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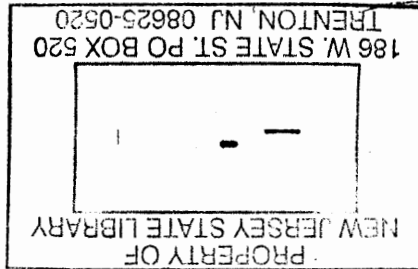
# New Jersey Hazardous Waste Facilities Plan

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**September, 1984**

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**New Jersey Hazardous Waste Facilities Siting Commission**

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# **New Jersey Hazardous Waste Facilities Plan**

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**Draft**

**September, 1984**

Prepared By  
**Environmental Resources Management, Inc.**  
999 West Chester Pike  
West Chester, Pennsylvania 19382

Under Contract To  
**Hazardous Waste Facilities Siting Commission**  
28 West State Street, Room 614, CN-406  
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## Hazardous Waste Facilities Siting Commission

September, 1984

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## ACKNOWLEDGEMENTS

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NJDEP Division of Environmental Quality  
Bureau of Enforcement Services  
Bureau of Enforcement Data Management

NJDEP Division of Waste Management  
Bureau of Classification and Manifest  
Bureau of Compliance and Enforcement  
Bureau of Field Operations  
Bureau of Hazardous Waste Engineering  
Bureau of Registration and Permits  
Bureau of Hazardous Site Mitigation

NJDEP Division of Water Resources  
Bureau of Industrial Waste Management  
Office of Permit Administration

NJDEP Office of Regulatory Services

NJDEP Office of Science and Research

NJ Department of Labor  
Bureau of Demographic and Economic Analysis

NJ Department of Transportation  
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## EXECUTIVE SUMMARY

### INTRODUCTION

#### General Background

The Major Hazardous Waste Facilities Siting Act, NJAC 7:26-13 (referred to as the Act), was signed into law on 10 September 1981. Formerly Senate Bill 1300 (Senate Committee Substitute), the Act became the first law in New Jersey providing for the development of needed hazardous waste treatment, storage, and disposal facilities.

#### The Siting Act

The Act provides a mechanism to site and construct major commercial (off-site) hazardous waste treatment, storage, and disposal facilities. It employs four phases:

Planning: This involves the development of criteria for choosing sites and an analysis of the number and type of facilities needed based on both a survey of wastes produced and the life expectancy of existing facilities. The planning phase also requires research into the means of minimizing the quantity of waste generated.

Siting: This phase is comprised of finding locations that meet the siting criteria and investigating their suitability.

Licensing: The Act requires the development of a comprehensive application process to oversee the design, construction, and operation of specific facilities.

Regulating: Procedures for monitoring facilities during operation and after closure to assure compliance with state and federal regulations, as well as to protect human health and safety, is the final phase in the development of new facilities.

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### The Siting Commission

The Act establishes a governing body - the Hazardous Waste Facilities Siting Commission - to execute the state's responsibilities under the Act. The nine members of the Commission are appointed for staggered terms of one to three years by the Governor, with the advice and consent of the Senate. The composition of the Commission is designed to provide a variety of perspectives. Three members are county or municipal elected or appointed officials, three are employed by industrial firms, and three are representatives of environmental or public interest organizations.

### The Mandate

The Siting Commission is responsible for planning for the proper management of all of New Jersey's hazardous waste. Specifically, its duties include:

- Review of the criteria for siting new major hazardous waste facilities proposed by New Jersey DEP and adopted 19 September 1983.
- Preparation of the Major Hazardous Waste Facilities Plan.
- Proposal and adoption of site designations for the number and type of new major hazardous waste facilities determined to be necessary in the Plan.
- Adoption of rules and regulations for exemptions.

### Commission Policies

The Commission has a responsibility beyond simply determining the number and types of facilities required to properly manage New Jersey's hazardous waste; that additional responsibility is to promote a higher order of waste management in the future. This will require the Commission to examine the production of wastes as well as the treatment and disposal of wastes. After examining, for the first time, all relevant data as they relate to generation of hazardous waste, the Commission proposes that a new management hierarchy be developed. The new management hierarchy proposed by the Commission, in order of preference, includes:

1. Source reduction
2. Recycling
3. Recovery
4. Treatment and incineration
5. Secure disposal

This new management hierarchy must be implemented over time and the current regulatory framework must be adjusted so as to support new treatment technologies. As envisioned, future facilities should incorporate the preferred technologies with the private sector acting as owner and operator.

In projecting the need for new capacity, the Commission is seeking to assign waste to the best available technology. In the short term, this is likely to increase the cost of hazardous waste treatment and disposal. However, over time the advantage to both the environment of New Jersey and the health of its citizens will more than offset this increase.

All hazardous waste treatment technologies produce some residues. These residues have virtually no commercial value and must be sent to a disposal facility. It is the goal of the Commission to limit the use of secure disposal facilities to residues from treatment process, bulk waste from the cleanup of abandoned sites, and a small quantity of wastes, such as metal sludges, for which there is no practicable alternative. Without a facility to dispose of such wastes, the implementation of any new management program is impossible.

Finally, the Commission will continue to explore regional management options in cooperation with our neighboring states. Some of New Jersey's waste, and some waste from other states, may lend themselves to technologies which are not yet commercially proven. However, quantities of these wastes are limited and the supply and demand factors must be considered on a regional basis.

#### Introduction to Facilities Plan

One of the requirements of the Act is the preparation of a Hazardous Waste Facilities Plan. This document presents that Plan.

The purpose of the Plan is to define the state's need for commercial treatment, storage, and disposal facilities for the next three to five years. The Plan represents a comprehensive analysis of New Jersey's waste management practices. Waste generation patterns and expected growth of New Jersey's

industrial base were examined along with the existing and anticipated capacity and capabilities of commercial facilities. The Plan compares forecasts of future manifested waste relative to the anticipated available facility capacity to determine the number and types of facilities New Jersey will need to insure proper waste management.

## SOURCES OF INFORMATION

### Hazardous Waste Data Base

#### Manifests

An important data base used in developing this Plan was New Jersey's hazardous waste manifest information. Since 1978, New Jersey has required that generators use the hazardous waste manifest, a multipart form used to track hazardous waste from the point of generation to ultimate disposal. The manifest requires information regarding: type of waste, quantity, physical form, means of shipment, and the names of the generator, the transporter, and the intended commercial facility.

New Jersey has computerized key data from each manifest since 1978. For this study, the data for 1981, 1982, and 1983 were analyzed. Those three years represent the most accurate and complete compilation of information.

The manifests provided information not only on New Jersey's generation and waste receipts at the state's present facilities, but also on the quantities of waste imported from other states to New Jersey facilities as well as that exported to other states from New Jersey's generators.

#### Treatment, Storage, and Disposal Facilities Annual Reports

The reports submitted annually to New Jersey DEP by treatment, storage, and disposal facilities provide information on waste managed on site by the generator industry itself.

#### Interim and Final Permit Application

Permit applications submitted by treatment, storage, and disposal facilities for interim (Part A) and final (Part B) status were reviewed to provide details on the capabilities

and capacities of each facility. This information proved most useful in determining the types and sizes of existing waste management technologies in New Jersey.

### Additional Information

#### The New Jersey Industrial Waste Survey Report

The New Jersey Industrial Waste Survey, prepared by IT Enviroscience in cooperation with the Research and Development Council of New Jersey, provided valuable information via a formal and comprehensive survey of New Jersey generators' waste generation and plans for waste reduction. It also provided an overview of the range of available technologies for source reduction and waste treatment.

#### New Jersey's Management Plan for Remedial Action

Often referred to as the "Cleanup Plan", this document provides descriptions of the uncontrolled (abandoned) hazardous waste sites in New Jersey. These descriptions provide a basis for estimating the amount of waste expected to require off-site treatment or disposal as a result of site cleanups.

#### Survey of On-Site TSDFs

To evaluate the prospects for commercialization of on-site facilities, a questionnaire was prepared and administered by the Commission and the New Jersey Chemical Industry Council.

#### Survey of Transporters

A survey was also made of selected hazardous waste transporters permitted to operate in New Jersey. These surveys were conducted to determine the primary routes used to transport waste in the state and the major costs involved in doing so. This information was further analyzed to evaluate the impact that the transportation element has on generators' decisions for waste management.

#### Air Pollution Enforcement Data System

The Air Pollution Enforcement Data System, maintained by the Bureau of Air Pollution Control, contains information on fuel-burning equipment requiring air pollution control

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devices. This data system provided the fundamental information for estimating the quantity of waste and waste-derived fuels burned on site in industrial boilers.

### U.S. EPA Effluent Guidelines Development Documents

The U.S. EPA Effluent Guidelines Development Documents served as the source of information on expected increases in hazardous waste generation due to the implementation of pretreatment standards for industrial wastewaters.

### Adjustments of the Information

The manifest data base contained a number of transactions which caused artificial increases in the quantity of waste manifested. These included: waste routed through transfer/storage facilities, intracompany shipments, manifesting of blended fuels, etc.

Adjustments were made to these quantities based on discussions with generators, facility managers, and New Jersey DEP personnel of various divisions. These adjustments resulted in quantities which more accurately reflected the real amount of waste requiring treatment or disposal at off-site facilities.

### PRESENT QUANTITIES OF MANIFESTED WASTE

#### Quantities Currently Manifested

The manifest data base records 565,000 tons of waste managed off site in 1981, 451,000 tons in 1982, and 500,000 tons in 1983. After adjustments, the real quantities for each of the three years equaled 412,000, 344,000, and 403,000 tons, respectively. Aqueous liquids comprise 46 to 50 percent of these quantities, solvents 7 to 9 percent, oils 15 to 19 percent, other hazardous liquid wastes 4 to 7 percent, and sludges and solid hazardous wastes 18 to 20 percent.

#### Major Generating Industries

The single largest industry manifesting waste off site is the chemical industry (SIC 28). This industry alone accounted for over 34 percent of the waste sent off-site in all three years. The major generating industrial groups within SIC 28 are Pharmaceuticals (SIC 2869), Miscellaneous Industrial Inorganic Chemicals (SIC 2819), and Miscellaneous Chemical Preparations

(SIC 2899). The petroleum industry (SIC 29) and primary metals (SIC 33) are the next largest groups. Petroleum industry generation averaged nearly twelve percent of New Jersey's total for the three years; primary metals generation averaged over five percent of the state's total.

### Imports and Exports

New Jersey generators and facilities are greatly involved in an interstate waste management network. In 1983, New Jersey generators manifested 225,000 tons to other states. Most of this waste went to New York, Ohio, and Pennsylvania, primarily for disposal in landfills or combustion as an auxiliary fuel in cement kilns.

Of the nearly 400,000 tons of waste received at commercial facilities in New Jersey in 1983, 38 percent came from states outside New Jersey. Most of the waste imported from other states was sent to duPont's Chambers Works plant and SCA's Newark plant for aqueous treatment. The incineration facility operated by Rollins Environmental Services also receives significant quantities of out-of-state waste.

### Transportation

An analysis was made of the primary routes used to transport manifested waste throughout the State of New Jersey. It was found that most of the waste entered New Jersey from other states at the southwest border entry points, and of the exports passed through to other states via the same border points.

### Existing Treatment, Storage, and Disposal Facilities in New Jersey

Hazardous wastes may be treated, stored, or disposed of on-site by the generator, or be shipped off-site to a commercial facility. Because the data on these facilities vary, treatment, storage, and disposal facilities are separated into commercial off-site and non-commercial on-site plants.

The capacity by type of treatment provided by the 26 operational facilities is summarized below:

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	<u>Estimated Throughput Capacity in Tons Per Year</u>
Aqueous Treatment	409,000
Incineration	35,000
Oil Recovery/Fuel Blending	392,000
Solvent Recovery	183,000
Transfer/Storage	<u>49,000</u>
TOTAL	1,068,000

The preparation of the Plan considered the current capabilities of each facility and any plans for expansion. The compliance history of each was also examined to determine the possibilities of a facility's closing due to serious violations or inability to meet the requirements of the Part B permit.

#### Commercial Facilities

In 1982, 34 commercial facilities were authorized by the New Jersey DEP to handle hazardous waste. Three of these facilities no longer accept hazardous waste, three have not yet begun full operation, one is temporarily out of operation, and one facility is limited to a single off-site waste stream.

#### Non-Commercial Facilities

Annual reports for 1983 of 242 non-commercial facilities were analyzed to determine waste flows and types. These facilities were estimated to produce and handle 11,767,000 tons in 1983. Three firms represent 89.8 percent of the total, almost all of which is wastewater with characteristic corrosivity, being strong acids or alkalies with minor contaminants. If the wastewater from these facilities is excluded from the total, then 1,204,000 tons of hazardous wastes are estimated for on-site waste generation and management in 1983.

#### ADDITIONAL SOURCES OF FUTURE MANIFESTED WASTE

Not all the waste likely to exert demand for commercial facilities is adequately represented in the current manifest data base, nor is most of it even included in non-commercial TSDF annual reports. The information contained in this Plan represents a first-time effort to quantify these "additional sources" of future manifested waste.

Additional sources include wastes from the cleanup of uncontrolled sites and wastes generated from both the pretreatment of industrial wastewaters and from stricter regulations on the burning of wastes and waste-derived fuels in boilers.

### Cleanup Wastes

The description of the 106 sites in the New Jersey Cleanup Plan were examined to estimate the amount of waste at each site and the amount of waste likely to be sent off site for treatment or disposal. Though a variety of considerations influence the decision of whether to remove waste from a site or leave it in place, some generalizations were possible. Aqueous waste - from lagoons and impoundments - will likely be treated on site. Contaminated soil, because of the costs involved in removal, will also likely be treated or contained on site. Bulk oils, drums, and tank cleaning/decontaminating solutions will probably be shipped off site for treatment.

These generalizations suggest that 76,000 tons of waste may reasonably be expected to be manifested off site each year during the time frame of the Plan. Sludges and contaminated soils should account for most of this waste. Because the specific details of Remedial Action Master Plans (RAMPS) and Remedial Investigation/Feasibility Studies (RI/FSS) are not yet available for most of the sites in the Cleanup Plan, estimates of waste quantities should be considered in order of magnitude projections.

### Shift from On-Site to Off-Site Facilities

Closure of on-site facilities could easily shift a considerable amount of previously unmanifested waste to the commercial market. One good example of this type of shift was seen in the 1983 data when duPont closed its Gibbstown wastewater treatment plant and shipped 42,000 tons of aqueous organic waste to duPont's commercial facility at Chambers Works. This shift alone increased the 1983 manifested quantities by nine percent over the 1982 quantities.

This example notwithstanding, a review of the on-site treatment and disposal facilities with the staff of the Bureau of Hazardous Waste Engineering indicated that no additional on-site facilities are expected to close and shift waste to commercial facilities.

### Waste Burned in Boilers

An intensive analysis of the records on fuel-burning equipment was conducted to estimate the amount of waste likely to require commercial treatment upon promulgation of stricter regulations limiting the burning of waste and waste-derived fuels in industrial boilers. From the Air Pollution Enforcement Data System, it was estimated that approximately 40,000 tons of waste per year are burned in boilers having rated gross heat inputs of between 0.5 million and 187 million BTU per hour. Stricter regulations could shift 9,000 tons per year from on-site burning in boilers to off-site facilities.

### Impact of Effluent Regulations

Regulations setting pretreatment standards for new and existing sources under the Federal Water Pollution Control Act are also likely to increase the amounts of waste manifested to commercial facilities. The U.S. EPA Effluent Guidelines Development Documents estimate both water quality and non-water quality impacts from the implementation of pretreatment standards served as the basic source documents. EPA's nationwide estimates by industry were applied to New Jersey using common indicator statistics of size (e.g., number of plants or number of employees by industry) to yield preliminary estimates.

The Pretreatment Section in New Jersey's Division of Water Resources reviewed these estimates. Based on their comments, the quantity of waste expected to be generated from the implementation of pretreatment regulations was finalized at 32,000 tons annually.

### Impact of Regulatory Shifts in Other States

Discussions were conducted with the regulatory personnel of the eastern United States regarding two major issues: RCRA program changes and changes in availability of commercial facilities.

It was determined that landfill capacity had decreased markedly. It will probably be further restricted due to stricter regulation of some waste types. Applications for new land emplacement facilities are not progressing as quickly as those for treatment and incineration facilities.

## ANALYSIS OF DATA

### Demand for Off-Site Facilities

Normalized manifested waste quantities for 1981, 1982, and 1983 were projected to 1988 based on expected economic recovery and growth, waste listings and delistings, and potential for at-source reduction. These projected quantities, including those currently being exported, represent New Jersey's "demand" for facilities. The economic indicator used for projections was industry shipments in constant (1972) dollars. Estimates of at-source reduction were developed, using the responses given by generators to the Research and Development Council's Industrial Waste Management Survey, and provided a basis for estimating waste reduction.

Quantities estimated from the 1981, 1982, and 1983 manifest data were weighted 1:1:2 to give more weight to the 1983 data which contained fewer variations due to errors. The weighted quantities equaled 431,000 tons. The addition of the 117,000 tons projected for other sources of manifested waste (e.g., waste from site cleanups) resulted in a total projection of 548,000 tons for 1988.

### Three Cases for Determining Facility Needs

Facility needs were analyzed under three alternative cases:

- Market-Driven - Wastes were assigned to technologies based largely on how they would be managed in the free market system.
- Maximum Treatment - Wastes were assigned to treatment technologies consistent with the Commission's proposed waste management hierarchy:
  - a. Materials recovery
  - b. Energy recovery
  - c. Hazardous constituent destruction
  - d. Reduction of volume or hazard
  - e. Isolation from environment
- Maximum Use of Non-Commercial Capacity - Excess capacity of on-site, company-owned facilities was considering additional capacity to which wastes might be assigned in the same manner as in the market-driven case.

These cases allow evaluation of facility needs in the face of varied and changing available policy options. The market-driven case examines facility choices in the short-term—those whose implementation requires little change in current waste management practices among generators.

The maximum treatment case is one toward which New Jersey can strive over time. It requires not only regulatory initiatives but changes in the fundamental thinking presently guiding generators in their choice of facilities.

The maximum use of commercial capacity case is a variation of the market-driven case. A survey was conducted of on-site facilities to determine their interests in commercialization. Little interest was expressed. Further analysis was given to suggest that even if interest were expressed in commercialization, the collective existing capacity was actually quite small.

For each case, the "demand" for facilities, as represented by the projected total for 1988 of 548,000 tons, was compared with the "supply of facilities", as represented by the capacity of existing commercial facilities in New Jersey. The comparison indicated the following shortfalls:

<u>Facility Type</u>	<u>Shorfall Market-Driven Case (tons)</u>	<u>Shortfall Maximum Treatment Case (tons)</u>
<u>Immediate Needs</u>		
Incineration	21,000	105,000
Stabilized Land Emplacement	52,000	71,000
Unstabilized Land Emplacement	68,000	39,000
<u>Future Needs</u>		
Oil Recovery	0	47,000
Pyrometallurgical Metals Recovery	3,000	4,000
Ion Exchange Metals Recovery	0	3,000
Advance Thermal Destruction	0	19,000
Land Treatment	20,000	0

## CONCLUSIONS

The needed facilities were determined based on two criteria after the analysis of the three cases was complete: (1) a shortfall exists in both the market-driven and the maximum treatment cases, and (2) the size of the shortfall suggests that the private sector would develop the facility without public subsidy. The application of these two criteria and other considerations revealed a clear need for two types of facilities: rotary kiln incinerator of not less than 20,000 to 30,000 tons per year but not more than 110,000 tons per year, and land emplacement facility of eighty acres (twenty-year life).

The facilities specified in the Plan adhere to the present New Jersey regulatory system and supply a market-driven need. Nevertheless, the specified facilities will still be needed in the future when New Jersey develops the new regulatory system necessary to support the maximum treatment case.

The specified facilities can handle a broad range of wastes. As New Jersey moves toward the maximum treatment case, technologies specific to certain wastes will be developed and will take a portion of the markets of existing facilities. Still, the wastes projected for the more specialized facilities in the maximum treatment case can, for the most part, be managed by New Jersey's existing facilities and the new incineration and land emplacement facilities specified by this Plan.

## FUTURE AGENDA

### New Regulations

New regulations governing land emplacement facilities, waste in boilers, and wastewater pretreatment are only a few of the additional items which must be addressed by the Commission. For that reason, this Plan is scheduled for periodic update. Updates will be necessary not only to accommodate new regulations but also changing market conditions and state-of-the-art technology.

### Need for Regional Planning

This Plan clearly shows that waste management disregards state boundaries. For that reason, the creation of a consortium of states' siting authorities in the mid-Atlantic area has been formed to coordinate waste management efforts on a regional

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basis. To date, a regional system of waste classification has been proposed and an analysis of regional capacity needs is being explored.

#### Adjustments in the Siting Act

As facility needs are analyzed and new facilities are sited, adjustments to the Siting Act are likely to be necessary. The purpose of any and all adjustments will be to improve hazardous waste management in New Jersey so its population and natural environment are protected.

## CHAPTER ONE

### INTRODUCTION

In the environmentally conscious decade of the 1980s, New Jersey faces two difficult hazardous waste challenges; namely, how to clean up abandoned disposal sites and how to prevent future hazardous waste crises. The extent to which these challenges are met will in large part depend upon whether or not New Jersey has adequate modern facilities to properly manage its hazardous wastes.

Hazardous waste management presents the state with a growing dilemma: how to reconcile the demand for safe treatment, storage, and disposal options that protect human health and the environment with the growing (and vocal) reluctance of the public to accept the needed new facilities once they are proposed.

#### The Major Hazardous Waste Facilities Siting Act

In 1981, the New Jersey Legislature attempted to come to grips with this dilemma when it recognized that:

- proper treatment, storage, or disposal of hazardous waste is the exception rather than the rule;
- improper management of hazardous substances results in substantial impairment of public health and the environment;
- providing for the siting, design, construction, operation, and use of environmentally-acceptable facilities is a public purpose in the best interest of all of New Jersey's citizens; and
- the informed participation of the public and of elected officials is essential for the establishment of a mechanism for the rational siting of new facilities.

This recognition culminated in the 1981 enactment of the Major Hazardous Waste Facilities Siting Act (P.L. 1981, Chapter 279; generally known as S-1300 and hereafter as the Act). The Act

develops a rational method for planning, licensing, and siting new hazardous waste management facilities in appropriate areas of the state.

## The Commission

The Act establishes the Hazardous Waste Facilities Siting Commission (hereafter, the Commission), a nine-member group appointed by the Governor, with the advice and consent of the Senate. The Commission is composed of three industry representatives, three county and municipal government representatives, and three environmental or public interest group representatives.

## The Advisory Council

The Act also establishes the Hazardous Waste Advisory Council, a thirteen-member group, which is also appointed by the Governor with the advice and consent of the Senate. The membership reflects a broad-based representation of interests, including representatives of community organizations, fire fighters, elected officials, and hazardous waste generators, transporters, and facility operators.

## The Task Force

The Commission has formed an additional advisory group, the Hazardous Waste Source Reduction and Recycling Task Force (hereafter, the Task Force). The Task Force will advise the Commission on various policies to encourage the reduction and recycling of New Jersey's hazardous waste streams. Members of the Task Force represent environmental organizations, academia, and industry.

## The Work of the Commission

As the central focus of the Act, the Commission is empowered to define the state's hazardous waste facility needs. Once defined, the group is charged with the task of assessing appropriate sites for new facilities. The designation of sites for the specific facilities needed to manage waste streams generated in New Jersey is guided by the state's siting criteria.

## The Siting Criteria

The purpose of the criteria is to prevent any significant threat to human health or the environment that might result from the operation of a new hazardous waste management facility. The Act requires the criteria to:

- protect the residents of the state;
- insure structural stability of the new major hazardous waste facilities;
- protect surface water;
- protect ground water;
- provide for the safe transportation of hazardous waste to new major commercial hazardous waste facilities;
- protect environmentally-sensitive areas; and
- protect air quality.

The criteria were developed by the Hazardous Waste Advisory Council and adopted by the New Jersey Department of Environmental Protection (DEP). The adopted criteria (NJAC 7:26-13) incorporate the requirements of the Act as well as further discussion on how risk to population will be determined. Section 7:26-13(b) requires New Jersey DEP and the Commission to:

"take into consideration, at every step of the siting process, the following factors:

1. the density of population in proximity to the facility;
2. the size and type of the facility;
3. the type of waste expected to be present at the facility;
4. the transportation means and routes available to evacuate the population at risk in a maximum credible accident, including both spills and fires;

5. the size and types of other hazardous waste facilities and facilities that handle hazardous materials in the adjacent area; and
6. the availability of fire, police, and other emergency management personnel and medical facilities in the area."

## The Plan

In conjunction with the criteria, the Hazardous Waste Facilities Plan (hereafter, the Plan) provides the backbone for future siting decisions to be made by the Commission. This document presents the draft of the Commission's Plan, as required by Section 10 of the Major Hazardous Waste Facilities Siting Act.

The contents of the Plan are specified in the Act. Included are:

1. an inventory and appraisal, including the identity, location, and life expectancy of all hazardous waste facilities within the state and the identity of every person engaging in hazardous waste collection, treatment, storage, or disposal within the state;
2. a current inventory of the sources, composition, and quantity of hazardous waste generated within the state;
3. projections of the amounts and composition of hazardous waste to be generated within the state in each of the next three years;
4. a determination of the number and type of new major hazardous waste facilities needed to treat, store, or dispose of hazardous waste in this state;
5. an analysis of the ability of all existing facilities to meet current and proposed state and federal environmental, health and safety standards, and their performance in meeting these standards;

6. an analysis of transportation routes and transportation costs from hazardous waste generators to existing or available suitable sites for major hazardous waste facilities;
7. procedures to encourage co-disposal of solid and hazardous waste, source reduction, materials recovery, energy recovery, waste exchanging and recycling, and to discourage all inappropriate disposal techniques, and to minimize the amount of hazardous waste to be treated, stored, or disposed of in this state; and
8. a regional analysis of existing and necessary major hazardous waste facilities and recommended procedures for coordinating major hazardous waste facilities planning on a regional basis.

## Availability of the Plan

The availability of this publication will appear in the New Jersey Register. The Plan is available to all interested persons. The Commission will hold public hearings on the Plan, the notice of which must be published at least thirty days in advance in at least two newspapers circulating in the specific area where the hearings will be held.

The Commission will consider all comments made at public hearings and make any necessary revisions to the draft Plan. Upon revision, the Commission will adopt the final Plan and begin the important effort of finding appropriate sites for new hazardous waste facilities.

This projection of manifested hazardous waste quantities<sup>1</sup> presents a significant portion of New Jersey's future demand for commercial hazardous waste treatment, storage, and disposal facilities. It will be used in combination with information supplied by Chapters Three, Four, and Five to estimate New Jersey's future facility needs in Chapter Six.

## DATA BASE REORGANIZATION FOR FACILITY NEEDS ANALYSIS

### The Data Base

An important data base for the development of the Plan is New Jersey's hazardous waste manifest information. Since 1978, New Jersey has required that generators use the hazardous waste manifest, a multipart form used to track hazardous waste from the point of generation to ultimate disposal. All hazardous waste moved over public roads must be accompanied by a manifest containing information regarding: type of waste, quantity, physical form, means of shipment, and the names of the generator, the transporter, and the recipient of the waste.

Manifested quantities reflect the amount of hazardous waste that generators sent off site for treatment, storage, or disposal and indicate New Jersey generators' current demand for commercial facilities. These figures do not include waste generated and managed on site at non-commercial, company-owned facilities. The New Jersey DEP computer systems convert manifested quantities to the common unit of tons by means of the following multipliers<sup>2</sup>:

Gallons:	8.34/2000
Cubic Yards:	1684.8/2000
Liters:	2.203/2000
Kilograms:	2.204/2000
Pounds:	1/2000

New Jersey has computerized much of the data it has acquired from each manifest since 1978. For this study, the data for 1981, 1982, and 1983 were analyzed. Those three years represent the most accurate and complete compilation of information on hazardous waste production and management in

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<sup>1</sup> All quantities through this Facilities Plan are given in terms of short tons: 1 ton equals 2,000 pounds.

<sup>2</sup> The multipliers are based on the assumption that all volume units have the same density. The density assumed in this case is that of water.

## CHAPTER TWO

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### FIVE YEAR PROJECTIONS FOR MANIFESTED HAZARDOUS WASTE

#### OBJECTIVE

Chapter Two of the Facilities Plan - Five-Year Projections for Manifested Hazardous Waste - uses manifested waste data for 1981, 1982, and 1983, the Hazardous Waste Facilities Siting Commission's "Interim Report - An Analysis of the New Jersey Manifest Information" issued in January 1984, and other documented data to forecast future waste quantities. The major activities of this chapter include:

- a. Reaggregation of the Data Base for Facility Needs Analysis. Generators are reorganized by SIC codes to allow evaluation and projection of waste generating practices by industry. Waste quantities by EPA/DEP codes are assigned to treatability categories indicating suitability to commercially-available waste treatment technologies.
- b. Normalization of Data Base. The totals reported for all manifested waste are adjusted to exclude the following quantities: (1) those double-counted because of generators' use of transfer/storage stations, (2) those managed at non-commercial, company-owned facilities but tracked with a New Jersey manifest, (3) blended fuels sent from solvent and oil recoverers to be burned as auxiliary fuels in cement kilns, etc., under a hazardous waste manifest, (4) wastes brokered from treatment facilities, and (5) waste generated from one-time events, such as major accidents.
- c. Calculation of Projected Hazardous Waste Quantities. Using factors reflecting industrial activity (economic recovery and growth in real terms), waste listings and delistings, waste reduction possibilities, and anticipated regulatory changes by industry, quantities are projected through the year 1988.

New Jersey.<sup>3</sup> The accuracy of these data was assured by frequent quality control on the part of data entry personnel and by comparisons of the computerized data with generators' annual reports filed with New Jersey DEP.

## Generator Reorganization by SIC Codes

As hazardous waste generation largely reflects industrial activity, hazardous waste quantities are best projected according to some measure of industrial activity. Thus, it was necessary to group generators by industry classification. The Standard Industrial Classification (SIC) coding system, developed by the U.S. Office of Management and Budget in 1957 (1972 being the most recent year of major revision), proved well-suited to the purposes of the Plan for three reasons: (1) it groups industries according to the composition and structure of the economy and covers the entire field of economic activity; (2) it facilitates comparison of statistics describing the various facets of the economy; and (3) industrial economic analyses and forecasts available from government agencies and professional forecasting firms are typically prepared in terms of, or at least consistently cross-reference, this classification system.

For each generator, a four-digit (specific industry) SIC code was determined in all cases possible. Sources for this information included George D. Hall's New Jersey Manufacturers Directory 1982 and the 1980 New Jersey State Industrial Directory published by the State Industrial Directories Corporation. The staff of New Jersey's Department of Commerce and Economic Development also assisted in determining SIC codes for generators not listed in either directory.

To present totals, generators were combined according to two-digit codes (major groups) except for the major group SIC 28 - Chemical and Allied Products - which generates a disproportionately large amount of waste. Table 2-1 details the percentage of hazardous waste manifested in each major SIC group in 1981, 1982, and 1983.<sup>4</sup> Table 2-2 details the major generating sectors in SIC 28 for these three years. Figure 2-1 depicts graphically the percentages of manifested hazardous waste generation by industry for the year 1982.

<sup>3</sup> They include not only waste manifested by New Jersey generators but also out-of-state ("imports") accepted by New Jersey commercial facilities.

<sup>4</sup> Waste quantities before normalization (see pages 21 and 22); relative percentages change marginally after normalization.

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TABLE 2-1  
GENERATION OF MANIFESTED WASTE  
BY MAJOR INDUSTRIAL GROUP

<u>SIC Code</u>	<u>Group Name</u>	<u>Percent of 1981 Waste</u>	<u>Percent of 1982 Waste</u>	<u>Percent of 1983 Waste</u>
20	Food and Kindred Products	2.1	4.4	3.5
22	Textile Mill Products	0.2	0.3	0.2
25	Furniture and Fixtures	<0.1	<0.1	<0.1
26	Paper and Allied Products	0.9	2.2	1.0
27	Printing and Publishing	0.2	0.2	0.4
28	Chemicals and Allied Products	38.6	37.6	34.1
29	Petroleum Refining <sup>1</sup>	12.5	10.6	12.8
30	Rubber and Miscellaneous Plastics	0.3	0.3	0.2
31	Leather and Leather Goods	0.1	<0.1	<0.1
32	Stone, Clay, Glass, and Concrete	7.5	3.7	1.0
33	Primary Metals	3.9	5.2	6.8
34	Fabricated Metals	2.7	2.0	3.2
35	Machinery, Except Electrical	2.3	2.6	1.7
36	Electrical and Electronic Machinery	1.4	1.2	0.7
37	Transportation Equipment	1.7	1.3	1.0
38	Measuring, Analyzing, Controlling Instruments	0.4	0.3	0.6
42	Transportation Services	1.5	0.6	0.3
49	Electric, Gas, Sanitary Services	1.9	1.5	3.5
7399	Miscellaneous Business Services <sup>2</sup>	5.7	6.6	7.1
7699	Miscellaneous Repair and Industrial Services <sup>3</sup>	13.7	14.9	15.9
90-97	Government and Military	1.9	1.0	0.7
Misc. <sup>4</sup>		1.5	3.5	4.0
	TOTAL	<u>100</u>	<u>100</u>	<u>100</u>

<sup>1</sup> About 88 percent from 2911-Petroleum Refining; 12 percent from 2992-Blending and Rerefining.  
<sup>2</sup> Includes solvent recovery operations.  
<sup>3</sup> Includes the majority of industrial contractors, environmental service contractors, and commercial tank cleaning firms. These groups typically manifest the hazardous waste produced from their activities on behalf of their customers under their own name. This group also includes commercial facilities not classed as solvent recovery or oil recovery, except Rollins.  
<sup>4</sup> Includes Rollins Environmental Services, Inc. for waste it sent as a generator.

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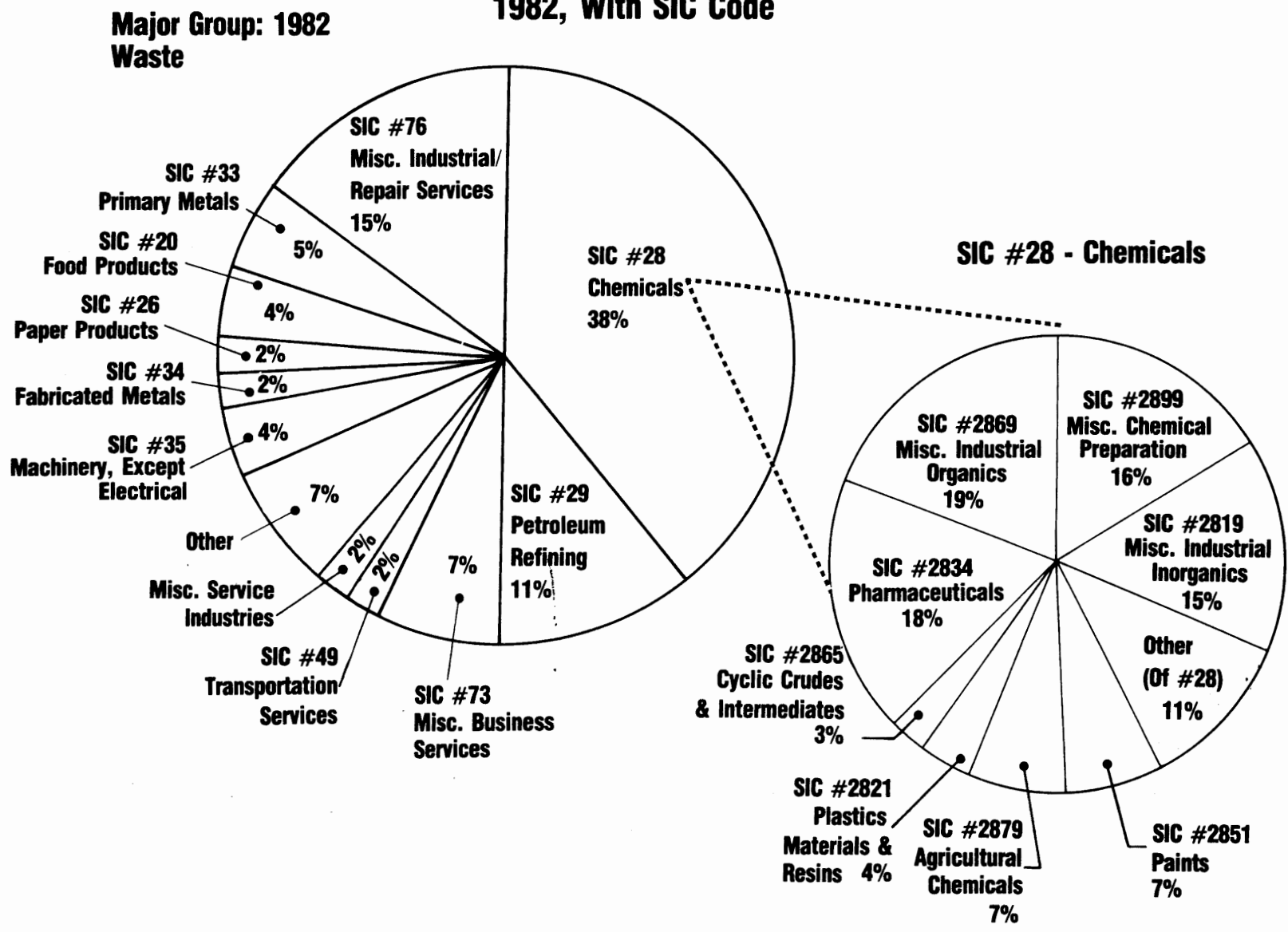
TABLE 2-2

GENERATION OF MANIFESTED WASTE  
BY INDUSTRIES WITHIN SIC 28

<u>SIC</u>	<u>Percent of SIC 28</u>			<u>Percent of All NJ Waste</u>		
	<u>81</u>	<u>82</u>	<u>83</u>	<u>81</u>	<u>82</u>	<u>83</u>
2819 Industrial Inorganic Chemicals, NOS <sup>1</sup>	22.2	15.0	32.3	8.7	5.8	11.1
2821 Plastic Materials and Resins	3.6	4.0	3.4	1.4	1.5	1.1
2834 Pharmaceutical Preparations	14.5	18.1	16.9	5.6	6.8	5.8
2851 Paints and Allied Products	5.4	7.2	7.6	2.1	2.7	2.6
2865 Cyclic Crudes and Intermediates	3.6	2.9	2.8	1.4	1.1	1.0
2869 Industrial Organic Chemicals, NOS	22.5	18.9	13.8	8.7	7.1	4.5
2879 Agricultural Chemicals, NOS	5.4	7.4	8.4	2.1	2.8	2.9
2899 Chemical Preparations, NOS	16.3	16.0	6.5	6.3	6.0	2.2
Other 28	<u>6.2</u>	<u>10.1</u>	<u>8.3</u>	<u>2.3</u>	<u>3.8</u>	<u>2.9</u>
	100	100	100	38.6	37.6	34.1

<sup>1</sup> NOS: Not otherwise specified

**Figure 2-1  
Generation of Manifested Waste  
By Industrial Group  
1982, With SIC Code**



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## Quantity Reaggregation by Treatability Categories

Generators, when completing manifests, identify the type of waste using the EPA/New Jersey hazardous waste coding system (see Appendix A). This system identifies the hazardous properties or constituents of the waste, but it does not describe its treatability or its potential for recycling. For purposes of the Facilities Plan, it was necessary to reaggregate these waste quantities in terms of their treatability, i.e., to group together those waste types having similar physical and chemical characteristics and general treatment requirements. Examination of wastes in terms of their treatability provides a very suitable scheme for modeling the dynamic situation of hazardous waste management.

Treatability categories were assigned to wastes identified on a computer listing, provided by the New Jersey DEP, of all New Jersey generators' manifest transactions<sup>5</sup> in 1981, 1982, and 1983. The assignment of treatability categories required a significant investment of time to examine simultaneously the EPA/New Jersey waste code, the generator's SIC code and the industrial processes typical of that code, the original units of measure for each waste load shipped, the physical form (liquid, solid, sludge, or gas), the nature and range of waste handling methods available at the generator-selected commercial facility, and the initial method of handling actually employed by the commercial facility for each waste shipment received. This information had to be examined compositely to assign waste to treatability categories.

### Example of Assignment to Categories

The method of assigning a manifested waste to a treatability category is best illustrated by an example. One example is F005 (non-halogenated solvents and still bottoms) sent from one generator in SIC 2893 (Printing Ink) to a solvent recovery facility, a cement kiln and a fuel blending facility. For shipments to the solvent recovery facility, treatability category non-halogenated solvents was assigned, its non-halogenated nature being determined from the EPA code (F005). For the shipments sent to the cement kiln or fuel blending facility in 1981 or 1982, the hybrid treatability category combustible liquid/sludge was given, indicating that the waste

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<sup>5</sup> A waste transaction is defined as the total quantity of a single waste type between one generator and one commercial treatment, storage, or disposal facility.

was merely a combustible substance.<sup>6</sup> For 1983 data, additional information was available on the physical state and combustible wastes were classified under either combustible liquid or combustible sludge. In the absence of additional information in 1981 and 1982, the waste remained in the combustible liquid/sludge category. To complete the task report summary totals, however, this category was prorated among the combustible liquid and combustible solid/sludges based on the ratio of liquid to solids/sludges observed for 1983 data.

## Direct Examination of Transactions

For 1981 and 1982 data, all waste types manifested by individual generators in quantities of 100 tons or more were examined specifically and assigned to a treatability category. By this method, at least eighty percent of total 1981 and 1982 wastes received direct examination. Furthermore, this method examined an average of ninety percent of the total quantity of each significant waste type: those generated in very large amounts in New Jersey (e.g., X900, X726, and D001, each equaling 7.0 percent or more of the state's total waste quantity in all three years) and those having special treatability requirements (e.g., arsenic, cyanide, and certain organic wastes).

The examination of 1983 data was somewhat different because the data were available later and were requested in a different format. Again, all generator manifest transactions of 100 tons or more in 1983 were examined directly. However, to provide more representative examination, at least 100 additional transactions were examined from each of the following tonnage ranges: 51 to 99, 11 to 50, and 1 to 10.

For any year, the unexamined portion of a waste type was prorated among the treatability categories determined for the examined portion of the same waste type. To prorate, a multiplier was calculated for each waste type by dividing the manifested quantity (reported in the Commission's Interim Report) by the examined quantity. This method of examination, including proration, resulted in a calculation error of less than two percent from the total quantity reported in the Interim Report. The calculation error is primarily attributed to the fact that the multiplier was calculated to only two decimal places.

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<sup>6</sup> While the waste is likely a liquid, the code F005 applies to still bottoms as well.

## Unexamined Waste Types

The examination cutoff of 100 tons or more in 1981 and 1982 resulted in some waste types not being examined at all. This occurred with 1983 data also, but to a much lesser extent because of the more representative method of examining waste transactions. The unexamined waste types were typically reported in very minute quantities, and cumulatively they accounted for not more than three percent of the total manifested waste in any of the three years. Because of the extensive amount of time required to analyze such disproportionately small amounts of waste and because of the difficulty of reclassifying them without more information than that available from manifests, the quantities for these wastes were summed and listed under "unexamined". Assignment of these wastes to treatability categories is not essential for the completion of a realistic facility needs analysis.

Table 2-3 details manifested hazardous waste quantities by treatability categories after in-depth evaluation. The summation of quantities by the major treatability categories is displayed in Table 2-4.

## DATA BASE NORMALIZATION

During the preparation of the Interim Report, the Siting Commission identified several types of manifest transactions which, when included in the data base, caused artificial increases in the total quantities of manifested hazardous waste. It was necessary during the preparation of this Plan to understand the nature of these transactions, identify them in the data base, and eliminate their effects.

### Double Counting

#### Transfer/Storage Facilities

"Double counting" refers to instances in which a quantity of waste is recorded twice in the data base in the same or slightly varied physical/chemical form. The most common case of double counting is that in which a transfer/storage facility manifests to treatment or disposal facilities a waste which it accepted from other generators and repackaged without affecting the waste's properties or volume. The transfer/storage facility serves as a broker in most cases, locating for the generator a treatment or disposal firm. It often accepts small quantities of wastes and brokers bulk quantities of that waste type to treatment or disposal facilities.

Transfer/storage facilities provide a useful waste management service to generators, especially small quantity generators. However, the total demand for an ultimate treatment or disposal facility is not affected by whether the transfer/storage facility continues its service. The waste that transfer/storage facilities manifest to other commercial facilities was already manifested once when the original generator sent the waste to the transfer/storage facility.

All waste sent from transfer/storage facilities had to be discounted. Hazardous wastes which transfer/storage facilities may have generated from their own operations, in addition to that accepted from generators, was found to be minimal. Elimination of waste quantities counted in the data base twice due to transfer/storage facility intervention reduced the manifested waste total by 44,400 tons in 1981, 34,300 tons in 1982, and 49,000 tons in 1983.

### Brokering by Solvent and Oil Recovery Facilities

Another variation of double counting occurs when solvent recovery and oil recovery facilities accept, as a service to their customers, waste types which they themselves have not the capability to treat but which they broker for the original generator to an appropriate commercial facility. For those waste types, the solvent recoverer or oil recoverer serves only as a transfer facility. Neither the composition nor the volume of the waste type is altered. Based on discussions with facility operators, manifest transactions in which solvent or oil recoverers acted as transfer facilities amounted to about 2,700 tons in 1981, 2,200 tons in 1982, and 2,000 tons in 1983.

### Manifesting of Blended Fuels

Solvent and oil recoverers' practice of blending spent solvents and oils for fuel can lead to double counting if the blended fuels are sent to cement kilns or other energy recovery units accompanied by manifests. While recovered solvents or oils resold as product need not be manifested, the regulations do not specify clear manifesting requirements for solvents and oils blended for auxiliary fuel. Some blended fuels from solvent and oil recoverers are being manifested. However, this practice is not consistent over all solvent and oil recoverers. These manifested quantities do not represent new demand to the commercial facility market, but rather wastes leaving the commercial market. Elimination of the

wastes sent for use as fuel but tracked with hazardous waste manifests accounted for 27,300 tons in 1981, 21,500 tons in 1982, and 30,200 tons in 1983.

Pending fuel standards by New Jersey DEP may result in more consistent manifesting of blended fuels. Though this may increase overall quantities of manifested waste, the increase would still be artificial. Blended fuels used for energy recovery would still represent double-counted waste.

Summary

Total waste, then, eliminated from the data base due to double counting equals 74,400 tons in 1981, 58,000 tons in 1982, and 81,200 tons in 1983 as follows:

	<u>1981</u>	<u>1982</u>	<u>1983</u>
Transfer/Storage Facilities	44,400	34,300	49,000
Brokering of Spent Solvents and Waste Oils	2,700	2,200	2,000
Manifesting of Blended Fuels	<u>27,300</u>	<u>21,500</u>	<u>30,200</u>
	74,400	58,000	81,200

Intracompany Waste Shipments to Captive Facilities

The data base includes many cases of a company or plant listed on the same manifest as both the generator and the commercial facility. It was determined, with the cooperation of the New Jersey DEP's Bureau of Manifest and Classification, that these were almost all movements of waste to company-owned, non-commercial facilities, many times when a manifest was not even required.

Waste tracked to company-owned, non-commercial facilities does not represent existing demand for commercial facilities and therefore should be excluded from the quantity used in the facility needs analysis.<sup>7</sup> Wastes discounted due to management at company-owned facilities amounted to 55,400 tons in 1981, 31,600 tons in 1982, and 5,000 tons in 1983. The great

<sup>7</sup> An analysis of the possible shift from use of on-site facilities to commercial facilities will be examined in Chapter Four.

decrease in the 1983 quantity is very likely attributable to generators' better understanding of the requirements governing use of manifests.

## One-Time Events

Wastes generated from site cleanups and other one-time or infrequent events are not necessarily governed by the same determinants as are wastes from industrial activity. Thus wastes from major accidents, CERCLA remedies, and RCRA closures were discounted because they should not be included and projected along with production-generated wastes. However, because these wastes present additional real demand for commercial facilities in New Jersey, they are considered separately in more detail in Chapter Four. It should be noted that wastes resulting from plant and routine transportation spills are not eliminated. These wastes have some general relationship with industrial activity and in the aggregate, provide some measure of steady business to spill contractors.

Elimination of quantities generated from site cleanup and major accidents reduced the data base by 31,000 tons in 1981, 18,000 tons in 1982, and 500 tons in 1983.

## Inclusion of Residues from Commercial Waste Treatment Operations

Residue from commercial facilities' operations are not excluded from the data base. Though these wastes do represent a small fraction of the original waste received by commercial facilities, residues require additional treatment or disposal and, therefore, still represent demand for commercial facilities. The quantity of residue remaining in the data amounts to approximately 31,600 tons in 1981, 34,400 tons in 1982, and 39,800 tons in 1983.

## Inclusion of Non-Hazardous Waste

It should be noted that the normalized data base contains some manifested non-hazardous waste, or "generator declared" waste. Many industries, aware of the penalties for non-compliance under RCRA and also realizing that the commercial hazardous facilities are safer than sanitary landfills and some other industrial waste management facilities, often elect either to declare their waste hazardous or to code it on the manifest as non-hazardous and ship it to a commercial facility. Often it is difficult for generators, particularly small ones, to

determine accurately whether each load or drum of waste is hazardous. If great variability exists in the waste stream, many generators will manifest as hazardous every time.

New Jersey DEP has included some codes in its "X" series of wastes primarily for non-hazardous waste (e.g., the X900 series). These codes were assigned at the request of generators wanting to send their waste to commercial facilities which would only accept that waste with a completed manifest.

In most cases, even though wastes in these cases are not, or may not be, hazardous, they need to be included in the data base. These wastes represent real demand for commercial facilities and must be included when defining facility needs. One case, though, is excluded. Hoffman LaRoche in Warren County sent most of its industrial wastewater to the Middlesex County Utility Authority (a publicly-owned treatment works) in 1982 and 1983 because its local municipal wastewater treatment plant could not handle the wastewater. Hoffman LaRoche manifested the waste under X900. The manifest served primarily as a bill of lading. The waste was not hazardous and the Middlesex County Utility Authority is not a commercial hazardous waste facility. This exclusion accounted for 4,000 tons in 1982 and 10,000 tons in 1983.

### Normalized Totals of Manifested Waste

The normalized data base contains the quantities of wastes generated relative to general industrial activity and likely to be generated on an ongoing basis. It equals 412,000 tons in 1981, 344,000 tons in 1982, and 403,000 tons in 1983.

Table 2-5 shows the conversion of the total manifested hazardous waste data to the normalized data base. Table 2-6 details treatability categories for the normalized hazardous waste quantities in New Jersey. Table 2-7 combines the normalized quantities in Table 2-6 into summary treatability groups. Table 2-8 is a further summarization of treatability categories.

### DEVELOPMENT OF PROJECTION FACTORS

The Major Hazardous Waste Facilities Siting Act (NJAC 7:26-13) requires that the Hazardous Waste Facilities Plan include a projection of manifested waste quantities for a five-year period. The projection factors to be used in predicting

TABLE 2-5

CONVERSION OF MANIFESTED DATA BASE  
TO NORMALIZED DATA BASE  
(In Thousands of Tons)

<u>Total</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
Manifested Hazardous Waste	573.0	456.0	500.0
<u>Less</u>			
Waste from Transfer Storage Facilities	44.4	34.3	49.0
Waste Brokered by Solvent and Oil Recovery Facilities	2.7	2.2	2.0
Waste Sent for Auxiliary Fuel Under Manifest	27.3	21.5	30.2
Waste to Captive Facilities	55.4	31.6	5.0
Waste from One-Time Events	31.0	18.0	0.5
Non-Hazardous Waste	--	4.0	10.0
Normalized Manifest Hazardous Waste	412.0	344.0	403.0

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TABLE 2-6

NORMALIZED AND ADJUSTED MANIFESTED  
QUANTITIES BY TREATABILITY CATEGORIES  
(In Thousands of Tons)

	<u>1981</u>	<u>1982</u>	<u>1983</u>
<b>AQUEOUS LIQUIDS</b>			
Corrosive, with Metals	20	21	21
Corrosive, NOS	45	34	58
Contains Cyanide	<1	<1	1
Contains Hexavalent Chrome	29	19	9
Inorganics, NOS	5	2	0
Tank Cleaning Solutions	31	14	16
Organics, NOS	15	13	60
Aqueous Liquids, NOS	62	51	24
<b>SOLVENTS AND LIQUIDS</b>			
Non-Halogenated Solvents	13	9	10
Halogenated Solvents	4	4	8
Solvents, NOS	11	13	20
Automotive Oils	24	22	37
Industrial Oils	32	36	27
Fuel Oils	4	6	11
Oils, NOS	<1	2	3
<b>OTHER LIQUIDS</b>			
Combustible Liquids	20	19	14
Liquids with Toxic Metals	<1	2	1
Reactive Liquids	2	<1	1
Corrosive Liquids	<1	<1	<1
PCB Liquids	<1	1	3
Liquid Waste, NOS	1	<1	3
<b>SLUDGES AND SOLIDS</b>			
With Heavy Metals	21	14	36
With Organics	29	30	17
Paint Residue	7	2	<1
Oily Residue	16	7	7
Combustible, NOS	1	2	2
Corrosive, NOS	3	2	2
Reactive, NOS	<1	<1	<1
Toxic, NOS	1	<1	1
Sludges and Solids, NOS	5	5	9
<b>UNEXAMINED</b>	<u>10</u>	<u>12</u>	<u>2</u>
<b>TOTAL</b>	<u>412</u>	<u>344</u>	<u>403</u>

TABLE 2-7

NORMALIZED AND ADJUSTED MANIFESTED QUANTITIES  
BY SUMMARY TREATABILITY CATEGORIES  
(In Thousands of Tons)

	<u>1981</u>	<u>1982</u>	<u>1983</u>
<b>AQUEOUS LIQUIDS</b>			
Inorganic	138	109	106
Organic	69	45	83
<b>SOLVENTS</b>			
Halogenated	13	9	10
Non-Halogenated	4	4	8
Solvents, NOS	11	13	20
<b>OILS</b>			
Automobile	24	22	37
Industrial	32	36	27
Fuel	4	6	11
Oils, NOS	<1	2	3
<b>OTHER LIQUIDS</b>			
Combustible	21	19	17
Toxic with Metals	<1	2	1
Reactive	2	1	1
Corrosive	<1	<1	<1
Toxic with Organics	<1	1	3
<b>SLUDGES AND SOLIDS</b>			
Heavy Metals	22	15	37
Oily	17	7	7
Paint	7	2	<1
Combustible	2	4	3
Corrosive	3	2	3
Reactive	<1	2	<1
Organics	30	31	22
Other	2	<1	2
<b>UNEXAMINED</b>	<u>10</u>	<u>12</u>	<u>2</u>
<b>TOTAL</b>	412	344	403

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TABLE 2-8

NORMALIZED AND ADJUSTED MANIFESTED  
WASTE QUANTITIES BY  
MAJOR TREATABILITY GROUPS  
(In Thousands of Tons)

	<u>1981</u>	<u>1982</u>	<u>1983</u>
Aqueous Liquid	207	154	189
Solvents	28	26	38
Oils	60	66	78
Other Liquids	23	23	22
Organic Sludges and Solids			
Inorganic Sludges and Solids			
Unexamined	<u>10</u>	<u>12</u>	<u>2</u>
TOTAL	412	344	403

hazardous waste quantities through 1988 were developed to account for the following influences on the generation of manifested waste:

- a. Economic recovery and real growth
- b. Waste listing and delisting
- c. Waste reduction and recycling
- d. Regulatory changes

## Economic Recovery and Real Growth

Of the different indicators of industrial growth, industry shipments in constant (1972) dollars is the most appropriate for projecting hazardous waste quantities. This indicator is more strongly related to production or volume of output than total employment, which includes non-production as well as production workers. Changes in non-production employment, such as clerical, sales, or managerial, would not affect waste generation. The production worker statistic, while a better measure than total employment for the purposes of the Facilities Plan, was also deemed inadequate. Increased plant automation in many industries could have little impact on waste generation while considerably reducing the number of production workers. Value added, a growth indicator which subtracts from an industry's shipments figure an amount equal to the costs of raw and intermediate materials to produce a figure equal to the given industry's own contribution to the economy, would have been the best statistic to use. However, complete and sufficient data are not available to use it for forecasting waste quantities.

The 1984 U.S. Industrial Outlook prepared by the Bureau of Industrial Economics in the U.S. Department of Commerce served as the primary source for industrial shipments projections. The growth parameter must be expressed in constant dollars because "... percent change in constant dollars is used to measure change in volume, and indicates real growth or lack of it. It affords a uniform basis for evaluating industry growth and interindustry comparisons without the distorting influence of price change".<sup>8</sup>

Because the figures in the Outlook were calculated for industries on a nationwide basis, it was necessary to meet with New Jersey's Bureau of Demographic and Economic Analysis to confirm the applicability of the figures to New Jersey's industries. Where necessary, the Outlook figures were

<sup>8</sup> U.S. Department of Commerce. Bureau of Industrial Economics. 1984 U.S. Industrial Outlook, p. 2.

adjusted to reflect the particularities of the state's industrial base. Table 2-9 shows, for each industry, the observed changes in industry shipments in constant dollars from 1981-1982 and 1982-1983 as well as the forecasted changes through 1988.

The 1982-83 and forecasted 1983-84 figures reflect the Outlook assumption that the recovery which began in the first quarter of 1983 will continue through 1984. The somewhat lower compound annual rate for 1985 through 1988 reflects expected real growth.

## Waste Listings and Delistings

### Waste Listings

New Jersey DEP. Table 2-10 shows those wastes not in the RCRA list of 40 CFR 261 to which New Jersey has assigned a state waste code ("X" prefix). Of these, only X721 through X728 have been incorporated into the state's hazardous waste regulations and thus require manifests. The others are those which the state is currently evaluating for inclusion in the regulations. Some generators, though, are already voluntarily using manifests when shipping these other "X" wastes. In fact, quantities were manifested for 22 of these 26 "X" wastes.

It is very likely that X387 (Polychlorinated Biphenyls, N.O.S.) will be incorporated into the regulations in 1984. The data base already reports 2,844 tons manifested in 1981, 2,518 tons manifested in 1982, and 4,709 tons manifested in 1983. Because of EPA and state environmental agencies' well-publicized concerns to regulate PCBs, it is believed that the quantities reported for 1981, 1982, and 1983 reflect a large majority of X387 that generators would have manifested to commercial facilities had it been included in the regulations.

It is difficult to predict increases in manifested quantities of PCBs since they are no longer manufactured or used in transformers and capacitors. Generation is linked to the rate at which old transformers are replaced and to some degree the availability of disposal services, but it is not a function of industrial activity. Based on discussions with New Jersey DEP, it is estimated that once listed, quantities of PCBs manifested might increase immediately by five to ten percent and then be generated at a fairly constant average annual rate for at least the time frame of this Plan.

Table 2-9

## Economic Projection Factors

SIC#	Industry	$\Delta 81-82^{1,2}$	$\Delta 82-83^{1,2}$	forecasted $\Delta 83-84^{1,2}$	forecasted compounded annual rate $\Delta 1985-1988^{1,2}$	Notes
20	Food and Kindred Products	+1.1%	+1.6%	+1.0%	+0.3% <sup>E</sup>	
22	Textile Mill Products	-7.8%	+9.0%	+0.3%	+0.3% <sup>E</sup>	
24	Lumber and Wood Products	-5.8%	+8.0% <sup>E</sup>	+5.0% <sup>E</sup>	+3.0% <sup>E</sup>	estimated composite
25	Furniture	--	+11.7% <sup>E</sup>	+9.5% <sup>E</sup>	+4.0% <sup>E</sup>	
26	Paper and Allied Products	-4.0%	+1.0% <sup>E</sup>	+1.0% <sup>E</sup>	+0.8% <sup>E</sup>	
27	Printing and Publishing	-0.6% <sup>E</sup>	+0.5% <sup>E</sup>	+1.0% <sup>E</sup>	+2.5% <sup>E</sup>	estimated composite
28	Chemicals and Allied Products	-7.2%	+2.5%	+3.0% <sup>E</sup>	+3.2% <sup>E</sup>	
	Except:					
281	Industrial Inorganic Chemicals	-6.3% <sup>E</sup>	0.0% <sup>E</sup>	+4.6% <sup>E</sup>	+3.4% <sup>E</sup>	
282	Plastic Materials et al.	-5.4%	+10.0%	+6.9%	+3.9% <sup>E</sup>	
283	Drugs	+1.7% <sup>E</sup>	+3.7% <sup>E</sup>	+3.6% <sup>E</sup>	+3.0% <sup>E</sup>	
284	Soaps, Detergents, Perfumes, etc.	+1.9%	+1.8%	+2.2%	+2.2%	
285	Paints, Varnishes, et al.	-7.5%	+6.8%	+5.4%	+2.0%	
286	Industrial Organic Chemicals	-8.0% <sup>E</sup>	+3.7% <sup>E</sup>	+4.7% <sup>E</sup>	+3.7%	
287	Agricultural Chemicals.	-11.5%	-10.0%	+12.0%	+5.2%	
2899	Misc. Chemical Preparations	-11.5%	+5.0%	+3.9%	+2.0%	
29	Petroleum Refining and Related Industries	-3.1%	-2.6%	+1.0% <sup>E</sup>	1.0% <sup>E</sup>	
30	Rubber/Misc. Plastic Prods.	-4.4%	+4.1%	+5.1%	+3.0% <sup>E</sup>	
31	Leather Goods	-11.7%	-1.0%	-1.4%	-2.0%	
32	Stone, Clay, Glass, Concrete	-8.2%	-2.0% <sup>E</sup>	+0.5% <sup>E</sup>	+0.5% <sup>E</sup>	
33	Primary Metal Industries	-23% <sup>E</sup>	+10% <sup>E</sup>	+4.0% <sup>E</sup>	+1.7% <sup>E</sup>	estimated composite
34	Fabricated Metal Products	-15.6%	-6.2%	-2.0%	+1.0% <sup>E</sup>	
35	Machinery, not Electrical		-8.2% <sup>E</sup>	+2.0% <sup>E</sup>	+1.0% <sup>E</sup>	
36	Electrical and Electronic	-2.0% <sup>E</sup>	+4.0% <sup>E</sup>	+4.5% <sup>E</sup>	+4.0% <sup>E</sup>	estimated composite
3711	Motor Vehicles	-9.5%	-1.0% <sup>E</sup>	+3.0% <sup>E</sup>	+1.3%	unit output
38	Instruments for Measurement, Analysis and Control	-5.0%	-4.0%	+1.0% <sup>E</sup>	+3.0%	
39	Misc Manufacturing	--	+3.0% <sup>E</sup>	+3.0%	+3.7%	rate of general economy

Table 2-9 (Continued)

SIC#	Industry	Δ81-82	Δ82-83	forecasted Δ83-84	forecasted compounded annual rate Δ 1985-1988	Notes
42	Motor Freight	-9.6%	+3.0% <sup>E</sup>	+5.0%	+3.7%	growth parameter: operating revenue in constant dollars source: Standard and Poor Industry Analysis July 1983. Growth parameter: Deman
48	Communications	+5.8%	+5.6%	+5.0%	+7.0%	
49	Electric and Gas Utilities	-1.0%	-3.0%	+2.0%	+1.5% <sup>E</sup>	
Misc. Service Sector Industries: <sup>3</sup>						
	Rapid Growth		+2.0% <sup>E</sup>	+3.0% <sup>E</sup>	+4.0% <sup>E</sup>	growth parameter: total employment
	Declining		-2.0% <sup>E</sup>	-- E	+1.0% <sup>E</sup>	growth parameter: total employment

<sup>1</sup> Δ Indicates change.

<sup>2</sup> Adapted from 1984 U.S. Industrial Outlook, (Statistic = total industry shipments in constant (1972) dollars), modified to reflect industry activity in New Jersey

<sup>E</sup>Indicated figure not provided in Outlook. The figure represents the consultant's estimate derived from the Outlook narrative and conference with economists from New Jersey's Bureau of Demographic and Economic Analysis regarding New Jersey's industrial activity relative to that of the U.S. overall.

<sup>3</sup> Waste included in 2992, 4953, 7399, and 7699 which represent residuals from hazardous waste facilities are not projected. The future quantity of waste from these facilities will depend upon the future volume of waste received rather than general economic growth. Rather than applying economic growth factors in this task, the quantities of residuals are kept constant with adjustments made in Task Four depending on additional waste receipts.

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TABLE 2-10

NEW JERSEY STATE-LISTED WASTES

<u>Waste Code</u>	<u>Waste Name</u>
X103	Acrylonitrile
X123	Arsenic and Compounds NOS
X126	Arsenic Trioxide
X176	Chloroform
X188	Creosote
X190	Cyanides/Soluble Salts and Complexes Of
X210	1,2-Dibromoethane
X222	2,6-Dichlorophenol
X226	1,2-Dichloropropane
X228	Dichloropropene, NOS
X239	Diethylstilbestrol
X276	Ethyleneoxide
X283	Formaldehyde
X334	Nickel and Compounds, NOS
X386	Phthalic Anhydride
X387	Polychlorinated Biphenyl, NOS
X425	Tetrachloroethylene
X442	Trichloroethene
X721	Oil Waste from Gas Stations
X722	Waste Oil and Bottom of Resin and Commercial Tank Cleaning
X723	Oil Waste of Gas Tank Clean Outs
X724	Waste Petroleum Oil of Tank Truck Clean Outs
X725	Oil Spill Cleanup Material
X726	Metal Working, Turbine, Diesel, and Quench Oils
X728	Waste Oil and Bottom Sludge of Processing Facilities
X799	Containers, Crushed Empty (Rinsed)
X825	Contaminated Soil/Sludge Aband.
X850	Packed Laboratory Chemicals
X900	Chemical Process-Liquid, NOS
X905	Gas from Chemical Process-NOS
X910	Chemical Process-Solids, NOS
X920	Food Processing, NOS
X930	Detergent, NOS

Regulation of the other 21 unmanifested "X" wastes (except for the X900 series) is not expected before the end of 1985, but is likely before 1988. Once included, an approximate twenty percent increase could be assumed to occur in manifested quantities of those wastes during the first year of inclusion over the quantities reported in the previous year (last year of non-inclusion). Changes in the manifested quantities of these waste types thereafter will depend upon industrial activity.

Regulation of the X900 series as hazardous wastes is not expected; additional increments for these wastes are not necessary. Nevertheless, these wastes can be expected to increase proportionally to the rates of industrial activity predicted for those industries generating them and continue to exert a demand on commercial facilities.

U.S. EPA. On 10 February 1984, the U.S. EPA published in the Federal Register an Interim Final Rule to regulate as a generic category a group of wastes generated during the manufacture of chlorinated aliphatic hydrocarbons. The Interim Final Rule regulates distillation residues, heavy ends, tars, and reactor clean-out wastes. Table 2-11 shows the major commercial products whose manufacturing processes generate these waste types.

EPA documentation notes that the waste types regulated under the Interim Final Rule are currently being generated by three manufacturers in New Jersey. The consultant's conversation with the EPA project officer determined that only a small percentage of waste expected to be newly manifested under this listing is expected from the New Jersey manufacturers. The quantity should only be about 500 tons. It is assumed, though, that these generators are already manifesting these wastes under a "U" or an "X" waste code. If so, this Interim Final Rule, when it becomes effective in August 1984, will probably not increase manifested quantities.

The U.S. EPA is also reportedly evaluating certain oil refinery wastes, e.g., cooling tower sludge, for inclusion. Though no formal notices have yet appeared in the Federal Register, additional wastes of this type may be expected to be included during the latter half of this Facilities Plan. The consultant estimates that an additional 10,000 tons in 1987 and 1988 may become regulated should these wastes be listed. However, the consultant's experience with petroleum refineries nationwide suggests that no more than half that quantity (or 5,000 tons) will be managed off site.

TABLE 2-11

MAJOR COMMERCIAL PRODUCTS GENERATING  
CHLORINATED ALIPHATIC HYDROCARBON RESIDUES

Regulated under new generic RCRA Listing F024

Carbon tetrachloride  
1-Chlorobutane (n-Butyl chloride)  
Chloroethane (Ethyl chloride)  
Chloroform (Trichloromethane)  
2-Chloro-1,3-butadiene (Chloroprene)  
Chloromethane (Methyl chloride)  
2-Chloro-2-methylpropane (t-Butyl chloride)  
3-Chloro-2-methylpropene (Methallyl chloride)  
3-Chloropropene (Allyl chloride)  
Dichlorobutadiene  
Dichlorobutenes  
1,4-Dichlorobutene  
1,2-Dichloroethane (Ethylene dichloride)  
Dichloromethane (Methylene dichloride)  
1,2-Dichloropropane  
1,3-Dichloropropene  
Hexachlorocyclopentadiene  
Tetrachloroethylene (Perchloroethylene).  
1,1,1-Trichloroethane  
1,1,2-Trichloroethane  
Trichloroethylene (1,1,2-Trichloroethene)  
1,2,3-Trichloropropane  
1,2,3-Trichloropropene  
Vinyl chloride (Chloroethene)  
Vinylidene chloride (1,1-Dichloroethane)

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## Waste Delisting

New Jersey DEP does not currently receive a large amount of individual waste stream delisting petitions annually and it does not foresee any increases in their number in the next few years. New Jersey DEP also has no plans at this time to issue any blanket exclusions for waste streams in its regulations.

Based on New Jersey RCRA delisting history, it is assumed that about 1,000 tons of waste will be the subject of delisting petitions each year. Based on that assumption and the additional assumption that half of the waste (or 500 tons) involved in petitions will actually be delisted, 2,000 tons of waste should be delisted by 1988. Most of this delisting will probably affect metal sludges and oily sludges. However, manifested quantities will probably actually decrease by only 1,000 tons. Waste management patterns among New Jersey generators indicate a strong likelihood that half or more of any delisted waste will continue to be managed at commercial hazardous waste facilities.

## Summary

The additional quantity of manifested wastes resulting from waste listings and delistings will affect the following treatability categories of wastes as indicated:

<u>Treatability Category</u>	<u>Increase</u>	<u>Decrease</u>	<u>Net Effect</u>
Toxic Liquids	300		+ 300
Heavy Metal Sludges	--	500	- 500
Oily Sludges	5,000	500	+4,500
Organic Solids/Sludges	200		+ 200

## Waste Reduction

Some reduction of currently manifested wastes is expected to occur during the following years. Typical changes will include:

- the reduction of aqueous waste streams by improved water use,
- shift from off-site to on-site treatment,

- substitution of non-hazardous substances for hazardous constituents process streams, and
- recycling/reuse of waste streams on site, etc.

Currently, the driving forces for these changes include the liability and the economic costs associated with management of hazardous waste under existing regulations. Additional reduction will possibly depend upon new factors which could be applied by government and/or industry to the current management system. The factors to be applied are presently being evaluated by a Task Force formed by the Commission to examine the specific question of source reduction in New Jersey.

### The Hazardous Waste Source Reduction/Recycling Task Force

One of the Commission's ultimate goals is to reduce the volume of waste that requires off-site treatment or disposal. Toward that end, the Commission's Task Force will explore various policies and the proper combination of incentives and disincentives necessary to achieve the maximum degree of reduction and recycling. The Task Force will examine a variety of legal, financial, and industrial strategies. Furthermore, the Task Force will make specific policy recommendations and work with the Commission in legislating those recommendations.

### Waste Management Hierarchy

Overall, the Commission and the Task Force are seeking to develop a management hierarchy for future waste management, which, in order of preference, includes:

- Source Reduction
- Recycling
- Recovery
- Treatment and Incineration
- Secure Disposal

The focus should not be solely on the industrial/commercial and research/development producers of hazardous waste but also on government, universities, and other institutions as they too are capable of source reduction.

Source reduction is any method or technique applied at the site of generation, the use of which reduces the volume of hazardous waste produced without increasing risk to the public or the environment. Examples include:

- Improved process/production control and maintenance.
- Process modification
- Substitution
- Equipment changes

Recycling is processing used material for reuse. Examples include:

- Waste exchange (some transactions)
- Batch-toll processing (solvents)
- Closed loop processing

Reuse is recycling without processing. Examples include:

- Waste exchange (some transactions)
- Neutralization/coagulation

Recovery is processing a used material to extract a usable component or to generate energy. Examples include:

- Waste exchange (some transactions)
- Material reclamation
- Fuel program

### Estimates of Expected Reduction

Table 2-12 contains the consultant's engineering judgment of the changes in manifested quantities expected to occur by 1988 through source reduction. The factors for different categories of waste generated in different industries are multiplied by the results of the projections for economic growth. For example, a factor of 0.9 for a certain waste type within an SIC code reduces the waste projected for that category (based on economic growth) by ten percent. It should be noted that some factors indicate an increase in the generation of some wastes; however, net reduction overall occurs.

The waste reduction factors are based on the following sources of information:

TABLE 2-12

MULTIPLICATION FACTORS FOR PROJECTED WASTE QUANTITIES TO  
REFLECT WASTE REDUCTION

	SIC Codes										
	<u>281</u>	<u>282</u>	<u>285</u>	<u>286</u>	<u>287</u>	<u>289</u>	<u>29</u>	<u>33</u>	<u>34</u>	<u>35</u>	<u>36</u>
Aqueous											
Inorganic	.8	.9		.8	.8	.8	.5	.7	.7	.7	.7
Organic		.7									
Solvents											
Non-Halogenated			.5						.75		
Halogenated											
Mixed											
Solvents, NOS			.5						.75		
Oils											
Automobile								.9			
Industrial								.9	.9	.75	
Fuel								.9			
Oils, NOS								.9			
Other Liquids											
Combustible											
Toxic with Metals											
Reactive											
Corrosive									.9		
Toxic with Organics											
Sludges and Solids											
Heavy Metals	1.1			.5			1.1				
Oily											
Paint			.5								
Combustible											
Corrosive											
Reactive											
Organic			.5	1.2							
Other	1.1			.5							

- The New Jersey Industrial Waste Survey prepared by IT Envirosience, in cooperation with the Research and Development Council of New Jersey, which asked questions regarding generators' future plans.
- Extensive surveys and analysis conducted by the Minnesota Waste Management Board of wastes that are similar in many ways to New Jersey wastes. The goal of the Minnesota study was to understand the opportunity for practicable waste reduction.
- General experience with numerous generators of hazardous waste as part of other projects.

The general method for estimating the waste reduction factors in Table 2-12 involved analyzing the future changes (as suggested by the New Jersey Research and Development Council survey), correlating these findings with similar studies, such as that carried out by Minnesota, and verifying the numbers against general experience and New Jersey generators' past and present attempts at waste generation.

### Regulatory Changes

Pending regulatory changes and programs potentially affecting the quantity of New Jersey's manifested wastes include:

1. Wastewater pretreatment
2. Restrictions on wastes burned in boilers
3. Waste-end taxes

Of the three, the waste-end tax is the only one having the potential to decrease manifested waste quantities. Some states have already enacted a waste-end tax; Missouri, for example, charges a tax of \$25 per ton for wastes managed by land disposal. Other states have decided not to create such a tax. Whether a waste-end tax bill would come into effect in New Jersey during the time frame of this Plan cannot be determined. If one were enacted, the effect on waste generation would depend on the size of the tax. This potential influence on future waste generation must be factored in and when enacted.

Wastes generated from pretreatment, as well as those shifted to the commercial market due to restrictions on wastes burned in boilers, will probably increase manifested waste quantities. These two special components of increased demand are

further evaluated in Chapter Four and added to this Chapter's figures to define total future demand for analysis in Chapter Six.

## Shift From On-Site to Off-Site Treatment

Closure of on-site commercial facilities will also serve to increase the amount of waste manifested to commercial facilities. While this component is also examined in Chapter Four, instances of shift from on-site to off-site treatment are apparent in the 1983 data base. The most notable example is a shift of 42,000 tons of EPA waste type K104 from duPont's Gibbstown facility to duPont Chambers Works. This quantity alone represents a nine percent increase in 1983 manifested waste over 1982 not attributable to economics, listing/delisting, or regulatory changes. Chapter Four provides a further analysis of the expected on-site to off-site shift through 1988.

## 1988 PROJECTED HAZARDOUS WASTE FOR NEW JERSEY

Table 2-13 displays the 1988 projected manifested waste quantities, calculated by applying the economic projection factors only to the 1981, 1982, and 1983 quantities.<sup>9</sup> The application of economic projection factors to 1981 waste resulted in a forecast of 449,000 tons for 1988. Applying similar economic projection factors to 1982 and 1983 waste resulted in 391,000 tons and 451,000 tons, respectively.

It is the consultant's opinion that the differences among manifested waste quantities in 1981, 1982, and 1983 represent some permanent waste reduction. This was confirmed by reversing the economic growth/decline factors for 1981-1982 and 1982-1983 to eliminate the effects of the economy on waste generation in 1982 and 1983.<sup>10</sup> If the changes in waste generation were solely from economic activity, the adjusted

---

<sup>9</sup> Quantities generated as residuals from commercial facilities are kept constant. Residual quantities from commercial facilities will be altered as necessary in Chapter Six to reflect any changes in waste receipts.

<sup>10</sup> The 1983 waste quantity used in this calculation was less the 42,000 tons identified for duPont, Gibbstown. This waste, in the data base due to closure of an on-site facility, skews the manifested quantity for 1983 because it is not new waste generated from increased production or expanded markets. It represents a change in management practice only.

TABLE 2-13

PROJECTIONS OF NEW JERSEY MANIFESTED  
WASTE QUANTITIES FOR 1988  
ECONOMIC RECOVERY/GROWTH  
(In Thousands of Tons)

<u>Treatability Codes</u>	<u>Base Year for Projection</u>		
	<u>1981</u>	<u>1982</u>	<u>1983</u>
AQUEOUS LIQUID			
Inorganic	157	133	122
Organic	72	53	95
SOLVENTS			
Halogenated	15	11	11
Non-Halogenated	5	5	10
Mixed	0	0	0
Solvents, NOS	12	15	22
OILS			
Automobile	26	24	41
Industrial	32	36	29
Fuel	5	6	12
Oils, NOS	1	2	3
OTHER LIQUIDS			
Combustible	23	22	19
Toxic with Metals	<1	2	1
Reactive	2	<1	2
Corrosive	<1	<1	<1
Toxic with Organics	<1	2	5
SOLIDS AND SLUDGES			
Heavy Metals	24	15	37
Oily	16	7	7
Paint	7	2	<1
Combustible	4	5	4
Corrosive	4	2	3
Reactive	<1	2	<1
Organic	31	35	24
Other	2	<1	2
UNEXAMINED	<u>10</u>	<u>12</u>	<u>2</u>
TOTAL	449	391	451

However, a non-economy-related decrease in manifested waste generation of approximately fourteen percent between 1981 and 1982. A three percent increase between 1982 and 1983 yields a net reduction of eleven percent between 1981 and 1983. A larger number of base years are needed to confirm with measurable statistical precision that this reduction is permanent.

It is well-known that industry has taken steps to reduce waste generation. However, the differences among the three years also reflect waste inventorying (storage), validity of the general approach used in the analysis of manifest data, capability to treat more waste on-site in 1982 because of increased underutilization of capacity at existing on-site treatment processes, shifts between on-site and off-site management, and other similar factors. For this reason, the projected quantities for the three years were averaged on a weighted basis to produce the projected waste quantities representing future demand for commercial facilities. Fifty percent weight was assigned to 1983 projected quantities,<sup>11</sup> 25 percent weight to 1982 projected quantities, and 25 percent weight to 1981 projected quantities. Though quantities for each treatability category were weighted in this way, the example below illustrates the weighting on the total quantity:

1981 projected (0.25)(449,000)	112,000
1982 projected (0.25)(391,000)	97,000
1983 projected (0.50)	
(451,000-51,000 duPont)	200,000
duPont, Gibbstown	<u>51,000</u>
	460,000

To the resulting weighted quantities (plus the duPont Gibbstown waste of 57,000 tons), the waste reduction factors were applied to produce the forecasted waste quantities from normal industrial production and production-related activities. A reduction in the projected 1988 weighted average quantities of 33,000 tons is expected as a result of waste reduction. Further adjustment for waste listing and delisting results in projected quantity of 431,000 tons by 1988 represents expected

<sup>11</sup> The 1983 weighted quantity used for 1988 projections was less the 51,000 tons of projected duPont Gibbstown waste. This waste, in the data base due to closure of an on-site facility, skews the projected quantity of manifested waste based on economic factors. This quantity is added to the weighted projected quantity separately. Other anticipated on-site to off-site shifted waste will be added in Chapter 4.

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TABLE 2-14

1988 PROJECTED MANIFESTED WASTE QUANTITIES  
FOR NEW JERSEY  
(In Thousands of Tons)

<u>Treatability Codes</u>	<u>Weighted Average Projections (Economic Factors Only)</u>	<u>Adjustment for Waste Reduction</u>	<u>for Waste Listing and Delisting</u>	<u>Final Projected Quantities</u>
<b>AQUEOUS LIQUID</b>				
Inorganic	134	-23		111
Organic	104			104
<b>SOLVENTS</b>				
Halogenated	12	- 2		10
Non-Halogenated	7			7
Solvents, NOS	18	- 2		16
<b>OILS</b>				
Automobile	33	- 1		32
Industrial	32	- 2		30
Fuel	9			9
Oils, NOS	2			2
<b>OTHER LIQUIDS</b>				
Combustible	21			21
Toxic with Metals	1			1
Reactive	1			1
Corrosive	<1			<1
Toxic with Organics	3		+0.3	3
<b>SOLIDS AND SLUDGES</b>				
Heavy Metals	28	- 1	-0.5	27
Oily	9		+4.5	13
Paint	3	- 1		2
Combustible	4			4
Corrosive	3			3
Reactive	1			1
Organic	28	- 1	+0.2	27
Other	1			1
<b>UNEXAMINED</b>	<u>6</u>			<u>6</u>
<b>TOTAL</b>	<b>460</b>	<b>-33</b>	<b>+4.5</b>	<b>431</b>

demand for off-site commercial facilities. Table 2-14 displays the weighted quantities adjusted for waste reduction and waste listings/delistings by summary treatability categories. This data, along with the Chapter Four data regarding cleanup waste, increases in waste due to wastewater pretreatment and more stringent standards or burning waste in boilers, and other changes are used in Chapter Six to determine New Jersey's future hazardous waste needs.

## CHAPTER THREE

## COMMERCIAL TSD FACILITY CAPACITY ANALYSIS

OBJECTIVE

In order to draw reliable conclusions about the need for new facilities, it is necessary to understand the capabilities of the commercial facilities presently operating in New Jersey. This Chapter presents an accurate account of existing commercial facilities in New Jersey, including number, location, capacity, compliance status, and quantity and type of waste accepted.

The Chapter contains an overview of the various technologies for the recovery, treatment and disposal of hazardous wastes. The technologies discussed include those which are being used at facilities in New Jersey plus those which have been commercially proven in other states. The discussion also addresses several technologies which are considered emerging technologies. The technology overview is not intended to address all technical aspects; the reader should refer to the Research and Development Council of New Jersey's "New Jersey Industrial Waste Study."<sup>1</sup> The R&D council's report contains an excellent review of treatment technologies.

This Chapter singles out recovery and recycling technologies for more detailed analysis. The analysis addresses the principle technical processes, the state of development, emissions and residuals, and associated costs.

Also examined are wastes exported from New Jersey to facilities in other states as well as wastes imported to New Jersey. This assessment indicates the relative importance of New Jersey facilities as compared to facilities in other states.

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<sup>1</sup> See T. Busmann, et al. New Jersey Industrial Waste Study: Waste Projection and Treatment. Washington, DC: U.S. EPA, 1984.

(Copies available through the New Jersey Hazardous Waste Facilities Siting Commission.)

## OVERVIEW OF HAZARDOUS WASTE MANAGEMENT TECHNOLOGIES

Waste management technologies can be divided into categories per the approach used in the "New Jersey Industrial Waste Study" by the New Jersey R&D Council:

- Chemical and Biological Destruction Technologies
- Thermal Destruction Technologies
- Separation Technologies
- Disposal Technologies
- Source Control

Table 3-1 illustrates the specific technologies addressed in the R&D Council's study for each of these five categories.

### Chemical and Biological Destruction Technologies

Destruction technologies permanently alter hazardous materials to render them non-hazardous or more environmentally acceptable. For example, SCA Chemical Services located in Newark carries out chemical destruction of a variety of hazardous waste streams. Most destruction techniques degrade hazardous chemicals into simpler non-toxic compounds, and all of the technologies discussed here do so by oxidation. Oxidation is a chemical change caused by contact with an excess amount of a compound known as an oxidizing agent. Common oxidizing agents are oxygen and chlorine compounds.

### Biological Treatment

Biological treatment systems utilize a variety of microorganisms to oxidize waste compounds. Biological treatment systems are well-developed, having successfully treated a variety of industrial wastewater streams, and the same systems are applicable to aqueous hazardous wastes containing organics (i.e., contaminated waters). The primary process variables which characterize various biological treatment systems are the method of contacting the waste and biomass (microbes), and the degree of aeration.

Table 3-1

Technologies Addressed In The  
New Jersey Industrial Waste Study<sup>1</sup>

- Chemical and Biological Destructive Technologies
  - Biological oxidation
    - Suspended growth
    - Attached growth
    - Anaerobic
  - Chemical oxidation
    - Chlorine
    - Oxygen
    - Ozone
    - Hydrogen peroxide
- Thermal destruction
  - Single chamber liquid
  - Rotary kiln
  - Multiple hearth
  - Fluid bed
  - Chlorinated organic
  - Pyrolysis
  - Molten salt combustor
  - Cement kilns
  - Coincineration/boilers
  - At-sea incineration
  - High temperature fluid wall
  - Plasma arc torch
  - Magnetic furnace
  - Super critical water
  - Microwave
- Separation Technologies
  - Physical-chemical
    - Emulsion breaking
    - Density differential separators
    - Filtration/coalescence
    - Chemical separation
    - Electrical separation
    - Thermal separation
  - Volatilization
    - Fractional distillation
    - Steam stripping
    - Evaporation
    - Inert-gas stripping
- Separation Technologies (cont'd)
  - Adsorption
    - Carbon
    - Synthetic
  - Extraction
  - Liquid/solids separation
    - Screening
    - Carification/thickening
    - Dewatering
    - Pressure filtration
    - Vacuum filtration
    - Belt filtration
  - Centrifuge
  - Chemical precipitation/
  - Membrane Separation
    - Dialysis
    - Reverse osmosis
    - Ultra filtration
    - Electrodialysis
    - Ion Exchange
- Disposal Technologies
  - Natural waters
  - Deep well injection
  - Stabilization
  - Land farming
  - Secure landfill
  - Solar evaporation
- Source Control
  - Recycle/reuse

<sup>1</sup> See T. Busmann, et al. New Jersey Industrial Waste Study: Waste Projection and Treatment. 1984.

Conventional Treatment Systems. Conventional systems are most applicable to aqueous waste streams of relatively constant composition, containing low concentrations of organics and some suspended solids. In the Activated Sludge Process, the microorganisms are suspended in the liquid waste mixture by violent aeration, and the biomass is filtered from the effluent and recycled. In a Trickling Filter, the liquid wastewater runs through a packed bed containing an attached microbial population and countercurrent aeration through the packed bed provides oxygen. The Rotating Biological Contactors System uses large rotating discs which support an attached microbial growth and are only partially submerged in the waste liquid. Anaerobic Digestion occurs in a closed vessel in the absence of oxygen and produces methane as a degradation byproduct.

## Chemical Oxidation

Destructive treatment through oxidation may also be done chemically, usually employing oxygen or chlorine as the oxidizing agents. In chemical oxidation, electrons are transferred from one reactant to another and toxic constituents are converted into simpler, less toxic chemicals. Chlorinolysis, which uses elemental chlorine, bleach (sodium hypochlorite), chlorine dioxide, or bromine chloride as the oxidizing agent, may be carried out at elevated temperatures or with a catalyst to improve the oxidation rate.

The primary application of chemical oxidation has been to destroy cyanides in plating wastes, but has also been widely applied to phenols, organic sulfur compounds, and other dilute aqueous organic waste streams. Chlorinolysis is effective for treatment of waste streams containing more than one percent organics.

## Thermal Destruction Technologies

Incineration technologies destroy wastes having a very broad range of compositions by exposing them to high temperatures (in the presence of air) thus effecting either partial or complete oxidation of waste material. Rollins Environmental Services operates New Jersey's only incinerator, a rotary kiln unit, in Bridgeport. The important factors in incinerator design are temperature, residence time and turbulence within the combustion chamber. Existing federal regulations specify that an

incinerator must have a destruction and removal efficiency (DRE) of at least 99.99%, and it has been shown that certain high temperature destruction technologies have achieved DREs of up to 99.9999%. New Jersey DEP further requires a 99.9% combustion efficiency. Incineration is particularly useful for recalcitrant chlorinated organic waste streams.

There are many high temperature destruction technologies available for various applications. However, two designs account for the vast majority of existing hazardous waste incineration facilities: rotary kiln and liquid injection.

#### Rotary Kiln Incinerator

The rotary kiln incinerator consists of a large rotating refractory-lined cylinder, which is inclined. The liquids, sludges, and solid or containerized wastes are fed into the higher end of the kiln, where burners using fuel or fuel blended with high heating value waste maintain a temperature between 1500° F and 3000° F depending on particular design. The waste is agitated by the rotating action of the kiln which is of sufficient length to reduce the wastes to ash. The ash cools and collects at the low end of the kiln. Gaseous products are further destroyed in a secondary combustion chamber, followed by air pollution control equipment such as a scrubber. Rotary kiln incinerators have the advantage of being able to accept solid, liquids, or bulk containerized wastes. A wide variety of organic wastes such as distillation bottoms, solvent and paint wastes (halogenated and non-halogenated), pesticides, and almost any which does not contain a very high amount of inorganic material can be incinerated in a rotary kiln.

#### Liquid Injection Incinerator

Liquid Injection incineration is another well-developed, high temperature destruction technique. Incinerators of this type usually have a single refractory-lined chamber equipped with atomizing nozzles through which wastes and supplementary fuels are pumped. A secondary combustion chamber may be present as well as air pollution control equipment. These systems can burn nearly any combustible liquid organic waste at temperatures ranging from 1300° F to 4000° F. Low heating value wastes are blended with fuels or high heating value wastes to facilitate smooth operation and complete combustion.

Shipboard incineration at sea uses this design, except that air pollution control equipment is not required. It is claimed that the immense buffering capacity of the ocean negates any adverse environmental effects potentially posed by combustion products.

## Other Commercially Proven Thermal Destruction Technologies

There exist three other thermal destruction technologies which are commonly employed in applications other than the hazardous waste management industry. These processes offer promising potential in the search for treatment methods for specific wastes and recalcitrant compounds.

Multiple Hearth Incinerator. The Multiple Hearth Incinerator of a large vertical refractory-lined cylinder with several hearths located above each other within a shell. "Rabble arms" convey the wastes, starting at the top hearth, from each hearth to the next hotter hearth below. Because solids and volatilized gaseous components of the waste flow countercurrently, waste gases generated from the top hearth may not receive high temperature exposure adequate for complete combustion. The use of multiple hearth incinerators is limited to solid and sludge-like hazardous wastes which are easily burned.

Fluidized Bed Incineration. This well-developed technology is presently used to destroy various types of municipal and industrial waste sludges. Preheated air passed through a perforated plate fluidizes a bed of granular material at temperatures up to 2100° F. The violent air flow mixes the waste to facilitate combustion and the granular bed acts as a substantial heat source as well as a dry scrubber to reduce the need for pollution control. Fluidized beds are not suitable for solid wastes or wastes containing high levels of chloride.

Wet Air Oxidation. This is a commercially proven technology that involves oxidation reactions which are essentially the same as combustion reactions, but occur in the liquid state. This technology is generally applicable to cyanides and aqueous organic streams which are too dilute to incinerate and too toxic to treat biologically.

### Emerging Thermal Destruction Technologies

Other, less developed, but promising emerging thermal destruction technologies include molten salt destruction, pyrolysis, high temperature fluid wall incineration, plasma arc incineration, and supercritical water treatment.

Molten Salt Destruction. This method injects solid, liquid or gaseous wastes under a pool of molten salt at 1500° F to 1800° F, thus effecting immediate combustion of the wastes. Ash residue and most of the gaseous reaction products are retained in the salt which must be replaced periodically to remove these impurities.

Pyrolysis. Pyrolysis occurs when waste products are exposed to high temperatures in the absence of oxygen. The equipment used in pyrolysis is similar to incineration equipment with special provisions to prevent air from entering the pyrolytic chamber.

High Temperature Fluid Wall Incineration. This method passes waste through a vertical tube at temperatures above 4000°. This high temperature exposure provides little chance for undesirable side reactions and creates virtually no products of incomplete combustion (PIC's).

Plasma Arc Incineration. In this method, wastes are exposed to a gas which has been electrically excited to its plasma state, sometimes creating temperatures in excess of 90,000° F. This system achieves greater DREs than other technologies, essentially total destruction.

Supercritical Water Treatment. This method consists of dissolving wastes in water above its critical point of 374° F and 218 atmospheres of pressure. Under these conditions water becomes an excellent solvent for many types of organic wastes, breaking them down into simpler compounds. However, super critical water will not dissolve salts thus making this technology suitable for wastes high in salt content and with too low of an organic content to support incineration.

## Separation Technologies

Separation technologies are used to separate the hazardous and non-hazardous components of waste streams. These methods allow the recovery of waste components, reduce the volume of waste, solidify wastes, and remove soluble and suspended constituents from liquid waste streams. For example, Oil Recovery Company in Clayton, New Jersey, utilizes the separation processes of screening, gravity separation, filtration, and flocculation in its fuel blending facility.

### Physical Separation

The simplest types of physical separation technologies, filtration and sedimentation, are based on particle size and density. Filtration processes involve separating the solids from the liquids, by forcing the liquid through a screen, cloth or sand filter by gravity, pressure or a vacuum. Gravity separation (flotation or sedimentation) works for many industrial wastes; oil and grease tend to rise naturally to the surface where they can be skimmed off. In sedimentation processes, heavy solid particles are allowed to settle out of the suspension, and the fluid can then be removed from above the solids. Flocculation is used when the suspended particles are too small for either sedimentation or filtration; the addition of flocculating chemicals, such as alum, can aid in aggregating very small particles.

### Component Separation

Component separation techniques rely on such characteristics as boiling points and electrical charges. Processes such as distillation, stripping and evaporation all use boiling point differences. Distillation processes separate the more volatile (lower boiling point) materials by boiling them off and collecting them. Evaporation is used to separate a solvent in vapor form from solids or slurries.

Carbon absorption, electrolysis and ion exchange procedures are based on electrical properties. Activated carbon is used to remove dissolved organic wastes from water. When the carbon comes into contact with these materials, it holds them either at the surface or internally. The spent carbon can be reactivated by thermal treatment. Electrolysis separates positively and negatively charged particles by using an electrical current. This process is frequently used on metal ions in aqueous waste streams. Ion exchange systems are similar to carbon adsorption except they employ resins which can be designed for selective removal of ionic (charged) compounds.

## Chemical Separation

The most common chemical separation technologies involve precipitation. Neutralization or pH adjustment is accomplished by adding acidic or basic feedstocks to corrosive wastes depending upon their pH. Precipitation is a chemical process which converts a waste stream with soluble constituents into one with insoluble constituents. This is often accomplished by a pH adjustment, but usually to a different pH than with neutralization, e.g., adding lime or sodium hydroxide to elevate the pH of certain wastes causes heavy metals to settle out.

## Land Disposal Technologies

Most treatment technologies generate residues which require some form of disposal. These wastes have traditionally been buried in secure landfills, with or without stabilization, or injected down deep wells. No commercial land disposal facility for hazardous wastes is presently operating in New Jersey. Two emerging technologies are receiving increased attention: above ground storage and mined repository.

## Secure Landfills

Secure landfills are designed and operated to contain buried wastes, to minimize the generation of leachate and to remove leachate as it is generated. Long-term landfill performance is determined by the design standards, the hydrogeological characteristics of the site, the types of waste, the daily operations at the site, and the post-closure maintenance and monitoring procedures. The design standards provide for liners, a top cover, and a leachate collection system. Bottom liners are constructed of compacted clay and/or synthetic membranes, with a drainage bed placed above the bottom liner to collect leachate. The design of the final cover is important to reduce infiltration of precipitation into the closed landfill.

Landfilled wastes are generally bulk and drummed solids and sludges which are segregated chemically to insure compatibility. Highly reactive, volatile and ignitable materials, as well as bulk liquids, are not legally allowable wastes for landfill disposal. The U.S. EPA is investigating what other wastes should be excluded from landfills based on such aspects as the toxicity, mobility and persistence of waste.

## Stabilization/Solidification

Stabilization/solidification techniques bind semi-solid wastes into a solid material. The cement-based and pozzolanic processes are most commonly used to treat inorganic sludges and metal-bearing wastes. Wastes containing more than 10 to 20% organic content are generally not good candidates for these processes.

In the cement-based process, the wastes are stirred in water and mixed directly with cement. In the pozzolanic process the wastes are mixed with fine-grained siliceous (pozzolanic) material and water to produce a concrete-like solid. The most common materials used are fly ash, ground blast furnace slag, and cement kiln dust.

Solidification processes generally do not chemically change the waste itself, but improve the handling and reduce the mobility of the waste. In the stabilization process, physical characteristics of the waste may not change, but the contaminants are altered by chemical binding. The binding either induces a chemical change to produce an insoluble form or it captures the waste in an insoluble matrix or crystal lattice.

Stabilization/solidification thus reduces the mobility of waste constituents in a landfill environment. The EPA has determined that some stabilized/solidified wastes can be managed as nonhazardous wastes, and has removed several stabilized metal finishing wastes from their hazardous waste list on a generator-specific basis.

## Landfarming

Landfarming involves applying wastes to the land at controlled rates. The soil system constitutes the treatment medium for degrading or immobilizing the wastes by a variety of physical, chemical, and biological processes. Applied organics are removed by the biological activity of the soil microorganisms; this occurs at the soil surface or within the top several inches of the soil profile. Suspended solids are removed by physical settling and filtration on the soil. Heavy metals are removed principally by adsorption onto soil colloids, precipitation, and ion exchange in the soil.

Many organic hazardous and nonhazardous wastes can generally be treated by landfarming, although oily wastes are the most common candidates for this process. Metal concentrations in the waste are critical and can reduce the life of a landfarm site. The applicability of the treatment process also depends upon build-up of salts in the soil.

Successful operation of a landfarm requires 1) controlling the migration of waste constituents, particularly heavy metals to the ground water, 2) maintaining waste loading rates below the levels of biological and phytotoxicity levels, and 3) properly managing storm water runoff.

### Deep-Well Injection

Deep-well injection involves pumping industrial fluids into a porous formation between impervious layers of rock where the wastes become permanently stored. The injection zone may be several hundred feet to a mile beneath the earth's surface. This method has been used extensively in Texas, Louisiana, Ohio, and other states for the disposal of oil field brines, pickling and plating wastes, and by-products from organic chemicals production.

Suitable geologic conditions for deep-well injection seemingly do not occur in New Jersey. Also, New Jersey State regulatory agencies feel that more appropriate treatment methods are readily available. For these reasons, it would be very difficult to obtain a permit for this type of disposal.

### Above-Ground Storage

Above-ground storage facilities provide long-term storage of hazardous wastes. They facilitate monitoring of the wastes and allow the wastes to be retrieved when economical methods for the recovery or destruction of the wastes are developed. Such facilities consist of lined tanks for bulk liquids and specially designed buildings for drummed wastes, similar to industrial warehouses. Currently, above-ground storage is being practiced for short-term and medium-term storage. For example, any storage of wastes by generators for more than 90 days must be permitted by RCRA; some generators have been storing PCBs in drums for several years. Long-term storage would involve the same technical concepts with additional considerations regarding drum and tank life.

## Underground Repositories

Underground vaults constructed in relatively unfractured, stable rock formations below ground water supplies could serve as long-term retrievable storage or be readily converted to a permanent isolation facility by backfilling. Industrial companies currently store hazardous chemical products in salt cavities and gaseous propane in underground vaults.

A hazardous waste management company proposes to develop, in a Louisiana salt dome, a large facility that could receive wastes transported by ships. The Minnesota Waste Management Board researched at length the concept of a crystalline bedrock repository. However, the Board recently decided to drop further consideration of this concept because it was an unproven technology and because of the potential for bedrock conditions to vary unpredictably, even over short distances.

## Source Control

Source control refers to methods used to reduce the hazardous nature or quantities of wastes at their original source of generation. One large category of source control techniques is on-site treatment. The methods are similar to those used at commercial off-site facilities but are operated on site by a waste generator. Examples include metal and acid recovery and recycling systems at metal finishing plants or neutralization and biological treatment systems typically used by pharmaceutical manufacturers.

A second category of source control techniques is based on reducing the amount of waste produced. By altering production processes or substituting different raw materials, a generator may be able to change the hazardous nature or reduce the quantity of hazardous wastes produced. An example of the former is the replacement of a halogenated extraction process solvent with a nonhalogenated solvent. Substitution of one product for another may also eliminate a hazardous waste altogether. These source control methods are invariably specific to a certain process, and can therefore only be applied on a case by case basis.

## Types of Facilities

The technologies discussed in this section, as well as many other minor technologies may be used in different combinations to create a waste management facility. Table 3-2 further clarifies this distinction by detailing the various technologies used by different types of facilities.

## TYPES OF FACILITIES FOR RECOVERING AND RECYCLING WASTES

Many of the technologies discussed in the previous section can be combined or used singularly at commercial facilities to recover materials in waste as well as energy values. This section gives special attention to these recovery facilities, discussing the technical aspects and economics of recovery and its general applicability to New Jersey waste types. Materials that can be recovered include solvents, oils, acids and metals. Energy can also be recovered through the use of coincineration and fuel blending techniques.

### Material Recovery Facilities

#### Solvent Recovery

Solvents are used in many industrial processes in New Jersey. Contaminated solvents can be treated to separate the contaminants by a number of technologies including distillation, solvent extraction, adsorption, filtration and evaporation. Distillation (batch, continuous or steam) is used by most commercial solvent processors.

Process Description. In distillation, the volatile mixtures of solvents are exposed to increasing amounts of heat and the more volatile (lower boiling point) components of the mixture are vaporized. The vapor is then condensed. Depending on the efficiency of the system and the purity of the solvent required, repeated distillation might be required. Typically 75 percent of a batch can be recovered. The residue, known as still bottoms, becomes a waste product and can be a liquid or a sludge depending upon a number of conditions.

The success of the recovery depends on the types and amounts of impurities. Contaminants with boiling points close to that of the solvent are more difficult to separate. An increase in the concentration of impurities also affects the recoverability. The presence of too many solids requires the addition of extra filtration steps.

Table 3-2  
Technologies Used by Various Facility Types

<u>Facility Type</u>	<u>Waste Treatment Technologies</u>
Incineration	May include any thermal destruction method, with or without heat recovery
Fuel Blending	emulsion breaking, filtration, evaporation, screening, filtration, centrifugation, gravity separation
Waste Oil Refining	emulsion breaking, gravity separation, distillation, steam stripping, evaporation, screening, filtration, centrifugation
Solvent Recovery	gravity separation, fractional distillation, steam stripping, evaporation, screening, filtration
Aqueous Treatment	biological treatment, chemical oxidation/reduction, emulsion breaking, gravity separation, chemical separation, adsorption, extraction thickening, centrifugation, filtration, membrane separation, chemical precipitation/neutralization
Metals Recovery	chemical separation, electrical separation, evaporation adsorption, extraction, chemical precipitation/neutralization, membrane separation, ion exchange
Stabilization	chemical separation, dewatering, filtration, chemical precipitation/neutralization, solidification
Land Disposal	landfill, with or without stabilization/solidification
Landfarm	landfarming

Typical solvent recovery facilities require a minimum amount of land. There usually is included an office building, an unloading dock, storage area for waste and reprocessed solvents, and the reprocessing area. Curbing and diking is required to contain any leaks or spills. Distillation processes require a still (or distillation column), pumps, a steam generator or other heat source, and heat exchangers.

State of Development. Distillation technology is very well developed with few technical problems. Most recovery facilities are small (5 million gal/year). There is little economy of scale; consequently, it is often economical to have an on-site recovery unit for any large quantities dependent upon other considerations.

New Jersey has six presently-operating commercial facilities which recover solvents. For example, Marisol Inc. produces lacquer thinner, safety solvents, hydraulic fluid, and fuels from pharmaceutical, food and electronic waste solvents. Solvents Recovery Service of New Jersey, Inc. specializes in tolling, i.e., custom distillation where the recovered solvent is returned to the generator for reuse. SCA Chemical services is permitted to recover solvents but is not presently doing so, and McKesson Envirosystems is temporarily out of operation.

Emissions and Residuals. Solvent recovery can produce some air and wastewater emissions. Odors, primarily from the storage area rather than the processing area, can be mitigated by closing systems and adding vapor collection systems. The waste water from wash downs and steam strippers is collected and treated on site before being discharged to a publicly-owned treatment works (POTW) sewer. Pretreatment methods could include filtration, phase separation and biological treatment. Spills can be contained with proper diking and concrete pads.

The distillation process produces two types of residuals. The ash from the boilers and some still bottoms are disposed of in secure landfills. Often still bottoms have a BTU (British Thermal Unit) value and can be incinerated or even blended as fuels.

Economics. Solvent recovery costs vary widely and depend on the purity of the waste to be recovered. In some instances the solvent recovery facility is willing to pay up to \$1.50 per gallon for high quality waste solvent due to its high resale value. In many cases, though, the solvent recovery firm may charge up to \$2.00 per gallon to remove a waste solvent.

## Oil Recovery

Used lubricating oils can be recovered to produce lubricating oils of quality equal to virgin oils. This process is typically referred to as oil rerefining. The term oil recovery refers to rerefining as opposed to the larger practice of fuel blending.

Process Description. Two methods may be employed in waste oil rerefining; the acid/clay method or the distillation method. The acid/clay method involves the evaporation of waste oil from solids, the addition of acid to break emulsified water from the oil, and clay to absorb and adsorb any impurities or oil additives present. Flocculants are often water added to facilitate settling of suspended solids. The water, clay and precipitates are then removed by filtration or centrifugation. The distillation method, by far the most capital-intensive method, involves a pretreatment step to remove solids and sludges, a distillation step to isolate desirable long chain hydrocarbons and a finishing step which is simply using chemical additives to enhance the lubricating characteristics of the oil.

State of Development. Oil rerefining was widely practiced during World War II when virgin oil was scarce. Since then oil rerefining operations have become rare, with greater availability of virgin oils. A great majority of the oil rerefining operations have utilized the acid/clay method, and it is therefore a technology which is well-understood and well-developed. Oil distillation technology in general is also a well-developed technology but its application to oil rerefining can present problems with fouling and side reactions.

Emissions and Residuals. Residuals from the acid/clay method include decanted water, which may be treated in a conventional wastewater treatment system, and the oily clay sludge that is separated. Costs for disposal of this residue have made this method less popular. Residuals from distillation rerefining include settled solids and distilled water and impurities. The wastes from this method are much easier to deal with than those from the acid/clay method.

Economics. Neither of the two oil rerefining methods is, at present, an economically-attractive recovery technique. The acid/clay method is less expensive to operate but disposal costs of the voluminous residuals from the process have driven up overall costs. The distillation method is an energy intensive process with a much smaller quantity of residuals, but seemingly is economically infeasible until the price of reclaimed oil increases further or the cost of purchasing waste oils (now about \$0.20-0.30 per gallon) decreases. More stringent regulation of fuel blending, a competitive use of waste oil, should make oil re-refining more attractive.

## Acid Recovery

Process Description. Acid recovery processes are designed to recover either the free acid or both free acid and metal salts. The major source of contaminated acids is the steel industry which removes surface scale and rust from iron and steel by immersion in an acid bath (pickle liquor). Ninety percent of the spent pickle liquor is hydrochloric or sulfuric acid.

Two methods are available for recovery of spent sulfuric and a hydrochloric acid liquor. Cooling of the liquor results in separation of ferrous sulfates or ferric chloride crystals which are separated by centrifugation. The second process involves roasting of the iron salts to produce iron oxides and either sulfur dioxide gas or hydrogen chloride gas. The gases are then regenerated as acids for recycling. The crystallization method is by far the more commonly used method of recovery.

Economics. Spent pickle liquor represents a significant volume of New Jersey's hazardous waste that can be substantially reduced through recovery and recycling. Nevertheless, economics represents a major barrier to wider application. The economics of acid recovery are based on cost and availability of acid, costs of disposing spent pickle liquor, and the market value of the by-products. Acid recovery may cost from \$25 to \$50 per ton, with by-products yielding a resale value from \$0-\$10 per ton. Presently, neutralization at aqueous waste treatment facilities with land disposal of the treated residues is more attractive than risking a major capital investment in acid recovery technology to serve the troubled steel industry.

## Metals Recovery

A number of wastes have been listed or declared hazardous because they contain one or more, frequently more, of the following RCRA metals, sometimes in low concentrations:

Arsenic	Lead
Barium	Mercury
Cadmium	Selenium
Chromium	Silver

Process Description. These wastes may be rendered non-hazardous by recovering these metals using many of the same processes developed and practiced in production by the chemical process industry. These processes include neutralization/precipitation, evaporation, electrolysis, ion exchange and reverse osmosis. The wastes applicable to metals recovery are typically generated by electroplating, surface finishing and printed circuit board production.

The method of recovery is dependent on the specific wastes present, the concentration and the number of contaminants. Metals recovery chemistry is complex, and frequently will use two or more processes. Since the process and equipment is specific to each waste stream, there is no typical metal recovery concept other than the three general steps of: 1) extraction (typically dissolution) of metals to be removed, 2) rejection of impurities, and 3) concentration (upgrade) of the recovered metal.

State of Development. Currently, several metals recovery facilities in New Jersey recover gold (Vanguard Research Associates), silver (Crown Bullion, Drew Metalex, Madison Industries), and nickel and copper (CP Chemicals). These facilities are not currently considered hazardous waste facilities but their status is under discussion by New Jersey DEP. Pass Recovery, a registered commercial facility, recovers lead from scrap. Some Pennsylvania facilities recover zinc from electric arc furnace dusts.

Most metals recovery practiced in the nation is done at the source, as somewhat widely practiced by the electroplating industry with reuse of the recovered metal in the production process. One of the more common metals separation techniques involves passing metal bearing liquid wastes through a series of ion exchange cannisters of varying selectivity. While one set of cannisters is being used, a comparable set would be regenerated, producing a highly concentrated backwashwater. The U.S. EPA has funded research of a process for greater than

99 percent extraction and recovery of copper, zinc, chrome and nickle from mixed wastes with the process now being demonstrated at a metal finishing and plating plant in California.

Economics. Treatment and recovery costs averaged several dollars per thousand gallons of metal bearing liquid, but there is a large cost range depending on waste characteristics. Metals recovery has proven economically feasible with some nickel, chromium and silver bearing wastes. Nevertheless, major barriers to wider application exist:

1. The waste usually must be rich in the particular metal to be recovered, nearly absent in contaminants that would interfere with recovery, and particularly large in volume to produce economies of scale; hazardous wastes typically do not meet any of these conditions.
2. Land disposal frequently is considerably less expensive than recovering the metals and thereby rendering the waste non-hazardous.

Factors that may make metals recovery more attractive include more stringent limits on metals in wastewater, rising costs of raw materials, and growing pressure to discourage land disposal of hazardous waste.

## Energy Recovery Facilities

### Fuel Blending

Blended fuel products can be made from wastes either by blending different wastes with high BTU-values or by mixing additional fuel oils with wastes. Typical waste streams with high BTU value are waste oils, solvents and distillation bottoms. The uses for blended fuel include industrial boilers, cement kilns and incinerators.

Process Description. Waste oils normally need pretreatment to remove bottoms, sediments and water (BS&W). The removal of the water is achieved through separation and dehydration. The bottoms and sediments that do not settle upon storage require removal by filtration. The final products after blending must meet American Society of Testing and Materials specifications on BS&W in fuel oils.

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Waste oils for fuel blending are generated by many industries. These oils include used lubricating oils, cooling oils, cutting oils, transmission oils and non-PCB transformer oils. Sources for solvents include solvent cleaners, spent extraction solvents and other solvents from chemical processing industries. Distillation bottoms are the residue from solvent recovery operations. The limitations on using these wastes include BS&W concentrations, whether or not the impurities are ignitable, the viscosity of the wastes, and the presence of toxics.

State of Development. Fuel blending is a simple process which is well developed. Commercial facilities operate on throughputs as small as 5,000 gallons per day. There are currently eleven operating commercial fuel blending facilities in New Jersey. Two fuel blending facilities are being constructed and another has recently ceased operations. For example, the Oil Recovery Company recovers fuel grade oil from waste lubrication oil using the following processes: heating, screening gravity separation filtering, chemical flocculation and blending. L & L Oil Service recovers #4 and #6 grade fuel oil from waste motor oils and various lubricating oils using gravity separation and dehydration.

Emissions and Residuals. A fuel blending facility generates air and water emissions, plus some residuals. The small amount of waste water removed from the waste oils would contain organics and some heavy metals; however, these concentrations should be sufficiently low to permit discharge into publicly owned treatment works (POTW). Possible air emissions could result from evaporation from the storage tanks, but could be mitigated by vapor collection systems. The residuals normally are less than 10 percent of the wastes processed, and land disposal is normally the method used.

Economics. Fuel blending in New Jersey has grown with the past increases in virgin fuel costs and is presently in a relatively stable disposition. Treatment in this industry is simple and inexpensive. Fuel blenders may pay up to \$0.20-0.30 per gallon for collected waste oils and may sell the final product for 85 percent of virgin fuel costs.

## Coburning in Cement Kilns and Boilers

Blended fuels (see preceding description of fuel blending) and some waste organic liquids or semi-liquids with sufficient heating value are frequently burned in kilns used in the manufacture of cement or in industrial boilers used for heating and steam production.

Cement Kilns. The manufacturing of cement, light aggregate and some other products use a special type of rotary kiln. The destruction of hazardous wastes by coburning with primary fuels and raw materials in industrial kilns has been proven effective in studies by the U.S. EPA. The kilns operate at high temperatures (2,600 to 3,000° F) and provide very long residence times, which make possible very high destruction of principal organic hazardous constituents (POHCs). Theoretically, a kiln could be fired solely on waste feed as long as the waste mix has sufficient heating value.

The alkaline environment of a cement kiln neutralizes the hydrochloric acid gases produced from the burning of chlorinated waste. Typically, additional air pollution control equipment is not required. Most ash and nonvolatile heavy metals are incorporated into the clinker (product of the kiln) and eventually into the cement product.

Coburning in kilns is widely practiced. Although New Jersey has no cement kilns, New Jersey generators have manifested waste to cement kilns in Pennsylvania, New York and Virginia.

Boilers. Blended fuels also are coincinerated with a primary fuel in some industrial boilers. When the boilers are at the site of the waste generator, the advantages include energy recovery and elimination of transportation risks. Industrial boilers usually feature a liquid injection design. The incorporation of blended fuels sometimes creates the need for additional maintenance and air pollution testing. Problems encountered include corrosion of metal parts when halogenated wastes are burned and incomplete combustion of some wastes; however, boilers represent large capital investments and owners are usually careful with what they burn.

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The U.S. EPA estimates that nationally 40,000 industrial boilers are used to burn hazardous waste.<sup>2</sup> An extensive national survey of nearly 25,000 facilities is being carried out by U.S. EPA to identify those that burn used oil and waste oil or waste-derived fuel materials. The Chapter Four Report documents the information available from New Jersey DEP about the extent of this practice in New Jersey; at least twelve generators report burning wastes in boilers.

The only waste stream associated with coincineration in boilers is the combustion gas exhaust, which may or may not require air pollution control equipment. It is rare for boilers to require the extensive air pollution control equipment used on incinerators since the fuels burn to complete combustion much easier than incinerated wastes. Extensive research by the U.S. EPA on burning of hazardous wastes in boilers indicates that destruction/removal efficiencies can surpass 99.99% for principal organic hazardous constituents.<sup>3</sup> Even so, heavy metal emissions can be significant and the practice of coincineration should be well controlled and regulated to avoid burning of highly toxic and refractory compounds. The U.S. EPA expects that Congress will remove the current exemption for this practice with new regulations drafted by the EPA. In advance of EPA initiatives, the New Jersey DEP has drafted more stringent fuel standards. Future trends, therefore, are uncertain.

Economics. The sole motivator for a generator to use this type of technology is cost savings. A waste generator might pay up to one dollar per gallon to incinerate wastes at a commercial facility. Instead, the generator could burn the waste on site at no cost or even charge a small fee to have high BTU wastes removed by a fuel blender. For a fuel user, the cost of quality blended fuel with high heating value may be 15 percent less than virgin fuel.

## Incineration With Steam Generation

An additional method of energy recovery involves production of steam in a waste heat boiler such as a rotary kiln incinerator, a liquid injection incinerator or an industrial boiler (see Co-burning in Kilns and Boilers). This technology can use a wide variety of incinerable wastes and closely resembles the incineration technologies with the exception that the incinerators must be designed and built for the purpose of heat recovery with a heat exchanger and associated piping. It is necessary to locate

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<sup>2</sup> Communication with U.S. EPA, Office of Solid Waste.

<sup>3</sup> Incineration and Disposal of Hazardous Waste, Proceedings of the Tenth Annual U.S. EPA Research Symposium, Fort Mitchell, Kentucky, April 3-5, 1984.

a heat exchanger and associated piping. It is necessary to locate the incinerator adjacent to a potential steam user, as is frequently done in siting the acclaimed European incineration facilities.

This technology requires the same air emission control, e.g., flue gas treatment, scrubbers and electrostatic precipitators, as with incineration without steam generation. Incinerator and boiler design is well understood. However, corrosion of the boiler heat exchangers frequently presents a problem.

The economics of the process are dependent on sufficient quantities of incinerable waste plus a demand for the steam. The sale of generated steam can reduce total incineration costs by 25 percent after accounting for the investment made in the added equipment.

## COMMERCIAL FACILITIES OPERATING IN NEW JERSEY

Information about the number, location, capacity and legal status of commercial hazardous waste treatment, storage and disposal facilities was obtained from data at the New Jersey DEP Bureau of Hazardous Waste Engineering, interviews with personnel affiliated with the facilities, and previous studies done by the consultant and other organizations.

### Overview of Facilities

#### Number of Facilities

In 1982, 34 commercial facilities were authorized by the New Jersey DEP. Three of these no longer accept hazardous wastes, three have not yet commenced full operation, one is temporarily out of operation and one facility is a limited-activity treatment facility.<sup>4</sup> Thus, at present, there are 26 fully operational commercial hazardous waste facilities in New Jersey.

#### Capacity of Facilities

The facilities collectively offer a wide range of treatment options. Nevertheless, almost all of the facilities are either just storage/transfer operations or offer only a specialized service appropriate for a narrow range of waste types.

<sup>4</sup> Reichhold Chemicals, Inc. burns one specific off-site waste stream in its plant boilers.

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Seventeen facilities currently operate resource recovery facilities, eleven of which are oil recovery/fuel blending facilities, with the remaining six facilities involved in solvent recovery. Three facilities treat aqueous wastes, two only transfer or rebatch wastes (S&W Waste and Advanced Environmental Technology Corporation), and one incinerates wastes. Five facilities are involved in treatment of unique waste streams and cannot be categorized. There are, at present, no commercial land disposal facilities in New Jersey.

Table 3-3 presents an estimate of the capacity, in terms of throughput in tons per year, of the 34 commercial facilities in New Jersey. Most of the information on capacity reflects capacities quoted by facility personnel, confirmed where possible with data in DEP files. These capacities do not reflect any future expansion plans which facilities may have. Also, it should be noted that some of these facilities have closed.

## Location of Facilities

Figure 3-1 shows the location of the authorized New Jersey facilities, keyed to the identification number listed. The facilities are concentrated around the two major metropolitan areas in New Jersey, with ten facilities within thirty miles of Camden, and nineteen located within thirty miles of Newark.

TABLE 3-3  
ESTIMATED THROUGHPUT CAPACITY OF COMMERCIAL FACILITIES IN NEW JERSEY  
(Tons Per Year)

	<u>Aqueous Treatment</u>	<u>Incineration</u>	<u>Oil Recovery/ Fuel Blending</u>	<u>Solvent Recovery</u>	<u>Transfer/ Storage</u>	<u>Other</u>	<u>Manifested Waste Received</u>		
							1981	1982	1983
Advanced Environmental Technology Corp.					14,000		2000	1600	200
All County Environmental <sup>3</sup>			20,000				11600	10000	7000
B&L Oil Corporation			15,000				12000	9900	15500
BP North American <sup>2</sup>			11,000				0	0	0
Baron Blakeslee Inc.				24,000			600	300	100
Browning Ferris Industries <sup>3</sup>					13,000		4500	800	0
C. R. Warner, Inc.			20,000				0	0	0
Cylinder Maintenance Corp.						Note <sup>1</sup>	0	<50	200
Detrex Chemical Ind.				1,000			100	200	<50
E.I. duPont de Nemours & Co.	150,000 <sup>4</sup>						157800	98900	15430
Emergency Technical Services							<50	<50	0
Flowen Oil Co.			18,000				0	2500	8500
Kit Enterprises <sup>3</sup>	Note <sup>1</sup>						30300	3400	0
L&L Oil Services			18,000				7500	8900	10100
Lionetti Waste Oil Service			13,000				7900	6800	13100
Marisol, Inc.				43,000			18800	14100	8800
McKesson Corporation <sup>2</sup>					Note <sup>1</sup>		0	0	0
McKesson Envirosystems <sup>5</sup>				16,000			24600	9500	0
Modern Transportation	42,000						43000	9700	500
Noble Oil Co.			32,000				100	9100	17000
Oil Recovery Co., Inc.			219,000				16000	19300	12000
Pass Recovery Systems, Inc.							300	<50	100
Perk Chemical Co.					2,100		800	500	600
PITCCO			Note <sup>1</sup>				1200	1400	1700
Pure Stream, Inc.			2,400				2600	1900	3900
Reichhold Chemicals Inc.						11,500	400	400	0
Resultz, Inc. <sup>2</sup>					Note <sup>1</sup>		0	0	0
Rollins Environmental Services		35,000					26600	26900	20300
SCA Chemical Services	200,000		45,000	50,000			65600	43600	46200
S&W Waste			30,000		35,000		11210	10600	16900
Safety-Kleen Corp.				23,000			0	1300	18700
Solvents Recovery Services				40,000			23100	17900	22500
Standard Tank Cleaning Corp.	17,000						7000	8400	12600
Underwater Technics						Note <sup>1</sup>	<50	600	200
Column Totals (rounded)	409,000	35,000	443,000	199,100	62,000	11,800	475,400	316,900	391,100

<sup>1</sup>Information not available

<sup>2</sup>Future Operation

<sup>3</sup>No longer accepting hazardous waste

<sup>4</sup>Excluding projected capacity for on-site wastes

<sup>5</sup>Temporarily out of operation

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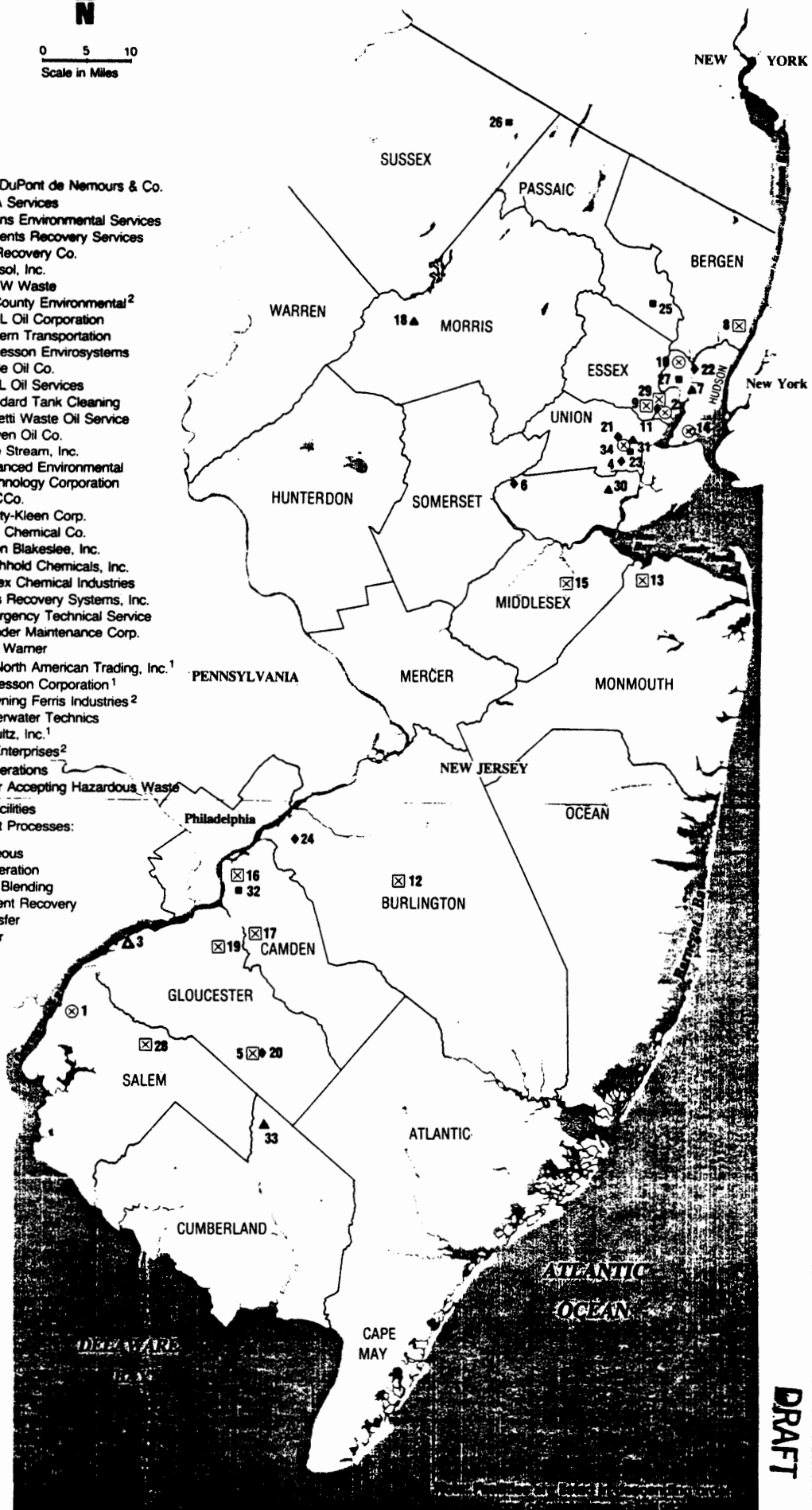


1. E.I. DuPont de Nemours & Co.
2. SCA Services
3. Rollins Environmental Services
4. Solvents Recovery Services
5. Oil Recovery Co.
6. Marisol, Inc.
7. S & W Waste
8. All County Environmental<sup>2</sup>
9. B & L Oil Corporation
10. Modern Transportation
11. McKesson EnviroSystems
12. Noble Oil Co.
13. L & L Oil Services
14. Standard Tank Cleaning
15. Lionetti Waste Oil Service
16. Flowen Oil Co.
17. Pure Stream, Inc.
18. Advanced Environmental Technology Corporation
19. PITCO.
20. Safety-Kleen Corp.
21. Perk Chemical Co.
22. Baron Blakeslee, Inc.
23. Reichhold Chemicals, Inc.
24. Detrex Chemical Industries
25. Pass Recovery Systems, Inc.
26. Emergency Technical Service
27. Cylinder Maintenance Corp.
28. C.R. Warner
29. BP North American Trading, Inc.<sup>1</sup>
30. McKesson Corporation<sup>1</sup>
31. Browning Ferris Industries<sup>2</sup>
32. Underwater Technics
33. Rezult, Inc.<sup>1</sup>
34. Kit Enterprises<sup>2</sup>

<sup>1</sup> Future Operations  
<sup>2</sup> No Longer Accepting Hazardous Waste

Key to Facilities  
 Treatment Processes:

- ⊗ Aqueous
- ▲ Incineration
- ⊠ Fuel Blending
- ◆ Solvent Recovery
- ▲ Transfer
- Other



**Figure 3-1**  
**Commercial Interim Status**  
**Hazardous Waste Facilities**  
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Description of Individual Facilities<sup>5</sup>

Advanced Environmental Technology Corporation  
Goldmine Road  
Flanders, NJ 07836

AETC specializes in transfer and storage of a wide range of chemicals in small quantities such as laboratory chemicals or small quantity production chemicals. Much of AETC's work consists of consulting on hazardous waste handling procedures with the remainder being containerizing and removing waste to authorized treatment facilities. The company handles approximately 500 drums of waste per week.

All County Environmental Services Company  
One River Road  
Edgewater, NJ 07020

All County was a fuel blending facility as well as hazardous waste transporter dealing with bulk liquids only. The facility consists of two 150,000 gallon tanks where compatible wastes were mixed and stored, awaiting sale as blended fuels. This facility is currently closed by DEP order.

B & L Oil Corporation  
472 Frelinghuysen Avenue  
Newark, NJ 07114

B & L produces an industrial grade fuel oil from waste lubricating oils. The company processes about 10,000 gallons per day of waste oil, recovering approximately 90 percent of that amount. Processes include settling to separate bottoms, sediment and water (BS&W), addition of silicates to promote further settling; and addition of caustic as a cleaning and precipitating agent. Total tank storage volume at the facility is 385,500 gallons.

<sup>5</sup>As of May 1984

BP North American Trading, Inc.  
Gilligan Street  
Newark, NJ 07102

This is a new facility, affiliated with BP Chemical Company, which has not begun operation yet. The facility plans to process waste oils for use as a fuel constituent, mixing with virgin fuels to produce an industrial grade fuel. The facility's potential capacity is about 3 million gallons per year.

Baron Blakeslee, Inc.  
49 Central Avenue  
Kearny, NJ 07032

The Baron Blakeslee facility primarily is a distributor of virgin solvents. The solvent recovery operation is a secondary function which distills halogenated and nonhalogenated waste solvents and still bottoms. The recovery facility has a potential capacity of approximately 24,000 tons per year but presently processes a small percent of that amount. The facility accepts drummed waste only and operates two batch stills and one fractionating column.

Browning Ferris Industries, Inc.  
714 Division Street  
Elizabeth, NJ 07207

This is a transfer facility with no on-site treatment. It presently handles only municipal and industrial non-hazardous wastes. BFI formerly processed approximately 50 tons per day of hazardous oily sludge and chemical waste until it completed RCRA closure in December 1983.

CR Warner, Inc.  
East Lake Road  
P.O. Box 134  
Woodstown, NJ 08098

This oil recovery facility has very recently begun operation. The company accepts all types of waste oil including lubrication oils, fuel oils, quench oils and metal working oils. The firm plans to process about 5.5 million gallons per year.

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Cylinder Maintenance Corporation  
590 Belleville Turnpike  
Kearny, NJ 07032

This facility cleans out residuals from compressed gas cylinders which contain hazardous constituents. The facility handles approximately five tons per year of hazardous wastes. Residuals from the processes include a caustic scrubber wastewater sludge which is drummed and sent to a disposal facility.

Detrex Chemical Industries, Inc.  
Gold Shield Division  
835 Industrial Highway  
Unit #1  
Cinnaminson, NJ 08077

Detrex is primarily a distributor of solvents, and operates this solvent recovery facility as a service to customers. The recovery facility is mainly used for recycling of waste trichloroethylene. No primary manufacturing takes place at this Detrex facility.

E. I. duPont de Nemours  
Chambers Works  
Carneys Point Twp.  
Deepwater, NJ 08023

DuPont operates a 40-million gallons per day wastewater/treatment plant at its Chambers Works in Deepwater and utilizes a small percentage of this capacity to treat aqueous hazardous waste on a commercial basis. The treatment processes include neutralization, flocculation, sedimentation, an activated sludge treatment system using suspended activated carbon with a final clarification step. Primary settled solids are filter pressed and placed in a secure landfill on site. Solids from the activated sludge system are incinerated in a multiple hearth incinerator with heat recovery. Carbon is recovered from the incinerator ash. The facility does not accept drummed waste.

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Emergency Technical Service Corporation  
Mud Pound Road  
Vernon Township, NJ 07836

ETSC is a specialty waste treatment firm which destroys only very reactive wastes such as explosives, shock sensitive materials and pyrophoric wastes. The firm handles an average of 80 pounds per day of reactive materials.

Flowen Oil Delaware Valley, Inc.  
1800 Carmen Street  
Camden, NJ 08105

Flowen Oil reprocesses and blends about 30,000 gallons per day of waste lubricating oils to produce a commercial grade fuel oil used in industrial boilers. The facility separates nonrecoverable impurities by the following processes: sedimentation, heating, screening and centrifugation. Impurities consist mostly of solids and water, and amount to about 10 percent of the accepted waste oils. The final product is tested to assure sufficient quality for use as a boiler fuel.

Kit Enterprises  
Elizabeth, NJ

Kit has been closed since 1982. Kit had the capacity to treat all types of oils including food processing wastes such as animal fats and oils as well as industrial lubricating oils and fuels. The facility also reported the capability to neutralize corrosive wastes, but very few details about any processes are available.

L & L Oil Service  
740 Lloyd Road  
Aberdeen, NJ 07747

L & L is a transfer and storage facility handling waste fuel oil, lubricating oils and hydraulic oils. The facility heats the oil to vaporize some water and lower the viscosity to increase ease of handling. Some gravity settling occurs when the heated oil is stored in tanks awaiting transfer to a larger oil recovery facility. L & L has the capacity to handle 20,000 gallons per day.

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Lionetti Waste Oil Service, Inc.  
RD#1, Box 5A  
Old Bridge, NJ 08857

This facility only transfers and stores waste automobile lubricating oil which they collect from service stations and auto agencies. Some blending occurs inadvertently when waste oil is stored, awaiting transfer to an oil recovery facility. Lionetti has the potential capacity to handle 3,000 gallons per day of waste oil.

Marisol, Inc.  
125 Factory Lane  
Middlesex, NJ 08846

Marisol is a solvent recovery facility with a small fuel blending operation. The solvent reclamation operation includes three pot stills, one with a fractionating column. Most of Marisol's business consists of refining a high grade waste solvent to a quality which is adequate for thinning or cleaning purposes. The fuel blending operation consists of mixing solvent distillation bottoms with waste oils. The facility presently reclaims about five million gallons of waste solvent per year.

McKesson EnviroSystems  
600 Doremus Avenue  
Newark, NJ 07102

This facility also recovers waste solvents and some solvents with an aqueous phase. The facility was purchased by McKesson from Inland Chemical Company late in 1981 and one year later suffered an explosion which virtually destroyed all the processing area. McKesson is seeking approval from DEP to rebuild the facility and is planning on opening a solvent transfer station in Woodbridge, New Jersey. The Newark facility had the potential capacity to handle 4.8 million gallons per month of halogenated and nonhalogenated solvents.

Modern Transportation, Inc.  
75 Jacobus Avenue  
Kearny, NJ 07032

Modern presently treats about 10,000 tons per year of aqueous wastes but has the capacity to treat at least 37,000 tons per

year. The facility processes metal bearing and corrosive wastewaters utilizing neutralization, gravity settling and dewatering equipment. The plant also has transfer, storage and some treatment capacity for oily wastes. Modern has also applied for permission to carry out more advanced wastewater treatment.

Noble Oil Company  
Route 206 & Carner Road  
Vincentown, NJ 08088

This facility is a transfer and storage facility for waste fuel oils, lubrication oils and hydraulic oils. Noble handles approximately 10,000 gallons per day of waste oil.

Oil Recovery Company  
Cenco Boulevard  
P.O. Box 345  
Clayton, NJ 08312

Oil Recovery treats waste oils, oil spill cleanup wastes, and oil tank cleanouts. Processing at the facility includes heating, screening, gravity separation, filtering, chemical flocculation, and fuel blending of many types of waste oils. Total capacity amounts to about 60 million gallons per year.

Pass Recovery Systems, Inc.  
1500 Main Avenue  
Clifton, NJ

Pass Recovery manufactures solder products from scrap lead and tin. The facility operates three 500-pound melting vessels and could potentially recover 300 tons per year.

Perk Chemical Company, Inc.  
217 S. First Street  
Elizabeth, NJ 07206

Perk Chemical does transfer, storage, recovery and blending of waste solvents. The facility operates one batch still, a water separator, a mix tank and also has a total drum storage capacity of approximately 250,000 gallons. The firm treats only non-flammable chlorinated solvents and acts only as a transfer station for flammable solvents.

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Pricketts Industrial Tank Cleaning Corporation (PITCCO)  
735 North Hurffville Road  
Deptford, NJ 08096

PITCCO operates a tank cleaning service which removes oil residues from fuel oil tanks. The firm washes out tanks and returns the washout to its facility in tank trucks. The facility has eight tanks of various capacities totaling about 95,000 gallons, in which water is allowed to settle. The oil is then transported to an oil recovery facility.

Pure Stream, Inc.  
P.O. Box 1240  
Blackwood, NJ 08012

Pure Stream is an oil recovery facility which deals specifically with oil/water emulsions. The plant has an estimated potential capacity of 30,000 gallons per day and storage capacity of over 150,000 gallons. The processes include preheating, screening, plate separation, oil separation and filtration. Pure Stream is unique in the fact that they will accept water to oil emulsion ratios up to 20:1.

Reichhold Chemicals, Inc.  
726 Rockefeller Street  
Elizabeth, NJ 07202

Reichhold Chemicals is a primary manufacturer of polyester and alkyd resins, and their plans to operate a non-commercial solvent recovery operation and incineration with heat recovery are presently being reviewed by DEP. The facility is petitioning DEP to recover solvent to use in production and burn still bottoms in an incinerator to produce process steam.

Resultz, Inc.  
North Mill Road  
Vineland, NJ 08360

Resultz, Inc. is a proposed waste oil collection and transfer facility which has very recently received operating permits from DEP. Very little information is available on this facility at the time of this writing.

Rollins Environmental Services, Inc.  
P.O. Box 221  
Bridgeport, NJ 08014

Rollins has been operating a near full-service waste treatment facility at Bridgeport since 1969. Treatment processes used at the facility are rotary kiln incineration; aqueous treatment including neutralization, cyanide destruction and chrome reduction; and biological treatment consisting of aeration, filtration, activated sludge treatment, carbon adsorption, and clarification. Rollins is no longer accepting any aqueous wastes but has continued operation of its incinerator. The 25,000 tons per year of incinerable wastes accepted utilizes about 70 percent of the available incineration capacity.

SCA Chemical Services - Earthline Division  
100 Lister Avenue  
Newark, NJ 07105

Earthline, a subsidiary of the major hazardous waste management company SCA Chemical Services, operates an integrated hazardous waste treatment facility which accepts a wide range of aqueous and organic wastes. Earthline has the process capability to do acid-base neutralization, waste detoxification (oxidation-reduction), decanting and dewatering, and fuel reclamation and blending, with potential treatment capacity totaling about 300,000 tons per year. SCA Chemical Services has recently been acquired by Waste Management, Inc.

S & W Waste, Inc.  
225 Jacobus Avenue  
S. Kearny, NJ 07032

This facility is a transfer and storage operation handling a wide range of wastes. S & W accepts organic and aqueous liquids and sludges, in bulk or in drums. Much of the operation involves mixing liquid waste with absorbents to render them acceptable for landfilling. The plant presently handles about 10,000 tons of waste per year and is in the process of relocating to a new property very near to the present site. Operations at the new property should be of much greater efficiency and capacity.

Safety-Kleen Corporation  
Box 215  
Almo Industrial Park  
Clayton, NJ 08312

Safety-Kleen's primary service is a parts-washing machine rental service. Maintenance shops rent the parts washers from Safety-Kleen and the company replaces the solvent periodically. Spent solvent is then collected and recovered at this facility. The company can potentially distill a combined total of more than 20,000 tons per year of mineral spirits and a chlorinated water soluble solvent.

Solvents Recovery Services of New Jersey, Inc.  
1200 Sylvan Street  
Linden, NJ 07036

SRS recovers usable solvent products from waste solvents in three ways: 1) distillation of a waste solvent back to its original specifications for reuse by the waste generator (batch tolling), 2) restoration of a waste solvent to a usable quality, but not to its original purity, with the product sold to someone other than the generator, and 3) blending spent solvents of satisfactory quality with still bottoms to produce a commercial grade fuel, often used in cement kilns or incinerators. The equipment used in this processing includes distillation columns, fractionation towers, batch stills, thin film evaporators, and drying equipment for water removal. SRS treats approximately 0.5 to 1 million gallons per month depending on waste solvent characteristics.

Standard Tank Cleaning  
184 Hobart Avenue  
Bayonne, NJ 07002

This facility cleans oil residues from tanks and barges, mostly for barges delivering oil to the nearby Exxon Refining. The company stores the tank washouts to allow the water to settle out, and then uses the waste oil to fuel the boilers used for steam cleaning.

Underwater Technics  
2735 Buren Avenue  
Camden, NJ

This firm specializes in hazardous materials cleanup. Much of the waste handled by Underwater Technics is oil spill cleanup wastes, but the firm also decants other oil/water wastes.

## Compliance Status of Commercial Facilities

A comprehensive review of each commercial facility's regulatory compliance history was undertaken to determine the possibilities of untimely facility closure initiated either by: 1) the DEP, due to the severity and/or frequency of a facility's noncompliance violations, or 2) the facility itself, due to the increases or expected increases in direct/indirect operating costs generated by attempts to comply with new regulations.

The consultant examined enforcement records and other facility files at DEP's Office of Regulatory Services (legal enforcement) as well as the Divisions of Waste Management, Water Resources, and the Bureau of Air Pollution Control. The files included:

- (1) Notices of Prosecution and Violation
- (2) Administrative Consent Orders
- (3) RCRA Inspection Reports
- (4) Pollution Incident Reports
- (5) DEP/Facility Correspondence

Key enforcement persons for each facility were interviewed, including enforcement attorneys, Bureau engineers, DEP administrators and field inspectors. Information was obtained on the nature and relative importance of hazardous waste activities at the site, the justification for DEP's jurisdiction, the quality of the facility's compliance efforts and the facility's understanding of its regulated status.

Table 3-4 summarizes the compliance review. The process by which these results were synthesized from DEP files and discussions with its personnel was facility-specific. All available information was evaluated against the following criteria:

- 1) the type and size of facility operations,
- 2) the circumstances surrounding the violations and the enforcement officer's justification for the penalty assessed or action recommended,
- 3) amount of guidance available to the facility from DEP, and
- 4) the nature and outcome of a facility's challenge of DEP's authority to regulate it.

TABLE 3-4  
 NEW JERSEY COMMERCIAL HAZARDOUS WASTE FACILITIES  
 COMPLIANCE EVALUATION SUMMARY

	<u>Likely to Continue Operating</u>	<u>Closed, Unlikely to Reopen</u>	<u>Closed Likely to Reopen</u>	<u>Other</u>
Advanced Environmental Technology Corp.	X			
All-County Environmental Services, Inc.		X		
B and L Oil Corp.	X			
BP North American				x <sup>1</sup>
Baron Blakeslee	X			
Browning Ferris Industries		x <sup>2</sup>		
C.R. Warner, Inc.				x <sup>1</sup>
Cylinder Maintenance	X			
Detrex Chemical - Gold Shield Division	X			
E.I. duPont deNemours	X			
Earthline - SCA Chemical				x <sup>3</sup>
Emergency Technical Services Corp.	X			
Flowen Oil Delaware Valley	X			
KIT Enterprises		X		
L and L Oil Service, Inc.	X			
Lionetti Waste Oil	X			
Marisol, Inc.	X			
McKesson Corporation (transfer)				x <sup>1</sup>
McKesson Envirosystems (solvent recovery)			X	
Modern Transportation				x <sup>4</sup>
Noble Oil Company				x <sup>5</sup>
Oil Recovery Co., Inc.				x <sup>6</sup>
Pass Recovery Systems, Inc.	X			
Perk Chemical Co.	X			
PITCCO	X			
Pure Stream, Inc.	X			
Reichhold Chemical, Inc.	X			
Rezultz, Inc.	X			
Rollins Environmental Services, Inc.	X			
S and W Waste, Inc.	X			
Safety-Kleen Corp.				
Solvents Recovery Services of New Jersey, Inc.	X			
Standard Tank Cleaning Corp.	X			
Underwater Technics, Inc.	X			

Table Footnotes

<sup>1</sup>New or proposed facility.

<sup>2</sup>Closure at BFI completed on 12 December 1983. Commercial non-hazardous waste activities continue.

<sup>3</sup>Situation uncertain. SCA's compliance records are currently the subject of legal review.

<sup>4</sup>Facility closure currently being considered distinctly possible by the DEP for reasons unrelated to this facility's environmental compliance history.

<sup>5</sup>Situation uncertain. Noble continues operating pending the outcome of negotiations with DEP. Indictment for criminal activities leaves untimely facility closure a distinct possibility.

<sup>6</sup>Situation uncertain. This facility is currently an enforcement case with DEP.

The facilities likely to continue operating are those whose history reflects improved compliance over time and a fundamental understanding that, in the hazardous waste management business, regulatory compliance and good faith interaction with the state are basic tenets of good business practice.

New Jersey has already promulgated state standards for the types of facilities currently operating in the state. Hence, wholesale revisions to the regulatory program are unlikely. However, in this field of rapidly emerging technology and escalating governmental scrutiny, regulatory changes at the state and federal level are inevitable.

**IMPORT AND EXPORT OF MANIFESTED WASTE TO AND FROM NEW JERSEY**

The hazardous waste management industry operates as an interstate business with substantial transportation of waste across state boundaries. In fact, many commercial facilities assert that to be financially viable, they must serve a multi-state area.

The movement of waste to and from New Jersey certainly reflects this as shown below:

<u>Year</u>	<u>Waste Manifested by NJ Generators to Facilities in Other States</u> (percent of total waste manifested)	<u>Waste Manifested by Out-of-State Generators to Facilities in NJ</u> (percent of total waste received by facility)
1981	44%	45%
1982	46%	40%
1983	45%	38%

New Jersey was a net exporter of waste, exporting about 225,000 tons in 1983 versus imports of 150,000 tons.

## Imported Wastes

Table 3-5 shows the manifested waste received by 30 New Jersey commercial facilities. The table is organized as to location of generator:

- Six states in New Jersey's region (Connecticut, Delaware, Maryland, New York, Pennsylvania, and Virginia).
- New England states other than Connecticut
- Other states as a whole
- New Jersey

## Largest Sources of Imported Waste

Pennsylvania generators account for more waste imports than any other state. The amount received from Pennsylvania declined by over 40 percent from 1981 to 1982, mostly due to substantial decreases in aqueous wastes. However, in 1983 the amounts increased sharply, nearly returning to 1981 levels. New York generators ranked second each year among the sources of imported waste. The quantity of waste received from New York and Pennsylvania collectively accounted for over 50 percent of all imports in each of 1981, 1982, and 1983.

## Facilities Importing Relatively Large Amounts of Waste

Only eight New Jersey facilities received less waste from New Jersey industries than from out-of-state industries for two or more years from 1981 through 1983. Three of these facilities are rather small, receiving no more than 500 tons in any year, and a fourth is temporarily closed. The remaining four are larger facilities: SCA, Safety-Kleen, Rollins, and Noble Oil.

Incineration. Rollins, in both 1981 and 1982, received three times more waste from generators located outside New Jersey than from those in New Jersey. In 1983, imports to Rollins declined while wastes from New Jersey generators increased; still, imports exceeded New Jersey wastes. There is no geographic pattern in these imports other than slightly more coming from New

Table 3-5  
 Manifested Waste Received by New Jersey Commercial Facilities  
 From Various States in 1981, 1982, and 1983<sup>1</sup>  
 (Tons Per Year)

Commercial Facility TSDF	Connecticut	Delaware	Maryland	New York	Pennsylvania	Virginia	Other New England States	Other States	Total Out-of-State	New Jersey	Predominant Wastes
Advanced Environmental Technology Corp.	34	0	0	240	256	0	1	0	531	1,444	aqueous and organic liquids
	15	0	0	303	278	2	0	0	598	1,018	
	0	60	9	61	24	0	0	0	154	30	
All County Environmental Services	229	208	1	617	2,774	0	161	25	4,015	7,614	oils and non- halogenated solvents
	189	83	24	977	1,679	0	99	0	3,051	6,502	
	0	0	1,404	497	575	0	620	0	3,096	3,790	
B&L Oil Corporation				78	1,148				1,226	10,534	oils
				1,391	0				1,391	8,526	
				1,220	0				1,270	14,271	
Baron Blakeslee Inc.			3	225	96			3	327	264	TCE and other solvents
			2	82	82			0	166	139	
			0	98	0			0	98	0	
Browning Ferris Industries				1,833	2				1,835	2,629	chemical process solids & sludges
				0	0				0	769	
				0	0				0	0	
Cylinder Maintenance Corporation			0		0				0	0	hazardous gases
			1		0				1	4	
			0		171				171	0	
Detrex Chemical Ind.				0	21				23	69	TCE
				21	12				33	127	
				0	0				0	19	
E.I. duPont de Nemours & Company	4,369	9,833	7,415	1,131	31,234	4,324	5,223	4,821	68,350	89,407	aqueous wastes
	1,533	2,823	7,939	1,450	15,073	2,509	1,550	5,665	38,542	58,611	
	3,640	5,204	4,682	2,969	33,870	2,558	1,158	2,260	56,341	98,003	
Emergency Technical Services		1		2	2		1		6	21	explosives pyrophoric and shock sensitive wastes
		0		1	1		2		4	8	
		0		0	0		0		0	0	
Flomen Oil - Delaware Valley				0	0				0	0	oils
				37	544				581	1,889	
				0	479				479	8,015	

<sup>1</sup> 1981 figures listed first, 1982 second and 1983 third.

Continued

Manifested Waste Received by New Jersey Commercial Facilities  
From Various States in 1981, 1982, and 1983<sup>1</sup>  
(tons per year)

Commercial Facility TSD <sup>1</sup>	Connecticut	Delaware	Maryland	New York	Pennsylvania	Virginia	Other New England States	Other States	Total Out-of-State	New Jersey	Predominant Wastes
L&L Oil Service, Inc.									0	7,542	oils
									0	8,906	
									0	10,084	
Kit Enterprises	11,152			1,589	1,195		107		14,043	16,234	food processing wastes & oil
	721			216	73		0		1,010	2,383	
	0			0	0		0		0	0	
Lionetti Waste Oil Service				0	0				0	7,951	oils
				0	1				1	6,844	
				1,230	2,736				3,966	9,174	
Marisol, Inc.	570	115	339	5,796	2,212	857	589	39	10,517	8,292	all solvents
	99	58	639	1,362	1,529	739	1,386	52	5,864	8,204	
	0	0	486	882	233	688	0	144	2,433	6,402	
McKesson Envirosystems	42	0	26	14,663	915		3,800	2,251	21,697	2,909	all solvents
	203	9	0	2,846	571		2,040	796	6,465	3,043	
	0	0	0	0	0		0	0	0	0	
Modern Transportation	1,312	985		7,347	3,498		565		13,707	29,301	aqueous wastes some oils
	20	167		1,854	1,404		0		3,445	6,287	
	0	0		546	0		0		546	0	
Noble Oil Company		0	0	51	0				51	55	oils
		0	169	2,239	2,638				5,046	4,035	
		672	188	4,668	4,278				9,806	7,208	
Oil Recovery Co., Inc.	0	656	2,847	962	3,237	0	60		7,762	8,255	oils
	310	465	2,659	529	3,761	115	0		7,839	11,421	
	0	859	1,640	0	2,556	574	0		5,629	6,391	
Pass Recovery Systems, Inc.					0			0	0	6	solid lead scrap
					16			0	16	56	
					0			147	147	9	
Perk Chemical Co., Inc.	0			121	70		26	24	241	578	all solvents
	39			83	0		6	0	128	418	
	0			0	0		0	0	0	554	
Prickett's Industrial Tank Cleaning Co. (PITCCO)		5			47				52	1,173	fuel oil emulsions
		19			51				70	1,357	
		0			0				0	1,651	

<sup>1</sup> 1981 figures listed first, 1982 second and 1983 third.

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Manifested Waste Received by New Jersey Commercial Facilities  
From Various States in 1981, 1982, and 1983<sup>1</sup>  
(Tons Per Year)

Continued

Commercial Facility TSDF	Connecticut	Delaware	Maryland	New York	Pennsylvania	Virginia	Other New England States	Other States	Total Out-of-State	New Jersey	Predominant Wastes
Pure Stream, Inc.				272	636				908	1,667	oil emulsions
				81	526				607	1,289	oils
				0	2,643				2,643	1,256	
Reichhold Chemicals, Inc.			0		263				263	133	non-halogenated solvents
			99		119				218	59	
			0		0				0	0	
Rollins Environmental Services	1,781	823	516	7,847	3,376	2,214	2,413	2,119	21,089	5,550	all types of combustible wastes
	1,258	1,056	153	6,793	1,441	5,868	1,229	3,035	20,833	6,098	
	995	0	0	3,314	1,738	1,919	1,175	2,137	11,278	9,010	
S&W Waste, Inc.	8			1,012	223		64	155	1,462	9,748	aqueous wastes sludges, solids
	8			542	240		63	0	853	9,754	oils, non-halo- genated solvents
	0			360	10		0	0	370	16,526	
SCA Services	10,269	389	1,422	9,353	8,633	0	4,663	899	35,628	29,971	aqueous wastes non-halogenated solvents
	4,167	44	1,786	8,604	2,788	11	4,617	78	22,095	21,544	oil
	3,809	0	4,347	10,963	442	0	4,885	514	24,960	21,239	
Safety Kleen Corp.	0		0	0	0	0	0	0	0	0	proprietary solvent cleaners
	188		148	328	253	76	129	185	1,307	28	
	886		2,683	4,350	3,313	1,556	2,814	1,842	17,444	1,303	
Solvents Recovery Service of NJ	4,063	355	0	1,535	2,638	709	130	0	9,430	13,646	all solvents
	1,688	506	20	2,414	1,533	317	34	0	6,512	11,417	
	2,688	276	0	1,155	2,367	2,430	0	9	8,925	13,538	
Standard Tank Cleaning Company				35	0				35	6,947	oils and oil emulsions
				50	13				63	8,332	
				0	0				0	12,577	
Underwater Technics					0				0	5	oils, process chemicals
					91				91	508	
					162				162	0	
TOTALS (rounded)	34,000	13,000	13,000	55,000	62,000	8,000	18,000	10,000	213,000	262,000	
	10,000	5,000	14,000	32,000	35,000	10,000	11,000	10,000	127,000	190,000	
	12,000	7,000	15,000	32,000	56,000	10,000	11,000	7,000	150,000	241,000	

<sup>1</sup> 1981 figures listed first, 1982 second and 1983 third.

York and New England than from Pennsylvania and Mid-Atlantic states. This reflects the fact that the Rollins service of incinerating non-liquid waste is not duplicated elsewhere in the East.

Aqueous Treatment. The SCA and duPont facilities specialize in aqueous waste treatment, and both received large amounts from out-of-state generators. In fact, aqueous wastes appear to account for about 50 percent of the waste imported to New Jersey from 1981 to 1983. SCA received most of its imports from New York and New England while duPont's imports came mostly from Pennsylvania, Maryland, Delaware, and Virginia. This shows the significance of transportation costs in relationship to the typically low prices charged for aqueous waste treatment and the location of SCA in Newark and duPont in Deepwater. Chapter Five will analyze the significance of transportation in more detail.

Solvent Recovery. The large solvent recovery facilities (e.g., Marisol and SRS) received large amounts of wastes from generators in other states, as did Safety-Kleen, the partswashing machine rental company. Although Maryland, New York and Connecticut have solvent recovery facilities, the large amount of waste shipped to New Jersey facilities indicates the cost-effectiveness of some out-of-state generators' using facilities in New Jersey.

Oil Recovery. It is evident from Table 3-5 that New Jersey's treatment capacity is well-developed in oil recovery as well as solvent recovery. Oil recovery facilities collectively imported a large amount of waste oils but not as much as received from New Jersey generators.

### Exported Wastes

Table 3-6 lists exported waste quantities by state of destination. This information was compiled using the most recent manifest files from 1981, 1982, and 1983. Table 3-6 also shows the predominant method used by the receiving facilities to treat or dispose of the New Jersey waste. This analysis is based on the consultant's understanding of the treatment operations conducted at the many facilities in these states.

Table 3-6

Quantity of Waste Manifested from New Jersey  
Generators to Facilities in Other States  
(tons)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>Predominant Management Method</u>
AL	12,365	6,460	3,280	landfill
AR	690	813	337	incineration
CA	584	146	0	incineration
CT	2,424	2,722	2,579	solvent recovery, aqueous treatment
DE	307	429	314	stabilization
GA	0	426	0	incineration, aqueous treatment
ID	0	205	125	landfill
IL	0	0	1,812	incineration
IN	996	50	2,751	incineration unknown
KY	2,213	616	2,199	solvent recovery
LA	186	181	430	incineration, landfill
MA	198	505	783	solvent recovery
MD	41,769	33,168	22,379	landfill (now closed), aqueous treatment, oil recovery, solvent recovery
MI	16	315	2,324	solvent recovery, oil recovery
MN	590	1,145	479	incinerator (captive)
MO	54	108	0	landfill
NC	409	26	954	aqueous treatment, energy recovery
NH	14	4	5	incineration
NY	43,368	36,540	41,669	landfill, aqueous treatment, energy recovery, oil recovery

Table 3-6

Quantity of Waste Manifested from New Jersey  
Generators to Facilities in Other States  
(tons)  
(continued)

OH	9,558	14,785	38,581	landfill, landfarm, aqueous treatment
OK	331	333	2,368	deepwell injection
PA	118,029	101,368	97,331	aqueous treatment, landfill, oil recovery, energy recovery
RI	127	752	447	aqueous treatment
SC	6,463	3,749	2,258	solvent recovery, landfill
TN	217	1	20	energy recovery
TX	347	1,502	163	deepwell injection, incineration
VA	7,102	4,439	5,194	energy recovery
WI	0	0	1	landfill
WV	60	44	0	solvent recovery
U.S. Export	1,197	1,097	497	
TOTAL (rounded)	250,000	212,000	225,000	

## Exports to Pennsylvania

An overwhelming majority of wastes exported were sent to Pennsylvania. Most of these wastes were aqueous waste for which there exists a large treatment capacity in Pennsylvania (three large treatment facilities are located in the Philadelphia region). In addition to aqueous wastes, Pennsylvania facilities also accepted a significant portion of wastes for landfill disposal. Nevertheless, both of the two landfills in eastern Pennsylvania have closed.

## Other Predominant States

Other predominant destination states include in ranked order: New York, Ohio, Maryland and Alabama. All of these states have substantial landfill capacity, a disposal method which is lacking in New Jersey, and landfilling the predominant management method in each case. The landfill facility in Maryland closed at the start of 1983, and the significance of this state as a destination of New Jersey waste diminished somewhat.

## Predominant Receiving Facilities

Waste Conversion, Inc. is the largest out-of-state receiving facility for New Jersey wastes, treating 21,700 tons of New Jersey waste in 1983. The plant, located in Lansdale, 30 miles north of Philadelphia, is primarily an aqueous treatment facility, but also does some oil recovery and accepts a wide range of wastes mostly in liquid or sludge form.

Chem-Clear, Inc. operates aqueous treatment facilities located in Chester, Pennsylvania and Baltimore, Maryland. Chem-Clear also does a small amount of oil recovery and accepts bulk or containerized liquids or solids. In 1983, the Baltimore plant treated 9,300 tons and the Chester facility treated 19,500 tons of New Jersey wastes.

CECOS International, located in Niagara Falls, New York, operates a secure landfill facility with some aqueous treatment on site. CECOS has plans to install a supercritical water thermal oxidizer. In 1983, the firm disposed of 19,000 tons of New Jersey waste. CECOS also operates a landfill in Cincinnati, Ohio, which accepts a substantial amount of New Jersey wastes.

Fondessy Enterprises, Inc. operates a landfill located in Oregon, Ohio. Processes at the facility, which accepted about 17,400 tons of New Jersey's landfillable wastes in 1983, include stabilization, land treatment and landfill.

Conversion Systems, Inc. specializes in a proprietary stabilization process using fly ash. Their stabilization facility treated 15,600 tons of New Jersey wastes in 1983 and is located in Marcus Hook, Pennsylvania.

Keystone Portland Cement Company burns hazardous combustible materials as auxiliary fuels for its two cement kilns at its cement production facility just north of Bethlehem, Pennsylvania. Keystone burned about 12,400 tons of auxiliary waste fuels from New Jersey in 1983.

American Recovery operates an aqueous treatment facility in Baltimore, Maryland, and an oil recovery facility in Sparrows Point, Maryland. The Baltimore facility has the capacity for many aqueous processes and accepts bulk and containerized liquids and solids. The Sparrows Point facility treats all types of waste oil and sells the product as fuel oil. Both facilities combined to treat 12,000 tons of New Jersey waste in 1983.

SCA Services operates a secure landfill and aqueous treatment facility in Model City, New York. This facility, which accepted 9,500 tons of New Jersey wastes in 1983, has a wide range of aqueous treatment capacities.

Delaware Container, located in Coatesville, Pennsylvania, treated about 7,300 tons of New Jersey waste in 1983. The facility is primarily a transfer and storage operation but also does limited amounts of neutralization thickening and solidification.

Evergreen Landfill disposed of 6,500 tons of New Jersey waste in 1983. The facility, located in Northwood, Ohio, does no on-site waste processing other than secure landfill disposal.

Chemical Waste Management runs a large secure landfill in Emelle, Alabama with some other on-site treatment capabilities. The amount of waste manifested by New Jersey generators to their facility has declined from over 12,000 tons in 1981 to about 3,000 tons in 1983. The facility is recognized by many to be the dominant landfill in the Eastern U.S.; this prominence is documented by the fact that during a six-month period in 1981, the facility received wastes from 39 states at an annual rate of 250,000 tons.

### Management Methods for Exported Wastes

For 1983, manifested wastes were totalled by the different recovery, treatment and disposal methods used by the receiving facilities. These computations considered the type of waste and the predominant management methods used by facility.

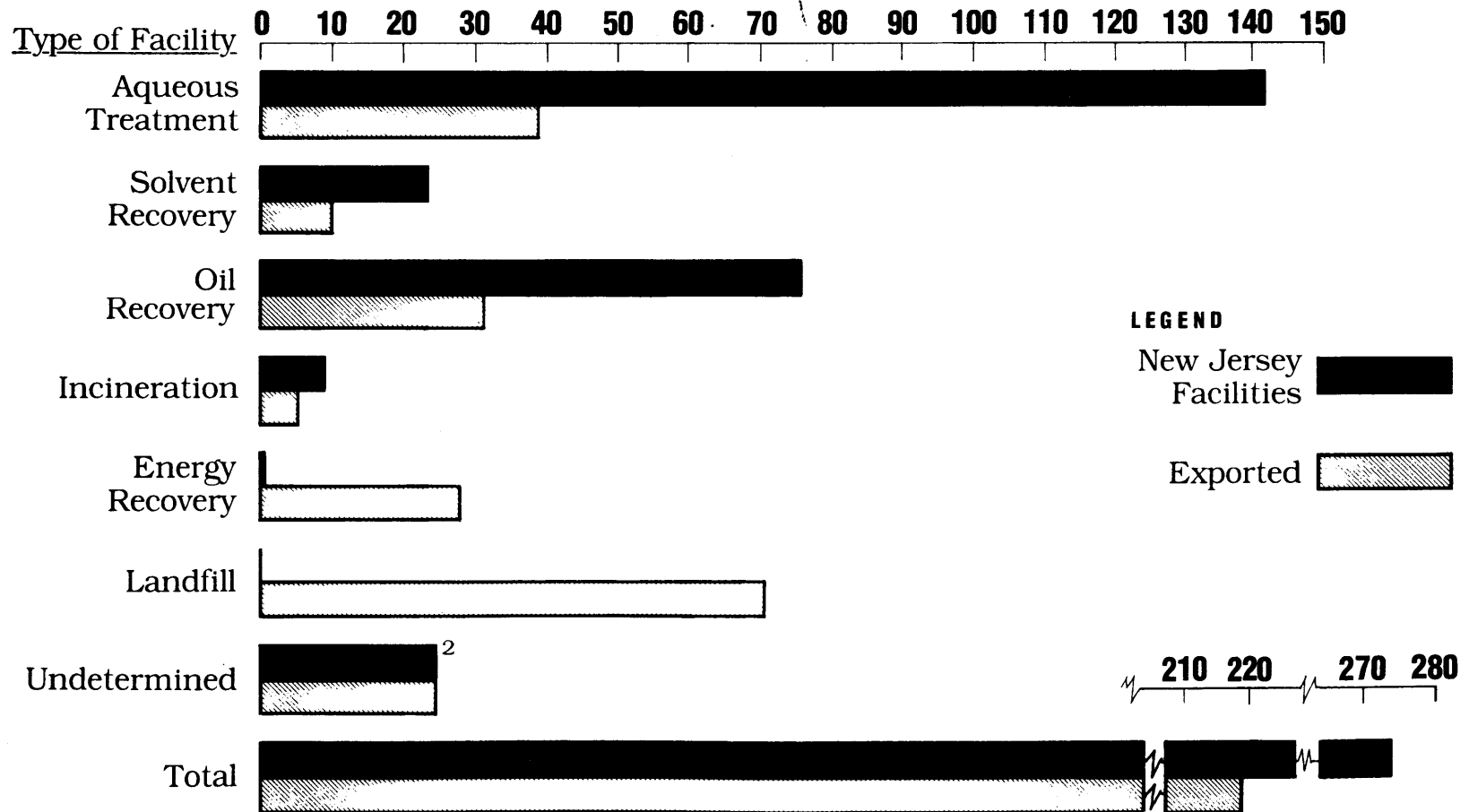
Table 3-7 shows the recovery, treatment and disposal methods employed for New Jersey wastes. The table is split to distinguish between wastes managed by New Jersey facilities and wastes manifested to facilities in other states. Figure 3-2 depicts the information graphically.

This information may have some minor discrepancies from actual methods. Sometimes, it was difficult to determine how wastes were managed at facilities which operate several treatment methods. Such facilities include SCA Services in New York, Browning Ferris Industries in Maryland, and CECOS International in New York. Also, it was often difficult to determine treatment methods at many of the more obscure facilities. In this case, the waste quantity was assigned to the unknown category.

As shown in Table 3-7, the two waste treatability types most heavily exported (as a percentage of the quantity of that waste type generated) are landfillable waste and wastes for energy recovery. The obvious reason for the 100 percent export of landfillable wastes is that there exists no commercial landfill in New Jersey. About 28,000 tons per year of New Jersey's wastes are exported and burned as supplemental fuels at cement kilns (again, a facility lacking in New Jersey).

New Jersey has substantial capacity in oil recovery, solvent recovery, and aqueous treatment; yet 20-30 percent of these types of wastes generated within New Jersey are sent to out-of-state facilities. In contrast, Table 3-5 indicates that oil and solvent recovery and aqueous treatment facilities do treat significant quantities of imported wastes. This situation is probably due to natural market forces of varied pricing and transportation costs.

**Figure 3-2  
New Jersey Wastes Manifested  
To New Jersey  
And Out-of-State Facilities<sup>1</sup>  
(For 1983 in Thousands of Tons)**



<sup>1</sup>Based on predominant treatment and disposal methods of facilities

<sup>2</sup>Mostly storage/transfer facilities

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CHAPTER FOUR

PROJECTIONS FOR NON-MANIFESTED  
HAZARDOUS WASTE

OBJECTIVE

The objective of Chapter Four of the Facilities Plan is three-fold:

1. To forecast quantities for wastes not currently manifested but which in the future will represent additional demand for commercial facilities. Four sources of future manifested wastes include:
  - a. wastes generated as a result of cleanup activities at inactive disposal sites,
  - b. wastes shifted to commercial facilities due to closure of on-site facilities,
  - c. waste shifted to commercial facilities due to more stringent regulation of wastes and waste-derived fuels burned in boilers, and
  - d. wastes generated from implementation of industrial wastewater treatment and pretreatment regulations.
2. To estimate the quantity of hazardous waste generated in New Jersey that is managed on site in RCRA-regulated facilities.
3. To survey other states to obtain information on pending regulations and commercial facility proposals/closures that may affect waste quantities imported into New Jersey.

## WASTES GENERATED FROM SITE CLEANUPS

### New Jersey DEP's Cleanup Plan

New Jersey DEP developed the "Management Plan for Remedial Actions" (the Cleanup Plan) to provide a systematic approach to remedial actions and to coordinate cleanup and enforcement actions at hazardous waste sites. Several site cleanups in this Plan are scheduled for implementation in the 1984 through 1988 time frame.

The Cleanup Plan (as originally issued in 1983) includes 106 sites. Remedial action is already in progress at some sites. Most sites though are in the various stages of investigation and planning. The nature and scope of cleanup activities have been very well defined for some sites while virtually nothing is known about other sites except that a potential hazard exists. At this stage in the Cleanup Plan's implementation, then, information about the quantity and types of waste to be generated is understandably incomplete.

### Generalizations About Remedial Actions

Remedial action at an uncontrolled hazardous waste site can take many forms. The action depends upon the size and scope of the original waste handling operations, the type of waste present, and a variety of site-specific factors. The remedial action program for a specific site may or may not require that wastes be removed from the site and separately disposed of at a commercial hazardous waste facility.

Often, it is neither technically nor economically feasible to remove waste from a site. And in some cases, a greater hazard can be created by disturbing long-buried waste than by leaving it in place. For example, it is usually not feasible to completely remove hazardous wastes from municipal landfills because much of the waste is often thinly dispersed throughout a massive amount of municipal refuse. In such circumstances, remedial action can consist of either isolating, immobilizing, or stabilizing the waste in place by a variety of methods.

A variety of considerations impact the decision to remove waste from a site or to leave it in place, not the least of which are cost and availability of off-site disposal facilities. However, the following generalizations can be made based on experience to date in New Jersey:

- Large bodies of aqueous waste, such as those found in lagoons or impoundments, are best treated on site using a portable wastewater treatment system whenever possible. However, the bottom sludge remaining in lagoons or impoundments often must be removed for off-site disposal if the bottom of the lagoon is below or very close to the water table.
- Aqueous streams generated during tank closures, tank cleaning, decontamination procedures, and test pumping of contaminated ground water at cleanup sites, are usually sent for off-site management.
- Bulk waste oils, common in tanks or impoundments, are usually removed and disposed of off site, often via incineration.
- If retrievable without excessive difficulty or hazard, drummed wastes will usually be disposed of off site, with the disposal method used depending upon the type of waste.
- Contaminated soil often covers a large area and represents an enormous volume of waste which can be prohibitively expensive to remove and dispose of off site. Therefore, if possible, it is usually not sent off site. Likely exceptions are instances where the contaminated soil is low in volume but high in potential hazard.
- Other contaminated materials, such as protective clothing, generated by the conduct of site cleanup operation, are usually drummed and managed off site.

#### Quantity of Waste Generated by the Cleanup Plan

The consultant reviewed the descriptions provided for each of the 106 sites covered by the Cleanup Plan to arrive at an estimate of the amount of waste generated by the Cleanup Plan. Sites were discussed with appropriate New Jersey DEP personnel and contractors directly involved in the cleanup. Using the information available and the previously discussed generalizations regarding on-site versus off-site disposal, the consultant projected that 68 of the sites in the Cleanup Plan might generate wastes for off-site disposal (see Table 4-1).

TABLE 4-1

PROJECTED NUMBER OF SITES IN NEW JERSEY DEP  
CLEANUP PLAN THAT MIGHT GENERATE  
WASTE FOR OFF-SITE DISPOSAL

<u>Year<sup>1</sup></u>	<u>Sites To Be Cleaned Up</u>	<u>Sites That Might Generate Wastes For Off-Site Disposal</u>
1984	10	9
1985	16	11
1986	19	13
1987	21	14
1988	12	7
Unscheduled	<u>23</u>	<u>14</u>
TOTAL	101 <sup>2</sup>	68

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<sup>1</sup> Cleanup will start in the indicated year but will not necessarily be completed in that year. If a site cleanup included treatment of ground water, this operation may take several years to complete.

<sup>2</sup> New Jersey DEP "Management Plan for Remedial Action, 1983" originally included 106 sites; some have been completed in 1983.

Remedial action plans have not yet been completed for all of the sites and many sites have not yet been fully investigated. However, the consultant has been able to draw the following conclusions from its investigations:

1. The sites containing tens of thousands of removable drums (e.g., Chemical Control in Elizabeth, New Jersey) have already been identified and largely cleaned up.
2. While many sites containing removable drums still remain, they appear to mostly contain hundreds rather than thousands of drums. Based on the site descriptions in the Cleanup Plan, it appears unlikely that more than 4,000 to 8,000 drums per year (roughly equivalent to 1,000 to 2,000 tons per year) will be removed from the designated sites and disposed of off site during the 1984 to 1988 time frame.
3. By far, the largest quantity of waste having a reasonable potential for off-site disposal will be oils, sludges, and other residues removed from lagoons and impoundments. The quantity available for off-site disposal will depend on the specifics of the remedial action plans still being developed.

### Examples of Cleanup Actions

The largest lagoon in the Cleanup Plan is at the Bridgeport Rental and Oil Services site in Logan Township, Gloucester County. This 11.5-acre lagoon contains a floating layer of PCB-contaminated oil at the top and oily sludges at the bottom. Based on very rough estimates, the lagoon contains almost 10,000 tons of oil and 50,000 tons of bottom sludge. For this particular site, all of the cleanup wastes will be treated on site: the wastewater via a portable treatment system and the oil and sludge incinerated by a mobile incineration unit. However, this site illustrates the large quantity of waste involved in a lagoon cleanup, which if not managed on site would represent substantial new demand for commercial facilities.

Another example is the Burnt Fly Bog Site in Monmouth and Middlesex Counties. This site may be expected to generate over 20,000 tons of organic liquids, tars, and other residues over a period of several years according to New Jersey DEP estimates. While most other sites will not be as large, even

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the cleanup of a relatively small lagoon can generate a very large quantity of waste (e.g., a one-foot thick layer of sludge removed from a one-acre lagoon amounts to approximately 1,500 tons).

Another source of wastes for off-site disposal is intermittent aqueous wastes generated during the course of cleanup operations. The quantity of this waste can often be quite significant. For example, in setting up site monitoring wells, a 48-hour pump test at 100 gallons per minute will generate 1,200 tons of aqueous waste. Identified sources of nearly 10,000 tons of bulk aqueous wastes for off-site disposal include Burnt Fly Bog, Quanta Resources Corporation, Renora Incorporated, and Kin-Buc Incorporated.

## Identification of Additional Sites

It should be noted that the New Jersey DEP estimates that it has ranked some 139 additional sites. These will be incorporated into the next update of the Cleanup Plan. However, these sites likely will not generate large quantities of wastes during the time frame of this Facilities Plan.

## Environmental Cleanup Responsibility Act

The newly-enacted Environmental Cleanup Responsibility Act (ECRA) should result in additional cleanup waste for off-site disposal. A requirement of ECRA is that a property cannot change ownership until hazardous waste cleanup requirements have been met. Thus, many industrial facilities, particularly in the oil and chemical process industries, may have to remove drummed wastes and/or clean up lagoons prior to sale. While it is extremely difficult to predict the quantities of waste that will directly result from ECRA, the sale of only a few large chemical manufacturing facilities could easily contribute several thousand drums per year as well as several thousand cubic yards of sludges or residues from lagoon cleanups.

## Quantity Estimates

Based on these considerations, the consultant estimates that in order to accommodate wastes from site cleanup activities within the state, the Facilities Plan should be structured to handle the annual waste quantities indicated in Table 4-2.

TABLE 4-2

PROJECTED ANNUAL QUANTITY OF SITE CLEANUP WASTE  
AVAILABLE FOR OFF-SITE DISPOSAL  
AROUND 1988

<u>Type of Waste</u>	<u>Projected Quantity of Waste Most Likely<sup>1,2</sup> Expected (tons/yr)</u>
<u>Drummed Waste</u> (expected to be mostly organic liquids and residues)	4,000
<u>Bulk Oils</u> (many with PCBs)	6,000
<u>Sludges and Contaminated Soil</u> (mostly contaminated with oils and other organics)	60,000
<u>Bulk Aqueous Wastes</u> (mostly with organics)	6,000
	<u>76,000</u>

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<sup>1</sup> These are order of magnitude projections based on limited information.

<sup>2</sup> Actual quantities are dependent on the specific requirements stipulated in the site Remedial Action Management Plan (RAMP) or Remedial Investigation and Feasibility Study (RI/FS).

The estimates for drummed wastes were arrived at by reviewing the cleanup plans for sites that appeared to have drummed wastes available for off-site disposal. To account for the possibility of encountering either greater than expected amounts of drummed wastes or additional sites, this number was roughly doubled. Added to this was approximately 2,000 tons per year of drummed waste (approximately 8,000 drums) that might be reasonably expected from ECRA cleanups.

The estimate of 60,000 tons per year for sludge and soils was based on the possibility of having to remove a two-foot thick layer of material from the equivalent of five, four-acre sites per year. It is important to note that the addition of even one very large site requiring the removal of contaminated soil could easily double or triple this number.

The estimates illustrate that management of contaminated soil on or off site is the most important factor influencing the amount of waste generated in site cleanups. Without more site-specific information, these estimates must be considered rough and realistically could be much larger or smaller.

In estimating quantities, it should be noted that by the latter years of the Cleanup Plan, most of the very large sites will have already been remedied. The remaining sites will tend to be small, as will probably be the case of any new sites discovered during that period. For the very small sites, i.e., less than one acre, it is often more cost-effective to remove contaminated soil for off-site disposal rather than to employ on-site geotechnical solutions. Thus, we can foresee a strong demand for off-site disposal to continue through and probably beyond 1988, even though the larger sites have already been addressed.

## Waste Types

Most of the drummed wastes can be expected to be organic liquids such as solvents and a wide variety of other organic residues, both liquid and semi-solid. Some drummed aqueous wastes can be expected, most of it probably acids and/or metal solutions. However, inorganic drummed wastes will probably represent a small fraction of the total. Given the wide variety of wastes expected, at least some wastes will be incinerable.

Most waste oils should be incinerable, though many will be contaminated with PCBs and require special incinerator operating conditions. Some sludges also, such as oily sludge, may be incinerable. However, it is reasonable to expect that

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fixation and/or disposal into a secure landfill will be the most appropriate disposal method for this group of wastes. Possibly no more than ten percent of the total quantity of sludge and contaminated soil will have sufficient organic content to warrant incineration.

Recognizing that the treatability of cleanup wastes cannot be determined in the absence of detailed site investigations, it is still useful to assign projected waste quantities to treatability categories to enable an assessment of facility needs. Table 4-3 details projected cleanup wastes by treatability categories determined by considering the possible waste characteristics outlined above.

## Effect of Siting New Facilities in New Jersey

The actual quantities encountered will depend on the specific requirements stipulated in either the Site Remedial Action Management Plan (RAMP) or the subsequent Remedial Investigations and Feasibility Study (RI/FS). Most of these have not yet been completed. It is important to realize that in the development of a RAMP or RI/FS, economic considerations often determine whether to pursue on-site containment measures or off-site disposal. A RAMP or RI/FS may be forced towards on-site containment if adequate off-site disposal is not available within an economic handling distance. Thus, the existence of adequate, economically competitive land disposal capacity within the state will tend to encourage site cleanup plans involving off-site disposal.

One factor that would tend to possibly reduce the amount of incinerable waste sent off site is the use of EPA's mobile incineration system for site cleanups. While only in the experimental stage now, if this technique proves to be cost-effective and usable in a wide variety of instances, the amount of incinerable waste sent off site could be lower than projected. This would be particularly true of the more highly incinerable wastes, such as waste oils. However, due to logistics and the steps needed to satisfy air pollution control requirements, it is reasonable to expect that the use of the mobile incineration system will be restricted to the larger sites.

TABLE 4-3

PROJECTED CLEANUP WASTES  
BY TREATABILITY CODES

<u>Type of Waste/Treatability Codes</u>	<u>Projected 1988 Quantity (tons/yr)</u>
<u>Drummed Wastes</u>	
Liquid Waste, N.O.S.	2,000
Sludges, N.O.S.	2,000
<u>Bulk Liquids</u>	
Oils, N.O.S.	2,000
Liquids with Toxic Organics	4,000
<u>Sludges and Contaminated Soils</u>	
Combustible Sludges	6,000
Sludge, N.O.S.	54,000
<u>Bulk Aqueous Wastes</u>	
Aqueous with Organics	<u>6,000</u>
	76,000

## SHIFT FROM ON-SITE TO OFF-SITE FACILITIES

### Data Sources

The Bureau of Hazardous Waste Engineering (BHWE) in New Jersey DEP's Division of Waste Management reviews engineering designs and registration applications of existing or proposed hazardous waste facilities. Source documents maintained by the BHWE concerning on-site facilities include:

- Permit Applications (Parts A and B)
- Annual TSD Reports
- Permit Applications and Plans for Reconstruction, Expansion, or Other Facility Modifications

### Selection of On-Site Facilities

The BHWE estimates that as many as 378 plants have filed RCRA Part A applications for RCRA interim status since November of 1980. At present, about 200 facilities are operating under interim or final RCRA status. The other facilities have either closed or were determined to fall outside the scope of RCRA regulation. Twenty-eight of the operating, RCRA-regulated facilities are commercial facilities, though one (Reichhold Chemical) has only limited commercial activity.

Most of the non-commercial, RCRA-regulated facilities (as many as 150 facilities) are permitted for storage only. The remaining facilities, numbering about 20 to 25, were those whose Part A applications indicated the existence of some treatment or disposal process on site. These treatment and/or disposal facilities were selected for further evaluation because of the implications for future commercial facility needs should they close or commercialize. Table 4-4 lists these facilities.

### Anticipated Facility Closures

The consultant interviewed the staff of EPA Region II, as well as New Jersey DEP's Field Enforcement Operations and Bureau of Hazardous Waste Engineering, regarding the on-site treatment/disposal facilities listed in Table 4-4 as well as the major on-site storage facilities. Information from these sources and from the facilities themselves was obtained to identify any facilities which have indicated their intention to initiate closure or which New Jersey DEP may move to close due

TABLE 4-4

ON-SITE FACILITIES REVIEWED FOR  
COMMERCIALIZATION OR CLOSURE POSSIBILITIES

	<u>Facility Name and Identification</u>	<u>Treatability/ Disposal Codes*</u>
a.	Allied Chemical Company Elizabeth, NJD002451490	(D82, T02)
b.	American Cyanamid Company Princeton, NJD002349009 Bound Brook, NJD002173276	(T04) (T03, T04)
c.	Arsynco, Inc. Carlstadt, NJD044688935	(T03)
d.	Ciba Geigy Corporation Summit, NJD001316713	(T03)
e.	Englehard Minerals and Chemicals Corp. East Newark, NJD002141489	(T03)
	Englehard Industries Division Carteret, NJD041211392 Newark, NJD064274657	(T03) (T04)
g.	Gateway Terminal Service, Inc. Carteret, NJD055933030	(T03)
h.	Hercules, Inc. Kenvil, NJD002170710	(T04)
i.	International Business Machines Dayton, NJD002177210	(T04)
j.	International Flavors and Fragrances, Inc. Union Beach, NJD002139228	(T03)
k.	International Paint Company, Inc. Union, NJD002139228	(T04)
l.	Jersey Smelting and Refining Jersey City, NJD000540062	(T04)

TABLE 4-4 (continued)

<u>Facility Name and Identification</u>	<u>Treatability/ Disposal Codes*</u>
z. USR Optonix, Inc. Washington Township, NJD049487887	(T04)
aa. Vanguard Research Associates, Inc. South Plainfield, NJD990753493	(T03)
bb. Weyerhaeuser Company Barrington, NJD000768267	(T04)
cc. Witco Chemical Corporation Paterson, NJD002163350	(T04)

\* Description of Treatability/Disposal Codes  
(Source: RCRA Part A applications)

- T01 - Treatment in tanks
- T02 - Treatment in impoundments
- T03 - Incineration
- T04 - Other treatment
- D80 - Disposal in a landfill
- D81 - Disposal by land application
- D82 - Ocean disposal
- D83 - Disposal in an impoundment

to engineering or compliance considerations. It was found that closure at any currently operating on-site facilities is not expected.

It should be noted that some facilities closed during 1982. The most notable example was duPont's Gibbstown aqueous waste treatment plant. That waste is now being sent to Chambers Works. Shifts of this waste and other wastes to the commercial market from plants closed during the three-year period for which this Plan examined data were already reflected in the manifest data. With the exception of duPont's waste, on-site to off-site shifts did not markedly impact manifested waste quantities.

### Cessation of Ocean Disposal

According to the U.S. EPA Region II office, EPA expects to strictly implement the phase-out schedules on which New Jersey's one ocean disposer with a RCRA-regulated waste has been placed. This is part of EPA's general policy to fast-track the cessation of ocean disposal in the United States. This waste, about 38,000 wet tons in 1983, is an acidic waste. The current disposal permit expires in June 1985. Though the company is presently investigating a variety of alternative waste management methods should that permit actually not be renewed, it is likely that this waste will be treated on site and possibly discharged to a POTW. The cessation of industrial waste ocean disposal, then, is not expected to exert a significant additional demand on New Jersey commercial facilities.

### Other On-Site Facility "Delistings"

Of the original number of on-site facilities granted interim status, it has been noted that several facilities have been "delisted" as RCRA facilities because of the following reasons:

1. their waste is not hazardous (e.g., United States Gypsum Company in Port Reading, American Cyanamid in Linden),
2. their Part A listing was actually for a future facility for which plans have been dropped (e.g., Gateway Terminal Corporation in Carteret, Mobil Research and Development in Pennington),

3. the activity at the facility is not regulated under RCRA (e.g., Pantasote Film in Passaic, McWilliams Forge in Rockaway), or
4. the plant has ceased its manufacturing/commercial operations (e.g., NL Industries in Pedricktown, Curtiss-Wright in Wood-Ridge).

Such "delistings" of facilities have no impact on the demand for commercial facilities.

### Wastes Managed at On-Site Facilities

#### Data Source

Wastes which are managed on site by the generator need not be manifested, and as a result manifest data cannot be used to analyze the amounts and types of such wastes. However, New Jersey DEP requires annual reports for all facilities that store, treat, or dispose of hazardous waste, including on-site facilities.

The consultant analyzed 318 annual reports submitted for 1983 on-site facilities. Of the 318 facilities, 76 reported managing no hazardous waste in 1983.

#### Types and Quantities of On-Site Wastes

Based on the remaining 242 annual reports, 11,767,000 tons per year of hazardous wastes are produced and treated, stored, or disposed of on-site in New Jersey. The distribution of this total among the 242 generators is as follows:

<u>Number of Generators</u>	<u>Cumulative Amount Reported by Generators</u>	<u>Percentage of Total On-Site Wastes in New Jersey</u>
3	10,565,000 tons/yr	89.8
16	1,118,000	9.5
41	72,000	0.6
182	12,000	0.1

#### Largest Generators

Thus, sixty firms account for 99.9 percent of the hazardous waste managed on site. The three largest generators are Toms River Chemical, Merck and Company, and Monsanto. These three

firms classified virtually all, in excess of 99.98 percent, of their on-site waste under the EPA system as being D002, wastes with the characteristic of corrosivity. These wastes are predominantly water with either a strong acid or alkali which can be neutralized in on-site treatment facilities and discharged to surface water, subject to federal and state water pollution control regulations. To account for such quantities, each facility would process, on an average, over two million gallons of wastewater each day, a level not unusual for plants the size of Toms River Chemical, Merck and Company, and Monsanto.

## Types of Wastes

Table 4-5 shows how wastes are managed on site by type and quantity of waste and by management method. This is based on an analysis of all waste streams reported by a facility to be greater than 100 tons during 1983. Such size streams accounted for 99.7 percent of the total of 11,767,000 tons reported for 1983 on-site facilities in New Jersey.

## Total Hazardous Waste Generated in New Jersey

Adding the normalized amount of 403,000 tons manifested in 1983 (Chapter Two) to the 11,767,000 tons managed on-site provides an estimate of over 12,000,000 tons of hazardous waste produced in New Jersey in 1983. Four points should be made about this estimate:

1. The on-site figure has not been normalized.
2. Some double accounting seemingly occurs because a generator reporting storage of waste on site in 1983 may have manifested this waste off site in that year as well.
3. The estimate excludes small-quantity generators.
4. The level of hazard associated with each waste is an important element in the analysis of commercial and on-site management of waste.

If the aqueous wastewater generated from the three aforementioned firms is excluded from the total on-site hazardous wastes managed, then 1,200,000 tons of hazardous wastes may be considered to be managed on site (this number still includes some wastewater generated by smaller firms). Adding the normalized amount of waste manifested in 1983 to this revised

TABLE 4-5  
 ESTIMATED WASTE TYPES, MANAGEMENT, AND  
 QUANTITIES AT NON-COMMERCIAL  
 FACILITIES IN NEW JERSEY  
 (Tons for 1983)

<u>Types</u>	<u>On-Site Management Method</u>					<u>Total (rounded)</u>
	<u>Storage</u>	<u>Aqueous Treatment</u>	<u>Incineration/ Energy Recovery</u>	<u>Other Treatment</u>	<u>Unknown</u>	
Aqueous Liquids	89,600	11,168,000	--	--	--	11,258,000
Solvents	13,700	--	--	6,700	--	20,000
Oils	1,300	--	500	--	--	2,000
Other Liquids	284,000	--	3,700	12,300	--	300,000
Sludges and Solids	87,600	--	1,800	65,800	--	155,000
Not Examined	--	--	--	--	32,000	32,000
TOTAL (rounded)	476,000	11,168,000	6,000	85,000	32,000	11,767,000

TABLE 4-5

ESTIMATED WASTE TYPES, MANAGEMENT, AND  
 QUANTITIES AT NON-COMMERCIAL  
 FACILITIES IN NEW JERSEY  
 (Tons for 1983)

<u>Types</u>	<u>On-Site Management Method</u>					<u>Total (rounded)</u>
	<u>Storage</u>	<u>Aqueous Treatment</u>	<u>Incineration/ Energy Recovery</u>	<u>Other Treatment</u>	<u>Unknown</u>	
Aqueous Liquids	89,600	11,168,000	--	--	--	11,258,000
Solvents	13,700	--	--	6,700	--	20,000
Oils	1,300	--	500	--	--	2,000
Other Liquids	284,000	--	3,700	12,300	--	300,000
Sludges and Solids	87,600	--	1,800	65,800	--	155,000
Not Examined	--	--	--	--	32,000	32,000
<b>TOTAL (rounded)</b>	<b>476,000</b>	<b>11,168,000</b>	<b>6,000</b>	<b>85,000</b>	<b>32,000</b>	<b>11,767,000</b>

estimate of on-site wastes gives a total of 1,600,000 tons per year. Manifested wastes make up 25 percent of this total. When this Plan is adopted by the Commission, these estimates will continue to undergo refinement with new data analyzed as they become available.

## BURNING OF WASTES IN BOILERS

### Currently Exempted Practice

Burning hazardous wastes and waste-derived fuels in industrial boilers as auxiliary fuels is defined as a beneficial use exempted from RCRA coverage. Both the New Jersey DEP's Division of Environmental Quality and the U.S. EPA intend to regulate this practice more stringently, most likely resulting in the discontinuance of this practice for certain types of wastes and equipment. This more stringent regulation will likely exert some additional demand for off-site facilities.

Because the boilers are presently exempted, the quantity of waste burned in boilers is not reported in annual reports submitted by treatment, storage, and disposal facilities nor is it included with the manifest data if the waste is managed on site. Even if generated and manifested first to a fuel blending facility, requirements for manifesting waste-derived fuels are ambiguous. Thus, there is no data management system which is currently in force and specifically designed to monitor the quantity and quality of wastes and waste-derived fuels in industrial, commercial, or residential boilers. The analysis in this section is based then on partial information available from the Air Pollution Enforcement Data System and the manifest data system. The personnel of New Jersey DEP's Bureau of Air Pollution Control assisted the consultant in developing the following methodology for estimating the quantity of waste and waste-derived fuels burned in boilers.

### Bureau of Air Pollution Control Data

The New Jersey DEP's Bureau of Air Pollution Control operates the Air Pollution Enforcement Data System (APEDS) to maintain information on the construction, installation, alteration, or operation of air pollution control apparatus or equipment. Source data contained in the APEDS identify fuel burning equipment which are reported to be burning wastes as a primary or secondary fuel. The Bureau of Enforcement Data Management obtained this information from APEDS and reviewed the final data base prepared by the consultant.

The APEDS identified boilers which are burning either "waste solvents" or "reprocessed oils". In some of these cases, more information was obtained about the wastes from original permit/certificate applications. The data finally assimilated from APEDS and the permit applications is given on Table 4-6.

## Additional Burning of Waste in Boilers

It must be noted that more wastes and waste-derived fuels are burned in boilers than identified by Table 4-6. Some waste-derived fuels may have been reported in terms of the American Society for Testing and Materials (ASTM) fuel designations (No. 4, 5, or 6 Fuel Oil). If so, they are not included in Table 4-6 because the APEDS system cannot distinguish between cases of ASTM designations used for waste-derived fuels and the same ASTM designations used for petroleum-based virgin fuels.

It should also be noted that information in APEDS is kept updated more in terms of air emission sources, stacks, and control equipment, rather than in terms of fuel types and fuel consumption. For example, initial information from APEDS identified 21 waste burning boilers at 14 plants. Subsequent review of the files revealed that one boiler has changed over from waste solvents to No. 6 fuel oil, whereas two boilers at another plant burned waste solvents only on an experimental basis. Table 4-6 now lists only eighteen boilers at twelve plants.

Discussions with New Jersey DEP facility inspectors indicate that waste burning is carried out in at least sixteen more plants, though this has not yet been entered in the APEDS. Table 4-6 also excludes residential and commercial boilers because no data are available. Under these circumstances, the data base on Table 4-6 should be looked upon merely as a rough indicator of the current practice of burning wastes which have been largely generated on site.

## Quantity of Waste Reported in APEDS

As shown in Table 4-6, the total quantity of wastes currently reported in APEDS is about 11 million gallons per year (estimated to be about 39,000 tons per year). The rated gross heat input of these boilers range from 0.5 million BTU per hour to 187 million BTU per hour. The estimated quantity of wastes burned in boilers having a rated gross heat input greater than 20 million BTU per hour is about 34,000 tons per year (90 percent of reported wastes). The percent of firing rate supplied by wastes (percent of fuel usage) is greater

than 25 percent in the case of five out of the eleven boilers with rated gross heat input greater than 20 million BTU per hour.

## Manifest Data

It is possible to obtain some preliminary information on waste-derived fuels from manifest data. The New Jersey manifest system provides information on the quantities of waste oils transported in New Jersey because waste oil is regulated as a hazardous waste (identified by the New Jersey waste codes X721 through X728). The quantities of waste oils manifested in New Jersey during 1981, 1982, and 1983 are given in Table 4-7. It should be noted that some of the wastes comprising "generation" are double-counted. Further, not all of the waste oils are manifested to fuel blending facilities in New Jersey; some were sent to other types of facilities or to fuel blending facilities in other states. The lower half of Table 4-7 gives a more accurate representation of waste oil generated in New Jersey and managed at fuel blending facilities, whether in New Jersey or another state.

## New Jersey Fuel Blending Facilities

A current list of commercial fuel blenders in New Jersey and their estimated capacities are given in Table 4-8. The manifested waste transactions - both receipt and generation - at eight which specialize in fuel blending are presented in Table 4-9. Waste oils comprise most of the receipts, with solvents making up the remainder.

The average of waste receipts to the eight selected fuel blenders is 62,000 tons per year. The "generation" quantities shown in Table 4-9 represent some blended fuels, unusable oil, as well as bottoms, sediments, and water separated from the waste oil. Assuming that the discharge of separated water to a sewer amounts to ten percent of the receipts, the difference between receipts and generation for the selected fuel blenders in Table 4-9 indicates that 55 to 70 percent of receipts is incorporated into waste-derived fuel. This factor indicates that the eight selected New Jersey facilities blend at least 40,000 tons per year of waste into fuels.

TABLE 4-7

WASTE OILS MANIFESTED IN NEW JERSEY  
DURING 1981, 1982, AND 1983<sup>1</sup>  
(All Quantities in Tons)

NJ/EPA Waste Code	1981			1982			1983		
	Generated	Exported	Imported	Generated	Exported	Imported	Generated	Exported	Imported
X721	31,936	4,759	7,088	25,667	937	9,311	39,720	3,650	9,088
X722	9,925	1,457	1,288	8,600	2,646	2,375	11,689	3,764	7,231
X723	211	50	49	30	13	0	358	244	21
X724	7,978	185	3,125	1,515	96	120	1,893	299	0
X726	64,576	29,803	29,447	50,373	27,569	6,649	41,689	18,492	8,574
X727	13	0	24	4	2	0	101	85	8
X728	0	0	0	33	22	0	2,918	2,875	0
TOTAL QUANTITY	114,639	36,254	41,021	86,222	31,285	18,455	98,368	29,409	24,922

NORMALIZED QUANTITIES OF WASTE OIL MANIFESTED TO  
FUEL BLENDEES BY TREATABILITY CATEGORIES<sup>2</sup>  
(All Quantities in Thousands of Tons)

<u>Treatability Categories</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
Automobile Oils	24	22	37
Industrial Oils	32	36	27
Fuel Oils	4	6	11
Oils, N.O.S.	<1	2	3
TOTAL QUANTITY	60	66	78

<sup>1</sup> Source: "An Analysis of the New Jersey Manifest Information 1981-1982: Interim Report", New Jersey Hazardous Waste Facilities Commission, January 1984, Table 1.

New Jersey Manifest Information.

<sup>2</sup> Source: Chapter Two Report.

TABLE 4-8

ESTIMATED CAPACITY OF COMMERCIAL FUEL  
 BLENDERS IN NEW JERSEY<sup>1</sup>  
 (All Quantities in Tons Per Year)

<u>Facility Name</u>	<u>Capacity</u>
B&L Oil Corporation	15,000
BP North America	11,000
C. R. Warner, Inc.	20,000
Earthline-SCA Services	45,000
Flowen Oil Delaware Valley	18,000
L&L Oil Service, Inc.	18,000
Lionetti Waste Oil Service	13,000
Noble Oil Company	32,000
Oil Recovery Company	219,000
Pure Stream, Inc.	2,400
S&W Waste, Inc.	<u>30,000</u>
TOTAL CAPACITY	423,000 tons/year

<sup>1</sup> Source: Chapter Three Report

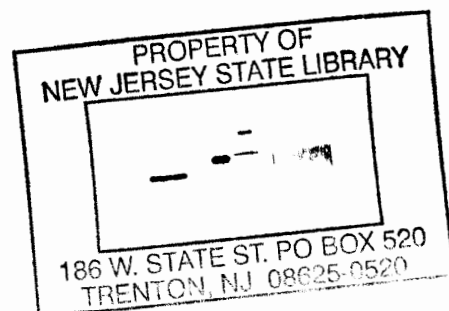


TABLE 4-9

WASTE TRANSACTIONS OF EIGHT COMMERCIAL FUEL BLENDERS  
 IN NEW JERSEY DURING 1981, 1982, AND 1983<sup>1</sup>  
 (All Quantities in Tons)

Facility Name	1981		1982		1983	
	Receipt	Generation	Receipt	Generation	Receipt	Generation
B&L Oil Corporation	11,767	4,770	9,923	3,350	14,850	6,945
Flowen Oil	0	0	2,470	90	9,410	6,631
L&L Oil Service	7,542	2,880	8,906	2,460	8,810	2,672
Lionetti Waste Oil Service	7,952	7,800	6,871	4,450	13,542	5,902
Noble Oil Company	106	400	9,092	3,230	17,039	2,304
Oil Recovery Company	16,017	1,300	19,327	2,440	12,779	2,274
Perk Chemicals	819	640	547	420	720	224
Pure Stream	<u>2,575</u>	<u>20</u>	<u>1,844</u>	<u>10</u>	<u>4,016</u>	<u>83</u>
TOTAL QUANTITY	46,778	17,810	58,980	16,450	81,166	27,035

<sup>1</sup> Source: "An Analysis of the New Jersey Manifest Information 1981-1982: Interim Report", New Jersey Hazardous Waste Facilities Commission, January 1984, Tables 18, 19, 20.

New Jersey Manifest Information.

### Other Fuel Blending Operations

To obtain an estimate of the total amount of waste blended as fuel at New Jersey facilities, the figure of 40,000 tons needs to be increased to reflect:

- a. Waste oil blended as fuels at other commercial facilities (such as Earthline-SCA, S&W Waste, and Standard Tank Cleaning Corporation).
- b. Solvents blended as fuels at other commercial facilities (such as Marisol and SRS).

These are estimated to amount collectively to 20,000 tons per year, yielding a gross estimate of 60,000 tons per year of waste present in waste-derived fuels blended at commercial facilities in New Jersey.

### Quantity of Waste Burned in Boilers

In summary, the APEDS data indicate that about 40,000 tons of waste is burned in industrial boilers. This waste must be assumed to have been largely generated on site, considering the limitations of the data base. On the other hand, the manifest data indicate that an additional 60,000 tons of waste is also burned every year in boilers, but not necessarily in New Jersey, after having first been blended as a waste-derived fuel at a commercial facility. These two data sources thus indicate that a total of 100,000 tons per year of waste are burned in boilers (or about 30 million gallons).

It is interesting to compare this estimate with the U.S. EPA's current nationwide study<sup>1</sup> of the practice of handling/burning "used or waste oils and waste-derived fuel materials". Track I of the study involved sending questionnaires to handlers and burners of used or waste oils and waste-derived fuel materials. These facilities were selected "from a prepared list, not a sampling frame with a known relationship to the population of burners and handlers". The results of this survey are, therefore, "not generalizable" and the "reported quantities do not account for all the used or waste oils and waste-derived fuel materials handled or burned".

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<sup>1</sup> "Methodology Report for the Survey of Handlers and Burners of Used or Waste Oil and Waste-Derived Fuel Material (Survey of Waste as Fuel: Task I)". Report to U.S. EPA by Westat, February 1984. pp. 6-1 and 6-2.

These preliminary results, however, indicate that at least 275 million gallons of used or waste oils and waste-derived fuel materials were burned during 1982 in the United States. This includes the quantities reported by sampled burner facilities as having been burned and the quantities identified by sampled handler facilities as materials which "was/will be burned as fuel" on site. Knowing that the sampled facilities do not fully cover all handlers/burners in the United States, the U.S. EPA has carried out a separate analysis to estimate that as much as 500 million gallons of waste oil alone can be involved. In comparison, the estimate of thirty million gallons of waste oil and solvents for New Jersey, as prepared in this report, seems reasonable.

### Proposed New Regulations on Burning Waste in Boilers

New Jersey DEP's Division of Environmental Quality is now drafting more stringent regulations on the use of liquid fuels in industrial boilers. The regulations will consist of two parts: (a) liquid fuel standards and (b) boiler exemption rules.

The proposed liquid fuel standards include concentration limits on the following contaminants: ash, sulfur, arsenic, beryllium, cadmium, chromium, lead, mercury, nickel, polychlorinated biphenyls (PCBs), and total halogen. Other properties covered by the regulations involve flash point and heat of combustion. It should be noted that these standards will apply to all fuels and are basically designed to control air pollution due to emissions from boilers.

A fuel oil from a petroleum refinery will usually meet the standards, though some samples of these fuel oils will not pass the test for nickel or chromium. Waste-derived fuels are expected to fail this test more often, thereby preventing their use in boilers without the appropriate air pollution controls such as scrubbers.

Even if a waste-derived fuel material meets the standards, compliance with the boiler exemption rule is also required. These additional criteria define allowable boiler size, stack height, air monitoring requirements, and beneficiality of the reuse of waste-derived fuel. The rule also provides for certification to operate control apparatus or equipment. The minimum boiler capacity specified by the boiler exemption rule is 20 million BTUs per hour, and it is estimated that 1,100 boilers operating in New Jersey are rated for a gross heat input greater than this capacity.

### Effect of Proposed New Regulations

If the liquid fuel standards are indeed promulgated as described above, the issue of the future impact of these standards on the practice of burning waste-derived fuel materials will mainly narrow down to two questions:

- What fraction of the waste-derived fuels, offered for analysis, will meet with the proposed standards?
- For the fuels that fail the standards, what collective capacity of boilers with the appropriate and necessary air pollution controls will be offered for the combustion of waste-derived fuels?

The answer to the first question is probably that waste-derived fuels (unless blended down substantially with virgin fuel) may often not meet the standards. This is based on New Jersey DEP's testing of samples carried out in connection with the development of the standards.

In answer to the second question, the New Jersey DEP estimates that nearly 400 boilers may have appropriate controls to enable their utilization for such purposes. This is based on the fact that these number of boilers are rated for a gross heat input of greater than 100 million BTU per hour and would probably have suitable air pollution control facilities. Even with this large number of seemingly acceptable boilers, it is difficult to assess at this stage whether the boiler owners will consider burning fuels which have failed fuel standards. These large boilers represent major investments and can be essential to the owners' overall operations. These factors may prevail despite the cost savings of replacing virgin fuels.

It is premature to attempt to quantify the impact of regulations in a drafting stage on a widely prevalent industrial practice. However, since proposed fuel standards are related to the capabilities of fuel burning equipment and, since several issues need to be considered before finally promulgating fuel standards, it is the consultant's estimate, as explained below, that the practice of burning wastes and waste-derived fuels in boilers will not be affected so as to substantially increase the total 1988 demand for off-site facilities.

## Waste Burned on Same Site as Generated

Any curtailment of the practice for waste generated on site would seemingly increase the demand for off-site facilities because these wastes are not now manifested. However, two factors suggest that this will not occur to a large degree. First, as shown in Table 4-6, this practice occurs mostly in large boilers which likely will meet the boiler exemption rules and whose owners probably have already considered the issues of combustion efficiencies and potential for boiler damage. Second, even if the practice is curtailed, on site management via another alternative could still prove more attractive to the generator than shipping the waste off site.

Assuming discontinuance of the current burning of wastes in boilers rated for gross heat input below 20 million BTU per hour, it is expected that only 4,600 tons (refer to Table 4-5) of the amount reported as generated and burned on site (40,000 tons) will be shifted to off-site management facilities. Because not all boilers burning wastes and waste-derived fuels are included in the APEDS system, it may be expected that this amount of waste shifted to off-site management facilities will likely double to equal about 9,000 tons.

## Wastes Blended into Fuels at Commercial Facilities

Change will likely be more pronounced in the practice of burning waste-derived fuels (blended at a commercial facility) in boilers. The cost savings realized by replacing virgin fuels with waste-derived fuels is a compelling argument that the practice will still be attractive, but a shift to larger boilers should occur. The shrinkage of suitable boilers for burning the wastes and the added administrative costs to the boiler owner may reduce the demand for waste-derived fuels and thus result in lower prices. The competitive technologies of incineration and waste oil re-refining and the similar technology of burning in cement kilns should become more attractive. Nevertheless, any shift in the practice or use of waste-derived fuels blended at commercial fuel blending facilities would not increase the total estimate of manifested wastes because the manifest data already include wastes currently received by fuel blenders.

## EFFLUENT REGULATIONS

### Implementation of Effluent Regulations in New Jersey

The U.S. Environmental Protection Agency (EPA) has proposed or promulgated several regulations to limit the discharge of pollutants into navigable waters of the United States or to publicly-owned treatment works (POTW). The regulated effluent discharges are from facilities involved in different industrial activities. These regulations include effluent limitations based on "best practicable technology" (BPT) and "best available technology" (BAT), establish "new source performance standards" (NSPS), and define "pretreatment standards of new and existing sources" (PSNS and PSES). These regulations were promulgated under the Federal Water Pollution Control Act (also known as the Clean Water Act).

In many cases, the regulations will require additional treatment of wastewater prior to discharge, and this treatment may contribute to the generation of more solid wastes. These wastes, due to the presence of toxic pollutants, may be defined to be hazardous and covered by RCRA.

The Bureau of Industrial Waste Management, in New Jersey DEP's Division of Water Resources, is responsible for implementing industrial pretreatment programs and permitting the direct discharge of industrial wastewaters to surface streams. This group is currently dealing with several aspects of the pretreatment program, including the development of criteria to set the effluent limits under the industrial wastewater discharge permitting program. The Pretreatment Section is now obtaining baseline monitoring reports (BMR) from the categorical industrial users of POTWs.

### Projecting Additional Waste Generation in New Jersey

Source documents for evaluating the impact of effluent regulations on hazardous waste management are not yet available in New Jersey. The consultant's methodology for projecting additional hazardous waste generation in New Jersey due to effluent regulations was based on the supplementary information provided by the U.S. EPA, including:

- Development documents for effluent limitations guidelines and standards for point source categories
- Economic analysis of proposed effluent standards and limitations for industries

- Federal Register notices on the proposal/promulgation of effluent regulations

The following is a brief description of the methodology:

## Step 1 - Study of EPA Information

Select industrial activities for analysis; identify the related SIC codes; note the status of pertinent effluent regulations; review EPA's evaluation of the non-water quality impact of given regulations, their prediction of types and quantities of solid wastes, and classification of these wastes as being hazardous.

## Step 2 - Development of Waste Generation Factors

Review EPA data on predicted waste quantity per plant on a national basis.

## Step 3 - Extrapolation to the Case of New Jersey

Identify the industrial basis (number of plants within an industry category that EPA reviewed in developing the guidelines) from EPA's overview of the industry affected by given regulations; define corresponding industrial basis for New Jersey by counting similar plants listed in the state's manufacturers' directory; if similar plants could not be identified, use other factors (such as industry shipments, labor figures) to define the state's industrial base as a percentage of the national basis; apply waste generation factors to predict the generation of solid wastes in New Jersey.

## Summary

Effluent regulations for twenty different industrial activities were studied in this analysis. The solid wastes expected are usually sludges with metals, though many will be organic sludges. At times waste oils may be generated, and some generators may decide to ship aqueous streams untreated off site rather than pretreat on site. In summary, the preliminary analysis predicts a total quantity of additional solid wastes of about 66,000 tons per year.

### Data Base Normalization

It should be noted that this data base is a first attempt at quantifying the impact at a state level and likely contains some inaccuracies. There are several shortcomings in this methodology:

- Projecting for a specific state by using a waste generation factor which is calculated from a national data base may lead to error.
- This method does not take into consideration the subcategorization of industrial activities which form subparts of several effluent regulations. For example, plants in different subcategories (wood preserving, plywood, hardboard, etc.) of the same industrial activity (timber products) may be affected differently by regulations.
- Some companies are referenced with more than one SIC in a manufacturers' directory. These companies' involvement in the secondary SIC activities may be at comparatively low levels; however, the methodology for defining the industrial base did not distinguish such.
- Some generated solid wastes may not be hazardous.
- Several plants may already be in compliance with the forthcoming regulations; thus, they would not generate any additional waste.

Under these circumstances, it was necessary to revise the preliminary estimates based on judgment and experience. The Pretreatment Section of New Jersey DEP receives the baseline monitoring reports and has been conducting waste surveys of several industrial users of POTWs, and thus represents the most knowledgeable source about pretreatment in New Jersey. The staff of the Pretreatment Section made the following observations:

- The number of plants in each of the selected categories were probably overestimated; this is especially true of inorganics and electroplating industries.

- It must be noted that several facilities which are not treating their effluent may prefer to change their processes rather than construct treatment facilities.
- All plants in iron and steel industry in New Jersey discharge directly to surface water and, therefore, are not subject to pretreatment standards.
- Additional wastes generated may be managed on site.
- Some solid wastes generated may not be hazardous (such as those generated by can making and copper forming as well as sludge precipitation by treatment with lime).
- Based on these facts, the predicted waste quantities for New Jersey could be reduced across the board by fifty percent.

The consultant reviewed these remarks and reduced the preliminary estimates by fifty percent. The final summarized projections are given on Table 4-10 in terms of the generating industry, waste types, and quantities.

## EFFECT OF DEVELOPMENTS IN NEIGHBORING STATES ON NEW JERSEY FUTURE WASTE IMPORTS AND EXPORTS

Proposed or future regulations in neighboring states, as well as changes in the availability of commercial facilities in these states, will affect to varying degrees New Jersey waste imports and exports. Reasonable sources of information on these RCRA developments are the environmental regulatory agencies in these states. The consultant contacted the regulatory agencies in New York, Connecticut, Pennsylvania, Delaware, Maryland, West Virginia, Ohio, Michigan, Vermont, New Hampshire, Maine, Massachusetts, Rhode Island, Virginia, Kentucky, Indiana, Tennessee, South Carolina, Georgia, and Alabama.

In general, the consultant made inquiries regarding two major issues:

- a. RCRA Program Changes (i.e., planned listings of waste streams, new regulations which may either increase statewide manifested wastes or affect out-of-state imports).

TABLE 4-10

ESTIMATE OF FUTURE GENERATION OF HAZARDOUS WASTE  
 RESULTING FROM ADDITIONAL INDUSTRIAL WASTEWATER TREATMENT  
 IN NEW JERSEY  
 (Tons Per Year)

Industry	SIC Codes	Treatability Categories					Totals (Rounded)
		Heavy Metal Sludge	Sludges, NOS	Corrosive Sludges	Aqueous Liquids with Organics and Metals	Waste Industrial Oils	
Timber Products	24	--	10	--	--	--	10
Chemicals and Allied Products	28	16,300	2,600	--	300	--	19,200
Leather and Leather Goods	31	--	500	--	--	--	500
Primary Metals	33	3,100	1,200	1,000	--	3,200	8,500
Fabricated Metals	34	1,400	300	--	--	--	1,700
Machinery, except Electrical	35	--	300	--	--	--	300
Electrical and Electronic Machinery	36	1,300	300	--	--	--	1,600
Transportation Equipment	37	--	300	--	--	--	300
Measuring, Analyzing, Controlling Instruments	38	--	300	--	--	--	300
Miscellaneous Manufacturing	39	--	300	--	--	--	300
<b>TOTALS (rounded)</b>		<b>22,100</b>	<b>6,100</b>	<b>1,000</b>	<b>300</b>	<b>3,200</b>	<b>33,000</b>

- b. Changes in Availability of Commercial Facility (e.g., commercial facility closures, proposed new commercial facilities, reopening of closed facilities).

The following summation is based on the responses of the individuals contacted at the state agencies.

RCRA Program Changes

- 1. Planned listing of waste streams as RCRA wastes other than those a state has already designated or those wastes that EPA will list:

- Northeast: Listings should not increase current imports to New Jersey.

New listings typically involve small quantities of exotic wastes. The only exception to that is New Hampshire which intends to list waste oils within two years. However, existing waste oil recovery capacity in New England should suffice.

- Midwest: Listings should not increase current imports to New Jersey.

Indiana may consider regulating ~~waste~~ oils, but a proposal is not even in draft form yet.

- South/Southeast: Listings should not increase current imports to New Jersey.

Tennessee may attempt to regulate waste oils, though a proposal to do so was once rejected by the Waste Management Review Board.

- 2. Planned regulation of PCBs as hazardous wastes:

- Both Indiana and Maryland intend to regulate PCBs; however, this should not change the current waste management practices for those wastes. Besides, no New Jersey facilities can currently accept them.

- 3. Other state-initiated changes in state regulations effecting a marked increase in the demand for commercial facilities, its own or New Jersey's.

- Northeast: None

- Midwest: Probably none

Ohio expects to lower the small quantity generator exemption to 100 kg/mo. No estimates are available for waste quantities, but it is likely that they are modest. Furthermore, small quantity generators are likely to seek some alternative to shipping their wastes to New Jersey, given the cost of transportation.

- South/Southeast: Probably none

The same situation occurs in Maryland as in Ohio. Some waste will probably come up to New Jersey, but the quantity should not markedly impact the amount of waste Maryland is already exporting to New Jersey due to the modest amount collectively generated by small generators.

4. Restrictions on types of waste accepted at its commercial TSDFs:

- Northeast: Potential major impact.

Starting 30 April 1984, New York prohibited the land disposal of waste containing more than five percent of certain listed "organic chemicals and pesticides" (mainly organic chemicals designated by OSHA as carcinogenic), with the percent being reduced to two percent by 31 December 1985. Starting 31 March 1985, New York will prohibit wastes containing in excess of five percent of halogenated, nitrogenated, and aromatic organic compounds and "certain other organic chemicals in Federal toxic waste regulations". The restricted chemicals include trichloroethane, chlorobenzene, carbon tetrachloride, nitrobenzene, aniline, benzene, toluene, acetone, and ethyl acetate. Also, New York's disposal fee, in place for about eighteen months, may effect a decrease in the amount of waste sent to CECOS and SCA-Model City.

- Midwest: Probably none

Ohio rejects, procedurally but not statutorily, wastes requiring specialized or very advanced treatment for which the generator state has not aggressively sought TSD possibilities in its own state.

- South/Southeast: Probably none

Alabama may move to restrict activities at Chemical Waste Management's large landfill in Emelle within the next six months. The form of those restrictions is not clear at this time, but they are likely to at least increase the cost. Actual availability to out-of-state generators may not be affected. South Carolina did have a piece of legislation in effect for a year restricting the land disposal of wastes that are prohibited for landfilling in the states where generated. That law has since been repealed and those wastes are once again being accepted.

## Changes in Availability of Commercial Facilities

### 1. Expected commercial facility closures:

- Northeast: Significant reduction in capacity of landfills.

Of six interim status landfills in Pennsylvania, four have closed, including three in eastern Pennsylvania that accepted New Jersey waste. Frontier Chemical Company, an aqueous treatment facility, in New York may close as the result of an enforcement action, but waste should be able to shift easily to other available facilities. Geochem Corporation in Massachusetts may close as the result of an enforcement action, but no New Jersey waste was manifested there.

- Midwest: Insignificant reduction in capacity of incineration, aqueous treatment, and landfill facilities.

Environmental Enterprises in Ohio may close as the result of an enforcement action, but less than 20 tons of New Jersey waste was manifested there in 1982. Two off-site aqueous treatment plants in Ohio are threatened by the Part B process, but that should not impact New Jersey waste management. The large landfill operated by CECOS International in Ohio will probably be closed for a brief but unspecified period of time for repair of a new cell wall and two slopes which have failed.

- South/Southeast: Reduction in landfill and incineration capacity.

Atlantic Coast Environmental in Delaware is threatened with closure because of the Part B process. In 1982, the facility accepted 400 tons of New Jersey waste, mostly D001 and D002. If closed, waste should be easily shifted to other facilities. The Browning-Ferris Industries (BFI) landfill facility in Maryland closed in early 1983, and a new landfill opened by a state authority will be closed soon. Maryland's new landfill did not accept New Jersey waste and New Jersey waste sent to BFI has been shifted to other facilities.

## 2. Proposed new commercial facilities:

- Northeast: Many active proposals.

In Pennsylvania, there are at least two proposals to site new land disposal facilities; one in the western part of the state and a third which is appealing the state's denial of its permit application. A landfill that had recently closed now proposes to reopen. All proposed landfills would accept only stabilized, inorganic waste.

In Massachusetts, IT Corporation has withdrawn its plans to develop a major facility featuring rotary kiln incineration and stabilization/landfill disposal.

A PCB oils/transformers treatment facility is planned in Maine. Though classed as commercial, it is supposedly restricted to equipment and oils from Central Maine Power.

Stablex proposes in New Hampshire a chemical treatment facility with a landfill for treatment residues only. The facility is in the draft permit stage. Also in New Hampshire, ACT Corporation proposes a solvent recovery facility that is now in the draft permit stage.

Conversion Systems, Inc. has inquired into possibility of building an incinerator in New York. Nothing formal has been submitted.

In Rhode Island, Antonelli Plating Company has received a permit to construct a commercial facility to treat electroplating wastes. ETICAM Corporation is presently looking for a site for an electroplating waste treatment facility.

- Midwest: Significant proposal for incineration capacity.

Waste Technologies, Inc. plans a large rotary kiln incinerator in Ohio near the Pennsylvania and West Virginia borders. EPA and the state have granted permits, but in early April the permit was remanded by EPA pending settlement of a suit brought by the State of West Virginia. Settlement is likely. Also, in Ohio, TRICIL Environmental proposes a treatment plant for electroplating wastes. This is planned primarily for the Cleveland area electroplating industry, but it will likely expand its commercial base following the beginning of operations.

Environmental Management Systems, Inc. in Michigan has received a lengthy notice of deficiency on original Part B for landfill/solidification process/wastewater treatment plant, but plans to resubmit a Part B shortly for the landfill only.

- South/Southeast: Various proposals.

In Kentucky, Pyrochem, Inc. proposes an incinerator. The Part B has been reviewed and found deficient in many respects; the applicant is presently preparing additional information.

In North Carolina, SCA is in the preliminary stages of developing plans for a chemical treatment facility. Also, the state has a proposal before the legislature to authorize siting of a secure chemical landfill. If that is not acted on this session, it is likely to come up in the 1985 session.

Eastern Resource Technologies proposed a landfill in Maryland; however, the application was denied because of "inherent site deficiencies".

## Conclusions

The direct implications for New Jersey are as follows:

1. The trend to restrict the landfill disposal of certain wastes, particularly organic wastes, continues; what remains unclear is how severe these restrictions will eventually become.
2. Landfill capacity has declined somewhat over the past two years with the closure of five facilities in Pennsylvania and Maryland; however, several facilities continue to operate and have been able to accommodate new waste shipments.
3. The landfill facilities that are currently receiving wastes from New Jersey will most likely remain open; however, the potential for (a) forced closure because of ground water contamination at older cells which were not designed by state-of-the-art standards, or (b) inability to gain approval for expanded capacity upon depletion of permitted cells makes the long-term prospects uncertain.
4. There are several proposals by private companies to develop incineration, treatment, and landfill facilities in other states, and proposals involving incineration and treatment have progressed much further than those featuring landfill disposal.
5. The incineration facility proposals in Ohio and Kentucky have advanced quite far and collectively represent a measurable amount of new capacity for wastes currently accepted at the Rollins facility in Bridgeport; this geographic area now accounts for about ten percent of the wastes handled at Rollins.

## **SUMMARY OF ADDITIONAL DEMAND FOR COMMERCIAL FACILITIES**

The primary objective of Chapter Three is to project for 1988 the waste types and quantities not included in the Chapter Two report that will require treatment or disposal in commercial facilities. Table 4-11 presents a summary of these wastes as estimated in previous sections. Total projected additional demand equals 117,000 tons. This represents a 27 percent increase over the Chapter Two projected manifest quantity of 431,000 tons. Total projected demand for off-site commercial facilities, therefore, equals 548,000 tons of waste for 1988.

TABLE 4-11

1988 PROJECTED ADDITIONAL NEW JERSEY DEMAND FOR  
COMMERCIAL FACILITIES IN NEW JERSEY  
(In Thousands of Tons)

<u>Treatability Categories</u>	<u>Site Cleanups</u>	<u>Shift From On-Site Facilities</u>	<u>Shift From Waste Burning in Boilers</u>	<u>Compliance with Effluent Regulations</u>	<u>Total Projections</u>
<b>AQUEOUS LIQUID</b>					
Inorganic	--	--	--	--	--
Organic	6	--	--	<1	6
<b>SOLVENTS</b>					
Halogenated	--	--	--	--	--
Non-Halogenated	--	--	--	--	--
Mixed	--	--	--	--	--
Solvents, N.O.S.	--	--	--	--	--
<b>OILS</b>					
Automobile	--	--	--	--	--
Industrial	--	--	--	3	3
Fuel	--	--	--	--	--
Oils, N.O.S.	2	--	--	--	2
<b>OTHER LIQUIDS</b>					
Combustible	--	--	9	--	9
With Toxic Organics	4	--	--	--	4
Wastes, N.O.S.	2	--	--	--	2
<b>SOLIDS AND SLUDGES</b>					
Combustible Sludges	6	--	--	--	6
Heavy Metal Sludges	--	--	--	22	22
Corrosive Sludges	--	--	--	1	1
Wastes, N.O.S.	<u>56</u>	<u>--</u>	<u>--</u>	<u>6</u>	<u>62</u>
<b>TOTALS</b>	<b>76</b>	<b>0</b>	<b>9</b>	<b>32<sup>1</sup></b>	<b>117<sup>2</sup></b>

<sup>1</sup> Total here does not match the total in Table 4-9 (estimates of waste from pretreatment) due to rounding to thousands of tons. The quantity of 32,000 tons is retained throughout the rest of this Plan.

<sup>2</sup> In addition to the 431,000 projected in Chapter Two.

Site cleanup waste contributes 65 percent of the additional 117,000 tons, of which 56,000 tons cannot be described further than miscellaneous solids and sludges.

No significant amount of waste is expected to shift to the commercial market from on-site facility closures. However, 9,000 tons of combustible liquids should shift due to stricter regulations on burning wastes and waste-derived fuels in industrial boilers.

Compliance with effluent regulations should generate 32,000 additional tons of waste by 1988, or 27 percent of the expected additional demand. The majority of that waste will be heavy metal sludges.

In comparison with the quantities projected from the manifest data base, the combined effects of these increases result in negligible increases in aqueous waste, waste solvents, and waste oils. Other liquid wastes increase about 50 percent overall, combustible liquids increasing by 52 percent and toxic organic liquids doubling. Solids and sludges as a group more than double as the original projection of 78,000 tons increases by 91,000 tons to equal 169,000 tons. Individually, the heavy metal category will increase 260 percent and the combustible category treble.

Table 4-12 combines the Chapter Two and Chapter Four quantities by treatability categories. The 62,000 tons of solid and sludge wastes, N.O.S. are prorated among the other types of solids and sludges in the same ratio as used in Chapter Two.

TABLE 4-12

1988 PROJECTED DEMAND FOR COMMERCIAL  
FACILITIES IN NEW JERSEY  
(In Thousands of Tons)

<u>Treatability Codes</u>	<u>1988 Projected Demand from Manifest Data (from Task One)</u>	<u>1988 Additional Projected Demand (from Task Three)</u>	<u>1988 Total Projected Demand</u>
<b>AQUEOUS LIQUIDS</b>			
Inorganic	111		111
Organic	104	6	110
<b>SOLVENTS</b>			
Halogenated	10		10
Non-Halogenated	7		7
Solvents, N.O.S.	16		16
<b>OILS</b>			
Automobile	32		32
Industrial	30	3	33
Fuel	9		9
Oils, N.O.S.	2	2	4
<b>OTHER LIQUIDS</b>			
Combustible	21	11	32
Toxic with metals	1		1
Reactive	1		1
Corrosive	<1		<1
Toxic with organics	3	4	7
<b>SOLIDS AND SLUDGES</b>			
Heavy Metals	27	44	71
Oily	13	10	23
Paint	2	1	3
Combustible	4	9	13
Corrosive	3	3	6
Reactive	1	1	2
Organic	27	22	49
Other	1	1	2
<b>UNEXAMINED</b>	<u>6</u>		<u>6</u>
<b>TOTAL</b>	<b>431</b>	<b>117<sup>1</sup></b>	<b>548</b>

<sup>1</sup> 117,000 tons for additional projected demand is retained throughout the remainder of this Plan. See Table 4-11.

**CHAPTER FIVE****TRANSPORTATION ANALYSIS****OBJECTIVE**

Chapter Five of the Plan examines the dynamics of hazardous waste transportation. It delineates the primary routes used and estimates the quantity of manifested waste transported in and among five multi-county regions in New Jersey. It defines the major points of entry and exit for interstate manifested waste shipments.

This Chapter also analyzes waste transportation costs. It examines how costs are typically calculated, the variability among costs for different types of carriers (nationwide waste carriers, local waste carriers, common carriers), and the impact of ICC deregulation.

Finally, Chapter Five briefly evaluates the significance that transportation distance and cost can have on a generator's choice of hazardous waste facilities. Chapter Six of this Plan uses the information contained herein to provide an assessment of the factors guiding these generators' decisions.

**TRAFFIC****Hazardous Waste Transporters**

All hazardous waste transporters are required to register annually with the New Jersey Department of Environmental Protection (DEP). There were 1,080 registered hazardous waste transporters in 1983.<sup>1</sup>

Transporters are required to comply with Section 7:26-7.5 of the state's hazardous waste regulations. These regulations include licensing requirements, transporters' manifest obligations, and requirements for emergency procedures.

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<sup>1</sup> Computer listings which identify hazardous waste generators, transporters, and treatment, storage, or disposal facilities in New Jersey are available at the Commission office. Due to the length of these listings, they have not been included in the text of this Facilities Plan.

Major Intrastate Routes

Figure 5-1 presents a map of New Jersey sectored into the following five multi-county regions.

<u>New Jersey Region</u>	<u>Counties</u>
I - Northwest	Sussex, Warren, Morris, Hunterdon, Somerset
II - Northeast	Passaic, Bergen, Union, Hudson, Essex
III - Central	Mercer, Middlesex, Monmouth
IV - Southwest	Burlington, Camden, Gloucester, Salem
V - Southeast	Ocean, Atlantic, Cumberland, Cape May

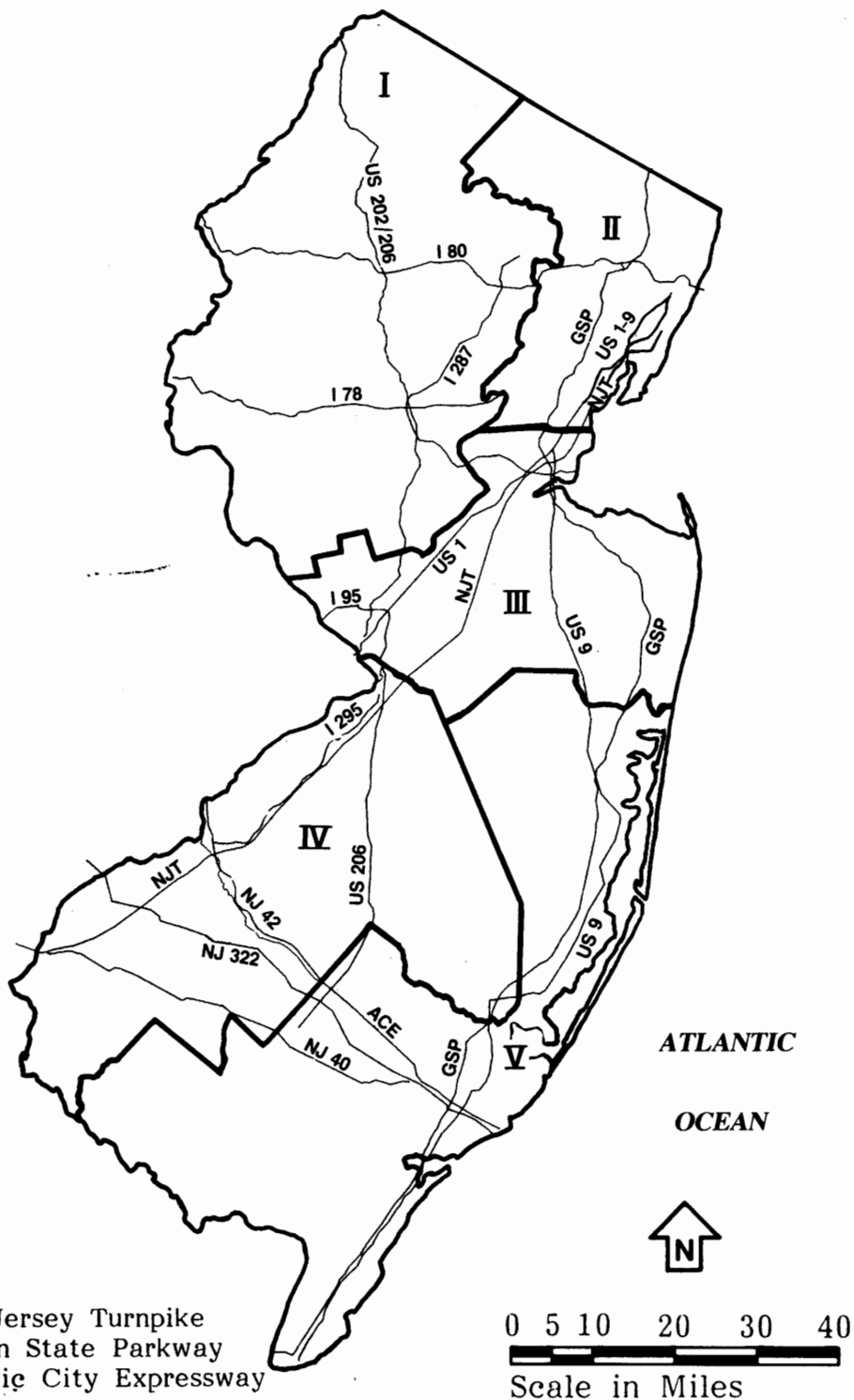
Delineated on that map are the primary routes used for transporting waste in and among the five regions. Table 5-1 also shows the primary connecting routes among regions. These routes were determined by surveying several New Jersey-registered hazardous waste transporters located in New Jersey and other states regarding the routes most often used when traveling in the five regions.<sup>2</sup> Transporters reported that they frequently use numbered highways - i.e., interstate, U.S., state, and county - since restrictions on these highways such as traffic lights and limited-weight bridges are infrequent. Although no numbered routes in New Jersey carry restrictions specifically regarding the transport of hazardous waste, the New Jersey Department of Transportation does recommend that hazardous materials and wastes be hauled over routes removed from population centers.

Manifested Waste Quantities Transported Over New Jersey Roads

Figure 5-2 shows five regional maps, each describing the estimated quantity of manifested hazardous waste transported in the following cases:

<sup>2</sup> Appendix B contains a list of the transporters surveyed and the questions asked.

### Figure 5-1 Primary Routes For Hazardous Waste Transportation\*



KEY

- NJT = New Jersey Turnpike
- GSP = Garden State Parkway
- ACE = Atlantic City Expressway

\*As determined by interviews with New Jersey transporters.



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TABLE 5-1

PRIMARY WASTE TRANSPORTATION  
ROUTES THROUGHOUT NEW JERSEY<sup>1</sup>

<u>To</u>	<u>From</u>				
	<u>I Northwest</u>	<u>II Northeast</u>	<u>III Central</u>	<u>IV Southwest</u>	<u>V Southeast</u>
I. Northwest	US 202/206 I-78 I-287	I-78 to US 9 I-80 to US 9 US 206 to US 9	I-287 I-78 to US 202/206	US 202/206 NJT	US 202/206 to I-78 to US 9
II. Northeast	I-78 to US 9 I-80 to US 9 US 202/206 to US 9	US 1 US 9 I-287	US 1 US 9 I-287	NJT US 1	US 9 to I-287
III. Central	I-287 US 202/206	US 1 US 9 I-287	US 1 US 9 NJT	NJT	GSP US 9
IV. Southwest	I-295 to US 202/206	NJT to US 1	NJT	I-295 US 322 NJ Rt 130	NJ Rt 322 US 40
V. Southeast	US 322 to to ACE to I-295 to US 202/206	GSP US 9 to	GSP US 9	NJ Rt 322 US 40	GSP NJ Rt 322 ACE US 40

<sup>1</sup> As determined by telephone survey of registered transporters.

Abbreviations:

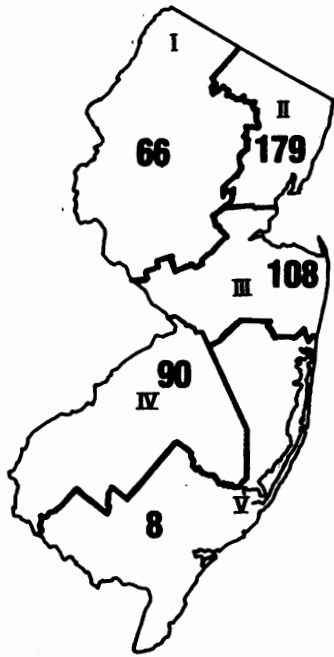
NJT - New Jersey Turnpike

GSP - Garden State Parkway. All truck traffic prohibited above Exit 105 (Eatontown) in Monmouth County.

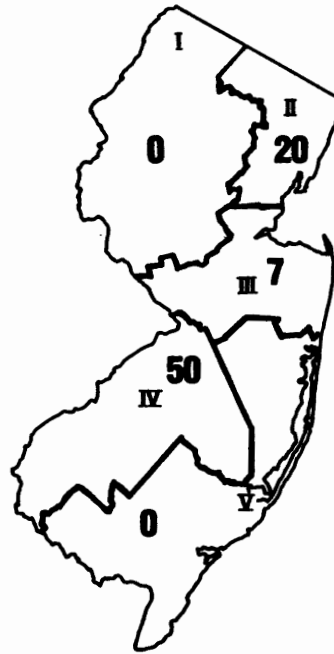
ACE - Atlantic City Expressway

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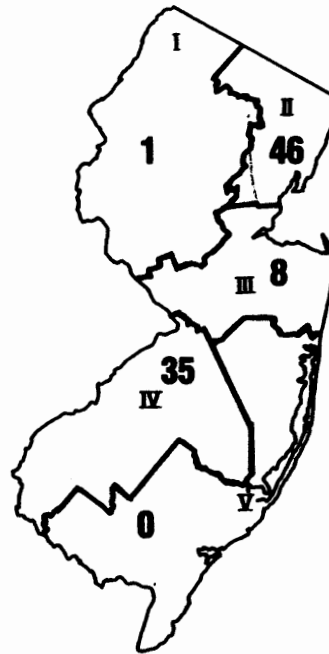
**Figure 5-2  
New Jersey Regional Manifested Waste  
Handling Statistics (In Thousands of Tons)**



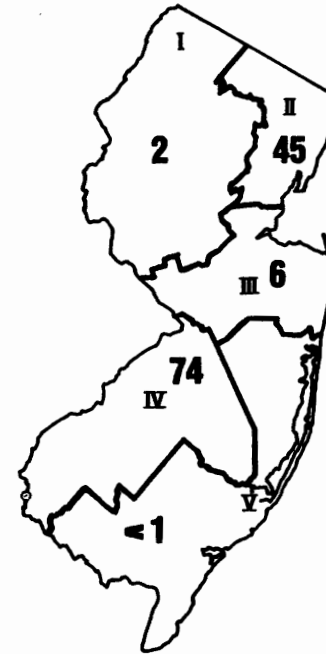
**Map A  
Manifested Waste  
Generated in Region**



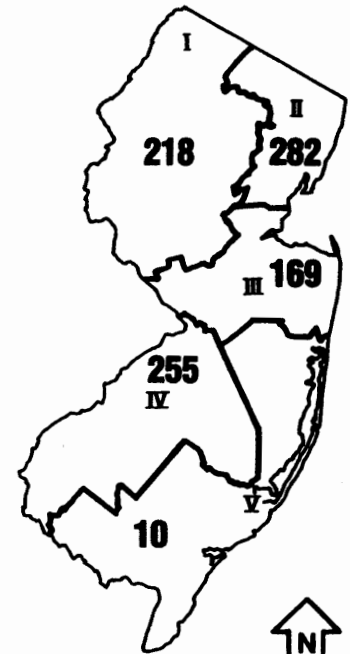
**Map B  
Manifested Waste  
Accepted at Regional  
Commercial Facilities  
From Same Region**



**Map C  
Manifested Waste  
Accepted at Regional  
Commercial Facilities  
From Other  
New Jersey Regions**



**Map D  
Manifested Waste  
Accepted at Regional  
Commercial Facilities  
From Other States**



**Map E  
Total Estimated  
Manifested Waste  
Transferred Through  
Region From  
In-State & Out-of-State  
Generators**



- Map A Waste generated by industries in the region and manifested for off-site management at any commercial facility, either in New Jersey or out of state
- Map B Waste accepted at commercial facilities in the region from the same region's generators only
- Map C Waste accepted at commercial facilities in the region from other New Jersey region's generators
- Map D Waste accepted at commercial facilities in the region from other states' generators
- Map E Total waste transported within or through the region, either from the region's or other generators, to the region's commercial facilities or to other regions' commercial facilities

Table 5-2 presents the same estimated quantities in chart form.

Major Interstate Points of Entry/Exit for Imported/Exported Manifested Wastes

States involved in interstate transportation of manifested hazardous waste with New Jersey were divided into three multi-state groupings:

<u>Multi-State Grouping</u>	<u>Included States</u>
North	Eastern NY, all New England
Midwest	Western and central NY, northern PA, OH, IL, IN, MI, MO, WI
South	Southern PA, MD, DE, VA, NC, SC, AL, KY, WV, GA

Figure 5-3 displays the major points of entry and exit to the three multi-state groupings. It shows for each multi-state grouping estimated quantities of manifested waste imported from and exported to New Jersey. Major points of entry/exit and quantities for New Jersey imports and exports are also shown in chart form below.

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TABLE 5-2

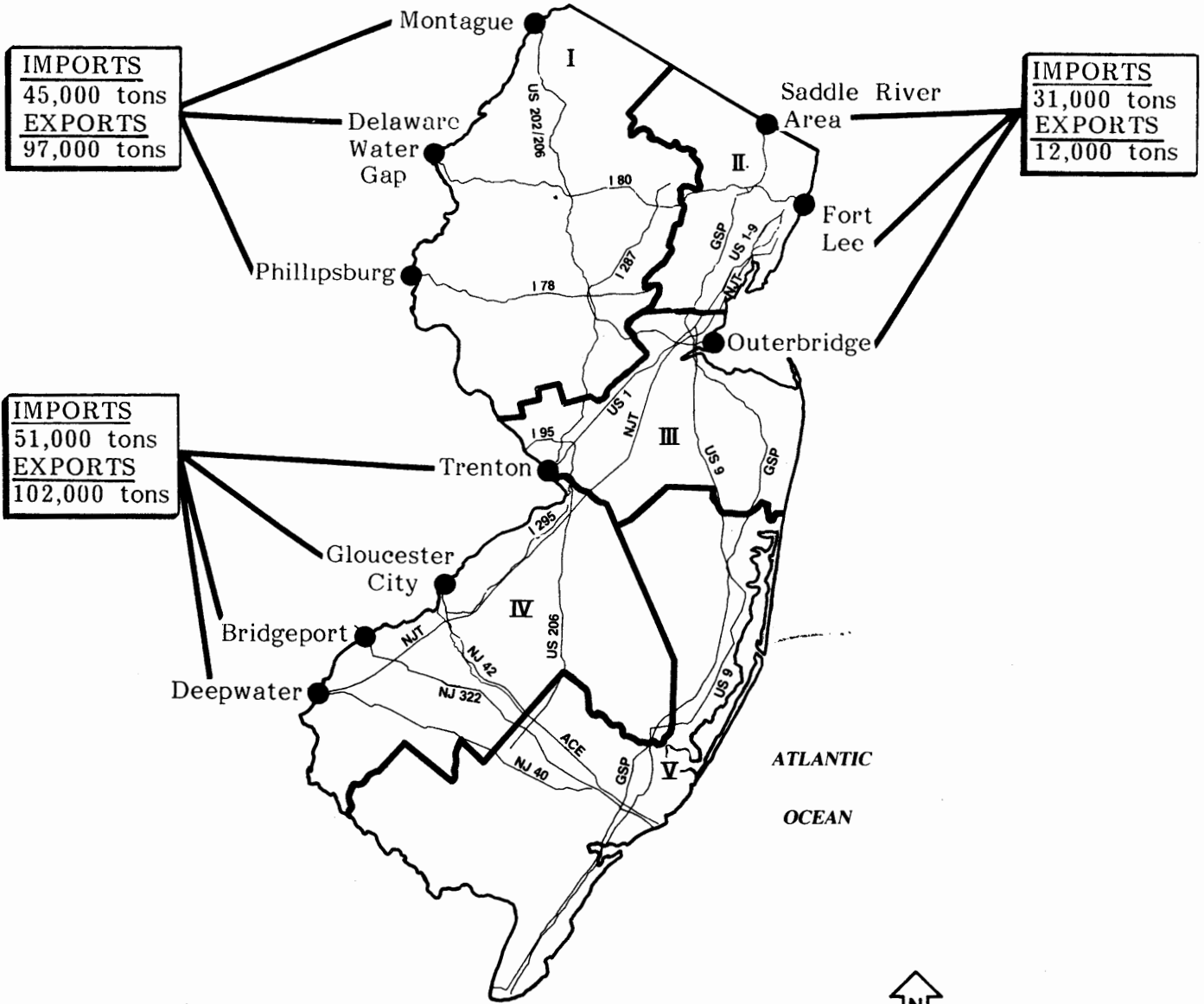
NEW JERSEY 1982 REGIONAL MANIFESTED  
WASTE HANDLING STATISTICS  
(in thousands of tons)

New Jersey Region	Manifested Waste Generated in Region	Manifested Wastes Accepted at Commercial Facilities in Region			Total Estimated Manifested Waste Transferred Through Region <sup>1</sup>
		From Same Region	From Other New Jersey Regions	From Other States	
I. Northwest	66	0	1	2	218
II. Northeast	179	20	46	45	282
III. Central	108	7	8	6	169
IV. Southwest	90	50	35	74	255
V. Southeast	8	0	0	<1	10

<sup>1</sup> From generators, to commercial facilities in region, or enroute to other regions.

**Figure 5-3  
Major Points of Entry/Exit For  
Imported & Exported Waste**

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Estimated 1982 Manifested Quantities

**KEY**

- NJT = New Jersey Turnpike
- GSP = Garden State Parkway
- ACE = Atlantic City Expressway

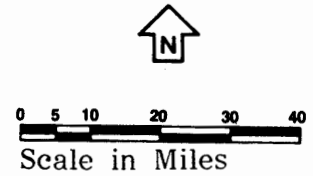


TABLE 5-3

**MAJOR INTERSTATE ENTRY/EXIT POINTS  
AND IMPORT/EXPORT MANIFESTED QUANTITIES**  
(quantities in thousands of 1982 tons)

<u>Multi-State Region</u>	<u>Major Points of Entry/Exit</u>	<u>Manifested Imports to New Jersey</u>	<u>Manifested Exports From New Jersey</u>
North	Saddle River Area Fort Lee Outerbridge	31	12
Midwest	Montague Delaware Water Gap Phillipsburg	45	97
South	Trenton Gloucester City Bridgeport Deepwater	51	102

**TRANSPORTATION COSTS****Typical Costs**

Tables 5-4 and 5-5 estimate capital investment, fixed annual, and per mile costs for transportation of bulk liquid wastes (Table 5-4) and drummed wastes (Table 5-5). They show average one-way trip times and how transporters typically calculate the costs of their services. The estimated capital, fixed, and variable annual costs used were verified with hazardous waste transporters.

The comparative costs for bulk liquid and drummed waste over distances of 50, 100, and 500 miles are repeated below:

<u>One-Way Distance</u>	<u>Bulk Liquids</u>		<u>Drums</u>	
	<u>Unit Cost</u>	<u>Total Transportation Cost for Truckload (20 tons)</u>	<u>Unit Cost</u>	<u>Total Transportation Cost for Truckload (18 tons)</u>
50 miles	\$3.95/mi	\$ 198	\$5.20/mi	\$ 260
100 miles	\$3.17/mi	\$ 317	\$3.92/mi	\$ 392
500 miles	\$2.41/mi	\$1,205	\$2.94/mi	\$1,470

TABLE 5-4

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**BULK WASTE TRANSPORTATION COSTS  
5,000-GALLON VACUUM TRAILER**

Item

## Capital Costs

Tractor (power unit)	\$55,000
Vacuum trailer (5,000 gallons)	35,000
	<u>\$90,000</u>

## Daily Capital Charge

\$88.00<sup>1</sup>

## Other Fixed Annual Costs

Labor overhead (@ 35% annual labor salary of \$22,000)	\$ 7,700
Labor supervision (@ 20% annual labor salary of \$22,000)	4,400
Insurance and taxes	4,500
Permits	2,000
General and administrative (@ 10% other fixed annual costs)	1,900
	<u>\$20,500</u>

## Daily Proration of Other Fixed Annual Costs

\$82.00

## Daily Labor Rate (@ \$22,000/yr, \$11/hr)

\$88.00

## Per Mile Charges

Fuel (3.8 mpg @ \$1.30/gal)	\$0.34/mi
Tires (estimate)	0.10/mi
Maintenance (estimate)	0.10/mi
General and administrative (10% of per mile charges)	0.05/mi
	<u>\$0.59/mi</u>

<u>One-Way Distance in Miles</u>	<u>One-Way Driving Time (hrs)</u>	<u>Loading/ Unloading Time</u>	<u>One-Way Layover Time</u>	<u>Cost Per Mile</u>
50	2	2	--	\$3.95 <sup>2</sup>
100	3	2	--	\$3.17
500	13	2	8	\$2.41 <sup>3</sup>

<sup>1</sup> Assumes 12% interest, 8 years operating life, 250 operating days per year.

<sup>2</sup> Assumes daily capital charges and daily proration of other fixed costs charges at 60% daily rate. 10% premium paid since a second 50-mile run cannot be made in the same day. The size of actual premium charged by the transporter depends on frequency of customers' business and whether a second shorter trip can be scheduled or loss of road miles made up by using truck for other activities, e.g., maintenance.

<sup>3</sup> Truck in use for 2 days. Includes charges for driver's overtime and personal expenses.

TABLE 5-5

DRUMMED WASTE TRANSPORTATION COSTS  
80 DRUMS ON FLAT BED TRAILER

<u>Item</u>				
Capital Costs				
	Tractor (power unit)		\$55,000	
	Flat bed trailer		25,000	
			<u>\$80,000</u>	
	Daily Capital Charges			\$80.00 <sup>1</sup>
Other Fixed Annual Costs				
	Labor overhead (@ 35% annual labor salary of \$22,000)		\$ 7,700	
	Labor Supervision (@ 20% of annual labor salary of \$22,000)		4,400	
	Insurance and taxes		4,500	
	Permits		2,000	
	General and administrative (@ 10% other fixed annual costs)		1,900	
			<u>\$20,500</u>	
	Daily Proration of Other Fixed Annual Costs			\$82.00
	Daily Labor Rate (@ \$22,000/yr, \$11/hr)			\$88.00
Per Mile Charges				
	Fuel charges (4.5 mpg @ \$1.30/gal)		\$0.22/mi	
	Tires (estimate)		0.10/mi	
	Maintenance (estimate)		0.10/mi	
	General and administrative (@ 10% FAC)		0.04/mi	
			<u>\$0.46/mi</u>	
<u>One-Way Distance in Miles</u>	<u>One-Way Driving Time (hrs)</u>	<u>Loading/Unloading Time</u>	<u>One-Way Layover Time</u>	<u>Cost Per Mile</u>
50	2	3	--	\$5.20 <sup>2</sup>
100	3	3	--	\$3.92
500	13	3	8	\$2.94 <sup>3</sup>

- <sup>1</sup> Assumes 12% interest, 8 years operating life, 250 operating days per year.  
<sup>2</sup> Assumes Daily Capital Charges and Daily Proration of Other Fixed Charges at full daily rate. Scheduling the flat bed truck for other drum work is much less likely than scheduling a vacuum trailer for other bulk work because of the lesser availability of drum work and the availability of smaller, less expensive vehicles to handle a small number of drums.  
<sup>3</sup> Truck in use for 2 days. Includes charges for driver's overtime and personal expenses.

Regarding liquid waste transported in bulk form, fifty-mile (one-way) distances have the highest per mile cost because a premium is usually paid by the customer for employing a truck less than a full day and the driver's wages are distributed over fewer miles for the time involved. Five hundred mile (one-way) distances result in the lowest per mile cost because longer distances can take advantage of more efficient driving time and other economies of scale. Even counting DOT-required non-driving time for the driver and overtime rates, a 500-mile trip only employs equipment for two days.

Drum transportation costs are higher than those for bulk liquid for like distances due mostly to the additional time and effort required to load drums. Eighty drums equal a full truckload and each drum must be loaded individually.

## Survey of Costs

The consultant contacted fourteen hazardous waste haulers to verify the calculated typical costs. The haulers interviewed were of three types: (1) nationwide waste carriers, (2) local waste carriers, and (3) common carriers. An average of the loaded truck-mile costs reported are summarized below:

### LOADED TRUCK-MILE COSTS

Type of Waste Transporter Interviewed	<u>Bulk, One-Way Distance</u>			<u>Drummed, One-Way Distance</u>		
	<u>50 mi</u>	<u>100 mi</u>	<u>500 mi</u>	<u>50 mi</u>	<u>100 mi</u>	<u>500 mi</u>
Nationwide Waste Carrier	\$3.42	\$3.00	\$2.50	\$6.00	\$4.00	\$2.70
Local Waste Carrier	\$4.50	\$3.00	\$2.40	\$5.00	\$3.50	\$2.90
Common Carrier	\$3.04	\$2.40	\$2.26	\$6.64	\$4.20	\$2.62
Consultant's Estimate	\$3.95	\$3.17	\$2.41	\$5.20	\$3.92	\$2.94

Local waste carrier costs for fifty-mile, one-way distances tend to be higher because of the need to charge higher premiums for use of a truck less than a full day. Having a smaller network of customers and generally smaller businesses overall, higher premiums are necessary to recover the costs of

the capital equipment. Local waste carriers, however, offer lower costs for drum transportation for shorter distances. Drummed waste reportedly constitutes a greater portion of their business. Their familiarity with their own local markets allows them to develop greater coordination in the management and transport of containers.

## Effect of Deregulation

The present cost differential between nationwide waste carriers and common carriers is not quite so great as it was immediately following the Interstate Commerce Commission's August 1982 so-called "deregulation". Initially, the ICC's declaratory order that hazardous waste of no economic value destined for disposal was outside its jurisdiction tripled the amount of equipment available for waste transport and introduced a new pricing system.<sup>3</sup> However, since that time, many common carriers unsophisticated in the transportation of hazardous waste have left the market, while others have undergone training to comply with previously unfamiliar regulations and have consequently raised their prices above the standard tariff to reflect those additional costs. This has caused prices to stabilize closer to their pre-deregulation levels.

## SIGNIFICANCE OF TRANSPORTATION IN GENERATORS' WASTE MANAGEMENT DECISIONS

### Composite Transportation - Commercial Facility Costs

Table 5-6 displays the costs for various hazardous waste treatment/disposal methods plus transportation at distances of 50, 100, and 500 miles from New Jersey. Costs are given for both bulk wastes and drums. This table presents transportation costs in the only appropriate form for accurate evaluation - together with the costs for the waste treatment or disposal method selected.

Table 5-7 shows that transportation costs form a small part of total incineration costs but a large part of aqueous waste treatment costs. This supports the Chapter Three findings that aqueous treatment facilities in New Jersey receive most of their waste from nearby generators. In contrast, the Rollins incineration facility received waste from generators in 21 states. Given the present variability among prices

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<sup>3</sup> Common carriers typically bill customers according to the standard tariff established for commodity transportation.

TABLE 5-6

## TOTAL HAZARDOUS WASTE MANAGEMENT COSTS

	Bulk (20 tons)			Drummed (18 tons)		
	<u>50 miles</u>	<u>100 miles</u>	<u>500 miles</u>	<u>50 miles</u>	<u>100 miles</u>	<u>500 miles</u>
Landfill:						
Bulk @ \$60/ton*	\$ 1,400	\$ 1,500	\$ 2,400	X	X	X
Drums @ \$150/ton*	X	X	X	\$ 3,000	\$ 3,100	\$ 4,200
Incineration:						
Liquid @ \$150/ton*	\$ 3,200	\$ 3,300	\$ 4,200	\$ 3,000	\$ 3,100	\$ 4,200
Solid and Very Toxic Liquids @ \$600/ton	\$12,200	\$12,300	\$13,200	\$11,000	\$11,200	\$12,200
Aqueous Waste Treatment: @ \$25/ton*	\$ 700	\$ 800	\$ 1,700	\$ 700	\$ 800	\$ 1,900

\* Typical costs provided for purposes of analysis; actual costs range considerably. Source: Booz-Allen and Hamilton, Inc. 1982 report on Commercial Hazardous Waste Management Industry, prepared for U.S. EPA Office of Policy Analysis.

TABLE 5-7

TRANSPORTATION COST AS PERCENT OF  
WASTE MANAGEMENT COSTS IN TABLE 5-6

	<u>Bulk (20 tons)</u>			<u>Drummed (18 tons)</u>		
	<u>50 miles</u>	<u>100 miles</u>	<u>500 miles</u>	<u>50 miles</u>	<u>100 miles</u>	<u>500 miles</u>
Landfill:						
Bulk @ \$60/ton*	14%	20%	50%	X	X	X
Drums @ \$150/ton*	X	X	X	10%	13%	36%
Incineration:						
Liquid @ \$150/ton*	6%	9%	29%	10%	13%	36%
Solid and Very Toxic Liquids @ \$600/ton*	2%	2%	9%	3%	4%	12%
Aqueous Waste Treatment: @ \$25/ton*	29%	38%	71%	43%	50%	79%

\* Typical costs provided for purposes of analysis; actual costs range considerably. Source: Booz-Allen and Hamilton, Inc. 1982 report on Commercial Hazardous Waste Management Industry, prepared for U.S. EPA Office of Policy Analysis.

charged by different types of commercial facilities (and to a lesser extent by different facilities of the same type), generators have long since stopped assuming that facilities located considerable distances from their plants were "too expensive" by virtue of the transportation costs.

Figure 5-4 shows the out-of-state commercial facilities currently receiving large quantities of non-aqueous New Jersey waste. The most frequently utilized out-of-state commercial facilities by type, other than aqueous treatment facilities, are landfills. Cement kilns and incinerators are the second and third most frequently utilized facilities by type, respectively.

### Importance of Costs in Selecting Facilities

A survey of generators prepared for the Delaware River Basin Commission and the New Jersey DEP<sup>4</sup> examined the importance of economic factors in selecting off-site facilities. The study reported that costs of transportation and disposal are important, but second to potential future liability posed by a facility to the generator. In other words, the generator first screened candidate facilities against selected risk criteria; facilities deemed to pose an acceptable risk were then evaluated with regard to total cost of transportation and disposal.

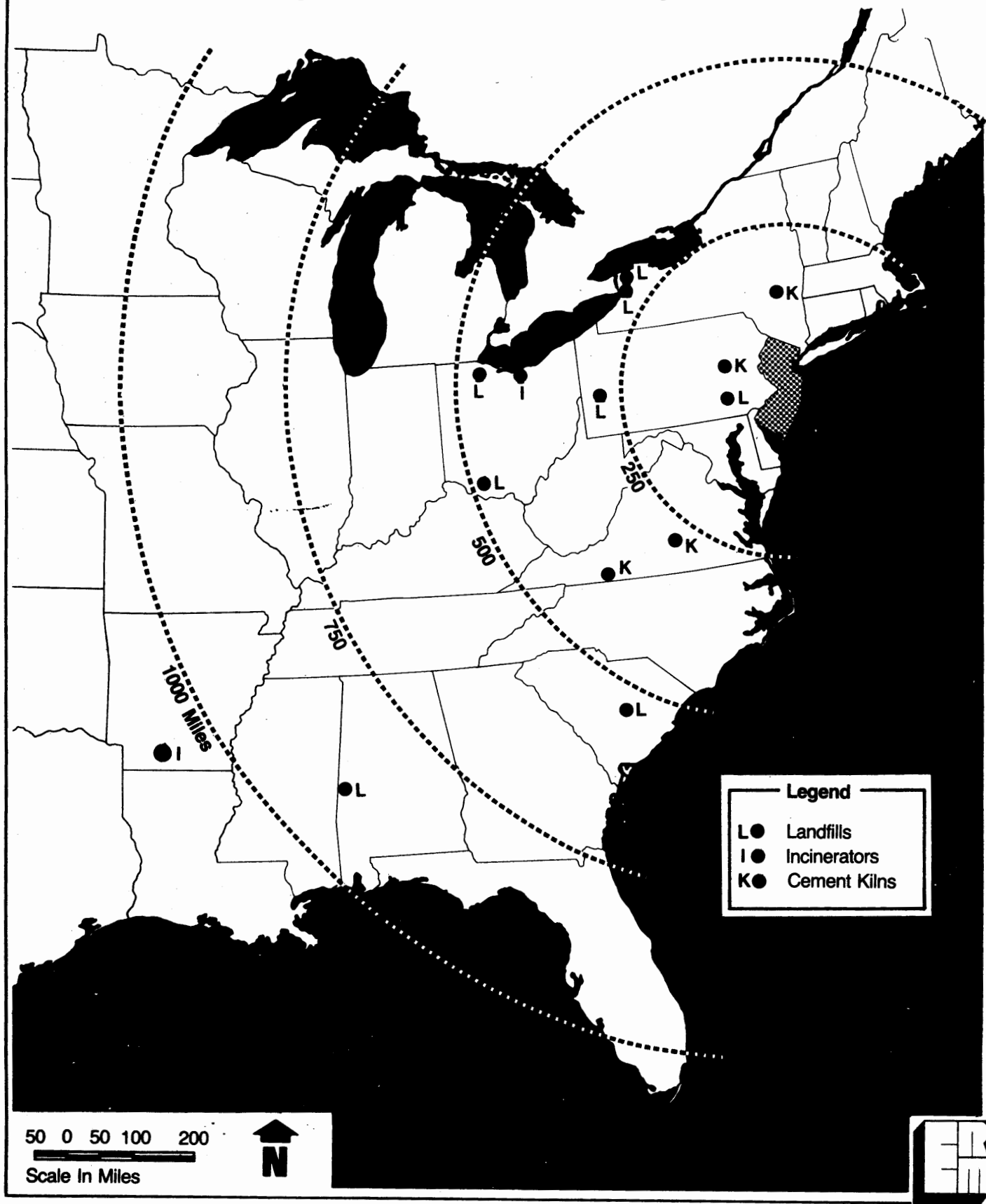
That 1980 report suggested that placing liability considerations before direct costs would become more widespread among generators after the implementation of RCRA. This has proven true for the most part. Transporters who, as part of their services, broker disposal/treatment facilities for their customers reported that generators are increasingly asking for the regulatory status and compliance information of the suggested facilities, not only the facilities' prices.

Some generators have wastes which can either be incinerated or disposed in landfills. For generators that consider the liability of incineration and landfill disposal to be about equal for their waste, the decision on which facility to use is clear. The difference between \$4,200 to landfill drummed solids 500 miles away and \$12,000 to incinerate solids 50

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<sup>4</sup> "Importance of Economic Factors to Onsite-Offsite Hazardous Waste Management Decisions." Prepared by Booz-Allen and Hamilton, Inc. under subcontract to Environmental Resources Management, Inc. January 1980.

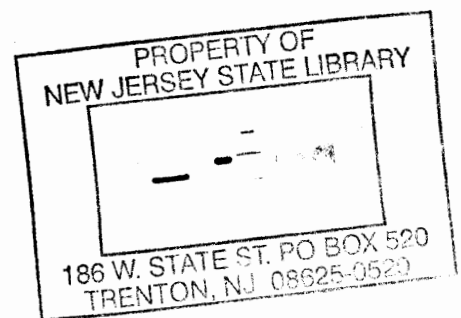
**Figure 5-4**  
**Commercial Facilities Receiving Significant Amounts of Non-Aqueous Waste from New Jersey Generators** **DRAFT**



miles away is quite compelling. The fact that \$1,500 of the landfilling cost is transportation is not considered in isolation.

The cost differential between landfills and higher treatment technologies certainly applies to existing landfills. The prices charged to customers by new landfills are likely to be higher than those charged by existing ones. New landfills will encounter higher capital investment costs, which will be passed along to the customer in the form of higher prices. Thus, it is possible that new landfills located closer to some generators but having a greater disposal price than those of existing landfills will not get the generators' waste; the new landfill's overall price including transportation will still be higher. This seemingly was the case in Maryland, where a state authority recently opened a hazardous waste landfill which is now closed because of low business volume.

Chapter Six, which predicts the new commercial facility capacity necessary to meet New Jersey's needs, will consider the information presented in this Chapter to develop more definitive conclusions on factors influencing generators' waste management decisions.



## CHAPTER SIX

## NEW FACILITIES NEEDED BY NEW JERSEY

**OBJECTIVE****Shortfall Between Supply and Demand**

This Chapter defines the new facilities needed in New Jersey. One of the important considerations is the shortfall between "supply" (the capacity of existing commercial facilities) and "demand" (the future quantity of waste expected to be manifested).

**Supply**

It is assumed, as explained in Chapter Three, that the majority of existing commercial facilities in New Jersey will continue in operation and will continue to receive, in 1988, the same quantity of waste from other states as in 1983. That is, the "supply" of available capacity for managing New Jersey waste equals the existing capacity less that portion used for waste from other states.

**Demand**

"Demand" is equal to the 1988 projections of currently manifested waste (Chapter Two) plus the previously non-manifested waste which is expected to shift off site in 1988 (Chapter Four). That is, all waste expected to be manifested by New Jersey generators, including that currently being exported, will serve as demand for New Jersey capacity. This reflects a goal that New Jersey should manage waste from its industry without undue reliance on facilities in other states.

**Alternative Cases**

To better understand the alternatives for managing hazardous waste in New Jersey, the Commission selected three alternative cases for analysis:

1. Market-Driven Case - Wastes are assigned to technologies essentially based on how wastes would be managed in the free market, i.e., the generators' assessments of risk and cost of regulatorily permitted management methods.
2. Maximum Treatment Case - Wastes are assigned to technologies in accordance with the Commission's proposed waste management hierarchy:
  - a. technologies that recover the materials in the waste for reuse;
  - b. technologies that recover the energy value of the waste;
  - c. technologies that totally destroy the hazardous portion of the waste;
  - d. technologies that decrease the volume and/or hazard of the waste; and
  - e. technologies that isolate the waste from the environment.
3. Maximum Use of Non-Commercial Capacity - Wastes that cannot be accommodated by existing New Jersey commercial facilities are assigned to existing excess on-site, non-commercial New Jersey facilities based on estimates of such excess capacity in the same manner as the market-driven case.

For each case, this Chapter examines: (a) capacity shortfalls, (b) cost to New Jersey generators, (c) the conformity of the specified technologies with the legislative mandate of the Commission, and (d) the prospects for private development of the needed facilities.

## ASSIGNMENT OF WASTES TO TECHNOLOGIES

### Total Demand

Table 6-1 shows total demand for commercial facilities, organized by waste type and expressed as the sum of the 1988 projections from Chapters Two and Four. This table includes:

TABLE 6-1

1988 PROJECTED DEMAND FOR  
COMMERCIAL FACILITIES IN NEW JERSEY  
(In Thousands of Tons)

<u>Treatability Categories</u>	<u>1988 Projected Demand From Manifest Data (From Chapter Two)</u>	<u>1988 Additional Projected Demand (From Chapter Four)</u>	<u>1988 Total Projected Demand</u>
Aqueous Liquids	215	6	221
Solvents	33		33
Oils	73	5	78
Other Liquids	26	15	41
Sludges and Solids	78	91	169
Unexamined	<u>6</u>	<u>—</u>	<u>6</u>
TOTAL	431	117	548

- Projections of normalized waste manifested in 1981, 1982, and 1983, accounting for economic recovery/growth and source reduction.
- Projections of previously non-manifested waste to reflect cleanup of inactive sites, reduced burning of waste in on-site boilers, implementation of pretreatment standards and effluent limitations for industrial wastewater, and closure of on-site facilities.

It should be noted that the 62,000 tons of solids and sludges, N.O.S. projected in Chapter Four are prorated among the other types of solids and sludges in the same ratio as projected in Chapter Two.

### Summary of Waste Assignments

The assignment of waste types to appropriate technologies for the alternative cases is summarized in Table 6-2. The summary uses the existing waste management pattern as a basis, showing how the alternative cases depart from the technologies used by New Jersey generators in 1983. The assignment to technologies for the case which makes maximum use of non-commercial capacity is the same as for the market-driven case.

### MARKET-DRIVEN WASTE ASSIGNMENTS

Table 6-3 shows the assignment of waste quantities by type to technologies under the market-driven case. The assignment closely follows the 1983 distribution, which reflects generators' selection of alternatives which they believe best met their needs in 1983 in terms of cost, risks, and liabilities. Thus, the market-driven case is the best reflection of how wastes would be handled in the free market.

### Changes from 1983

The market-driven case shows in Table 6-3, however, some changes between types of facilities used in 1983 in other states and those which could be developed in 1988 in New Jersey. As described below, these changes typically reflect either more stringent regulations in New Jersey or the technical inability to develop the same type of facility in New Jersey.

TABLE 6-2

## SELECTED MANAGEMENT METHODS BY WASTE CATEGORY

<u>Waste Type</u>	<u>Typical Management Methods Used By Generators in 1983</u>	<u>Selected Market-Driven Management Methods</u>	<u>Selected Maximum Treatment Management Methods</u>
<b>AQUEOUS LIQUIDS</b>			
Aqueous inorganic wastes	Aqueous treatment	Aqueous treatment	Aqueous treatment
Aqueous organic wastes	Aqueous treatment	Aqueous treatment	(1) 10% - Advanced thermal destruction 90% - Aqueous treatment
<b>SOLVENTS</b>			
Solvents	Solvent recovery	Solvent recovery	Solvent recovery
<b>OILS</b>			
Automobile oils	Fuel blending	Fuel blending	(2) 90% - Waste oil recovery 5% - Fuel blending 5% - Incineration
Industrial oils	Fuel blending Cement kiln	Fuel blending	(3) 50% - Waste oil recovery 25% - Incineration 25% - Fuel blending
Fuel oil	Fuel blending	Fuel blending	Fuel blending
Oils, N.O.S.	Fuel blending	Fuel blending	(4) 50% - Waste oil recovery 25% - Incineration 25% - Fuel blending

TABLE 6-2 (continued)

<u>Waste Type</u>	<u>Typical Management Methods Used By Generators in 1983</u>	<u>Selected Market-Driven Management Methods</u>	<u>Selected Maximum Treatment Management Methods</u>
<b>OTHER LIQUIDS</b>			
Combustible liquids	Incineration Cement kiln Fuel blending	Fuel blending Incineration	(5) 80% - Incineration 10% - Fuel blending 10% - Solvent recovery
Liquids with metals	Aqueous treatment	Aqueous treatment	Aqueous treatment
Reactive liquids	Aqueous treatment	Aqueous treatment	Advanced thermal destruction
Corrosive liquids	Aqueous treatment	Aqueous treatment	Aqueous treatment
PCB liquids	PCB chemical treatment Incineration Landfill	Incineration	Incineration
<b>SOLIDS AND SLUDGES</b>			
Heavy metal solids and sludges	Landfill Pyrometallurgical metals recovery	Landfill Landfill with stabilization Pyrometallurgical metals recovery	(6) 5% - Central metals recovery 5% - Pyrometallurgical metals 90% - Landfill with stabilization
Oily sludges	Fuel blending Landfill	Fuel blending Land treatment	Incineration
Paint residues	Landfill Solvent recovery	Landfill with stabilization Solvent recovery	(7) 35% - Solvent recovery 65% - Incineration

TABLE 6-2 (continued)

## FOOTNOTES

- (1) Based on the assumption that 10 percent of the aqueous organic wastes will have organics at a concentration too high for biological aqueous treatment yet too low for conventional incineration and/or the waste constituents inhibit biological treatment. These wastes are candidates for advanced thermal destruction.
- (2) Based on the following assumptions about automobile oils: 90 percent high enough quality to be recovered for lubricating value; 5 percent mixed or otherwise non-recoverable (can be blended for fuel); 5 percent contain large amounts of water or toxic contaminants preventing use as fuel (must be incinerated).
- (3) Based on the following assumptions about industrial oils: 25 percent too contaminated even for use as fuel (requires incineration); 25 percent mixed, contaminated, or otherwise rendered non-recoverable (can be blended for fuel); 50 percent high enough quality to be recovered for lubricating value.
- (4) Same distribution as industrial oils (see (3) above).
- (5) Based on approximate 1983 distribution of combustible liquids: less than 1 percent halogenated solvents (25 percent recoverable/75 percent require incineration); 28 percent non-halogenated solvents (25 percent recoverable/25 percent blended for fuel/50 percent require incineration); 71 percent listed as ignitable liquid (50 percent blended for fuel/50 percent require incineration) or other combustible liquids (20 percent can be blended for fuels/80 percent must be incinerated).
- (6) Based on approximate 1983 distribution of heavy metal solids and sludges: 23 percent heavy metal sludges (43 percent from fabricated metals, electrical machinery, and transportation equipment industries -- most likely from electroplating or metal finishing operations [25 percent with segregated streams that can go to a central metals recovery facility/75 percent with mixed metal sludges that must be landfilled]/57 percent from other industries [must be landfilled]); 77 percent solids with metals (15 percent from steel production furnaces [all currently

going to pyrometallurgical metal recovery]/43 percent solids with lead [assume 10 percent can go to pyrometallurgical metal recovery/90 percent must be landfilled]/42 percent other solids with metals [must be landfilled]).

Additional quantities of heavy metal sludges can be expected in 1988 from two sources. First, 22,000 tons of sludges from the pretreatment of industrial wastewaters can be expected. Approximately 10 percent of this is from electroplating and metal finishing wastewaters and can go to a central metals recovery facility. The remainder requires landfilling. Second, 22,000 tons of sludges with metals will come from cleanup of abandoned sites -- all of this must be landfilled.

The total breakdown is then: 10 percent amenable to metal recovery/90 percent must be landfilled.

- (7) Based on 1983 management of paint residues: 100 percent sludges (65 percent to landfills [assigned to incineration]; 35 percent sent for solvent recovery).
- (8) Based on ~~approximate~~ 1983 distribution of corrosive sludges and solids: 5 percent sludges (can go to aqueous treatment)/95 percent solids (must be landfilled).
- (9) Based on approximate 1983 distribution of sludges and solids with organics: 27 percent sludges (15 percent contaminated soils [require advanced thermal destruction to destroy organics]/85 percent other sludges that can be incinerated); 73 percent solids with organics (27 percent still bottoms, PCB wastes, or generally ignitable solids [that can be incinerated]/48 percent oily wastes such as oil spill cleanup waste or API separator sludges [can go to a land treatment facility]/8 percent contaminated soils ([require advanced thermal destruction to destroy organics]/17 percent empty containers or unspecified solids [must be landfilled])).

TABLE 6-3

ASSIGNMENT OF PROJECTED 1988 MANIFESTED  
 NEW JERSEY WASTES - MARKET-DRIVEN CASE  
 (In Thousands of Tons)

Waste Type	Materials Recovery		Energy Recovery	Treatment/Destruction			Disposal	
	Solvent Recovery	Pyrometallurgical Metal Recovery	Fuel Blending	Aqueous Treatment	Incineration	Land Treatment	Stabilized Land Emplacement	Unstabilized Land Emplacement
AQUEOUS LIQUIDS								
Inorganic				111				
Organic				110				
SOLVENTS								
Halogenated	10							
Non-Halogenated	7							
Mixed Solvents, NOS	16							
OILS								
Automobile			32					
Industrial			33					
Fuel			9					
Oils, NOS			4					
OTHER LIQUIDS								
Combustible			22			10		
Toxic with Metals				1				
Reactive				1				
Corrosive				<1				
PCB Liquids						7		

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TABLE 6-3 (continued)

Waste Type	Materials Recovery		Energy Recovery	Treatment/Destruction			Disposal	
	Solvent Recovery	Pyrometallurgical Metal Recovery	Fuel Blending	Aqueous Treatment	Incineration	Land Treatment	Stabilized Land Emplacement	Unstabilized Land Emplacement
SLUDGES AND SOLIDS								
Heavy Metals		3					46	22
Oily Paint	1		20			3	2	
Combustible					13			
Corrosive								6
Reactive								2
Organics					7*	17		25
Other								2
UNEXAMINED				2	2			2
ADDITIONAL RESIDUALS					6		4	9
TOTAL	34	3	120	225	45	20	52	68

\* Includes PCB wastes -- must go to a PCB-permitted incinerator.

## Landfilled Wastes

Wastes currently going to landfills in other states would largely go to a new New Jersey land emplacement facility in this case. Some of these wastes, however, could not be disposed of by land emplacement in New Jersey because of existing or expected New Jersey DEP restrictions on land disposal organic wastes, liquids, and certain sludges.

Only a small volume of liquid wastes was landfilled in 1983. The halogenated solvent wastes and the liquid PCB wastes are reassigned to incineration. Such an incinerator must be permitted to burn PCBs.

The oily sludges that were landfilled in 1983 are sent to a land treatment facility in this case. These are generally American Petroleum Institute (API) separator sludges, a waste that is very commonly landfarmed.

Solids and sludges with organics, which were nearly all landfilled in 1983, were assigned differently in this case. The halogenated sludges and still bottoms, as well as the PCB solids, are assigned to incineration because they are the wastes most likely to be prohibited at a New Jersey land disposal facility. The oily sludges, oily spill cleanups, and other landfilled oily wastes are assigned to land treatment.

Finally, the non-halogenated sludges and still bottoms, spill cleanups, and other non-specific chemical solids and sludges all continue to go to land emplacement.

## Wastes Sent to Deep-Well Injection Facilities

Injection of wastes into underground wells is improbable in New Jersey due to the lack of suitable geologic conditions. Waste currently sent by New Jersey generators to deep-well facilities in other states is assigned to aqueous waste treatment in this case. It is assumed that fifty percent of the 1983 aqueous waste identified in Chapter Three as going to "other" facilities was going to deep wells.

## Wastes Sent to Cement Kilns

Four cement kilns currently accept wastes from New Jersey for burning as supplementary fuel. Since no cement kilns exist in New Jersey, these wastes are reassigned in this case to fuel

blending and incineration facilities. In 1983, the combustible liquids going to cement kilns broke down in the following way: 1 percent contained halogenated compounds, 17 percent contained only non-halogenated compounds, and the halogen content of the remaining 82 percent was unknown. Non-halogenated wastes and low-concentration halogenated wastes can be blended for fuel. Wastes with a higher halogen content complicate fuel blending and must be incinerated.

It is assumed that none of the halogenated waste and 100 percent of the non-halogenated wastes are amenable to fuel blending. The wastes with undetermined halogen content are assumed to have the same halogenated to non-halogenated ratio (1:17) as the specified wastes and are assigned accordingly.

All of the oily waste that went to cement kilns in 1983, a relatively small amount, is assigned to fuel blending in this case.

### Stabilization of Landfilled Wastes

Heavy metal solids and sludges generated by manufacturing industries are stabilized prior to landfilling in this case. Heavy metal solids and sludges expected to be generated from site cleanups and shipped to commercial facilities represent wastes for which stabilization is not appropriate. The estimates in Chapter Four of these site cleanup wastes exclude those wastes amenable to stabilization, since they would most likely be stabilized and managed on site. For this reason, heavy metal solids and sludges from site cleanups that are expected to represent new demand for off-site capacity are sent directly for land emplacement.

Paint residues assigned to land emplacement in this case are stabilized prior to disposal, although stabilization could be complicated by the presence of organic compounds. Finally, the additional incinerator ash from the burning of solvent recovery and fuel blending residuals is assumed to contain metals and, therefore, is stabilized prior to land emplacement.

### Changes in Residual Quantities

Table 6-4 shows the change from 1983 to the 1988 market-driven case in waste quantities handled by new or existing New Jersey facilities. Table 6-4 also shows the resulting increase in the quantities of residuals from those facilities and their

TABLE 6-4

ADDITIONAL RESIDUALS MANAGEMENT IN 1988  
MARKET-DRIVEN CASE

<u>Technology/ Facility</u>	<u>Additional Waste Handled in New Jersey In 1988 Over 1983 (tons)</u>	<u>Additional Residuals Generated (tons)</u>	<u>Selected Management Method for Residuals</u>
Aqueous Treatment	86,000	4,300 ( 5%) <sup>1</sup>	Land Emplacement
Solvent Recovery	11,000	1,000 ( 9%) <sup>2</sup>	Incineration
Fuel Blending	45,000	4,500 (10%) <sup>1</sup>	Incineration
Incineration	36,000	7,000 (20%) <sup>3</sup>	Land Emplacement
Metal Recovery	3,000	0 <sup>4</sup>	

<sup>1</sup> Derived from Technical and Economic Analysis of Hazardous Waste Management Facilities, prepared by Environmental Resources Management, Inc. for Minnesota Waste Management Board, October 1983.

<sup>2</sup> Based on 1983 manifested receipts and residual shipments by New Jersey solvent recovery facilities.

<sup>3</sup> Based on manifested receipts and off-site shipments from Rollins incinerator for 1981, 1982, and 1983.

<sup>4</sup> Residual produced is non-hazardous.

presumed distribution among subsequent management facilities. The distribution is based on the management method selected for these residuals by facility operators in 1983.

### **MAXIMUM TREATMENT CASE**

The assignment of wastes to technologies under the maximum treatment case is based strictly on the characteristics of the wastes and the hierarchy of treatment technologies outlined in the previous section. Cost is not an important consideration, as it is with the market-driven case. Table 6-5 shows the assignment of 1988 manifested wastes to technologies in this case.

Where existing New Jersey facilities can manage a waste in the best applicable way, wastes will be assigned to those technologies. However, if the appropriate management method for a waste is a technology for which no facility exists in New Jersey, then that waste automatically represents demand for a facility of that type even if it is currently going to another type of facility in New Jersey.

### **New Technologies**

Some technologies used in this case were discussed in Chapter Three but not used in the market-driven case. Three terms, advanced thermal destruction, central metals recovery, and waste oil recovery, require further explanation.

#### **Advanced Thermal Destruction**

This category of treatment includes technologies which have the potential for greater destruction of organic constituents, or which are more appropriate for certain wastes, than conventional rotary kiln incineration. Such technologies include supercritical water, plasma arc pyrolysis, molten salt destruction, wet air oxidation, and high-temperature fluid wall incineration. Most of these are still undergoing development, and their full potential is undefined. Rather than specifying a particular technology, the broader category "advanced thermal destruction" is used, since selecting a specific technology will require additional data beyond the scope of this study.

## Ion Exchange Metals Recovery

Several areas of the country, including the New York City/New Jersey port area, are investigating the possibility of a central facility to recover the heavy metals that electroplaters and metal finishers will be required to remove from their wastewater discharges. Using such a facility would require segregating metal wastewater streams and placing ion exchange canisters in the generators' process lines. The ion exchange medium in the canisters pulls metals from the wastewater. Exhausted canisters are shipped to a central facility where the metals are recovered and the ion exchange medium regenerated.

Development of such a facility would require a large amount of cooperation among electroplaters and metal finishers but would greatly decrease the amount of heavy metal sludge generated from conventional pretreatment, as projected in Chapter Four. The New York Port Authority is currently considering financing the development of such a facility.

## Waste Oil Recovery

Waste oil recovery leads to recovery of a product with lubricating value near or equivalent to the virgin material. (It does not refer to the blending of oils as fuels). The acid/clay process for oil recovery is less popular now and the vacuum distillation process is more prevalent. However, a new commercial oil recovery facility would likely combine several technologies under the general category of re-refining.

## Waste Reassignments

Some wastes are assigned to different management methods in the maximum treatment case than they were in the market-driven case. These reassignments occur when a "higher" form of management (e.g., recovery of material versus recovery of energy value) exists for a waste but was not utilized in the market-driven case. These reassignments are described below.

## Aqueous Wastes

In general, aqueous wastes have no recovery value and are successfully treated, either by neutralization, oxidation/reduction, biological treatment, or some other method, at aqueous treatment facilities. A small portion of aqueous organic wastes contain organics at a concentration which may

interfere with biological treatment. Although they went to aqueous treatment facilities in 1983, these wastes have been assigned in this case to advanced thermal destruction, e.g., supercritical water, to assure destruction of the organic portion.

### Oils

It is anticipated that waste oils will be more strictly regulated in the future and that more effort will be put into recovering oils for reuse. Almost all of these oils were blended for fuels in 1983.

The recoverability of oils is a function of the type of oil, the types of contaminants in the oil, the source, and the technology applied to reclaim the oil as a fuel. It is assumed that nearly all manifested automobile crankcase oil can be recovered, with only small amounts requiring fuel blending or incineration. Waste industrial oils are of varied types including cutting and machining oils, cooling oils, lubricating oils, and others. Some of them are generated in significant quantities as unmixed, recoverable oils. Others are mixed with solvents or other oils, making recovery difficult. These oils do, however, have fairly high heating values and can be blended for fuels. Finally, some oils either have a low heating value or are contaminated with toxic metals or organics and must be incinerated. Waste fuel oils are simply blended into fuels in this case. Oils not otherwise specified are similar to industrial oils from the same sources and are handled in the same way.

### Other Liquids

Combustible Liquids. Some generators in 1983 sent potentially recoverable solvents or wastes that could have been blended as fuels to incinerators or cement kilns. This may have been due to previous contractual arrangements, geographic location, unfamiliarity with recovery alternatives, or the fact that the waste solvents were contaminated to the degree that they had more value as fuels than recoverable solvents. In this case, it is assumed that 25 percent of the halogenated and non-halogenated solvents listed as combustible liquids are potentially recoverable, ignoring costs. Another 25 percent of the non-halogenated solvents are assumed to have sufficient BTU value to be blended as fuels. The remaining solvents would require incineration. Almost half of all the wastes in this category are not described as solvents; most are simply listed on the manifests as "ignitable". Since little is known

about their quality, it is assumed that they are split twenty percent to eighty percent between those that can be blended for fuels and those that must be incinerated.

Reactive Liquids. Liquid wastes with the characteristic of reactivity are frequently cyanide- or sulfide-bearing wastewaters. These wastes can be rendered non-hazardous through oxidation but are somewhat difficult to oxidize. Advanced thermal destruction technologies - e.g., wet air oxidation - can easily handle the cyanide wastes and most other reactive wastes, but sulfide wastes can be a problem due to the difficulty in oxidation. Some design modifications, however, can allow these advanced thermal destruction technologies to handle the sulfide wastes.

Liquids with Toxic Organics. These wastes are almost exclusively liquid PCB-contaminated wastes. They will require management at facilities capable of PCB destruction. Incineration is the most thorough means of meeting the strict requirements for PCB destruction.

## Sludges and Solids

Heavy Metal Sludges and Solids. Heavy metal sludges in 1988 will come from three sources: existing generators, industries which will have to meet wastewater pretreatment standards by that time, and site cleanups. Recovering metals for reuse from sludges or wastewaters is practical only when waste streams with different metals are segregated; it is impractical for mixed metal sludges. Existing generators include some platers and metal finishers as well as some others. Of the heavy metal sludges currently being generated, almost half come from industries most likely generating those wastes from electroplating or metal finishing operations. It is assumed that one-quarter of these wastes are generated as single metal sludges, making them amenable to metal recovery, while the other three-quarters are mixed metal sludges that must be land emplaced after stabilization.

Other heavy metal sludges are assumed to be mixed metal sludges requiring stabilization and land emplacement, including those metal sludges from abandoned site cleanups. Expected wastes from electroplaters and metal finishers that will have to meet pretreatment requirements represent about ten percent of the total heavy metal sludges expected from pretreatment. These industries could participate in an ion exchange metals recovery facility. The rest of these pretreatment wastes must be land emplaced.

TABLE 6-5

ASSIGNMENT OF PROJECTED 1988 MANIFESTED  
NEW JERSEY WASTES - MAXIMUM TREATMENT CASE  
(In Thousands of Tons)

Waste Type	Materials Recovery				Energy Recovery	Treatment/Destruction			Disposal		
	Solvent Recovery	Oil Recovery	Ion Exchange Metals Recovery	Pyrometallurgical Metal Recovery	Fuel Blending	Aqueous Treatment	Incineration	Advanced Thermal Destruction	Land Treatment	Unstabilized Land Emplacement	Stabilized Land Emplacement
AQUEOUS LIQUIDS											
Inorganic						111					
Organic						99		11			
SOLVENTS											
Halogenated	10										
Non-Halogenated	7										
Mixed											
Solvents, NOS	16										
OILS											
Automobile		28			2						
Industrial		17			8						
Fuel					9						
Oils, NOS		2			1						
OTHER LIQUIDS											
Combustible	3				3						
Toxic with Metals											
Reactive							1				
Corrosive											
PCB Liquids							<1		1		
											7*

TABLE 6-5 (continued)

Waste Type	Materials Recovery				Energy Recovery	Treatment/Destruction				Disposal	
	Solvent Recovery	Oil Recovery	Ion Exchange Metals Recovery	Pyrometallurgical Metal Recovery	Fuel Blending	Aqueous Treatment	Incineration	Advanced Thermal Destruction	Land Treatment	Unstabilized Land Emplacement	Stabilized Land Emplacement
SLUDGES AND SOLIDS											
Heavy Metals			3	4						22	42
Oily							23				
Paint	1						2				
Combustible							13				
Corrosive						<1				6	
Reactive								2			
Organics							39	5		5	
Other				<1							2
UNEXAMINED						2	2				2
ADDITIONAL RESIDUALS							6			6	25
TOTAL	37	47	3	4	23	213	129	19	—	39	71

\* Includes PCB wastes -- must go to a PCB-permitted incinerator.

Nearly half of the solids with metals are lead-bearing and it is assumed that ten percent of those wastes can go to metal recovery. This is approximately the same amount currently going to pyrometallurgical metal recovery. The rest of the solids with metals must be land emplaced.

Another option can be considered for maximum treatment of these wastes. It assumes that all electroplating and metal finishing operations can be retrofitted to provide segregated waste streams amenable to recovery. However, this option is not considered because it would require significant investments in retrofitting process lines by a number of generators.

Oily Sludges. While these wastes can be successfully treated through land application, they are assigned to incineration in this case to assure complete destruction of the organic portions of the waste.

Paint Residues. Paint residues in 1983 were largely organic and all in sludge form. One-third of the sludges had a high enough solvent content to warrant solvent recovery. The other two-thirds were landfilled, but are assigned to incineration in this case. These wastes would require an incinerator capable of taking sludges.

Combustible Sludges and Solids. The small amount of combustible solids that went out of state to a cement kiln in 1983 are reassigned in this case to incineration.

Corrosive Sludges and Solids. While these wastes were landfilled in 1983, the sludges can be chemically treated and/or dewatered at an aqueous treatment facility, as they are assigned in this case. The solids would continue to go to a land emplacement facility.

Reactive Sludges and Solids. See discussion on reactive liquids above.

Sludges and Solids with Organics. Sludges with organics in 1983 were made up of contaminated soils, solvent-based sludges and still bottoms, and other ignitable sludges. The solvent-based sludges and still bottoms, as well as the other ignitable sludges, can be incinerated, while the contaminated soils should have the organics separated by solvent extraction prior to incineration. Nevertheless, the presence of refractory organics may dictate advanced thermal destruction.

Nearly half of the solids with metals are lead-bearing and it is assumed that ten percent of those wastes can go to metal recovery. This is approximately the same amount currently going to pyrometallurgical metal recovery. The rest of the solids with metals must be land emplaced.

Another option can be considered for maximum treatment of these wastes. It assumes that all electroplating and metal finishing operations can be retrofitted to provide segregated waste streams amenable to recovery. However, this option is not considered because it would require significant investments in retrofitting process lines by a number of generators.

Oily Sludges. While these wastes can be successfully treated through land application, they are assigned to incineration in this case to assure complete destruction of the organic portions of the waste.

Paint Residues. Paint residues in 1983 were largely organic and all in sludge form. One-third of the sludges had a high enough solvent content to warrant solvent recovery. The other two-thirds were landfilled, but are assigned to incineration in this case. These wastes would require an incinerator capable of taking sludges.

Combustible Sludges and Solids. The small amount of combustible solids that went out of state to a cement kiln in 1983 are reassigned in this case to incineration.

Corrosive Sludges and Solids. While these wastes were landfilled in 1983, the sludges can be chemically treated and/or dewatered at an aqueous treatment facility, as they are assigned in this case. The solids would continue to go to a land emplacement facility.

Reactive Sludges and Solids. See discussion on reactive liquids above.

Sludges and Solids with Organics. Sludges with organics in 1983 were made up of contaminated soils, solvent-based sludges and still bottoms, and other ignitable sludges. The solvent-based sludges and still bottoms, as well as the other ignitable sludges, can be incinerated, while the contaminated soils should have the organics separated by solvent extraction prior to incineration. Nevertheless, the presence of refractory organics may dictate advanced thermal destruction.

The appropriate management method for solids with organics is a function of the concentration of organics in the wastes. Most of these solids in 1983 were still bottoms, PCB wastes, or were listed as ignitable - almost all were assigned to incineration in this case. Some of the "ignitable" solid wastes are actually not incinerable. For example, tank bottoms are comprised mostly of water, rust, and silt and yet are ignitable because of small amounts of hydrocarbons. These tank bottom cleanouts, about ten percent of these solids, are not appropriate for incineration and should be sent for land emplacement. Nearly fifty percent of solids with organics are oily wastes, either from refineries or from oil spill cleanups. These wastes can be very successfully managed at a land treatment facility. In this case, however, these wastes are sent to an incinerator to insure destruction of the organics. The rest of these solids are divided between contaminated soils (assigned to incineration), and empty containers and unspecified solids (assigned to land emplacement).

Sludges and Solids, N.O.S.. It is assumed for safety that unidentified sludges will be stabilized prior to land emplacement.

### Stabilization of Landfilled Wastes

As in the market-driven case, the heavy metal solids and sludges from manufacturing industries and from non-recoverable pretreatment wastes are stabilized prior to land emplacement. Those from site cleanups are not stabilized. In addition, all of the ash from the incineration of solvent recovery and oil recovery residuals, the residuals from the advanced thermal destruction of reactive wastes, and the residuals from a central metals recovery facility are stabilized in this case based on the possibility that they might contain heavy metals. It should be noted that more extensive stabilization of wastes sent to land emplacement facilities will result in a larger volume of waste requiring this type of facility.

### Changes in Residual Quantities

Table 6-6 shows the change from 1983 to 1988 for this case in waste quantities handled by new or existing New Jersey facilities. Table 6-6 also shows the resulting increase in the quantities of residuals from those facilities and their presumed distribution among subsequent management facilities. The distribution is based on the same hierarchy of treatment described above.

TABLE 6-6

ADDITIONAL RESIDUALS MANAGEMENT IN 1988  
MAXIMUM TREATMENT CASE

<u>Technology/ Facility</u>	<u>Additional Waste Handled in New Jersey in 1988 Over 1983 (tons)</u>	<u>Additional Residuals Generated (tons)</u>	<u>Selected Management Method for Residuals</u>
Aqueous Treatment	74,000	3,700 ( 5%) <sup>1</sup>	Land Emplacement
Solvent Recovery	14,000	1,260 ( 9%) <sup>2</sup>	Incineration
Fuel Blending	-52,000	- 5,200 (10%) <sup>1</sup>	Land Emplacement (decrease)
Incineration	120,000	24,000 (20%) <sup>3</sup>	Land Emplacement
Oil Recovery	47,000	4,700 (10%) <sup>1</sup>	Incineration
Advanced Thermal Destruction	19,000	4,750 (25%) <sup>4</sup>	Land Emplacement
Ion Exchange Metals Recovery	3,000	2,550 (85%) <sup>5</sup>	Land Emplacement
Pyrometallurgical Metals Recovery	4,000	0 <sup>6</sup>	—

<sup>1</sup> Derived from Technical and Economic Analysis of Hazardous Waste Management Facilities, prepared by Environmental Resources Management, Inc. for Minnesota Waste Management Board, October 1983.

<sup>2</sup> Based on 1983 manifested receipts and residual shipments by New Jersey solvent recovery facilities.

<sup>3</sup> Based on manifested receipts and off-site shipments from Rollins incinerator in 1981, 1982, and 1983.

<sup>4</sup> Based on an analysis of expected incoming waste streams: 58 percent aqueous wastes (5 percent residual)/42 percent sludges and solids (50 percent residual). Residual estimates based on best engineering judgment.

<sup>5</sup> Derived from Technical Report: Central Recovery Facility Feasibility Study by Pope-Reid Associates, Inc. for Minnesota Department of Energy, Planning and Development and Metropolitan Council. 30 November 1982.

<sup>6</sup> Residual product not hazardous.

## COMPARISON OF THREE CASES

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### Capacity Shortfalls

Table 6-7 summarizes the available capacity of the existing types of New Jersey facilities after subtracting 1983 imports from the total capacities estimated in Chapter Three. Table 6-7 also shows the projected demand for capacity, i.e., the assignment of projected 1988 manifested wastes and additional residuals, for the market-driven and maximum treatment cases. As noted previously, the waste assignments for the market-driven case are the same as for the maximum use of non-commercial capacity case.

#### Market-Driven Case

Major needs for 1988 in this case include:

- A 21,000-ton per year incinerator that can handle liquids, sludges, and solids.
- A 120,000-ton per year land emplacement facility for stabilized and unstabilized waste with restrictions on organic wastes and liquids, integrated with a 52,000-ton per year stabilization facility.
- A 20,000-ton per year land treatment facility.
- A 3,000-ton per year pyrometallurgical metal recovery facility.

Existing aqueous treatment, solvent recovery, and fuel blending capacity appear to be adequate to handle New Jersey generators' wastes in this case. However, there are some possible exceptions to this. For example, the pending New Jersey DEP fuel standards and regulations for burning wastes in boilers may dictate upgrading the existing fuel blending facilities, particularly in regard to segregating and testing incoming shipments and removing metal contaminants in waste oils.

TABLE 6-7

SHORTFALL IN FACILITY CAPACITY  
FOR MANAGING NEW JERSEY MANIFEST WASTE  
(In Thousands of Tons)

Waste Type	Materials Recovery				Energy Recovery	Treatment/Destruction			Disposal		
	Solvent Recovery	Oil Recovery	Ion Exchange Metals Recovery	Pyrometallurgical Metal Recovery	Fuel Blending	Advanced Thermal Destruction	Incineration	Aqueous Treatment	Land Treatment	Stabilized Land Emplacement	Unstabilized Land Emplacement
<u>Available Capacity</u>											
Existing Capacity	199	0	0	0		0	35	409	0	0	0
1983 Waste Imports	31	0	0	0	33	0	11	77	0	0	0
Available Capacity	168	0	0	0	390	0	24	332	0	0	0
<u>Market-Driven Case</u>											
Demand	34	0	0	3	120	0	45	225	20	52	68
Shortfall New Capacity	0	0	0	3	0	0	21	0	20	52	68
<u>Maximum Treatment Case</u>											
Demand	37	47	3	4	23	19	129	213	0	71	39
Shortfall	0	47	3	4	0	19	105	0	0	71	39

Immediate Needs. The immediately-needed facilities under this case include:

- 105,000 tons per year of incinerator capacity that can handle liquids, sludges, and solids.
- A 110,000-ton per year land emplacement facility for stabilized and unstabilized waste, integrated with a 71,000-ton per year stabilization facility.

Needs Upon Full Implementation. Facilities required after full implementation of the maximum treatment case include:

- A 47,000-ton per year waste oil recovery facility (oil re-refinery).
- 19,000 tons per year of advanced thermal destruction capacity.
- A 3,000-ton per year ion exchange central metals recovery facility featuring regeneration of ion exchange canisters.
- A 4,000-ton per year pyrometallurgical metals recovery facility.

As with the market-driven case, existing aqueous treatment, fuel blending, and solvent recovery capacity appear to be adequate to handle New Jersey generators' wastes. However, the same possible exceptions apply to the maximum treatment case as discussed in the market-driven case.

#### Commercialization Case

The case which makes maximum use of non-commercial capacity is a variant of the market-driven case. It differs from the market-driven case in that it would feature the commercialization of certain on-site facilities and the use of this capacity in preference to siting new facilities offering the same technology.

As discussed in Chapter Four, a large amount of waste is managed on site at facilities owned and operated by the generator of the waste. In Chapter Six, the consultant, working with a trade association, surveyed selected owners of on-site facilities to evaluate the prospect that such facilities could meet New Jersey's needs for additional commercial capacity. Appendix C describes the survey and the results of the survey. In summary, the survey found little interest on the part of the facility owners to commercialize.

Ignoring the issue of the operators' willingness to commercialize, there are on-site facilities which, with expansion and modification, could possibly meet all of New Jersey's needs for new facilities. For example, existing hazardous waste land emplacement facilities and land treatment facilities operated by New Jersey generators could dispose of other New Jersey wastes dependent upon their design, their ability to meet the siting criteria, and other considerations. To do this on a continuous basis for a reasonable amount of time would require expansion if not modification of the land emplacement facilities and land treatment facilities.

Similarly, the need for additional incineration capacity could technically be met by commercializing existing on-site facilities. However, some major expansions and modifications in the facilities would be required as the collective capacity of on-site incinerators total about 4,000 tons per year.

To overcome the lack of interest on the part of on-site facility owners to commercialize, the state would have to undertake some major new programs, e.g., sharing of liability, assisting the permitting process, providing economic incentives, and amending the siting criteria. However, the comparatively small amount of capacity available does not warrant such programs. There may be some special situations where commercialization could benefit, e.g., recovery of a particular metal; however, a commercialization program will not provide New Jersey with the needed facility capacity within the time period envisioned by the Major Hazardous Waste Facilities Siting Act.

## Cost to Generators

### Facility Charges to Generators

Table 6-8 compares the relative costs to New Jersey generators of the market-driven and maximum treatment cases. The commercialization case would have approximately the same costs as the market-driven case.

Table 6-8 reflects the following:

1. Approximate unit (per-ton) prices, typically charged by operating facilities or estimated from an analysis of capital and operating costs, are used for estimating the cost of each type of facility.
2. Transportation costs are not included.

TABLE 6-8

COMPARATIVE ANNUAL COSTS TO NEW JERSEY GENERATORS  
OF MAXIMUM TREATMENT AND MARKET-DRIVEN CASES  
(1984 DOLLARS)

Facility Type	Estimated Costs for 1988 Demand		
	Comparative Unit Cost (\$/ton) <sup>1</sup>	Market-Driven Costs (\$1,000/yr)	Maximum Treatment Costs (\$1,000/yr)
<b>RECOVERY FACILITIES</b>			
Solvent Recovery	100	\$ 3,400	\$ 3,700
Ion Exchange			
Metals Recovery	300	0	900
Fuel Blending	(20)	(2,400)	(500)
Waste Oil Recovery	30	0	1,400
Pyrometallurgical			
Metals Recovery	50	200	200
<b>TREATMENT FACILITIES</b>			
Aqueous Treatment	55	12,400	11,700
Land Treatment	50	1,000	0
Incineration	325	14,600	41,900
Advanced Thermal			
Destruction	500	0	9,500
<b>DISPOSAL FACILITIES</b>			
Land Emplacement	75	5,100	2,900
Land Emplacement			
with Stabilization	100	<u>5,200</u>	<u>7,100</u>
ESTIMATED TOTAL COSTS (rounded)		\$40,000	\$79,000

<sup>1</sup> These are generalized estimates and vary widely. For example, some generators may actually be paid for solvents they send to solvent recovery facilities.

### 3. Long-term liability costs are not included.

Table 6-8 multiplies the unit price for a particular type of facility by the demand assigned to that type. Demand is that shown in Table 6-7. Unit prices can vary considerably from those shown in Table 6-8 dependent primarily upon waste characteristics. In fact, for some facilities, and some wastes, generators can receive a credit. Unit prices have been estimated using the following sources:

- Preliminary Technical and Economic Analysis of Seven Types of Hazardous Waste Recovery and Treatment Facilities, prepared by ERM for Missouri Environmental Improvement and Energy Resources Authority, July 1984.
- Technical and Economic Analysis of Hazardous Waste Management Facilities, prepared by ERM for the Minnesota Waste Management Board, October 1983.
- Hazardous Waste Management Technologies - An Assessment, prepared by ERM for the Pennsylvania Department of Environmental Resources, February 1983.
- Comprehensive Hazardous Waste Management Study, prepared by ERM for the Mississippi Hazardous Waste Council, January 1982.
- Review of Activities of Major Firms in the Commercial Hazardous Waste Management Industry: 1982 Update, prepared by Booz-Allen and Hamilton, Inc. for the Office of Policy Analysis, U.S. EPA, August 1983.
- Technical Report No. 1 -- Plating Industry Compliance with Environmental Regulations -- Costs and Cost Comparisons, prepared by Pope-Reid Associates, Inc. for the Minnesota Waste Management Board, July 1983.
- Hazardous Waste Quantities and Facility Needs in Maryland, prepared by Arthur D. Little, Inc. for the Maryland Hazardous Waste Facilities Siting Board, August 1981.
- General knowledge of hazardous waste management facilities and costs.

Table 6-8 shows that the costs to generators for off-site management of hazardous waste will depend greatly upon which case is advanced in New Jersey. A policy decision to develop the maximum treatment case fully will cost New Jersey generators about \$39 million more per year than the market-driven case, assuming that generators use the new facilities versus optional types available in other states.

## Transportation Costs

Because New Jersey generators currently ship about 45 percent of their waste to facilities in other states, the development of new facilities in New Jersey will at least reduce the transportation component of total costs for managing waste off site.

Chapter Five gives estimates for costs of transportation and indicates existing out-of-state facilities used by New Jersey generators. Obviously, developing new facilities in New Jersey will reduce the costs of the present practice of transporting wastes longer distances to facilities in other states. Table 6-9 estimates the potential savings in transportation costs of developing new incineration and land emplacement facilities in New Jersey to accept that waste currently exported to facilities in other states. The savings range from \$3.6 to \$4.5 million per year.

## Prospects for Private Development of Facilities

The intent of New Jersey's siting program is that needed new facilities be developed and operated by the private sector. Whether that occurs depends mostly on the economic attractiveness of a given facility, to understand which would require an analysis of expected return on investment, degree of competition, and level of business risk. Although such an analysis is beyond the scope of this study, some general conclusions are still possible.

The past and present efforts by commercial waste management companies to site new facilities in New Jersey indicate that market considerations and profit potential for both a new incinerator and land emplacement facility warrant the business risks. The quantity of waste expected to be attracted by both types of facilities should, in comparison with the size of viable facilities operated elsewhere, yield an acceptable return on investment. The prospects for development are not as high for the other types of facilities.

TABLE 6-9

TRANSPORTATION COST SAVINGS OF  
DEVELOPING AND USING NEW FACILITIES IN NEW JERSEY

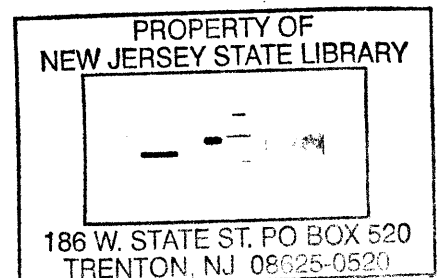
	Quantity of Waste Anticipated to be Exported in 1988 Without New Facilities (ton/yr) <sup>1</sup>	Weighted Average Distance Away <sup>2</sup> (miles)	Average Transportation Costs (\$/ton-mile)	Total Approximate Cost (\$1,000/year)
<u>Existing Out-of-State Facilities</u>				
Cement Kilns	32,000	160	\$.13 to .18	700 - 900
Incinerators	16,000	600	\$.10 to .13	1,000 - 1,200
Land Emplacement Facilities	78,000	380	\$.10 to .13	3,000 - 3,900
TOTAL				4,600 - 6,000
<u>New New Jersey Facilities</u>				
All	126,000 <sup>3</sup>	50 <sup>4</sup>	\$.16 to .24	1,000 - 1,500
TOTAL SAVINGS (rounded)				3,600 - 4,500

<sup>1</sup> Based on percentage of total waste stream going to those facilities in 1983.

<sup>2</sup> Weighted according to quantity of New Jersey waste accepted in 1983.

<sup>3</sup> Sum of above.

<sup>4</sup> Transportation assumed to average fifty miles one way for new facilities in New Jersey.



## Land Emplacement Facility

As stated in Chapter Four, the long-term prospects for adequate land emplacement capacity remain uncertain. A New Jersey land emplacement facility should represent an attractive alternative for generators, especially if existing facilities continue to close (five landfills closed in Pennsylvania and Maryland in the last two years).

Other than siting, the major obstacle to developing a land emplacement facility could be the rather stringent limitations which the New Jersey DEP might place on the facility design and operation, in comparison with limitations on existing facilities in other states. Special limitations could make a facility non-competitive. As a possible example of this, the Major Hazardous Waste Facilities Siting Act, NJAC 7:26-13, requires that "...all new major hazardous waste facilities shall be:

1. totally or partially constructed above existing grade;
2. physically accessible to inspection personnel;
3. designed to allow 99.9 percent extraction of all hazardous waste stored or disposed of therein; and
4. designed to prevent any significant adverse impact on the environment or public health".

It remains to be seen how these requirements will be interpreted. Furthermore, the New Jersey DEP is now drafting regulations for which wastes are prohibited from land emplacement facilities. These regulations could reduce the market demand more so than reflected in Table 6-7.

## Incineration Facility

The fact that Rollins' rotary kiln incinerator operated at less than eighty percent capacity in 1983 indicates that the market for such a facility is limited. However, an important consideration, as explained in Chapter Four, is that the trend to restrict certain organic wastes from landfill disposal and to regulate more stringently the practice of fuel blending and burning of wastes in boilers should increase the demand for incineration services.

Furthermore, if Rollins' incinerator gets the permit to burn PCB wastes that they are seeking, their available capacity for hazardous wastes could be severely limited. In fact, Rollins could turn away some of their current hazardous waste customers in favor of PCB wastes, which are a more lucrative market, causing a greater demand for a new New Jersey incinerator.

The major obstacle to developing an incinerator is the high degree of competition represented by less expensive, substitute technologies provided at facilities in other states. Of the 43,000 tons of waste manifested by New Jersey generators and thermally destroyed in 1983, 28,000 tons went to cement kilns in other states. The kilns should continue to compete for a large share of the market. Also, much of the organic sludges and solids assigned to incineration, even under the market-driven case, are currently acceptable for disposal at landfills in the Midwest and Southeast.

### Land Treatment Facility

Although no company has proposed to develop a land treatment facility in New Jersey, many companies in the nation land treat wastes on their own sites because they believe it is the most cost-effective alternative for those wastes. Such a facility should be commercially viable. The major obstacle to developing a land treatment facility could be the rather stringent manner in which the New Jersey DEP might review an application to construct one. Commercial land treatment facilities, if not carefully managed, particularly with regard to waste receipts, can cause permit violations and thus make commercial development risky. Furthermore, there are no existing commercial facilities which offer only land treatment services; each is typically combined with a land emplacement facility. Thus, a commercial land treatment facility is not likely in New Jersey; more likely would be the development of on-site, dedicated land treatment capacity by generators of land treatable wastes.

### Metals Recovery and Advanced Thermal Destruction Facilities

In comparison with the incineration and land emplacement facilities, the two metals recovery facilities and the advanced thermal destruction facility specified in the maximum treatment case do not appear as economically attractive. Although the capital investments required are less for these facilities, the market demand is much smaller. The developer of a centralized metals recovery facility must coordinate his

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plans with the industrial wastewater pretreatment program, whose future implementation is subject to delays and other unknowns. Nevertheless, the concept continues to be investigated and a strong signal by the state to support the siting and development of such facilities could attract the necessary investment. The pyrometallurgical metal recovery process shows only a small demand, and a facility in Pennsylvania currently offers such a service. Some of the advanced thermal destruction technologies show promise; however, most are still in the testing phase of development.

## Waste Oil Re-Refinery

The waste oil re-refinery represents a major capital investment, upwards of \$10 million. Analysis done for other states<sup>1</sup> indicates that to realize an acceptable return on such a large investment would necessitate purchasing waste oil or selling recovered oil at somewhat more favorable prices than the market will currently bear. More stringent state and federal regulations for fuel blending are expected, and this should result in a shift of undetermined size from fuel blending to oil re-refining. Nevertheless, a New Jersey facility would still have to compete with fuel blending and incineration facilities plus re-refineries in Canada and eastern Pennsylvania.

## Summary

In summary, the prospects of the private sector developing the specified facilities are rated as follows:

Incineration	Moderate to High
Land Emplacement	Moderate to High
Land Treatment	Low
Centralized Metals Recovery	Low to Moderate
Pyrometallurgical Metals Recovery	Low
Advanced Thermal Destruction	Low to Moderate
Waste Oil Re-Refinery	Low

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<sup>1</sup> Technical and Economic Analysis of Hazardous Waste Management Facilities, prepared by ERM for the Minnesota Waste Management Board, October 1983.

## NEEDED NEW FACILITIES

### Needed Types of Facilities

The following criteria will be used to determine whether a particular type of facility is needed by New Jersey:

1. A shortfall exists between projected 1988 demand for such a facility and the capacity available within New Jersey for both the "market-driven" and "maximum treatment" cases; and
2. Given the size of the shortfall, it is reasonable to assume that private waste management companies would develop such a facility in New Jersey without public subsidy and that the price of services would be competitive with similar facilities available in other states.

These two criteria recognize the intent of the New Jersey Hazardous Waste Facilities Siting Act that the private sector develop the facilities, i.e., market forces should govern and prompt private investment in the needed facilities. Nevertheless, the first criterion assures that facilities developed by market forces will support and not preempt the long-term goal of maximum recovery and treatment of hazardous waste.

These two criteria and the findings of the previous section indicate a clear need in New Jersey to develop two types of facilities:

Incineration  
Land Emplacement

### Incineration Facility

As described in Chapter Three, there are numerous incineration technologies. The appropriate technology for New Jersey should meet the following criteria:

1. Commercially proven
2. Sufficiently versatile to make the transition from the "market-driven" to the "maximum treatment" case.

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Commercially Proven. The appropriate technology should be commercially proven as evidenced by numerous applications in the United States and elsewhere. This will: (a) facilitate permitting in that the U.S. EPA or the New Jersey DEP will have precedents upon which to base their reviews; (b) facilitate public understanding in that the experiences of facilities which have operated for several years can be analyzed to evaluate the impact upon potential host communities; and (c) help assure the continuous availability of capacity by avoiding the business risks associated with experimental and demonstration facilities. This criterion eliminates all incineration technologies except rotary kiln, liquid injection, multiple hearth, fluidized bed, and wet air oxidation.

Versatility. Because the siting program in New Jersey depends upon private initiative and investment, the incineration technology should accommodate the "market-driven" demand. However, the technology should have the versatility to accommodate the types of wastes that will be generated in the future as the New Jersey regulatory system moves toward the "maximum treatment" case. Tables 6-3 and 6-5 show that solids and sludges in the waste stream assigned to incineration increase from about half of the total in the market-driven case to about two-thirds in the maximum treatment case. This trend, and the wide variety of wastes incinerated in both cases, identifies rotary kiln incineration as the most needed technology, with specialized incinerators such as fluidized bed and liquid injection units having second priority.

Capacity. The facility should have a minimum capacity of 20,000 to 30,000 tons per year, depending upon the BTU value of the waste, to be economically-viable and have sufficient kiln diameter to burn drums directly. This minimum preferred capacity equals the demand for incineration capacity under the market-driven case.

Summary. These considerations indicate that New Jersey initially needs one incineration facility, featuring the rotary kiln technology and having a capacity of at least 20,000 to 30,000 tons per year. After adopting a site designation for the rotary kiln facility, the Siting Commission should again analyze changes in the regulatory system, any increased market demand for incineration, technical advances in developing various incineration technologies, and the availability of facilities in other states to determine if additional facilities are needed. Full implementation of the maximum treatment case could necessitate additional incineration capacity, up to a total of 110,000 tons per year.

Stablization/Land Emplacement Facility

The shortfall in disposal via land emplacement would start at 120,000 tons per year with the market-driven case and decrease to 110,000 tons per year with the maximum treatment case. The makeup of the waste changes more so, with maximum treatment case wastes having a higher percentage of residuals from waste treatment facilities. Also, in the maximum treatment case, more of the wastes assigned to land emplacement are stabilized.

Economically-viable commercial land emplacement facilities range in size from a minimum of about 30,000 tons per year to a maximum of over 200,000 tons per year. These considerations suggest that only one land emplacement facility is required in New Jersey. It should have the capability to stabilize waste as well as dispose of waste directly.

The annual requirements for land emplacement area are calculated as follows:

<u>Case</u>	<u>Waste Demand (tons/year)</u>	<u>Stabilization Additives<sup>1</sup> (tons/year)</u>	<u>Volume Requirements<sup>2</sup> (cubic yards/year)</u>	<u>Area Requirements<sup>3</sup> (acres/year)</u>
Market-Driven	120,000	78,000	172,000	4
Maximum Treatment	110,000	106,000	180,000	4

- 1 Assumes 1.5 tons of stabilizing material (lime, fly ash) for every ton of waste to be stabilized.
- 2 Assuming 1.0 ton per cubic yard for unstabilized waste, 1.25 tons per cubic yard for stabilized waste.
- 3 Assuming an average landfill height of 25 feet, excluding buffer zones and area between cells.

The determination of needed capacity for a land emplacement facility is approached differently than for a treatment facility; site life must be considered. It is reasonable to assume an active life of twenty years for the needed land emplacement facility. The scope of this project did not include long-term projections of waste demand; however, it seems reasonable to assume that demand will remain constant as any increase in generation beyond 1988 could be offset by source reduction, reduced need for site cleanups, and shifts to substitute treatment and disposal technologies.

These assumptions indicate that New Jersey needs a land emplacement facility with a cell area of about eighty acres. This area excludes buffer zones and unused area between cells.

## Consideration of Facilities Needed Upon Full Implementation of the Maximum Treatment Case

The facilities specified in the Plan thus adhere to the market-driven case and the present New Jersey regulatory system. Nevertheless, the specified facilities will still be needed in the future when New Jersey develops the new regulatory system necessary to support the maximum treatment case. The facilities specified by this Plan tend to be more general in their application, i.e., can handle a broader range of wastes. As New Jersey moves towards the maximum treatment case, technologies specific to certain wastes will be developed and will take a portion of the markets of the more general facilities. A waste oil re-refinery, for example, will draw some wastes away from fuel blending. Still, the wastes projected for the more specialized facilities in the maximum treatment case can, for the most part, be managed by New Jersey's existing facilities and the new incineration and landfill facilities specified by this Plan.

## Updating the Plan

The analysis indicates, for the maximum treatment case, a need for some types of facilities not included in the market-driven case:

- Waste Oil Re-refinery
- Advanced Thermal Destruction
- Ion Exchange Metals Recovery

For various reasons, the Plan cannot specify that New Jersey needs these facilities. More planning information is required and/or some changes in the regulatory system are needed. The Commission can reexamine the need for such facilities when updating the Plan.

The hazardous waste management industry is undergoing rapid change. As existing facilities close, New Jersey DEP promulgates new regulations, new technologies develop, and generators alter waste management practices, the relationship between supply and demand changes also. The Plan is conceived as part of a system in which the development initiative is left up to private enterprise, and the development of facilities in New Jersey could follow several directions.

Also, the Plan is based on a reasonable data base but it had some limitations. Information about generators' preferences and future plans was minimal.

The Major Hazardous Waste Facility Siting Act recognizes these dynamics and requires that the Plan be revised and updated every three years, or more frequently dependent upon changes in existing facilities, waste generation, and technological advances.

#### Wastes Not Manageable by Specified Facilities

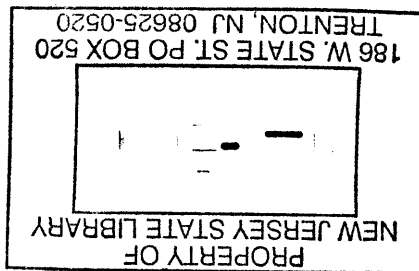
The Plan specifies facilities which technically could treat and dispose of all wastes generated in New Jersey. Realistically, however, facility capacity capable of handling all of New Jersey's waste types may not be developed in New Jersey. In the market-driven case, for example, the waste assigned to land treatment must be managed by another type of facility because the Plan does not specify a land treatment facility as "needed". It is believed that New Jersey DEP might prohibit the land emplacement of these wastes and, though it is technically feasible to incinerate these wastes, the cost of incineration would exceed substantially the cost of out-of-state alternatives. Thus, at least from a market-based perspective, there may be wastes which require a certain management method yet a facility of that type is not specified as "needed" in the Plan.

The Plan also shows that aqueous treatment capacity adequately supplies demand. However, some waste may have constituents that are not treatable at New Jersey facilities.

These are just two examples of potential voids in the types of waste which could be treated by the existing facilities in New Jersey and facilities specified in the Plan. Clearly, the Plan must be flexible to consider facilities which, though not specified in the Plan, address voids. The Commission should evaluate any private enterprise proposals to develop these facilities and should designate such facilities as needed if the developer demonstrates each of the following justifications:

1. The facility would handle types of waste which the existing and specified facilities cannot manage.
2. The facility would make the total system of facilities in New Jersey more effective, from both environmental and economic perspectives, than the specified and existing facilities.

- 3. The facility would be more supportive of the Commission's policies for source reduction, materials and energy recovery, waste exchange, and recycling than the specified facilities.



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**APPENDIX A**

**U.S. EPA/NEW JERSEY DEP  
HAZARDOUS WASTE CODING SYSTEM**

APPENDIX A

U.S. EPA/NEW JERSEY DEP HAZARDOUS WASTE CODING SYSTEM

<u>Waste Code</u>	<u>Waste Name<sup>1</sup></u>	<u>Waste Code</u>	<u>Waste Name</u>
D001	Characteristic of Ignitability	F007	Plat. Solu. of Electrplt. Oper.
D002	Characteristic of Corrosivity	F008	Plat. Sludge of Electrplt. Oper.
D003	Characteristic of Reactivity	F009	Strip. and Solu. Electroplt. Oper.
D004	Arsenic	F010	Sludge-Oil Bath of Metl. Treat. Oper.
D005	Barium	F011	Solu.-Salt Bath of Metl. Treat. Oper.
D006	Cadmium	F012	Qnch. Sludge of Metl. Treat. Oper.
D007	Chromium	F013	Float Tailing of Metl. Recov. Oper.
D008	Lead	F015	Cyanide Solu. of Metl. Recov. Oper.
D009	Mercury	F017	Paint Sludge - Mechtelect. Prod. Ind.
D010	Selenium	F018	Wastewater Sludge of Ind. Painting
D011	Silver	F019	Wastewater Sludge of Conv. Coating Aluminum
D012	Endrin	K001	Sludge of Wood Preserv.-Creosote, etc.
D013	Lindane	K002	Wastewater Sludge of Chrome-Yell/Orange
D014	Methoxychlor	K012	Acrlontrile Btms. - Furification Of.
D015	Toxaphene	K015	Benzyl Chlori. Btms. - Distilltn. Of.
D017	2,3,4-TP (Silvex)	K016	Distiltn. Residues of Carbon Tetra.
F001	Spt. Hal. Solv. and Sludge (Degreasing Oper.)	K020	Vinyl Chloride Distil. Btms.
F002	Spt. Hal. Solv. and Still Bottom of Degreasing	K021	SB Waste of Fluoromethanes Prod.
F003	Non-Hal. Solv. and Still Bottom (Xylene, etc.)	K022	Prod. Tars of Phenol/Acetone
F004	Cresols, Nitrobenz. Solv. and Still Bottom	K023	Lite Ends of Produ. Pathalic Anh.
F005	Non-Hal. Solv. and Still Bottom (Toluene, etc.)	K024	Phthalic. Anhydride Btms. of Prod.
F006	Wastewater Sludge of Electrplt. Oper.	K030	Tri-Perchloethylene Prod. Btms.

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## APPENDIX A (continued)

<u>Waste Code</u>	<u>Waste Name</u>	<u>Waste Code</u>	<u>Waste Name</u>
K031	Salts from MSMA/Cacodylic Acid	P002	1-Acetyl-2-Thiourea
K032	Wastewater Sludge of Chlordane Prod.	P003	Aceolein
K034	Filter Solids of Chlordane Prod.	P004	Aldrin
K035	Wastewater Sludge of Creosote Prod.	P005	Allyl Alcohol
K047	Pink/Red H2O of TNT Operations	P010	Arsenic Acid
K048	DAF Float of Petro./Refining Ind.	P011	Arsenic Pentoxide
K049	Oil Emulsion Solid-Petro./Ref. Ind.	P012	Arsenic Trioxide
K050	H.E.B. Sludge of Petro./Ref. Ind.	P013	Barium Cyanide
K051	API Sludge of Petro./Ref. Ind.	P015	Beryllium Dust
K052	Tank Btms. - Leaded Petro./Ref. Ind.	P018	Brucine
K053	Chrome Trimmings of Leather Ind.	P019	2-Butanone Peroxide
K055	Buffing Dust of Leather Ind.	P021	Calcium Cyanide
K061	Emission Sludge of Furnace Prod. of Steel	P022	Carbon Disulfide
K062	Pickle Liq-Steel Finishing Oper.	P023	Chloroacetaldehyde
K063	Lime-Sludge Pickle-Steel Finish Oper.	P029	Copper Cyanides
K069	Emission Sludge of Lead Smelting	P030	Cyanides
K078	Paint Ind. Solv. Cleaning Wst.	P032	Cyanogen Bromide
K079	Paint Ind./Haz./Caust. Cleaning Wst.	P035	2,4-Dichlorophenoxyacetic Acid
K081	Paint Ind. Wastewater Sludge	P039	Disulfoton
K083	Distiltn. Btms. of Aniline Prod.	P044	Dimethoate
K086	Ink Ind. Wst., Washes, Sludge	P047	4,6-Dinitro-O-Cresol and Salts
K087	Tank Tar Sludge of Coking Oper.	P064	Isocyanic Acid, Methyl Ester
K104	Wastewater Strm. by Nitrobenzen/Ani.	P066	Methomylactonitrile
P001	3 (Acetonyl Benzyl)-4-Hydroxycoumarin	P069	2-Methyl

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## APPENDIX A (continued)

<u>Waste Code</u>	<u>Waste Name</u>	<u>Waste Code</u>	<u>Waste Name</u>
P071	Methyl Parathion	U001	Acetaldehyde (I)
P074	Nickel Cyanide	U002	Acetone (I)
P076	Nitric Oxide	U003	Acetonitrile (I,T)
P077	P-Nitroaniline	U005	Acetamide, N-9H-Fluoren-2-YL
P078	Nitrogen Dioxide	U006	Acetyl Chloride (C,R,T)
P089	Parathion	U007	Acrylamide
P090	Pentachlorophenol	U008	Acrylic Acid (I)
P092	Phenylmercuric Acetate	U009	Acrylonitrile
P094	Phorate	U011	Amitrolé
P095	Phosgene	U012	Aniline (I,T)
P096	Phosphine	U013	Asbestos
P097	Phosphorothioic Acid, O,O-Dimethyl	U017	Benzal Chloride
P098	Potassium Cyanide	U019	Benzene (I,T)
P100	1,2-Propanediol	U021	Benzidine
P102	2-Propynyl-Ol	U022	Benzo (A) Pyrene
P105	Sodium Azide	U027	Bis(2-Chloroisopropyl) Ether
P106	Sodium Cyanide	U028	Bis(2-Ethylehexyl) Phthalate
P107	Strontium Sulfide	U031	N-Butyl Alcohol (I)
P110	Tetraethyl Lead	U032	Calcium Chromate
P115	Thallium (I) Sulfate	U036	Chlordane, Technical
P117	Thiuram	U037	Chlorobenzene
P120	Vanadium Pentoxide	U038	Chlorobenzilate
P121	Zinc Cyanide	U043	Chloroethene
P123	Camphene, Octachloro	U044	Chloroform

## APPENDIX A (continued)

<u>Waste Code</u>	<u>Waste Name</u>	<u>Waste Code</u>	<u>Waste Name</u>
U051	Creosote	U109	1,2-Diphenylhydrazine
U052	Cresols	U112	Ethyl Acetate (I)
U054	Cresylic Acid	U113	Ethyl Acrylate (I)
U055	Cumene (I)	U114	Ethylenebis (Dithiocarbamic Acid)
U056	Cyclohexane (I)	U115	Ethylene Oxide (I,T)
U057	Cyclorhexanone (I)	U116	Ethylene Thiourea
U061	DDT	U120	Fluoranthene
U068	Dibromomethane	U121	Fluorotrichloromethane
U069	Di-N-Butyl Phthalate	U122	Formaldehyde
U070	O-Dichlorobenzene	U123	Formic Acid (C,T)
U076	1,1-Dichloroethane	U126	Glycidylaldehyde
U077	1,2-Dichloroethane	U132	Hexachlorophene
U078	1,1-Dichloroethylene	U133	Hydrazine (R,T)
U080	Dichloromethane	U134	Hydrofluoric Acid (C,T)
U083	1,2-Dichloropropane	U135	Hydrogen Sulfide
U088	Diethyl Phthalate	U138	Iodomethane
U092	Dimethylamine (I)	U140	Isobutyl Alcohol (I,T)
U099	1,2-Dimethylhydrazine	U142	Kepone
U101	2,3-Dimethylphenol	U144	Lead Acetate
U102	Dimethyl Phthalate	U147	Maleic Acetate
U103	Dimethyl Sulfate	U150	Melphalan
U105	2,4-Dinitrotoluene	U151	Mercury
U107	Bi-N-Octyl Phthalate	U154	Methanol (I)
U108	1,4-Dioxane	U158	4,4-Methylenebis (2-Chloraniline)

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## APPENDIX A (continued)

<u>Waste Code</u>	<u>Waste Name</u>	<u>Waste Code</u>	<u>Waste Name</u>
U159	Methyl Ethyl Ketone (I,T)	U209	1,1,2,2-Tetrachloroethane
U160	Methyl Ethyl Ketone Peroxide (R,T)	U210	Tetrachloroethylene
U161	Methyl Isobutyl Ketone (I)	U211	Tetrachloromethane
U162	Methyl Methacrylate (I,T)	U213	Tetrahydrofuran (I)
U164	Methylthiouracil	U214	Thallium (I) Acetate
U165	Naphthalene	U219	Thiourea
U166	1,4-Naphthalenedione	U220	Toluene
U167	1-Naphtylamine	U221	Toluenediamine
U169	Nitrobenzene (I,T)	U222	O-Toluidine Hydrochloride
U170	4-Nitrophenol	U223	Toluene Diisocyanate (R,T)
U174	N-Nitrosodiethylamine	U224	Toxaphene
U179	N-Nitrosopiperidine	U226	1,1,1-Trichloroethane
U180	N-Nitrosopyrrolidine	U227	1,1,2-Trichloroethane
U184	Pentachloroethane	U228	Trichloroethylene
U186	1,3-Pentadiene	U229	Trichlorofluoromethane
U188	Phenol	U232	2,4,5-Trichlorophenoxyacetic Acid
U189	Phosphorus Sulfide (R)	U235	Tris (2,3-Dibromopropyl) Phosphate
U190	Phthalic Anhydride	U238	Urethane
U192	Pronamide	U239	Xylene (I)
U196	Pyridine	U244	Thiram
U197	P-Benzo Quinone	U246	Bromine Cyanide
U200	Reserpine	X103	Acrylonitrile
U201	Resorcinol	X123	Arsenic and Compounds, NOS <sup>2</sup>
U208	1,1,1,2-Tetrachloroethane	X126	Arsenic Trioxide

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APPENDIX A (continued)

<u>Waste Code</u>	<u>Waste Name</u>		
X176	Chloroform	X722	Waste Oil and Btm. of Res. and Commer. Tank Cln
X188	Creosote	X723	Oil Waste of Gas Tank Clean Outs
X190	Cyanides/Soluble Salts and Complexes Of	X724	Waste Pet. Oil of Tank Truck Clean Outs
X210	1,2-Dibromoethane	X725	Oil Spill Cleanup Material
X222	2,6-Dichloropropane	X726	Metal Wkg., Turbine, Diesel, and Quench Oils
X226	1,2-Dichloropropane	X727	Waste Oil Electric Transformers
X228	Dichloropropene, NOS	X728	Waste Oil and Btm. Sludge of Process. Faciliti
X239	Diethylstilbestrol	X799	Containers, Crushed Empty (Rinsed)
X276	Ethyleneoxide	X825	Contaminated Soil/Sludge Aband.
X283	Formaldehyde	X850	Packed Laboratory Chemicals
X334	Nickel and Compounds, NOS	X900	Chemical Process.-Liquid, NOS
X386	Phthalic Anhydride	X905	Gas from Chemical Process.-NOS
X387	Polychlorinated Biphenyl, NOS	X910	Chemical Process.-Solids, NOS
X415	Tetrachloroethylene	X920	Food Processing, NOS
X442	Trichloroethene	X930	Detergent, NOS
X721	Oil Waste from Gas Stations	X940	Poison/Pesticide, NOS

<sup>1</sup> Abbreviations appear as listed in the manifest system.

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**APPENDIX B**

**LIST OF NAMES AND INTERVIEW QUESTIONS  
FOR THE TRANSPORTERS CONTACTED  
IN THE PREPARATION OF THE  
TRANSPORTATION ANALYSIS**

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HAZARDOUS WASTE TRANSPORTERS  
CONTACTED FOR CHAPTER FOUR DATA

AMERICAN RECOVERY, INC.  
Baltimore, Maryland

ASHLAND CHEMICAL COMPANY, INC.  
Newark, New Jersey

BFI CHEMICAL SERVICES, INC.  
Pedricktown, New Jersey

BRALLEY WILLETT TANK LINES, INC.  
Richmond, Virginia

CECOS INTERNATIONAL, INC.  
Buffalo, New York

CHEMICAL LEAMAN TANK LINES, INC.  
Lionville, Pennsylvania

CHEMICAL WASTE MANAGEMENT, INC.  
Emelle, Illinois

CONTINENTAL VANGUARD, INC.  
Bellmawr, New Jersey

DELAWARE CONTAINER, INC.  
Coatesville, Pennsylvania

ELDREDGE, INC.  
West Chester, Pennsylvania

GEOCHEM, INC.  
Chelmsford, Massachusetts

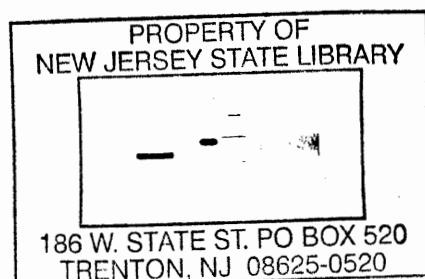
PEABODY VIP, INC.  
Chester, Pennsylvania

FRANK STAMATO, INC.  
Lodi, New Jersey

WASTE CONVERSIONS, INC.  
Hatfield, Pennsylvania

QUESTIONS ASKED TRANSPORTERS SURVEYED

1. Name of person interviewed
2. New Jersey terminal location
3. Home facility location
4. Area served from New Jersey
5. Principal routes taken enroute to:
  - New England
  - Western New York
  - Midwest
  - South
  - Southeast
6. Approximate quantity of hazardous waste transported annually.
7. Hazardous waste transport as percentage of overall business. Transportation business.
8. Form most frequently transported: bulk or drums
9. Range of services
10. Description of pricing structure
11. Perceived impact of ICC "deregulation"
12. Other comments.



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**APPENDIX C**

**EVALUATION OF COMMERCIALIZATION  
POSSIBILITIES AT COMPANY-OWNED  
RCRA FACILITIES: STUDY METHODOLOGY**

APPENDIX C

EVALUATION OF COMMERCIALIZATION  
POSSIBILITIES AT COMPANY-OWNED  
RCRA FACILITIES: STUDY METHODOLOGY

Introduction

Among the cases for assessing future facility needs for off-site manifested waste, one case involves use of excess capacity at presently non-commercial, company-owned facilities. A survey of such facilities was conducted, the purpose of which was twofold: to investigate the commercialization possibilities of on-site treatment or disposal facilities among New Jersey companies and to ascertain the major obstacles limiting interest in commercialization of excess capacity.

Study results indicated little or no interest in commercialization of on-site facilities within the next three to five years. Liability, public opposition, and additional operational/maintenance requirements were most often named as major obstacles. In general, the respondents also felt that the regulatory situation was still in a state of flux. When foreseeing a need to maintain on-site facilities for their own use, most respondents indicated they would rather invest their resources in completing the Part B process successfully before taking up the question of facility commercialization.

Development of Study

Survey Instrument

The consultant prepared a brief, two-page survey asking respondents four questions:

1. Identify the RCRA-regulated processes on site (a list of regulated treatment and disposal methods was attached to help standardize responses) and percent present utilization.
2. Indicate whether interested or not interested in commercialization.
3. If not interested, indicate primary reasons limiting interest.

4. Indicate incentives necessary to alleviate obstacles to commercialization.

The survey was designed to identify interested companies only and responses were not taken as commitments. A copy of the survey form follows the end of this appendix.

The questions and format of the survey were reviewed by the board of the New Jersey Chemical Industry Council. Suggested revisions were considered and incorporated as appropriate before distribution.

#### Choice of Survey Recipients

From the list of over 300 original RCRA Part A applications on file with the Bureau of Hazardous Waste Engineering, the consultant selected approximately thirty facilities as possible commercialization candidates. The facilities were chosen from among those listed as having on-site incinerators, landfills, or other treatment processes.<sup>1</sup> The choice of on-site processes for the survey was guided by the preliminary results of the Task One and Task Two reports identifying amounts of waste available to existing treatment processes in New Jersey.

#### Administration of Survey

The New Jersey Chemical Industry Council mailed surveys to those companies which are members of the Council. This included about sixty percent of the candidate plants. The Council prepared a cover letter describing the purpose of the survey and requesting prompt cooperation.

The Council insured the confidentiality of responses by replacing the name on each survey form with a code before forwarding the information to the Siting Commission's consultant. The Council conducted all follow-up telephone calls to survey recipients and was most helpful in securing additional information from respondents when needed by the consultant to complete the analysis.

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<sup>1</sup> Companies with storage facilities only were not considered.

The remaining surveys were mailed by the Siting Commission. The Commission's cover letter and procedures for confidentiality were patterned after those of the Council. Follow-up telephone calls to those survey recipients were also conducted by the Commission.

### Survey Responses

Of the thirty surveys mailed, nineteen were determined to be not applicable: eleven were delisted as RCRA-regulated, three closed as hazardous waste facilities, two were Part A listings for future facilities never constructed, and three facilities belonged to plants that ceased primary production. Responses from plants to which the survey was not applicable served as an excellent check on the Task Three work which evaluated status, current activities, and anticipated closures at on-site facilities.

Responses from companies still operating applicable treatment or disposal facilities indicated little interest in commercializing those facilities. While some companies have initiated preliminary discussions regarding the commercialization of their existing facilities, it is not expected that their companies will advance plans to commercialize.

Underutilized capacity appears to exist mostly at on-site incinerators.<sup>2</sup> Cumulatively, though, their total capacity does not exceed 4,000 tons per year; that is less than one-fifth the size of Rollins' one facility in Bridgeport. About 1,000 tons per year of this capacity is permitted for only one waste stream. It would seem then that even if interest were expressed in commercializing on-site facilities and the percentage of underutilization were high, the absolute available capacity would actually be quite low and probably not warrant the investment of resources to begin operating commercially.

Liability, public/community opposition, and additional operational and maintenance requirements were often cited as major obstacles to commercialization. These obstacles are apparently so formidable in the minds of some companies that some responded no incentives could be developed to mitigate them. Discussions with facility representatives revealed additional concerns that the regulatory situation in New

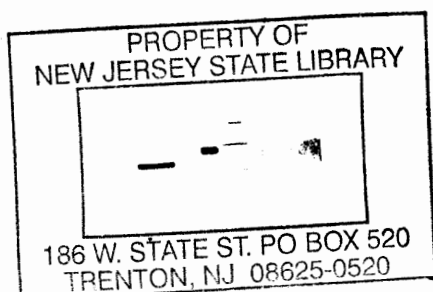
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<sup>2</sup> Because few companies actually returned the form fully completed and many responses had to be obtained verbally, it was not possible to quantify the extent of excess capacity currently existing at the surveyed plants.

Jersey is still in developmental stages. Companies in or preparing to enter the Part B process seem to be more interested in finalizing their RCRA status and securing their permits before they consider commercializing any excess capacity. Some facilities did speculate that if the Part B permit were granted and acceptance of off-site waste appeared feasible, acceptance would very likely be limited to waste generated by other corporate plants.

Conclusions

The results of the commercialization study suggest that no additional waste treatment or disposal capacity for New Jersey manifested waste will become available due to the commercialization of company-owned, on-site facilities during the time frame of this plan. The potential for on-site facility commercialization may increase after 1988 should the New Jersey DEP develop and implement before that time programs educating the public to the variety and ability of hazardous waste facilities, including their relative position in industrial manufacturing operations.



NEW JERSEY HAZARDOUS WASTE FACILITIES PLAN  
Commercialization Study Questionnaire

Prepared by

Environmental Resources Management, Inc.  
P.O. Box 357  
West Chester, Pennsylvania 19380

For

New Jersey Hazardous Waste Facilities  
Siting Commission  
CN-406  
Trenton, New Jersey 08625  
Richard J. Gimello, Executive Director

Facility Owner: \_\_\_\_\_  
Code No. \_\_\_\_\_

- 1. If you engage in any of the treatment or disposal methods listed on Page 3, please indicate below the handling code, the capacity, and the present and predicted future utilization of this capacity as a percent.

<u>Handling Code</u>	<u>Capacity</u>	<u>Percent Utilized</u>		
		<u>Present</u>	<u>1987</u>	<u>1989</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

2. If you have underutilized capacity at your hazardous waste treatment or disposal facility, would your company be interested in accepting waste from other Missouri generators on a commercial basis?

- Interested\*
- Not Interested

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\*If you check "Interested", you need not answer questions 3 and 4. Thank you for your cooperation. If "Not Interested", please continue.

3. If not interested, what are the obstacles?

- Liability
- Potential for Contamination of Products
- Regulatory Burden
- Public/Community Opposition
- Need for Reserve Capacity
- Operation and Maintenance Burdens
- Planned Closure

Other: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. Which incentives would remove these obstacles?

- Freedom from Liability or State Sharing of Liability
- Technical Assistance in Changeover to Commercial Operation
- Tax Credits or Deductions
- Second Party Leasing of Facility
- State Endorsement
- Public Education Program
- Community Benefits Program

Other: \_\_\_\_\_

\_\_\_\_\_

HANDLING CODES FOR TREATMENT, STORAGE, AND DISPOSAL METHODS

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1. Storage

- S01 Container (barrel, drum, etc.)
- S02 Tank
- S03 Waste Pile
- S04 Surface Impoundment
- S05 Other (specify)

2. Treatment

(a) Thermal Treatment

- T06 Liquid injection incinerator
- T07 Rotary kiln incinerator
- T08 Fluidized bed incinerator
- T09 Multiple hearth incinerator
- T10 Infrared furnace incinerator
- T11 Motlen Salt Destructor
- T12 Pyrolysis
- T13 Wet air oxidation
- T14 Calcination
- T15 Microwave discharge
- T16 Cement kiln
- T17 Lime kiln
- T18 Other (specify)

(b) Chemical Treatment

- T19 Absorption mound
- T20 Absorption field
- T21 Chemical fixation
- T22 Chemical oxidation
- T23 Chemical precipitation
- T24 Chemical reduction
- T25 Chlorination
- T26 Chlorinolysis
- T27 Cyanide destruction
- T28 Degradation
- T29 Detoxification
- T30 Ion exchange
- T31 Neutralization
- T32 Ozonation
- T33 Photolysis
- T34 Other (specify)

(c) Physical Treatment

- (1) Separation of components
- T35 Centrifugation
- T36 Clarification
- T37 Coagulation
- T38 Decanting
- T39 Encapsulation
- T40 Filtration
- T41 Flocculation

T42 Flotation

T43 Foaming

T44 Sedimentation

T45 Thickening

T46 Ultrafiltration

T47 Other (specify)

(2) Removal of Specific Components

T48 Absorption-molecular sieve

T49 Activated carbon

T50 Blending

T51 Catalysis

T52 Crystallization

T53 Dialysis

T54 Distillation

T55 Electro dialysis

T56 Electrolysis

T57 Evaporation

T58 High gradient magnetic separation

T59 Leaching

T60 Liquid ion exchange

T61 Liquid-Liquid extraction

T62 Reverse osmosis

T63 Solvent Recovery

T64 Stripping

T65 Sand filter

T66 Other (specify)

(d) Biological Treatment

T67 Activated sludge

T68 Aerobic lagoon

T69 Aerobic tank

T70 Anaerobic lagoon

T71 Composting

T72 Septic tank

T73 Spray irrigation

T74 Thickening filter

T75 Tricking filter

T76 Waste stabilization pond

T77 Other (specify)

3. Disposal

D80 Underground injection

D81 Landfill

D82 Land treatment

D83 Ocean disposal

D84 Surface impoundment (to be closed as a landfill)

D85 Other (specify)