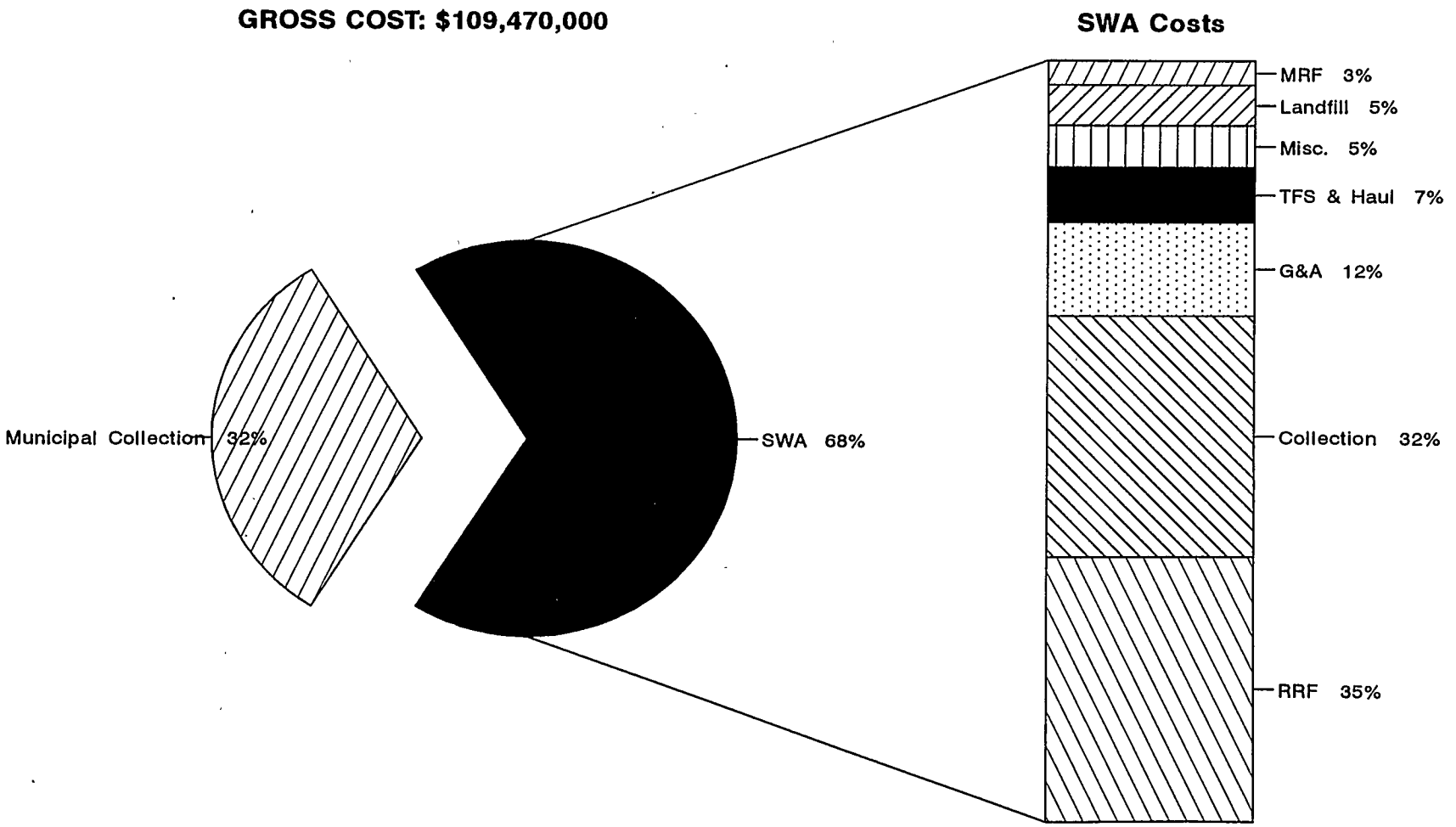
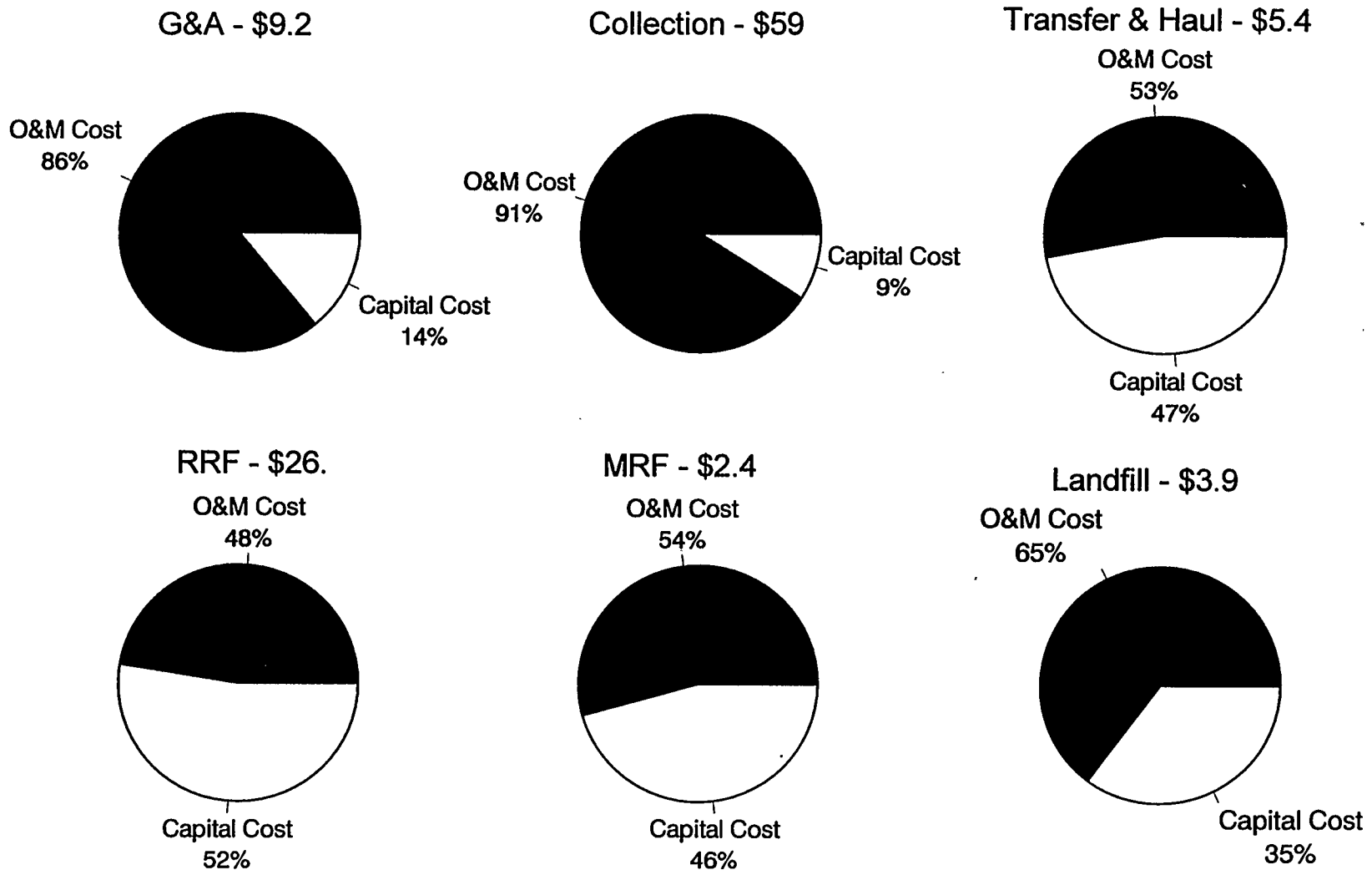


FIGURE 4-5: O&M AND CAPITAL COST BY FUNCTION IN FY92

(Cost to Manage 700,000 tons of Analyzed MSW)
(Costs in Millions of Dollars)



4.4.1 Cost of the Resource Recovery Facility

The FY 1992 gross cost of processing at the RRF all of the 724,923 tons of MSW and 18,829 tons of "back door" RRF fuel generated at the landfills was approximately $38.4 million. This cost was offset by revenues of almost $9.0 million, resulting in a net cost of about $29.4 million. Included in these costs is the cost of producing the back door RRF fuel at the landfill, processing ferrous metals at the ferrous metal processing facility, and disposing of the 24,073, 134,003, and 127,223 tons of unprocessible waste, residue, and ash, respectively, at the landfill.

Although the RRF, including the associated ferrous processing and landfill operations, accounts for about 35 percent of costs incurred by the Authority[36], the 744,000 tons of waste processed at the RRF represent about 68 percent of the waste (80 percent of the MSW) treated by the Authority.

The makeup of these costs is provided in Table 4-4. Of the $38.4 million gross cost, about 44 percent is non-landfill O&M costs, 48 percent non-landfill capital costs, and 9 percent landfill costs. (This is indicative of the capital-intensive nature of the RRF.) About 6 percent of the landfill cost is attributed to the production of RRF fuel, i.e., back door waste.

Revenues of almost $9.0 million were derived from the sale of electricity and ferrous metals. Electricity sales to FP&L plus the imputed value of electricity used by the Authority at the North County Complex (exclusive of the RRF) amounted to almost $8.8 million, while ferrous metal sales amounted to about $.2 million.

The average gross cost of processing the approximately 744,000 tons of MSW and back door RRF fuel processed at the RRF was about $52 per ton. The average revenue generated per ton processed was about $13. The average net cost per ton was about $39.

4.4.2 Cost at the Materials Recovery Facility

The gross cost of processing all of the 68,066 tons of recyclables at the MRF in FY 1992 was approximately $2.69 million. Included in this analysis is the cost of processing the 3,612 tons of residue generated at the MRF at the RRF, and the disposal of the ash associated with this tonnage. This cost was offset by revenues of about $1.77 million, resulting in a net cost of about $925,000.

Although the MRF, including the associated RRF and landfill costs, accounts for about 2 percent of the total costs incurred by the Authority in FY 1992 to treat waste, the 68,066 tons of recyclables represent about 6 percent of the waste (7 percent of the MSW) treated by the Authority.

The makeup of these costs is also provided in Table 4-4. Of the $2.69-million gross cost, about 54 percent is non-landfill O&M costs, 46 percent non-landfill capital costs, and 0.2 percent landfill costs. About 94 percent of the non-landfill O&M cost (i.e., $1.36 million) is attributed to the MRF; the balance is attributed to the processing of the MRF residue at the RRF.

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[36] The costs are exclusive of the cost incurred to close the Dyer and Lantana landfills, the development of the W. Central transfer station, and the development of the S. County site.

TABLE 4-4: FY92 COSTS AND REVENUES FOR THE RRF, MRF, AND LANDFILL

COST/REVENUE	Resource Recovery Facility		Material Recovery Facility		Landfill	
	Dollars	% Gross Cost	Dollars	% Gross Cost	Dollars	% Gross Cost
COSTS						
Operating & Maintenace Costs	16,813,966	43.8	1,362,006	50.6	4,963,103	65.9
Capital Cost	18,407,358	48.0	1,151,780	42.8	2,573,174	34.1
Total O&M Costs	35,221,323		2,513,786		7,536,277	
RRF COSTS						
Operating & Maintenace Costs	NA		81,656	3.0	NA	
Capital Cost	NA		89,395	3.3	NA	
Total O&M Costs			171,051			
LANDFILL COSTS						
Unprocessible Waste	293,820		0		NA	
Residue	1,635,537		0		NA	
Ash	1,200,985		5,833		NA	
Total Landfill Cost	3,130,342	8.2	5,833	0.2		
GROSS COSTS	38,351,665	100.0	2,690,669	100.0	7,536,277	100.0
REVENUES						
Electricity	8,768,435		42,584		0	
Materials	237,839		1,722,760		11,325	
Total Revenues	9,006,274		1,765,344		11,325	
NET COST	29,345,391		925,326		7,524,952	
AVERAGE GROSS COST	52		40		14	
AVERAGE NET COST	39		14		14	
TONS	743,752		68,066		536,961	

Similarly, about 93 percent of the non-landfill capital cost (i.e., $1.15 million) is attributed to the MRF. Although the absolute value of the capital cost of the MRF is significantly less than that of the RRF, on a relative basis the MRF is capital intensive.

The average gross cost of processing the approximately 68,000 tons of recyclables at the MRF was about $40 per ton. The average revenue generated was about $26 per ton, resulting in a net average cost of about $14 per ton.

These results indicate that the net cost of constructing, operating, and maintaining the County MRF is only a small fraction of the cost of the curbside recycling program.

4.4.3 Cost at the North County Landfills

The total cost of disposing of the 480,000 tons (or 753,000 cubic yards) of waste in the North County landfills was about $7.10 million, resulting in an average cost of $14.80 per ton (or $9.40 per cubic yard). Of this cost, about 65 percent was for O&M expenses, and 35 percent was capital costs.

In addition to disposal activities at the landfills, about 57,000 tons of material were processed and diverted from the landfills. The average net cost of processing the 57,000 tons of material diverted from the landfills is about $420,000, or $7.40 per ton. About 77 percent of the gross cost of processing and diverting this material is attributed to O&M costs, and 23 percent to capital costs. This cost is partially offset by the $11,325 received from the sale of metals, primarily recovered from white goods. Most other materials, e.g., mulch, fill, and RRF fuel, are diverted without any revenues being generated. Some of these materials are used as cover on the landfills and as feedstock to the sludge composting facility.

The total cost of processing, diverting, and/or disposing of waste at the landfills was about $7.54 million. About 66 percent of this cost comprised O&M costs, and 34 percent comprised capital costs. The average net cost of the landfill operations was $14.00 per ton (or $8.40 per cubic yard). The makeup of this cost was also provided in Table 4-4.

4.5 Allocation of Costs by Type of Waste

In this subsection, the $101-million net cost of managing the 700,285 tons of Analyzed MSW is allocated to the cost of managing either the 614,269 tons of garbage/trash or the 86,016 tons of recovered materials. The materials recovered consist of the 61,612 tons recovered at the MRF, 14,622 tons of metals recovered at the RRF, and 9,782 tons recovered at the landfills. (See Table 3-7 in Section 3 for a list of the recovered materials included in the 700,285 tons of Analyzed MSW.)

The results presented are total allocated costs, i.e., G&A, facility, ground, utility, and vehicle maintenance cost are included in the allocation.[37] In general, the allocation process followed the following steps: (1) the portion of each expenditure that is applicable to the management of the approximately 700,000 tons of Analyzed MSW was determined, as discussed previously; (2)

[37] The allocation procedures are provided in the tables presented in Appendix B.

expenses that were dedicated to garbage/trash or recyclables were identified, such as the MRF expenses being allocated to recyclables; (3) other expenses were apportioned based a number of factors such as tonnage, volume, and land area. General and Administrative costs that were not specifically assigned to a type of waste in step 2 were allocated to garbage/trash or recyclables in proportion to the dollar value allocated to each type of waste for all other costs. Consequently, the absolute value of the costs attributed to the management of garbage/trash or recyclable reflects all costs, including G&A costs, and the relative value of these costs is unaffected by the allocation of these G&A costs.

4.5.1 Cost of Managing Garbage/Trash

The FY 1992 gross cost of managing approximately 614,000 tons of garbage/trash collected, transferred, processed, combusted, and/or disposed of in the County IMSWM System was approximately $88.9 million. Seventy-five (75) percent of the gross cost comprised O&M costs, and 25 percent comprised capital costs. These costs were offset by revenues of about 6.4 million, resulting in a net cost of $82.4 million. The average cost of managing these 614,000 tons of garbage/trash was $134 per ton.

Of the gross cost of $88.9 million, approximately $58.5 (71 percent) was incurred by the Authority, and the balance of $30.3 million (29 percent) was borne by taxpayers, residents, and businesses for the collection of garbage/trash, including the cost of purchasing or leasing garbage bags, cans, and containers. The allocation of the $88.8 million cost by functional area is presented in Figure 4-6. The allocation by functional area of the $58.5 million cost borne by the Authority is shown in Figure 4-7.

Collection costs alone account for about 51 percent of the total cost of managing garbage/trash, while collection, transfer, and hauling account for almost 56 percent of this cost. The RRF accounts for about 28 percent of total cost, while the landfills account for less than 5 percent of this cost. The smaller contribution of the landfill cost is partially due to the significant volume reduction resulting from the combustion of MSW at the RRF.

4.5.2 Cost of Managing Recyclables

Recyclable materials are recovered from the RRF, MRF, and landfills. Materials recovered at the MRF are associated with the curbside collection program, while materials recovered at the RRF and landfills are from mixed MSW. A portion of the cost of collecting, transferring, and processing MSW to recover materials at the RRF and landfills have been apportioned to the management of recyclables and are included in this analysis.

The FY 1992 gross cost of managing approximately 85,800 tons of recyclables collected, transferred, processed, combusted, and/or disposed of in the IMSWM System was approximately $20.6 million. Eighty-Six (86) percent of the gross cost comprised O&M costs, and 14 percent comprised capital costs. These costs were offset by revenues of about 1.8 million, resulting in a net cost of $18.8 million. The average cost of managing these 85,800 tons of recyclables was $218 per ton.

Of the gross cost of $20.6 million, approximately $15.7 million (76 percent) was incurred by the Authority, and the balance of $4.9 million (24 percent) was borne by taxpayers, residents, and

FIGURE 4-6: ALLOCATION OF COSTS TO MANAGE GARBAGE/TRASH

Allocation by Functional Area
(Cost to Manage 614,000 tons of Garbage/Trash)

GROSS COST IS $88,850,000

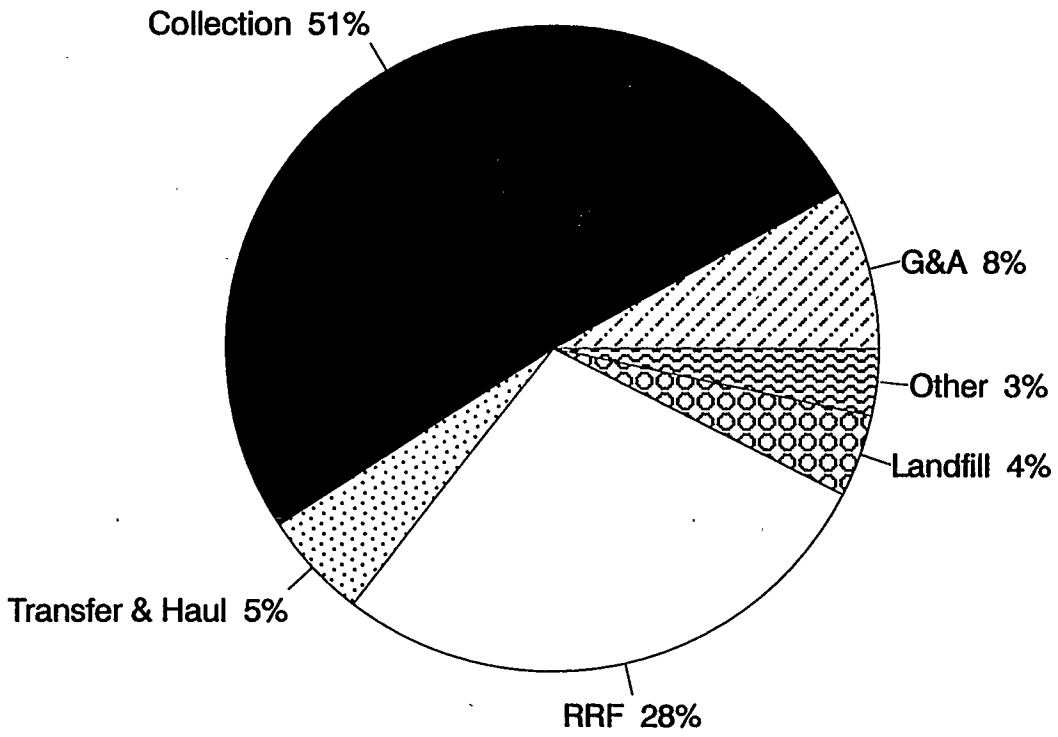
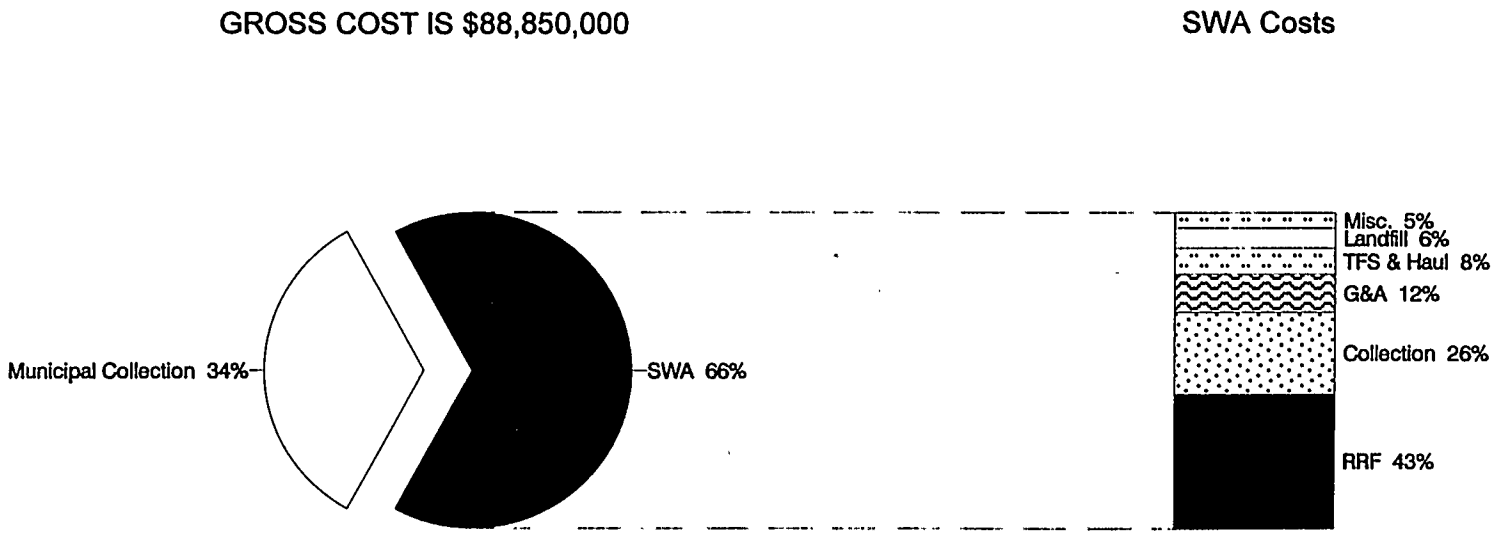


FIGURE 4-7: COST TO MANAGE GARBAGE/TRASH BY FUNCTION (FY92)

Solid Waste Authority and Municipal Costs
(Cost to Manage 614,000 tons of Garbage/Trash)



businesses for the collection of recyclables, including the materials recovered from garbage/trash. The allocation of the $20.6 million cost by functional area is presented in Figure 4-8. The allocation by functional area of the $15.7 million borne by the Authority is shown in Figure 4-9.

Collection costs alone account for about 65 percent of the gross cost of managing recyclables, while collection, transfer, and hauling account for almost 68 percent of this cost. The RRF accounts for about 3 percent, the MRF 12 percent, and the landfills about 1 percent of this cost. The promotional, educational, and public relations expenses are about 3 percent.

These results show that collection, transfer, and haul of recyclables, and activities to promote recycling and ensure proper sorting of wastes, account for almost 70 percent of the gross cost of managing recyclables in Palm Beach County.

4.5.3 Cost of Managing HHW

The cost of managing the 192 tons of HHW processed in FY 1992 was about $725,000. This cost does not include the cost of collection, because most HHW is delivered to drop-off sites by residents and businesses. Of this cost, about 80 percent comprised O&M costs and 20 percent comprised capital costs. About 35 percent of the cost was attributable to G&A costs. The G&A costs include all G&A costs directly attributed to the HHW program plus a proportional share (based on costs) of other G&A not directly attributed to other programs.

4.6 Program Incremental Costs

Program Increment Costs (or Savings) are defined as "the difference between the cost of managing MSW with and without the inclusion of a particular program." In this subsection the estimated Program Incremental Costs of the North County RRF and the curbside recycling program, including the MRF, are presented, respectively.

The Program Incremental Costs presented below reflect FY 1992 price levels and contractual relationships. These estimates should not be interpreted as the costs or savings of eliminating the current programs. Because of existing contractual commitments and sunk capital expenditures, the costs of eliminating existing programs would be substantially different from the costs presented here. Rather, the Program Increment Costs presented here should be interpreted as the costs or savings or these programs in FY 1992.

To calculate Program Incremental Costs, it is necessary to estimate the expenditures that would have occurred to manage a given quantity of MSW (i.e., the same quantity that was managed in FY 1992) assuming that a program (i.e., the RRF or the curbside recycling program) was never implemented. These cost estimates require various assumptions which are more fully explained in Appendix C. The resulting Program Incremental Costs are presented in Table 4-5.

In FY 1992, the Program Incremental Cost of the RRF, including the Ferrous Processing Facility, was about $15 million. This represents a $35 per ton cost for the approximately 438,000 tons of Analyzed MSW that was either combusted or recovered as ferrous metals at the

FIGURE 4-8: ALLOCATION OF COSTS TO MANAGE RECYCLABLES

Allocation by Functional Area

(Cost to Manage 85,800 tons of Recyclables)

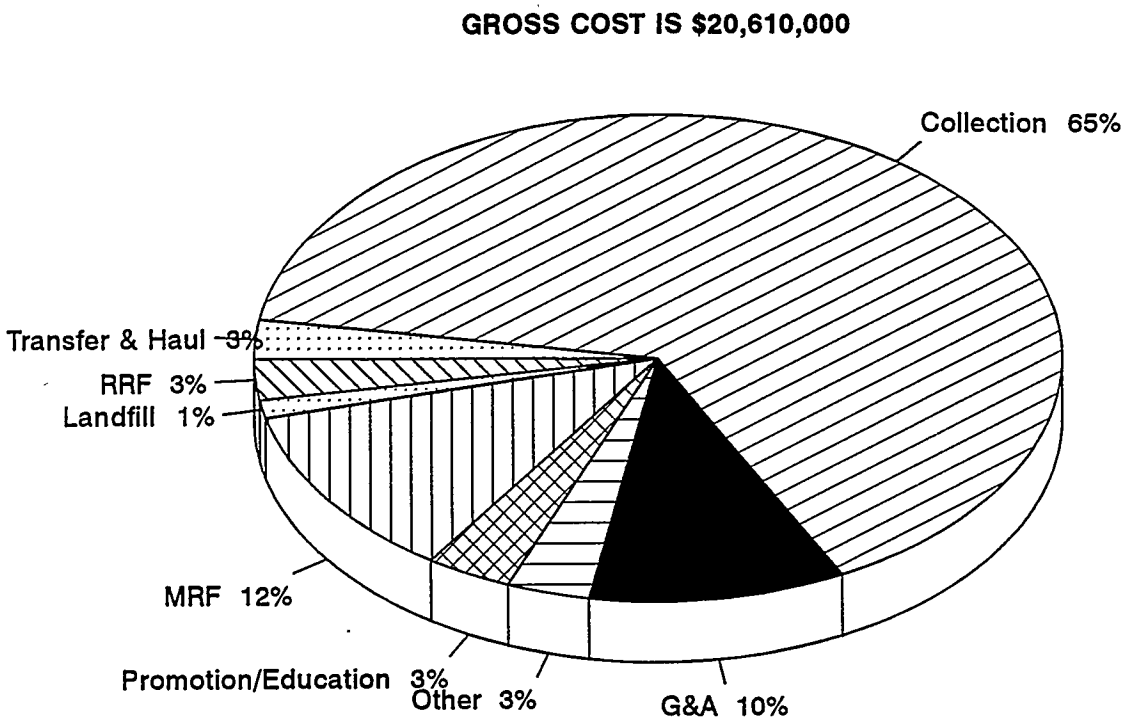


FIGURE 4-9: COST TO MANAGE RECYCLABLES BY FUNCTION (FY 1992)

Solid Waste Authority and Municipal Costs
(Cost to Manage 85,800 tons of Recyclables)

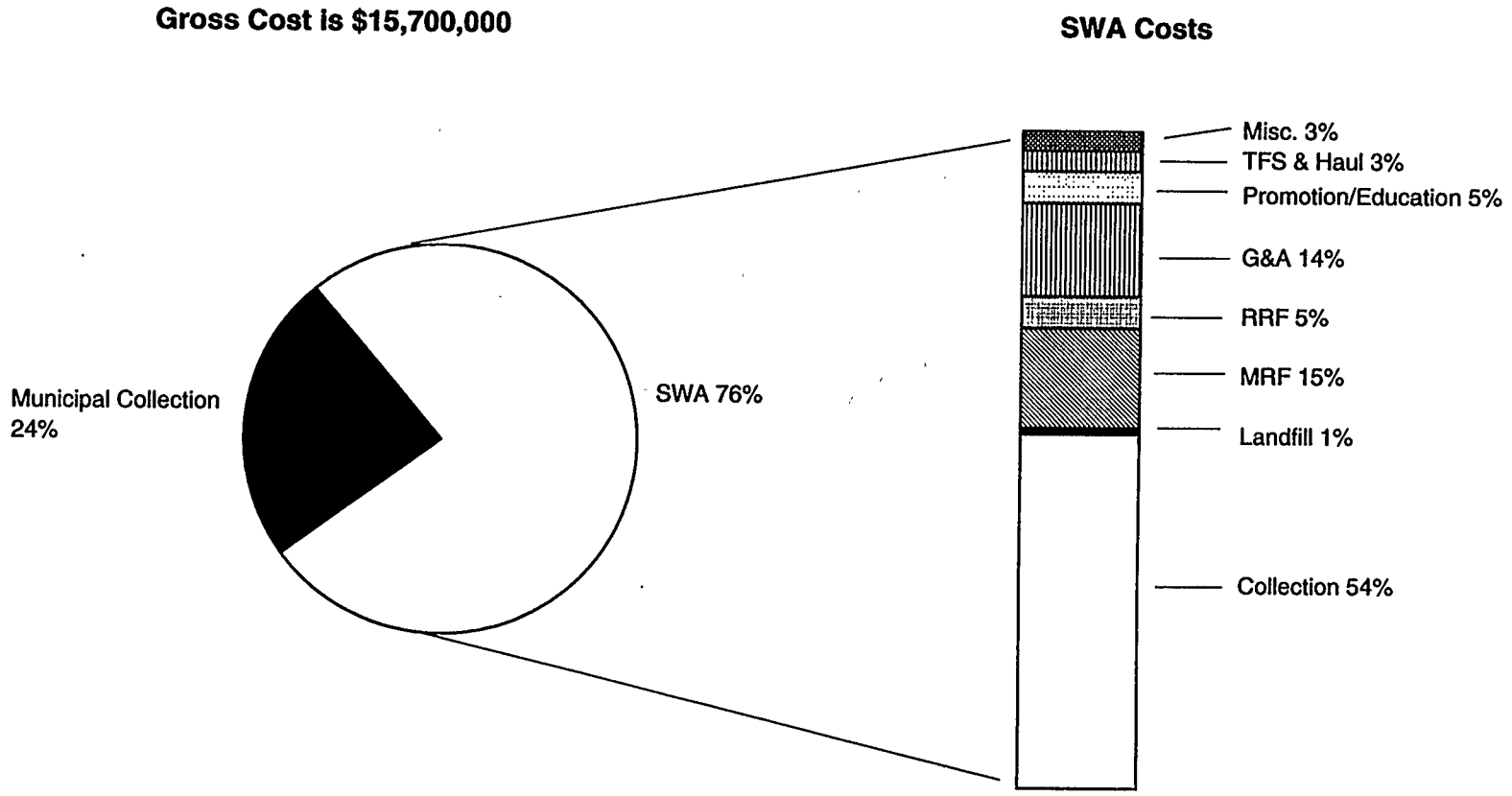


TABLE 4-5: PROGRAM INCREMENTAL COSTS IN FY92

CATEGORY	RESOURCE RECOVERY FACILITY PROGRAM ($ millions)	CURBSIDE COLLECTION & MRF PROGRAM ($ millions)
General & Administrative	$1.28	$0.349
Collection	0.00	9.260
Transfer & Haul	0.00	0.000
RRF	18.10	0.000
MRF	0.00	0.531
Promotion & Education	0.00	0.551
Misc. Recycling	0.00	0.000
Landfill	(4.05)	(0.637)
Total	$15.3	$10.1
Average Cost ($/ton)	35	164

RRF.[38]

This cost is principally made up of the $18.1 million net operating, maintenance, and capital costs of the RRF. To a lesser extent there is an estimated $1.28 million increase in G&A cost related to contract management, environmental programs, engineering services, and insurance. For this analysis it was assumed that half of the cost incurred in FY 1992 for these activities was attributed to the RRF.

These incremental costs were partially offset by an estimated $4.04 million savings at the landfill. These savings reflect reduced labor and equipment used at the Class I landfill. In addition, since the ash from the RRF was used as cover material, the RRF eliminated the need to buy cover material. Finally, the RRF reduced the volume of the Class I landfill capacity consumed in FY 1992 by an estimated 705,000 cubic feet. Since, in this analysis, the capital cost of the landfill is based on the consumption of capacity, the landfill savings reflect the preservation of this capacity.

It is important to note that the Program Incremental Cost of the RRF does not include any incremental cost associated with collection, transfer, and haul. Since the RRF is located across the street from the Class I landfill and there would have been no change in collection and transfer station activities, the absence of the RRF would not have affected collection activities, transfer station options, or haul distances. Dumping MSW on the paved tipping floor at the RRF rather than dumping at the landfill, however, could have increased truck tire lives and reduced vehicle maintenance costs. Such potential savings were not included in this analysis.

Since the value of the energy generated by the RRF and used by the Authority at the North County Complex was already valued and added to other operating expenses, no further adjustment was made.[39]

The Program Incremental Cost of the curbside recycling program, including the MRF, was about $10 million in FY 1992. This represents about a $164 per ton cost for the approximately 61,500 tons of Analyzed MSW that were collected, processed at the MRF, and sold or beneficially used in FY 1992.

This cost is principally made up of the $9.2 million incremental cost of collection. Of particular interest is that for the Authority, which contracts for collection services in the unincorporated areas of the County, "there was no cost reduction in the MSW rates coinciding with recycling."[40] A review of the municipal collection contract amendments to add curbside recycling also indicates that there was no savings in garbage/trash collection costs when the curbside recycling programs were implemented in the various communities throughout the County. Furthermore, although the

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[38] This tonnage does not include the unknown quantity of aluminum recovered at the RRF. Therefore, the average program incremental cost is slightly smaller than that reported here.

[39] Because the value of this electricity is slightly less than the cost the Authority would have paid to FP&L, the incremental cost of the RRF is slightly overstated.

[40] SWA, Memo from Dan Pellowitz, SWA, to Alan Cohen, CSI, March 15, 1994.

recent rebidding of collection services in the unincorporated areas of the County resulted in reductions of both the collection rates for garbage/trash and recyclables, the relative cost of the curbside collection program increased.

The other incremental costs include about $366,000 for administering the recycling program, $578,000 for public education, and a $566,000 net incremental cost of the MRF. For this analysis it was assumed that 75 percent of the public education costs were attributed to the curbside recycling program.

These incremental costs were partially offset by an estimated $637,000 savings at the landfill. These savings reflect reduced labor and equipment used at the Class I landfill. The curbside recycling program reduced the volume of the Class I landfill capacity used in FY 1992 by an estimated 79,300 cubic feet. Since, in this analysis, the capital cost of the landfill is based on the consumption of capacity, the landfill savings reflects the preservation of this capacity.

5. Energy Usage Analysis

5.1 Summary of Results

Energy is consumed in the County to collect and transport waste; operate equipment in the RRF, ferrous processing facility, and MRF; operate rolling stock used in the RRF, MRF, and Landfills; and operate and maintain ancillary facilities such as the maintenance and administration building.

Energy usage data was collected from the SWA and from municipalities. Engineering estimates were made to supplement the data received. First, the total quantity of energy consumed (e.g., MWh, gallons of diesel fuel, Btus of natural gas) was determined for each activity or facility. The data on energy consumed to collect, haul, and process garbage/trash were combined with information on the energy consumption of rolling stock at the transfer stations, RRF, MRF, and Landfills to obtain an estimate of the energy consumed per ton of garbage/trash and recyclables managed by the Palm Beach County IMSWM System.

In FY 1992, the Palm Beach County IMSWM System configuration resulted in the consumption of the equivalent of over 4 million gallons of diesel fuel, exclusive of the energy consumed to haul recycles to their markets and of the energy produced from the Resource Recovery Facility. Table 5-1 converts the energy usage to equivalent gallons of diesel fuel to manage each ton of garbage/trash and recyclables.

The average amount of energy consumed per ton to manage the 863,962 tons of garbage/trash was about 4.8 equivalent gallons of diesel fuel (0.68 million Btus). For each ton of garbage/trash collected, about 11 equivalent gallons of diesel fuel (1.55 million Btus) were generated, resulting in a net generation of about 6.2 equivalent gallons per ton (0.87 million Btus).

The average energy consumed per ton to collect and process curbside-collected recyclables was about 3.9 equivalent gallons of diesel fuel. The energy consumed to haul the recovered materials to market ranged from 1.3 to 19.0 equivalent gallons per ton, depending on the distance traveled. From the data in Table 10, it can be seen that hauling recycled materials long distances can significantly increase the energy consumed to manage recyclables.

The difference in the transfer vehicle energy consumption between garbage/trash and recyclables reflects the difference in their bulk densities. On average, each load of garbage/trash weighed about 19.8 tons, whereas each load of recyclables weighed 17.4 tons.

5.2 Collection Vehicles

Fleet data that included the number and types of vehicles, vehicle age, miles travelled, hours operated, and fuel consumed were sought from six of the 13 municipalities that collect their own garbage/trash or recyclables and from a number of private firms that collect MSW in the County. Data was made available by only two municipalities, Boca Raton and Lake Worth, and two private sanitation companies, Waste Management of Palm Beach and D&V Carting. The diesel fuel consumed by collecting garbage, trash, and recyclables is presented in Table 5-2.

The collection of garbage and trash consumed 1.7 gallons per ton collected (i.e., 327,045 divided by 190,561). On the other hand, the collection of recyclables consumed about 2.9 gallons per ton collected, or more than one and two-thirds the fuel consumed per ton to collect garbage/trash.

TABLE 5-1: ENERGY CONSUMED TO COLLECT GARBAGE, TRASH, AND RECYCLABLES (FY92)

VARIABLES	GARBAGE	TRASH	GARBAGE/ TRASH	RECYCLABLES
Tons Collected	139,291	51,270	190,561	16,137
Diesel Fuel Consumed (gallons)	242,232	84,813	327,045	46,365
Total Miles	645,639	394,008	1,039,647	238,084
Miles per Gallon	2.67	4.65	3.18	5.13
Gallons per Ton	1.74	1.65	1.72	2.87

Source: Boca Raton, Computer Printouts of Fleet Informantion and Vehicle Information provided by Waste Management of Palm Beach.

TABLE 5-2: ENERGY CONSUMED TO COLLECT GARBAGE, TRASH, AND RECYCLABLES (FY92)

VARIABLES	GARBAGE	TRASH	GARBAGE/ TRASH	RECYCLABLES
Tons Collected	139,291	51,270	190,561	16,137
Diesel Fuel Consumed (gallons)	242,232	84,813	327,045	46,365
Total Miles	645,639	394,008	1,039,647	238,084
Miles per Gallon	2.67	4.65	3.18	5.13
Gallons per Ton	1.74	1.65	1.72	2.87

Source: Boca Raton, Computer Printouts of Fleet Informantion and Vehicle Information provided by Waste Management of Palm Beach.

5.3 Transfer Vehicles

Based on information provided by the SWA,[41] the amount of fuel consumed to transfer and haul waste from the Belle Glade, Delray Beach, Lantana, and North County transfer stations was calculated. The results of this analysis are presented in Table 5-3.

The weighted average of the "miles per gallon" for all four transfer stations is about 4.6. The gallons consumed per ton-mile hauled (one-way distance) is 0.022.

5.4 Energy Consumption at Transfer Stations and Facilities

The energy consumed at the transfer stations and facilities is provided in Table 5-4. The RRF in-plant usage of 61,200 MWh is based on data obtained from the acceptance test results of the RRF. All other data was supplied by the SWA.[42,43]

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[41] Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System," March 1993, page 12, and Worobel, B. "Energy Consumption FY91/92," data given CSI, February 1993.

[42] Worobel, B., "Energy Consumption FY 1991/1992," SWA, Data given to CSI, February 1993.

[43] Booth, John D., letter to Alan S. Cohen, November 22, 1993.

TABLE 5-3: ENERGY CONSUMPTION OF TRANSFER VEHICLES IN PALM BEACH COUNTY (FY92)

VARIABLES	BELLE GLADE	DELRAY BEACH	LANTANA	NORTH COUNTY	TOTAL
Tons Hauled	42,098	263,804	288,877	121,878	716,657
Number of Loads	2,093	13,438	14,971	6,051	36,553
Vehicle Miles Traveled	213,792	846,909	595,920	189,288	1,845,909
Diesel Fuel Consumed (gallons)	46,116	175,523	133,583	48,672	403,894
Miles per Gallon	4.64	4.83	4.46	3.89	4.57
Gallons per Ton	1.10	0.67	0.46	0.40	0.56
Mile per Load (One-Way)	51.1	31.5	19.9	15.6	25.2
Gallons per Ton-Mile	0.021	0.021	0.023	0.026	0.022

Source: Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System," March 1993.

TABLE 5-4: ENERGY CONSUMPTION FOR IMSWMS IN PALM BEACH COUNTY (FY92)

ACTIVITY	DIESEL FUEL (gallons)	NATURAL GAS (therms)	ELECTRICITY (MWh)	TOTAL ENERGY (billions of Btus)
COLLECTION VEHICLES				
Garbage/Trash	1,482,751			209.1
Recyclables	195,568			27.6
TRANSFER VEHICLES				
Belle Glade Transfer Station	49,788			7.0
Delray Transfer Station	175,523			24.7
Lantana Transfer Station	133,583			18.8
North County Transfer Station	48,674			6.9
FACILITIES				
Belle Glade Transfer Station	2,759		30	0.5
Delray Transfer Station	19,203		499	4.4
Lantana Transfer Station	13,945		367	3.2
North County Transfer Station	12,946		407	3.2
Resource Recovery Facility (RRF)	265,000	155,725	61,165	261.7
Material Recovery Facility (MRF)	14,253		594	4.0
Landfills	437,000			61.6
Balance of N. County Complex			3,006	10.3
TOTAL				643.1

NOTES:

1. Diesel fuel consumption at facilities is for rolling stock.
2. Diesel fuel consumption at the landfills and MRF based on engineering estimate.

6. Environmental and Safety Regulations and Permitting Requirements

The costs of compliance with the environmental regulations and permit requirements discussed in this section are reflected in the costs and energy consumption levels reported in this Case Study.

6.1 Overview of Federal Environmental Legislation and Regulations

The potential environmental impacts of solid waste management facilities have led to the development of an extensive network of federal and state regulations. Embodied in many federal environmental laws is an implicit federal-state partnership whereby the federal government sets the agenda and standards for pollution abatement while the states carry out the day-to-day activities of implementation and enforcement.

The Clean Air Act, most recently amended in 1990, established programs for protecting public health and the environment from exposure to toxic air pollutants.[44] The Clean Water Act, most recently amended in 1987, is the principal federal law protecting the nation's waterways from pollution.[45] The Safe Drinking Water Act, most recently amended in 1988, established programs for protecting public drinking water systems from harmful contaminants.[46] The Solid Waste Disposal Act and Resource Conservation and Recovery Act (RCRA) of 1976, most recently amended in 1992 and currently undergoing Congressional review for reauthorization, is the main piece of federal legislation addressing with landfill disposal regulation.[47] A brief summary of these four federal Acts as they apply to solid waste management facilities is given below.

In February 1991, the U.S. Environmental Protection Agency (EPA) issued final rules for municipal waste combustors in response to the Clean Air Act. These rules, commonly referred to as the New Source Performance Standards (NSPS), apply to municipal waste combustors with capacities of 250 tons per day or greater, and whose construction, reconstruction, or modification commenced after December 20, 1989.[48] The NSPS establish maximum emission levels for new or extensively modified major stationary sources. These emission levels were determined by "best adequately demonstrated" continuous control technology analysis and are presented in Table 6-

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[44] The Clean Air Act and Major Amendments are codified as 42 U.S.C. 7401-7671, 1990.

[45]The Clean Water Act and Major Amendments are codified as 33 U.S.C. 1251-1387, 1987.

[46]The Safe Drinking Water Act and Amendments are codified as 42 U.S.C. 300f-300j-11, 1988.

[47] The Solid Waste Disposal/Resource Conservation and Recovery Act and Major Amendments are codified as 42 U.S.C. 6901-6991k, 1992.

[48] Federal Register, "Standards of Performance for New Stationary Sources: Municipal Waste Combustors," Vol. 56, No. 28, pages 5488-5527, 1991.

1.[49] In addition to the NSPS, the EPA also proposed emissions limitations for existing (i.e., constructed, reconstructed, or modified prior to December 20, 1989) municipal waste combustors.

The owner/operator of a proposed municipal waste combustor must apply for a Prevention of Significant Deterioration (PSD) permit and conduct a Best Available Control Technology (BACT) analysis to determine the applicable level of emissions control. BACT analysis evaluates the energy, environmental, and economic impacts of various alternative control technologies. The PSD permit requirements reflect the principle which holds that areas where the air quality is better than required by the national ambient air quality standards (NAAQS) established for six criteria pollutants (ozone, sulfur, dioxide, NO_x, carbon monoxide, lead, and particulates) should be protected from significant new air pollution, even if the NAAQS would not be violated by a proposed new source. Areas not meeting NAAQS are called nonattainment areas and are subject to more stringent control requirements determined by "reasonable available control technology" (RACT).

Emissions from municipal waste combustors, in addition to meeting allowable limits, must also be monitored by the facility owner/operator. Monitoring requirements for existing facilities include continuous emissions monitoring for carbon monoxide and sulfur dioxide. Annual stack testing must be conducted for particulate matter, dioxin/furans, hydrogen chloride, and opacity.

The 1991 EPA regulations also required that chief facility operators and shift supervisors be certified in accordance with operating standards established by the American Society of Mechanical Engineers (ASME). While the states must develop certification programs with standards meeting those of ASME, no formal training requirement is included in the regulations.

Pursuant to the Clean Water Act, a solid waste management facility cannot cause a discharge of pollutants that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES) into United States waters. The states are responsible for establishing water quality standards and are authorized to issue discharge permits. The NPDES permit requires the source to attain technology-based effluent limits, "best practicable control technology" (BPT), and "best available technology" (BAT). The initial BPT limitations focus on regulating discharges of conventional pollutants such as bacteria and oxygen-consuming materials. The BAT limitations emphasize controlling toxic pollutants such as heavy metals, pesticides, and other organic chemicals. Table 6-2 provides a listing of the pollutants regulated under the NPDES.

A separate permit is required to dispose of dredge or fill material into the waters, including wetlands. The U.S. Army Corps of Engineers administers this permit program. Other regulations promulgated under the Clean Water Act include guidelines for using and disposing of sewage sludge.

Pursuant to the Safe Drinking Water Act, a facility or practice cannot contaminate an underground drinking water source beyond the solid waste management facility boundary or beyond an alternate boundary. Table 6-3 provides the maximum contaminant levels as

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[49] Congressional Research Service, "Summary of Environmental Laws Administered by the Environmental Protection Agency," The Library of Congress, January 1993.

TABLE 6-1

NEW SOURCE PERFORMANCE STANDARDS

POLLUTANT	EMISSION LIMIT[1]	TECHNOLOGY BASIS[4]	MONITORING
Dioxins and Furans	30 ng/dscm	GCP, SD/FF	Annual Stack Test[2]
Particulate Matter	34 mg/dscm	FF	Annual Stack Test[2]
Opacity	10%	FF	CEMS, 6-min. avg.
Sulfur Dioxide	30 ppm or 80% reduction	SD/FF	CEMS, 24-hr. avg.
Hydrogen Chloride	25 ppm or 95% reduction	SD/FF	Annual Stack Test[2]
Nitrogen Oxides	180 ppmv[3]	SNCR	CEMS, 24-hr. avg.
Carbon Monoxide:			
Modular	50 ppmv	GCP	CEMS, 4-hr. avg.
Massburn	100 ppmv	GCP	CEMS, 4-hrs. avg.
Massburn/Rotary	100 ppmv	GCP	CEMS, 24-hr. avg.
Fluidized Bed	100 ppmv	GCP	CEMS, 4-hr. avg.
RDF/Full-Dedicated	150 ppmv	GCP	CEMS, 24-hr. avg.
RDF/Co-Fired	150 ppmv	GCP	CEMS, 4-hr. avg.

Source: Federal Register, "Standards of Performance for New Stationary Sources: Municipal Waste Combustors," Vol. 56, No. 28, 1991.

1 All emission limits are dry basis corrected to 7% O_2.

2 In the case of small plants (less than 250 TPD), if compliance is demonstrated for two consecutive years, the facility need only conduct testing every third year. If a non-compliant result occurs, another two years of consecutive testing must be done before the facility can switch back to the three-year cycle.

3 The NO_x standard applies to large plants only; small plants are exempt.

4 Good Combustion Practice (GCP); Spray Dryer (SD); Fabric Filter (FF); Selective Non-Catalytic Converter (SNCR).

TABLE 6-2

POLLUTANTS REGULATED BY THE NPDES PERMIT PROGRAM

OXYGEN DEMAND: Biochemical Oxygen Demand Chemical Oxygen Demand Total Oxygen Demands Total Organic Carbon Other	METALS: Aluminum Cobalt Iron Vanadium
SOLIDS: Total Suspended Solids (Residues) Total Dissolved Solids (Residues) Other	METALS (ALL FORMS) Other metals not specifically listed under Group 1
NUTRIENTS: Inorganic Phosphorus Compounds Inorganic Nitrogen Compounds Other	INORGANIC Cyanide Total Residual Chlorine
DETERGENTS AND OILS: MBAS NTA Oil and Grease Other Detergents or Algicides	MINERALS: Calcium Chloride Fluoride Magnesium Sodium Potassium Sulfur Sulfate Total Alkalinity Total Hardness Other Minerals

Source: 40 CFR, EPA, Part 123--"Appendix A - Criteria for Reporting in the NPDES Programs."

TABLE 6-3

MAXIMUM CONTAMINANT LEVELS PROMULGATED UNDER THE SAFE DRINKING WATER ACT

CHEMICAL	MCL (mg/l)
Arsenic	0.05
Barium	1.0
Benzene	0.005
Cadmium	0.01
Carbon Tetrachloride	0.005
Chromium (Hexavalent)	0.05
2,4-Dichlorophenoxy Acetic Acid	0.1
1,4-Dichlorobenzene	0.075
1,2-Dichloroethabe	0.005
1,1-Cichloroethylene	0.007
Endrin	0.0002
Fluoride	4.0
Lindane	0.004
Lead	0.05
Mercury	0.002
Methoxyclor	0.1
Nitrate	10.0
Selenium	0.01
Silver	0.05
Toxaphene	0.005
1,1,1-Trichloroethane	0.2
Trichloroethylene	0.005
2,4,5-Trichlorophenoxy Acetic Acid	0.01
Vinyl Chloride	0.002

Source: 40 CFR, EPA, Part 257 - "Criteria for Classification of Solid Waste Disposal Facilities and Practices."

promulgated under this Act. The primary enforcement responsibility lies with the states, provided they adopt regulations as stringent as the federal requirements, develop adequate procedures for enforcement, maintain records, and create plans providing emergency water supplies.

Pursuant to RCRA, criteria were established to determine which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on public health or the environment.[50] The objective of these criteria is to mitigate adverse effects through the protection of floodplains, endangered species, surface water, and groundwater. These criteria also provide guidelines for sludge utilization and disposal under the Clean Water Act.

Subtitle D of RCRA primarily addresses non-hazardous waste, whereas Subtitle C of RCRA addresses hazardous waste disposal. In October 1991, the EPA promulgated revised Subtitle D regulations applicable to municipal solid waste landfills, with an effective date of October 1993. In general, the new regulations require liners, leachate collection, groundwater monitoring, and corrective action at municipal landfills.[51]

The management of ash from municipal waste combustors is also governed by regulations established pursuant to RCRA. Much controversy surrounds the toxicity of incinerator ash and whether it should be classified as a hazardous waste under Subtitle C of RCRA, as a non-hazardous waste under Subtitle D of RCRA, or as a special waste. In 1991, the EPA began requiring the use of the Toxic Characteristic Leaching Procedure (TCLP) to determine the toxicity of ash. During FY 1992, municipal waste combustor ash was regulated under Subtitle D as a "special waste" that required special handling regardless of the TCLP results concerning toxicity. In the absence of sufficient federal guidance on municipal waste combustor ash disposal, some states took the lead in developing requirements and rules.[52]

Other federal regulatory agencies with permitting oversight of solid waste management facilities include: the Federal Aviation Administration (FAA), which reviews processing plants that require

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[50] 40 CFR, EPA, Part 257--"Criteria For Classification of Solid Waste Disposal Facilities and Practices."

[51] On October 1, 1993, the Federal criteria for MSW landfills under subtitle D of RCRA were amended to extend the date of compliance for small landfills to April 9, 1994, and by delaying the effective date of subpart G, Financial Assurance, to April 9, 1995, for all MSW landfills. In addition, the MSW landfill criteria were amended by removing the exemption from the groundwater monitoring requirements and by delaying the date for compliance with all requirements of the MSW landfill criteria for two years for owners and operators of MSW landfill units in arid and remote areas that meet the qualifications of the small landfill exception in the MSW landfill criteria. (Federal Register, "Solid Waste Disposal Facility Criteria; Delay of Compliance and Effective Dates," Vol. 58, No. 189, pages 51536-51548, 1993.)

[52] On May 2, 1994, the U.S. Supreme Court ruled that ash from municipal waste combustors is not exempt from the Subtitle C requirements of RCRA as is MSW. Under RCRA, regular testing of ash, principally for toxic metals, lead, and cadmium, will be required. Ash deemed to be hazardous must be disposed of in licensed hazardous waste disposal facilities that protect groundwater.

tall emission stacks, and the Federal Energy Regulatory Commission (FERC), which reviews processing plants that generate electric power.

6.2 Overview of State and Local Environmental Regulations

At a minimum, state regulators are required to adopt and enforce the federal requirements, but they may choose to impose more stringent or more extensive requirements. A brief summary of the State of Florida's regulations for solid waste management activities follows. Specific environmental requirements for facilities are then discussed as they apply to the individual components of the Palm Beach County IMSWM System.

In 1976, the State created the Florida Resource Recovery and Management Act (the Act), whose public purpose is "to enhance the beauty and quality of our environment; conserve and recycled our natural resources; prevent the spread the disease and the creation of nuisances; protect the public health, safety, and welfare; and provide a coordinated statewide resource recovery and management program."[53] The Florida Department of Environmental Regulations (DER) is responsible for the execution and enforcement of the provisions of the Act as contained in Florida Administrative Code (FAC), Title 17, Department of Environmental Regulations, Chapter 17-701-Solid Waste Management Facilities (referred to as the General Requirements). The Act directs the DER "to plan for and regulate the storage, collection, transportation, separation, processing, recycling and disposal of solid waste in order to protect the public safety, health and welfare, to enhance the environment for the people of the state, and to recover resources which have the potential for further use, and to assure that the final irreducible residue is disposed of in a manner which enhances the environment."[54]

The Act also directs the DER to develop and implement a hazardous waste management program. The 1983 amendments to the Act provide directions and funds for establishing a cooperative hazardous waste management program among local, regional, and State levels of government.

The Act also establishes goals for reducing the amount of MSW prior to its final disposal or incineration at a solid waste disposal facility. The goals provide that the amount of solid waste that would have been disposed of in the absence of reduction and recycling efforts undertaken within the County and the municipalities within its boundaries be reduced by at least 30 percent by the end of 1994. In determining whether the established reduction goals have been achieved, no more than one-half of the goal may be met with reductions in yard trash, white goods, construction and demolition debris, and tires.

Individual permits, usually granted by local jurisdictions and pertinent to such issues as wastewater, surface water, and storage tanks are also required. The South Florida Water Management District provides review for the water quality and quantity impacts arising from the operations of solid waste management facilities. In addition, the Palm Beach County Public

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[53] Florida Statutes, Title 29, Chapter 403, subsequently renamed the Florida Solid and Hazardous Waste Management Act, most recently amended 1992.

[54] FAC, Title 17, DER, Chapter 17-701--Solid Waste Management Facilities, 1990, amended 1992. For purposes of this Case Study, 1990 regulations are cited unless otherwise noted.

Health Unit monitors the health impacts arising from these facilities.

6.2.1 Integrated Municipal Solid Waste Management System Facilities: Permit Requirements Summary

This section briefly summarizes the permit requirements applicable to each of the facilities included in the Authority's IMSWM System: the four transfer stations; the RRF; the MRF; the composting facility; the HHW facility; and the Class I and III Landfills. All of the IMSWM System facilities located at the North County Complex (the RRF, the Class I and III Landfills, the MRF, and the ferrous processing facility) except the composting facility were permitted under either the original Power Plant Site Certification (PA 84-20) (i.e., the RRF and Landfills) or under modifications thereto (the North County Complex facilities developed subsequent to the RRF and Landfills) or were approved for construction by the FDER (i.e., the composting facility). Table 6-4 provides a summary of original permit approval or latest renewal dates for the IMSWM System facilities.

6.2.1.1 Solid Waste Transfer Stations

The Authority operates the four transfer stations under general permit conditions, as specified in the General Requirements,[55] which are modeled after the federal criteria.[56] These four transfer stations are listed below along with their initial operating dates and current permit expiration dates. Pursuant to the general permit conditions,[57] a permittee's use of a general permit is limited to five years.

TRANSFER STATION	INITIAL OPERATING DATE	PERMIT EXPIRATION DATE
North County	1991	August 1996
South County	1986	September 1994
Glades Regional	1981	May 1997
Central County	1988	December 1996

In accordance with the General Requirements, the transfer stations provide the operational appurtenances necessary to maintain a clean and orderly operation. They have effective barriers designed to prevent unauthorized entry and dumping. The stations also provide fire protection and fire-fighting equipment to ensure the safety of employees and provisions to deal with accidental burning of solid waste within the stations. They also have adequate communications capabilities to summon emergency services, and they are staffed with employees trained in the

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[55] FAC, Title 17, DER, Chapter 17-101 Solid Waste Management Facilities.

[56] 40 CFR EPA, Pat 243--"Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste."

[57] FAC, Title 17, DER, Chapter 17-4.540 General Conditions For All General Permits, 1982, amended 1988.

TABLE 6-4

SUMMARY OF ENVIRONMENTAL REVIEWS AND PERMITS FOR THE FACILITIES OF THE IMSWM SYSTEM

APPROVAL/RENEWAL DATE	REVIEW AGENCY	DESCRIPTION OF PERMIT
April 1985	Federal Energy Regulatory Commission	North County Complex: Certification for Small Power Production Facility
November 1985	Palm Beach County Commissioners	North County Complex: Special Exception Zoning Permit
March 1986/January 1992	DER	North County Complex: Power Plant Site Certification (PA 84-20)
October 1986	Army Corps of Engineers	North County Complex: Permit to Fill Wetlands
November 1986	U.S. Environmental Protection Agency	North County Complex: Prevention of Significant Deterioration (PSD)
September 1989	DER	South County Transfer Station: Permit to Operate (Renewal)
February 1990	South Florida Water Management District	North County Transfer Station: Stormwater Discharge Permit
February 1990	DER	North County Complex: Injection Wells: Permit to Construct and Operate (Modification to PA 84-20)
August 1990	DER	MRF: Permit to Construct and Operate (Modification to PA 84-20)
March 1991	DER	Compost Facility: Approval to Construct and Operate
August 1991	DER	North County Transfer Station: Permit to Operate
December 1991	DER	Central County Transfer Station: Permit to Operate (Renewal)
January 1992	DER	North County Complex: Modified PSD
April 1992	DER	Ferrous Processing Facility: Permit to Construct and Operate (Modification to PA 84-20)
May 1992	DER	Glades Regional Transfer Station: Permit to Operate (Renewal)
July 1992	South Florida Water Management District	North County Complex: Landfill-Storwater Discharge Permit

safe operation of all equipment.

6.2.1.2 North County Regional Resource Recovery Facility

Simultaneous to its initiation of the procurement process for the Resource Recovery Facility (RRF), the Authority initiated environmental permitting activities for the North County Complex, which at that time included the RRF and the Class I and Class III Landfills. Accordingly, the Authority prepared the applications for applicable environmental permits and approvals and submitted them to the responsible federal, State, and local agencies.

The Authority received Power Plant Site Certification (PA 84-20) from DER in March 1986. The PSD permit was issued by the U.S. EPA in November 1986. These permits established the performance criteria for the air pollution control, wastewater treatment, and other environmental control systems applicable to the RRF and the Landfills.

Site Certification PA 84-20 was issued subject to the following conditions:

- quarterly reporting of emissions monitoring to the DER and the Palm Beach County Public Health Unit;
- quarterly reporting of water discharges;
- quarterly reporting of groundwater monitoring;
- quarterly submission of monthly landfill reports;
- quarterly reporting of leachate monitoring;
- EP-toxicity test upon commencement of commercial operations; and operational safeguards, including:
  - compliance with the federal OSHA standards during construction and operation, and
  - compliance with State standards specified under Section 440.56, Florida Statutes, by the Industrial Safety Section of the Florida Department of Commerce during operation.

The Authority subsequently applied for and, on January 14, 1992, received a modified Site Certification permit. This required new stack air emissions tests within 180 days of issuance of the modified permit. Table 6-5 summarizes the modified Site Certification emissions requirements and the levels achieved by the RRF during testing in March and July of 1992.

6.2.1.3 Materials Recovery Facility and Ferrous Processing Facility

The MRF and the ferrous processing facility were issued permits to construct and operate, in the form of modifications to Power Plant Site Certification PA 84-20: the permit to construct and operate the MRF was issued in August 1990; the ferrous processing facility permit was issued

TABLE 6-5

FACILITY EMISSIONS TEST RESULTS
NORTH COUNTY REGIONAL RESOURCE RECOVERY FACILITY

PARAMETER	MODIFIED PERMIT LIMIT	TEST RESULTS LIMIT[1]
Particulate Matter	.015 grains/dscf	.0036 grains/dscf
Sulfur Dioxide	70% removal or 30 ppm	94% removal or 6.3 ppm
Nitrogen Oxides	.48 lbs/MMBtu	.374 lbs/MMBtu
Carbon Monoxide	400 ppmv, 1-hr avg.	42 ppmv
Lead	.0004 lbs/MMBtu	.000227 lbs/MMBtu
Mercury	.00024 lbs/MMBtu	.0000159 lbs/MMBtu
Hydrogen Fluoride	.0032 lbs/MMBtu	.0000689 lbs/MMBtu
Beryllium	.00000073 lbs/MMBtu	.00000049 lbs/MMBtu
Volatile Organic	.016 lbs/MMBtu	.002 lbs/MMBtu
Acid Gases (Total)	90% Removal	98% Removal
Dioxins/Furans		
Unit No. 1	60 ng/dscf	15.2 ng/dscf[1]
Unit No. 2	60 ng/dscf	10.7 ng/dscf[2]

Source: From Official Statement Relating to $58,510,000 Solid Waste Authority of Palm Beach County, Refunding and Improvement Revenue Bonds, series 1992.

NOTES:

(1) Stack air emissions test, March 3 through March 11, 1992.

(2) Unit No. 2 exceeded the dioxin/furans limit during the March 1992 compliance testing. Pursuant to a DER request in a Warning Letter (June 12, 1992), Unit No. 2 was retested on July 1 and 2, 1992. The retest results were within permit limits.

in January 1992. Neither the MRF nor the ferrous processing facility are subject to the General Requirements.[58] Each of these recyclable materials recovery facilities is classified as a Facility for Processing Recyclable Materials, because they each receive curbside- and otherwise-collected materials that have been diverted from the waste stream and which are therefore no longer considered MSW by definition.

6.2.1.4 Composting Facility

On March 4, 1991, the Authority received approval from the DER to construct and operate a 2.3- to 3.0-TPD composting facility. This was not a construction and operation permit, per se, and consequently no permit conditions apply. Rather, the DER issued a letter of approval for construction and operation to occur pursuant to the General Requirements.[59] The composting facility consists of the following major components: a 15,000-square-foot compost building; an administration and control building; a windrow system; an aeration system; and a compost storage area, in accordance with the General Requirements.[60]

The Authority is responsible for assuring the compliance of each batch of compost processed with the applicable standards.[61] The Authority is required to submit quarterly residual analysis and shipping and sales reports to the DER. The DER applicable standards for compost are summarized below:

Class AA compost must meet federal stabilization standards, as outlined in "Processes to Further Reduce Pathogens,"[62] in addition to the following chemical criteria:

Parameter	Maximum Allowable Concentration
Cadmium	≤30 mg/kg dry weight
Copper	≤900 mg/kg dry weight
Lead	≤1,000 mg/kg dry weight
Nickel	≤100 mg/kg dry weight
Zinc	≤1,800 mg/kg dry weight

Manufacturers of Class AA compost must provide users with the following residuals analysis information: total nitrogen; total phosphorous; total potassium; and the recommended application rate.

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[58] FAC, Title 17, DER, Chapter 17-701--Solid Waste Management Facilities.

[59] FAC, Title 17, DER, Chapter 17-701--Solid Waste Management Facilities.

[60] FAC, Title 17, DER, Chapter 17-701--Solid Waste Management Facilities.

[61] FAC, Title 17, DER, Chapter 17-640--Domestic Wastewater Residuals, 1991.

[62] 40 CFR, EPA, Part 257--"Criteria for Solid Waste Disposal Facilities and Practices, Appendix II Processes to Further Reduce Pathogens."

6.2.1.5 Household Hazardous Waste Facility

The HHW facility is exempt from federal and State regulations as a treatment, storage, or disposal facility because: (1) it accepts only household or conditionally exempt hazardous waste, and (2) it is operated as part of an MSW disposal system. Transport of the material for disposal (out of state) is handled through the manifest system prescribed by federal Subtitle C (RCRA) regulations governing the transportation of hazardous materials.

6.2.1.6 Class I and Class III Landfills

The Class I and Class III Landfills at the North County Complex were originally permitted under the Power Plant Site Certification PA 84-20 of March 1986. This certification exempts the landfills from the permitting requirements of the General Requirements.[63] In accordance with the Conditions of Certification (PA 84-20):

- the landfills must comply with current operating criteria;
- the operator must provide pre-construction and post-construction notification to DER of new landfill cells; and
- the operator must demonstrate how compliance with new or revised regulations will be achieved every five years.

The DER defines Class I landfills as those that receive an average of 20 tons per day or more of solid waste, which includes general, non-hazardous household, commercial, industrial, and agricultural wastes. (Combustion ash from the RRF is disposed of in the Class I Landfill.) Class III landfills are those which receive trash and/or yard waste.
In accordance with the General Requirements and consistent with RCRA Subtitle D requirements, the Class I Landfill consists of the construction of a double bottom liner system, leachate collection and pumping system, leachate treatment and disposal facilities, and borrow lakes for cover material. The Class III Landfill consists of the construction of a single bottom liner system, leachate collection and pumping system, and borrow lakes for cover material. The leachate effluent from each Landfill was in compliance with the maximum allowable concentration values (see Table 6-3) during FY 1992. The Class I Landfill also collects and flares methane gas.

6.3 Overview of Occupational Health and Safety Regulations

6.3.1 Federal Regulations

The Occupational Safety and Health Act of 1970[64] imposes two basic duties on private employers. State and local governments in their roles as employers are not required to comply with these duties, which are:

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[63] Telephone conversation with Mr. Joseph Kahn, DER, June 22, 1994.

[64] Occupational Safety and Health Act of 1970, 5 USC 5108, 1970, most recently amended October 1992.

(1) To comply with occupational safety and health standards developed by the Occupational Safety and Health Administration (OSHA) pursuant to the Occupational Safety and Health Act; and

(2) To comply with the General Duty Clause, Section 5(a)(1), which requires that employers protect their employees from recognized hazards not regulated by an OSHA standard.

Pursuant to the Occupational Safety and Health Act, OSHA, created within the Department of Labor, is responsible for promulgating legally enforceable standards. These OSHA standards require conditions, or the adoption or use of one or more practices, means, methods, or processes, reasonably necessary and appropriate to protect workers on the job. These standards include the General Industry Standards, 29 CFR Part 1910, which apply to all workplaces unless more specific OSHA standards apply. The General Industry Standards are applicable to solid waste processing facilities and are listed in Table 6-6.

Periodic inspections, either routine or in response to complaints, are conducted by OSHA to ensure that specific applicable standards are being met and that the workplace is generally free from recognized hazards likely to cause serious injury or death. When OSHA compliance officers discover areas of non-compliance resulting in hazards, employers may be issued citations, and penalties and abatement periods may be proposed.

6.3.2 State and Local Safety Requirements

As previously discussed, all private employees are required to comply with the General Industry Standards developed by OSHA. Thus, the Authority-owned but privately operated IMSWM System facilities (i.e., the RRF, MRF, and ferrous processing facility) must comply with OSHA General Industry Standards.

The transfer stations, compost facility, and Class I and III Landfills are owned and operated by the Authority. Although OSHA provisions do not apply to state and local governments in their role as employers, the Act does provide that any state desiring to gain OSHA approval for its private-sector occupational safety and health plan must provide a program that covers its state and local government workers and that is at least as effective as its plan for private employees. State plans may also cover only public-sector employees. The state of Florida does not have an OSHA-approved state plan. The Authority, however, through its Risk Management Division, has established a safety program for its employees which includes general safety practices, accident investigations, physical inspections, meetings, reports, and enforcement of rules.[65]

[65] Solid Waste Authority Safety Manual, Palm Beach County, FL, October 1991.

TABLE 6-6
OSHA STANDARDS AND RULES

OSHA STANDARDS AND RULES	REQUIREMENT
Cadmium Standard	29 CFR 1910.1027
Chemical Safety and Handling	29 CFR 1910.120
Confined Space	29 CFR 1910.146
CPR/First Aid	29 CFR 1910.151
Crane Operation	29 CFR 1910.179
Electrical Policy	29 CFR 1910.300
Emergency Response Drill	29 CFR 1910.157
Eye Protection	29 CFR 1910.133
Fire Extinguishers and 1.5" Hose	29 CFR 1910.157(g)
Flammable Materials	29 CFR 1910.120h (1&2)
Hazard Communication	29 CFR 1910.120h (1&2)
HazMat Emergency Response Team	29 CFR 1910.1201(2)i
Lead Standard	29 CFR 1910.1025
Lock Out/Tag Out	29 CFR 1910.147
Machine Operating and Guarding	29 CFR 1910.212
Noise (Hearing Protection)	29 CFR 1910.95(k)
Powered Industrial Truck	29 CFR 1910.178(1)
Respirator Training	29 CFR 1910.134(b)(3)
Nuclear	10 CFR Part 31 & 32
Scaffolding	29 CFR 1926.451

Source: 29 CFR, OSHA, Part 1901--"Occupational Safety and Health Standards.

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Palm Beach Shores, "Addendum to Contract for Collection and Disposal of Solid Wastes Between the Town of Palm Beach Shores and County Sanitation, Inc.," June 2, 1990.

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Appendix A
Glossary of Terms

ALLOCATED COST ($/year):	That portion of the Total Cost that is expended or apportioned to a specific activity such as the management of garbage, trash, recyclables, yard waste, or household hazardous waste.
ANALYZED MSW:	Portion of the MSW stream for which the cost of collecting, transferring, hauling, processing, combusting, marketing, and/or disposing of such waste is known or can be reasonably estimated.
AVERAGE COST	($/ton):Total or Allocated Cost divided by the tons of MSW, garbage, trash, recyclables, or yard waste, as appropriate.
AVERAGE PROGRAM INCREMENTAL COST (SAVINGS) ($/ton):	The Program Incremental Cost divided by the number of tons of materials diverted from the landfill by the program.
BULKY WASTE:	Oversized items, including white goods and furniture, that have been separated from the MSW stream for separate collection.
COMMERCIAL MSW:	Municipal solid waste that is generated by sources other than households, including businesses (e.g., offices, restaurants, retail stores, and industry); institutions (e.g., schools and government establishments); and public areas (e.g., train stations, airports, and litter from roadside).
GARBAGE:	Garbage is all MSW exclusive of source-separated trash, recyclables, yard waste, household hazardous waste, and bulky waste.

HAZARDOUS WASTE:	Waste which because of its quantity, concentration, or physical, chemical, or infectious characteristics, may pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed and is defined as such in accordance with federal and State laws. Does not include Household Hazardous Waste.
HOUSEHOLD HAZARDOUS WASTES (HHW):	Materials that are separated from Residential MSW as household hazardous wastes for separate collection and treatment. Such materials may include paints and solvents, pesticides, herbicides, and propane tanks.
INTEGRATED SOLID WASTE MANAGEMENT:	A practice of using several (i.e., two or more) alternative waste management techniques to treat, process, and/or dispose of the Municipal Solid Waste stream. Alternative waste management techniques include source reduction, recycling, composting, combusting, and landfilling.
MARGINAL COST (SAVINGS) ($/ton):	The cost (savings) of managing an additional ton of MSW, garbage, trash, recyclables, or yard waste.
MARGINAL COST (SAVINGS) OF SUBSTITUTION ($/ton):	The net cost (savings) of managing an additional ton of recyclables or yard waste less the savings (cost) of managing one less ton of garbage.
MATERIALS RECOVERY:	A term describing the extraction and utilization of materials from a waste stream.
MUNICIPAL SOLID WASTE (MSW):	Non-hazardous solid wastes generated by households, commercial and business establishments, institutions, and light industry; it excludes industrial process wastes, agricultural wastes, mining wastes,

	construction and demolition debris, offal, sludges, and ashes, except ashes derived from the combustion of MSW. In practice, specific definitions vary across jurisdictions.
PROGRAM INCREMENTAL COST (SAVINGS) ($/year):	The difference between the cost of managing MSW with or without a particular program (e.g., curbside collection, processing, and marketing of recyclables.)
RECOVERED MATERIALS:	Recyclable materials that are recovered from MSW and may also include some contamination.
RECYCLABLE MATERIALS OR RECYCLABLES:	Materials that still have useful physical or chemical properties after serving their usefulness for a given individual or firm and can, therefore, be reused or recycled for the same or other purposes.
RECYCLE:	To convert discarded materials into useful products through reuse and remanufacturing.
RESIDENTIAL MSW:	Municipal solid waste that is generated by households.
RESIDUE:	That portion of processed MSW that is ultimately disposed of in a landfill.
RESOURCE RECOVERY:	A term describing the extraction and utilization of energy or materials from a waste stream.
SECONDARY MATERIAL:	A material that is used in place of a primary or raw material in manufacturing a product; often handled by dealers and brokers in "secondary markets."

SELF-HAUL:	The delivery of MSW or other wastes to an integrated municipal solid waste management system by a private firm or individual that is not under contract to a municipality, authority, utility, or other public entity responsible for municipal solid waste management to make such deliveries.
TOTAL NET COST OR TOTAL COST ($/year):	The aggregate of all expenditures incurred to manage municipal solid waste, inclusive of general and administrative, planning, capital, collection, processing, transfer and haul, marketing, promotion and education, and disposal costs, less any revenues derived from resource recovery activities.
YARD WASTE:	Vegetative material that is segregated from the MSW stream for separate collection and/or processing, including grass, prunings, plants, and small tree limbs, but excluding tree stumps, land-clearing debris, and other large vegetative matter (see Brush).
TRASH:	Combination of yard waste, bulky waste, vehicle tires, and other debris consisting of paper, cardboard, cloth, glass, and other similar materials exclusive of kitchen and table food waste, and animal or vegetative waste that is attendant with or results from the storage, preparation, cooking, or handling of food material.
WHITE GOODS:	That portion of bulky waste which consists of large appliances, such as refrigerators, stoves, washing machines, and dryers.

Appendix B
Allocation of Costs and Result Tables

The allocation procedure used to determine the cost incurred for various functions or types of waste is presented in this Appendix. The procedure involved the following steps: (1) classification of each expenditure by function; (2) determination of expenditures that are totally or partially "applicable" or "not applicable" to the 700,000 tons of Analyzed MSW; (3) allocation of the Analyzed MSW expenditures to the management of garbage/trash and recyclables; and (4) allocation of Solid Waste Authority of Palm Beach County (SWA or Authority) costs to manage HHW. Each of these steps is discussed below. The resulting allocations of the total net cost of $124.5 million are provided in Tables B.1 through B.10 at the end of this Appendix.

B.1 Step 1: Classification of Expenditures by Function

The expenditures incurred by the Authority and by the municipalities of Palm Beach County provided in Table C.2 of Appendix C were classified into the following functional areas: General & Administrative (G&A); Collection; Transfer and Haul; Facility O&M, Processing, and Other O&M; Landfill; and Promotion, Education, & Public Relations.

In Table C.2 of Appendix C, transfers, encumbrances, depreciation, and interest were subtracted from each expenditure to obtain a net cost. Transfers only reflect debits or credits to individual funds and do not reflect cost to the Authority. Similarly, encumbrances do not reflect current year expenditures. Depreciation and interest cost were subtracted from each account because they are treated separately in the analysis.

The Authority allocated administrative/overhead costs to some cost accounts, particularly those accounts associated with collection activities. For consistency in this evaluation, these administrative/overhead costs were allocated to the G&A functional area and not to the collection functional area.

The results of the classification of expenditures by function are provided in Tables B.3 through B.7. For example, the $520,057 net expense of the Office of the Executive Director, listed in Table C.2: Fund 403 - Operating Fund, was classified as a G&A expense and listed in Table B.3: General & Administrative Cost (FY 1992). Similarly, the Franchise Hauler Fee plus Other Expenses for District 1 (see Table C.2: Fund 415 - Mandatory Collection Fund) less the Administrative Overhead Charge included in Other Expenses results in the $1,304,319 cost (i.e., 1,278,505 + 133,478 - 107,664) shown in Table B.3: Collection Costs (FY 1992). The Administrative Overhead Charge was subtracted from the total because this charge is included in the G&A costs.

Promotion, education, and public relation costs where often aggregated and reported as part of another expense account. For example, the Recycling Service Administration account's reported expense of $393,611 included promotional expenses of $27,483. A detailed review of each account helped identify these expenses and facilitated a separate accounting of these expenses.

The $34,129 lease on recycling trucks is reported as an interest expense in Fund 403 under the Financial Services account (number 403804) (Table C.2). Therefore, this expense was originally classified as an interest expense, as shown in Table B.10. Ultimately, these lease payments were treated as collection costs, as shown in Table B.1.

Except for the North County Landfill, the costs provided in Table B.8: Capital Costs (FY 1992) were obtained from Table C.3: Assets - SWA by aggregating the calculated Annualized Costs for each type of facility or equipment. For example, the $5,631 capital cost of the Belle Glade transfer station HHW building was obtained from the first page of Table C.3.

A number of costs reported in Tables B.3 through B.10 were not obtained directly from the fund accounts provided in Table C.2. The respective City Self Collection Costs and City Contracted Collection Costs of $26,561,450 and $6,493,118 in Table B.3 are the municipal collection costs calculated in Section C.3 of Appendix C. The estimated $2,107,939 cost of plastic bags, trash cans, and containers used to collect garbage in the unincorporated areas, shown in Table B.4, was derived by using the methodology described in Section C.5 of Appendix C. The Electricity Revenues of $8,768,435 in Table B.6 are the revenues calculated in Section C.2 of Appendix C. The Recycling revenues of $1,971,923 are those reported by the Authority as shown in Table C.1 of Appendix C. Finally, the $1,009,015 North County Landfill capital cost in Table B.9 was obtained from Section C.2.3 of Appendix C.

The costs reported in Tables B.6, B.7, and B.9 were rearranged by facility to generate Tables B.1 and B.2. For example, the $1,151,895 capital cost of the MRF as reported in Table B.1 is the sum of the share of the capital costs of the North County Complex allocated to the MRF ($234,667) and the capital costs of the MRF ($917,228), as shown in Table B.9.

B.2 Step 2: Determination of "Applicable" and "Not Applicable" Expenses

About $22.6 million of the $124.5 million total net cost is classified as being "not applicable" to the management of the 700,000 tons of Analyzed MSW. The Analyzed MSW is that portion of the MSW managed by the Authority for which collection, transfer, haul, processing, combustion, and disposal costs were calculated.

The $22.6 million represents costs to: (1) manage the 169,000 tons of Other Waste (e.g., sewage sludge, C&D debris, and tires); (2) manage the approximately 232,000 tons of self-hauled, imported, and other MSW for which collection costs are not known; and (3) develop the new West Central transfer station, close the Dyer and Lantana landfills, and purchase, maintain, and develop the South County site. These latter expenses are appropriately allocated to the cost of managing waste generated prior to or after FY 1992.

Each expense in Tables B.3 through B.10 was first reviewed to determine whether it could be classified as being either "applicable" or "not applicable." For example, 100 percent of the collection costs in Table B.4 is applicable to the management of the 700,000 tons of Analyzed MSW. On the other hand, 100 percent of the South County Landfill Construction, South County Site, Dyer Landfill Closure, and Lantana Landfill Closure costs listed in Table B.7 is classified as "not applicable."

The footnotes in Tables B.3 through B.10 describe the methods used to determine the portion of other expenses that are not applicable to the management of the 700,000 tons of Analyzed MSW. Generally, tonnage figures are used to apportion non-landfill costs. The North County landfill costs are apportioned based on volume rather than tonnage.

For example, consider the $1,362,182 Recycling Center (i.e., MRF) cost in Table B.6. Of the

total 68,066 tons of recyclables processed at the MRF, 3,162 tons were imported, self hauled, or brought to drop-off sites, i.e., are not included in the 700,000 tons of Analyzed MSW. Multiplying the $1.36 million cost by the ratio of 3,162 to 68,066 results in the $63,280 of this cost that is not applicable to the 700,000 tons of Analyzed MSW.

Similarly, consider the $2,121,511 Landfill Operations cost in Table B.7. The volume of Other Waste disposed of in the North County landfills represented about 27.2 percent (204,620 divided by 752,686) of the volume of waste disposed of in the landfills. The operating costs at the landfills attributed to the disposal of these Other Wastes was calculated by multiplying the $2.12 million cost by 27.3 percent, resulting in about $577,000. The balance of the waste disposed of at the landfills consisted of garbage/trash, and residue and ash derived from garbage/trash. The percentage, by volume or weight, of garbage/trash that is not applicable to the 700,000 tons of Analyzed waste is about 26.5 (i.e., 228,581 divided by 863,962 tons)[1]. Multiplying this percentage by the $1,544,772 (i.e., $2,121,511 minus $576,739) results in a cost of $408,000 that is also not applicable to the Analyzed MSW. Summing the $576,000 and $408,000 results in the $985,000 cost reported in Table B.7 as not being applicable to the 700,000 tons of Analyzed MSW.

B.3 Step 3: Allocation of Analyzed MSW Costs by Type of Waste

The procedure to allocate the $101 million cost of managing the 700,000 tons of Analyzed MSW to the cost of managing garbage/trash and recyclables is similar to the procedure used to determine what costs or proportion of costs were "applicable" or "not applicable." The footnotes in Tables B.3 through B.10 describe the variables used to determine the portion of these costs apportioned to garbage/trash and recyclables. First, specific costs that were either 100-percent associated with the management of either garbage/trash or recyclables were identified and allocated accordingly. Generally, all non-landfill and non-G&A expenses are allocated based on tonnage; landfill costs are allocated based on volume; and G&A expenses that are not 100-percent applied to either garbage/trash or recyclables are allocated in direct proportion to the allocation of other costs.

In some cases additional information was used to allocate costs. For example, the recyclables collection costs for Districts 1 through 9 in Table B.4 were obtained directly from residential recycling collection expenses reported by the Authority, rather than apportioned by tonnage.[2]

The costs attributed to recyclables include a portion of the cost of collection, transfer and haul, RRF, and landfill to account for the recovery of materials from garbage/trash at the RRF and landfills. For example, consider the derivation of the $136,578 attributed to the transfer of recyclables at the South County Transfer Station, as reported in Table B.5. Of the 263,804 tons

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[1] See Table 4-1. The percent by weight is the same as the percent by volume because the weighted average density of the garbage/trash and residue and ash generated from the garbage/trash is multiplied by tons in both the numerator and denominator to estimate percent by volume, and as such cancel themselves out.

[2] Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System," SWA, March 1993, page 11.

of MSW transferred at this station, about 9.4 percent was recyclables. Thus 9.4 percent of the $1,105,287 cost, or $103,890, is attributed to the transfer of curbside recyclables. About 3.6 percent of garbage/trash was recovered as recyclables. Multiplying this percentage by the $1,001,397 cost of Analyzed MSW at the South County Transfer Station results in a cost of $35,688 that is also allocated to the transfer cost of recyclables. The reported cost in Table B.5 of recyclables at the South County Transfer Station is $139,578, which is the sum of $103,890 and $35,688.

Refer to the footnotes in Tables B.3 through B.10 for more details on the variables used to allocate costs.

B.4 Step 4: Allocation of Costs to Manage HHW

The costs that can be 100-percent attributed to HHW activities were allocated to the management of HHW. For example, the capital costs reported in Table B.9 for the HHW building at the Belle Glade and Delray transfer stations and the North County Complex were allocated to the cost of managing HHW. G&A expenses that are not 100-percent attributable to HHW activities were allocated to HHW in direct proportion to other costs that were apportioned to the management of HHW. A portion of Promotion/Education/ Public Relations, and of Facility/Grounds/Utility and Vehicle Maintenance were also allocated to HHW using the same procedures to allocate these costs to garbage/trash and recyclables. See footnotes of Tables B.3 through B.10 for more details.

TABLE B.1: PALM BEACH COUNTY'S INTEGRATED MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM COSTS (FY92)

(Includes City Collection Cost) (Annualization of Capital Outlays)

COSTS	TOTAL	PERCENT OF TOTAL	NOT APPLICABLE	ANALYZED MSW	PERCENT OF TOTAL	GARBAGE/ TRASH	PERCENT OF TOTAL	RECYCLABLES	PERCENT OF TOTAL	HHW
General & Administrative (O&M)	$10,858,488	8.7%	$2,716,393	$7,901,708	7.8%	$6,042,877	7.3%	$1,858,831	9.9%	$240,386
General & Administrative (Capital Cost)	1,743,114	1.4%	431,235	1,301,384	1.3%	1,041,246	1.3%	260,138	1.4%	10,495
General & Administrative (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total G&A Costs	12,601,602	10.1%	3,147,628	9,203,092	9.1%	7,084,123	8.6%	2,118,969	11.3%	250,882
Collection (O&M)	56,323,257	45.2%		56,323,257	55.7%	43,354,249	52.6%	12,731,694	67.9%	0
Collection (Capital Cost)	2,468,424	2.0%		2,468,424	2.4%	2,110,398	2.6%	595,339	3.2%	0
Collection (Lease)	34,129	0.0%		34,129	0.0%	0	0.0%	34,129	0.2%	0
Total Collection	58,825,810	47.2%		58,825,810	58.2%	45,464,647	55.2%	13,361,163	71.2%	0
Transfer & Haul (O&M)	3,790,059	3.0%	946,296	2,843,763	2.8%	2,558,410	3.1%	285,354	1.5%	0
Transfer & Haul (Capital Cost)	3,389,162	2.7%	859,477	2,529,685	2.5%	2,276,807	2.8%	252,878	1.3%	0
Transfer & Haul (Interest)	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
Total Transfer & Haul	7,179,221	5.8%	1,805,772	5,373,449	5.3%	4,835,217	5.9%	538,232	2.9%	0
NCRRRF/Fe Processing (O&M)	16,661,557	13.4%	4,458,396	12,203,161	12.1%	11,674,767	14.2%	528,394	2.8%	0
NCRRRF/Fe Processing (Revenues)	(9,006,274)	-7.2%	(2,382,188)	(6,624,086)	-6.5%	(6,449,156)	-7.8%	(174,930)	-0.9%	0
NCRRRF/Fe Processing (Capital Cost)	18,366,012	14.7%	4,896,468	13,469,544	13.3%	13,262,883	16.1%	206,662	1.1%	0
NCRRRF/Fe Processing (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total NCRRRF	26,021,295	20.9%	6,972,675	19,048,620	18.8%	18,488,494	22.4%	560,126	3.0%	0
MRF (O&M)	1,362,006	1.1%	63,272	1,298,734	1.3%	0	0.0%	1,298,734	6.9%	0
MRF (Revenues)	(1,722,760)	-1.4%	(46,495)	(1,676,265)	-1.7%	0	0.0%	(1,676,265)	-8.9%	0
MRF (Capital Cost)	1,151,895	0.9%	53,511	1,098,384	1.1%	0	0.0%	1,098,384	5.9%	0
MRF (Interest)	0	0.0%	0		0.0%	0	0.0%		0.0%	0
Total MRF	791,141	0.6%	70,288	720,853	0.7%	0	0.0%	720,853	3.8%	0
Household Hazardous Waste (O&M)	310,740	0.2%	0	0	0.0%	0	0.0%	0	0.0%	310,740
Household Hazardous Waste (Capital Cost)	134,052	0.1%	0	0	0.0%	0	0.0%	0	0.0%	134,052
Household Hazardous Waste (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total HHW	444,792	0.4%	0	0	0.0%	0	0.0%	0	0.0%	444,792
Compost (O&M)	123,153	0.1%	123,153	0	0.0%	0	0.0%	0	0.0%	0
Compost (Capital Cost)	423,251	0.3%	423,251	0	0.0%	0	0.0%	0	0.0%	0
Compost (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Compost	546,404	0.4%	546,404	0	0.0%	0	0.0%	0	0.0%	0
NC Landfill/Dredging (O&M)	4,984,735	4.0%	2,439,948	2,544,787	2.5%	2,389,231	2.9%	155,556	0.8%	0
NC Landfill/Dredging (Revenues)	(11,325)	-0.0%	($2,995)	(8,329)	-0.0%	0	0.0%	(8,329)	-0.0%	0
NC Landfill/Dredging (Capital Cost)	2,682,063	2.2%	1,302,841	1,379,222	1.4%	1,295,779	1.6%	83,443	0.4%	0
NC Landfill/Dredging (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Landfill	7,655,473	6.1%	3,739,793	3,915,680	3.9%	3,685,010	4.5%	230,670	1.2%	0
Promotion/Education/PR (O&M)	770,378	0.6%	0	741,497	0.7%	28,882	0.0%	712,615	3.8%	28,882
Maintenance Building (O&M)	1,241,339	1.0%	430,101	811,060	0.8%	704,160	0.9%	106,900	0.6%	178
Maintenance Building (Capital Cost)	586,670	0.5%	203,270	383,315	0.4%	332,793	0.4%	50,522	0.3%	84
Maintenance Building (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Maintenance Building	1,828,009	1.5%	633,371	1,194,375	1.2%	1,036,953	1.3%	157,422	0.8%	263
Facilities/Grounds/Utilities (O&M)	1,500,797	1.2%	321,428	1,179,154	1.2%	1,048,779	1.3%	130,375	0.7%	216
Facilities/Grounds/Utilities (Capital Cost)	178,528	0.1%	50,794	127,709	0.1%	112,271	0.1%	15,437	0.1%	26
Total Facilities/Grounds/Utility	1,679,325	1.3%	372,221	1,306,862	1.3%	1,161,051	1.4%	145,812	0.8%	241
W.Central & S. County Sites (O&M)	677,350	0.5%	677,350	0	0.0%	0	0.0%	0	0.0%	0
W.Central & S. County Sites (Capital Cost)	2,548,258	2.0%	2,548,258	0	0.0%	0	0.0%	0	0.0%	0
Total W.Central & S. County	3,225,608	2.6%	3,225,608	0	0.0%	0	0.0%	0	0.0%	0
Dyer & Lantana Landfills (O&M)	1,928,883	1.5%	1,928,883	0	0.0%	0	0.0%	0	0.0%	0
Dyer & Lantana Landfills (Capital Cost)	82,832	0.1%	82,832	0	0.0%	0	0.0%	0	0.0%	0
Total Dyer & Lantana Landfills	2,011,715	1.6%	2,011,715	0	0.0%	0	0.0%	0	0.0%	0
Other (Capital Costs)	793,385	0.6%	103,316	689,955	0.7%	620,654	0.8%	69,301	0.4%	114
Misc. Recycling (Capital Cost)	144,906	0.1%	6,732	138,174	0.1%	0	0.0%	138,174	0.7%	0
Totals										
Operating and Maintenace Costs	100,532,742	80.7%	14,105,218	85,847,122	84.9%	67,801,355		17,808,453		580,402
Revenues	(10,740,358)	-8.6%	(2,431,678)	(8,308,680)	-8.2%	(6,449,156)		(1,859,524)		0
Capital Costs	34,692,552	27.9%	10,961,984	23,585,797	23.3%	21,052,831		2,770,279		144,771
Truck Lease Cost	34,129	0.0%	0	34,129	0.0%	0		34,129		0
Total	124,519,065		22,635,524	101,158,368		82,405,030		18,753,337		725,173

TABLE B1: PALM BEACH COUNTY'S INTEGRATED MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM COSTS (CONT.)

NOTES:

1. Costs incurred for activities other than those related to Analyzed MSW are either allocated to "HHW" or "Not Applicable," as appropriate.

SOURCES:

1. "Comprehensive Annual Financial Report Solid Waste Authority of Palm Beach County – A Component Unit of Palm Beach County, Florida – Fiscal Year Ending September 30, 1992."
2. Solid Waste Authority of Palm Beach, "Unit Expenditure Summary," February 25, 1993.
3. Solid Waste Authority of Palm Beach, "Unit Expenditure Status," February 15, 1993.
4. Solid Waste Authority of Palm Beach, "Fixed Assets by Location," September 30, 1992.
5. Solid Waste Authority of Palm Beach, "Combining Schedule of Revenues and Expenses by Fund," September 30, 1992 (Final).
6. Solid Waste Authority of Palm Beach, "Adjusting Journal Entries, September 30, 1992," February 1, 1993.

ALLOCATION OF COSTS: See Tables B3 through B10.

TABLE B.2: PALM BEACH COUNTY'S INTEGRATED MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM COSTS (FY92)

(SWA Only) (Annualization of Capital Outlays)

COSTS	TOTAL	PERCENT OF TOTAL	NOT APPLICABLE	ANALYZED MSW	PERCENT OF TOTAL	GARBAGE/ TRASH	PERCENT OF TOTAL	RECYCLABLES	PERCENT OF TOTAL	HHW
General & Administrative (O&M)	$10,858,488	12.2%	$2,785,205	$7,831,221	11.9%	$5,943,473	11.4%	$1,887,749	13.7%	$242,061
General & Administrative (Capital Cost)	1,743,114	2.0%	443,092	1,289,238	2.0%	1,024,117	2.0%	265,121	1.9%	10,784
General & Administrative (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total G&A Costs	12,601,602	14.1%	3,228,297	9,120,460	13.9%	6,967,590	13.4%	2,152,869	15.6%	252,845
Collection (O&M)	23,181,148	26.0%		23,181,148	35.2%	15,186,076	29.2%	7,995,072	57.9%	0
Collection (Capital Cost)	358,026	0.4%		358,026	0.5%	0	0.0%	358,026	2.6%	0
Collection (Lease)	34,129	0.0%		34,129	0.1%	0	0.0%	34,129	0.2%	0
Total Collection	23,573,303	26.4%		23,573,303	35.8%	15,186,076	29.2%	8,387,227	60.7%	0
Transfer & Haul (O&M)	3,790,059	4.2%	946,296	2,843,763	4.3%	2,558,410	4.9%	285,354	2.1%	0
Transfer & Haul (Capital Cost)	3,389,162	3.8%	859,477	2,529,685	3.8%	2,276,807	4.4%	252,878	1.8%	0
Transfer & Haul (Interest)	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
Total Transfer & Haul	7,179,221	8.0%	1,805,772	5,373,449	8.2%	4,835,217	9.3%	538,232	3.9%	0
NCRRRF/Fe Processing (O&M)	16,661,557	18.7%	4,458,396	12,203,161	18.5%	11,674,767	22.4%	528,394	3.8%	0
NCRRRF/Fe Processing (Revenues)	(9,006,274)	-10.1%	(2,382,188)	(6,624,086)	-10.1%	(6,449,156)	-12.4%	(174,930)	-1.3%	0
NCRRRF/Fe Processing (Capital Cost)	18,366,012	20.6%	4,896,468	13,469,544	20.5%	13,262,883	25.5%	206,662	1.5%	0
NCRRRF/Fe Processing (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total NCRRRF	26,021,295	29.2%	6,972,675	19,048,620	28.9%	18,488,494	35.5%	560,126	4.1%	0
MRF (O&M)	1,362,006	1.5%	63,272	1,298,734	2.0%	0	0.0%	1,298,734	9.4%	0
MRF (Revenues)	(1,722,760)	-1.9%	(46,495)	(1,676,265)	-2.5%	0	0.0%	(1,676,265)	-12.1%	0
MRF (Capital Cost)	1,151,895	1.3%	53,511	1,098,384	1.7%	0	0.0%	1,098,384	8.0%	0
MRF (Interest)	0	0.0%	0		0.0%	0	0.0%		0.0%	0
Total MRF	791,141	0.9%	70,288	720,853	1.1%	0	0.0%	720,853	5.2%	0
Household Hazardous Waste (O&M)	310,740	0.3%	0	0	0.0%	0	0.0%	0	0.0%	310,740
Household Hazardous Waste (Capital Cost)	134,052	0.2%	0	0	0.0%	0	0.0%	0	0.0%	134,052
Household Hazardous Waste (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total HHW	444,792	0.5%	0	0	0.0%	0	0.0%	0	0.0%	444,792
Compost (O&M)	123,153	0.1%	123,153	0	0.0%	0	0.0%	0	0.0%	0
Compost (Capital Cost)	423,251	0.5%	423,251	0	0.0%	0	0.0%	0	0.0%	0
Compost (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Compost	546,404	0.6%	546,404	0	0.0%	0	0.0%	0	0.0%	0
NC Landfill/Dredging (O&M)	4,984,735	5.6%	2,439,948	2,544,787	3.9%	2,389,231	4.6%	155,556	1.1%	0
NC Landfill/Dredging (Revenues)	(11,325)	-0.0%	($2,995)	(8,329)	-0.0%	0	0.0%	(8,329)	-0.1%	0
NC Landfill/Dredging (Capital Cost)	2,682,063	3.0%	1,302,841	1,379,222	2.1%	1,295,779	2.5%	83,443	0.6%	0
NC Landfill/Dredging (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Landfill	7,655,473	8.6%	3,739,793	3,915,680	5.9%	3,685,010	7.1%	230,670	1.7%	0
Promotion/Education/PR (O&M)	770,378	0.9%	0	741,497	1.1%	28,882	0.1%	712,615	5.2%	28,882
Maintenance Building (O&M)	1,241,339	1.4%	430,101	811,060	1.2%	704,160	1.4%	106,900	0.8%	178
Maintenance Building (Capital Cost)	586,670	0.7%	203,270	383,315	0.6%	332,793	0.6%	50,522	0.4%	84
Maintenance Building (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Maintenance Building	1,828,009	2.0%	633,371	1,194,375	1.8%	1,036,953	2.0%	157,422	1.1%	263
Facilities/Grounds/Utilities (O&M)	1,500,797	1.7%	321,428	1,179,154	1.8%	1,048,779	2.0%	130,375	0.9%	216
Facilities/Grounds/Utilities (Capital Cost)	178,528	0.2%	50,794	127,709	0.2%	112,271	0.2%	15,437	0.1%	26
Total Facilities/Grounds/Utility	1,679,325	1.9%	372,221	1,306,862	2.0%	1,161,051	2.2%	145,812	1.1%	241
W.Central & S. County Sites (O&M)	677,350	0.8%	677,350	0	0.0%	0	0.0%	0	0.0%	0
W.Central & S. County Sites (Capital Cost)	2,548,258	2.9%	2,548,258	0	0.0%	0	0.0%	0	0.0%	0
Total W.Central & S. County	3,225,608	3.6%	3,225,608	0	0.0%	0	0.0%	0	0.0%	0
Dyer & Lantana Landfills (O&M)	1,928,883	2.2%	1,928,883	0	0.0%	0	0.0%	0	0.0%	0
Dyer & Lantana Landfills (Capital Cost)	82,832	0.1%	82,832	0	0.0%	0	0.0%	0	0.0%	0
Total Dyer & Lantana Landfills	2,011,715	2.3%	2,011,715	0	0.0%	0	0.0%	0	0.0%	0
Other (Capital Costs)	793,385	0.9%	103,316	689,955	1.0%	620,654	1.2%	69,301	0.5%	114
Misc. Recycling (Capital Cost)	144,906	0.2%	6,732	138,174	0.2%	0	0.0%	138,174	1.0%	0
Totals										
Operating and Maintenace Costs	67,390,633	75.5%	14,174,030	52,634,526	80.0%	39,533,777		13,100,749		582,077
Revenues	(10,740,358)	-12.0%	(2,431,678)	(8,308,680)	-12.6%	(6,449,156)		(1,859,524)		0
Capital Costs	32,582,154	36.5%	10,973,841	21,463,253	32.6%	18,925,305		2,537,948		145,060
Truck Lease Cost	34,129	0.0%	0	34,129	0.1%	0		34,129		0
Total	89,266,558		22,716,193	65,823,228		52,009,926		13,813,302		727,136

TABLE B.3: GENERAL & ADMINISTRATIVE COSTS (FY92)

COSTS	TOTAL	NOT APPLICABLE	ANALYZED MSW	UNALLOCATED	GARBAGE/ TRASH	RECYCLABLES	HHW
Office of the Executive Director	$520,057	$128,659	$388,267	$0	$310,655	$77,612	$3,131
Financial Services	1,305,474	322,966	974,648	.0	779,822	194,826	7,860
Mng Dir Adm Envir Fin	186,732	46,196	139,411	0	111,544	27,867	1,124
Planning & Special Projects	58,098	14,373	43,375	0	34,705	8,670	350
Personnel Admin	220,344	54,512	164,506	0	131,622	32,884	1,327
Customer Services Admin	1,909,443	472,384	1,425,563	0	1,140,602	284,960	11,497
Office Services	226,894	56,132	169,396	0	135,535	33,861	1,366
Misc Administrative	463,287	114,614	345,883	0	276,744	69,140	2,789
Mng Dir Oper & Support	160,826	39,787	120,070	0	96,069	24,001	968
Recycling Services Admin	366,128	17,008	349,120	0		349,120	
Operations Contract Mgmt	241,736	59,804	180,477	0	144,401	36,076	1,455
Util Oper & Sup Admin	86,825	21,480	64,822	0	51,865	12,958	523
Dir SW Mgt Oper – Fld Svc	86,043	21,286	64,238	0	51,398	12,841	518
Land Mgt Svc Admin	95,217	23,556	71,088	0	56,878	14,210	573
Transpt Svc Admin	77,233	19,107	57,661	0	46,135	11,526	465
Maint Sup Admin	58,632	14,505	43,774	0	35,024	8,750	353
Dir Ops Cont & Bgt	607	150	453	0	363	91	4
Dir. Financial Services	125,679	31,092	93,830	0	75,074	18,756	757
Mics. Bank Charges	8,343	2,064	6,229	0	4,984	1,245	50
Dir Plan & Enivir Program	165,552		0	0			165,552
Dir Eng Const Util	105,141	26,011	78,497	0	62,806	15,691	633
Design & Const Admin	95,412	23,604	71,233	0	56,994	14,239	574
Engineering Services	119,042	29,450	88,875	0	71,110	17,766	717
Construction Ops	411,471	101,795	307,198	0	245,791	61,407	2,477
Inventory Services	228,562	56,545	170,641	0	136,531	34,110	1,376
Risk & Safety Admin	2,181,713	539,741	1,628,835	0	1,303,242	325,593	13,136
Purchasing Admin	335,970	83,117	250,830	0	200,691	50,139	2,023
CESDG Program	13,925		0	0			13,925
Land Aplication Services	196,710	196,710	0	0			
Enironmental Prog. Admin	656,706	162,465	490,287	0	392,282	98,005	3,954
Misc. Landsite Expenses	33,883	8,382	25,297	0	20,240	5,057	204
Electricity From RRF	116,712	28,874	87,135	0	69,718	17,418	703
Other Misc. Expenses	91	23	68	0	54	14	1
TOTAL	$10,858,488	$2,716,393	$7,901,708	$0	$6,042,877	$1,858,831	$240,386

ALLOCATION OF COSTS:

Allocation is proportional to all other non–G&A costs.

"Land Application Services" are for the application of sludge at Dyer and/or Lantana landfills, and thus the entire expense is "Not Applicable."

"Recycling Service Administrator" expenses are allocated between "Not Applicable" and "Recyclables" based upon the percent of recyclables that are municipally managed."

TABLE B.4: COLLECTION COSTS (FY92)

COSTS	TOTAL	NOT APPLICABLE	ANALYZED MSW	UNALLOCATED	GARBAGE/ TRASH	RECYCLABLES	HHW
Man Collection District 1	$1,304,319		1,304,319	$0	$946,916	$357,403	
Man Collection District 2	3,655,234		3,655,234	0	2,749,379	905,855	
Man Collection District 3	6,535,590		6,535,590	0	4,451,531	2,084,059	
Man Collection District 4	5,660,807		5,660,807	0	4,015,189	1,645,618	
Man Collection District 5	1,092,067		1,092,067	0	719,473	372,594	
Man Collection District 6	2,265,894		2,265,894	0	1,981,541	284,353	
Man Collection District 7	373,195		373,195	0	304,070	69,125	
Man Collection District 8	204		204	0	155	49	
Man Collection District 9	316		316	0	241	75	
Man Collection Legal	23,086		23,086	0	17,581	5,505	
Recycling Collection LW	178,931		178,931	0		178,931	
Recycling Collection Tri City	136,219		136,219	0		136,219	
Recycling Collection WPS	326,202		326,202	0		326,202	
Recycling Collection	541,791		541,791	0		541,791	
Commercial Recycling Collection	47,358		47,358	0		47,358	
Recycling Grant	1,039,935		1,039,935	0		1,039,935	
Bags/Container Cost Unicorp.	2,107,939		2,107,939	0	2,012,506	95,433	
City Self Collection Costs	26,651,450		26,651,450	0	23,382,070	3,269,380	
City Contracted Collection Costs	6,493,118		6,493,118	0	4,883,995	1,609,123	
TOTAL	$58,433,655	$0	$58,433,655	$0	$45,464,647	$12,969,008	$0

ALLOCATION OF COSTS:

1. Since all the wastes collected are "Analyzed MSW", none of the costs are "Not Applicable."
2. "District" costs are allocated based upon the percentage of the franchise fees that are attributed to the collection of garbage/trash and recyclables, respectively.
3. A fraction of the garbage/trash collection cost is apportioned to recyclables to account for the materials that are recovered at the NCRRRF and Landfill. Such apportionment is based upon the percent tonnage recovered from the Analyzed garbage/trash.

TABLE B.5: TRANSFER & HAUL COSTS (FY92)

COSTS	TOTAL	NOT APPLICABLE	ANALYZED MSW	UNALLOCATED	GARBAGE/ TRASH	RECYCLABLES	HHW
South County Transfer Station	$950	$236	$714	$0	$624	$90	
West County Transfer Station	344,478	85,650	258,828	0	249,604	9,224	
South County Transfer Station	1,471,043	365,756	1,105,287	0	965,709	139,578	
Central County Transfer Station	1,279,939	318,241	961,698	(0)	874,270	87,428	
North County Transfer Station	645,572	160,513	485,059	0	438,427	46,632	
W. Central Transfer Station	5,251	5,251	0	0			
W. County TFS (Landsite)	19,576	4,867	14,709	0	14,184	524	
S. County TFS (Landsite)	10,875	2,704	8,171	0	7,139	1,032	
Central County TFS (Landsite)	12,375	3,077	9,298	(0)	8,453	845	
				0			
				0			
				0			
TOTAL	$3,790,059	$946,296	$2,843,763	($0)	$2,558,410	$285,354	$0

ALLOCATION OF COSTS:

1. "Not Applicable" costs are based on the percentage of garbage, trash, recyclables, and bulky wastes that are not collected by or on behalf of the Authority or a municipality.
2. Allocation of Analyzed MSW is based on the percentage throughput of Analyzed garbage/trash and recyclables at each transfer station.
3. The costs of garbage/trash is reduced and the costs of recyclables increased to account for the materials that are recovered at the landfill and NCRRRF from garbage/trash.
4. Allocations are based upon tons of waste.

TABLE B.6: FACILITY O&M, PROCESSING, AND OTHER O&M COSTS (FY92)

COSTS	TOTAL	NOT APPLICABLE	ANALYZED MSW	UNALLOCATED	GARBAGE/ TRASH	RECYCLABLES	HHW
Compost Facility	$123,153	$123,153	$0	$0			
HHW Services	310,740		0	0			310,740
Recycling Center	1,362,182	63,280	1,298,902	0		1,298,902	
NCRRRF Operations (Contractor)	13,529,281	3,621,124	9,908,157	0	9,680,235	227,922	
NCRRRF Operations (Other)	2,649,637	709,178	1,940,459	0	1,895,822	44,637	
NCRRRF Coordination	137,959	36,925	101,034	0	98,710	2,324	
Facility Maintenance	310,056	40,376	269,635	0	242,553	27,083	45
Ground Maintenance	608,148	79,194	528,866	0	475,746	53,121	87
Equipment Maint. Services	1,241,339	430,101	811,060	0	704,160	106,900	178
Utility Systems	582,593	201,858	380,652	0	330,481	50,171	84
Tire Grant	130,990	130,990	0	0		0	
Mulch (Reduction Program)	201,780	137,974	63,806	0		63,806	
Ferrous Metal Processing	344,680	91,169	253,511	0		253,511	
Material Recovery Facility	(176)	(8)	(168)	0		(168)	
Recycling Revenues	(1,971,923)	($112,399)	(1,859,524)	0		(1,859,524)	
Electrict Revenues	(8,768,435)	(2,319,279)	(6,449,156)	0	(6,449,156)		
TOTAL	$10,792,004	$3,233,635	$7,247,235	$0	$6,978,550	$268,685	$311,134

ALLOCATION OF COSTS

Compost Facility Costs:

1. Because feedstock is primarily sludge, entire cost is allocated to "Not Applicable."
2. Woodchips and mulch used as bulking agent are treated as a recycled product and none of the costs are allocated to recyclables.

Materials Recovery Facility Costs (Revenues):

1. Allocation of the cost to "Not Applicable" reflects the percentage of Recyclables that are imported from other counties, i.e., "self-hauled" recyclables.
2. The balance of the costs is allocated to recyclables.

NCRRRF Costs (Revenues):

1. Allocation of the cost to "Not Applicable" reflects the percentage of Garbage/Trash that is "self-hauled," plus an apportionment of the costs attributed to the shredding and combustion of tires, i.e., other waste processed at the NCRRRF.
2. The portion of the NCRRRF that is allocated to recyclables is based upon the percentage of front-end cost that are apportioned to the recovery of metals and the percentage of Analyzed MSW recovered as metals for recycling.
3. Percentages are based on tons of waste processed at the NCRRRF.

Ferrous Processing Costs:

1. Allocation of the cost to "Not Applicable" reflects the percentage of Garbage/Trash that is "self-hauled."
2. Percentages are based on tons of waste processed at the NCRRRF.

Mulch Costs:

1. Allocation of the cost to "Not Applicable" reflects the percentage of yard waste that is "self-hauled."

TABLE B.7: LANDFILL COSTS (FY92)

COSTS	TOTAL	NOT APPLICABLE	ANALYZED MSW	UNALLOCATED	GARBAGE/ TRASH	RECYCLABLES	HHW
Landfill Operations	$2,121,511	$985,337	$1,136,174	$0	$1,045,634	$90,540	
S. County Landfill Construction	29,933	29,933	0	0			
South County Site	550,942	550,942	0	0			
Marine Sup Operations	108,315	56,856	51,459	0	50,694	764	
Lantana Landfill Closure	($49,560)	(49,560)	0	0			
S. County Landfill Construction	96,475	96,475	0	0			
Dyer Landfill Closure	1,978,443	1,978,443	0	0			
Landfill Development: Eng	428,920	199,212	229,708	0	229,708		
Landfill Development: Con	1,899,720	882,326	1,017,394	0	1,017,394		
Storm Water Control	28,235	13,114	15,121	0	15,121		
Drainage	2,000	929	1,071	0	1,071		
Marine Support Operations	63,264	33,208	30,056	0	29,609	446	
TOTAL	$7,258,198	$4,777,216	$2,480,982	$0	$2,389,231	$91,750	$0

ALLOCATION OF COSTS:

1. The S. County site costs are allocated to "Not Applicable" because this site is under construction and these costs do not apply to the management of waste generated in FY92.
2. The costs associated with the closure of the Dyer and Lantana landfills are allocated to "Not Applicable" since these costs do not apply to the management of waste generated in FY92.
3. The portion of the N. County landfill costs that are "Not Applicable" include that portion associated with the disposal of other waste and that portion associated with non-Analyzed wastes.
4. The N. County "Operations" cost is apportioned to garbage/trash and recyclables based upon the percentage of materials recovered from the garbage/trash at the landfill.
5. The allocation of N. County landfill costs is based upon the volume of waste disposed of at the landfill.
6. Fill from the marine operations was used at the N. County Landfill and for the construction of roads and pads for the Fe processing and compost facilities.
   The percentage of fill used for non-landfill activities represents a capital cost.
   The undepreciated portion of this cost was added to the "Not Applicable" costs. The depreciable portion associated with the Fe processing facility was allocated to recyclables.

TABLE B.8: PROMOTION/EDUCATION/PUBLIC RELATIONS COSTS (FY92)

COSTS	TOTAL	NOT APPLICABLE	ANALYZED MSW	UNALLOCATED	GARBAGE/ TRASH	RECYCLABLES	HHW
Dir Recycling Public Affairs	$83,436		$79,264	($0)	$4,172	$75,092	$4,172
Public Affairs Comm Education	431,755		410,167	0	21,588	388,580	21,588
Public Affairs Administration	62,439		59,317	(0)	3,122	56,195	3,122
Recycling Service Admin	27,483		27,483	0		27,483	
Recycling Grant	165,265		165,265	0		165,265	
				0			
				0			
				0			
TOTAL	$770,378	$0	$741,497	($0)	$28,882	$712,615	$28,882

ALLOCATION OF COSTS:

1. The recyclables that are "self-hauled" are imports from neighboring counties. The allocation assumes that the promotional activities are primarily targeted within Palm Beach County. Therefore, none of the costs are considered "Not Applicable."
2. Allocation of costs among garbage/trash, recyclables, and HHW are assumed to be 5, 90, and 5 percent, respectively.

TABLE B.9: CAPITAL COSTS (FY92)

COSTS	TOTAL	NOT APPLICABLE	ANALYZED MSW	UNALLOCATED	GARBAGE/ TRASH	RECYCLABLES	HHW
Administration Building & Anc.	1,516,224	375,104	1,131,991	0	905,714	226,277	9,129
N. County Complex (Adm. Build.)	226,890	56,131	169,393	0	135,532	33,860	1,366
N. County Complex (Landfill)	1,009,015	468,638	540,377	0	540,377		
N. County Complex (NCRRRF)	1,352,547	360,596	991,952	0	976,732	15,219	
N. County Complex (MRF)	234,667	10,901	223,766	0		223,766	
N. County Complex (HHW)	49,706		0	0			49,706
N. County Complex (Maintenance)	199,501	69,123	130,349	0	113,168	17,180	29
N. County Complex (Compost)	104,822	104,822	0	0			
Belle Glade TFS (Site & Bldg.)	10,433	2,594	7,839	0	7,560	279	
Belle Glade TFS (Equipment)	14,998	3,729	11,269	0	10,867	402	
Belle Glade TFS (HHW Bldg.)	5,631		0	0			5,631
Delray (SC) TFS (Site & Bldg.)	392,526	97,597	294,929	0	257,685	37,244	
Delray (SC) TFS (Equipment)	104,627	26,014	78,613	0	68,685	9,927	
Delray (SC) TFS (HHW Bldg.)	6,041		0	0			6,041
Lantana (CC) TFS (Site & Bldg.)	858,103	213,356	644,747	(0)	586,132	58,614	
Lantana (CC) TFS (Equipment)	139,799	34,759	105,040	(0)	95,491	9,549	
Lantana (CC) TFS (Drop Off)	22,365	22,365	0	0			
N. County TFS (Site & Bldg.)	769,287	191,274	578,013	0	522,445	55,568	
N. County TFS (Equipment)	220,915	54,928	165,987	0	150,030	15,957	
W. Central County Site	150,945	150,945	0	0			
N. County Landfill	751,538	349,052	402,486	0	370,412	32,073	
Dredging	822,577	431,785	390,792	0	384,989	5,802	
S. County Landfill Site	2,397,313	2,397,313	0	0			
Sludge Composting	318,429	318,429	0	0			
Maintenance Bldg. & Equip.	387,169	134,147	252,967	0	219,625	33,342	56
Utility	127,372	44,132	83,222	0	72,253	10,969	18
HHW Bldg.	72,674		0	0			72,674
Tub Ginders @ Landfill	77,875	36,169	41,706	0		41,706	
Tire Cutters	13,847	13,847	0	0			
48-Inch Magnet	7,211	3,349	3,862	0		3,862	
Materials Recovery Facility	917,228	42,610	874,618	0		874,618	
Misc. Recycling	144,906	6,732	138,174	0		138,174	
NCRRRF	17,013,465	4,535,872	12,477,593	0	12,286,151	191,442	
Dyer IMRF	82,832	82,832	0	0			
Ground Maintenance	44,669	5,817	38,846	0	34,944	3,902	6
Facility Maintenance	6,487	845	5,641	0	5,075	567	1
Transfer Tractors & Trailers	856,109	212,861	643,248	(0)	577,912	65,337	
Recycling Trucks	272,870		272,870	0		272,870	
Packer Trucks	85,156		85,156	0		85,156	
Other	793,385	103,316	689,955	0	620,654	69,301	114
TOTAL	$30,839,040	$10,530,749	$20,174,015	($0)	$17,901,188	$2,272,828	$134,276

TABLE B9: CAPITAL COSTS (FY92) (CONT.)

ALLOCATION OF COSTS:

N.County Landfill Site Aquisition and Development Cost:

1. Total landfill development and aquition cost is determined by first estimating the landfill development costs per cubic yard of capacity and then multiplying this cost per cubic yard by the cubic yards of all wastes disposed of in the landfill.
2. The amount apportioned to garbage in determined by multiplying the cost per cubic yard by the volume of garbage and trash disiposed of at the landfills, including RRF residue and ash; and MRF residue and unsold products, but excluding the volume of other wastes disposed of in the landfill.

Non-Landfill North County Complex (i.e., Site 7) Development (Including Administation Building and Utility) Cost:

1. The land development and aquisition cost associated with non-landfill activities at the N. County complex is determined by multiplying the capital cost by the percent of the development costs of the non-landfill portion
2. The portion of this cost that is Not Applicable is calculated by multiplying the total cost times the percentage of the tons of other waste and non-Analyzed MSW processed at the site.
3. The cost of the Analyzed MSW is allocated to garbage/trash or recyclables based on the percent of the tons of such wastes processed at the N. County complex.

Transfer Station Site, Building, and Equipment (Including Tractor and Trailer) Costs:

1. The cost apportioned to Not Applicable is calculated by multiplying the total cost by the percentage of tons of garbage/trash, recyclables, and bulky wastes that are non-municipally managed.
2. The cost of the Analyzed MSW is allocated to garbage/trash or recyclables based on the percent of the tons of such wastes transferred at each transfer station.
3. All of the cost of the HHW building located at Belle Glade and Delray transfer stations is allocated to HHW.

North County Landfill Equipment (Including the Magnet and Tub Grinder) Costs:

1. The protion of this cost that is Not Applicable is calculated by multiplying the total costs times the percentage of the volume of other waste and non-managed MSW disposed of at the landfill.
2. Except for the costs of the tub grinder and magnet, the cost of the municipally managed MSW is allocated to garbage/trash or recyclables based on the percent of the volume of materials recovered from the landfill.

Dredging Equipment Cost:

1. The dredging equipment costs are allocated in the same way as the landfill equipment costs except a portion of the cost that is not related to the landfill.
2. Such portion is determined by the percentage of fill used for non-landfill purposes such as the foundation of roads and buildings for the Fe processing and composting facilities.
3. The portion of the dredging capital costs that in not related to the landfill is further reduced to account for the amortization of these costs.

Materials Recovery Facility and Misc. Recycling Costs:

1. The portion of the MRF and Misc. Recycling Costs that are allocated to Not Applicable is calculated by multiplying the total cost by the percentage of recyclables that are non-numicipally managed.

North County Resource Recovery Facility Costs:

1. The NCRRRF Capital Cost that is allocated to Not Applicable is based on the portion of the capital costs attributed to the processing of tires plus the portion (i.e., tons) of the garbage/trash processed at the RRF that is non-Analyzed MSW.
2. The portion of the cost of the municipally managed MSW that is allocated to recyclables is calculated by multiplying the cost of the municipally managed MSW by the percent of the capital costs attributed to the front-en which if further multiplied by the percentage of materials recovered from the NCRRRF.

TABLE B.10: INTEREST (FY92)

COSTS	TOTAL	NOT APPLICABLE	ANALYZED MSW	UNALLOCATED	GARBAGE/ TRASH	RECYCLABLES	HHW
Bond Interest Expense	$34,073,621						
Bond Interest Income	(3,060,710)						
Net Bond Interest	31,012,911						
General & Administrative	0	0		0	0	0	0
NCRRRF	0	0		0	0	0	
Materials Recovery Facility	0	0		0			
Compost Facility	0	0		0			
Landfill	0	0		0	0	0	
Household Hazardous Waste	0			0			0
Maintenance Building	0			0	0	0	
Lease on Recycling Trucks	34,129		34,129	0		34,129	
TOTAL	$34,129	$0	$34,129	$0	$0	$34,129	$0

TABLE B.11: PALM BEACH COUNTY'S IMSWM SYSTEM COSTS WITHOUT THE RRF (FY92)

(Includes City Collection Cost) (Annualization of Capital Outlays)

COSTS	TOTAL	PERCENT OF TOTAL	NOT APPLICABLE	ANALYZED MSW	PERCENT OF TOTAL	GARBAGE/ TRASH	PERCENT OF TOTAL	RECYCLABLES	PERCENT OF TOTAL	HHW
General & Administrative (O&M)	$9,176,113	8.9%	$2,274,765	$6,732,722	7.8%	$4,764,732	7.1%	$1,967,991	10.6%	$168,626
General & Administrative (Capital Cost)	1,865,891	1.8%	451,553	1,398,580	1.6%	1,043,902	1.6%	354,678	1.9%	15,758
General & Administrative (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total G&A Costs	11,042,005	10.7%	2,726,318	8,131,302	9.5%	5,808,634	8.6%	2,322,668	12.6%	184,385
Collection (O&M)	56,323,257	54.4%		56,323,257	65.7%	43,354,249	64.4%	12,731,694	68.9%	0
Collection (Capital Cost)	2,468,424	2.4%		2,468,424	2.9%	2,110,398	3.1%	595,339	3.2%	0
Collection (Lease)	34,129	0.0%		34,129	0.0%	0	0.0%	34,129	0.2%	0
Total Collection	58,825,810	56.8%		58,825,810	68.6%	45,464,647	67.6%	13,361,163	72.3%	0
Transfer & Haul (O&M)	3,790,059	3.7%	946,296	2,843,763	3.3%	2,558,410	3.8%	285,354	1.5%	0
Transfer & Haul (Capital Cost)	3,389,162	3.3%	859,477	2,529,685	2.9%	2,276,807	3.4%	252,878	1.4%	0
Transfer & Haul (Interest)	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
Total Transfer & Haul	7,179,221	6.9%	1,805,772	5,373,449	6.3%	4,835,217	7.2%	538,232	2.9%	0
NCRRRF/Fe Processing (O&M)	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
NCRRRF/Fe Processing (Revenues)	0	0.0%	0	0	0.0%		0.0%	0	0.0%	0
NCRRRF/Fe Processing (Capital Cost)	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
NCRRRF/Fe Processing (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total NCRRRF	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
MRF (O&M)	1,362,006	1.3%	63,272	1,298,734	1.5%	0	0.0%	1,298,734	7.0%	0
MRF (Revenues)	(1,722,760)	−1.7%	(46,495)	(1,676,265)	−2.0%	0	0.0%	(1,676,265)	−9.1%	0
MRF (Capital Cost)	1,278,881	1.2%	59,410	1,219,471	1.4%	0	0.0%	1,219,471	6.6%	0
MRF (Interest)	0	0.0%	0		0.0%	0	0.0%		0.0%	0
Total MRF	918,127	0.9%	76,187	841,940	1.0%	0	0.0%	841,940	4.6%	0
Household Hazardous Waste (O&M)	310,740	0.3%	0	0	0.0%	0	0.0%	0	0.0%	310,740
Household Hazardous Waste (Capital Cost)	160,950	0.2%	0	0	0.0%	0	0.0%	0	0.0%	160,950
Household Hazardous Waste (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total HHW	471,690	0.5%	0	0	0.0%	0	0.0%	0	0.0%	471,690
Compost (O&M)	123,153	0.1%	123,153	0	0.0%	0	0.0%	0	0.0%	0
Compost (Capital Cost)	479,974	0.5%	479,974	0	0.0%	0	0.0%	0	0.0%	0
Compost (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Compost	603,127	0.6%	603,127	0	0.0%	0	0.0%	0	0.0%	0
NC Landfill/Dredging (O&M)	9,195,584	8.9%	3,540,215	5,655,369	6.6%	5,519,854	8.2%	135,515	0.7%	0
NC Landfill/Dredging (Revenues)	(11,325)	−0.0%	($2,995)	(8,329)	−0.0%	0	0.0%	(8,329)	−0.0%	0
NC Landfill/Dredging (Capital Cost)	4,768,166	4.6%	1,821,889	2,946,277	3.4%	2,858,080	4.2%	88,197	0.5%	0
NC Landfill/Dredging (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Landfill	13,952,426	13.5%	5,359,109	8,593,317	10.0%	8,377,933	12.5%	215,384	1.2%	0
Promotion/Education/PR (O&M)	770,378	0.7%	0	741,497	0.9%	28,882	0.0%	712,615	3.9%	28,882
Maintenance Building (O&M)	1,241,339	1.2%	463,055	778,058	0.9%	678,410	1.0%	99,647	0.5%	227
Maintenance Building (Capital Cost)	694,626	0.7%	259,115	435,384	0.5%	379,624	0.6%	55,760	0.3%	127
Maintenance Building (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Maintenance Building	1,935,965	1.9%	722,170	1,213,441	1.4%	1,058,034	1.6%	155,408	0.8%	353
Facilities/Grounds/Utilities (O&M)	1,500,797	1.4%	369,336	1,131,187	1.3%	1,009,733	1.5%	121,454	0.7%	274
Facilities/Grounds/Utilities (Capital Cost)	178,528	0.2%	55,982	122,513	0.1%	108,127	0.2%	14,386	0.1%	33
Total Facilities/Grounds/Utility	1,679,325	1.6%	425,319	1,253,700	1.5%	1,117,860	1.7%	135,839	0.7%	307
W.Central & S. County Sites (O&M)	677,350	0.7%	677,350	0	0.0%	0	0.0%	0	0.0%	0
W.Central & S. County Sites (Capital Cost)	2,548,258	2.5%	2,548,258	0	0.0%	0	0.0%	0	0.0%	0
Total W.Central & S. County	3,225,608	3.1%	3,225,608	0	0.0%	0	0.0%	0	0.0%	0
Dyer & Lantana Landfills (O&M)	1,928,883	1.9%	1,928,883	0	0.0%	0	0.0%	0	0.0%	0
Dyer & Lantana Landfills (Capital Cost)	82,832	0.1%	82,832	0	0.0%	0	0.0%	0	0.0%	0
Total Dyer & Lantana Landfills	2,011,715	1.9%	2,011,715	0	0.0%	0	0.0%	0	0.0%	0
Other (Capital Costs)	793,385	0.8%	131,348	661,892	0.8%	597,358	0.9%	64,534	0.3%	145
Misc. Recycling (Capital Cost)	144,906	0.1%	6,732	138,174	0.2%	0	0.0%	138,174	0.7%	0
Totals										
Operating and Maintenance Costs	86,399,660	83.4%	10,386,324	75,504,587	88.0%	57,914,269		17,353,005		508,749
Revenues	(1,734,084)	−1.7%	(49,490)	(1,684,594)	−2.0%	0		(1,684,594)		0
Capital Costs	18,853,983	18.2%	6,756,571	11,920,400	13.9%	9,374,296		2,783,418		177,012
Truck Lease Cost	34,129	0.0%	0	34,129	0.0%	0		34,129		0
Total	103,553,687		17,093,405	85,774,522		67,288,565		18,485,957		685,761

TABLE B.12: PALM BEACH COUNTY'S IMSWM SYSTEM COSTS WITHOUT CURBSIDE RECYCLING PROGRAM AND MRF (FY92)

(Includes City Collection Cost) (Annualization of Capital Outlays)

COSTS	TOTAL	PERCENT OF TOTAL	NOT APPLICABLE	ANALYZED MSW	PERCENT OF TOTAL	GARBAGE/ TRASH	PERCENT OF TOTAL	RECYCLABLES	PERCENT OF TOTAL	HHW
General & Administrative (O&M)	$10,492,360	9.2%	$2,954,409	$7,293,371	8.0%	$6,915,460	8.0%	$375,962	8.4%	$244,580
General & Administrative (Capital Cost)	1,768,928	1.5%	482,215	1,275,329	1.4%	1,209,247	1.4%	65,741	1.5%	11,384
General & Administrative (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total G&A Costs	12,261,288	10.7%	3,436,624	8,568,700	9.4%	8,124,706	9.4%	441,703	9.8%	255,964
Collection (O&M)	47,507,640	41.5%		47,507,640	52.3%	45,200,072	52.3%	2,307,568	51.4%	0
Collection (Capital Cost)	2,058,106	1.8%		2,058,106	2.3%	1,972,950	2.3%	85,156	1.9%	0
Collection (Lease)	0	0.0%			0.0%	0	0.0%		0.0%	0
Total Collection	49,565,745	43.3%		49,565,745	54.6%	47,173,021	54.6%	2,392,724	53.3%	0
Transfer & Haul (O&M)	3,790,059	3.3%	946,320	2,843,739	3.1%	2,735,206	3.2%	101,251	2.3%	0
Transfer & Haul (Capital Cost)	3,389,162	3.0%	859,498	2,529,664	2.8%	2,433,117	2.8%	90,106	2.0%	0
Transfer & Haul (Interest)	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
Total Transfer & Haul	7,179,221	6.3%	1,805,818	5,373,403	5.9%	5,168,323	6.0%	191,358	4.3%	0
NCRRRF/Fe Processing (O&M)	16,661,557	14.6%	4,452,907	12,208,650	13.4%	11,674,767	13.5%	533,883	11.9%	0
NCRRRF/Fe Processing (Revenues)	(9,006,273)	−7.9%	(2,238,759)	(6,767,515)	−7.4%	(6,588,797)	−7.6%	(178,717)	−4.0%	0
NCRRRF/Fe Processing (Capital Cost)	18,519,896	16.2%	4,642,556	13,877,340	15.3%	13,664,421	15.8%	212,918	4.7%	0
NCRRRF/Fe Processing (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total NCRRRF	26,175,179	22.9%	6,856,704	19,318,475	21.3%	18,750,391	21.7%	568,085	12.6%	0
MRF (O&M)	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
MRF (Revenues)	0	0.0%		0	0.0%	0	0.0%	0	0.0%	0
MRF (Capital Cost)	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
MRF (Interest)	0	0.0%			0.0%	0	0.0%		0.0%	0
Total MRF	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0
Household Hazardous Waste (O&M)	310,740	0.3%	0	0	0.0%	0	0.0%	0	0.0%	310,740
Household Hazardous Waste (Capital Cost)	139,707	0.1%	0	0	0.0%	0	0.0%	0	0.0%	139,707
Household Hazardous Waste (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total HHW	450,447	0.4%	0	0	0.0%	0	0.0%	0	0.0%	450,447
Compost (O&M)	123,153	0.1%	123,153	0	0.0%	0	0.0%	0	0.0%	0
Compost (Capital Cost)	435,177	0.4%	435,177	0	0.0%	0	0.0%	0	0.0%	0
Compost (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Compost	558,330	0.5%	558,330	0	0.0%	0	0.0%	0	0.0%	0
NC Landfill/Dredging (O&M)	5,474,586	4.8%	2,528,129	2,946,457	3.2%	2,813,731	3.3%	132,726	3.0%	0
NC Landfill/Dredging (Revenues)	(11,325)	−0.0%	($2,815)	(8,510)	−0.0%	0	0.0%	(8,510)	−0.2%	0
NC Landfill/Dredging (Capital Cost)	2,868,206	2.5%	1,302,748	1,565,458	1.7%	1,477,917	1.7%	87,540	1.9%	0
NC Landfill/Dredging (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Landfill	8,331,468	7.3%	3,828,063	4,503,405	5.0%	4,291,648	5.0%	211,757	4.7%	0
Promotion/Education/PR (O&M)	192,595	0.2%	0	185,374	0.2%	7,220	0.0%	178,154	4.0%	7,220
Maintenance Building (O&M)	1,241,339	1.1%	430,108	811,053	0.9%	706,126	0.8%	104,927	2.3%	178
Maintenance Building (Capital Cost)	609,368	0.5%	211,138	398,142	0.4%	346,634	0.4%	51,508	1.1%	88
Maintenance Building (Interest)	0	0.0%	0		0.0%	0	0.0%	0	0.0%	0
Total Maintenance Building	1,850,707	1.6%	641,245	1,209,195	1.3%	1,052,760	1.2%	156,435	3.5%	266
Facilities/Grounds/Utilities (O&M)	1,500,797	1.3%	321,431	1,179,150	1.3%	1,049,702	1.2%	129,448	2.9%	216
Facilities/Grounds/Utilities (Capital Cost)	178,528	0.2%	50,794	127,708	0.1%	112,473	0.1%	15,235	0.3%	26
Total Facilities/Grounds/Utility	1,679,325	1.5%	372,225	1,306,858	1.4%	1,162,175	1.3%	144,683	3.2%	241
W.Central & S. County Sites (O&M)	677,350	0.6%	677,350	0	0.0%	0	0.0%	0	0.0%	0
W.Central & S. County Sites (Capital Cost)	2,548,258	2.2%	2,548,258	0	0.0%	0	0.0%	0	0.0%	0
Total W.Central & S. County	3,225,608	2.8%	3,225,608	0	0.0%	0	0.0%	0	0.0%	0
Dyer & Lantana Landfills (O&M)	1,928,883	1.7%	1,928,883	0	0.0%	0	0.0%	0	0.0%	0
Dyer & Lantana Landfills (Capital Cost)	82,832	0.1%	82,832	0	0.0%	0	0.0%	0	0.0%	0
Total Dyer & Lantana Landfills	2,011,715	1.8%	2,011,715	0	0.0%	0	0.0%	0	0.0%	0
Other (Capital Costs)	793,385	0.7%	103,316	689,955	0.8%	620,654	0.7%	69,301	1.5%	114
Misc. Recycling (Capital Cost)	144,906	0.1%	6,732	138,174	0.2%	0	0.0%	138,174	3.1%	0
Totals										
Operating and Maintenance Costs	89,901,058	78.6%	14,362,690	74,975,434	82.5%	71,102,284		3,863,919		562,934
Revenues	(9,017,598)	−7.9%	(2,241,574)	(6,776,024)	−7.5%	(6,588,797)		(187,227)		0
Capital Costs	33,536,459	29.3%	10,725,265	22,659,875	24.9%	21,837,414		815,680		151,318
Truck Lease Cost	0	0.0%	0	0	0.0%	0		0		0
Total	114,419,919		22,846,381	90,859,285	1	86,350,900		4,492,372		714,253

Appendix C
Methodology and Data Used to Calculate Total, Net and Incremental Costs

The methodology and data used to calculate total, net, and incremental costs for managing MSW in Palm Beach County, i.e., collecting, transferring, hauling, processing, combusting, marketing recovered materials, and disposing of MSW, are presented in this Appendix. The methodology to calculate total and net costs consists of five steps: (1) determining the Authority's total reported cost; (2) adjusting the Authority total reported cost, as necessary; (3) estimating municipal collection costs; (4) estimating the costs of plastic bags, trash cans, and containers used to collect garbage; and (5) combining the Authority costs with the municipal collection costs. Each of these steps is described in Sections C.1 through C.5 below. The methodology to estimate program incremental costs is presented in Section C.6.

C.1 Step 1: Determining Authority Total Reported Costs

Revenues and Expenses of the Solid Waste Authority of Palm Beach County (Authority or SWA) for the Fiscal Year ending September 30, 1992 (FY 1992) are provided in Table C.1.[1] In FY 1992 the Authority had Operating Revenues of just over $113 million, Operating Expenses of just over $77 million, and Other Non-Operating Expenses of just under $31 million, for a Net Income of about $5 million. As a not-for-profit organization, the Authority will use this Net Income to offset costs in future years. Based on the treatment of revenues and expenses in this analysis, the reported net cost to the Authority in FY 1992 is about $103 million, as shown in Table C.1.

In order to analyze these costs, it was necessary to review the detailed costs that made up these expenses. The Authority, pursuant to the issuance of a series of revenue bonds, established 11 active funds through which all expenses are processed. Table C.2 provides the detailed accounting, by fund, of all expenses incurred by the Authority in FY 1992.

The detailed data were first compared to the final audited data to ensure completeness.[2] As can be seen on the first page of Table C.2, the detailed data reconcile exactly with the final audited expenses of the Authority. These expenses were then classified by functional area (see "Type of Expense" column). Telephone calls were made to the Authority to verify the proper classification of some expenses.

The fund accounts do not provide the derivation of the depreciation/amortization expenses. An analysis of the Authority's fixed asset account, which lists all the assets owned by the Authority (including each asset's purchase price, date of purchase and estimated useful life, and the location of the asset) was used to calculate the depreciation/amortization expense.[3] All assets listed in

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[1] The Authority uses an accrual basis of accounting whereby revenues are recognized as earned, and expenses are recognized when they are incurred. (Authority, "Comprehensive Annual Financial Report," Fiscal Year Ending September 30, 1992, page 21.)

[2] The detailed expenditures were obtained from the Authority's computer printout entitled "Unit Expenditure Status," February 15, 1992.

[3] Authority, computer printout entitled "Fixed Assets by Location," September 30, 1992.

the fixed asset account with a purchase price of greater than $25,000 are itemized in Table C.3. These assets represent about 98 percent of the Authority's aggregate capital outlays of approximately $385 million.

The purchase price was divided by the estimated useful life of each asset to calculate the depreciation/amortization expense. Assets that were older than their estimated useful lives were assigned no current value. Using this approach, the itemized assets represent almost 97 percent of the depreciation/amortization expense reported by the Authority.

The data from the Authority's fund and asset accounts were used to generate the tables in Appendix B and, as such, formed the information basis of the cost analysis.

C.2 Step 2: Adjusting the Authority's Reported Total Cost

For the purposes of this analysis, two adjustments were made to the Authority's reported costs. Furthermore, the reported depreciation and amortization expenses and net interest cost were replaced by a calculated annualized capital cost based on the purchase price, expected useful life of the Authority's capital assets, and an assumed Authority capital cost of capital of 7 percent.

C.2.1 Electricity Revenues and Other Operating Expenses

The electricity generated at the RRF is used for in-plant needs (approximately 61,200 MWh) and for the Authority's electricity needs, exclusive of the RRF, at the North County Complex (approximately 3,600 MWh). The excess is sold to Florida Power & Light (FP&L). The Authority pays the operator an amount equal to the share of electrical revenues it would have received had all of the net electricity (i.e., gross electricity generation less in-plant usage) been sold to FP&L. Consequently, the operator is indifferent to selling electricity to FP&L or to the Authority. Through this arrangement the Authority "purchases" electricity at the rate that FP&L pays for electricity generated by the RRF, rather than at the higher commercial rate it would have paid had it purchased all its electricity from FP&L.

The reported $8.65 million Electricity Generating Revenues (see Table C.1) are only those received from FP&L. Moreover, the reported Other Expenses of the Authority do not account for the value of the electricity generated at the RRF and used by the Authority. The adjustments made to account for this arrangement are: (1) increasing the electricity revenues, assuming all of the electricity net of in-plant usage was purchased by FP&L; and (2) increasing Other Expenses by this same amount to account for the Authority's use of RRF-generated electricity.

In FY 1992 the average electricity revenue received from FP&L was $32.42/MWh, and the Authority used 3,600 MWh of electricity from the RRF.[4] Thus, the value of the electricity used by the Authority is estimated to be $116,712 (i.e., $32.42 times 3,600). Since the Authority has already paid the operator of the RRF its share of this revenue through its operating fee, the entire amount should be added to the actual revenues received by the Authority (i.e., $8,651,723 + $116,712 = $8,768,435). Similarly, this amount should be added to the reported Other Expenses (i.e., $5,683,502 + $116,712 = $5,800,214).

[4] Discussions with Dan Pellowitz, the Authority, August 1993.

C.2.2 Calculating the Capital Cost of Non-Landfill Assets

The Authority reports capital expenses by depreciating or amortizing capital outlays (e.g., purchase prices, development costs) over the useful life of the assets. The procedure used by the Authority to account for fixed assets is:

> "Fixed assets are recorded at cost or, if donated, fair market value at the date of donation. Expenses which materially extend the useful life of existing assets are capitalized. Certain costs for professional services and interest associated with the acquisition and construction of property and equipment have been capitalized. Computer software development costs are included with depreciation. The cost of property sold or retired is removed from the appropriate accounts, and any resulting gain or loss is included in net income. Depreciation on property and equipment is computed using the straight-line method over the estimated useful lives of the assets, which are summarized as follows:
>
> | | |
> |---|---|
> | Buildings | 20-40 years |
> | Improvements other than buildings | 25-40 years |
> | Furniture, fixtures and equipment | 5-35 years."[5] |

Furthermore,

> "Debt discount and issue costs are amortized on the straight-line method over the life of the related debt issues."[6]

The Authority also reports the interest expenses incurred on all amounts borrowed to finance capital assets. Interest earning on borrowed funds that are invested prior to their use or as security to bondholder (e.g., interest earned on the debt service reserve fund) are reported as interest income.

The adjusted cost used in this analysis, as shown in Table C.1, substitutes a Capital Cost for the Depreciation/Amortization and net interest expenses (i.e., Interest Expenses minus Interest Income on Bond Proceeds). The rationale and procedure used to calculate the Capital Cost are presented in Appendix D. The "Annualized Cost" column in Table C.3 was calculated using this procedure. The capital cost for the $6.2 million worth of unitemized capital outlays was estimated by assuming an average useful life of five years. As can be seen in Table C.3, the capital cost of the asset is greater than its depreciation/amortization expense. Furthermore, the longer the estimated useful life of an asset, the greater the difference there is between the depreciation/amortization expense and the capital cost of the asset. However, because the FY 1992 debt service payments on the bonds issued by the Authority consist primarily of interest

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[5] Authority, "Comprehensive Annual Financial Report," Fiscal Year Ending September 30, 1992, page 22.

[6] Authority, "Comprehensive Annual Financial Report," Fiscal Year Ending September 30, 1992, page 23.

payments (i.e., the principal payments are relatively small) and the term of the financing is often shorter than the expected useful life of the assets being financed, the reported depreciation/amortization expense plus the net interest expenses is greater than the calculated capital cost.

C.2.3 Capital Cost Calculation of Landfills

The only exception in this analysis to the use of capital cost methodology described in Appendix D is the methodology used to estimate of the capital cost of acquiring and developing the North County landfills. To estimate the capital cost of the landfills, the cost of acquiring and developing them is divided by their volumetric capacity, to obtain a cost per cubic yard of capacity. This value is then multiplied by the capacity (i.e., cubic yards) actually consumed in FY 1992 to obtain the annual capital cost of the landfills.

This procedure is used because the capital cost of a landfill in any year is correlated to the level of consumption of landfill capacity rather than the age of the landfill. The consumption approach specifically takes into account the various consumption rates of garbage, trash, ash, etc. The depreciation/amortization approach does not take into account these variables. It assumes a linear or uniform annual consumption rate regardless of the amount or types of wastes disposed of in the landfill.

The acquisition and development cost of the North County Complex, including the landfills, is $47.7 million, as shown in Table C.4.[7] Of this amount, an estimated $27.9 million is attributed to the acquisition and development of the Class I and Class III landfills. To obtain an equivalent FY 1992 investment, 31 percent of this $27.9 million cost was escalated by 7 percent over 5 years, and the balance was escalated by 7 percent for 2 years. These percentages reflect the timing of the investment made by the Authority in the landfills. The 7 percent is the cost of capital used in this analysis. The resulting equivalent FY 1992 investment in the landfills is $34.2 million.

Except as discussed below, the percentages of the component costs attributed to the landfills shown in Table C.4 were obtained from an Authority study entitled "The Estimated Cost of the Components of the Authority's Integrated Solid Waste Management System."[8]

The percentage of functional land, i.e., land that is used for Authority activities rather than for buffering the neighboring municipality,[9] used in this analysis was derived by the Authority from

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[7] For a detailed discussion on the derivation of this cost, see the Authority, "Acquisition and Development Expenses," undated.

[8] Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System," March 1993, page 6.

[9] This analysis assumes that the cost of buffer zones and conservation land is allocated to functional areas in direct proportion to the percentage of function acreage used for each activity.

a CAD analysis of the site. Both the landfill and approximately 87.4 percent[10] of the dredge lakes acreage, or about 84.5 percent (i.e., 50.3 plus 87.4 percent of 39.1) of the total functional acreage, is estimated to be devoted to landfill activities in FY 1992.[11,12]

In this analysis the cost of constructing Jog Road, the main road through the Complex connecting 45th Street and the Beeline Highway, and of widening 45th Street are allocated based upon the quantity of waste delivered to each facility or the landfills, including the residue and ash from the MRF and RRF. Using this approach, an estimated 35 percent, by volume, of the waste that was hauled to and about the Complex was eventually delivered to the landfills.[13]

Given a total capacity of 25,499,911 cubic yards at the landfills,[14] the estimated cost per cubic yard consumed is about $1.34 (i.e., $34,183,976 divided by 25,499,911 cubic yards). The total landfill consumption in FY 1992 is estimated to be 752,686 cubic yards.[15] This results in a total capital cost for the landfills of $1,009,015 in FY 1992.

C.3 Step 3: Estimating Municipal Collection Costs

Collection of garbage/trash and recyclables is performed by individual municipalities, private haulers under contract to municipalities or commercial establishments, or the Authority. The Authority collects recyclables for the municipalities of Belle Glade, Lake Worth, Pahokee, South

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[10] This is approximately the percentage of fill obtained from the dredging activities in FY92 that was used to develop cells in the North County landfills.

[11] Although the Authority uses a similar methodology to estimate landfill costs, it only considered the 305.6-acre landfill area and 40.0-acre RRF area in its definition of functional area. Thus, the Authority study allocated 88.4 percent (i.e., 305.6 divided by 345.6) of the Complex's acquisition and development costs to the landfills.

[12] Prior to FY 1992, much of the dredge material was used to close the Lantana and Dyer landfills. Due to data limitations, the portion of the dredge lake area attributed to the closure of these landfills, was not allocated to these activities. As a result, the development cost of the landfills at the North County Complex is slightly overestimated.

[13] The Authority analysis estimated that 32 percent of the cost of these roads is attributed to the landfill. This is the Authority's estimate of the fraction of tons of waste delivered to the North County Complex that went to the landfills. Both approaches provide reasonable estimates of the landfill acquisition and development costs. The methodology used in this analysis was chosen for consistency with the remainder of the analysis.

[14] The Class I and Class III landfills are reported to have 16,285,928 and 9,213,983 cubic yards of capacity, respectively. This is a total of 25,499,911 cubic yards of capacity. (See Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System," March 1993, pp. 4 and 5.)

[15] The Authority reported landfill consumption of 746,864. Our estimate is used for consistency with the rest of this analysis.

Bay, and West Palm Beach. The Authority also contracts with private haulers for the collection of garbage/trash and recyclables (i.e., recyclables for residential units with four or fewer dwelling units) within the seven unincorporated districts. The costs of these collection activities are included in the total adjusted costs discussed in the previous sections.

The cost of collection for the 37 municipalities that collect their own garbage/trash and/or recyclables or contract with private haulers to collect garbage/trash and/or recyclables are not included in the Authority's costs. In order to determine the total cost of managing MSW in the County, it is necessary to estimate the cost of collection for these 37 municipalities. The methodology used to estimate these costs is provided in the following subsections.

C.3.1 Estimating Municipal Collection Costs for Municipalities That Collect Their Own Garbage/Trash or Recyclables

In Palm Beach County there are 13 municipalities that collect garbage/trash from residences and businesses located in their jurisdictions. Of these, nine also collect recyclables.[16] The purpose of this section is to describe the method used to estimate the collection costs incurred in FY 1992 by these municipalities.

Six of these 13 municipalities were contacted to obtain detailed financial and collection activity information. Five of the six municipalities contacted responded to this request. They are Boca Raton, Boynton Beach, Lake Park, Lake Worth, and North Palm Beach. Lake Worth only collects garbage/trash (the Authority collects recyclables in Lake Worth), while the others collect both garbage/trash and recyclables within their respective jurisdictions.

The five municipalities in the sample that collect their own garbage/trash represent about 52 percent of the 1992 population of, and 46 percent of the garbage/trash collected in, the 13 municipalities that collect their own garbage/trash. Similarly, the four municipalities in the sample that collect their own recyclables represent about 69 percent of the population, and 78 percent of the recyclables collected, in the nine municipalities that collect their own recyclables. See Table C.6 for details.

To estimate the total cost of collection for these municipalities, the following steps were performed: (1) collection costs were calculated from the financial data provided by these five municipalities; (2) a regression analysis was performed to estimate the relationship between tonnage collected and costs; and (3) the total cost for all 13 municipalities was estimated using the regression equations.

The estimated collection costs for the five municipalities analyzed are provided in Table C.7 through Table C.9. These tables provide the estimated total, garbage/trash, and recyclables collection costs, respectively. These collection costs are composed of General & Administrative, Salaries & Fringe Benefit, Operating & Maintenance, and Capital Costs. Except as discussed below, these expenses are those reported in the year-end financial reports provided by each

[16] The Authority collects recyclables in the other five municipalities.

municipality.[17]

The General & Administrative costs are estimated as a fraction of the G&A costs of each municipality, i.e., management, finance, contracts, billing, etc., and a fraction of the Department of Public Work's (DPW), or its equivalent in each municipality, G&A expenses. The fraction of these costs allocated to collection is based upon the ratio of the cost of collection to the total cost incurred by the municipality as a whole and the DPW, respectively. For example, in Boca Raton the $2.69 million non-G&A costs incurred to collect garbage/trash is about 4.5 percent of the $59.5 million spent citywide. Thus, 4.5 percent (i.e., $2,694,892 divided by $59,475,000) of the City's $7,250,400 million G&A expenses, or $328,525, is estimated to be associated with the G&A cost of garbage/trash collection.

Lake Worth runs its collection operations on an enterprise basis and, as such, allocates a portion of the Town's G&A expenses to this activity. Because the total citywide G&A expense for Lake Worth was not made available to us for this analysis, the City G&A expense for Lake Worth shown in Table C.7 is Lake Worth's estimate rather than the one estimated using the above methodology.

None of the municipalities' expense reporting procedures for collection activities account for building and land costs for things such as office space and vehicle storage. To account for these expenses it is assumed that Rent/Leases for buildings and land are equal to 10 percent of all other costs, thus increasing the estimated cost of collection by 10 percent.

Most of the municipalities' financial reports only specify capital outlays that occurred in FY 1992, rather than annual capital costs. For some of the municipalities analyzed, collection vehicles were purchased in prior years, and these capital outlays were not reflected in the FY 1992 figures. Other municipalities purchased a number of vehicles in FY 1992, making their capital outlays for this year relatively large. To properly account for capital costs and to be consistent with the capital costs reported for the Authority, fleet data (including the make and model of the collection vehicles, their date of purchase, and purchase prices) were analyzed. Similar information was also obtained for the cost of recycling bins.[18] Collection vehicles and recycling bin capital outlays were annualized over a five-year period[19] to obtain an estimate of the capital costs reported in Tables C.7 through C.9.

The total and average collection costs, for municipalities that collect their own garbage/trash and/or recyclables, are functions of the tons of waste collected, types of waste collected, design of the collection program, geographic size of the municipality being served, prevailing wage rates

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[17] See the references cited for each municipality provided in the Reference section.

[18] Many of the municipalities received their recycling bins from the Authority. The Authority purchased these bins with grant money received from the State of Florida. The costs of these bins, therefore, is included in the State "recycling grant" expense reported by the Authority. Therefore, the cost of the bins was either included in the municipality collection cost calculations or in the Authority costs.

[19] A five-year life for vehicles is consistent with the vehicle life used by the Authority.

(including fringe benefits within the municipality), and recycling participation rates.

Table C.8 shows that the average collection cost for garbage/trash ranges from $68 to $117 per ton collected. The lower average costs occurred in the larger municipalities of Boca Raton and Boynton Beach, whereas the higher average costs occurred in the smaller municipalities of Lake Park and North Palm Beach. This outcome reflects economies of scale in garbage/trash collection which, in part, result from the allocation of various fixed costs (i.e., some G&A and Capital Costs) over larger quantities of waste collected.

In addition to the number of tons collected or the size of the municipality, salaries and fringe benefits paid by a municipality also affect the relative costs among the municipalities. For example, compare the garbage/trash collection costs of the Cities of Boca Raton and Boynton Beach. The average cost per employee in Boca Raton is about $32,000, whereas it is only about $26,000 in Boynton Beach. This is the principal reason for the average garbage/trash cost in Boynton Beach is almost 18 percent lower than that of Boca Raton. Another reason is that the per-capita generation rate for garbage/trash is almost 25 percent lower in Boca Raton than in Boynton Beach.[20]

Table C.9 shows that the average collection cost for recyclables ranges from $84 to $321 per ton. Unlike the collection costs for garbage/trash, there does not seem to be a strong relationship between the size of the municipality and the average cost of collection. Both the high and low end of this range are for the two smallest municipalities, i.e., Lake Park and North Palm Beach.

This result reflects, in part, the large diversity of collection practices of the four municipalities analyzed. For example, consider the Town of Lake Park and the Village of North Palm Beach. Both are relatively small, with 1992 populations of about 6,600 and 11,700 persons, respectively. The average garbage/trash collection costs for Lake Park and North Palm Beach are relatively close. On the other hand, the average recycling collection cost for Lake Park is about three times as much as that for North Palm Beach. Although both municipalities use some or all of the same equipment and personnel to collect both garbage/trash and recyclables, the difference in average costs between the two municipalities is principally attributable to the percentage of these available resources assigned to recycling.

Lake Park, a municipality only two square miles in area, had the highest average recycling collection costs. The town collects garbage/trash four times a week. The same vehicles and crews are used one day a week to collect recyclables. Therefore, about 20 percent (i.e., one of five days) of all collection costs were allocated to recycling.[21,22] The village of North Palm

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[20] Part of the reason the garbage/trash generation rate in Boca Raton is lower than that of Boynton Beach is that the generation rate for recyclables is greater in Boca Raton.

[21] When Lake Park instituted its curbside recycling program, it did not have to add any staff or vehicles to its fleet. Rather, it reduced the level of service it provided in the collection of garbage/trash, such as eliminating backyard pickups and reducing the number of days of garbage/trash collection. This reduced level of service allows Lake Park to use the same personnel and vehicles to collect recyclables.

Beach, which has the lowest average recycling collection costs, collects commingled recyclables from single-family homes once a week and newspapers from multi-family homes once a week. The village has six collection vehicles, four of which are used full time to collect garbage/trash. The other two are used four days a week to collect garbage/trash and one day a week to collect recyclables. Therefore, only about 6.7 percent (i.e., [(.2)(2)/(6)] times 100) of the vehicle- and person-hours are devoted to recycling.

The cities of Boca Raton and Boynton Beach are relatively large municipalities, with 1992 populations of about 63,200 and 48,100, respectively. The average cost of recyclables collection in Boca Raton is about half that of Boynton Beach. This difference in the average cost of recyclables collection is primarily due to the greater tonnage per person collected in Boca Raton than in Boynton Beach. Boca Raton collected about 200 pounds of recyclables per person per year, whereas Boynton Beach collected only about 80 pounds of recyclables per person per year.

In order to estimate the collection costs for all the municipalities that collect their own MSW, a single-variate linear regression analysis was performed.[23] Two linear equations were obtained; the independent variable for the first equation is the annual tons of garbage/trash collected in a municipality, and the dependent variable is the annual cost of collecting garbage/trash in FY 1992. Similarly, the independent variable for the second equation is the annual tons of recyclables collected in a municipality, and the dependent variable is the annual cost of collecting recyclables in FY 1992.

The resulting equation for municipalities that collect their own garbage/trash is:

$$CG = 50.33(G) + 657{,}785;^{24}$$

where

CG = the annual cost of garbage/trash collection; and
G = the tons of garbage/trash collected in FY 1992.

Substituting the tonnage figures for each of the 13 municipalities that collect their own garbage/trash for "G" in the above equation and adding the calculated collection costs together for all 13 municipalities results in an estimated total annual cost of collecting garbage/trash of

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[22] Lake Park provides a good example for distinguishing the difference between incremental and average costs. As noted, 20 percent of the collection costs is allocated to collecting recyclables because in FY92, 20 percent of the resources was devoted to collecting recyclables. However, except for the value of the reduced services, which are not municipal expenses, the only incremental cost incurred was the cost of the recycling bins.

[23] The number of municipalities analyzed was insufficient to perform a meaningful multi-variate regression analysis.

[24] The correlation coefficient for this equation is 0.891, which means that about 89 percent of the variability in the collection costs among the municipalities analyzed can be explained by the independent variable, i.e., tonnage.

about $22.6 million (see Table C.10). The average cost per ton for collecting garbage/trash is estimated to be about $77.[25]

The resulting equation for municipalities that collect their own recyclables is:

$$CR = 99.08(R) + 117,740;[26]$$

where

CR = the annual cost of recyclable collection; and
R = the tons of recyclables collected in FY 1992.

Substituting the tonnage figures for each of the nine municipalities that collect their own recyclables for "R" in the above equation and adding the calculated collection costs together for all nine municipalities results in an estimated total annual cost of collecting recyclables of about $2.16 million (see Table C.11). The average cost per ton for collecting recyclables is estimated to be $176.[27]

C.3.2 Municipalities that Contract with Private Haulers for the Collection of Garbage/Trash and/or Recyclables

There are 24 municipalities in Palm Beach County that contracted with private firms in FY 1992 for the collection of garbage/trash and recyclables within their jurisdictions. Another municipality, South Bay, contracted with a private firm for the collection of garbage/trash.[28]

The methodology used for estimating the total collection costs for the 24 municipalities that contract for collection services consists of five steps, as follows: (1) for a sample of eight of these municipalities, total costs are determined along with the number of occupied units serviced; (2) the average cost per occupied unit is calculated for the eight municipalities in the sample; (3) the percentage of occupied units served is estimated for the municipalities in the sample; (4) the total number of occupied units serviced in the 24 municipalities is estimated by multiplying the percentage of occupied units served in the sample municipalities (determined in Step 3 above) by the total number of occupied units in the 24 municipalities; and (5) the total number of occupied units served (determine in Step 4 above) is multiplied by the average cost per occupied unit (calculated in Step 2 above) to obtain the total collection cost estimate. Occupied units include those that are occupied by full-time residence as well as those that are seasonally occupied.

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[25] The average cost of collecting garbage/trash for the five municipalities analyzed is about $75.

[26] The correlation co-efficient for this equation is .92, which means that about 92 percent of the variability in the recyclable collection costs among the municipalities analyzed can be explained by the independent variable (i.e., tons of recyclables collected).

[27] The average cost for the four municipalities analyzed is about $148.

[28] The Authority collects recyclables in South Bay.

This methodology assumes that the various contract relationships, including the average collection costs, of the sample municipalities provides a reasonable representation of the contract relationships for the 24 municipalities that contract for collection services.

Collection cost data was obtained for eight of the 24 municipalities, as shown in Tables C.12 and C.13. This information was obtain from copies of the actual monthly bills received by the municipalities and summary information provided by Waste Management of Palm Beach.

As can be seen in Table C.12, 30,197 of the 41,414 (or 72.9 percent) of the occupied units in the eight municipalities sampled were provided residential garbage/trash collection services. The average cost of this service was about $73 per occupied unit per year (i.e., $6.10 per occupied unit per month). For all 24 municipalities, about 89.7 percent of the 89,959 units, or about 80,716 units, are occupied. The estimated number of occupied units served is about 58,854 (i.e., 0.729 times 80,716). Multiplying the cost per unit by the number of units served yields an estimated annual cost of garbage/trash collection for these 24 municipalities of about $4.31 million (i.e., approximately 58,854 times 73).

As can be seen from Table C.13, 30,347 of the 41,414 (or 73.3 percent) of the occupied units in the eight municipalities sampled were provided residential recyclables collection services. The average cost of this service was about $24 per occupied unit per year (i.e., $1.96 per occupied unit per month). For all 23 municipalities, about 89.8 percent of the 88,746 units, or about 79,717 units, are occupied. The estimated number of occupied units served is about 58,414 (i.e., 0.733 times 88,746). Multiplying the cost per unit by the number of units served yields an estimated annual cost of garbage/trash collection for these 23 municipalities of about $1.37 million (i.e., approximately 58,414 times 24).

C.3.3 Total Estimated Municipal Collection Costs

Combining the results for collection of garbage/trash and recyclables for municipalities that collect their own MSW and those that contract for collection services results in a total collection cost estimate of $30.4 million, i.e., $22.6 million plus $4.31 million for garbage/trash, and $2.16 million plus $1.37 million for recyclables.

C.4 Step 4: Estimating Costs of Bags, Cans, and Containers

In addition to the expenses incurred by municipalities and the Authority, individuals and building owners incur the costs of plastic bags, garbage cans, and containers used in collection. Since the cost of bins used in the recycling programs is included in the capital costs of the municipalities and the Authority, the costs of using bags, cans, and containers must be included in the cost of managing garbage.[29]

The estimated costs of bags, cans, and containers is determined by multiplying the cost per bag, can, or container by the number of each used. Plastic bags are not reusable and are, therefore, consumed when the garbage is picked up. On the other hand, trash cans and containers are capital goods similar to the bins used for recycling. Furthermore, many people used both plastic

[29] No bags, cans, or containers are typically used to dispose of trash.

bags and either cans or containers, i.e., the plastic bag is used in the garbage can and plastic bags of garbage are thrown into the garbage containers at apartment buildings or condominiums. To estimate these costs, the following assumptions were used:

- individuals living in residences with four or fewer dwelling units, including mobile homes, used either or both 30-gallon plastic bags or 30-gallon garbage cans;
- individuals living in apartment buildings or condominiums with five or more dwelling units use 8-cubic-yard containers;
- 65 percent of all residents use plastic bags, and 70 percent of residents living in buildings with four or fewer dwelling units use garbage cans;[30]
- a 30-gallon plastic bag and 30-gallon garbage can hold approximately 0.149 cubic yards or 0.011 tons of garbage;[31]
- the average cost of a 30-gallon plastic bag is about $0.13;[32]
- the average cost of a 30-gallon garbage can is $20, and the average cost of an 8-cubic-yard container is $500; both have a useful life of 10 years; and
- the cost of capital is 7 percent.

Using the above assumptions, the costs of bags, cans, and containers was estimated to be approximately $1.9 million in municipalities that collected their own garbage, $800,000 in municipalities that contract for collection, and $2.1 million in the unincorporated areas of the County. The average cost of bags, cans, and containers throughout the County is about $9.30 per ton.

Of the 207,914 tons of garbage collected in municipalities that collect their own garbage, an estimated 168,054 tons were collected from residences with four or fewer dwelling units. The estimated cost of bags and cans for these residences is:

$$[(0.65)(11.73) + (0.70)(2.49)](168,054) = \$1,574,000.$$

An estimated 39,914 tons of garbage was collected from residences with five or more dwelling

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[30] These percentages are estimates based on discussions held with the Authority and private haulers.

[31] These values are based upon a conversion factor of 0.1337 cubic feet per gallon, and a bulk density of garbage in bags or cans of 150 pounds per cubic yard.

[32] A survey of plastic bags costs at retail outlets and information obtained from First Brands of Danbury, Connecticut (makers of Glad Bags), indicated typical costs ranging from 8 to 18 cents per bag. The average of this range is 13 cents.

units. The estimated cost of bags and containers for these residences is:

$$[(0.65)(11.73) + (1.0)(1.14)](39,914) = \$350,000.$$

The sum of these costs is the $1.9 million estimated cost of bags, cans, and containers for the collection of garbage in municipalities that collect their own garbage.

The factor "0.65" reflects the assumption that 65 percent of all individuals use plastic bags. The average cost of using plastic bags is about $11.73 per ton. The factor "0.70" reflects the assumption that 70 percent of individuals living in residences with four or fewer dwelling units use garbage cans. The annual capital cost of a garbage can that is used twice a week is $2.49. The factor "1.0" reflects the assumption that all individuals living in residences with five or more dwelling units are assumed to use containers. The annual capital cost of containers used twice a week is $1.14.

A similar methodology is used to calculate the costs of bags, cans, and containers for individuals living in municipalities that contract for collection and for individuals living in the unincorporated areas of the County.

The $26.7 million cost reported in Table B.4 for City Self Collection, is the sum of the $22.6 million cost for the collection of garbage/trash, the $2.16 million cost for the collection of recyclables, and the $1.9 million cost for the bags, cans, and containers. Similarly, the $6.5 million cost reported in Table B.4 for City Contractor Collection is the sum of the $4.3 million cost for the collection of garbage/trash, the $1.4 million cost for the collection of recyclables, and the $0.80 million cost for bags, cans, and containers. The $2.1 million cost reported for Bags/Container Cost Unicorp. is the $2.1 million estimated for bags, cans, and containers in the unincorporated areas of the County.

C.5 Step 5: Combining Authority and Municipal Collection Costs

The total net cost of $124.5 is the sum of the Authority, Municipal and bag/can/container costs incurred in FY 1992 for the Palm Beach County IMSWM System, (i.e., $89.3 plus $30.4, and $4.84 million). This is the total cost used in Table B.1 of Appendix B.

C.6 Step 6: Program Incremental Costs

The program incremental costs for the resource recovery facility (RRF) program and the curbside collection and materials recovery facility (MRF) programs are discussed in this section. It is important to note that when calculating Program Incremental Costs the tons of waste managed must be the same with and without a given program. For this analysis this tonnage is the 700,285 tons of Analyzed MSW.

Tables C.14 and C.15 show the changes in the classification of waste without each of these programs. Table C.14 is the same as Table 4-1 (Section 4 of this study), indicating that there would be no change in the classification of tonnage if there were no RRF. On the other hand,

without the curbside recycling program there would be no separately collected recyclables.[33] Without a curbside recycling program, recyclables currently collected by municipalities or the Authority are assumed to be collected as garbage/trash by municipalities. That is, the 311,411 tons of City Collected tonnage shown in Table C.15 is equal to the sum of the 294,381 tons of City Collected garbage/trash, the 12,300 tons of City Collected Recyclables, and the 4,760 tons of Authority Collected Recyclables shown in Table 4-1 (or Table C.14).

Similarly, the 572,924 tons of Contractor Collected garbage/trash shown in Table C.15 is equal to the sum of the 525,080 tons of Contractor Collected garbage/trash and the 47,844 tons of Contractor Collected recyclables shown in Table 4-1 (or Table C.14). The 47,663 tons of Self-Hauled garbage/trash shown in Table C.14 is equal to the sum of the 44,502 tons of Self-Hauled garbage/trash and the 3,162 tons of Self-Hauled recyclables in Table 4-1 (or Table C.14). Finally, all of the City and Contractor Collected recyclables are included in the Analyzed MSW stream. Therefore, the 388,844 tons of Contractor Collected Analyzed garbage/trash in Table C.15 is equal to the 341,000 tons of Contractor Collected garbage/trash in Table 4-1 (or Table C.14) plus the 47,844 tons of Contractor Collected recyclables in Table 4-1 (or Table C.14).

The estimated Program Incremental Cost of the RRF in FY 1992 is $15.3 million. For the 438,000 tons of Analyzed MSW that were either combusted at the RRF or recovered as ferrous metals from the RRF, the average Program Incremental cost was $35 per ton. The estimated Program Incremental Cost of the curbside recycling and MRF program in FY 1992 was $10.1 million. For the 61, 460 tons of Analyzed MSW that was recovered and sold or otherwise beneficially used reflects a total of about $164 per ton.

The methodologies and additional assumptions used to estimate these costs are presented below. Refer to Table C.16 for the breakdown of the Program Incremental Costs.

C.6.1 RRF Program Incremental Cost

The RRF Program Incremental Cost is composed of a $1.28 million incremental G&A cost and an $18.1 million incremental RRF cost. The costs are partially offset by an incremental savings of $4.05 million at the landfill.

The $1.28 million G&A incremental cost reflects an assumed added cost for contract administration, director of planning and engineering, director of engineering structures, risk and safety, and environmental programs. It is assumed in this analysis that half of the costs shown in Table B.1 for these G&A expenses are attributable to the RRF.[34] It is further assumed that

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[33] The calculation of the Program Incremental Costs for the curbside recycling and MRF program assumes that other recycling activities would continue. In particular, the Authority would continue to recover ferrous metals and aluminum from garbage/trash delivered to the RRF and mulch and compost from the garbage/trash delivered to the landfills.

[34] Discussions with the SWA indicate that the RRF contributes significantly to the G&A cost; the exact amount, however, is unknown. The relatively small contribution of the incremental G&A costs does not warrant further investigation of these costs to determine the actual amounts attributed to the RRF.

thee were no other G&A increment costs for the RRF. The resulting total incremental G&A cost is $1.68 million. About 75.8 percent of this cost, or about $1.28 million, is attributable to the Analyzed MSW. This percentage is the percentage of all non-G&A cost attributable to the management of the 700,285 tons of Analyzed MSW.

The incremental cost of the RRF includes all of the $16.7 million O&M and about $17.0 million of the capital costs[35] associated with the RRF. This total incremental cost is partially offset by $8.77 million in electricity revenues and $0.238 million in material revenues. The total net incremental cost is, therefore, $24.7 million (i.e., 16.7 + 17.0 - 8.77 - 0.238). Of this amount, about 73.5 percent is attributed to the Analyzed MSW. (This is the ratio of the 635,381 tons of Analyzed MSW to the 863,962 tons of garbage/trash managed in FY 1992.[36]) The $18.1 million incremental cost shown in Table C.16 is approximately equal to $24.7 times 0.735.

The incremental landfill savings occurred because the resource recovery activities reduce the tonnage (and volume) of waste disposed of at the Class I landfill. The $4.05 savings is the 73.5 percent portion of the $5.50 million total estimated savings at the landfill. The total incremental savings consists of the sum of an estimated $0.945 million incremental savings in landfill capital costs, $0.348 million incremental savings in compactor capital costs, $0.578 million incremental savings in landfill operating costs, $2.41 million incremental savings in cell development costs, and $1.22 million incremental savings in closure costs.

The FY 1992 landfill capital cost is estimated to be $1.34 per cubic yard. An estimated 705,000 cubic yards of landfill capacity were saved in FY 1992 as a result of the volume reduction due to combusting garbage/trash, recovering and diverting ferrous metals, and reducing the need for cover material. The $0.945 million estimated savings is equal to 705,000 times $1.34.

Based on information provided by the Authority on the utilization of compactors at the landfill, including required spares, CSI estimated that the RRF reduced the number of compactors required at the landfill by five.[37] Assuming that a compactor costs $375,000 and has a seven-year useful life, the estimated annual capital cost of the compactor, at a 7-percent cost of capital, is $0.348 million.

The $0.578 million savings in landfill operating costs consists of estimated incremental savings of $191,000, $92,100, and $295,000 for compactor O&M, wages and benefits of compactor operators, and cover material, respectively. These estimates were derived from data provided by the Authority on FY 1992 compactor maintenance and operator costs. The cost of the cover material was assumed to be $3.00 per cubic yard.

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[35] The approximately $1.35 million capital costs associated with the purchase and development of the North County Complex would not be saved if there were no RRF. These costs would be reallocated to other activities.

[36] The same ratio would be derived if volume rather than tonnage were used.

[37] The methodology and data used to estimate the number of compactors used at the landfill was adapted from SWA "Financial Impact of Landfill Depletion Due to Plant Outage," October 21, 1993.

The landfill cell development incremental cost of $2.41 million is based on historical costs for earthwork and engineering and construction of about $272,000 per acre, or $3.42 per cubic yard.[38] The RRF saved an estimated 705,000 cubic yards of landfill capacity in FY 1992. The $2.41 million incremental savings is equal to $3.42 times 705,000. The Authority also estimated the cost of closure and post-closure maintenance to be $1.73 per cubic yard. The $1.22 incremental closure savings is equal to $1.73 times 705,000.

C.6.2 Curbside Recycling and MRF Program Incremental Cost

The curbside recycling and MRF Program Incremental Cost consists of a $0.349 million incremental G&A cost, a $9.26 million collection incremental cost, a $0.531 million MRF incremental cost, and a $0.551 million Promotion and Education incremental cost. These costs are partially offset by an incremental savings of $0.637 million at the landfill.

The $0.349 million G&A increment cost reflects the Recycling Services Administration cost shown on Table B.1. It is further assumed that there were no other G&A incremental costs for the RRF. The resulting total incremental G&A cost is $0.366 million. About 95.4 percent of this cost, or about $0.349 million, is attributable to the Analyzed MSW. This percentage is the ratio of 64,904 tons of Analyzed recyclables to the total of 68,066 tons of recyclables.

The estimated incremental collection cost of $9.26 million is by far the most important calculation for estimating the curbside recycling Program Incremental Cost. This cost consists of the incremental collection cost to: (1) the Authority to collect recyclables in five municipalities; (2) the Authority to contract for the collection of recyclables in the unincorporated areas; (3) the municipalities that contract for collection of recyclables; and (4) the municipalities that collect their own recyclables. To this cost is added the Recycling Grant expenditures for such items as collection vehicles and recycling bins. These costs are somewhat offset by the savings incurred by residents to purchase bags, cans, and containers. These incremental costs are shown in Table C.17.

Of particular importance is the fact that when the Authority and the municipalities that contracted for the collection of recyclables implemented their curbside recycling programs, there was no reduction in the cost of collecting garbage/trash. Rather, contractors charge an additional fee for the collection of recyclables. These additional fees represent the incremental collection cost for the Authority and municipalities that contract for collection.[39]

The $1.49 million shown in Table C.17 for the collection of recyclables by the Authority in Lake Worth, West Palm Beach, Belle Glade, Pahokee, and South Bay is the sum of the $1.18

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[38] SWA, "Financial Impact of Landfill Depletion Due to Plant Outage," October 21, 1993.

[39] In 1993, the SWA rebid collection services in the unincorporated areas of the County. This was the first rebid since these contracts were amended to include curbside recycling. Although the total average rates charged for collection were significantly reduced as a result of this rebid, the relative cost of collecting recyclables increased. This further supports that the total fees charged to collect recyclables reflect the incremental collection cost of the curbside recycling program.

Recycling Collection cost for these communities listed in Table B.4, the $0.273 million Recycling Trucks capital cost shown in Table B.9, and the $0.034 million Lease of Recycling Trucks shown in Table B.10.

The $4.76 million paid by the Authority for the curbside collection of recyclables is equal to the portion of the total Mandatory Collection District expenses listed in Table B.4 that were attributed to the collection of recyclables.[40] These values differ from those allocated to Recyclables in Table B.4 because a portion of the cost of collecting garbage/trash is also allocated to the cost of collecting recyclables to account for the recovery and sale of materials from the garbage/trash (e.g., ferrous metals).

The $1.37 million expended by the 23 municipalities that contract for curbside collection of recyclables is the amount calculated in Section C.3.2, as shown in Table C.13. The $0.957 million expended by the 13 municipalities that collect their own MSW was estimated using the same methodology as described in Section C.2.1. This reflects an estimated $23.770 million cost to collect garbage/trash without the curbside recycling programs, as compared to the $24.727 million cost to collect garbage/trash and recyclables with the curbside recycling programs.

The Recycling Grant cost shown in Table C.17 is the $1.04 Recycling Grant cost shown in Table B.4. The $0.359 million savings in plastic bags, garbage cans, and containers resulting from the curbside recycling programs was estimated using the procedure described in Section C.6.1. This savings is the difference between the estimated cost of $5.188 million without the curbside recycling program and the estimated cost of $4.829 million with this program. This savings reflects the substitution of recycling bins for bags, cans, and/or containers. The cost of the bins is included in the costs of recyclables collection.

The incremental cost of the MRF includes all of the $1.36 million O&M and about $0.917 million of the capital cost[41] associated with the MRF. This total incremental cost is partially offset by $1.72 million in material revenues. The total net incremental cost is, therefore, $0.557 million (i.e., 1.36 + 0.917 - 1.72). Of this amount, about 95.4 percent is attributed to the Analyzed MSW. Thus the $0.531 million incremental cost shown in Table C.16 is approximately equal to $0.557 times 0.954.

The total incremental Promotion and Education cost is assumed to be 75 percent of the $0.770 million reported in Table B.8, or $0.578 million. Of this amount, 95.4 percent, or $0.551 million, is attributed to the Analyzed MSW. The remaining Promotion and Education cost was assumed to be expended to support recycling programs other than the curbside recycling program. Similarly, for this analysis it was assumed that all of the $0.145 million Miscellaneous Recycling

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[40] Pellowtiz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Management System," SWA, March 1993, page 11.

[41] The approximately $0.235 million capital cost associated with the purchase and development of the North County Complex would not be saved if there were no MRF. This cost would be reallocated to other activities.

cost reported in Table B.1 was spent to support other recycling programs.[42]

The incremental landfill savings occurred because the curbside recycling and MRF program reduced the tonnage (and volume) of waste disposed of at the Class I landfill. The $0.637 savings is 95.4 percent of the $0.668 million total estimated savings at the landfill. The total incremental savings consists of the sum of an estimated $0.109 million incremental savings in landfill capital costs, $0.0696 million incremental savings in compactor capital costs, $0.0722 million incremental savings in landfill operating costs, $0.277 million incremental savings in cell development costs, and $0.140 incremental savings in closure costs.

The FY 1992 capital cost of the landfills is estimated to be $1.34 per cubic yard. An estimated 81,100 cubic yards of landfill capacity were saved in FY 1992 as a result of the volume reduction due to the recovery and divergence of recovered material. The $0.109 million estimated savings is equal to about 81,100 times $1.34.

Based on the utilization of compactors at the landfill in FY 1992, including required spares, CSI estimated that the curbside recycling program, including the MRF, reduced the number of compactors required at the landfill by one.[43] Assuming that a compactor costs $375,000 and has a seven-year useful life, the estimated annual capital cost of the compactor, at a 7-percent cost of capital, is $69,600.

The $72,200 savings in landfill operating costs consists of an estimated incremental savings of $26,200 and $46,000 for compactor O&M, and wages and benefits of compactor operators, respectively. These estimates were derived from data provided by the Authority on FY 1992 compactor maintenance and operator costs.

The landfill cell development incremental cost of $277,000 is based on historical costs for earthwork and engineering and construction of about $272,000 per acre or $3.42 per cubic yard.[44] The curbside recycling and MRF program saved an estimated 81,100 cubic yards of landfill capacity in FY 1992. The $277,000 incremental savings is equal to $3.42 times 81,100. The Authority also estimated the cost of closure and post-closure maintenance to be $1.73 per cubic yard. The $140,000 incremental closure savings is equal to $1.73 times 81,100.

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[42] The relatively small contribution of these incremental costs does not warrant further investigation of these costs to determine the actual amounts attributed to the curbside program.

[43] The methodology and data used to estimate the number of compactors used at the landfill were adapted from SWA, "Financial Impact of Landfill Depletion Due to Plant Outage," October 21, 1993.

[44] SWA, "Financial Impact of Landfill Depletion Due to Plant Outage," October 21, 1993.

TABLE C.1: STATEMENT OF REVENUES AND EXPENSES
Year Ending September 30, 1992

	AS REPORTED	REPORTED COSTS	ADJUSTED COSTS
OPERATING REVENUES			
Assessments	$86,835,669		
Tipping Fees	14,533,877		
Electrical Generating Revenues	8,651,723	$8,651,723	$8,768,435
Recycling Revenues	1,971,923	1,971,923	1,971,923
Municipal Recycling Program	862,580		
Franchise Fees	492,968		
Other Revenues	32,166		
	113,380,906	10,623,646	10,740,358
OPERATING EXPENSES			
Personal Services	14,660,059	14,660,059	14,660,059
Franchise Hauler Contract Payments	19,951,609	19,951,609	19,951,609
Conrtact Payments to Plant Operator	13,529,280	13,529,280	13,529,280
Depreciation and Amortization	15,306,149	15,306,149	0
Capital Cost			32,575,911
Contractual Services	5,823,891	5,823,891	5,823,891
Repair & Maintenance	2,366,084	2,366,084	2,366,084
Other Expenses	5,683,502	5,683,502	5,800,214
	77,320,574	77,320,574	94,707,048
OPERATING INCOME (EXPENSE)	36,060,332	(66,696,928)	(83,966,690)
NON-OPERATING REVENUES (EXPENSES)			
Interest Income (Bond Proceeds)	3,060,710	3,060,710	0
Interest Income (Other)	3,165,158		
Grant Revenue	2,020,826		
Insurance Proceeds	32,977		
Miscellaneous Income	116,333		
Interest/Lease Expenses	(34,107,750)	(34,107,750)	(34,129)
Landsite Expenses	(5,259,484)	(5,259,484)	(5,259,484)
	(30,971,230)	(36,306,524)	(5,293,613)
NET INCOME (EXPENSE)	$5,089,102	($103,003,452)	($89,260,303)

Source: "Comprehensive Annual Financial Report, SOLID WASTE AUTHORITY of Palm Beach County, Florida, Fiscal Year Ending September 30, 1992."

Note: Interest Income on Bond Proceeds is assumed to be the earnings on the construction and Debt Service funds as reported in SWA, "Combining Schedule of Revenue and Expenses by Fund", September 30, 1992 (Final).

TABLE C.2: TOTAL EXPENSES -SWA OF PALM BEACH COUNTY BY FUND

	AUDITED YEAR END	SWA DETAILED	FUNDS 401	402	403	404	405	406	407	408	410	413	415
OPERATING EXPENSES	28,533,536	28,533,536	30,669	2,811	25,818,300	1,925	879	401	234	0	1,390	57	2,676,881
CONTRACTOR OPERATING FEES	13,529,280	13,529,280	0	0	13,529,281	0	0	0	0	0	0	0	0
FRANCHISE HAULER FEES	19,951,609	19,951,609	0	0	0	0	0	0	0	0	0	0	19,951,609
LANDSITE EXPENSES	5,259,484	5,259,484	46,915	0	0	0	0	4,832,181	6,383	0	374,005	0	0
DEPRECIATION & AMORTIZATION	15,306,149	15,306,149	1,229,410	0	418,146	602,824	0	718,333	2,078,449	875,653	8,983,345	399,989	0
INTEREST	34,107,750	34,107,750	0	0	34,130	34,073,621	0	0	0	0	0	0	0
TOTAL EXPENDITURES	116,687,808	116,687,808	1,306,994	2,811	39,799,856	34,678,370	879	5,550,915	2,085,065	875,653	9,358,740	400,046	22,628,489
OPERATING EXPENSES													
PERSONAL SERVICES	14,660,059	14,660,059											
OTHER OPERATING EXPENSES	5,683,502	5,683,502											
REPAIR, MAINTENANCE & SUPPLIES	2,366,084	2,366,084											
CONTRACTUAL SERVICES	5,823,891	5,823,891											
	28,533,536	28,533,536											

SOURCE: SWA, Computer output entitled "Unit Expenditure Status," Feb. 15, 1993

TABLE C.2: (Cont.) FUND 401 - CONSTRUCTION FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHARGE	TYPE EXPENSE	NOTES
4010003	LANTANA L/F CLOSURE	(49,560)	0	0	0	0	(49,560)		LANDFILL	Land site Expenses/Materials
4010009	SOUTH L/F SITE ACQUIS.	5,465	0	5,465	0	0	0			
4010014	NORTH TRANSFER FACILITY	8,697	0	8,697	0	0	(0)			
4010016	S CNTY L/F CONSTRUCTION	104,871	0	8,396	0	0	96,475		LANDFILL	Landsite Expenses
4010017	W. CENTRAL T/S CONSTRUCTION	301,301	0	301,301	0	0	0			
4014815	INVEST MGT	658,468	554,855	0	102,876	0	737		G&A	Bank Charges
4014852	OFF SVC DEPRECIATION	1,126,534	0	0	1,126,534	0	0			
4010016	S CNTY L/F CONSTRUCTION	29932.5	0	0	0	0	29,933		LANDFILL	Misc.
							0			
							0			
							0			
	TOTAL FUND 401	2,185,708	554,855	323,859	1,229,410	0	77,585	0		

TABLE C.2: (Cont.) FUND 402 - CONSTRUCTION FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHARGE	TYPE EXPENSE	NOTES
4024815	INVESTMENT MANAGEMENT	101,495,892	101,493,172	0	0	0	2,720		G&A	Bank Charges
Adj. #3	OTHER OPERATING EXPENSES	91	0	0	0	0	91		G&A	
	TOTAL FUND 402	101,495,983	101,493,172	0	0	0	2,811	0		

TABLE C.2: (Cont.) FUND 403 - OPERATING FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHARGE	TYPE EXPENSE	NOTES
4031101	OFFICE OF EXECUTIVE DIR.	521,011	0	954	0	0	520,057		G&A	
4031101	MGR DIR ADM ENVIR FIN	189,533	0	2,801	0	0	186,732		G&A	
4033503	SECTION CHEIF-M.I.S.	2,090	0	2,090	0	0	0		G&A	
4034201	DIR PLAN & ENVIR PROMS	165,622	0	70	0	0	165,552		HHW/G&A	
4034211	HAZARDOUS WASTE SVC	313,980	0	3,240	0	0	310,740		HHW/Collection	
4034212	CESDG PROGRAM	13,925	0	0	0	0	13,925		HHW/G&A	
4034231	ENVIR PROG ADM	856,959	0	200,253	0	0	656,706		G&A	
4034251	PLANNING & SPECIAL PROJ	58,098	0	0	0	0	58,098		G&A	
4034313	PUB AFF ADMIN	62,439	0	0	0	0	62,439		PROMO	
4034613	PERSONNEL ADMIN	222,053	0	1,709	0	0	220,344		G&A	
4034713	RISK & SAFETY ADMIN	2,338,118	0	156,405	0	0	2,181,713		G&A	Includes (0287,054) prior year adjustment
4034800	DIR. FINANCIAL SERVICES	125,679	0	0	0	0	125,679		G&A	
4034801	FINANCIAL SERVICES	1,722,398	368,358	16,436	0	34,130	1,305,474		G&A	SEE CAPITAL EXP PG FOR INTEREST
4034831	CUSTOMER SER ADMIN	1,926,960	0	16,517	0	0	1,909,443		G&A	
4034851	PURCHASING ADMIN	336,470	0	500	0	0	335,970		G&A	
4034852	OFFICE SERVICES	639,964	0	9,764	403,306	0	226,894		G&A	
4034871	M I S ADMIN	492,422	0	29,135	0	0	463,287		G&A	
4035101	MGR DIR OPER & SUPPORT	160,826	0	0	0	0	160,826		G&A	
4035102	NCRRF OPS COORD	153	0	0	0	0	153		WTE	Add to other
4035333	DELRAY TRANSFER STA	950	0	0	0	0	950		TFS	
4035602	UTILITY SYSTEMS	5,280	0	5,280	0	0	0		G&A	
4035608	DIR RCYCL CNTRC PUB AFF	83,436	0	0	0	0	83,436		PROMO	
4035613	PUB AFF COMM EDUCATION	459,374	0	27,619	0		431,755		PROMO	
4035632	INVENTORY SVC	3,873	0	0	0	0	3,873		G&A	Add to other Inv. service
4035633	EQUIP MAINT SVC	1,784	0	0	0	0	1,784		G&A	Add to other equipment
4035652	RCYLNG COL CITY LW	200,716	0	4,544	0	0	196,172	17,241	RECCOLL	
4035653	RECYCLING SER ADMIN	404,458	0	10,847	0	0	393,611		G&A	Incl $27,483 of promotion expenses
4035654	RCYLNG COL TRI CITY	136,219	0	0	0	0	136,219		RECCOLL	
4035655	COM'L RCYLNG COLL	63,466	0	3,266	12,843	0	47,358		RECCOLL	
4035657	RECYCLING CENTER	1,362,182	0	0	0	0	1,362,182		MRF	
4035658	RCYLNG COLL WPB	350,453	0	3,245	1,997	0	345,211	19,009	RECCOLL	
4035659	RCYLNG COLLECTION	547,032	0	5,241	0	0	541,791		RECCOLL	
4035660	RECYCLING GRANT	1,284,094	0	78,894	0	0	1,205,200		RECCOLL	Incl promotion/printing $106,206/Tran to Ctrl
4035671	OPERATIONS CONTRACT MGMT	241,736	0	0	0	0	241,736		G&A	
4035673	NCRRF OPS (OPER.CONT)	13,529,281	0	0	0	0	13,529,281		WTE	Contractor Operating Fee
4035673	NCRRF OPS	2,648,609	0	2,990	0	0	2,645,619		WTE	Includes $801,073 prior year adjustment
4035701	DIR ENG CONST UTIL	109,836	0	4,695	0	0	105,141		G&A	
4035703	NCRRF OPS COORD	137,861	0	55	0	0	137,806		WTE	
4035711	DESIGN & CONST ADIM	100,245	0	4,833	0	0	95,412		G&A	
4035712	ENGINEERING SVC	119,042	0	0	0	0	119,042		G&A	
4035731	UTIL OPER & SUP ADMIN	86,825	0	0	0	0	86,825		G&A	
4035732	UTILITY SYSTEMS	608,146	0	25,553	0	0	582,593		G&A	
4035733	LAND APPLIC SVC	199,655	0	2,945	0	0	196,710		SLUDGE	
4035734	COMPOSTING FACILITY	130,993	0	7,840	0	0	123,153		COMP	
4035735	REDUCTION PROGRAM	14,829	0	0	0	0	14,829		MULCH	
4035751	FACILITY MAINTENANCE	315,913	0	5,857	0	0	310,056		G&A	
4035752	GROUNDS MAINT	644,766	0	36,618	0	0	608,148		G&A	
4035753	SO. COUNTY SITE	552,192	0	1,250	0	0	550,942		LANDFILL	
4035801	DIR SW MGT OPER-FLD SVC	86,060	0	17	0	0	86,043		G&A	
4035803	TIRE GRANT	131,027	0	37	0	0	130,990		FACILTIY	
4035811	LAND MGT SVC ADMIN	95,217	0	0	0	0	95,217		G&A	
4035812	CONSTR OPS	412,054	390,774	583	0	0	20,697		G&A	
4035813	LANDFILL OPS	2,144,456	0	22,945	0	0	2,121,511		LANDFILL	
4035815	REDUCTION PROGRAM	197,859	0	10,908	0	0	186,951		MULCH/FACILITY	
4035831	TRANSPT SVC ADMIN	77,233	0	0	0	0	77,233		G&A	
4035832	W. COUNTY TRANS STAT	345,906	0	1,428	0	0	344,478		TFS	
4035833	S. COUNTY TRAN STAT	1,491,653	0	20,610	0	0	1,471,043		TFS	
4035834	CENT. CO TR STAT	1,329,210	0	49,271	0	0	1,279,939		TFS	
4035835	NO CO TR STAT	657,710	0	12,138	0	0	645,572		TFS	
4035836	W CEN TR STAT	5,596	0	345	0	0	5,251		TFS	
4035851	MARINE SUP OPS	1,231,585	1,069,510	53,760	0	0	108,315		LANDFILL	
4035871	MAINT SUPPORT ADMIN	58,645	0	13	0	0	58,632		G&A	
4035872	INVENTORY SVC	292,521	0	67,832	0	0	224,689		G&A	
4035873	EQUIP MAINT SVC	1,245,417	0	5,862	0	0	1,239,555		G&A	
4035901	DIR OPS CONT & BGT	607	0	0	0	0	607		G&A	
4035951	NCRRF OPS	48,810	0	44,792	0	0	4,018		WTE	Add to other ops
4039999	ADJUSTMENT FOR ADM/OH CHARGES					0	(1,754,028)			
	TOTAL FUND 403	44,342,512	1,826,642	981,986	418,146	34,130	39,347,680	36,250		

TABLE C.2: (Cont.) FUND 404 - DEBT SERVICE FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHARGE	TYPE EXPENSE	NOTES
4044815	INVESTMENT MANAGEMENT	37,174,319	2,495,949	0	602,824	34,073,621	1,925		G&A	Bank Charges
						0				
	TOTAL FUND 404	37,174,319	2,495,949	0	602,824	34,073,621	1,925	0		

TABLE C.2: (Cont.) FUND 405 - OPERATING RESERVE FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHG INCLUDED	TYPE EXPENSE	NOTES
4054815	INVESTMENT MANAGEMENT	1,177,855	1,176,976	0	0	0	879		G&A	Bank Charges
	TOTAL FUND 405	1,177,855	1,176,976	0	0	0	879	0		

TABLE C.2: (Cont.) FUND 406 - RENEWAL & REPLACEMENT FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHARGE	TYPE EXPENSE	NOTES
4064231	ENVIR. PROG ADMIN	12,761	0	12,761	0	0	0			
4064815	INVESTMENT MANAGEMENT	94,317	93,917	0	0	0	401		G&A	Bank Charges
4064852	OFFICE SERVICES	718,333	0	0	718,333	0	0			
4065441	LANDFILL OPERATIONS	4,549	0	4,549	0	0	0			
4065812	LAND MANAGEMENT SERVICES	390,774	0	0	0	0	390,774	390,774		Landsite Expenses/See Fund 403
4065813	LANDFILL CLOSURE/DYER	152,378	0	80,902	0	0	71,476		LANDFILL	Landsite Expenses
4065813	LANDFILL CLOSURE/DYER	1,485,946	0	254,479	0	0	1,231,467		LANDFILL	Landsite Expenses
4065813	LANDFILL CLOSURE/DYER	177,636	0	24,087	0	0	153,549		LANDFILL	Landsite Expenses
4065813	LANDFILL CLOSURE/DYER	521,951	0	0	0	0	521,951		LANDFILL	Landsite Expenses
4065813	LANDFILL DEVELOPMENT: ENG	598,171	0	169,252	0	0	428,920		LANDFILL	Landsite Expenses
4065813	LANDFILL DEVELOPMENT: CON	3,639,278	0	1,739,558	0	0	1,899,720		LANDFILL	Landsite Expenses/inc. landfill closure for NC
4065813	STORM WATER CONTROL	47,200	0	18,965	0	0	28,235		LANDFILL	Landsite Expenses
4065832	W. COUNTY TFS	19,576	0	0	0	0	19,576		TFS	Landsite Expenses
4065833	S. COUNTY TFS	10,875	0	0	0	0	10,875		TFS	Landsite Expenses
4065834	CENT. COUNTY TFS	72,577	0	60,202	0	0	12,375		TFS	Landsite Expenses
4065835	N. COUNTY TFS	0	0	0	0	0	0		TFS	Landsite Expenses
4065851	MARINE SUPPORT OPERATIONS	66,639	0	3,375	0	0	63,264		DREDGE	Landsite Expenses
4065872	INVENTORY SERVICES	50	0	50	0	0	0			
							0			
							0			
						0				
						0				
	TOTAL FUND 406	8,013,010	93,917	2,368,179	718,333	0	4,832,582	390,774		

TABLE C.2: (Cont.) FUND 407 - CAPITAL IMPROVEMENT FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS CONTIGENCY	LESS INTEREST	NET	ADMIN OH CHARGE	TYPE EXPENSE	NOTES
4071202	EXECUTIVE SUPPORT	928	0	0	0	0	928		G&A	Landsite Expenses
4074211	HAZARDOUSE WASTE SERVICE	590	0	590	0	0	0			
4074303	INFORMATION & COMMUNICATION	655	0	0	0	0	655		G&A	Landsite Expenses
4074810	FINANCIAL SERVICES	173,835	172,868	734	0	0	234		G&A	Bank Charges
4074830	CONSUMER SERVICES	9,728	0	4,928	0	0	4,800		G&A	Landsite Expenses
4074850	PURCHASING & ASSET MGT	2,089,865	11,416	0	0	0	0			
4074870	MANAGEMENT INFO SERVICES	7,895	0	7,895	0	0	0			
4075602	RECYCLING CENTER	10,080	0	10,080	0	0	0			
4075650	COMMERCIAL RECYCLING	14,970	0	14,970	0	0	0			
4075659	RECYCLING COLLECTION	31,670	0	31,670	0	0	0			
4075733	COMPOSTING	280	0	280	0	0	0			
4075752	GROUND MAINTENANCE	12,898	0	12,898	0	0	0			
4075872	INVENTORY SERVICES	50	0	50	0	0	0			
							0			
	TOTAL FUND 407	2,353,444	184,284	84,095	0	0	6,616	0		

TABLE C.2: (Cont.) FUND 408 - SUBORDINATE INDEBT FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHARGE	TYPE EXPENSE	NOTES
4084852	OFFICE SERVICES	888,853	13,200	0	875,653	0	0			
	TOTAL FUND 408	888,853	13,200	0	875,653	0	0	0		

TABLE C.2: (Cont.) FUND 410 - CONSTRUCTION FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHARGE	TYPE EXPENSE	NOTES
4104815	INVESTMENT MANAGEMENT	421,225	0	0	419,835	0	1,390		G&A	Bank Charges
4100123	INJECTION WELLS	91,858	0	91,858	0	0	0			
4100138	FERROUS METAL PROCESSING	364,680	0	20,000	0	0	344,680		REC	Landsite Expenses
4100139	PROPERTY, PLANT, & EQUIP	30,000	0	2,500	0	0	27,500		G&A	Landsite Expenses
4100141	MATERIALS RECYCLING FACILIT	32,074	0	32,250	0	0	(176)		REC	Landsite Expenses
4100207	ASSESS BILL PGM DEVLP	11,452	0	11,452	0	0	0			
4100137	OFF-SITE IMPROVEMENTS	3,347	0	3,347	0	0	0			
4100116	DRAINAGE	4,500	0	2,500	0	0	2,000		LAND	Landsite Expenses
4104852	OFFICE SERVICES	8,563,510	0	0	8,563,510	0	0			
	TOTAL FUND 410	9,522,647	0	163,907	8,983,345	0	375,395	0		

TABLE C.2: (Cont.) FUND 413 - GENERAL RESERVE FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHARGE	TYPE EXPENSE	NOTES
4134815	INVESTMENT MANAGEMENT	3,957,500	3,957,444	0	0	0	57		G&A	Bank Charges
4134852	OFFICE SERVICES	399,989	0	0	399,989	0	0			
	TOTAL FUND 413	4,357,489	3,957,444	0	399,989	0	57	0		

TABLE C.2: (Cont.) FUND 415 - MANDATORY COLLECTION FUND

ACCOUNT NUMBER	TITLE	TOTAL	LESS TRANSFERS	LESS ENCUMBRANCE	LESS DEPRECIATION	LESS INTEREST	NET	ADMIN OH CHG INCLUDED	TYPE EXPENSE	NOTES
4156100	OUTSIDE LEGAL SVC	23,086	0	0	0	0	23,086		COLLECTION	
4156110	DIST 1 FRANCHISE HAULER FEES	1,278,505	0	0	0	0	1,278,505		COLLECTION	
4156110	DIST 1 OTHER EXPENSES	133,478	0	0	0	0	133,478	107,664	COLLECTION	
4156120	DIST 2 FRANCHISE HAULER FEES	3,487,801	0	0	0	0	3,487,801		COLLECTION	
4156120	DIST 2 OTHER EXPENSES	540,690	0	0	0	0	540,690	373,257	COLLECTION	
4156130	DIST 3 FRANCHISE HAULER FEES	6,130,534	0	0	0	0	6,130,534		COLLECTION	
4156130	DIST 3 OTHER EXPENSES	893,526	0	0	0	0	893,526	488,470	COLLECTION	
4156140	DIST 4 FRANCHISE HAULER FEES	5,341,265	0	0	0	0	5,341,265		COLLECTION	
4156140	DIST 4 OTHER EXPENSES	803,622	0	0	0	0	803,622	484,080	COLLECTION	
4156150	DIST 5 FRANCHISE HAULER FEES	1,087,042	0	0	0	0	1,087,042		COLLECTION	
4156150	DIST 5 OTHER EXPENSES	92,243	0	0	0	0	92,243	87,218	COLLECTION	
4156160	DIST 6 FRANCHISE HAULER FEES	2,253,772	0	0	0	0	2,253,772		COLLECTION	
4156160	DIST 6 OTHER EXPENSES	162,703	0	0	0	0	162,703	150,581	COLLECTION	
4156170	DIST 7 FRANCHISE HAULER FEES	372,691	0	0	0	0	372,691		COLLECTION	
4156170	DIST 7 OTHER EXPENSES	27,012	0	0	0	0	27,012	26,508	COLLECTION	
4156180	DIST 8	204	0	0	0	0	204		COLLECTION	
4156190	DIST 9	316	0	0	0	0	316		COLLECTION	
	TOTAL FUND 415	22,628,489	0	0	0	0	22,628,489	1,717,778		

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
7	North County Complex	SITE 7	17,863,735	40	446,593	1,339,943
7	North County Complex	SITE UTILITY IMP	17,626,556	40	440,664	1,322,153
7	North County Complex	ZONING IMPROVEMENTS	7,781,884	40	194,547	583,712
7	North County Complex	SITE IMPROVEMENTS	13,516,445	40	337,911	1,013,857
15	Administration	HAWORTH MOD FURNITURE	93,458	5	18,692	22,794
15	Administration	BILL & COLLECT SOFTWARE	141,480	5	28,296	34,506
15	Administration	COMPUTER SOFTWARE	38,530	5	0	0
15	Administration	COMPUTER SOFTWARE	21,898	5	0	0
15	Administration	COMPUTER SYSTEM	79,259	5	0	0
15	Administration	MINI CMPTR	33,690	5	0	0
15	Administration	DATA GEN'L MINE	93,546	5	18,709	22,815
15	Administration	SOFTWARE DEVELOPMENT	22,318	5	0	0
15	Administration	SPECIAL ASSESSMENT PRO	48,891	4	12,223	14,434
15	Administration	SPECIAL ASSESSMENT PRO	1,604,409	5	320,882	391,300
15	Administration	SPECIAL ASSESSMENT PRO	2,090,776	5	418,155	509,921
15	Administration	PEERSON BALANCE	55,553	50	1,111	4,025
15	Administration	TELE SYSTEM	86,094	10	8,609	12,258
15	Administration	ADMINISTRATION BLDG	348,696	40	8,717	26,155
15	Administration	AUDIO VISUAL SYSTEM	122,291	10	12,229	17,411
15	Administration	MODULAR FURNITURE	37,886	5	7,577	9,240
15	Administration	ADMINISTRATION BLDG	4,635,107	40	115,878	347,675
15	Administration	MODULAR FURNITURE	25,752	5	5,150	6,281
15	Administration	MODULAR FURNITURE	379,569	10	37,957	54,042
15	Administration	MINI CMPTR	35,000	5	0	0
15	Administration	ADMIN BLDG EQUIP	389,600	25	15,584	33,432
15	Administration	MODULAR FURNITURE	40,734	5	8,147	9,935
20	Belle Glade TFS	WAREHOUSE(GARAGE)	81,378	20	4,069	7,682
20	Belle Glade TFS	CRAWLER DOZER	89,614	8	0	0
20	Belle Glade TFS	HAZARDOUS WASTE BLDG	75,073	40	1,877	5,631
20	Belle Glade TFS	SCALE	25,055	15	1,670	2,751
20	Belle Glade TFS	CASE BACKHOE	61,498	5	12,300	14,999

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
20	Belle Glade TFS	FRONT END LOADER	49,773	5	0	0
21	Delray TFS	TRANS STATION SITE	1,867,908	20	93,395	176,317
21	Delray TFS	STATION COMPACTOR	41,817	5	0	0
21	Delray TFS	STATION COMPACTOR	38,166	5	0	0
21	Delray TFS	TRANSFER STATION	1,764,685	20	88,234	166,574
21	Delray TFS	LOADER	81,049	5	16,210	19,767
21	Delray TFS	ALLIED GRAPPLER	65,000	5	13,000	15,853
21	Delray TFS	BACKHOE LOADER	76,337	5	15,267	18,618
21	Delray TFS	ALLIED GRAPPLER	65,000	5	13,000	15,853
21	Delray TFS	DELRAY HAZ WASTE BLDG	28,240	20	1,412	2,666
21	Delray TFS	WHEEL LOADER	141,610	5	28,322	34,537
21	Delray TFS	IMPROV HAZ WASTE BLDG	35,753	20	1,788	3,375
21	Delray TFS	TRANS STAT SITE IMPROV	525,831	20	26,292	49,635
21	Delray TFS	SO COUNTY TS EQUIP	51,067	5	0	0
25	NC Landfill	FRONT END LOADER	223,936	5	0	0
25	NC Landfill	GRADER	40,000	5	0	0
25	NC Landfill	FRONT END LOADER	110,280	5	0	0
25	NC Landfill	OFF ROAD DUMP TRUCK	79,333	5	15,867	19,349
25	NC Landfill	FRONT END LOADER	144,127	5	0	0
25	NC Landfill	FORKLIFT	21,000	5	4,200	5,122
25	NC Landfill	OFF ROAD DUMP TRUCK	79,333	5	15,867	19,349
25	NC Landfill	FRONT END LOADER	69,000	5	13,800	16,828
25	NC Landfill	HTDRAULIC BAILER	71,910	5	14,382	17,538
25	NC Landfill	POWER SCREEN UNIT W CO	124,500	5	24,900	30,364
25	NC Landfill	PIPE & ANCIL EQ	135,815	10	13,582	19,337
25	NC Landfill	LANDFILL COMPACTOR	271,068	5	54,214	66,111
25	NC Landfill	LANDFILL COMPACTOR	172,694	5	0	0
25	NC Landfill	ISUZU STREET SWEPER	77,995	5	15,599	19,022
25	NC Landfill	PIPE & ANCIL EQ	111,184	10	11,118	15,830
25	NC Landfill	ROME MAULER	450,000	5	90,000	109,751
25	NC Landfill	OPEN TOP TRAILER	33,000	5	6,600	8,048

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
25	NC Landfill	LOWBOY TRAILOR	37,500	5	0	0
25	NC Landfill	LANDFILL COMPACTOR	227,072	5	0	0
25	NC Landfill	SCRAPER PAN	282,154	4	0	0
25	NC Landfill	ROAD TRACTOR	49,500	8	0	0
25	NC Landfill	HYDRAULIC EXCAVATOR	49,448	5	9,890	12,060
25	NC Landfill	HYDRAULIC EXCAVATOR	49,448	5	9,890	12,060
25	NC Landfill	SCALES & PITS (3)	39,698	5	0	0
25	NC Landfill	HYDRAUL EXCAVATOR	119,713	4	0	0
25	NC Landfill	SCRAPER PAN	202,000	5	0	0
25	NC Landfill	HYDRAULIC EXCAVATOR	92,119	5	18,424	22,467
25	NC Landfill	HYDRAULIC EXCAVATOR	49,448	5	9,890	12,060
25	NC Landfill	HYDRAULIC EXCAVATOR	129,000	5	25,800	31,462
25	NC Landfill	TIRE SEGMATIZER W DIES.	202,700	5	40,540	49,437
25	NC Landfill	HYDRAULIC EXCAVATOR	65,338	5	13,068	15,935
25	NC Landfill	OFF ROAD DUMP TRUCK	79,333	5	15,867	19,349
25	NC Landfill	BULL DOZER	252,013	4	0	0
25	NC Landfill	BULL DOZER	163,887	5	0	0
25	NC Landfill	CONVEYOR & SORTER	51,076	5	10,215	12,457
25	NC Landfill	CHAMPION MOTOR GRADER	83,500	5	16,700	20,365
25	NC Landfill	BULL DOZER	160,485	4	0	0
25	NC Landfill	BULL DOZER	135,657	5	0	0
25	NC Landfill	BULL DOZER	163,887	5	0	0
25	NC Landfill	D-4 BULL DOZER	65,990	5	13,198	16,094
25	NC Landfill	BULL DOZER	161,098	4	0	0
25	NC Landfill	BULL DOZER	161,098	4	0	0
25	NC Landfill	BULL DOZER	22,685	5	0	0
25	NC Landfill	BACKHOE	44,700	5	0	0
25	NC Landfill	AIR CURTAIN DESTR	413,506	5	0	0
25	NC Landfill	WATER WAGON	155,490	5	31,098	37,923
25	NC Landfill	WHEELER LOADER W RAKE	205,016	5	41,003	50,001
25	NC Landfill	CRAWLER DOZER	163,887	5	0	0

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
25	NC Landfill	OFF ROAD DUMP TRUCK	199,880	5	39,976	48,749
25	NC Landfill	DUMP TRUCK	182,336	5	36,467	44,470
26	Belle Glade TFS	TRUCK, TRACTOR	66,695	5	13,339	16,266
26	Belle Glade TFS	TOP LOAD TRAILER	38,499	5	0	0
26	Belle Glade TFS	TRANSFER TRAILER 1992	35,000	5	7,000	8,536
26	Belle Glade TFS	TRUCK : RD TRACTOR	59,092	5	11,818	14,412
26	Belle Glade TFS	TRUCK, TRACTOR	66,695	5	13,339	16,266
26	Belle Glade TFS	TRUCK, TRACTOR	66,695	5	13,339	16,266
26	Belle Glade TFS	TRANSFER TRAILER	35000	5	7,000	8,536
26	Belle Glade TFS	TOP LOAD TRAILER	38,499	5	0	0
26	Belle Glade TFS	ROAD TRACTOR	60,747	5	0	0
26	Belle Glade TFS	TRANSFER TRAILER	35000	5	7,000	8,536
26	Belle Glade TFS	TRANSFER TRAILER	35,000	5	7,000	8,536
26	Belle Glade TFS	TRANS TRAILER OPEN TOP	35,000	5	7,000	8,536
26	Delray TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	Delray TFS	ROAD TRACTOR	59,092	5	11,818	14,412
26	Delray TFS	ROAD TRACTOR	59,092	5	11,818	14,412
26	Delray TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	Delray TFS	ROAD TRACTOR	60,747	5	0	0
26	Delray TFS	TRACTOR TRUCK	64,386	5	12,877	15,703
26	Delray TFS	ROAD TRACTOR	60,038	3	0	0
26	Delray TFS	ROAD TRACTOR	59,092	5	11,818	14,412
26	Delray TFS	ROAD TRACTOR	60,747	5	0	0
26	Delray TFS	TRACTOR TRUCK	64,386	5	12,877	15,703
26	Delray TFS	VOLVO ROAD TRACTOR	64,386	5	12,877	15,703
26	Delray TFS	VOLVO ROAD TRACTOR	64,386	5	12,877	15,703
26	Delray TFS	TOP LOAD TRAILER	38,899	5	0	0
26	Delray TFS	TOP LOAD TRAILER	38,499	5	0	0
26	Delray TFS	TRACTOR TRUCK	66,695	5	13,339	16,266
26	Delray TFS	VOLVO ROAD TRACTOR	64,386	5	12,877	15,703
26	Delray TFS	TOP LOAD TRAILER	38,499	5	0	0

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
26	Delray TFS	VOLVO ROAD TRACTOR	64,386	5	12,877	15,703
26	Delray TFS	TOP LOAD TRAILER	38,899	5	0	0
26	Delray TFS	ROAD TRACTOR	60,747	5	0	0
26	Delray TFS	TRACTOR TRUCK	64,386	5	12,877	15,703
26	Delray TFS	TOP LOAD TRAILER	38,899	5	0	0
26	Delray TFS	TRANS TRAILER OPEN TOP	35,000	5	7,000	8,536
26	Delray TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	Delray TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	Delray TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	Delray TFS	TRANSFER TRAILER	35,000	5	7,000	8,536
26	Delray TFS	CRECENT TRAILER	35,000	5	7,000	8,536
26	Delray TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	Delray TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	Delray TFS	TRANSFER TRAILER	37,000	5	7,400	9,024
26	Delray TFS	TRANSFER TRAILER	37,000	5	7,400	9,024
26	Delray TFS	EJECTION TRAILOR	46,900	5	9,380	11,438
26	Delray TFS	TRANSFER TRAILER	34,776	5	6,955	8,482
26	Delray TFS	TRANSFER TRAILER	37,000	5	7,400	9,024
26	Delray TFS	TRANSFER TRAILER	37,000	5	7,400	9,024
26	Lantana TFS	OPEN TOP TRAILER	33,000	5	6,600	8,048
26	Lantana TFS	OPEN TOP TRAILER	33,000	5	6,600	8,048
26	Lantana TFS	TRACTOR TRUCK	64,386	5	12,877	15,703
26	Lantana TFS	OPEN TOP TRAILER	33,000	5	6,600	8,048
26	Lantana TFS	OPEN TOP TRAILER	33,000	5	6,600	8,048
26	Lantana TFS	TRACTOR TRUCK	59,092	5	11,818	14,412
26	Lantana TFS	TRACTOR TRUCK	37,000	5	7,400	9,024
26	Lantana TFS	OPEN TOP TRAILER	33,000	5	6,600	8,048
26	Lantana TFS	ROAD TRACTOR	63,247	5	12,649	15,425
26	Lantana TFS	OPEN TOP TRAILER	33,000	5	6,600	8,048
26	Lantana TFS	ROAD TRACTOR	63,247	5	12,649	15,425
26	Lantana TFS	ROAD TRACTOR	61,327	5	0	0

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
26	Lantana TFS	ROAD TRACTOR	61,215	3	0	0
26	Lantana TFS	ROAD TRACTOR	60,747	5	0	0
26	Lantana TFS	ROAD TRACTOR	63,247	5	12,649	15,425
26	Lantana TFS	ROAD TRACTOR	63,247	5	12,649	15,425
26	Lantana TFS	OPEN TOP TRAILER	33,000	5	6,600	8,048
26	Lantana TFS	ROAD TRACTOR	63,247	5	12,649	15,425
26	Lantana TFS	OPEN TOP TRAILER	33,000	5	6,600	8,048
26	Lantana TFS	ROAD TRACTOR	60,747	5	0	0
26	Lantana TFS	ROAD TRACTOR	63,247	5	12,649	15,425
26	Lantana TFS	TRANSFER TRAILER	34,776	5	6,955	8,482
26	Lantana TFS	ROAD TRACTOR	63,247	5	12,649	15,425
26	Lantana TFS	ROAD TRACTOR	63,247	5	12,649	15,425
26	Lantana TFS	OPEN TOP TRAILER	33,000	5	6,600	8,048
26	Lantana TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	Lantana TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	Lantana TFS	EJECTION TRAILER	46,900	5	9,380	11,438
26	N. County TFS	ROAD TRACTOR TRUCK	59,092	5	11,818	14,412
26	N. County TFS	TRANSFER TRAILER	37,000	5	7,400	9,024
26	N. County TFS	TRANSFER TRAILER	37,000	5	7,400	9,024
26	N. County TFS	ROAD TRACTOR TRUCK	59,092	5	11,818	14,412
26	N. County TFS	TRANSFER TRAILER	35,000	5	7,000	8,536
26	N. County TFS	TRANSFER TRAILER	35,000	5	7,000	8,536
26	N. County TFS	TRANSFER TRAILER	35,000	5	7,000	8,536
26	N. County TFS	ROAD TRACTOR TRUCK	59,092	5	11,818	14,412
26	N. County TFS	ROAD TRACTOR TRUCK	59,092	5	11,818	14,412
26	N. County TFS	TRANSFER TRAILER	35,000	5	7,000	8,536
26	N. County TFS	ROAD TRACTOR TRUCK	59,092	5	11,818	14,412
26	N. County TFS	ROAD TRACTOR	61,327	5	0	0
26	N. County TFS	TRANSFER TRAILER	35,000	5	7,000	8,536
26	N. County TFS	TRANSFER TRAILER	35,000	5	7,000	8,536
27	Collection Vehicles	LABRIE RECYCLING TRUCK	73,333	5	14,667	17,885

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
27	Collection Vehicles	LABRIE RECYCLING TRUCK	50,160	4	12,540	14,809
27	Collection Vehicles	LABRIE RECYCLING TRUCK	83,026	5	16,605	20,249
27	Collection Vehicles	LABRIE RECYCLING TRUCK	92,720	5	18,544	22,614
27	Collection Vehicles	LABRIE RECYCLING TRUCK	22,451	5	4,490	5,476
27	Collection Vehicles	LABRIE RECYCLING TRUCK	27,709	4	6,927	8,180
27	Collection Vehicles	LABRIE RECYCLING TRUCK	92,720	5	18,544	22,614
27	Collection Vehicles	RECYCLING TRUCK	73,132	5	14,626	17,836
27	Collection Vehicles	LABRIE RECYCLING TRUCK	73,333	5	14,667	17,885
27	Collection Vehicles	LABRIE RECYCLING TRUCK	83,026	5	16,605	20,249
27	Collection Vehicles	RECYCLING TRUCK AMPI	27,060	5	5,412	6,600
27	Collection Vehicles	LABRIE RECYCLING TRUCK	83,026	5	16,605	20,249
27	Collection Vehicles	RECYCLING TRUCK AMPI	27,060	5	5,412	6,600
27	Collection Vehicles	LABRIE RECYCLING TRUCK	83,026	5	16,605	20,249
27	Collection Vehicles	TRUCK TRACTOR	64,386	5	12,877	15,703
27	NC Landfill	RECYCLING TRUCK	73,132	5	14,626	17,836
27	NC Landfill	RECYCLING TRUCK	73,132	5	14,626	17,836
28	Collection Vehicles	TRAILER PACKER	25,000	5	0	0
28	Collection Vehicles	GARBAGE TRUCK	110,044	5	22,009	26,839
28	Collection Vehicles	TRAILER OPEN TOP	41,898	8	0	0
28	Collection Vehicles	TRAILER PACKER	22,000	5	0	0
28	Collection Vehicles	TRAILER PACKER	22,000	5	0	0
28	Collection Vehicles	TRAILER PACKER	30,600	5	0	0
28	Collection Vehicles	REFUSE TRUCK	110,044	5	22,009	26,839
28	Collection Vehicles	TRAILER PACKER	22,000	5	0	0
28	Collection Vehicles	OSHKOSH TRUCK	129,069	5	25,814	31,479
29	NC Landfill	TIRE CUTTER	33,875	5	6,775	8,262
29	NC Landfill	TUB GRINDER	144,350	5	28,870	35,206
29	NC Landfill	TUB GRINDER	174,953	5	34,991	42,669
29	NC Landfill	LGE TIRE CUTTER	22,901	5	4,580	5,585
29	NC Landfill	48 INCH MAGNET	29,565	5	5,913	7,211
31	Dyer Landfill	ROADWAY BASE	48,330	5	0	0

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
31	Dyer Landfill	RADIO EQUIPMENT	21,764	5	0	0
31	Dyer Landfill	IMRF	51,608	10	5,161	7,348
31	Dyer Landfill	LANTANA L/F LAKE ACQ	342,000	40	8,550	25,653
31	Dyer Landfill	ROADWAYS & SCALES	207,801	3	0	0
31	Dyer Landfill	IMRF	46,849	5	9,370	11,426
31	Dyer Landfill	SCALE HOUSE	53,163	25	2,127	4,562
31	Dyer Landfill	ROADWAY WEARING SRFC	28,120	3	0	0
31	Dyer Landfill	IMRF	35,105	10	3,511	4,998
31	Dyer Landfill	WASTE DISCHARGE STRC	305,580	20	15,279	28,845
31	Dyer Landfill	CAPITALIZED REPAIRS	58,636	1	0	0
33	Lantana TFS	RUBBER TIRE LOADER	121,642	5	24,328	29,667
33	Lantana TFS	LANTANA CITIZEN CONV	85,509	20	4,275	8,071
33	Lantana TFS	STATIONARY COMPACTOR	50,330	5	10,066	12,275
33	Lantana TFS	MAIN BOOM ASSEMBLY	41,700	5	8,340	10,170
33	Lantana TFS	STATIONARY COMPACTOR	50,330	5	10,066	12,275
33	Lantana TFS	LANTANA SCALE HOUSE	115,220	20	5,761	10,876
33	Lantana TFS	BACKHOE	58,864	5	11,773	14,356
33	Lantana TFS	TS EQUIP GRAPPLE	87,000	5	17,400	21,218
33	Lantana TFS	TS EQUIP GRAPPLE	87,000	5	17,400	21,218
33	Lantana TFS	BACKHOE LOADER	76,337	5	15,267	18,618
33	Lantana TFS	LANTANA CITIZEN CONV	58,610	5	11,722	14,294
33	Lantana TFS	LANTANA TRF FACILITY	1,628,380	20	81,419	153,708
33	Lantana TFS	LANTANA TRF FACILITY	1,789,133	15	119,276	196,437
33	Lantana TFS	LANTANA TRF FACIL SI	710,610	5	142,122	173,311
33	Lantana TFS	LANTANA TRF FACILITY	2,813,585	20	140,679	265,583
33	Lantana TFS	LANTANA TRF FACILITY	54,381	1	54,381	58,188
35	W. Central County TFS Site	WEST COUNTY TS SITE	2,012,355	40	50,309	150,945
50	Maintenance Building	N CNTY TRANS FACILITY	1,204,853	15	80,324	132,286
50	N. County TFS	N COUNTY TS IMPROV	1,514,057	20	75,703	142,916
50	N. County TFS	N COUNTY TS EQUIP	81,000	10	8,100	11,533
50	N. County TFS	FRONT END LOADER	23,023	5	0	0

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
50	N. County TFS	EXCAVATOR	113,000	5	22,600	27,560
50	N. County TFS	WHEEL LOADER	141,610	5	28,322	34,537
50	N. County TFS	NO COUNTY TS	6,253,707	20	312,685	590,306
50	N. County TFS	N COUNTY SCALEHOUSE	382,075	20	19,104	36,065
50	N. County TFS	CASE BACKHOE	61,498	5	12,300	14,999
53	NCRRRF	NCRRF BUILDING	609,761	40	15,244	45,738
53	NCRRRF	NCRRF BUILDING	1,307,246	40	32,681	98,055
53	NCRRRF	NCRRF EQUIPMENT	28,708,000	25	1,148,320	2,463,448
53	NCRRRF	NCRRF BUILDING	4,301,169	40	107,529	322,627
53	NCRRRF	NCRRF	148,026,553	40	3,700,664	11,103,344
53	NCRRRF	SPRINKLER SYSM NCRRF BL	200,000	10	20,000	28,476
53	NCRRRF	NCRRF EQUIPMENT	646,000	5	129,200	157,553
53	NCRRRF	SEMI TRAILOR	39,489	5	7,898	9,631
53	NCRRRF	NCRRF EQUIPMENT	6,531,000	35	186,600	504,415
53	NCRRRF	SCALEHOUSE	1,281,157	25	51,246	109,937
53	NCRRRF	NCRRF EQUIPMENT	26,533,796	30	884,460	2,138,263
53	NCRRRF	SCALEHOUSE EQUIPMENT P	203,532	15	13,569	22,347
53	NCRRRF	SEMI TRAILOR	39,489	5	7,898	9,631
55	Dredging	TENDER BOAT	44,518	10	4,452	6,338
55	Dredging	950B W RUBBER TIRE	57,500	5	11,500	14,024
55	Dredging	72 INCH DREDGE PIPE	54,918	5	10,984	13,394
55	Dredging	DERRICK BARGE	95,200	5	19,040	23,218
55	Dredging	CUTTER HEAD	40,171	5	8,034	9,797
55	Dredging	DREDGE PUMP	172,747	5	34,549	42,131
55	Dredging	DIESEL ENGINE	50,000	5	10,000	12,195
55	Dredging	BULL DOZER	259,298	5	0	0
55	Dredging	DREDGE ELECTRA	1,600,000	5	320,000	390,225
55	Dredging	DREDGE	357,490	5	71,498	87,188
55	Dredging	DREDGE	25,957	5	0	0
55	Dredging	DREDGE	28,569	10	2,857	4,068
55	Dredging	DREDGE	22,856	5	0	0

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
55	Dredging	DREDGE	1,112,558	10	111,256	158,403
55	Dredging	DRAGLINE	100,000	3	0	0
55	Dredging	24" BUTT FUSION MACHINE	72,330	5	14,466	17,641
55	Dredging	PIPE & ANCIL EQUIP	23,944	10	2,394	3,409
55	Dredging	HDPE DREDGE PIPE	66,440	5	13,288	16,204
55	Dredging	FORKLIFT	21,000	5	4,200	5,122
55	Dredging	HALON FIRE SUPPRES	28,799	5	5,760	7,024
55	Dredging	PARTS FORK BLADE F/ENGI	50,003	5	10,001	12,195
55	Dredging	SCRAPER PAN	139,958	2	0	0
60	Utility	UTILITY BLDG	172,999	40	4,325	12,977
60	Utility	SITE UTILITIES EQUIP	217,300	25	8,692	18,647
60	Utility	UTILITY BLDG	1,233,913	40	30,848	92,555
60	Utility	SITE UTILITIES EQUIP	33,840	20	1,692	3,194
65	HHW building	F700 CAB & CHASSIS	29,972	5	5,994	7,310
65	HHW building	HAZ WASTE BLDG	667,527	40	16,688	50,071
65	HHW building	HAZ WASTE EQUIP	122,757	20	6,138	11,587
65	HHW building	HAZ WASTE IMPROVE	43,189	25	1,728	3,706
70	Maintenance Building	TRUCK SERVICE 1981	23,593	5	4,719	5,754
70	Maintenance Building	TRUCK FWD SERVICE	25,523	4	0	0
70	Maintenance Building	TRUCK FWD SERVICE	35,818	3	0	0
70	Maintenance Building	TRK BODY W EQUIP	49,724	5	9,945	12,127
70	Maintenance Building	TRUCK FWD SERVICE	25,523	4	0	0
70	Maintenance Building	HEAVY DUTY LIFTS	48,995	5	9,799	11,949
70	Maintenance Building	WORK STAT FURNITURE	20,316	5	0	0
70	Maintenance Building	FORK LIFT	22,150	5	0	0
70	Maintenance Building	4WD TRUCK	23,593	5	4,719	5,754
70	Maintenance Building	MAINTENANCE BLDG	3,986,099	40	99,652	298,994
70	Maintenance Building	FLD EQUIP TRK MTD	30,868	5	0	0
70	Maintenance Building	MAINT BLDG EQUIP	612,868	25	24,515	52,591
71	Ground Maintenance	72" CUT MOWER	32,500	5	6,500	7,926
71	Ground Maintenance	TRUCK : SERVICE	33,200	5	6,640	8,097

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
71	Ground Maintenance	FORD TRACTOR	40,930	5	8,186	9,982
71	Ground Maintenance	MOWER	27,460	5	5,492	6,697
71	Ground Maintenance	TRACTOR MOWER	31,367	5	0	0
71	Ground Maintenance	BACKHOE LOADER W BKT	25,412	5	5,082	6,198
71	Ground Maintenance	HYDRAULIC LAUDER	23,650	5	4,730	5,768
72	Ground Maintenance	STORM SHUTTERS	26,597	5	5,319	6,487
75	Collection Vehicles	TRANSIT BUS	60,235	5	12,047	14,691
75	Collection Vehicles	RECYCLING CRANE BODY	33,210	5	6,642	8,100
75	Collection Vehicles	COMPACTOR TRUCK	48,785	5	9,757	11,898
75	Collection Vehicles	RECYCLING CRANE TRK	48,785	5	9,757	11,898
75	Collection Vehicles	RAND COMPACTOR	30,330	5	6,066	7,397
75	Collection Vehicles	T/S EQUIP:GRAPPLE	29,171	5	5,834	7,115
75	Collection Vehicles	RECYCLING CRANE BODY	33,210	5	6,642	8,100
75	Collection Vehicles	40X600 OPEN METAL BLDG	31,374	5	6,275	7,652
75	Collection Vehicles	80X120X16 BLDG	39,524	5	7,905	9,640
75	Collection Vehicles	FOUNDATION FOR RECY	23,000	5	4,600	5,609
75	Collection Vehicles	FRONT END LOADER	28,297	5	5,659	6,901
75	Collection Vehicles	SERVICE TRUCK	29,410	5	5,882	7,173
75	Collection Vehicles	TRUCK REAR LOAD CONTAI	44,196	5	8,839	10,779
75	Collection Vehicles	T/S EQUIP:GRAPPLE	29,171	5	5,834	7,115
75	Collection Vehicles	40X600 OPEN METAL BLDG	23,655	5	4,731	5,769
75	Collection Vehicles	TRUCK: RECYC. HAULER	61,790	5	12,358	15,070
85	Composting	USED SCREEN UNIT	42,250	5	8,450	10,304
85	Composting	MICHIGAN LOADER	81,049	5	16,210	19,767
85	Composting	LOADER: FRONT END	70,826	5	0	0
85	Composting	COMPOST AGITATION SYST	148,500	10	14,850	21,143
85	Composting	SKID STEER LOADER	21,830	5	4,366	5,324
85	Composting	SLUDGE VAN(TRAILER)	41,195	5	8,239	10,047
85	Composting	TRACTOR: FARM TYPE	34,614	5	6,923	8,442
85	Composting	TRACTOR: FARM	33,126	5	0	0
85	Composting	TRACTOR: ROAD	61,215	3	0	0

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
85	Composting	SLUDGE SPREADER EQUIP	85,811	5	17,162	20,929
85	Composting	SLUDGE SPREADER EQUIP	43,654	5	8,731	10,647
85	Composting	SLUDGE/COMPOST MIXER	25,492	5	5,098	6,217
85	Composting	FARM TRACTOR	38,200	5	7,640	9,317
85	Composting	TRACTOR: FARM TYPE	26,552	5	5,310	6,476
85	Composting	COMPOST TEMP CONTROL	250,000	10	25,000	35,594
85	Composting	TRACTOR: ROAD	49,500	8	0	0
85	Composting	COMPOSTING BLDG IMPROV	74,726	20	3,736	7,054
85	Composting	COMPOSTING BLDG	1,257,282	20	62,864	118,679
85	Composting	TRANSFER TRAILER	37,000	5	7,400	9,024
85	Composting	COMPOSTING BLDG	133,676	20	6,684	12,618
85	Composting	IRRIGATION UNIT/TURN	28,075	5	5,615	6,847
90	S. County Site	S. COUNTY L/F SITE BOCA	6,594,801	40	164,870	494,670
90	S. County Site	SITE 1 NURSURY PLANTS (B	2,244,968	40	56,124	168,393
90	S. County Site	S. COUNTY L/F SITE BOCA	64,556	40	1,614	4,842
90	S. County Site	S. COUNTY L/F SITE BOCA	22,378,459	40	559,461	1,678,589
90	S. County Site	S. COUNTY L/F SITE BOCA	511,190	18	28,399	50,819
95	Materials Recovery Facility	MR EQUIPMENT	69,871	5	13,974	17,041
95	Materials Recovery Facility	FORKLIFT	78,377	7	11,197	14,543
95	Materials Recovery Facility	MR PROCESSING SYSTEM	236,955	10	23,696	33,737
95	Materials Recovery Facility	MR FEED SYSTEM	139,743	10	13,974	19,896
95	Materials Recovery Facility	NON-FERROUS SEPARATOR	130,630	10	13,063	18,599
95	Materials Recovery Facility	NON-FERROUS SEP	130,630	10	13,063	18,599
95	Materials Recovery Facility	MR EQUIPMENT	190,780	5	38,156	46,529
95	Materials Recovery Facility	ELECTRICAL EQUIP	66,226	10	6,623	9,429
95	Materials Recovery Facility	MR ELECTRIAL EQUIP	67,441	10	6,744	9,602
95	Materials Recovery Facility	LOADERS	147,304	7	21,043	27,333
95	Materials Recovery Facility	PAPER SORT CONVEYOR	66,226	10	6,623	9,429
95	Materials Recovery Facility	BALER/FEED CONVEYOR	298,929	10	29,893	42,561
95	Materials Recovery Facility	BALER/FEED CONVEYOR	298,932	10	29,893	42,561
95	Materials Recovery Facility	MATERIAL RECYCLING FACI	4,020,890	15	268,059	441,472

TABLE C.3: ASSETS - SWA OF PALM BEACH COUNTY, FLORIDA (FY92)

LOCATION NUMBER	LOCATION	ASSET DESCRIPTION	COST	EST LIFE YEARS	EPRECIATION MORTIZATIO	ANNUALIZED COST
95	Materials Recovery Facility	ELECTRICAL EQUIPMENT	66,226	10	6,623	9,429
95	Materials Recovery Facility	MISC. ROLLING STOCK/TOO	41,558	5	8,312	10,136
95	Materials Recovery Facility	DENSIFIER	56,140	5	11,228	13,692
95	Materials Recovery Facility	PAPER SORT CONVEYOR	66,226	10	6,623	9,429
95	Materials Recovery Facility	GLASS BENIFICATION SYST	144,603	10	14,460	20,588
95	Materials Recovery Facility	SPARES	104,504	5	20,901	25,488
95	Materials Recovery Facility	MRF IMPROVEMENTS	702,538	15	46,836	77,135
		TOTAL ITEMIZED	378,895,192		14,777,270	32,871,287
		TOTAL SWA ASSETS	385,113,681		15,306,149	33,664,672
		BALANCE	6,218,489		528,879	793,385
		PERCENT ITEMIZED	98.4%		96.5%	97.6%

SOURCE: SWA, Computer output entitled "Fixed Assets by Location," Feb. 17, 1993.

TABLE C.4: ESTIMATION OF THE NORTH COUNTY LANDFILL AQUISITION AND DEVELOPMENT COST

PROJECT COST COMPONENT	TOTAL COST	LANDFILL ALLOCATION PERCENT	LANDFILL COST
N. County Landfill Development	4,045,155	100.0%	4,045,155
Land Aquisition	17,589,243	84.5%	14,864,707
Scale Houses and Scales	1,762,164	50.0%	881,082
Injection Wells	5,772,254	29.1%	1,676,840
Landscaping	5,225,057	33.3%	1,741,511
Jog Road	2,953,064	35.5%	1,047,836
45th Street Widening	4,199,737	35.5%	1,490,193
Wetland Mitigation and SWM	2,056,291	84.5%	1,737,776
Offsite Mitigation	409,659	84.5%	346,204
Project Coordination	3,722,831	3.3%	120,992
Subtotal	47,735,455	58.6%	27,952,296

Source: Pellowitz, Dan, "The Estimated Costs of the Components of the Authority's Integrated Solid Waste Manatgement System", March 1993, page 6.

Notes: The bases for determining landfill allocation percent:

N. County Landfill Development: Reconsiled total

Land Aquisition: Percente of functional area

Scale Houses and Scales: Half of cost of 2 scale facilities

Injection Wells: Estimated percent of total wastewater

Landscaping: One third to landfills

Jog Road: Percent of waste, by volume, hauled to and within complex

45th Street Widening: Percent of waste, by volume, hauled to and within complex

Wetland Mitigation and SWM: Percent of functional area

Offsite Mitigation: Percent of functional area

TABLE C.5: NORTH COUNRY COMPLEX FUNCTIONAL ACRES

	ACRES	PERCENT	ACRES	PERCENT
Total Functional Area	**607.53**	**100.0%**	**64.12**	**100.0%**
Landfill Area	305.58	50.3%	-	-
NCRRRF Area	40.00	6.6%	40.00	62.4%
MRF Area	6.94	1.1%	6.94	10.8%
HHW Area	1.47	0.2%	1.47	2.3%
Administration Builing Area	6.71	1.1%	6.71	10.5%
Maintenance Building Area	5.90	1.0%	5.90	9.2%
Dredge Lakes Area	237.83	39.1%	-	-
Compost Facility Area	3.10	0.5%	3.10	4.8%
Total NC Complex Land Area	**1,320.00**			

Source: Telephone coversation with D. Pellowitz, August 1993.

Note: Acres obtained from CAD analysis of site.

TABLE C.6: DATA FOR MUNICIPALITIES THAT COLLECT THEIR OWN MSW

MUNICIPALITY	POPULATION		GARBAGE/TRASH		POPULATION		RECYCLABLES	
	TOTAL 1992	SAMPLE COMMUNITIES	TOTAL	SAMPLE COMMUNITIES	TOTAL 1992	SAMPLE COMMUNITIES	TOTAL	SAMPLE COMMUNITIES
Atlantis	1,653		(1)		1,653		(1)	
Belle Glade	16,105		15,926					
Boca Raton	63,224	63,224	44,681	44,681	61,492	61,492	6,289	6,289
Boynton Beach	48,144	48,144	49,107	49,107	46,284	46,284	1,917	1,917
Lake Park	6,639	6,639	8,151	8,151	6,704	6,704	572	572
Lake Worth	28,387	28,387	21,725	21,725				
Lantana	8,396		7,782		8,392		676	
North Palm Beach	11,747	11,747	10,005	10,005	11,343	11,343	754	754
Pahokee	6,871		4,702					
Palm Beach	9,819		11,014		9,814		623	
Palm Springs	9,706		5,684		9,763		708	
Riviera Beach	27,128		31,152		27,644		761	
West Palm Beach	68,270		81,602					
Total	304,436	158,141	291,531	133,669	183,089	125,823	12,300	9,532
Percent of Total		51.9%		45.9%		68.7%		77.5%

SOURCES:

1. SWA, "Palm Beach County Solid Waste Services, Municipal and Unicorporated", undated.
2. Bureau of the Census, "Population and Housing Unit Counts, Florida", 1990 Census of Population and Housing, U.S. Department of Commerce, Issued April 1993.
3. SWA, "Customer Tonnage Reports for 10/01/91 through 09/30/92."

NOTES:

1. The Town of Lantana collects garbage/trash and recyclables for the City of Atlantis.
2. The SWA contracts with private haulers for collection of recyclables in Belle Glade and Pahokee.
3. The SWA collects recyclables in Lake Worth and West Palm Beach.

TABLE C.7: TOTAL COLLECTION COSTS FOR SELECTED MUNICIPALITIES IN PALM BEACH COUNTY (FY92)

COST ITEM	LAKE WORTH	LAKE PARK	BOCA RATON	N. PALM BEACH	BOYTON BEACH
General and Administrative (G&A)					
City G&A	90,150	147,768	405,103	102,091	438,198
Dept. G&A	93,778	19,842	23,768	42,523	81,448
Subtotal G&A	183,928	167,610	428,872	144,613	519,646
Salaries & Fringe Benefits	1,419,054	266,375	2,363,111	541,877	1,568,200
Operation and Maintenance (O&M)					
Contract Services	89,503	0	0	0	0
Insurance	100,150	0	20,700	27,343	206,965
Fuel & Oil	32,783	0	37,820	28,497	(incl. R&M)
Utilities (e.g., elect., telephone)	0	0	2,885	0	1,045
Repair & Maintenance (Vehicles)	310,654	53,461	156,781	37,241	354,192
Repair and Maintenance (Other)	4,810	0	5,323	328	28,627
Rents/Leases (Equipment)	0	0	120	2,409	0
Rents/Leases (Blds. & Land)	214,879	73,231	302,096	72,948	245,548
Other (inc. unallocated expenses)	36,186	244,840	53,586	7,217	55,733
Subtotal O&M	788,965	371,532	579,311	175,983	892,110
Captial and Interest Expenses					
Interest	0	0	0	0	0
Capital Cost (Annualization)	155,649	167,633	380,638	84,570	240,721
Subtotal Capital Expenses	155,649	167,633	380,638	84,570	240,721
Total Collection Expenses	2,547,596	973,150	3,751,933	947,043	3,220,678
Population (1992)	28,387	6,639	63,224	11,747	48,144
Tonnage	21,747	8,740	50,970	10,827	51,098
Average Cost per Person	$89.75	$146.58	$59.34	$80.62	$66.90
Average Cost per Ton	$117.15	$111.34	$73.61	$87.47	$63.03

NOTES:

1. The allocation of G&A is based on the percentage of non-G&A expenses.
2. Lake Worth G&A calculated by the Town.

TABLE C.8: GARBAGE COLLECTION COSTS FOR SELECTED MUNICIPALITIES IN PALM BEACH COUNTY (FY92)

COST ITEM	LAKE WORTH	LAKE PARK	BOCA RATON	N. PALM BEACH	BOYTON BEACH
General and Administrative (G&A)					
City G&A	90,150	119,900	328,525	95,285	375,685
Dept. G&A	93,778	16,100	19,275	39,688	69,829
Subtotal G&A	183,928	136,000	347,801	134,972	445,514
Salaries & Fringe Benefits	1,419,054	222,244	1,879,748	505,752	1,357,097
Operation and Maintenance (O&M)					
Contract Services	89,503	-	-		-
Insurance	100,150	-	16,466	25,520	179,308
Fuel & Oil	32,783	-	35,272	26,597	(incl.)
Utilities (e.g., elect., telephone)		-	2,295		904
Repair & Maintenance (Vehicles)	310,654	42,769	148,421	34,759	312,522
Repair and Maintenance (Other)	4,810	-	4,234	306	28,627
Rents/Leases (Equipment)		-	96	2,248	-
Rents/Leases (Blds. & Land)	214,879	59,420	244,990	68,085	210,519
Other (inc. unallocated expenses)	36,186	209,885	42,625	6,736	29,206
Subtotal O&M	788,965	312,075	494,399	164,251	761,087
Captial and Interest Expenses					
Interest	0	0	0	0	0
Capital Cost (Annualization)	155,649	119,305	320,746	78,932	197,522
Subtotal Capital Expenses	155,649	119,305	320,746	78,932	197,522
Total Garbage Collection Expenses	2,547,596	789,624	3,042,693	883,907	2,761,219
Population (1992)	28,387	6,639	63,224	11,747	48,144
Tonnage	21,747	8,168	44,681	10,073	49,181
Average Cost per Person	$89.75	$118.94	$48.13	$75.25	$57.35
Average Cost per Ton	$117.15	$96.67	$68.10	$87.75	$56.14

NOTES:

1. The allocation of G&A is based on the percentage of non-G&A expenses.
2. Lake Worth G&A calculated by the Town.
3. Tonnages includes some other wastes, which are collected by the municipalities.

TABLE C.9: RECYCLABLES COLLECTION COSTS FOR SELECTED MUNICIPALITIES IN PALM BEACH COUNTY (FY92)

COST ITEM	LAKE WORTH	LAKE PARK	BOCA RATON	N. PALM BEACH	BOYTON BEACH
General and Administrative (G&A)					
City G&A		27,867	76,578	6,806	62,513
Dept. G&A		3,742	4,493	2,835	11,619
Subtotal G&A		31,609	81,071	9,641	74,132
Salaries & Fringe Benefits		44,131	483,364	36,125	211,103
Operation and Maintenance (O&M)					
Contract Services		-			-
Insurance		-	4,234	1,823	27,657
Fuel & Oil		-	2,548	1,900	(incl.)
Utilities (e.g., elect., telephone)		-	590		141
Repair & Maintenance (Vehicles)		10,692	8,360	2,483	41,670
Repair and Maintenance (Other)		-	1,089	22	0
Rents/Leases (Equipment)		-	25	161	-
Rents/Leases (Blds. & Land)		13,811	57,106	4,863	35,030
Other (inc. unallocated expenses)		34,955	10,961	481	26,527
Subtotal O&M		59,457	84,913	11,732	131,024
Captial and Interest Expenses					
Interest		0	0	0	0
Capital Cost (Annualization)		48,328	59,892	5,638	43,199
Subtotal Capital Expenses		48,328	59,892	5,638	43,199
Total Recyclables Collection Expenses		183,526	709,240	63,136	459,458
Population (1992)	28,387	6,639	63,224	11,747	48,144
Tonnage	0	572	6,289	754	1,917
Average Cost per Person	NA	27.64	11.22	5.37	9.54
Average Cost per Ton	NA	320.85	112.77	83.74	239.68

NOTES:

1. The allocation of G&A is based on the percentage of non-G&A expenses.
2. Lake Worth G&A calculated by the Town.

TABLE C.10: ESTIMATED CITY GARBAGE/TRASH COLLECTION COSTS

CITY	TONS	COST	COST/TON
Atlas/Lantana	7,782	1,049,453	135
Belle Glade	15,926	1,459,341	92
Boca Raton	44,681	2,906,580	65
Boynton Beach	49,107	3,129,340	64
Lake Park	8,151	1,068,025	131
Lake Worth	21,747	1,752,312	81
N. Palm Beach	10,005	1,161,337	116
Pahokee	4,702	894,437	190
Palm Beach	11,014	1,212,120	110
Palm Springs	5,684	943,861	166
Riviera Beach	31,152	2,225,665	71
W. Palm Beach	81,602	4,764,814	58
Total (Based on Regression)	291,553	22,567,282	77
Total (Based on Average)		21,836,610	75

NOTES:

1. Estimate includes annualization of Capital Outlays
2. Allocation of G&A based on Non-G&A Expenses

TABLE C.11: ESTIMATED CITY RECYCLABLES COLLECTION COSTS

CITY	TONS	COST	COST/TON
Atlas/Lantana	676	184,718	273
Boca Raton	6,289	740,854	118
Boynton Beach	1,917	307,676	160
Lake Park	572	174,414	305
N. Palm Beach	754	192,446	255
Palm Beach	623	179,467	288
Palm Springs	708	187,889	265
Riviera Beach	761	193,140	254
Total (Based on Regression)	12,300	2,160,604	176
Total (Based on Average)		1,826,367	148

NOTES:

1. Estimate includes annualization of Capital Outlays
2. Allocation of G&A based on Non-G&A Expenses

TABLE C.12: ESTIMATED CONTRACTOR GARBAGE/TRASH COLLECTION COSTS

MUNICIPALITY	LING UNITS					SAMPLE COMMUNITIES					
	SINGLE	MULTI (4 OR LESS)	MULTI (> 4)	MOBILE	TOTAL	OCCUPIED	% OCC.	SERVICED	OCCUPIED	TOTAL	ANNUAL COST ($)
Briny Breezes	53	19	20	568	660	620	93.9%				
Cloud Lake	45	13	4	1	63	51	81.0%	40	51	63	4,656
Delray Beach	9,592	7,818	9,598	519	27,527	24,389	88.6%	15,469	24,389	27,527	1,315,591
Glen Ridge	83	8	1	1	93	88	94.6%	66	88	93	7,841
Golf	133	30	0	4	167	150	89.8%				
Golfview	55	3	0	0	58	56	96.6%	61	61	58	6,456
Greenacres	1,999	3,672	4,733	782	11,186	9,891	88.4%				
Gulf Stream	295	26	143	6	470	421	89.6%				
Haverhill	357	36	34	0	427	386	90.4%	440	440	427	33,264
Highland Beach	223	318	2,892	18	3,451	3,186	92.3%				
Hypoluxo	110	238	366	65	779	627	80.5%				
Juno Beach	257	369	1,328	115	2,069	1,689	81.6%				
Jupiter	5,760	4,288	4,002	552	14,602	13,459	92.2%				
Jupiter Inlet	231	2	16	0	249	219	88.0%				
Lake Clarke Shores	1,088	288	54	3	1,433	1,308	91.3%				
Manalapan	184	25	75	3	287	263	91.6%				
Mangonia Park	236	259	0	5	500	444	88.8%				
Ocean Ridge	469	226	623	17	1,335	1,209	90.6%				
Palm Beach Gardens	5,031	4,469	2,135	536	12,171	10,856	89.2%	9,519	10,856	12,171	617,347
Palm Beach Shores	342	136	568	3	1,049	897	85.5%				
Royal Palm Beach	3,783	1,153	873	76	5,885	5,529	94.0%	4,602	5,529	5,885	225,372
South Bay	474	417	183	139	1,213	999	82.4%				
South Palm Beach	33	23	1,743	32	1,831	1,698	92.7%				
Tequesta	1,405	94	947	8	2,454	2,281	93.0%				
Total	32,238	23,930	30,338	3,453	89,959	80,716	89.7%	30,197	41,414	46,224	2,210,527

FY 92 COUNTYWIDE ESTIMATED COST	
72.9%	(% occupied units served)
58,854	(Estimated occupied units served)
73	($ per occupied unit served)
6.10	t per month)
4,308,323	(Estimated annual cost)

SOURCES:

1. Bureau of the Census, "1990 Census of Population and Housing," Table 7. Structural and Vacancy Characteristics, Florida, pages 98-99.
2. City of Delray Beach, "Monthly Invoices," October 1, 1991 through September 30, 1992.
3. Village of Delray Beach, "Monthly Invoices," October 1, 1991 through September 30, 1992.
4. Waste Management of Palm Beach, "Summary of Collection Cost Invoices for Selected Communities," June 10, 1993.

TABLE C.13: ESTIMATED CONTRACTOR RECYCLABLE COLLECTION COSTS

MUNICIPALITY	LING UNITS					SAMPLE COMMUNITIES					
	SINGLE	MULTI (4 OR LESS)	MULTI (> 4)	MOBILE	TOTAL	OCCUPIED	% OCC.	SERVICED	OCCUPIED	TOTAL	ANNUAL COST ($)
Briny Breezes	53	19	20	568	660	620	93.9%				
Cloud Lake	45	13	4	1	63	51	81.0%	40	51	63	902
Delray Beach	9,592	7,818	9,598	519	27,527	24,389	88.6%	15,469	24,389	27527	366,128
Glen Ridge	83	8	1	1	93	88	94.6%	66	88	93	1,489
Golf	133	30	0	4	167	150	89.8%				
Golfview	55	3	0	0	58	56	96.6%	61	61	58	1,376
Greenacres	1,999	3,672	4,733	782	11,186	9,891	88.4%				
Gulf Stream	295	26	143	6	470	421	89.6%				
Haverhill	357	36	34	0	427	386	90.4%	440	440	427	10,032
Highland Beach	223	318	2,892	18	3,451	3,186	92.3%				
Hypoluxo	110	238	366	65	779	627	80.5%				
Juno Beach	257	369	1,328	115	2,069	1,689	81.6%				
Jupiter	5,760	4,288	4,002	552	14,602	13,459	92.2%				
Jupiter Inlet	231	2	16	0	249	219	88.0%				
Lake Clarke Shores	1,088	288	54	3	1,433	1,308	91.3%				
Manalapan	184	25	75	3	287	263	91.6%				
Mangonia Park	236	259	0	5	500	444	88.8%				
Ocean Ridge	469	226	623	17	1,335	1,209	90.6%				
Palm Beach Gardens	5,031	4,469	2,135	536	12,171	10,856	89.2%	9,669	10,856	12171	232,612
Palm Beach Shores	342	136	568	3	1,049	897	85.5%				
Royal Palm Beach	3,783	1,153	873	76	5,885	5,529	94.0%	4,602	5,529	5885	101,524
South Palm Beach	33	23	1,743	32	1,831	1,698	92.7%				
Tequesta	1,405	94	947	8	2,454	2,281	93.0%				
Total	31,764	23,513	30,155	3,314	88,746	79,717	89.8%	30,347	41,414	46,224	714,063

FY 92 COUNTYWIDE ESTIMATED COST	
73.3%	(% occupied units served)
58,414	(Estimated occupied units served)
24	($ per occupied unit served)
1.96	t per month)
1,374,486	(Estimated annual cost)

SOURCES:

1. Bureau of the Census, "1990 Census of Population and Housing," Table 7. Structural and Vacancy Characteristics, Florida, pages 98-99.
2. City of Delray Beach, "Monthly Invoices," October 1, 1991 through September 30, 1992.
3. Village of Delray Beach, "Monthly Invoices," October 1, 1991 through September 30, 1992.
4. Waste Management of Palm Beach, "Summary of Collection Cost Invoices for Selected Communities," June 10, 1993.

TABLE C.14: PORTION OF WASTE STREAM FOR WHICH COLLECTION COSTS ARE ESTIMATED (WITHOUT RRF)

WASTE TYPE	TOTAL WASTE STREAM (tons)	ANALYZED MSW (tons)
GARBAGE/TRASH		
City Collected	294,381	294,381
Contrator Collected	525,080	341,000
Self Hauled	44,501	0
Subtotal Garbage/Trash	863,962	635,381
RECYCLABLES		
City Collected	12,300	12,300
Contrator Collected	47,844	47,844
SWA Collected	4,760	4,760
Self Hauled/Drop Off/Imported	3,162	0
Subtotal Recyclables	68,066	64,904
HOUSEHOLD HAZARDOUS WASTE	192	0
OTHER WASTES		
Sludge	60,465	0
Asbestos	1,092	0
C&D Debris	75,519	0
Fill	7,549	0
Land Clearing	10,423	0
Tires	4,288	0
Miscellaneous	10,140	0
Subtotal Other Wastes	169,476	0
TOTALS	1,101,696	700,285

TABLE C.15: PORTION OF WASTE STREAM FOR WHICH COLLECTION COSTS ARE ESTIMATED (WITHOUT CURBSIDE RECYCLING/MRF)

WASTE TYPE	TOTAL WASTE STREAM (tons)	ANALYZED MSW (tons)
GARBAGE/TRASH		
City Collected	311,441	311,441
Contrator Collected	572,924	388,844
Self Hauled	47,663	0
Subtotal Garbage/Trash	932,028	700,285
RECYCLABLES		
City Collected	0	0
Contrator Collected	0	0
SWA Collected		
Self Hauled/Drop Off/Imported		0
Subtotal Recyclables	0	0
HOUSEHOLD HAZARDOUS WASTE	192	0
OTHER WASTES		
Sludge	60,465	0
Asbestos	1,092	0
C&D Debris	75,519	0
Fill	7,549	0
Land Clearing	10,423	0
Tires	4,288	0
Miscellaneous	10,140	0
Subtotal Other Wastes	169,476	0
TOTALS	1,101,696	700,285

TABLE C.16: PROGRAM INCREMENTAL COSTS IN FY92

CATEGORY	RESOURCE RECOVERY FACILITY PROGRAM ($ millions)	CURBSIDE COLLECTION & MRF PROGRAM ($ millions)
General & Administrative	$1.28	$0.349
Collection	0.00	9.260
Transfer & Haul	0.00	0.000
RRF	18.10	0.000
MRF	0.00	0.531
Promotion & Education	0.00	0.551
Misc. Recycling	0.00	0.000
Landfill	(4.05)	(0.637)
Total	$15.3	$10.1
Average Cost ($/ton)	35	164

TABLE C.17: COLLECTION INCREMENTAL COSTS - CURBSIDE RECYCLING AND MRF PROGRAM IN FY92

Category	Incremental Cost (millions of dollars)
Authority Collection in Five Municipalities	$1.490
Authority Contracts in Unicorporated Area	4.760
Municipality Contracts	1.370
Municipality Collection	0.957
Recycling Grant	1.040
Bags, Cans and Containers	(0.359)
Total	$9.260

Appendix D
Capital Cost Calculation

A capital expense is the purchase of an asset or service with a useful life of greater than one year. Accountants report capital expenses as capital outlays, i.e., the actual payment made during the year, or depreciated/amortized expenses, e.g., using straight line depreciation the capital outlay is divided by the useful life of the asset.

Capital assets may be purchased entirely with cash, financed over time using borrowed funds, or a combination of the two. If totally or partially financed, interest payments on borrowed funds are reported by accountants as interest expenses.

Following these accounting practices the cost of a capital asset in a given reporting period (e.g., fiscal year) is reported as either the capital outlay incurred, or the depreciation/ amortization expense incurred in the reporting period, plus interest paid, if any, on borrowed funds to finance the capital asset. Some financial reports, such as a cash flow analysis, also report the actual debt service, i.e., principal plus interest payments, on borrowed funds.

Although these approaches are appropriate for generating financial statements of non-profit organizations, none is an appropriate measure of the economic capital costs of the asset. The reporting of capital outlays does not recognize that a capital asset will be used over two or more years and, therefore, its costs should be spread over the assets useful life. The depreciation/amortization approach does not adequately distinguish between the same asset purchased with cash or with borrowed funds. Because loan repayment and debt service payments, and in particular the interest portion of such payments, can vary significantly from year to year based solely on the means of borrowing funds and not the use of the asset, these expenses are not an appropriate measure of the capital cost of the asset.

The approach used in the report to calculate capital costs is to "annualize" or "capitalize" capital outlays over the useful life of the asset using a cost of capital of 7 percent.[1] Generally, the cost of capital reflects the rate of return expected on invested funds.

Using this approach the capital cost of an asset is independent of the method used to pay for the asset, and has the same annual value over the useful life of the asset.

To illustrate the method used to calculate capital costs and compare it to the other ways of reporting capital expenses, consider a transfer tractor and trailer with a 5 year useful life and a purchase price of $105,000.

To estimate the annual capital cost the purchase price, i.e., capital outlay, of $105,000 is multiplied by the following capitalization factor:

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[1] The cost of capital is related to the rates of return that can be earned on invested funds and the rates of interest that must be paid on borrowed funds. As the economy changes and interest rates increase or decrease, the cost of capital may also change over time. The 7-percent cost of capital is about the mid-point of cost of capital often used for public entities.

$$\frac{r}{1-[1/(1+r)^n]}$$

where "r" is the cost of capital, or .07 in this analysis, and "n" is the useful life of the asset.

Substituting .07 for "r" and 5 or "n" in the above equation results in a capitalization factor of:

$$0.2539=\frac{.07}{1-[1/(1.07)^5]}.$$

Multiplying $105,000 by this capitalization factor results in an annual capital cost of $25,610. Capitalization factors for various costs of capital and useful lives of assets are provided in Table D.1.

Table D.2 shows the difference between the capital cost calculated above for this tractor/trailer over its 5 year useful life and the capital expenses reported using various accounting procedures. This table clearly shows that the differences among these reporting procedures vary significantly. Also note that the capital cost as calculated above is identical to the a loan repayment or debt service schedule on a 7 percent loan with a constant annual repayment schedule as shown in Case 7.

TABLE D.1: CAPITALIZATION FACTORS

NUMBER YEARS	COST OF CAPITAL 5%	6%	7%	8%	9%	10%
2	**0.5378**	**0.5454**	**0.5531**	**0.5608**	**0.5685**	**0.5762**
3	0.3672	0.3741	0.3811	0.3880	0.3951	0.4021
4	**0.2820**	**0.2886**	**0.2952**	**0.3019**	**0.3087**	**0.3155**
5	0.2310	0.2374	0.2439	0.2505	0.2571	0.2638
10	**0.1295**	**0.1359**	**0.1424**	**0.1490**	**0.1558**	**0.1627**
15	0.0963	0.1030	0.1098	0.1168	0.1241	0.1315
20	**0.0802**	**0.0872**	**0.0944**	**0.1019**	**0.1095**	**0.1175**
30	0.0651	0.0726	0.0806	0.0888	0.0973	0.1061
40	**0.0583**	**0.0665**	**0.0750**	**0.0839**	**0.0930**	**0.1023**
50	0.0548	0.0634	0.0725	0.0817	0.0912	0.1009

TABLE D.2: COMPARISON OF CAPITAL COSTS AND OTHER ACCOUNTING METHODS - PURCHASE OF TRACTOR/TRAILER WITH 5-YEAR USEFUL LIFE FOR $105,000

YEAR	CAPITAL COST	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8
1	25,609	105,000	112,350	112,350	21,000	28,350	28,350	25,609	28,350
2	25,609	0	6,072	5,880	21,000	27,072	26,880	25,609	26,880
3	25,609	0	4,704	4,410	21,000	25,704	25,410	25,609	25,410
4	25,609	0	3,241	2,940	21,000	24,241	23,940	25,609	23,940
5	25,609	0	1,675	1,470	21,000	22,675	22,470	25,609	22,470

DEFINITION OF CASES:

CASE 1: Capital Outlay reporting. Purchased with cash.

CASE 2: Capital Outlay reporting. Financed with borrowed funds. Interest 7%. Constant annual payments

CASE 3: Capital Outlay reporting. Financed with borrowed funds. Interest rate of 7%. Constant principal payment, interest paid on unpaid balance.

CASE 4: Straight line depreciation/amortization reporting. Purchased with cash.

CASE 5: Straight line depreciation/amortization reporting. Financed with borrowed funds. Interest rate of 7%. Constant annual payments.

CASE 6: Straight line depreciation/amortization reporting. Financed with borrowed funds. Interest rate of 7%. Constant principal payment

CASE 7: Debt Service reporting. Financed with borrowed funds. Interest rate of 7%. Constant annual payments

CASE 8: Debt Service reporting. Financed with borrowed funds. Interest rate of 7%. Constant annual principal payments.

Appendix E
Estimated Residential Tonnage Collected by Private Haulers

Approximately 525,000 tons of MSW were collected by private haulers and delivered to the SWA's IMSWM System in FY 1992.[1] The private haulers provide collection services to homeowners, businesses, and institutions throughout the County. Haulers competed for collection franchises or contracts in 24 communities and seven districts in the unincorporated portion of the County. The winning firm is usually given the exclusive right to collect all the MSW generated in a jurisdiction.

Municipalities typically pay for or charge homeowners for a portion of the residential MSW generated in the community. The larger multi-family dwellings as well as businesses in the community are allowed to make their own arrangements for collection with the selected firm. The franchise agreement may specify the per-container or maximum allowable per-container charge for this service, or allow each large multi-family complex or business to negotiate its own price for collection with the hauler, subject to a dispute resolution procedure managed by the municipality.

Because the number of large multi-family complexes and businesses served in this manner is large, the types of service provided are numerous, the charges for these services are highly variable, and the business arrangements between the customer and the haulers are often confidential, an estimate of the collection cost for that portion of the MSW stream so collected was not included in this study.

For the above reason, only 341,000 of the 525,000 tons of privately collected garbage/trash is included in cost analyses that include collection costs. This tonnage represents the tons of garbage/trash that are: (1) generated from residential and commercial establishments; (2) collected by private firms; and (3) paid for through contracts with municipalities and the private collection company. The methodology and data used to estimate this tonnage is provided in this Appendix.

Table E.1 lists the 24 communities that gave franchises to or contracted with private haulers to collect garbage/trash within their jurisdictions in FY 1992. The number and types of dwelling units within each municipality were obtained from the 1990 U.S. Bureau of the Census housing statistics.

Waste generation factors, presented in Table E.2, were derived from a survey conducted from May 1991 to May 1992 by DUS Consultants.[2] Collection routes that service only one type of dwelling unit were established. Data was collected in each season to account for the impact of winter residents. The mean and standard deviations of the data obtained from all samples collected for each type of dwelling unit were calculated. The values in Table E.2 are the mean values so determined.

To obtain the estimated residential tons generated in each community the number of dwelling

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[1] SWA, "Customer Tonnage Reports for 10/01/92 through 09/30/92", Office of Recycling, Public Affairs, and Contract Management.

[2] DUS Consultants, "1992 Residential Generational and Assessment Review," August 12, 1992.

units by type presented in Table E.1 were multiplied by the generation rates per type of dwelling unit as shown in Table E.2. For example, the total of 27,308 residential tons estimated for Delray Beach was calculated as follows:

$$27{,}308 = (9{,}592)*(1.99) + (7{,}818)*(0.85) + (1{,}890)*(0.52) + (519)*(1.14).$$

The total tonnage reported in Table E.1 is the sum of the residential tonnage calculated for each community, including the unincorporated areas. Because the housing data was taken from the 1990 Census, this total was adjusted to obtain a 1992 tonnage estimate. Countywide, the total number of dwelling units in 1990 was 461,665 and in 1992 was 471,171. The ratio of the 1992 to 1990 values, or 1.02, is multiplied by the 1990 estimate of residential tonnage to obtain the 1992 estimated tonnage.[3]

[3] Housing data for each community for 1992 was sought from the County, but was not made available for this analysis.

TABLE E.1: ESTIMATED RESIDENTIAL GARBAGE/TRASH COLLECTED BY PRIVATE HAULERS (FY92)

MUNICIPALITY	UNITS					RESIDENTIAL TONS
	SINGLE	MULTI (4 OR LESS)	MULTI (> 4)	MOBILE	TOTAL	
Briny Breezes	53	19	4	568	644	771
Cloud Lake	45	13	1	1	60	102
Delray Beach	9,592	7,818	1,890	519	19,819	27,308
Glen Ridge	83	8	0	1	92	173
Golf	133	30	0	4	167	295
Golfview	55	3	0	0	58	112
Greenacres	1,999	3,672	932	782	7,385	8,475
Gulf Stream	295	26	28	6	355	631
Haverhill	357	36	7	0	400	745
Highland Beach	223	318	569	18	1,128	1,031
Hypoluxo	110	238	72	65	485	533
Juno Beach	257	369	261	115	1,002	1,092
Jupiter	5,760	4,288	788	552	11,388	16,146
Jupiter Inlet	231	2	3	0	236	463
Lake Clarke Shores	1,088	288	11	3	1,390	2,419
Manalapan	184	25	15	3	227	399
Mangonia Park	236	259	0	5	500	695
Ocean Ridge	469	226	123	17	835	1,209
Palm Beach Gardens	5,031	4,469	420	536	10,456	14,640
Palm Beach Shores	342	136	112	3	593	858
Royal Palm Beach	3,783	1,153	172	76	5,184	8,684
South Bay	474	417	36	139	1,066	1,475
South Palm Beach	33	23	343	32	431	300
Tequesta	1,405	94	186	8	1,693	2,982
Unincorporated	81,493	51,340	35,594	15,980	184,407	242,536
Totals	113,731	75,270	41,567	19,433	250,001	334,073
Estimated Tonnage 1992						341,000

NOTE: The 1992 estimated tonnage is calculated by multiplying the estimated tonnage using the 1990 Census data by the ratio of total dwelling units in 1992 to the total number of dwelling units in 1990.

SOURCES:

1. Bureau of the Census, "1990 Census of Population and Housing", Table 7. Structural and Vacancy Characterisics, Florida, pages 98-99.
2. DUS CONSULTANTS, "1992 Residential Generation and Assessment review", August 18, 1992, and

TABLE E.2: ESTIMATED TONS GENERATED PER UNIT PER YEAR

RESIDENTIAL CATEGORIES	GARBAGE/TRASH	RECYCLABLES	TOTAL
	(Tons/Unit/Year)		
Single Family	1.99	0.21	2.20
4 Units or Less	0.85	0.23	1.08
Greater Than 4 Units	0.52	0.12	0.64
Mobile Homes	1.14	0.15	1.29

SOURCE: DUS CONSULTANTS, "1992 Residential Generation and Assessment Review," August 18, 1992.

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13. ABSTRACT *(Maximum 200 words)*
Report documents an evaluation of the environmental, economic, and energy impacts of integrated municipal solid waste management in Palm Beach County, Florida. The primary objective of this case study, and five other stud ies, was to develop and present consistent cost, resource use (especially energy), and environmental regulatory information on each operating IMSWM system. The process is defined as using two or more alternative waste management techniques. Detailed reports on each system are available.

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