PART II. PLANNING NEEDS AND POLICY OBJECTIVES.

CHAPTER 5. WASTE-MANAGEMENT NEEDS AND GOALS.

5.1 MSW-Management Needs and Goals.

5.1.1 Capacity Needs.

5.1.1.1 Existing Capacity.

5.1.1.1.1 Recycling.

In FY '91, the Sanitation Department's recycling programs handled an average of about 650 tons of materials per day. The existing collection fleet could absorb more material: the average paper truck in the curbside programs (following the reduction in collection frequency to every-other-week) is filled to only 75 percent of its available (compacted) volume at the end of its route, and the average container truck is filled to only half of its available volume.

The opposite is the case, however, on the processing side of the equation: the only processing center for mixed metals, glass, and plastics, the East Harlem facility, is incapable of processing more than its current 40 tons a day on an extended basis. This leaves an overflow of more than 100 tons a day of these materials, which are being handled on a temporary basis through short-term contracts with two private processors outside the city. Paper -- which makes up the majority of the recycled tonnage -- is not processed for sale directly by the City: it is sold to brokers on the basis of short-term contracts that bring the City less revenue than it would receive if it sold processed paper directly to an end-user mill. Since the City is currently paying to deliver its newspaper to private brokers, rather than being paid for this material, it is clear that either processing capacity, or mill capacity, or both, are insufficient. However, since there appears to be sufficient mill capacity to absorb this supply, the problem appears to be more of a processing-capacity shortfall than a market shortfall.

The more-than-100 private carter transfer stations in the city, with a total capacity of some 15,000 tons a day, can easily absorb the commercial wastes generated in the city. The majority of these transfer stations have some degree of processing capacity to recover recyclable materials, and additional processing capacity is being installed over time. This processing capacity meets the current demand for recovering recyclable material. Generally speaking, the secondary-materials markets are currently able to absorb the amounts of recyclable materials now recovered from New York City's commercial waste stream. (See Appendix Volumes 3.1 and 3.2 for more details on recyclables markets.)

5.1.1.1.2 Transfer — Public and Private.

The Sanitation Department's marine transfer station in the South Bronx (at Hunts Point) is near the end of its useful life. The Department's seven other operating marine transfer stations, which have been rehabilitated recently, provide adequate transfer capacity to transport waste from the other boroughs to the Fresh Kills landfill.

There are sufficient private transfer stations in operation to handle the transfer requirements for commercial waste.

5.1.1.1.3 Incinerators.

The planned upgrade~~s~~ of the ~~Sanitation Department's three existing~~ Southwest Brooklyn incinerator~~s~~ and the closure of the Betts Avenue and Greenpoint incinerators by the end of 1995 will ~~increase their combined daily capacity to close to their original design capacity of approximately 3,000 tons by 1999,~~ reduce the City's incineration capacity to 750 tons per day ~~from their present (1992) operating capacity of approximately 2,000 tons per day~~. ~~Offsetting this increase are~~ The likely closure of most on-site hospital incinerators after 1992 due to new DEC regulations, and the closure of the approximately 2,000 remaining on-site apartment-house incinerators after 1993 will further reduce incineration capacity.

5.1.1.1.4 Landfill.

The Fresh Kills landfill has an estimated 100 million cubic yards of remaining capacity. At the current rate of use (14,000 tons a day,[1] which translates to about 20,000 cubic yards),[2] this is equivalent to about 20 years of remaining life. (Remaining landfill life would be decreased to something on the order of 12 years, however, if commercial wastes were also disposed of at Fresh Kills.) Beyond the volumetric capacity, three other considerations may affect the amount of available capacity at Fresh Kills. First: the load-bearing capability of the soils beneath the landfill limit the rate at which tonnage can be piled on without creating the potential for the underlying layers to slide sideways. Second: it is possible that restrictions on exporting waste, or rapidly increasing tip fees at out-of-City landfills, will induce private carters to bring some or all of their wastes to Fresh Kills sooner rather than later. Third: the consent agreement between the City and the New York State DEC (signed in 1990) empowers the DEC to order the closure of Fresh Kills after 1998 if the City has not succeeded in obtaining a permit for operating the landfill or a new interim agreement for continued landfilling.

5.1.1.2 Current and Projected Needs.

The four figures on the following pages show projected MSW capacity requirements. Figure 5.1.1-1 shows how the municipally collected waste stream (residential and institutional wastes) is expected to grow over the next 20 years. Figure 5.1.1-2 shows how the total MSW waste stream (including commercial wastes) is projected to change. Figure 5.1.1-3 shows how much municipal processing capacity for recyclables would be required if between 25 and 40 percent of the City's MSW were recycled (excluding commercial wastes, which are expected to be processed in private facilities), and compares that daily volume to currently existing and currently projected capacity (i.e., the Year 2000 Projected Baseline). This figure also shows the amount of waste-to-energy/incineration capacity that currently exists and that is projected (according to existing plans) to be available in the year 2000. Figure 5.1.1-4 shows the range of estimates for the residential MSW stream.

5.1.2 Regulatory Compliance.

The Fresh Kills landfill, the disposal facility for the majority of the waste generated in the City, currently is not in full compliance with DEC regulations (NYCRR Part 360); in the absence of an operating permit, it is operating pursuant to a consent agreement while the upgrades discussed above in Chapters 3 and 4 will be carried out. The Southwest Brooklyn incinerator will be upgraded ~~Sanitation Department's three incinerators are being upgraded~~ so that it can operate in ~~they will come into~~ compliance with new regulations (NYCRR Part 219), and the Betts Avenue and Greenpoint incinerators will be shut down. A permit application for the East Harlem Materials-Recovery Facility was filed in 1990, and is pending. All on-site apartment-house incinerators will have to close after 1993 pursuant to local law.

Most of the City's commercial waste passes through privately operated transfer stations. Some of these facilities are operating under permit and in full compliance with all applicable regulations, most are not.

Recent budgetary constraints have severely impeded the Department's ability to meet Local Law 19 targets and deadlines. In July, 1991, the Natural Resources Defense Council (NRDC), various City Council members, the Citywide Recycling Advisory Board, and several New York City residents brought suit alleging non-compliance with Local Law 19 mandates; in February, 1992, a ruling was issued made in favor of the petitioners.

6NYCRR Subpart 360-15, the regulatory framework under which the current plan is being prepared, establishes the waste-

Figure 5.1.1-1: Projected Municipal Solid Waste Quantities (Residential and Institutional Only)

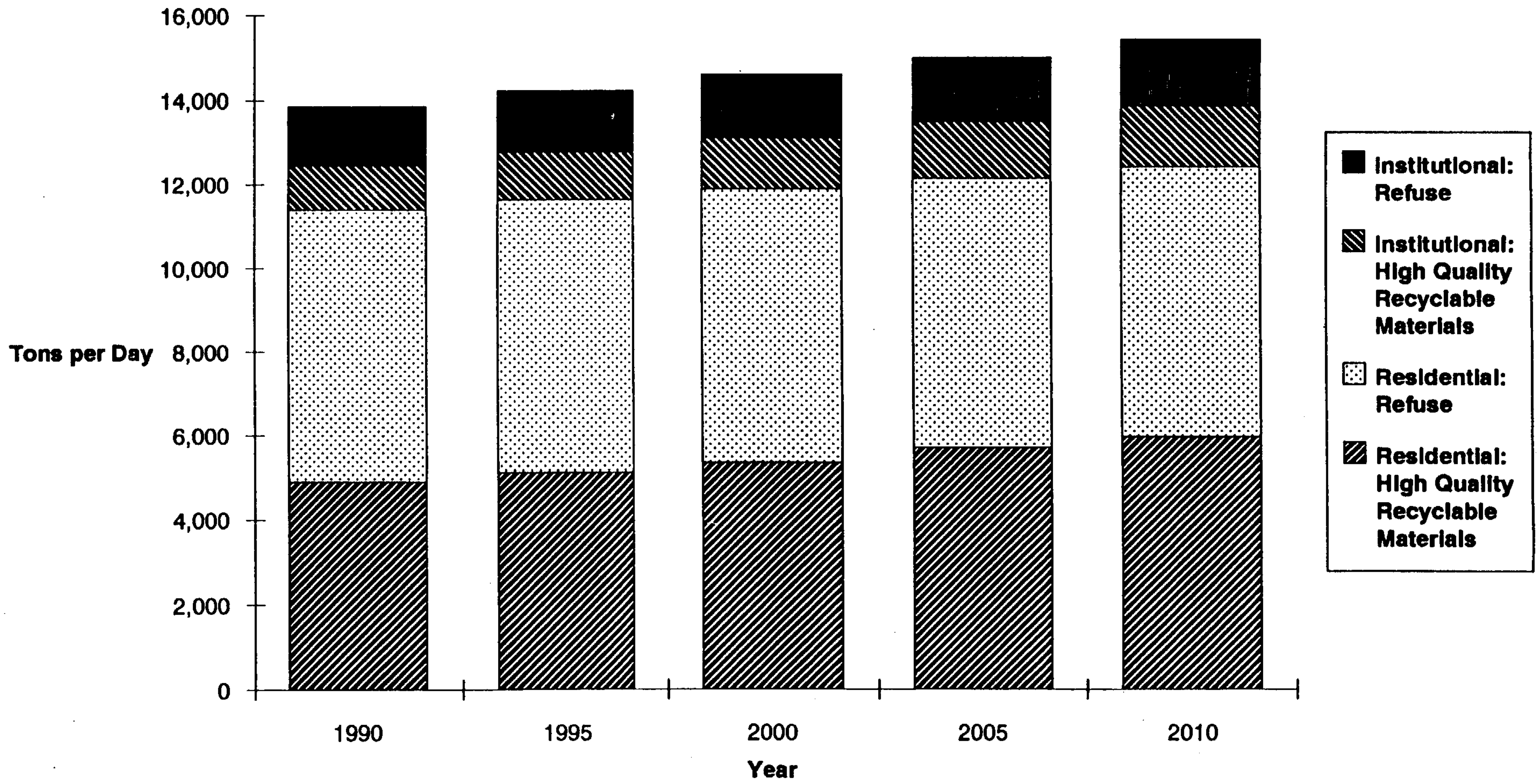


Figure 5.1.1-2: Projected Municipal Solid Waste Quantities, Including Commercial Waste

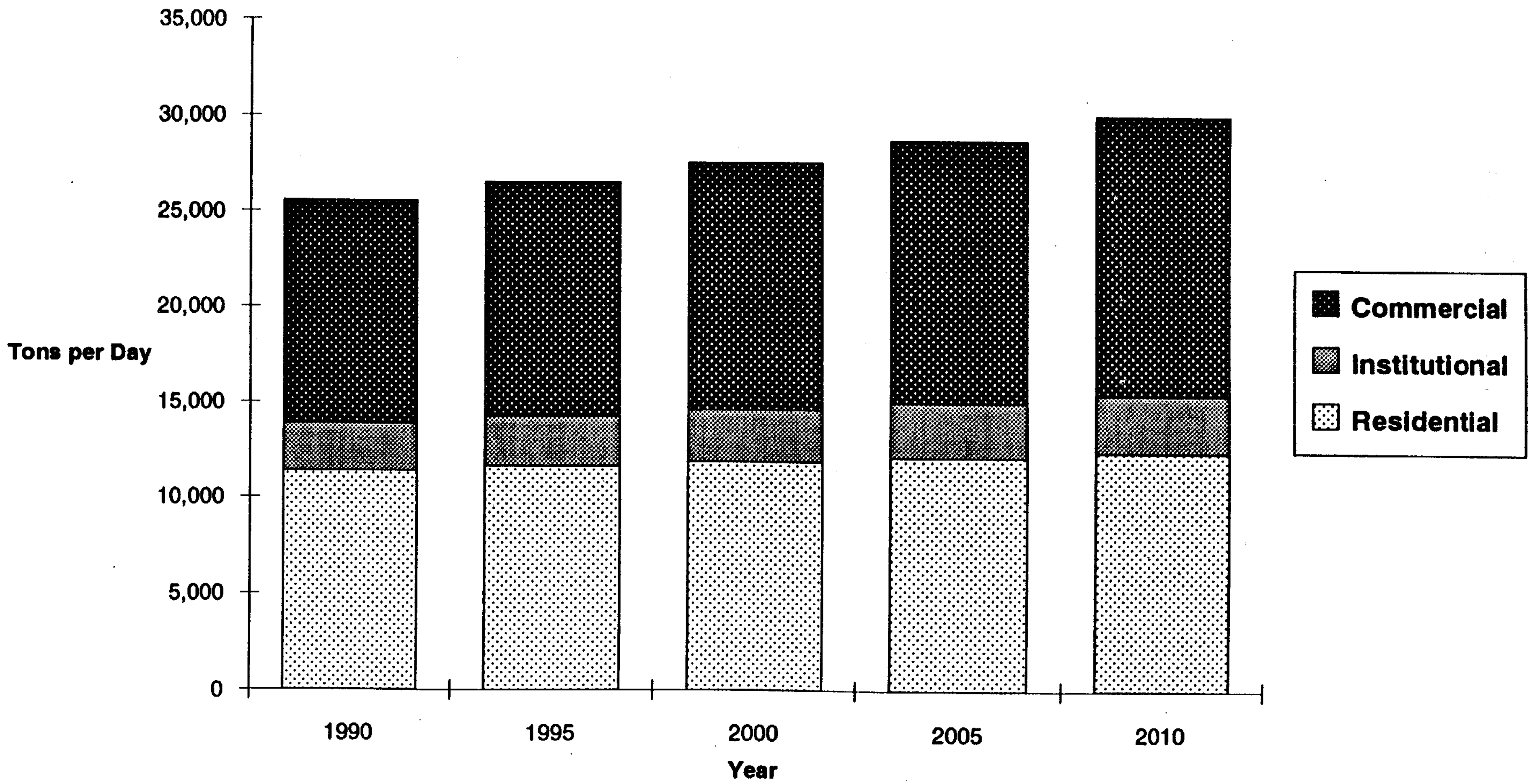
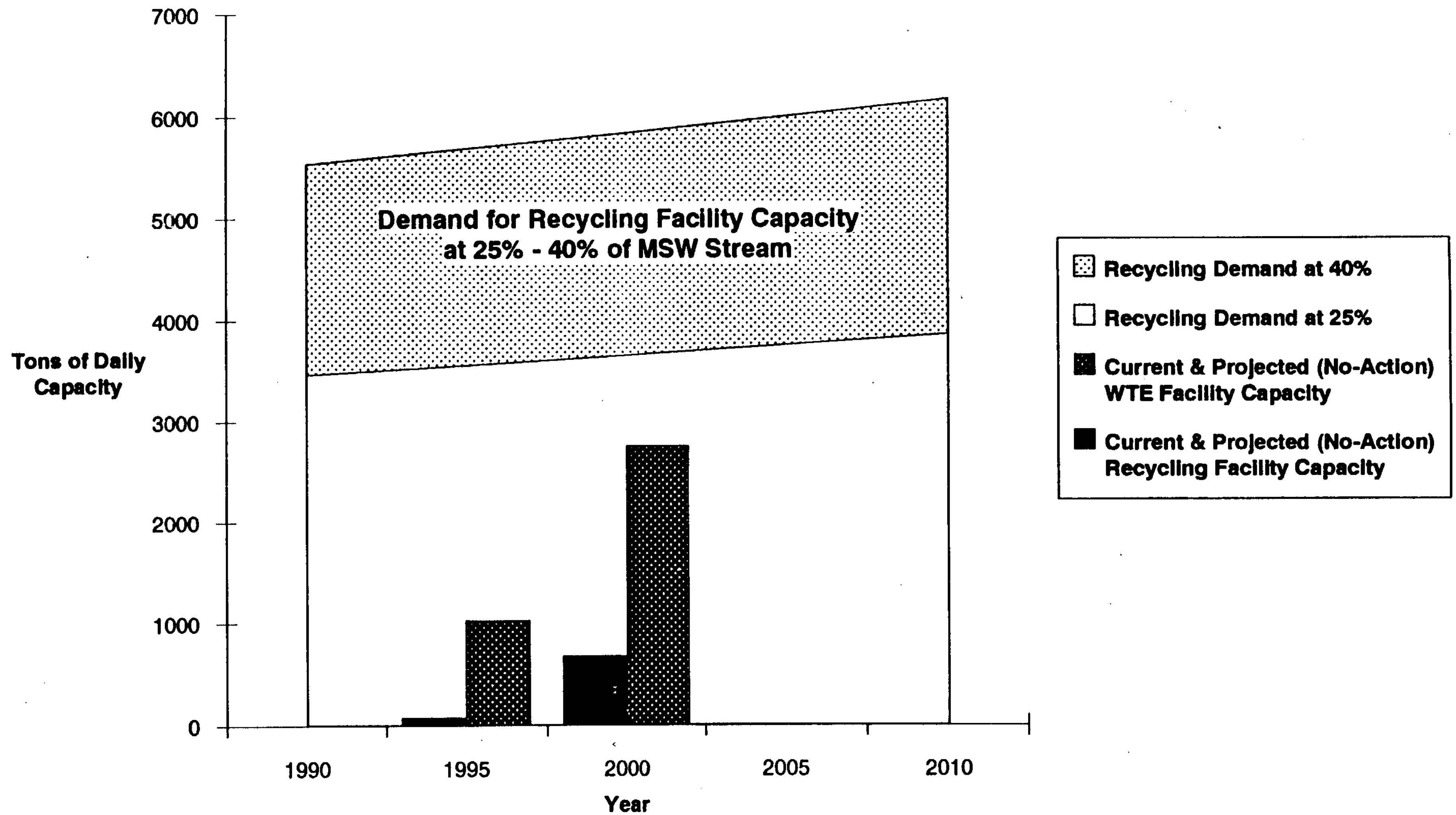


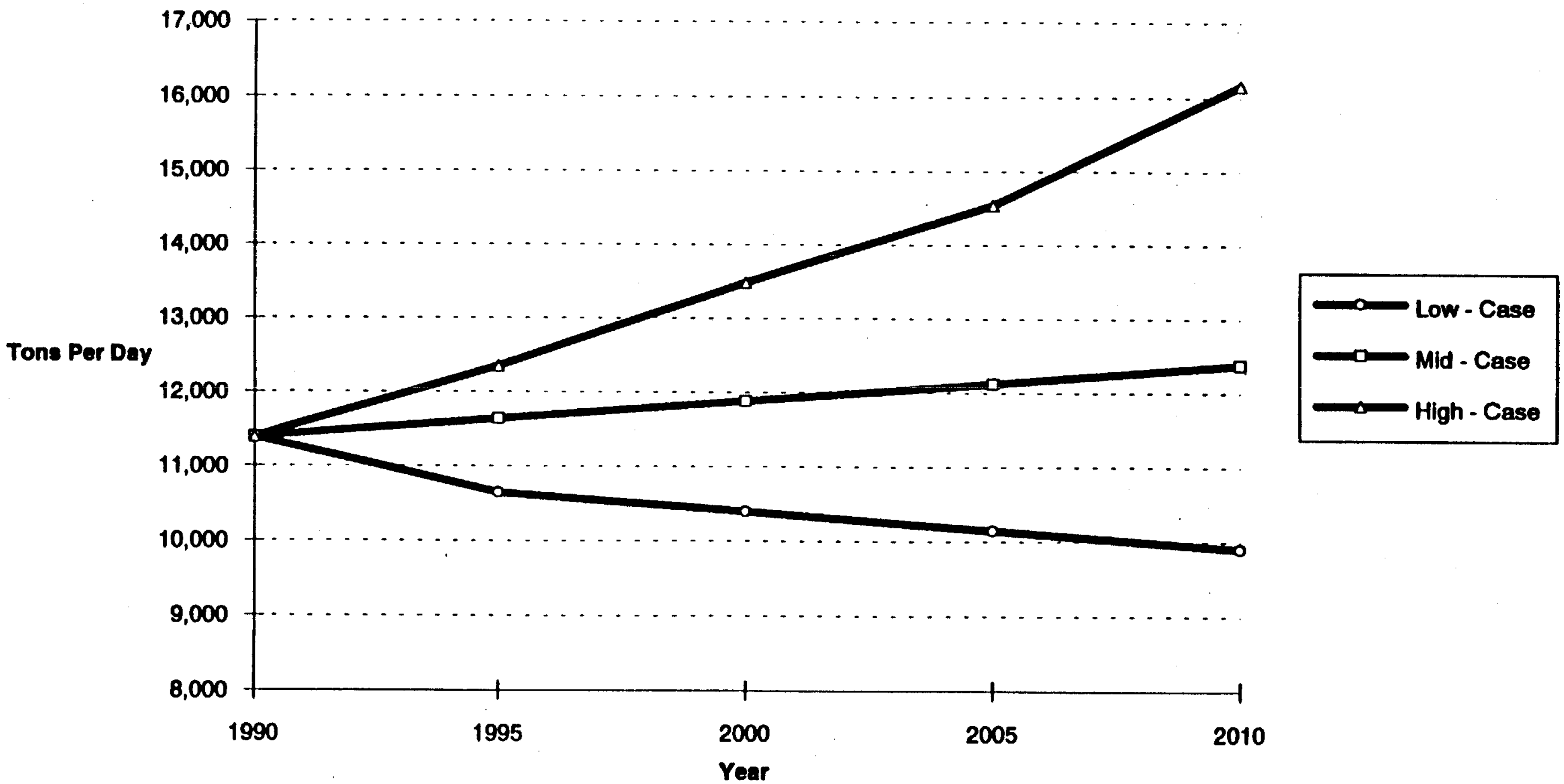
Figure 5.1.1-3: MSW Recycling Facility Requirements *



* Not including commercial wastes.

Figure 5.1.1-4

Alternative Growth Projections for Residential MSW



management "hierarchy" and the goal of combining waste-streams whenever this would produce an environmental benefit. The City's current waste-management system clearly has a considerable distance to go to comply with the intent of these regulations. Levels of prevention and recycling would need to increase significantly to reach 10 percent and 40 percent respectively. The existing municipal incinerators need to be retrofitted to recover waste heat. Black-bag medical waste is burned in a municipal incinerator, de-watered dredge-spoils and shredded construction-and-demolition debris are used as landfill cover, and the use of sludge products on closed landfills has been proposed; efforts to usefully integrate the management of other waste streams have not yet been attempted.

5.1.3 Policy Objectives.

In addition to meeting the capacity needs and regulatory requirements indicated above (including the waste-management "hierarchy" repeatedly referred to above), it is the City's objective to minimize environmental and economic costs to the greatest extent possible given the range of potentially feasible alternatives (or conversely, to maximize environmental and economic benefits). Because waste-management is one of the most fundamental components of an urban infrastructure, an even more basic goal is to provide a safe system that can be relied on for the management of all of the City's wastes every day. Given the inevitable uncertainties associated with forecasts for public and private waste-streams, collection systems, processing technologies, secondary-materials markets, and the weather, this objective dictates the need for flexibility and redundancy in the elements of the system.

A more expansive set of secondary goals reflects additional factors -- other things (reliability, environmental impacts, costs) being relatively equal -- that the City chooses to prioritize. These "secondary" goals, since they are more numerous, involve more discretion, and are sometimes in competition with each other, are difficult to prioritize.

Relative degrees of compliance with some of these objectives can be quantified: projected air emissions from one alternative system can be compared to the net emissions of another, water usage can be quantitatively compared, as can capital and operating costs, estimates of the numbers of jobs created, and the amount of energy used and produced. All of these factors can then be used to rank-order alternative systems from best to least, and order-of-magnitude relative differences can be readily understood. Other types of objectives lend themselves less well to quantitative rankings, but alternative systems can nonetheless be "graded" in terms of how well they meet these objectives.

The lists below present these two types of objectives (quantifiable and non-quantifiable). Neither list is ordered in a way that reflects any attempt at prioritization. These objectives were used in evaluating the alternative integrated waste-management scenarios developed in this planning process. An evaluation of the final-phase alternative systems in terms of these criteria is presented in Chapter 17.

Least Overall System Cost
Lowest Facility Air Emissions
[Water pollutant emissions were discovered to be negligible in all alternative scenarios, and to differ little between scenarios; differences in vehicular air impacts were discovered to be much less significant that differences in facility emissions]
Least Facility Acreage Required
Minimum Waste Transport Distances by Road
Most Positive Energy Impacts

Consistency with State Hierarchy
Reliance on Established Technology
Reliable for Capacity Needs
Flexibility
Redundancy
Minimum Dependence on Other Jurisdictions
Equitable Facility Distribution
Ease of Recycling (for Waste Generators)
Degree to Which Consciousness of the Need for Waste Prevention is Enhanced
Least Impact on Residential Neighborhoods
Implementation Speed
Minimum Disruption of Existing Systems (Public and Private)
Most Effective Use of Marine Transport

5.2 Sludge-Management Needs and Goals.

5.2.1 Capacity Needs.

5.2.1.1 Existing Capacity.

Ocean dumping of sludge, upon which the City currently relies, will be illegal after July 1, 1992. As of January, 1992, 20 percent of the City's sludge was being dewatered and disposed of through newly implemented privatized (interim plan) upland methods.

5.2.1.2 Current and Projected Needs.

The City's current and projected sludge-disposal-capacity needs are summarized on Figure 5.2.1-1. In July, 1992, when ocean dumping must cease, the City will generate 660 dry tons of dewatered sludge a day. This amount is expected to increase to 700 tons a day by 2010.

5.2.2 Regulatory Compliance.

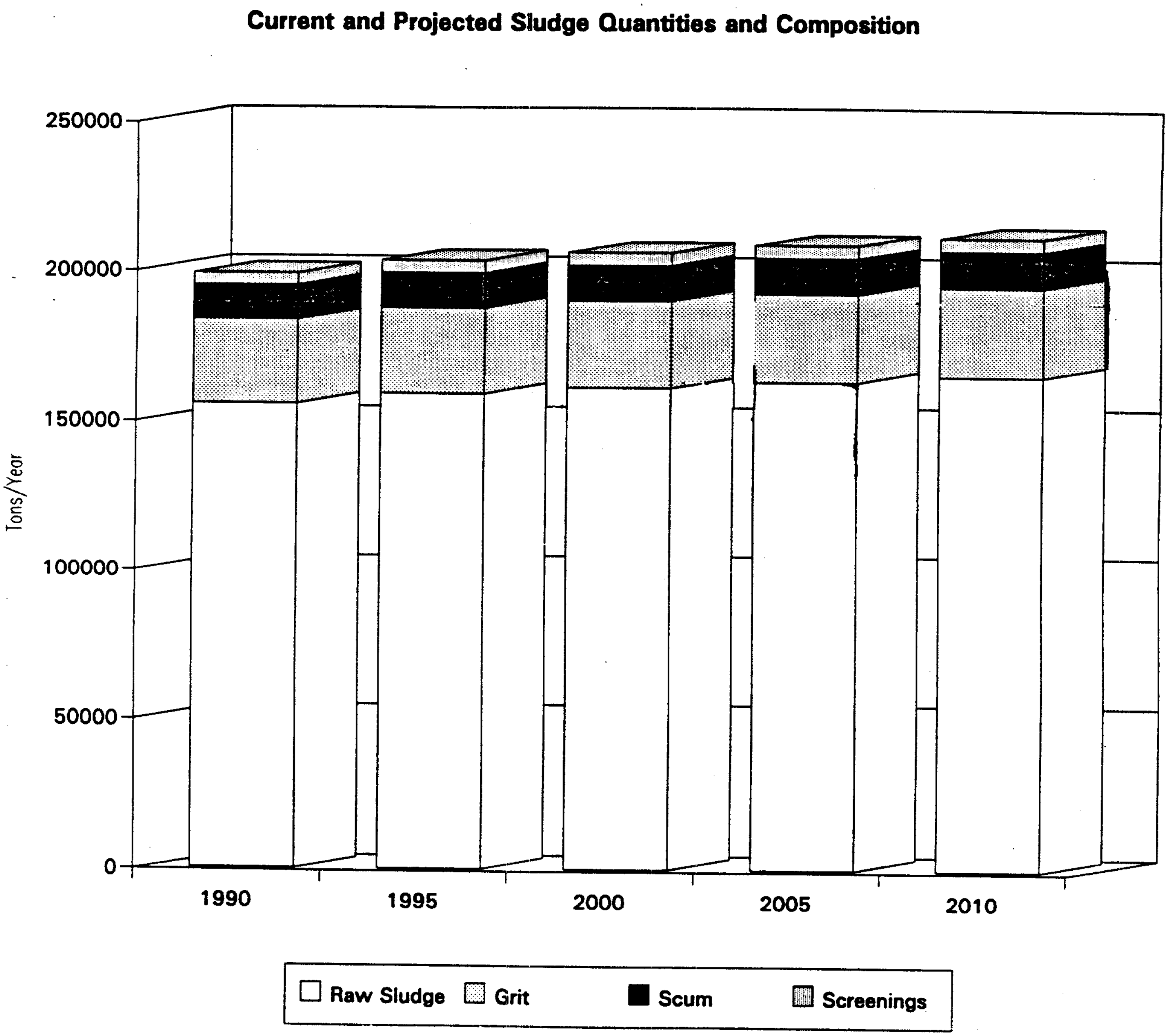
The current system, which, under terms of a consent order between the Department of Environmental Protection and the U.S. EPA must end by July, 1992, is obviously not in compliance with federal regulations.

5.2.3 Policy Objectives.

All of the policy objectives discussed in section 5.1.3 also pertain to sludge management. In addition, the following guidelines were used in shaping the alternative plans:[3]

- "The Long Range Plan should maximize the beneficial use of sludge.
- All sludges produced by New York City WPCPs should be considered for beneficial use options.
- All Long Range Plan processing facilities should be located within New York City.
- It is preferable that alternatives be framed with a total average program capacity equal to approximately 200 percent of the year 2020 average sludge production.
- Existing gravity thickening and anaerobic digestion facilities will be used in the Long Range Plan.
- Centrifuge dewatering facilities, currently under construction at eight locations around the City, will be used in the Long Range Plan.
- Intermediate Range Plan facilities in the New York City area will be considered for use in the Long Range Plan alternatives.
- Existing available WPCP lands as well as adjacent lands to dewatering facilities have priority in framing alternatives.
- It is preferable to select sites based on the ability to install storage and processing facilities at one site.

Figure 5.2.1-1


Current and Projected Sludge Quantities and Composition
250000
200000
150000
100000
50000
0
Tons/Year
1990
1995
2000
2005
2010
Raw Sludge
Grit
Scum
Screenings

- Preferably, each facility framed in an alternative must be capable of processing at least 10 percent of the City's sludge production.

- Estimated sizes of sludge utilization markets provide the basis for establishing processing capacities for each technology.

- Select sites based on the following approaches: centralized, single technology sites; centralized, multiple technology sites; decentralized, single technology sites; decentralized, multiple technology sites."

5.3 Medical-Waste-Management Needs and Goals.

5.3.1 Capacity Needs.

5.3.1.1 Existing Capacity.

Existing medical-waste-disposal capacity is equal to the current demand (as detailed in Chapter 3), but, in addition to its relatively high costs (and environmental impacts), this capacity is subject to several vulnerabilities, including the reliance on out-of-City disposal capacity, and the imminent closure of most of the current on-site hospital incinerators. As for the 300 tons of black-bag waste that are currently incinerated at the Sanitation Department's Southwest Brooklyn incinerator, provision will be made to continue to incinerate those tons at another Sanitation incinerator during the period that the Southwest Brooklyn incinerator is closed for upgrading.

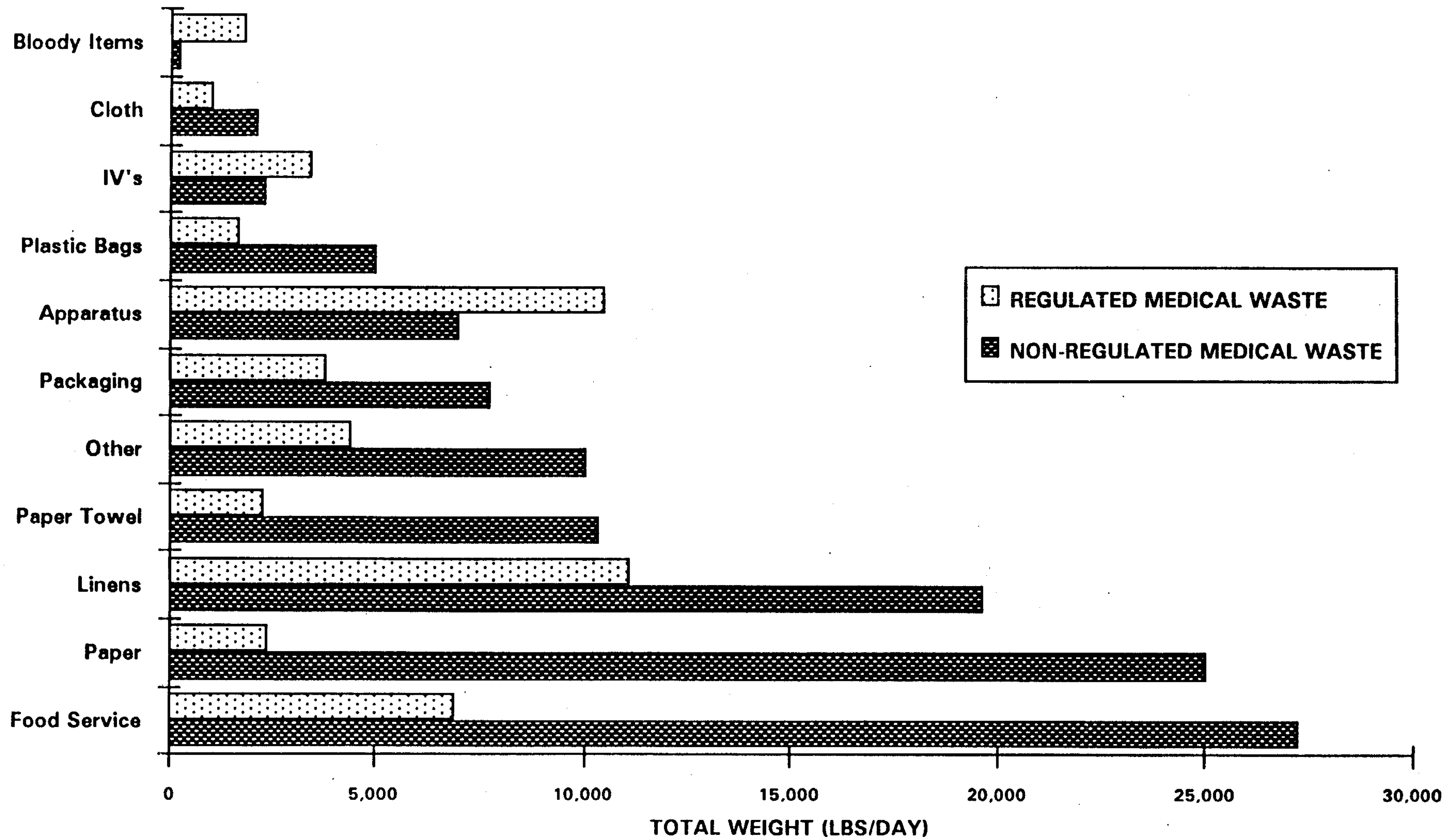
5.3.1.2 Current and Projected Needs.

At present, about 950 tons per day of regulated and non-regulated medical waste combined is generated.[4] (About 75 tons of this non-regulated waste, however, are generated by so-called "small-quantity generators," and so are not collected as "medical waste" from hospitals and institutions, but instead are collected and managed as ordinary commercial waste.) The composition of this waste stream is shown in the figure on the following page. The demand for regulated-medical-waste disposal capacity is expected to increase by about 50 percent over the plan period.

5.3.2 Regulatory Compliance.

On-site hospital incinerators that do not comply with the NYCRR Part 219 regulations that take effect at the end of 1992 will be forced to close. Most other facilities for medical-waste management are in compliance with applicable regulations.

Figure 5.3.1-1: Medical Wastes (Regulated and Non-Regulated): Quantities and Composition *



* Quantities obtained from NYC Medical Waste Management Study Final Report, Volume 3: Task 2A. Non-regulated medical waste quantities do not include kitchen and corrugated wastes.

5.3.3 Policy Objectives.

The policy objectives discussed in section 5.1.3 also pertain to medical-waste management. In addition, these goals for the medical-waste management plan were adopted by the Citywide Recycling Advisory Board's Medical Waste Subcommittee:[5]

"The establishment of a Medical Waste Management System that complies with the State Solid Waste Management Act and other pertinent regulations.

The establishment of a Medical Waste Management System that is not dependent on out-of-state resources.

The reduction of public and worker exposure to Medical Wastes, for aesthetic reasons and protection against associated hazards.

The control of the proliferation of waste treatment technologies for which insufficient data exist to conduct an evaluation of impacts.

The control and reduction of unnecessarily high costs to the health care system and the public.

The inclusion of a variety of waste management and treatment options that allow institutions with dissimilar waste-generation profiles to achieve similar waste reduction and management goals effectively.

The reduction of environmental impacts of Medical Waste generation as well as disposal.

The preservation of resources, including land that is consumed for landfill space or unnecessary waste processing."

5.4 Harbor-Debris-Management Needs and Goals.

5.4.1 Capacity Needs.

5.4.1.1 Existing Capacity.

Pier-maintenance material and large pieces of material (primarily wood) that are collected from surface waters and shoreline areas, as noted in Chapter 3, are disposed of upland by private contractors, either in out-of-state landfills or through a chipping operation that provides fuel for an out-of-city power plant. Some floatable materials, as also noted in Chapter 3, are landfilled at Fresh Kills. The amount of material landfilled is insignificant compared to the overall quantities of solid wastes landfilled at Fresh Kills.

5.4.1.2 Current and Projected Needs.

The total volume of floatables and pier-maintenance material in 1991 was 31,000 tons. Because of the pier-renovation and -removal program that is currently underway, this amount is projected to decrease to 6,000 tons in 2010 (as depicted in Figure 5.4.1-1), after which time the amount of these materials collected in the City is expected to remain relatively stable.

5.4.2 Regulatory Compliance.

Current EPA regulations require that the material in harbor debris (the overwhelming majority of harbor debris material is wood) be disposed of on land. Other than landfilling at Fresh Kills, the~~ir~~ disposal of this material is handled by private contractors at out-of-city landfills or by a chipping facility that sends fuel to an up-state power plant.

5.4.3 Policy Objectives.

The primary policy objective is to create new disposal capacity to replace the former use of ocean incineration. Alternative disposal methods, including land-based incineration and woodchipping, need to be implemented in order to comply with EPA regulations.

5.5 Dredge-Spoils-Management Needs and Goals.

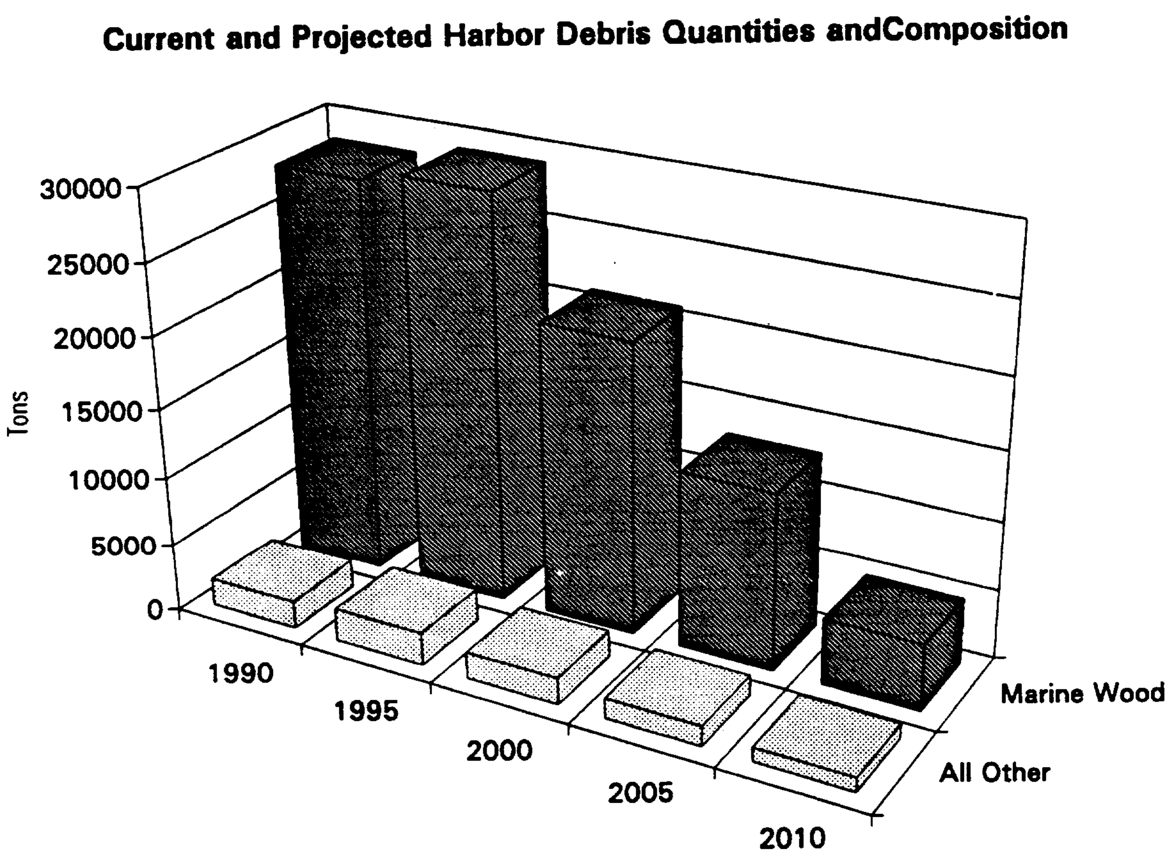
5.5.1 Capacity Needs.

5.5.1.1 Existing Capacity.

Most material dredged from New York Harbor is deposited in the ocean. There is remaining capacity at the "Mud Dump" for approximately 100 tons of dredged material. The Corps of Engineers, which regulates the ocean disposal of dredged material, and the U.S. EPA have proposed that "borrow pits" on the ocean floor (holes left from sand and gravel mining) be used for the disposal of dredge spoils, or that the "Mud Dump" site be relocated. These alternatives will have adequate capacity for the indefinite future for materials that meet the Corps' standards for ocean disposal.

Upland disposal sites must be found for material that does not meet these standards (as described in Chapter 3 [Section

Figure 5.4.1-1



Current and Projected Harbor Debris Quantities andComposition
30000
25000
20000
15000
10000
5000
0
Tons
1990
1995
2000
2005
2010
Marine Wood
All Other

3.10]). Although there are no significant restrictions on the amount of dewatered dredge material that can be used as landfill cover, there are capacity limitations for dredge-spoil-dewatering facilities. The Department of Sanitation's current dredge-spoils-dewatering facility at the Fresh Kills landfill can process no more than 87,000 tons of material a year. Expanding this facility would require the use of landfill acreage that could otherwise be used for landfilling MSW or for other waste-management facilities. ~~The Sanitation Department plans to replace this facility with an ash landfill.~~ There are no other dredge-spoils-dewatering facilities in New York City.

5.5.1.2 Current and Projected Needs.

Current and projected needs are summarized in figure 5.5.1-1. The volume of material that will not meet the Corps of Engineers' ocean-dumping criteria is projected to decrease slightly due to various measures described in the preceding chapters, while the overall volume of dredge material is expected to remain fairly stable.

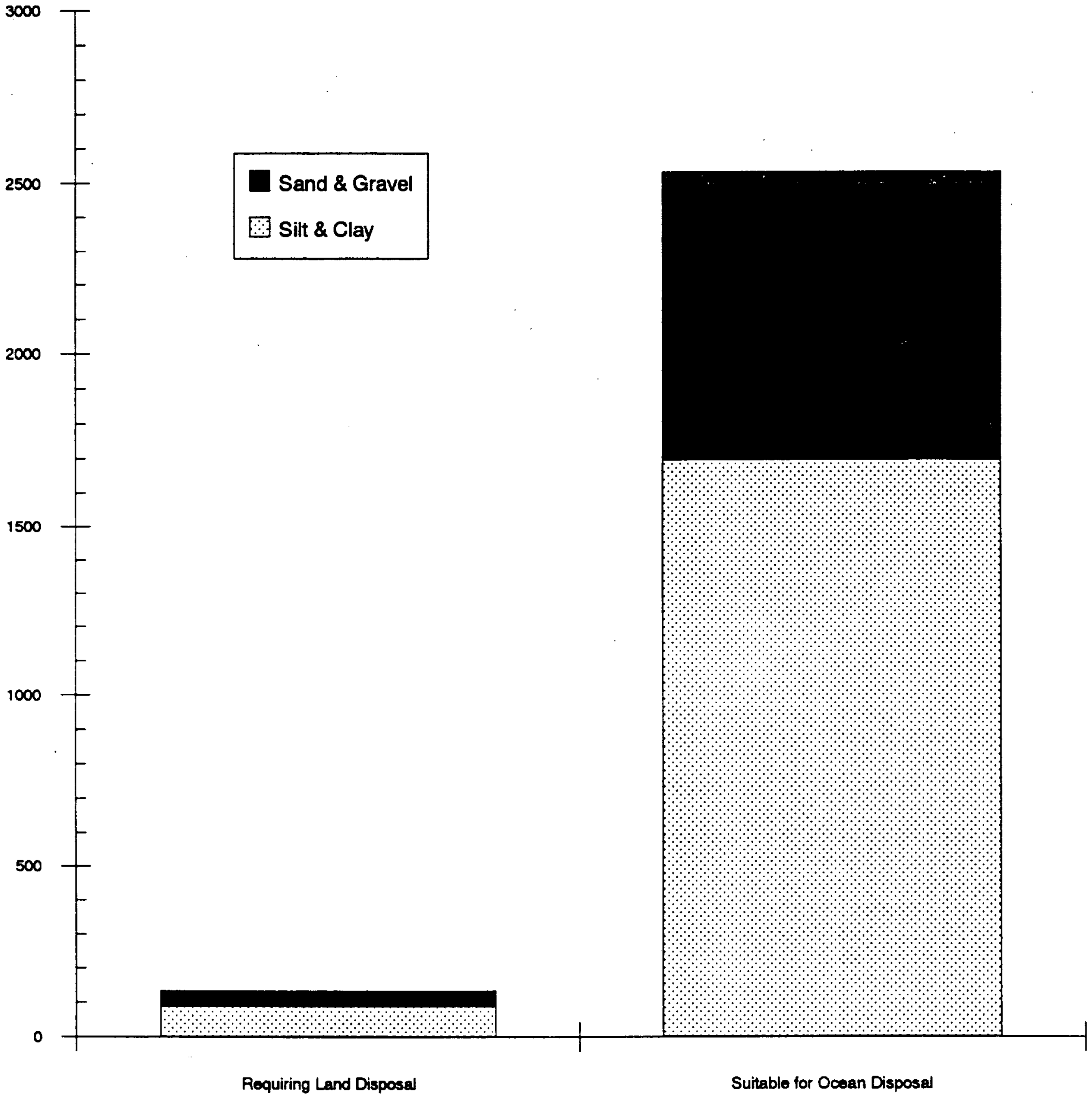
5.5.2 Regulatory Compliance.

The dredge-spoils-management system complies with current regulations, but the standards for disposing of materials at sea are becoming more stringent. Less material will meet ocean-disposal standards in the future. The use of borrow pits may not, however, increase ocean disposal costs, however, since transportation distances may be reduced: proposed borrow pits are located in the Harbor, while the current "Mud Dump" is located six nautical miles east of Sandy Hook. Current standards and regulations for the use of dewatered dredge material in applications such as landfill cover and beach sand are ambiguous or nonexistent, and therefore serve to discourage potential "beneficial re-use" of dredge material.

5.5.3 Policy Objectives.

In addition to the general waste-management objectives discussed above, the Department of Sanitation has the specific objective of minimizing the costs of disposing of the material that it must dredge in order to maintain its marine operationsand minimizing the costs of obtaining suitable clean material for landfill cover.

Figure 5.5.1-1: Current Dredge Spoil Tonnages, 1990 (000s of tons)



5.6 Construction-and-Demolition-Debris-Management Needs and Goals.

5.6.1 Capacity Needs.

5.6.1.1 Existing Capacity.

A survey of private transfer stations (in Appendix Volume 4.2) identified 49 transfer stations that handle construction and demolition wastes only. An additional 33 private transfer stations handle putrescible waste and construction and demolition debris. These stations, as noted in Chapter 3, typically recover nearly half of this material for recycling. More than half of the recovered proportion is screenings that are usually used for landfill cover; the demand for landfill cover in the region can easily absorb this supply. The next-highest proportion of recovered material is metal, which, again, is readily absorbed by the existing demand. Most of the remaining residue is shipped to landfills out of the City that accept C&D waste, many of which are on Long Island. As is documented in Appendix 2-A, there is sufficient landfill capacity for construction and demolition debris within an economically feasible transport range to last beyond the planning period. If out-of-City export of construction and demolition materials is severely restricted in the future, the volume of non-recyclable residue that would need to be landfilled within the City would increase the amount of material currently landfilled at Fresh Kills by almost a third.

The Department of Sanitation's construction-waste shredding/crushing equipment at the Fresh Kills landfill has a current capacity of 550 cubic yards per day. This amount of crushed material will continue to be needed for road-building at the landfill for the foreseeable future.

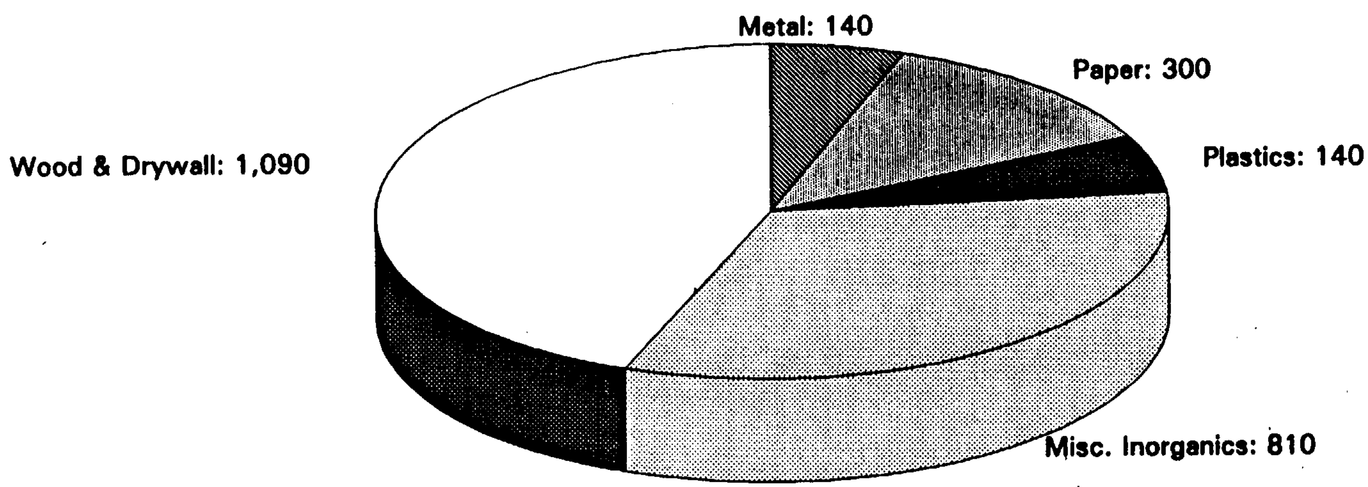
Since the burial of asbestos at Fresh Kills requires no specialized/dedicated infrastructure, the amount of space there that can be devoted to asbestos disposal is flexible. Because asbestos represents a very small percentage of the waste landfilled at Fresh Kills (under 0.02 percent), the overall capacity constraints at Fresh Kills do not pose appreciable restrictions for asbestos disposal.

5.6.1.2 Current and Projected Needs.

More than 8,000 tons per day of processing capacity is required for the management of current and projected volumes of construction and demolition debris.[6] The quantity and composition of this material are shown in Figure5.6.1-1.

Figure 5.6.1-1

Construction & Demolition Debris Composition (Thousands of tons, 1990)



5.6.2 Regulatory Compliance.

A significant number of the currently operating C&D transfer/processing facilities do not have 6NYCRR Part 360 permits to operate.

5.6.3 Policy Objectives.

The general waste-management objectives discussed above are equally applicable to the management of construction and demolition debris.

Endnotes

1. 1991 calendar year average.

2. At 1400 pounds per cubic yard.

3. This quotation is taken from p. I-25 of the December, 1991 New York City Sludge Management Plan, Long Range Plan, Generic Environmental Impact Statement III.

4. Based on a 302-day year.

5. This quotation is from Appendix Volume 8, The New York City Medical Waste Management Plan, p. 8.

6. This estimate of C&D processing capacity needed (as for other materials-recovery facilities) is based on a 6-day week/ 302-day year.

CHAPTER 6. ENVIRONMENTAL EVALUATION CRITERIA AND METHODOLOGIES.

6.1 Air-Impact Analysis.

A variety of air-impact analyses were performed to evaluate the impacts of alternative waste-management facilities, systems, and integrated scenarios.

Air-emission factors were developed for each potential type of facility and vehicle, so that the relative effects of individual components could be compared, and so that the total "loadings" for each integrated scenario could be summed and compared. These emission factors were developed on a "unitized" basis, for facilities of a typical or "reference" size, so that emissions from a particular facility type or from a total scenario could be calculated by multiplying the number of tons of waste of a particular type by the proposed size(s) of a particular facility and the number of facilities of that type.

Of greater interest from a public-health (and regulatory) perspective is the likely concentration of pollutants from a particular facility or combination of facilities in the air that people breathe -- i.e., the "ground-level" or ambient concentrations. Since the pollutants that are released from a "stationary point source" -- a stack or a vent -- are blown by the wind, dispersed, and thereby diluted before they come into contact with human nostrils (or skin), the effect of local meteorological conditions must be taken into account. In addition to such meteorological factors as wind speeds and direction, the other most significant factors (besides the characteristics of the stack and of the exhaust gases themselves) pertain to the relationship between the height of the stack and the height of the heuristic nostrils (the "receptor" height), and to the distance downwind from the pollutant source. In general, the higher the stack in relation to the ground, or in relation to the nostrils (since they might be breathing through an open window in a tall building), the greater the degree of dispersion and dilution, and the lower the ambient concentration.

These effects are calculated using a computer model loaded with data on all of these factors. A standard, EPA-approved model was used, along with meteorological data recorded at LaGuardia Airport. (The air-modeling protocol, and a more detailed discussion of modeling results, along with the outputs of the modeling analysis, are presented in Appendix Volumes 6 [for individual facilities] and 7.2 [for integrated scenarios].) The dispersion of pollutants from the eight types of facilities that produce the most significant emissions were modeled.[1] These facilities are mass-burn and refuse-derived-fuel incinerators for municipal solid wastes, a medical-waste incinerator, a sludge incinerator, a sludge heat-drying facility, an in-vessel compost facility, an ash landfill, and a materials-recovery facility.

There are a number of location-specific conditions that may affect the dispersion of exhaust gases from a facility in New York City. In order to develop more refined siting criteria for specific facility types and sizes that take these conditions into account, dispersion modeling was conducted to test the effects of varying geographic circumstances. Some of these conditions derive from the relationship between the height of the stack or vent from which pollutants are released and the height of surrounding terrain and nearby buildings. The absence or presence of buildings in the surrounding area is also a factor, since buildings can interrupt and "roughen" the flow of air in a given region. A third factor stems from the Federal Aviation Administration's restrictions on the height of stacks in areas near airports. To account for the effects of all of these factors, separate model runs were conducted for prototypical facilities with high and low surrounding terrain, with receptors at ground-level and in elevated buildings, with "urban" and "rural" surface conditions, and with stacks high enough to avoid stack "downwash" conditions[2] and stacks only half that height.

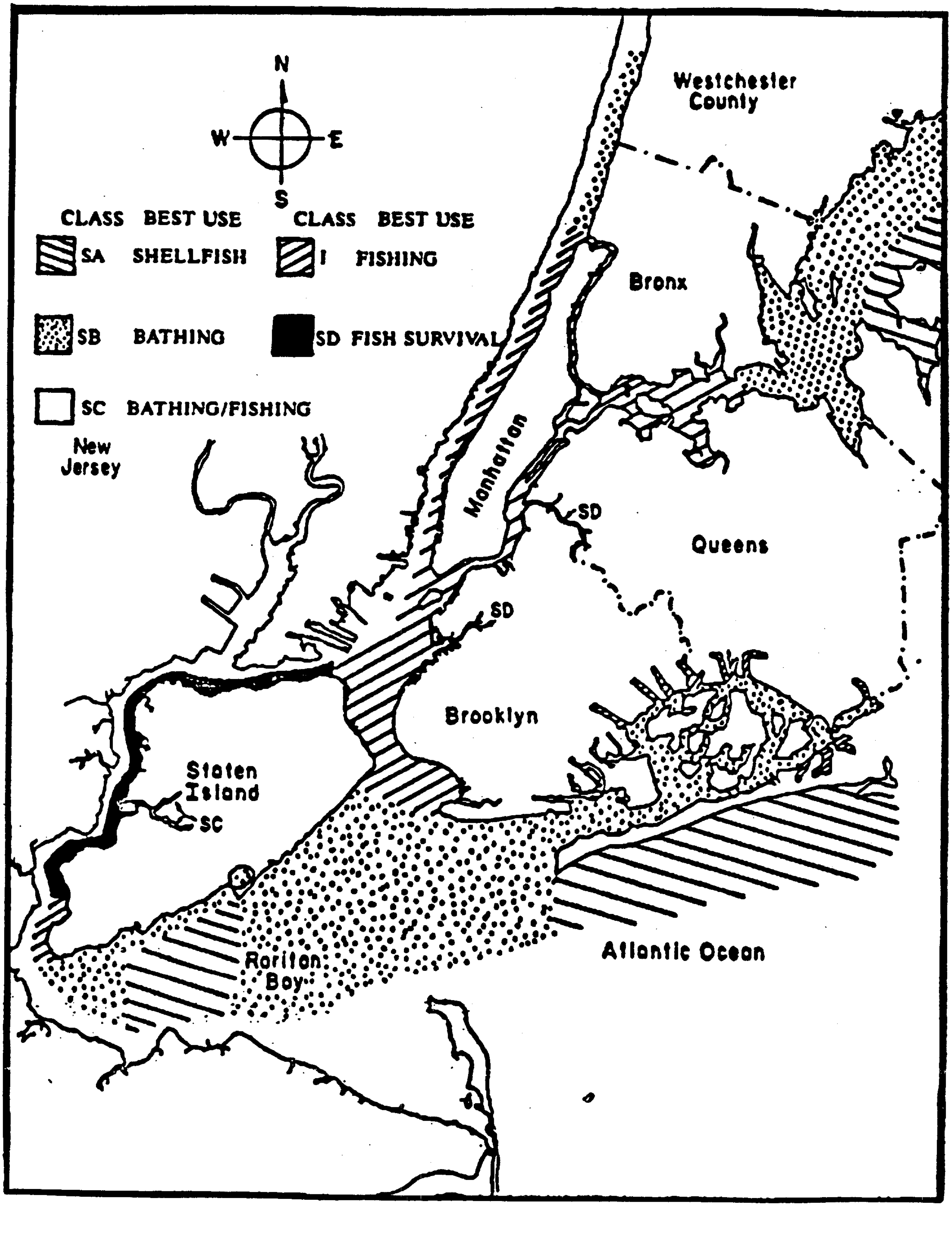
The air-quality impacts of alternative integrated scenarios were addressed in two ways, by calculating the "net loadings," and by modeling the cumulative impacts of combinations of facilities. In addition to the effects of various facilities ("stationary" or "point" sources), the air-emissions from the collection- and transport-vehicle miles travelled were also calculated, both for individual facility types, and for combinations of facilities in integrated scenarios.

In order to assess the overlapping effects of emission "plumes" from multiple facilities of various types, facilities in three second-phase scenarios and in two final-phase scenarios were assumed to be located in particular regions of the City that met basic siting criteria (as specified below in section 6.8). In the second phase of cumulative modeling, the deposition of particulates on the ground and on surface-water, as well as the ambient concentration of gaseous pollutants, was also calculated. Potential ambient air-pollutant concentrations due to vehicle exhaust at individual intersections were also estimated by modeling dispersion effects at sample locations representative of those where overlapping traffic flows due to waste-management systems might converge.

6.2 Water-Quality Analyses.

Figure 6.2-1 depicts existing State surface water classifications for the New York Harbor/estuarine region. The

Figure 6.2-1: Existing New York State Surface Water Classifications



impacts of alternative waste-management systems and system components on surface-water quality were analyzed by considering the effects of two types of pollutant loadings: direct and indirect (i.e., "surface run-off") facility discharges into surface and ground waters, and the deposition of air-borne particulates onto surface waters either directly or from being washed off hard surfaces into these waters.

Pollutants that enter waterways are dispersed and diluted by currents and tides, until regularly occurring discharges result in "steady-state" pollutant concentrations. These flows, and the differential dispersion and dilution effects of different regions of the harbor/estuarine region, were modeled by computer. In order to assess the maximum pollutant concentrations that would be produced by different types of facilities sited in varying locations, the harbor system was divided into 41 reaches, and a constant non-decaying pollutant load (one million pounds per day) was assumed to be discharged into each reach. The analysis of the maximum pollutant concentrations produced at the point of discharge, coupled with an analysis of the relative levels of existing pollutant concentrations in those reaches, provides guidance for the siting of waste-management facilities.

6.3 Traffic-Impact Analyses.

There are two kinds of traffic impacts associated with waste-management systems. One set of impacts is due to trucks driving in start-and-stop fashion on local streets to collect waste materials. The second is due to the transport of collected materials on designated truck routes to processing facilities, or to the shipment of material that has already been transferred or processed in some way from one type of facility to another.

The first type of traffic is likely to generate more overall miles travelled, and therefore, to create more air emissions and noise, and to consume more fuel. While more vehicle occupants citywide might experience more frustration due to the collective citywide delays caused by start-and-stop collection trucks, these effects are dispersed relatively equally across the City. From a <u>traffic</u>-analysis perspective, however, the most significant impacts are due to the incremental congestion (and consequent air-pollution problems in specific locations) on specific intersections and roadways that is due to the <u>concentrated</u> effects of many trucks and employee vehicles converging on a single facility or combination of nearby facilities. It is these latter impacts that were the primary focus of the traffic analyses.

These analyses involved several steps. First, data were developed on the number of vehicle trips, by type of vehicle and hour of the day, which would be generated by each type and size of facility. Second, areas of the City that met the most fundamental siting criteria for large-scale waste-management facilities in terms of land-use, zoning, and transportation access were identified (small-scale facilities being of less import from a traffic perspective), and the most critical "portals" or "chokepoints" leading into these areas, and the most critical and/or congested intersections within them, were identified. (The locations of the specific intersections that were analyzed are indicated on the borough maps in Chapter 17.) The peak-hour vehicle trips that would be generated by various types of waste-management facilities were then compared to existing traffic levels at these critical locations to assess the potential effect of alternative facilities. If it was determined that a particular intersection or chokepoint could not absorb the additional traffic generated by a particular type and size of facility, that area was deemed to be unsuitable for that type of facility, and the siting criteria for that facility were refined to tentatively preclude any other area of the City that might pose similar restrictions. For traffic problems that would be mitigable, alternative mitigation concepts were developed, their effects calculated, and their order-of-magnitude costs assessed.

A more detailed discussion of the traffic-impact analysis methodology and results is contained in Appendix Volume 6.

6.4 Noise-Impact Analyses.

Just as there are two types of traffic impacts associated with waste-management systems, there are two types of noise: collection noise and facility noise.

Facility-related noise is the less significant in terms of its potential impacts on human eardrums, and the easier to evaluate. Data were developed on the noise produced by each type of equipment in each type of facility. These were considered in relation to the overall facility design and operating characteristics, and to the facility siting criteria.

The more significant noise impacts from a waste-management system are due to the effects of clanking, grinding, start-and-stop collection noise, much of which occurs in residential neighborhoods (where many people sleep, or try to sleep, when collection trucks are working), or in busy commercial areas where there is already a great deal of noise. In order to assess the differential noise impacts of alternative collection systems (which involve different numbers of collection routes and vehicle miles travelled, and different types of collection equipment), a modeling technique known as the "fractional impact method" was used.[3] More people would be exposed to more noise in one alternative system than in another. The fractional impact method provides a way of measuring this difference by calculating the relative number of people who would be disturbed by a given average noise level in each system. The noise levels produced by a particular type of truck, the number of collection miles that would be traveled in different areas of the City, the types of land use and the population densities of those areas, and the time of day that collection would take place were used to calculate the differential effects of alternative collection systems.

6.5 Odor Impacts.

Odors are a common by-product of solid-waste management. Odors can provoke significant public disturbance. Odors may sometimes be little more than a nuisance; at other times, when the odorants are associated with toxic substances (e.g., hydrogen sulfide), they may represent a threat to public health.

In most cases, offensive odors are the result of the microbial decomposition of organic waste (e.g., kitchen waste or sewage sludge). Other odors are characteristic of the chemical composition of the waste or the disposal process itself. These odors can be managed by expeditious and properly designed and operated disposal technologies. Because some odors may develop even under the best of conditions, careful attention must be given to facility location, design, and operation.

The odor analysis for this plan consisted of a review of the general sources of odor in solid-waste-management facilities, a review of the universe of odor-control techniques, and the development of general design and operational guidelines for minimizing these odors. It also entailed a review of the design and operating characteristics proposed for each type of reference facility. As a guide to facility siting, these facilities were ranked in terms of their relative odor potential. Facility-specific mitigation measures were proposed where warranted; these included siting criteria when appropriate.

6.6 Infrastructural/Utility-Systems/Community Services Analysis.

The most significant limiting factors in New York City's utility systems are water supply and sewage treatment capacity. Since water supply through the City's distribution network is relatively equal throughout the City, the analysis of water-supply was based on a calculation of the net water-usage requirements of City-supplied water under various combinations of facilities and programs.

A more significant constraint imposed by the City's existing utility system is on the amount of used water that can be discharged into the City's sewage-treatment system, particularly in drainage areas that are served by treatment plants that are already operating at or near their maximum capacity. Comparisons of water-discharge volumes with available treatment-plant capacity were used to develop additional siting guidelines.

A second type of limitation imposed on sewage discharge is on the concentrations of pollutants permitted. The pollutant loadings for each of the alternative facility types were compared, as were net loadings for alternative integrated waste-management scenarios.

None of the types of waste-management facilities considered in the universe of reference facilities, either individually or in total, would produce significant incremental demands on the existing network of police, fire, public health, education, or transportation systems.

6.7 Energy Impacts.

Total-system energy impacts were calculated for the 12 first-phase scenarios[4] and for the four final-phase systems. Inputs to these calculations were the total amount of energy (from all types of fuel sources) used in all of the facilities and by all of the vehicles in a particular scenario. These energy "expenditures" were offset by the amount of energy "produced" by waste-to-energy and landfill-gas-recovery facilities. The sum of these debits and credits can be thought of as the local energy balance. A second calculation considered the energy-saving effects of using recycled materials in place of virgin materials; adding these effects to the local energy balance provides a broader understanding of "global" energy impacts.

6.8 Secondary Economic Impacts.

"Secondary economic impacts" are the indirect effects produced by capital and operating expenditures for programs, collection systems, and facilities. They are commonly referred to as the "multiplier" effects of dollars spent, and include jobs created, sales generated, and taxes collected by businesses that are affected by the jobs created and dollars spent directly on waste-management. In addition, there are the offsetting effects, the "reverse multiplier," as it were, which result when increased waste-disposal costs displace spending (by taxpayers and by government) that would have occurred if those dollars had not been allocated to the waste-management system. The "multipliers" used for this analysis, which are tied to the effects on specific types of businesses, were the so-called "RIMS" multipliers (Regional Input-Output Modeling System) developed by the U.S. Department of Commerce. The product of this analysis is an evaluation of the relative "productivity" of expenditures for various types of waste-management systems, which in turns allows informed public-policy judgements about the relative costs and benefits of choosing a system from a larger economic perspective than that of direct costs alone.

6.9 Land-Use Impacts.

Net acreage requirements for the total set of facilities in alternative integrated waste-management systems were compared.

The relative effect of different types and sizes of waste-management facilities on blocking light and views from adjacent populations was considered.

6.10 Facility Siting.

Facility-siting criteria are primarily the result of the technology/facility-specific environmental analyses described above. Appropriate sites for specific types of facilities depend on facility size (which is a function of waste-shed, different sizes of which were evaluated through the WastePlan modeling process), the space requirements associated with a particular type of technology and material-transport system, adjacent land-use, specific regulatory requirements (e.g., Federal Aviation Administration restrictions on stack height, 6 NYCRR Part 360 requirements for distance to ground- and surface waters, to airport runways, limitations on noise at property boundaries), environmental analyses that identify particular siting constraints for particular types or sizes of facilities (traffic, air, public health, odor, water quality, sewage-discharge capacity), particular site characteristics (e.g., wetlands, landmark areas) and more generalized regulatory guidelines, such as the City Charter's Fair Share criteria, the City Planning Commission's waterfront planning objectives, and the Coastal Zone Management program's consistency criteria. (A more detailed description of siting considerations is presented in Chapter 13.)

Based on these considerations, siting criteria were developed for each type of facility. A computerized screening system was used to identify regions of the City that might be suitable for these facilities on the basis of zoning (as a surrogate for existing land-use), waterfront access, roadway access, and rail access. Potentially suitable regions were matched with the combination of facility types needed for an integrated waste-management system. The distribution of facilities thus created was used in the analysis of potential cumulative impacts on air quality, water quality, traffic, and public health.

6.11 Public Health.

The public-health analysis involved three steps:

First, pollutants associated with waste-management facilities were reviewed to identify those that might have potential significance from an occupational- or public-health perspective, and to determine the levels at which these pollutants could be of concern and under what circumstances (e.g., exposure pathways).

Secondly, reference-facility operations and emissions were reviewed to determine if there were any significant differences between them from an occupational- or public-health perspective, and whether there were any impacts that should be considered significant. This analysis was based on characterizations of individual facilities (and collection systems), including the materials that would enter the facilities and the materials that would leave them, their conceptual designs (equipment types, building configurations), unit pollutant emission rates for air and water, noise levels, and odor potential, and modeling of ambient concentrations produced by facility (and collection system) emissions.

Thirdly, the cumulative impacts of alternative scenarios and systems were similarly assessed. These assessments were based on net-loading calculations of pollutants discharged to air and water, on a calculation of differential noise impacts due to alternative collection systems, and on a review of ambient air and surface-water pollutant concentrations due to the operation of alternative waste-management systems.

Endnotes

1. "Most significant" either because they produce the highest pollutant concentrations, because they produce the greatest quantity of emissions overall, or because they represent extreme or "boundary" cases that represent the "worst case" for a range of other facility types.

2. "Good Engineering Practice" stack heights.

3. The fractional impact methodology was developed by the U.S. EPA, and has been adopted by the National Research Council of the National Academy of Sciences.

4. The "maximum-burn" benchmark case was not included in the first-phase analysis.