Preliminary Recycling Plan
Fiscal Year 1991

The City of New York
David N. Dinkins, *Mayor*

Department of Sanitation
Steven M. Polan, *Commissioner*

Office of Operations Planning

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New York City Recycles

THE CITY OF NEW YORK Department of Sanitation

STEVEN M. POLAN
Commissioner

125 Worth Street
New York, N.Y. 10013
Telephone (212) 566-5010

October 9, 1990

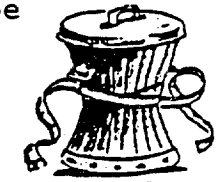
The Honorable David N. Dinkins
Honorable Members of the Council
Members of the Citywide Recycling Advisory Board

I am pleased to submit this report on the Department of Sanitation's activities during the first year of mandatory recycling pursuant to Local Law 19 of 1989. This document, which constitutes the preliminary recycling plan required by the law, contains information and data that still need further review and analysis. However, I am hopeful that in its present form it will serve as a useful reference for you and others who are interested in helping to shape a successful recycling program for the City.

As a new Sanitation Commissioner, I thought it appropriate to delay the delivery of this report until I had sufficient opportunity to study the Department's current recycling program and to offer my initial assessment of it. The purpose of this letter is to provide you with some general observations and to give you the benefit of my evolving thoughts about the course I would like to set for the future. I am determined that the Department take every reasonable step to comply with the ambitious requirements of Local Law 19, but also that our common goal -- establishing an environmentally and economically sound waste-reduction and waste-management program for the City -- is achieved.

You will find that the attached report does not address all of the 23 items that, in accordance with Local Law 19, were to be included in this preliminary recycling plan. This is due to the fact that another, parallel waste-management planning effort, the Solid-Waste-Management Plan, is evaluating these items in a broader context and we believe that it is more appropriate to address them in that fashion. That plan is scheduled for completion in mid-1991.

My purpose in writing at some length in this introductory letter is to state as explicitly as possible where we have succeeded, where, despite the dedicated efforts of our personnel, we have fallen short, and the directions in which we are headed, so that the evolving debate about recycling's place in the integrated waste-management strategy we are developing will be



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focused on facts and not on preconceptions.

The success of our recycling programs will be critical to all of us. This is true because the cost of waste disposal is going up, not just because of the increased costs of recycling per se, but because the costs of alternative waste-disposal techniques are also going up due to our increased awareness of the environmental impacts, the increased costs of regulatory compliance, the capacity limitations of our existing landfills and disposal facilities, and the limitations that other jurisdictions are placing on the importation of non-local wastes.

In reading the enclosed report, it is important that the relative costs and environmental impacts of alternative waste-disposal techniques be kept in mind. A detailed analysis of these economic and environmental costs will be a central component of the forthcoming Solid-Waste-Management Plan (which is being prepared in the form of a generic environmental impact statement). Equally important, it must be realized that our current projections of recycling costs are based on what we know to date. It is possible, even probable, that with time and experience these costs will decrease.

The City has allocated considerable resources to recycling, perhaps more than to any other new programmatic initiative in recent years. This investment -- and it must be viewed as an investment intended to provide future returns -- totalled about $50 million in the fiscal year just ended, and approximately $80 million is budgeted for this year.

These are some of the noteworthy achievements to date:

- Curbside source-separation programs have been established in 27 of the City's 59 community districts, covering more than one-third of the City's households, and the tonnage of recyclable materials collected by the Department exceeded Local Law 19's first-year goal of 700 tons per day. (Other types of residential programs reach an additional 14 community districts.) The portion of the residential waste stream that is being diverted from the Fresh Kills landfill for recycling rose to over six percent.

- The City's first detailed analysis of composition of our residential, institutional and commercial waste streams was completed. We now have the fundamental data on the components in our waste that we need in order to design effective and efficient waste-management programs. This study also developed the first New York-specific data on waste generation for the range of businesses that

comprise New York's commercial sector.

- The City-designed and -constructed intermediate processing center (IPC) in East Harlem, operating under a service contract with a private vendor, exceeded its anticipated performance level by climbing to an average processing rate of almost 100 tons per day from the Department's curbside collections. Operational improvements were made to reduce the amount of unrecyclable, post-processing residue from 20 percent of the weight of the incoming material at the beginning of the fiscal year to just over five percent at the end -- an impressive rate for a facility of this type.

- To supplement the capacity of the East Harlem IPC, two contracts were let for additional private processing capacity of Department-collected residential recyclable materials. The development process for a second City-owned IPC -- a 300-ton-per-shift facility on Staten Island to be designed, constructed and operated by a private vendor under a contract with the City -- is underway. Also, Department engineers have begun to design a conversion of the former Hamilton Avenue incinerator into a 50-ton-per-shift processing facility to provide additional processing capability on an interim basis while long-term plans for a permanent recycling infrastructure are being developed.

- Contracts for four new privately operated buy-back centers (another Local 19 requirement) were approved and at least three of these facilities will be operational soon. The performance results from these facilities will help us to make future decisions about the effectiveness of this alternative collection strategy.

- A pilot leaf-composting study at the Edgemere landfill in Queens was successful, providing useful information and experience for future full-scale composting operations. The City's first full-scale leaf-and-yard-waste composting facility is now under construction at the Fresh Kills landfill and will be ready to begin operating this fall.

- Preliminary surveys of end-use markets for 15 secondary materials were completed as a first step in the process of developing long-term marketing and market-development strategies.

Overall, however, and perhaps, in retrospect, inevitably, given the aggressive schedule and tonnage requirements established by Local Law 19, our performance so far represents an uneven mix of achievements and disappointments. That there are substantial difficulties should come as no surprise. New York's recycling law attempts to change behavioral patterns and economic forces that are deeply rooted. (Unfortunately, one of the simplest and most effective tools other communities have used for influencing public behavior -- charging householders directly for collection service, and thus providing economic incentives to reduce waste and to recycle -- is not available to us.) The changes that we must make will not come about easily, quickly, or solely through changes in local governmental policy. Moreover, there is no existing model for what we are trying to accomplish; thus we acknowledge that the Department is learning as we implement the law.

Among my leading concerns are the following:

- The program as designed is proving to be much more expensive than most anticipated. Initially estimated by the Department to cost $65 per ton, we now estimate that the collection and processing system we currently employ will cost between $198 and $273 a ton at full implementation. This approach to residential curbside collection is unacceptably costly and inefficient, and without changes, will continue to be so. We anticipate substantial labor-relations difficulties in effecting the changes we must make.

- Program management has been driven by the overriding objective of meeting first-year tonnage requirements. Focussing on tonnage had the unintended consequence of limiting the attention paid to other critical objectives. The fundamentals for effective management over the long haul -- personnel, organizational structure, procedures and internal controls, and labor agreements -- were not in place at the program's inception, and some elements are still lacking today. From a management perspective, the program has been brought up too quickly; from a legal perspective, the Department had no choice.

- We are not diverting a sufficiently high percentage of the targeted recyclable materials in most neighborhoods where curbside collection has been implemented -- even in those areas where high participation generally would be expected -- to give me reasonable confidence that an eventual 75 percent diversion rate (as originally projected by

the Department) is realistic and attainable. (The diversion rate is the percent of the recyclable material designated for collection that is actually captured by our collection programs.) In fact, without significant improvements in our effectiveness in increasing the rate at which we are getting New Yorkers to recycle, a 30 percent diversion rate is a more realistic projection. We must find ways to do better.

- Based on the results of the waste-composition analysis and reasonable assumptions about participation and capture rates, the currently targeted (and in many ways the most "easily" recycled) materials alone will make it difficult to reach the third-year tonnage goal and will not allow us to reach the fourth- and fifth-year tonnage goals of Local Law 19. (It should be noted that the Office of Management and Budget expressed a similar concern when Local Law 19 was enacted.)

- The City's insufficient recycling infrastructure for separating and sorting materials to produce higher-grade commodities has placed us at a significant disadvantage in the marketplace; the materials we have collected are costly to process and difficult to market, and, without changes, that situation could well worsen as our collections expand. Processing capacity shortfalls might well represent the most problematic near-term challenge for the Department. The need for speed in developing this new capacity in itself creates the potential for problems: in particular, our need to contract to build additional processing capacity before the first new facility has been brought on line and tested raises some concern.

- Unanticipated institutional barriers (for example, widely diverse building types, management structures, waste-handling arrangements and practices, labor issues, space limitations, and employee educational needs) have impaired our ability to tap the relatively substantial tonnage of recyclables (other than office paper) in the waste streams of City and other public agencies.

- We still do not have a sufficiently detailed picture of the commercial carting industry's collection, transfer, recycling, and out-of-city transport and disposal systems -- notwithstanding

Local Law 19's mandates -- to make informed judgments about the appropriate mechanisms to encourage increased commercial recycling. Our delay in promulgating commercial recycling regulations is in part due to these uncertainties.

- The City has only limited opportunities to speed the development of recycling markets. While the private investment decisions necessary to productively utilize recyclables can be motivated at the margin by local incentives, they are more fundamentally based upon the relative cost structures between recyclables and virgin materials, historical biases and federal tax preferences toward new materials, and prevailing economic conditions. Consequently, in order to handle and dispose of recyclables, the City must be prepared to bear increased marketing costs for the foreseeable future.

- There are formidable difficulties inherent in any attempt to limit consumer choice through the legislative process or otherwise, not least of which is our ability as a City to influence diverse interests at the state and federal levels. We still have a long way to go in developing a coherent strategy that can overcome these obstacles and move us toward our overall waste-reduction objectives. Given the escalating costs of all means of waste disposal, it is essential that we do so.

Nonetheless, the experience of implementing programs in a real-world setting has provided us with some valuable insights that could not have been gained by other means. Some important groundwork has been laid by the many hard-working members of the Department who have performed new and unfamiliar duties under often trying conditions. In the rush to meet mandated deadlines there has been little time to develop systems to monitor and evaluate progress. The challenge that lies ahead will be to apply productively the lessons these experiences have taught us.

One of the most misunderstood aspects of the Department's programs to date are the markets for the "secondary" materials we collect. It is not an area that, up to this point, we have adequately mastered, as this report describes. Our initial collection programs were set up before we had developed sufficient processing capacity to enable us to get the secondary materials we had collected directly to end-use markets. I intend to move beyond this difficulty by exploring ways to develop quickly new facilities to sort, bale and transport our newspaper

directly to paper mills, rather than relying solely on short-term contracts with intermediate brokers. We also need to find better ways to bring on new sorting and crushing facilities for bottles and cans so that our ability to process materials will not constrain our ability to collect or market them. We know that end-users of secondary materials prefer certain material specifications and guaranteed long-term supplies, particularly if large capital investments on their part are required in order to expand capacity. Our goal must be to develop ways to respond effectively to those needs.

Another of the areas where we have not met expectations is the degree to which we are capturing the materials that we have designated for recycling in the neighborhoods where we have already initiated curbside recycling. The results of the waste-composition study, along with what we know about district-specific generation rates, have revealed that the overall diversion of targeted materials has been low -- even lower in some districts than the relatively modest 30 percent rate that was projected for the first year. The experience has been the most disappointing in high-density, low-income neighborhoods. Also, contrary to our hopes, we have found that neighborhood recycling rates generally do not climb automatically over time.

While the Department's outreach and education efforts have been considerable, they have nonetheless proven inadequate for several reasons. First, they were not predicated on market research that might have tested in advance the strategies that would best motivate the various kinds of New Yorkers. Second, our outreach programs have been limited to a short period before we begin collections in a new neighborhood. Due to the pace of the implementation schedule, we have not had sufficient education resources (or have not allocated them efficiently enough) to return with programs that could help boost participation, and we have not been able to give enough attention to building up more self-sustaining grassroots networks. Third, we had neither the resources nor a program of sufficient size to utilize mass media advertising, which can be so effective in changing attitudes and behavior.

Given our weaknesses in the area of public education, I know that the start of our new enforcement program has raised some concerns. Let me restate our enforcement philosophy. We believe that enforcement capability is important and necessary if mandatory recycling is to be meaningfully implemented, but it should only be used after repeated efforts to achieve compliance have failed. Recognizing that the allocation of resources between education and enforcement at this early stage of implementation may have been misjudged, we intend to reassign 25 of our newly created enforcement positions to the public education program for the first year. This will have dual benefits: more manpower for education and outreach, and

opportunities for our personnel to become even better trained in educational techniques and more familiar with the neighborhoods in which they will work.

But we will still need to do much more to make our outreach more effective in meeting the specific requirements of individual neighborhoods. We also need to develop a more systematic approach to measuring and documenting the effectiveness of alternative educational strategies.

One of the ways that we will try to accomplish these learning objectives -- as well as others -- is through a program of research-and-development/pilot-scale projects that we hope to carry out in the coming years to find new, effective ways to attain higher recycling rates. We refer to the pilot projects as our "extensive recycling" programs.

Through these extensive recycling programs we intend to try, in a variety of areas and with a variety of sectors that reflect the range of New York City conditions, a range of initiatives designed to teach us how to get the greatest volumes of marketable materials most effectively. (We need to focus on maximizing the <u>volume</u> of recyclable materials rather than on <u>tonnage,</u> since landfill capacity is a function of volume, not weight.) To develop cost-effective ways to achieve our goals, we would like, for starters, to find ways to:

- reduce our collection costs through more efficient techniques such as "wet/dry" separation (that is, collecting waste sorted into only two categories, food waste and everything else), lengthening routes, reducing collection-crew size, and substituting recycling collections for regular collections;

- develop collection systems that are more suited to the dynamics of the different neighborhoods (with different density and income levels) and commercial and institutional sectors that we have analyzed -- e.g., various kinds of "drop-off" containers and facilities, expanded types of "buy-back" operations, working cooperatively with businesses and private carters and transfer-station operators, using economic incentives to encourage new roles for building superintendents, tenant associations, and neighborhood groups;

- broaden the types of materials that we collect (our waste-composition study, among other things, shows us that we would have to achieve unprecedented and altogether heroic participation

and capture rates in order to achieve our tonnage objectives if we collect only the materials designated by Local Law 19 and in our current programs);

- develop expanded compost options for a variety of organics in the waste stream (such as encouraging people with backyards to do their own composting, helping residents of suitable apartment complexes to use newly developed small-scale technologies that are designed with these sorts of complexes in mind, helping neighborhoods to use locally made compost to green vacant lots); and

- increase local usage of recycled materials, through expansion of traditional City procurement techniques to encompass a broader range of materials (e.g., using "plastic wood" for a variety of purposes), and through the development of non-traditional "markets" (e.g., using compost for landfill cover and for re-claiming degraded areas) (as in the past we developed "glassphalt").

Among the many challenges of designing programs with the information that we acquire will be to maintain sufficient simplicity, uniformity, and equity so that we can continue to service all of the City as efficiently as possible, while nonetheless working with, rather than against, the characteristics that give each area its distinctive personality.

It is far too early to make any judgment as to whether Local Law 19 can be called a success. We can, however, say that it has put us on a useful course for making the necessary transition to a more environmentally sound waste-management system, even if we are finding that, in places, it offers a well-intentioned but overly rigid set of requirements. We will focus on those intentions, and try to improve their execution, even if that may mean coming back to you, at the conclusion of our solid-waste-management planning process, with some suggested modifications of the law to better fulfill its spirit.

In the few months that I have been Sanitation Commissioner, I have come to the conclusion that this agency performs its traditional functions very well and that there are many talented and committed people at all levels who are trying to make recycling succeed. Nevertheless, it has become clear to me that our changing waste-management mission calls for a different type of internal structure. The Department's recent focus has been primarily on the operational aspects of recycling collection, and it is clearly important to retain and continue to build our strength in this area. However, at the same time, there is a greater need to elevate the importance that waste reduction,

marketing, and economic development issues will play in the future programs of the Department. I have decided, therefore, to create a new Office of Solid-Waste-Management Policy to be headed by a new Deputy Commissioner. This new office will bring under one integrated unit all of the functions critical to long-range waste-management policy, including research -- particularly in the area of waste prevention -- policy analysis, and economic development activities. It also will be responsible for advancing the key programmatic objectives that emerge from the solid waste management plan.

In conclusion, I would also like to emphasize that we in the Department are well aware of the City's severe budget constraints and, despite the many references to resource availability in this report, it is not intended to be a budget-advocacy document. We recognize that there are separate processes and forums for proposing, defending, and debating new expenditure proposals, and that many competing priorities must be evaluated.

We look forward to continuing to work with you -- candidly and cooperatively -- to make recycling work in New York City.

Sincerely,

Steven M. Polan

TABLE OF CONTENTS

TABLE OF EXHIBITS

CHAPTER I

RECYCLING PROGRAMS OVERVIEW

In 1986, in response to a growing recognition that the City's option's for disposing of waste were narrowing, the Department of Sanitation began voluntary newspaper recycling programs in certain neighborhoods and individual apartment buildings. In 1989, the City Council, with the support of the Department, enacted mandatory recycling legislation applicable to all waste generators Citywide. The Law -- known as Local Law 19 -- became effective on July 14, 1989. Its intention was to minimize environmentally undesirable methods of waste disposal, preserve landfill capacity, diminish the costs of a resource recovery program, and aid in the conservation of the environment.

Today the Department of Sanitation's bulk, curbside and containerized recycling programs, mandated by Local Law 19, serve more than 2 million households in 40 of 59 community board districts throughout New York City 27 -- districts are on the curbside program alone; six percent of the daily residential waste stream is now diverted for recycling the City has committed substantial financial resources to these programs; over $79 million is provided for recycling operations during the current fiscal year; in addition, $30.8 million has been allocated for capital expenditures related to recycling.

Local Law 19 requires that the Department submit an annual report detailing the recycling program's progress, problems, issues and long-term strategies. This, the preliminary first-year report, is to be followed by a final report next year. Twenty-three items were enumerated for inclusion in these reports, the majority of which are covered in this preliminary report. Notable exceptions are facility siting options and cost comparisons between recycling and other waste disposal techniques, including resource recovery. These issues, as well as others, will be contained in either the final report or in the City's Solid Waste Management Plan scheduled for completion in mid-1991.

As an additional introductory note, the Department is cognizant that it lacks complete answers for many of the significant questions raised by the list of topics contained in Local Law 19. This reflects the simple fact that New York City is exploring new terrain in developing a recycling program in an urban, high density enviornment; there are no models, instruction manuals, or case studies applicable to our situation. Thus we learn as we progress, we make mistakes, and we build from our successes. To expect our level of certainty about the future to be significantly more advanced at this stage would be unrealistic.

Local Law 19 mandated that the Department establish and implement programs that would reduce or recycle Department-collected and Department-disposed solid waste by specified tons per day (tpd) within one year of the enactment date (by April 1990) and in each succeeding year. The law also established a schedule for bringing Community Board districts into the recycling program: by July 1990 one-third of all households in the City were to source-separate their waste; by July 1992 two-thirds of all households were to participate, and by January 1994 all households in the City were to be on-line.

The first year's goals for Department-collected waste have been accomplished. The Department not only diverted from the waste stream the 700 tons per day required in

the first year of the law, but exceeded that goal by an additional 124 tpd. In addition, complying with the law, we have brought more than one-third of all households into the residential recycling program. Further, we have written the regulations governing residential recycling and, with this report, have issued the preliminary recycling plan. We acknowledge, however, that we have been late in achieving some milestones, most notably the issuance of commercial recycling regulations.

But while we have achieved a great deal in the first year, both the mandated tonnage goals and the schedule for Community Board participation have made it, and will continue to make it, difficult for the Department to proceed in the systematic and reflective way we would like. Based on all that we have learned from our experience in the previously unknown terrain into which we have ventured, we believe that the mandates of Local Law 19 were not adequately thought through from an overall management perspective. This lack of foresight is not surprising given the fact that recycling in New York entails significant initial costs and complex education strategies. These could only have been fully understood once we embarked on the program.

Waste Reduction

Waste Reduction -- to cut down on the amount of materials that must be collected and either recycled, burned, landfilled, or exported -- is the preferred strategy in New York State's hierarchy of waste management. Reduction can be achieved in a number of ways: (a) by substituting reusable, durable goods for disposable ones -- e.g., reusable utensils for plastic throw-aways; (b) by reusing materials, without significant reprocessing, for the same purpose for which they were originally intended -- e.g., refillable containers instead of single-use disposables; (c) by reuse after processing -- e.g., backyard composting of yard and food wastes; (d) by eliminating excess materials -- e.g., reducing unnecessary packaging.

Reduction of waste is, however, the least understood option in waste management because it depends on altering buying habits, preferences, and manufacturing (and packaging) processes that usually take place outside the locality wishing to reduce or eliminate waste. Environmentally desirable buying habits depend on both voluntary compliance and the availability of realistic purchasing alternatives. Shifting patterns of manufacturing and packaging is difficult and is likely to result in strong opposition from manufacturers, and possibly -- at least in the short-term -- in higher costs and in fewer consumer choices.

Nevertheless, the Department is making a concerted effort to promote effective legislation at the federal, state, and local levels. Additionally, the Department intends to expand the scope of its education programs in order to encourage changes in consumer behavior.

Recycling

Given the practical near-term difficulties of reducing waste at the source, as well as the requirements of Local Law 19, the Department has devoted most of its efforts toward recycling.

The Department's citywide recycling program requires the public to separate its recyclables from the waste stream it generates. Source-separation, as this report will explain, is sometimes inconvenient and, despite educational campaigns, not always fully understood. Nevertheless, none of the subsequent stages of recycling can proceed until materials with potential value are extracted from the waste stream.

The separated recyclables must then be collected and delivered to intermediaries with the capacity to further sort, process, and aggregate the materials for the next-level buyer. Without adequate processing capacity and markets for the recyclables, those carefully separated materials may end up in landfills.

Unfortunately, collection, processing, and marketing efforts are at times in conflict: collection is most efficiently done when materials are commingled; marketability is greatest when materials are fully separated; both are constrained by the capacity available to accept and process materials.

Thus, the series of steps required by recycling is far more complicated and expensive than the garbage collecting and dumping process the Department has historically undertaken. Success cannot be measured solely by tonnage diverted. There are physical and institutional problems of putting in place a new collection system, developing adequate processing capacity, and encouraging sufficient markets. And there are educational problems: they involve the Department *and* the people of the City in deliberate, discretionary activities. Both garbage generators and garbage handlers must be knowledgeable about the composition of the solid waste "mass". Garbage generators, in addition, must cooperate with the Department by separating out recyclables and, often, by setting them out on the curb on designated days.

To that end, the Department has undertaken major education efforts to reach its own personnel and, at sufficiently greater cost and complexity, to reach the City's diverse population, which in this context is significantly diverse by income and education levels, primary language and housing type. Nevertheless, the Department is not satisfied with these efforts. While, not surprisingly, we have been successful in reaching the already converted -- those who came to the program with a commitment to recycling already in place -- we have not been as successful in capturing the attention of those who are less environmentally conscious.

Local Law 19 Mandates

First Year Goals

Most of the goals stipulated in Local Law 19 have either been achieved or will be achieved soon (see Exhibit I.1). Some have been delayed; these too are detailed.

Tonnage Goals

The keys to our meeting the law's first-year goals where the successful collection of newspapers, magazines, corrugated cardboard, metal and glass containers, office paper, and bulk materials. These materials were collected by the following programs:

- The *Curbside* program, which requires source-separated recyclables to be put out on the curb for Department pick-up. It serves residences, institutions, and City agencies not participating in other recycling programs;

- The *Containerized* program, which serves large apartment houses (generally 200 units or more), institutions and city agencies that have storage areas for containers accessible to Department vehicles;

EXHIBIT I.1
MANDATORY RECYCLING LAW REQUIREMENTS

MANDATE	DATE DUE	STATUS
Tonnage Goals in Tons Per Day (TPD)		
DOS disposed: 1,430 TPD	April 1990	Measurements Uncertain
DOS collected: 700 TPD	April 1990	Achieved on Schedule
Households Serviced		
1/3 of City	July 1990	Achieved 1.6 million Curbside/Containerized 2.0 million bulk
Regulations		
Residential	December 1989	Adopted January, 1990
City Agency	January 1990	Adopted September, 1990
Commercial	April 1990	Drafted September, 1990; issuance early 1991
Consumer Affairs	April 1990	Drafted Sept. 1990; issuance early 1991
Dept. of General Services	January 1991	
Yard Waste		
Separation, Collection, Composting	January 1991	Site selected; construction on schedule
Batteries & Tires	January 1991	No program in place; unlikely to be met
Christmas Tree	January 1991	On schedule
Recycling Centers		
10 Processing Centers or Equivalent		While necessary processing capacity has been available to date this is a source of concern as tonnage increases. East Harlem IPC and two private vendor contracts in place.
Buyback Centers	No due date	
- Brooklyn		Approval by BOE July 1990
- Bronx		Approval by BOE July 1990
- Manhattan		Approval by BOE July 1990, no site
- Queens		Approval by BOE Aug. 1990
- Staten Island		Delayed; no responses to RFP.
Marketing Recyclable Materials		
- Submit Plan	January 1991	In progress
Education and Research Program		
- Notify Community Boards and affected constituents of regulations	Within 30 days	Completed on schedule
- Develop Education Program	July 1990	Work in progress
Preliminary Recycling Plan	July 1990	Submitted October, 1990
Recycling Advisory Boards		
- Each Borough	January, 1990	Established
- Citywide	April 1990	Interim Board
Department of General Services Recycling Plan Procurement Analyses	July 1990	Achieved Sept. 1990

- *Bulk* programs, which collect such large items as appliances and furniture;
- The *City Agency Office Paper* program, which collects high-grade office paper;
- *Lot Cleaning*, which recycles bulk waste and dirt from vacant lots that are cleaned by the Department; and
- The *Self Help* program, which separates for recycling metal and wood from the materials dumped at self help sites by private citizens.

Given these recycling programs and our plans for extending them, we have reason to be optimistic that the tonnage projection for FY 91 can be met. Meeting this projection, however, is predicated on a number of assumptions, including the availability of adequate processing capacity and the effectiveness of new educational approaches and materials. Meeting the tonnage projections for FY 92, while still possible, is at present questionable. And the additional programs necessary for us to meet the law's fourth and fifth year goals have not yet been developed. As a result of the projected difficulties from 1992 on, the Department is now embarked on a number of research efforts designed to result in the creation of new programs -- programs which may offer the potential of meeting the out-year tonnage goals. These research efforts include:

1. *Waste Composition Study* (see Chapter II, "Waste Composition"). By analyzing more precisely the materials that make up the City's waste streams, and in what proportions they appear, we will be better able to designate new materials for recycling, to design efficient collection systems, to build or procure the necessary processing capacity, and to locate markets for these recyclables.

2. *Intensive Recycling* (see Chapter V, "Residential Recycling"). In this program we will explore ways of maximizing the full potential of waste reduction, reuse and recycling in two demographically different areas of the City: one low income/high density location in Manhattan and one medium income/medium density location in Brooklyn. The study will explore (a) the extent to which we can discourage the generation of waste and encourage the reuse of materials that would otherwise be discarded; (b) the long-term economic feasibility of recycling additional materials; (c) the rates of diversion and participation that we can expect to achieve with various education and outreach strategies; and (d) the problems and prospects of implementing our various waste reduction and recycling programs in other parts of the City.

3. *Market Research (see Chapter IX, " Market Development ").* The 1988 White Paper, "New York City Recycling Strategy", affirmed that market demand was the single greatest constraint to recycling. Furthermore, as the Northeast region pursues recycling more aggressively the potential availability of recyclable materials may well increase faster than the capacity of markets to absorb them. Our ongoing studies of 15 separate components of the waste stream include an assessment of current and future market capacity.

Regulations

In January 1990 we promulgated regulations covering collection of recyclables from residential buildings. These regulations designated recyclable materials, described

the means of collecting them, and set forth the obligations of building owners, landlords, and residents, as well as the penalties for failing to meet those requirements. On August 27th we published regulations governing the obligations of city agencies and nonprofit institutions to recycle; these regulations will become final in September. Public comment on draft regulations governing recycling by the commercial sector will be invited in September, and these regulations could become effective by early 1991.

Additional Reports

The most important study of recycling in its broad solid waste management context is the Comprehensive Solid Waste Management Plan. This study will make projections of economic and demographic developments that will affect waste generation over the next 20 years, and it will apply these projections to the residential, institutional, and commercial sectors of the City in order to estimate the size and characteristics of the future waste stream.

On the basis of these projections and an assessment of current and projected disposal capacity, the Comprehensive Plan will develop overall planning objectives and evaluation criteria for existing, planned, and future programs designed to meet the City's waste management needs and goals. It will evaluate waste management options currently available in terms of their environmental impact, siting requirements, costs, feasibility, anticipated reductions of volume, implementation time, and effectiveness elsewhere. It will also evaluate waste management options in terms of defined planning objectives and criteria, e.g., environmental impact, cost, and feasibility as well as the hierarchy for solid waste management established by the State (first, waste reduction; then, recycling and reuse; followed by waste-to-energy; and, as a last resort, landfilling). Finally, the Comprehensive Plan will develop a preferred integrated solid waste management plan, describe all of its required elements, and document the planning process (specifically the evaluation and selection of alternatives) and the environmental impacts in a Generic Environmental Impact Statement (GEIS).

In the chapters that follow, the Department presents a candid assessment of its recycling programs to date. We believe that candor is in the best interests of the Department, the City, the recycling effort, and the larger environmental concerns which prompted adoption of Local Law 19 and the State's Solid Waste Management Act.

Given the physical and social diversity of the City, the recycling programs we develop here can be models for the nation. But they will become worthy of emulation if, and only if, they succeed. To succeed, they must be built on a solid information base, including regular doses of self analysis and, where warranted, self criticism.

CHAPTER II

WASTE COMPOSITION

The city's first study of waste produced by the major categories of generators -- the residential, institutional, and commercial/industrial sectors -- was conducted pursuant to the requirements of Local Law 19 in order to assist in formulating the city's waste management plans and programs. From this study -- the nation's most comprehensive analysis of waste -- we calculated the waste generation rates[1] of the sectors mentioned above.

The study points in many important directions both for further analysis and for recycling program planning. We obtained important knowledge of the physical and chemical characteristics of the municipal waste stream and its different composition in the various sanitation districts and boroughs. In the near-term, such knowledge will guide us in the design of our operations and the siting of facilities; in the longer term, it will help to remove uncertainty and guesswork from waste management plans.

More specifically, what we learned will guide our waste reduction and recycling efforts by: (a) targeting additional materials for recycling; (b) evaluating waste management alternatives; (c) gauging participation levels so that we can refine educational outreach programs; and (d) designing collection and processing operations. The task is by no means completed. Waste generation and composition will change in the future as a result of shifts in the city's economic and demographic characteristics. We have learned that we cannot assume that household income and population density are the only forces behind waste generation. These observations underscore the need for detailed and ongoing analysis, without which this waste composition study is merely an elaborate "snapshot" of New York City's waste stream at one moment in time, and of little utility for long-term planning.

Methodology[2]

After formulating statistically representative samples for each of the sectors of the study, we designed routes along which dedicated trucks collected waste for sampling. The residential and institutional samples were obtained during two consecutive weeks in each of the four seasons of the year so that we could learn how the composition and generation of waste changes according to seasonal activities. Funding constraints limited sampling of the commercial/industrial sector to only one season. Almost 3,000 samples were sorted for the entire study. The waste stream was separated into 46 components, each quantified by weight and volume.

Residential Sector

Exhibit II.1 shows the yearly averages by weight for the primary residential waste components[3].

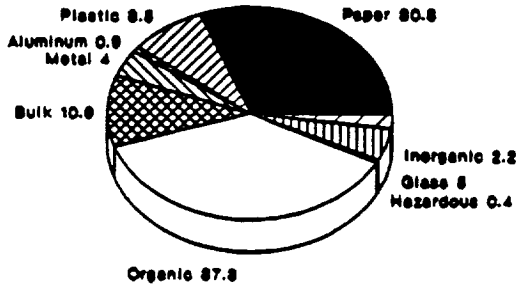
- *Organic materials* are the largest components of waste (37.4 percent). Within this category, a leaf waste recycling program will be initiated in FY 91 in one community board of Queens and in all of Staten Island. Food waste (12.5 percent of all residential waste), also compostable, is the largest not-yet-recycled component of this category.

1. See Appendix I for the definition of terms and materials.
2. See Appendix II for details on all sections of this chapter.
3. See Appendix I for the definitions of all materials.

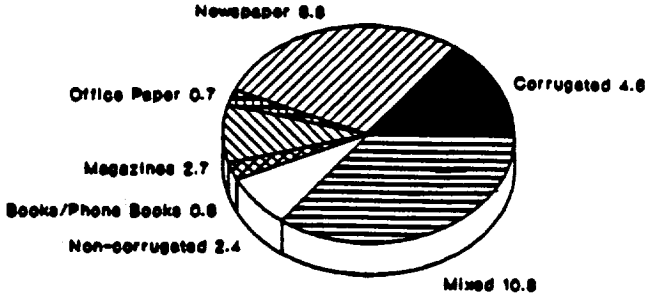
- *Paper* is the second largest waste category (30.8 percent). Its main components are mixed paper (10.8 percent) and newspaper (8.9 percent). The Department has initiated a pilot project to determine the feasibility and costs of recycling mixed paper. Newspapers, magazines, and corrugated cardboard are already being recycled.

EXHIBIT II.1

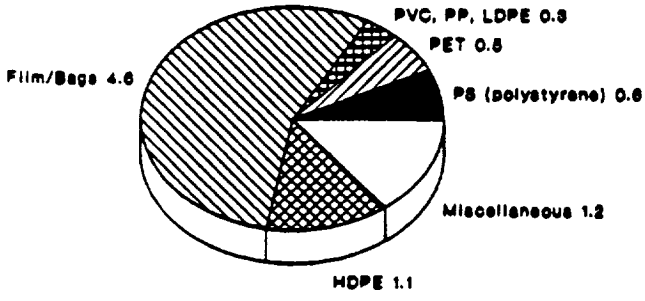
WASTE COMPOSITION IN NEW YORK CITY (1990) PERCENTAGE BY WEIGHT



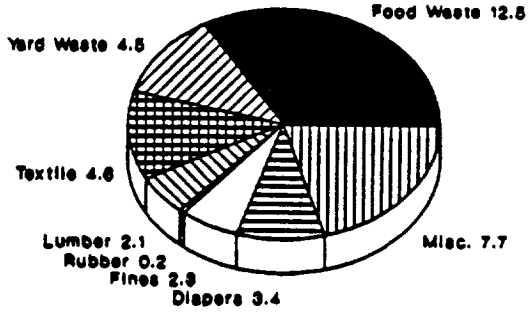
Distribution of Materials by Broad Categories Residential Sector



Composition of Paper



Composition of Plastic



Composition of Organics

- *Bulk items* constitute 10.9 percent of all residential waste. About half is collected through the lot cleaning program; the rest is about evenly split between curbside collection and self help. Curbside collection is usually carried out once a week and upon request from residents. The selfhelp program allows New York City residents to bring their bulk (mostly discarded furniture and appliances) to designated areas for final disposal. Bulk collection for recycling started in May 1989.
- *Plastics* account for 8.5 percent of residential waste. In this category, rigid plastic, a designated recyclable under Local Law 19, constitutes 2.7 percent. Mixed plastics is collected separately at selected Manhattan sites in the Intensive Recycling pilot. Commingled collections of rigid plastic containers, metal and glass recently began on Staten Island.
- *Glass* (including 1.8 percent accounted for by discarded returnables) makes up 5.0 percent of all residential waste and is largely accounted for by food and beverage containers. Glass is presently collected together with metal and sorted by color at the Intermediate Processing Center (IPC). Crushed glass not separated by color is used as "glassphalt."

Exhibit II.2 summarizes the borough and citywide waste generation by demographics and material categories.

EXHIBIT II.2
RESIDENTIAL WASTE GENERATION AND COMPOSITION
BY BOROUGHS AND CITY AVERAGE

PARAMETERS	BROOKLYN	BRONX	MANHATTAN	QUEENS	STATEN ISLAND	CITYWIDE AVERAGE
DEMOGRAPHICS						
Median Income ($k)	12.6	11.8	15.5	17.4	21.0	14.8
Population Density	61.5	60.1	127.3	34.5	15.0	48.7
PERCENT(%) OF NYC HOUSEHOLDS	30.0	15.0	25.0	26.0	4.0	100.0
GENERATION RATE (lbs/hh/wk)						
Historical data (1988)	46.0	43.0	34.0	46.0	68.0	44.0
Waste Composition Study	47.0	45.0	34.0	52.0	63.0	45.0
% OF NYC RESIDENTIAL WASTE	31.0	15.0	19.0	29.0	6.0	100.0
% OF WASTE RECYCL-ABLE*	44.7	42.7	38.4	46.6	51.7	44.2
% OF NYC RESIDENTIAL RECYCLABLES*	30.0	14.0	18.0	32.0	6.0	100.0
MATERIAL DISTRIBUTION						
PAPER	29.4	28.8	33.8	32.4	29.7	30.8
CORRUGATED CARDBOARD	4.4	4.7	5.0	4.5	3.9	4.6
NEWSPAPER	8.2	8.0	10.3	9.5	8.2	8.8
MAGAZINES	2.5	2.4	3.0	3.0	2.8	2.7
PLASTICS	8.2	8.7	9.8	8.1	6.8	8.5
RIGID CONTAINERS	2.7	2.7	3.0	2.7	2.3	2.7
ORGANIC	36.1	37.0	38.0	37.6	39.0	37.4
YARD WASTE	3.6	2.4	2.2	6.9	10.4	4.6
GLASS	5.1	5.4	5.5	4.4	3.9	5.0
METAL	3.9	4.0	4.2	4.0	4.0	4.0
ALUMINUM	0.9	0.9	1.0	0.9	0.8	0.9
INORGANIC	2.4	2.4	2.4	2.0	1.0	2.2
HAZARDOUS	0.4	0.4	0.4	0.3	0.3	0.4
BULK	13.4	12.1	4.2	10.7	15.4	10.9

(*) NYC Recyclables include: newspapers, magazines, corrugated cardboard, rigid containers, ferrous meta, yard waste, aluminum, glass and bulk

In general, the city's waste composition follows broad national patterns with the exception of bulk and yard waste, especially the former.

We generate less yard waste because New York City is densely populated. There are no ready answers as to why New Yorkers generate less bulk. Further analysis of construction and demolition waste will be conducted as part of the Solid Waste Management Plan. Lower density boroughs were found to be the highest waste generators in terms of pounds per week per household; conversely, higher density boroughs generate less waste, in part because they produce less yard waste. The generation of bulk waste is also somewhat higher in the lower density boroughs, probably due to the fact that higher density boroughs utilize private carters for construction bulk collection with the exception of low density Staten Island and high density Manhattan, each borough's share of residential waste and recyclables is roughly equal to its share of population. Income and density do not appear to have a significant effect on the total pool of recyclables.

Institutional Sector

Exhibits II.3 and II.4 present details of the composition and generation of waste and recyclables for institutions, which include public and private elementary and secondary schools, hospitals, and other public and private not-for-profit segments. The geographic clustering of the institutions and the quantity of waste each generates determine institutional waste concentration by borough. Brooklyn leads with 36.7 percent of all institutional waste, followed by Queens, Manhattan and the Bronx; Staten Island is a distant fifth.

- Paper (45.5 percent) and organics (31.4 percent) are the two largest categories, dominated, in turn, by miscellaneous paper (23.7 percent) and food waste (16.1 percent). Plastics, metal and glass follow in that order (10.4, 4.4, and 2.2 percent respectively).
- Recyclables account for 34 percent of all waste, with office paper and corrugated cardboard -- the two largest categories -- accounting for 16.0 percent. The inclusion of "other plastics" and mixed paper would increase the relatively low concentration of recyclables in this sector to almost 60 percent of all the waste.
- Bulk, averaging 2 percent of all waste, has thus far been difficult to capture for recycling because its generation fluctuates widely during the course of the seasons and within the institutional categories, driven by such random events as building renovation or the start of the academic year. For instance, in the summer of 1989, bulk accounted for 28 percent of all the waste generated by junior high schools. A consequence of such unpredictability is that contracts are awarded for disposal without provisions for recycling.
- Hospitals (not-for-profit and public facilities) serviced by the Department generate recyclables (over 35 percent of the total) at higher rates than the institutional average due to their apparently heavy use of corrugated cardboard, plastics, and office paper, which reflect their uninterrupted flow of medical and non-medical supplies and the increasing administrative/office functions. Overall, city hospitals' waste generation -- 54 lbs./bed/wk. -- would increase by an estimated 30 percent, to 81 lbs./bed/wk., if regulated waste were included. The quantity approximates the national average of 90 lbs./bed/wk.
- Schools, which represent about half of all institutions serviced by the Department, generate 36 percent of the recyclable materials. Generation rates per student (3.3 lbs./day) are comparable to the findings reported by other municipalities. Distinctions can be made, however, according to age: high school students generate a higher proportion of metal (soft-drink cans), while younger children generate more plastic and paper containers, glass containers appear in still lower concentrations in this group, probably because of safety concerns in elementary schools.
- Colleges generate 3 lbs. of waste per student, close to the 4 lbs. per student average cited in the literature. The largest component available for recycling is office paper (22 percent). Newspaper, corrugated cardboard and magazines together comprise almost a quarter of the recyclable waste.
- Nursing homes generate 4.2 percent of all institutional waste, but only 2.5 percent of institutional recyclables. These findings can be explained by the low turnover of residents (which stabilizes waste generation at lower levels than in

EXHIBIT II.3
INSTITUTIONAL WASTE GENERATION AND COMPOSITION BY BOROUGHS AND CITY AVERAGE

	BROOKLYN	BRONX	MANHATTAN	QUEENS	ISLAND	CITYWIDE AVERAGE
PAPER	44.4	44.2	49.0	45.1	46.1	45.5
NEWSPAPER	4.2	3.2	5.9	3.9	3.6	4.3
CORRUGATED CARDBOARD	11.3	12.1	12.5	11.6	11.3	11.7
OFFICE PAPER	4.2	4.3	6.3	4.7	5.8	4.8
MAGAZINES	1.0	1.0	1.3	1.0	1.2	1.1
MISCELLANEOUS	23.8	23.6	23.0	23.9	24.3	23.7
PLASTICS	10.1	10.7	11.0	10.4	10.2	10.4
FILM	4.6	4.7	4.8	4.7	4.6	4.7
RIGID CONTAINERS	3.5	3.7	3.7	3.6	3.5	3.6
MISCELLANEOUS	1.9	2.2	2.5	2.1	2.1	2.1
ORGANICS	32.1	32.3	28.6	31.7	31.3	31.4
YARD WASTE	3.2	3.2	2.2	3.1	3.1	3.0
TEXTILE	2.1	2.2	2.5	2.1	2.0	2.2
FOOD WASTE	16.7	16.8	13.9	16.4	16.1	16.1
MISCELLANEOUS	10.2	10.1	10.0	10.1	10.2	10.1
METAL	4.6	4.4	4.4	4.4	4.3	4.4
FERROUS	3.7	3.5	3.4	3.5	3.4	3.5
ALUMINUM	0.9	0.9	1.0	0.9	0.9	0.9
GLASS	2.1	2.1	2.7	2.1	2.1	2.2
MISCELLANEOUS	0.2	0.2	0.4	0.2	0.2	0.3
BULK	2.1	2.0	1.3	1.9	1.9	1.9
HAZARDOUS	0.3	0.3	0.5	0.3	0.3	0.3
% of waste recyclable (*)	32.8	32.8	38.1	33.4	33.6	34.0
% of NYC Institutional waste	36.7	15.2	18.0	21.5	8.5	100.0
% of NYC Institutional recyclables	35.5	14.7	20.2	21.2	8.5	100.0
GENERATION RATE (tpd)	304.4	189.2	165.8	265.4	91.3	1016.0

EXHIBIT II.4
COMPOSITION OF RECYCLABLES FOR DIFFERENT CATEGORIES OF THE INSTITUTIONAL SECTOR

	HOSPITALS	SCHOOLS	COLLEGE	NURSING	CORREC-TIONAL	MUNICIPAL	TRANSP
#SITES CITYWIDE	69.0	428.0	18.0	32.0	9.0	95.0	7.0
CORRUGATED CARDBOARD	16.1	10.3	12.2	8.4	8.2	5.7	7.9
NEWSPAPER	3.5	3.7	6.6	1.6	4.0	10.7	32.9
OFFICE PAPER	6.1	3.3	22.1	1.8	2.6	29.5	3.4
MAGAZINES	1.3	2.5	5.1	0.6	0.5	3.5	1.3
RIGID CONTAINERS	1.0	9.0	1.0	0.6	0.6	0.4	0.7
GLASS	3.4	1.7	2.7	0.7	1.1	3.0	5.1
ALUMINUM	1.0	1.4	1.2	0.8	0.7	1.6	1.1
FERROUS METAL	3.0	4.1	1.7	3.6	3.5	1.1	5.9
BULK	0.5	2.0	0.8	0.5	1.1	0.4	0.1
% of waste recyclable (*)	35.2	36.0	53.5	18.6	22.3	55.9	58.3
% of NYC Institutional waste	24.9	36.9	5.9	4.2	6.5	6.6	0.5
% of NYC Institutional recyclables	27.9	42.3	10.1	2.5	4.6	11.8	0.9
GENERATION RATE (lb/unit/wk)	53.9	3.5	3.0	21.6	13.9	NA	NA

(*) NYC Recyclables include: newspapers, magazines, corrugated cardboard, office paper, rigid containers, ferrous metal, aluminum, glass, bulk.

hospitals) and by the fact that the composition itself is comparable to the residential sector's.

- Correctional facilities also generate recyclables at a somewhat lower proportion of their total waste. Per-inmate generation of waste (14 lbs./wk.) is far lower than the 32 lbs. per week reported in other studies.
- Municipal buildings generate 6.6 percent of all institutional waste but almost 12 percent of all recyclable materials because of the quantity of office paper (almost 30 percent of all waste). The concentration of newspaper (almost 11 percent) is nearly three times the proportion cited in a comparable study, whereas corrugated paper (5.7 percent) is less than half the expected concentration.
- Transportation hub waste composition is consistent with expectations: commuters discard a high proportion of newsprint (33 percent) and glass and metal containers (12 percent).

Commercial/Industrial Sector

The results of our study of the commercial/industrial sector are summarized in Exhibits II.5 and II.6. Nine segments were covered by the study, but data were available for only eight at the time of this writing. Private carters -- not the Department -- collect waste in this sector; they are regulated by the Department of Consumer Affairs, not by the Department of Sanitation. As with the institutional sector, commercial waste generation rates are proportional to the size of the industry's segments, except for the wholesale, food retail, and restaurant segments, which produce more waste than their size would suggest. As expected, waste generation by borough reflects the geographic clustering of the industries: Manhattan is by far the dominant location for all the business and commercial establishments, followed, in order, by Brooklyn, Queens, the Bronx, and Staten Island. The preliminary findings can be summarized as follows:

- By broad categories of materials, paper (50.7 percent) is the largest component of the commercial waste stream, followed at a distance by organics (20.0 percent), and bulk (17.8 percent). This pattern of waste composition is similar to the one found in the institutional sector. The high generation of paper in the commercial sector accounts to a large extent for its larger concentration of recyclables.
- Currently targeted recyclables -- newspapers, corrugated cardboard, office paper, magazines, rigid plastic containers, metals, glass, and bulk -- account for 53.4 percent of the waste stream. The figure would rise to 58.4 percent if all plastic materials were included in the recyclables category.
- Miscellaneous paper and food waste are a significant portion (28.8 percent) of the aggregated waste stream. The pool of recyclables would increase substantially if both categories were included.
- Offices account for the generation of nearly half (45.7 percent) of all the recyclable commercial waste, largely due to the heavy concentration of paper (84 percent), especially office paper (23 percent). Overall waste generation by offices in the private sector is higher than in the public sector largely because the former is much larger than the second. In all cases, paper is the major waste component; however, there are differences: public offices produce a significantly greater amount of office paper; private offfices, of corrugated cardboard.

EXHIBIT II.5
COMMERCIAL/INDUSTRIAL WASTE GENERATION AND COMPOSITION
BY BOROUGHS AND CITY AVERAGE

	BROOKLYN	BRONX	MANH	QUEENS	STATEN ISLAND	CITYWIDE (1)	AVERAGE (2)
MATERIAL DISTRIBUTION							
PAPER	52.0	55.3	65.6	53.3	55.6	61.7	50.7
NEWSPAPER	5.4	5.9	7.7	5.7	6.5	7.0	5.8
CORRUGATED CARDBOARD	20.8	21.7	15.1	20.6	22.4	17.0	13.9
OFFICE PAPER	6.2	6.9	13.0	6.4	6.5	11.0	9.0
MAGAZINES	1.1	1.3	2.1	1.3	1.3	1.8	1.5
MISCELLANEOUS	18.6	19.6	27.6	19.4	18.9	24.9	20.5
PLASTICS	6.9	6.8	6.5	6.8	6.7	6.6	5.4
FILM	4.4	4.2	3.7	4.2	4.0	3.9	3.2
RIGID CONTAINERS	0.6	0.6	0.5	0.6	0.7	0.5	0.4
MISCELLANEOUS	1.9	2.0	2.3	2.0	2.0	2.2	1.8
METAL	3.2	3.3	2.9	3.2	3.0	3.0	2.5
ALUMINUM	0.7	0.7	0.8	0.7	0.7	0.8	0.6
FERROUS	2.5	2.6	2.1	2.5	2.2	2.2	1.8
GLASS	2.9	3.0	3.1	3.2	3.5	3.1	2.5
ORGANIC	33.4	30.0	20.9	32.0	29.5	24.4	20.0
TEXTILES	8.8	5.2	4.8	7.0	3.5	5.5	4.6
FOOD WASTE	13.4	13.5	8.5	13.9	16.5	10.1	8.3
MISCELLANEOUS	11.2	11.2	7.5	11.0	9.4	8.6	7.1
YARD WASTE	0.1	0.1	0.1	0.1	0.1	0.1	0.1
HAZARDOUS	0.1	0.1	0.2	0.1	0.1	0.1	0.1
BULK	N/A	N/A	N/A	N/A	N/A	N/A	17.8
% of waste recyclable *	40.2	42.7	44.5	41.0	43.9	43.4	53.4
% of NYC commercial waste	11.9	4.9	68.7	12.5	2.0	100.0	100.0
% of NYC commercial recyclables	11.0	4.8	70.3	11.8	2.1	100.0	100.0
GENERATION RATE (tpd)	1213	502	7010	1277	207	10210	12210

EXHIBIT II.6
COMPOSITION OF RECYCLABLES FOR DIFFERENT SEGMENTS OF THE COMMERCIAL/
INDUSTRIAL SECTOR ***

	OFFICES	GENWHL	GENRET	RESTAUR	FAST FOOD	APRL MFG	FOOD RET	HOTELS
PAPER	84.4	47.3	67.4	31.3	41.1	23.3	56.4	51.0
NEWSPAPER	10.9	1.7	9.6	1.9	1.0	0.6	9.8	7.6
CORRUGATED CARDBOARD	9.3	29.0	42.1	20.0	15.4	11.3	36.1	12.5
OFFICE PAPER	22.8	1.3	1.4	0.2	0.0	0.3	0.0	2.6
MAGAZINES	2.8	0.4	1.2	0.5	0.7	0.1	0.7	4.0
MISCELLANEOUS	38.6	14.8	13.1	8.7	23.9	11.0	9.8	24.3
PLASTICS	5.8	7.5	8.3	6.9	8.1	7.8	5.6	7.2
FILM	3.0	4.8	4.6	4.8	5.2	6.4	2.8	3.3
RIGID CONTAINERS	0.3	0.7	0.5	0.9	0.9	0.1	1.0	0.9
MISCELLANEOUS	2.5	2.0	3.1	1.2	1.9	1.3	1.7	2.9
METALS	2.2	6.1	2.1	2.7	3.5	3.0	3.3	2.3
ALUMINUM	0.9	0.6	0.7	0.6	0.9	0.6	0.7	0.9
FERROUS	1.3	5.5	1.4	2.1	2.6	2.4	2.6	1.4
GLASS	2.2	1.1	5.6	7.1	2.1	0.5	1.5	8.4
ORGANIC	4.7	37.4	7.0	51.7	45.1	64.2	32.4	30.0
TEXTILES	0.6	1.9	1.5	0.8	0.4	48.8	0.7	3.6
FOOD WASTE	1.7	9.7	1.1	40.8	39.0	0.5	17.5	21.9
MISCELLANEOUS	2.3	25.8	4.3	9.9	5.5	14.8	14.2	4.3
YARD WASTE	0.2	0.0	0.1	0.1	0.1	0.0	0.0	0.1
HAZARDOUS	0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.2
% of waste recyclable *	50.6	40.4	62.6	33.3	23.6	15.8	52.4	38.2
% of NYC commercial waste	39.0	13.1	4.6	8.8	1.9	8.1	4.7	8.6
% of NYC commercial recyclable	45.7	12.2	6.7	6.8	1.0	3.0	5.8	7.6

Key Abbreviations:
Apri mfg = Apparel manufacturing; GenWhl = General Wholesale; GenRet = General Retail;
Restaur = Restaurant; Food Ret = Food retail (stores);

* NYC Recyclables include: newspaper, corrugated cardboard, office paper, magazines, rigid containers, metals, glass, bulk.

** Bulk is not included in the first citywide average and included in the second.

*** It should be noted that the percent estimates do not add up to 100 because the ten segments do not cover the entire industry. Data for the printing and publishing segment were not yet available at the time of this writing. According to preliminary estimates, this industry accounts for 0.5% of all commercial/industrial waste.

- The wholesale industry is the second largest generator of recyclables (12.2 percent). This segment produces waste out of proportion to its size, and corrugated cardboard is the largest component (29.0 percent). Food waste (9.7 percent) and paper miscellaneous (14.8 percent) are the other major materials; however, neither is yet recyclable.
- The composition of waste generated by restaurants and fast food places is largely comparable: food (40.8 and 39.0 percent, respectively) and corrugated cardboard (20.0 and 15.4 percent) are the largest components, clearly reflecting the activities of these segments. In inverse order, these are also the largest components of waste in food retail stores, where corrugated cardboard accounts for 36.1 percent; food, 17.5 percent. In addition, food is second to miscellaneous paper (21.9 and 24.3 percent, respectively) in the hotel segment.

Policy Options

The waste composition study answers some of the basic questions of waste management:

- Who are the generators?
- How do the quantities and composition of waste vary from generator to generator?
- Where is waste concentrated?

Knowledge of major generators is the basis for waste forecasts. In the study, waste generation and composition are related to certain major characteristics of the generators -- depending on the sector, income and population density, range of activities, and size.

In general, waste generation and composition in the three sectors of the study present different patterns: in the residential sector, waste is more diversified by composition, but its concentration does not vary greatly across boroughs (except for bulk and yard waste). The opposite applies in the institutional and commercial sectors, for here the geographic location of the individual segments and their activities jointly determine the quantity and composition of waste generated. Efficiency demands emphasis on just such patterns as the basis for integrated waste management planning. For instance:

- Determining additional materials to designate as recyclables when their concentration in the waste stream justifies the relative costs of collection: the examples of food waste and mixed paper are mentioned in the previous section; textiles constitute another potential material.
- Commingled collections for minor recyclables (e.g., glass, aluminum, and plastic containers) because separate collections would entail under-utilization of equipment and manpower; and also for materials (e.g., food and yard waste) that can be processed and recycled jointly.
- Designing collection and processing of recyclables and non-recyclables in such a way as to ensure full utilization of manpower and equipment. Such rationalization of operations would bring about the greatest benefits in the institutional and commercial sectors, given the geographic clustering of the generators and the make-up of their waste, which is usually dominated by

specific materials (e.g., office paper and corrugated cardboard) to a larger extent than residential waste. By the same token, siting processing facilities in areas with the highest generation of recyclables would allow economies in transportation costs.

- Targeting noncombustible and difficult to burn materials for recycling and waste reduction in order to enhance the efficiency of incineration.

- Optimizing the mix of service delivery between the Department and private carters so as to minimize costs for taxpayers and for users of private collection services. For instance, the Department of Sanitation stands ready to make its expertise and facilities available to free disposal institutions for their collection and recycling programs, and for their waste reduction efforts. Indeed, several such institutions have been actively seeking the Department's expertise.

We do not pretend to have come to firm conclusions on any of these matters at this time. We are still analyzing the data, and policy recommendations and initiatives will follow the completion of that analysis. However, we will be able to formulate those policies based on a clear portrait of the city's waste stream and the characteristics of the city's generators.

CHAPTER III

TONNAGE GOALS

Local Law 19 mandated that the City collect a specified number of tons of recyclables per day (tpd) each year. It establishes goals for both Department-collected and Department-disposed of waste streams. The difference between Department-collected waste and Department-disposed of waste is that the latter includes waste which the private carters collect and dispose of at the Fresh Kills landfill. The amount of private carter tonnage disposed of at Fresh Kills over the last few years has decreased significantly because of increased tipping fees (fees charged to dispose of waste at the landfill).

FY 90 Recycling of Department Collected Waste

By April 1990, one year after the enactment of Local Law 19, the Department operated ten recycling programs that, in total, exceeded mandated tonnage for Department collected waste by 124 tpd (see Exhibit III.1). Three of the programs were especially successful -- Curbside Recycling (28 percent over goal), Lot Cleaning (120 percent over goal), and City Agency (13 percent over goal). Five programs missed their goals by from 22 percent (Containerized Recycling), to 100 percent (asphalt recycling was not operational in April). The Christmas Tree Recycling program was not included because the program was not operational in April. It should be noted that the Department includes asphalt and dirt in its estimates of tonnage collected, although these materials have not yet been formally designated as recyclables. If these items were excluded, the Department still met the first year tonnage requirements.

EXHIBIT III.1
Citywide Recycling Performance
(in tons per day, April 1990)

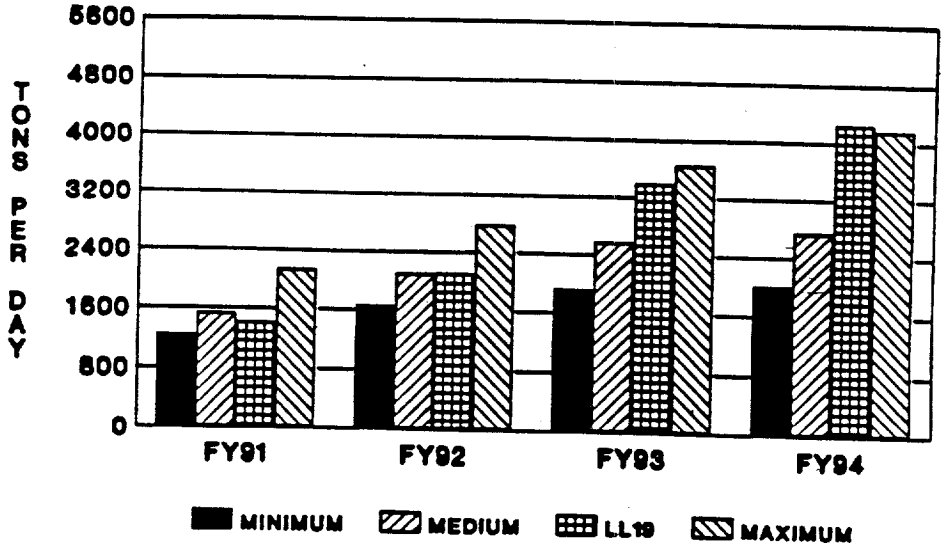
Programs	Plan	Actual	Difference	%
Curbside	254	325	71	+28%
Containerized	79	62	-17	-22%
Curbside Bulk	153	90	-63	-41%
Self help Bulk	81	50	-31	-38%
Lot Cleaning	104	227	123	+118%
Housing Authority Bulk	0	21	21	---
City Agencies	15	17	2	+13%
Contractual	69	32	-37	-54%
Recycled Asphalt (RAP)	83	0	-83	-100%
LOCAL LAW 19 GOAL	700	824	124	18%

The reasons for the variances from goals are program specific and are examined below:

- Curbside exceeded its goal by 28 percent through the introduction of additional materials, e.g., magazines and corrugated in 18 districts, and metal and glass in two districts. In addition, a significant amount of tonnage was captured through a concerted effort to reduce the residue rate (the percent of unprocessed metal and glass or nonrecyclable material) at the East Harlem IPC through the double processing of material.

- We underestimated the number of City employees who would participate in the City Agency Office Paper Recycling Program; consequently we exceeded our initial estimate by 13 percent.
- We captured additional recyclable tonnage by extending recycling to all areas of the Lot Cleaning operation; therefore we exceeded our initial estimate by 120 percent, at the cost of cleaning fewer lots.
- Containerized collection fell below target for several reasons: 17 MTA collection sites planned for FY 90 were not implemented due to a decision by the MTA not to move forward until recycling became mandatory; implementation in hospitals has also moved more slowly than expected; delays in the delivery of containers meant that implementation of programs in some institutions and large apartment houses was delayed. The cumulative effect of these factors was that the program fell 22 percent below plan.
- Delays, due to the telephone company strike, in setting up telephone lines for scheduling residential bulk pick-up and late dissemination of outreach material meant that the implementation of bulk recycling was delayed. By April, we were back on schedule; however, the delays combined with the overestimation of bulk tonnage resulted in a shortfall in tonnage collected by the Residential Bulk Recycling Program.
- The shortfall in Self Help Bulk Recycling tonnage can be partially explained by the overestimate of potential participation.
- Housing Authority Bulk Recycling began in February as a pilot. Preliminary findings suggest that base tonnage figures used to project the recycling tonnage consisted not only of bulk material but of a significant amount of raw garbage. Our projections were erroneously high.
- The Contract Recycling tonnage fell short primarily for two reasons. Original projections assumed the implementation of a buy back center in each borough by April. In fact, only one was operational at that time. Three additional centers have since received Board of Estimate approval, but no proposal was received for a buyback center in Staten Island, and the Manhattan center faces additional delays due to siting problems. Second, the tonnage assumptions were predicated on WE CAN having two redemption centers in full operation by April. Siting problems have delayed opening the second center while the first operated at a lower than expected volume during a move and the renovation of a new site.
- The Recycled Asphalt program was not operational in April because of an unforseen mechanical problem with the asphalt crusher, a problem which has since been corrected.

EXHIBIT III.2
Department Recycling Projections
Sensitivity Analysis



Recycling Tonnage Goals for Department Collected Waste FY 91 - 94

The Department formulated a set of tonnage projections for the Department-collected recycling programs based on a limited amount of historical information combined with information gathered by both the Department and other organizations and municipalities.

As can be seen in Exhibit III.2 our revised projections suggest the likelihood, but not the certainty of our meeting the tonnage mandated by Local Law 19 in FY 91. In FY 92 we project a shortfall of 18 tons per day against the mandated goal. Given the inherent uncertainties in this estimating process, and the considerable margin for error, our actual chances for meeting the FY 92 requirements are too close to call. If we are to meet the fourth and fifth year goals (3400 tpd and 4250 tpd), our projections confirm that we must identify additional recyclables, add programs, and increase our educational efforts. All Department-collected tonnage projections assume that the amount of tonnage recycled will not be constrained by the location of processing centers, their capacities and/or market conditions for recyclables. These may prove to be unwarranted assumptions.

A sensitivity analysis was conducted (see Appendix VI for details), projections were developed showing a minimum, a medium and a maximum outlook. The minimum projections consider no growth in diversion rates. The medium projections, which the Department feels reflects realistic goals, are based on our experience to date and reflect our limited grasp of the correlation between diversion and recovery rates and the duration of the program. In addition, they assume operating under the current budget with the current collection system. Nevertheless, these projections do not reflect the limit of our ambitions. The Department is striving to reach the maximum projections which assume growing diversion rates over time through strategies described elsewhere in this report.

Tonnage projections for the minimum and medium scenarios do not reflect the effects of enforcement, the new education strategies proposed by the Department, or the possible increase in diversion of other materials generated by the addition of plastics in a district. This is due to the fact that none of the above mentioned variables were in effect prior to FY 91 and therefore are not reflected in the historical information upon which these projections were based. In reviewing these projections, we must reiterate the fact that the accuracy of any projection is necessarily lim

ited. Current analysis has shown that the diversion levels assumed in the original White Paper, for paper and container goods (metal, glass and plastic), 85 and 60 percent respectively, are not attainable in the short-term.

Commercial Waste History

In July 1988 private carters -- who collect waste from the commercial/industrial sector -- disposed of 13,000 tpd at City landfills; by the time of Local Law 19, the figure had decreased to 1000 tpd. The reduction can be explained by the fee increase - from $18 to $40 per cubic yard -- the Department charges private carters for dumping waste at our landfill. Private carters understandably responded to the new economics of their situation, exporting waste and increasing post-collection recyclable separation to the extent the cost of such separation made business sense.

While the reduction in commercial waste tonnage is desirable -- the landfill will have a longer life -- this development makes it virtually impossible for the Department to assess whether the commercial sector is meeting Local Law 19 mandated goals.

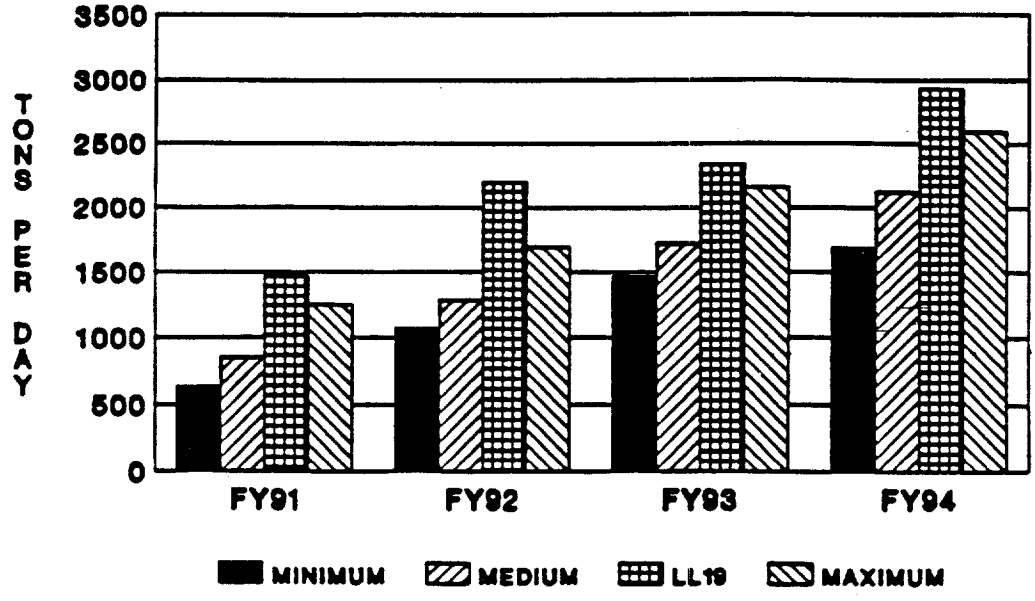
While the law requires that the Department designate materials constituting at least 50 percent of the commercial waste stream as recyclables, and annual tonnage goals are specified that assume a significant portion of designated materials are recycled, there is presently no system in place for the Department to systematically collect, analyze and monitor recycling tonnage information from the commercial sector. Because waste is now being exported, the tonnage cannot be calculated on the basis of reduced tonnage at Fresh Kills. While the Department provided technical assistance to private carters seeking to expand recycling activities, we have no basis to confirm whether the first year target of 730 tons was met. The commercial regulations will incorporate reporting requirements aimed toward obtaining more precise information on commercial recycling activities, though our actual ability to obtain reliable data remains uncertain.

Recycling Tonnage Goals for Commercial Waste FY 91 - 94

As in the Department-collected section, projections were also formulated for commercial recycling. The Department first estimated the amount of material private carters recycled prior to the enactment of Local Law 19, which is referred to as the baseline, before projecting tonnage for FY 91-94. Baseline tonnage must be removed from the overall recycled tonnage to comply with measurement methodology established by Local Law 19. We assumed recycling activities were motivated solely by economic considerations, that is, the value of the material exceeded the cost of separating and disposing of it. Preliminary estimates are that approximately 25 percent of private carter tonnage was recycled before the enactment of Local Law 19.

Some of the key factors affecting the commercial recycling projections are: the accuracy of the baseline figure itself; compliance of the private carters; the cooperation of the commercial establishments they service; trends in the composition of waste; and,

EXHIBIT III.3
Commercial Recycling Projections
Sensitivity Analysis*



* TONS PER DAY IN EXCESS OF PRE-LL19 RECYCLING WHICH IS ESTIMATED AT 2817 TPD.

because of the vast differences in the amount of recyclable material generated by service versus manufacturing establishments, the growth or decline in these industries.

Projections were established for three ranges in the commercial sector, minimum, medium and maximum.

As indicated in Exhibit III.3, it appears that commercial recycling will fall short of the mandated goal, even considering the optimistic (maximum) projections.

As is the case for Department-collected waste projections, the commecial projections assume adequate processing capacity and markets to purchase recyclables.

CHAPTER IV

WASTE REDUCTION AND PREVENTION

Waste reduction, at least in rhetorical terms, is at the top of everyone's solid waste management hierarchy. The New York State Solid Waste Management Plan of 1988 sets a 1997 statewide goal of eight to ten percent reduction in the waste stream through source minimization strategies, in addition to a 40 percent reduction through recycling. Local Law 19 also encourages the Department to make waste reduction a priority. In practice, however, waste reduction receives less attention and fewer resources than competing, less desirable waste management methods.

To be candid, neither the Department nor the government broadly defined have committed their energies to preventing waste, although the ideal is widely acknowledged. So long as the landfill had room, the challenge was to manage materials in the form in which they came to us, as waste. This approach has been taken nationally despite the fact that modern waste management is expensive and minimizing what we have to manage is clearly the fiscally responsible course.

The Department is more than ever convinced of the need for a conceptual shift -- a shift from waste management to materials management. We have observed that there are many ingredients in the waste we collect for disposal or recycling that do not need to be there: excess packaging; clothes tossed out because they have become unfashionable; yard waste that could be composted in a backyard for home fertilizer use; unwanted mail thrown out unopened. But translating these observations into a comprehensive waste prevention strategy is a difficult and complex process.

This past year the Department initiated its first waste prevention efforts with initial support and collaboration from citizen and environmental groups and other city agencies. These efforts are admittedly still in their infancy. Among its research efforts, the Department analyzed the applicability to New York City of waste prevention programs implemented elsewhere around the country. Most significantly, we implemented local waste prevention education campaigns and materials reuse programs -- the first ever in New York City.

Public Education and Programs
Fiscal Year 1990

In December 1989 the Department embarked on its first reuse/exchange contract by entering into an 18 month inter-agency agreement with the Department of Cultural Affairs to co-fund the expansion of the Materials for the Arts (MFA) program.

Last year, MFA received donations of goods and materials valued at $660,000 from corporations, local businesses and private donors. MFA matches these materials with non profit cultural and arts organizations. This program assists hundreds of groups in the City while diverting material from the waste stream. Sanitation's agreement with Cultural Affairs will allow further expansion of the MFA program in the coming year.

Fiscal Year 1991 and Beyond

In Spring 1990, the Department undertook a small-scale intensive waste prevention and recycling pilot project (see Chapter V," Residential Recycling "). Thirteen buildings on the Upper East Side and in Central and East Harlem are participating. In the Fall (FY 91), we will distribute reusable canvas and string shopping bags promoting waste prevention to each of the 3,000 participating households. The bags will contain tip sheets addressing waste prevention in the home, at work, and while making purchasing decisions at the store. Households will also receive information about specific materials, including diapers and "junk mail," and directories tailored to each building, which lists repair shops, thrift shops, and charity groups servicing the area that accept donations of used household items.

Beyond the pilot project, the Department plans to implement several waste prevention education campaigns and operations in the coming year:

- A "Householder's Guide to Waste Prevention" will be available in Fall 1990 to educate residents about how they can reduce waste. The booklet also identifies groups that accept donations of used clothing, furniture and other household items.

- A subway poster campaign promoting simple waste prevention techniques for the home and the office will begin in Winter 1991. The subway poster will also serve as an advertisement for the *Householder's Guide.*

- The Department will begin a waste prevention training program for businesses. Staff will seek opportunities to speak at conventions and private sector gatherings to teach purchasing managers about the benefits of buying durable and reusable goods.

We will continue to integrate waste prevention into all appropriate Department educational materials and programs. In particular the "Team Up to Clean Up" school curriculum will include a new chapter on "reduce and reuse" in the updated version to be distributed in January 1991. Three to five thousand City teachers request the curriculum annually.

We will seek to incorporate waste prevention practices into standard city agency administrative procedures and policies. These include: (a) integrating waste prevention criteria into city procurement policy; (b) establishing a model waste prevention office; and (c) training the Department's outreach staff to address waste prevention in all its recycling outreach activities.

While campaigns to prevent waste can heighten consumer awareness, it is difficult to measure their effectiveness in minimizing waste. But two of our programs can measurably reduce the amount of materials the Department collects: (a) the funding of private, not-for-profit operations that reuse materials otherwise discarded; and (b) home composting of organic wastes.

This year, the Department received funding to aid organizations -- usually charities assisting low income groups -- in developing the reuse of products and materials otherwise discarded. Additionally, we were funded to support a small educational and training effort to promote home composting. These funds will be applied primarily to the Brooklyn "Intensive Zone" (see Chapter V, Residential Recycling), where, during FY 91, we will implement waste prevention programs. The waste prevention

approaches in the Zone, which also incorporates strategies to maximize recycling, will include: (a) waste prevention education; (b) operations that maximize the life span of materials and products otherwise discarded; (c) home composting training and demonstration; and (d) research and surveys to gauge the success of our programs (see Exhibit IV.1).

Research

Fiscal Year 1990

FY 90 was devoted to investigating waste prevention policies and programs around the country and making preliminary determinations about how best to integrate a waste *minimization* perspective into prevailing urban solid waste management culture. We investigated specific products and materials that are common targets for prevention, including disposable diapers, direct mail, and packaging. We found, however, significant knowledge gaps that could not be filled without the assistance of outside expertise. Thus, during Spring 1990, the Department began to seek cooperation and sponsorship from other city agencies, federal and state governments, corporations, foundations, and private, nonprofit environmental research groups. The results of these contacts hold promise for helping us, for example, measure the effectiveness of our waste prevention programs. We are also investigating opportunities for outside researchers to use New York City as their investigative arena, for example, in test-marketing pilot products that reduce waste at the source.

Fiscal Year 1991 and Beyond

The Cornell Cooperative Extension has agreed to provide support for a survey on waste prevention attitudes and participation. This survey will ask selected city residents about their understanding of, attitude toward, and participation in waste prevention, and will help to quantify current household waste prevention behavior in New York. We are also seeking to leverage our resources with outside funds for additional waste prevention research (see Exhibit IV.2).

Legislation, Regulation and Policy Initiatives

Beyond our efforts to educate, the Department, together with interested environmental groups and the City Council, recognize the need to consider mandatory approaches to waste prevention and/or incentives to reduce waste. We do not believe that voluntary local change, in the end, will suffice to reduce the amount of solid waste that is generated from the outset. Local action needs to be balanced with legal controls to require manufacturers and government entities to incorporate waste prevention principles in their purchasing, production, and marketing tactics. Our success in preventing waste depends on contributions to and initiations of legislation to compel the integration of waste prevention in private and public sector decision making.

Fiscal Year 1990

The Department is an associate member of the Source Reduction Council of the Coalition of Northeastern Governors (CONEG). We are helping to establish goals and standards for preferred packaging to be used by industry and the states. The Council is working to add specifics to their hierarchy of packaging guidelines, which is:

(1) no packaging;

(2) minimal packaging;

(3) refillable/reusable/consumable packaging;

(4) recyclable packaging; and,

(5) packaging with recycled content.

Fiscal Year 1991 and Beyond

In the past we have primarily reacted to legislative initiatives by others at the state or federal level, but the activity at these levels of government on the waste prevention front has been slight. Too often waste prevention has been either misunderstood as interchangeable with, or overlooked in favor of recycling. Now, in addition to reviewing proposed federal, state, and City legislation and regulations regarding waste prevention, reuse and recyclability, we must play a more aggressive role in initiating proposals to reduce waste at the source.

Farsighted policy at state and federal levels carries the promise of having wider, longer term effects than anything a local level entity, even one the size of New York City, could accomplish. Thus we support, at the federal level, proposals to facilitate people's control of direct mail they receive. Direct mail, more commonly known as "junk mail," is purportedly the fastest growing portion of the mixed paper waste stream. At the state level, we are considering legislation to provide economic incentives for the use of durable, reusable, and refillable packages and products (see Chapter XI, "Legislation"). At the city level, we are continuing to evaluate strategies through the Solid Waste Management Plan, and to work with the City Council on a number of waste prevention initiatives that are now pending.

The Department is committed to achieving a significant amount of waste reduction through prevention and reuse programs because we recognize that recycling by itself is not a solution to the solid waste crisis. Recycling incurs costs of waste collection and waste management that are often comparable to, or more expensive than, the current costs of disposal. Because effective waste prevention programs reduce the need for waste management, and because such programs conserve resources, we support waste prevention as an integral tactic for containing New York City's waste stream. Nevertheless we recognize that waste prevention entails a significant cultural transformation; a difficult and complicated task.

EXHIBIT IV.1
Waste Prevention Education and Programs Planned for the Brooklyn Intensive Zone

The Intensive Zone will comprise two sections of a community district (approximately 20,000 households) in Brooklyn, encompassing an area of medium density and medium income that already recycles newspaper, magazines, corrugated cardboard, metal and glass containers and bulk items.

The waste prevention components of the Zone are:

Education

- *Distribution of The Householder's Guide to Waste Prevention* (prepared in FY 90), which explains how to reduce both the volume and weight of waste generated in the household. Information on how to minimize waste from diapers and junk mail will be included. These items *each* comprise about three percent of the city's residential waste stream.

- *Development of a school curriculum* on waste prevention, and introduction of the curriculum to all schools in each zone.

- *Outreach to all retail businesses* in each section to work with them to sell reusable products and to take back reusable items from regular customers (e.g., hangers and bags).

- *Outreach to all private, nonprofit and public offices and institutions* in each section to educate staff and management on how to reduce their waste.

- A *waste prevention advertising campaign* in mass transit hubs of the zones.

- *A waste prevention video or slide show* to enhance outreach to institutions and community groups.

- Working with manufacturers to *test-market waste prevention products* (e.g., concentrates, refillable containers).

Programs

- *Programs to maximize the use of materials and products that might otherwise be discarded.* Potential exists to increase the amount of materials being re-used in New York City. We plan to contract with existing organizations in the reuse business to expand their programs in the Waste Prevention zones, and more generally to enhance their effectiveness throughout the City. Preliminary analysis of results of our waste composition study indicate that bulk items, which include furniture and appliances, makeup about 10 percent of the City's residential waste stream. Textiles, which include clothes, constitute about four percent of the waste stream.

- *Providing reusable cloth bags to grocery store shoppers,* with encouragement to bring these bags each time they shop. Zone grocery stores will carry the bags, which shoppers can obtain by redeeming coupons included in waste prevention mailings. Shopping bags, paper and plastic, come to about two percent of the city's residential waste stream.

- *Waste audits of institutions and businesses in the zones.* This program will provide, through a contractor, technical assistance, training and demonstration of waste prevention techniques suitable for the office, and will identify areas where administrative changes can minimize waste.

- *Technical assistance and demonstration of backyard composting for yard, leaf and vegetative kitchen wastes.* In low density neighborhoods, yard waste comprises about 10 percent of the residential waste stream, according to the City's waste composition study data. Any organic wastes

composted in backyards provides substantial savings to the Department in terms of avoided collection, handling and disposal or composting costs. Residents, once convinced of the ease and value of backyard composting, can be expected to do so for many years. Thus, technical assistance programs are expected to be one-time costs to establish habits that will provide savings to the Department over an extended period.

The contract involves intensive training of zone residents (volunteers willing to devote time to community outreach) in the biology and mechanics of home composting, thus enabling them to educate their neighbors about the benefits of backyard composting, and assist them in the construction of compost piles and bins. The contract would also support a local gardening organization to strengthen staff and establish or expand a compost demonstration site. In addition, an agricultural extension service with expertise in horticultural outreach would perform, for three months (starting in April 1991), intensive education and promotion of composting in the area around the demonstration site; outreach targets would include community groups, schools and other institutions. Outreach by experts will enhance the continuing peer education performed by the trained volunteer composters. The overall project includes: (1) volunteer training; (2) an interpretive home composting exhibit on an accessible, centrally-located site; (3) technical education on-site to invited community and school groups and local residents; and (4) coordination of workshops on home composting for area residents at area meeting places.

EXHIBIT IV.2

Waste Prevention Research Ideas for Which the Department Is Seeking Outside Funds

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In addition to performing a survey to identify resident's attitudes towards waste prevention, we are seeking funds to perform a similar survey for the private, commercial sector:

- *Retail materials management methods and purchasing patterns.* This survey targets New York City businesses and investigates administrative policies regarding materials use and reuse (e.g., is packaging back-hauled to the distributor? Are customers encouraged to bring their dry cleaning hangers back?). Part II of the survey investigates purchasing patterns for product types bought by retailers. Answers will help to quantify New Yorkers' buying habits in terms of product types (single-use throw-away objects versus durable items; preferred packaging types, etc.)

The Department is receptive to collaborating with environmental groups on research projects. We continue to meet with researchers to refine scopes of work for potential projects, which include:

- *The life-cycle consequences of reducing waste.* In addition to evaluating solid waste impacts, it is imperative to examine total economic, environmental and energy costs of waste prevention strategies before lobbying for new legislation or regulatory changes. Total "cradle-to-grave" costs of a product should be considered when advocating one over another. Such research can bolster support for implementing waste prevention policies by showing the cost savings to industry of instituting waste prevention at the source.

- *Measuring the effectiveness of waste prevention education, training and programs.* A study performed in Berlin, Germany evaluated the effectiveness of waste prevention education on a group of volunteers whose waste generation was measured over the time period in which they were undergoing waste prevention training.

  A workable scale on which to replicate the Berlin study may be to measure the waste generated in one building where residents undergo intensive waste prevention education and training. The Department has already agreed to provide waste material from such a building to the researchers if they choose to go ahead with this project.

  The waste would then be sorted according to the following categories: durable items; non-durable items/throw-away items; containers and packaging; organic waste; toxins; miscellaneous. Measurements should identify volume, weight, chemical composition and constituency (single or multiple materials in construction).

- *Identification of the institutional and social obstacles to waste prevention.* To prevent waste effectively, one needs to know how people choose what they buy, and the gamut of marketing techniques used by advertisers and manufacturers. One then needs to identify barriers to change in (a) purchasers' decision-making processes, and (b) marketing techniques. With this information in hand, the Department will be in a position to determine which methods are most effectively applied at the local level and can then begin to work on implementation.

- *Evaluating the effectiveness of different educational strategies.* There are many approaches to educating local audiences about waste prevention. Which ones work best with which sectors? One approach may be to survey New Yorkers (using focus group formats and other means) about their responsiveness to different educational and promotional tools.

CHAPTER V

RESIDENTIAL RECYCLING

The Department's residential recycling program constitutes the largest recycling effort in the country and one of the first designed to collect from multifamily buildings as well as from single family homes. As of April 1990, two million City households were covered by these programs.

We have achieved a good deal, but there is a danger that the success we have thus far achieved may have masked underlying problems. Therefore, without minimizing the many achievements, we will assess the present status of the programs and discuss the problems encountered.

Participation

The Department's original tonnage projections when Local Law 19 was enacted assumed that the diversion of recyclables would climb over a three-year period from 30 to 50 to 75 percent. While diversion rates in many districts did start at the 30 percent level, we have not experienced the growth that was projected. In most cases diversion has grown only modestly from the level initially achieved at implementation. Absent major changes in collection strategies and the capacity for much more intensive outreach and enforcement, we do not now believe a 75 percent diversion rate is attainable in the near-term. Our detailed assumptions about tonnage and diversion are contained in Chapter III, "Tonnage Goals". In order to meet Local Law 19's long-term goals, we must ensure a much higher level of initial participation as well as seek new ways to influence those unmotivated to recycle.

Our educational efforts are described in detail in Chapter VI, Education. We are particularly concerned that the standard methods used to inform residents about recycling in their districts -- meetings with community board leaders, direct mail, and outreach to building superintendents, civic associations, and schools -- have proved less effective in high density/low income neighborhoods than in other neighborhoods. Although we have made efforts to vary our educational strategies to reach the City's diverse populations, our efforts have not been as successful as we had hoped. Programmatic changes within districts, changing collection schedules, and sometimes confusing literature have not helped an already difficult process. However, participation depends on more than residents simply understanding what is to be done; they must be motivated to change their behavior. We still have a long way to go in understanding what motivates different communities to comply: economic incentives? Convenience? Environmental concerns? Peer pressure? But while we have much to learn, we have only limited resources with which to conduct the necessary research and analysis. Further, the various mandates of Local Law 19 all too often force us to act before we have had full opportunity to evaluate past approaches and test new strategies.

Residents' Concerns

Many people have let us know that they find certain recycling requirements inconvenient. For example, some people don't like tying up their newspapers, magazines, and corrugated cardboard. They prefer to save time and the cost of buying twine by

setting out their bundles of recyclables in shopping bags (paper or plastic) or containers.

The regulations, on the other hand, were written to meet the demands of processing and markets. Small bundles of tied paper are immediately identifiable, prevent litter, are picked up easily, and eliminate the need to remove the bags, which are contaminants to wastepaper dealers. To resolve the tension between the two perspectives, the Department will test alternatives of paper bags and covered containers in the Intensive Recycling Zone.

People have also complained about the requirement that they rinse the bottles and cans before placing them in the blue recycling collection containers. But rinsing helps prevent potential vermin and rodent problems in both the household and the processing center. It would not be to the City's benefit to eliminate the requirement.

Because container theft has been a significant problem in many neighborhoods, some residents would prefer to set their recyclables out in plastic bags instead of the blue containers provided by the City. We provide decals, at no cost, to designate replacement containers, but many believe new containers will also be stolen, whereas, plastic bags are readily available, convenient, and not subject to theft.

From a recycling perspective, use of plastic bags presents several questions: can they be recycled? Can Sanitation workers clearly distinguish between a bag of garbage and a bag of recyclables? Can recyclables be quickly and easily removed from the bags at the processing facility?

In FY 91 the Department will conduct a pilot study of the use of plastic bags. If the test proves to be successful, our current collection methods will be re-evaluated.

The Mobile Drop-Off program has given communities without a curbside program a place where they could voluntarily take their recyclables. It served as an effective means of advance education for the curbside recycling program, and was a good indicator of where voluntary curbside programs would be successful. Once recycling became mandatory and curbside began rapid expansion, the cost of running a mobile drop-off program became less defensible, and as a result of fiscal constraints, it was eliminated. In order to augment the reduced mobile-drop off program and to provide as many people as possible with the opportunity to recycle, the Department is helping long-standing drop-off programs like Village Green and the Upper West Side Recycling Center, and is placing permanent drop-off containers in those community districts which are scheduled at a later date for recycling implementation.

Operational Efficiencies

Since collection is the largest single cost of operating the recycling program, achieving greater efficiencies is essential to the long-term success of the program. Currently many trucks in low density areas have low efficiency because they are less than half full by the end of the route.

Among the operational improvements the Department may consider implementing are: route extension -- the extension of existing routes to reflect the diversion of recyclables from regular collection routes; substitution -- a move from twice-a- week collection of solid waste to once-a-week collection of solid waste along with once-a-week collection of recyclables; and the possible move to one-worker collection crews.

Further, in order to increase efficiency the Department will evaluate alternate week collection in ten mostly single-family districts over the course of FY 91. Residents will be asked to store their recyclables for two weeks prior to collection. Alternate week collection should allow a more efficient use of trucks and an associated reduction in cost. But some residents are concerned that alternate week collection will require additional storage containers, create difficulty in remembering which week recyclables are to be put out, and induce worries about vermin and fire. We will carefully assess these issues and evaluate whether alternate week collection adversely affects participation.

In addition, there are technological issues which affect operational efficiency. For example, what is the best design for collection trucks? The factors which make selection of specialized equipment difficult have to do primarily with the uncertainties in the program at this time. Recycling tonnage is not yet predictable and the best collection method has not been determined. During the start-up phase of the program operational flexibility is critical. The criteria for selecting specialized equipment includes: that it be flexible in capacity for carrying different types of materials; have sufficient capacity for efficient routes; have compartments which allow separate dumping; perform reliably; and be maintainable. Currently the Department is investigating the development of a vehicle that meets these criteria and also has the ability to vary the bin separation while on the collection route. The challenge is to plan for a future that has not yet been defined. We must experiment and take reasonable risks without losing the ability to change course as we learn more about the most effective methods for attaining technological efficiency.

Incentives for Participation

Economic Incentives

While public education is our primary strategy for achieving wide participation, we recognize that both positive incentives and the prod of enforcement are necessary elements in the process of changing personal habits regarding waste management.

To help determine how well economic incentives stimulate recycling in low income/high density districts, the Department is funding an expansion of the buyback program from one to four facilities. Such centers pay individuals and small business owners by the pound for recyclable materials, then sort and package the materials before selling them to next-level users.

The original buyback center, R2B2, is located in the Bronx, and the additional centers will be located in Manhattan, Brooklyn, and Queens. No proposal was received in response to an RFP for such a facility in Staten Island. An addition to three of the buyback centers this year will be a mobile buyback truck, which will be routed through low income areas and Housing Authority sites. We believe this convenient opportunity to sell recyclables may motivate more low income people to participate.

"We Can," a nonprofit redemption center partially funded by the Department, runs two programs. The first is a Manhattan center that accepts an unlimited number of redeemable bottles and cans. In the first year of operation almost 14 million containers were brought to this center, mostly by the poor and homeless. We Can's second program is its collection network through which 950 offices and schools donated one million bottles and cans last year.

Enforcement as an Incentive

Enforcement also creates a significant incentive to recycle, albeit a negative one. Building owners, landlords, or residents who, after a six month grace period, do not comply with recycling requirements, can be held liable for a civil penalty ranging from $25 for the first violation to $500 per bag, with a maximum fine of $10,000 for persistent violators in buildings with nine or more apartments. (See Appendix IV for a description of the enforcement program.)

Although regulations were in place in January 1990, the issuance of summonses was postponed until August to allow for ample notice and warnings to residents and proper training of the new Sanitation recycling police force.

To ensure that the proper balance between education and enforcement is maintained in FY 91 the new Sanitation police class of 25 officers will be assigned the task of outreach and education rather than enforcement. In addition to expanding the educational resources available, this reassignment will also ensure development of a Sanitation police force firmly committed to recycling education.

We are also cognizant of the special challenges enforcement of the recycling regulations present in multi-unit buildings. While it is clear that a landlord who has not met his or her obligations under the regulations should receive a summons, how to identify and summons a noncomplying tenant is more complicated. Our enforcement personnel, if invited, will be able to search through garbage for identification of individual offenders in buildings where the landlord has provided the information and opportunity to recycle, but this may not succeed in many cases. While we will continue to work closely with landlords on tenant education, the first responsibility to comply with recycling regulations remains with landlords, just as it does with other sanitation, health and fire codes.

Some people have expressed concern that phasing in enforcement in some districts before the whole city is participating puts an unfair burden on those areas that started first. While this response is understandable, we believe that the Department's enforcement schedule is consistent with the intent of the City Council when it passed Local Law 19: that it is necessary if we are to achieve city and state legal mandates, and that it is appropriate in the context of the city's waste disposal crisis.

Intensive Recycling, Waste Prevention And Reuse

The Department is committed to researching new ways of reducing the waste stream, recycling additional materials, and improving public participation and diversion rates in its recycling programs. The Intensive Recycling programs and research carried out during FY 90 and planned for FY 91, summarized here, represent our initial strategies for achieving these goals.

The Department received funding in FY 90 to study the feasibility of intensive recycling in New York City. These funds were used to start two pilot projects in FY 90 -- an Intensive Education mini-pilot and an Intensive Collection mini-pilot -- and to contract with consultants to assist in the planning of a larger Intensive Recycling, Waste Prevention and Reuse Zone (Intensive Zone) for FY 91.

The Intensive Education mini-pilot started in March 1990 at a seven-building apartment complex in Harlem -- an area classified demographically as low income and high density. The goal of the pilot was to evaluate the impact of different educational strategies on participation rates. This has been done by measuring resident participa-

tion in the newspaper/magazine and metal/glass recycling programs already in place in the complex, both before and after education.

Seven different education and outreach strategies were tested, one per building. However, during outreach we learned that, education aside, there are several fundamental problems in these buildings that pose significant obstacles to recycling. For example, chute rooms are typically very dirty, making it less likely that residents will remain in them to separate materials. In addition, the buckets for metal/glass are frequently stolen, and when they are present, are often filled with garbage. In reality, the amount of glass or metal now recovered from any given building may have more to do with the supers' willingness to sort through garbage than with resident cooperation. For the above reasons, we are reluctant at this point to draw conclusions about the relative impact of the different education strategies.

In June, the Department launched an Intensive Collection mini-pilot in selected Manhattan apartment buildings served by the Containerized Recycling program for newspapers/magazines and metal/glass. The buildings chosen are classified as high income/high density and low income/high density. The goal of this pilot is to learn about the collection, processing, and marketing of mixed paper and mixed plastics on a small scale, in anticipation of the larger collection program planned in the Intensive Zone.

Participation in this pilot increased steadily in its initial weeks and has now leveled off, producing just under one ton of mixed paper and slightly more than a quarter ton of mixed plastics each week. What diversion rate this represents has not yet been determined. It is clear, however, that the tonnage of mixed paper and mixed plastics collected is substantially less on a per-household basis in the low income buildings than it is in the high income buildings. In addition, we have learned that those buildings with the more convenient collection areas (i.e. chute rooms) have higher participation rates.

Further experiments with outreach will be aimed at: 1) reducing contaminants in the materials (such as plastic-coated paper and food residues); 2) learning ways of increasing participation rates in low income buildings up to that of the high income buildings; and 3) educating residents about waste prevention (see Chapter IV, "Waste Prevention").

In addition to these pilots, the Department issued several consultant contracts in FY 90. These focused on three materials (mixed paper, mixed plastics, and food waste) that have been identified as significant percentages of the waste stream and are potentially recyclable.

From the consultants' reports, we have learned about existing programs around the world that are recovering these materials, and the program methods, successes, and failures. We have also gained an information base on the long- and short-term market expectations for mixed plastics and mixed paper collected in New York City. Finally, reports on collection and composting methods for residential food waste, and the existing and emerging processing technologies and facilities for mixed paper and mixed plastics, have provided guidance for the design and implementation of the Intensive Zone for FY 91.

The Intensive Zone, which the Department proposed and was funded to implement, will test, in an area of medium income and medium housing density in Brooklyn: 1) waste prevention and reuse education and programs (see Chapter IV); 2) recycling of new materials (mixed paper, mixed plastics, food waste, and dry cell batteries); and 3)

maximizing collection of materials targeted by existing programs. We are also in the early stages of designing a modified intensive program for a low income, high density area of Manhattan.

Improving participation in existing recycling collection programs in the Intensive Zone will be approached in several ways. One approach will be to place special collection receptacles at locations where recyclables are typically discarded without recovery, such as transportation hubs, parks, on commercial streets and at special events.

We also plan to maximize "Bottle Bill" recovery rates by requesting the not-for-profit, bottle and can redemption organization, WE CAN, to focus its efforts in the Intensive Zone, and by conducting an education campaign for residents, encouraging them to directly redeem their beverage containers or to set up building-wide or community-based redemption programs.

A third strategy will be to maximize the collection of materials from not-for-profit institutions and city agencies. To the extent possible, the Department will focus the Recycling Division outreach staff and the Environmental Action Coalition (under contract to the Department to develop office paper programs in not-for-profit institutions, schools, and government agencies) on implementing city agency and nonprofit institution programs in the Intensive Zone.

Finally, we will be re-educating people concerning previously designated recyclables collected in the Intensive Zone, as collections for new materials are introduced.

Experience with the FY 90 pilots has alerted us to barriers to participation in areas of low income and high density housing. Consequently, in addition to the Intensive Recycling Zone in Brooklyn, the Department has decided to do further research in FY 91 in an area of low income and high density housing in Manhattan.

The information gathered will help us determine whether to direct resources to collecting more materials or to increasing participation in recycling already targeted materials.

FY 91 Implementation Plans

In FY 91 we plan to expand the Curbside program from 27 to 40 community districts. We plan to add plastic to 21 districts, metal and glass to 25 districts, and magazines and corrugated cardboard to 18 districts. The Bulk program will increase from 36 to 52 districts and Christmas tree collection from 24 to all 59 districts. In addition, outreach staff will handle pilots for leaf and yard waste, intensive recycling, and plastic bag collections. (See Exhibit V.1)

To further accelerate our collection effort and to make recycling procedures more uniform citywide, all new districts will begin with at least five materials -- newspaper, magazines, corrugated cardboard, metal, and glass. Further, by the end of the fiscal year, those districts already recycling will include collection of all five materials as well. This will make citywide public education less fragmented and the program less confusing to the public.

Implementing a mandatory recycling law has presented formidable challenges. The diversity of the population challenges our educational resources. The sheer size of the city challenges our fiscal resources. The density of housing stock presents storage and enforcement problems. But we are encouraged by the enthusiasm and willingness of many New Yorkers to participate -- the challenge is to find more cost-effective ways to increase that participation.

CURRENT IMPLEMENTATION SCHEDULE for RECYCLING COLLECTION

Note: SP = Spring; F = Fall

District	Number of Households	Implementation Date							
		Newspaper	Magazines	Corrugated Cardboard	Bottles and Cans	Plastic Containers	Alternate Week Collection Start Date	Bulk	Yard Waste
BRONX 1	23,584	04/15/91	04/15/91	04/15/91	04/15/91	SP/92		02/04/91	
BRONX 2	8,657	04/15/91	04/15/91	04/15/91	04/15/91	SP/92		02/04/91	
BRONX 3	15,070	02/11/91	02/11/91	02/11/91	02/11/91	SP/92		02/04/91	
BRONX 4	38,431	02/11/91	02/11/91	02/11/91	02/11/91	SP/92		02/04/91	
BRONX 5	37,006	02/11/91	02/11/91	02/11/91	02/11/91	SP/92		02/04/91	
BRONX 6	17,879	03/04/91	03/04/91	03/04/91	03/04/91	03/04/91		02/04/91	
BRONX 7	48,700	03/04/91	03/04/91	03/04/91	03/04/91	03/04/91		02/04/91	F/91
BRONX 8	41,416	F/91	F/91	F/91	F/91	F/92		04/02/90	F/91
BRONX 9	63,731	03/11/91	03/11/91	03/11/91	03/11/91	F/92	03/11/91	02/04/91	
BRONX 10	41,830	03/25/87	05/14/90	05/14/90	05/14/90	03/11/91	03/11/91	05/22/89	F/91
BRONX 11	41,610	05/29/90	05/29/90	05/29/90	05/29/90	03/11/91	03/11/91	04/02/90	
BRONX 12	46,164	05/15/89	05/20/91	05/20/91	05/15/89	05/20/91		04/02/90	F/91
BROOKLYN 1	52,569	F/92	F/92	F/92	F/92	F/92		02/03/92	
BROOKLYN 2	43,640	10/24/88	12/10/90	12/10/90	10/24/88	12/10/90		04/02/90	F/91
BROOKLYN 3	52,921	08/13/90	08/13/90	08/13/90	08/13/90	F/91		04/02/90	
BROOKLYN 4	30,041	F/92	F/92	F/92	F/92	F/92		02/03/92	
BROOKLYN 5	49,239	F/92	F/92	F/92	F/92	F/92		02/03/92	F/91
BROOKLYN 6	46,394	04/08/89	04/08/89	04/08/89	04/02/90	10/22/90		02/04/91	
BROOKLYN 7	39,757	01/14/91	01/14/91	01/14/91	01/14/91	01/14/91	01/14/91	02/04/91	F/91
BROOKLYN 8	36,249	F/92	F/92	F/92	F/92	F/92		02/03/92	
BROOKLYN 9	40,499	F/91	F/91	F/91	F/91	F/92		02/04/91	F/91
BROOKLYN 10	51,674	06/22/87	05/14/90	05/14/90	05/14/90	12/17/90		02/04/91	F/91
BROOKLYN 11	63,017	01/14/91	01/14/91	01/14/91	01/14/91	F/91	01/14/91	02/04/91	F/91
BROOKLYN 12	58,711	01/14/91	01/14/91	01/14/91	01/14/91	F/91	01/14/91	02/04/91	F/91
BROOKLYN 13	45,380	06/18/90	06/18/90	06/18/90	06/18/90	12/17/90		02/04/91	
BROOKLYN 14	59,952	F/91	F/91	F/91	F/91	SP/92		02/04/91	F/91
BROOKLYN 15	61,034	F/91	F/91	F/91	F/91	SP/92		02/04/91	F/91
BROOKLYN 16	24,003	SP/92	SP/92	SP/92	SP/92	SP/92		05/22/89	F/91
BROOKLYN 17	52,854	SP/92	SP/92	SP/92	SP/92	SP/92		02/03/92	F/91
BROOKLYN 18	62,982	SP/92	SP/92	SP/92	SP/92	SP/92		05/22/89	F/91

CURRENT IMPLEMENTATION SCHEDULE for RECYCLING COLLECTION

Note:SP = Spring; F = Fall

		Implementation Date							
District	Number of Households	Newspaper	Magazines	Corrugated Cardboard	Bottles and Cans	Plastic Containers	Alternate Week Collection Start Date	Bulk	Yard Waste
MANHATTAN 1	13,017	09/25/89	09/25/89	09/25/89	11/13/90	SP/92		02/05/90	
MANHATTAN 2	55,474	11/13/86	02/06/89	02/06/89	11/13/90	SP/92		02/05/90	
MANHATTAN 3	66,343	04/23/90	04/23/90	04/23/90	05/06/91	SP/92		02/05/90	
MANHATTAN 4	53,811	11/17/87	02/06/89	02/06/89	05/20/91	SP/92		02/05/90	
MANHATTAN 5	28,096	06/19/89	06/19/89	06/19/89	05/20/91	SP/92		02/05/90	
MANHATTAN 6	95,094	06/19/89	06/19/89	06/19/89	05/20/91	SP/92		04/02/90	
MANHATTAN 7	121,231	10/04/89	10/04/89	10/04/89	05/29/90	04/01/91		04/02/90	
MANHATTAN 8	134,164	03/26/90	03/26/90	03/26/90	06/10/91	SP/92		04/02/90	
MANHATTAN 9	53,107	06/04/90	06/04/90	06/04/90	06/24/91	SP/92		04/02/90	
MANHATTAN 10	44,492	12/04/89	12/04/89	12/04/89	07/23/90	SP/92		04/02/90	
MANHATTAN 11	73,630	12/04/89	12/04/89	12/04/89	07/23/90	SP/92		04/02/90	
MANHATTAN 12	73,824	06/11/90	06/11/90	06/11/90	06/24/91	SP/92		04/02/90	
QUEENS 1	75,192	F/91	F/91	F/91	F/91	F/92		04/02/90	F/91
QUEENS 2	38,653	F/91	F/91	F/91	F/91	F/92		04/02/90	F/91
QUEENS 3	52,377	F/92	F/92	F/92	F/92	F/92		04/02/90	F/91
QUEENS 4	45,094	F/92	F/92	F/92	F/92	F/92		04/02/90	F/91
QUEENS 5	62,781	F/92	F/92	F/92	F/92	F/92		04/02/90	F/91
QUEENS 6	53,822	04/24/87	10/15/90	10/15/90	06/10/88	10/15/90		05/22/89	F/91
QUEENS 7	83,050	02/26/90	02/26/90	02/26/90	02/26/90	04/01/91	04/01/91	05/22/89	F/91
QUEENS 8	54,540	04/21/90	04/21/90	04/21/90	04/21/90	12/17/90		05/22/89	F/91
QUEENS 9	42,773	SP/92	SP/92	SP/92	SP/92	SP/92		05/22/89	F/91
QUEENS 10	38,836	SP/92	SP/92	SP/92	SP/92	SP/92		02/03/92	F/91
QUEENS 11	43,739	06/20/88	09/17/90	09/17/90	11/14/88	09/17/90	09/17/90	05/22/89	F/91
QUEENS 12	64,965	10/01/90	10/01/90	10/01/90	10/01/90	10/01/90	10/01/90	05/22/89	F/91
QUEENS 13	55,867	10/29/90	10/29/90	10/29/90	10/29/90	10/29/90	10/29/90	05/22/89	11/05/90
QUEENS 14	37,250	SP/92	SP/92	SP/92	SP/92	SP/92		05/22/89	F/91
STATEN Is 1	52,883	04/17/89	02/19/90	02/19/90	04/17/89	09/10/90		05/22/89	11/05/90
STATEN Is 2	40,675	04/17/89	02/19/90	02/19/90	04/17/89	09/10/90		02/05/90	11/05/90
STATEN Is 3	41,512	05/18/87	02/19/90	02/19/90	11/14/88	09/10/90		02/05/90	11/05/90
TOTAL 59	2,991,286								