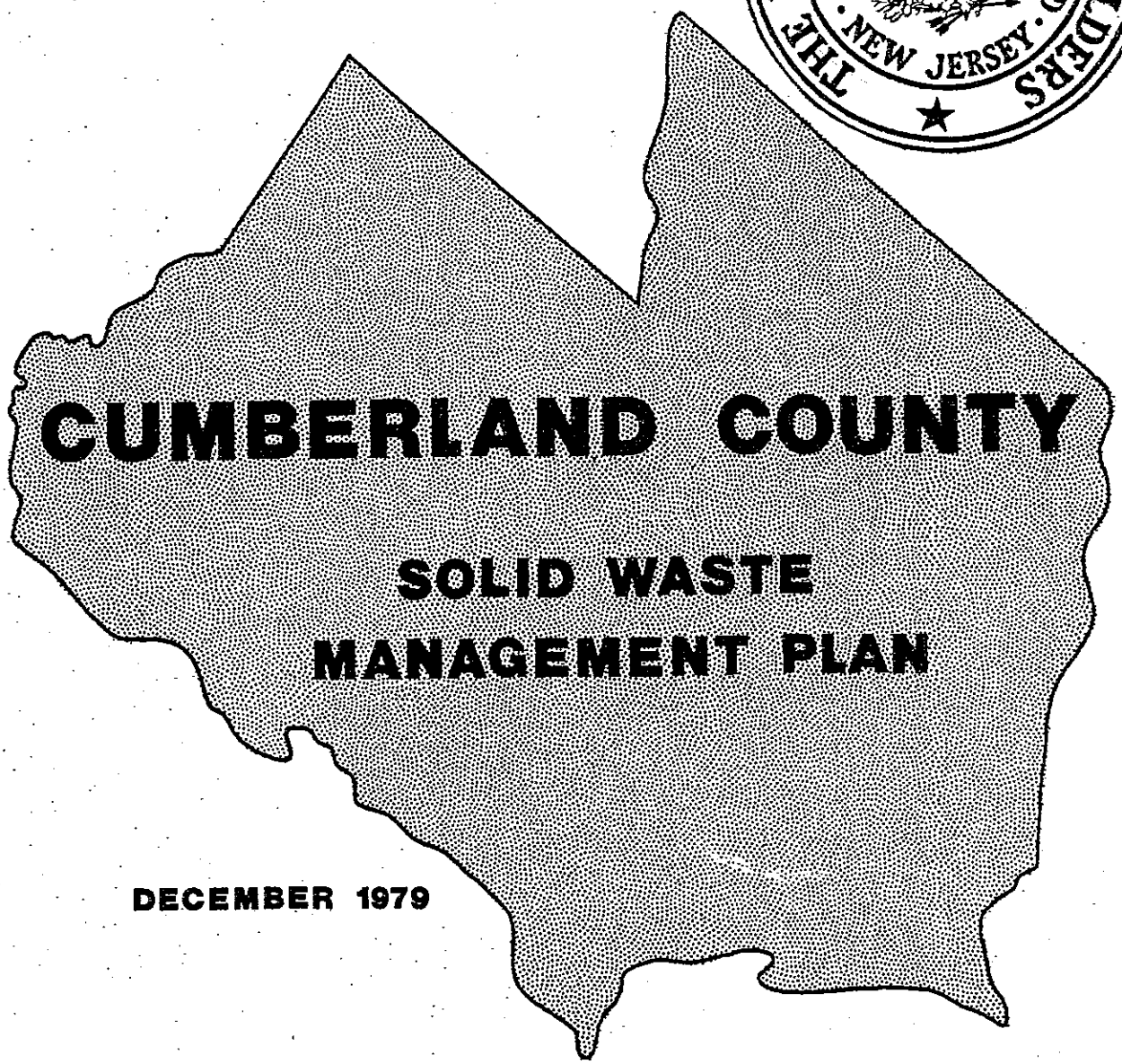

CUMBERLAND COUNTY

SOLID WASTE MANAGEMENT PLAN

DECEMBER 1979

CUMBERLAND COUNTY PLANNING BOARD

ras ASSOCIATES

REUTTER, ANDERSON, SCHOOR
ASSOCIATES

CUMBERLAND COUNTY SOLID WASTE MANAGEMENT PLAN

PREPARED FOR

THE CUMBERLAND COUNTY BOARD OF CHOSEN FREEHOLDERS

IN COOPERATION WITH

THE CUMBERLAND COUNTY SOLID WASTE ADVISORY COUNCIL

December, 1979

PREPARED BY

RAS ASSOCIATES
Reutter Anderson Schoor Associates

FOREWORD

The following is a draft copy of Cumberland County's Solid Waste Management Plan as required by Ch. 326 P.L. 1975. This Plan was developed by the Cumberland County Planning Board in conjunction with their consultants.

The Cumberland County Solid Waste Advisory Council, at their September 19, 1979 meeting, reviewed and approved the Plan as contained herein for submission to the Board of Chosen Freeholders.

A public hearing was held by the Board of Chosen Freeholders on Nocember 20, 1979 at which time the public was invited to comment on the Plan's content prior to final adoption by the Freeholders.

On December 13, 1979 the Board of Chosen Freeholders at their regular monthly meeting adopted the following solid waste management plan.

ACKNOWLEDGEMENTS

The following Solid Waste Management Plan was prepared for the Cumberland County Board of Chosen Freeholders in conjunction with the Solid Waste Advisory Council and the Cumberland County Planning Board.

RAS Associates would like to thank the persons and agencies listed below who have contributed in the development of the Plan:

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INTRODUCTION AND OVERVIEW

In accordance with Chapter 326 of the Public Laws of 1975, Cumberland County has developed a Solid Waste Management Plan, calling for the environmentally sound disposal of the waste stream for a ten year period.

Currently, over 300 tons per day of municipal and industrial solid waste are generated within Cumberland County. 95% of these wastes are disposed of in municipal landfills located throughout the County. A small percentage of the wastes are exported to surrounding counties for disposal.

By 1982 many of the landfills servicing the municipalities in the western part of the County will have reached capacity and been closed. Municipalities in the eastern part of the County have adequate capacity at their landfills to accommodate wastes generated until 1987-88.

The proposed Solid Waste Management Plan for Cumberland County calls for the development of a new landfill incorporating state-of-the-art technology to become operational by 1982 servicing the western municipalities with a system of "greenboxes" for many of the small rural communities. In 1987 a new landfill would be constructed for the remaining municipalities in the County. All environmentally unsecure landfills would be eventually terminated. Recommendations are made for the institution of source separation/recycling programs to reduce the burden on existing and planned facilities.

Listed below are the five sections into which this plan has been divided, including a brief description of the topics addressed in each section.

I. PUBLIC INFORMATION AND PARTICIPATION PROGRAM

A narrative description of the programs carried out during the development of this Plan to keep the public informed and to foster public participation in the planning process.

II. IDENTIFICATION OF TECHNICAL NEEDS

A detailed examination of the current and future waste stream in Cumberland County which addresses the following issues —

Where is the waste coming from?

Where is it going?

How much waste will we have in future years?

What about sludge and septic wastes?

III. DEVELOPMENT, EVALUATION AND SELECTION OF ALTERNATIVES

A review of options for waste disposal during the planning period, a screening of full-county alternatives, and the selection of waste management plans.

IV. SELECTION AND SITING OF FACILITIES

A look at sites in Cumberland County where new disposal areas could be located, including discussions of various site development factors.

V. FINANCIAL, LEGAL AND INSTITUTIONAL PLANS

A review of waste control issues, financial requirements, administrative and management options, and a discussion on coordination with regulatory agencies. Also included is a discussion concerning plan updating provisions.

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PUBLIC INFORMATION AND PARTICIPATION PROGRAM

I. PUBLIC INFORMATION AND PARTICIPATION PROGRAM

A. PUBLIC INFORMATION AND PARTICIPATION PROGRAM (PIPP)

Under Chapter 326, the solid waste management planning districts are required to "Provide citizens and municipalities with opportunities to contribute to the development and implementation of solid waste management plans by requiring public hearings prior to their adoption ....".

The NJDEP guidelines for the preparation of the plan mandate two basic components for the Public Information and Participation Program (P.I.P.P).

a. A process for keeping the public informed of the district's plan development and implementation program.

b. A process for the receipt, evaluation, and consideration of public input during plan development and implementation process.

Furthermore, the Guidelines state that the PIPP should involve the following groups.

- The District's Solid Waste Advisory Council
- The Solid Waste Management Industry
- Public Agencies involved in related planning and implementation activities
- The General Public

The Cumberland County PIPP consisted of the following elements:

- Monthly Newsletters
- Public Meetings
- Surveys

The Public Information and Participation Program is an ongoing task that was initiated at the onset of plan development and will continue through adoption by the Freeholders. When completed, an account of all PIPP events and materials will be compiled into a supplemental report.

B. NEWSLETTER

A monthly newsletter highlighting the county's progress towards development of a solid waste management plan was distributed throughout the County.

The principal mailing list for the newsletter was provided by the County. It included county and municipal officials, persons involved in solid waste collection and disposal, major industries, schools, libraries and the general public. The initial list included approximately 375 persons. From time to time more names were added as requests were received.

The newsletter included the following topics:

Introduction:

— An Introduction to the PIPP and newsletter.

SWAC:

— A description of the Cumberland County Solid Waste Advisory Council, its membership, purpose, and the time and place of their meetings. The public was invited to attend these meetings.

Monthly Progress Report:

— The progress of the county and their consultants, RAS Associates, towards the preparation of the solid waste management plan was outlined each month in the newsletter. Preliminary results of specific work tasks were presented.

Solid Waste News from Around the State:

— Current developments in solid waste management that may effect Cumberland County were described in this section. Highlighted were the findings of the four county market survey, an examination into potential energy and materials markets in Cumberland, Salem, Atlantic, and Cape May Counties.

Public Meeting Announcement:

— The time, place, and agenda of upcoming public meetings on solid waste management were advertised in this section.

Need for Public Input:

– The need for public input and participation and the willingness to address any related questions was indicated.

PIPP Coordinator:

– The name, address and telephone number of the County's PIPP coordinator was listed in each newsletter.

All of the newsletters will be included in the PIPP Supplement.

C. PUBLIC MEETINGS

Throughout the months of plan development a series of public meetings were held in a further attempt to inform the public on the purpose and progress of the County's solid waste management plan.

Meetings were held at the Freeholders Meeting Room of the Cumberland County Courthouse in the City of Bridgeton. Press releases were prepared and submitted to area newspapers for extensive media exposure. Meetings were also advertised in the monthly solid waste newsletter.

Presentations were given by both the County and their consultants, followed by a question and answer session. A presentation package containing an agenda of the meeting and topics of items to be discussed was distributed to those in attendance.

Copies of various publications including the Federal Resource Conservation and Recovery Act (RCRA) and Ch. 326 were made available to persons in attendance. Attendees were requested to sign-in so that a formal listing of participants could be compiled. Persons not receiving the monthly newsletter were added to the list for future mailings upon request.

Minutes of the meetings were prepared and will be included in the PIPP supplement.

D. SURVEYS

An effort was made to involve representatives of the solid waste industry as well as the general public in the development of alternatives for solid waste management.

A questionnaire was developed listing basic disposal alternatives, along with their economic and environmental ramifications, being considered in the 10 year plan.

This questionnaire was sent to major collector/haulers of solid wastes throughout Cumberland County along with a cover letter detailing the planning process and the need for industry's input. Recipients were also advised of the monthly newsletter and if not already on the mailing list were provided a means of being added to this list.

Additional space was provided for comments and questions, responses were supplied by the Consultants or the County.

The same survey was distributed to persons in attendance at the 1st public meeting.

Results of these questionnaires were taken into consideration when alternative technologies were chosen. A summary of the responsas as well as the questionnaire itself will be included in the PIPP Supplement.

TASK II

IDENTIFICATION OF TECHNICAL NEEDS

II. IDENTIFICATION OF TECHNICAL NEEDS

A. INTRODUCTION

Prior to formulation of the Cumberland County Solid Waste Management Plan covering a ten year period, the existing County collection and disposal system must be examined. The objective of Task 2 planning activities was to create a comprehensive solid waste data base, to define the existing collection and disposal practices and project future waste generation rates for Cumberland County.

In the past, information regarding generation, collection and disposal of solid wastes was difficult to obtain. As a greater awareness for the problems related to solid waste arose, the need for such data became evident. Although much of this needed data is now available in the form of municipal surveys, weighing programs, collector/hauler reports and disposal facility reports, there are still informational gaps for which allowances must be made.

The Solid Waste Administration, several years ago, began a reporting program for all solid waste generated or disposed of in New Jersey. Every year during the months of May and June each individual or business that collects and transports waste in the state is required to complete a report on wastes collected during the preceding calendar year. These reports include information on the amount, type, origin and disposal location of all waste collected and transported by them during the preceding year. All reports from collector/haulers statewide are entered into a computer and the data is then compiled by county, disposal location, origin, etc.

Disposal facilities are also required to report the quantities and types of waste accepted for disposal on a yearly basis. This data is also entered into a computer and compiled in the same fashion as the collector/hauler reports.

The most current reports available are for 1977 and were relied on for the purpose of this report. It should be noted that these reports are only as accurate as the information supplied by the collector/haulers, or landfill operators. Accurate records are not available from some of the small municipal landfills due to the manner in which the wastes are received.

In Cumberland County, certain factors occurred which compromised the accuracy of these reports. These included the incorrect conversion of cubic yards of solid waste to tons, double reporting of wastes, and inaccurate estimates of wastes reported. Special attention was paid to these factors during the calculation of existing waste generation as presented in this report, to insure an accurate estimate. In many cases, municipal officials as well as members of the solid waste industry were contacted to verify the collector/hauler and disposal facilities reports.

To supplement SWA data, and to obtain additional information on the generation, collection, transportation and disposal of wastes, a questionnaire was sent to each municipality within Cumberland County. The official in each municipality with prime responsibility concerning solid wastes was asked to respond to questions on existing collection and disposal practices. A copy of the actual survey form is included in Appendix 2.

Population projections utilized in this report were obtained from the Cumberland County Planning Board. Population estimates for 1980, 1985, 1990, 1995 and 2000 are presented in Appendix 2. For 1977, population estimates supplied by the New Jersey State Department of Labor and Industry were used.

B. SOLID WASTE GENERATION RATES

1. Existing Rates.

a. Collected Refuse. Collected refuse includes waste collected by municipal forces, private companies under contract to municipalities, or private companies under contract to individual households and industrial/commercial establishments.

Collection by municipal forces or by private collectors under contract to municipalities is offered as a part of municipal services by four Cumberland County communities: Vineland City, Millville City, Commercial Twp., and Maurice River Twp. Refuse collected in this manner is generally defined as "municipal waste" and includes household waste, commercial waste from wholesale, retail or service establishments as well as institutional wastes. The Solid Waste Administration (SWA) definition of municipal waste is included in Appendix 2.These wastes are reported as Type "10" wastes.

The amount of municipal waste collected during 1977 in the four municipalities who offer collection service is listed in Table 2—1. Municipal waste generation rates in lbs./capita/day are also presented. It should be stressed that the refuse collected under this system does not constitute the entire amount of waste generated in the respective communities. Private haulers under contract to individual households or commercial establishments collect a significant portion of the waste in the four above mentioned municipalities as well as throughout Cumberland County.

Besides collecting municipal waste on an individual household basis, private collectors handle most of the industrial, commercial and other solid wastes generated in the County. Industrial, commercial and other solid wastes include all those solid wastes not categorized as municipal wastes. For purposes of this study, this category also includes liquid wastes other than

TABLE 2–1

1977 MUNICIPAL WASTE GENERATION IN THOSE MUNICIPALITIES WHICH OFFER COLLECTION SERVICE

Municipality	Tons/Year	1977 Population*	Lbs./Cap./Day
Commercial Twp.	450	3,843**	0.80
Maurice River	1,500	4,593	1.79
Millville City	9,600	24,461	2.16
Vineland	15,600	52,674***	2.71

* From N.J. Dept. of Labor and Industry

** Municipal Collection in Commercial Twp. serves approximately 80% of the population.

*** Contract Collection in Vineland serves approximately 60% of the population.

Sample Calculation:

$$9{,}600 \frac{\text{tons}}{\text{year}} \times \frac{2{,}000 \text{ lb.}}{\text{ton}} \times \frac{1 \text{ year}}{365 \text{ days}} \times \frac{1}{24{,}461} = 2.15 \text{ lb./cap./day}$$

septic and sewerage sludges. The solid wastes that are considered here include: bulky wastes, dry hazardous wastes, dry non-hazardous chemical wastes, vegetative wastes, animal and food processing wastes, and non-chemical industrial wastes. Liquid wastes include: waste oil and sludges, bulk liquids and semi-liquids, liquid hazardous wastes and liquid chemical wastes. The Solid Waste Administration's definitions of these wastes are included in Appendix 2.

Total collected refuse in Cumberland County includes the municipal, industrial, commercial and other solid waste collected by private collectors as well as the municipal waste collected by municipal forces or private collectors under contract to a municipality. Table 2–2 lists, by municipality, the amount of refuse collected in 1977.

Liquid wastes, other than septic and sewerage sludge, are generally attributed to commerce and industry. It follows that the majority of liquid waste generation occurs in the three major Cumberland County municipalities of Bridgeton, Millville and Vineland. Table 2–3 shows 1977 liquid waste generation in gallons per year.

b. Uncollected Refuse. Uncollected refuse is solid waste that is transported to the disposal site by private residents. This waste is generally restricted to municipal waste, bulky waste and vegetative waste generated in the private household.

All the registered landfills in Cumberland County allow the disposal of uncollected refuse. This disposal method is restricted to residents of the municipality where the landfill is located except in two instances where two communities share one common landfill.

Table 2–4 lists, by municipality, the amount of uncollected refuse generated and disposed of in Cumberland County. Because of the municipal service collection in Vineland City, uncollected refuse is minimal and usually consists of bulky waste and vegetative waste.

c. Summary. Total waste generated in Cumberland County's municipalities is the sum of collected and uncollected refuse and is presented in Table 2–5 with the corresponding per capita waste generation rates. 122,954 tons of solid waste was found to be generated in the county in 1977 with generation rates varying from 0.57 to 6.74 lbs./capita/day.

In two instances, two municipalities were combined into a single study area because of jointly owned landfills. Residents of Hopewell Township and Greenwich Township utilize a landfill in Hopewell, while a landfill in Stow Creek Township serves residents of Stow Creek and Shiloh. Per capita waste generation was computed on a combined basis.

Various surveys have been performed in the past to establish waste per capita generation rates. Results of two of these surveys are shown in Table 2–6. There are, of course, other wastes, including sludges, street sweepings, bulky wastes, etc., generated at the municipal

TABLE 2–2

1977 COLLECTED REFUSE

Municipality	Tons
Bridgeton	12,424
Commercial	506
Deerfield	4
Downe	–
Fairfield	345
Greenwich	–
Hopewell	–
Lawrence	1
Maurice River	1,500
Millville	24,600
Shiloh	–
Stow Creek	–
Upper Deerfield	313
Vineland	59,283
Various	9,959
Total Collected Refuse	108,935 Tons

TABLE 2–3

1977 LIQUID WASTE GENERATION BY MUNICIPALITY IN GALLONS/YEAR

	Waste Classifications				
Municipality	70	72	76	77	Total
Bridgeton	15,000				15,000
Millville	40,000		12,015	2,000	54,015
Vineland		40,000	530		40,530
Various	176,000			100,000	276,000
	231,000	40,000	12,545	102,000	385,545

Waste Classifications*

70 – Waste Oil and Sludges

72 – Bulk Liquid and Semi-Liquids

76 – Liquid Hazardous Waste

77 – Liquid Chemical Waste

*N.J. Department of Environmental Protection, Solid Waste Administration
(See Appendix 2 for Waste Classification Definitions)

TABLE 2–4

1977 UNCOLLECTED REFUSE

Municipality	Tons/Year
Bridgeton	2,131
Commercial	282
Deerfield	700
Downe	458
Fairfield	315
Greenwich-Hopewell	1,505
Lawrence	875
Maurice River	300
Millville	5,400
Shiloh-Stow Creek	1,700
Upper Deerfield	353
Vineland	–
Total Uncollected Refuse	14,019 Tons

TABLE 2—5

CUMBERLAND COUNTY SOLID WASTE GENERATION

Municipality	Tons/Year	1977 Population*	Generation Rate (lb./cap./day)
Bridgeton	14,555	19,806	4.03
Commercial	788	3,843	1.13
Deerfield	704	2,551	1.51
Downe	458	1,893	1.33
Fairfield	660	5,507	0.66
Greenwich-Hopewell	1,505	4,958	1.67
Lawrence	876	2,300	2.09
Maurice River	1,800	4,593	2.15
Millville	30,000	24,461	6.74
Shiloh-Stow Creek	1,700	1,775	5.26
Upper Deerfield	666	6,462	0.57
Vineland	59,283	52,674	6.18
Various	9,959	—	—
Cumberland County	122,954	130,823	Avg. 5.16

*From N.J. Department of Labor and Industry

Sample Calculation:

$$30{,}000 \text{ tons/year} \times \frac{2{,}000 \text{ lb.}}{\text{tons}} \times \frac{1 \text{ year}}{365 \text{ days}} \times \frac{1}{24{,}461} = 6.74 \text{ lb./cap./day}$$

TABLE 2–6

PER CAPITA SOLID WASTE GENERATION RATES FOR BARIOUS SIZED MUNICIPALITIES[1]

	Small, Rural (< 1000 Pop.)	Small, Industrial (1,000 - 10,000 Pop.)	Medium, Rural (10,000 - 25,000 Pop.)	Medium, Urban (25,000 - 75,000 Pop.)	Medium, Industrial (75,000 - 100,000 Pop.	Large (> 100,000 Pop.)	Nat. S.W. Survey - 1968 RURAL	Nat. S.W. Survey - 1968 URBAN	Nat. S.W. Survey - 1968 AVERAGE
Residential	2.0	2.0	2.4	2.4	2.4	2.4	3.0	3.2	3.1
Commercial	1.5	2.0	2.5	2.5	3.5	3.5	0.4	1.2	1.0
Industrial	0.0	0.5	0.5	1.2	1.8	3.0	0.4	0.6	0.6
TOTAL	3.5	4.5	5.4	6.1	7.7	8.9	3.8	5.0	4.7

[1] From "Solid Wastes", Chapter 2, Solid Waste Characteristics, Table 10, Pennsylvania State University, Civil Engineering Dept., Workshop Proceedings, 1972.

level, but this study deals primarily with the municipal waste classes indicated in the table. Solid waste generation rates are classified by the size and type of community.

The data in the table is based on two surveys. The three right hand columns contain the data from the 1968 National Solid Waste Survey. Per capita generation rates are shown for urban and rural areas, and the national average is also indicated. In the six left hand columns, data is shown from a Pennsylvania State University survey. This generation rate data is categorized by population class intervals.

For purposes of comparison with Cumberland County generation rates, an expected range of per capita generation rates has been established for each municipality. This expected range was estimated on the population and location of the municipality within the county, as well as the classes and percentages of waste collected. These expected ranges are shown in Table 2–7. The actual waste generation rates for Cumberland County municipalities and the expected range are shown in Table 2–8. Also shown in the table in the right hand column are the percentage deviations from the end of the range where actual generation rates fell outside the expected range.

A review of the table shows that for most municipalities, per capita generation rates fell close to, or within their respective expected ranges. Of the deviations that occurred, the generation rates of the smaller rural areas tended to be lower than the expected range, while the generation rate for Millville, an urban area, was above the expected range. In rural areas, private collectors will complete a load which is actually collected from a number of municipalities. When wastes are collected in this manner they are reported as originating in "Various" municipalities and cannot be assigned to one town or used in computing generation rates. Also, not all of the waste generated in rural areas enters the waste stream; some waste is disposed of by individual landowners on their own property or indiscriminately in wooded areas.

Waste generation per capita is higher than the expected range in Millville due to the concentration of industry in the urban municipality.

Table 2–9 shows the 1977 total waste generated in Cumberland County broken down into waste types. Significantly, nearly all industrial waste is generated in Bridgeton, Millville and Vineland. Relative percentages of the solid waste generated, by municipality, are shown in Figure 2–1.

2. Future Waste Projections. To plan for an effective solid waste management system for Cumberland County, it is necessary to project the types and amounts of wastes that can be expected in the future. In this section, projections for future years will be presented.

TABLE 2–7

EXPECTED PER CAPITA GENERATION RATE IN CUMBERLAND COUNTY

RANGES (Lb./Capita/Day)

Urban Municipalities, Large (> 25,000 Population)

	Low	High
Residential	2.4	3.2
Commercial	1.0	2.5
Industrial	0.6	1.2
Total	4.0	6.9

Urban Municipalities, Medium (10,000 - 25,000 Population)

	Low	High
Residential	2.4	3.2
Commercial	1.0	2.5
Industrial	0.5	0.6
Total	3.9	6.3

Rural Municipalities, Small (<10,000 Population)

	Low	High
Residential	0.5	3.0
Commercial	0.4	1.5
Industrial	0	0.4
Total	0.9	4.9

TABLE 2–8

PER CAPITA GENERATION RATES FOR MUNICIPALITIES

Municipality	Generation Rate (lb./cap./day)	Expected Range (lb./cap./day)	Deviation From End of Expected Range
Bridgeton	4.03	3.9 - 6.3	As Expected
Commercial	1.13	0.9 - 4.9	As Expected
Deerfield	1.51	0.9 - 4.9	As Expected
Downe	1.33	0.9 - 4.9	As Expected
Fairfield	0.66	0.9 - 4.9	Lower by 27%
Greenwich-Hopewell	1.67	0.9 - 4.9	As Expected
Lawrence	2.14	0.9 - 4.9	As Expected
Maurice River	2.15	0.9 - 4.9	As Expected
Millville	6.74	3.9 - 6.3	Higher by 7%
Shiloh - Stow Creek	5.26	0.9 - 4.9	Higher by 7%
Upper Deerfield	0.57	0.9 - 4.9	Lower by 37%
Vineland	6.18	4.0 - 6.9	As Expected

TABLE 2-9

1977 GENERATION BY WASTE TYPE (TONS)

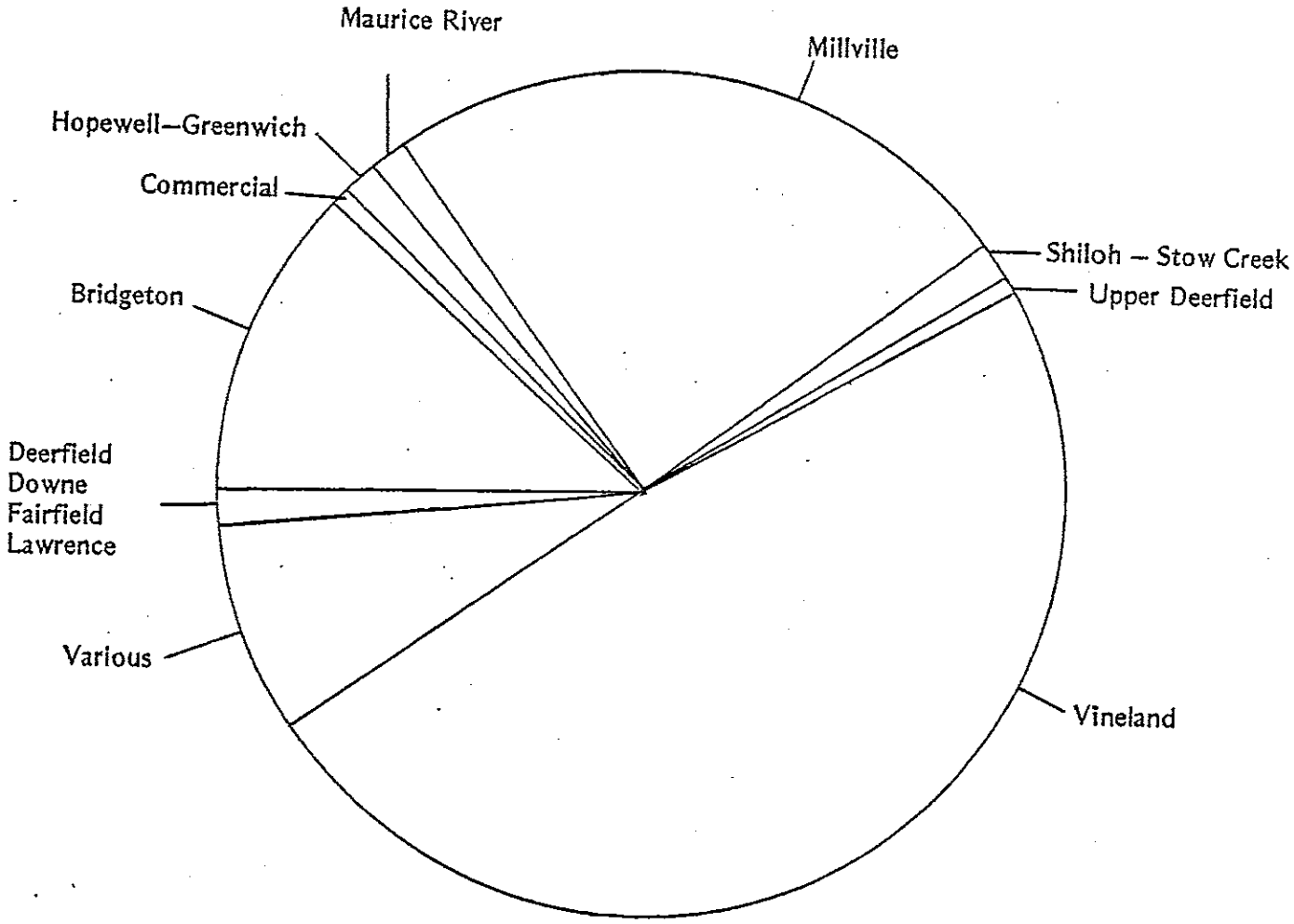
Municipality	Municipality Collected 10	All Other 10	13	18	23	25	26	27	Total
Bridgeton	—	8,397	1,429	4,080	184	154	36		14,555
Commercial	450	338	—	—	—	—	—	—	788
Deerfield	—	704	—	—	—	—	—	—	704
Downe	—	358	60	—	40	—	—	—	458
Fairfield	—	540	20	—	100	—	—	—	660
Hopewell-Greenwich	—	1,505	—	—	—	—	—	—	1,505
Lawrence	—	601	150	—	125	—	—	—	876
Maurice River	1,500	300	—	—	—	—	—	—	1,800
Millville	9,600	10,000	3,000	—	—	—	—	7,400	30,000
Stow Creek-Shiloh	—	1,700	—	—	—	—	—	—	1,700
Upper Deerfield	—	537	37	—	92	—	—		666
Vineland	15,600	13,982	12,016	2,030	731	—	—	14,924	59,283
Various	—	9,805	75	—	60	—	—	19	9,959
	27,150	48,767	16,787	6,110	1,332	154	36	22,618	122,954

Total Type 10 - 75,917

10 — Municipal
13 — Bulky Waste
18 — Dry Non-Hazardous Chemical Waste
23 — Vegetative Waste
25 — Animal and Food Processing Waste
26 — Oil Spill Clean-up Wastes
27 — Non-chemical waste

FIGURE 2–1

1977 SOLID WASTE GENERATION BY MUNICIPALITY



a. Municipal Wastes. The amount of municipal waste (Type 10) generation relies to a great extent on the population of a given municipal area. In the past it was assumed that the per capita generation rate for municipal wastes increased by 2-4% annually. At present, the EPA is no longer predicting annual increases and does not have a set policy on predicting generation rates. A review of past and present data as well as future employment and population projections for Cumberland County indicated that no substantial increases in the municipal per capita generation rate is expected, except in two municipalities. Due to the rapid growth predicted for Vineland and Millville, it is expected that the municipal waste generation rates will increase through the year 2000.

Presently, 4.40 lbs./capita/day of Millville's 1977 total waste generation rate of 6.74 lbs./capita/day (from Table 2–8) is attributed to municipal waste only. It is estimated that the Millville municipal waste generation rate will increase yearly and by the year 2000 approach the Pennsylvania State University Survey municipal waste generation rate of 4.90 lbs./capita/day for a medium urban area. Similarly, Vineland's 1977 municipal waste generation rate of 3.09 lbs./capita/day will increase and by the year 2000 approach the National Solid Waste Survey's urban average of 4.40 lbs./capita/day.

Municipal waste projections for the remainder of Cumberland County's municipalities were based on the 1977 municipal waste generation rates. Population projections supplied by the Cumberland County Planning Board were used for all municipalities.

Projected municipal waste generation for 1980, 1985, 1990, 1995 and 2000 is shown in Table 2–10. Because of decreasing population in Bridgeton, waste quantities will decrease, while the remaining municipalities show increases. Using 1977 as base year, a 30.3% overall increase is expected in municipal waste generation by the end of the ten year planning period (1990).

b. Industrial, Commercial and Other Solid Wastes. Industrial and commercial waste projections to the year 2000 have been estimated based on future employment projections for Cumberland County. Table 2–11 lists these estimates in five year intervals. A projected slight decrease in the following waste categories, non-chemical industrial waste, dry non-hazardous chemical waste and oil spill clean-up waste, are a reflection of the forecasted decrease of employment in the manufacturing industry. The projected decrease of employment in the agriculture, forestry, and food processing industries will result in a reduction in animal and food processing waste and vegetative waste towards the year 2000. Bulky waste is generated in the individual household ("white goods", etc.) as well as industry. Increases in population have therefore been taken into consideration for projections of this waste type. Table 2–11 shows a gradual increase in bulky waste.

TABLE 2–10

CUMBERLAND COUNTY MUNICIPAL WASTE PROJECTIONS

	Tons/Year				
	1980	1985	1990	1995	2000
Bridgeton	8,283	8,211	8,140	8,098	8,055
Commercial	803	832	861	902	943
Deerfield	714	757	800	842	883
Downe	367	382	397	416	435
Fairfield	562	595	628	657	686
Hopewell-Greenwich	1,508	1,574	1,639	1,700	1,761
Lawrence	598	612	627	640	653
Maurice River	1,943	2,049	2,155	2,273	2,391
Millville	20,979	23,533	26,234	28,725	31,302
Stow Creek-Shiloh	1,781	1,872	1,963	2,059	2,155
Upper Deerfield	530	579	627	702	777
Vineland	32,594	37,938	43,566	49,677	56,056
Various	10,110	10,714	11,317	11,924	12,531
Cumberland County	80,772	89,648	98,954	108,615	118,628
% Increase Over Base Year 1977	6.40	18.09	30.34	43.07	56.26

TABLE 2–11

CUMBERLAND COUNTY

INDUSTRIAL AND COMMERCIAL WASTE PROJECTIONS

PROJECTIONS(TON)

	1977	1980	1985	1990	1995	2000
13	16,787	17,307	18,331	19,372	20,413	21,454
18	6,110	6,067	6,000	6,000	6,030	6,100
23	1,332	1,240	1,077	979	914	848
25	154	143	124	113	106	98
26	36	36	35	35	36	36
TOTALS	47,037	47,253	47,777	48,709	49,823	51,131

Projected generation of waste oils, bulk liquids and semi-liquids, liquid hazardous wastes and liquid chemical wastes are based on employment trends in the manufacturing industries. These projections are shown in Table 2–12. As is the case for industrial wastes, a slight decrease in quantities generated is projected for the future.

Total solid waste generation predictions are shown in Table 2–13. These figures include municipal wastes, and commercial and industrial wastes. An increase of 21.6% is expected in total solid waste production between base year 1977 and 1990.

c. Waste Projection Summary. The prediction of solid and liquid waste quantities is dependent upon the accuracy and completeness of the population and economic projections they are based upon as well as the collector/hauler generation data. There are a great deal of economic and social factors which play a role in these predictions, along with many intangibles.

The state law governing the "326" plans calls for an updating process every two years. At each two year review, the most current population and economic indicators should be studied. Solid waste projections should then be adjusted accordingly.

C. SOLID WASTE COLLECTION, TRANSPORT, AND DISPOSAL PRACTICES IN CUMBERLAND COUNTY

1. Municipal Collection Systems. Four of the fourteen municipalities in Cumberland County provide collection service for municipal solid wastes generated by their residents. The extent of service varies from one municipality to the next; thus the practice in each of the four communities will be discussed separately. A summary of these collection practices is provided in Table 2–14.

a. Commercial Township. Utilizing a single 20 cubic yard compactor truck and three municipal personnel, the township provides weekly curb side collection for 80% of its residents. All commercial wastes are excluded from this collection. Special collections for leaves, tree stumps, and bulky wastes are provided in the spring and again in the fall. The collection costs have been estimated at $17,348 per year by the township. The collection vehicle is in service Monday through Thursday, delivering about 450 tons per year to the municipal landfill within the township. It should be noted that there is a seasonal (summer) increase in solid waste generation in Commercial Township. Additional wastes are generated due to the seasonal occupancy of summer homes, cottages and cabins in the Laurel Lakes area.

b. Maurice River Township. A private commercial hauler entered into contract with the municipality to provide weekly collection service for all of the residential waste generated within the township. The contract does not provide for the collection of commercial

TABLE 2–12

LIQUID WASTE PROJECTIONS

	1977	1980	1985	1990	1995	2000
	Base	.993	.982	.982	.987	.949
70	231,000	229,383	226,842	226,842	227,997	230,769
72	40,000	39,700	39,280	39,280	39,480	39,960
76	12,545	12,457	12,319	12,319	12,382	12,532
77	102,000	101,286	100,164	100,164	100,674	101,898
Total	385,545	383,826	333,605	338,605	380,533	385,159

TABLE 2—13

TOTAL SOLID WASTE PROJECTIONS FOR CUMBERLAND COUNTY

IN TONS/YEAR

		Projections				
	1977	1980	1985	1990	1995	2000
Municipal	75,917	80,772	89,648	98,954	108,615	118,628
Industrial, Commercial, & Other Solid Wastes	47,037	47,253	47,777	48,709	49,823	51,131
Total	122,954	128,025	137,425	147,663	158,438	169,758

TABLE 2–14

MUNICIPAL COLLECTION PRACTICES IN CUMBERLAND COUNTY

Municipality	Collection Type	Contract Specifications	Collection Includes	Collection Costs/Year	Waste Collected Tons/Year	Frequency of	Size and No. of Trucks	Point of Collection
Commercial Twp.	Municipal		80% Household	17,346	450	1/week	(1) 20 CY	Curbside
Maurice River Twp.	Contract	July 1977 to September 1980 $75,726	100% Household	23,300	1,800	1/week	(1) 20 CY	Curbside
Millville	Municipal		100% Household	79,764	9,600	1/week	(3) 20 CY	Curbside
Vineland	Contract	2 Year Renewable $165,000/ Year	60% Household	165,000	15,600	2/week	(2) 20 CY	Curbside

wastes. The hauler's 20 cubic yard compactor truck, operating two days per week, collects 1500 tons of refuse per year, utilizing two local landfills for disposal of the waste. The cost to the township for this service, which began in July, 1977 and extends until September 1980, is $75,726.

c. City of Millville. Weekly collection service for all of the residential solid wastes generated within the City of Millville is provided by the municipality. This service is not offered to commercial establishments. City personnel, utilizing three-20 cubic yard compactor trucks, collect about 9,600 tons per year of this waste, depositing the refuse in the Millville municipal landfill. Special collections are provided for leaves during the fall months and for bulky wastes in the months of April and October. The total cost for this service is $76,357 per year.

d. City of Vineland. Approximately 60% of the residential waste generated within the city is collected biweekly by a commercial hauler under contract with the municipality. Wastes emanating from commercial establishments are excluded from this collection. Two 20 yard compactor trucks operating 5-1/2 days a week deliver a combined 15,600 tons per year of refuse to the City of Vineland Landfill. The two year renewable contract costs the City of Vineland $165,000 per year.

2. Non-Municipal Collection. Through agreement with individual households, and commercial and industrial establishments private collector/haulers are responsible for the collection of about 65% of the total countywide solid waste generation. The activity of these haulers from one municipality to the next appears to be a function of the extent of municipal collection, the size and population density of the municipality, and the degree of commercial and industrial development within the municipality.

The aforementioned factors work in combination to make Bridgeton a major area of commercial hauler activity. With a population density greater than 3000 persons per square mile, ample commerce and industry, and the absence of municipal collection, private haulers collect greater than 85% of the 14,555 tons per year of solid waste generated within the city.

Although municipal collection is available to some extent, the neighboring cities of Vineland and Millville represent the largest markets for the private hauling industry in Cumberland County. The large volume of solid waste in these cities is primarily attributable to the significant commercial and industrial development in the area. Private haulers in Vineland account for the collection of about 75% of the 59,283 tons per year of solid waste generated within the City. In Millville, the private hauling industry collects about half of the 30,000 tons per year of solid waste requiring disposal.

Located in the southeastern portion of the county, Maurice River and Commercial Townships represent areas where municipal collection systems and the lack of significant waste

generating commerce and industry restrict the need for private hauling services. The Port Norris section of Maurice River Township contains numerous facilities for the processing of shellfish. The major waste product, clam and oyster shells, is returned to the bay of origin by the processors and thus does not appear in the waste stream. Collection by private haulers accounts for about 10% of the solid waste generated in Commercial Township. In Maurice River Township, collection by private haulers is virtually non-existent.

Upper Deerfield Township, bordering the northeastern portion of Bridgeton, and Fairfield Township, to Bridgeton's southeast, generate what may be termed moderate yearly tonnages of solid waste. From a solid waste standpoint, the two townships exhibit remarkable similarity. Each generates about 660 tons per year of solid waste. Collection in each of the townships by private haulers amount to about half of what is generated.

The seven remaining municipalities, which include Deerfield Township, Downe Township, Greenwich Township, Hopewell Township, Lawrence Township, the Borough of Shiloh, and Stow Creek Township, may be classified as rural in nature. These municipalities, comprising 35% of the total land area in Cumberland County, collectively generate approximately 4% of the solid waste within the county, amounting to less than 5,000 tons. Virtually none of this waste is collected by private haulers.

Many private haulers collect from several Cumberland County municipalities. Often, a single truckload will contain wastes from more than one municipality. In the yearly reports submitted to the New Jersey Solid Waste Administration, the origin of such a truckload is listed as "various". Nearly 10,000 tons per year of solid waste originating in "various" locations throughout the county are collected by private haulers.

Nonmunicipal collection practices in Cumberland County are listed in Table 2—15.

3. Delivery of Solid Waste to Disposal Areas. Sharing a common border, Stow Creek Township and the Borough of Shiloh utilize a single common landfill, located in Stow Creek, for the disposal of their solid wastes. Similarly, the adjoining townships of Hopewell and Greenwich share the use of a common landfill located in Hopewell Township. Each of the remaining 10 Cumberland County municipalities maintains a municipal landfill within its respective municipal boundary, with the exception of Maurice River Township, which utilizes two local landfilling sites.

This practice of "in town" landfill siting serves to limit the distance between solid waste generation and disposal locations. Excepting the joint landfill operations in Stow Creek-Shiloh and Hopewell-Greenwich, less than 20% of the solid waste generated in Cumberland County crosses a municipal boundary prior to disposal.

TABLE 2–15

NON–MUNICIPAL COLLECTION PRACTICES

Municipality	Size (Square Miles)	Population Density (Persons/Sq.Mi.)	Municipal Collection (tons/year)	Municipal Collection (tons/year)
Bridgeton	6.5	3,047	—	12,424
Commercial	34	113	450	56
Deerfield	17	153	—	4
Dowe	56	34	—	—
Fairfield	43	128	—	345
Greenwich	19	52	—	—
Hopewell	31	126	—	—
Lawrence	36	65	—	1
Maurice River	95	49	1,500	—
Millville	44	552	9,600	15,000
Shiloh	1.3	464	—	—
Stow Creek	19	62	—	—
Upper Deerfield	32	203	—	313
Vineland	69.5	758	15,600	43,683
Various				9,959
TOTAL	503.3		27,150	81,785

Slightly more than half of these extra local solid wastes are exported to disposal locations outside of Cumberland County. Table 2–16 lists the counties accepting solid wastes generated in Cumberland County, and the quantities they reportedly accepted in 1977. Overall, about 9% of the solid waste generated in Cumberland County is transported to disposal sites outside of the county. Most of the extra-local wastes remaining in Cumberland County are delivered to the City of Bridgeton Landfill, with the small remaining fraction of this waste going to the large landfills in Millville and Vineland.

Solid wastes imported from other New Jersey Counties amounted to about 3,600 tons in 1977. Representing about 3% of the total solid waste disposed of in Cumberland County, nearly all of this waste entering the County was delivered to the City of Vineland landfill, for disposal. A very small percentage was disposed of at the Upper Deerfield Landfill. Table 2–17 lists sources and quantities of imported solid wastes in 1977.

Waste oil and sludges, bulk liquids and semi-liquids, liquid hazardous wastes, and liquid chemical wastes generated in Cumberland County are for the most part hauled to landfills or processing facilities outside of the county for disposal. Of the 385,545 gallons of these wastes generated in Cumberland County in 1977, only 40,000 gallons were reportedly disposed of at the City of Vineland landfill. Table 2–18 lists the quantities and disposal locations of these liquid wastes as reported to the Solid Waste Administration in 1977.

4. Existing Solid Waste Disposal Areas and Processing Facilities. Presented in this section are discussions of each of the registered solid waste disposal and processing facilities currently operating in Cumberland County. Information presented herein was gathered from SWA files, previous reports, and in some cases, discussions with facility operators. Discussions are presented by facility type and by SWA Identification Number. The locations of the facilities are shown by SWA Identification Number in Figure 2–2.

It should be noted that there are two regulatory agencies actively regulating solid waste facilities in New Jersey. The first of these, the Department of Environmental Protection, Solid Waste Administration (SWA), has the basic regulatory functions of reviewing and approving engineering plans, waste quantity and type reporting, facility registrations and inspection/enforcement. The second regulatory agency, the Board of Public Utilities (BPU) sets tipping fee rates (by approved tariff) for those landfills which accept wastes from any collector hauler who delivers the waste to the disposal facility. All landfills are regulated by the SWA, but only a few landfills in Cumberland County are subject to rate regulation by the BPU. Where landfills are regulated by the BPU, it is so noted in the following discussions.

a. Solid Waste Disposal Area.

City of Bridgeton Landfill (0601A) – Located off Mayor Aitkin Drive in Bridgeton, this facility is a BPU regulated landfill. The 26 acre site has an estimated remaining life of 3 years and 350,000 cubic yards.

TABLE 2–16

DISPOSAL OF SOLID WASTES GENERATED IN CUMBERLAND COUNTY (1977)

Disposal County	Tons	% Tons
Atlantic	629	0.5
Burlington	529	0.4
Camden	51	0.04
Cumberland	112,311	91.3
Gloucester	9,411	7.7
Ocean	20	0.02
Salem	3	0.002
TOTAL	122,954	100%

TABLE 2–17
SOLID WASTE IMPORTATION (1977)

Origin County	Tons/Year	Disposal Location
Atlantic County	1,260	City of Vineland Landfill
Camden County	288	City of Vineland Landfill
Cape May County	19	City of Vineland Landfill
Gloucester County	435	City of Vineland Landfill
Salem County	1,105	City of Vineland Landfill
TOTAL	3,107 tons/year	

TABLE 2–18

LIQUID WASTES DISPOSAL (1977)

Disposal Location	Gallons
Gloucester County	245,545
Hudson County	100,000
Cumberland County	40,000
TOTAL	385,545

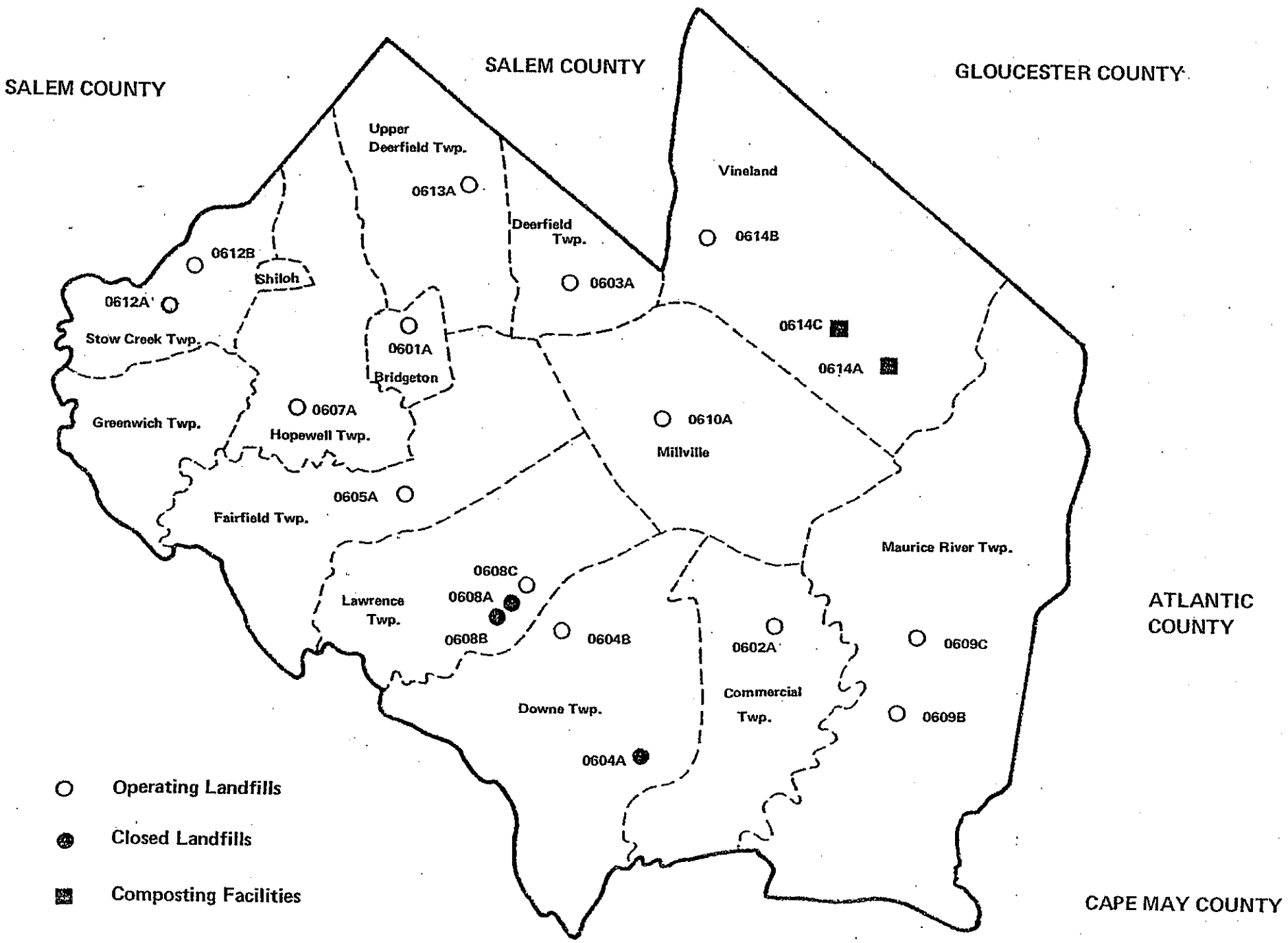


Figure 2-2
REGISTERED DISPOSAL AREAS

The facility has been approved by the SWA to accept municipal waste, bulky waste, vegetative waste, animal and food processing waste, and non-chemical industrial waste. In 1977, 101,818 cubic yards of waste were reportedly disposed of, while in 1976, the figure was 109,727 cubic yards.

An engineering plan for the facility was approved by the SWA in 1977. Two groundwater monitoring wells were to be constructed in early 1978. Inspection violations as reported by the SWA have included insufficient and eroded cover, wind-blown refuse and inadequate leachate control.

Opened in 1968, use of the facility is restricted to DEP and BPU registered commercial haulers, business and industry in Bridgeton and residents of the municipality. Final end use plans for the site call for a ski slope 70 feet above the surrounding grade.

Commercial Township Landfill (0602A) – This municipally owned and operated landfill is located on Snow Hill Road in Commercial Township on a 33-1/2 acre site.

Use of the facility is restricted to municipal collection forces and Township residents who disposed of approximately 4,600 cubic yards of municipal waste in 1977. The remaining life of the landfill is estimated to be 5 years. The landfill is operating under an approved engineering plan.

Inadequate cover, excessive working face width and excessive lift height were among the inspection violations as reported by the SWA in recent years.

Deerfield Township Landfill (0603A) – The Deerfield Township Landfill is located off of Vineland Avenue, Deerfield Township. The size of the existing site is 5.6 acres and has been utilized for approximately 40 years. Use of the landfill is restricted to Township residents only.

Waste material accepted at this site consists of municipal and bulky waste. The total volume accepted in 1976 and 1977 were 2,100 and 700 cubic yards, respectively. Virtually all waste is transported to the landfill by individual residents.

Remaining capacity on the 5.6 acre site has been estimated to be approximately 10 years. The Township owns an additional 22 acres adjoining the existing site which can be incorporated into the operation. The landfill has an approved engineering plan.

The last SWA reported violation occurred in 1977 for inadequate intermediate and daily cover material. Since that time, there have been no reported violations.

Downe Township Landfill Site Number 2 (0604A) – Located off Hansey Creek Road, this site is one of three landfills utilized by Downe Township for solid waste disposal. Used primarily by Township residents in the vicinity of Dividing Creek, this 0.5 acre site has presently reached capacity and final cover must be applied.

Registered to accept municipal, bulky and vegetative waste, the landfill reported 600 cubic yards disposed of in 1977. Past SWA inspection violations reported included visible scattered refuse, poor compaction, and inadequate daily cover. Since June 1978, there have been no SWA reports of any additional violations.

The site is leased by the Township, which is contemplating the acquisition of adjacent land for expansion of the landfill.

Downe Township Landfill Site Number 3 (0604B) – Located on a 12.4 acre site on Ackley Road, this facility started operation in June 1978. It is registered to accept municipal, bulky, tires, leaves and chopped trees, and vegetative wastes. The facility's life is estimated at 12-15 years which can be lengthened if Township-owned acreage surrounding the landfill is incorporated into the operation.

An engineering plan of the facility was approved by the SWA in December 1977. Two groundwater monitoring wells have been recently installed.

No inspection violations have been reported by SWA since the landfill started operation.

Downe Township Landfill Site Number 1 (0608B) – The Downe Township Landfill (Site Number 1) is located on Newport-Center Grove Road in Lawrence Township. The two acre site was closed in October 1978 when capacity was reached.

In 1977, the site's last full year of operation, 2500 cubic yards of municipal, bulky and vegetative waste was disposed of at the landfill.

An engineering plan of the landfill was submitted in 1973 and approved by the SWA. Periodic inspections by the SWA found the site in satisfactory condition on many occasions. The SWA-reported violations that did occur included scattered visible paper, inadequate cover material and excessive slopes. The final SWA inspection in November, 1978 reported the site closed with final cover properly applied.

Fairfield Township Landfill (0605A) – Located on Lumis Mill Road in Fairfield Township, use of this 15 acre landfill is restricted to Township residents only. Reportedly, 3000 cubic yards of municipal waste, 100 cubic yards of bulky waste, and 500 cubic yards of vegetative waste were disposed of at the site in 1977. Remaining capacity has been estimated to be 2 to 3 years.

Inspection violations reported by the SWA in the last several years have included too wide of a working face, excessive lift height and inadequate daily and intermediate cover.

The landfill is operating under an engineering plan approved in 1971.

Hopewell Township Landfill (0607A) – In operation for more than 20 years, this landfill is used by residents of Hopewell Township and Greenwich Township only. The 11 acre site is located on Trench Road in Hopewell. Approximately 4,300 cubic yards of municipal waste were disposed of in 1977.

The remaining life of the site is estimated at 4 years. However, the Township has purchased 15 acres adjacent to the existing site and engineering expansion plans are now being prepared by the Township Engineer. Expansion would significantly increase the remaining capacity.

An engineering plan for the current site was approved by the SWA in September 1978. Two groundwater monitoring wells are planned to be installed by April, 1979.

Inspection violations reported by the SWA have included excessive working face width, inadequate cover and compaction, excessive grades, and visible scattered litter.

Lawrence Township Landfill Site Number 1 (0608A) – Located on Shaws Mill Road in Lawrence Township, this 2.8 acre site served Township residents from 1965 until it reached capacity in 1978. During the last full year of operation, 875 tons of municipal, bulky and vegetative waste was disposed of at the landfill.

Inspection violations reported by the SWA in the last several years have dealt primarily with visible scattered litter and inadequate daily cover. A final inspection by the SWA in October, 1978 reported the site properly closed.

Lawrence Township Landfill Site Number 2 (0608C) – Lawrence Township Landfill Site No. 2 is located on Shaws Mill Road, across from Site No. 1. Opened in the Fall of 1978, use of this 3.6 acre site is restricted to Township residents only. An additional four acres adjacent to the site are available for future expansion.

An engineering plan for the landfill was approved by the SWA in September, 1977 and two groundwater monitoring wells have been installed. The remaining life of the 3.6 acre site has been estimated to be 30 years.

No inspection violations have been reported since the landfill began operation.

Maurice River Township Landfill Site No. 1 (0609B) – Located on Delsea Drive (Route 47) 1-1/2 miles south of Buckshutum Road, this facility is one of two landfills serving Maurice River Township residents. The 5 acre site is registered to accept municipal waste, bulky waste, tires, leaves and chopped tree waste, vegetative waste, and tree stumps. Approximately 1200 tons total of these waste types were disposed of in 1977. Remaining life of the facility was estimated at 7-1/2 years in 1978.

An engineering plan for the landfill has been approved by the SWA and one groundwater monitoring well has been installed.

Inspection violations reported by the SWA have included scattered visible refuse, excessive grades, and inadequate cover.

Maurice River Township Landfill Site No. 2 (0609C) – This 4.8 acre site is located on Weatherly Road in Maurice River Township. In 1977, 600 tons of municipal, bulky, and vegetative waste were reported as disposed of at the site.

Although remaining life of the landfill is estimated at less than one year, engineering expansion plans that would greatly increase the facility's capacity have recently been submitted to the SWA.

SWA inspections on many occasions have reported the site in satisfactory condition. Those violations that did occur included inadequate cover, pest control, and visible scattered refuse.

Millville City Landfill (0610A) – The Millville City Solid Waste Disposal Area is a municipally owned and operated sanitary landfill located on Cedarville Rd. in Millville. The landfill is approximately 54 acres in size with an estimated remaining life of 9 years and 329,000 tons (as reported in 1978).

The facility is registered to accept municipal waste, bulky waste, vegetative waste and non-chemical industrial waste. Use of the landfill is restricted to municipal collection forces, private collector/haulers operating in the city, and residents of Millville.

For the purposes of this study, a vehicle counting survey conducted by the municipal engineer was used to determine the amount of waste disposed of on a yearly basis. This survey was used due to inconsistencies in Solid Waste Administration data. Based on the survey it was estimated that approximately 30,000 tons per year of waste is disposed of at the facility, consisting of approximately 19,600 tons municipal waste, 3,000 tons bulky waste, and 7,400 tons industrial waste.

Since virtually all waste generated in Millville is disposed of at this facility and its use is restricted to residents of Millville, the survey figures were also used in determining waste generation in Section B of this report.

Opened in 1957, an engineering plan for the facility was approved in 1977. Inspection violations reported by SWA in recent years have dealt with inadequate cover, scattered litter, and lift height and working face width cover.

Three groundwater monitoring wells are tested four times per year. Review of the monitoring well data shows that for a few parameters, there is some low level contamination. However, given the close proximity of the monitoring wells to the fill area, the probability of substantial contamination of area water supplies is low.

Stow Creek Township Landfill (0612A) -- This facility is jointly operated by Stow Creek Township and the Borough of Shiloh. Its use is restricted to the residents of these two municipalities.

Located on Jericho-Roadstown Road in Stow Creek, the 9.2 acre site has been in use over 20 years. Approximately 1700 tons of municipal refuse is disposed of in the landfill each year. The remaining life of the facility is estimated at 3 years.

An engineering plan was submitted to the SWA in 1973. Inspection violations reported by the SWA have included excessive working face width, inadequate cover and inadequate cover compaction.

Stow Creek Township Landfill No. 2 (0612B) – This is a proposed inactive site located across Roadstown-Jericho Road from the active Stow Creek–Shiloh landfill. The proposed facility has been registered with the SWA since 1975.

Upper Deerfield Township Landfill (0613A) – This BPU regulated facility is located on a 12 acre site off Husted Station Road in Upper Deerfield Township. Use of the landfill is restricted to Township residents and commercial refuse haulers registered with the BPU.

A reported 2716 cubic yards of municipal, bulky, and vegetative wastes was disposed of at the site in 1977. Because of decreasing capacity at the Bridgeton landfill, portions of Bridgeton's municipal waste is brought by BPU registered haulers to the Upper Deerfield landfill. This has greatly increased the amount of waste deposited per year over the 1977 figure. Remaining life of the facility is estimated at less than 2 years, however, adjacent land could be utilized for expansion.

An engineering plan of the site has been completed and submitted to the SWA. Inspection violations reported by the SWA in recent years have dealt with visible litter, inadequate cover and improper grading.

City of Vineland Landfill (0614B) – The City of Vineland is a BPU regulated facility located on S. Mill Road in Vineland. The 57 acre site has been in operation since 1970 and is municipally owned and operated.

Waste disposed of at the site as reported for 1977 consisted of 52,685 cubic yards of municipal waste, 19,608 cubic yards of bulky waste, 14,921 cubic yards of animal and food processing wastes, and 2350 cubic yards of industrial waste. Remaining life of the landfill is presently estimated at 10 years.

Liquid septic waste is accepted at the site and is discharged into a manhole which is connected to the City of Vineland Wastewater Treatment Plant.

An engineering plan for the site was approved by the SWA in late 1978. Plans have been made to install four groundwater monitoring wells as well as additional methane gas vents to compliment a single existing vent. Inspection violations reported by the SWA in recent years have included excessive working face width, wind-blown refuse and inadequate cover.

b. Composting Facilities.

Alex Hayes Composting Facility (0614A) – This privately-owned and operated composting facility is located on Mays Landing Road in Vineland. In operation since 1972, the facility reported 10,000 cubic yards of vegetative waste processed in 1977. Remaining life of the site is estimated at less than 3 years.

Numerous SWA inspections in recent years have noted no violations.

City of Vineland Composting Facility (0614C) – This facility has been closed and inactive since 1976 when the SWA revoked the facility registration for accepting wastes other than leaves and chopped tree waste, failure to submit an engineering plan, inadequate cover material and compaction, and failure to submit the appropriate registration statement.

The site is located at the northeast corner of Hance Bridge Road and Sherman Ave. on land owned by the American Institute of Mental Studies.

A listing of the solid waste facilities detailed in this section is provided in Table 2–19.

TABLE 2–19

CUMBERLAND COUNTY SANITARY LANDFILL INVENTORY

Facility Location	SWA Registration Number	Cubic Yards Accepted in 1977	Tons Accepted 1977	[1]Estimated Yearly Cost of Operation	Estimated Remaining Life (Years)[2]	Status
City of Bridgeton*	0601A	101,818	23,984	97,000	3	Active
Commercial Twp.	0602A	4,600	788	—	5	Active
Deerfield Twp.	0603A	5,833	700	12,800	10	Active
Downe Twp.	0604A	600	88	7,600	—	Closing
Downe Twp.	0604B	—	—	—	12 - 15	Opened May 1978
Fairfield Twp.	0605A	3,600	660	12,700	2-3	Active
Hopewell Twp.	0607A	4,300	1,545	12,600	4	Active
Lawrence Twp.	0608A	7,300	876		—	Closed Fall 1978
Lawrence Twp.	0608B	2,500	350	14,500	—	Closed Oct. 1978
Lawrence Twp.	0608C	—	—		30	Opened Oct. 1978
Maurice River Twp.	0609B	4,800	1,200		7.5	Active
Maurice River Twp.	0609C	2,400	600	35,000	0.5	Active
City of Millville	0610A	153,800	30,000	76,400	9	Active
Stow Creek Twp.	0612A	14,167	1,700	10,700	3	Active
Stow Creek Twp.	0612B	—	—	—	—	Proposed Site
Upper Deerfield Twp.*	0613A	2,716	666	30,600	2	Active
City of Vineland+	0614A	10,000	2,000	—	3	Active
City of Vineland*	0614B	215,300	50,900	202,000	10	Active

*Under the jurisdiction of the New Jersey Board of Public Utilities

+Composting Facility

[1]As furnished by municipalities as part of survey

[2]As of 1978

D. SLUDGE AND SEPTIC WASTE COLLECTION AND DISPOSAL

1. Sludge. Sewage sludge waste disposal accounts for a relatively small portion of the solid waste stream in Cumberland County. Almost all of the sludges are generated at domestic wastewater treatment plants. There are five wastewater treatment plants serving the populated areas of Cumberland County. The combined wastewater flow of these plants equals approximately 12 million gallons per day (mgd). The major wastewater treatment plants are: two Cumberland County Utilities Authority plants (Bridgeton and Seabrook), the City of Millville plant, the Landis Sewerage Authority plant (Vineland), and City of Vineland plant.

In an attempt to coordinate planning efforts for sewage sludge and septage utilization and disposal, the NJDEP Division of Water Resources recently distributed a program guidance document to County Solid Waste Management Districts (SWMD's) and 201 wastewater facilities planning agencies. This document defined the respective areas of responsibility to avoid duplication of efforts and to assure the completeness of both solid waste and wastewater management plans.

The 201 agencies have the primary responsibility in planning design, and construction of permanent septage and sewage sludge treatment facilities. The ultimate disposal and utilization of septage and sewage sludges are also deemed the responsibility of the 201 agencies. Proposed plans by the 201 agencies to deal with these waste types must be included, whenever possible, in the county solid waste management plans.

The State recognized the importance of cooperation between 201 agencies and SWMD's and called for a review by each SWMD of 201 plans before being submitted to the State.

Upon completion of permanent facilities for the disposal and/or utilization of sludges and septage, the Solid Waste Management District along with the SWA have sole responsibility in developing adequate interim measures.

a. Generation and Disposal.

Cumberland County Utilities Authority (Bridgeton Plant) — The CCUA operates a activated sludge treatment plant in the City of Bridgeton. The present treatment scheme consists of primary sedimentation, activated sludge, secondary sedimentation and chlorination with a design capacity of 7 mgd. Average daily flows are approximately 3.5 mgd. The wastewater effluent is discharged into the Cohansey River.

Sludge production rates for the existing treatment plant are estimated at 933,000 gallons per year at a solids concentration of greater than 30%. Sludge dewatering is via sludge centrifuges which produce high solids concentration cake. The dewatered sludge is distributed to local nurseries and utilized as a soil conditioner. Therefore, the dewatered sludge is considered a recoverable resource and does not enter directly into the solid waste stream of the County.

Landis Sewerage Treatment Plant – The Landis Sewerage Treatment Plant is a 7 mgd primary treatment facility located in Vineland with an average daily flow of approximately 4.8 mgd. Service area includes all of Vineland except the old Vineland Business District. The wastewater treatment scheme consists of primary treatment, stabilization pond, and chlorination with final disposal via land application.

Sludge dewatering is via sludge drying beds with on-site landfilling as the disposal technique. Approximately 2,675,000 gallons of sludge are generated annually.

City of Vineland – The City of Vineland Wastewater Treatment Plant is a primary wastewater treatment facility utilizing two Imoff tanks for sedimentation. Average flows are approximately 0.85 mgd. The effluent is conveyed to the Landis STP for final disposal. Sludge generation rates are approximately 474,000 gallons per year and the sludge is landfilled on-site.

City of Millville – The City of Millville operates a 2.6 mgd secondary biological treatment plant. The treatment scheme consists of primary and secondary biological wastewater treatment with effluent disposal into the Maurice River. Sludge generation rates are approximately 2 dry tons per day or 1,700,000 gallons per year. Sludge stabilization is via wet air oxidation and the final product is given away for use as a soil conditioner, as part of an ongoing sludge giveaway program.

CCUA (Seabrook Plant) – The Cumberland County Utilities Authority operates a 0.2 mgd secondary biological treatment plant in the Seabrook section of Upper Deerfield. The plant processes sludge by anaerobic digestion and sludge drying beds. Dewatered sludge is conveyed to local nurseries for utilization as a supplemental soil conditioner. The dewatered sludge does not enter into the solid waste stream and is utilized as a recoverable resource.

The primary means of sewage sludge disposal within the County are on-site landfilling and sludge give-away programs. For the most part, sewage sludge is not a major contributing factor in the overall solid waste stream. According to the SWA collector/hauler reports for 1977, it was reported that approximately 226,000 gallons of liquid sewage sludge was delivered to the Millville landfill, and small amounts were also reportedly delivered to landfills in Vineland and Maurice River Township. However, review of the facility disposal reports indicates that no sewage

sludge was accepted, so that whether this material was actually disposed of could not be confirmed. Nevertheless, only a small portion of the sludge generated in Cumberland County currently enters the solid waste stream.

b. Projections. The quantity of sewage sludge which is expected to be generated within the study area during the planning period is totally dependent upon the outcome of the ongoing "201 facilities plans". The facilities plans are presently evaluating cost-effectiveness, environmental impacts and social implications of constructing sanitary sewer collection systems and wastewater treatment plants in the County. Because of the uncertainties of the wastewater treatment requirements of the area, projection of future sludge generation quantities is difficult at best.

Nevertheless, for the purposes of planning, estimates have been made of future sludge generation rates. Current and future sludge generation projections are shown in Table 2–20. Sludge projections are based on the following:

Cumberland County Utilities Authority – Sludge generation projections assume a wastewater flow at the Bridgeton Plant of 6 mgd by the year 2000. Sludge solids concentration from the new plant is expected to be 25%. It is assumed that flow from the Seabrook area will be treated at the Bridgeton plant starting in 1985.

Landis Sewerage Authority – It is assumed that the Landis Sewerage Authority plant will upgrade to secondary treatment and practice sludge dewatering to a 25% sludge solids concentration. A plant flow of 11 mgd is assumed by the year 2000. It is also assumed that the Landis plant will start treating the flow from the old Vineland plant prior to 1985.

City of Millville – It is assumed that the sludge volume from the Millville plant will continue to increase in proportion to projected population increases.

As shown in the Table, by 1985, total sludge volumes are expected to decrease from 5,900,000 gallons per year (1978) to 5,100,000 gallons per year. This projected decrease is expected to occur as a result of the inception of sludge dewatering by the Landis Sewerage Authority. By 2000, the total sludge volume is expected to increase to approximately 6,900,000 gallons per year, primarily as a result of expansion of the number of people served by wastewater treatment plants.

2. Septic Wastes.

a. Generation, Collection, and Transportation. Septic waste generation rates for 1977 are listed in Table 2–21. A total of 4,328,800 gallons of septic wastes were reportedly collected in 1977 in Cumberland County. Septic wastes are collected by private haulers operating

TABLE 2-20

SLUDGE GENERATION PROJECTIONS[1] IN GALLONS PER YEAR

	1979	1985	2000
Cumberland County Utilities Authority			
Bridgeton Plant	933,000[2]	1,200,000	1,600,000
Seabrook Plant	96,340	—	—
Landis Sewerage Authority (LSA) Plant — Vineland	2,675,000	1,900,000	2,900,000
City of Vineland Plant	474,000	—	—
City of Millville Plant	1,700,000	2,000,000	2,400,000
TOTAL	5,900,000	5,100,000	6,900,000

[1] See Text for Assumptions.

[2] Projection for New Plant.

TABLE 2—21

1977 SEPTIC WASTE GENERATION AND DISPOSAL FROM 1977 SWA COLLECTOR/HAULER REPORTS
(In Gallons Per Year)

Generation Municipality / Disposal Location	DISPOSAL WITHIN COUNTY				EXPORTED			
	Bridgeton	Vineland	Millville	Upper Deerfield	Mullica Twp., Atlantic County	Quinton Twp., Salem County	Franklin Twp., Gloucester County	Municipal Generation Total
Bridgeton	237,200	109,000	—	—	—	550,000	—	896,200*
Commercial Twp.	14,000	—	30,000	—	—	—	—	44,000
Deerfield Twp.	1,000	—	—	—	—	—	—	1,000
Downe Twp.	13,000	—	—	—	—	—	—	13,000
Fairfield Twp.	4,000	—	—	63,000	—	—	—	67,000
Greenwich Twp.	—	—	—	—	—	—	—	0
Hopewell Twp.	1,000	—	—	31,500	—	—	—	32,500
Lawrence Twp.	21,000	—	—	—	—	—	—	21,000
Maurice River Twp.	1,000	—	22,000	—	—	—	—	23,000
Millville	—	25,500	174,000	—	94,100	—	—	293,600
Shiloh	—	—	—	—	—	—	—	0
Upper Deerfield Twp.	6,000	—	—	126,000	—	—	—	132,000
Vineland	—	1,800,000	—	—	94,100	—	13,700	1,907,800
Various	804,800	—	—	—	—	—	—	804,800
Total Generated in County & Disposed of Within County	1,103,000	1,934,500	226,000	220,500				Total Generated Within County 4,235,900 Gal.
		TOTAL — 3,484,000 Gallons						
Imported	360,000	193,000	—	—				
		TOTAL — 553,000 Gallons						
Total Disposed of Within County	1,462,800	2,220,500	226,100	220,500				
		TOTAL — 4,129,900 Gallons						
Exported					188,200	550,000	13,700	
					TOTAL — 751,900 Gallons			

*Includes surrounding municipalities.

throughout the County. The septic wastes are primarily disposed of and treated at wastewater treatment plants located in Vineland, Millville and Bridgeton. Therefore, most of the septic waste does not directly enter into the solid waste stream in Cumberland County. In the past, quantities of septic wastes were disposed of in several of the landfills in the County, but this practice is decreasing as the SWA has continued to limit acceptance at these facilities.

According to the 1977 septic waste figures reported in the collector/hauler reports, 3,592,904 gallons or 83% of the septic waste generated within the study area was disposed of within the County. The remaining 17% of the septic waste generated within Cumberland County was exported for disposal in Atlantic, Gloucester and Salem Counties.

The major septic disposal areas within Cumberland County include the City of Vineland and the CCUA Bridgeton wastewater treatment plants which received 56% and 31% of the septic waste generated within the County, respectively. The remaining 12% of the septic waste was equally disposed of in the City of Millville wastewater treatment plant and in the Upper Deerfield landfill. Table 2-21 also lists the quantity of septic waste disposed of, by disposal location. In addition to the septic wastes generated within the County in 1977, approximately 553,000 gallons of septic waste was imported from outside the County and disposed of either in the CCUA Bridgeton or the City of Vineland wastewater treatment plants. According to the operators of the CCUA treatment plants, in 1978 the City of Vineland and the CCUA Bridgeton treatment plants received 6 million and 2 million gallons of septic waste, respectively. These volumes are substantially larger than those volumes reported delivered in 1977 by SWA-registered collector/haulers.

The 1977 estimated septic waste generation rates developed by RAS for Cumberland County were approximately 50% lower (2,096,000 gallons) than the reported values in the collector/hauler reports. Reasons for the discrepancies can be attributed to (1) difficulty in accurately estimating waste quantities received for disposal (2) incorrect classification of holding tank wastewater as septic wastes, (3) greater quantities of septic waste imported into the County and classified as County-generated, and (4) pumpout frequencies greater than every 2.8 years. It is clear, however, that significant quantities of septic wastes are imported into the County for disposal, and this trend may be increasing.

The CCUA Bridgeton plant accepts septic wastes from all townships of the County. The waste is discharged into the head works of the treatment plant. The City of Vineland plant accepts septic wastes via a manhole located at the landfill. Septic waste is then conveyed to the City of Vineland plant for treatment and stabilization. The City of Millville treatment plant only accepts septic waste generated within the City boundaries. The septic wastes are discharged into the head works of the treatment plant. No septic wastes are currently being accepted at the Seabrook (CCUA) Treatment Plant.

b. Projections. Septic waste projections are based on current waste generation data supplied by the SWA, population projections developed and supplied by the Cumberland County Planning Board and an average septic tank pumpout rate of 2.85 years. Future and current estimated septic waste generation rates for the County are included in Table 2–22.

3. "201" Facility Planning.

Septic waste projections for Millville and Vineland were based on an assumed constant unsewered population of 25% and 33%, respectively. For Upper Deerfield, an estimated 2000 people are currently sewered and the remainder of the population is assumed to be unsewered. The City of Bridgeton is completely sewered, therefore, a zero generation rate was utilized for septic waste production. Depending upon the outcome of the ongoing CCUA "201 facilities plans", septic waste generation rates for Fairfield, Hopewell and Upper Deerfield may be substantially lower than those indicated in the Table. The draft facilities plan has initially selected sewering of these communities. Wastewater treatment capacity has already been constructed into the CCUA Bridgeton plant for these areas.

TABLE 2–22

COUNTY SEPTIC WASTE GENERATION PROJECTIONS
IN GALLONS PER YEAR

	1978	1980	1985	1990	1995	2000
Commercial	127,236	12,882	133,519	138,157	144,737	151,315
Deerfield	84,309	85,132	90,263	95,395	100,329	105,263
Downe	62,829	63,914	66,513	69,079	72,368	75,658
Fairfield	183,586	188,454	199,507	210,526	220,395	230,263
Greenwich	32,664	32,894	34,539	36,184	37,829	39,474
Hopewell	130,559	130,559	136,020	141,447	146,382	151,316
Lawrence	75,526	75,263	77,105	78,947	80,952	82,237
Maurice River	155,066	163,059	172,007	180,921	190,789	200,658
Millville	808,256	815,559	836,151	856,776	874,440	892,138
Shiloh	19,967	20,263	20,822	21,382	22,204	23,026
Stow Creek	39,342	40,921	43,487	46,053	48,520	50,987
Upper Deerfield	149,243	146,612	165,822	185,033	214,638	244,243
Vineland	579,975	596,334	637,399	678,454	719,161	759,868
Total	2,448,558	2,371,846	2,613,154	2,738,354	2,872,744	3,006,446

TASK III

DEVELOPMENT, EVALUATION & SELECTION OF ALTERNATIVE SYSTEMS

III. DEVELOPMENT, EVALUATION & SELECTION OF ALTERNATIVE SYSTEMS

A. INTRODUCTION

This section of the Cumberland County Solid Waste Management Plan will identify and discuss alternative systems for the collection and disposal of solid wastes. Particular emphasis will be placed on the implementation of disposal systems which could become operational within several years.

Waste management alternatives will be screened by evaluating the environmental and economic feasibility of each. Finally, a solid waste management alternative will be selected and developed into a solid waste management plan. Alternatives for septic and sludge management will be discussed, and septic and sludge management plans will also be selected.

B. RESOURCE RECOVERY SYSTEMS (HIGH TECHNOLOGY)

In the last decade, many types and sizes of resource recovery facilities have been proposed and built in the U.S. and throughout the world. Some of these facilities have been pilot or demonstration type plants, constructed to show how a given technology works.

Due to the high capital expenditures involved, it is important that any resource recovery technology considered be well developed. Leading candidate technologies that meet this criteria include mass burning, refuse derived fuel (RDF), modular incineration and pyrolysis. Each of these technologies will be reviewed.

It should be noted that most high technology systems are built in areas with sufficient large waste generation rates so as to make them viable. These technologies will be considered for use on both a County-wide basis (200-300 TPD) as well as on a 4-County basis (1000-1500 TPD).

1. Mass Burning. The generation of steam from burning unprocessed refuse in waterwall boilers has been practiced for more than 20 years in Europe. Its rapid acceptance has lead to the construction of several hundred units in Europe and Japan ranging in size from less than 100 tons per day to more than 2,000 tons per day in an Amsterdam facility. In the United States, the few plants which have been built have all been built since 1967.

Steam is produced at a rate of from one to three pounds per pound of solid waste, depending on design, operating conditions and the heat value of the solid waste. The steam can be used directly in turbines to drive major industrial process equipment or it can be used in a turbo-generator to produce electricity. A new conceptual application is co-generation or feeding the steam to an extracting steam turbine to generate electricity with a portion of the steam

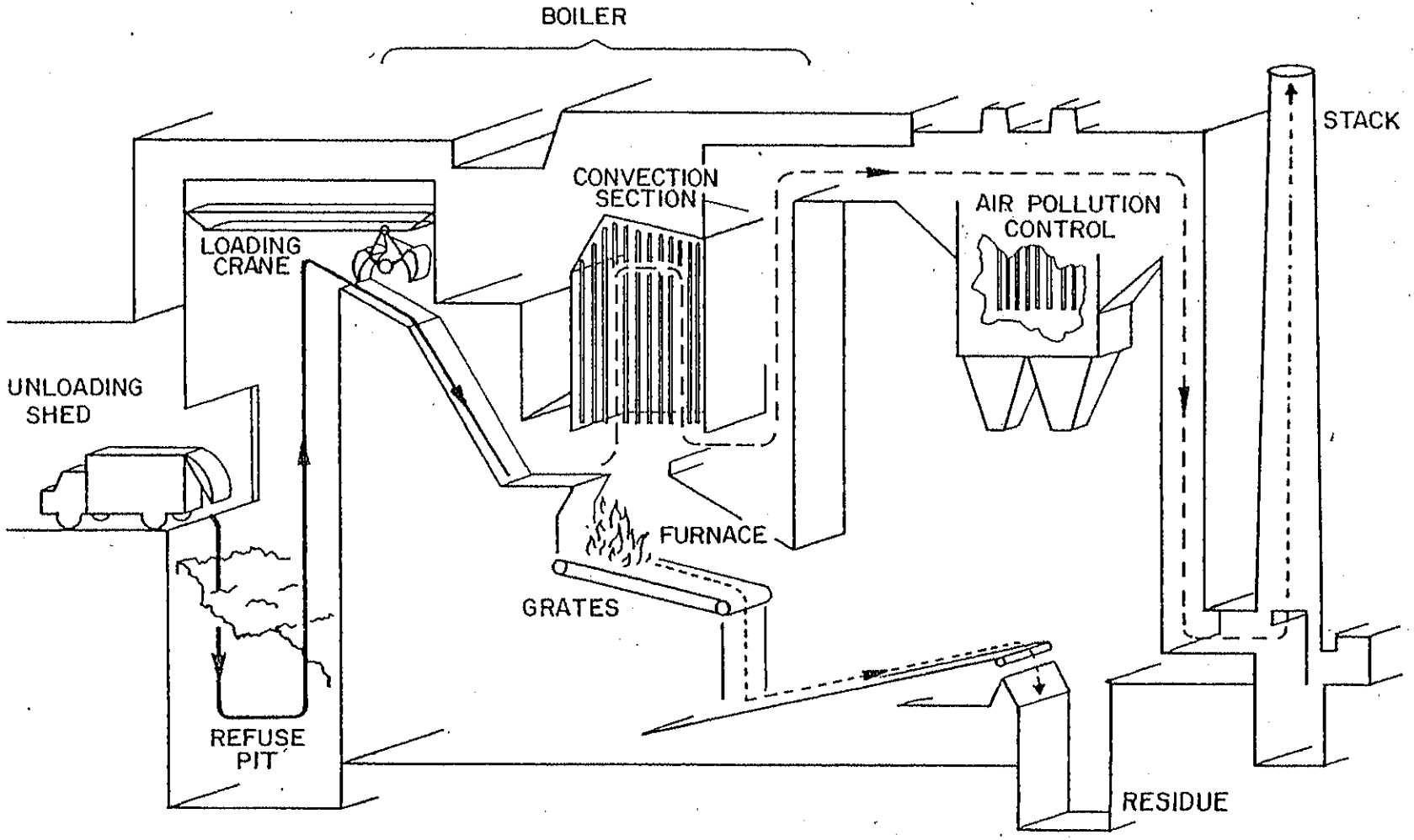
extracted for use as process steam. Technically, mass burning refuse boilers have demonstrated good and reliable performance and have received national acceptance.

Waterwall combustion systems are available from companies such as Wheelabrator-Frye, Inc. (WFI), Universal Oil Products (UOP) and Titan Environmental Services. WFI, headquartered in Boston, Massachusetts represents the Von Roll Company of Zurich. Its Saugus, Massachusetts facility is the most successful commercial facility in the United States. Other WFI facilities are planned for Logan Township in Gloucester County, New Jersey, Minneapolis-St. Paul, Minnesota, and Westchester County, New York. UOP is a wholly owned subsidiary of the Signal Company, a large company involved in oil exploration, refining and distribution of petroleum based products. UOP is in the process of negotiating for resource recovery projects in the North Andover area of northeastern Massachusetts and in Pinellas County, Florida (near Tampa). Titan Environmental Services is located in Paramus, New Jersey. The Environmental Service Division is in the business of designing, constructing, financing and lease-operating resource recovery facilities. The Titan firm has stated that the constitutional and institutional constraints in New Jersey have kept them from structuring any projects for the state.

In the mass burning system, unprocessed municipal solid waste is deposited on a tipping floor, then pushed into a large storage pit. A loading crane mixes the refuse before transferring it to the furnace feed hopper, as shown in Figure 3-1. From the feed hopper, the waste is fed onto mechanical grates where continuous combustion occurs as it travels through the furnace. Non-combustibles fall off the end of the grate, are quenched with water and then conveyed to trucks for transport to a residue disposal site. Ferrous metal is generally recovered from the residue conveyor.

As the waste travels on the grate, the combustion reduces the volume by approximately 95% and the heat energy is conveyed to the water filled boiler tubes in the upper section of the furnace. Generated steam is piped to the market user. The flue gases, after transferring their heat, pass through an electrostatic precipitator for cleaning prior to stack discharge.

The basic difference between the available commercial systems lies in the boiler tube configuration, type of grate and excess air requirements. Boiler tubes are arranged to maximize the efficiency of heat transfer without causing excessive tube failure through corrosion. The three types of grates used are the reciprocating (back and forth), rocking and traveling grate. Each differ in the manner in which they agitate and turn the refuse over to facilitate burn out and maximize heat release. Air is introduced in the furnace beneath the grates (underfire air) to aid in combustion and to keep the grates cool. Air is also introduced above the refuse bed (overfire air) to promote mixing of the gases (turbulence) and to aid in combustion. These variables and the resident time and temperature combine to offer different processing methods.



TYPICAL WATERFALL FURNACE

FIGURE 3–1

Source: USEPA, Resource Recovery Plant Implementation, Technologies

Figure 3-2 illustrates an energy balance for a typical mass burning refuse boiler. In a well designed and operated unit, energy conversion efficiencies could exceed the 62% shown. Design changes in boiler tubes, for example, can allow the furance to operate at lower excess air levels. This will result in reducing flue gas losses and accordingly raise the availability of BTU sold per BTU input. A 1000 ton per day plant can market approximately 190,000 lbs. of saturated steam per hour.

Economic transport of steam dictates that the market user be no more than two miles from the facility. In addition, condensate return from the market is preferred to reduce overall system energy requirements. Finally, since refuse is a heterogeneous material, it is important that the crane operator properly mix the feed before charging. Insufficient mixing not only reduces the stability of steam produced but also can cause damage to the grates.

Progress has been made on adding new refuse boiler capacity in the United States. No new contracts, however, have been signed since later 1976. Several potential applications are now in the negotiating stage or in the final evaluation stage. The twin cities of Minneapolis and St. Paul, Minnesota are particularly noteworthy since they are presently closing contracts for a 1500 ton per day facility.

Cost estimates for 1,000 and 1,500 ton per day mass burning facilities are shown in Table 3-1. Cost information shown in the table does not represent any specific system, but rather an average cost of a typical waterwall combustion facility. Tipping fees are estimated to be between $16 and $32 per ton (June 1979 dollars) including a credit for recycled energy and materials. Assumptions made in completing the estimate are as follows:

a. Operation.

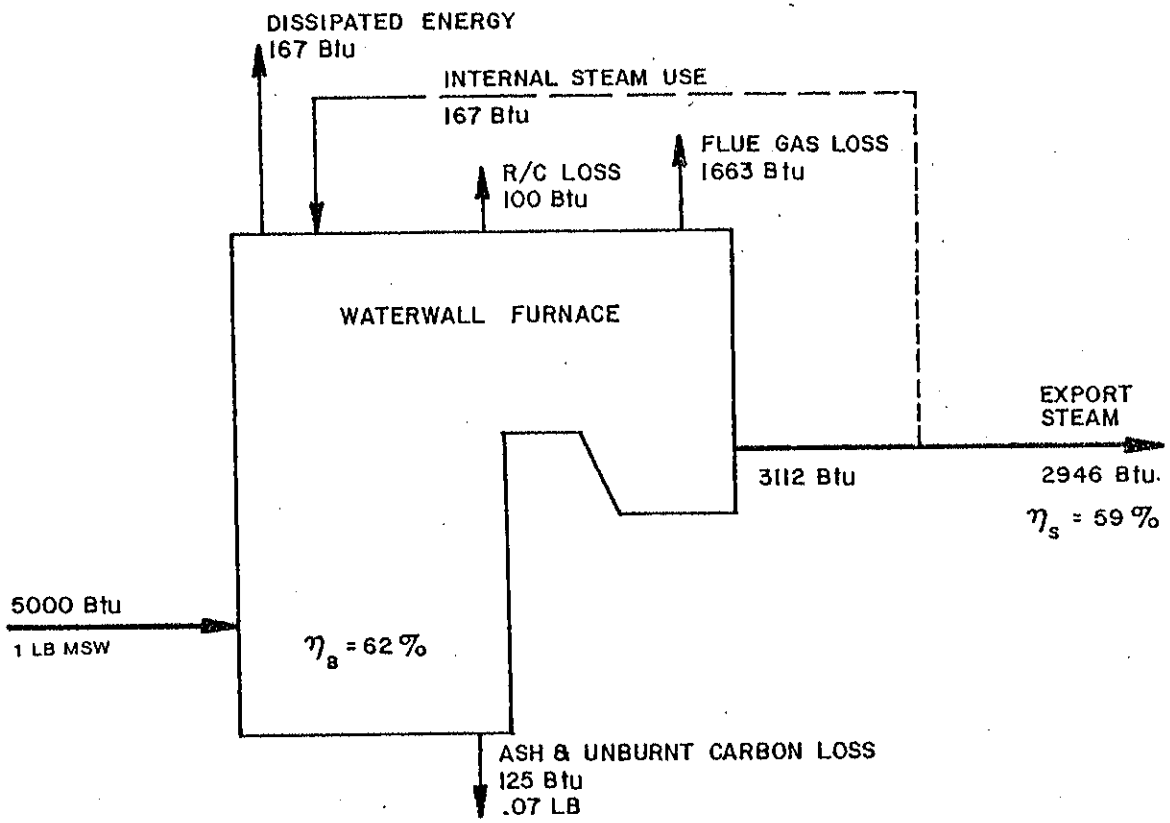
(1) Processing capacities of 1000 and 1500 tons per day.

(2) Furnace or boiler operation of 6 days per week, 24 hours per day, year-round.

(3) Installed, design or rated capacity 25 percent greater than processing capacity or 1250 and 1875 tons per day, respectively, i.e., boiler availability of 80 percent.

(4) Throughput at processing capacity; i.e., 100 percent utilization of processing capacity.

(5) Annual throughput of 312,000 and 468,000 tons per year, respectively.



TYPICAL WATERWALL FURNACE ENERGY BALANCE

FIGURE 3–2

Source: USEPA, Resource Recovery Plant Implementation, Technologies

TABLE 3-1

COST ESTIMATE

WATERWALL INCINERATOR PROJECTS (1,000's OF DOLLARS)

	PROCESSING CAPACITY	
	1,000 Tons/Day (312,00 Tons/Yr.)	1,500 Tons/Day (468,000 Tons/Yr.)
CAPITAL		
System	$ 73 – 78,000	$ 78 – 83,000
Net Interest During Construction	2,300	2,500
Debt Service Reserve	7,300	8,400
Operating Cost Reserve	3,200	4,500
Bonding Cost	1,800	2,000
Start-Up Contingency	2,900	3,200
Land and Site Preparation	1,000	1,300
CAPITAL COST RANGE	$ 91,500 - 96,500	$ 99,900 – 104,900
AVERAGE CAPITAL COST	$ 94,000	$ 102,400
ANNUAL COSTS		
Operation & Maintenance	$ 3,900 – 5,400	$ 5,400 – 7,900
Amortization of Capital	9,300 – 9,800	10,200 – 10,700
ANNUAL COST	$ 13,200 – 15,300	$ 15,600 – 18,600
UNIT COST (S/Ton)	$42.30 - $49.03	$ 33.33 - $ 39.74

June 1979 Dollars

TABLE 3-1(cont.)

COST ESTIMATE

WATERWALL INCINERATOR PROJECTS (1,000's OF DOLLARS) Cont.

	PROCESSING CAPACITY	
	1,000 Tons/Day (312,000 Tons/Yr.)	1,500 Tons/Day (468,000 Tons/Yr.)
REVENUES		
Steam Sales	$ 4,500	$ 6,700
Ferrous Sales	270	410
Interest on Debt Service Reserve and Operating Cost Reserve (6-1/2%) simple interest)	680	840
SUBTOTAL	$ 5,450	$ 7,950
ANNUAL DISPOSAL CHARGE	$ 7,750 - 9,850	$ 7,650 - 10,650
UNIT DISPOSAL CHARGE ($/Ton)	$24.83 - 31.57	$16.35 - 22.76

June 1979 Dollars

b. System Capital Cost.

(1) 2 boilers for 1000 and 1500 ton per day plants.

(2) Saturated steam conditions, i.e., virtually no superheat.

(3) Auxiliary fossil fuel firing and/or auxiliary fossil fuel boiler.

(4) Ferrous recovery.

c. Other Capital Costs.

Includes:

(1) Bonding or Financing Cost. Monies expended to investment banking firm, authority, legal counsel and consultants for services rendered in executing the sale of the bond issue.

(2) Net Interest Cost During Construction. Cost attributable to the differential between the interest on construction financing and the interest on bond income.

(3) Start-Up Contingency. Funds expended during the start-up period when revenues are negligible.

(4) Debt Service or Bond Reserve. Bond sales typically contain a reserve fund to protect the bondholders (capital contingency).

(5) Operating Cost Reserve. Fund created to cover operating contingencies such as operator non-performance, major unscheduled repairs, alternative differential disposal costs or some other unpredictable change in operation.

(6) Land and site preparation at $50,000 per acre.

Excludes:

(7) Capital cost associated with residue disposal.

(8) Cost of replacing major system components.

It should be noted that the estimated cost of waterwall incineration includes the direct feed of refuse into the incinerator. The estimated cost of refuse derived fuel (presented later) does not include the cost of transportation to the location where the fuel is fired. If the distance between the RDF facility and the location where the fuel is fired becomes more than ten miles, the cost difference between RDF and waterwall incineration narrows.

2. Pyrolysis. The generation of pyrolytic gas from solid waste, while being successful on the pilot scale has had a problematic history at the demonstration scale. The most notable failure occurred due to the inadequate performance of the USEPA sponsored 1000 ton per day Monsanto Langard pyrolysis system in Baltimore, Maryland. However, new processes are still being tried, and many of these processes offer promising solutions to the technical problems of the past.

One of the leading pyrolysis systems is the Union Carbide Purox System. The system is designed to convert municipal solid waste (and sludge in some cases) into a clean burning, low sulfur fuel gas; an inert, glassy aggregate; and ferrous metal for recycling. The wastewater stream produced is cleaned before being discharged into a sanitary sewer system.

The gases leaving the pyrolytic reactor contain 30 to 40 percent moisture which is removed in a gas cleaning unit, along with ash, tars and other combustible liquids. The resultant fuel gas contains approximately 65 percent CO and H_2 in a ratio of about two to one. The heating value ranges from 300 to 390 Btu/cu. ft. as compared with natural gas at 1050 Btu/cu. ft.

The pyrolysis process involves three fundamental steps: refuse preparation, pyrolysis and gas cleaning as shown in Figure 3-3. Refuse preparation involves the use of refuse shredder to reduce the size of municipal solid waste. Shredded refuse is conveyed past a magnetic separator that extracts ferrous metals, before being introduced into the pyrolysis reactor by air locking feed rams.

The key component of the Purox system is the vertical shaft furnace, where shredded solid waste passes through three processing zones. Oxygen is introduced in the lower zone at a rate of about 0.2 tons per ton of solid waste. In the upper zones, refuse is dried by hot gases; in the middle zone, refuse is pyrolyzed into gases, liquids and char; in the bottom zone, the oxygen reacts with the char to provide the heat required (approximately 3000 Deg. F.) to melt or slag any non-combustible materials. The molten slag mixture continuously drains into a water quench tank. The residue is extracted through a water seal and is collected as a hard granular aggregate. Gas cleaning equipment removes condensables and leaves the fuel gas suitable for a waste heat boiler.

The majority of energy consumed in the Purox process is in refuse shredding and oxygen production. See Figure 3-4. Fuel gas production is about 11 cubic feet per pound of solid waste.

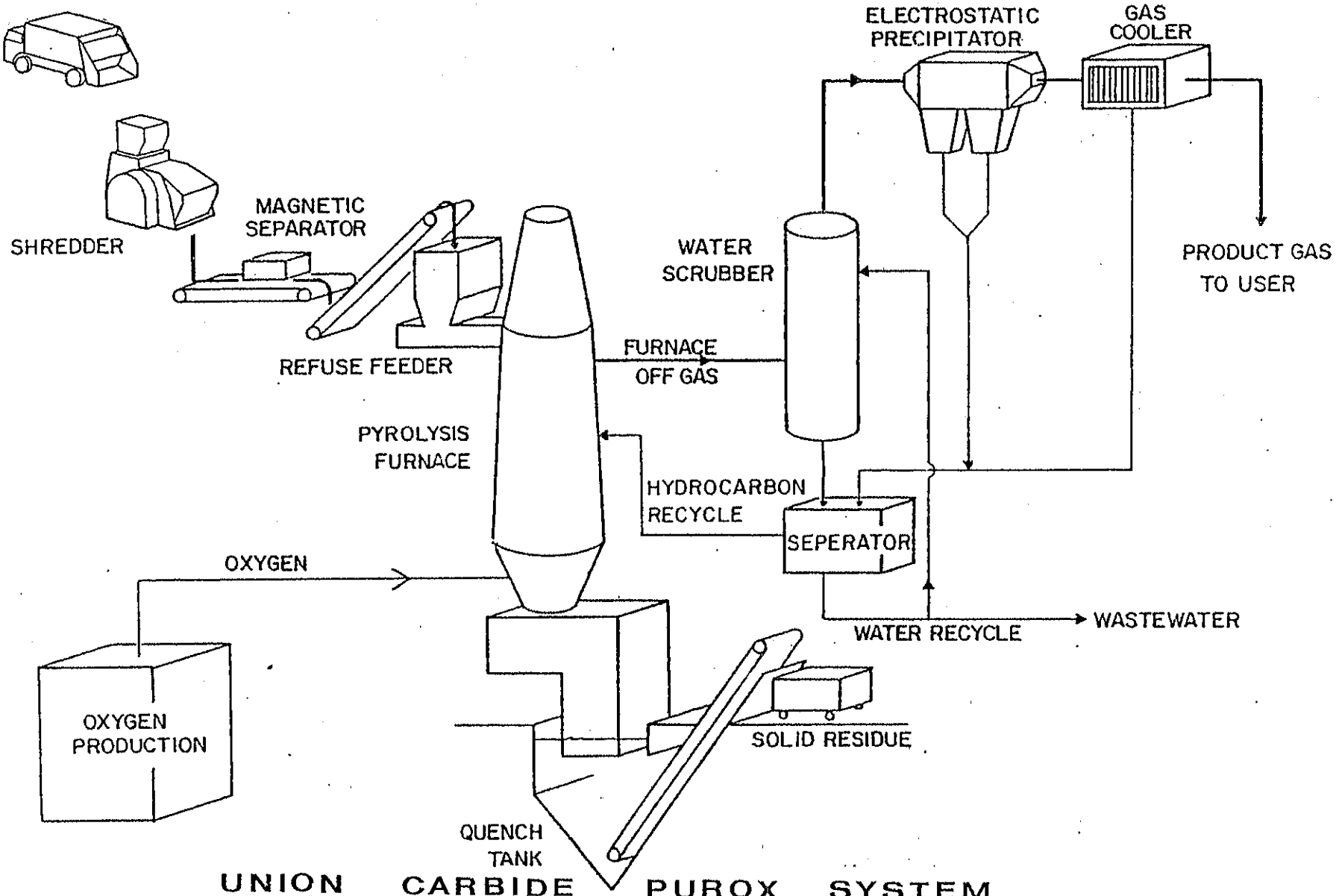
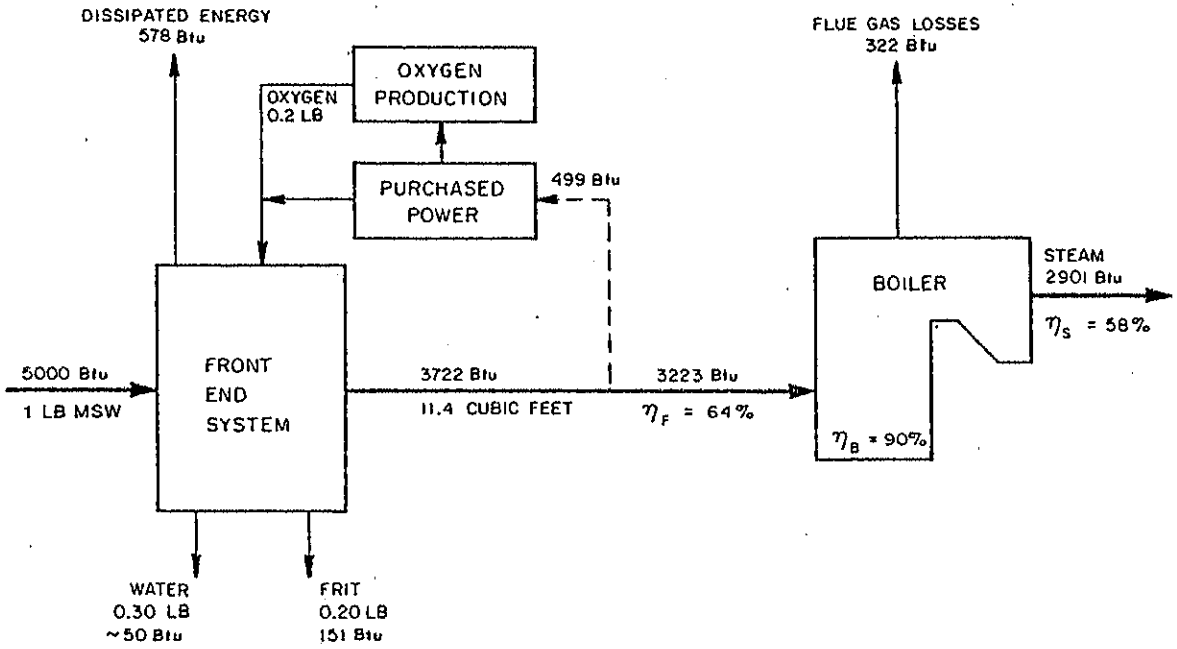


FIGURE 3–3

Source: USEPA, Resource Recovery Plant Implementation, Technologies



ENERGY BALANCE FOR PUROX SYSTEM

FIGURE 3–4

Source: USEPA, Resource Recovery Plant Implementation, Technologies

If the fuel is used in a boiler, the combustion efficiency would approximate 90 percent, with a net system efficiency of about 58 percent. The energy products, therefore, can be low-Btu fuel gas, steam and/or electricity. For some applications in the United States, consideration has been given to adding conventional back-end process technology to produce either ammonia (NH_3), methanol (CH_3OH) or methane (CH_4), however, the economic viability remains uncertain.

The Purox process has been demonstrated at a prototype demonstration plant in South Charleston (200 tons per day). Currently, Union Carbide is marketing 350 tons per day Purox modules. Tests have also been made to accommodate sewage sludges into the Purox process (co-disposal). Figure 3-5 shows a typical mass balance of one type of co-disposal arrangement.

Cost estimates for 1,000 and 1,500 ton per day pyrolysis facilities are shown in Table 3-2. Cost information shown in the table represents the approximate costs of a Purox type pyrolysis system. Tipping fees are estimated to be between $23 and $40 per ton (June 1979 dollars), including credits for the sale of pyrolytic gas and recycled materials. Assumptions used in completing the estimate are as follows.

All costs are in June 1979 dollars.

(a) Operation.

(1) Processing capacities of 1000 and 1500 TPD.

(2) Furnace operation of 6 days per week, 24 hours per day, year-round.

(3) Installed, design or rated capacity of 29%, greater than processing capacity of 1400 and 2100 TPD, respectively.

(4) Throughput at processing capacity, i.e., 100% utilization of processing capacity.

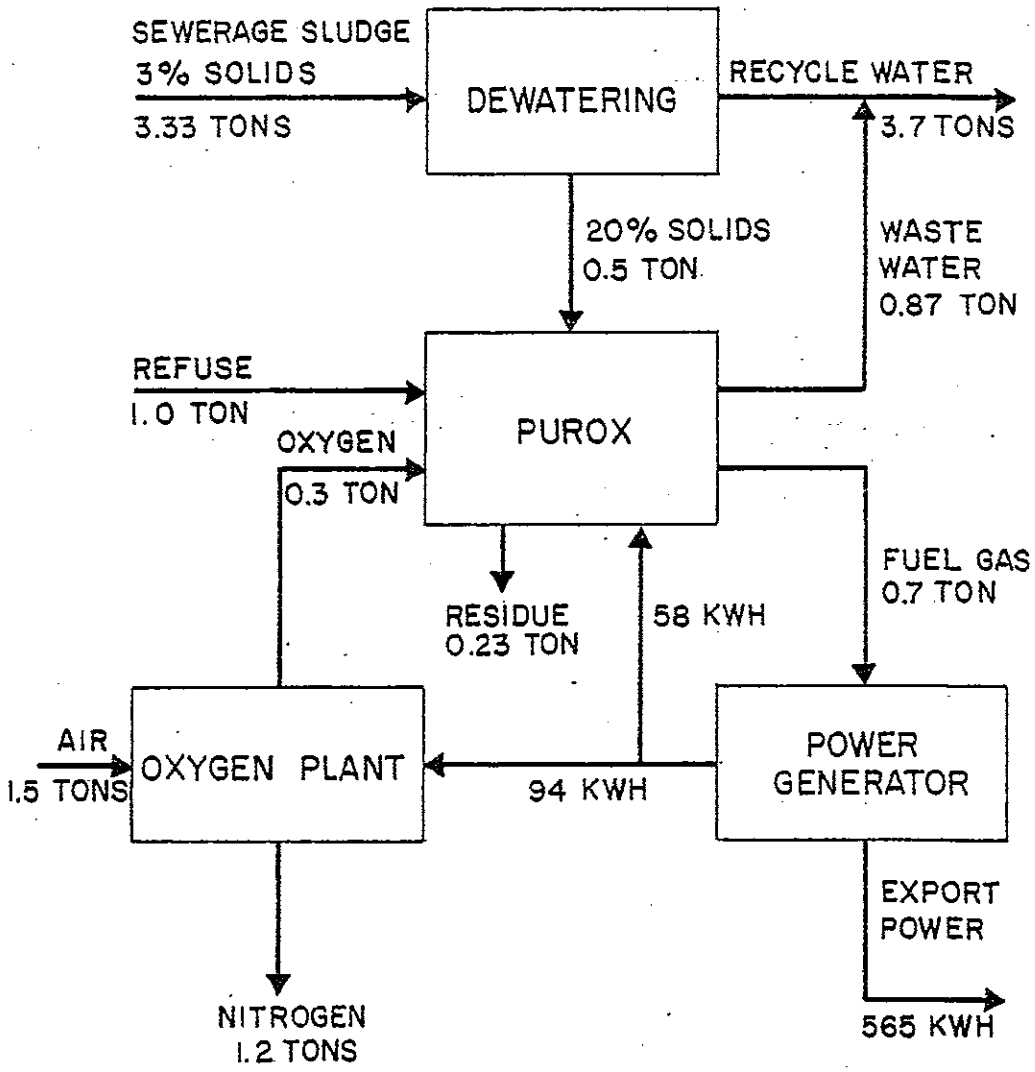
(5) Annual throughput of 312,000 and 468,000 tons per year, respectively.

(6) No co-disposal.

(b) System Capital Cost.

(1) 4 – 350 TPD modules for 1000 TPD plant, and 6 – 350 TPD modules for 1500 TPD.

(2) Oxygen plant and Unox plant.



CO-DISPOSAL OF SEWAGE SLUDGE AND REFUSE IN THE PUROX SYSTEM

FIGURE 3–5

TABLE 3–2

COST ESTIMATE

PUROX PYROLYSIS PROJECTS (1,000's OF DOLLARS)

	1,000 Tons/Day (312,000 Tons/Yr.)	PROCESSING CAPACITY 1,500 Tons/Day (468,000 Tons/Yr.)
CAPITAL		
System	$75,000 - $ 95,000	$ 95,000 – $ 115,000
Bonding Cost	2,000	2,400
Net Interest During Construction	2,500	3,000
Start-Up Contingency	3,000	3,800
Debt Service Reserve	8,000	9,600
Operating Cost Reserve	3,500	5,000
Land and Site Preparation	1,000	1,200
CAPITAL COST RANGE	$95,000 – $115,000	$120,000 – $ 140,000
AVERAGE CAPITAL COST	$105,000	$130,000
ANNUAL COSTS		
Operating & Maintenance	$ 4,700 –$ 6,200	$ 6,600 – $ 8,900
Amortization of Capital	9,700 – 11,700	12,200 – 14,300
ANNUAL COST	$14,400 – $ 17,900	$ 18,800 – $ 23,200
UNIT COST	$46.15 - $ 57.37	$ 40.17 - $ 49.57
ANNUAL REVENUES		
Gas Sales	$ 3,800	$ 5,700
Ferrous Sales	760	1,100
Interest on Debt Service Reserve & Operating Cost Reserve (6-1/2% Simple Interest)	750	950
Subtotal	$ 5,310	$ 7,750
ANNAUL DISPOSAL CHARGE	$ 9,090 – $ 12,590	$ 11,050 – $ 15,450
UNIT DISPOSAL CHARGE	$29.13 - $40.35	$23.61 - $33.01

June 1979 Dollars

(3) Fuel produced is 350 Btu/cu. ft.; i.e., no methanation unit.

(4) Auxiliary fossil fuel boiler.

(c) Other Capital Costs.

Includes:

(1) Bonding or Financing Cost – Monies expended to investment banking firm, authority, legal counsel and consultants for services rendered in executing the sale of the bond issue.

(2) Net Interest Cost During Construction – Cost attributable to the differential between the interest on construction financing and the interest on bond income.

(3) Start-Up Contingency – Funds expended during the start-up period when revenues are negligible.

(4) Debt Service or Bond Reserve – Bond sales typically contain a reserve fund to protect the bondholders (capital contingency).

(5) Operating Cost Reserve – Fund created to cover operating contingencies such as operator non-performance, major unscheduled repairs, alternative differential disposal costs or some other unpredictable change in operation.

(6) Land and site preparation at $50,000 per acre.

Excludes:

(7) Capital cost associated with residue disposal, however, not likely.

(8) Cost of replacing major system components.

Alternative pyrolysis systems include those available from Torrax and Occidental. The basic differences in the Torrax System as compared to the Purox system is that no refuse preprocessing is required, hot air is used in the vertical combustion chamber instead of oxygen and the resultant fuel gas, with its relatively low Btu content, is injected in a waste heat boiler and recovered as steam. In the United States, Torrax was developed by Carborundum and Andco in their 75 ton per day (TPD) pilot plant in Orchard Park, New York.

The Occidental process (originally the Garrett system) utilizes fluff RDF, together with the heated solid residue after the pyrolysis reaction, as feed to a vertical, stainless steel reactor. The material exiting the reactor consists of a mixture of char, ash and pyrolytic gases. The gases are rapidly cooled to produce an oil-like liquid fuel. The pyrolytic oil is expected to have a heating value of approximately 10,500 Btu per pound as compared with 18,000 Btu per pound for No. 6 fuel oil.

3. Refuse Derived Fuel (RDF). During the 1970's, the development of refuse derived fuel (RDF) technology has come from a concept to the installation of several commercial facilities. RDF processes mechanically extract the combustible fraction of municipal solid waste for use as a substitute for fossil fuels.

Initially, development was slow because the market was not receptive to solid fuels. In the 1960's, the country made a transition from coal to gaseous and liquid fossil fuels. Air pollution laws and the excellent availability of low cost oil and natural gas caused the change to new types of boilers, without ash handling equipment. When the impact of the Arab oil embargo was felt by industries and utilities, plans for future energy supply began to adjust. While no definite conclusions have been reached, a new trend is being established. The United States will be converting to a more balanced usage of fossil fuels with a higher percentage of coal in the energy mix.

In the State of New Jersey, 50 percent of the industrial boilers are more than 25 years in age and approximately half of these are in excess of 30 years old. During the next five to ten years, most of these boilers will be replaced. Corporate management, not wanting to be held captive to an oil based energy supply, is investigating steam boilers which have the capability to burn oil, gas, coal and/or a suitable fossil fuel substitute.

The opportunities to link energy supply problems with solid waste disposal are numerous with successful applications inevitable. Processes to manufacture RDF in sizes from 4 inch to a powder have demonstrated good performance and are commercially available. In addition, steam boilers which use RDF have been ruled by the Internal Revenue Service as tax exempt capital equipment items.

Many large boiler manufacturers in the United States — Foster Wheeler, Babcox and Wilcox, Combustion Engineering and Erie City Boiler — have recognized the opportunities. They have designed the "dedicated" boiler which is capable of firing 100 percent RDF. One dedicated boiler facility is currently under construction at the Hooker Chemicals and Plastics Corporations plant in upstate New York.

The traditional approach to RDF application is also well underway. This approach consists of modifying existing boilers to pneumatically feed RDF for co-firing in coal boilers. Facilities currently operating in Milwaukee, Wisconsin, Brockton, Massachusetts and Ames, Iowa are successful producing RDF for co-firing large boilers.

Currently, emphasis has been placed on the recovery of materials from solid municipal waste. Materials considered for recovery include ferrous and non-ferrous metals, glass, paper and even plastics. Considering present day technology, only the recovery of ferrous and non-ferrous metals appears to be viable economically. However, due to the dry type separation employed at RDF plants, additional technologies can easily be added to recover more portions of the recycleable waste stream, as the technology becomes economically viable.

An RDF plant is a processing facility where municipal solid waste is shredded and classified. Several types of RDF can be produced: fluff RDF, densified RDF and powder RDF. The RDF must have the physical and combustion properties necessary to make it compatible with the specific boiler-furnace firing and ash handling system being considered. Figure 3-6 is a schematic representation of a typical process train showing approximate quantities of RDF, ferrous metals and other non-combustibles.

Fluff RDF burns efficiently in suspension as it falls down through the turbulent flame zone of a boiler. It can be burned in both suspension-fired and cyclone fired boilers, and in certain stoker and spreader-stoker fired boilers. It is most applicable to large utility-class boilers, however, new combustion systems such as fluidized-bed furnaces may also be amenable, as they become available for commercial use. Particle sizes generally range from 1/4 inch to 2 inch for co-firing with pulverized coal, however, particle sizes of 4 inch minus have provided efficient burnout for dedicated boilers.

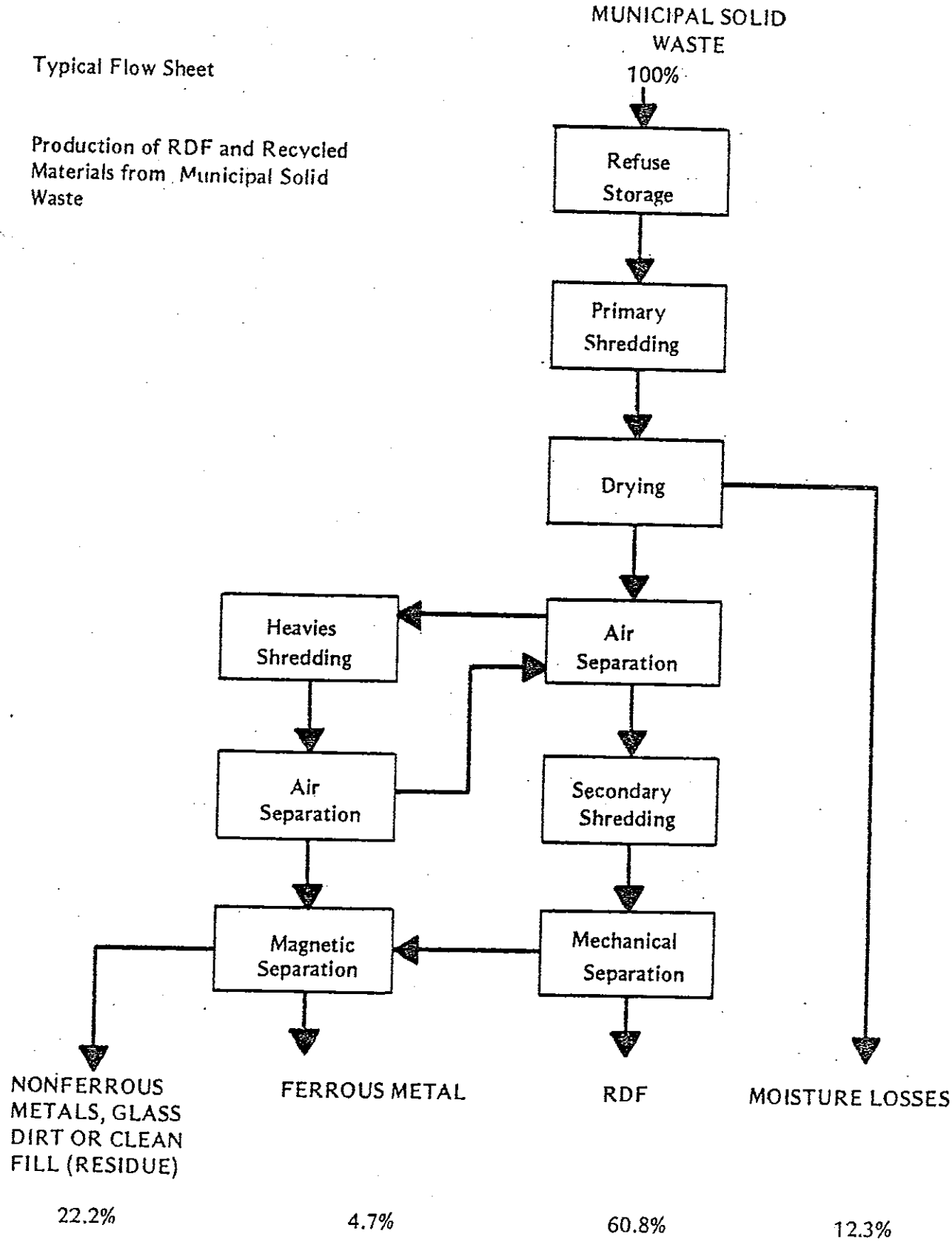
Upon delivery to the site, the solid waste is dumped on a concrete pad sufficient in size to store an adequate supply of waste. Specially equipped front end loaders pick up the refuse and deposit it on a conveyor belt for feeding the primary shredder. After size reduction, the waste moves to an air dryer, where moisture is removed. The drying process facilitates further processing and permits the production of a fuel with a uniform moisture content. After drying, the shredded refuse is air classified to separate the light combustible fraction from the heavier non-combustible fraction containing ferrous and non-ferrous metals, glass and miscellaneous materials. The light fraction undergoes further size reduction and mechanical separation to remove most of the remaining fine non-combustibles. The RDF product would then be conveyed to delivery vehicles or stored in silos on-site.

The heavy fraction is further shredded and classified to separate any remaining combustibles which are recycled to the first air separator. The heavies are then combined with non-combustibles rejected from the mechanical separator and fed to a magnetic separator where the ferrous metals are recovered for sale. The remaining non-combustibles, consisting principally of glass, dirt and non-ferrous metals such as aluminum, zinc, lead and copper, could be further processed for materials recovery or placed in a landfill.

RDF PROCESS SCHEMATIC DIAGRAM
FIGURE 3–6

Typical Flow Sheet

Production of RDF and Recycled Materials from Municipal Solid Waste



Fuel can be reclaimed from storage at the fuel processing plant and delivered to packer trucks or rail cars for shipment to a dedicated boiler or co-fired boiler. Alternatively, it can be moved pneumatically if the steam plant is located near the fuel preparation plant. When the fuel is delivered via truck or rail, it is transferred pneumatically to storage bins at the steam plant. The air used to transport the fuel is exhausted to the atmosphere, after passing through a bag filter to remove particulates, or can be used as combustion air.

The transport of RDF can be costly when the product must be hauled from the refuse processing plant to the boiler site. This entails surge storage after processing, transportation, and re-storage at the boiler plant. Significant savings and system simplicity can be accomplished when the RDF plant is within conveyor (pneumatic, mechanical) distance of the boiler plant.

Figure 3-7 illustrates one method of receiving and firing RDF. The storage bins are large, rectangular, straight-walled steel bins with "live bottoms". Rotating screw or drag conveyors reclaim the fuel from the base of the storage bin and convey it to the pneumatic transport unit. The pneumatic feeder meters the flow to RDF to a boiler for suspension burning. For co-firing applications, the RDF is fed between coal-fired burners to assure contact with high-temperature flame and complete combustion. Feed rates of 20 percent RDF (80 percent coal), on a BTU supplied basis, have been achieved, but not consistently.

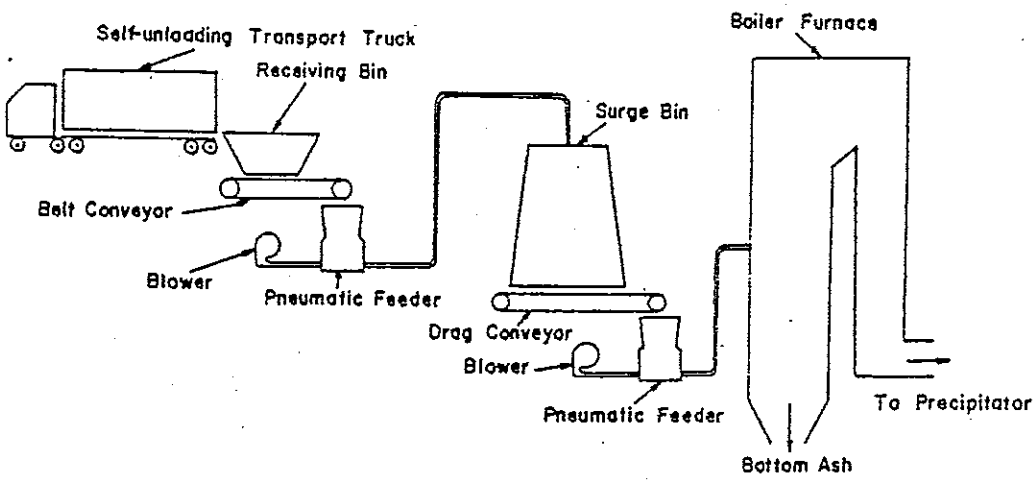
The recovered ferrous is prepared for market by several stages of shredding, classification and magnetic separation, using equipment presently employed by the auto shredding industry. The ferrous fraction generally consists of flat chips of metal, nominally two inches (2") in size with traces of organics. Market studies indicate that ferrous scrap is acceptable for detinning, or can be sold directly to the steel industry.

The non-ferrous metals, glass, dirt, and other dense components of the municipal solid waste stream can be further processed to recover marketable items. One process train involves the use of a trommel (inclined rotating circular screen), a rising current separator, shear shredder, rod mill, and screens to produce a 30 percent enriched non-ferrous mix. The economic feasibility is marginal, but increasing with time, as unit processes are refined and arranged to accommodate market requirements. The non-ferrous, non-combustible stream can also be heat-treated to burn off the contained organics and sterilize the residue, or it can be landfilled without further processing.

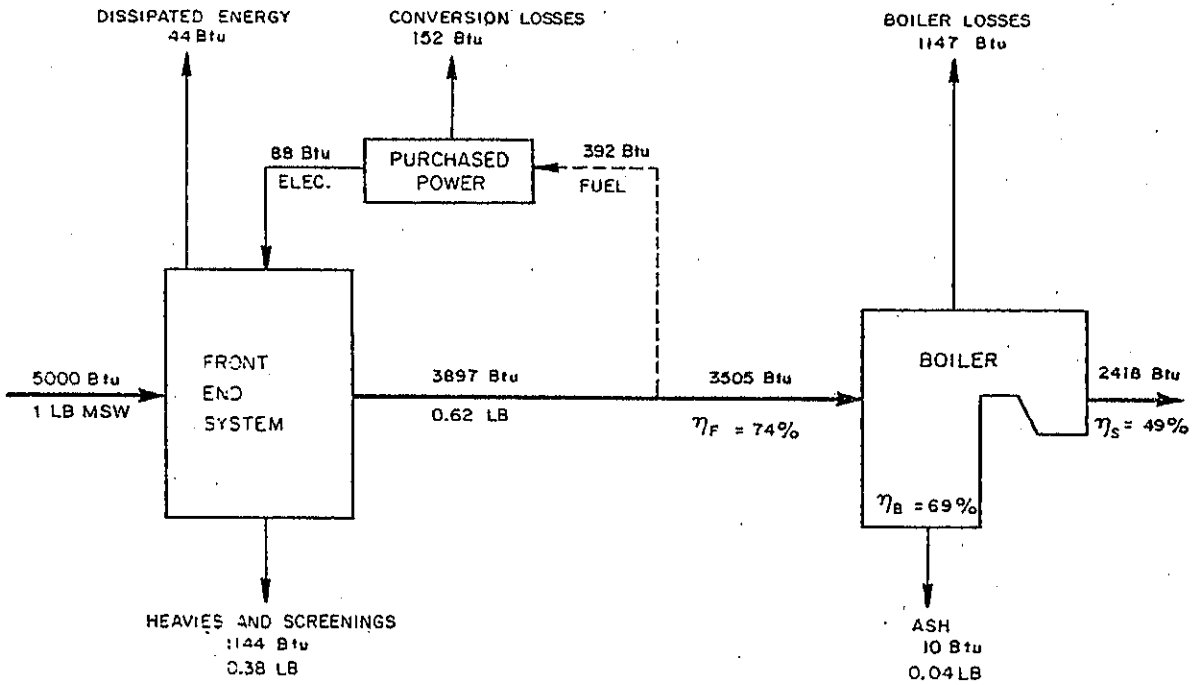
An energy balance for a typical fluff RDF plant is offered as Figure 3-8. It is based on a system having two-stage shredding, a trommel screen, air classification, and truck transport to a user 15 miles away. Sixty-two (62) percent of the refuse received is assumed recovered as RDF. The process illustrated previously in Figure 3-6 included drying and classification of non-combustibles. The energy expended for drying and non-combustible separation would be offset by the increased recovery yield. Therefore, Figure 3-8 provides a reasonable estimate of energy inputs and outputs.

FIGURE 3-7

RDF RECEIVING AND FIRING FACILITY



Source: Energy from Solid Waste, Cheremisinoff and Morresi, 1976, p. 53.



FLUFF RDF ENERGY BALANCE

FIGURE 3–8

Source: USEPA, Resource Recovery Plant Implementation, Technologies

RDF can have a nominal particle size of twenty to thirty mesh (screen sizing) up to four inches. Densified and powder RDF forms are available commercially. RDF can be densified into a briquette or pelletized form to simulate that of solid coal or coke, The densified forms are more convenient to handle than fluff-RDF and more compatible with stoker-type furnaces. A pulverized powder-like RDF has, perhaps, the greatest overall applicability to existing combustion systems. Powder RDF requires significantly greater levels of investment for processing than fluff, and would inevitably have to be offered at a higher cost than fluff. The most highly developed processing system for powdered RDF is the Eco-Fuel II^{R} concept, patented by Combustion Equipment Associates. Such a facility is presently under design for a site in Newark, New Jersey.

Cost estimates for 250, 500, 1000 and 1500 tons per day RDF facilities are shown in Table 3-3 and 3-4. Cost estimates shown in the table represent typical values for a pelletized fuel type RDF facility. Without sale of the non-ferrous mix, tipping fees are estimated to range between $15 and $26 per ton (1979 dollars). Assumptions made in completing the cost estimates are as follows:

(a) Operation.

(1) Processing capacities of 250, 500, 1000 and 1500 tons per day.

(2) RDF plant operation of 6 days per week, 24 hours per day, year-round.

(3) Installed, design or rated capacity 25 percent greater than processing capacity or 312, 625, 1250 and 1875 tons per day, respectively; i.e., processing equipment availability of 80 percent.

(4) Throughput at processing capacity; i.e., 100 percent utilization of processing capacity.

(5) Annual throughput at 312,000 and 468,000 tons per year, respectively.

(b) System Capital Cost.

(1) RDF plant with ferrous and 30 percent enriched non-ferrous mix recovery sub-systems.

(2) Two dedicated boilers at RDF user location with air pollution control.

(3) RDF transport vehicles and RDF storage bins.

TABLE 3-3

COST ESTIMATE

REFUSED DERIVED FUEL WITH DEDICATED BOILER FIRING PELLETIZED FUEL
(1,000's OF DOLLARS)

	250 TPD	500 TPD
CAPITAL		
RDF Plant	$ 9,900 – 11,800	$ 16,000 – 19,000
Dedicated Boilers	2,400	3,900
Subtotal	$ 12,300 – 14,200	$ 19,900 – 22,900
Bonding Costs	420	700
Net Interest During Construction	4,200	7,000
Start Up Contingency	1,100	1,800
Debt Service Reserve	1,700	2,900
Operating Cost Reserve	530	800
Land and Site Preparation	150	200
CAPITAL COST RANGE	$ 20,400 – 22,300	$ 33,300 – 36,300
AVERAGE CAPITAL COST	21,350	34,800
ANNUAL COSTS		
Operating & Maintenance	$ 950 – 1,150	$ 1,620 – 1,790
Amortization of Capital	2,100 – 2,300	3,400 – 3,700
ANNUAL COST	$ 3,050 – 3,450	$ 5,020 – 5,490

June 1979 Dollars

TABLE 3-3

COST ESTIMATE

REFUSED DERIVED FUEL WITH DEDICATED BOILER FIRING PELLETIZED FUEL (continued)

	250 TPD	500 TPD
ANNUAL REVENUES		
RDF Sales	$ 1,040	$ 2,080
Ferrous Sales	190	380
30% enriched non-ferrous mix	170	340
Interest on Debt Reserve and Reserve	180	240
Subtotal	$ 1,580	$ 3,040
ANNUAL DISPOSAL CHARGE	$ 1,470 – 1,870	$ 1,980 – 2,450
UNIT DISPOSAL CHARGE	18.84 – 23.97	12.70 – 15.71
UNIT DISPOSAL CHARGE WITHOUT REVENUE FROM NON-FERROUS MIX	21.02 – 26.15	14.87 – 17.88

June 1979 Dollars

TABLE 3–4

COST ESTIMATE

REFUSE DERIVED FUEL PLANT WITH DEDICATED BOILER FIRING PELLETIZED FUEL
(1,000's OF DOLLARS)

	1,000 Tons/Day (312,000 Tons/Yr.)	1,500 Tons/Day (468,000 Tons/Yr.)
CAPITAL		
RDF PLANT	$ 26,000 - 31,000	$ 38,000 – 43,000
Dedicated Boilers	6,300	8,400
Subtotal	$ 32,300 – 37,300	$ 46,400 – 51,400
Bonding Cost	800	1,100
Net Interest During Construction	1,100	1,600
Start-Up Contingency	1,400	1,900
Debt Service Reserve	3,400	4,800
Operating Cost Reserve	2,100	2,900
Land and Site Preparation	1,100	1,300
CAPITAL COST RANGE	$ 42,200 – 47,200	$ 60,000 – 65,000
AVERAGE CAPITAL COST	42,400	62,500
ANNUAL COSTS		
Operating and Maintenance	$ 4,500 – 5,000	$ 5,700 – 7,100
Amortization of Capital	4,300 – 4,800	6,100 – 6,600
ANNUAL COST	$ 8,800 – 9,800	11,800 – 13,700
UNIT COST	$ 28.20 - 31.41	$25.21 - 29.27

June 1979 Dollars

TABLE 3–4 (Cont'd)

COST ESTIMATE

REFUSE DERIVED FUEL PLANT WITH DEDICATED BOILER FIRING PELLETIZED FUEL (cont.)

(1,000's OF DOLLARS)

	1,000 Tons/Day (312,000 Tons/Yr.)	1,500 Tons/Day (468,000 Tons/Yr.)
ANNUAL REVENUES		
RDF Sales	$ 4,150	$ 6,170
Ferrous Sales	760	1,100
30% Enriched Non-ferrous mix	670	1,000
Interest on Debt Service Reserve & Operating Cost Reserve	350	500
Subtotal	$ 5,930	$ 8,770
ANNUAL DISPOSAL CHARGE	$ 2,870 - 3,870	$ 3,030 - 4,930
UNIT DISPOSAL CHARGE	$ 9.20 - 12.40	$ 6.47 - 10.53
UNIT DISPOSAL CHARGE WITHOUT REVENUE FROM NON-FERROUS MIX	$ 11.37 - 14.55	$ 8.61 - 12.67

June 1979 Dollars

(c) Other Capital Costs.

Includes:

(1) Bonding or Financing Cost. Monies expended to investment banking firm, authority, legal counsel and consultants for services rendered in executing the sale of the bond issue.

(2) Net Interest Cost During Construction. Cost attributable to the differential between the interest on construction financing and the interest on bond income.

(3) Start-Up Contingency. Funds expended during the start-up period when revenues are negligible.

(4) Debt Service or Bond Reserve. Bond sales typically contain a reserve fund to protect the bondholders (capital contingency).

(5) Operating Cost Reserve. Fund created to cover operating contingencies such as operator non-performance, major unscheduled repairs, alternative differential disposal costs or some other unpredictable change in operation.

(6) Land and site preparation at $50,000 per acre.

Excludes:

(7) Capital cost associated with residue disposal.

(8) Co-generation equipment.

(9) Cost of replacing major system components.

(10) Cost of RDF transport (RDF plant to firing location).

4. Modular Incineration. Modular incineration, as the name implies, makes use of one or more small scale incinerator "modules" for the combustion of various materials, including solid waste. This modular concept shows particular promise in the area of solid waste disposal for smaller communities whose waste generation rate is insufficient to justify several disposal alternatives where economic considerations mandate economy of scale.

The use of small scale incinerators was common practice in the past. In many instances, these units were located on site, for use by apartment houses or commercial institutions. Unfortunately, these early designs often resulted in emissions of smoke, particulates and odors due to incomplete combustion of the waste material. The addition of costly pollution control equipment proved to be prohibitive for small incineration units. As the need for protecting the environment became apparent, more stringent air pollution codes were enacted nationwide, signaling a rapid decline in the use of small as well as large incinerators as a waste disposal technique. In general, increased use of landfills was the end result.

More recently, technological advances in combination with dwindling land area amenable to landfilling have spurred renewed interest in incineration for both solid waste disposal and energy recovery in the form of steam. Until recently, waterwalled incinerators received the bulk of attention in this area, with many successful large scale operations in Europe leading the way for similar applications in this country. However, the high capital and operating costs of these incinerators dictate the use of large facilities to take advantage of economies of scale. Such large operations require waste volumes characteristic of the larger metropolitan areas.

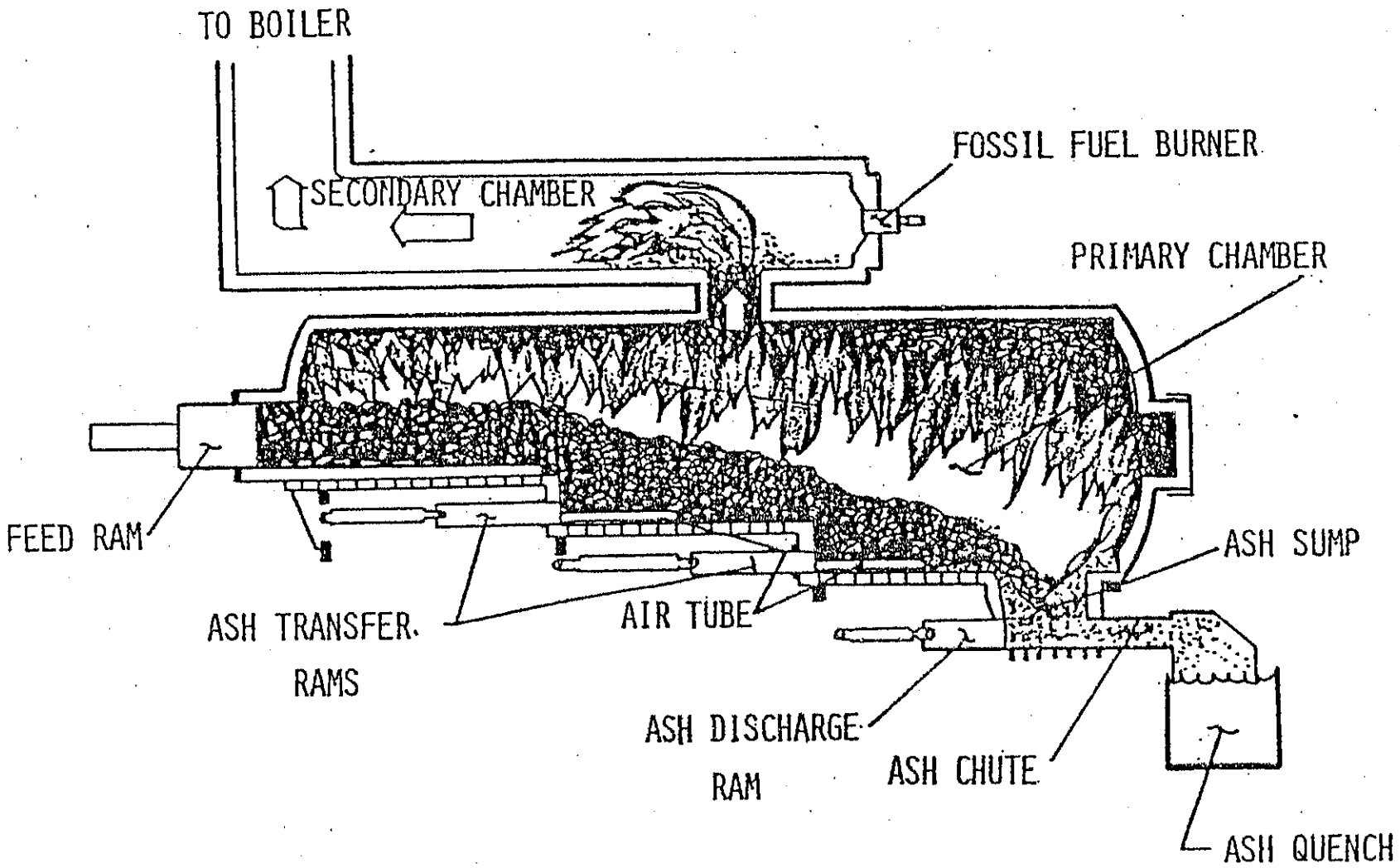
The modern modular incinerator offers promise in overcoming size limitations as well as pollutant emission problems. Reduction of emissions to achieve current ambient air quality standards may be accomplished through utilization of a multiple chamber "starved" or controlled air to volatilize the waste in an atmosphere defficient of oxygen, in much the same way a pyrolysis system operates. Unlike a pyrolysis process, a secondary chamber is provided in which the volatized products are ignited in the presence of excess air to complete the combustion process. Some innovative designs utilize the heat of combustion of these volatile products as transmitted in the flue gas as the energy source for the firing of a waste heat boiler, recovering energy in the form of steam.

Modular incinerators are presently available for several manufacturers including Consumat, Smokatrol, Environmental Control Products and C.I.C.O. Units are available in 25 and 50 TPD units with multiple units being used for larger waste quantities. Modular units have been operational in towns such as Groveton N.H. and Siloam Springs, Arkansas since 1975. Figure 3-9 provides a cross-sectional view through a typical modular incineration unit.

Cost estimates for 40 and 80 ton per day modular incineration facilities are shown in Table 3-5. These estimates do not represent costs of any specific system, but rather an average cost of a typical modular incineration facility. Disposal tipping fees ranging from $16 to $32 per ton include a credit for steam sales, assuming a nearby market. These estimates were obtained using the following assumptions:

FIGURE 3-9

CROSSECTIONAL VIEW THROUGH A TYPICAL MODULAR INCINERATION UNIT



Source: Consumat Systems, Inc., Richmond, Va.

TABLE 3-5

COST ESTIMATE
MODULAR INCINERATION PROJECTS

	40 Tons Per Day	80 Tons Per Day
System	$ 813,000 – 1,000,000	$ 1,375,000 – 1,625,000
Land & Site Preparation	38,000	45,000
Utilities & Construction	759,000	1,350,000
Net Interest During Construction	200,000	320,000
Debt Service Reserve	204,000	326,000
Operating Cost Reserve	109,000	253,000
Bonding Cost	50,000	80,000
Startup Contingency	125,000	200,000
Total Capital Cost Range	2,298,000 – 2,485,000	3,949,000 – 4,199,000
Average Capital Cost	2,392,000	4,074,000
Annual Costs		
Operations & Maintenance	$ 280,000 – 355,000	$ 425,000 – 585,000
Amortization of Capital	234,000 – 253,000	402,000 – 428,000
	514,000 – 608,000	827,000 – 1,013,000
Revenues		
Steam Sales	195,000	388,000
Interest on Debt Service Reserve and Operating Cost	20,000	38,000
Reserve (6-1/2%, simple interest)	215,000	426,000
ANNUAL DISPOSAL CHARGE	$ 299,000 – 343,000	$ 401,000 – 587,000
UNIT DISPOSAL CHARGE ($/Ton)	24.11 – 31.69	16.17 – 23.67

(a) Operation.

(1) Processing capacities of 50 and 100 tons per day.

(2) Furnace and boiler operation of 6 days per week, 24 hours per day, year-round.

(3) Installed, design or rated capacity 25 percent greater than processing capacity or 50 and 100 tons per day, respectively, ie., boiler availability of 80 percent.

(4) Throughput at processing capacity, ie., 100% utilization of processing capacity.

(5) Annual throughput of 62,400 and 124,800 tons per year, respectively.

(b) System Capital Cost.

(1) 1 or 2 boilers for the 50 ton per day facility, 2 boilers for the 100 ton per day plant.

(2) Saturated steam conditions, ie., virtually no superheat.

(3) Auxiliary fossil fuel utilized 20% of the time of operation.

(c) Other Capital Costs.

Includes:

(1) Bonding or Financing Cost. Monies expended to investment banking firm, authority, legal counsel and consultants for services rendered in executing the sale of the bond issue.

(2) Net Interest Cost During Construction. Cost attributable to the differential between the interest on construction financing and the interest on bond income.

(3) Start-Up Contingency. Funds expended during the start-up period when revenues are negligible.

(4) Debt Service or Bond Reserve. Bond sales typically contain a reserve fund to protect the bondholders (capital contingency).

(5) Operating Cost Reserve. Fund created to cover operating contingencies such as operator non-performance, major unscheduled repairs, alternative differential disposal costs or some other unpredictable change in operation.

(6) Land and site preparation at $15,000 per acre.

Excludes:

(7) Capital cost associated with residue disposal.

(8) Cost of replacing major system components.

C. LANDFILLING

1. Conventional Landfilling. Land disposal of solid wastes has been practiced since early times. Primarily due to economic considerations, this low technology approach to solid waste disposal remains the most widely used disposal technique in the State of New Jersey.

Current landfill practice differs greatly from that in the past. Initially, solid waste was deposited on a selected piece of land and allowed to decompose in the open air; hence the term "open dump". Problems associated with these "dumps" include odors, airborne litter, contamination of ground and surfacewaters, and the harborage of disease vectors such as flies, mice, and rats.

Utilizing the significant fuel content in solid wastes, "dumps" were often set aflame to effect volume reduction. These "open burning dumps" added air pollution emissions to an already lengthy list of environmental insults.

In the early 20th century, the practice of burying solid waste with earth materials began to gain in acceptance. In the more recent past, implementation of further strategies designed to mitigate environmental problems associated with this land disposal technique lead to the concept of a "sanitary landfill". Currently, state-of-the-art refinements to sanitary landfilling operations have led to the concept of a "secure" or "controlled" sanitary landfill.

2. Secure Landfilling. A secure sanitary landfill is a disposal facility designed to isolate the waste material from the surrounding environment and thereby minimize adverse environmental impact. These isolation techniques vary from one facility to the next, but most incorporate some or all of the following procedures.

(a) Cover. Three stages of covering with earth materials are utilized in a properly operated sanitary landfill. Daily cover is applied at the end of the operational day to the working surface of the compacted waste material, which may be exposed no longer than 24 hours under DEP regulations. Consisting of a minimum six inch thickness after compaction, daily cover serves to minimize odors, to prevent entrainment of material in the wind, to serve as a precipitation and fire barrier, and to deny disease vectors access to the waste for food or shelter. Intermediate cover, with a minimum thickness of 1 foot after compaction, serves the same functions as daily cover, although by virtue of its thickness remains effective for much longer periods. Exposure of this type of cover is limited to a maximum of six months by state regulations. Final cover, mandated to have a minimum thickness of 2 feet by the state, provides the isolation functions of daily and intermediate covers, in addition to serving as a growth medium for vegetation atop the completed fill area.

(b) Lining/Leachate Control. The sides and bottom of the fill area may be lined with impermeable material so as to prevent the leachate (water percolating through the waste) from contaminating groundwater supplies. Where sufficient distance exists between the groundwater and the fill bottom, natural attenuation of the leachate through physico-biological action in the subsurface soils may occur, and liners need not be utilized. For the most part, the depth to the water table is minimal in the State of New Jersey, mandating the use of one or more layers of lining material.

Recent innovations include the lining of the surface of the completed landfill with impermeable material. Such a design may incorporate a two layer final cover. The lower layer may be of impermeable material, the upper layer of soil more conducive to the growth of vegetation.

A leachate collection system may be located atop the bottom liner in areas where percolated water will collect. This highly polluted liquid may undergo treatment so as to precipitate out inorganic materials and destory potentially harmful organisms.

Treated leachate may be spray irrigated upon areas with intermediate or daily cover to enhance evaporation, or may be delivered to local sewage treatment plants for further treatment.

(c) Gas Venting. Decomposition of waste material in the anaerobic environment of a sanitary landfill leads to the generation of significant quantities of gaseous decomposition

products, primarily carbon dioxide and methane. Lateral methane migration may constitute a hazard to the surrounding area. A system of methane vents in the fill area allows vertical escape of the lighter than air methane, mitigating problems due to lateral migration. These vents may be incorporated into a collection system for use of the off gas as a low grade gaseous fuel.

(d) Compaction. Prior to the application of cover material, heavy equipment with a minimum gross weight of 10,000 pounds should travel over the waste one or more times. Such a procedure compacts the waste, conserving valuable landfill space. Properly compacted waste may exhibit an in-place density of greater than 1000 pounds per cubic yard. Poor compaction practices enhance erosion of cover material while wasting useable volume.

(e) Grading and Drainage. To minimize the generation of leachate, proper grading of the landfill site must serve to divert precipitation and subsequent runoff from the fill area. Ponding of water upon exposed fill surfaces is indicative of poor grading and drainage practices.

(f) Monitoring Wells. Periodic analysis of the groundwater at various points within and around the fill area is necessary to detect the initiation of groundwater contamination in the event of failure of the liner to contain leachate generated within the fill area.

The aforementioned techniques designed to protect the environment require significantly greater capital and operating expenditures than those encountered in simplistic "open dumps". Table 3-6 provides cost estimates for 80, 450 and 350 ton per day controlled sanitary landfills.

Assumptions made in completing the cost estimate are as follows:

- 50 foot fill height.
- On-site leachate pretreatment with discharge to sanitary sewer.
- In-place refuse density of 850 pounds per cubic yard.
- 312 operating days per year.
- 8% inflation factor for capital recovery calculations.
- Land costs of $5,000 per acre.
- 10 year landfill life expectancy.

D. COLLECTION/TRANSFER SYSTEMS

1. Collection Practices. Collection of municipal solid wastes may be accomplished by municipal forces, by private haulers under contract to a municipality (municipal contract collection) or by private haulers through agreements with individual households. Commercial and industrial solid waste collection is generally limited to private haulers under agreement with commercial/industrial establishments. An optimal collection system must complement the selected disposal alternative to insure an effective county-wide solid waste management plan.

TABLE 3-6
CONTROLLED SANITARY LANDFILL
COST ESTIMATE (1,000's OF DOLLARS)

	47 Ac. 450 Tons/Day (140,000 Tons/Yr)	10 Ac. 80 Tons/Day (25,000 Tons/Yr.)	36 Ac. 350 Tons/Day (110,000 Tons/Yr.)
CAPITAL COSTS			
Synthetic Bottom & Side Liner	862	194	669
Leachate Collection System	285	61	219
Leachate Treatment Plant	305	85	234
Land	235	50	180
Site Preparation and Engineering	410	116	313
Clay "Cap" Liner	804	171	616
Revegetation	47	10	36
Ditching and Burning	78	17	60
CAPITAL COST	3,026	704	2,127
ANNUAL COSTS			
Salaries	131	42	116
Utilities	31	10	25
Engineering, Administration, Lab	50	40	50

TABLE 3-6

CONTROLLED SANITARY LANDFILL (cont.)

	47Ac. 450 Tons/Day (140,000 Tons/Yr.)	10 Ac. 80 Tons/Day (25,000 Tons/Yr.)	36 Ac. 350 Tons/Day (110,000 Tons/Yr.)
ANNUAL COSTS (cont.)			
Operating Equipment			
— Amortization	283	159	279
— Operation	56	43	52
Amortization of Capital	308	72	216
ANNUAL COST	859	366	736
Unit Cost (with on-site cover)	6.13	14.64	6.69
Unit Cost (with off-site cover)	6.50	15.38	7.04

June 1979 Dollars

From the standpoint of collection efficiency, two major factors are: payload density and travel distance. Payload density has been found to vary with the size and condition of the collection vehicle. Large trucks (25 cubic yards or more) generally achieve greater densification. The same holds true for newer trucks. Commonly, private haulers utilize larger trucks and replace them on a more frequent basis than municipal forces.

Disposal tipping fees based on cubic yards have traditionally encouraged a collector/hauler, either municipal or private, to achieve the highest payload density possible in order to eliminate excessive disposal costs. Cubic yard tipping fees basically mean that a collector/hauler's disposal costs are a function of the number of trips to the disposal site, not the actual amount of waste transported. This "encouragement" to keep trips to the disposal site at a minimum does not exist for municipalities who operate their own collection fleet and utilize their own landfill.

A conversion of tipping fees based on cubic yards to fees based on tons would eliminate the strongest profit incentive in the solid waste collection system (the less significant incentive to keep trips at a minimum due to transport costs would still remain). The removal of this incentive for high payload density would seriously reduce collection efficiency and increase collection costs.

Collection by private haulers through individual agreements with households represents a fragmented approach which tends to maximize travel distances in the collection scheme. Municipal or municipal contract collection minimize necessary travel by collecting all of the municipal solid wastes in a given area, diminishing the distance between collection stops.

Other variables influence payload density and collection efficiency, some of which are attitude and supervision of collection, type of waste collected, and the weather during collection. However, these factors are basically uniform for both public and private collection crews and cannot be assigned as an advantage to either municipal, municipal contract collection, or private collection.

2. Transfer Systems. In contrast to previously discussed alternatives, a transfer station does not represent a solid waste disposal alternative. The function of such a facility is to optimize haul distances between collection and disposal location, thereby reducing overall disposal costs.

A transfer station is a facility where refuse from collection vehicles is deposited and reloaded into larger vehicles for transport to a disposal location. One transfer trailer is usually capable of accepting the wastes from three or four collection vehicles. The use of one vehicle rather than several to transport this waste to its disposal location forms the basis of the transfer station concept.

Transfer stations vary widely in both size and complexity. A small community may utilize a conveniently placed "roll off" container, hauling it to a disposal site on a regular basis or when it fills. A larger facility may utilize a storage silo or silos, limiting odors and disease vector problems. Compaction equipment may be supplied by the transfer station, or may be self-contained in the long haul transfer trailer. A transfer station may be accompanied by a recycling operation to reduce the volume of refuse to be hauled to the disposal site.

The feasibility and scale of a transfer system depend to a great extent on the distance to the disposal location and the actual volume of solid waste to be hauled. To minimize travel, the facility should ideally be located in the centroid of the area of generation. The economic incentive of transfer station utilization will increase with increasing distance to disposal location. Capital costs as well as annual operating and maintenance costs are shown in Tables 3-7 and 3-8 for a 85 TPD transfer station.

E. FOUR COUNTY ENERGY AND MATERIAL MARKET SURVEY

Under Chapter 326, each county is required to include "the maximum practicable use of resource recovery systems" as part of their solid waste management plan. Resource recovery is to be encouraged through the development of systems to collect, separate, recycle and recover metals, glass, paper and other materials of value for reuse or for energy production.

To determine potential markets for recovered materials and energy, the four Southern Group III counties of Cumberland, Cape May, Atlantic and Salem joined together in a study, examining potential markets on both a 4-county and individual county basis. The report, prepared by Betz, Converse, Murdoch Inc., identified twenty-one users of energy with an equivalent consumption of greater than 50 tons per day of solid waste within the four county area.

The Atlantic City Electric Company was cited as a potential long-term energy market with a 600 TPD equivalent consumption. Vineland Electric Utility has a potential energy demand of 60 TPD of municipal solid waste. Both utilities expressed doubt as to the viability of using refuse for energy.

Six industries throughout the region may serve as possible short-term markets for small scale resource recovery units such as modular incinerators. Three of these potential markets are located within Cumberland County.

There appear to be markets for paper, glass, ferrous and aluminum adequate for acceptance of these recovered within the region, with many of these markets located in Cumberland County.

The findings and recommendations of Betz, Converse, Murdoch are contained in Appendix 3 of this report.

TABLE 3-7

CAPITAL COSTS FOR SOLID WASTE TRANSFER STATION

Item No.	Description	Capital Cost	Asset Life	CRF	Annual Amortization (at 8%)
1	Land (2 acres)	$ 3,000	30	.08883	$ 300
2	Building and Utilities ($25/Ft.^{2}) (Construction and site development)	50,000	30	.08883	4,400
3	Stationary Compact (with subframe and hopper)	40,000	10	.14903	6,000
4	Engineering, Permits, Licenses, and Legal Fees (5% of Item 1) (15% of Items 2 and 3)	14,000	20	.10185	1,400
5	Contingency (10% of Items 1 through 4)	11,000	10	.14903	1,600
		$118,000			$ 13,700
					$ 0.62/Ton

TABLE 3-8

ANNUAL O & M COSTS FOR SOLID WASTE TRANSFER STATION
(8 Hours - 260 Days/Year)

Item No.	Description	Unit O&M Costs	Annual O&M Costs
1	Labor (Salaries, Wages, Fringe Benefits and overhead) — one supervisor — one employee	Supervisor wage of $8.25/Hr. Employee wage of $6.00 Fringe benefits at 30% of wages. Overhead at $.08/Ton	$ 40,300
3	Facility and Equipment Maintenance, Materials & Supplies	$ .25/Ton	5,500
4	Utilities (heat, electricity, telephone, water)	$ .10/Ton	2,200
5	Other Expenses and Contingency	$ .10/Ton	2,200
	ANNUAL CAPITAL COST		$ 50,200 13,700
	TOTAL ANNUAL CAPITAL AND O&M COSTS		$ 63,900

F. IDENTIFICATION OF BASIC SOLID WASTE DISPOSAL ALTERNATIVES

Outlined in this section are the basic disposal alternatives which are now or will be available to Cumberland County. These basic alternatives vary in their availability to each individual municipality in the County. It may be necessary to interface two or more to develop a comprehensive disposal plan for all the municipalities in Cumberland County. In subsequent sections of this plan, full county, staged alternatives will be developed.

Disposal costs listed for each alternative are in June 1979 dollars unless otherwise noted.

1. Utilization of Existing Landfills. The remaining life of the existing BPU regulated sanitary landfills in Cumberland County may be viewed as a function of future generation rates and the future rates of exportation and importation of waste by the County. With the practice of local "in town" landfilling, the estimated remaining life of the landfills in most of the municipalities is less than 10 years. The larger facilities presently in operation at Bridgeton, Millville and Vineland have estimated remaining lives of 3, 9 and 10 years, respectively. The Millville and Upper Deerfield Landfills are presently considering expansion. At present, tipping fees at Cumberland County landfills range from $1.20 to $1.60 per ton, upgrading these landfills with environmental controls should result in tipping fees of about $6/ton.

2. Development of a New County Landfill. A large landfill, utilizing state of the art technology to protect the environment, could be constructed within Cumberland County. A major difficulty in this alternative would involve selecting a site suitable for landfill development and acceptable to the communities at large. Disposal tipping fees for this alternative should lie between $6.50 and $15 per ton (depending on size), with implementation possible in three years.

3. County Refuse Derived Fuel Resource Recovery Facility. The County may construct a facility for its own use, similar to the facility currently under construction by Combustion Equipment Associates in Newark, N.J. The product fuel may be a coarse shred, a "fluff", a powder, or pelletized fuel depending upon current market requirements. With a minimum implementation time of five years prior to utilization of a facility of this type, disposal tipping fees have been estimated at $15 to $26 per ton (depending on size).

4. County Waterwalled Incineration Resource Recovery Facility. A facility of this type could be located in Cumberland County to burn solid waste and provide steam for direct industrial consumption or for driving a turbine for electrical production. Disposal tipping fees for this alternative are in the area of $16 to $32 per ton. Such a facility would require about five years to become operational, but would have to service a wide area of South Jersey to be economical.

5. County Pyrolysis Resource Recovery Facility. This alternative would involve thermally processing Cumberland County's solid waste in an oxygen free or oxygen deficient environment to produce solid, liquid, and gaseous fuels, in addition to an inert residue requiring further disposal. Disposal tipping fees have been estimated to range from $23 to $90 per ton, with a minimum startup period of about five years, but would have to service a wide area of South Jersey to be economical.

6. County Modular Incineration Resource Recovery Facility. A system of one or more small scale modular incinerators (50 to 100 TPD capacity could be implemented in Cumberland County to provide steam to existing local markets. Disposal tipping fees would range from $24.42 to $35.89 per ton with a time period of approximately one and a half to two years for a unit to become operational.

7. Exportation to a Regional Refuse Derived Fuel Facility. A large RDF facility, constructed outside of Cumberland County, may be implemented on a regional basis to take advantage of the economy of scale. The capacity of such a facility would allow for solid waste from Cumberland County and other counties included in the region.

8. Exportation to a Regional Waterwalled Incineration Facility. A large regional waterwalled incinerator may be constructed outside of Cumberland County to take advantage of the economy of scale offered by this alternative. The capacity of such a facility would allow for solid waste from Cumberland County and other counties in the Region.

G. IDENTIFICATION OF FULL COUNTY ALTERNATIVES

The basic solid waste disposal alternatives described in Section F can be used to formulate viable "full County" alternatives for solid waste disposal. These alternatives take into consideration the timing required for implementation, as well as the need for a comprehensive solid waste disposal plan for all municipalities in Cumberland County.

In some cases, the alternatives refer to the Eastern and Western sections of the County. The eastern section includes Commercial, Downe, Lawrence, Maurice River, Millville and Vineland. The Western section includes Bridgeton, Deerfield, Fairfield, Greenwich, Hopewell, Shiloh, Stow Creek and Upper Deerfield. Full County alternatives are as follows:

1. Under this option, starting in 1982 all wastes from the Eastern section of the County would be disposed of at a new landfill for the Western municipalities. A new landfill for the Eastern municipalities would be operational in 1987 to accommodate wastes generated in that section of the County. During the interim period, wastes shall be disposed of by present disposal practices in the East.

2. Present disposal practices would continue in the County until 1982 under this alternative. At that time, all wastes currently accepted at the present Bridgeton landfill will be distributed between and disposed of at the Millville municipal landfill and the City of Vineland landfill. A transfer station would be used if viable. All other municipalities would continue their present waste disposal practices until 1987. In 1987, a new County landfill would be in operation to accommodate all wastes generated within the County.

3. This alternative is identical to Alternative 2 except that in 1987, new landfills would be implemented for the Eastern and Western sections of the County.

4. This alternative is similar to Alternative 3 except that in 1987 a new Millville and a new Vineland landfill would serve the Eastern municipalities. A new Western landfill would accommodate wastes generated in that section of the County.

5. Under this option, by January, 1982, a new County landfill would be operational to accommodate all wastes generated within the County. A transfer station located at the present Bridgeton landfill would consolidate the transportation of wastes from the Western municipalities to the new County landfill.

6. On or before 1987, it is expected that those landfills that have been classified as "open dumps" under the Federal law of the Resource and Recovery Act (RCRA) will either have closed or will have undergone upgrading and expansion, complying with stringent environmental standards. Alternative 6 is identical to Alternative 1 except for the addition of a greenbox system, "Greenboxes" or waste storage containers could be located at each present rural municipal landfill site to collect solid waste. The wastes from these greenboxes would be transported to either the new Western County landfill or existing landfills on a periodic basis depending upon individual local generation rates. Bridgeton, Millville, Commercial Township, Maurice River Township, and Vineland would not utilize greenboxes. They would haul directly to the landfill.

7. This option finds the Eastern portion of Cumberland County utilizing a new Eastern landfill beginning January, 1982. In that same year, the Western municipalities deliver their wastes to a transfer station at Bridgeton for export to an out-of-county landfill.

8. Under this alternative, by January, 1982, a new County landfill could be operational and will primarily accommodate the wastes from Bridgeton. All other municipalities would continue present disposal practices and utilize the new County landfill as local landfills are phased out.

9. This disposal option calls for the phasing-in of a County network of modular incinerators, replacing existing landfills as they achieve capacity. These incinerators would supply steam to local markets.

10. Under this alternative, present disposal practices would continue until January, 1982, at which time the waste accepted at the Bridgeton landfill would be burned in a 50 or 100 TPD modular incinerator in Bridgeton. A modular incinerator accommodating Millville's waste would be in operation by January, 1987. A landfill in the eastern section would be operational by January, 1987 to accommodate the remaining wastes generated in the County.

11. As part of this plan, municipal landfills would be phased out by 1985, according to this option. All waste generated within the County would be burned in a County-wide waterwalled incinerator (350 TPD) to be operational by January, 1985.

12. Under this option, as municipal landfills reach capacity and are phased out, a County-wide RDF facility would be implemented by 1985 to accommodate these wastes and supply RDF type fuels to local markets.

13. A County-wide pyrolysis facility would be implemented by 1985 and utilized by each municipality as local landfills are phased out, under this alternative.

14. As part of this disposal option, a four-county regional RDF facility would include waste exported from Cumberland County to be processed into fuel utilized by local markets. Transfer stations would be used if viable.

15. Under this alternative, a four-county regional waterwalled incinerator would include waste exported from Cumberland County to be burned for energy utilized by local markets. Transfer stations would be used if viable.

16. This alternative recommends the continued use of the existing landfills throughout the duration of the planning period.

17. As in Alternative 16, the present landfill network would be utilized for solid waste disposal throughout the planning period. The remaining life of these landfills would be expanded through the use of shredding or baling devices, possibly in combination with front end separation for materials recovery.

H. PRELIMINARY SCREENING

The 17 full county alternatives outlined in Section G have been subjected to a preliminary screening in order to identify the most feasible alternatives which will then be subsequently

analyzed in detail on a cost-effectiveness basis. Considered in the preliminary screening were social, political and economic factors, input from the Cumberland County Solid Waste Advisory Council, the results of an opinion survey of Cumberland County collector/haulers on solid waste disposal practices, and views expressed at public hearings held during the planning process.

Alternative 1: The division of the County into eastern and western sections and the location of a new landfill in each section may reduce transportation costs in the hauling of waste to the landfills. The construction of new landfills will enhance implementation of state-of-the-art environmental controls to protect the surrounding environment and public health.

RESOLUTION: THIS ALTERNATIVE SHOULD BE FURTHER CONSIDERED

Alternative 2: The solid waste disposal problem in the City of Bridgeton is in need of a short term solution. The allocation of wastes from Bridgeton to the Millville and Vineland landfills is a solution that may be implemented in the near future. The construction of a new county landfill may be initiated during this time to accommodate the county's waste as present landfills reach capacity. A new county landfill offers the advantage of economy of scale in conjunction with state of the art environmental controls.

RESOLUTION: THIS ALTERNATIVE SHOULD BE FURTHER CONSIDERED

Alternative 3: Analagous to Alternative 2, this plan provides Bridgeton with a short-term solution for solid waste disposal. As in Alternative 1, the division of the county into the East and West may reduce hauling costs to the new landfills.

RESOLUTION: THIS ALTERNATIVE SHOULD BE FURTHER CONSIDERED.

Alternative 4: Although a short-term waste disposal solution for Bridgeton is offered in this alternative the implementation of 2 new landfills for the east (Millville and Vineland) in 1987 in addition to a new Western landfill in 1987 would fail to take advantage of economy of scale. Higher tipping fees as a result of this multi-landfill approach would by far outweigh the modest savings realized in transport costs.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 5: A new county-wide landfill operational in 1982, would take advantage of economy of scale and provide state-of-the-art environmental controls, as well as offering a short-term disposal option for the City of Bridgeton. Transportation costs to a new county landfill may be reduced through use of a transfer station located in Bridgeton.

RESOLUTION: THIS ALTERNATIVE SHOULD BE FURTHER CONSIDERED

Alternative 6: Anticipating future requirements of the Resource Conservation and Recovery Act (RCRA), this alternative foresees the closing of existing landfill sites. Placing greenboxes at current landfill sites offers the advantage of complying with existing local land use practices. Construction of new landfills to accommodate wastes deposited within the greenboxes would utilize state-of-the-art environmental controls.

RESOLUTION: THIS ALTERNATIVE SHOULD BE FURTHER CONSIDERED

Alternative 7: This alternative calls for a transfer station at Bridgeton to export the wastes generated by the Western municipalities to an out of county landfill. At the present time, no known acceptable out of county sanitary landfills exist within reasonable hauling distance of Bridgeton. This is, in actuality, a method of moving the problem to another location, rather than a realistic approach to solid waste disposal.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 8: This alternative allows for the phasing out of local landfills and the utilization of a new county landfill in a stepwise orderly fashion. The new county landfill, to begin operation in 1/82, could take advantage of the economy of scale as well as providing adequate environmental controls.

RESOLUTION: THIS ALTERNATIVE SHOULD BE FURTHER CONSIDERED

Alternative 9: A network of modular incinerators throughout Cumberland County parallels the piecemeal approach to solid waste disposal currently in existence in the County. Each incineration grouping would require a nearby market for its product stream. The four County Market Survey uncovered a limited number of these steam markets within the County. After applying a credit for steam sales, disposal tipping fees for a modular incineration facility remain relatively high.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 10: In contrast to Alternative 9, this option places two modular incineration units in areas where significant solid waste generation occurs and potential steam markets have been identified in the Four County Market Survey. However, the high tipping fees associated with modular incineration represent a significant barrier to implementation of this option. Should the value of product steam continue to increase at current rates, increased revenues from

steam sales may enhance the economic competitiveness of modular incineration relative to other disposal options. However, at the present time, implementation of this high technology option is premature, and its consideration as a disposal option should be reevaluated in future updates of the solid waste management plan, rather than at the present time.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 11: For a waterwalled incinerator to be economically feasible, a minimum waste acceptance rate of 1000 to 1500 TPD is required. Cost estimates for these larger facilities were presented in Section III-B.

Unit costs ($ per ton) for small scale (250-500 TPD) waterwalled incinerators as would be required to process all of the municipal waste generated within Cumberland County lie well above those for larger scale waterwall units, or those for modular incineration facilities better suited for small scale applications.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 12: The economic viability of a refuse derived fuel facility diminishes substantially when design capacity falls below 1000 TPD. The expected municipal waste generation rate in 1985 will be approximately 350 TPD in Cumberland County, a rate insufficient to justify construction of an RDF facility due to the lack of necessary economy of scale.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 13: At the present time, the application of pyrolysis on a commercial scale represents an unproven technology. Two major attempts at applications of this technology, in Baltimore and San Diego, have met with failure in the recent past, leaving the future of pyrolysis uncertain.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 14: Exporting solid waste from Cumberland County to a regional RDF facility would significantly increase transportation cost and requirements, with a concurrent dependence on dwindling supplies of fossil fuels for transport. In addition, the viability of this alternative was questioned in the Four County Market Survey (See Section III-E).

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 15: Although a county wide waterwalled incinerator would take advantage of some economies of scale, disposal tipping fees remain comparatively high for such facilities. Transport costs to an out of county disposal location may also prove substantial. These cost disadvantages, in combination with the lack of a readily available steam market as concluded in the Four County Market Survey, weigh disfavorably against this option.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 16: The continued use of existing landfills may not be considered a viable solution for solid waste disposal needs in that most present landfill areas will achieve capacity prior to the end of the planning period. In addition, this "no action" option fails to consider closure of existing disposal sites within five years of implementation of the Federal Resource Conservation and Recovery Act provisions for land disposal, and may foster degradation of the environment, contrary to the goals of Chapter 326 legislation.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

Alternative 17: This option represents an attempt to postpone the pressing solid waste disposal problems rather than an attempt at offering a viable solution compatible with economic and environmental constraints. The high capital and operating costs associated with shredding or baling equipment, in conjunction with significant energy usage for equipment operation outweigh the benefits of extended utilization of existing landfills. Materials recovery operations require economy of scale not present at existing landfill disposal sites for economic justification. Finally, this alternative makes no provisions for impending federal land disposal regulations, and may promote the potential for environmental damage at the existing landfill sites.

RESOLUTION: THIS ALTERNATIVE SHOULD BE DELETED FROM FURTHER CONSIDERATION

I. COST–EFFECTIVENESS ANALYSIS

As a result of the preliminary screening, six full county disposal alternatives (Nos. 1, 2, 3, 5, 6, and 8) will be analyzed further on a cost basis. The primary components of this analysis will be the solid waste transport and disposal costs that will arise from each of the various proposed alternatives. The quantity of wastes used in the cost effectiveness analysis included all solid non-hazardous commercial and industrial wastes as well as municipal wastes.

Division of the County into Eastern and Western sections was considered in the alternatives to evaluate the economy of scale versus transportation savings involved in each disposal option. The Eastern section includes the municipalities of Commercial, Downe, Lawrence, Maurice River, Millville and Vineland. The Western section includes the municipalities of Bridgeton, Deerfield, Fairfield, Greenwich, Hopewell, Shiloh, Stow Creek and Upper Deerfield. The municipalities of Greenwich-Hopewell and Shiloh-Stow Creek were combined for the purposes of analysis since their volumes of waste have been reported jointly (landfills used by these municipalities are also jointly operated). Therefore, transport and disposal costs were computed on a combined basis for Stow Creek-Shiloh and Hopewell-Greenwich.

The analyses have been further subdivided into parts A, B, C, and D depending upon the number of landfill sites under consideration in each alternative (See section IV 1-4).

At the present time, Commercial Township, Maurice River Township, the City of Millville and the City of Vineland provide municipal or municipal contract collection service. The remaining municipal solid waste finds collection service provided by private collector/haulers, or is delivered to the disposal area by those generating the waste (uncollected refuse). Costs for the transport of uncollected and privately collected wastes are variable, depending on the individual collection service and the distance from the point of collection to the disposal facility. Thus, for the purposes of analysis it was assumed that all Cumberland County municipalities will provide municipal or municipal contract collection. This enables prediction of transport costs for each municipality through readily available data, in addition to providing for waste control (See section 5A).

Annual costs per capita may differ significantly between the Eastern and Western Sections of the County due to the smaller per capita waste generation rates in the West (See section IIB).

All cost figures in this section are in June, 1979 dollars unless otherwise noted. A compilation of all cost estimates can be found in Appendix 3.

Alternative 1.

This disposal plan calls for a new landfill for the Western section of the county to be located in Fairfield (A) or Deerfield (B) in 1982. The waste flow is shown graphically in Figure 3-10. A maximum disposal tipping fee of $15.38 per ton is expected at the new landfill due to the lack of economy of scale with a small landfill (See section C). Larger landfills, such as a county-wide landfill, will have reduced disposal tipping fees as will be seen in the following alternatives. Annual costs per capita are expected to range from $8.35 to $8.62 depending upon the location of the new Western landfill.

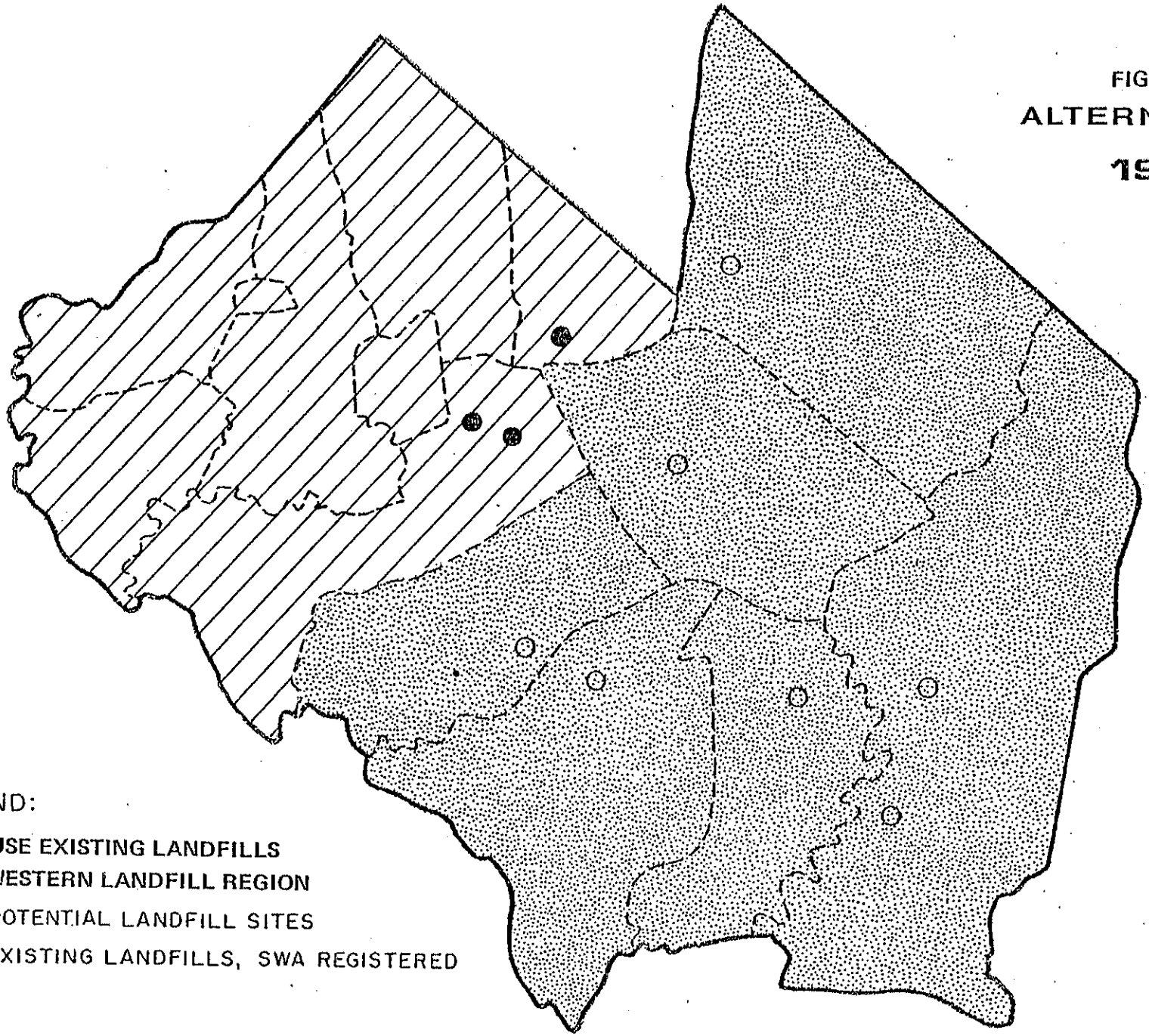


FIGURE 3-10
ALTERNATIVE 1
1982

By 1987, a new landfill for the Eastern section of the county would be operational in Millville (A) or Vineland (B). Figure 3-ll shows this waste flow scheme. With a disposal tipping fee of $7.04 per ton, annual costs per capita are expected to range from $9.64 to $10.61 depending upon the location of the new landfill.

Alternative 2.

A short term disposal solution for the wastes currently accepted at the Bridgeton Landfill is offered in this alternative starting in 1982. The waste stream will be divided and distributed between the present Millville and Vineland Landfills as shown in Figure 3-12. This waste flow would primarily involve the Western municipalities. The per capita cost of this alternative for the West is estimated to be $2.72 with a disposal tipping fee of $1.40 per ton*.

In 1987, a new county landfill would be operational to accommodate all wastes generated within Cumberland County. Figure 3-13 depicts this alternative. Four sites were chosen in computing the cost-effectiveness analysis of a full county landfill: Deerfield (A), Fairfield (B), Millville (C), and Vineland (D). All would have a disposal tipping fee of $6.50/ton. Transport and disposal cost estimates for the East utilizing the new county landfill ranged from $9.64 to $10.96 per capita. Per capita costs for the West ranged from $4.14 to $5.14 depending upon the location of the landfill. Costs per capita are expected to increase about 41%* from 1982 to 1987 for the West when the new county landfill becomes operational. This increase reflects the higher disposal costs required for implementing an environmentally sound landfill.

Alternative 3.

This alternative is identical to Alternative 2 with respect to the short term disposal option for Bridgeton in 1982. Figure 3-12 depicts this waste flow scheme.

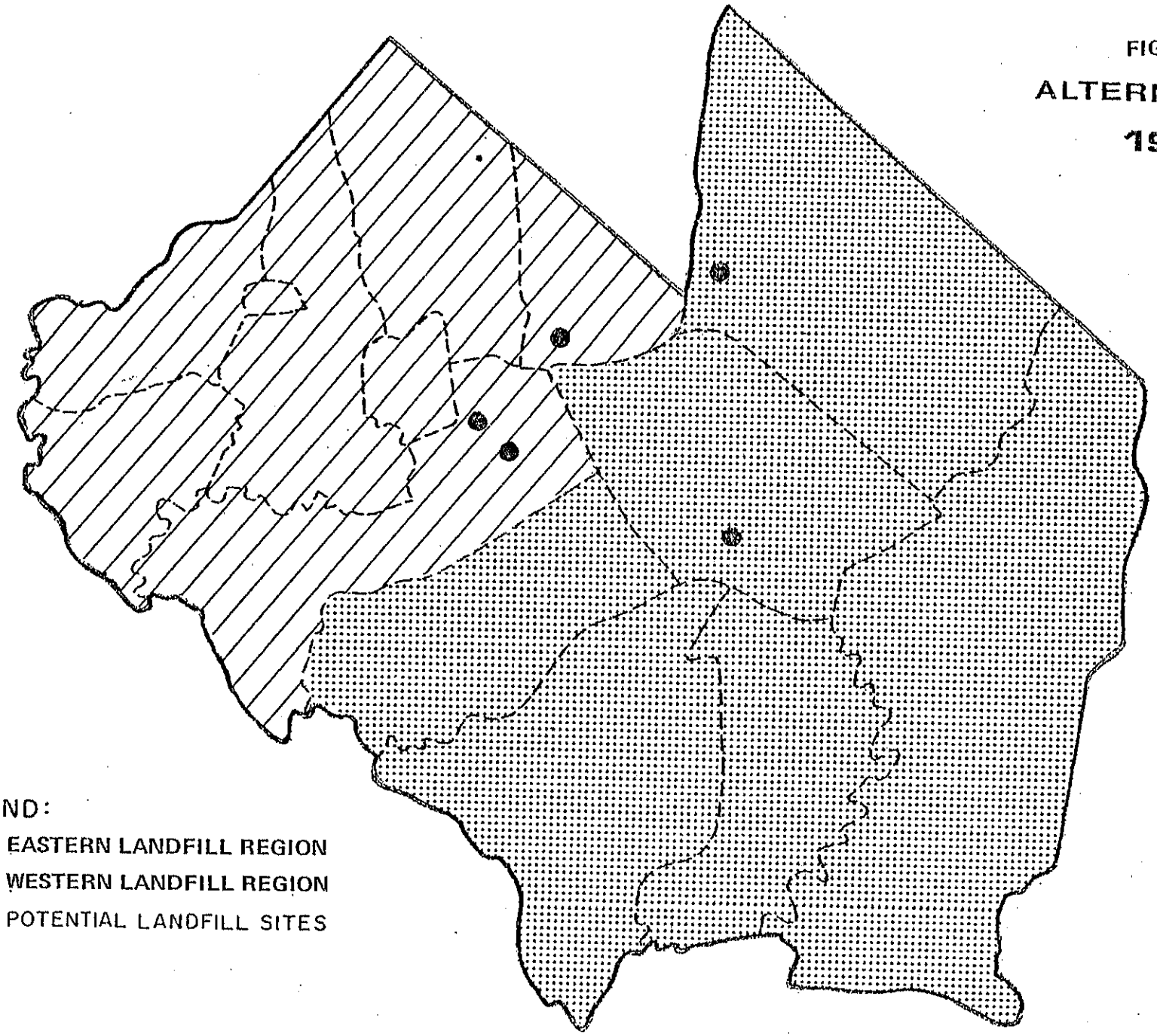
In 1987, two new landfills would be in operation; one to serve the East and one to serve the West. The proposed location for the new Eastern landfill, in Millville (A) or Vineland (B), is expected to have a disposal tipping fee of $7.04 per ton. Cost estimates for the East are $9.64 and $10.61 per capita, depending upon the location of the landfill. Cost estimates for the West, with the location of the landfill in Fairfield (A) or Deerfield (B), are expected to be $8.21 or $8.48 per capita depending upon the location of the landfill. The disposal tipping fee at the Western Landfill would be $15.38/ton.

*Assuming current tipping fees

FIGURE 3-11

ALTERNATIVE 1 & 3

1987



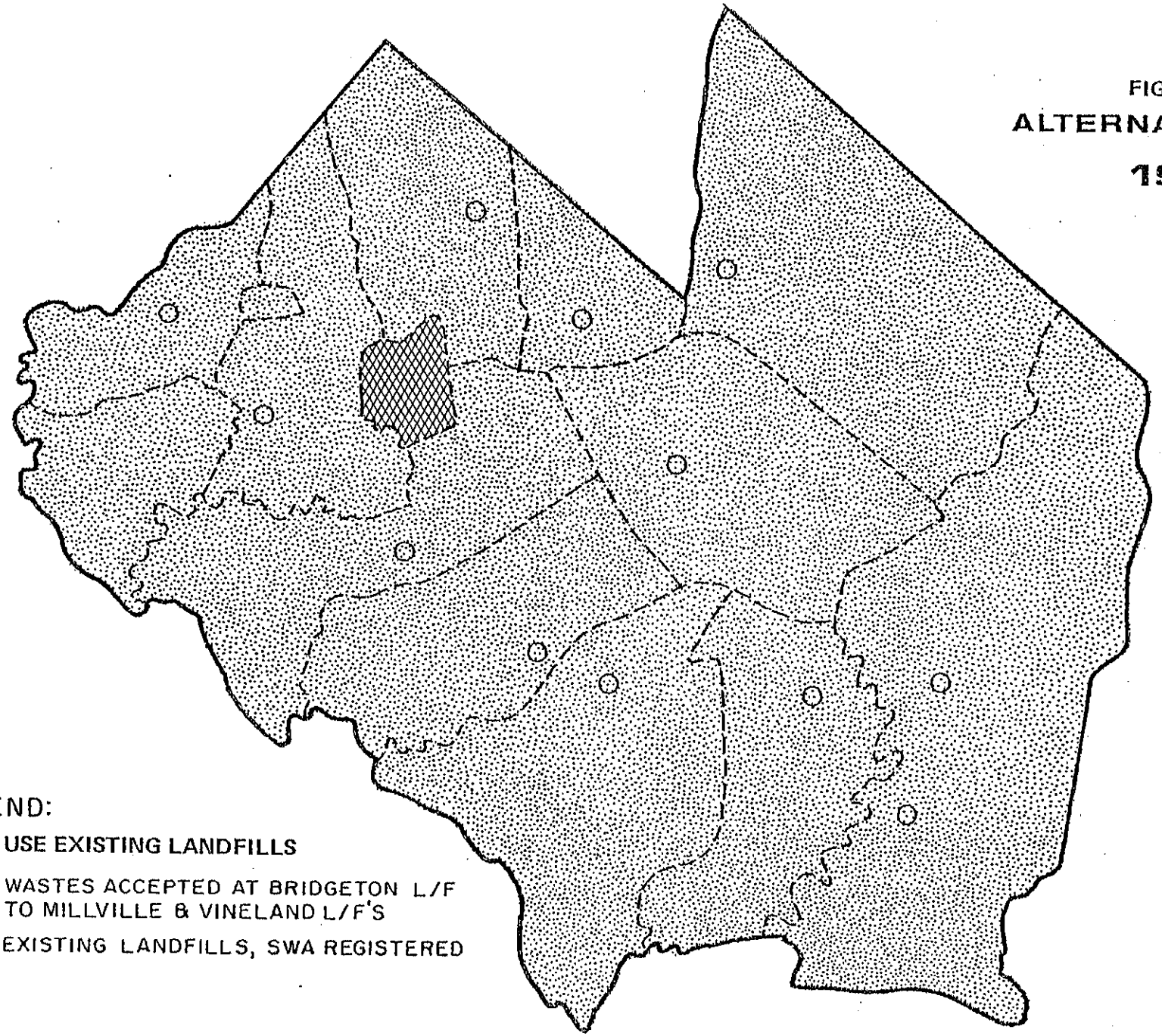
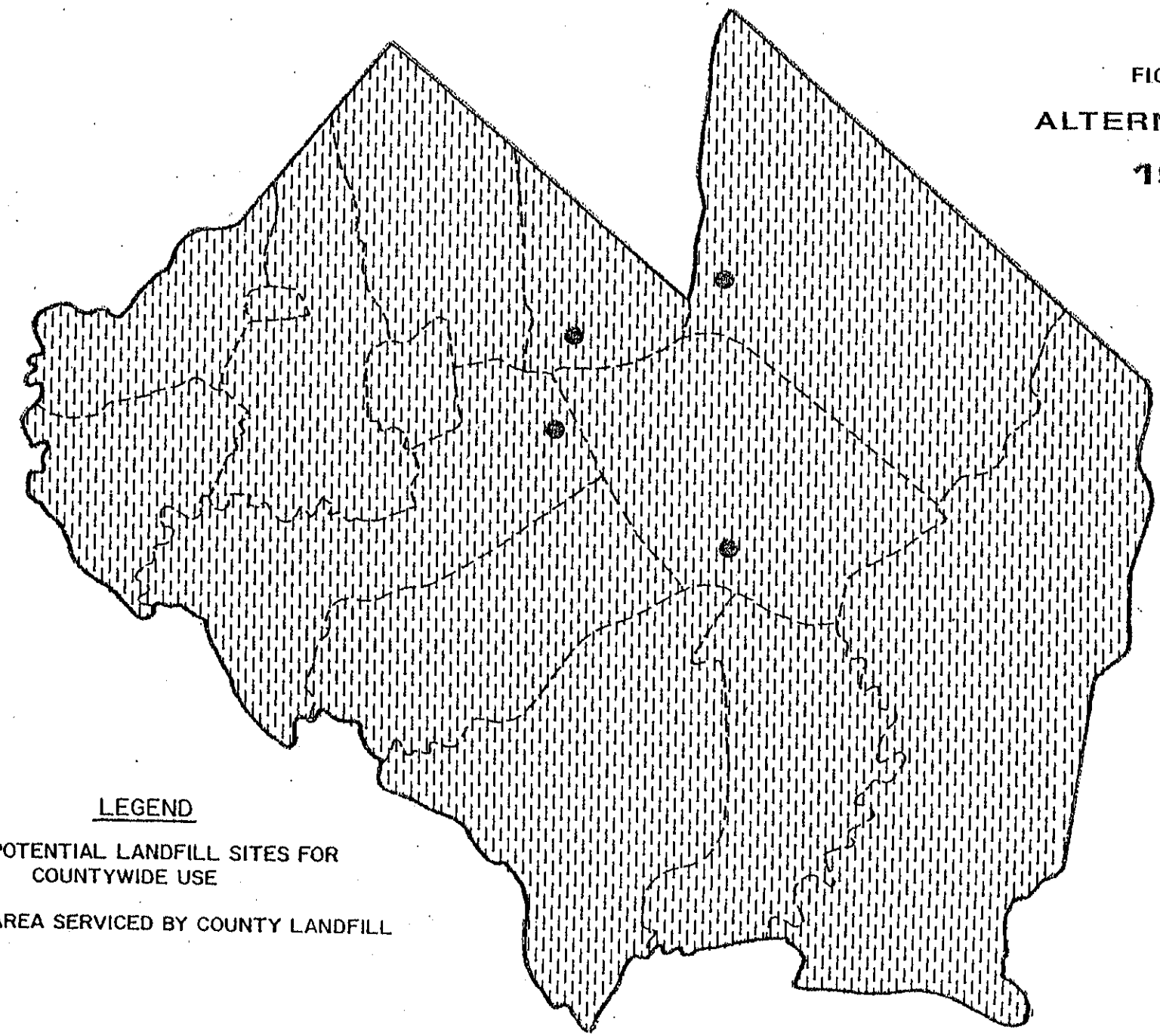


FIGURE 3-12
ALTERNATIVE 2 & 3
1982

FIGURE 3-13

ALTERNATIVE 2

1987



LEGEND

● POTENTIAL LANDFILL SITES FOR COUNTYWIDE USE

AREA SERVICED BY COUNTY LANDFILL

Alternative 5.

The Western cost estimates for 1982 include the cost of utilizing a transfer station to consolidate the transport of waste to a new county landfill. Per capita costs of $4.33 to $4.81 were calculated for the West based on the proposed locations of the new county landfill. The Eastern communities would directly haul their wastes to the new county landfill under this alternative with transport and disposal costs ranging from $8.92 to $10.77 per capita. The waste flow scheme shown in Figure 3-14.

Compared with Alternative 2 for the West in 1987 where wastes are hauled directly to the new county landfill, it is seen that no real savings in transportation costs are acquired utilizing a transfer station for the West in this alternative. Annual per capita costs range from $4.35 to $4.77 for the West. Annual per capita costs for the East in 1987 would increase by 4% over those of 1982 due to the increase of waste generation. A range of $9.64 to $10.96 per capita has been calculated for the East.

Alternative 6.

As local landfills reach capacity and are closed, greenboxes will be utilized at those landfills with small waste generation rates. The wastes from the West will be transported to the new Western landfill, to be operational in 1982, and wastes from the East to the new Eastern landfill, to be operational in 1987, as shown in Figure 3-15. Assuming that all existing landfills will reach capacity and be closed by 1987, cost estimates for the East and West were calculated for this time period. All estimates exclude the cost of transporting wastes to the greenboxes since private individuals will likely transport their own wastes to the greenboxes. Annual per capita costs are expected to range from $9.73 to $10.64 for the East and $8.46 to $8.88 for the West depending upon the respective landfill locations.

Alternative 8.

This alternative finds a new county landfill, operational in 1982, to accommodate wastes from the East and West as shown in Figure 3-16. The county landfill will be utilized as local landfills reach capacity and are phased out. Assuming that all local landfills will be phased out by 1987, cost estimates for the East and West were calculated for this time period. Annual per capita costs range from $9.64 to $10.96 depending upon the location of the new county landfill.

Cost estimates for the West, are expected to range from $4.14 to $5.14 depending upon the location of the new county landfill.

FIGURE 3-14

ALTERNATIVE 5

1982

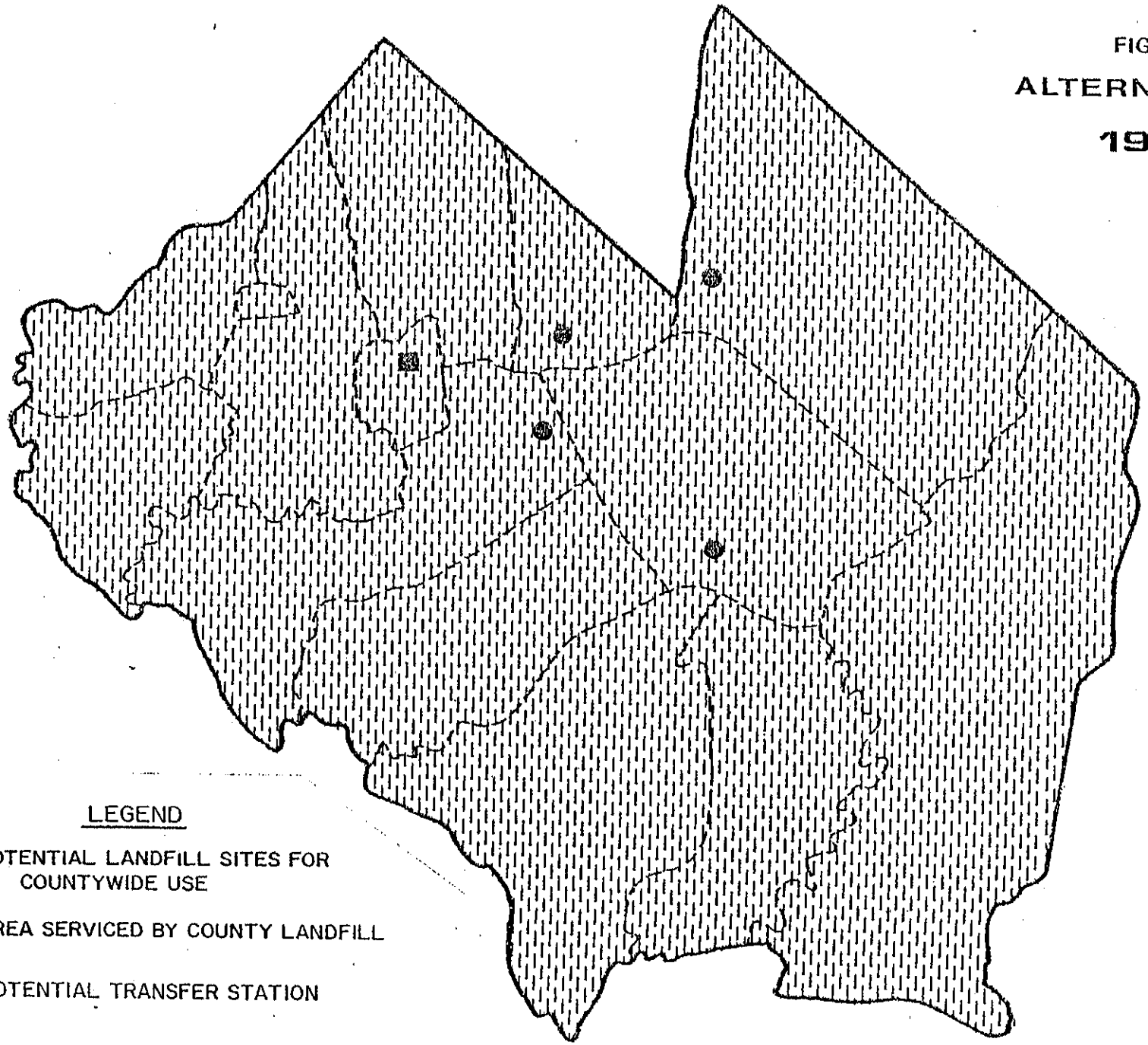


FIGURE 3-15

ALTERNATIVE 6

1987

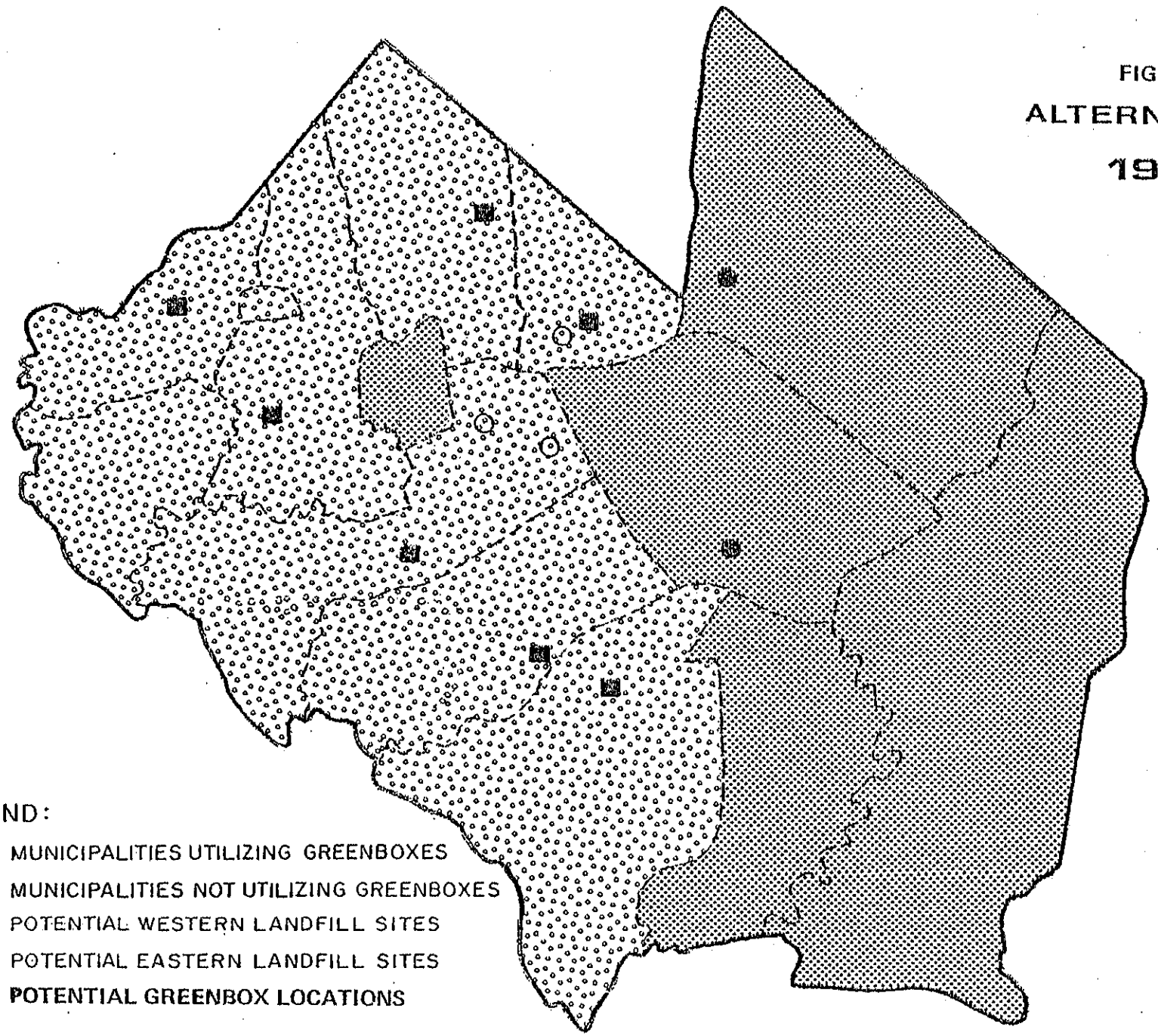
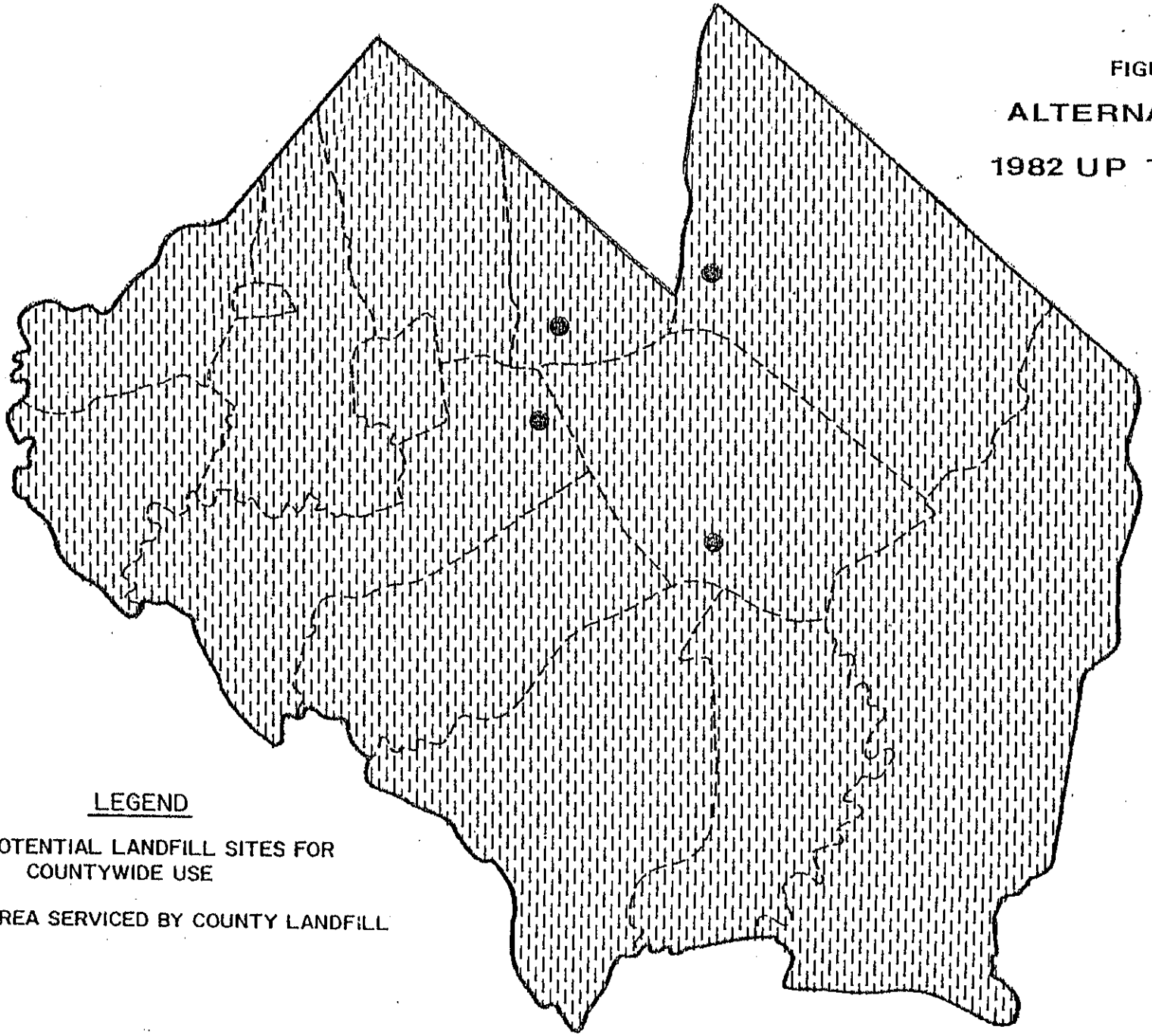


FIGURE 3-16

ALTERNATIVE 8

1982 UP TO 1987



J. FINAL SCREENING OF ALTERNATIVES

Of the six alternatives subjected to cost effective analysis, all will result in an elevation in the overall costs of solid waste disposal. This increase reflects added transportation costs as the local landfills achieve capacity and are replaced by larger regional landfills, in addition to significantly higher tipping fees necessitated by the implementation of state of the art environmental controls at the regional landfill sites.

Central to the solid waste disp[sal problem is the lack of additional capacity at the City of Bridgeton Landfill. At the present time, wastes from Bridgeton in addition to wastes from many of the Western municipalities are accepted for disposal at this site. With the closure of this landfill imminent within the next 1-3 years, all six alternatives have made provisions for disposal of waste flows now entering the City of Bridgeton Landfill in the near future (1982).

It is noteworthy that none of the selected alternatives calls for the implementation of high technology resource recovery facilities. Chapter 326 legislation strongly promotes "the maximum practicable use of resource recovery procedures."

The municipal waste generation rate in Cumberland County is insufficient to justify most high technology resource recovery facilities, whose economic viability requires economy of scale. Modular incineration, amenable to low generation rates, is not cost effective at the present time, although the increasing value of its marketable steam makes its future use promising. A source separation/recycling program, as will be discussed in Section III K, appears most suitable as a resource recovery technique for Cumberland County, and should be utilized extensively in conjunction with any alternative approach.

Table 3-9 ranks the six alternatives subjected to cost effective analysis. All six offer viable solutions to solid waste disposal in the County throughout the planning period. The cost effective analysis revealed negligible differences in cost among the alternatives; hence the ranking reflects application of several other significant criteria, including acceptability, feasibility, flexibility, and fairness to the individual communities within the county.

Alternative 6 fairs well in light of these criteria. The greenbox concept allows for the continuation of the delivery of refuse in sparsley populated areas by private individuals (uncollected refuse) to sites currently utilized for purposes of disposal, thus continuing with existing land use practices. Initiation of municipal or municipal contract collection for these rural areas would be costly due to significant distances between points of collection. Phasing in of greenboxes as local landfills achieve capacity, or are closed under RCRA, allows for utilization of existing landfill space without increasing the burden on existing landfills located in other rural Cumberland County municipalities.

TABLE 3–9

FINAL RANKING OF ALTERNATIVES

Ranking	Alternative Number	Description Summary
1	6	New western landfill beginning 1/82 with wastes phased in as surrounding landfills achieve capacity. Green boxes for smaller municipalities. New eastern landfill in 1987.
2	1	New western landfill beginning 1/82. New eastern landfill beginning 1/87.
3	8	New Full County landfill beginning 1/82. Wastes phased in as existing landfills close.
4	5	Transfer station in Bridgeton accepting waste from western municipalities for transport to New Full County landfill beginning 1/82. Eastern municipalities to New Full County landfill beginning 1/87.
5	3	Use of existing landfills until 1/87, with wastes distributed between existing landfills in Millville and Vineland beginning 1/82. New eastern landfill beginning 1/97. New western landfill beginning 1/87.
6	2	Use of existing landfills until 1/87, with wastes distributed between existing landfills in Millville and Vineland beginning 1/82. New Full County landfill beginning 1/87.

By locating a landfill in the Western portion of the County by 1982, Alternative 1 provides for a limited degree of uncollected refuse. In addition, this option offers a disposal site for Bridgeton and the Western municipalities as their landfills achieve capacity, without placing further burden on existing landfills in other municipalities. An option calling for two landfills offers flexibility, in that the initial site may serve as a full county disposal location on an interim basis, should problems currently unforseen delay the construction of a second fill area.

Alternative 8 offers the benefit of economy of scale, provides a near term solution for Bridgeton, and allows for the incorporation of waste flows as other Cumberland County landfills achieve capacity. Alternatives 2 and 3 take advantage of existing landfill capacity within the County, while placing an additional burden on the larger municipal landfills in Vineland and Millville, accelerating the rate at which these sites will be filled. Alternative 3 is viewed as the more desirable of the two, in that planning for two landfills allows for greater flexibility as previously discussed.

The use of a transfer station in Bridgeton as described in alternative 5 fails to provide a clear economic incentive as indicated by the cost effective analysis. However, should the cost of fossil fuels continue to rise at a rate greater than the rate of inflation, transportation savings realized through use of a transfer station should improve.

A summary of the estimated annual per capita costs and the estimated costs per ton for each alternative can be found in Tables 3-10 and 3-11 respectively. Where "County" average figures are shown in the Tables, these are the approximate tipping fees if "rate averaging" between the various disposal facilities were implemented. Rate averaging will be discussed further in Section V of this Plan.

It is important to note that while it appears at face value that disposal costs can be expected to increase during the planning period, there are many "hidden costs" which are not currently reflected in BPU landfill tipping fees (current tipping fees are approximately $.35 to $.40 per cubic yard). For example, the estimated actual operating costs of the Vineland Landfill is about $4.00 per ton or $1.00 per cubic yard, according to the City. A similar actual operating cost is reported at the City of Bridgeton facility. Thus, to date, the posted tariffs or tipping fees for these two facilities do not reflect the true cost of operation.

Even greater actual disposal costs are being incurred in the rural municipalities, where small, municipal landfills are common. Comparison of operating costs reported by municipalities (see Municipal Survey Results in Appendix 3) and the estimated disposal tonnages reveals that currently, disposal costs of up to $20 per ton are being incurred in the East, while the costs in the West range up to $86 per ton. By contrast, under the top ranked alternative, costs would rise to $15 per ton in the West following the opening of a new, environmentally secure landfill in 1982. In the East, the estimated disposal cost would rise to $7.00 per ton by 1987. With rate averaging,

TABLE 3–10

SUMMARY OF ANNUAL PER CAPITA COSTS FOR
WASTE TRANSPORT AND DISPOSAL

	Annual $/Capita		
	1982	1987	% Increase Over 1982
Alternative 1			
East	–*	9.64 - 10.61	–
West	8.35 - 8.62	8.21 - 8.49	– 2
County	–*	9.31 - 9.93	–
Alternative 2			
East	–*	9.64 - 10.96	–
West	2.72	4.14 - 5.14	71
County	–*	8.03 - 9.26	–
Alternative 3			
East	–*	9.64 - 10.61	–
West	2.72	8.21 - 8.48	200
County	–*	8.06 - 9.91	–
Alternative 5			
East	8.92 - 10.77	9.64 - 10.96	4
West	4.33 - 4.81	4.35 - 4.77	0
County	7.54 - 8.98	8.09 - 9.15	4
Alternative 6			
East	–*	9.73 - 10.64	–
West	–*	8.46 - 8.88	–
County	–*	9.36 - 10.13	–
Alternative 8			
East	–*	9.64 - 10.96	–
West	–*	4.14 - 5.14	–
County	–*	8.03 - 9.26	–

*These costs cannot be determined due to insufficient data on present transport and disposal costs.

TABLE 3-11

SUMMARY OF ANNUAL COSTS PER TON

	Annual $/Ton		
	1982	1987	% Increase Over 1982
Alternative 1			
East	—*	8.97 - 9.87	—
West	17.23 - 17.77	17.14 - 17.72	0
County	—*	10.24 - 11.09	—
Alternative 2			
East	—*	8.97 - 10.20	—
West	5.61	8.64 - 10.74	73
County	—*	8.92 - 10.28	—
Alternative 3			
East	—*	8.97 - 9.87	—
West	5.61	17.14 - 17.72	210
County	—*	8.95 - 11.00	—
Alternative 5			
East	8.44 - 10.19	8.97 - 10.20	3
West	8.94 - 9.93	9.03 - 9.96	6
County	8.52 - 10.15	8.98 - 10.16	2
Alternative 6			
East	—*	9.09 - 9.94	—
West	—*	17.90 - 18.79	—
County	—*	10.40 - 11.25	—
Alternative 8			
East	—*	8.97 - 10.20	—
West	—*	8.64 - 10.74	—
County	—*	8.92 - 10.28	—

*These costs cannot be determined due to insufficient data on present transport and disposal cost.

the cost in 1987 would be $8.25 per ton. Due to the economy of scale associated with subregional East and West landfills, it is expected that it may even be more cost-effective for some of the smaller, rural municipalities to terminate their local disposal facilities even before they are full to take advantage of the lower costs at the larger new disposal facilities.

K. RECOMMENDED SOLID WASTE PLAN SELECTION

The recommended solid waste management plan for Cumberland County includes the following:

1. The institution of source separation/waste flow reduction programs throughout the County. Source separation programs should focus on separation of such waste stream components as glass, ferrous, paper, aluminum and tires.

The role of the County should be to foster source separation programs throughout the County providing technical assistance and market information to individual municipalities. These programs may first be instituted at the small municipal landfills in Cumberland County where residents deliver their own wastes. The New Jersey DOE has estimated a potential 20% reduction in the volume of solid waste through source separation programs. These programs and goals have been detailed in the New Jersey DOE Energy Master Plan.

Today, the disposal of used tires continues to create significant problems. If incinerated in large quantities, tires produce unacceptable levels of particulates and sulfur emissions in the air. When landfilled, not only do tires take up valuable landfill space, but whole tires will resist compacting and burying and rise or "float" to the surface where they pose potential problems as breeding places for vectors and as a fire hazard. Due to the problems associated with the disposal of tires and the increasing costs for environmentally sound disposal facilities, the Cumberland County Planning Board is currently examining alternative methods for tire disposal in Cumberland County. The primary objective of the study is to determine alternate methods of tire disposal that would reduce the number of tires being landfilled in the County.

Specific Recommendations on Source Separation Programs are as follows:

a. A county-wide program to inform and educate the public on the advantages and merits of recycling and source separation programs should be initiated.

b. Implementation of a pilot-scale separation program in county and/or municipal office buildings.

c. The county should act as a clearinghouse for information on implementation of recycling programs and available markets.

d. Individual municipalities should be encouraged to legislate mandatory source separation programs in their districts.

2. Development of a new landfill in the Western Section of the County to accommodate wastes currently being disposed in Bridgeton and surrounding municipalities. This facility (with a capcity of 80 TPD) should become operational in 1982, the estimated closure date of the present Bridgeton landfill.

3. The development of a new landfill to be operational by 1987-88 for the Eastern Section of the County (capacity 350 TPD), to replace the existing Millville and Vineland landfills.

4. The phasing out of small municipal landfills, as they reach capacity or are closed due to implementation of strict environmental guidelines under RCRA. As each of these landfills is closed, use of a "greenbox" system (s) should be further investigated for the municipality(ies).

5. The proper closure of landfills as they reach capcity including final cover, gas venting wells and continued groundwater monitoring.

6. Continued use of public and private composting areas such as the Alex Hayes Composting facility in Vineland.

The plan described above is shown graphically in Figures 3-17, and 3-18. Should the development of a new landfill to accommodate the Western Section of Cumberland County not occur as planned the following approaches should be considered:

a. The construction of a single county-wide landfill in 1982, providing disposal for municipalities as their own landfills reach capacity.

b. The transport of wastes currently being disposed in Bridgeton to the existing Vineland and Millville landfills.

c. The transport of wastes currently being disposed in Bridgeton to out of county locations, with or without the construction of a transfer station in Bridgeton.

d. Further evaluation of modular incineration as a viable alternative for wastes generated in Bridgeton and the Western Cumberland County Municipalities.

The existing patterns of collection and transport within the county are deemed adequate for the present time. When the final solid waste management plan is implemented and new landfills are constructed, possible modifications in transport routes will be needed. Due to the low population densities in many of the municipalities throughout Cumberland County, municipal collection other than greenbox service may not be viable.

FIGURE 3-17

SELECTED ALTERNATIVE 1982

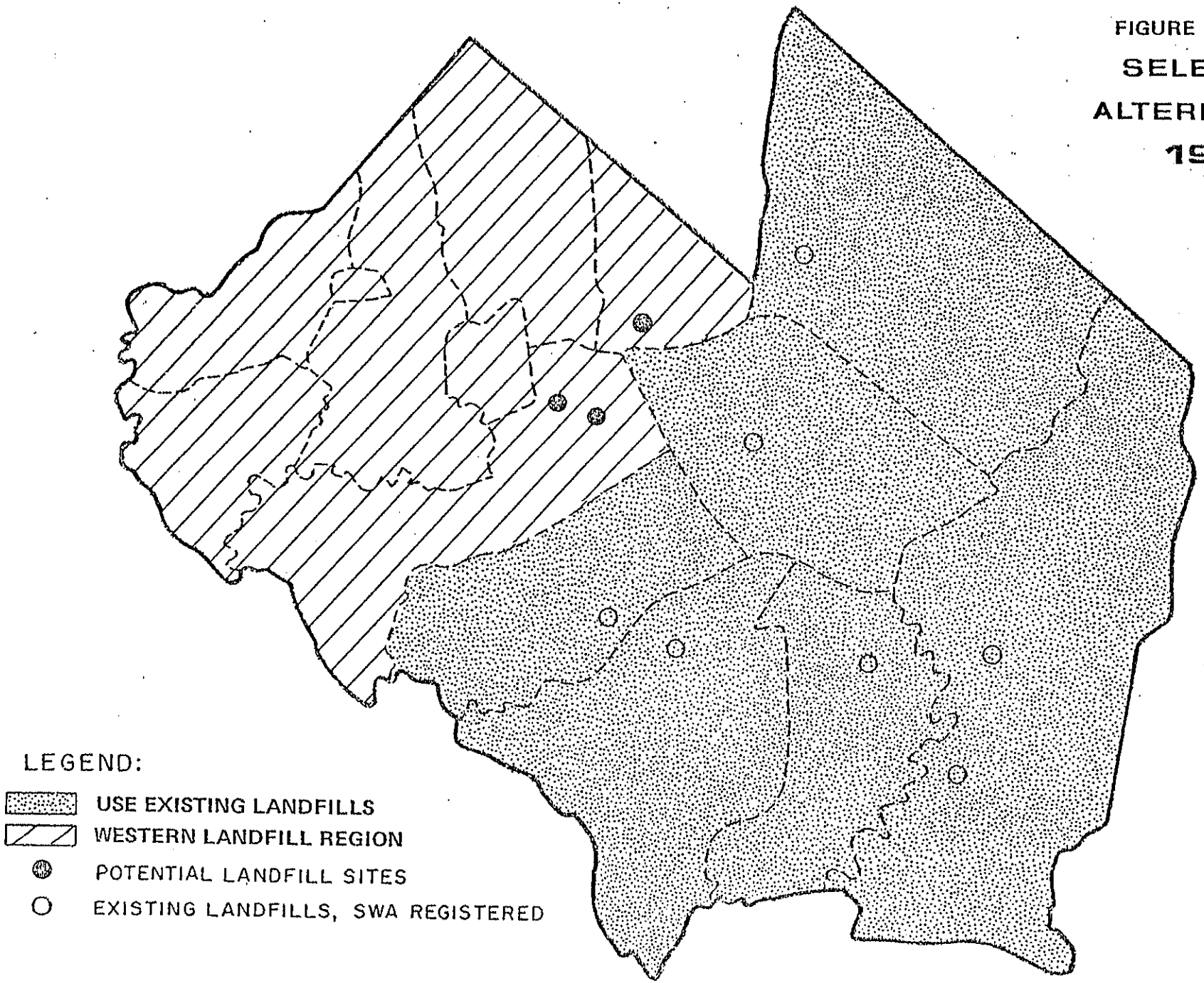
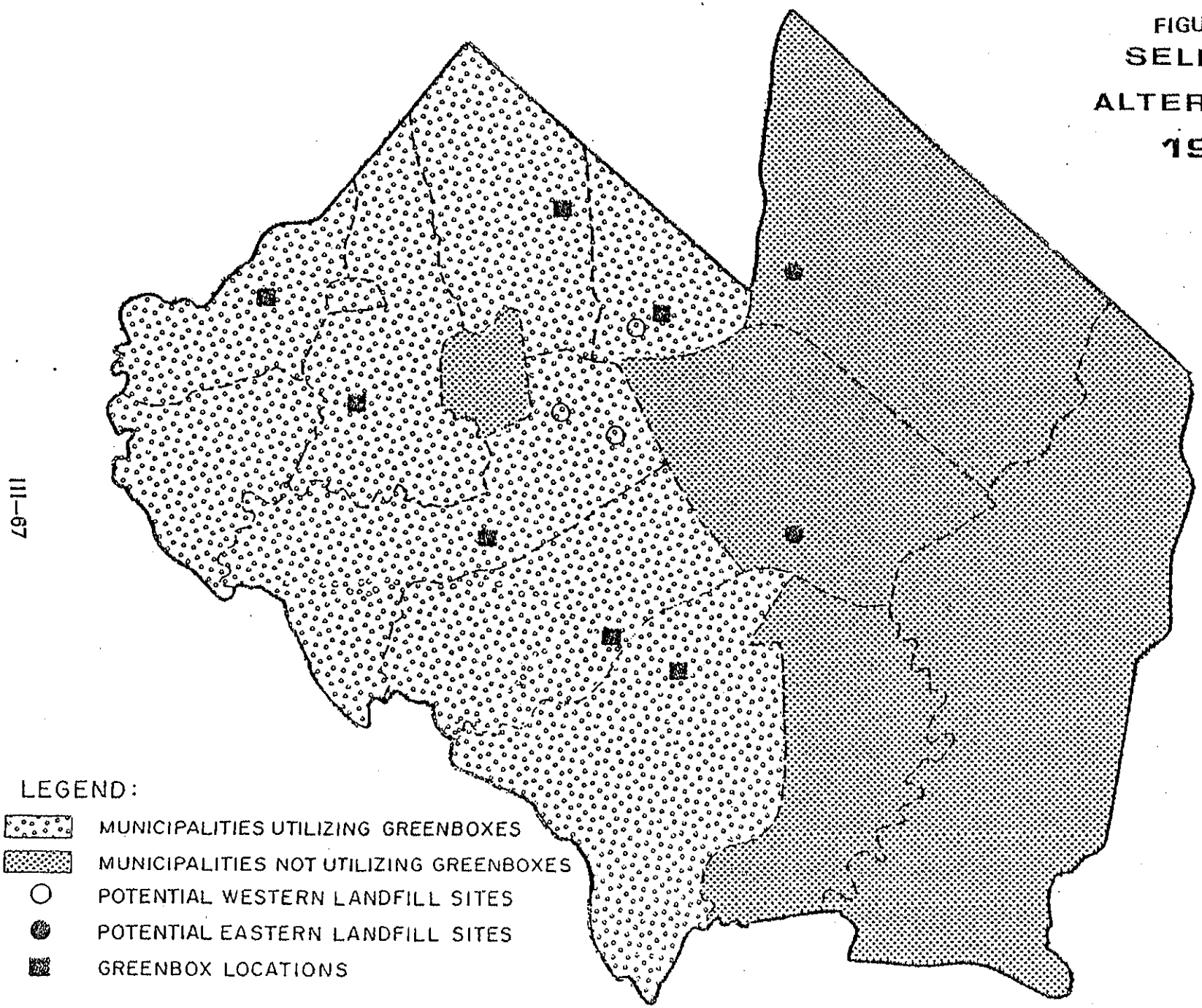


FIGURE 3-18
SELECTED
ALTERNATIVE
1987



L. SEPTIC WASTE MANAGEMENT ALTERNATIVES AND PLAN SELECTION

Proper planning for septic waste disposal must receive serious consideration in that the pathogen laden waste offers continuous potential for the spread of disease. Unlike many other areas of the state, septic waste disposal has not been a problem for most of Cumberland County. Wastewater treatment plants in Vineland, Millville and Bridgeton accept septic wastes from private haulers, with the Bridgeton (CCUA) Plant accepting septic wastes from throughout the County.

It has been reported that there has been illegal dumping of septic wastes in the Southeast portion of the County. Review of state regulations for design and operation of new septic waste handling facilities reveals that such facilities could be constructed, but the cost of disposal would be between five and ten cents per gallon. This is five to ten times higher than the prevailing treatment plant disposal rates (about 1 cent per gallon). Therefore, a new facility would not be cost-effective. It is recommended that increased enforcement activities be undertaken to eliminate the illegal dumping problem, since low-cost disposal facilities are already available in Cumberland County.

Regarding new or expanded treatment facilities, it is recommended that provisions continue to be made for septic waste disposal at all plants larger than one million gallons per day. It is not recommended that such provisions be made at small wastewater treatment plants, as such plants can be upset by "slug" loadings of septic wastes.

M. SLUDGE MANAGEMENT ALTERNATIVES AND PLAN SELECTION

Continued upgrading and expansion of the existing sewage treatment network, which is expected to occur during the planning period, will increase the volumes of sludge generated within Cumberland County. Coupled with the current trend of the limitation or refusal of landfills to accept sewage sludge, a clear need exists for comprehensive planning for the disposal of this waste material.

Acceptable options for sludge disposal include incineration, stabilization or composting followed by controlled landspreading, and co-disposal with solid waste. Given the rural nature of Cumberland County, continuation and expansion of landspreading programs is recommended. Prior to landspreading, sludge should be suitably stabilized and dewatered, so as not to present an immediate runoff problem following landspreading. Stabilization should include aerobic or anaerobic digestion followed by dewatering. Of course, landspreading should only be carried out if the sludge does not contain harmful or toxic contaminants which would adversely affect vegetative growth.

Following the inception of controlled landfilling, it is recommended that landfilling of sludge be limited to sludges (industrial or municipal) which are not suitable for land application. Such sludges would only be disposed of at the controlled landfill, and the volumes accepted should be limited to a reasonable amount. Municipal sludges might also be accepted during winter months, where landspreading or inventorying is impractical. It is recommended that sludge disposal at uncontrolled landfills be phased out over the planning period.

TASK IV

SELECTION AND SITING OF NEEDED FACILITIES

IV. SELECTION AND SITING OF NEEDED FACILITIES

In accordance with landfilling alternatives presented in Section III, potential sites were screened and evaluated with regard to their environmental suitability for landfilling utilization. Site evaluation factors that were employed in the screening process addressed both natural and human environmental characteristics, and are presented below.

A. SITE SELECTION FACTORS

1. Natural Environment.

a. Topography.

(1) Slopes – Steeply sloping land is undesirable in that it presents difficulties in site preparation and landfilling operation. With increasing slope, soil (cover) stabilization against erosion becomes increasingly more difficult. Land sloping at or in excess of 15 percent is classified as an environmentally sensitive area for this reason and should be avoided where possible. Few areas in Cumberland County naturally exceed 10 percent in slope, with most of the county following in the 0-5 percent range.

(2) Terrain – Existing site terrain will dictate the extent of regrading required during site preparation activities. For example, if a site has been left in a pockmarked irregular configuration with steep side slopes as a result of sand and gravel or fill excavation activities, the complexity and cost of site preparation will be significantly higher than had the site been abandoned with a smooth bottom and gentle side slopes.

b. Size.

(1) Area, Depth, Volume – For a site to be potentially suitable it must satisfy size requirements dictated by planned waste disposal rates and facility life requirements of the waste management alternatives. The required areal size of a site is governed by the planned ultimate height (thickness) of waste deposition. Both, inturn, regulate the ultimate capacity (volume) of the site. Thereby, if a site consists of an excavated area (i.e. a sand and gravel pit or borrow area), its depth is necessarily taken into consideration in evaluating the adequancy of its areal extent. Further, in the comparison of excavated vs. nonexcavated sites of the same surface area and some planned ultimate waste capacity, filling of the former would result in a topographically lower final grade than in the latter since, in the case of a pit, some filling would occur below surface grade.

(2) Expansion Potential – A desirable size-related characteristic of any potential site is that it provide additional area for expansion of landfilling beyond the planned capacity, should the need arise.

c. Geology. Within a study region where the geology causes significant variability in the types of materials outcropping at the surface, evaluation of this criteria can be critical. The geology of an area controls either wholly or in-part other factors such as the hydrologic function, e.g. whether the site is linked to an aquifer and the value of that aquifer, and the character of soils at the site (since soil properties vary with varying parent materials). Wherever it is avoidable, potential sources of groundwater contamination should not be sited on the recharge (water intake) areas of geologic formations which are or have the potential of becoming water supply aquifers. Therefore, in regions where non-water-bearing and - transmitting formations outcrop, potential impacts on groundwater can be minimized by siting waste disposal facilities on these natural barriers to water movement. In so doing, landfilling site preparation costs may also be minimized in that the natural aquiclude may preclude the necessity of artificially lining the landfill with synthetic materials or imported clay. Unfortunately, in Cumberland County natural deposits of relatively impermeable materials are localized and erratic in distribution. Further, with the exception of an area immediately adjacent to the Cohansey River downstream of Bridgeton, the entire County is underlain by the Cohansey Sand which is a valuable water supply aquifer. Further, the area not underlain by the Cohansey Sand lies predominantly within environmentally sensitive areas (i.e. wetlands, floodplains, CAFRA, etc.).

d. Soils. Soils criteria that are evaluated are indicators of soil suitability for landfill liner and cover utilization, and separation distances to groundwater.

1. Permeability – The rate at which a soil will transmit water enters into the suitability of a soil as both potential cover and liner materials. As cover material permeability decreases, runoff increases and infiltration decreases; thereby leachate generation decreases. In a similar manner, as permeability (of soils forming the base of an above grade landfill) decreases, the rate of leachate discharge to groundwater decreases.

2. Texture – Particle size distributions of soil materials are indicators of a soils contamination attenuation ability.

3. Depth to Seasonally High Groundwater Table – It is undesirable to deposit waste materials in close proximity to the water table. Groundwater tables fluctuate in elevation seasonally in responses to evaportranspiration and precipitation. Therefore, what may appear to be a dry area in the summer and fall may be submerged or swampy in winter and spring.

Groundwater table levels in Cumberland County are generally high. Only relatively few soil series occurring within the County can provide the minimal desirable buffer between groundwater and landfilled wastes.

4. Soil Availability – In order to prevent the need for costly importation of soil materials for cover utilization, a potential site should have its own adequate quantities of material available.

e. Surfacewater Drainage.

1. Proximity to Surface Water Courses – Streams and rivers on and adjacent to potential landfilling, sites can impose severe site planning, design, preparation and operation costs as well as provide the vehicle for downstream water quality degradation.

2. Flood Hazard – Landfilling within the floodways of surfacewater courses can lead to enhanced flooding conditions by removal of flood storage areas.

f. Vegetation and Wildlife. On-site and adjacent vegetation and wildlife is considered to the extent that potential impacts on endangered and threatened species and their habitats by landfilling disruptions are evaluated. Site vegetation also influences site preparation costs (e.g. a previously cleared site in successional vegetation may be developed at a lower cost and with fewer potential impacts than one which is heavily forested).

g. Proximity to Environmentally Sensitive Areas.

1. Pinelands Protection/Preservation Areas
2. Floodplains
3. CAFRA Delineated Areas
4. Steep Slopes (15%)
5. Aquifer Recharge Areas for Existing and Future Potable Water Supply Aquifers
6. Parks and Preserves in Public Ownership
7. Endangered and Threatened Species Habitats
8. Prime Farm Lands
9. Water Bodies
10. Unique Ecosystems
11. Historic, Archeological and Cultural Resource Areas
12. Formally Proposed or Delineated Wild and Scenic Rivers

h. Groundwater.

1. Depth
2. Existing Quality

(3) Proximity to Recharge/Discharge Areas
(4) Flow Direction and Relationship to Nearby Wells
(5.) Importance of Underlying Unit as a Water Supply Source

i. Mineral Resources.

(1) Loss of Mineral Resources Due to Proposed Use of Site

2. Human Environment.

a. Current On-site and Adjacent Property Land Use – Compatibility of Proposed Landfill Use with Master Plan and Zoning Restrictions and Compatibility with Bordering Land Use

b. Proximity to Water Supply Wells.

(1) Public
(2) Residential
(3.) Industrial

It is desirable, though not formally required by solid waste regulations, to maintain adequate separation between landfill sites and pumping centers so as to avoid potential adverse impact. This is especially true where the site lies up-gradient from the groundwater withdrawal.

c. Proximity to Airports. Landfills are generally not to be sited within 2.5 miles of the center-point of an airport runway. This is a New Jersey requirement for which exceptions may be granted.

d. Proximity to Waste Source (Population) Centers. Waste hauling distance has a significant impact on waste collection and transport costs. Therefore, distances from population centers to suitable disposal sites should be minimized.

e. Access and Transportation Patterns. Proximity to and access from a site to adequate transportation routes that serve centers of population and waste sources must be evaluated. Further, the condition or trafficability of the roads and their current truck and/or waste hauler usage are considered.

f. Existing Utilities. Water, sewer, and electrical service are investigated for on-site and off-site availability.

g. Site Ownership. The number of separate owners involved with a particular site affects the site acquisition potential. Further, whether the site is in private or public ownership may have a bearing on acquistion.

B. TRANSFER STATION SITING CRITERIA

In previously discussed alternatives a transfer station was considered for the City of Bridgeton as a solution to their lack of available expansion capacity at their present landfill.

Siting requirements for transfer stations are considerably less stringent in comparison to those for landfills. Since no waste is actually being disposed of on site, the environmental controls required are minimal.

A transfer station of sufficient capacity to accept waste now being disposed of in Bridgeton would require a minimum of 2 acres. Utility requirements are minimal as are the land preparation costs if sited in an open area.

The main objective of a transfer station is to minimize transportation costs when hauling over a considerable distance. Therefore the major consideration for siting such a facility is its location in respect to the waste origin and final deposition. The facility should be sited central to collection points and with good access to major highways.

Presently, the Cumberland County Solid Waste Management Plan does not include the use of transfer stations. If in the future, a transfer station is deemed viable, a study should be conducted to locate a site, including possible utilization of the present landfill location.

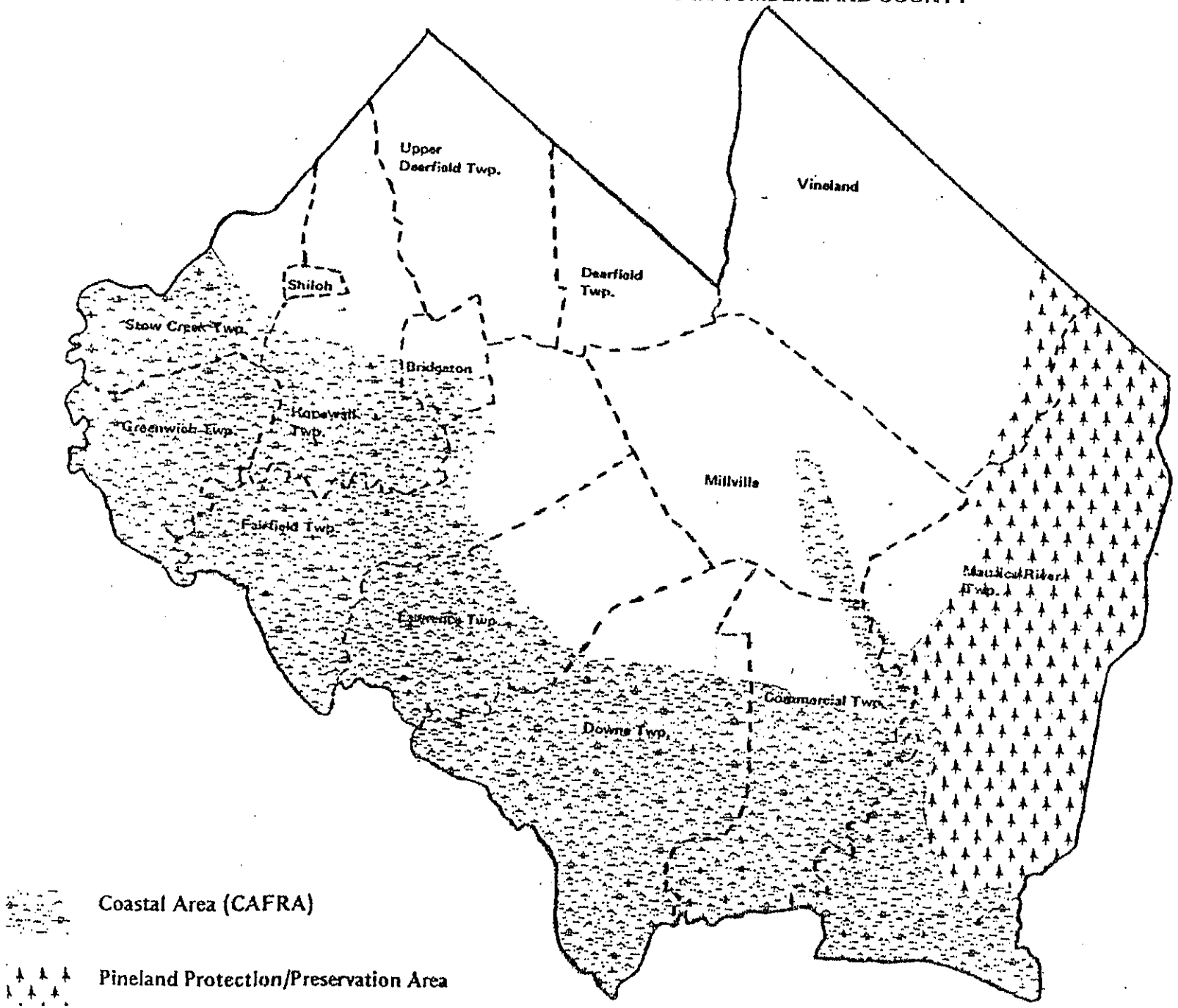
C. LANDFILL SITING

Consistent with the solid waste management plan presented in Section II.K., a screening process was undertaken to locate potential landfill sites in Cumberland County. The western section of the County was scanned for suitable sites approximately 15 to 20 acres in size; the eastern section for sites 45 to 50 acres in size; and the entire County for sites 60 to 70 acres in size.

The screening process was initiated by scanning aerial photographs of the County dating from 1978. All portions of the County except those within the limits of the Pinelands Protection/Preservation Area, and the jurisdiction of CAFRA, were reviewed (Figure 4-1). The preliminary screening focused on land disturbed by sand and gravel extraction and borrow pit operations due to the benefits that can derive from reclaiming existing pits through landfilling. Also investigated were existing landfills that had potential for upgrading and expansion.

Preliminary screening indicated that the eastern section of the County has several sites potentially suitable to satisfy both the full-county and eastern section alternatives needs. However, the western section of the County was deficient in potential sites and no centralized site was found that could serve the full County. Therefore, the field of search for potential sites was expanded

STATE REGULATED LANDS IN CUMBERLAND COUNTY



and above-grade sites in the western section and central portion of the County were investigated. Table 4-1 condenses the evaluation of key siting factors for the full list of potential sites examined in Cumberland County. Site numbers are keyed to Figure 4-2.

Of the 28 potential sites identified through the preliminary identification/screening process, several have been found to be unacceptable for development due to insufficient size and/or insufficient area for possible expansion. As mentioned above, the engineering design requires sites of approximately 20 acres to serve the western communities alone, approximately 40 acres to serve eastern communities alone, and approximately 60—70 acres to serve the entire County. For this reason, potential sites No. 2, 3, 4, 11, 17, 20, 21, 22, and 24 are removed from further consideration.

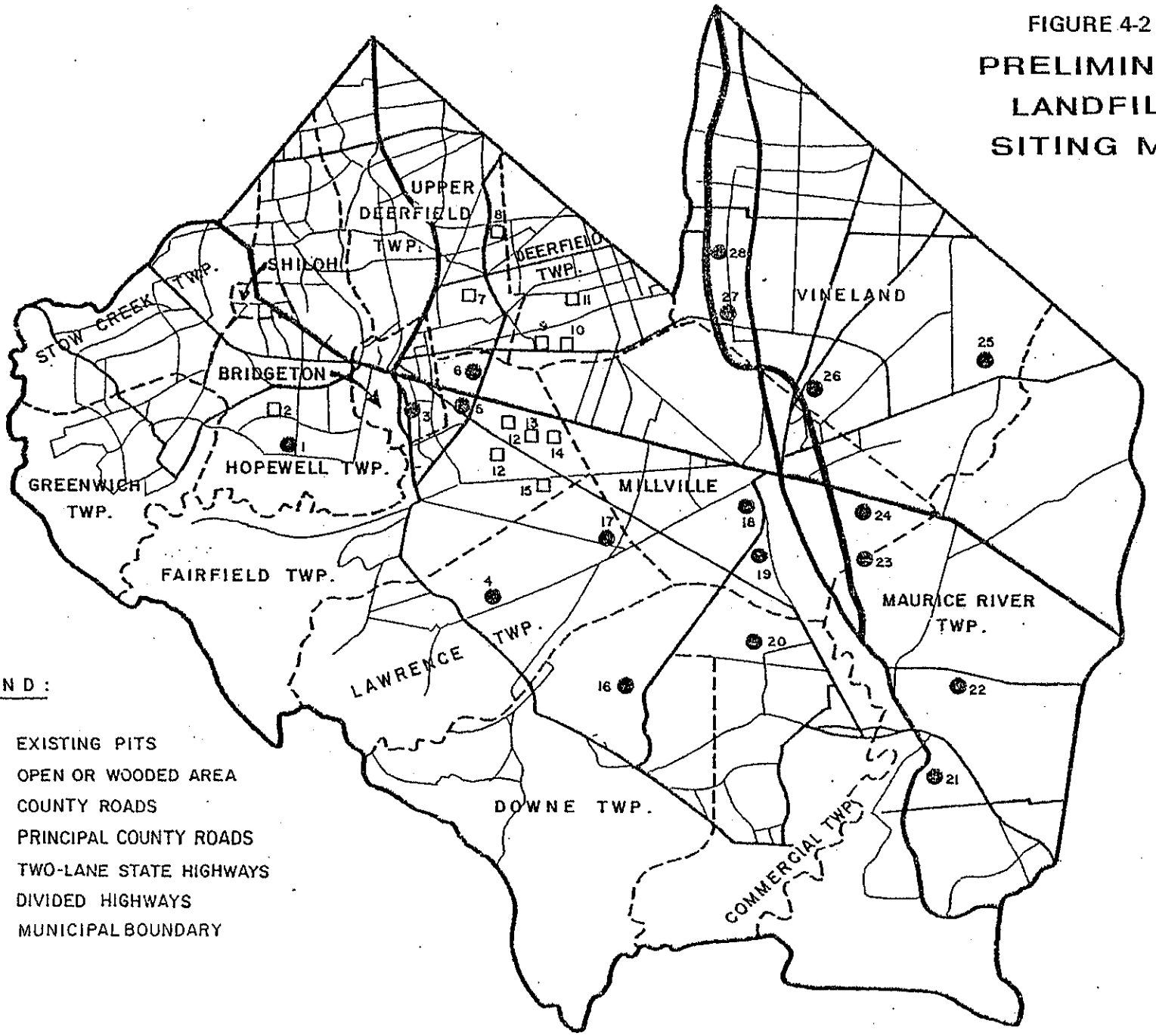
In addition, several of the potential sites which were identified have been found to be occupied by presently-operating extraction industries (sand and gravel mining operations). These sites should not be considered for immediate landfill development. However, they cannot be totally eliminated from possible future consideration as landfill sites, since sand and gravel pits are eventually abandoned for economic reasons such as exhaustion of minable materials or difficulty of extraction. The sites affected by such existing use include No. 6, 16, 23, and 26.

The New Jersey Pine Barrens are a unique and sensitive ecosystem covering an irregular area of southern New Jersey, and lying over a large, unpolluted, fresh groundwater reservoir. Due to the environmental and economic value of the Pinelands, the State of New Jersey has empowered the Pinelands Planning Commission to develop a master plan for the protection, preservation and orderly development of the New Jersey Pine Barrens. An 18-month moratorium on development, extending until August 1980, has been declared to allow the commission time to prepare the Plan before significant additional degradation of Pinelands designated protection and preservation areas can occur. It is reasonable to expect that landfilling will be strongly discouraged and/or excluded within the designated Pinelands area of New Jersey. Therefore, two of the potential landfill sites, number 21 and 22, which lie within the Pinelands Protection Area, should be taken out of further consideration for site selection.

In addition, the State of New Jersey, through the Coastal Area Facility Review Act (CAFRA; NJSA 13:19-1 et. seq.), has designated a "coastal zone" which, because of its environmental value and sensitive nature, requires protection from degradation and/or unorganized or insensitive development. Under CAFRA, the State is empowered to regulate all development and construction activities within the designated coastal zone. Solid waste handling and disposal facilities are discouraged and/or restricted within the coastal zone, and for this reason potential landfill sites number 1 and 2, which lie within the CAFRA boundary should be removed from further consideration.

FIGURE 4-2

PRELIMINARY LANDFILL SITING MAP



Cultural factors also have an impact on the site screening process. For this reason potential sites, identified through aerial photography, were examined in terms of current land use, zoning practice, and community Master Plans. Such factors as on-site zoning and master plan projections for residential use may be taken to preclude site use as a future landfill. Some of the proposed sites, when examined in this regard during the screening process appear to have limitations or drawbacks at least potentially severe enough to remove them from further consideration as potential landfill sites. In this category are sites number 7 and 8, which are intended for high or low density residential use according to municipal master plans.

D. CONCLUSIONS AND RECOMMENDATIONS

Twenty-eight locations were examined for their potential use as sites for new landfills in the County. As a result of an extensive criteria analysis, 12 were identified as warranting further examination. Table 4-2 lists these sites, their location and applicable service area(s). Three sites were deemed suitable for serving the western section of the County, five sites for eastern Cumberland County, and eight sites which could service the entire County. A more detailed description of each site can be found in Table 4-I.

It should be noted that any site chosen for a future landfilling operation will require extensive improvements as discussed earlier. Unfortunately, within Cumberland County, no areas are naturally amenable to landfilling in a controlled fashion as is now required. The final siting of a landfill, therefore becomes a function of the economics of site preparation as well as its location in relation to areas of waste generation with subsequent effects on transportation costs.

Cost-effectiveness analyses were previously presented in Section 3-I of this report. Potential sites in close proximity to one another were grouped for purposes of calculating transportation costs. The following is a discussion of each site or group of sites meriting further examination.

1. Site 5. This existing borrow pit appears suitable for use as a western County landfill. It is approximately 26 acres in size, on Buckshutem Road, 1.5 miles outside of Bridgeton. Land preparation costs would be low due to present land contours. Accessibility to the waste generation areas in the western section of the County is excellent. Cover material would be available on-site.

2. Sites 9 & 10. Located off of Sherman Avenue in Deerfield Township, sites 9 and 10 should be considered for use as western County landfills. The tracts of land are presently wooded and would require considerable site preparation. Site 10 is 60 acres in size and could also be utilized as a county-wide site.

TABLE 4-2
POTENTIAL LANDFILL SITES

SITE NO.	SERVICE AREA	LOCATION	PRESENT USE
5	West	Fairfield Twp.	Borrow Pit
9	West	Deerfield Twp.	Wooded - Vacant
10	West/Co.	Deerfield Twp.	Wooded - Vacant
12	Co.	Fairfield Twp.	Wooded - Vacant
13	Co.	Fairfield Twp.	Wooded - Vacant
14	Co.	Fairfield Twp.	Wooded - Vacant
15	Co.	Fiarfield Twp.	Wooded - Vacant
18	East/Co.	Millville	Landfill
19	East/Co.	Millville	Old Borrow Pit
25	East	Vineland	Old Borrow Pit
27	East	Vineland	Old Borrow Area
28	East/Co.	Vineland	Old Borrow Area

3. Sites 12, 13, 14 & 15. These four sites all lie within Fairfield Twp. between Rt. 49 and Buckshutem Road, three miles from Bridgeton and seven miles from Millville. The areas are all greater than 100 acres in size and completely wooded. Site preparation costs would be significant. Access is good for vehicles from Bridgeton, Millville, and Vineland.

4. Sites 18 & 19. Site 18 is the existing Millville landfill. The City has acquired an additional tract of land (for future use) directly adjacent to the present operation. The additional acreage is an existing gravel pit. Site preparation would be moderate. The pit may be used for servicing eastern Cumberland County or for the entire County.

Site 19 is an abandoned sand and gravel operation off of Rt. 555, about 1 mile from site 18. Accessibility is very good. The site is approximately 60 acres in size with ample expansion capability. Site preparation would be minimal. The site is well removed from residential areas.

5. Site 25. This site is comprised of a wooded area and an old sand and gravel pit off of Rt. 552 in Vineland. The site is approximately 8 miles from Vineland, 7 miles from Millville and 16 miles from Bridgeton. It is of sufficient size to accept wastes from the eastern section of the County. Site preparation would be moderate. The major limitation of this site is its distance to areas of high waste generation.

6. Sites 27 & 28. These two sites are located along Rt. 55 in Vineland and are old borrow areas. Site 27 is suitable in size for an eastern County landfill, while site 28 could be utilized for either an eastern landfill or one for the entire County. Minimal site preparation would be required. Only the first several feet of material have been stripped from these areas. Thus, as in the wooded areas, the fill would have to extend upwards to a greater extent than in an existing pit.

It is recommended that upon implementation of the final SWMP, the above referenced sites, as well as any others that are identified in the interim, be further examined for their use as landfills. Further site evaluation (landfill feasibility analyses) should include additional field visitation, availability of clay liner materials, soil borings, cover material availability, further land use and transportation evaluations, and purchase/ownership evaluations. Following final site(s) selection and purchase of the property, the implementing agency can proceed with the preparation of Engineering Plan(s) for the facility.

TASK V

FINANCIAL, LEGAL AND INSTITUTIONAL PLAN

V. FINANCIAL, LEGAL AND INSTITUTIONAL PLAN

A. INTRODUCTION TO WASTE CONTROL

As Cumberland County moves toward the development of a county wide landfill system, control of the movement of solid waste will become more essential. The principal goal is to acquire the ability to contract, on a long term basis, the collection of the waste and its subsequent disposal at the county landfill. Revenue to repay the capital debt and to cover operating costs will be derived from tipping fees. Without a minimum continuous flow of solid waste to the facility, expected income will fall short of projected costs, and the project's viability will be jeopardized.

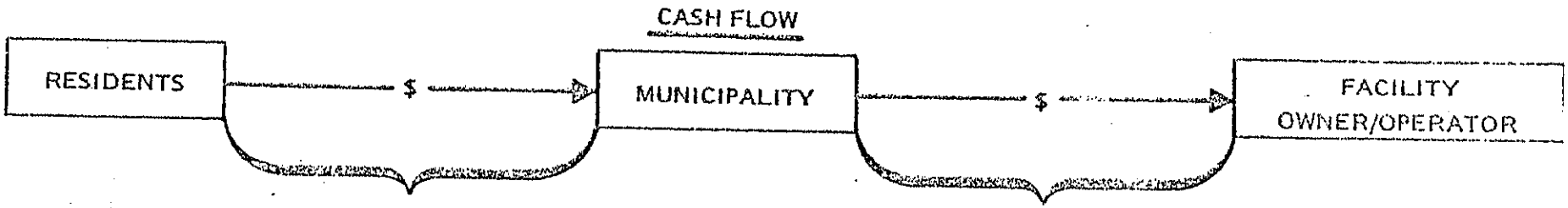
There are other fundamental advantages to waste control. Effective long-term planning requires knowledge of waste loadings over time and the rate at which the waste will actually deplete the capacity of available and proposed disposal facilities. Furthermore, until the waste can be directed to environmentally sound landfills, it will go to the cheapest disposal site, resulting in potential adverse impacts on the environment and the health of nearby residents.

1. Municipal Contracts. The municipal contract approach for waste control involves the development of contracts between the municipalities and the County's Designee* for the processing and/or disposal of municipal waste. Through the terms of each contract, the County's Designee would be responsible for disposal of delivered municipal refuse generated within each municipality and would be paid a service fee based on a standard formula applied to the tonnage delivered or guaranteed under contract. The municipality is reimbursed by the waste generators via property taxes or "Garbage District" taxes. Figure 5-1 is a simplified illustration of the flow of funds and method of payment that relates to residential waste disposal service under the municipal contract approach.

The opportunity for the County to receive the refuse depends on the extent to which the municipality has control of the refuse within its jurisdiction. It may be necessary to modify certain municipal contract rights in order for them to obtain the waste control for the County.

The municipal contract approach to waste control is the least complex alternative, but normally involves a significant investment of time.

*The County's Designee would be the agency of the County which is charged with the responsibility for implementation of the Solid Waste Management Plan.



PAYMENT:	Portion of Municipal Tax (includes Collection and Disposal)	Scheduled Payment for Disposal
BASED ON:	Real Estate Property Assessment	Tipping rate times guaranteed tonnage as identified in contract between Municipality and Facility

DISPOSAL SERVICE
MUNICIPAL CONTRACT APPROACH

FIGURE 5-1

If the municipality collects its own waste, then it already has the waste control feature needed for contracting with the County or its designated agent. Such municipalities would only need to pass an ordinance stating that the municipality will guarantee to bring their waste to the new facility, when it comes on-line.

Some communities sign contracts with private collectors for periods generally ranging from one to three years. Under this situation, the municipality could change the designated disposal site from its current location to the new landfill location the next time it prepares its invitation to bid on collection service. Future or modified contracts with site designation clauses must make provisions for changes in haul distance. A specified unit hauling price should be added to or subtracted from the contracted service fee depending on whether the transportation time to the new facility is longer or shorter, respectively.

Municipalities that fit into these first two categories are listed below.

Private Under Contract Municipal	With Municipality
Commercial Township	Maurice River Township
Millville	Vineland

The municipal contracts may have to have a "put or pay" provision, depending on the quantity of waste scheduled for delivery to the designated facility. A "put and pay" provision means that the municipality must deliver a minimum tonnage, on a periodic basis, to the facility or pay as though it did deliver the guaranteed minimum tonnage. This has been considered an infringement upon the municipality's debt. From a financial viewpoint, however, it assures a flow of funds for payments to the bond holders.

When "put or pay" clauses are required in municipal contracts, the full provision generally does not take effect until the second or perhaps third year. Tonnage is estimated prior to the first year of delivery. Weighing records are kept during the year, and then a permanent waste quantity is established by adjusting the original estimate.

The investment banking community has revised its position on the traditional "put or pay" requirement, but certain circumstances must be met. The municipality must have control over collection and be willing to sign a clause committing all the municipal refuse collected within its jurisdiction. In addition, the quantity of refuse contractable for the project plus that tonnage not committed in the surrounding area must be significantly larger than the proposed landfill capacity.

There are two basic disadvantages to the municipal contract approach to waste control: (1) it is a time-consuming process and (2) all the municipal contracts must be virtually

identical. One of the major difficulties is establishing identical contract terms with each of the municipalities. The contracts have to contain the same pricing formula and cover the same time frame. The basic difference is in the tonnage of waste committed, which is keyed to population. It is a difficult task to arrive at an agreement that is acceptable to all jurisdictions. This method of waste control has contributed to delaying several resource recovery projects throughout the country. Compared to other counties in New Jersey, the number of municipalities which would have to be committed is relatively small.

In the State of New Jersey, the only successful long term municipal contract is that between the City of Newark and a resource recovery firm. With only one municipality involved, of course, the contractural process is greatly simplified. Newark also controlled the waste stream since it collected and disposed directly in a contracted landfill site.

Should the County decide to pursue the municipal contract approach, the County would visit each municipality and request that they contract with the County or its designee to dispose of their waste at the selected facility. The term of the contract would be for a minimum of 20 years, with renewal available after the 20 year period in increments of five years.

To more accurately evaluate the true cost of disposal, the towns should be shown how to allocate the total service cost into collection, transportation and disposal.

Additionally, it would benefit them to know and understand the impact that existing State regulations, the new Federal sanitary landfill definition, and the future environmental legislative trends will have on the cost of disposal over the next 20 year period. If this accounting of true cost is not presented to the communities, they will not have a realistic picture of the situation they will be facing when they make their decision for conventional land disposal.

2. Franchise. Cumberland County could gain control of the waste stream by establishing a franchise. With this approach, the County's designee would petition the Board of Public Utilities (BPU) requesting that they be granted a franchise to control the disposal of solid waste within the District. The BPU has the power to designate any County as a franchise area. Specifically, Section 31 of NJ PL 1975, c. 326 states:

> "The Board of Public Utility Commissioners shall, after hearing, by order in writing, when it finds that the public interest requires, designate any municipality as a franchise area to be served by one or more persons engaged in solid waste collection and any solid waste management district as a franchise area to be served by one or more persons engaged in solid waste disposal at rates and charges published in tariffs or contracts accepted for filing by the board; provided, however, that the proposed franchise area for solid waste collection or for solid

waste disposal conforms to the solid waste management plan of the solid waste management district in which such franchise area is to be located, as such plan shall have been approved by the Department of Environmental Protection.

The board shall encourage the consolidation of all accounts, customers, routes and facilities by persons engaged in solid waste collection or solid waste disposal within such franchise areas."

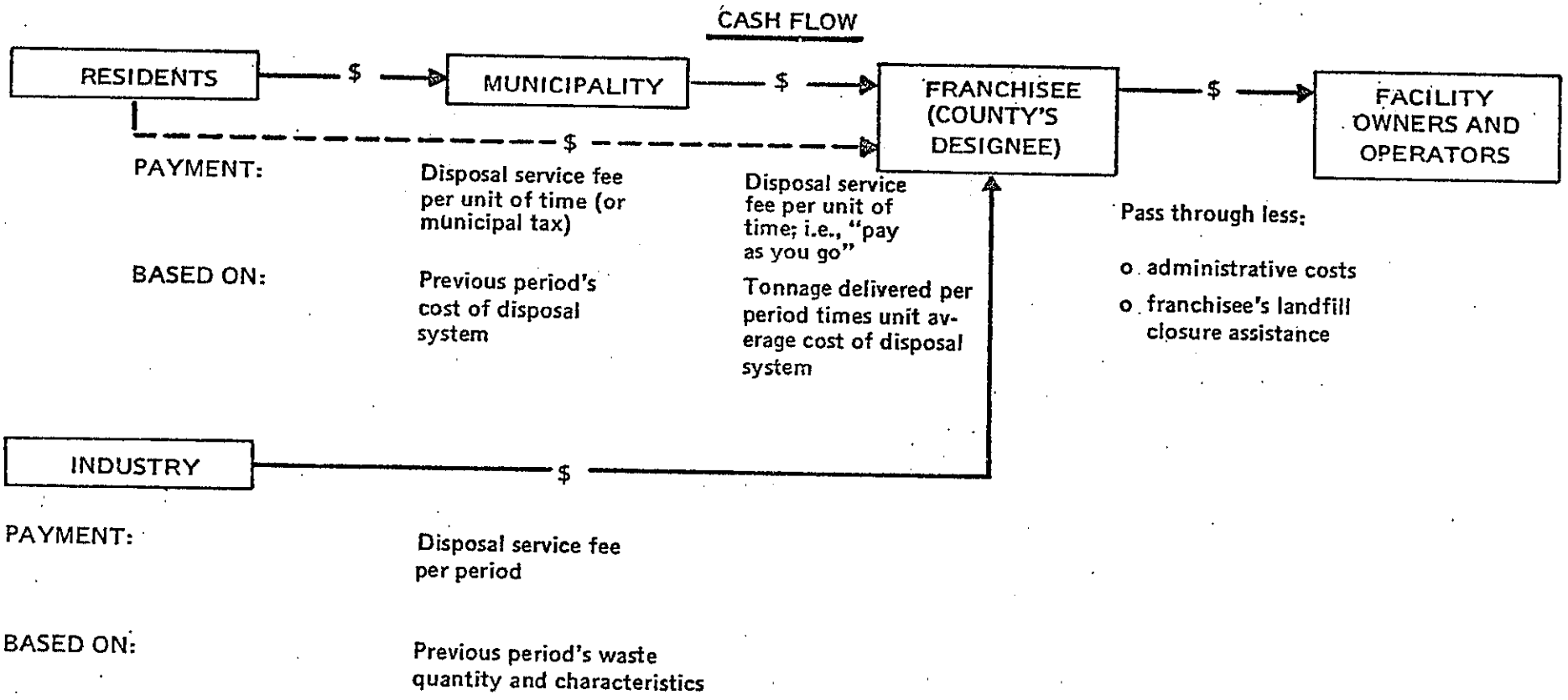
The franchise not only permits the County to have exclusive operational rights for disposal in a particular geographical area, but also requires waste generators, other than municipal, in the area to deliver refuse to a designated facility(ies). The County would perform an economic analysis to estimate the tipping fee and include it in the franchise petition. The review and approval of tipping rates is the responsibility of BPU. The BPU has maintained the position that they will entertain such petitions, but no franchises have been issued to date. Figure 5-2 illustrates the cash flow that relates to residential waste disposal under this approach.

The franchise method of gaining control of the waste stream is the best in terms of level of control and overall management of the solid waste system. All the advantages to this approach stem from the high level of control over the entire waste stream in the County. It allows for a total system's management approach; i.e., all the municipal waste could be planned for optimal use. The franchisee can implement source separation programs and act as a clearinghouse for all imported waste as well as direct waste to any proposed resource recovery facility. Phased implementation would be facilitated, thus providing a smooth transition over time.

The County's designee could seek an average tipping rate within the County via its franchise application. In general, the rate structure and the consolidation of revenue associated with a franchise could foster effective and efficient management of improved public services throughout the solid waste system.

Highlights of the advantages associated with a franchise are:

- Complete control over the waste generated within the County, both municipally and privately collected.
- Creates a more predictable solid waste program with which industry will be better able to participate.
- Financial packaging for new facilities will be simpler and likely contain a lower interest rate on borrowing.



DISPOSAL

FRANCHISE APPROACH

FIGURE 5–2

The franchise petitions BPU has reviewed to date have not been accompanied by support from many of the involved municipalities. The fundamental concern by the local municipalities has been that it creates a monopoly inside the franchised jurisdiction. Historically, there has not been a desire on the part of municipalities and their residents to have such control residing in one area. BPU records support this concern, indicating that towns with their own landfills or other disposal methods have been apprehensive of authorities, franchises and other forms of centralized governmental control. Typically, the strongest municipal support for a franchise petition has been generated by the host community (where a new facility is located).

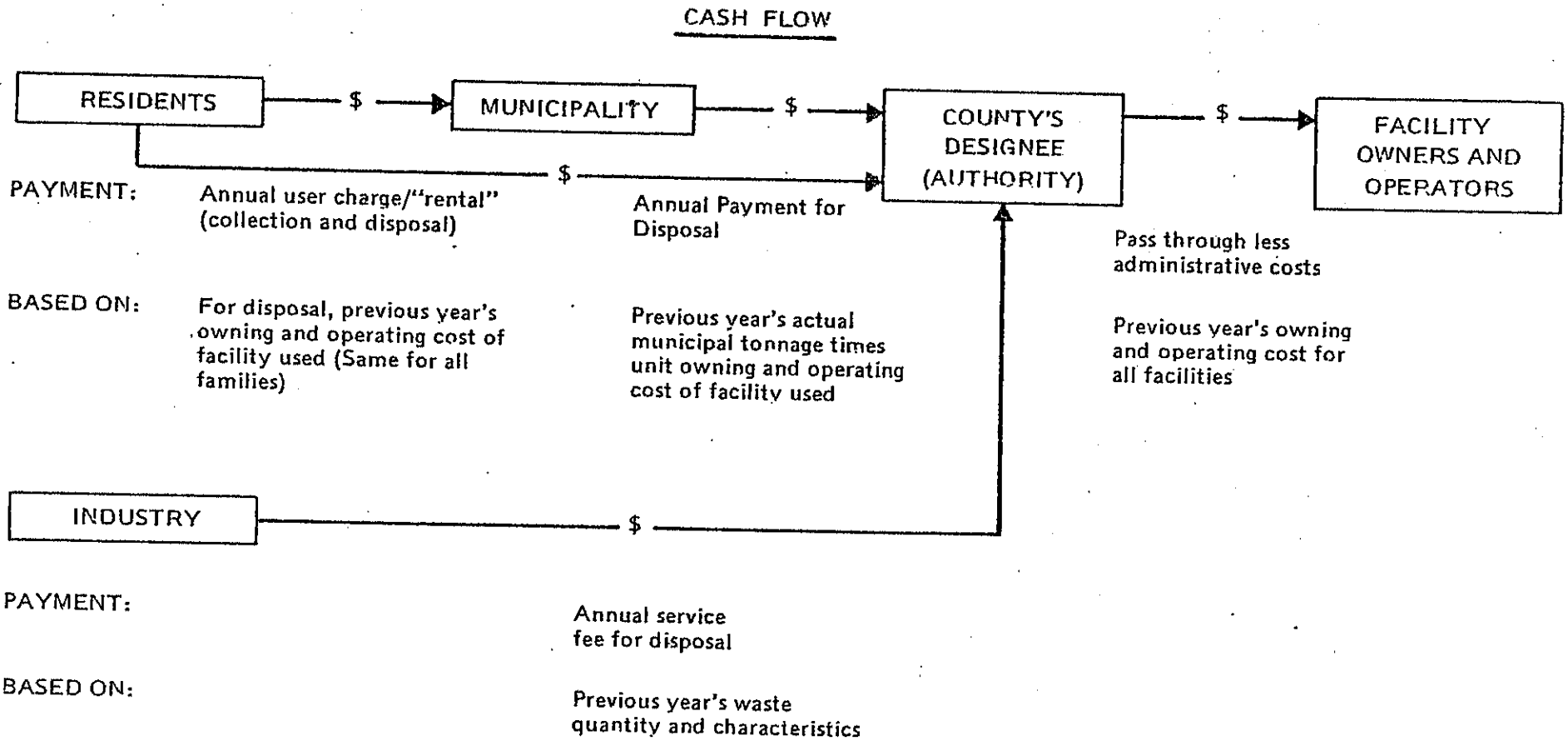
In these previous attempts by the public and private sector to gain a franchise in a specific area, concern has been expressed that the service price may rise rapidly after they have made their commitment. Service rates, however, would be subject to the approval of the BPU and in time, rates would stabilize and become reasonably uniform among Solid Waste Districts.

If the franchise approach is pursued, it will be imperative that a comprehensive public information and participation program be designed and implemented in the County to educate the public-at-large to the benefits they will receive under a franchise system. These include the transfer of solid waste disposal responsibilities and confidence that a long-term solution, based on resource conservation and recovery, will result.

The timing and approach to preparation of a franchise petition will be critical to its success. Close coordination with the 326 planning schedule is essential. Gaining the documented support of key municipalities within the County is fundamental.

3. User Charge System. The third method, the user charge concept, is used extensively in the United States and works similarly to the user charge placed on individual dwellings for wastewater collection and treatment or for other utility services. It involves the establishment of a fee structure for billing users directly for services rendered. The user makes payment to the County's designee on a monthly, quarterly, or yearly basis. Accumulated monies are used to pay for facility operation, whether operated by government or private enterprise, and to retire the capital debt. Figure 5-3 presents a simplified cash flow arrangement for a municipal refuse disposal service operating with the user charge system.

Once established, the user charge strongly encourages the waste generators to send their waste to the designated facility, since no waste generator would be inclined to pay twice for disposal. The waste collector/hauler does not pay a tipping fee at the facility, although manifest systems might have to be established to assure that wastes delivered were generated within the County.



V-8

DISPOSAL SERVICE
USER CHARGE APPROACH

FIGURE 5–3

The user charge method is normally employed where a general obligation (GO) bond is used as the financing instrument. It adds protection to the full-faith-and-credit backing of the local government's offering.

Generally, the revenue received from user charges is sufficient to cover debt repayment. Funds are first applied to debt repayment, then the balance is applied to facility operating costs.

In the event that some customer does not pay the user charge, the service charge with interest is normally added to the property tax in the ensuing year.

A problem that has occurred with this approach is that the collector/haulers that use the facility have tended to drift into sections outside the geographical service area and therefore obtain free dumping for customers who did not pay the user charge. The cost of processing this incremental tonnage must then be added to the user charge in the following year. With analogous reasoning, the user charge and the disposal service normally encompasses all commercial, institutional and industrial establishments (with a few exceptions) as well as residential dwellings. Otherwise, some residential haulers might collect from some businesses. This differs from the municipal contract approach where only municipal waste is handled.

Local acceptance of a user charge has been difficult because it is viewed no differently than a new fee. Since the charge is applied directly, it is more visible to the user and appears as another tax in another field. The only real problem with the service fee is that the user does not know exactly what his charge will be from year to year. With the municipal contract approach, the unit tipping fee is known, e.g., $X/ton, adjusted for inflation, as specified in the contract. Whereas, with the user charge the unit tipping fee is often not known. It is keyed to operating costs. This can result in a lower or higher charge depending on the by-product energy produced, plant operating efficiency and waste throughput.

4. Recommendations. Of the three methods of approach to waste control – municipal contract, franchise and user charge – the franchise method is recommended for Cumberland County. This method provides the best control of the waste stream in terms of level of control and overall management of the solid waste system. Obtaining a franchise for all or a portion of the County is very important, since a franchise is the only way to assure timely construction of upgraded landfills as existing landfills reach capacity. These new landfills will be much more costly than existing landfills, and only a franchise can assure waste flow to the new sites, given the large amount of scavenger, or private collection in the County.

With the current disposal situation indicating a reaching of capacity at the Bridgeton landfill in the next several years, it is important that the County's designee act quickly in

obtaining a franchise. A franchise should be obtained for either the entire County, or for only the western half of the County, initially. If only a partial franchise is obtained initially, the franchise area could be expanded, or additional franchises obtained, as existing landfill capacities in other sections of the County are depleted. The final decision on franchise coverage should be made by the County Board of Freeholders, or the County designee.

B. FINANCIAL REQUIREMENTS AND ALTERNATIVES

1. Introduction. Any landfill project in Cumberland County, regardless of its size, must stand on its own as an economic entity. That is, the project's total capital and operating costs must be recovered through the income generated by the receipt of disposal fees. The ability to demonstrate this will exert significant influence on the availability and cost of financing.

A landfill can be financed in one of three basic ways: General Obligation Bonds, Revenue Bonds (project financing) and private financing. A fourth option is leverage lease revenue bonds, a hybrid of Revenue Bonds. The ultimate financing mechanism may involve a combination of these three methods where permitted by statute.

A summary of the discussion which follows is offered in Table 5-1. It identifies the four financing options in terms of key decision-making elements. As noted, the County is charged with the responsibility of guaranteeing a long-term supply of waste to the facility under any and all financing plans.

2. General Obligation Bonds. General obligation (GO) bonds are long-term, tax exempt obligations secured by the full-faith-and-credit of a political jurisdiction, which in this case would be the County. The County would guarantee a GO bond based on its ability to levy on all taxable real property, such as ad valorem taxes as may be necessary to pay the principal and interest on the bond. With GO bond financing, the capital market would evaluate the credit worthiness of the County and would not specifically evaluate the technical, marketing and economic risks of a particular project. This is different from project financing using a revenue bond. The capabilities of the facility would still be subject to scrutiny by the County in determining whether revenues would be sufficient to minimize its obligation through taxes.

The typical GO bond is offered competitively to investment banking houses and banks (underwriters). These underwriters make sealed bids for the right to purchase and resell the bonds. Usually, firms group together to form underwriting syndicates to purchase the entire bond issue. The bidder offering the lowest net interest cost to the jurisdiction is awarded the right to place the bonds on the market for resale to prospective bondholders.

GO bonds are generally the lowest cost alternative to financing public projects. The specific interest rate as a GO bond is a function of the credit rating of the County (the issuing jurisdiction) and the availability of money in the capital market.

TABLE 5–1

DECISION MAKING ELEMENTS FOR FINANCING OPTIONS

Financing Option	RISK ELEMENTS				County Ownership	County Debt	Interest Rate	Tax Benefits on Capital Asset
	Technology	Facility Operation	By-Product Marketing	Long Term Solid Waste Delivery Contracts				
General Obligation Bonds	Total Risk	Total Risk	Total Risk	Necessary	Yes	Does Increase	Low	Lost
Revenue Bonds	No Risk	No Risk	No Risk	Necessary	After Completion of Debt payment	No Impact	Within 200-250 Basis Points of G.O.	Normally Lost
Private Financing	No Risk	No Risk	No Risk	Necessary	No	No Impact	Highest	Gained
Leverage Lease Revenue Bonds	No Risk	No Risk	No Risk	Necessary	Could After Completion of Debt Payment	No Impact	At or Between G.O. and Revenue Bond	Gained

The use of the GO bond instrument generally means that the County has decided to build, own and operate the landfill. As owner/operator, the County acquires an advantage. County ownership affords County control and flexibility over the facility and the project operations. A direct link is thus provided between the County and the service it provides its residents. As owner, however, the County also assumes full risk for the project.

Accordingly, the major deterrent to using GO bonds is that all of the risks inherent in the project, landfill operation and waste control would be the responsibility of the County.

The establishment of long-term contracts with the municipalities in the County to guarantee that refuse collected in each community is transported to the designated site is a responsibility of the County. This responsibility, however, is common to any and all financing approaches.

It is possible for the County to contract for all of these risks, i.e., the County could hire an engineering firm to provide design and construction management services, and it could hire a contractor to operate the landfill. Nevertheless, the County retains the responsibility for success of the landfill operation over the life of the GO bond. In the event of a civil action, the County could bring suit against the individual contractors, but any failure jeopardizing bond holder repayments still remains at the government level.

The use of GO bonds will impact the County's debt limit. In New Jersey, the Local Bond Law permits the County to incur debt, without the approval of the Local Finance Board, of an amount not exceeding two (2) percent of the average equalized property valuations in the County. Any debt in excess of that amount requires approval of the Local Finance Board. Because of the relatively small magnitude of capital required for a new landfill, the impact, if the debt were included in the debt of the County, would probably not be large enough to jeopardize available borrowing for other capital projects under consideration.

However, if the facility can be operated on a self-liquidating basis, the County is permitted, for as long as the facility is operating successfully, to deduct the amount of debt authorized for the facility from the gross debt of the County. Accordingly, with a self-liquidating GO bond, the debt would not impact on capital project borrowing. Nevertheless, if in any future year, expenses connected with the facility exceeded the income generated, the entire remaining debt is added back into the County debt, thus reducing borrowing capacity for other projects. The tax advantages which would be available to private business such as depreciation, investment tax credit and residual ownership values are lost with a GO bond offering.

To establish the bond on a self-liquidating basis, the Local Finance Board must be satisfied. The County would prepare a project report detailing the cash flow from which the Local Finance Board would base its approval.

Advantages:

a. Low Interest Rates – GO bonds carry the lowest interest rate of any long-term debt instrument because the risk to the bondholder is minimal since the County guarantees repayment through its tax collecting capacity.

b. GO bond issuing procedures are well understood and require a short lead time.

c. With the GO bond approach, the County assumes direct control over the project.

d. No technical or economic analysis of the resource recovery project to be funded is required.

e. More than one project, may be grouped under one bond issue.

Disadvantages:

a. Will impact the County's debt limit.

b. All the project risks (technical system, markets, system operation, waste control) are acquired by the County.

c. Tax benefits on the capital assets (investment tax credit, accelerate depreciation, residual ownership value) are lost.

d. An authority can not issue a GO bond because it does not have the requisite taxing powers.

e. Ease of raising capital may be deterrent to full consideration of the advantages of private system operation and of the technical and economic risks of the project.

3. Revenue Bonds. A mechanism that is becoming more frequently used to avoid the disadvantages associated with GO bonds is the revenue bond. A revenue bond is issued to finance a single project with revenue producing services.

Revenue bonds are long-term, tax-exempt obligations issued by a specific governmental agency, an independent authority or a quasi-public agency which is created specifically for the project. Revenue bonds do not have the full-faith-and-credit backing; rather, they pledge the net

revenue generated by the project for repayment of the debt. The increased risk of a revenue bond offering as viewed by the prospective bond purchaser results in a correspondingly higher interest rate.

A typical revenue bond is negotiated with one underwriter rather than competitively bid. The negotiations between the local authority or project sponsor and the underwriter will include a determination of the underwriter's profit and the interest rate. Negotiated interest rates are often higher than competitive interest rates; however, the incremented costs are partially offset by the advice the investment banking firm provides during its evaluation of the project and its preparation of the revenue bond circular and official statement.

The revenue bond circular and official statement summarize for the prospective bondholders the technical and economic feasibility of the project. The local authority usually hires a "third party" consultant to confirm the underwriter's costs and revenue estimates.

The principal reason for the attractiveness of revenue bonds in financing landfills is that it allows the participants to share in the risks and rewards of a project. Revenue bond financing allows for flexibility in structuring the financial package and the laws of the State of New Jersey provide a number of methods through which revenue bonds can be issued. Accordingly, arrangements for ownership, operation and control of the project can be negotiated as desirable to achieve the maximum benefit to both the County and any private firm. Ultimately, the participants in the transaction are in a better position to share the risks and economic benefits of the project.

Since revenue bonds are issued by an authority or specific agency without taxing power to secure the debt, they typically have interest rates 100 to 150 basis points higher than that of GO bonds. The incremental cost can be minimized with sound contractural agreements and financially secure project participants.

Prior to the issuance of a revenue bond, a comprehensive analysis of the facility plans and of the risks is required. Results are set forth in a prospectus or official statement which would be distributed in connection with the issuance of the bonds. It is essential that the revenues be sufficient to support the project. The technical and economic analysis gives particular emphasis to the technology, level of waste control, operating expertise and efficiency.

The County is in a far different position of risk with revenue bonds than with GO bonds. Of the three basic areas of risk -- technology, facility operation and waste control -- only waste control is ultimately the County's responsibility.

The County must control a waste stream of sufficient quantity to meet the operational capacity of the landfill. This contract guarantee will specify a mutually agreed upon tonnage (a

daily or weekly average) to be delivered to the facility. This point cannot be over-emphasized, for it is paramount to the success of the project. Failure to deliver this tonnage would proportionately decrease the revenues to the project. As mentioned in the previous section of this report, the investment community may want a "put or pay" provision in the contract which states that should the County (via the users or municipalities) fail to deliver a specified tonnage in a specified period of time, they are required to pay as if it were delivered.

With revenue bonds, the technology risk is not assumed by the County or its designee, rather, by the landfill contractor selected through evaluation by the County's designee. (Assuming that the County's designee wants a landfill contractor to construct and operate the landfill. Alternatively, the designee could contract out initial construction, then operate the landfill itself.) The landfill contractor typically provides a performance guarantee as part of its contractural commitments. Likewise, the marketing-related and operational risks are the responsibility of the private operator.

Even though the County or its designee is not liable for project risks beyond guaranteeing delivery of refuse, it will be evaluating risk elements for the purposes of landfill construction procurement, overall system management and County participation in contract negotiations. The timing of landfill operation and its operational capacity will be carefully analyzed in order to facilitate smooth interfacing with other disposal operations in the area.

The County should share in the gross revenue derived from tipping fees throughout the length of the contract, since it is responsible for waste delivery.

With revenue bonding, equity participation by the landfill contractor is possible. Since many of the companies in the industry do not like or would not bid if equity participation is mandatory, most local governments, through their designee, will offer this as an option, which a proposer may take advantage of through an alternative bid. The benefit to the County, if this occurs, is a reduction in the amount of debt requested in the bond issue and a possible reduction in operational expenses. This option should be carefully reviewed during the preparation of the County's Invitation for Bid.

Advantages:

a. Relatively low interest rate (compared to private financing) because interest on debt is tax-exempt.

b. Does not impact on the County's debt limit.

c. Bond repayment is provided through project revenues.

d. Provides a balance of risk and economic benefits among the key project participants.

e. Issuance of a revenue bond requires detailed documentation of the project's technology, products and economic viability, therefore, fostering responsible decision-making.

Disadvantages:

a. Interest rates are somewhat higher than that for GO bonds.

b. May only be used to finance a specific project.

c. Requires more time to arrange.

d. Tax benefits (investment tax credit, depreciation and residual ownership benefits) are normally lost.

A revenue bond is issued by an authority, a distinct local government agency or a quasi-public organization created for management of the project.

4. Private Financing. Private financing is a third alternative for financing a landfill. In this approach, the County would contract with a private firm for solid waste management services. The private firm would then raise the capital, purchase the equipment, construct the facility and operate the landfill.

In the event that a particular geographic area provides benefits which the private financial community views as outstanding, it is likely that there will be private business concerns which are willing to finance a facility. The County should explore this approach and offer it as an option when it solicits Invitations for Bid.

Interest rates, as compared to GO and revenue bonds, are substantially higher, since the tax exempt feature of public sector borrowing is not available. Some of the private firms in the industry may have internal complications in borrowing money of the magnitude required for construction of an environmentally sound landfill. Private sector capital programs dictate that the projects with the highest rate of return on investment (ROI) go forward, assuming the risks are equal. If a private firm has an opportunity to invest in a high ROI project other than a landfill, then it must also structure a correspondingly high ROI in its bid for a landfill project or forego the private financing approach.

In the event that private financing is obtained the risks involved in connection with technology and operation fall to the private entrepreneur rather than the County. However, as in the other methods discussed above, the County or its designee must secure control over the waste stream.

With private sector financing, the County would be relieved of having to devote capital bonds to the project, therefore, the County's debt would not be affected. The ownership of the facility generally remains with the private company after the contract life. The County could include a provision in the bid documents requesting that a County purchase program be established after the private company retired its project debt.

The tax incentives and benefits available under the Internal Revenue Code would be available to the private company. The tax savings will reduce costs to the company, however, the ROI required would more than offset these savings.

Private financing is primarily used in political jurisdictions with poor credit ratings or where the local government decides not to risk any money in solid waste management. Without assuming some risks, the local government foregoes the right to any future benefits associated with the solid waste system and forces higher service costs.

Advantages:

a. County does not contribute any capital funds.

b. Risks involved with system ownership and operation reside with the private firm. (The County, however, must secure control over the waste stream).

c. Tax benefits available to the private sector are gained.

Disadvantages:

a. The high cost of capital is reflected in higher service fees.

b. Potential benefits of future operations (e.g., higher revenues from escalating energy prices) are not shared with the County as much as they would be under alternative financing mechanisms.

c. County must locate an acceptable firm and negotiate a contract.

5. Leverage Lease Revenue Bond. A thorough investigation of leverage leasing will be warranted if the County selects revenue bonding as the financial instrument for capital formation for the landfill project. For the purposes of this report, however, it is important to compare leverage leasing with the other financial instruments and identify its unique features.

Leverage leasing is not a specific financial instrument but instead a financial package that combines several financial options. Bascially, it is a modification or refinement of revenue bonding applications. The arrangement involves the pooling of private and public sector funds to the benefit of both parties. The concept is based upon the benefits (lower costs for long-term capital and interest) that occur to the local government when a financial intermediary is interposed between the long term source of capital (a bond) and the local government.

Normally 70 to 80% of the capital requirements are raised through a municipal revenue bond offering with its tax-exempt feature. The balance of the required capital (20 to 30%) is contributed by a private corporation or individual to gain the tax benefits available under current Internal Revenue Service rulings. This financial intermediary would receive the tax shelters (investment tax credits, accelerated depreciation and residual value of the landfill) in return for furnishing "up-front" equity in the project. It should be noted that the tax benefits for a landfill operation are not as substantial as those for resource recovery plants due to the small amount of equipment involved. In new environmentally sound landfills, much of the capital is expended for site preparation and liner placement.

Leverage leasing is an extremely complex mechanism to arrange. The legal contracts and the terms of agreement binding the County, the financial intermediary and the company operating the facility are complicated and take a great deal of time to formulate. Once negotiated, IRS rulings are required, adding possibly six to nine months.

The cost of financing with this hybrid of revenue bonding could equal general obligation bonding or be slightly lower, depending on the project appraisals prepared by the investment community, the combined credit rating of the project participants and the specific contractural agreements between major participants.

The risk to the County, as before, involves controlling the waste stream. All other risks associated with the project are assigned to the facility operator in much the same way as revenue bonds.

Leverage leasing presents a very positive cost picture of raising money for capital intensive projects. The prime cause for its slow acceptance is that the financial intermediary (equity participant) requires an indemnification clause for his commitment. In the event that the facility should fail during the course of the contract, the equity owner becomes liable to the Federal government for all tax savings accrued during the term of operation, assuming the asset has not been fully depreciated. The sheltered taxes then become payable in the year of failure. To protect himself against this possibility, it is normal for the equity owner* to ask to be indemnified by one of the involved parties for any tax losses.

*Equity owners must also keep abreast of changes in the tax laws to be assured that new reforms do not impinge upon their involvement.

Generally, the County's designee or the landfill firm would be the one required to compensate the injured party. The amount of compensation could place the County's designee in a financially disasterous position, since the tax savings to the equity owner are substantial. The normal payback periods for the capital associated with this arrangement are no more than five years.

The complexity of this mechanism, therefore, must be weighed against the financial benefits to the County's designee and the people it serves. Consequently, full details must be provided in the Invitation to Bid and be thoroughly supported in the bidder's response to the County's designee, in order for a proper evaluation to occur.

Advantages:

a. Maximum utilization of tax shelters with benefits of tax-exempt revenue bond financing.

b. Reduces demand on County capital bonds.

c. Interest rate on entire financial package could equal or be lower than that for GO bonds.

d. County risks are low, i.e., only waste control, like that with a revenue bond approach.

e. Debt retirement is provided through long-term lease payments from the operating company.

Disadvantages:

a. Legally complex; time consuming to formulate and to gain IRS approval.

b. If the project failed, the indemnification clause required by the financial intermediary would severly constrain the County and/or the operator financially.

c. Because of the relatively small amount of equipment involved, a landfill operation may not be attractive for leverage lease financing.

6. Conclusion. GO bonds have the lowest interest rate, while private financing has the highest. With GO bonding, the County assumes full liability for the entire project, versus no liability (with the exception of waste control) under the other three options. Furthermore, a GO bond is the only financial instrument that will increase the County debt. The revenue bond offers an attractive balance of cost and liability to the County. The only risk is in guaranteeing a long-term supply of waste to the facility, a risk common to any financing approach.

Final decision on which financing method to be utilized should be made by the County, as the development of the landfill continues in the next several years. Which financing is eventually utilized will depend on the administrative agency selected to operate the landfill, the status of waste stream control, and the level of bonded indebtedness already incurred by the County.

C. ADMINISTRATION AND MANAGEMENT OPTIONS

Before any county-wide solid waste system can be implemented, an implementation agency with requisite financial, jurisdictional, legal and operational capability is required. The county-based institutional structures available under New Jersey statutes are:

- County Department
- County Municipal Utilities Authority
- County Improvement Authority

Other institutional structures, based on aggregating municipalities, may be created to implement and administrate solid waste systems. The three major State Statutes concerning solid waste disposal as a multi-municipal basis are: (1) Incineration Authorities Law of 1948, (2) Solid Waste Management Authorities Law of 1968, and (3) The Consolidated Municipal Services Act. These structures, however, are not well-suited to a county-wide setting and will not be discussed.

The selection of an effective implementation agency should be made soon if the County is to achieve control over the waste stream in time for implementation of a landfill in the near future. A discussion of the requisite areas of responsibility that should be considered in selecting an institutional body follows.

—Financial Capabilities. While there are differences between the technical alternatives for solid waste management in terms of capital and operation and maintenance costs, the implementation agency must have the resources to meet these costs or be capable of acquiring them. Costs for solid waste processing and disposal facilities do not, at present, qualify for Federal or State funding such as is available in the wastewater treatment area. Accordingly, the costs of implementing regional solid waste/resource recovery systems will fall most heavily on counties, large cities or their designated authorities. Thus, the institutional body will be

responsible for working closely with the investment banking community and local agencies in the preparation of a financial package. Each type of implementation agency has capital acquisition methods specific to its structure. If revenue bonds are to be used to finance the project, then the legal body must be an authority of some kind.

—Contractual Vehicle. An institutional body is necessary for procurement of the facility, to act as the vehicle for contracting, bid documentation and legal obligations between the various participants in the landfill project. The County's designated agent would also petition the Board of Public Utilities for a franchise, establish a user charge system and/or negotiate contracts with municipalities in the County. It must have the power to make these contractural obligations for a long time period (20 years or more).

—Control of Waste Stream. The implementation agency selected must have sufficient flexibility and authority to gain long-term waste control. Much difficulty and time is involved in establishing control over the sources, types and quantities of solid wastes entering the designated processing and disposal sites,

—Ability to Acquire Land. Generally, a public body has the legal ability to acquire property for a solid waste disposal facility. The problem stems in overcoming public resistance to siting certain facilities in certain locations. New Jersey State laws allow governmental units and authorities to acquire land either by agreement with the owner(s) or by exercising their power of eminent domain. The difference between the alternative institutional structures is in the number of approvals required to site facilities.

Alternative implementation agencies which could be utilized in Cumberland County are discussed below.

1. County Department. The County Solid Waste Disposal Financing Law (NJSA 40:66A-31.1 et seq.) could be used by the County to create a new County department to handle solid waste management. The law allows the County to plan, finance and construct solid waste facilities. As such the County may contract with any government, private individual or corporation for the delivery, collection, processing and/or disposal of solid waste. This includes municipalities in the County and any adjoining county.

Financing of facilities may be affected through GO bonds, leases, grants and user fees for services. Revenue sharing funds may also be employed. Revenue bonds, however, cannot be issued. As previously mentioned, the County would have direct control over the landfill, but it would also assume all associated risks as legal owner/operator.

The County may acquire land by gift, purchase, lease or eminent domain, but governmental land not owned by the County cannot be acquired without the consent of the owner. Existing

facilities owned by the private sector may be purchased at a mutually satisfactory price. If the parties fail to reach a price, even after submission to an arbitration board, the County may exercise its powers of eminent domain to obtain the property. The DEP must approve any solid waste facility plans and sites.

2. County Authority. A County Municipal Utilities Authority (MUA) or a County Improvement Authority (NJSA 40:37A-45) can be used to implement the Plan and supervise the solid waste management system. The powers provided to each are similar in terms of administrative structure, financing, contract negotiations, enforcement and land acquisition. With respect to a County MUA, Chapter 384 of the Laws of New Jersey of 1977 became effective on February 10, 1978 requiring some County Sewerage Authorities to reorganize as Municipal Utilities Authorities. (The Cumberland County Sewerage Authority was included and reorganized as the Cumberland County Utilities Authority.) Provisions of the MUA Act were expanded to include solid waste with Section 24 authorizing an MUA to undertake the financing of a solid waste facility as a general improvement. Thus, the Cumberland County Utilities Authority has the statutory authority to finance solid waste facilities.

Financing of solid waste facilities would be through the issuance of revenue bonds and/or private financing. Revenues to retire the debt would be generated from service contracts with participating municipalities and/or private collector/haulers. The authority could also purchase capital assets with income, leases and grants.

Contractural powers are broad, as an Authority may enter into all contracts necessary for fulfillment of its responsibilities. Enforcement powers could be established through the municipal contracts and user agreements negotiated with the municipalities. An Authority may acquire property by purchase, gift, grant or condemnation.

The basic difference between a County MUA and a County Improvement Authority involves site selection procedures. For an MUA, solid waste/resource recovery facility plans and sites require the approval of DEP. For an Improvement Authority, site selection requires the approval of the DEP plus municipalities comprising at least 75% of the County's population and the County Planning Board. These additional approvals could delay or modify implementation of specific elements of the Plan.

In general, a County authority has advantages over the County department. It provides the County with a vehicle to assume control over the solid waste system yet the County does not incur any financial obligations. An Authority would only assume liability in the area of waste stream control.

Since many obstacles have occurred in the past as new authorities and departments have been created to handle water and wastewater disposal problems in New Jersey, it is recommended that there be a maximum amount of interchange between municipalities and the County, as a final decision is reached on the implementation agency. A County decision with widespread municipal support will facilitate the creation of a sound legal body, with subsequent execution of municipal contracts for waste disposal at a new County landfill.

3. Recommendation. Responsibility for the implementation of the Solid Waste Management Plan will be with the Board of Chosen Freeholders.

D. RATE AVERAGING

Once concept which has recently been advanced to economically allow for improvements in the solid waste disposal system is the concept of rate averaging. Under rate averaging systems, all disposal facilities charge one set unit tipping fee for disposal (say "X" dollars per cubic yard). All of the fees collected are pooled together to cover the operating costs of all the facilities.

If rate averaging were in effect in a given disposal district, it would make no difference whether wastes were delivered to a conventional landfill, a controlled landfill, or a resource recovery facility; all would charge the same tipping fee.

Rate averaging as a public and municipal utility rate structure is not new. Nearly all electric and water utilities, as well as some sewerage utilities charge a uniform fee for services rendered regardless of the proximity of the users to the wells, generating station, or treatment plant. Rate averaging offers a reasonable solution to the problems that occur when some localities have to pay substantially higher disposal costs as new disposal facilities open, while other communities pay a fraction of these costs since their conventional landfills have not yet reached capacity. It should, however, be noted that the substantial rate differential that currently exists between conventional and controlled landfills will be narrowed within five years, as all conventional landfills will face substantial upgrading costs as a result of federal programs under the Resource Conservation and Recovery Act (RCRA). Under RCRA, most existing conventional landfills will be given five years to upgrade or be closed.

Rate averaging can be imposed over an entire county, over more than one county, or over individual solid waste districts within a county. The final decision on where or when to implement rate averaging should rest with the agency selected to implement the solid waste management plan. Imposition of true rate averaging within a district may require the obtaining of a disposal franchise, to avoid institutional problems associated with dividing up collected revenues between private operators. After obtaining a franchise, the implementing agency could

contract with private operators to run disposal facilities if desired for a specific fee, with the agency collecting revenues and tipping fees itself. The disposal facitlity would receive its contracted fee for disposal facility operation.

E. COORDINATION WITH REGULATORY AGENCIES

1. N.J. Department of Environmental Protection (DEP). The DEP is charged with the environmental regulation of solid waste disposal facilities. The Solid Waste Administration (SWA) within the DEP is primarily responsible for the review of solid waste facility engineering plans, inspection and enforcement of state regulations on operation of disposal facilities, registration of facilities and collector/haulers, and for review of solid waste management plans.

Many complaints voiced about the DEP in the past have centered around the decentralization of the various divisions of the DEP (air, water, solid waste, stream encroachment, etc.). Recently, much progress has been made in expediting the departmental review processes. With continuing progress in this regard, regulatory delay should not interfere with timely development of environmentally sound disposal facilities.

2. New Jersey Board of Public Utilities (BPU). The BPU is responsible for the economic regulation of landfills and collector/haulers in New Jersey. BPU regulates tipping fees at landfills, and collector/hauler charges for collection service. Since it is obvious that there will be substantial increases in disposal costs in the next decade, it is suggested that the BPU expedite collector/hauler requests to allow for increases in collection charges as a result of increased disposal costs. While it is recognized that BPU cannot grant automatic "pass-throughs" of increased disposal costs, one option that could be considered would be as follows:

- as soon as approval is granted for increased disposal tipping fees, all collector/haulers using that facility are immediately notified that rates are to be increased after a 90 day period.
- all collector/haulers have two weeks to file for an increased colletion tariff, which would could be collected starting at the same time as the disposal cost increase.
- BPU would screen all proposals, and act on the less complex increases before the 90 day period is up.

It is understood that the BPU is already expediting collector/hauler tariff increases to the extent possible. Continuation of this policy will assure that undue financial hardship is not placed on medium and small collector/haulers as disposal costs increase.

F. DISCUSSION OF PROVISIONS FOR PLAN UPDATE AND ENFORCEMENT

Under Chapter 326, each solid waste management plan is to be updated every two years. For the Cumberland County Plan, responsibility for updating should remain the responsibility of the County Planning Board (under whose jurisdiction this plan was prepared). Following the assignment of responsibilities to a County authority or department, the new agency would assume responsibility for updating the plan.

APPENDIX 2

WASTE IDENTIFICATION AND DEFINITION

SOLIDS

SOLID WASTES	DEFINITIONS
10 Municipal (Household, Commercial and Institutional)	Waste originating in the community consisting of household waste from private residences, commercial waste which originates in wholesale, retail or service establishments such as restaurants, stores, markets, theatres, hotels and warehouses, and institutional waste material originating in schools, hospitals, research institutions and public buildings. Laboratory wastes and infectious wastes are not included in this category.
12 Dry Sewage Sludge	Sludge from a sewage treatment plant which has been digested and dewatered and does not require liquid handling equipment.
13 Bulky Waste	Large items of waste material such as appliances, furniture, whole trees, branches, tree trunks, and stumps. Also included are waste building materials and rubble resulting from construction, remodeling, repair and demolition operations on houses, commercial buildings, pavements and other structures. Discarded automobiles, trucks and trailers and large vehicle parts and tires are included under this category.
17 Dry Hazardous Waste	Non-liquid waste materials which pose a present or potential threat to human health, living organisms or the environment. ~~are inherently dangerous to handle or dispose of.~~ Included in this category are waste materials which are toxic, corrosive, irritating or sensitizing, ~~biologically infectious~~, explosive or flamable. Included are dry pesticides and any containers that were used to ship or store hazardous wastes.

SOLIDS, cont.

WASTE ID		DEFINITIONS
17	Dry Hazardous Waste	Non-liquid waste materials which pose a present or potential threat to human health, living organisms or the environment. ~~are inherently dangerous to handle or dispose of.~~ Included in this category are waste materials which are toxic, corrosive, irritating or sensitizing, ~~biologically infectious~~, explosive or flamable. Included are dry pesticides and any containers that were used to ship or store hazardous wastes.
18	Dry Non-Hazardous Chemical Waste	Non-liquid material normally generated by or used in chemical, petro-chemical, plastic, pharmaceutical, biochemical or microbiological manufacturing processes that is not included in the dry hazardous waste category.
23	Vegetative Waste	Waste materials from farms, plant nurseries, and greenhouses produced from the raising of plants. This waste includes such crop residues as plant stalks, hulls, leaves and tree wastes processed through a wood chipper.
25	Animal and Food Processing Wastes	Processing waste materials generated in canneries, slaughterhouses, packing plants or similar industries. Also included are dead animals.
26	Oil Spill Clean-Up Wastes	Wastes generated during an oil spill clean-up operation which include, but are not limited to, oil soaked sand and straw.
27	Non-Chemical Industrial Waste	Solid waste materials resulting from the manufacturing industry. Specifically not included is waste material of a chemical nature which is normally generated by, or used in, chemical, petro-chemical, plastic, pharmaceutical, biochemical or microbiological manufacturing processes.

WASTE IDENTIFICATION AND DEFINITION

LIQUIDS

LIQUID WASTES		DEFINITIONS
70	Waste Oil and Sludges	Automotive crank case drainings and other discarded oils from industrial, aviation and miscellaneous applications including waste oils and materials which are in the form of a highly concentrated slushy residue.
72	Bulk Liquid and Semi-Liquids	Liquid or a mixture consisting of solid matter suspended in a liquid media which is contained within, or is discharged from, any one vessel, tank or other container which has the capacity of 20 gallons or more. Included are bulk or semi-liquids for which there is not a specific waste category.
73	Septic Tank Clean-Out Wastes	Pumpings from septic tanks and cesspools. Not included are wastes from a sewage treatment plant.
74	Liquid Sewage Sludge	Liquid residue from a sewage treatment plant consisting of sewage solids combined with water and dissolved materials.
76	Liquid Hazardous Waste	Free flowing material which ~~is inherently dangerous to handle or dispose of.~~ poses a present or potential threat to human health, living organisms, or the environment. Included in this category are waste materials which are toxic, corrosive, irritating or sensitizing, ~~biologically infectious~~, explosive or flammable. This category shall include liquid pesticides.

CUMBERLAND COUNTY POPULATION PROJECTIONS

Municipality	1977[1]	1980[2]	1985	1990[2]	1995	2000[2]
Bridgeton	19,806	19,536	19,368	19,200	19,100	19,000
Commercial	3,843	3,918	4,059	4,200	4,400	4,600
Deerfield	2,551	2,588	2,744	2,900	3,050	3,200
Downe	1,893	1,943	2,022	2,100	2,200	2,300
Fairfield	5,507	5,729	6,065	6,400	6,700	7,000
Greenwich	989	1,000	1,050	1,100	1,150	1,200
Hopewell	3,969	3,969	4,135	4,300	4,450	4,600
Lawrence	2,300	2,288	2,344	2,400	2,450	2,500
Maurice River	4,593	4,957	5,229	5,500	5,800	6,100
Millville	24,461	25,787	28,294	30,800	32,950	35,100
Shiloh	603	616	633	650	675	700
Stow Creek	1,172	1,244	1,322	1,400	1,475	1,550
Upper Deerfield	6,462	6,382	6,966	7,550	8,450	9,350
Vineland	52,674	54,935	58,718	62,500	66,250	70,000
TOTAL	130,823	134,892	142,949	151,000	159,100	167,200

[1]New Jersey Department of Labor and Industry Estimates

[2]Estimates Supplied by the Cumberland County Planning Board

PREDICTIONS OF INDUSTRIAL EMPLOYMENT IN CUMBERLAND COUNTY IN EMPLOYEES*

	Actual 1970	Estimated 1975	1980	1985	1990	1995	2000
Agriculture, Forestry & Fishing	1,300	1,600	1,100	900	800	700	600
Food & Kindred Products	2,700	2,900	2,700	2,400	2,200	2,100	2,000
Manufacturing	21,400	17,700	17,500	17,300	17,300	17,400	17,600

*Source: "New Jersey Toward the Year 2000: Employment Projections"
Michaelson, C., and Greenberg, M. 1978
Model 4:OBERS

SOLID WASTE MANAGEMENT QUESTIONNAIRE
for

1) What year was the municipal landfill opened? _____

2) When is the landfill open? _____

_____

3) Who is permitted to use the landfill? _____

_____

4) Is there a method to control users? _____

_____

5) Does your municipality charge a fee for dumping? _____

6) What equipment does your municipality have to operate the landfill? _____

_____

7) What is the annual cost of operating the landfill?
Salaries _____ Operating _____

8) What type of wastes is the landfill authorized to accept (ex. municipal, bulky, vegetative, septic tank, etc.)? _____

_____

9) How much refuse is disposed of at your landfill per year? _____ How is it determined? _____

_____

10) What is the remaining capacity of your landfill (in Years)? _____

11) Do private collectors need a permit or license to operate in your municipality? _____

12) Do you have any large commercial establishments or institutions that use your landfill? ___
If yes, what type of refuse do they dispose? _____

_____

13) Do you have any groundwater monitoring wells? _____
If yes, how often are they tested? _____

14) Do you have an engineering design for the landfill? _____

15) Has the landfill been sited for DEP violations within the last five years? _____ If yes, please list violations? _____

_____

16) Does your municipality have any ordinances dealing with solid waste management? _____

_____

17) Has voluntary or mandatory separation of glass, newspaper and cans been considered by your municipality? _____

_____

18) Does your municipality offer refuse collection as a service to your residents? _____ If yes, please continue. If no, please proceed to number 27

19) Is the collection done by municipal employees or private contractors? _____

If private, who _____

20) Who is the service provided to (i.e. residents, municipal, school, business, industry)?

_____

21) What is the frequency of collection? _____

22) Where is the point of collection? _____

23) What equipment does your municipality have available for collection? _____

_____

24) What is the annual cost of collection? Salaries _____ Operating _____

25) Approximately how much refuse is collected in a year? _____

26) When was the municipal collection system started? _____

27) Do you foresee any changes in your present system in the near future? _____

_____

28) Who filled out this questionnaire? _____

_____

APPENDIX 3

Four County Energy Market Survey
Cost Effectiveness Analysis

1.2 PROJECT APPROACH

Energy market information was developed and analyzed through a series of steps, as follows:

- Identify candidate markets using information and data from local governmental or commercial industrial directories.
- Survey candidate markets using a questionnaire technique.
- Target those markets whose energy profile is potentially compatible with energy conversion technology, and contact by telephone.
- Conduct on-site interviews with fifteen (15) target markets and obtain additional information.
- Evaluate each market based upon a set of evaluation criteria.
- Recommend opportunities for inclusion in short-range and long-range planning.

Materials market information was developed and analyzed as follows:

- Identify candidate markets using information provided by State and local agencies, and local telephone directories.
- Contact local and regional markets by telephone and obtain information and letter commitments, where possible.
- Conduct on-site interviews with selected markets.
- Prepare market summaries.

1.3 FINDINGS

1.3.1 Energy Markets

1. Of the sixty-one (61) potential energy markets contacted in the program, of which forty-three (43) provided responses, twenty-one (21) have an energy consumption level greater than the energy equivalent of fifty (50) tons per day of municipal refuse, or 450 million BTUs.

2. The largest single energy consumer is the Atlantic Electric Company. In terms of equivalent tons of refuse, however, market capacity is limited by the ratio of 10% of refuse-derived-fuel (RDF) to total fuel demand. This limitation results in an equivalent refuse

demand potential of 600 tons per day. The Atlantic Electric Company has serious concerns regarding the viability of RDF co-firing and may participate only under a funded developmental or limited test program at this time.

3. The only other electric utility in the study area which operates a non-nuclear generating station is the City of Vineland Municipal Utility. Potential refuse demand here is approximately 60 tons-per-day due to the assumed 10% co-firing limitation. Similar concerns on viability plus serious plant siting problems are of issue here.

4. Of the remaining nineteen (19) markets, all of which are industrial, only seven (7) exhibit energy profile characteristics which are potentially compatible with resource recovery technology.

5. Of these seven (7) markets, one (1) is considered a developmental application, viz., E.I. DuPont in Deepwater, New Jersey.

6. The remaining six (6) industrial markets (3 in Salem County, 3 in Cumberland County) represent potential short-range applications of waste-to-energy technology.

1.3.2 Materials Markets

1. Markets for mixed and separate paper exist throughout the state although local markets (waste brokerages) will accept only separated paper.

2. Markets for flint or mixed color glass exist in ample quantities in Salem and Cumberland counties. Markets are both direct processors and one broker.

3. Markets for ferrous metals and aluminum are available through at least two (2) brokers located in Vineland, NJ. Aluminum pickups for each county are available.

1.4 RECOMMENDATIONS

1.4.1 Energy Markets

The following short-range and long-range applications of energy recovery technology should be considered in the solid waste management planning process.

Market	Equivalent Tonnage	County	Timing
Crest Containers Millville	210	Cumberland	Short-Range
Kerr Glass Millville	350	Cumberland, plus	Short-Range
Owens-Illinois Bridgeton	400	Cumberland, plus	Short-Range
Anchor-Hocking Salem	260	Salem, plus	Short-Range
Mannington Mills Salem	90	Salem	Short-Range
B.F. Goodrich Pedricktown	300	Salem, plus	Short-Range
Atlantic Electric Atlantic City	600	Atlantic, plus	Long-Range
City of Vineland Vineland	60	Cumberland	Long-Range
E.I. DuPont	320	Salem, plus	Long-Range

1.4.2 Materials Markets

Each county should consider low-scale technology materials separation as part of the county plan. Markets served, direct or through brokers, will primarily be a function of transportation costs and commitment to capital investment.

TRANSPORTATION COSTS PER MILE

Cost Component	Cost Factors (Per Mile)	Unit Cost	Cost Per Mile ($)
Fuel Consumption	0.109	$ 0.85/Gal	0.0927
Oil Consumption	0.001	5.33/Gal	0.0053
Tire Wear	0.0004	175.00/Tire	0.0700
Depreciation	0.0000016	40,000/Truck	0.0640
Maintenance			
(Truck Value)	0.0000018	40,000/Truck	0.0720
(Mechanic Labor)	0.005	12.33/Hr.	0.0617
Driver Time	0.04	12.50/Hr.	0.500
TOTAL			$ 0.8657
			(for 20 C.Y.)

Cost Component	Cost Factors (Per Mile)	Unit Cost	Cost Per Mile ($)
Fuel Consumption	0.109	$ 0.85/Gal	0.0927
Oil Consumption	0.001	5.33/Gal	0.0053
Tire Wear	0.004	175.00/Tire	0.0700
Depreciation	0.0000016	45000.00/Truck	0.0720
Maintenance			
(Truck Value)	0.0000018	45000.00/Truck	0.0810
(Mechanic Labor)	0.005	12.33/Hr.	0.0617
Driver Time	0.04	12.50/Hr.	0.500
TOTAL			0.8827 (for 25 C.Y.)
Fuel Consumption	0.109	0.85/Gal	0.0927
Oil Consumption	0.001	5.33/Gal	0.0053
Tire Wear	0.00067	175.00/Tire	0.1167
Depreciation	0.0000016	50000.00/Truck	0.08
Maintenance			
(Truck Value)	0.0000018	50000.00/Truck	0.09
(Mechanic Labor)	0.005	12.33/Hr.	0.0617
Driver Time	0.04	12.50/Hr.	0.500
TOTAL			0.9464 (for 31 C.Y.)

Cost Component	Cost Factors (Per Mile)		Unit Cost	Cost Per Mile ($)
Fuel Consumption	0.109	$	0.85/Gal	0.0927
Oil Consumption	0.001		5.33/Gal	0.0053
Tire Wear	0.0012		175.00/Tire	0.21
Depreciation	0.0000016		58000.00/Truck	0.0928
Maintenance				
(Truck Value)	0.0000018		58000.00/Truck	0.1044
(Mechanic Labor)	0.005		12.33/Hr.	0.0617
Drive Time	0.04		12.50/Hr.	0.5
TOTAL				1.0669 (for 65 C.Y.)

SUMMARY

Truck Size	Cost Per Mile ($)
20 C.Y.	0.8657
25 C.Y.	0.8827
31 C.Y.	0.9464
65 C.Y. (Transfer Trailer)	1.0669

ROLL–OFF CONTAINER TRANSPORT COST

Cost Component	Cost Factors (Per Mile)	Unit Cost	Cost Per Mile ($)
Fuel Consumption	0.109	$ 0.85/Gal	0.0927
Oil Consumption	0.001	5.33/Gal	0.0053
Tire Wear	0.0012	175.00/Tire	0.2100
Depreciation	0.0000016	75000.00/Truck	0.1200
Maintenance			
(Truck Value)	0.0000018	75000.00/Truck	0.1350
(Mechanic Labor)	0.005	12.33/Hr.	0.0617
Driver Time	0.04	12.50/Hr.	0.5000
TOTAL			1.1247

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 1A* (WEST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Cost ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,469	14,675	21,000	226,000	247,000	16.83	12.69
Deerfield Township	2,650	731	2,000	11,000	13,000	17.78	4.91
Fairfield Township	5,863	700	1,000	11,000	12,000	17.14	2.05
Greenwich-Hopewell Twp.	5,055	1,534	4,000	24,000	28,000	18.25	5.54
Shiloh-Stow Creek Twp.	1,898	1,817	6,000	28,000	34,000	18.71	17.91
Upper Deerfield Twp.	6,616	685	2,000	11,000	13,000	18.98	1.96
TOTAL	41,551	20,142	36,000	311,000	347,000		
					West County Avg:	17.23	8.35

*Assumes Disposal at New Western Landfill in Fairfield

[1]Assumes Unit Disposal Cost at $15.38/Ton

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 1B* (WEST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,469	14,675	30,000	226,000	256,000	17.44	13.15
Deerfield Twp.	2,650	731	1,000	11,000	12,000	16.42	4.53
Fairfield Twp.	5,863	700	2,000	11,000	13,000	18.57	2.22
Greenwich-Hopewell Twp.	5,055	1,534	5,000	24,000	29,000	18.90	5.74
Shiloh-Stow Creek Twp.	1,898	1,817	7,000	28,000	35,000	19.26	18.44
Upper Deerfield Twp.	6,616	685	2,000	11,000	13,000	18.98	1.96
TOTAL	41,551	20,142	47,000	311,000	358,000		
				West County Avg:		17.77	8.62

*Assumes Disposal at New Western Landfill in Deerfield

[1]Assumes Unit Disposal Cost at $15.38/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 1A* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	2,000	6,000	8,000	9.48	1.94
Downe Twp.	2,053	494	1,000	3,000	4,000	8.10	1.94
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	10,000	15,000	25,000	11.96	4.68
Millville	29,296	35,672	46,000	251,000	297,000	8.33	10.14
Vineland	60,231	71,103	253,000	501,000	754,000	10.60	12.52
TOTAL	103,398	111,114	315,000	782,000	1,097,000		
				East County Avg:		9.87	10.61

*Assumes Disposal at New Eastern Landfill in Millville

[1]Assumes Unit Disposal Cost of $7.04/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 1B* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	6,000	10,000	11.85	2.43
Downe Twp.	2,053	494	3,000	3,000	6,000	12.15	2.92
Lawrence Twp.	2,366	910	5,000	6,000	11,000	12.09	4.65
Maurice River Twp.	5,337	2,091	11,000	15,000	26,000	12.43	4.87
Millville	29,296	35,672	89,000	251,000	340,000	9.53	11.61
Vineland	60,231	71,103	103,000	501,000	604,000	8.49	10.03
TOTAL	103,398	111,114	215,000	782,000	997,000		
				East County Avg:		8.97	9.64

*Assumes Disposal at New Eastern Landfill in Vineland

[1]Assumes Disposal Cost at $7.04/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 1A* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	21,000	227,000	248,000	16.83	12.85
Deerfield Twp.	2,806	774	2,000	12,000	14,000	18.09	4.99
Fairfield Twp.	6,199	734	1,000	11,000	12,000	16.35	1.94
Greenwich-Hopewell Twp.	5,271	1,600	4,000	25,000	29,000	18.13	5.50
Shiloh-Stow Creek Twp.	1,993	1,908	6,000	29,000	35,000	18.34	17.56
Upper Deerfield Twp.	7,200	735	2,000	11,000	13,000	17.69	1.81
TOTAL	42,770	20,482	36,000	315,000	351,000		
					West County Avg:	17.14	8.21

*Assumes Disposal at New Western Landfill in Fairfield

[1]Assumes Unit Disposal Cost at $15.38/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 1B* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	30,000	227,000	257,000	17.44	13.32
Deerfield Twp.	2,806	774	1,000	12,000	13,000	16.80	4.63
Fairfield Twp.	6,199	734	2,000	11,000	13,000	17.71	2.10
Greenwich-Hopewell Twp.	5,271	1,600	6,000	25,000	31,000	19.38	5.88
Shiloh-Stow Creek Twp.	1,993	1,908	7,000	29,000	36,000	18.87	18.06
Upper Deerfield Twp.	7,200	735	2,000	11,000	13,000	17.69	1.81
TOTAL	42,770	20,482	48,000	315,000	363,000		
					West County Avg:	17.72	8.49

*Assumes Disposal at New Western Landfill in Deerfield

[1]Assumes Unit Disposal Cost at $15.38/Ton

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 2* (WEST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,469	14,675	59,000	21,000	80,000	5.45	4.11
Deerfield Twp.	2,650	731	2,000	1,000	3,000	4.10	1.13
Fairfield Twp.	5,863	700	2,000	1,000	3,000	4.29	0.51
Greenwich-Hopewell Twp.	5,055	1,534	9,000	2,000	11,000	7.17	2.18
Shiloh-Stow Creek Twp.	1,898	1,817	9,000	3,000	12,000	6.60	6.32
Upper Deerfield Twp.	6,616	685	3,000	1,000	4,000	5.84	0.60
TOTAL	41,551	20,142	84,000	29,000	113,000		
				West County Avg:		5.61	2.72

*Assumes Distribution and Disposal of Waste between the Millville and Vineland Landfills

[1]Unit Disposal Cost at $1.40/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 2A* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	30,000	96,000	126,000	8.55	6.53
Deerfield Twp.	2,806	774	1,000	5,000	6,000	7.75	2.14
Fairfield Twp.	6,199	736	2,000	5,000	7,000	9.51	1.13
Greenwich-Hopewell Twp.	5,271	1,600	6,000	10,000	16,000	10.00	3.04
Shiloh-Stow Creek Twp.	1,993	1,908	7,000	12,000	19,000	9.96	9.53
Upper Deerfield Twp.	7,200	735	2,000	5,000	7,000	9.52	0.97
TOTAL	42,770	20,484	48,000	133,000	181,000		
					West County Avg:	8.84	4.23

*Assumes Disposal at New County Landfill in Deerfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 2B* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	26,000	96,000	122,000	8.28	6.32
Deerfield Twp.	2,806	774	2,000	5,000	7,000	9.04	2.49
Fairfield Twp.	6,199	736	1,000	5,000	6,000	8.15	0.97
Greenwich-Hopewell Twp.	5,271	1,600	5,000	10,000	15,000	9.38	2.85
Shiloh-Stow Creek Twp.	1,993	1,908	7,000	12,000	19,000	9.96	9.53
Upper Deerfield Twp.	7,200	735	3,000	5,000	8,000	10.88	1.11
TOTAL	42,770	20,484	44,000	133,000	177,000		
				West County Avg:		8.64	4.14

*Assumes Disposal at New County Landfill in Fairfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 2C* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	57,000	96,000	153,000	10.39	7.93
Deerfield Twp.	2,806	774	3,000	5,000	8,000	10.34	2.85
Fairfield Twp.	6,199	736	3,000	5,000	8,000	10.87	1.29
Greenwich-Hopewell Twp.	5,271	1,600	9,000	10,000	19,000	11.88	3.60
Shiloh-Stow Creek Twp.	1,993	1,908	11,000	12,000	23,000	12.05	11.54
Upper Deerfield Twp.	7,200	735	4,000	5,000	9,000	12.24	1.25
TOTAL	42,770	20,484	87,000	133,000	220,000		
				West County Avg:		10.74	5.14

*Assumes Disposal at New County Landfill in Millville

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 2D* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	61,000	96,000	157,000	10.66	8.13
Deerfield Twp.	2,806	774	2,000	5,000	7,000	9.04	2.49
Fairfield Twp.	6,199	736	3,000	5,000	8,000	10.87	1.29
Greenwich-Hopewell Twp.	5,271	1,600	9,000	10,000	19,000	11.88	3.60
Shiloh-Stow Creek Twp.	1,993	1,908	10,000	12,000	22,000	11.53	11.04
Upper Deerfield Twp.	7,200	735	2,000	5,000	7,000	9.52	0.97
TOTAL	42,770	20,484	87,000	133,000	220,000		
				West County Avg:		10.74	5.14

*Assumes Disposal at New County Landfill in Vineland

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 2A* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	5,000	9,000	10.66	2.19
Downe Twp.	2,053	494	3,000	3,000	6,000	12.15	2.92
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	11,000	14,000	25,000	11.96	4.68
Millville	29,296	35,672	95,000	232,000	327,000	9.17	11.16
Vineland	60,231	71,103	178,000	462,000	640,000	9.00	10.63
TOTAL	103,398	111,114	294,000	722,000	1,016,000		
				East County Avg:		9.14	9.83

*Assumes Disposal at New County Landfill in Deerfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 2B* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	5,000	9,000	10.66	2.19
Downe Twp.	2,053	494	2,000	3,000	5,000	10.12	2.44
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	12,000	14,000	26,000	12.43	4.87
Millville	29,296	35,672	84,000	232,000	316,000	8.86	10.79
Vineland	60,231	71,103	306,000	462,000	768,000	10.80	12.75
TOTAL	103,398	111,114	411,000	722,000	1,133,000		
				East County Avg:		10.20	10.96

*Assumes Disposal at New County Landfill in Fairfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 2C* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	2,000	6,000	8,000	9.48	1.94
Downe Twp.	2,053	494	1,000	3,000	4,000	8.10	1.94
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	10,000	15,000	25,000	11.96	4.68
Millville	29,296	35,672	46,000	251,000	297,000	8.33	10.14
Vineland	60,231	71,103	253,000	501,000	754,000	10.60	12.52
TOTAL	103,398	111,114	315,000	782,000	1,097,000		
				East County Avg:		9.87	10.61

*Assumes Disposal at New Eastern Landfill in Millville

[1]Assumes Unit Disposal Cost of $7.04/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 2D* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	6,000	10,000	11.85	2.43
Downe Twp.	2,053	494	3,000	3,000	6,000	12.15	2.92
Lawrence Twp.	2,366	910	5,000	6,000	11,000	12.09	4.65
Maurice River Twp.	5,337	2,091	11,000	15,000	26,000	12.43	4.87
Millville	29,296	35,672	89,000	251,000	340,000	9.53	11.61
Vineland	60,231	71,103	103,000	501,000	604,000	8.49	10.03
TOTAL	103,398	111,114	215,000	782,000	997,000		
				East County Avg:		8.97	9.64

*Assumes Disposal at New Eastern Landfill Vineland

[1]Assumes Disposal Cost at $7.04/Ton

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 3* (WEST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,469	14,675	59,000	21,000	80,000	5.45	4.11
Deerfield Twp.	2,650	731	2,000	1,000	3,000	4.10	1.13
Fairfield Twp.	5,863	700	2,000	1,000	3,000	4.29	0.51
Greenwich-Hopewell Twp.	5,055	1,534	9,000	2,000	11,000	7.17	2.18
Shiloh-Stow Creek Twp.	1,898	1,817	9,000	3,000	12,000	6.60	6.32
Upper Deerfield Twp.	6,616	685	3,000	1,000	4,000	5.84	0.60
TOTAL	41,551	20,142	84,000	29,000	118,000		
				West County Avg:		5.61	2.72

*Assumes Distribution and Disposal of Waste between the Millville and Vineland Landfills

[1]Unit Disposal Cost at $1.40/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 3A* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	21,000	227,000	248,000	16.84	12.85
Deerfield Twp.	2,806	774	2,000	12,000	14,000	18.09	4.99
Fairfield Twp.	6,199	736	1,000	11,000	12,000	16.30	1.94
Greenwich-Hopewell Twp.	5,271	1,600	4,000	25,000	29,000	18.13	5.50
Shiloh-Stow Creek Twp.	1,993	1,908	6,000	29,000	35,000	18.34	17.56
Upper Deerfield Twp.	7,200	735	2,000	11,000	13,000	17.69	1.81
TOTAL	42,770	20,484	36,000	315,000	351,000		
				East County Avg:		17.14	8.21

*Assumes Disposal at New Western Landfill in Fairfield

[1]Assumes Unit Disposal Cost at $15.38/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 3B* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	30,000	227,000	257.000	17.44	13.31
Deerfield Twp.	2,806	774	1,000	12,000	13,000	16.79	4.63
Fairfield Twp.	6,199	736	2,000	11,000	13,000	16.79	2.09
Greenwich-Hopewell Twp.	5,271	1,600	6,000	25,000	31,000	19.37	5.88
Shiloh-Stow Creek Twp.	1,993	1,908	7,000	29,000	36,000	18.06	18.06
Upper Deerfield Twp.	7,200	735	2,000	11,000	13,000	17.68	1.80
TOTAL	42,770	20,484	48,000	315,000	363,000		
					West County Avg:	17.72	8.48

*Assumes Disposal at Western Landfill in Deerfield

[1]Assumes Unit Disposal Cost at $15.38/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 3A* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	2,000	6,000	8,000	9.48	1.94
Downe Twp.	2,053	494	1,000	3,000	4,000	8.10	1.94
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	10,000	15,000	25,000	11.96	4.68
Millville	29,296	35,672	46,000	251,000	297,000	8.33	10.14
Vineland	60,231	71,103	253,000	501,000	754,000	10.60	12.52
TOTAL	103,398	111,114	315,000	782,000	1,097,000		
				East County Avg:		9.87	10.61

*Assumes Disposal at New Eastern Landfill in Millville

[1]Assumes Unit Disposal Cost of $7.04/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 3B* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	6,000	10,000	11.85	2.43
Downe Twp.	2,053	494	3,000	3,000	6,000	12.15	2.92
Lawrence Twp.	2,366	910	5,000	6,000	11,000	12.09	4.65
Maurice River Twp.	5,337	2,091	11,000	15,000	26,000	12.43	4.87
Millville	29,296	35,672	89,000	251,000	340,000	9.53	11.61
Vineland	60,231	71,103	103,000	501,000	604,000	8.49	10.03
TOTAL	103,398	111,114	215,000	782,000	997,000		
				East County Avg:		8.97	9.64

*Assumes Disposal at New Eastern Landfill Vineland

[1]Assumes Disposal Cost at $7.04/Ton

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5A * (EAST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	3,974	815	4,000	5,000	9,000	11.04	2.26
Downe Twp.	1,975	477	3,000	3,000	6,000	12.58	3.04
Lawrence Twp.	2,310	891	3,000	6,000	9,000	10.10	3.90
Maurice River Twp.	5,066	1,985	10,000	13,000	23,000	11.59	4.54
Millville	26,790	32,844	87,000	213,000	300,000	9.13	11.20
Vineland	56,448	65,041	163,000	423,000	586,000	9.01	10.38
TOTAL	96,563	102,053	270,000	663,000	933,000		
				East County Avg:		9.14	9.66

*Assumes Disposal at New County Landfill in Deerfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5B * (EAST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	3,974	815	4,000	5,000	9,000	11.04	2.26
Downe Twp.	1,975	477	2,000	3,000	5,000	10.48	1.26
Lawrence Twp.	2,310	891	3,000	6,000	9,000	10.10	3.90
Maurice River Twp.	5,066	1,985	11,000	13,000	24,000	12.09	4.74
Millville	26,790	32,844	77,000	213,000	290,000	8.83	10.82
Vineland	56,448	65,041	280,000	423,000	703,000	10.81	12.45
TOTAL	96,563	102,053	377,000	663,000	1,040,000		
				East County Avg:		10.19	10.77

*Assumes Disposal at New County Landfill in Fairfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5C * (EAST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	3,974	815	2,000	5,000	7,000	8.59	1.76
Downe Twp.	1,975	477	1,000	3,000	4,000	8.39	2.03
Lawrence Twp.	2,310	891	3,000	6,000	9,000	10.10	3.90
Maurice River Twp.	5,066	1,985	10,000	13,000	23,000	11.59	4.54
Millville	26,790	32,844	43,000	213,000	256,000	7.79	9.56
Vineland	56,448	65,041	231,000	423,000	654,000	10.06	11.59
TOTAL	96,563	102,053	290,000	663,000	953,000		
				East County Avg:		9.34	9.87

*Assumes Disposal at New County Landfill in Millville

[1]Assumes Unit Disposal Cost at $6.50/Ton

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5D * (EAST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	3,974	815	4,000	5,000	9,000	11.04	2.26
Downe Twp.	1,975	477	3,000	3,000	6,000	12.58	3.04
Lawrence Twp.	2,310	891	5,000	6,000	11,000	12.35	4.76
Maurice River Twp.	5,066	1,985	10,000	13,000	23,000	11.59	4.54
Millville	26,790	32,844	82,000	213,000	295,000	8.98	11.01
Vineland	56,448	65,041	94,000	423,000	517,000	7.95	9.16
TOTAL	96,563	102,053	198,000	663,000	861,000		
				East County Avg:		8.44	8.92

*Assumes Disposal at New County Landfill in Vineland

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5A* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	5,000	9,000	10.66	2.19
Downe Twp.	2,053	494	3,000	3,000	6,000	12.15	2.92
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	11,000	14,000	25,000	11.96	4.68
Millville	29,296	35,672	95,000	232,000	327,000	9.17	11.16
Vineland	60,231	71,103	178,000	462,000	640,000	9.00	10.63
TOTAL	103,398	111,114	294,000	722,000	1,016,000		
				East County Avg:		9.14	9.83

*Assumes Disposal at New County Landfill in Deerfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5B* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	5,000	9,000	10.66	2.19
Downe Twp.	2,053	494	2,000	3,000	5,000	10.12	2.44
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	12,000	14,000	26,000	12.43	4.87
Millville	29,296	35,672	84,000	232,000	316,000	8.86	10.79
Vineland	60,231	71,103	306,000	462,000	768,000	10.80	12.75
TOTAL	103,398	111,114	411,000	722,000	1,133,000		
					East County Avg:	10.20	10.96

*Assumes Disposal at New County Landfill in Fairfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5C* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	2,000	6,000	8,000	9.48	1.94
Downe Twp.	2,053	494	1,000	3,000	4,000	8.10	1.94
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	10,000	15,000	25,000	11.96	4.68
Millville	29,296	35,672	46,000	251,000	297,000	8.33	10.14
Vineland	60,231	71,103	253,000	501,000	754,000	10.60	12.52
TOTAL	103,398	111,114	315,000	782,000	1,097,000		
				East County Avg:		9.87	10.61

*Assumes Disposal at New Eastern Landfill in Millville

[1]Assumes Unit Disposal Cost of $7.04/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5D* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	6,000	10,000	11.85	2.43
Downe Twp.	2,053	494	3,000	3,000	6,000	12.15	2.92
Lawrence Twp.	2,366	910	5,000	6,000	11,000	12.09	4.65
Maurice River Twp.	5,337	2,091	11,000	15,000	26,000	12.43	4.87
Millville	29,296	35,672	89,000	251,000	340,000	9.53	11.61
Vineland	60,231	71,103	103,000	501,000	604,000	8.49	10.03
TOTAL	103,398	111,114	215,000	782,000	997,000		
				East County Avg:		8.97	9.64

*Assumes Disposal at New Eastern Landfill Vineland

[1]Assumes Disposal Cost at $7.04/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5A * (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs to T/S($)	Annual Transfer[1] Station Cost($)	Annual Disposal Cost ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,371	12,000	21,000	96,000	129,000	8.76	6.68
Deerfield Twp.	2,806	774	1,000[2]	—	5,000	6,000	7.75	2.14
Fairfield Twp.	6,199	736	1,000	1,000	5,000	7,000	9.51	1.13
Greenwich-Hopewell Twp.	5,271	1,600	4,000	2,000	10,000	16,000	10.00	3.04
Shiloh-Stow Creek Twp.	1,993	1,908	4,000	3,000	12,000	19,000	9.96	9.53
Upper Deerfield Twp.	7,200	735	2,000	1,000	5,000	8,000	10.88	1.11
TOTAL	42,770	20,484	24,000	28,000	133,000	185,000		
					West County Avg:		9.03	4.33

*Assumes Disposal at New County Landfill in Deerfield

[1]Includes Amortization of Transfer Station Cost Plus Transport Costs to Disposal Location

[2]Waste is Transported Directly to Landfill Located Within the Township

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5B * (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs to T/S($)	Annual Transfer[1] Station Cost($)	Annual Disposal Cost ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,371	12,000	20,000	96,000	128,000	8.69	6.63
Deerfield Twp.	2,806	774	2,000	1,000	5,000	8,000	10.34	2.85
Fairfield Twp.	6,199	736	1,000[2]	—	5,000	6,000	8.15	0.97
Greenwich-Hopewell Twp.	5,271	1,600	4,000	2,000	10,000	16,000	10.00	3.04
Shiloh-Stow Creek Twp.	1,993	1,908	4,000	3,000	12,000	19,000	9.96	9.53
Upper Deerfield Twp.	7,200	735	2,000	1,000	5,000	8,000	10.88	1.11
TOTAL	42,770	20,484	25,000	27,000	133,000	185,000		
					West County Avg:		9.03	4.33

*Assumes Disposal at New County Landfill in Fairfield

[1]Includes Amortization of Transfer Station Cost Plus Transport Costs to Disposal Location

[2]Waste transported directly to landfill located within the Township

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5C * (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs to T/S($)	Annual Transfer[1] Station Cost($)	Annual Disposal Cost ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,371	12,000	31,000	96,000	139,000	9.44	7.20
Deerfield Twp.	2,806	774	2,000	2,000	5,000	9,000	11.63	3.21
Fairfield Twp.	6,199	736	1,000	2,000	5,000	8,000	10.87	1.29
Greenwich-Hopewell Twp.	5,271	1,600	4,000	3,000	10,000	17,000	10.63	3.23
Shiloh-Stow Creek Twp.	1,993	1,908	4,000	4,000	12,000	20,000	10.48	10.04
Upper Deerfield Twp.	7,200	735	2,000	2,000	5,000	9,000	12.24	1.25
TOTAL	42,770	20,484	25,000	44,000	133,000	202,000		
					West County Avg:		9.86	4.72

*Assumes Disposal at New County Landfill in Vineland

[1]Includes Amortization of Transfer Station Cost Plus Transport Costs to Disposal Location

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5D * (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs to T/S($)	Annual Transfer[1] Station Cost($)	Annual Disposal Cost ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,371	12,000	32,000	96,000	140,000	9.50	7.25
Deerfield Twp.	2,806	774	2,000	2,000	5,000	9,000	11.63	3.21
Fairfield Twp.	6,199	736	1,000	2,000	5,000	8,000	10.87	1.29
Greenwich-Hopewell Twp.	5,271	1,600	4,000	4,000	10,000	18,000	11.25	3.41
Shiloh-Stow Creek Twp.	1,993	1,908	4,000	4,000	12,000	20,000	10.48	10.04
Upper Deerfield Twp.	7,200	735	2,000	2,000	5,000	9,000	12.24	1.25
TOTAL	42,770	20,484	25,000	46,000	133,000	204,000		
					West County Avg:		9.96	4.77

*Assumes Disposal at New County Landfill in Millville

[1]Includes Amortization of Transfer Station Cost Plus Transport Costs to Disposal Location

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5 A * (WEST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs to T/S ($)	Annual Transfer[1] Station Cost($)	Annual Disposal Cost($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,469	14,675	12,000	21,000	95,000	128,000	8.72	6.57
Deerfield Twp.	2,650	731	1,000[2]	—	5,000	6,000	8.20	2.26
Fairfield Twp.	5,863	700	1,000	1,000	5,000	7,000	10.00	1.19
Greenwich-Hopewell Twp.	5,055	1,534	4,000	2,000	10,000	16,000	10.43	3.17
Shiloh-Stow Creek Twp.	1,898	1,817	3,000	3,000	12,000	18,000	9.91	9.48
Upper Deerfield Twp.	6,616	685	1,000	1,000	5,000	7,000	10.22	1.06
TOTAL	41,551	20,142	22,000	28,000	132,000	182,000		
					West County Avg:		9.04	4.38

*Assumes Disposal at New County Landfill in Deerfield

[1]Includes Amortization of Transfer Station Cost Plus Transport Costs to Disposal Location

[2]Waste is Transported Directly to Landfill Located Within the Township

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5B * (WEST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs to T/S ($)	Annual Transfer[1] Station Cost($)	Annual Disposal Cost($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,469	14,675	12,000	19,000	95,000	126,000	8.59	6.47
Deerfield Twp.	2,650	731	2,000	1,000	5,000	8,000	10.94	3.02
Fairfield Twp.	5,863	700	1,000[2]	—	5,000	6,000	8.57	1.02
Greenwich-Hopewell Twp.	5,055	1,534	4,000	2,000	10,000	16,000	10.43	3.17
Shiloh-Stow Creek Twp.	1,898	1,817	3,000	2,000	12,000	17,000	9.36	8.96
Upper Deerfield Twp.	6,616	685	1,000	1,000	5,000	7,000	10.21	1.06
TOTAL	41,551	20,142	23,000	25,000	132,000	180,000		
					West County Avg:		8.94	4.33

*Assumes Disposal at New County Landfill in Fairfield

[1]Includes Amortization of Transfer Station Cost Plus Transport Costs to Disposal Location

[2]Waste Transported Directly to Landfill Located Within the Township

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5C * (WEST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs to T/S ($)	Annual Transfer[1] Station Cost($)	Annual Disposal Cost($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,469	14,675	12,000	31,000	95,000	138,000	9.40	7.09
Deerfield Twp.	2,650	731	2,000	2,000	5,000	9,000	12.31	3.40
Fairfield Twp.	5,863	700	1,000	2,000	5,000	8,000	11.43	1.36
Greenwich-Hopewell Twp.	5,055	1,534	4,000	3,000	10,000	17,000	11.08	3.36
Shiloh-Stow Creek Twp.	1,898	1,817	3,000	4,000	12,000	19,000	10.46	10.01
Upper Deerfield Twp.	6,616	685	1,000	1,000	5,000	7,000	10.22	1.06
TOTAL	41,551	20,142	23,000	43,000	132,000	198,000		
					West County Avg:		9.83	4.77

*Assumes Disposal at New County Landfill in Millville

[1]Includes Amortization of Transfer Station Cost Plus Transport Costs to Disposal Location

1982 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 5 D * (WEST)

Municipality	1982 Population	1982 Tons/Year	Annual Transport Costs to T/S ($)	Annual Transfer[1] Station Cost($)	Annual Disposal Cost($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,469	14,675	12,000	32,000	95,000	139,000	9.47	7.14
Deerfield Twp.	2,650	731	2,000	2,000	5,000	9,000	12.31	3.40
Fairfield Twp.	5,863	700	1,000	2,000	5,000	8,000	11.43	1.36
Greenwich-Hopewell Twp.	5,055	1,534	4,000	3,000	10,000	17,000	11.08	3.36
Shiloh-Stow Creek Twp.	1,898	1,817	3,000	4,000	12,000	19,000	10.46	10.01
Upper Deerfield Twp.	6,616	685	1,000	2,000	5,000	8,000	11.68	1.21
TOTAL	41,551	20,142	23,000	45,000	132,000	200,000		
					West County Avg:		9.93	4.81

*Assumes Disposal at New County Landfill in Vineland

[1]Includes Amortization of Transfer Station Cost Plus Transport Costs to Disposal Location

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 6A* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport[1] Costs ($)	Amortization[2] Container Cost($)	Annual Disposal[3] Costs($)	Total Annual Cost($)	$/Ton	Annual $/Capita
Commercial Twp.[4]	4,115	844	2,000	—	6,000	8,000	9.48	1.94
Downe Twp.	2,053	388	2,000	1,000	3,000	6,000	15.46	2.92
Lawrence Twp.	2,366	618	3,000	1,000	6,000	10,000	16.18	4.23
Maurice River Twp.[4]	5,337	2,091	10,000	—	15,000	25,000	11.96	4.68
Millville[4]	29,296	35,672	46,000	—	251,000	297,000	8.33	10.14
Vineland[4]	60,231	71,103	253,000	—	501,000	754,000	10.60	12.52
TOTAL	103,398	110,716	316,000	2,000	782,000	1,100,000		
					East County Avg:		9.94	10.64

*Assumes Disposal At New Eastern Landfill in Millville

[1]Does not include cost of transport to the container

[2]Based on Optimal container size at 8% interest with 6 year asset life

[3]Assumes unit disposal cost at $7.04/Ton

[4]These municipalities will not utilize greenboxes

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 6B* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport[1] Costs ($)	Amortization[2] Container Cost($)	Annual Disposal[3] Costs($)	Total Annual Cost($)	$/Ton	Annual $/Capita
Commercial Twp.[4]	4,115	844	7,000	–	6,000	13,000	15.40	3.16
Downe Twp.	2,053	388	4,000	1,000	3,000	8,000	20.62	3.90
Lawrence Twp.	2,366	618	5,000	1,000	6,000	12,000	19.42	5.07
Maurice River Twp.[4]	5,337	2,091	14,000	–	15,000	29,000	13.87	5.43
Millville[4]	29,296	35,672	89,000	–	251,000	340,000	9.53	11.61
Vineland[4]	60,231	71,103	103,000	–	501,000	604,000	8.49	10.03
TOTAL	103,398	110,716	222,000	2,000	782,000	1,006,000		
						East County Avg:	9.09	9.73

*Assumes Disposal At New Eastern Landfill in Vineland

[1]Does not include cost of transport to the container

[2]Based on Optimal container size at 8% interest with 6 year asset life

[3]Assumes unit disposal cost at $7.04/Ton

[4]These municipalities will not utilize greenboxes

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 6A * (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport[1] Costs ($)	Amortization Container Cost($)	Annual Disposal[3] Costs($)	Total Annual Cost ($)	$/Ton	Annual $/Capita
Bridgeton[4]	19,301	14,731	30,000	—	227,000	257,000	17.45	13.32
Deerfield Twp.	2,806	774	3,000	1,000	12,000	16,000	20.67	5.70
Fairfield Twp.	6,199	608	3,000	1,000	11,000	15,000	29.67	2.42
Greenwich-Hopewell Twp.	5,271	1,600	9,000	2,000	25,000	36,000	22.50	6.83
Shiloh-Stow Creek Twp.	1,993	1,903	10,000	2,000	29,000	41,000	21.49	20.57
Upper Deerfield Twp.	7,200	598	3,000	1,000	11,000	15,000	25.08	2.08
TOTAL	42,770	20,219	58,000	7,000	315,000	380,000		
						West County Avg:	18.79	8.88

*Assumes disposal at new western landfill in Deerfield

[1]Does not include cost of transport to the container

[2]Based on optimal container size at 8% interest with 6 year asset life

[3]Assumes unit disposal cost at $15.38/Ton

[4]These municipalities will not utilize greenboxes

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 6B * (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport[1] Costs ($)	Amortization Container Cost($)	Annual Disposal[3] Costs($)	Total Annual Cost ($)	$/Ton	Annual $/Capita
Bridgeton[4]	19,301	14,731	21,000	--	227,000	248,000	16.83	12.85
Deerfield Twp.	2,806	774	3,000	1,000	12,000	16,000	20.67	5.70
Fairfield Twp.	6,199	608	1,000	1,000	11,000	13,000	21.38	2.10
Greenwich-Hopewell Twp.	5,271	1,600	5,000	2,000	25,000	32,000	20.00	6.07
Shiloh-Stow Creek Twp.	1,993	1,908	7,000	2,000	29,000	38,000	19.92	19.07
Upper Deerfield Twp.	7,200	598	3,000	1,000	11,000	15,000	25.08	2.08
TOTAL	42,770	20,219	40,000	7,000	315,000	362,000		
						West County Avg:	17.90	8.46

*Assumes disposal at new western landfill in Fairfield

[1]Does not include cost of transport to the container

[2]Based on optimal container size at 8% interest with 6 year asset life

[3]Assumes unit disposal cost at $15.38/Ton

[4]These municipalities will not utilize greenboxes

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 8A* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	30,000	96,000	126,000	8.55	6.53
Deerfield Twp.	2,806	774	1,000	5,000	6,000	7.75	2.14
Fairfield Twp.	6,199	736	2,000	5,000	7,000	9.51	1.13
Greenwich-Hopewell Twp.	5,271	1,600	6,000	10,000	16,000	10.00	3.04
Shiloh-Stow Creek Twp.	1,993	1,908	7,000	12,000	19,000	9.96	9.53
Upper Deerfield Twp.	7,200	735	2,000	5,000	7,000	9.52	0.97
TOTAL	42,770	20,484	48,000	133,000	181,000		
					West County Avg:	8.84	4.23

*Assumes Disposal at New County Landfill in Deerfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 8A* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	5,000	9,000	10.66	2.19
Downe Twp.	2,053	494	3,000	3,000	6,000	12.15	2.92
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	11,000	14,000	25,000	11.96	4.68
Millville	29,296	35,672	95,000	232,000	327,000	9.17	11.16
Vineland	60,231	71,103	178,000	462,000	640,000	9.00	10.63
TOTAL	103,398	111,114	294,000	722,000	1,016,000		
				East County Avg:		9.14	9.83

*Assumes Disposal at New County Landfill in Deerfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 8B* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	26,000	96,000	122,000	8.28	6.32
Deerfield Twp.	2,806	774	2,000	5,000	7,000	9.04	2.49
Fairfield Twp.	6,199	736	1,000	5,000	6,000	8.15	0.97
Greenwich-Hopewell Twp.	5,271	1,600	5,000	10,000	15,000	9.38	2.85
Shiloh-Stow Creek Twp.	1,993	1,908	7,000	12,000	19,000	9.96	9.53
Upper Deerfield Twp.	7,200	735	3,000	5,000	8,000	10.88	1.11
TOTAL	42,770	20,484	44,000	133,000	177,000		
				West County Avg:		8.64	4.14

*Assumes Disposal at New County Landfill in Fairfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 8B* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	5,000	9,000	10.66	2.19
Downe Twp.	2,053	494	2,000	3,000	5,000	10.12	2.44
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	12,000	14,000	26,000	12.43	4.87
Millville	29,296	35,672	84,000	232,000	316,000	8.86	10.79
Vineland	60,231	71,103	306,000	462,000	768,000	10.80	12.75
TOTAL	103,398	111,114	411,000	722,000	1,133,000		
				East County Avg:		10.20	10.96

*Assumes Disposal at New County Landfill in Fairfield

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 8C* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	57,000	96,000	153,000	10.39	7.93
Deerfield Twp.	2,806	774	3,000	5,000	8,000	10.34	2.85
Fairfield Twp.	6,199	736	3,000	5,000	8,000	10.87	1.29
Greenwich-Hopewell Twp.	5,271	1,600	9,000	10,000	19,000	11.88	3.60
Shiloh-Stow Creek Twp.	1,993	1,908	11,000	12,000	23,000	12.05	11.54
Upper Deerfield Twp.	7,200	735	4,000	5,000	9,000	12.24	1.25
TOTAL	42,770	20,484	87,000	133,000	220,000		
				West County Avg:		10.74	5.14

*Assumes Disposal at New County Landfill in Millville

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 8C* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	2,000	6,000	8,000	9.48	1.94
Downe Twp.	2,053	494	1,000	3,000	4,000	8.10	1.94
Lawrence Twp.	2,366	910	3,000	6,000	9,000	9.89	3.80
Maurice River Twp.	5,337	2,091	10,000	15,000	25,000	11.96	4.68
Millville	29,296	35,672	46,000	251,000	297,000	8.33	10.14
Vineland	60,231	71,103	253,000	501,000	754,000	10.60	12.52
TOTAL	103,398	111,114	315,000	782,000	1,097,000		
				East County Avg:		9.87	10.61

*Assumes Disposal at New Eastern Landfill in Millville

[1]Assumes Unit Disposal Cost of $7.04/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 8D* (WEST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs($)	Annual Disposal[1] Costs($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Bridgeton	19,301	14,731	61,000	96,000	157,000	10.66	8.13
Deerfield Twp.	2,806	774	2,000	5,000	7,000	9.04	2.49
Fairfield Twp.	6,199	736	3,000	5,000	8,000	10.87	1.29
Greenwich-Hopewell Twp.	5,271	1,600	9,000	10,000	19,000	11.88	3.60
Shiloh-Stow Creek Twp.	1,993	1,908	10,000	12,000	22,000	11.53	11.04
Upper Deerfield Twp.	7,200	735	2,000	5,000	7,000	9.52	0.97
TOTAL	42,770	20,484	87,000	133,000	220,000		
				West County Avg:		10.74	5.14

*Assumes Disposal at New County Landfill in Vineland

[1]Assumes Unit Disposal Cost at $6.50/Ton

1987 SOLID WASTE TRANSPORT AND DISPOSAL COSTS
ALTERNATIVE 8D* (EAST)

Municipality	1987 Population	1987 Tons/Year	Annual Transport Costs ($)	Annual Disposal[1] Costs ($)	Total Transport & Disposal Costs	$/Ton	Annual $/Capita
Commercial Twp.	4,115	844	4,000	6,000	10,000	11.85	2.43
Downe Twp.	2,053	494	3,000	3,000	6,000	12.15	2.92
Lawrence Twp.	2,366	910	5,000	6,000	11,000	12.09	4.65
Maurice River Twp.	5,337	2,091	11,000	15,000	26,000	12.43	4.87
Millville	29,296	35,672	89,000	251,000	340,000	9.53	11.61
Vineland	60,231	71,103	103,000	501,000	604,000	8.49	10.03
TOTAL	103,398	111,114	215,000	782,000	997,000		
				East County Avg:		8.97	9.64

*Assumes Disposal at New Eastern Landfill Vineland

[1]Assumes Disposal Cost at $7.04/Ton

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AMENDMENTS

TO THE

CUMBERLAND COUNTY

SOLID WASTE MANAGEMENT PLAN