

## SOLID WASTE MANAGEMENT: ISSUES AND OPTIONS FOR MEMPHIS AND SHELBY COUNTY

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### ABSTRACT

This research project analyzes the crisis in solid waste management and looks at alternative solutions. The literature review documents a shortage of landfill space and environmental concerns associated with landfilling and incineration. It also analyzes the promise and the limitations of recycling. Building on this foundation, the current situation in solid waste management in Memphis and Shelby County is evaluated. At the present time, the metropolitan area is not suffering the ills experienced by other cities. Landfill space is plentiful and inexpensive. In addition, it is well managed by Browning-Ferris Industries (BFI). City officials are making progress in developing alternatives for future solid waste management. Older landfills and dump sites are being monitored by the Memphis-Shelby County Health Department, but at this time only the North Hollywood Dump Site is a particular concern. The EPA Superfund has proposed remedies to manage the situation. The state is presently investigating the Penal Farm landfill for possible groundwater contamination, but no results are available at this time. In general, Memphis appears to be in a strong position in solid waste management.

### INTRODUCTION

There are two components to this project. The first, an analysis of the national situation in solid waste management, was conducted primarily through a review of pertinent professional journals and popular interest publications. The second, an analysis of the current situation in Memphis and Shelby County, was carried out through interviews with city, county, and state officials with responsibilities relating to solid waste management, and with officials of Browning-Ferris Industries and Waste Management, Inc. Reference to literature and to U.S. Geological Survey (U.S.G.S.) maps was made as warranted. Information provided through interviews was verified by more than one source where possible.

One of the major environmental issues in the nineties is the question of solid waste management. Faced with spiralling costs, growing environmental concerns, and rapidly diminishing landfill space, it is no longer possible to continue with the

traditional practice of "dumping" all of our garbage in landfills. An out of sight, out of mind approach is no longer viable because changes in our patterns of consumption, combined with mounting concerns about our environmental and personal health, have made safe and economical management of solid waste a necessity.

There is little comprehensive data available concerning the composition of the waste stream we must manage. This is due primarily to the lack of a central information network charged with the responsibility of gathering this data. Other nations, including Japan, see this information as vital to effective solid waste management (Hershkowitz 1987 p.3). This data concerning the composition of our waste stream is useful because it will guide policy makers in choosing the appropriate solutions for particular situations. As our concern with solid waste grows, however, our sources of data will likely grow as well. On the Federal level, the reauthorization of the Resource Conservation and Recovery Act (RCRA) gives Congress the opportunity to mandate improved management of the waste stream, including collection of more comprehensive data on what its components are (Levenson 1990 p.32). In Tennessee, Governor Ned McWherter has ordered a \$400,000 study of how cities handle their solid waste. The findings and recommendations are due in 1991 (O'Koon 1990 p.34).

Despite this lack of comprehensive data, there is enough consensus among the sources of information which are available to make a reasonable analysis of our current situation. The study by Franklin Associates done in 1986 for the Environmental Protection Agency (EPA) provides a look at where we were twenty years ago and projects our waste stream in the year 2000 (Table 1) (Blumberg, 1989 p.11).

As Table 1 indicates, paper and paperboard products make up the largest portion of our waste stream. Further, this portion is projected to grow more rapidly than any other component with the exception of plastic. This dominance is due in large part to the increased amount of disposable packaging which accompanies most consumer goods. Packaging alone now accounts for approximately one third of our waste stream (Blumberg 1989, p.13). Since this study and others (e.g. Levenson 1990, p.12) indicate a growth of one to two million tons of waste per year, there is a

Table 1. Waste Stream Composition Projection to 2000

Year	1970		1984		2000	
	Million Tons	%	Million Tons	%	Million Tons	%
Paper	36.5	33.1	49.4	37.1	65.1	41.0
Glass	12.5	11.3	12.9	9.7	12.1	7.6
Metals	13.5	12.2	12.8	9.6	14.3	9.0
Plastics	3.0	2.7	9.6	7.2	15.5	9.8
Rubber	3.0	2.7	3.3	2.5	3.8	2.4
Textiles	2.2	2.0	2.8	2.1	3.5	2.2
Wood	4.0	3.6	5.1	3.8	6.1	3.8
Misc.	1.9	1.7	2.5	1.9	3.2	2.1
Food	12.7	11.5	10.8	8.1	10.8	6.8
Yard	21.0	19.0	23.8	17.9	24.4	15.3
Totals	110.3	100.0	133.0	100.0	158.8	100.0

Source: Franklin Associates (1986)

clear need for effective solutions to our solid waste management problem.

The history of municipal involvement in solid waste dates back more than one hundred years. In the late nineteenth century, only 43% of cities had any system of solid waste collection, either by direct collection or through subcontracting. By 1915, this figure had grown to 50%, and by the late 1930's all American cities of 100,000 or more citizens had organized programs (Blumberg 1989, p.6).

Prior to the rise of municipal involvement, individual citizens disposed of their own trash, using methods such as open air dumping, burning, or feeding swine. Swine feeding was a popular option for many cities until a series of epidemics in the 1950's led to regulations which kept feeding from being economically viable. By the 1970's, only 4% of municipal governments used this approach, compared with 44% in 1925 (Blumberg 1989, p.10). Recycling has not been a significant part of urban waste stream management except during the two world wars, when resource shortages made recycling a necessity. During World War II, for example, 35% of our paper was recycled (Blumberg 1989, p. 198). After both wars, recycling decreased after it was no longer economical. These examples give early evidence of a recurring theme in modern solid waste management: economic considerations play a significant (and often determining) role in deciding environmental issues.

Contemporary wisdom in the solid waste management field calls for an "integrated approach," one which uses a combination of landfilling, incineration, and recycling. Another area given attention is "source reduction," or more simply, reducing the amount of solid waste which must be managed. This is likely to

be the most difficult road to take, since ours is a society which thrives on materialism. As Howard Levenson notes, "changing production, purchasing, and consumption patterns will require transformations in behavioral and cultural attitudes" (Levenson 1990, p.13).

In Tennessee, 46% of our landfills are expected to be closed by 1995 (O'Koon 1990, p.34). Similar situations exist in other states (Buell 1990, p.1). Nationally, the EPA estimates that within two years, a third of all landfills will be full, and that within twenty years, four fifths will be full (Grossman and Shulman 1990, p.38). Siting new landfills is increasingly difficult due to state and Federal environmental regulations (Fessenden 1989, p. 46) and community activism opposing landfills. Nashville mayor Bill Boner's spokesman, Billy Fields, was quoted as saying "This is the most emotional issue we've faced since court-ordered bus-ing" (O'Koon 1990, p.35). The "not in my backyard" syndrome has affected waste management as citizens oppose siting landfills near where they live. Compounding the difficulty is the influence of sprawling suburbs, which has made it harder to place landfills "at the edge of town" (Fessenden 1989, p.44). Current cost estimates for a safe, appropriately managed landfill are about \$642,000 per acre (O'Koon 1990, p.35). As a result of these forces, some are looking elsewhere. In the spring of 1989, a plan to open the lagoons of the Marshall Islands to open dumping was announced. Without specific plans to ensure environmental safety, 25 million tons per year were to be dumped, leading to an expected annual profit of \$27 million (Fosberg 1989, p. 79). Clearly, alternatives to landfilling are becoming necessary for future solid waste management.

In addition to landfilling, many cities use incineration, generally as part of a waste-to-energy program where solid waste is burned to rid the city of a problem while creating a salable resource: steam. This steam is sold to a nearby industry to drive machinery. For example, Vicon has a contract with the city of Pittsfield, Massachusetts to burn all of its solid waste for \$22.51 a ton, compared to tipping fees in excess of \$100 paid by other Northeastern cities for landfilling (Buell 1990, p.1). Vicon then sells the steam which it produces by burning the waste to Crane and Company, which uses it in its paper manufacturing processes. (Forestell, personal interview 6/18/90). This process is called "resource recovery" because it recovers a resource (energy) from what would otherwise be a waste product. (Recycling is the other major activity of resource recovery, with recovered raw materials as the byproduct instead of energy.)

The major advantage of incineration in terms of solid waste management is a 90% reduction in the volume of waste ultimately landfilled (Schwab 1986, p.8). In addition, of course, there is the benefit of the energy provided as a byproduct of the incineration. Achieving such a dramatic reduction in the amount of material destined for a landfill is certainly a noteworthy accomplishment.

Incineration is not without its difficulties and drawbacks, however. It competes directly with recycling as a solid waste strategy, since the materials most valuable from a recycling standpoint, such as computer paper and plastics, are needed by incineration plants because of their high BTU values (Blumberg 1989, p.203). Also, incineration is not an option in many places. A sufficiently high volume of waste is needed to make large incineration plants economically viable, and many areas do not have industrial customers wanting to purchase the steam produced through incineration (Schwab 1986 p.8). The most serious

Table 2. Landfilling Operations in Shelby County

	Collection	Disposal
Memphis	Own	BFI
Bartlett	Own	BFI
Arlington	Own	Own
Germantown	Waste Management (contracted)	BFI
Collierville	Own/operate a transfer station	BFI
Millington	Own	BFI
County areas	Own	BFI

(Source: BFI, Waste Management and city officials)

Table 3. BFI Landfilling Rates of Shelby County

Date	Rate	% Increase
7-1-86 to 6-30-87	\$1.88/cu.yd.	
7-1-87 to 6-30-88	\$2.16/cu.yd.	+14.8%
7-1-88 to 6-30-89	\$2.50/cu.yd.	+15.7%
7-1-89 to 6-30-90	\$2.86/cu.yd.	+14.4%
7-1-90 to 6-30-91	\$3.30/cu.yd.	+15.4%

(Source: Contract dated 5/14/86 with BFI and Memphis)

drawback to incinerating solid waste is the ash which is a residual of the burning process. As a result of the impending closing of many landfills and the difficulties involved in siting new ones and the environmental concerns associated with incinerating waste, recycling is getting a closer look as a viable solution to the growing solid waste management crisis. Cited for its ecological soundness and energy savings, recycling is seen by many as the way of the future. Each ton of 100% recycled paper saves 17 trees, 4100 kwh energy, 7000 gallons of water, 60 lbs of air polluting effluents, 3 cubic yds. of landfill space, and up to \$100 in waste disposal fees (Davis and Kinsella 1990, p.48).

#### ISSUES AND OPTIONS FOR MEMPHIS AND SHELBY COUNTY

##### Managing the Current Waste Stream

Like all local governments, Memphis and Shelby County need to be aware of their current situation in solid waste management and be prepared to adjust their operations in the future as warranted. In general, the area is well equipped to handle its current waste stream for the next quarter century. This gives the city and county governments sufficient time to make long range plans for solid waste management. Through contractual arrangements with Browning-Ferris Industries (BFI), the city and county have satisfactory solid waste disposal programs. BFI operates two landfills in Shelby County, one at Holmes and Malone in southeast Shelby County and the other on Old Millington Road in Millington. According to Andy Ashford, Director of Market Development for BFI, the Holmes Road site has 10 years of capacity left, while the Millington site has 25 years left. As Table 2 indicates, BFI dominates the landfilling operations in the county. In addition, BFI and Waste Management, Inc. share the vast majority of the private collection contracts with businesses and apartment complexes in the area. Thus, with the exception of that produced by residents of Arlington, virtually all of the county's solid waste is ultimately managed by BFI. This monopoly arrangement has potential advantages and disadvantages. It allows the efficient management of a necessary public need—safe disposal of waste—but it also relies on the managerial discretion of a private firm, whose objectives may not always coincide with those of the local governments. Fortunately for

Memphis, BFI has operated in a safe and efficient manner. Ben Ivy, a supervisor with the Memphis-Shelby County Health Department, reports that BFI "meets or exceeds all of the requirements" of the various regulatory agencies (personal interview, 6/22/90). Likewise, Marilyn Brown, executive director of the Memphis City Beautiful Commission, gives BFI high marks for their operations (personal interview, 6/22/90).

The rates set for landfilling at the BFI sites are negotiated and contracted for in advance. The current contract began on July 1, 1986 and will expire on June 30, 1991. The rates for each year are set by the cubic yard (Table 3).

The estimated total volume stated in the contract is 2,000,000 cubic yards per year. Other cities pay the same rates as Memphis. Relative to other urban areas, Memphis and Shelby County pay substantially less for landfilling. While some Northeastern cities pay in excess of \$100 per ton in tipping fees, Memphis and Shelby County pay approximately \$8 per ton, based on the current rates. This obviously presents a savings for local governments. What is a concern, however, is the rate the landfilling fees increase over the life of the existing contract. From 1986 to 1991, the fees increased a total of \$1.43/cu.yd, which amounts to a 15.08% average annual increase. In terms of dollars, the contract for the estimated volume was for \$3,760,000.00 in 1986-87, whereas the same volume in 1990-91 will incur landfilling fees of \$6,600,000.00.

The primary factors leading to the escalating costs relate to the environmental regulations imposed by the State of Tennessee and the Environmental Protection Agency (EPA). Preparation of new landfill space in Tennessee currently costs between \$80,000 and \$120,000 per acre, a cost which ultimately is passed on to the users of the landfill. The newest regulations require recompacted clay to minimize leaching into groundwater supplies, installation of a leachate collection system, and at least 3 feet of soil coverage over the landfill. The BFI site in Millington has eight monitoring wells currently in operation, and they plan to have 26 in operation when the areas being used expand to the site capacity. The levels of groundwater contamination and methane production are monitored carefully at the site. Also, the original hydrogeological work done to prepare the site determined that there is a permeability of  $10^{-6}$  cm/sec. After recompacting the clay at the site (as

Table 4. Classification of Dump and Landfill Sites

Letter	Status
C	Closed
L	Unpermitted landfill (operating without a license)
D	Dump Site (open dumping; nothing is buried)
S	Sanitary Landfill (all purpose, regulated)
P	Permitted Landfill (for specific, inert materials)

required by the new state and Federal regulations), the permeability will drop to  $10^{-7}$  cm/sec. All of these environmental protection measures lead to greater operating costs and, therefore, higher landfilling fees (Fleming, personal interview, 6/22/90). While Memphis continues to enjoy safe, economical, and efficient disposal of its solid waste, the increasing costs associated with landfilling suggest that planning for alternative disposal methods would be cost-effective in the long run.

To that end, the city has established the EARTH Complex (Environmental and Resource Technology Complex), which their promotional literature proclaims as "a prototype for waste disposal and recycling in the future." On the 4500-acre complex next to the Allen Generating Plant on the banks of the Mississippi, the city is piloting programs involving methane recovery, sludge compost, sod farming, agricultural demonstration areas, combined landfill/sludge disposal, solid waste recycling, wildlife preservation, and improved agricultural farmland. Marilyn Brown of Memphis City Beautiful indicates that the complex serves two purposes: (1) serving a public information need as a model program in environmental technology, and (2) serving the city by placing it in a position to control its own destiny in solid waste management. While Memphis is in a strong position compared with many other cities, Brown credits Memphis Mayor Dick Hackett's administration with looking beyond their term of office for long range solutions. Failure to do this, she believes, is what created the waste management problems in other urban areas (personal interview, 6/22/90).

Adding to the efforts undertaken by the city, BFI and Waste Management, Inc. are in the process of developing community education programs relating to options for solid waste. BFI has its MOBIUS curriculum for use in schools to build an understanding of the waste cycle. Waste Management has Recycle America, aimed at building recycling programs in local communities.

In sum, it appears that Memphis and Shelby County have the solid waste management situation well in hand, but are looking toward the future by developing alternatives which are ecologically and economically sound.

#### Monitoring Existing Waste Sites

In addition to managing the current waste stream, Memphis and other communities need to monitor existing and closed dump sites and landfills to ensure their environmental safety. Locally, this responsibility is carried out by the Memphis-Shelby County

Health Department, which tracks all known dump and landfill sites. Their classification system has several categories (Table 4).

The most significant in terms of volume are the sanitary landfills, which are the general purpose landfills such as the ones operated by BFI. These are subject to extensive regulations like those in effect at the Millington-BFI site. In terms of potential problems, the unpermitted landfills and dump sites are significant simply because of their non-compliance with environmental health laws and the lack of monitoring of what goes in them. Consequently, the health department is working to have these closed, though none are presently known to be hazardous. (Dugger, personal interview, 6/22/90).

The closed landfills and dump sites need monitoring because of the potential for groundwater contamination. Typically, these areas were used prior to the advent of environmental regulations on siting and operations. As a result, the ground is more likely to have contamination from products dumped there before regulations mandated alternative disposal methods. At the present time, only the North Hollywood dump site is a particular concern, though the recently closed landfill on Walnut Grove Ave near the Penal Farm is being tested by the Tennessee Bureau of the Environment—Division of Solid Waste Management for possible groundwater contamination (Woodward, personal interview, 6/20/90). This area warrants particular concern, as it is located adjacent to a recharge zone for the Memphis aquifer. At this time, there is no conclusive evidence of contamination. (Patterson, personal interview 8/30/90).

The North Hollywood site was used from the 1930's until the 1970's for industrial and municipal wastes. It was the first site in Tennessee to receive priority status under the EPA's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), popularly known as the Superfund (Charlier 1990, p.1,10 and EPA 1990, p.2).

Since no drinking water is drawn from the site, the primary concern relates to the site's proximity to the Wolf River. Contaminants leaching into the river pose some problem, though the greater problem is the Wolf River flooding the site. This is considered the primary means of contaminants reaching the river and being carried away from the site (Charlier 1990, p.10).

At the present time no specific health risks are expected, though the EPA suggests in their report that further study may be warranted as time progresses. The Centers for Disease Control conducted a study in 1985 which found "no evidence of increased health effects among persons living in the Hollywood area that could be attributed to the North Hollywood Dump" (EPA 1990, p.4).

There are two concerns relating to the North Hollywood site: (1) the contamination of the groundwater and (2) the quality of the surface water at the site.

Among the four alternatives (no action, soil coverage, soil coverage with some extraction of contaminants, and containment barriers) identified by the EPA for the groundwater near the landfill areas, the EPA recommends installation of a low-permeability soil cover at the present time, with continued monitoring and extraction only if groundwater contamination levels increase (EPA 1990, p.4).

Among the six alternatives (no action, fish harvesting, dredging, containment with hydraulic fill, containment by natural deposition via rerouting the Wolf River, and a combination of excavation and containment) for the surface water at the dredge

pond and Oxbow Lake, the EPA recommends containing the contaminated sediments where they are with hydraulic fill (EPA 1990, p.6-8).

Each of these preferred alternatives was arrived at after a consideration of nine factors which are used by the EPA. Further discussion of these is contained in the Superfund Proposed Plan Fact Sheet (p.4-8). These criteria are: 1) Overall protection of Human Health and the Environment, 2) Compliance With the Applicable or the Relevant and Appropriate Requirements, 3) Reduction of Toxicity, Mobility, or Volume, 4) Long Term Effectiveness, 5) Short Term Effectiveness, 6) Implementability, 7) Cost, 8) State Acceptance, 9) Community Acceptance.

Combined, the two preferred alternatives will cost approximately \$8,000,000. The costs are to be shared by the City of Memphis, Velsicol Chemical Corporation, and Buckman Laboratories, Inc. Velsicol and Buckman were identified by the EPA as "Potentially Responsible Parties" (PRP's). No specific formula for cost sharing has been developed yet (Charlier 1990, p.1).

#### SUMMARY AND CONCLUSION

As noted earlier, all cities need to be aware of the national solid waste management crisis. Fortunately for the Memphis-Shelby County area, the crisis is not an immediate one. Landfill space is plentiful and inexpensive in comparison with other cities, and the operations appear to be carried out in a manner which is safe, economical, and ecologically sound. All of the professionals interviewed for this paper indicated a high degree of confidence in BFI's landfill operations. For this, Memphians can be glad.

As would be expected in a major urban center like Memphis, there is a problem with groundwater contamination from old dump sites. However, the situation could be considerably worse than it is. In an area with hundreds of active and inactive dumps and landfills, only one is known to pose significant problems. Based on the level of response advocated by the EPA, even the North Hollywood Dump Site is manageable.

The situation the Memphis-Shelby County area seems to be facing is one of guarded opportunity. Based on the lessons learned by other communities in Tennessee and nationally, continuing vigilance is needed to ensure that our solid waste is managed properly. Relatively speaking, however, we are in good shape. We have the space available in our landfills to proceed cautiously and to learn from the experiences of other cities as they develop new methods of managing solid waste. In addition, the EARTH complex, BFI, Waste Management, and a host of local initiatives by citizens and corporations will provide ideas for the future. Through all of this, we have the luxury of time to develop and implement the most appropriate solutions.

The only potential drawback to this luxury of time is if we allow it to excuse inaction. Knowing the issues and equipped to evaluate the options, we need to move forward and create the future we want for our solid waste management.

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