W.P.

Dept. of Environmental Protection
Division of Coastal Resources

Coastal Development Potential Study

ersey Department of Environmental Protection - Division of Coastal Resources

Coastal Development Potential Study

New Jersey Department of Environmental Protection - Division of Coastal Resources

Rogers & Golden
1427 Vine Street
Philadelphia, Pennsylvania 19102

September 1979

Preparation of this document
was partially funded by the
Office of Coastal Zone Management
National Oceanic & Atmospheric Administration
under the provisions of Section 305 of the
Federal Coastal Zone Management Act
(P.L. 92-583 as amended)

Foreword

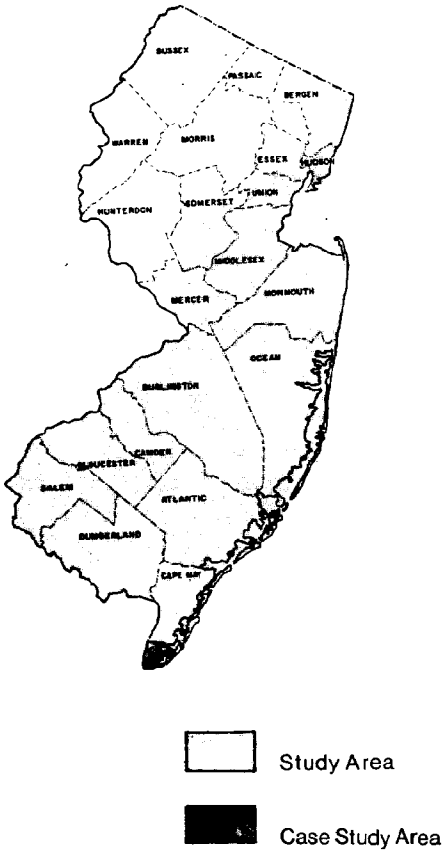
New Jersey's Department of Environmental Protection, Division of Coastal Resources (DEP-DCR), in responding to the requirements of the Federal Coastal Zone Management Act (CZMA) (P.L. 92-583), is engaged in assessing the development potential of the coastal zone for a number of uses. This study is in support of that responsibility.

The Division of Coastal Resources has developed a Coastal Location Acceptability Method (CLAM). The Development Potential Study is part of CLAM and specifically examines development potential from the vantage point of a developer if he operated in an unregulated environment.

This study provides descriptions of potential land and water uses by detailing factors in the built and natural environment that influence development. It also presents a method for evaluating the costs occurring for a use in any one location. At this time, the Division of Coastal Resources plans to use the information presented in this report for various planning endeavors.

As shown on the accompanying map, the study area comprises the Coastal Plain, the Hackensack Meadowlands, and all other land within 2,000 feet of tidal water. A case study, using the costs and the method for identifying sites with high development potential, was performed in lower Cape May County.

Many assumptions and special considerations were required in developing the sets of cost estimates for the land and water uses. For full understanding and proper use of this report, one should carefully read all introductory materials, notes and assumptions.



Study Area

Case Study Area

Acknowledgments

This study was greatly aided by information and insights generously made available to us by developers and other professionals who shared their knowledge of New Jersey with us.

Stewart McKenzie, designer of the Coastal Location Acceptability Method (CLAM), of which this study is a part, managed the contract for DEP-DCR and provided many helpful suggestions.

David Kinsey, Acting Director of DCR, was project leader for this, as well as other CLAM studies.

Michael Hochman, Data Manager of DCR, aided our research and provided cartographic expertise.

We especially acknowledge the following individuals who served on the steering committee for their help in formulating criteria, compiling cost and factor data, reviewing drafts, and participating in work sessions.

COASTAL DEVELOPMENT POTENTIAL STUDY
STEERING COMMITTEE

Michael Redpath
Soundings

Mercedes Johnson
Marine Trades Association

Robert L. Myers
Cape May County Planning Board

Joe Andrea
Wapora, Inc.

Carl Eby
Soil Conservation Service

John Serkies
Office of Business Advocacy
Department of Labor & Industry

Barry Weshnak
Barrymor Enterprises

Joseph Birgeles
NY/NJ Port Authority

Tom Thomas
Townplan Associates

John J. Tedesco
The Coastal Group, Inc

Hirair Hovnanian
Hovson's Inc.

Dave Bosted
Department of Community Affairs

Dana Rowan
American Littoral Society

David Cox
New Jersey Department of Transportation

Arthur E. Williamson, Sr.
A.E. Williamson & Co.

Cable Spence
New Jersey Farm Bureau

Thomas Hall
Governor's Office of Policy & Planning

Ralph Treadway
Division of Planning and Research
Department of Labor and Industry

David Steiner
Supler Construction

Joseph L. Lomax
Osprey, Inc.

Ken Bosted
Green Acres, Department of Environmental Protection

Michael Gross
Giordano, Halleron and Crahoy

John Bachalis
New Jersey Business and Industry Association

Gary Sawhill
Coastal Plains, Inc.

Susan Bonsall
Department of Environmental Resources
Cook College, Rutgers

Staff

John Rogers, Study Director

USES

George Macpherson
Fritts Golden
Joanne Jackson
John Rogers

COSTS

George Macpherson
Joanne Jackson
John Rogers

SURVEY OF DEVELOPERS

Joanne Jackson

FACTOR RESEARCH

Joanne Jackson
John Rogers
George Macpherson
Anne Marble

CASE STUDIES

John Rogers
Joanne Jackson
Anne Marble
Mei-Ing Liu

DEVELOPMENT POTENTIAL ANALYSIS METHOD

John Rogers
Fritts Golden
Peter Harms

COMPUTER PROGRAM

Peter Harms

GRAPHICS

Mei-Ing Liu

EDITING

Fritts Golden
John Rogers
Joanne Jackson

PRINTING

Speedy Impressions
Philadelphia, PA

MAP PRODUCTION

The Campion Co.
Philadelphia, PA

D&W
Trenton, NJ

SUBCONTRACTORS

Dames & Moore
Jim Cool
Phil Hopkins

Table of Contents

List of Tables

List of Figures

Chapter 1
Introduction

Section 303(a) of the Federal Coastal Zone Management Act (CZMA) (P.L. 92-583) sets forth a goal of Coastal Zone Management Programs, which is "to preserve, protect, develop and, where possible, to restore or enhance, the resources to the Nation's coastal zone for this and succeeding generations."

Two of these objectives - preservation and development - often are in conflict. In order to strike a balance, detailed information is needed as to which coastal locations have high priority or potential for development and which coastal locations are sensitive to impacts.

The purpose of this study is to provide the New Jersey Department of Environmental Protection, Division of Coastal Resources (DEP-DCR) with detailed information for use in determining the development potential of coastal locations for particular land and water uses. "Development potential" is defined here as the capability of an area to be developed for a specific use and refers to cost considerations, as opposed to environmental and socio-economic factors.

The Development Potential Study is one part of New Jersey's Coastal Location Acceptability Method (CLAM). The other two portions, an Environmental Sensitivity Analysis and a Socio-Economic Analysis, will be used with this study to identify areas in which there are conflicts between environmental and socio-economic factors and development potential and to determine Use-Location Acceptability Ranks. Once conflicts have been identified and rankings made, the feasibility of new development will be more clearly understood. The flow chart for the CLAM analysis procedure is shown in Figure 1.

The Development Potential Study describes 182 land and water uses, lists those factors of the physical environment (both natural and man-made) which influence those uses, and presents a method - Development Potential Analysis - whereby various locations in a given area are studied for a specific use and ranked for development potential according to total development costs.

The land and water uses studied were identified by DEP-DCR in cooperation with Rogers & Golden. They are grouped into seven major categories: housing, commerce, industry, utilities, infrastructure, harvest, and recreation. A list of 65 development potential factors was compiled from the uses studied.

Development potential factors are those elements or characteristics of the built or natural environment which are required for successful development of a use, or which are desirable and enhance the attractiveness of a location for development. The locational requirements of the uses dictate the number and type of the development potential factors. These factors were taken from a literature survey of each use and further confirmed, except for the standard industrial classifications, by questionnaire and telephone interviews. Table 1 is a matrix which shows the relationship between uses and development potential factors.

Some factors are use-specific, such as mineral resources for the extraction industry, while other factors, such as access to roads, apply to almost all uses. More important, some factors are essential for the location of a facility, such as volume of processing water to an industry, while others represent costs or levels of desirability, such as vegetation or views of water. In many cases, the particular combination of factors will be the real determinant for development potential for a particular use.

The critical elements of this method are the data base - the factor maps and factor cost sheets - and the techniques for analyzing the factors relevant to a specific use. Chapter 4, Case Studies, indicates that the method and the data are currently workable for regional planning purposes. The information presented in this report may be supplemented or refined through updating and through the use of specific information gained from subsequent use of the method.

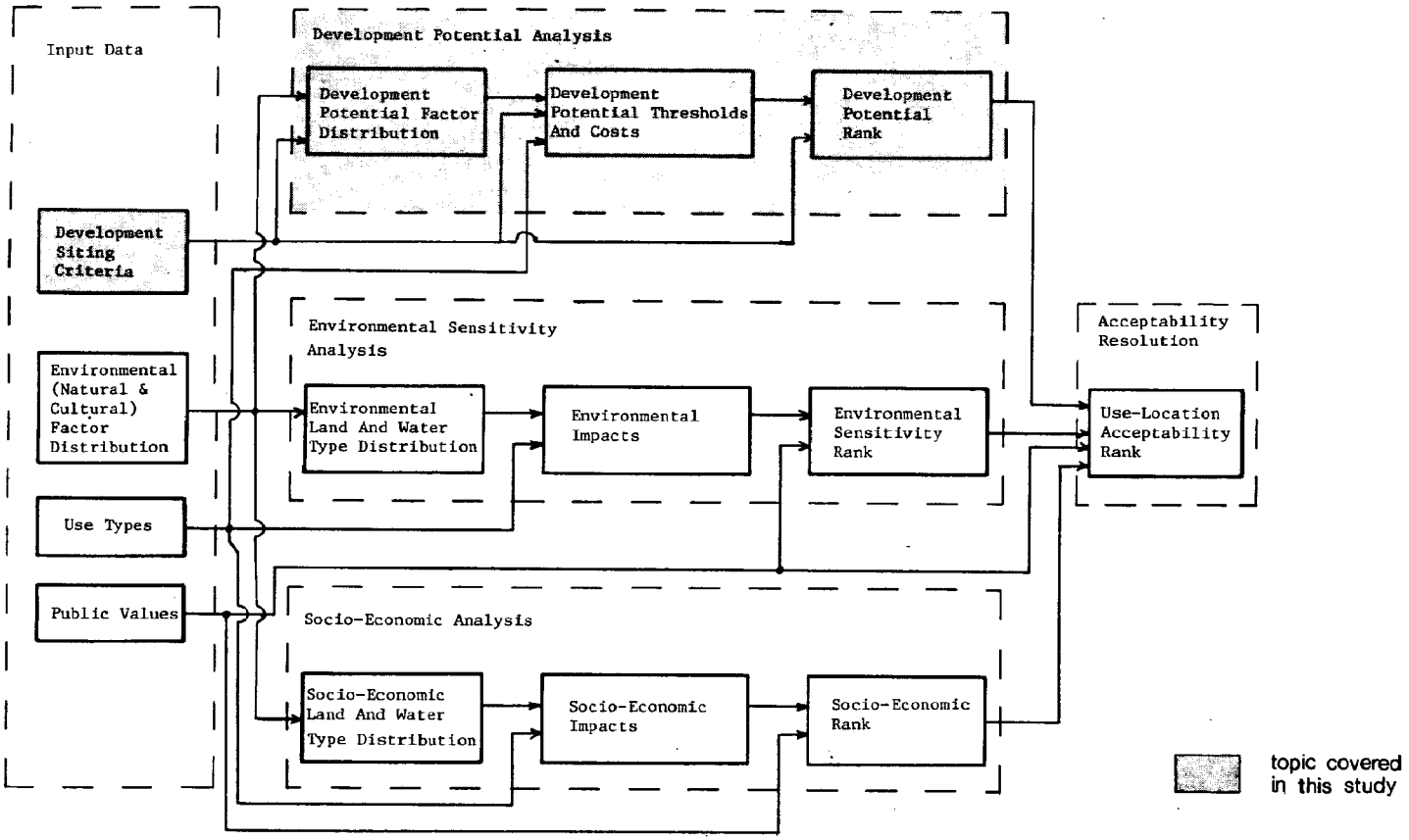
It should be emphasized that the Development Potential Analysis procedure presented here is a logical process, siting costs being the major determinant. Some facility or development planners, usually the larger and more experienced ones, use a rational approach to a project, balancing a carefully weighted set of factors. Among the tools of such developers are market analysis and research into land costs, taxes, and government regulation. This study assumes that such research would be done by the developer before Development Potential Analysis.

Other development planners use a more intuitive approach. Still others may use very few locational factors, perhaps simply finding acreage in the area where the chairman of the board wants to live. Obviously, the location of new development cannot always be predicted. The aim of this study is to present a rational method for determining development potentials for specified uses.

It is necessary to appreciate the logic and limits of the Development Potential Study in order to understand the method presented here. The following sections detail the assumptions and considerations that have gone into the study.

FIGURE 1.

SIMPLIFIED FLOW CHART OF THE CLAM ANALYSIS PROCEDURE



are reasonable as they pertain to the specific characteristics of the prototypes. The quality of construction, especially in housing types, and the scale of a particular development, could result in substantially different costs. Even in areas as small as the coastal plain of New Jersey there are significant regional cost differences. For these reasons the cost information should be considered as a general guide. Methods for adjusting the cost figures for inflation are presented in the Appendix.

The factor cost may be either plus (+) or minus (-). Those marked with a (+) are called bonus values because they increase the value of the land use. Those marked with a (-) are deficiency costs because they represent additional expenses that must be met by the developer.

A baseline site type is defined as a site type with no bonus values and no deficiency costs. Baseline cost, then, is the cost of constructing the baseline development size of a given prototype on a baseline site type. The baseline cost plus any bonus values and/or deficiency costs become total development costs.

The baseline unit cost given for each land use represents the cost of building materials and construction - what builders refer to as "bricks and mortar" - and certain development potential factor specifications. These factor specifications are known as baseline specifications and are shown in the cost tables in Chapter 2. One data category of each factor was designated as the baseline specification.

Each data category of each factor was assigned a cost (except, of course, the data category designated as the baseline specification, which is zero-cost because its costs were included in the baseline cost).

Information for the cost figures was obtained from builders, lawyers, real estate agents and a thorough literature search.

Factor Information

Chapter 3 is composed of Factor Information and Factor Discussion Sheets. There is a Factor Information Sheet for every factor employed in the Development Potential Study. These Factor Information Sheets present the best source of mapped information. In cases where the factor is not mapped, cannot be mapped, or a map was prepared by Rogers and Golden specifically for this study, a Factor Discussion Sheet is also presented. The Factor Information and Discussion Sheets make possible quick and accurate assessments of the data base.

Development Potential Analysis

The Development Potential Analysis is a method whereby various locations in a given area are studied for a specified use and ranked according to development costs. The method has six sequential steps, as shown in Figure 2.

This method allows the user to look at a potential land or water use across a study area or to look at a number of land and water uses in an area. The method can also be used to review the development potential of a site.

A computer model has been developed in both batch and interactive modes to perform all the steps except mapping factors.

Case Studies

Three uses - Marinas, Fish Processing Plants and Detached Housing - were chosen to illustrate how the Development Potential Analysis Method works. The case studies comprise Chapter 4.

These uses are examined at two scales. They are first presented for the entire study area and for a part of a county - the lower portion of Cape May County.

The three uses were mapped at 1:250,000 for the entire study area and at 1:24,000 for lower Cape May County. Due to the difficulties of accurate mapping at 1:250,000 (a half-mile becomes approximately one-quarter inch) and the reductions that were necessary to include these maps in this report, only necessary (black dot) factors were mapped at the 1:250,000 scale. At both scales, the costs associated with each relevant factor were summed and high, medium and low development potentials were assigned to each site-type.

Because its assumptions, criteria and procedures, are explicit the Development Potential Analysis Method can be an important planning tool for state planners and facility developers. As criteria and data are improved or modified in the future, the method should become increasingly useful as a planning tool.

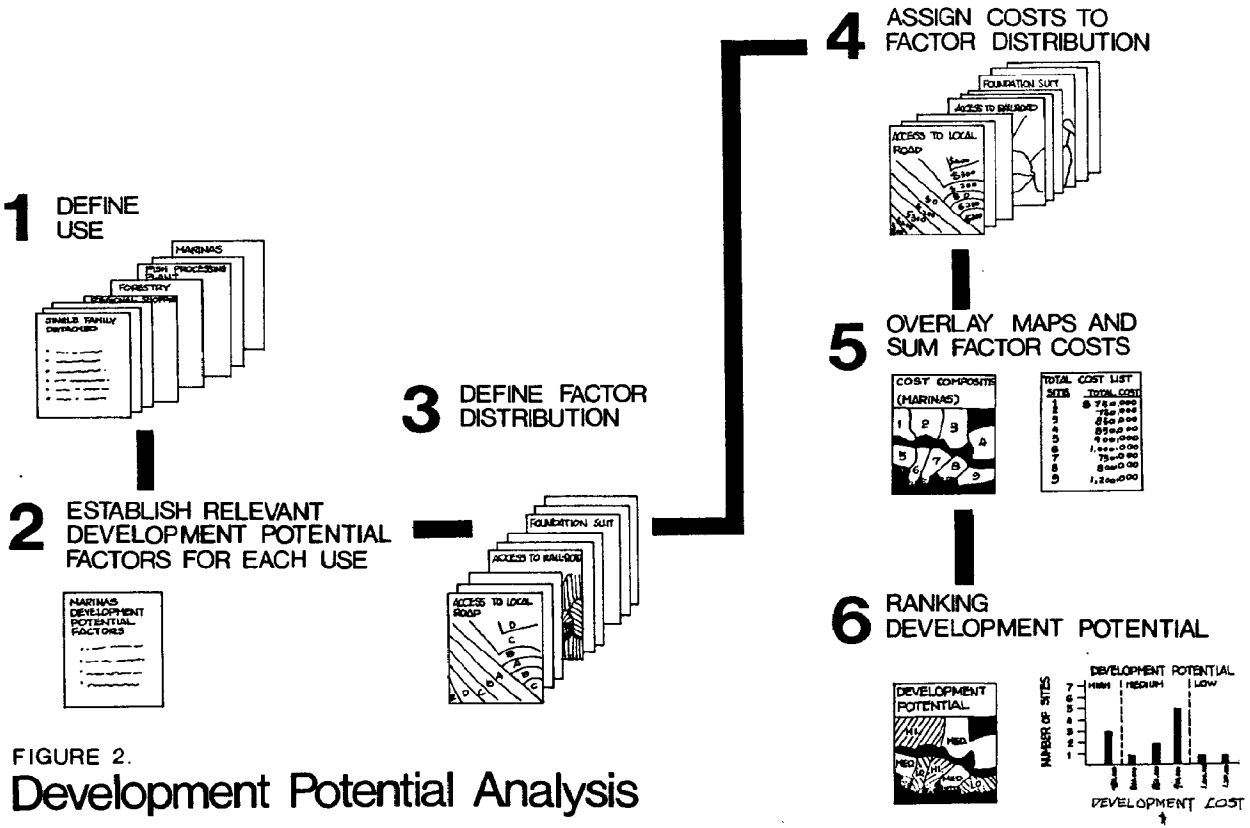


FIGURE 2.

Development Potential Analysis

Chapter 2
Use Descriptions and Cost Data

This chapter presents 182 land and water uses (hereafter referred to as "land uses") compiled for this study by New Jersey's DEP-DCR and Rogers & Golden. A prototype was established for each use to facilitate concentration on the most important features of that use type. Site plans and photographs accompany each land use description. (Note that these are for illustration and do not form the basis for the cost figures given.)

Once the list of land uses was established (see Table 2), questionnaires were sent to builders, developers, real estate agents and facility operators to determine the Baseline Unit Cost of construction for each use and its Development Potential Factors (elements or characteristics of the environment necessary or highly desirable for the given land use). The questionnaires were followed by telephone interviews. (Table 3.)

Certain definitions had to be established and assumptions made in order to develop the list of the Development Potential Factors and the costs associated with each use.

The majority of Development Potential Factors can be grouped into four major categories: access factors, proximity factors, site factors and amenity factors. These are discussed more fully on the Factor Information Sheets in Chapter 3. Data on each relevant factor is provided on the Factor Cost Sheets, which accompany the use descriptions in this chapter. Additional cost information is given in Table 4, Element Cost Sheets.

Factor Considerations

ACCESS FACTORS -- Access factors pertain to a site's location with respect to infrastructure required by any given use. Most uses, for example, require road access. Therefore, the cost of building an access road is a deficiency cost to those uses locating at sites requiring an access road. Access factors have in common the fact that they represent a direct outlay by the developer. Insofar as they represent fairly hard engineering costs, they can be estimated with a relatively high level of confidence.

In manual analysis, data categories in access factors are assigned to ranges of distance (i.e., Data Category I: 0-1/2 mile). Costs are calculated in each category by multiplying the element cost by the average distance of the data category (in this example, 1/4 mile).

Access to Roads -- The type, and therefore the cost, for access roads varies with the use. Rural housing, for example, requires no more than an unpaved road that is perhaps more accurately thought of as a driveway. Other uses, which generate higher levels of traffic, require access roads built to higher standards. Element costs for three different levels of access road may be found on the Element Cost Sheet.

Access to Railroad -- This cost is for a single-track rail spur. Estimates for this factor vary widely. They may be found on the Element Cost Sheet.

Access to Electric Power Transmission Grid and Distribution Line -- There are a number of variables associated with this factor, the principal ones being voltage of the line, amperage, single-phase or multiphase, and whether the line is overhead or underground. Also, utilities have a rather complex pricing policy by which they may reduce the charges for their cost of extending a line based upon their anticipated revenue from the extension. Approximate linear costs for distribution lines, both overhead and underground, and for overhead transmission lines, may be found on the Element Cost Sheet.

Access to Channel -- The assumptions for channel dredging costs, in general, are that the channel's sides will be angled at 45°, and that an average of one-half the depth of the channel will have to be dredged. Assumptions as to channel width and cost per cubic yard of material dredged may be found on the Factor Cost Sheets of the uses in question.

Access to Public Water Supply -- Costs given for access to water supply vary with the type of facility. Element costs for three types of pipes are given on the Element Cost Sheet.

Access to Public Sewerage -- Costs given for access to water supply vary with the type of facility. The cost of installing pipe of various sizes is given on the Element Cost Sheet.

Access to Gas Pipeline -- This factor is important to many industries. Costs are based on the pipe sizes given on the Element Cost Sheet.

PROXIMITY FACTORS -- Unlike access factors, which represent a direct dollar cost to the developer of the use in question, proximity factors represent the amount of money that a representative developer of a given use would be willing to pay for proximity to a particular factor. In this sense, the figures given represent an attempt to approximate the vagaries of the marketplace. The figures are based on information gathered from a large number of interviews and questionnaire responses with various New Jersey builders and developers. Because of their intrinsically soft nature, however, these figures generally cannot be regarded with as high a level of confidence as can the figures for access factors. There also tends to be a greater degree of variation across the study area for them, as they are more dependent on local market conditions.

As with access factors, data categories are assigned to ranges of distance and costs are estimated on the basis of the average distance in each category. All proximity factors have been calculated with simple radii. It would be desirable to calculate these factors using travel time; however, these data were not available.

The cost figures pertaining to service and market centers are the result of a two-step process. The first step categorizes urban

TABLE 2. LAND USE INDEX

HOUSING
1. Rural housing
2. Single family detached
3. Single family attached
4. Garden apartments and midrise housing
5. Highrise housing
6. Mobile homes
7. Retirement communities

COMMERCE AND SERVICE
8. Regional shopping centers
9. Neighborhood shopping centers
10. Hotels and motels
11. Warehousing

INDUSTRIAL
Standard Industrial Classifications
FOOD AND KINDRED PRODUCTS (20)
12. Meat and packing plants (2011)
13. Sausages and other prepared meats (2013)
14. Poultry dressing plants (2015)
15. Creamery butter (2021)
16. Cheese, natural and processed (2022)
17. Condensed and evaporated milk (2023)
18. Ice cream and frozen desserts (2024)
19. Fluid milk (2026)
20. Canned and cured seafood (2031)
21. Canned specialties (2032)
22. Canned fruits and vegetables (2033)
23. Dehydrated food products (2034)
24 Pickles, sauces and salad dressings (2035)
25. Fresh and frozen packaged fish (2036)
26. Frozen fruits and vegetables (2037)
27. Flour and other grain mill products (2041)
28. Prepared feed for animals and fowl (2042)
29. Distilled liquor, except brandy (2085)
30. Bottled and canned soft drinks (2086)
31. Food preparation necessities (2099)
TEXTILE AND MILL PRODUCTS (22)
32. Weaving mills, cotton (2211)
33. Weaving mills, synthetics (2221)
34. Weaving and finishing mills, wool (2231)
35. Knit fabric mills (2256)
36. Knitting mills, nec (2259)
37. Finishing plants, cotton (2261)
38. Finishing plant, synthetic (2262)
39. Tufted carpets and rugs (2272)
40. Felt goods, nec (2291)
41. Processed textile waste (2294)
42. Coated fabrics, not rubberized (2295)
43. Tire cord and fabric (2296)
44. Cordage and twine (2298)
APPAREL AND OTHER TEXTILE PRODUCTS(23)
45. Men's and boys' clothing, nec (2329)
46. Women's and misses dresses (2335)
47. Corsets and allied garments (2342)
LUMBER AND WOOD PRODUCTS (24)
48. Logging camps and contractors (2411)
49. Sawmills and planing mills, general (2421)
50. Millwork (2431)
51. Veneer and plywood (2432)
52. Wood preserving (2491)
FURNITURE AND FIXTURES (25)
53. Wood office furniture (2521)
54. Metal office furniture (2522)
55. Public building furniture (2531)
56. Metal partitions and fixtures (2542)
PAPER AND ALLIED PRODUCTS (26)
57. Pulp mills (2611)
58. Paper mills except building paper (2621)
59. Paperboard mills (2631)
60. Paper coating and glazing (2641)
61. Bags, except textile bags (2643)
62 Die cut paper and board (2645)
63 Presses and molded pulp goods (2646)
64 Sanitary paper products (2647)
65 Converted paper products (2649)
66 Folding paper board boxes (2651)
67. Set-up paper board boxes (2652)
68 Building paper and board mills (2661)
PRINTING AND PUBLISHING (27)
69. Book printing (2732)
70. Commercial printing lithograph (2752)
71. Manifold business forms (2761)
72. Typesetting (2791)
CHEMICALS AND ALLIED PRODUCTS (28)
73. Alkalies and chlorine (2812)
74. Industrial gases (2813)
75. Cyclic intermediates and crudes (2815)
76. Inorganic pigments (2816)
77. Industrial organic chemicals (2818)
78 Industrial inorganic chemicals (2819)
79 Plastic material and resins (2821)
80. Synthetic rubber (2822)
81. Cellulosic man-made fibers (2823)
82. Pharmaceutical preparations (2834)
83 Soap and other detergents (2841)
84 Toilet preparations (2844)
85 Paints and allied products (2851)
86 Fertilizers (2871)
87 Agricultural chemicals (2879)
88. Adhesive- and gelatins (2891)
89. Explosives (2892)
90. Printing ink (2893)
91. Carbon black (2895)
92. Chemical preparations (2899)
PETROLEUM AND COAL PRODUCTS (29)
93. Paving mixtures and blocks (2951)
94. Asphalt felt and coatings (2952)
95. Lubricating oils and greases (2992)
96. Petroleum and coal products (2999)
RUBBER AND PLASTIC PRODUCTS (30)
97. Miscellaneous plastics products (3011)
LEATHER AND LEATHER PRODUCTS (31)
98. Leather and leather tanning (3111)
STONE, CLAY AND GLASS PRODUCTS (32)
99. Flat glass (3211)
100. Glass containers (3221)
101. Pressed and blown glass (3229)
102. Concrete block and brick (3271)
103. Concrete products (3272)
104. Lime (3274)
105. Gypsum products (3275)
106. Asbestos products (3292)
PRIMARY METAL INDUSTRIES (33)
107. Gray iron foundries (3321)
108. Malleable iron foundries (3322)
109. Steel foundries (3323)
110. Primary copper (3331)
111. Primary lead (3332)
112. Primary zinc (3333)
113. Primary aluminum (3334)
114. Nonferrous wire drawing & insulating (3357)
115. Primary metal products, nec (3399)
FABRICATED METAL PRODUCTS (34)
116. Cutlery (3421)
117. Miscellaneous metal work (3449)
118. Screw machine products (3451)
119. Metal stamping (3461)
120. Valves and pipe fittings (3494)
121. Metal foil and leaf (3497)
MACHINERY, EXCEPT ELECTRICAL (35)
122. Farm machinery (3522)
123. Construction machinery (3531)
124. Hoists, cranes and monorails (3536)
125. Machine tools, metal cutting type (3541)
126. Machine tools, metal farming types (3542)
127. Special dies, tools, jigs, fixtures (3544)
128. Metal working machinery, nec (3548)
129. Paper industries machinery (3554)
130. Printing industry machinery (3555)
131. Special industry machines, nec (3559)
132. Pumps and compressors (3561)
133. Power transmission equipment (3566)
134. Miscellaneous machinery (3599)
ELECTRICAL EQUIPMENT & SUPPLIES (36)
135. Electric measurement equipment(3611)
136. Motor and generators (3621)
137. Electric housewares & fans (3634)
138. Electric lamps (3641)
139. Lighting fixtures (3642)
140. Radio and TV receiving sets (3651)
141. Electric components (3679)
TRANSPORTATION EQUIPMENT (37)
142. Motor vehicles (3711)
143. Motor vehicles parts & accessories (3714)
144. Aircraft equipment, nec (3729)
145. Boat building and repairing (3732)
146. Motorcycles & bicycles & parts (3751)
INSTRUMENTS AND RELATED PRODUCTS (38)
147. Engineering & scientific instruments (3811)
148. Optical instruments & lenses (3831)
149. Surgical & medical instruments (3841)
150. Surgical appliances & supplies (3842)
151. Ophthalmic goods (3851)
152. Photographic equipment & supplies (3861)
153. Extraction industry (No SIC)

INFRASTRUCTURE
154. Collector and local roads
155. Limited access roads
156. Railroad
157. Ports (Major)
158. Ports (Minor)
159. Airports

UTILITIES
160. Liquid waste disposal
161. Solid waste disposal
162. Communication structures
163. Water supply

HARVEST
164. Field crops
165. Fresh market vegetables
166. Nurseries
167. Greenhouses
168. Orchards
169. Cranberry farming
170. Blueberry farming
171. Forest
172. Commercial fishing docks

RECREATION
173. Playing fields
174. Golf courses
175. Seashore amusement parks
176. Campgrounds
177. Summer campgrounds
178. Parks
179. Beach bathing
180. Sport fishing
181. Marinas
182. Natural areas and rivers

areas; the second measures the influence of the urban center in siting new development. The classification system distinguishes between three types of urban centers. The two Metropolitan Service Centers that influence the data -- New York and Philadelphia -- are outside of the study area, but the inclusion of this factor accounts for the desire to develop around these cities and within the New York-Philadelphia corridor.

Those areas designated as Regional Service Centers usually have a population of at least 7,000 (1970 census). There are two exceptions to this. County seats are designated as Regional Service Centers, even if their population is less than 7,000, because of the variety of services they offer. Urban areas where the summer population exceeds 7,000 are also included in the Regional Service Center category. Those areas with lesser population but having a post office, a bank, and a supermarket are designated as Community Service Centers.

The second step is assigning accessibility to service and market centers. Since Regional Service Centers offer more services, they draw from a larger area. Fifteen miles, a distance roughly equal to thirty minutes driving time, is considered to be the maximum range of influence Regional Service Centers have in the siting of developments. In other words, Regional Service Centers do not create bonus values for developments located more than 15 miles away from them. Community Service Centers offer fewer services and therefore have a smaller drawing area. They influence development potential only within a radius of five miles.

Proximity to Major Highway Intersection

A major highway intersection is the intersection of an arterial road and one or more collector roads, or of two or more arterial roads, or an interchange of a limited access road.

Proximity to Metropolitan Service Center

Two Metropolitan Service Centers influence the study area. They are Phila-

TABLE 3. DISTRIBUTION OF QUESTIONNAIRES AND TELEPHONE INTERVIEWS COMPLETED FOR THIS STUDY BY USE CATEGORIES AND COUNTIES

USE CATEGORIES	ATLANTIC COUNTY	BERGEN COUNTY	BURLINGTON COUNTY	CAMDEN COUNTY	CAPE MAY COUNTY	CUMBERLAND COUNTY	ESSEX COUNTY	GLOUCESTER COUNTY	HUNTERDON COUNTY	MERCER COUNTY	MIDDLESEX COUNTY	MONMOUTH COUNTY	MORRIS COUNTY	OCEAN COUNTY	SALEM COUNTY	SOMERSET COUNTY	UNION COUNTY	TOTAL
HOUSING	8	1	2	1	3	1	1	4	1	1	2	1	1	7	3	1	1	39
COMMERCE AND SERVICE	10	2	2	1	2	1	1	3	1	1	1	2	1	8	2	1	1	40
INDUSTRIAL	2	2	2	2	2	2	2	2	2	4	2	2	2	4	3	1	1	37
INFRASTRUCTURE	1	3	2	2	3	1	1	2	1	1	1	1	1	3	1	1	1	26
UTILITIES	3	7	4	4	3	1	4	2	3	1	4	2	3	3	1	1	3	49
HARVEST	3	3	3	4	2	2	2	4	2	2	4	2	2	3	2	2	2	44
RECREATION	2	0	1	1	2	1	2	2	1	2	1	1	1	1	1	1	1	21
TOTAL	29	18	16	15	17	9	13	19	11	12	15	11	11	29	13	8	10	256

TABLE 4. ELEMENT COST SHEETS

Element Cost Sheet

ELEMENT OR ACTIVITY	COST ($)	INCREMENT
Storm Sewer		
15"	12	linear foot
21"	15	linear foot
27"	22	linear foot
33"	26	linear foot
42"	40	linear foot
manholes	1,000	each
grass swales	2	linear foot
Electric power distribution line access		
overhead	4-13	foot
underground (5" PVC conduit, (2'-3' deep)	25	foot
Electric power transmission grid access		
500 KV (steel tower construction)	400,000	mile
230 KV (H wood frame construction)	230,000	mile
169 KV	130,000	mile
Single track rail spur (power cost additional)	300,000-750,000	mile
Track with third rail at grade 18" stone ballast - 7" x 9" wood ties spaced 24" (power cost additional)	75	linear foot
Elevated rail structure, 2 tracks, 15' high single concrete piers & track costs (same as above)	1,500	linear foot
Overhead railroad bridges	100	square foot of span
Public water supply		
1½" copper tubing, 4' deep	9	foot
6" steel pipe, 4' deep	18	foot
8" steel pipe, 4' deep	22	foot
fire hydrant	15	each
Public sewerage		
6" vitrified clay pipe, 4' deep	12.50	foot
8" vitrified clay pipe, 4' deep	16	foot
15" vitrified clay pipe, 4' deep	35	foot
manholes	7.50	each
central treatment system	1,000-3,000	unit
Septic tank	1,500-3,500	unit
Gas line		
2" steel pipe, 4' deep	6	foot
6" steel pipe, 4' deep	18	foot
8" steel pipe, 4' deep	22	foot

Element Cost Sheet

ELEMENT OR ACTIVITY	COST ($)	INCREMENT
On-site disposal system	1,000-3,000	dwelling unit
Drainage tiles (4"-6" perforated, cement or PVC)	1.75-3.50	foot
Clearing and grubbing		
densely wooded	1,500-2,000	acre
thinly wooded	800-1,000	acre
brush and scrub	500-700	acre
Bulk excavating	3.50-10.00	cubic yard
Cut and fill	.50-2.25	cubic yard
Fill (compacted, imported) (1 mile)	6-20	cubic yard
Hauling (each additional mile)	.40-.75	mile
Grading, rough	1,500	acre
Grading, fine (by machine)	2,000-3,000	acre

ELEMENT OR ACTIVITY	COST ($)	INCREMENT
Soil stabilization		
site vegetation	300-14,000	acre
blankets, nets, mulches	7,000-12,000	acre
chemicals	1,300	acre
sandbags, other barriers	3	bag
hydro mulch	400-2,300	acre
Channel dredging (soft material)		
hydraulic disposal	1.00-2.50	cubic yard
barge disposal, long haul	up to 5.00	cubic yard
Access road, level 1 (unpaved, 9" crushed stone, 20' width)	40,000-50,000 3.40-4.25	mile square yard
Access road, level 2 (4½" bituminous paving, 9" crushed stone, 24' width)	130,000-170,000 9.25-12.10	mile square yard
Access road, level 3 (4½" bituminous paving, 8" base rock, 10" sub base, 26' width)	150,000-300,000 9.85-19.70	mile square yard
Curbing (pre-cast concrete, 6" x 8" x 18")	6	foot
Sidewalks	6	linear foot
Street trees	10	linear foot

delphia and New York.

Proximity to Regional Service Center
A Regional Service Center is an urban area having a population of more than 7,000 (this may be only the summer-time population), or a County Seat.

Proximity to Community Service Center
A Community Service Center is an urban area having a minimum of a post office, a bank, and a supermarket.

Proximity to Public Transportation
Public transportation is considered to be bus stops and train stations. Proximity to public transportation is generally a more important factor in siting low cost housing than it is in siting more expensive housing.

Proximity to Parking -- Inclusion of this factor acknowledges that some land uses are heavy traffic generators, and that parking is an important consideration. Bonus values approximate the amount that the use-developer would be willing to pay for proximity.

Proximity to Public Open Space -- Publicly owned land is land that the public may visit for either active or passive recreation. This factor includes state and federally owned parks, natural areas, recreation areas and County parks of more than 100 acres.

Proximity to Ports -- A port is defined here as a cargo-handling facility on a channel of at least 12-foot depth.

Proximity to Airports -- This factor refers to general utility airports, basic transport airports, and air carrier airports.

Proximity to River and Bay Shore Frontage
River and Bay Shore Frontage is the property adjacent to rivers, lakes, or bay shores. In general, the amount of bonus is proportional to the size of the water body; the larger the body of water, the larger the bonus value.

The dollar amounts were obtained from interviews with builders and developers in New Jersey and were averaged.

Proximity to Ocean Beach Frontage -- Ocean beach frontage is that property adjacent to the beach. Builders and developers consistently gave a bonus value of $50,000 per 100'x100' lot. For more intensive uses, a developer will pay a bonus of $30,000 per unit. Bonus value decreases sharply for properties not directly adjacent to the beach, but remains a factor for land within 15 miles of the ocean.

Proximity to Resort Community -- Resort Communities are communities that actively seek tourists and vacationers. These are generally coastal communities.

Proximity to Fishing Community -- A coastal community which has boat maintenance, freezer storage, and ice-making facilities for commercial and/or sport fishermen is considered a Fishing Community.

SITE FACTORS -- Site factors refer to the intrinsic characteristics of a site, primarily soil and subsoil conditions. In terms of remedying the site factor deficiencies of any particular site, hard engineering costs can be estimated. However, the regional scale of the present study does not allow us to treat these factors, which are by definition site-specific, with a high degree of confidence. Costs for various site preparation activities are given on the Element Cost Sheets. Data categories were established for each factor to allow manual analysis. In order to arrive at dollar figures for deficiency costs, some assumptions had to be made. These are discussed below under the individual factors.

Slope -- Deficiency costs for slope were obtained on a per acre basis by calculating for various slopes the cubic yards of earth that would have to be cut and filled in order to grade the slope to the baseline specification for each use. This cubic yardage of earth was then multiplied by the cost of cut and fill given on the element cost sheet in order to arrive at a dollar figure.

Soil Drainage, Soil Load Bearing Capacity, Deep Foundation Suitability, Shallow Foundation Suitability -- These four factors are all difficult to deal with at any but the site scale. Problems of soil drainage can be remedied by installing drainage tiles, but the costs of tilefields vary with factors such as soil type, slope, and impermeable surfaces. Thus, general figures cannot be given for this factor. Nevertheless, costs of drainage tiles on a per foot basis are given on the element cost sheet. Relative costs for these factors can be approximated by assuming that these soil problems can be remedied by adding fill to deficient sites. We recognize that this may not be the cheapest or most effective or efficient method for any given situation, but it allows consistency from one use to another. Intermediate soil conditions assume that an appropriate portion of a site is filled to a depth of 3 feet. Deficiency costs for poor soil conditions are roughly double those for intermediate.

Soils Suitable for On-Site Disposal Systems
For many uses, if public sewerage is not available, the use will not occur. For other uses, development will occur only if soils suitable for on-site disposal systems are present. There are some uses, however, which might be undertaken in the absence of both public sewerage and soils suitable for on-site disposal system. Here the deficiency costs were estimated as the additional expense requried to provide for on-site disposal. This was done in terms of yards of fill required. A range of costs for on-site disposal systems may be found on the element cost sheet.

Depth to Water Table -- This factor is significant for solid waste disposal facilities and the assumptions concerning it may be found on the appropriate factor cost sheet.

AMENITY FACTORS -- Amenity factors are similar to proximity factors in that they do not represent direct outlays by the developer, but rather reflect the dollar value which the developer would be willing to pay for the presence of the amenity in question. For this reason, they are rather specific to

each particular marketing situation. Values assigned for these factors should not be treated with a high level of confidence. The values given on the factor cost sheets are, however, based on information gathered through questionnaire responses from and interviews with a large number of New Jersey builders and developers, and are a representative reflection of present market conditions.

On-Site Amenities -- On-site amenities are those features of a site which enhance its value for a particular use. There are two such amenities, vegetation and topography. Vegetation is defined as tree and shrubs which already exist on a site, and whose presence will make the use in question more valuable. Specimen trees, for example, will enhance the value of housing. Similarly, some uses are made more attractive, and hence more valuable, by a certain amount of topographic relief.

Character of Surrounding Area -- Character of surrounding area is composed of two data categories -- compatible land use and incompatible land use, with the former the baseline specification, and the latter assigned a deficiency cost. Compatible land uses vary from one use to another, but may be considered in general as land uses that are similar to or supportive of the use in question. In the case study presented in Chapter 4, incompatible land use for Detached Housing was defined as proximity to sewage treatment plants, industrial land uses and airports.

Visual Amenities -- Visual amenities are features of a landscape that are visible from the site in question. They differ from on-site amenities in that they are not on the site in question, but rather can be seen from it. Whereas character of the surrounding area refers to the effect of the surroundings on the marketing of a particular site, the values associated with visual amenities reflect only the amount that users would be willing to pay for the visual enjoyment offered by views from a site. Those elements of landscape that are considered as offering visual amenity are vegetation, woodland or forest, topographic relief, agricultural landscapes, and townscapes. These vary from one use to another, and are specified accordingly on the appropriate factor cost sheets.

OTHER FACTORS -- There are a number of other factors that are an important consideration for a variety of different uses, which do not fit readily into any of the four broad categories of factors described above. They are discussed separately below.

Potable Water Supply -- This factor becomes a consideration, for certain low density uses, when public water supply is not available. It is a binary consideration: if it is present, development will proceed; if it is not present, development will not occur.

Forest Cover Type -- Costs given for this factor are the estimates of foresters of the value of woodland per acre independent of real estate.

Cost Calculation

This section explains assumptions made in developing cost figures and shows how to interpret the Factor Cost Sheets that accompany each use description in this chapter.

Cost calculation starts with a baseline cost for each use, a constant that represents the cost of constructing a baseline development on a baseline site type. From this is calculated a baseline unit cost, the baseline cost of constructing each unit in a baseline development. Where baseline developments contain one unit, the baseline cost and baseline unit cost are the same. Baseline unit costs are shown at the top of each Factor Cost Sheet.

A baseline site type is an area with no deficiency or bonus costs. The baseline site type is made up from the overlay of the baseline data categories of each development potential factor. These form the baseline specifications. Baseline specifications are marked with an asterisk (*) on the Factor Cost Sheets and represent zero factor costs. Therefore, the baseline site type, by definition, has no factor costs.

Factor costs are caused by variations of site conditions which alter the baseline cost by introducing either deficiency costs, marked as (-) costs, or bonus values, marked as (+) costs. These may be a cost per development, factors marked (C), or cost per development unit, factors marked (V). C costs will not vary with the size of development. V costs are proportional to the number of units in a development.

Using these sheets for cost calculation (see Case Studies, Chapter 4), the factor costs are summed for each site type, deficiency and bonus first separately, then in combination. These summary factor costs are then expressed as percentages of the baseline development cost (or baseline unit costs if the calculation is on a unit basis). Deficiency factor costs are expressed as variable percentages adding to the baseline cost, and bonus factor costs as variable percentages reducing the baseline cost.

In order to sort either the deficiency, bonus or combination costs into high, medium, or low development potential ranks, cutoffs are introduced into the range of percentage factor cost variation. For example, if the range of factor cost variation were from a bonus of +50% of the baseline cost to a deficiency of -100%, then rankings might be assigned as follows:

High. +50% (bonus): 0 (baseline)
Medium. 0 (baseline): -50% (deficiency)
Low. -50% (deficiency): -100% (deficiency)

Neither the baseline unit costs nor the factor costs attempt to account for anything other than construction costs. The baseline unit costs do not include the cost of land, architectural fees, surveys, insurance, permits, or financing costs. These expenses can increase the cost of developments by about 40 percent. In a full market analysis, variations of land cost, market demand and permitting costs would be combined with these development potential costs.

Baseline unit costs do include site preparation and landscaping expenses. Costs

for clearing and grubbing of brush and scrub, part of the baseline unit cost, are given in Table 4.

All factor cost information refers only to siting costs. There are some operational costs that may be influenced by siting: for example, the distance to market from a fish processing plant may produce significantly different operating costs. This type of constraint was considered to be beyond the scope of this study. Maintenance costs were also excluded.

For land uses where there is a difference between the size of the baseline development and that of the unit of development, the total factor cost per unit is given as well as the total cost. For example, in the discussion of Hotels and Motels, costs are given for the building and then broken down to give costs per room. In general, the baseline development size was kept to a minimum. Larger sizes may be calculated by analyzing developments containing more than one baseline development.

Several aspects of cost fluctuations deserve mention here. The quality of construction, especially in housing, and the scale of development could result in different costs. Within New Jersey there are significant regional cost differences. In some cases, variations in cost can be attributed to the local labor costs; in others, they result from different physical factors. For example, it is more expensive to build a marina in the northern part of the state due to higher tides and stronger currents. Other factors, most notably soil load bearing capacity and soil drainage, are site-specific. Those factors have been assigned only very general costs. For these reasons it was necessary to assign a range of costs to several land use types. All land uses have a note explaining any use-particular assumptions.

The "Levels of Confidence" column refers to the consultants' confidence in the given figures. The extensive scope of the study and the number of cost variations made it impossible to present figures having a uniform degree of accuracy. Generally a low level of confidence indicates that there is great site-specific variability in costs pertaining to that factor.

In most cases, this study was constrained by only being able to consider existing systems irrespective of capacities or future projections. In each case we had to assume the linear cost of expanding the existing system, be it road, sewer, water, channel navigation or landfill. This study does not therefore consider the costs or economics of expanding or upgrading those systems or the need to do so.

Housing

Rural Housing

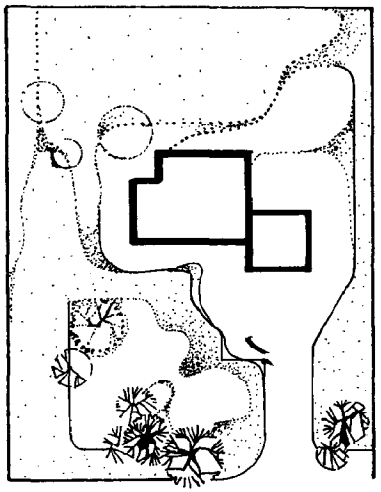
Rural housing is defined for our purposes as housing on lots of greater than 1 acre. Rural housing is often owner-built or built a few units at a time by a local developer. The sites are usually rural road frontage, subdivided from larger agricultural, wooded, or vacant parcels. In some instances an entrepreneur will subdivide a larger parcel into large lots, make basic required improvements such as streets, and sell lots to individuals or small developers.

The scale of rural housing ranges from multi-acre estates, to farm houses, to mini-estates, to large lot subdivisions.

Rural housing does not experience any severe constraints; its basic requirements are for adequate potable water (well or public supply), ability to dispose of effluent (on-site septic system or public sewer), and access from a public road or right-of-way. Other site factors will affect design, e.g., basement or non-basement construction, level house or split-level. Distance to telephone and electric service is a cost factor in developing a site and can be limiting to an individual locating some distance from these services.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Local Road
- o Access to Electric Power Distribution Line
- o Flooding
- o Slope
- o Soil Drainage
- o Soils Suitable for On-Site Disposal Systems
- o Access to Public Sewerage
- o Access to Public Water Supply
- o Potable Water Supply
- o Proximity to Ocean Beach Frontage
- o Proximity to River or Bay Shore Frontage
- o On-Site Amenities
- o Character of Surrounding Area
- o Visual Amenities



Rural Housing

BASELINE UNIT COST: $45,000 - $65,000

DEVELOPMENT SIZE: 1 unit, 1 acre

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 50,000 - 100,000 - 150,000	0 - 50,000 - 100,000 - 150,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 50,000 - 100,000 - 150,000	0 - 50,000 - 100,000 - 150,000	Medium
Flooding [V]	*	Not in Flood Prone Area In Flood Prone Area	0 [6]	0	
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	- 2,250 0 - 5,000 - 9,000	- 2,250 0 - 5,000 - 9,000	Medium
Soil Drainage [V]	*	High Medium Low	0 [1] - 1,500 - 3,000	0 - 1,500 - 3,000	Low
Soils Suitable for On-Site Disposal Systems [L2] [V]	*	Slight [5] Moderate Severe Limitations	0 - 1,500 - 2,500	0 - 1,500 - 2,500	Medium
Access to Public Sewerage [L1] [C]	*	0 - 1/2 1/2 - 1 1/2 [2] 1 1/2 - 3 3+ miles	0 - 65,000 - 130,000 - 195,000	0 - 65,000 - 130,000 - 195,000	Medium
Access to Public Water Supply [L1] [C]	*	0 - 1/2 1/2 - 1 1/2 [2] 1 1/2 - 3 3+ miles	0 - 50,000 - 100,000 - 150,000	0 - 50,000 - 100,000 - 150,000	Medium
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Potable Water Supply [L2] [V]	*	Available Not Available	0 X [3,4]	0 X	High
Proximity to Ocean Beach Frontage [V]	*	adjacent 0 - 1/2 1/2 - 5 5 - 15 15+ miles	+ 100,000 + 30,000 + 5,000 + 2,000 0	+ 100,000 + 30,000 + 5,000 + 2,000 0	High
Proximity to River or Bay Shore Frontage [V]	*	adjacent 0 - 1/2 1/2 - 1 1+ mile	+ 40,000 + 8,000 + 2,000 0	+ 40,000 + 8,000 + 2,000 0	High
On-Site Amenities [V]	*	Vegetation Other	+ 2,500 0	+ 2,500 0	Medium
Character of Surrounding Area [V]	*	Compatible land use Not compatible land use	0 - 2,500	0 - 2,500	Medium
Visual Amenities [V]	*	Forest or woodland Agricultural landscape Topography Other	+ 2,500 + 1,000 + 1,000 0	+ 2,500 + 1,000 + 1,000 0	Medium
	*	Baseline Specification			

NOTE:
Due to the wide variety of housing types that can be found in this housing category - owner-built cabins to high-amenity custom built dwellings - there can be a corresponding variation in price range. The figures used here are based on a two-story house with a full basement and an area of 1,800 square feet, costing approximately $35 per square foot. Deficiency costs for Access to Local Roads assume a Level 1 access road (see Element Cost Sheet). It is assumed that a builder will prefer public water and sewage to private water supply and on-site waste disposal. Public water costs are based on 1 1/2 inch copper tubing, while public sewer hookups are based on ' inch vitrified clay pipe installed at a depth of 4 feet.

C = costs are constant per development
V = costs vary with number of units

Single Family Detached

Single-family detached housing is the dwelling type universally referred to as a "house." It is free standing on its own lot, is occupied by one family, and, for our purposes here, occurs at densities ranging from 1 to 6 units per acre. (Density is in gross acres, i.e., total number of units divided by total acreage of the development.)

Detached housing, by definition, shares no common walls with other dwellings. Typically a front and rear yard and smaller side yards surround a house. Building height ranges from 1 to 3 stories, with 1 and 2 story houses predominant.

This type of housing is almost totally owner-occupied.

The rigid grid pattern of post-war housing with houses lined up and down a regular grid pattern of streets has given way to more frequent use of curvilinear streets and cul-de-sacs and to the practice of grouping houses more closely together to create a more varied living environment. In grouping, single-family detached units are sited more closely together than has traditionally been the case, in order to provide larger common spaces and to decrease the road and utility footage required to serve a development.

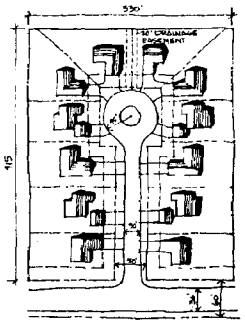
Compared to other housing types, such as garden apartments or townhouses, single-family detached housing is primarily oriented to families with children. An exception is found in special cases such as with retirement communities, where a specific market is targeted. These are discussed separately.

Reasonable access to shopping, employment, cultural and religious facilities, and schools are all part of the market's demand of housing. Unlike many land uses which are tightly controlled by economic factors such as transportation costs, access to markets, or access to raw materials, housing is fairly footloose. People are willing to travel reasonably far to get the sort of housing environment they desire and can afford.

Putting aside very real considerations of environment (type of nearby housing, quality of the local school district) which influence housing choice, we can isolate some factors which indicate areas of greater potential for single-family housing. Chief among these are land availability and cost. Proximity to service centers is also important. In terms of physical site factors, water supply and sewage disposal are obligatory, as is availability of electric and telephone service.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Local Road
- ● Access to Electric Power Distribution Line
- o Proximity to Metropolitan Service Area
- o Proximity to Regional Service Center
- o Proximity to Community Service Center
- o Proximity to Public Transportation
- o Slope
- o Soil Drainage
- o Access to Public Water Supply
- o Potable Water Supply
- o Access to Public Sewerage
- o Soils Suitable for On-Site Disposal Systems
- o Proximity to Ocean Beach Frontage
- o Proximity to River or Bay Shore Frontage
- o On-Site Amenities
- o Character of Surrounding Area
- o Visual Amenities
- o Flooding



Single Family Detached

BASELINE UNIT COST: $40,000 - $100,000

DEVELOPMENT SIZE: 4 units, 1 acre

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 50,000 - 100,000 - 150,000	0 - 50,000 - 100,000 - 150,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 135,000 - 270,000 - 405,000	0 - 33,750 - 67,500 - 101,250	Medium
Proximity to Metropolitan Service Center [V]		0 - 15 15 - 30 30 - 45 45 - 60 60+ miles	+ 10,000 + 7,500 + 5,000 + 2,500 0	+ 2,500 + 1,875 + 1,250 + 750 0	Medium
Proximity to Regional Service Center [V]		0 - 2 2 - 7 7 - 15 * 15+ miles	+ 6,000 + 3,000 + 1,500 0	+ 1,500 + 750 + 375 0	Medium
Proximity to Community Service Center [V]		0 - 1 1 - 3 3 - 5 * 5+ miles	+ 8,000 + 6,000 + 2,000 0	+ 2,000 + 1,500 + 500 0	
Proximity to Public Transportation [V]		0 - 1 1 - 2 2 - 3 * 3+ miles	+ 1,000 + 500 + 100 0	+ 250 + 125 + 25 0	Low
On-Site Amenities [V]		Vegetation * Other	+ 8,000 0	+ 2,000 0	Medium
Character of Surrounding Area [V]	*	Compatible Land Uses Not compatible	0 - 10,000	+ 2,500 0	Medium
Visual Amenities [V]		Woodland Topography * Other	+ 8,000 + 2,000 0	+ 2,000 + 500 0	Medium
Soil Drainage [V]	*	High [1] Medium Low	0 - 6,000 - 12,000	0 - 1,500 - 3,000	Low
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 6,750 - 15,000 - 27,000	0 - 1,690 - 3,750 - 6,750	Medium
Soils Suitable for On-Site Disposal Systems [L2] [V]	*	Slight [5,9] Moderate Severe Limitations	0 - 5,500 - 9,000	0 - 1,375 - 2,250	Medium
Access to Public Water Supply [L1] [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles [3]	0 - 100,000 - 200,000 - 300,000	0 - 25,000 - 50,000 - 75,000	Medium
Potable Water Supply [L2] [V]	*	Available [3,4] Not Available	0 X	0 X	High
Access to Public Sewerage [L1] [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles [2]	0 - 100,000 - 200,000 - 300,000	0 - 25,000 - 50,000 - 75,000	Medium
Proximity to Ocean Beach Frontage [V]	*	Adjacent 0 - 1/2 1/2 - 5 5 - 15 15+ miles	+ 200,000 + 80,000 + 12,000 + 4,000 0	+ 50,000 + 20,000 + 3,000 + 1,000 0	High
Proximity to River or Bay Shore Frontage [V]	*	Adjacent 0 - 1/2 1/2 - 1 1+ mile	+ 40,000 + 8,000 + 2,000 0	+ 10,000 + 2,000 + 500 0	Medium
Flooding [V]	*	Not in Flood Prone Area In Flood Prone Area [6]	0	0	
	*	Baseline Specification			

NOTE:
There is considerable range in the quality and size of Single Family Detached Housing. The figures given here are based on a two-story house with a full basement and an area of 2,000 square feet. Construction costs are assumed to be $35 per square foot. Deficiency costs for Access to Local Road assume a Level 1 access road (see Element Cost Sheet). Public water costs are based on the use of a 6 inch steel pipe installed at a depth of 4 feet and Public Sewerage Access is based on the use of an 8 inch vitrified clay pipe installed 4 feet deep.

C = costs are constant per development
V = costs vary with number of units

Single Family Attached

In single-family attached housing, at least one wall or floor/ceiling is common between units. Essentially, we are considering here higher density versions of the single-family detached house, but spatial constraints or site design dictates building a greater number of units (6 to 15 per gross acre) on a site. Elimination of side yards and reduction of yards associated with each unit achieve these higher densities. (Mid- and high-rise single-family housing, though "attached," is more constructively considered a multifamily unit).

A wide range of housing types falls within the single-family attached category: duplexes (twins), triplexes, quadplexes, and townhouses (rowhouses) are the basic types. The plexes have many of the characteristics of a detached house, but share party walls or floors/ceilings. Often they are almost indistinguishable from detached housing, only the structures are merged at the lot line. Townhouses are essentially rows of attached single-family dwellings typically 5 to 10 units in length, with only the end units having side yards.

All of these attached housing types and their variations commonly share two characteristics: at least 1 wall is common to two units and they are 1 to 3 stories high. While a higher number of rentals are found in attached than in detached single-family housing, a high proportion of units are owner-occupied. Ownership is usually fee simple or through a condominium arrangement. In condominium ownership, the homeowner owns the unit outright, and, rather than owning a specific lot, the homeowner owns an undivided proportionate share of all land and common facilities in the condominium.

Originally, townhouses (rowhouses) provided lower cost housing, chiefly in urban areas. In the 1960s, higher priced townhouses began to be marketed on more expensive parcels of land by-passed in earlier development phases. More recently, attached single-family housing has become a common form in suburban areas.

Most units are bought by those who prefer to own rather than rent their homes but who do not want to maintain yards. Part of this market is made up of people who value the amenities offered within many attached-house communities or which are available nearby. Moreover, a townhouse or other attached form of housing is usually less expensive than a similarly sized detached house due to use of less land per unit and less road length per unit.

Where site amenities are important, such as woods or water, a group of attached houses requires less disturbance of the site than an equal number of detached houses. This is often a marketing feature because many are willing to forgo extensive private yards in exchange for a larger common area.

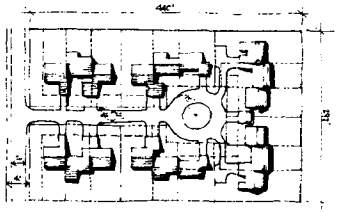
The population mix occupying single-family attached housing can be expected to have fewer families with children than would be found in detached homes. Single people, young marrieds, and older couples are a prime market for attached housing.

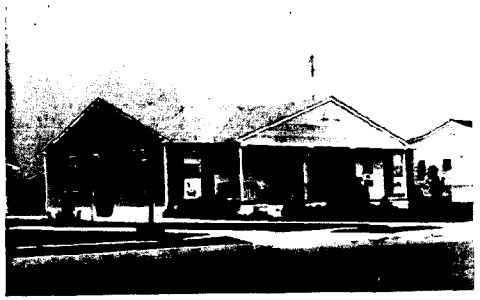
Change in preferences, cost of housing, and even change in size of families have all worked to broaden the demand for attached housing. Attached housing (including apartments) accounts for about 50% of all new housing. Twenty-five years ago only 6% of new starts were multifamily housing, and those were primarily apartments.

Attached and detached housing have essentially the same set of factors controlling their location. Access to employment, shopping, schools, recreation, and cultural activities are all important from a market standpoint. Availability of water, availability of sewage disposal, and availability of utilities are each important construction or cost considerations.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Local Road
- o Access to Electric Power Distribution Line
- o Proximity to Metropolitan Service Center
- o Proximity to Regional Service Center
- o Proximity to Community Service Center
- o Proximity to Public Transportation
- o On-Site Amenities
- o Character of Surrounding Area
- o Visual Amenities
- o Soil Drainage
- o Slope
- o Soils Suitable for On-Site Disposal System
- o Access to Public Water Supply
- o Access to Public Sewerage
- o Proximity to Ocean Beach Frontage
- o Proximity to River or Bay Shore Frontage
- o Flooding





Single Family Attached

BASELINE UNIT COST: $20,000 - $40,000

DEVELOPMENT SIZE: 10 units, 1 acre

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 15,000 - 30,000 - 45,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 135,000 - 270,000 - 405,000	0 - 13,500 - 27,000 - 40,500	Medium
Proximity to Metropolitan Service Center [V]	*	0 - 15 15 - 30 30 - 45 45 - 60 60+ miles	+ 16,000 + 12,000 + 8,000 + 4,000 0		Medium
Proximity to Regional Service Center [V]	*	0 - 2 2 - 7 7 - 15 15+ miles	+ 12,000 + 6,000 + 2,000 0	+ 1,200 + 600 + 200 0	Medium
Proximity to Community Service Center [V]	*	0 - 1 1 - 3 3 - 5 5+ miles	+ 8,000 + 5,000 + 2,500 0	+ 800 + 500 + 250 0	Medium
Proximity to Public Transportation [V]	*	0 - 1 1 - 2 2 - 3 3+ miles	+ 4,000 + 2,000 + 1,000 0	+ 400 + 200 + 100 0	Medium
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	- 7,900 0 - 17,200 - 32,000	- 790 0 - 1,720 - 3,200	Medium
Soil Drainage [V]	*	High [1]	0 - 7,000 - 16,000	0 - 700 - 1,600	Low
Access to Public Water Supply [L1] [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles [2]	0 - 100,000 - 200,000 - 300,000	0 - 10,000 - 20,000 - 30,000	Medium
Potable Water Supply [L2] [V]	*	Available [3,4] Not Available	0 X	0 X	
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Access to Public Sewerage [L1] [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles [2]	0 - 100,000 - 200,000 - 300,000	0 - 10,000 - 20,000 - 30,000	Medium
Soils Suitable for On-Site Disposal Systems [L2] [V]	*	Slight [5] Moderate Severe Limitations	0 - 9,000 - 16,000	0 - 900 - 1,600	Medium
Proximity to Ocean Beach Frontage [V]	*	Adjacent 0 - 1/2 1/2 - 5 5 - 15 15+ miles	+ 300,000 + 100,000 + 15,000 + 5,000 0	+ 30,000 + 10,000 + 1,500 + 500 0	High
Proximity to River or Bay Shore Frontage [V]	*	Adjacent 0 - 1/2 1/2 - 1 1+ miles	+ 120,000 + 30,000 + 5,000 0	+ 12,000 + 3,000 + 500 0	Medium
On-Site Amenities [V]	*	Vegetation Other	+ 2,000 0	+ 200 0	Medium
Character of Surrounding Area [V]	*	Compatible Land Use Not Compatible	0 - 25,000	0 - 2,500	Low
Visual Amenities [V]		Woodland Topography Other	+ 1,000 + 1,000 0	+ 100 + 100 0	Medium
Flooding [V]	*	Not in Flood Prone Area [6] In Flood Prone Area	0	0	
	*	Baseline Specification			

NOTE:
The figures presented here are based on a two story townhouse with a full basement and an area of 1,200 square feet per dwelling unit. The Access to Public Sewerage figures are based on the use of an 8 inch vitrified clay pipe installed at a depth of 4 feet. The Access to Public Water Supply numbers are based on the use of a 6 inch steel pipe installed at a depth of 4 feet. Deficiency costs for Access to Local Road assume a Level 2 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Garden Apartments and Midrise Housing

Garden apartments and midrise housing are two residential types intermediate between single-family housing and high-rise housing.

Garden apartments are rental units. Townhouses and other attached housing forms are similar, but are owned by the resident. As the name implies, garden apartments strive to provide characteristics of suburban living to the renter. Small yards frequently accompany ground-level units. Units are 2 to 3 stories, with the trend being to 2-story units. A slope can often be used to gain an additional floor without having to use more than 1 flight of stairs. Open space surrounds each unit, often configured to provide at a rate of between 1.5 and 1.75 spaces per apartment. Parking is open, covered, or in garages. Most designs now use outdoor balcony corridors or open stairwells for second floor access rather than interior public corridors.

Garden apartments are either constructed as a separate development or are one of a mix of residential types in a planned development. Maximum site coverage is 25%, but usually coverage is 15% or less. Densities in garden apartments range from 10 to 20 units per acre. A 25% coverage will house about 20 families per acre.

Well designed garden apartments are almost indistinguishable from attached single family dwellings.

Midrise housing is intermediate between garden apartments and highrise housing. These multi-family units are between 4 and 6 stories high. Elevators are necessary because of the distance between the ground level and upper floors. Density ranges of between 20 and 35 units per acre typify midrise housing.

Parking for midrise housing is either around the building or is in a garage under or adjacent to the building.

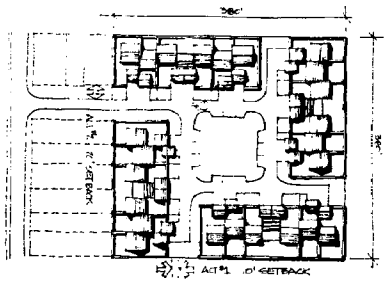
Midrise housing can be used to improve the overall population density of a mixed use development without resorting to high-rise development. In practice, once a unit is over 4 stories, necessitating elevators, the developer will often build higher than 6 stories.

Midrise housing can be either rental or condominium. There are differences between the two which affect design. Security and privacy are more important considerations in sales housing. Also, condominium units are generally built at a density between 10 and 25 percent lower than rental units. One-quarter to one-half more parking is required for sales units.

Garden apartments and midrise housing are similar in their need for employment centers or prospective job generators, shopping, schools, recreation, and cultural activities. For large developments the availability, frequency, and directness of transportation to key centers is important. Character of the area surrounding the site and the quality of site and near-site amenities will also affect development choices.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Local Road
- ● Access to Electric Power Distribution Line
- o Proximity to Metropolitan Service Center
- o Proximity to Regional Service Center
- o Proximity to Community Service Center
- o Proximity to Public Transportation
- o Slope
- o Soil Drainage
- o Soil Load Bearing Capacity
- o Access to Public Water Supply
- o Access to Public Sewerage
- o Proximity to Ocean Beach Frontage
- o Proximity to River or Bay Shore Frontage
- o On-Site Amenities
- o Character of Surrounding Area
- o Visual Amenities
- o Flooding



Garden Apartments and Midrise Housing

BASELINE UNIT COST: $15,000 - $40,000

DEVELOPMENT SIZE: 20 units - one acre

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 -120,000 -240,000 -360,000	0 -6,000 -12,000 -18,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 -135,000 -270,000 -405,000	0 -6,750 -13,500 -20,250	Medium
Proximity to Metropolitan Service Center [V]	* 	0 - 15 15 - 30 30 - 45 45 - 60 60+ miles	+12,000 +9,000 +6,000 +3,000 0		Medium
Proximity to Regional Service Center [V]	 *	0-2 2-7 7-15 15+ miles	+6,000 +3,000 +1,000 0	+300 +150 +50 0	Medium
Proximity to Community Service Center [V]	 *	0-1 1-3 3-5 5+ miles	+10,000 +8,000 +3,000 0	+500 +400 +150 0	Medium
Proximity to Public Transportation [V]	 *	0-1 1-2 2-3 3+	+8,000 +4,000 +2,000 0	+400 +200 +100 0	Medium
Slope [V]	*	0-3 3-8 8-15 15+ %	-8,300 0 -19,000 -35,000	+415 0 -975 -1,750	Medium
Soil Drainage [V]	*	High [1] Medium Low	0 -9,000 -18,000	0 -450 -900	Low
Soil Load Bearing Capacity [V]	*	High [1] Medium Low	0 -12,000 -27,000	0 -600 -1,350	Low
Access to Public Water Supply [C]	*	0 - 1/2 [3] 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 -100,000 -200,000 -300,000	0 -5,000 -10,000 -15,000	Medium
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Access to Public Sewerage [C]	*	0 - 1/2 [3] 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 -100,000 -200,000 -300,000	0 -5,000 -10,000 -15,000	Medium
Proximity to Ocean Beach Frontage [V]	 *	Adjacent 0 - 1/2 1/2 - 5 5-15 15+ miles	+550,000 +140,000 +15,000 +2,000 0	+27,500 +7,000 +750 +100 0	High
Proximity to River or Bay Shore Frontage [V]	 *	Adjacent 0 - 1/2 1/2 - 1 1+ miles	+160,000 +30,000 +2,000 0	+8,000 +1,500 +100 0	Medium
On-Site Amenities [V]	 *	Vegetation Other	+300 0	+150 0	Medium
Character of Surrounding Area [V]	 *	Compatible Land Uses Other	+5,000 0	+250 0	Medium
Visual Amenities [V]	 *	Vegetation Townscape Other	+2,000 +2,000 0	+100 +100 0	Medium
Flooding [V]	*	Not in Flood Prone Area In Flood Prone Area [6]	0	0	
	*	Baseline Specification			

NOTE:
The figures given here are for a three story, slab on grade, apartment house, each unit having an area of 800 feet. The Access to Public Water figures are based on the use of a 6 inch steel pipe installed at a depth of 4 feet. The Access to Public Sewerage numbers are based on the use of an 8 inch vitrified clay pipe installed at a depth of 4 feet. Deficiency costs for Access to Local Roads assume a Level 2 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Highrise Housing

Highrise residential buildings are, for this study, taller than six stories. These are buildings of steel frame or reinforced concrete construction with fire-proof elevators.

When the price of land exceeds $5.00 per square foot, highrise construction or other forms of high density use are dictated. Highrise buildings are also developed to take advantage of and market unobstructed views, particularly from upper floors. These floors command a higher rent or price than lower floors.

Privately developed highrise housing is typically market as luxury apartments or condominiums. High land and construction costs require that rents or selling prices be high. People are willing to pay the ensuing high prices and even additional premiums for the amenities which often come with these buildings.

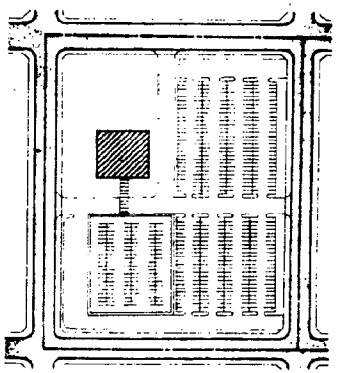
Highrise buildings can be developed singly, in groups, or as part of a mix of residential types. In a development with varied housing types, a highrise building helps obtain the overall density needed for a successful project and also secures added open space.

A problem for highrise developments is acceptance in any but the urban or near-urban market. A major element of the suburban milieu is direct access to open space. The highrise, with only visual access to open space, must compete with residential types offering more immediate access to the outdoors. Also, suburban locations are traditionally family oriented. The downtown and densely-built suburban housing market includes a high percentage of young and old people without families. These groups are more receptive to the type of living offered by a highrise.

The mixture of unit types within the highrise is also a problem for the developer. The two-year lag between the time a highrise apartment building is conceived and ready for occupancy may witness a change in the market for larger or smaller units. The time lag requires that front-end money and construction financing be substantial. Other housing types typically bring units to market in smaller increments with an earlier return.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Electric Power Distribution Line
- o Proximity to Metropolitan Service Center
- o Proximity to Regional Service Center
- o Proximity to Community Service Center
- o Proximity to Public Transportation
- o Slope
- o Soil Drainage
- ● Deep Foundation Suitability
- o Access to Public Water Supply
- o Access to Public Sewerage
- o Proximity to Ocean Beach Frontage
- o Proximity to River or Bay Shore Frontage
- o Character of Surrounding Area
- o Visual Amenities
- o Flooding



Highrise Housing

BASELINE UNIT COST: $20,000 - $75,000

DEVELOPMENT SIZE: 50 units, 1 acre

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 3,000 - 6,000 - 9,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 135,000 - 270,000 - 405,000	0 - 2,700 - 5,400 - 8,100	Medium
Proximity to Metropolitan Service Center [V]	* 	0 - 15 15 - 30 30 - 45 45 - 60 60+ miles	+ 50,000 + 35,000 + 20,000 + 5,000 0		Medium
Proximity to Regional Service Center [V]	*	0 - 2 2 - 7 7 - 15 15+ miles	+ 35,000 + 20,000 + 7,500 0	+ 700 + 400 + 150 0	High
Proximity to Community Service Center [V]	*	0 - 1 1 - 3 3 - 5 5+ miles	+ 20,000 + 15,000 + 5,000 0	+ 400 + 300 + 100 0	High
Proximity to Public Transportation [V]	*	0 - 1 [7] 1 - 2 2 - 3 3+ miles	+ 4,000 + 3,000 + 2,000 0	+ 80 + 60 + 40 0	Medium
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 7,700 - 16,900 - 29,000	0 - 154 - 338 - 580	Medium
Soil Drainage [V]	*	High [1] Medium Low	0 - 10,000 - 20,000	0 - 200 - 400	Low
Deep Foundation Suitability [V]	*	High [1] Medium Low	0 - 15,000 - 30,000	0 - 300 - 600	Low
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Access to Public Water Supply [C]	*	0 - 1/2 [3] 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 115,000 - 230,000 - 345,000	0 - 2,300 - 4,600 - 6,900	Medium
Access to Public Sewerage [C]	*	0 - 1/2 [3] 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 185,000 - 370,000 - 555,000	0 - 3,700 - 7,400 - 11,000	Medium
Proximity to Ocean Beach Frontage [V]	 *	Adjacent 0 - 1/2 1/2 - 5 5 - 15 15+ miles	+ 1,500,000 + 650,000 + 40,000 + 5,000 0	+ 30,000 + 13,000 + 800 + 100 0	High
Proximity to River or Bay Shore Frontage [V]	 *	Adjacent 0 - 1/2 1/2 - 1 1+ miles	+ 500,000 + 175,000 + 5,000 0	+ 10,000 + 3,500 + 100 0	Medium
Character of Surrounding Area [V]	*	Compatible Land Use Not compatible	0 - 10,000	0 - 2,000	Medium
Visual Amenities [V]	 *	Vegetation Townscape Other	+ 7,500 + 7,500 0	+ 150 + 150 0	Medium
Flooding [V]	*	Not in Flood Prone Area [6] In Flood Prone Area	0	0	
	*	Baseline Specifications			

NOTE:
There is a wide variation in types of high-rise housing. The figures given here are based on a ten-story building with dwelling units of 875 square feet. The Access to Public Water Supply figures are based on the use of an 8 inch steel pipe installed at a depth of 4 feet. The Access to Public Sewerage figures are based on the use of an 15 inch vitrified clay pipe installed 4 feet deep. Deficiency costs for Access to Collector Road are based on a Level 2 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Mobile Home Parks

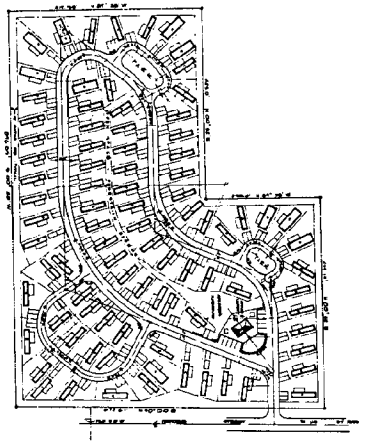
Mobile homes are movable or portable dwellings constructed for towing on their own chassis and designed to connect to utilities without the use of a permanent foundation. "Mobile home" is something of a misnomer, since most mobile homes are not moved from their original site. The appeal of mobile homes is in their low cost rather than their mobility. They constitute a near monopoly of the low end of the single-family housing market. Most mobile homes are 14 feet wide, the greatest width allowable on the road. The majority of units are between 45 and 60 feet long, although some are as long as 70 feet.

Mobile home parks are developments for mobile homes. They provide concrete pads on which the homes rest, and hook-ups for electricity, water and sewage. They also generally provide, at a minimum, laundry facilities. The larger ones may also have community recreational facilities. Ownership arrangements take a number of forms. In an open park, the tenant brings his own mobile home to the park, and plugs it into a site which he rents from the park owner. In a closed park, the tenant buys the home from the park owner, who then charges a monthly site rental. In some parks, the lot is sold to the tenant, and condominium forms of ownership are also becoming more common. Nevertheless, the great majority of parks rent their sites.

Mobile home parks usually range in size between 20 and 60 acres. Densities are in the neighborhood of 6 to 7 sites per gross acre. The locational requirements of mobile home parks are similar to those of other types of single-family housing. Public water supply, sewerage, and electricity are essential. Access to a collector road facilitates delivery of the mobile homes, which are wider then most highway vehicles. Soil drainage is highly desirable, as are visual amenities. Mobile home parks should be within reach of employment, schools, shopping, recreation, and religious and cultural activities.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Collector Road
- ● Access to Electric Power Distribution Line
- o Proximity to Metropolitan Service Center
- o Proximity to Regional Service Center
- o Proximity to Community Service Center
- o Proximity to Public Transportation
- o Flooding
- o Slope
- o Soil Drainage
- o Access to Public Sewerage
- o Soils Suitable for On-Site Disposal Systems
- o Access to Public Water Supply
- o Potable Water Supply
- o Proximity to Ocean Beach Frontage
- o Proximity to River or Bay Shore Frontage



Mobile Home Parks

BASELINE UNIT COST: $12,000 - $30,000

DEVELOPMENT SIZE: 120 units, 20 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					Medium
Access to Collector Road C	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 120,000 - 240,000 - 360,000	0 - 1,000 - 2,000 - 3,000	High
Access to Electric Power Distribution Line C	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 135,000 - 270,000 - 405,000	0 - 1,125 - 2,250 - 3,375	Medium
Proximity to Metropolitan Service Center V	 *	0 - 15 15 - 30 30 - 45 45 - 60 60+ miles	+ 24,000 + 18,000 + 12,000 + 6,000 0	+ 200 + 150 + 100 + 50	Low
Proximity to Regional Service Center V	 *	0 - 2 2 - 7 7 - 15 15+ miles	+ 30,000 + 18,000 + 6,000 0	+ 250 + 150 + 50 0	Medium
Proximity to Community Service Center V	 *	0 - 1 1 - 3 3 - 5 5+ miles	+ 42,000 + 33,000 + 12,000 0	+ 350 + 275 + 100 0	Medium
Proximity to Public Transportation V	 *	0 - 1 1 - 2 2 - 3 3+ miles	+ 45,000 + 20,400 + 9,600 0	+ 375 + 170 + 80 0	Medium
Flooding V	*	Not in Flood Prone Area In Flood Prone Area	0	0	Medium
Slope V	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 216,000 - 450,000 - 700,000	0 - 1,800 - 3,750 - 5,833	Medium
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Soil Drainage V	*	High Medium Low	0 - 36,000 - 60,000	0 - 300 - 500	Medium
Access to Public Sewerage L1 C	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 -100,000 -200,000 -300,000	0 - 833 - 1667 - 2500	Medium
Soils Suitable for On-Site Disposal Systems L2 V	*	Slight Moderate Severe Limitations	0 -120,000 -228,000	0 -1,000 -1,900	Medium
Access to Public Water Supply L1 C	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 -100,000 -200,000 -300,000	0 - 833 - 1667 - 2500	Medium
Potable Water Supply L2 V	*	Available (3,4) Not available	0 X	0 X	High
Proximity to Ocean Beach Frontage V	 *	Adjacent (8) 0 - 1/2 1/2 - 5 5 - 15 15+ miles			
Proximity to River or Bay Shore Frontage V	 *	Adjacent 0 - 1/2 1/2 - 1 1+ mile	+120,000 + 40,000 + 15,000 0	+ 1,000 + 333 + 125 0	
	*	Baseline Specification			

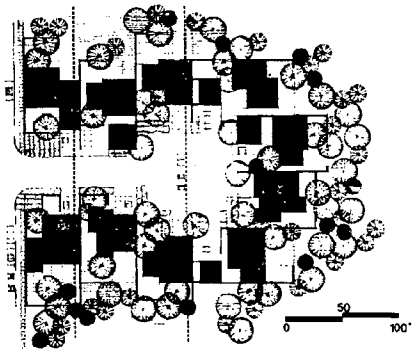
NOTE:
The variation costs in mobile home park is determined, in part, by whether sites are sold or rented. The Access to Public Sewerage figures are based on the use of an 8 inch vitrified clay pipe installed at a depth of 4 feet. The Access to Public Water figures are based on the use of a 6 inch steel pipe installed at a depth of 4 feet. Deficiency costs for Access to Collector Road and based on the use of a Level 2 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Retirement Communities

Retirement communities are developments which provide housing specifically for elderly and retired persons. While retirement communities may provide a mix of housing types, such as apartments and townhouses, the predominant trend is to small, single-family detached houses. As their name implies, one of the major attractions of retirement communities is the sense of community they provide to residents. To this end, these communities generally feature common meeting spaces and recreational facilities for community residents. Housing densities tend to be fairly high for detached housing, on the order of 6 houses per gross acre. Because so much of the activity of residents is centered on the community, it is desirable that they contain a large number of units. This is also necessary to support their relatively extensive communal facilities. Acreage for retirement communities may range up to several thousand acres, with 400 acres being a reasonable minimum.

The site requirements for retirement communities are similar to those for other types of single-family housing, with the obvious exception that proximity to employment and schools is not important, but proximity to health care facilities is a major concern. These communities are often found at the outer fringe of urbanized areas, just beyond the areas being developed for conventional single-family housing. Proximity to shopping and religious and cultural activities is desirable, as is proximity to recreation to a lesser degree, since so many recreational opportunities are provided within the community. Visual amenities and pleasant character of the surrounding area are important. Proximity to water supply, sewerage, and electric power is important. Because of the number of



units in these communities, they generate significant volumes of automobile traffic; therefore, they should have access to a collector road. Lastly, slope is an important consideration, to protect residents from undue exertion.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Collector Road
- o Access to Electric Power Distribution Line
- o Proximity to Metropolitan Service Center
- o Proximity to Regional Service Center
- o Proximity to Community Service Center
- o Proximity to Public Transportation
- o Flooding
- ● Slope
- o Soil Drainage
- ● Access to Public Sewerage
- ● Access to Public Water Supply
- o Proximity to Ocean Beach Frontage
- o Proximity to River or Bay Shore Frontage
- o On-Site Amenities
- o Visual Amenities

Retirement Communities

BASELINE UNIT COST: $20,000 - $50,000

DEVELOPMENT SIZE: 600 units, 100 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 250 - 500 - 750	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 130,000 - 260,000 - 390,000	0 - 217 - 433 - 650	Medium
Proximity to Metropolitan Service Center [V]		0 - 15 15 - 30 30 - 45 45 - 60 60+ miles	+ 200,000 + 150,000 + 100,000 + 50,000 0	+ 333 + 250 + 167 + 83 0	Medium
Proximity to Regional Service Center [V]	*	0 - 2 2 - 7 7 - 15 15+ miles	+ 300,000 + 240,000 + 120,000 0	+ 500 + 400 + 200 0	Medium
Proximity to Community Service Center [V]	*	0 - 1 1 - 3 3 - 5 5+ miles	+ 240,000 + 210,000 + 180,000 0	+ 400 + 350 + 300 0	Medium
Proximity to Public Transportation [V]	*	0 - 1 [7] 1 - 2 2 - 3 3+ miles	+ 180,000 + 120,000 + 60,000 0	+ 300 + 200 + 100 0	Low
Flooding [V]	*	Not in Flood Prone Area In Flood Prone Area	0	0	
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 1,600,00 - 24,000,000 - 3,750,000	0 - 2,667 - 4,000 - 6,167	Medium
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Soil Drainage [V]	*	High [1] Medium Low	0 - 240,000 - 480,000	0 - 400 - 800	Low
Access to Public Sewerage [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 167 - 333 - 500	High
Access to Public Water Supply [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 167 - 333 - 500	High
Proximity to Ocean Beach Frontage [V]	*	Adjacent 0 - 1/2 1/2 - 5 5 - 15 15+ miles	+ 5,000,000 + 2,000,000 + 500,000 + 75,000 0	+ 8,333 + 3,333 + 833 + 167 0	Low
Proximity to River or Bay Shore Frontage [V]	*	Adjacent 0 - 1/2 1/2 - 1 1+ mile	+ 1,000,000 + 500,000 + 75,000 0	+ 1,667 + 833 + 125 0	Low
On-Site Amenities [V]	*	Vegetation Other	+ 100,000 0	+ 167 0	Medium
Visual Amenities [V]	*	Vegetation Topography Other	+ 50,000 + 30,000 0	+ 83 + 50 0	Medium
	*	Baseline Specification			

NOTE:
The baseline unit costs given for Retirement Communities are based on a smaller than average facility. Retirement Communities can cover 1,000 acres or more. The Access to Public Water Supply figures are based on the use of a 6 inch steel pipe installed at a depth of 4 feet. The Access to Public Sewerage Figures are based on the use of an 8 inch vitrified clay pipe installed 4 feet deep. Deficiency costs for Access to Collector Road are based on a Level 2 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Commerce and Service

Regional Shopping Centers

A shopping center is "a group of architecturally unified commerical establishments built on a site which is planned, developed, owned, and managed as an operating unit related in its location, size, and type of shops to the trade area that the unit serves. The unit provides on-site parking in definite relationship to the types and total size of the stores."* This definition distinguishes shopping centers from shopping areas or shopping districts, which do not have a unified design and operation.

Shopping centers are classified according to their major tenants. A regional shopping center has as its major tenant one or more full-line department stores. A neighborhood shopping center, on the other hand, has a supermarket as its major tenant. Regional shopping centers provide a full range of shopping goods, general merchandise, apparel, furniture, and home furnishings. A regional center typically has 400,000 square feet of gross leasable area (GLA). Gross leasable area is the total floor area designed for tenants' occupancy and exclusive use: all the area on which tenants pay rent. GLA is generally 70 to 90% of the total building area of a regional center. Regional centers may range in size from a GLA of 300,000 square feet to more than 1,000,000. Regional centers of more than 750,000 square feet of GLA, including three or more department stores, are classified as super-regional centers. These differ from regional centers only in scale and strength of customer drawing power. In a regional or super-regional center, each department store would usually have a GLA of at least 100,000 square feet.

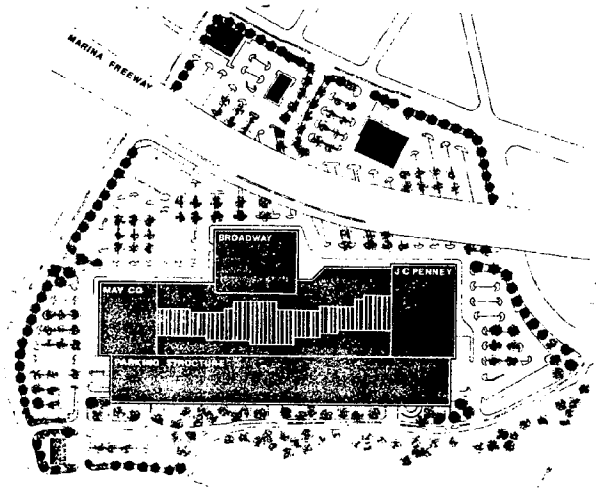
*Urban Land Institute. 1977. Shopping Center Development Handbook. Washington, D.C.

Because the overwhelming majority of customers travel to shopping centers by automobile, adequate parking space is extremely important. The number of parking spaces required by a center is proportional to the center's GLA. The parking index refers to the number of parking spaces required per 1000 square feet of GLA. Experience has shown that a parking index of 5.5 is most appropriate. Thus a regional center of 400,000 square feet GLA will require 2,200 parking spaces (400x5.5).

The trade area of a shopping center may be defined as the area containing people who are likely to purchase a given class of goods or services from a particular firm or group of firms. Regional centers might have a trade area with a radius of up to 10 miles. The extent of the trade area depends on driving time, however. The maximum driving time to a typical regional center is on the order of 20 minutes. A regional center located near a high-speed highway, then, will have a larger trade area than a similar center which is not so located. From this it can be seen that location and accessibility are of great importance for shopping centers. In terms of population, a regional center requires a population within its trade area of at least 150,000 people. This is a very rough estimate, the actual number will vary with such consideration as income levels and competing retail outlets. Within suburban metropolitan areas, a regional center would ordinarily be no closer than 5-10 miles from the nearest competing center.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Arterial Road
- ● Access to Electric Power Distribution Line
- o Proximity to Major Highway Intersections
- o Proximity to Metropolitan Service Center
- o Slope
- o Soil Drainage
- o Soil Load Bearing Capacity
- ● Access to Public Sewerage
- ● Access to Public Water Supply
- ● Visibility From Road
- ● Population Density



Regional Shopping Centers

BASELINE UNIT COST: $18,000,000

DEVELOPMENT SIZE: 350,000 square feet, 25 acres (includes parking)

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Arterial Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 200,000 - 400,000 - 600,000	0 - 200,000 - 400,000 - 600,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 [10] 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 160,000 - 320,000 - 480,000	0 - 160,000 - 320,000 - 480,000	Low
Proximity to Major Highway Intersections [V]		0 - 1 [3] 1 - 2 2 - 3 3 - 5 5+ miles	+ 750,000 0 X X X	+ 750,000 0 X X X	Medium
Proximity to Metropolitan Service Center [V]		0 - 15 15 - 30 30 - 45 45 - 60 * 60+ miles	+ 750,000 + 500,000 + 300,000 + 100,000 0	+750,000 +500,000 +300,000 +100,000 0	Medium
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 150,000 - 550,000 - 925,000	0 - 150,000 - 550,000 - 925,000	Medium
Soil Drainage [V]	*	High [1] Medium Low	0 - 375,000 - 750,000	0 - 375,000 - 750,000	Low
Soil Load Bearing Capacity [V]	*	High [1] Medium Low	0 - 400,000 - 875,000	0 - 400,000 - 875,000	Low
Access to Public Sewerage [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 185,000 - 370,000 - 555,000	0 - 185,000 - 370,000 - 555,000	Medium
	*	Baseline Specification			

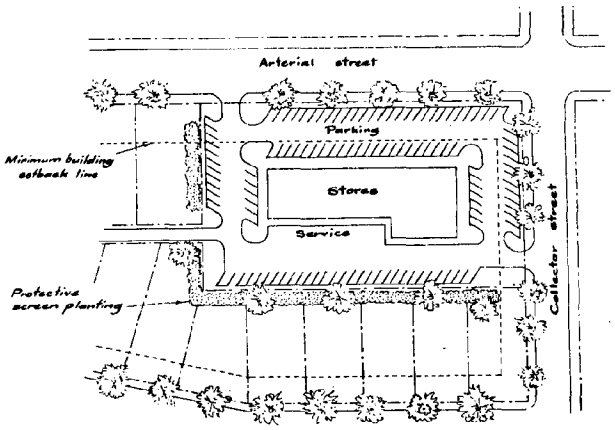
Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Access to Public Water Supply [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 115,000 - 230,000 - 345,000	0 - 115,000 - 230,000 - 345,000	Medium
Visibility from Road [V]	*	Visible [3] Not Visible	0 X	0 X	High
Population Density [V]	*	0 - 200 [3] 200 - 500 500 - 1,000 1,000 - 2,500 2,500 - 5,000 5,000+ per unit	X X X X 0 + 750,000	X X X X 0	High
	*	Baseline specification			

NOTE:

Regional Shopping Center sites range from 15 to 50 acres. In some instances they may be even larger. The gross leasable area (GLA) can range from 150,000 to 500,000 square feet or more. When planning for shopping centers it should be recalled that every 1,000 square feet of building area requires approximately 5 parking spaces (the index is roughly equivalent to an area ratio of 2.2 square feet of parking area per square foot of building area) and that the enclosed common area is typically 10 to 30 percent of the total enclosed area in most shopping centers. The figures given here assume building costs of $17,050,000 and $950,000 for parking and adjacent areas. The Access to Public Water Supply figures are based on the use of an 8 inch steel pipe installed at a depth of 4 feet. The Access to Public Sewerage figures are based on the use of a 15 inch vitrified clay pipe installed at a depth of 4 feet. Deficiency costs for Access to Collector Road assume a level 3 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Neighborhood Shopping Centers



A neighborhood shopping center is a group of stores distinguished by unified development and management, with integrated provision for customer parking. Neighborhood centers are distinguished from regional centers by the nature of the major tenant in the center. Neighborhood shopping centers have supermarkets as their major tenants.

Neighborhood centers, also sometimes called convenience centers, provide for the sale of convenience goods (food, drugs, and sundries) and personal services which meet the needs of an immediate neighborhood trade area. Other tenants might include a drug store, laundry, sandwich shop, and similar retail establishments. A neighborhood shopping center might range in size from 30,000 to 100,000 square feet of gross leasable area (GLA). A typical GLA would be 60,000 square feet. The trade area of a neighborhood center might extend about 1.5 miles, or a driving time of 6 minutes. The population required to support such a center might range from 2,500 up to 40,000 people.

Development Potential Factors

- Undeveloped Land
- Access to Collector Road
- Access to Electric Power Distribution Line
- o Slope
- o Soil Drainage
- o Soil Load Bearing Capacity
- Access to Public Sewerage
- Access to Public Water Supply
- Population Density

BASELINE UNIT COST: $1,750,000

DEVELOPMENT SIZE: 55,000 square feet, 5 acres (includes parking)

Neighborhood Shopping Centers

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 48,000 - 96,000 - 144,000	0 - 48,000 - 96,000 - 144,000	Low
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 30,000 - 110,000 - 185,000	0 - 30 000 - 110.000 - 185,000	Medium
Soil Drainage [V]	*	High [1] Medium Low	0 - 75,000 - 150,000	0 - 75,000 - 150,000	Low
Soil Load Bearing Capacity [V]	*	High [1] Medium Low	0 - 36,000 - 72,000	0 - 36,000 - 72,000	Low
Access to Public Sewerage [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Access to Public Water Supply [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Population Density [V]	 *	Less than 1,000 square miles [3] 1,000 square miles or greater	X 0	X 0	High
	*	Baseline Specification			

NOTE:
Neighborhood Shopping Centers range in size from 3 to 15 acres. As with Regional Shopping Centers, every 1,000 square feet of building area requires approximately 5 parking spaces. The amount of common area tends to be less in neighborhood shopping centers than in regional shopping centers. The figures given here assume building costs of $1,650,000 and $100,000 for parking and adjacent areas. The Access to Public Sewerage figures are based on the use of an 8 inch vitrified clay pipe installed 4 feet deep. The Access to Public Water figures are based on the use of a 6 inch steel pipe installed at a depth of 4 feet. Deficiency costs for Access to Collector Road assume a Level 2 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Hotels and Motels

Hotels and motels provide lodging for people away from home. Services beyond simple lodging are usually offered and, indeed, are often vital to the success of the enterprise.

For discussion, hotels and motels can be divided into three broad categories: motels, commercial hotels, and resort hotels. These distinctions are not exclusive; an establishment can exhibit characteristics of any or all of the categories.

Motels (deriving their name from motor and hotel) offer lodging and parking, with rooms usually accessible from an outdoor parking area. Their primary market is the road traveler needing temporary lodging. Limited amenities, such as a swimming pool and a restaurant, are typically part of the establishment or are close by.

Commercial hotels offer lodging and, usually, meals, entertainment, and various personal services. Room access is through a central lobby and internal hallways. Meeting rooms, ballrooms, restaurant, swimming pools, health clubs, and game decks and courts are also provided in many commercial hotels. Commercial and other travellers are the principal guests of these hotels, but meetings, conventions, and private functions are an important part of their business.

Resort hotels are similar to commercial hotels with the added factor of a special amenity or activity which attracts customers. Resort hotels cater to different clientele. For example, some are family oriented, while others may draw young marrieds. Some will specialized in "pampering" guests, others stress activities, events or special attractions provided by the hotel or available nearby.

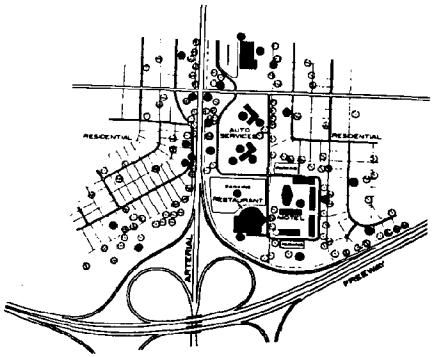
Proper site location is critical to hotel or motel success. Access is important for all types of hotels and motels; it is critically important for motels and commercial hotels. Where the later intend to capture business traveler trade they must be immediately accessible to on/off ramps of a major artery, and the road must be one used by the commercial traveler. Alternatively, or as an adjunct to highway location, a hotel or motel is best located in an area which generates a high number of transients. Large commercial centers and areas with a number of corporate headquarters, for example, are two such areas which generate a demand for hotel and motel facilities. It is noteworthy that business travelers and conventioneers account for 50% and 20%, respectively, of all room occupancy. Location is critical for these commercially oriented establishments.

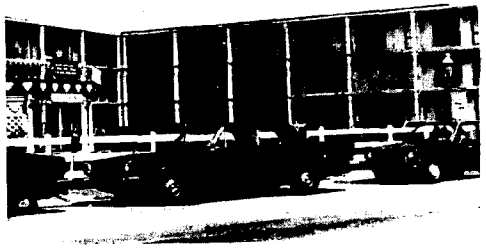
Another important consideration is the availability of utilities, especially water and sewerage.

Fluctuations in occupancy are of concern to hotels and motels. Establishments with a high percentage of business trade often experience slack weekends. Resorts which are seasonal -- as would likely occur in coastal areas in temperate regions -- are booked solid in season and are nearly unoccupied in off-season periods. A successful hotel or motel must maintain about a 60% annual occupancy rate to break even.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Collector Road
- ● Access to Electric Power Distribution Line
- o Proximity to Metropolitan Service Center
- o Proximity to Regional Service Center
- o Proximity to Resort Community
- o Slope
- o Soil Drainage
- o Soil Load Bearing Capacity
- o Deep Foundation Suitability
- o Access to Public Sewerage
- o Access to Public Water Supply
- o Proximity to Ocean Beach Frontage
- o Proximity to River or Bay Shore Frontage
- o Character of Surrounding Area
- o Visual Amenities





Hotels and Motels

BASELINE UNIT COST: $600,000 - $2,100,000

DEVELOPMENT SIZE: 50 units, 1 acre

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 3,000 - 6,000 - 9,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 135,000 - 270,000 - 450,000	0 - 2,700 - 5,400 - 8,100	Medium
Proximity to Metropolitan Service Center [V]	 *	0 - 15 15 - 30 30 - 45 45 - 60 60+ miles	+ 80,000 + 60,000 + 30,000 + 10,000 0	+ 80,000 + 60,000 + 30,000 + 10,000 0	Medium
Proximity to Regional Service Center [V]	 *	0 - 2 2 - 7 7 - 15 15+ miles	+ 50,000 + 30,000 + 10,000 0	+ 50,000 + 30,000 + 10,000 0	Medium
Proximity to Resort Community [V]	 *	0 - 1 1 - 3 3 - 5 5+ miles	+ 75,000 + 50,000 + 25,000 0	+ 75,000 + 50,000 + 25,000 0	Medium
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 9,500 - 16,000 - 54,000	0 - 190 - 320 - 1,080	Medium
Soil Drainage [V]	*	High [1] Medium Low	0 - 9,000 - 20,000	0 - 180 - 400	Low
Soil Load Bearing Capacity [V]	*	High [1] Medium Low	0 - 15,000 - 35,000	0 - 300 - 700	Low
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Deep Foundation Suitability [V]	*	High [1] Medium Low	0 - 12,000 - 30,000	0 - 240 - 600	Low
Access to Public Sewerage [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 185,000 - 370,000 - 555,000	0 - 3,700 - 7,400 - 11,100	Medium
Access to Public Water Supply [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 115,000 - 230,000 - 345,000	0 - 2,300 - 4,600 - 6,900	Medium
Proximity to Ocean Beach Frontage [V]	 *	Adjacent 0 - 1/2 1/2 - 5 5 - 15 15+ miles	+ 1,500,000 + 650,000 + 40,000 + 5,000 0	+ 30,000 + 13,000 + 800 + 100 0	High
Proximity to River or Bay Shore Frontage [V]	 *	Adjacent 0 - 1/2 1/2 - 1 1+ mile	+ 500,000 + 175,000 + 5,000 0	+ 10,000 + 3,500 + 100 0	Medium
Character of Surrounding Area [V]	*	Compatible Land Use Other	+ 7,500 0	+ 150 0	Medium
Visual Amenities [V]	 *	Vegetation Townscapes Other	+ 7,500 + 7,500 0	+ 150 + 150 0	Medium
	*	Baseline Specification			

NOTE:

Due to the wide variety of hotel and motel size and style, there is a corresponding variation in the price range. Generally motels are less expensive than hotels. The figures given here are for a hotel with an area of 30,000 square feet. The Access to Public Sewerage figures are based on the use of a 15 inch vitrified clay pipe installed at a depth of 4 feet. The Access to Public Water Supply figures are based on the use of 8 inch steel pipe installed 4 feet deep. Deficiency costs for Access to Arterial Road are based on the use of a Level 2 road (see Element Cost Sheet). When planning for Commercial Hotels the Proximity to Resort Community factor should be dropped and when planning for Resort Hotels the Proximity to Metropolitan Service Center factor should be dropped.

C = costs are constant per development

V = costs vary with number of units

Warehousing

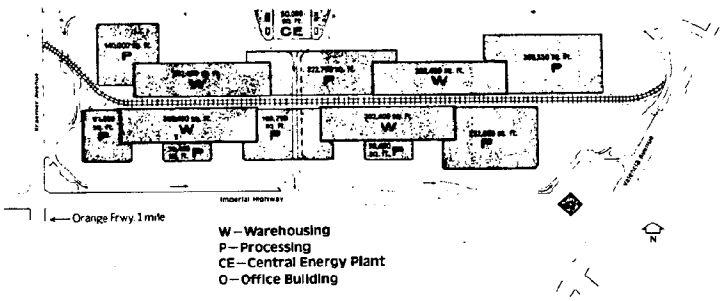
Warehouses are storage facilities for various kinds of goods, either finished products on their way to market, or components awaiting further stages of manufacture. Modern warehouses are typically one-story buildings, although high-reach fork lifts allow ceiling heights up to 30 feet or higher. Warehousing and distribution centers are characterized by low ratios of employment to building coverage. They also do not typically generate nuisances such as noise, odors, and smoke. The principal impact of warehousing will normally be the generation of a relatively high volume of truck traffic.

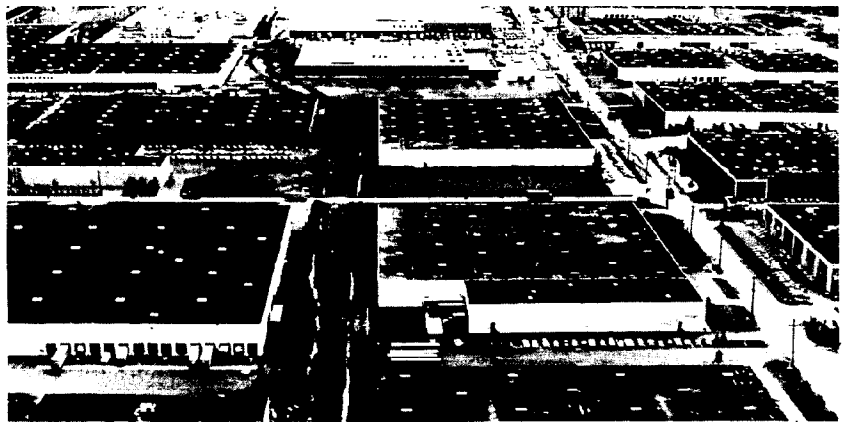
Large-volume producers of industrial or consumer goods may operate their own warehouses for the storage of inventory. Other warehouses are operated on a contract basis. This latter type is more commonly found at the breakpoints between different modes of transportation; that is, goods off-loaded from a ship will likely have to be stored for some period of time before being shipped by another mode, such as rail or truck.

Whether a warehouse is operated by a manufacturer or on a contract basis, it is of paramount importance that it be sited conveniently to transportation. A location near two or more modes of transportation is preferable to a location near only one mode. Sites should be level or nearly so.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Arterial Road
- ● Proximity to Major Highway Intersection
- o Access to Railroad
- ● Access to Electric Power Distribution Line
- o Proximity to Ports
- o Proximity to Airports
- o Slope
- o Soil Drainage
- o Access to Public Sewerage
- o Access to Public Water Supply





Warehousing

BASELINE UNIT COST: $1,500,000 - $2,500,000

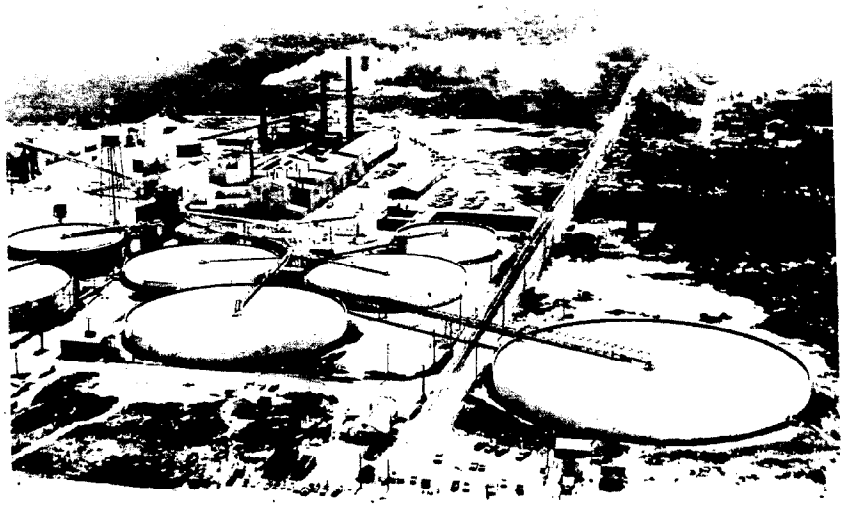
DEVELOPMENT SIZE: 40,000 square feet, 3 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Arterial Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Proximity to Major Highway Intersection [V]	 * 	0 - 1 1 - 2 2 - 3 3 - 5 5+ miles	+ 7,000 + 5,000 + 3,000 0 X	+ 7,000 + 5,000 + 3,000 0 X	Medium
Access to Railroad [C]	*	0 - 1 1 - 3 3 - 5 5+ miles	0 - 600,000 - 1,200,000 - 1,500,000	0 - 600,000 - 1,200,000 - 1,500,000	Medium
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 135,000 - 270,000 - 405,000	0 - 135,000 - 270,000 - 405,000	Medium
Proximity to Ports [V]	 *	0 - 1 1 - 5 5 - 10 10 - 15 15+ miles	+ 40,000 + 30,000 + 6,000 + 2,000 0	+ 40,000 + 30,000 + 6,000 + 2,000 0	Low
Proximity to Airports [V]	 *	0 - 1 1 - 5 5 - 10 10 - 15 15+ miles	+ 20,000 + 15,000 + 3,000 + 1,000 0	+ 20,000 + 15,000 + 3,000 + 1,000 0	Low
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 29,000 - 48,000 - 162,000	0 - 29,000 - 48,000 - 162,000	Medium
Soil Drainage [V]	*	High [1] Medium Low	0 - 30,000 - 70,000	0 - 30,000 - 70,000	Low
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Access to Public Sewerage [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Access to Public Water Supply [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
	*	Baseline Specification			

NOTE:
These figures are based on a one story slab, on grade warehouse with a capacity of 1,200,000 cubic feet. The higher figure presented in the baseline unit cost refers to cold storage warehouses. The access to transportation figures given here assume dependence on mixed transportation modes. If a warehouse operation is heavily dependent on one or two modes, higher prices would be paid for those factors. Deficiency costs for Access to Arterial Road are based on the use of a Level 3 access road (see Element Cost Sheet). The Access to Public Water Supply figures are based on the use of a 6 inch steel pipe installed at a depth of 4 feet and Public Sewerage Access is based on the use of an 8 inch vitrified clay pipe installed 4 feet deep.

C = costs are constant per development
V = costs vary with number of units



Industrial

A variety of industries and a wide range of possible sizes for an industrial facility can occur. Therefore, it is necessary to initially determine a reasonable range of industries which might be developed in New Jersey's coastal zone. The list of industries examined is based on available data about industries presently in the coastal zone, and on studies of industrial uses in other coastal zones. Industries regulated under the New Jersey Coastal Area Facility Review Act (CAFRA) are also included.

The basis for locational decisions can vary significantly from one industry to the next and even within the same industry. Also, some firms follow a systematic approach to locating facilities while others are strongly influenced by such factors as where the president of the company lives or wants to live. We deal here only with objective development factors.

Six references used to develop the list of industries and development potential factors are:

1) U.S. Department of Commerce. 1973. Industrial Locational Determinants. Washington, D.C.

2) Delaware State Planning Office. 1974. Local Impacts and Requirements of Manufacturing Industries. Dover, Delaware.

3) Industrial Location Service, EDA. 1978. Vineland, Bridgeton and Millville, New Jersey.

4) New Jersey Bureau of Operation Statistics and Reports, Division of Planning & Research. 1979. Computer search for industries located in the coastal zone having over 250 employees.

5) McKenzie, S.K. Hess and R. Kull. 1977. Land and Water Use Classification for use in the New Jersey Coastal Zone Planning Method. Office of Coastal Zone Management, NJDEP.

6) New Jersey Coastal Area Facility Review Act. (CAFRA). Chapter 185, Laws of 1973. N.J.S.A. 13:19-1 et seq.

A list of 132 industrial uses was developed from references 2, 3, 5 and 6 above, and was further extended using the language in CAFRA. These uses and their development potential factors are shown in the following table. Standard Industrial Classifications (SIC) are used. The list is not exhaustive; rather, it provides, a representative list of potential industrial users in the coastal zone.

Most industries require flat land. Other industrial requirements vary substantially by industry or from one facility to the next. Factors shown in the following table for different industries are compiled mainly from references 1 and 2. Reference 2 was relied on heavily. No interpretation is made as to the relative importance of factors for any given industry.

The data used were compiled for the most part between 1970 and 1974. Many were collected by mailed survey, and in some cases industrial uses were represented by a single respondent.

Definitions of the development potential factors are as follows:

DEVELOPMENT POTENTIAL FACTORS

- Energy Requirements

  Average annual consumption of the four primary sources of energy were calculated on a per employee basis. In addition to matching industry energy demands with local area capacities, this information may also be useful in anticipating future industrial impacts resulting from shortfalls of particular forms of energy.

  The existing data base only contains data on electric power line distribution showing level of service by transmission lines. This data is explained in Factor Information Sheet #4, in Chapter 3. The cost data for 230 kv and 500 kv transmission lines are found in Table 3.

- Employment Characteristics

  a. Professional

     If this characteristic is checked, the industry requires a heavy concentration of scientists, engineers, designers, technicians, etc.

  b. Percent Female

     This item is self-explanatory and may be useful in industries when high unemployment or underemployment exists for one of the sexes.

  c. Total Employment

  d. Unemployment

     Factor Information Sheet S9 can be used for this factor.

- Transportation Requirements

  The percent distributions of each industry's total shipments by the four major modes of transportation in 1967 -- air, water, rail and trucks are presented.

  In determining the better locations for each class of industry, consideration should be given to the type(s) of transportation most commonly used. Where one mode is preferred or is required the development potential factor for that mode should be listed. Factor information sheets 2, 3, 6, 19, 20, in Chapter 3, can be used for this factor. Cost data on each mode is contained in Table 3.

- Population Density

  This characteristic shows the preference of the percentage of the firms surveyed for communities of different sizes. The industries surveyed are located across the country.

  Factor Information Sheet 8, 9, 10 and 58 can be applied when using this factor. Costs associated with these factors are operational expenses rather than siting expenses.

- Foundations

  The buildings required for each industrial facility require different types of foundations depending on the building size and the equipment and machinery required for operation. A black dot shows the types of foundations required for each facility.

  Factor Information Sheets 26, 27 and 28 can be applied for these factors.

- Undeveloped Land

  This number represents the acreage requirement of plants. (See Factor Information Sheet 1.)

- Water Use

  This data represents the total freshwater requirements from both public and/or private water systems. (See Factor Information Sheets 32, 34 and 35.)

- Sewage Disposal

  Both the public sewer effluent and solid waste average are shown.

- Markets

  This category indicates the average distribution of shipments by distance from the plant. When transportation costs are high relative to other factors of production, an industry may tend to locate in close proximity to its product market. This would be reflected by a high percentage of total shipments in the under 50 mile or under 200 mile columns. Presumably, areas without the appropriate markets could not expect industries with a high proportion of local shipments to locate there.

  Markets is an operational cost rather than siting costs.

- Support

  Agglomeration and Support Industry Requirements

  a. Forward Linkage

     If this characteristic is checked, it means the industry tends to locate near the consumer of its product.

  b. Backward Linkage

     This indicates the industry tends to locate near its raw products or materials suppliers.

  c. Concentration Dependence

     This is an indication that the industry tends to locate near other industries of the same type for purposes of cost sharing of facilities or services.

  d. Urban Orientation

     This indicates a firm achieves cost savings by locating near markets or other industries of similar types.

     Support deals with operational cost rather than siting costs.

ADDITIONAL DATA

- Income

  a. Average Income Per Employee, 1967

     This category shows the average wage or salary per employee for each industry in 1967. Although in 1967 dollars, this figure can be used in conjunction with recent cost of living adjustment to generate an estimate of new income an area might accrue directly from a specific industry.

POLLUTION DATA

As explained in Chapter 1, pollution and environmental data are not a focus of this study, some information concerning pollution has been included as reference material.

As shown below, each industry was assigned a value between 0 and 5 according to its pollution potential.

4 - very high pollution potential
3 - high pollution potential
2 - above average pollution potential
1 - average pollution potential
0 - below average pollution potential

These weights were developed for the Delaware State Planning Office by the Battelle Laboratories (2). A description of each of the air and water pollution categories follows:

(1) Biochemical Oxygen Demand

Biochemical oxygen demand (BOD) is a surrogate indicator of the effect of a combination of substances and conditions on water quality. Specifically, BOD is a measure of the amount of dissolved oxygen that will be depleted from water during the natural biological assimilation of organic pollutants.

(2) Dissolved Solids

The concentration of total dissolved solids is the aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, sodium, potassium and other substances. The nature and magnitude of changes in water quality depends, to a large extent, upon the total concentration of the above salts, commonly referred to as total dissolved solids.

(3) Suspended Solids

Suspended solids from various types of waste discharge cause turbidity. Turbidity is measured by the extent to which light passing through water is scattered by suspended materials. Turbidity is undesirable for a number of reasons. For example, it decreases photosynthesis by interfering with the penetration of light.

(4) Oil and Grease

The discharge of oil and grease into surface waters can create serious environmental problems by forming barriers to oxygen entering the water, thereby cutting oxygen supplies of fish and wildlife.

(5) Inorganic Nitrogen

Nitrogen is one of the basic elemental nutrients needed to sustain aquatic life. Trace quantities are essential to support aquatic ecosystems. However, excessive quantities of nitrogen promote overenrichment and are undesirable.

(6) Phosphorus

Phosphorus is similar to nitrogen in that small quantities in water are necessary but large quantities are detrimental to aquatic life.

(7) Nitrogen Oxides

Oxides of nitrogen, together with hydrocarbons, participate in photochemical reactions leading to the formation of photochemical smog. Nitric oxide forms during high-temperature combustion; it then oxidizes to nitrogen dioxide, which leads to the smog formation.

(8) Hydrocarbons

Hydrocarbons in air result from the incomplete combuston of petroleum products and contribute to smog formation.

(9) Particulates

Suspended particulate matter, often referred to as particulates, is the most prevalent atmospheric pollutant and detracts from the usual quality of air.

(10) Sulfur Oxides

Sulfur dioxide is generally the only sulfur oxide considered. At very high concentrations, it is detectable by taste or smell. It is readily oxidized into sulfur trioxide which, when in contact with water, becomes sulfuric acid, a very corrosive chemical.

Development Potential Factors

STANDARD INDUSTRIAL CLASSIFICATION		REFERENCES	ENERGY REQUIREMENTS				EMPLOYMENT				TRANSPORTATION				POPULATION DENSITY						
											Modal Split				Population by Jurisdiction						
			Bituminous Coal *Short Ton/Employee*	Kilowatt Hour Equivalent *Thousands of Employees*	Barrels of Fuel Oil *Barrels per Employee*	Natural Gas *Millions of ft^3/Employee*	Professional	Percent Female	Total Employment *By Jurisdiction*	Unemployment *By Jurisdiction*	Air	Water	Rail	Truck	Under 25,000	25,000-49,999	50,000-99,999	100,000-249,999	250,000-499,999	500,000-999,999	1,000,000 or more
20	FOOD AND KINDRED PRODUCTS																				
2011	Meat and packing plants		2.18	144	7.9	113		14			-	-	30.4	69.6							
2013	Sausages and other prepared meats		0.11	89	6.6	158		28				2.3	52.3	44.6							
2015	Poultry dressing plants		0.03	58	6.1	78		55			0.1	0.1	8.6	91.1							
2021	Creamery butter		1.37	539	26.3	865		17					58.4	41.6							
2022	Cheese, natural and processed		0.77	263	18.1	396		17													
2023	Condensed and evaporated milk		8.23	512	38.3	1025		17					68	32							
2024	Ice cream and frozen desserts		0.02	40	8.2	80		24					.2	99.8							
2026	Fluid milk		0.48	98	7.5	125		14													
2031	Canned and cured seafood		0.27	105	24.0	175		58				1.0	88.2	10.4							
2032	Canned specialties		0.14	204	31.1	266		35				0.1	61.3	37.8							
2033	Canned fruits and vegetables		0.56	151	14.4	306		35				3.5	76.4	19.8							
2034	Dehydrated food products		0.44	225	9.1	604		42				2.3	65.2	32.5							
2035	Pickles, sauces and salad dressings		1.17	99	5.4	142		42				3.1	32.6	63.9							
2036	Fresh and frozen packaged fish		0.87	36	9.9	14		58			0.2	0.2	1.6	97.9							
2037	Frozen fruits and vegetables			102	13.1	214		49				0.5	58.4	40.7							
2041	Flour and other grain mill products							14				0.3	95.4	4.2							
2042	Prepared feed for animals and fowls		1.07	249	12.7	503		15					51.1	48.5							
2085	Distilled liquor, except brandy			97	2.8	204		14			0.6	2.2	86.2	10.7							
2886	Bottled and canned soft drinks		.52	60	4.1	78		10				3.2	19.4	77.0							
2099	Food preperation necessities		.96	118	9.8	200		34				0.7	61.4	37.7							
22	TEXTILE AND MILL PRODUCTS																				
2211	Weaving mills, cotton		2.62	65	3.8	87		42			0.1	0.1	17.6	81.0							
2221	Weaving mills, synthetics		1.92	66	6.8	89		39			0.2	0.1	4.8	93.9							
2231	Weaving and finishing mills, wool		1.27	124	29.7	92		37			0.5		1.5	88.9							
2256	Knit fabric mills		0.25	112	21.6	117		65													
2259	Knitting mills, nec							65													
2261	Finishing plants, cotton		13.17	350	52.3	404		28													
2262	Finishing plant, synthetic		6.76	350	47.9	426		28													
2272	Tufted carpets and rugs		1.47	188	29.7	296		36				13.3	14.9	73.5							
2291	Felt goods, nec		0.03	179	44.7	154		29													
2294	Processed textile waste							29													
2295	Coated fabrics, not rubberized			156	23	213		29			2.0		3.2	93.							
2296	Tire cord and fabric		0.61	72	0.7	186		29													
2298	Cordage and twine		0.40	44	8.3	44		29													

Additional Data

FOUNDATIONS			UNDEVELOPED LAND	WATER USE	SEWAGE DISPOSAL		MARKETS			SUPPORT				INCOME	WATER POLLUTION						AIR POLLUTION				
							Percent Distribution by shipment			Industrial External Linkages															
Deep Foundations	Shallow Foundation	Soil Bearing Capacity	Acres for Plant	Per Employee (thousands of gallons per year)	Public Sewer Effluent/Employee (gallons/year)	Solid Waste Per Employee (pounds/year)	Under 50 Miles	Under 200 Miles	Under 500 Miles	Forward Linkage	Backward	Conc. Dependence	Urban Orientation	Average Income/Employee (1967 dollars)	BOD	Dissolved Solids	Suspended Solids	Oil and Grease	Phosphorus	Inorganic Nitrogen	Hydrocarbons	Nitrogen Oxides	Particulates	Sulfur Oxides	Average # of Employees
	•		199	6,730	4206	1,712	9	33	52		X		X	7380	1	0	1	4	0	0	1	0	1	0	
	•		41	4,149	3333	7,612	11	47	69		X		X	6960	1	0	1	2	0	0	1	0	1	0	
	•		203	6,501	3679	12,501	8	40	70		X		X	3720	1	0	1	1	1	2	1	0	0	0	
	•		24	22,758	9310	4,320	6	55	93					5220	1	0	1	0	0	0	0	0	0	0	
	•		27	8,636	3863	2,873	14	67	88					5180	1	3	1	0	3	4	0	0	0	0	
	•		188	25,000	7222	6,422	13	58	84					6320	1	0	1	0	0	0	0	0	0	0	
	•		41	7,272	4772	29,394	24	94	100				X	6360	1	0	1	0	0	0	0	0	0	0	
	•		1077	5,592	4019	5,681	14	67	88				X	6420	1	2	1	0	1	1	0	0	0	0	
	•		183	5,853	487		14	23	33					4370	1	0	1	0	0	0	0	0	0	0	
	•		380	8,522	4729		4	39	79					5780	1	0	1	0	0	0	0	0	0	0	
	•		518	7,779	3045	21,667	6	25	48					4730	1	0	1	0	0	0	0	0	0	0	
	•		369	8,679	2264		6	30	44					5230	1	0	1	0	0	0	0	0	0	0	
	•		110	4,923	3230		10	40	78					5080	1	0	1	0	0	0	0	0	0	0	
	•		160	4,418	697		7	21	45					3610	1	0	1	0	0	0	0	0	0		
	•		1542	15,173	3146		4	20	41					4580	1	0	1	0	0	0	0	0	0	0	
	•		1940	8,378	1621	303	5	31	69					6970	1	0	1	0	0	0	0	0	0	0	47
	•		527	9,636	527		24	73	91					6110	0	0	0	0	0	0	0	0	0	0	29
	•		3773	13,043	3043		4	29	49					6960	1	0	4	0	0	0	?	0	1	0	39
	•		169	3,024	1774	4,950	47	86	95					5890	2	0	1	0	0	0	0	0	0	0	40
	•		243	12,266	3660		10	49	73					5740											34
	•		43,083	2,503	448		7	37	59					4630											930
	•		242	2,090	242	735	7	33	60					4870	1	0	1	0	0	0	0	0	0	0	399
	•		82	6,583	1500	485	24	81	89					5170	1	0	1	0	0	0	0	0	0	0	160
	•		23	4,380										5440											74
	•		17											4230											49
	•		3,789	10,601	3120	3,734				X				5410	0	1	0	0	0	0	0	0	0	0	177
	•		369	14,230	2538	4				X				6200											121
	•		72	4,568	2690	125	6	19	42					5210	1	0	1	0	0	0	0	0	0	0	151
	•		111	3,846	1538		8	25	59					5840											136
	•		31				8	25	59	X			X	4600											34
	•		97	5,125	1875		10	29	54	X			X	6930											111
	•		499	799	389		8	25	59	X			X	4820											842
	•		59	30,000	10000		8	25	59					4750											69

Development Potential Factors

STANDARD INDUSTRIAL CLASSIFICATION		REFERENCES	ENERGY REQUIREMENTS				EMPLOYMENT				TRANSPORTATION				POPULATION DENSITY						
											Modal Split				Population by Jurisdiction						
			Bituminous Coal *Short Ton/Employee*	Kilowatt Hour Equivalent *Thousands of Employees*	Barrels of Fuel Oil *barrels per Employee*	Natural Gas *Millions of ft³/Employee*	Professional	Percent Female	Total Employment *By Jurisdiction*	Unemployment *By Jurisdiction*	Air	Water	Rail	Truck	Under 25,000	25,000-49,999	50,000-99,999	100,000-249,999	250,000-499,999	500,000-999,999	1,000,000 Or more
23	APPAREL AND OTHER TEXTILE PRODUCTS																				
2329	Men's and boys' clothing, nec.		0.01	10	0.5	12		84			-	-	-	-							
2335	Women's and misses' dresses		0.02	3	0.5	3		87			-	-	-	-							
2342	Corsets and allied garmets		0.04	6	0.4	3		84			-	-	-	-							
24	LUMBER AND WOOD PRODUCTS																				
2411	Logging camps and contractors		0.04	108	12.0	134		4			-	-	-	-							
2421	Sawmills and planing mills, general		0.08	115	14.8	113		6			-	17.7	70.4	11.8							
2431	Millwork		0.32	30	2.1	40		16			-	0.1	87.5	12.4							
2432	Veener and plywood		0.43	118	6.5	262		12			-	0.2	96.0	3.7	40	20	20	0	0	0	0
2491	Wood preserving		0.82	230	19.7	487		24			6.9	6.9	62.1	31.0							
25	FURNITURE AND FIXTURES																				
2521	Wood office furniture		39	1.3	50	1.9					-	0.7	48.4	49.4							
2522	Metal office furniture		33	6.8	237	1.6					-	-	-	-	40	20	0	20	0	20	0
2531	Public building furniture		47	2.3	83	3.9					0.5	0.1	66.7	32.3							
2542	Metal partitions and fixtures		-	2.9	115	5.7					0.1	0.3	12.6	86.5							
26	PAPER AND ALLIED PRODUCTS																				
2611	Pulp mills		10.83	1641	435.4	2497		10													
2621	Paper mills except building paper		43.02	1169	203.8	1479		10							47	26	7	13	7	0	0
2631	Paperboard mills		47.63	1951	399.9	2672		7													
2641	Paper coating and glazing		1.36	154	14.8	182		34							0	30	0	14	14	14	14
2643	Bags, except textile bags		0.27	44	2.4	5		33							9	4	12	12	23	12	28
2645	Die cut paper and board		-	69	6.7	92		34							25	25	25	0	0	0	25
2646	Presses and molded pulp goods		3.09	364	44.4	742		34													
2647	Sanitary paper products		0.55	108	32.9	142		34							17	17	32	17	0	0	0
2649	Converted paper products		0.19	41	6.7	67		34													
2651	Folding paper board boxes		0.29	45	4.5	53		41													
2652	Set-up paper board boxes		0.33	20	3.7	15		41													
26661	Building paper and board mills		19.98	953	101.7	1869		10			-	9.9	71.9	18.6	31	21	9	6	6	9	15
27	PRINTING AND PUBLISHING																				
2732	Book printing		-	-	-	-		50			-	-	-	-	13	23	13	23	7	7	7
2752	Commercial printing lithograph		.02	34	2.3	74		28			-	-	-	-	14	11	14	14	10	14	23
2761	Manifold business forms		-	-	-	-		38			-	-	-	-							
2791	Typesetting		-	10	0.1	10		38			-	-	-	-	6	0	12	0	6	6	58

Additional Data

FOUNDATIONS			UNDEVELOPED LAND	WATER USE	SEWAGE DISPOSAL		MARKETS			SUPPORT				INCOME	WATER POLLUTION						AIR POLLUTION				
Deep Foundations	Shallow Foundation	Soil Bearing Capacity	Acres for Plant	Per Employee (thousands of gallons per year)	Public Sewer Effluent/Employee (gallons/year)	Solid Waste Per Employee (pounds/year)	Percent Distribution by shipment			Industrial External Linkages				Average Income/Employee (1967 dollars)	BOD	Dissolved Solids	Suspended Solids	Oil and Grease	Phosphorus	Inorganic Nitrogen	Hydrocarbons	Nitrogen Oxides	Particulates	Sulfur Oxides	Average # of Employees
							Under 50 Miles	Under 200 Miles	Under 500 Miles	Forward Linkage	Backward	Conc. Dependence	Urban Orientation												
	●		71				-	-	-					4000											82
	●		10				10	29	51		x	x	x	4240											42
	●		237											4250											150
	●		9			0	-	-	-					4800	2	0	2	0	0	0	0	0	1	1	4
	●		398			92271	10	35	55					4900	2	0	2	0	0	0	0	0	1	1	18
	●		217			27540	5	25	46					1978	2	0	1	0	0	0	0	0	1	1	20
	●		1064	11543	402	19430	5	18	31					5770	1	0	2	0	0	0	0	0	1	1	141
	●		147	5000		32900	27	72	87					5070	2	0	1	0	0	0	0	0	1	1	44
	●		528	775	431	470702	9	26	63		x			2072	0	0	0	0	0	0	0	0	0	0	18
	●		238	819	409	4417					x		x	2033	0	0	0	0	0	0	0	0	0	0	18
	●		149			17332	5	29	45					2074	0	0	0	0	0	0	0	0	0	0	28
	●		47			19681	6	18	53					2065	0	0	0	0	0	0	0	0	0	0	14
	●		1160	257714	285	0	3	23	41					8320	2	1	3	0	0	0	0	0	1	1	336
	●		2291	89222	2922	34626	6	27	62					8010	1	0	1	0	0	0	0	0	1	0	690
	●		1241	122043	3699	33960	6	25	54					7960	1	0	1	0	0	0	0	0	1	0	453
	●		644	6434	1913	31097	8	31	62	x		x	x	7030	1	0	2	0	0	0	0	0	0	0	111
	●		372	9523	158	19403	7	26	52	x		x	x	6010	1	0	2	0	0	0	0	0	0	0	99
	●		128			19403	17	49	70	x		x	x	6310	1	0	2	0	0	0	0	0	0	0	51
	●		351	12162	351	6486	8	23	54	x		x	x	6690	1	0	2	0	0	0	0	0	0	0	156
	●		535	8890	238		6	28	62					7010	1	0	2	0	0	0	0	0	0	0	242
	●		432	1081	540		5	30	65	x		x	x	5640	1	0	2	0	0	0	0	0	0	0	55
	●		713	9259	1481	22842	30	74	90	x			x	6540	0	0	0	0	0	0	0	0	0	1	104
	●		94			9922	28	69	88	x			x	4760	0	0	0	0	0	0	0	0	0	1	50
	●		456	39569	3871	15556	7	22	45	x				7050	1	0	3	0	0	0	0	0	0	0	272
	●		53			22270	-	-	-	x	x		x	-											62
	●		32			13063	-	-	-		x	x	x	6770											22
	●		305				-	-	-	x	x		x	5460											136
	●		17				-	-	-	x	x	x	x	8170											17

Development Potential Factors

STANDARD INDUSTRIAL CLASSIFICATION		REFERENCES	ENERGY REQUIREMENTS				EMPLOYMENT				TRANSPORTATION				POPULATION DENSITY						
											Modal Split				Population by Jurisdiction						
			Bituminous Coal *Short Ton/Employee*	Kilowatt Hour Equivalent *Thousands of Employees*	Barrels of Fuel Oil *barrels per Employee*	Natural Gas *Millions of ft³/Employee*	Professional	Percent Female	Total Employment *By Jurisdiction*	Unemployment *By Jurisdiction*	Air	Water	Rail	Truck	Under 25,000	25,000-49,999	50,000-99,999	100,000-249,999	250,000-499,999	500,000-999,999	1,000,000 or more
28	CHEMICALS AND ALLIED PRODUCTS																				
2812	Alkalies and chlorine		222.58	2985	50.9	3299	x*	8			-	18.7	72.1	9.0							
2813	Industrial gases		9.80	1385	11.6	3956	x*	11*			0.1	0.1	80.0	19.6							
2815	Cyclic intermediates and crudes		16.57	1233	158.3	1313	x*	11			0.2	10.5	32.0	57.2	34	8	25	25	0	0	8
2816	Inorganic pigments		25.52	1107	153.3	1588	x*	11			-	1.7	69.2	28.6							
2818	Industrial organic chemicals,nec		50.27	2658	43.5	5849	x*	13			-	27.2	58.6	14.1	18	25	8	25	8	8	8
2819	Industrial inorganic chemicals		17.59	1752	51.6	1467		11			-	8.9	80.6	10.4	55	18	0	9	0	9	0
2821	Plastic material and resins		19.39	537	66.8	714		9			0.1	19.5	50.1	30.0	33	0	0	56	0	11	0
2822	Synthetic rubber		19.53	1418	14.4	4016		19*			-	-	-	-							
2823	Cellulosic man-made fibers		120.81	1163	15.0	574		27*			-	-	-	-							
2834	Pharmaceutical preparations		1.66	81	14.0	121		40			-	-	-	-	27	0	9	9	37	9	9
2841	Soap and other detergents		5.81	259	21.2	465	x*	22			-	6.7	40.7	52.5							
2844	Toilet preparations		.26	39	4.6	26	x*	54			0.6	2.3	32.4	60.7	13	20	7	13	7	20	20
2851	Paints and allied products		.16	76	4.6	91	x*	16*			0.1	4.3	19.7	75.4							
2871	Fertilizers		2.40	1013	21.8	2968	x*	8			-	16.2	65.3	18.3							
2879	Agricultural chemicals		5.85	294	11.1	596	x*	11*			-	0.3	63.5	35.8	30	0	40	10	10	0	10
2891	Adhesives and gelatins		0.31	210	89.6	-		18*			2.0	2.1	17.2	75.1							
2892	Explosives		48.4	400	75.7	619		18			-	2.5	36.1	61.2							
2893	Printing ink		-	134	18.5	110		18*			0.1	12.2	2.1	84.1							
2895	Carbon black		-	1813	-	5844		18*			-	-	-	-							
2899	Chemical preparations		10.80	370	17.7	456		18*			0.1	3.7	61.0	35.0	10	30	10	25	15	0	10
29	PETROLEUM AND COAL PRODUCTS																				
2951	Paving mixtures and blocks		-	863	128.0	831		11*			-	0.1	54.1	45.5	0	20	40	0	20	0	20
2952	Asphalt felt and coatings		.46	458	49.8	840		11*			-	3.5	45.6	50.8							
2992	Lubricating oils and greases		.44	234	26.7	250		11*			-	-	-	-							
2999	Petrolium and coal products		2.93	1400	36.0	4200		11*			-	-	-	-							
30	RUBBER AND PLASTIC PRODUCTS																				
3011	Miscellaneous plastics products		0.27	61	4.9	96		42*			-	-	-	-	22	18	16	18	9	2	14
31	LEATHER AND LEATHER PRODUCTS																				
3111	Leather and leather tanning		3.95	196	32.1	188		15*			0.3	-	4.9	92.6							
32	STONE, CLAY AND GLASS PRODUCTS																				
3211	Flat glass		7.20	812	3.0	2495		8*			0.1	0.1	57.6	41.9							

Additional Data

FOUNDATIONS			UNDEVELOPED LAND	WATER USE	SEWAGE DISPOSAL		MARKETS			SUPPORT				INCOME	WATER POLLUTION						AIR POLLUTION				
							Percent Distribution by shipment			Industrial External Linkages															
Deep Foundations	Shallow Foundation	Soil Bearing Capacity	Acres for Plant	Per Employee (thousands of gallons per year)	Public Sewer Effluent/Employee (gallons/year)	Solid Waste Per Employee (pounds/year	Under 50 Miles	Under 200 Miles	Under 500 Miles	Forward Linkage	Backward	Conc. Dependence	Urban Orientation	Average Income/Employee (1967 dollars)	BOD	Dissolved Solids	Suspended Solids	Oil and Grease	Phosphorus	Inorganic Nitrogen	Hydrocarbons	Nitrogen Oxides	Particulates	Sulfur Oxides	Average # of Employees
	•		7113	215865	26368	0	13	45	77				x	8110	1	4	2	0	0	0	0	0	1	0	1011
	•		746	384583	11250		27	60	85				x	7620											91
	•		2762	55640	1880	8010	7	20	41				x	8370	1	2	1	2	0	0	0	0	0	0	261
	•		875	102580	1075	699	7	24	58				x	7110	1	2	2	0	0	0	0	0	0	0	194
	•		2279	243215	4954	7236	7	25	56				x	8880	1	0	1	2	0	0	0	2	0	0	281
	•		498	81198	6719	26626	21	52	74				x	8160	1	3	2	0	0	0	3	3	4	2	199
	•		1751	43591	2325	173990	12	29	57	x	x		x	8060	1	0	1	0	0	0	0	0	0	1	139
	•		835	54260	1826	762	12*	29*	57*	x	x		x	8760	1	0	1	0	0	0	3	0	0	0	382
	•		4414	57294	94	4272	12*	29*	57*		x		x	6210	1	0	1	0	0	0	1	0	0	0	2554
	•		765	4560	1334	10467	5*	21*	44*				x	8050	0	0	0	0	0	0	0	0	0	1	129
	•		408	13576	2251	14308	12	42	81				x	8020	1	0	0	0	0	0	0	0	1	0	51
	•		265	6800	4600	23966	7	24	51				x	6320	0	0	0	0	0	0	1	0	1	0	66
	•		265	6800	4600	23966	11	42	78				x	7440	0	0	0	0	0	0	1	0	1	0	45
	•		989	18437	312	148	20	68	87				x	6210	0	0	0	0	0	0	0	0	2	1	
	•		2204			7610	14	35	66				x	7020	0	4	0	0	3	0	0	0	1	1	
	•		215	42142	10000																				
	•		11647	59260		958	5	31	70					6920	1	2	1	4	0	2	0	0	1	1	886
	•		203			1440976	9	66	82	x			x	7630	0	0	0	0	0	0	0	0	1	0	47
	•		631			0	19	38	64		x		x	8140	0	0	0	0	0	0	4	0	2	0	255
	•		872	31684	4210	7210	20	37	68					6910	0	0	0	0	0	0	0	0	1	0	26
	•		445	19000		480	53	85	93				x	7380	1	0	0	0	0	0	3	0	2	0	22
	•		1590	14038	3461	11128	21	59	92				x	6690	1	0	0	0	0	0	2	0	1	2	125
	•		28	4000	2000		34*	63*	86*				x	7950											29
	•		796	10000			34*	63*	86*				x	6270											29
	•		182	6080	2870		13	36	62					5710											56
	•		1380		5433	16319	5	62	80	x	x			6070	1	2	1	2	0	0	0	0	0	0	55
	•		1213	1884	1206	40	3	24	73					8230	0	0	1	1	2	0	0	0	0	0	613

Development Potential Factors

STANDARD INDUSTRIAL CLASSIFICATION		REFERENCES	ENERGY REQUIREMENTS				EMPLOYMENT				TRANSPORTATION				POPULATION DENSITY						
											Modal Split				Population by Jurisdiction						
			Bituminous Coal *Short Ton/Employee*	Kilowatt Hour Equivalent *Thousands of Employees*	Barrels of Fuel Oil *Barrels per Employee*	Natural Gas *Millions of ft³/Employee*	Professional	Percent Female	Total Employment *By Jurisdiction*	Unemployment *By Jurisdiction*	Air	Water	Rail	Truck	Under 25,000	25,000-49,999	50,000-99,999	100,000-249,999	250,000-499,999	500,000-999,999	1,000,000 or more
3221	Glass containers		-	529	20.5	1609		36			-	0.6	21.0	78.4	37	18	18	9	9	0	9
3229	Pressed and blown glass		0.09	422	7.5	1256		30			0.1	0.2	59.5	39.5	59	33	0	8	0	0	0
3271	Concrete block and brick		0.47	174	30.6	277		6*			-	5.0	13.1	80.0							
3772	Concrete products		0.10	117	11.5	106		6*			-	-	-	-							
3774	Lime		308.1	4475	116.7	6441		6*			-	-	72.4	27.6							
3275	Gypsum products		5.12	1097	84.8	2874		6*			-	1.0	78.2	20.7							
3292	Asbestos products		1.58	164	26.4	275		16*			-	0.4	37.2	62.0							
33	PRIMARY METAL INDUSTRIES																				
3321	Gray iron foundries		1.14	187	2.9	247		4			-	4.6	44.7	50.3	32	11	27	8	4	10	4
3322	Malleable iron foundries		5.82	226	4.8	363		4			-	-	-	-	14	24	28	24	5	0	5
3323	Steel foundries		1.46	150	6.6	328		8			-	-	-	-	20	12	22	12	10	12	10
3331	Primary copper		11.04	1188	137.3	2642		4*			-	0.4	95.1	4.5							
3332	Primary lead		20.37	1114	7.7	1257		4*			0.1	-	90.6	9.2							
3333	Primary zinc		83.48	1746	1.3	2847		4*			-	3.6	90.6	5.5							
3334	Primary aluminum		24.93	1731	6.9	4992		3			-	-	91.1	8.3							
3357	Nonferrous wire drawing & insulating		.42	81	12.3	150		26			0.2	3.2	46.8	49.3	24	36	20	8	8	0	4
3399	Primary metal products, nec		.20	378	15.8	910		8*			0.1	-	76.0	23.0	30	6	10	20	30	10	0
34	FABRICATED METAL PRODUCTS																				
3421	Cutlery		0.12	66	15.0	57		28			0.1	-	4.0	94.6	30	30	16	0	8	8	0
3449	Miscellaneous metal work		0.36	63	2.1	142		14			-	7.7	8.2	83.9	27	37	18	0	9	0	9
3451	Screw machine products		0.11	31	3.8	66		25			-	-	-	-	12	21	25	15	9	6	9
3461	Metal stamping		1.59	56	2.5	89		21*			0.6	0.3	48.7	50.1	13	26	18	21	11	3	8
3494	Values and pipe fittings		.40	75	4.1	158		18*			0.5	0.2	59.0	39.9	22	27	16	16	8	8	4
3497	Metal foil and leaf		-	94	8.1	170		18*			-	-	-	-	16	17	0	17	17	0	17
35	MACHINERY, EXCEPT ELECTRICAL																				
3522	Farm machinery		1.78	85	2.6	151		10*			0.1	-	47.0	52.0	22	30	13	16	4	13	2
3531	Construction machinery		2.81	73	2.2	130		8*			0.2	1.9	72.5	25.0	9	17	25	25	9	5	5
3536	Hoists, cranes and monorails		-	41	1.7	99		11			1.4	0.1	49.7	48.1	31	15	23	15	0	0	8
3541	Machine tools, metal cutting type		.48	44	3.9	74	x*	10			5.1	-	8.7	53.4	2	15	22	24	13	14	10
3542	Machine tools, metal farming types		0.03	45	3.7	78	x*	18			2.4	3.7	14.3	79.3	22	14	0	14	22	7	14
3544	Special dies, tools, jigs, fixtures		0.25	39	1.9	63	x*	8			1.2	9.5	15.4	73.2	6	17	33	27	6	11	0
3548	Metal working machinery, nec		0.63	54	7.3	119	x*	18			0.3	0.5	15.0	83.2	25	21	11	25	7	4	7

Additional Data

FOUNDATIONS			UNDEVELOPED LAND	WATER USE	SEWAGE DISPOSAL		MARKETS			SUPPORT				INCOME	WATER POLLUTION						AIR POLLUTION				
							Percent Distribution by shipment			Industrial External Linkages															
Deep Foundations	Shallow Foundation	Soil Bearing Capacity	Acres for Plant	Per Employee (thousands of gallons per year)	Public Sewer Effluent/Employee (gallons/year)	Solid Waste Per Employee (pounds/year)	Under 50 Miles	Under 200 Miles	Under 500 Miles	Forward Linkage	Backward	Conc. Dependence	Urban Orientation	Average Income/Employee (1967 dollars)	BOD	Dissolved Solids	Suspended Solids	Oil and Grease	Phosphorus	Inorganic Nitrogen	Hydrocarbons	Nitrogen Oxides	Particulates	Sulfur Oxides	Average # of Employees
	●		8459	1746	476	7982	11	54	92	×				6390	0	0	1	0	0	0	0	0	1	0	1710
	●		372	2287	557	7982	14	41	77			×		6170	0	0	1	0	0	0	0	0	1	0	306
		●	700			1592	52	89	98	×				6170	0	0	1	0	0	0	0	0	4	0	14
		●	439			1592	27*	71*	93*	×				6180	0	0	1	0	0	0	0	0	4	0	19
	●		1343	15806	645	4425	7	73	93					6260	0	0	1	0	0	0	0	0	3	0	87
	●		1958	7049	327	4425	14	53	88	×				7070	0	0	1	0	0	0	0	0	3	0	182
	●		2211	5970	597	1290	6	27	60			×	×	6760	1	0	1	0	0	0	0	0	0	0	263
●			551	6006	1914	20222	12	49	77	×	×	×	×	6990	1	0	0	0	0	0	0	0	1	0	142
●			1837	4580	1068		12*	49*	77*	×	×	×	×	7360											358
●			455	2025	739	34578	12*	49*	77*	×	×	×	×	7050	0	0	0	0	0	0	0	1	1	0	270
●			9572	60416	1770	0	13	53	59	×				6950	0	0	0	0	0	0	0	0	1	4	1055
●			2555	40000		0	10	35	65	×				7000	0	0	0	0	0	0	0	0	1	4	270
●			8090	64391	3013	0	7	30	46	×				7140	0	0	0	0	0	0	0	4	1	0	736
●			17116	86822	3474	0	-	-	-					8020	0	0	2	0	0	0	0	0	1	0	2975
●			1609	4301	1863		6	28	51	×			×	7000											348
	●		154	10000	495		12	47	66	×			×	7260											28
	●		208	9333	1166		3	11	16				×	6170											104
	●		429				15	54	78	×	×	×	×												
	●		106				13	40	74	×		×	×												
	●		264	1339	702	13174	16	48	80			×	×	7460	1	0	1	1	1	0	0	0	0	0	88
	●		405	1363	848		4	21	54	×			×	7170	0	0	0	0	0	0	0	0	0	1	166
	●		805	3636	1818		10*	32*	67*				×	7380	0	0	0	0	0	0	0	0	0	1	112
	●		883	4948	869		5	27	65				×	6950	0	0	1	0	0	0	0	0	1	1	89
	●		15765	2032	441		4	23	44				×	7430	0	0	1	0	0	0	0	0	1	1	230
	●		5969	3623	3623		4	18	70				×	7990	0	0	1	0	0	0	0	0	1	1	117
	●		112	841	544		8	26	53	×		×	×	8710	0	0	1	0	0	0	0	0	1	1	101
	●		191	357	357		5	32	54	×		×	×	8550	0	0	1	0	0	0	0	0	1	1	85
	●		60	2121	1212		11	43	89	×		×	×	9090	0	0	1	0	0	0	0	0	1	1	17
	●		558	1051	558		7	30	66	×		×	×	7240	0	0	1	0	0	0	0	0	1	1	114

Development Potential Factors

STANDARD INDUSTRIAL CLASSIFICATION		REFERENCES	ENERGY REQUIREMENTS				EMPLOYMENT				TRANSPORTATION				POPULATION DENSITY						
											Modal Split				Population by Jurisdiction						
			Bituminous Coal *Short Ton/Employee*	Kilowatt Hour Equivalent *Thousands of Employees*	Barrels of Fuel Oil *Barrels per Employee*	Natural Gas *Millions of ft^3/Employee*	Professional	Percent Female	Total Employment *By Jurisdiction*	Unemployment *By Jurisdiction*	Air	Water	Rail	Truck	Under 25,000	25,000-49,999	50,000-99,999	100,000-249,999	250,000-499,999	500,000-999,999	1,000,000 or more
3554	Paper industry machinery		-	53	4.9	82	x*	12*			0.3	-	31.1	68.4	5	27	36	18	9	0	0
3555	Printing industry machinery		0.44	34	4.8	38	x*	12			3.0	-	2.2	93.5	12	17	17	34	4	0	0
3559	Special industry machines, nec		0.11	39	4.7	62	x*	12*			0.9	-	19.4	79.4	12	29	11	21	10	9	4
3561	Pumps and compressors		0.40	52	3.4	94	x	14			0.5	0.2	55.6	43.1	14	19	8	30	8	13	8
3566	Power transmission equipment		0.33	57	3.4	116	x	14			2.5	0.6	24.5	71.5	18	15	30	15	10	7	5
3599	Miscellaneous, machinery		0.14	43	1.6	51	x*	15			3.3	1.1	9.6	83.2	42	8	25	17	8	0	0
36	ELECTRICAL EQUIPMENT & SUPPLIES																				
3611	*Electric measurement equipment*		-	18	1.8	36	x*	45			6.5	1.6	45.9	37.3	13	10	24	17	3	17	13
3621	Motor and generators		0.78	49	1.5	96		36			0.7	0.2	14.6	79.6	28	17	17	17	7	0	7
3634	Electric housewares & fans		-	36	2.7	62	x*	51			0.3	4.8	10.2	79.3	27	16	16	10	5	0	21
3641	Electric lamps		0.03	52	3.1	134					0.3	-	78.4	21.1	20	60	0	0	0	20	0
3642	Lighting fixtures		0.94	50	1.9	75		36			0.9	2.1	28.4	64.1	14	16	28	12	12	10	8
3651	Radio and TV receiving sets		0.14	41	2.1	33		56*			1.0	0.4	40.7	55.1	6	0	59	6	6	0	6
3679	Electric components		0.16	28	5.0	33		58			3.9	3.4	5.3	73.4	20	24	16	20	6	6	4
37	TRANSPORTATION EQUIPMENT																				
3711	Motor vehicles		3.11	77	4.6	132		8			-	1.7	77.4	20.6							
3714	Motor vehicles parts & accessories		2.88	72	3.5	119					0.6	-	75.1	24.1							
3729	Aircraft equipment, nec		0.6	37	3.3	62	x*	15			6.9	-	36.5	54.6							
3732	Boat building and repairing		0.04	33	3.1	23		13			6.2	1.4	33.2	63.6	40	20	10	10	10	0	0
3751	Motorcycles & bicycles & parts		.14	51	4.3	88		16*			0.9	0.4	53.9	43.8	43	14	0	29	0	0	14
38	INSTRUMENTS AND RELATED PRODUCTS																				
3811	Engineering & scientific instruments		.05	34	5.8	36	x*	27*			11.5	-	19.3	62.8	0	14	0	14	14	44	14
3831	Optical instruments & lenses		.01	20	2.1	20	x*	45*			42.6	-	0.7	56.2	17	33	17	0	33	0	0
3841	Surgical & medical instruments		.02	25	1.8	49		50*			4.8	0.4	43.2	41.5	31	23	23	0	8	0	15
3842	Surgical appliances & supplies		-	19	0.8	38		50*			1.6	0.5	21.2	69.1	22	22	17	17	4	14	4
3851	Ophthalmic goods		-	25	4.6	25		52*			4.9	-	10.1	60.8	20	20	0	30	0	20	10
3861	Photographic equipment & supplies							26*			2.0	0.5	48.1	47.8	22	6	6	18	30	0	18

Additional Data

FOUNDATIONS			UNDEVELOPED LAND	WATER USE	SEWAGE DISPOSAL		MARKETS			SUPPORT				INCOME	WATER POLLUTION						AIR POLLUTION				
							Percent Distribution by shipment			Industrial External Linkages															
Deep Foundations	Shallow Foundation	Soil Bearing Capacity	Acres for Plant	Per Employee (thousands of gallons per year)	Public Sewer Effluent/Employee (gallons/year)	Solid Waste Per Employee (pounds/year)	Under 50 Miles	Under 200 Miles	Under 500 Miles	Forward Linkage	Backward	Conc. Dependence	Urban Orientation	Average Income/Employee (1967 dollars)	BOD	Dissolved Solids	Suspended Solids	Oil and Grease	Phosphorus	Inorganic Nitrogen	Hydrocarbons	Nitrogen Oxides	Particulates	Sulfur Oxides	Average # of Employees
	●		160				9	29	50	x		x	x	8100	0	0	1	0	0	0	0	0	1	1	103
	●●		104				7	25	48	x		x	x	8210	0	0	1	0	0	0	0	0	1	1	60
	●●		472	2041	628		4	20	59	x		x	x	8010	0	0	1	0	0	0	0	0	1	1	66
	●		408	810	474		3	15	36	x			x	7560	0	0	1	0	0	0	0	0	1	1	113
	●		1090	1349	746		9	31	58	x			x	7470	0	0	1	0	0	0	0	0	1	1	115
	●		114	1612	725		7	50	75	x		x	x	7130	0	0	1	0	0	0	0	0	1	1	13
	●		165	757	318		2	9	33				x	6890	0	0	0	0	0	0	0	0	1	0	123
	●		743	2076	1134		5	26	74					6780	0	0	0	0	0	0	0	0	1	0	353
	●		167	2110	1557		3	22	46				x	5410	0	0	0	0	0	0	0	0	1	0	180
	●		1304	910	648		11	22	57					5760	0	0	0	0	0	0	0	0	1	0	410
	●		362	1923	1346		8	23	55					6010	0	0	0	0	0	0	0	0	1	0	56
	●		1371	372	290		6	18	46				x	5510	0	0	0	0	0	0	0	0	1	0	385
	●		1344	217	709		8	27	52					5780	0	0	0	0	0	0	0	0	1	0	142
	●		7181	1404	967	23820	7	30	67					8410	1	0	1	1	1	0	0	0	0	1	3002
	●		2371	3926	994	13063	10	35	74				x	7920	1	0	1	1	1	0	0	0	0	1	256
	●●		1057	1034	597		12	25	45			x	x	8470											266
	●		581				8	32	51		x		x	5340											79
	●		241				3	18	42		x		x	5860											38
	●		988	497	354		5	22	55				x	7100											72
	●●		333	487	365		15	30	72				x	7840											72
	●		592				36	55	71			x	x	6350											74
	●		173	1980	1584		5	27	68			x	x	6610											32
	●		74	7699	442		7	22	67				x	5600											59
	●		186	2819	763		6	14	48				x	8640											188

Extraction Industry

The extractive industry as discussed in this report refers primarily to the mining of mineral sands. The minerals mined are those known colloquially as light and heavy minerals, or beach sands. These include the following: quartz, clay minerals, glauconite and ilmenite. Mineral sands found in New Jersey are used in the production of special industry sands, such as glass sand, foundry sand, sand-blast sand and filter sand. These special sands are obtained mostly from the Coastal Plain, which is the part of New Jersey south and east of a line from Perth Amboy to Trenton. Sand and gravel for concrete aggregate and other construction uses are obtained in large quantity from both the Coastal Plain deposits and the glacial deposits of the northern part of the State.

Mineral sands are made up almost entirely of mineral and rock fragments derived from preexisting rocks and transported by water or wind to their present location. In prospecting for such sands it becomes important to note the nature and thickness of the overburden as well as the thickness of the usable sand below it. Depth to the water table is important in that it may determine the method of excavation to be used. Physical or chemical properties of the mineral deposits should also be noted, since sand and gravel for most uses must now meet specifications for purity. Therefore, some degree of treatment or preparation is necessary. The processes for preparation generally include: (1) mixing of sands to obtain desired grain texture and clay content, (2) removal of clay and silt by washing, (3) modification of grain-size distribution by screening or water classification, (4) removal of certain minerals, generally those containing iron, (5) crushing or grinding to reduce the particle size, and (6) drying.

New Jersey is one of the leading States in the production of special industrial sands, the excavation of which is nearly all by mechanical means. Mining methods include both wet and dry mining. In the case of dry mining, deposits of mineral sand, or industrial sand and gravel can be worked with a variety of equipment such as bulldozers, front-end loaders, draglines, etc. Overburden, the covering of useless material above the deposit to be worked, is removed. Excavation of the mineral sands can then begin, with the material conveyed to a loading point for trucks, or directly to a concentrator for separation, prior to treatment at a processing plant.

Dredging, or wet mining, is the cheapest and most convenient method of excavation where the product is to be washed sand or gravel, and the deposit extends to a depth of a few feet below the water table. There are two basic dredge types: the bucket dredge and the suction dredge. In the case of the latter, a centrifugal pump, mounted on a barge sucks up the sand deposit through a movable pipe submerged beneath the water. The sand is broken by a rotating cutter head. The sand-water mixture is then pumped to a concentrator, or preparation plant. The concentrates from the dredge, upon pretreatment, are pumped ashore at about 60 percent solids and dewatered in a cyclone. They are dropped into a stockpile from which they are transported to a processing plant. Most mineral sands in New Jersey are mined by suction dredge. Bucket dredges are used for the coarser gravel found in south New Jersey.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Collector Road
- ● Access to Electric Power Distribution Line
- o Access to Railroad
- ● Availability of Mineral Resource
- o Slope

Extraction Industry

BASELINE UNIT COST: $400,000 DEVELOPMENT SIZE: 50 acres (includes 30 acres for buffer and overburden storage)

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 50,000 - 100,000 - 150,000	0 - 50,000 - 100,000 - 150,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 50,000 - 100,000 - 150,000	0 - 50,000 - 100,000 - 150,000	Medium
Access to Railroad [C]	*	0 - 1 1 - 3 3 - 5 5+ miles	0 - 600,000 - 1,200,000 - 1,500,000	0 - 600,000 - 1,200,000 - 1,500,000	Medium
Availibility of Mineral Resource [V]	*	Present [3] Not Present	0 X	0 X	High
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 400,000 - 600,000 - 925,000	0 - 400,000 - 600,000 - 925,000	Medium
	*	Baseline Specification			

NOTE:
The baseline unit cost for extractive industry represents the cost of a small office, earthmoving equipment, a storage shed, an on-site rail siding, and a cyclone fence surrounding the site. The most important considerations in locating an extractive industry are the thickness of the mineral deposit, and the thickness of the overburden overlying it. A third variable is the value of the mineral in question by volume. If, for example, it is economically worthwhile to remove 5 feet of overburden in order to recover 2 feet of a resource with a value of $2 per ton, then it will be worthwhile to remove more than 5 feet of overburden to recover 2 feet of a resource with a value of $5 per ton. This kind of analysis must be done on a case-by-case basis, which is beyond the scope of this study. Another important variable is Depth to Water Table. If the resource in question is below the water table, wet mining techniques must be used. These can be more or less expensive than dry mining techniques. Since they represent operating costs, they are beyond the scope of this study. Costs for Access to Collector Road are for a Level 1 access road, the specifications for which may be found on the Element Cost Sheet.

C = costs are constant per development
V = costs vary with number of units

Infrastructure

Collector and Local Roads

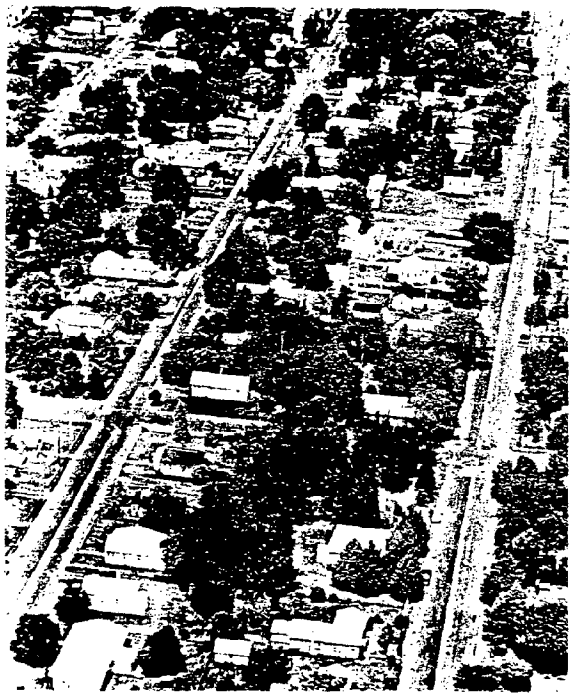
Collector and local roads serve functions rather different from that of arterial roads, of which limited access roads are a special type. Arterial roads do not go to many places, but they carry large numbers of people at generally high speeds to the places they do go. The emphasis with arterial roads is on mobility. With local roads, the emphasis is on access. That is, the function of local roads is to provide access to individual homes, businesses, farms, etc., on adjacent land. Most trips on local roads are for short distances and at low speeds. The function of collector roads is intermediate between those of arterial and local roads. Collector roads provide access between places which do not generate enough trips to justify service by an arterial road, and they also provide a link between arterial and local roads. Most trips on collector roads are of moderate length, at moderate speeds.

In the rural areas, collector roads might comprise 25% of total road miles, and might carry 19% of total vehicle-miles of travel (VMT). Local roads might represent 67% of total road miles, and might carry 8% of total VMT. Thus collector and local roads together, while comprising 92% of all road miles, would carry only 27% of total VMT.* Because collector and local roads carry a low level of VMT in proportion to their total length, and because their function is to provide access throughout the road network, it is not so imperative that they be built very close to the shortest straight-line distance between trip origins and destinations. Considerations which might move a route away from the shortest distance are the need for bridges or tunnels, slopes which would require cutting and filling, and soils with poor load bearing capacity. The land requirements of a road with a 60-foot right-of-way are 7.3 acres per mile of road.

*U.S. Dept. of Transportation. Highway Functional Classification: Concepts, Criteria and Procedures. July 1979.

Development Potential Factors

- • Undeveloped Land
- o Slope
- o Soil Load Bearing Capacity
- o Short Distance between Trip Origins and Destinations
- o Minimum Need for Bridges and Tunnels



Collector and Local Roads

BASELINE UNIT COST: $600,000

DEVELOPMENT SIZE: 1 mile, 2 lanes, 30 feet wide

Factor			Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land						
Slope V		*	0 - 3 3 - 8 8 - 15 15+ %	0 +100,000 +144,000 +235,000	0 +100,000 +144,000 +235,000	Medium
Soil Load Bearing Capacity V		*	High (1) Medium Low	0 - 50,000 -100,000	0 - 50,000 -100,000	Low
Short Distance between Trip Origins and Destinations V						
Minimum Need for Bridges and Tunnels V						
		*	Baseline Specification			

NOTE:
The baseline unit cost presented here is based on a roadway with a 9 inch base of crushed stone, 5 inches of bituminous paving with storm sewers and curbing. Two lane roads can vary in cost from a minimum of $330,000 to $400,000 per lane-mile. Four lane roads vary in cost from $200,000 to $250,000 per lane-mile. These construction costs exclude at-grade intersections. The figures given on the chart for slope and soil load bearing capacity assume a graded and filled width of 60 feet.

C = costs are constant per development
V = costs vary with number of units

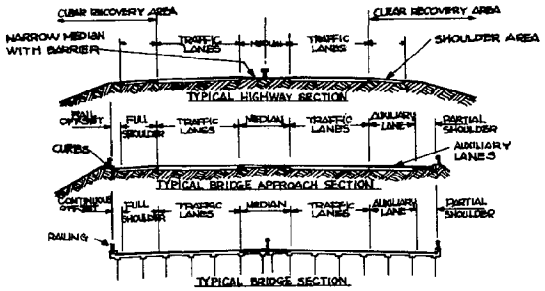
Arterial and Limited Access Roads

Roads present special siting problems because they are linear features. Rather than finding a single, relatively small area which best fulfills a given set of requirements, the need with a road is to find a continuous strip of land which best connects two points, the trip origin and trip destination points. Limited access roads are principal arterial roads which carry a high volume of relatively long-distance travellers at high speeds. For any given area, limited access roads will form a very small percentage of total road miles, but will carry a substantial percentage of total vehicle-miles of travel (VMT). For example, in rural areas, principal and minor arterial roads (a category that includes limited access roads) might comprise only 8% of total road miles, but might carry as much as 73% of total VMT.* The disproportion between percentage of road miles and percentage of VMT carried would be even greater in the case of limited access roads. Because of the high levels of VMT they carry, and because of their high costs of construction per mile, it is important that limited access roads be close to the shortest straight-line distance between the origin and destination points they serve. This not only keeps construction costs down, but also minimizes total of vehicle-miles of travel (VMT), an important consideration in a time of rising fuel costs.

In finding the best and cheapest route for a limited access road, a number of considerations may have to be weighed against the shortest straight-line distance between origin and destination points. If the shortest distance entailed a number of water crossings, for example, a longer route might be cheaper, since the cost of bridge construction is very high. The need for bridges and tunnels should therefore be minimized. Slope is another such consideration, because of the cost of cutting and filling. Similarly, soils with poor load bearing capacity may require expensive remedial measures. The only other requirement is land. A road with a 300-foot right-of-way requires roughly 36 acres of land per mile, exclusive of land required for entrance and exit ramps and similar features.

Development Potential Factors

- Undeveloped Land (36 acres/mile for 300' right-of-way)
- o Slope
- o Soil Load Bearing Capacity
- o Short Distance between Trip Origins and Destinations
- o Minimum Need for Bridges and Tunnels



BASELINE UNIT COST: $9,000,000

DEVELOPMENT SIZE: 1 mile, 6 lanes, 90 foot width

Arterial and Limited Access Roads

Factor			Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land						
Slope V		*	0 - 3 3 - 8 8 - 15 15+ %	0 -224,000 -336,000 -518,000	0 -224,000 -336,000 -518,000	Medium
Soil Load Bearing Capacity V		*	High (1) Medium Low	0 -400,000 -800,000	0 -400,000 -800,000	Low
Short Distance between Trip Origins and Destinations V			(12)			
Minimum Need for Bridges and Tunnels V			(12)			
		*	Baseline Specification			

NOTE:
The baseline unit cost given here assumes a roadway with 6 inches of bituminous paving on 12 inches of crushed stone. The construction of interstates or freeways, excluding interchanges may cost a minimum of 1.3 million dollars per lane-mile to a maximum of 3.2 million dollars per lane-mile. The figures for slope and soil load bearing capacity assume a graded and filled width of 114 feet. Generally engineering costs range between 10 and 15 percent of the estimated construction cost.

C = costs are constant per development
V = costs vary with number of units

Railroads

The problem of siting railroad alignments is similar to that of siting roads; they are linear features. Thus the problem is not simply to find one relatively small area which best fulfills a particular set of requirements, but rather to find a continuous strip of land which best connects two points, the trip origin and trip destination points. Because of high capital costs, railroads require a heavy volume of business in order to justify their construction. Once it has been determined that two areas may be profitably connected by a railroad, the most desirable route, will be the shortest straight-line distance between them, other things being equal.

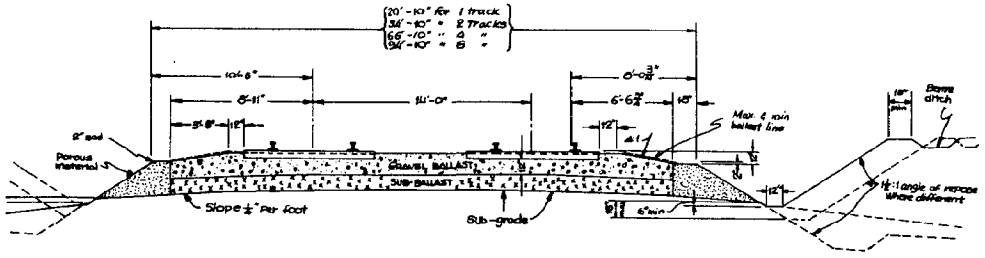
A number of considerations might move a railroad route away from the shortest distance. Because of their high construction costs, the need for bridges and tunnels should be avoided where possible. Slope is another important factor. Railroad grades should not exceed 2%. Because of the lost of cutting and filling, level ground is desirable. Soil load bearing capacity is also an important consideration. The only other requirement is land; a 200-foot right-of-way requires 24 acres of land per mile.

Because of rising energy costs, railroads may in the future be able to recapture some of the freight and passenger traffic that they have lost to competing modes, chiefly trucks and automobiles. This loss to competing modes over many years has resulted in the abandonment of many miles of rail line. These abandoned rights-of-way would be prime candidates for development if railroad service were restored, since acquisition of right-of-way is generally a major expense.

At present, it seems likely that most of the areas that could support rail service already do. However, the rapid growth of the Atlantic City area may make passenger and freight service from Philadelphia and New York an attractive proposition.

Development Potential Factors

- ● Undeveloped Land
- o Slope
- o Soil Load Bearing Capacity
- o Short Distance between Trip Origins and Destinations
- o Minimum Need for Bridges and Tunnels



Double main track on tangent

Railroads

BASELINE UNIT COST: $300,000

DEVELOPMENT SIZE: 1 mile, single track

Factor			Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land						
Slope V	*	0 - 3 3 - 8 8 - 15 15+ %		0 -117,000 -175,000	0 -117,000 -175,000	Medium
Soil Load Bearing Capacity V	*	High Medium Low	(1)	0 -210,000 -420,000	0 -210,000 -420,000	Low
Short Distance between Trip Origins and Destinations V			(2)			
Minimum Need for Bridges and Tunnels V			(2)			
	*	Baseline Specification				

NOTE:

There can be considerable variation in railroad construction costs. The figures for slope and soil load bearing capacity are based on a 200-foot right-of-way with a 50-foot width graded, cut and filled. See Element Cost sheet for information concerning elevated structures and overhead railroad bridges.

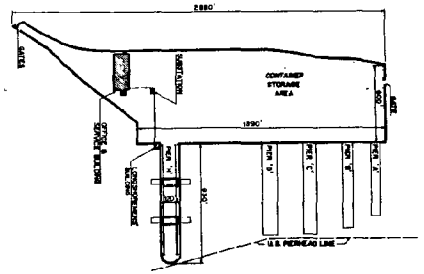
C = costs are constant per development
V = costs vary with number of units

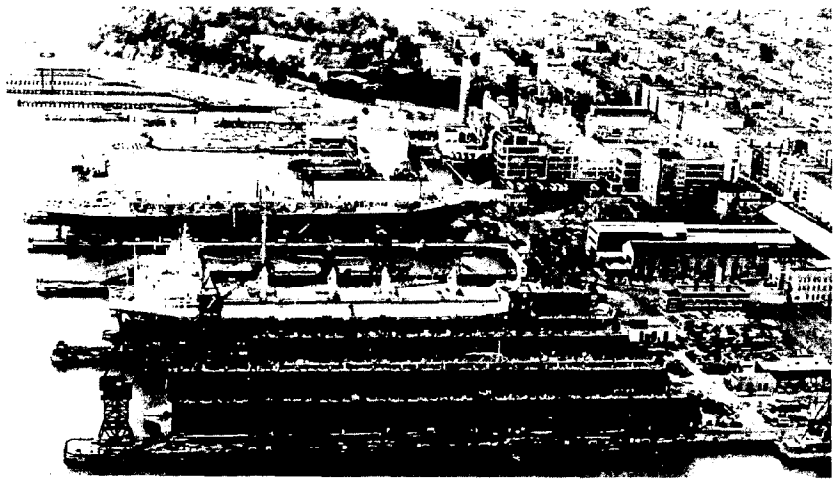
Ports (major)

Ports are transportation terminals where waterborne freight and/or passenger traffic come ashore. In general, passenger traffic is an insignificant proportion of total waterborne traffic, so ports may be regarded as cargo-handling facilities. Within this general definition, there is a wide range of possible types of ports. They may be categorized in terms of cargo (general cargo, dry bulk, break-bulk, containerized, etc.), in terms of ownership (port authority, private industrial shipper), in terms of volume of trade, or in a number of other ways. For the purposes of this study, a major port is defined as one having a minimum channel depth of at least 35 feet at mean low water. A minor port is one capable of handling small commercial vessels and barges, with drafts up to 12 feet.

It is important to draw a distinction between general ports, open to all shippers, and marine terminals owned and operated by private owners for their exclusive use. A large steel mill or oil refinery, for example, might operate its own port facility for receiving shipments of iron ore or crude oil. However, the onshore transportation requirements of such marine terminals may be rather different from those of a general port, since the cargo delivered to the private terminal is often to be used at the terminal site. For a general port, proximity to surface transportation modes, railroads, and highways, is of critical importance, since such ports are essentially transshipment points between water and surface modes.

A port facility typically consists, at minimum, of a berth for a ship, an apron adjacent to the berth, where the cargo is unloaded, and a transit shed, a covered storage area for cargo awaiting transshipment. Space is also required for the loading of cargo to and from trucks and railroad cars. There has been a pronounced trend in recent years away from break-bulk cargo toward containerization. This tends to require rather large amounts of open space, for the storage of containers.





Development Potential Factors

- ● Undeveloped Land (at least 50 acres)
- ● Access to Arterial Road (within 3 miles)
- ● Access to Railroad (within 5 miles)
- ● Access to Electric Power Transmission Grid
- ● Access to 35-foot Channel
- ● Marine Access (downstream from fixed bridges of less than 35-foot vertical clearance)
- o Proximity to Metropolitan Service Center
- o Slope (nearly level)
- ● Soil Load Bearing Capacity
- ● Access to Public Sewerage
- ● Access to Public Water Supply
- ● Embayments
- ● Dredging Maintenance
- o Minor Tides

Ports (major)

BASELINE UNIT COST: $30,000,000 DEVELOPMENT SIZE: 100 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Arterial Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Access to Railroad [C]	*	0-1 1-3 3-5 5+ miles	0 - 600,000 - 1,200,000 - 1,500,000	0 - 600,000 - 1,200,000 - 1,500,000	Medium
Access to Electric Power Transmission Grid [C]	*	0-1 1-3 3-5 5-10 10+ miles	0 - 300,000 - 600,000 - 1,125,000 - 1,500,000	0 - 300,000 - 600,000 - 1,125,000 - 1,500,000	Medium
Access to 35-foot Channel [C]	*	0-1 1-3 3-5 5-10 10+ miles	0 - 5,000,000 -10,000,000 -18,750,000 -25,000,000	0 - 5,000,000 -10,000,000 -18,750,000 -25,000,000	Medium
Marine Access [V]	*	Present (3) Not Present	0 X	0 X	High
Proximity to Metropolitan Service Center [V]	*	0-10 10-20 20-30 30-40 40+ miles	+ 800,000 + 400,000 + 200,000 + 100,000 0		Medium
Slope [V]	*	0-3 3-8 8-15 15+ %	0 - 320,000 - 480,000 - 740,000	0 - 320,000 - 480,000 - 740,000	Medium
Soil Load Bearing Capacity [V]	*	High (1) Medium Low	0 - 1,000,000 - 3,000,000	0 - 1,000,000 - 3,000,000	Low
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Access to Public Sewerage [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 185,000 - 370,000 - 555,000		Medium
Access to Public Water Supply [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 115,000 - 230,000 - 345,000		Medium
Embayments [V]	*	Present (3) Not Present	0 X	0 X	High
Dredging Maintenance [V]	*	Adequate (3) Not Adequate	0 X	0 X	High
Minor Tides [V]	*	5 feet or less Greater than 5 feet	0 - 4,000,000	0 - 4,000,000	Low
	*	Baseline Specification			

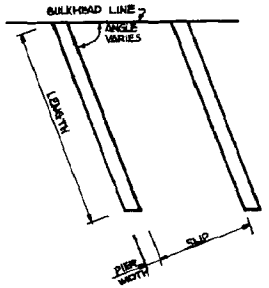
NOTE:
The baseline unit cost assumes a container port with two berths, each 100 feet long. Cost of Access to 35-foot channel are based on a channel 120 feet wide, with an average dredged depth of 18 feet. Unit cost for dredging is $5.00 per cubic yard. Slight currents are desirable, 1/2 to 1 knot: they aid in docking and undocking. Access to Arterial Road figures are based on the use of a Level 2 access road (see Element Cost Sheet). Access to Public Water Supply figures are based on the use of an 8 inch steel pipe installed at a depth of 4 feet. The Access to Public Sewerage figures are based on the use of a 15 inch vitrified clay pipe installed at a depth of 4 feet. Costs for port construction will be generally higher in the northern portions of the state and somewhat lower in southern sections.

C = costs are constant per development
V = costs vary with number of units

Ports (minor)

Minor ports are those capable of handling small commercial vessels and barges up to 12 feet in draft. Such ports might handle small commercial fishing boats, or barges carrying bulk cargo from a larger port. An operations base serving Outer Continental Shelf (OCS) exploration or production activity would also be an example of a minor port. Minor ports fulfill essentially the same function of transshipment as do major ports, but the difference in scale leads to qualitative differences in requirements. Minor ports do not require access to a railroad in order to be economically viable.

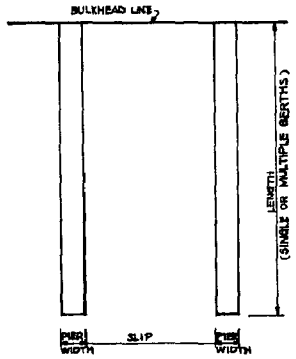
Nevertheless, access to transportation remains of paramount importance. A minor port should have ready access to an arterial road for shipment of cargo by truck. A typical minor port might, at minimum, provide berths for 3 or 4 boats or barges of up to 100 feet in length. Space along the berths would be required for handling cargo, as well as an area for the loading or unloading of trucks. Marine fuel storage capacity would be necessary.



ACUTE ANGLE PIER

Development Potential Factors

- Undeveloped Land (at least 5 acres)
- Access to Arterial Road (within 2 miles)
- Access to Electric Power Distribution Line
- Access to 12-foot Channel (within 1 mile)
- o Slope (nearly level)
- Proximity to River and Bay Shore Frontage
- Embayments
- Marine Access (downstream from fixed bridges with less than 25-feet vertical clearance)
- Dredging Maintenance
- o Minor Tides



RIGHT ANGLE PIER

Ports (minor)

BASELINE UNIT COST: $4,000,00(

DEVELOPMENT SIZE: 5 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Arterial Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 50,000 - 100,000 - 150,000	0 - 50,000 - 100,000 - 150,000	Medium
Access to 12-foot Channel [C]	*	0 - 1 1 - 2 2 - 3 3 - 5 5+ miles	0 - 750,000 - 1,200,000 - 2,000,000 - 2,500,000	0 - 750,000 - 1,200,000 - 2,000,000 - 2,500,000	Medium
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 80,000 - 120,000 - 185,000	0 - 80,000 - 120,000 - 185,000	Medium
Proximity to River and Bay Shore Frontage [V]	*	Adjacent [3] 0 - 1/2 1/2 - 1 1+ mile	0 X X X	0 X X X	High
Embayments [V]	*	Present [3] Not Present	0 X	0 X	High
Marine Access [V]	*	Present [3] Not Present	0 X	0 X	High
Dredging Maintenance [V]	*	Adequate [3] Inadequate	0 X	0 X	High
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Minor Tides [V]	*	5 feet or less Greater than 5 feet	0 - 700,000	0 - 700,000	Low
	*	Baseline Specification			

NOTE:
The baseline unit cost represents a facility with two berths for barges, each berth being 100 feet long. Access to 12-foot channel assumes a channel 80 feet wide, with an average dredged depth of 6 feet. Unit cost of dredging is $5.00 per cubic yard. Access to Arterial Road costs are based on the use of a Level 2 access road (see Element Cost Sheet). As with major ports and marinas, the costs associated with minor ports are somewhat higher in northern New Jersey and less in southern sections of the state.

C = costs are constant per development
V = costs vary with number of units

Airports

Airports are often classified by the types of aircraft they can accommodate. The Federal Aviation Administration (FAA) classification system is used by the New Jersey State Airport System. The airports are classified as follows:

Basic Utility Airports - accommodate almost all single-engine aircraft, and most twin-engine aircraft with less than 8,000 pounds maximum weight. The runway generally measures 2,200 to 3,200 feet in length.

General Utility Airports - provide additional runway length, which allows for the requirements of all propeller driven aircraft up to a maximum weight of 12,500 pounds. Its primary runway is generally 3,200 to 5,000 feet in length.

Basic Transport Airports - accommodate most turbine aircraft, virtually all piston aircraft, and business jets, up to a gross weight of 60,000 pounds. Its primary runway is 5,000 to 6,000 feet in length.

Air Carrier Airports - accommodate scheduled air transport passenger service. The runway should range from a minimum of 7,000 feet to 12,000 feet in length and have sufficient strength to support aircraft from 100,000 pounds gross weight to the heaviest air carrier aircraft to be accommodated.

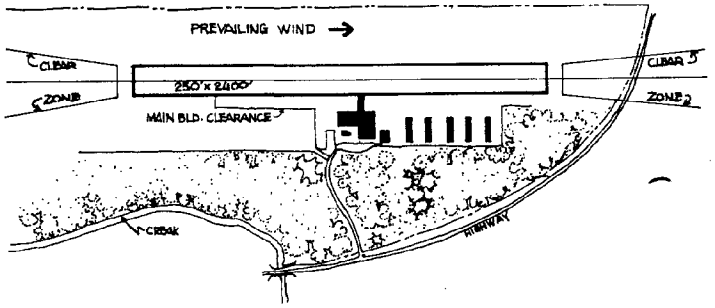
The New Jersey State Airport Systems Plan shows existing demand areas (see accompanying map on the following page). These areas are determined based on the the following factors:

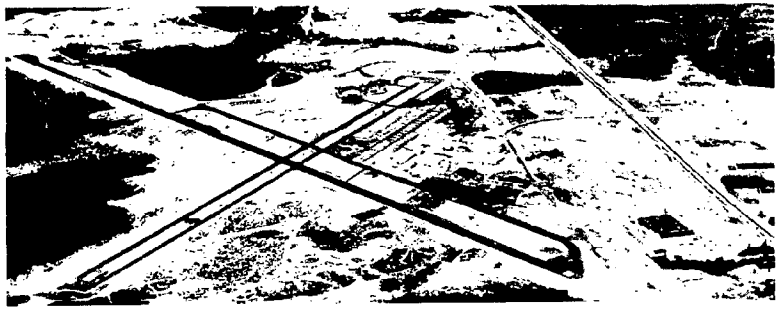
- they are within reasonable driving time (30 minutes) from urban centers;
- they have the capability of accommodating operations of the type and numbers of aircraft forecast;
- they have sufficient separation from other aviation facilities to eliminate or minimize airspace conflicts;
- population, employment, and income distribution;
- airport facilities available.

Additional Factors for Consideration Include:

- Undeveloped land (100-200 acres for airport and buffer area)
- Slope
- Compatible land uses

The list is further complicated depending on the type, size and instrumentation of aircraft. This type of analysis is very site-specific and can only be accomplished using specially designed models and technical airport planning expertise. A more general planning process cannot account for all the requisite considerations in sufficient detail to be useful in siting airports.





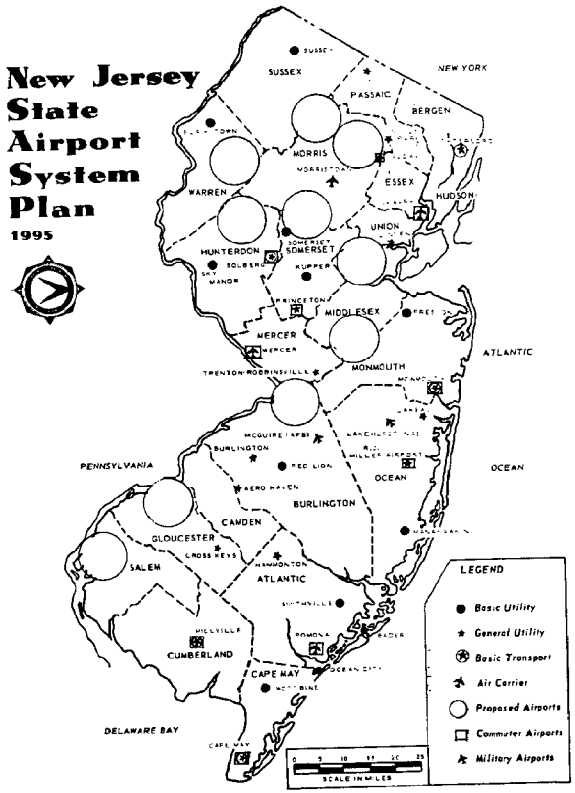
BASELINE UNIT COST: $20,000,000

DEVELOPMENT SIZE: 225 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 -300,000 -600,000 -900,000		High
Slope [V]	*	0-3 3-8 8-15 15+ %	0 -1,600,000 -2,400,000 -3,700,000	0 -1,600,000 -2,400,000 -3,700,000	Medium
Character of Surrounding Area [V]	*	Compatible Land Use Other (3)	0 X	0 X	High
	*	Baseline Specification			

NOTE:
The baseline unit cost given here is for a general utility airport serving propeller planes only, with a 12,500 pound limit. The deficiency costs for Access to Collector Road are based on a Level 3 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units


New Jersey
State
Airport
System
Plan
1995
SUSSEX
NEW YORK
PASSAIC
BERGEN
MORRIS
ESSEX
HUDSON
WARREN
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
ATLANTIC
OCEAN
PENNSYLVANIA
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
CUMBERLAND
CAPE MAY
DELAWARE BAY
LEGEND
Basic Utility
General Utility
Basic Transport
Air Carrier
Proposed Airports
Commuter Airports
Military Airports
SCALE IN MILES

Utilities

Liquid Waste Disposal

Liquid waste disposal within any community is generally accomplished by means of a sewerage system, also termed a wastewater system. The system may only allow for the collection of sanitary waste, or it may provide for the collection of storm water as well, in which case the system is termed a "combined system". The focus of this study will be upon sanitary sewerage systems.

A sewerage system is made up of two components; the collection system (the pipes) and the treatment plant. The majority of the sewer systems in existence and under construction are gravity-flow systems. Gravity systems generally conform to geographic and topographic boundaries, e.g. water sheds, rather than political boundaries. The collection system is generally designed to assure self-cleansing velocities, thus preventing sediment from collecting in the bottoms of the pipes. The minimum velocity required to sustain solid transport is between 2.0 and 2.5 feet per second. Velocities are held to a maximum of about 10 feet per second. Energy conservation within the sewerage collection system is therefore dependent on slope, with 0.5 to 2.0 percent normally required to attain the necessary velocity. To insure that adequate velocities are maintained, pumping stations or manholes may be installed. Where pumping is required over considerable horizontal distances the conduit (sewer line) is termed a "force main".

Sewer pipes vary in size from 6 to 8 inches for laterals, up to several hundred inches in diameter for interceptors. Interceptors are generally collectors which lead to the wastewater treatment facility, while laterals are collectors into which residential, commercial and industrial connections flow. Materials used for sewer conduits range from vitrified clay to a newly developed fiberglass reinforced mortar plastic pipe. In terms of the total cost of a sanitary sewer system, the collection network accounts for between 60 and 80 percent, and treatment plants only 20 to 40 percent.

Treatment facilities in sewerage systems are designed to remove varying proportions of solid and organic materials of domestic quality carried in the wastewater stream, as defined by applicable regulations. To the extent industrial and commercial waste is unsuitable for public treatment, pretreatment on-site may be required prior to release to the sewer system for treatment at the municipal (or private) plant.

Wastewater treatment is of three general types: primary, secondary, and tertiary treatment. Primary treatment refers to the removal of between 30 and 35 percent of the organic pollutants and up to one-half of the suspended solids. The processes involved include screening and skimming of solids, and a settling period to remove heavier suspended materials. Secondary treatment removes between 80 and 90 percent of the organic materials and over 80 percent of the suspended solids. Besides allowing for further sedimentation of suspended solids, secondary treatment involves a biological process which provides a further step in purification. Tertiary or advanced waste treatment is designed to remove one or more specific organic compounds, e.g. phosphates and nitrates. Additional steps are added to primary and secondary treatment in order to provide for additional purification.

The design of a sewerage system is primarily influenced by the definition of the service area and the projection of the final population size to be served. As part of a highly interactive system of land use, however, the sewerage system both influences and is influenced by the pattern of development. Academic studies tend to indicate that, within limits, construction of a new sewer system is often "self-insuring"; that is, by its presence new development is attracted to the areas to be served, thus stimulating additional population growth and urban development.*

Once the service area and ultimate population are determined, the engineering aspects of the system design — choice of slope, pipe, number of pumping stations or manholes and joint materials — becomes fairly straightforward.

Development Potential Factors

- Undeveloped Land
- Access to Local Road
- Access to Electric Power Distribution Line
- o Slope
- o Soil Load Bearing Capacity
- o Proximity to River or Bay Shore Frontage

*Urban Systems Research and Engineering, Inc. 1976. The Growth Shapers: The Land Use Impacts of Infrastructure Investments; Washington, D.C.: CEQ

Liquid Waste Disposal

BASELINE UNIT COST: $11,568,000 (plant and conveyance system) DEVELOPMENT SIZE: 10 acres (4 for plant, 6 for buffer)

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Access to Electric Power Distribution Line [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 50,000 - 100,000 - 150,000	0 - 50,000 - 100,000 - 150,000	Medium
Slope [V]	*	0 - 3 3 - 8 8 - 15 15+ %	0 - 64,000 - 96,000 - 160,000	0 - 64,000 - 96,000 - 160,000	Medium
Soil Load Bearing Capacity [V]	*	High Medium Low	0 - 120,000 - 240,000	0 - 120,000 - 240,000	Low
Proximity to River or Bay Shore Frontage [V]	*	Adjacent 0 - 1/2 1/2 - 1 1+ mile	0 - 80,000 - 240,000 - 320,000	0 - 80,000 - 240,000 - 320,000	Medium
	*	Baseline Specification			

NOTE:
The plant described here is assumed to have a capacity of 2 million gallons per day (MGD), and to serve a residential community of 10,000 persons, living in approximately 3,000 dwelling units, over an area of 3 square miles. A plant of this capacity, capable of secondary treatment with phosphorus removal, will cost $4,675,560. The cost of sewage treatment plants can be calculated using the formula $c=2,523,000\ (q^{0.89})$ where c is the dollar cost and q is the capacity in MGD. For the population density assumed, an average of 15 feet of pipe per person is a typical total for the conveyance system. This is assumed to be 105,000 feet of 8" vitrified clay, 30,000 feet of 15" vitrified clay, and 15,000 feet of 24" reinforced concrete pipe. The cost of the conveyance system is assumed to be $6,173,250. Four 1 MGD pumping stations at $180,000 each add an additional $720,000, for the total baseline unit cost of $11,569,000. Deficiency costs for Proximity to River or Bay Shore Frontage assume a 24" reinforced concrete force main costing $60 per foot.

C = costs are constant per development
V = costs vary with number of units

Harvest

A number of different land and water uses are considered under this category. They range from relatively capital-intensive land uses, such as greenhouses, to the gathering of naturally-occurring water resources, such as shellfishing. What they have in common is the harvesting of a resource.

Harvest uses tend to have qualitatively different locational requirements from other forms of development. To illustrate, residential or commercial or industrial uses generally have a shopping list of requirements which must be met, or which must be weighed and traded off among each other. This is not so much the case with harvest uses. Some uses simply require the presence of the resource. Shellfishing, for example, requires the presence of shellfish, of necessity. All other Development Potential Factors are subsidiary to this one. Other harvest uses, such as greenhouses, have so few requirements as to be virtually completely footloose. They can locate almost anywhere. Still other uses, particularly the more land-extensive ones such as forestry, are probably influenced by the price of land as much as by anything else. In New Jersey, if a piece of land is left alone for a long enough time, it will become forest. Thus a sizable portion of the land under forest in New Jersey may be forest in default of any other use.

In identifying lands with an especially high potential for harvest use in the abstract, it would be necessary to consider a number of factors in addition to soils. Access to market is an important consideration, for example. New Jersey field crops, such as wheat and soybeans, may be shipped to Philadelphia for export. More perishable crops, such as fruits and vegetables may go to regional markets such as Vineland or Hightstown, to roadside stands, or to local processors. In any case, New Jersey is close enough to New York and Philadelphia, and has a sufficiently dense road network, that location with respect to markets is not a locational determinant.

Another consideration in the abstract is proximity to what might be termed agricultural infrastructure. This would include agricultural machinery sales and repair facilities, seed and fertilizer dealers, and grain storage facilities. Of the numerous agricultural experts consulted in the course of this study, none thought that this was a significant locational factor in New Jersey. Although agriculture has experienced heavy pressure from other types of development in parts of the study area, there is still a sufficiently well-developed infrastructure to support commercially viable farming.

The various types of harvest uses are discussed individually below.

Field Crops

Field crops are crops such as soybeans, wheat, and alfalfa. They are characterized by extensive rather than intensive farming; that is, they tend to be grown on large acreages with relatively minor inputs of labor. As with most agricultural land uses, the quality of the soil is of preponderant importance. Above all else, the soil for field crops should be well drained. Open land classified by the Soil Conservation Service as being in Capability Classes I and II is considered prime open agricultural land. Such lands are ideal for field crops.

The importance of soils may be seen from the table below. The Soil Conservation Service rates each soil according to its estimated yield for a number of typical crops. Soils with the highest yield rating, 10, may yield up to ten times the crop per acre as soils with a yield rating of 1.

Estimated yields per acre by soil yield rating*

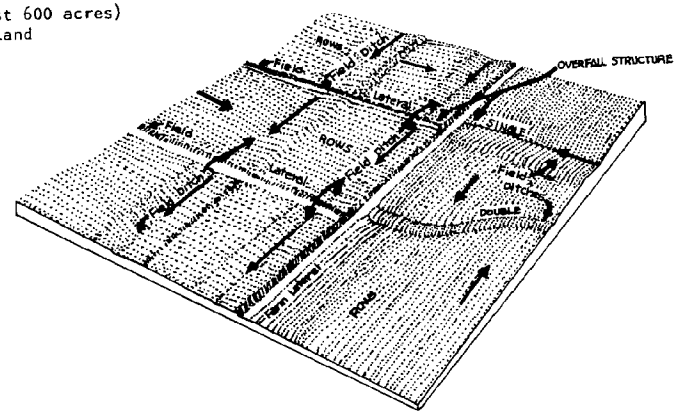
Rating	Crop				
	Tomatoes	Corn	Alfalfa	Wheat	Soybeans
	Tons	*Bu.*	*Tons*	*Bu.*	*Bu.*
1	8	50	1.0	10	5
2	10	60	1.5	15	10
3	12	70	2.0	20	15
4	14	80	2.5	25	20
5	16	90	3.0	30	25
6	18	100	3.5	35	30
7	20	110	4.0	40	35
8	22	120	4.5	45	40
9	24	130	5.0	50	45
10	26+	140+	5.5+	55+	50+

[1] Yield estimates prepared by interstate coordination in 1969.

* USDA, Soil Conservation Service. 1971. Soil Survey of Burlington County, New Jersey. Washington, DC

Development Potential Factors

- Undeveloped Land (at least 600 acres)
- Prime Open Agricultural Land



BASELINE UNIT COST: $375,000 DEVELOPMENT SIZE: 600 acres

Field Crops

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Prime Open Agricultural Land V	*	Capability Class I & II Soils [3]	0	0	
		Capability Class III Soils [15]	- 90,000	- 90,000	Medium
		Soils for Special Crops [12]	X	X	
	*	Baseline Specification			

NOTE:
The figure given in the baseline unit cost represents the total capital investment needed for field crops (machinery, equipment and buildings). The deficiency cost for Capability Class III soils is based on the difference in value between the best agricultural soils and those of only fair quality. Farmland assessment figures that evaluate agricultural land purely on their value for agricultural and horticultural uses indicate that over the entire study area, this difference is roughly $150 per acre.

C = costs are constant per development
V = costs vary with number of units

Fresh Market Vegetables

Development Potential Factors

- ● Undeveloped Land
- ● Prime Open Agricultural Land
- o Surface Water Availability
- o Groundwater Availability

Fresh market vegetables are crops such as tomatoes, snap beans, peppers, strawberries, and asparagus. They are characterized by their perishability. They must be delivered to a processor or to the consumer within a short time after having been picked. Picking generally requires large inputs of labor. In New Jersey, this is frequently accomplished by contract workers brought up for the season from Puerto Rico. The labor requirements of vegetable farming are not a locational factor.

There are two factors of paramount importance for vegetable farms: soil quality and water availability. Prime open agricultural land (SCS Capability Classes I and II) is ideal, although soil slightly sandier than would be ideal for field crops is desirable. It might be possible for a family to support itself raising multiple crops of mixed vegetables on as little as 20 acres, but this calls for heroically intensive cultivation. A more representative minimum acreage, to support a farmer and his family, is 200 acres.

Irrigation water is of critical importance for vegetable farming. A crop of tomatoes may take as much as one-fifth of an inch of water per day. Over a 30-day growing season, this is a total of 6 inches of water. In order to calculate in millions of gallons per day (MGD) the amount of water required, it will be necessary to multiply inches of water required times the minimum number of acres of such a farm. There are 27,000 gallons of water per acre-inch. Multiplying 27,000 gallons per acre-inch times 200 acres times one-fifth inch yields a total of 1,080,000 gallons. Thus a 200-acre vegetable farm will require 1.1 MGD of irrigation water. This water need not be of potable quality, but it should be of at least swimmable quality.

Fresh Market Vegetables

BASELINE UNIT COST: $225,000

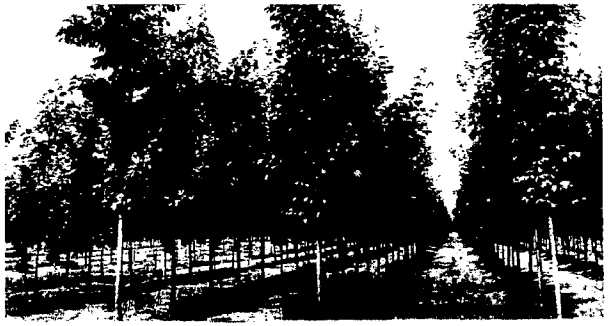
DEVELOPMENT SIZE: 200 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Prime Open Agricultural Land [V]	*	Capability Class I & II Soils [3]	0	0	
		Capability Class III Soils [15]	- 30,000	- 30,000	Medium
		Soils for Special Crops [15]	X	X	
Surface Water Availability [L1] [V]		0 - 1/2 [3,13,14]	X	X	
		1/2 - 1	- 1,500	- 1,500	
	*	1 - 3	0	0	Medium
		3 - 6	0	0	
		6+ MGD	0	0	
Groundwater Availability [L2] [V]		0 - 1/2 [3,13,14]	X	X	
		1/2 - 1	- 1,500	- 1,500	
	*	1 - 3	0	0	Medium
		3 - 6	0	0	
		6+ MGD	0	0	
	**	Baseline Specification			

NOTE:
The figures given in the baseline unit cost represent the total capital investment needed for vegetable farming (machinery, equipment and buildings). It is assumed that harvesting of crops is done by hand. Approximately 1.1 MGD of irrigation water will be needed for a farm this size. Its source is unimportant. The deficiency cost for Capability Class III Soils is based on the difference in value between the best agricultural soils and those of fair quality. Farmland assessment figures that evaluate agricultural land purely on their value for agricultural and horticultural uses, indicate that over the entire study area, this difference is roughly $150 per acre.

C = costs are constant per development
V = costs vary with number of units

Nurseries



Nurseries are specialty operations in which plants, shrubs, and trees are grown for transplanting. Nurseries may raise trees and woody ornamentals for the retail trade, or they may specialize in cuttings and stock for the wholesale trade. Although these operations can be quite large, they need not be extensive. Certain types of nurseries can probably be as small as 3 acres, but a 5-acre minimum is more realistic. Soil is of great importance. Prime open agricultural land (SCS Capability Classes I and II) is ideal. For nurseries which are selling stock balled and burlaped, slightly heavier soils are desirable, so the rootballs hold together. Irrigation water is also important. Allowing one-fifth of an inch per acre per day, a 5-acre nursery would require irrigation water, from either surface or groundwater, of 27,000 gallons per day. This water should be of swimmable quality.

Development Potential Factors

- ● Undeveloped Land (at least 5 acres)
- o Access to Local Road
- ● Prime Open Agricultural Land
- o Groundwater Availability
- o Surface Water Availability
- o Access to Public Water Supply

Nurseries

BASELINE UNIT COST: $225,000

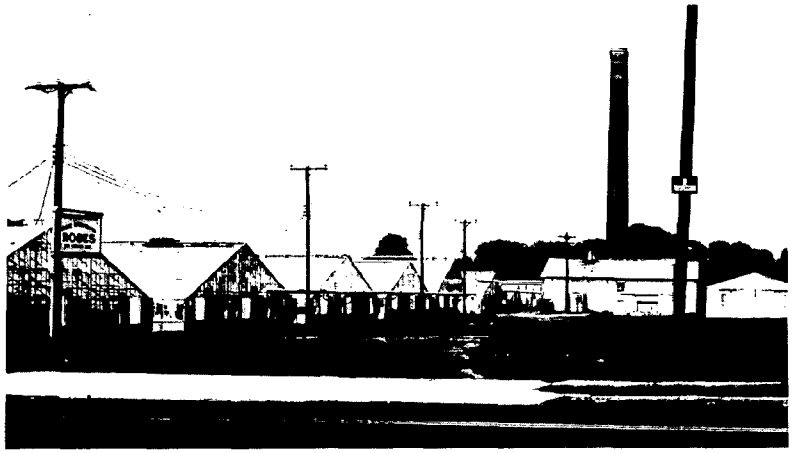
DEVELOPMENT SIZE: 5 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Prime Open Agricultural Land [V]	*	Capability Class I & II Soils Capability Class III Soils Soils for Special Crops [3,12]	0 - 750 X	0 - 750 X	Medium
Groundwater Availability [L1] [V]	*	Greater than 27,000 GPD Less than 27,000 GPD	0 X	0 X	High
Surface Water Availability [L2] [V]	*	Greater than 27,000 GPD Less than 27,000 GPD	0 X	0 X	High
Access to Public Water Supply [L2] [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	- 100,000 - 200,000 - 300,000	- 100,000 - 200,000 - 300,000	Medium
	*	Baseline specifications			

NOTE:
The baseline unit cost given here is based on a nursery having buildings with a total area of 6,000 square feet and parking facilities for 20 cars. The baseline specification for groundwater availability is 0 - 1/2 million gallons per day (MGD). The presence of additional groundwater will not be useful to the operation. The deficiency cost for Capability Class III Soils is based on the difference in value between the best agricultural soils and those of only fair quality. Farmland assessment figures, which evaluate agricultural land purely on their value for agricultural and horticultural uses, indicate that over the entire study area, this difference is roughly $150 per acre. Public water costs are based on the use of a 6 inch steel pipe installed at a depth of 4 feet.

C = costs are constant per development
V = costs vary with number of units

Greenhouses



Greenhouses are glass- or plastic-roofed structures in which plants are grown, protected from the weather. They will most likely be found as part of a nursery operation. In those cases where they are independent of a nursery, greenhouses have virtually no locational requirements. Plants are grown in special growing media, so soils are not a consideration. One acre would be enough to support a good-sized greenhouse. Requirements of water, which is normally supplied from a well, are similarly modest. 5000 gallons per day of swimmable quality water should be adequate for a greenhouse on 1 acre. Greenhouses produce relatively high-value, low-bulk goods, which can be successfully marketed over a broad area, so proximity to markets is not a significant consideration. The only siting consideration, and it is more a convenience than a requirement, is well-drained soil, to avoid the problems of wet ground.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Local Road
- o Groundwater Availability
- o Access to Public Water Supply

Greenhouses

BASELINE UNIT COST: $275,000

DEVELOPMENT SIZE: 3 greenhouses, 1 acre

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Groundwater Availability [L1] [V]	*	0 - 1/2 [13,14] 1/2 - 1 1 - 3 3 - 6 6+ MGD	0 0 0 0	0 0 0 0	High
Access to Public Water Supply [L2] [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
	*	Baseline Specification			

NOTE:
The figures given in the baseline unit cost are for three greenhouses, each with an area of 2,000 square feet. The baseline specification for groundwater availability is 0 - 1/2 million gallon per day (MGD). The presence of additional groundwater will not be useful to the greenhouse, and therefore the operation will not be willing to pay more money for it. The deficiency costs for Access to Public Water that are given here are based on the use of a 6 inch steel pipe, installed at a depth of 4 feet.

C = costs are constant per development
V = costs vary with number of units

Orchards

An orchard is a plantation of fruit trees or nut trees. In New Jersey, the two leading orchard crops are apples and peaches. The requirements of apple and peach orchards are virtually identical to those of fresh market vegetable farms, with the exception that slightly more rolling topography is desirable. This is to ensure good air drainage, so that pockets of cold air do not form causing frost damage.

Although smaller acreages could probably support an orchardist if intensively cultivated, 200 acres is a representative minimum acreage to support a family on a full-time basis. Soil requirements are very similar to those for vegetables, but should be loamy rather than sandy. Prime open agricultural land (SCS Capability Classes I and II) is ideal. Water requirements are on the order of 6 inches per acre. This requirement should be met by irrigation water availability of 1.1 million gallons per day (MGD). This may be supplied either from surface or groundwater, but in either case it should be of swimmable quality. Labor requirements are similar to vegetable farms, and are fulfilled in similar ways. They are not a locational determinant.

Development Potential Factors

- ● Undeveloped Land
- ● Prime Open Agricultural Land
- o Slope
- o Surface Water Availability
- o Groundwater Availability
- o Access to Public Water Supply

BASELINE UNIT COST: $1,700,000

DEVELOPMENT SIZE: 200 acres

Orchards

Factor			Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land						
Prime Open Agricultural Land [V]	*	Capability Class I & II Soils [3]	0	0	Medium
		Capability Class III Soils	- 30,000	- 30,000	
		Soils for Special Crops	X	X	
Slope [V]	*	0 - 3	- 6,000	- 6,000	Medium
		3 - 8	0	0	
		8 - 15	- 10,000	- 10,000	
		15+ %	- 40,000	- 40,000	
Surface Water Availability [L2] [V]	*	0 - 1/2 [13,14]	- 1,500	- 1,500	Medium
		1/2 - 1	0	0	
		1 - 3	0	0	
		3 - 6	0	0	
		6+ MGD	0	0	
Groundwater Availability [L1] [V]		0 - 1/2 [13,14]	- 1,500	- 1,500	Medium
		1/2 - 1	0	0	
		1 - 3	0	0	
		3 - 6	0	0	
		6+ MGD	0	0	
Access to Public Water Supply [L3] [C]	*	0 - 1/2 [14]	0	0	Medium
		1/2 - 1 1/2	- 100,000		
		1 1/2 - 3	- 200,000		
		3+ miles	- 300,000		
	*	Baseline Specification			

NOTE:
The baseline unit cost represents an investment of $8,500 per acre for clearing and planting. Roughly 1.1 million gallons per day (MGD) of water is required at peak periods. This can come from any combination of the three sources listed. Surface water will generally be preferable, because it involves the least cost. The Access to Public Water figures are based on the use of a 6 inch steel pipe installed at a depth of 4 feet. The deficiency cost for Capability Class III Soils is based on the difference in value between the best agricultural soils and those of only fair quality. Farmland assessment figures, which evaluate agricultural land purely on their value for agricultural and horticultural uses, indicate that over the entire study area this difference is roughly $150 per acre.

C = costs are constant per development
V = costs vary with number of units

Cranberry Farming

Development Potential Factors

- Undeveloped Land (at least 300 acres)
- Soil Association (Atsion-Muck-Atsion-Muck -Alluvial Land, Sandy Soil Association - at least 60 acres
- o Surface Water Availability
- o Ground Water Availability

Cranberries are grown under very specialized conditions. Their soil requirements are very similar to those of blueberries. They need acid, sandy, peaty soils with a high water table. Soil pH should be between 4.5 and 5.0. In addition, however, cranberries require huge amounts of water. This water is used to flood the cranberry bogs in winter, in order to protect the cranberries from cold weather. The Atsion-Muck-Alluvial land, sandy soil association, and the Atsion and Berryland soil series are ideal for cranberries.

Each acre of producing cranberry bog requires an acre-foot of reservoir storage capacity. Since these reservoirs average about 2 feet in depth, each acre of bog requires one-half acre of reservoir. Traditionally the reservoir is constructed near the head of a natural watercourse, and the bogs are laid out in chains downstream. This facilitates flooding the bogs. It also takes advantage of the fact that the best soils are usually found next to streams.

It would probably require about 60 acres of producing bogs to support a cranberry grower full-time. To this 60 acres must be added 30 acres for reservoirs. Sizeable additional acreage is highly desirable to provide an aquifer recharge area for the large volumes of groundwater involved in cranberry growing. A total of 300 acres of land is therefore taken as the minimum required. For these 60 acres of bogs, 6.5 million gallons per day (MGD) of water should be available. This should be at least of swimmable quality.

Cranberry Farming

BASELINE UNIT COST: $630,000

DEVELOPMENT SIZE: 600 acres (60 acres of bogs, 30 acres of reservoir)

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Soil Association V	*	Atsion-Muck-Alluvial Land, Sandy Soil Association Other	0 X	0 X	High
Surface Water Availability L1 V	*	0 - 1/2 (3,14) 1/2 - 1 1 - 3 3 - 6 6+ MGD	X X -2500 -1500 0	X X -2500 -1500 0	Medium
Groundwater Availability L2 V	*	0 - 1/2 (3,14) 1/2 - 1 1 - 3 3 - 6 6+ MGD	X X -2500 -1500 0	X X -2500 -1500 0	Medium
	*	Baseline Specification			

NOTE:
The baseline unit cost represents a cost of $7,000 per acre for clearing, grading, diking, and planting 60 acres of bog, $4,500 per acre for clearing and grading 30 acres of reservoir, and $7,500 for machinery and equipment. The soils in which cranberries are grown will nearly always be associated with an adequate amount of water for cranberry farming. Roughly 6.5 MGD of water is required at peak periods; this may come from either surface or groundwater. Surface water is preferable because there are no well-drilling or pumping costs.

C = costs are constant per development
V = costs vary with number of units

Blueberry Farming

Blueberries require quite specialized conditions in order to be grown commercially. They need acid, sandy, peaty soils with a high water table. Soil pH should be between 4.5 and 5.0, and the water table should be about 22" below the surface. The Atsion-Muck-Alluvial land, sandy soil association, and the Atsion and Berryland soil series are ideal for blueberry raising. Blueberries have recently been commanding very high prices, and some better drained lands have been converted to blueberries. These marginal areas often require irrigation. However, they are not ideal for blueberries.

The smallest acreage that could support a blueberry grower on a full-time basis, under a reasonable level of management, is around 50 acres. Water availability is not a locational consideration for blueberries because of the nature of the soils in which they grow.

Development Potential Factors

- Undeveloped Land
- Soil Association (Atsion-Muck-Alluvial land, sandy soil association, Atsion and Berryland series

Blueberry Farming

BASELINE UNIT COST: $150,000

DEVELOPMENT SIZE: 50 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Soil Association V	*	Atsion-Muck-Alluvial Land, Sandy Soil Association Other	0 X	0 X	High
	*	Baseline Specification			

NOTE:
The baseline unit cost for Blueberry Farming represents an initial investment of $2,000 per acre for clearing, grading, and ditching, as well as $1,000 for blueberry plants. The soils in which cranberries are grown will nearly always be associated with an adequate amount of water to grow blueberries.

C = costs are constant per development
V = costs vary with number of units

Forestry

In identifying areas with high potential for forestry use, two factors are of preponderant importance: existing vegetation and soils. At the present time, existing vegetation is the more important consideration. The most important trees commercially are pine, oak, mixed hardwoods and white cedar. The U.S. Soil Conservation Service classifies soils as to their suitability for woodland use. There are five woodland suitability groups. Soils in Group 1 have a very high potential productivity; those in Group 2, high; 3, moderately high; 4, moderate; and 5, low. Soils having development potential for forestry use will be those in woodland suitability groups 1 and 2. In addition, muck soils have high potential for the growth of white cedar. The acreage of forest required to support a commercial forester and his family will vary greatly, depending on the species of tree, but 500 acres is a representative figure.

*Source: New Jersey Bureau of Forestry. N.d. New Jersey's Forest Resources - Present and Future. Trenton.

Development Potential Factors

- ● Undeveloped Land
- o Soils in Woodland Suitability Groups 1 and 2
- o Prime Open Agricultural Land (soil for special crops/muck soils)
- o Forest Cover Types: immature pine, mature pine, oak, mixed hardwoods, white cedar

Forestry

BASELINE UNIT COST: $10,000

DEVELOPMENT SIZE: 500 acres

Factor			Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land						
Soils and Forest Cover Type	V	*	Woodland Suitability Groups I and II	0	0	High
			Muck Soils	+ 25,000	+ 50	
			Immature Pine	+ 25,000	+ 50	
			Mature Pine	+ 125,000	+ 250	
			Oak	+ 75,000	+ 150	
			Mixed Hardwoods	+ 350,000	+ 700	
			White Cedar	+ 475,000	+ 950	
		*	Baseline Specification			

NOTE:
The baseline unit cost represents a value of $20 per acre for woodland. This figure, based on tax assessment figures, reflects only the value of the land for forestry use. The development size of 500 acres should be treated with caution, since the acreage required to support an individual in full-time forestry will vary widely with tree species and other factors.

Two factors determine the suitability of land for forestry: soils and existing vegetation. Of these, the second is vastly more important. Soils in Woodland Suitability Groups 1 and 2 have potential for forestry use, and are taken as the baseline specification. In order to avoid problems of double-counting, this data category applies only to unforested land. The bonus figure for muck soils, which are ideal for growing white cedar, also applies only to unforested muck soils. The other bonus values reflect the relative worth of an acre of land under various types of forest cover.

C = costs are constant per development
V = costs vary with number of units

Commercial Fishing Docks and Fish Processing Plants

(Parts of the following are extracted from Bonsall, 1977.)

The fishing industry is separated into two distinct yet interdependent groups - fishermen and fish processors.

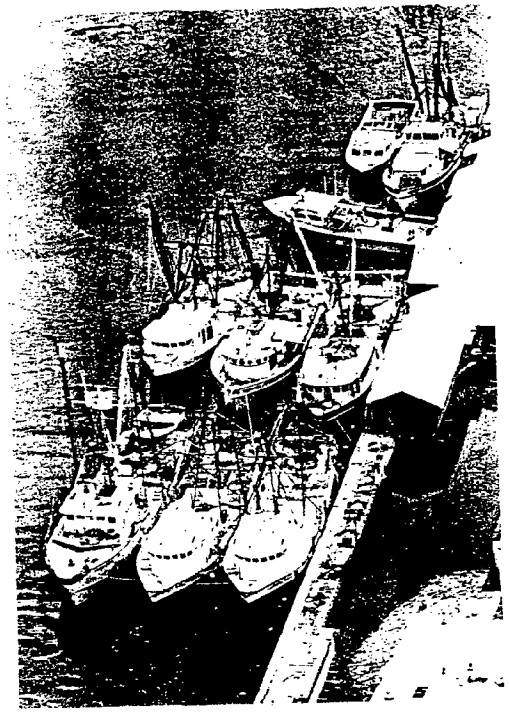
New Jersey's commercial fishing fleet consists of approximately 3,200 vessels and boats employing about 4,500 full- and part-time people. Eighty-six percent of these boats sail from three coastal counties: Ocean (47%), Atlantic (30%), and Cape May (9%). The balance of the fleet originates in Cumberland, Monmouth, Salem, and Bergen counties. The principal commercial fishing municipalities within each county are Belford and Highlands, Monmouth County; Point Pleasant and Barnegat Light, Ocean County; Atlantic City and Ocean City, Atlantic County; Wildwood and Cape May, Cape May County; and Port Norris and Bivalve, Cumberland County.

Fishermen require minor ports or marinas for docking. Different ports or marinas tend to specialize in catch depending on their proximity to the resource. Usually commercial fishing boats are separated from party boats at dock facilities.

Commercial fishing docks are usually adjacent to boat maintenance and ice or freezer storage facilities. Channel depth requirements for older boats are 12 feet; however, newer vessels require up to 16 feet.

Development Potential Factors

- Undeveloped Land
- Access to Collector Road
- Access to 16-foot Channel
- Marine Access
- o Proximity to Community Service Center
- o Proximity to Fishing Community
- o Access to Public Sewerage
- o Access to Public Water Supply
- o Proximity to River or Bay Shore Frontage
- Embayments
- o Minor Tides



Approximately 150 finfish species inhabit New Jersey's coastal waters or migrate through them, 30 of which are important to the fishing industry. Finfish catches vary with seasonal migration patterns and cyclic or sporadic population changes. Many species migrate northward and inshore from continental shelf waters as the ocean water becomes warmer during the spring and summer months. The more important of these species include the Atlantic menhaden, weakfish (sea trout), scup (porgy), bluefish, fluke (summer flounder), Atlantic mackerel, black sea bass, puffer and butterfish. Further offshore the bluefin tuna, bonito, swordfish, and white marlin move in a similar migration pattern but do not all move as far inshore. In the fall and winter these finfish species move offshore and/or southward. Consequently the best fishing for these fish is during the warmer months from April to November.

Another group of finfish, known as anadromous because they spawn in fresh water, moves into the estuaries and ascends tidal rivers during the late spring and early summer months. Included in this group are the striped bass, American shad, blueback herring, alewife, and white perch. Good fishing for these fish occurs during periods of their upstream spawning runs.

A third group of finfish which includes the whiting (silver hake), cod, Atlantic herring, ling (squirrel or red hake), yellowtail flounder, and winter flounder, migrates southward and/or towards the coast during the fall and winter months. Therefore, good fishing for these species occurs during the late fall and early spring periods.

New Jersey's coastal waters support abundant shellfish as well as finfish. The soft clam is abundant in the bays and rivers of the northern part of the state, especially in Sandy Hook Bay, and the estuaries of the Navesink, Shrewsbury, Shark, Manasquan, and Metedeconk Rivers down to Forked River in Barnegat Bay. The hard clam, which is more widely distributed,

Commercial Fishing Docks

BASELINE UNIT COST: $600,000

DEVELOPMENT SIZE: 50 slips, 10 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0-1/2 1/2-1-1/2 1-1/2-3 3+ miles	0 -150,000 -300,000 -450,000	0 -150,000 -300,000 -450,000	High
Access to 16-foot Channel [C]	*	0-1/2 1/2-1 1-2 2+ miles	0 - 550,000 -1,100,000 -1,460,000	0 - 550,000 -1,100,000 -1,460,000	Medium
Marine Access [V]	*	Present [3] Not Present	0 X	0 X	High
Proximity to Community Service Center [V]	 * 	0-1 1-3 3-5 5+ miles	- 15,000 - 5,000 - 1,000 0	- 15,000 - 5,000 - 1,000 0	Medium
Proximity to Fishing Community [V]	 * 	0-1 1-3 3-5 5+ miles	- 20,000 - 10,000 - 2,000 0	- 400 - 200 - 40 0	Medium
Access to Public Sewerage [C]	*	0-1/2 1/2-1-1/2 1-1/2-3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Access to Public Water Supply [C]	*	0-1/2 1/2-1-1/2 1-1/2-3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Proximity to River or Bay Shore Frontage [V]	*	Adjacent [3] 0-1/2 1/2-1 1+ mile	0 X X X	0 X X X	High
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Embayments [V]	*	Present [3] Not Present	0 X	0 X	High
Minor Tides [V]	*	2 feet or less Greater than 2 feet	0 - 40,000	0 - 40,000	Low
	*	Baseline Specification			

NOTE:
The baseline unit cost given here includes the cost of dredging within the dock. Dredging costs for Access to 16-foot Channel are based on a channel 60 feet wide, with an average dredged depth of 9 feet. Dredging cost can vary widely, from less than $2.50 per cubic yard to more than $10 per cubic yard depending on the amount and type of material, and the method of disposal. Costs given here are based on a $6 per cubic yard estimate. Cost for Fishing Docks, as for Marinas and Ports, are generally somewhat higher in the northern part of the state and lower in the southern section. Costs for Access to Collector Road are based on a Level 2 access road (see Element Cost Sheet). The Access to Public Water Supply numbers are based on the use of a 6 inch steel pipe, installed at a depth of 4 feet. The Access to Public Sewerage figures are based on the use of an 8 inch vitrified clay pipe installed at a depth of 4 feet.

C = costs are constant per development
V = costs vary with number of units

can be found in virtually all bays and rivers throughout the coast extending from Raritan and Sandy Hook Bays in the north to Delaware Bay in the south. The surf clam or sea clam is found in offshore marine waters all along the New Jersey coast, but is particularly abundant in the southern half of the state from Little Egg Harbor to Cape May Point.

The ocean quohog or mahogany quohog is becoming an increasingly important shellfish for harvesting in the light of declining surf clam stocks. Ocean quohogs are found off the New Jersey shore at depths of 37 to 55 meters. Estimates of a standing quohog crop in New Jersey waters is 2.3 billion pounds.

Oyster beds are located in Raritan Bay, the estuaries of the Navesink, Toms, Mullica, Tuckahoe, and Great Egg Harbor Rivers, and in the upper Delaware Bay. Some of the beds in Delaware Bay are dedicated to seed oyster production and after several years growth, the young oysters from these beds are transplanted to the lower Delaware Bay where the water is more saline and conducive to growth. Bay scallops are found in Barnegat Bay from Barnegat Light south to Manahawkin Bay and Little Egg Harbor.

The American lobster is another important shellfish found along the New Jersey coast from nearshore waters to the 200 fathom line. Major population areas include the Hudson Canyon, the slope of the Continental Shelf, and limited rocky inshore areas of the northern part of the state. Blue crabs are found in estuaries and nearshore waters along the entire coast.

Commercial fishermen operating from New Jersey landed approximately 121.6 million pounds of finfish and 42.1 million pounds of shellfish, valued at approximately $14.3 and 30.2 million pounds respectively in 1978 (Eugene LoVerde, 1979). Eleven finfish species comprised 95 percent of the catch in weight and 90 percent of the dollar value, using 1976 data. These fish include the menhaden, whiting, porgy, weakfish, fluke, sea bass, tilefish, Atlantic mackerel, bluefin tuna, bluefish, and red hake. Shellfish with greatest weight and dollar value in 1977 were the surf clam, ocean quohog, sea scallop, oyster, and hard clam. New Jersey ranked seventh nationally in commercial fisheries landings by weight and thirteenth by dollar value in 1973.

The fishing industry is beset with many problems which have evolved through the years since World War II. A major problem presently facing the industry is factors have combined to produce this situation including heavy foreign fleet and domestic commercial fishing off New Jersey shores, a dramatic upsurge in recreational fishing, a sharp increase in estuarine water pollution, and disease. A corollary problem is the industry's slow reaction to meet changing consumer preferences for fish and fish products in New Jersey and the United States. Consequently, commercial catch and market for finfish has declined throughout the years. At the same time some shellfish, such as surf clams, have increased. Certain species are currently overharvested while others are not. In the future, catch will shift to fish with higher potential for maintaining a safe sustained yield. These fish with the greatest potential include whiting, ling, butterfish, squid, Atlantic mackerel, and herring. Meanwhile, fluke and ocean quohog appear to be approaching their potential.

What happens to the finfish and shellfish once they are caught? For the most part, the finfish are sold at the dock to be taken to the fresh fish markets in New York, Philadelphia and Baltimore. Shellfish are sold at the dock for the fresh market as well, but are also sold to a variety of processing plants located along the New Jersey coast. Of the 43 wholesale dealers and processing plants in New Jersey, about half are devoted to processing shellfish. The remaining plants process finfish by filleting, freezing, canning, and smoking to produce frozen dinners, soups, sauces, gefilte-fish, and animal feeds. These plants employ about 2,000 people each year with Cumberland, Cape May, Atlantic, Essex and Camden Counties each employing an average of 300 people. New Jersey's processed fishery products were valued at $60 million in 1975.

Fish processing plants are covered under standard industrial classifications (SIC) in the Industrial chapter of this report. These include:

- 2031 Canned and Cured Seafood
- 2032 Canned Specialties
- 2036 Fresh and Frozen Packaged Fish

An example of the development potential factors for fish processing plants follows. Keep in mind that this represents an average fish processing facility that processes a mixture of products from raw frozen fish filets to fish sticks, and employs approximately 300 people. Requirements for water, space, and energy would probably increase as products become more specialized (i.e., breaded, pre-cooked fish sticks in ready-to-heat packages).

Development Potential Factors

- ● Undeveloped Land
- ● Access to Collector Road
- o Access to Railroad
- ● Access to Electric Power Distribution Line
- o Proximity to Commercial Fishing Dock
- o Proximity to Metropolitan Service Center
- o Slope
- o Soil Load Bearing Capacity
- o Access to Public Water Supply
- o Potable Water Supply
- o Access to Public Sewerage

Fish Processing Plants

BASELINE UNIT COST: $2,000,000 - $5,000,000 DEVELOPMENT SIZE: 4 acres (12 million pound processing plant with 2 production lines)

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 150,000 300,000 450,000	0 150,000 300,000 450,000	High
Access to Railroad [C]	*	0 - ½ ½ - 1½ 1½ - 3 3+ miles	0 - 600,000 -1,200,000 -1,500,000	0 - 600,000 -1,200,000 -1,500,000	Medium
Access to Electric Power Distribution Line [C]		0 - ½ ½ - 1½ 1½ - 3 3+ miles	0 - 48,000 - 96,000 - 144,000	0 - 48,000 - 96,000 - 144,000	Low
Proximity to Commercial Fishing Dock [C]	*	0 - 2 [16] 2 - 5 5 - 10 10+ miles			
Proximity to Metropolitan Service Center [V]		0 - 15 [16] 15 - 30 30 - 45 45 - 60 60+ miles			
Slope [V]		0 - 3 3 - 8 8 - 15 15%+	0 - 30,000 - 110,000 - 185,000	0 - 30,000 - 110,000 - 185,000	Medium
Soil Bearing Capacity [V]		High [1] Medium Low	0 - 7,000 - 16,000	0 - 7,000 - 16,000	Low
Access to Public Water Supply [C]		0 - ½ ½ - 1½ 1½ - 3 3+ miles	0 - 115,000 - 230,000 - 345,000	0 - 115,000 - 230,000 - 345,000	High
	*	Baseline Specification			

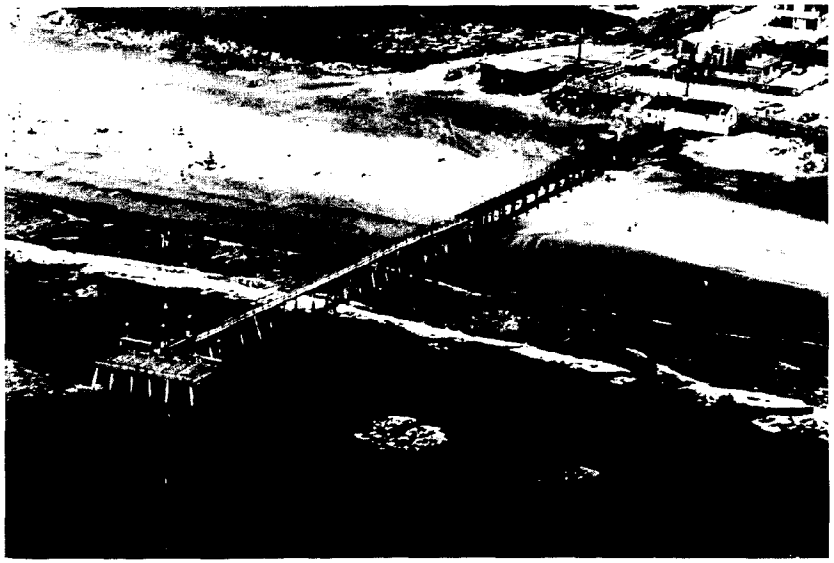
Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Potable Water Supply [V]					
Access to Public Sewerage [C]		0 - ½ ½ - 1½ 1½ - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	High
	*	Baseline Specification			

NOTE:

In developing a new processing plant it is assumed that a modern, relatively small, operation consisting of two production lines, each producing 6 million pounds of product per year, would be constructed. This type of plant includes machines for heading and gutting round fish, filleting them and producing blocks by the use of plate freezers. The baseline unit cost includes $100,000 - $200,000 for the purchase and installation of on-site equipment for fish waste disposal. Essential cold storage is included in the cost. Additional cold storage is a significant additional investment.

Source: Arthur D. Little. 1979. Preliminary Feasibility Study of a New Fish Processing Venture in Cape May County. Final report to Middle Township.

C = costs are constant per development
V = costs vary with number of units



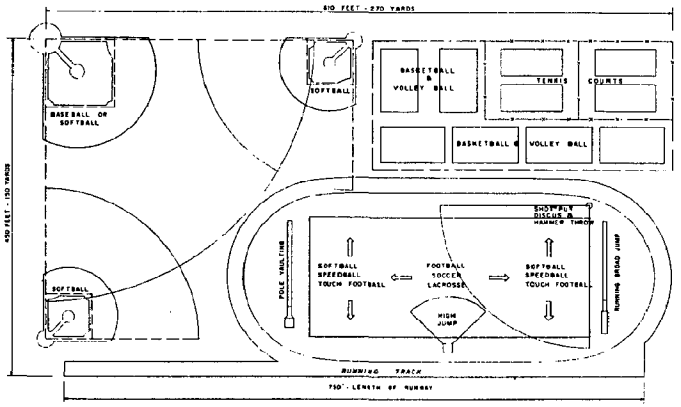
Recreation

Playing Fields

Playing fields, for the purposes of this study, include areas for field sports, such as baseball and softball, and for court sports, such as basketball and tennis. Individual basketball and tennis courts have such modest siting requirements that a regional study cannot usefully deal with them. Therefore, playing fields considered here will be large neighborhood or community facilities having a number of fields and paved courts together. Such facilities would be likely to range in area from 3 up to 30 acres. A single regulation baseball field, for example, requires as much as 4 acres. Such facilities may be expected to serve on the order of 10,000 persons within a driving time of 10 minutes. The principal requirements of playing fields are level, well-drained ground within easy reach of an adequate number of users.

Development Potential Factors

- Undeveloped Land (3 - 30 acres)
- Access to Collector Road
- o Soil Drainage
- o Slope (0 - 3%)



Source: New Jersey Department of Environmental Protection, Office of Environmental Review. Outdoor Recreation in New Jersey. 1973.

Playing Fields

BASELINE UNIT COST: --

DEVELOPMENT SIZE: 3 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 -150,000 -300,000 -450,000	-150,000 -300,000 -450,000	High
Soil Drainage [V]	*	High (1) Medium Low	0 - 3,000 - 5,000	0 - 3,000 - 5,000	Low
Slope [V]	*	0-3 3-8 8-15 15+ %	0 - 48,000 - 78,000 -120,000	0 - 48,000 - 78,000 -120,000	Medium
	*	Baseline Specification			

NOTE:
Playing Fields may range in size from 3 to 30 acres. The larger acreages will contain baseball fields and other grass playing fields. Those with smaller acreages will usually contain a higher percentage of tennis courts, basketball courts, and tot lots. Rather than give a baseline unit cost that could not be representative for all types of playing fields, typical costs are given below for various kinds of playing fields and courts.

Baseball field	$45,000
Football field	45,000
Tennis court	34,000
Basketball court	11,000
Tot lot	7,000

Access to Collector Road costs are based on the use of a level 2 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Golf Courses

In most cases, a regulation golf course has a par of 70, 71, 72 or occasionally 69 or 73. Many older courses built in the United States play to a total par of 70. However, in recent years par 72 has become the standard of excellence in the minds of many developers and golfers. It should be stressed, however, that the size and natural characteristics of a site determine what the total par should be; therefore, many courses are built outside the standard par 72. In many cases the golf course architect will determine that a shorter par 70 course many indeed be much better than a forced par 72 because it is more demanding and natural. Neither par nor total yardage should be the criterion of quality, for the objectives of the recreational development golf course should be that it be fair and enjoyable to play.

A regulation golf course comprises 18 holes with a combination of par 3s, 4s, and 5s, the sum of which equals pars 70 to 73. The standard mix for a par 72 golf course is ten par 4s, four par 3s, and four par 5s. Par 71 courses generally drop a par 4 and replace it with a par 3 or drop a par 5 and replace it with a par 4. A par 70 golf course generally has either six par 3s, eight par 4s, and four par 5s or four par 3s, twelve par 4s, and two par 5s. A par 73 golf course generally has an additional par 5 in place of a par 4. It is these combinations of pars which comprise what is considered to be the norm to qualify a course as "regulation" in the minds of golfers. However, it is neither total yardage nor par which determines the amount of area used, the quantity of lot frontage, and the cost of maintenance and control of the golf facility once it is built. The needs of the project, the shape of the total property, and the physical characteristics of the site all have an influence on how and where the golf course architect, planner, and owner decide to lay the course. Many times, the golf course will be layed out within the boundaries of a development.

There are five basic golf course design types, with several possible options each, which can facilitate the particular needs of an individual development. After a feasible location has been determined by studying the topography and the natural site characteristics the developer and design team can determine which type, or combination of types, would be most appropriate for the project from every standpoint.

The five basic prototypical configurations for an 18-hold regulation golf course are: (1) single fairway 18-hole course with returning nines, (2) single fairway continuous 18-hole course, (3) double fairway 18-hold course with returning nines, (4) double fairway continuous 18-hole course, and (5) 18-hole core golf course.

The United States Golf Association has set a general standard for par in relation to the yardage of any given hole: "Par is the score that an expert golfer would be expected to play without flukes and under ordinary weather conditions allowing two strokes on the putting green." The method for computing par on any hole is as follows:[1]

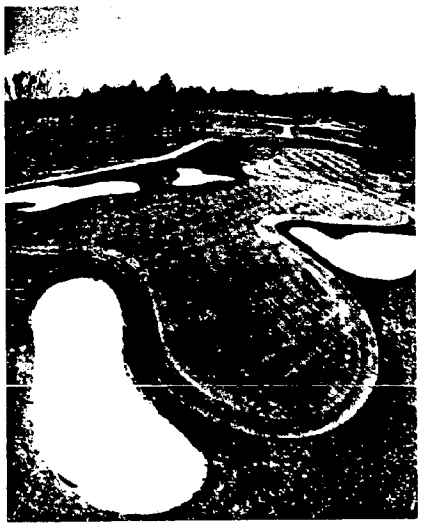
Distance in Yards

Men	Women	Par
Up to 250	Up to 210	3
251 to 470	211 to 400	4
471 and over	401 to 575	5
-	576 and over	6

[1] United States Golf Association. 1969. Golf Committee Manual and USGA Golf Handicap System.

Development Potential Factors

- ● Undeveloped Land (100 - 175 acres per 18-hole course)
- ● Access to Local Road
- o Slope
- o Soil Drainage
- o Groundwater Availability
- o Surface Water Availability
- o Access to Public Water Supply
- o Visual Amenities
  - Topography
  - Vegetation



Golf Courses

BASELINE UNIT COST: $1,250,000

DEVELOPMENT SIZE: 100 acres, 18 holes

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road C	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 +150,000 +300,000 +450,000	0 +150,000 +300,000 +450,000	High
Slope V	*	0-3 3-8 8-15 15+ %	+ 75,000 0 -110,000 -185,000	+ 75,000 0 -110,000 -185,000	Medium
Soil Drainage V	*	High (1) Medium Low	0 + 48,000 + 96,000	0 + 48,000 + 96,000	Low
Groundwater Availability L1 V	*	0-1/2 (13,14) 1/2-1 1-3 3-6 6+ MGD	+ 1,500 0 0 0 0	+ 1,500 0 0 0 0	Medium
Surface Water Availability L2 V	*	0-1/2 (13,14) 1/2-1 1-3 3-6 6+ MGD	+ 1,500 0 0 0 0	+ 1,500 0 0 0 0	Medium
Access to Public Water Supply L3 C		0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 +115,000 +230,000 +345,000	0 +115,000 +230,000 +345,000	Medium
Visual Amenities V	*	Topography Vegetation Other	+ 95,000 + 70,000 0	+ 95,000 + 70,000 0	Low
	*	Baseline Specification			

NOTE:
Existing topography, soil conditions, vegetation and surface water will dictate the amount of land required for a golf course. Generally the following space requirements apply: a standard 18-hole golf course, 120 to 160 acres; a standard 9-hole golf course, 70 to 90 acres; a 9-hole par-3 golf course, 45 to 60 acres. These acreages are sufficient to include a practice putting green, a practice driving range, a clubhouse, and parking facilities. The baseline unit cost given here does not include the cost of a clubhouse. Water has not been included as a visual amenity since water hazards are usually developed as part of the baseline cost. The costs for Access to Local Road are based on the use of a Level 2 access road (see Element Cost Sheet). The figures are based on the use of an 8 inch steel pipe installed at a depth of 4 feet.

C = costs are constant per development
V = costs vary with number of units

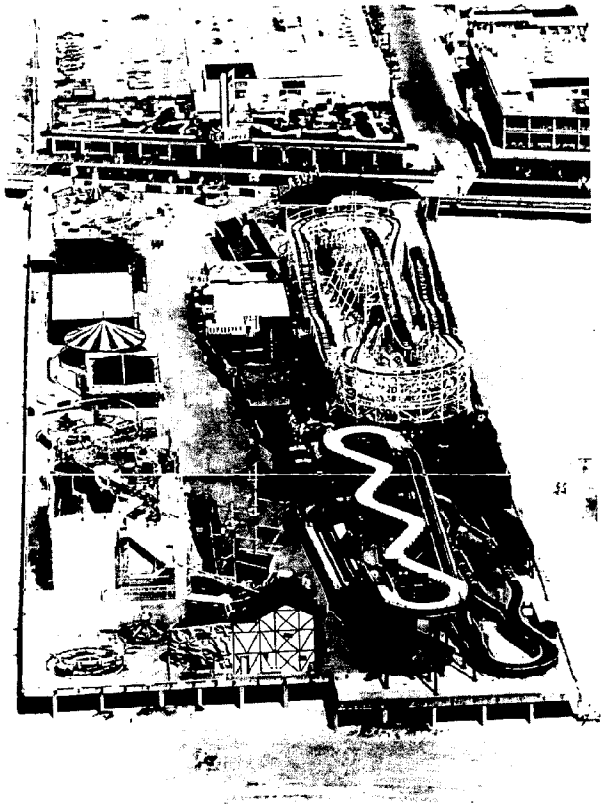
Seashore Amusement Parks

Seashore amusement parks are located along the boardwalks of heavily visited seashore communities. These amusement parks do not draw many visitors in and of themselves, but rather they are a part of the overall recreational ambience of the shore. They provide alternative activity for people who have been drawn to the shore primarily for beach bathing. Amusement parks typically provide a number of rides, a Ferris wheel, a roller coaster, a midway with games of skill, and small take-out food shops. The use of these parks is highly seasonal, concentrated mainly on summer weekends. Because so much of their business is concentrated in such short periods of time, amusement parks depend on the presence of large numbers of potential customers.

Seashore amusement parks are heavy traffic generators, not in terms of year long average volumes, but in terms of summer weekend peak loads. These sites having potential for development as seashore amusement parks should have access to a collector road. A portion of the acreage should be devoted to parking

Development Potential Factors

- ● Undeveloped Land
- ● Access to Collector Road
- ● Proximity to Resort Communities
- ● Access to Public Sewerage
- ● Access to Public Water Supply
- o Proximity to Ocean Beach Frontage
- o Character of Surrounding Area



Seashore Amusement Parks

BASELINE UNIT COST: $1,200,000 DEVELOPMENT SIZE: 5 acres

Factor			Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land						
Access to Collector Road	C		0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Proximity to Resort Communities	V		0 - 1 1 - 3 3 - 5 5+ miles	+ 200,000 + 100,000 + 50,000 0	+ 200,000 + 100,000 + 50,000	Medium
Access to Public Sewerage	C		0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - - -	0 - - -	Medium
Access to Public Water Supply	C		0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Proximity to Ocean Beach Frontage	V		Adjacent [3] 0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - - - -	0 - - - -	High
Character of Surrounding Area	V		Compatible Land Use [3] Other	0 X	0 X	High
		*	Baseline Specification			

NOTE:

The baseline unit cost given here is based on a park having three major rides costing an average of $250,000 each, (though a roller coaster can cost anywhere between $1,500,000 and $5,000,000) as well as buildings for arcades, and provisions for parking. Deficiency costs for Access to Collector Road are based on the use of a Level 2 access road (see Element Cost Sheet). Costs for Access to Public Water Supply are based on the use of a 6-inch steel pipe installed at a depth of 4-feet. The Access to Public Sewerage figures are based on the use of an 8-inch vitrified clay pipe installed at a depth of 4-feet.

C = costs are constant per development
V = costs vary with number of units

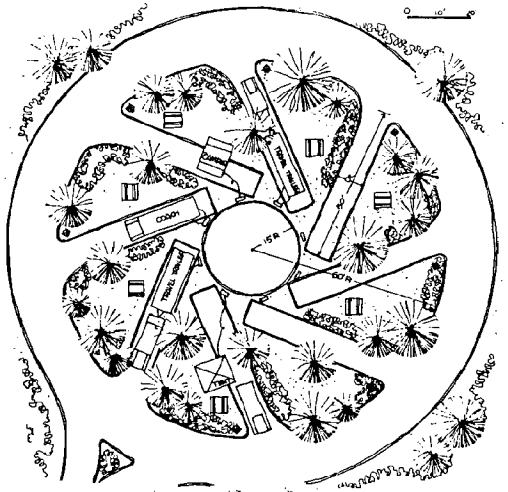
Campgrounds

Campgrounds are facilities providing campsites for travellers and vacationers with tents or trailers. Campgrounds may be geared to accommodate either trailer or tent campers, but most commonly, they can accommodate both. Campgrounds generally provide water and electrical connections, and some combination of sewer hook-ups, flush toilets, and dumping stations. Hot showers, laundry facilities, propane gas, groceries, ice, and refreshments are also often available. Recreational facilities usually include, at a minimum, picnic tables and fireplaces. Larger campgrounds may have a clubhouse, playground, swimming (either in a natural water body or a pool), fishing, boating, miniature golf, outdoor movies, and square dancing.

Campground users are vacationers. While campgrounds seek to provide as many recreational facilities as they can, it is highly desirable that they be located near some recreational facility or area that is sufficiently attractive to draw users from a considerable distance. New Jersey's Atlantic coastline is such an area, as are Federal open space and recreation areas, and State parks, forests, natural areas, and recreation areas. A campground may be several hundred acres in size, or even larger. Many, however, are significantly smaller, and 20 acres is taken here as a reasonable minimum. The traffic generated by a campground could in general be handled by a collector road. However, location on an arterial road is desirable because of the greater number of travellers such roads carry. Most other siting considerations are straightforward. Among on-site amenities, however, vegetation is of particular importance, in order to provide natural screening around individual campsites.

Development Potential Factors

- ● Undeveloped Land
- o Access to Collector Road
- o Proximity to Public Open Space
- o Soil Drainage
- o Soils Suitable for On-Site Disposal Systems
- o Public Sewerage
- o Public Water Supply
- o Potable Water Supply
- o Acceptable Water Quality - Fishing
- o Acceptable Water Quality - Swimming
- o On-Site Amenities
- o Visual Amenities



Campgrounds

BASELINE UNIT COST: $15,000 - $30,000

DEVELOPMENT SIZE: 140 units, 20 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Collector Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 1,070 - 2,150 - 3,200	High
Proximity to Public Open Space [V]	* 	0 - 1 1 - 3 3 - 5 5 - 10 10+ miles	+ 40,000 + 25,000 + 12,000 + 3,000 0	+ 285 + 175 + 85 + 20 0	Medium
Soil Drainage [V]	* 	High Medium Low	0 - 5,600 - 13,000	0 - 40 - 92	Low
Soils Suitable for On-Site Disposal Systems [L1] [V]	* 	Slight Moderate Severe Limitations	0 - 98,000 - 185,000	0 - 700 - 1,300	Low
Access to Public Sewerage [L1] [C]	* 	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles			Medium
Access to Public Water Supply [L1] [C]	* 	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles			Medium
Potable Water Supply [L2] [V]	* 	Available Not Available	0 X	0 X	High
Acceptable Water Quality - Fishing [V]	* 	Available Not Available	0 - 8,000	0	Medium
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Acceptable Water Quality - Swimming [V]	* 	Available Not available	0 - 12,000	0 -	Medium
On-Site Amenities [V]	* 	Vegetation Other	+ 17,000 0	+ 120 0	Medium
Visual Amenities [V]	* 	Woodland Other	+ 10,000 0	+ 70 0	Low
	*	Baseline Specification			

NOTE:
The baseline unit cost given for Campgrounds is based on a density of 7 units per acre, although slighter densities are frequently encountered. The costs for Access to Collector Road are based on a level 2 access road (see Element Cost Sheet). The deficiency costs for Access to Public Water are based on the use of a 6 inch steel pipe installed at a depth of 4 feet. The Access to Public Sewerage figures are based on the use of an 8 inch vitrified clay pipe installed at a depth of 4 feet.

C = costs are constant per development
V = costs vary with number of units

Summer Campgrounds

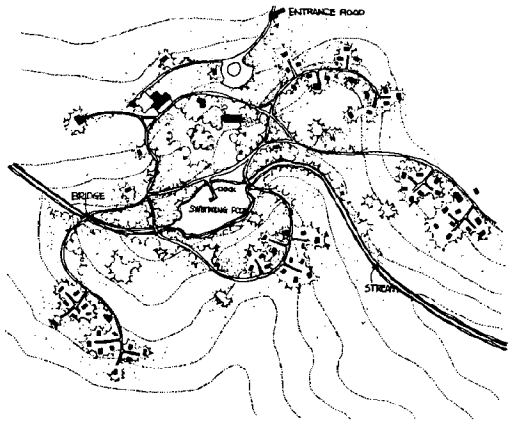
Summer camps are summer vacation facilities for school-age children. Generally, they provide a wilderness or semi-wilderness experience for children, who may stay for a week up to several weeks. Emphasis is on outdoor sports and activities, usually with particular regard for nature-related activities. Arts and crafts, hiking, swimming, canoeing, and nature lore are generally popular in summer camps. The larger and more elaborate camps might have playing fields for softball or soccer, as well as tennis or basketball courts.

Housing for campers can vary quite widely, from tents raised on platforms at the more rustic camps, to log cabins or wood frame barracks-style buildings, up to masonry dormitories. Meals are taken communally.

Because a sense of isolation is such an important part of camping, it is desirable to have relatively large acreages. The minimum size for a summer camp is taken to be 100 acres. Camps are privately owned, and must, therefore, compete in the market place for users. This puts a premium on a pleasant and attractive environment. Thus, on-site amenities are specially important for summer camps, since these constitute much of what they are offering. There should be woodlands on the site, and a body of water providing fishing, boating, and swimming. Access to at least a local road is also necessary.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Local Road
- o Proximity to Public Open Space
- o Soils Suitable for On-Site Disposal Systems
- o Access to Public Sewerage
- o Access to Public Water Supply
- o Potable Water Supply
- o Proximity to River or Bay Shore Frontage
- o Acceptable Water Quality - Fishing
- o Acceptable Water Quality - Swimming
- o On-Site Amenities
- o Character of Surrounding Area



Summer Campgrounds

BASELINE UNIT COST: $70,000 DEVELOPMENT SIZE: 100 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 50,000 - 100,000 - 150,000	0 - 50,000 - 100,000 - 150,000	High
Proximity to Public Open Space [V]	 *	0 - 1 1 - 3 3 - 5 5 - 10 10+ miles	+ 10,000 + 8,000 + 5,000 + 3,000 0	+ 10,000 + 8,000 + 5,000 + 3,000 0	Medium
Soils Suitable for On-Site Disposal Systems [V]	*	Slight [5] Moderate Severe Limitations	0 - 1,000 - 2,000	0 - 1,000 - 2,000	Medium
Access to Public Sewerage [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Access to Public Water Supply [L1] [C]	*	0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Potable Water Supply [L2] [V]	*	Available [3,4] Not Available	0 X	0 X	High
Proximity to River or Bay Shore Frontage [V]	 *	Adjacent 0 - 1/2 1/2 - 1 1+ miles	+ 20,000 + 2,000 + 500 0	+ 20,000 + 2,000 + 500 0	Medium
Acceptable Water Quality - Fishing [V]	*	Available Not Available	+ 2,000 0	+ 2,000 0	Medium
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Acceptable Water Quality - Swimming [V]	*	Available Not Available	+ 5,000 0	+ 5,000 0	Medium
On-Site Amenities [V]	*	Vegetation Other	+ 2,000 0	+ 2,000 0	Medium
Character of Surrounding Area [V]	 * 	Wooded Rural Other	+ 5,000 + 2,000 0	+ 5,000 + 2,000 0	Medium
	*	Baseline Specification			

NOTE:
Summer camps for children are highly varied in terms of the sorts of experience they offer. The baseline unit cost given here is based on a rustic camp with a wilderness atmosphere. Camps which heavily emphasize activities such as tennis will have higher baseline unit costs. The cost associated with Access to Local Road are based on the use of a Level 1 access road (see Element Cost Sheet). The Access to Public Water Supply figures are based on the use of a 6 inch steel pipe, installed at a depth of 4 feet. The deficiency costs associated with Access to Public Sewerage are based on the use of an 8 inch vitrified clay pipe installed at a depth of 4 feet.

C = costs are constant per development
V = costs vary with number of units

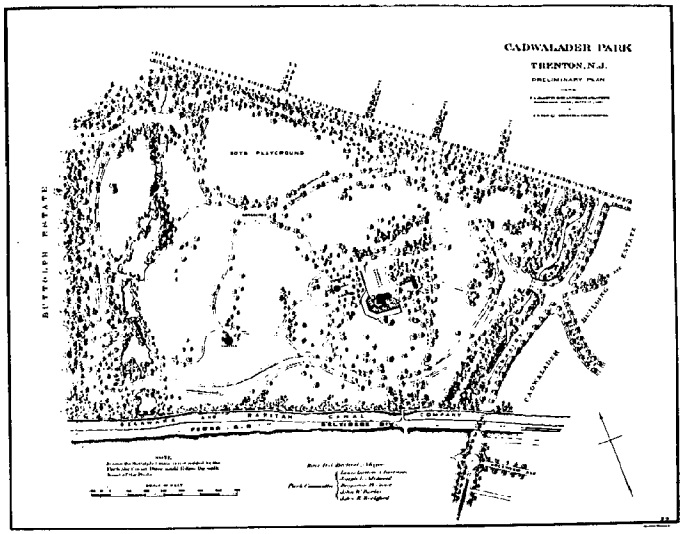
Parks

Parks, as defined in this study, are large facilities offering passive recreation to large numbers of people. Parks may range in area from 30 acres to 100 or more. While parks may include some playing fields, they will generally be less intensely developed, offering activities such as picnicking, hiking, and nature study. The requirements of such parks are rather different from those of more intensive recreational facilities Far from requiring level ground, a certain amount of topographic relief may be quite desirable for esthetic purposes, and to provide isolation from adjacent developed areas. Water on the site is also a very attractive feature. Floodplains, which are generally unsuitable for more intensive forms of development, may be ideal for inclusion in parks.

Such parks are not intended to compete with state parks, which offer a wilderness experience to people who are willing to travel relatively long distances. Rather, they provide a natural experience for nearby residents. Therefore, in order to be accessible to a sufficiently large number of users, these parks should be located in areas where roughly 50,000 people reside within a 20-minute drive.

Development Potential Factors

- ● Undeveloped Land (30 to 100+ acres)
- ● Access to Local Road
- o Slope
- o Proximity to River or Bay Shore Frontage
- o Proximity to Ocean Beach Frontage
- o On-Site Amenities
- o Visual Amenities
- o Population Density



Source: New Jersey Department of Environmental Protection, Office of Environmental Review. Outdoor Recreation in New Jersey. 1973.

Parks

BASELINE UNIT COST: --

DEVELOPMENT SIZE: 4 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road C		0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Slope V		0 - 3 3 - 8 8 - 15 15+ %	0 0 0 0	0 0 0 0	Medium
Proximity to River or Bay Shore Frontage V		Adjacent 0 - 1/2 1/2 - 1 1+ mile	+ 50,000 + 20,000 + 5,000 0	+ 50,000 + 20,000 + 5,000 0	Medium
Proximity to Ocean Beach Frontage V		Adjacent 0 - 1/2 1/2 - 5 5 - 15 15+ miles	+ 200,000 + 30,000 + 6,000 + 1,000 0	+ 200,000 + 30,000 + 6,000 + 1,000 0	Medium
On-Site Amenities V		Topography Other	+ 1,000 0	+ 1,000 0	Medium
Visual Amenities V		Vegetation Other	+ 2,000 0	+ 2,000 0	Medium
Population Density V		Less than 1,000 people per square mile Greater than 1,000 people per square mile	X 0	X 0	High
	*	Baseline Specification			

NOTE:
The baseline unit cost of Parks has been left blank because it is impossible to put a dollar value on Parks. The figures that are given are for a 4 acre park, but parks can range from less than an acre to 100 acres. Smaller parks are considered as Playing Fields and larger parks have been termed Natural Areas for the purposes of this study. No baseline specification has been given for slope, since the sort of topography derived for parks may vary widely. The costs for Access to Local Road are based on the use of a Level 2 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Beach Bathing

Beach bathing in this study refers to ocean bathing. There are freshwater bathing beaches in New Jersey, but the beaches tend to be small, and it is difficult to identify suitable areas at the scale at which this study is being done. Ocean bathing is the most popular form of outdoor recreation in New Jersey. On an average peak season weekend day, there are 775,000 recreation days of demand for swimming.* (A recreation day is one person engaging in one activity for an entire day; thus the total number of people swimming on a given day might be considerably higher than 775,000.)

Bathing is distributed all along New Jersey's 127 miles of Atlantic coastline between Sandy Hook and Cape May. Within this broad area, the locational requirements of bathing beaches are relatively modest. Water quality should be adequate for swimming. Areas of heavy boating, as at the mouth of an inlet, should be avoided. Also, areas subject to rip tides should be avoided, where they can be identified. The only other consideration is accessibility. Bathing beaches should be adjacent to or accessible from a road, and parking areas should be nearby.

Development Potential Factors

- ● Undeveloped Land
- o Access to Local Road
- o Proximity to Parking
- ● Proximity to Ocean Beach Frontage
- ● Acceptable Water Quality - Swimming

*Source: New Jersey Department of Environmental Protection, Office of Environmental Review. Outdoor Recreation in New Jersey. 1973.

Beach Bathing

BASELINE UNIT COST: ---

DEVELOPMENT SIZE: 2 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]		0 - 1/2 1/2 - 1 1/2 1 1/2 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 150,000 - 300,000 - 450,000	High
Proximity to Parking [V]		0 - 1/2 1/2 - 1 1+ mile	+ 30,000 + 15,000 0	+ 30,000 + 15,000 0	Low
Proximity to Ocean Beach Frontage [V]		Adjacent 0 - 1/2 1/2 - 5 5 - 15 15+ miles	0 X X X X	0 X X X X	High
Acceptable Water Quality - Swimming [V]		Acceptable Not Acceptable	0 X	0 X	High
	*	Baseline Specification			

NOTE:
No baseline unit cost has been given for Beach Bathing because it is impossible to put an accurate dollar value on beaches. The figures that are given here pertain to a 2 acre parcel. However, bathing beaches can be of any size. The costs given for Access to Local Road are based on the use of a Level 2 access road (see Element Cost Sheet).

C = costs are constant per development
V = costs vary with number of units

Sport Fishing

Recreational fishing in New Jersey takes many widely different forms. There is stream fishing from banks, bridges and stream beds; freshwater fishermen also fish from boats in the state's rivers, lakes, and bays. Saltwater fishing is similarly divided among surf fishermen and those who fish off piers, those who fish from private and charter boats in the ocean, and those who are involved in shellfishing.

All these diverse types of fishing have two requirements in common: the accessibility by fishermen, and the presence -- or at least the hope -- of fish. Streams where fish may be expected to be found can be readily identified from historical fishing data, stocking records, and stream quality data. Locating fish in more open bodies of water and in the ocean is more problematic. Access to fishing areas for fishermen is not of primary importance, since a degree of isolation may be highly desirable for recreational fishermen. Access is of more concern to those fishing from boats, in that they require access either to boat-launching ramps or to marinas (q.v.).

Of the 2.7 million fishermen engaged annually in recreational fishing and shellfishing, sixty percent reside in New Jersey with the balance coming mainly from Pennsylvania and New York (Bonsall, 1977). The estimated number of participants and person-days of recreation provided to New Jersey are estimated to be:

	Annual-1976	
	Participants	Person-Days Recreation
Ocean fishing	493,000	17,000,000
Estuarine fishing	483,000	20,000,000
Surf fishing	231,000	11,000,000
Crabbing	645,000	25,000,000
Clamming	16,000	10,000,000
	1,868,000 Total	83,000,000 Total

Source: Figley (1976)

Marine fishing is estimated to provide 36.07 million person days of recreation in New Jersey with approximately $10.42 expenditures/day yielding a total of $375.8 million to the state economy. Of this total, finfishing yielded approximately $217.2 million and shellfishing $158.6 million.

Twelve species comprise 95 percent of all the recreational finfish species caught off the New Jersey Coast. These include the bluefish, Atlantic Mackerel, striped bass, weakfish, white perch, winter flounder, summer flounder (fluke), black sea bass, porgy, cod, red hake (ling), and silver hake (whiting). Recreational shellfishermen engage mainly in clamming and crabbing. (Bonsall, 1977).

Development Potential Factors

Surf fishing - ocean
- • Ocean beach frontage
- o Jetties, groins, piers

Fresh water fishing - streams
- • Acceptable water quality - fishing
- o Bridges over streams

Fresh water fishing - navigable waters
- • Acceptable water quality - fishing
- o Proximity to marinas and boat launching ramps

Sport Fishing

BASELINE UNIT COST: --

DEVELOPMENT SIZE: --

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
SURF FISHING - OCEAN					
Proximity to Ocean Beach Frontage V	*	Adjacent [3] 0 - 1/2 1/2 - 5 5 - 15 15+ miles	0 X X X X	0 X X X X	High
Jetties, Groins, Piers V	*	Present Not Present	+ 100 0	+ 100 0	Low
FRESH WATER FISHING - STREAMS					
Acceptable Water Quality - Fishing V	*	Available [3] Not Available	0 X	0 X	High
Bridges over Streams V	*	Present Not Present	+ 100 0	+ 100 0	Low
FRESH WATER FISHING - NAVIGABLE WATERS					
Acceptable Water Quality - Fishing V	*	Available [3] Not Available	0 X	0 X	High
Proximity to Marinas and Boat Launching Ramps V	*	0 - 1 1 - 3 3 - 5 5 - 10 10+ miles	0 - 25 - 50 - 75 - 100	0 - 25 - 50 - 75 - 100	Low
	*	Baseline Specification			

NOTE:
Sport fishing refers to both fresh water and salt water fishing. The factors refer to the presence or absence of fishing opportunities. There are three basic types of sport fishing. Surf fishing in the ocean requires only the ocean. The dollar figure given as a bonus for jetties, groins, and piers should be regarded only as a default number, acknowledging that these features generally provide better-than-average fishing opportunities.

Fishing in streams requires a stream with water quality acceptable for fishing. The bonus figure for bridges over streams is a default figure, that recognizes that bridges may provide unusually good fishing opportunities. Fishing in navigable waters, that is, from boats, requires only water of quality acceptable for fishing. Fishing areas near marinas or boat launching ramps will tend to be favored over more distant fishing areas, and the deficiency numbers simply recognize that fact.

C = costs are constant per development
V = costs vary with number of units

Marinas

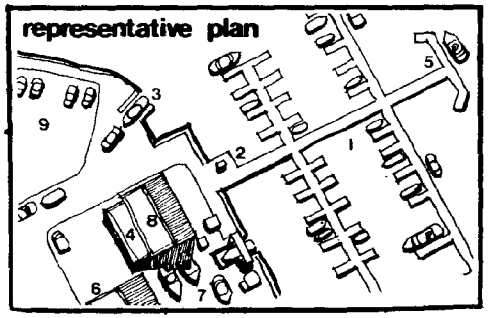
Marinas may be public facilities or may be private business operated independently or in association with a residential community. Marinas typically provide boat launching and storage facilities, boating supplies, and services for boat operation and maintenance. They also may include restaurant and motel accomodations. Each additional service, such as boat sales, adds to the attractiveness of the marina as a recreational facility and helps to ensure its financial success.

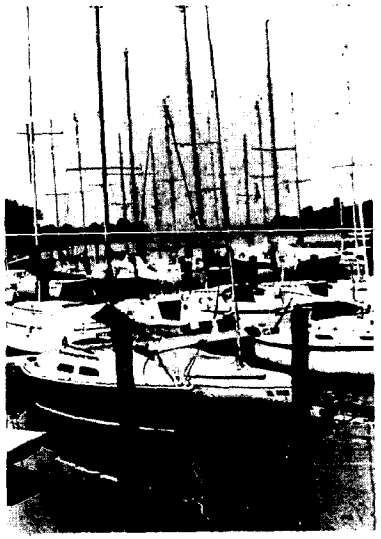
It has been found that a marina which is associated with a residential community must be economically independent of the residential community to ensure success. In order that this be so, marina-related facilities are usually designed as a unit within the site plan of the residential community or are associated with adjacent marina facilities where possible.

There are three basic types of marinas: wet marinas with open structures, where open pilework and/or floating breakwaters are used; wet marinas with solid structures, where bulkheads and landfill are used as moorings; and dry marinas, where boats are stored on land in warehouses, often in multi-level racks, and are moved to and from the water by cranes. Dry marinas are typically for boats measuring less than 24 feet in length.

Development Potential Factors

- ● Undeveloped Land
- ● Access to Local Road
- ● Access to 6-foot Channel
- o Access to Public Sewerage
- o Access to Public Water Supply
- ● Proximity to River or Bay Shore Frontage
- ● Embayments
- o Minor Tides





Marinas

BASELINE UNIT COST: $750,000

DEVELOPMENT SIZE: 100 ships, 5 acres

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Undeveloped Land					
Access to Local Road [C]	*	0 - 1/2 1/2 - 1 1 - 3 3+ miles	0 - 150,000 - 300,000 - 450,000	0 - 1,500 - 3,000 - 4,500	High
Access to 6-foot Channel [C]	*	0 - 1/2 1/2 - 1 1 - 2 2+ miles	0 - 120,000 - 240,000 - 320,000	0 - 1,200 - 2,400 - 3,200	Medium
Access to Public Sewerage [C]	*	0 - 1/2 1/2 - 1 1 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Access to Public Water Supply [C]	*	0 - 1/2 1/2 - 1 1 - 3 3+ miles	0 - 100,000 - 200,000 - 300,000	0 - 100,000 - 200,000 - 300,000	Medium
Proximity to River or Bay Shore Frontage [V]	*	Adjacent [3] 0 - 1/2 1/2 - 1 1+ mile	0 X X X	0 X X X	High
Embayments [V]	*	Present [3] Not Present	0 X	0 X	High
Minor Tides [V]	*	2 feet or less Greater than 2 feet	0 - 50,000	0 - 500	Medium
	*	Baseline Specification			

NOTE:
The baseline unit cost for Marinas includes the cost of dredging within the marina. Dredging costs for access to a 6-foot channel are based on a channel 40 feet wide, with an average dredged depth of 3 feet. Dredging costs can vary widely, from $2.50 per cubic yard, or less to more than $10 per cubic yard, depending on the amount and type of material, and the method of disposal. Costs were assumed to be $6 per cubic yard. Generally, marina costs are higher in the northern part of the state. The amount of land required for marinas is highly variable depending on the amount of parking and boat storage provided by the facility. Access to Local Road costs are based on the use of a Level 2 access road (see Element Cost Sheet). The Access to Public Water Supply figures are based on the use of a 6 inch steel pipe installed at a depth of 4 feet. The deficiency costs for Access to Public Sewerage are based on the use of an 8 inch vitrified clay pipe installed 4 feet deep.

C = costs are constant per development
V = costs vary with number of units

Natural Areas and Rivers

Natural areas are areas of land or water which have retained their natural character, although they are not necessarily completely undisturbed; or which contain rare or vanishing species of plant and animal life; or which possess similar features of interest which are worthy of preservation for the use of present and future residents of the state.

Three classifications are used for natural areas. These are:

Class I - Areas which demonstrate outstanding examples of ecosystems, biotic types and geologic types or formations that are common to this State, or biotic and geologic types which are atypical to this State, or habitats of rare and vanishing species or which are fragile and highly sensitive to the impact of man.

Class II - Areas which demonstrate the natural values which are lised for Class I, but which would not be significantly damaged or altered through interpretive use or through recreational use compatible with interpretive use.

Class III - Areas which demonstrate the natural values of Class I, but whose natural values would not be significantly damaged or altered through permitted recreational use.

These areas provide research and recreational opportunities and public education facilities. They may include trails for hiking and bicycling. Acreages of existing natural areas range from 10 to 2,500 acres. These acreages include a natural buffer zone. Owners of natural areas may be public or private; however, inclusion of areas as designated natural areas is determined by field study.

WILD RIVER AREAS

Development Potential Factors

- It demonstrates a free-flowing character, except that occasional and unobtrusive low dams, diversions, or other minor artificial alterations which do not cause inundation of the natural river bank may remain or a significant body of still water remains; and
- It is generally inaccessible except by trail, allowing only that an occasional and unobtrusive improved road or a similar easement may be allowed; occasional ford or crossing by a vehicle trail may remain; and
- Shorelines are primitive, allowing only that an occasional remote and unobtrusive dwelling, historic or special district, or similarly unobtrusive agricultural use or service structure minor in character may remain; and
- Water quality meets or is capable of being restored to meet minimum standards for primary contact recreation and to be capable of supporting aquatic life indigenous to the stream.

SCENIC RIVER AREAS

Development Potential Factors

- It demonstrates a free-flowing character except that occasional and unobtrusive low dams, diversions, or other minor artificial alterations which do not cause inundation of the natural river bank may remain or a significant body of still water remains; and
- It is generally inaccessible by road, allowing only that occasional short approached by conspicuous improved roads or longer reaches of inconspicuous and screened roads or railroads paralleling the river may be allowed; and
- Shorelines are largely primitive; short reaches approached by small communities, historic or special districts, or agricultural practices not adverse in effect on the river may be allowed, where contributing to the overall scenic quality and character of the area.

RECREATIONAL RIVER AREAS

Development Potential Factors

- It demonstrates an essentially free-flowing character, except that minor alterations, diversions or impoundments over minor distances remain; and
- The river is readily accessible by road, with the likelihood of paralleling roads along major reaches of the river bank; and
- Shorelines may have some extensive developments, although not being of a primarily developed character; and
- Water quality meets or is capable of being restored to meet minimum standards for desired recreation and of supporting aquatic life indigenous to the stream.

DEVELOPED RECREATIONAL RIVER AREAS

Development Potential Factors

- Significant impoundments, diversions or alterations may be present, provided river character and appropriate recreational opportunities are preserved; and
- The river is readily accessible to the public, with the likelihood of paralleling roads; where railroads, utility easements or roadways restrict general access, opportunity for water-borne recreation may qualify the river for inclusion in the System; and
- Shorelines are extensively developed, urban in character; where development restricts general access, opportunity for water-borne recreation may qualify the river for inclusion; opportunities for some natural shoreline are desirable; and
- Water quality meets or is capable of being restored to meet minimum standards for desired recreation and of supporting aquatic life indigenous to the stream.

Natural Areas and Rivers

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Natural Areas and Rivers					
Biotic Types	*	Typical Atypical Other			
Geologic Types	*	Typical Atypical Other			
Habitats of Rare and Vanishing Species	*	Presence of rare and Endangered Species Absence of Rare and Endangered Species			
Major Ecosystems	*	Present Not present			
Wild River Areas					
Free Flowing Characteristics	*	100% in Natural Condition 75% in Natural Condition 50% in Natural Condition 25% in Natural Condition			
River Accessibility	*	Public Road in Corridor Public Road not in Corridor			
Shore Lines of River	*	Natural Corridor Other			
Acceptable Surface Water Quality	*	Available [3] Not Available	0 X		
	*	Baseline Specification			

Factor		Data Categories	Total Factor Cost + or - ($)	Factor Cost/Unit + or - ($)	Level of Confidence
Recreational River Areas					
Free Flowing Characteristics	*	100% in Natural Condition 75% in Natural Condition 50% in Natural Condition 25% in Natural Condition			
River Accessibility	*	Public Road in Corridor Public Road not in Corridor			
Shorelines of Rivers	*	Natural Corridor Other			
Acceptable Surface	*	Available [3] Not Available	0 X		
Developed Recreational Area					
Free Flowing Characteristics	*	100% in Natural Condition 75% in Natural Condition 50% in Natural Condition 25% in Natural Condition			
River Accessibility	*	Public Road in Corridor Public Road not in Corridor			
Shorelines of Rivers	*	Natural Corridor Other			
Acceptable Surface Water Quality	*	Available [3] Not Available	0 X		
	*	Baseline specification			

FOOTNOTES

[1]Deficiency costs associated with soil drainage, soil load bearing capacity, and deep foundation suitability are necessarily general in the absence of site-specific information

[2]The amount paid for public sewerage and/or public water is determined by the cost of alternative systems. For example, in areas having few constraints for alternative systems, a developer would pay very little extra for public sewerage and/or public water supply, but in the areas where alternative systems were constrained, a typical developer might pay two or three times more for a parcel of land with public sewerage and/or public water supply.

[3]An "x" indicates that, in the absence of the baseline factor, the project would not be undertaken.

[4]Potable water becomes a developmental factor only in areas that are not serviced by public water supplies. In such areas the absence of potable water will preclude any schemes for development.

[5]The factor, Soils Suitable for On-Site Disposal Systems, becomes important only in those cases where public sewerage is not available.

[6]Structures may be built in the 100-year flood prone area if they are raised above the level of the 100-year flood, either on fill or on pilings. It is impossible to assign costs to this factor without knowing the characteristics of a particular site. Compacted fill will probably cost about $5.50 per cubic yard, with an additional charge of $0.40 for each mile it must be hauled.

[7]This factor may become irrelevant if the facility provides its own bus service.

[8]Though theoretically possible to site a mobile home park on land with ocean frontage, there is so little probability of this occurring that any figures employed here would be little more than fantasy.

[9]These figures can only be considered rough approximations. Accurate figures would require detailed knowledge of both the system and the specific site.

[10]Portions of the utility cost can usually be shared with the municipality and the utility company.

[11]Although safety considerations dictate that communication towers must not be near airports, no extra costs can be assigned more than five miles away from an airport

[12]While this factor is an important consideration, no data categories or costs can be generated in the absence of project specific information.

[13]The baseline specifications for this factor is all that is needed for this use. Additional quantities of the factor are superfluous and additional sums of money would not be expended for them.

[14]The source of water is unimportant. It is assumed that the user will pick the least expensive source, or combination of sources

[15]This figure is based on the average difference between gross receipts on yields between soils of Capability Class I and soils of Capability Class II.

[16]No figures have been given for Proximity to Metropolitan Service Center since, for industrial use, the costs are operating expenses rather than siting expenses.

Chapter 3
Factor Information

The data needs of a study as comprehensive as this one are obviously large. Over 300 sources were considered. The objective of this data collection task was to compile, record and map the relevant available data where reasonably possible. Not all data needs could be met in this initial effort, however. The available data suffers from several problems common to most data systems:

- A dearth of information on certain topics and a wealth of information on others
- Varying sophistication of data in different technical fields
- Incomplete recordkeeping.

Collection and evaluation were the beginning points in developing a comprehensive data system for land use planning in New Jersey's coastal zone.

Data requirements were dictated by the Development Potential Factor list developed for each use. (Development Potential Factors are elements or characteristics of the natural or built environment that are required for successful development of a use, or that are desirable and enhance the attractiveness of a location for development.)

Some Development Potential Factors are use-specific, such as mineral resources for the extraction industry, while other factors, such as access to road, apply to almost all uses. Moreover, the search for ordinal categories of suitability (i.e. high, medium and low) dictated that factors be divided into different levels or increments of cost. Data were therefore considered in terms of both data factors and data categories. A data factor is a class of information that is examined: "access to roads" or "proximity to resort communities", for example. Data categories are the divisions used to communicate information about the factors. Access to railroad categories might be "0-1," "1-3," "3-5," or "5+ miles."

Table 5 identifies all 65 of the factors considered in this study. Also shown are the date on which the data were compiled, the source agencies, or the agencies who prepared the data. The levels of confidence in the data were also noted in terms of the consultant's use and understanding of how the information was compiled, mapped and updated. The asterisks in the first column indicate maps produced by Rogers & Golden.

To record the sources and other pertinent information about the data, a form was developed: the Factor Information Sheet. One such sheet is provided for each data factor used. In some cases, where a single source was used for several factors, all factors were written up in a single Factor Information Sheet (e.g. "access to channel"). Each sheet gives a detailed profile of the data source or sources, including source map title, source agency, the person who knows how the data was compiled, agency address, use prepared for, informed agency people, date compiled, and date published.

Data format (map or table), scale, measurement units (miles, municipalities, parks, gallons per day), geographic units (roads, channels), geographic area covered (state, coastal zone), source data categories/map legend, reliability and accuracy, usefulness of data in this study, comments (including the map legend used in this study), and source citation are also provided.

Another section of the Factor Information Sheets indicates whether or not the data is computer encoded and what type of data (quantitative or qualitative data, spatial or nonspatial representation) it is. The term "qualitative" refers to data that is descriptive in nature; quantitative data involves measurements and/or calculations. For example, an embayment is a factor described as "a water body protected from extreme wind and wave action." Embayments are mapped as water bodies. Availability of groundwater is quantitative, as it is mapped according to groundwater yields in units of gallons per day. The term "spatial" refers to data that is available in a map format; the term "non-spatial" refers to data in chart, table or manuscript form.

When data were not mapped, or when data had not been mapped and we compiled and were able to map them, or when there were no available data compiled for mapping, we included a Factor Discussion Sheet. These sheets describe why the factor was not mapped or how the factor might be mapped in the future, if possible.

TABLE 5. FACTOR INFORMATION SHEET INDEX

Factor Number	Factor	Mapped for Study	Date Compiled	Source Agency	Level of Confidence
1	Undeveloped Land	*	1972-1974	USGS	High
2	Access to Roads	***	1978	NJDOT	High
3	Access to Railroads	*	1978	NJDOT	High
4	Access to Electric Power Transmission Line	*	1977	NJDOT	Med
5	Access to Electric Power Distribution line		1975	NJBPU	Med
6	Access to Channel		1975	NOAA	Med
7	Marine Access	*	1979	NOAA	High
8	Proximity to Metropolitan Service Centers	*	1979	R&G	High
9	Proximity to Regional Service Centers	*	1979	R&G	High
10	Proximity to Community Service Centers		1979	R&G	High
11	Proximity to Fishing Communities	*	1979	R&G	High
12	Proximity to Resort Communities	*	1979	R&G	High
13	Proximity to Public Transportation		1973	NJDOT	Med
14	Proximity to Marinas and Boat Launching Ramps	*	1974	NMFS	High
15	Proximity to Parking			R&G	
16	Proximity to Commercial Fishing Docks	*	1979	R&G	High
17	Proximity to Public Open Space	*	1977	NJGAP	High
18	Proximity to Disposal Sites	*	1975	NJDEP	Med-Low
19	Proximity to Ports	*	1979	NJDLI	High
20	Proximity to Airports	*	1975	NJDOT	High
21	Prime Open Agricultural Land	*	1971	USDA	Med
22	Woodland Suitability Group		varies	SCS	Med-High
23	Soil Association		varies	SCS	Med-High
24	Flooding		1976	NJDEP	Med
25	Slope		1975	NJDEP	Med
26	Shallow Foundation Suitability		varies	SCS	Med-High
27	Soil Load Bearing Capacity		varies	SCS	Med-High
28	Deep Foundation Suitability			D&M	
29	Availability of Mineral Resources			D&M	
30	Thickness of Overburden			D&M	
31	Soils Suitable for On-site Disposal Systems		varies	SCS	Med-High
32	Surface Water Availability			D&M	
33	Groundwater Availability			D&M	
34	Access to Public Sewerage	*	1975	NJDEP	Med
35	Access to Public Water Supply	*	1975	NJDEP	Med
36	Potable Water Supply		varies	NJDEP	Med
37	Depth to Water Table		varies	SCS	Med-High
38	Major Ecosystems	*	1954	SCS	Med
39	Free Flowing Characteristics		1977-78	HCRS	High
40	Habitats of Rare and Vanishing Species		1977-78	HCRS	High
41	River Accessibility		1977-78	HCRS	High
42	Shorelines of Rivers		1977-78	HCRS	High
43	Biotic Types		1977-78	HCRS	High
44	Geologic Types		1977-78	HCRS	High
45	Proximity to Ocean Beach Frontage	*	1975	NJDEP	High
46	Proximity to River and Bayshore Frontage	*	1975	NJDEP	High
47	Minimum Need for Bridges and Tunnels			R&G	
48	Embayments	*	1975	NJDEP	High
49	Visibility From Roads		1979	R&G	High
50	Dredging Maintenance			D&M	
51	Acceptable Water Quality	*	1972	NJDEP	Med
52	On-site Amenities				
53	Character of Surrounding Area				
54	Visual Amenities				
55	Short Distance Between Trip Origins and Destination				
56	Jetties, Groins and Piers				
57	Bridges Over Streams		1978	NJDOT	High
58	Population Density		1976	NJDEP	Med
59	Labor Force Availability		1979	NJDLI	Med
60	Minor Tides		1979	NOAA	High
61	Soil Drainage		varies	SCS	Med
62	Forest Cover		(1980)	NJDEP	Med
63	Historical Sites		1979	NJDEP	Med
64	Archaeological Sites		1979	NJDEP	Med
65	Gas Pipelines	*	1977	NJDEP	Med

LEGEND:

USDA	United States Department of Agriculture
SCS	USDA. Soil Conservation Service
NOAA	National Oceanic and Atmospheric Administration
NMFS	NOAA. National Marine Fisheries Service
USGS	United States Geological Survey
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NJBPU	New Jersey Board of Public Utilities
NJDLI	New Jersey Department of Labor and Industry
NJGAP	NJDEP. Green Acres Program
HCRS	Heritage Conservation and Recreation Services
D&M	Dames & Moore
R&G	Rogers & Golden

NOTE:

No dates or levels of confidence could be provided for some unmapped factors. These have been left blank.

Factor Information Sheet 1

Factor: UNDEVELOPED AND PUBLICLY OWNED LAND

Source Map Title: *Land Use and Land Cover, 1972-1974. Scranton, PA; NY and NJ: Newark, NJ; PA and NY: Wilmington, DE; NJ; PA and MD: Salisbury, MD; DE; NJ and VA.*

Source Agency: *U.S. Geological Survey*

Person:

Address: *National Cartographic Information Center, U.S. Geologic Survey, National Center, Reston, VA*

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: *1972-1974* Date Published: *1976, 1977*

Data Format:

Scale: *1:250,000*

Measurement Units: *Feet and Kilometers*

Geographic Unit:

Geographic Area Covered: *Mid-Atlantic Region*

Type of Data: (check boxes)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Computer Encoded? Yes ____ No X
If yes, what format?

Source Data Categories/Map Legend: *1. Urban or Built-up Land 2. Agricultural Land 3. Range Land 4. Forest Land 5. Water 6. Wetland 7. Barren Land*

Reliability & Accuracy: *Most accurate mapping of undeveloped land available at this scale. Will require periodic updating.*

Usefulness of Data: *This factor is required in locating all land uses considered in this study.*

Comments: *Publicly owned land (Factor 17) was added to developed and both were mapped at a scale of 1:250,000 for this study.*

Source Citation: *U.S. Department of the Interior, Geologic Survey. Land Use Series. Open File 77-664-1, 77-665-1, 76-636-1, 77-063-1.*

Rogers & Golden

Factor Information Sheet 2

Factor: ACCESS TO ROADS

Source Map Title: *New Jersey Highway Map and Guide*

Source Agency: *N.J. Department of Transportation* Phone: *(609) 292-8501*

Person:

Address: *1035 Parkway, Trenton, New Jersey*

Use Data Prepared For:

Informed Sources/Knowledgeable People: *Dave Cox*

Date Compiled: *1978* Date Published: *1979*

Data Format: *map*

Scale: *1:250,000*

Measurement Units: *miles and kilometers*

Geographic Unit:

Geographic Area Covered: *entire state*

Type of Data: (check boxes)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Computer Encoded? Yes ____ No X
If yes, what format?

Source Data Categories/Map Legend: *State Highways, Toll Highways, Other Divided Highways, Secondary Roads, Connecting Roads, Local Roads.*

Reliability & Accuracy: *Very reliable and accurate.*

Usefulness of Data: *This factor identifies proximity to roads, and it is needed for most land uses.*

Comments: *This factor was mapped at a scale of 1:250,000 for this study. The legend shows distances from roads, 0- 1/2, 1/2-1 1/2, 1 1/2-3, and 3+ miles.*

Source Citation: *New Jersey Department of Transportation. 1978. New Jersey Official Highway Map and Guide. NJ Department of Transportation.*

Rogers & Golden

Factor Information Sheet 3

Factor: ACCESS TO RAILROADS

Source Map Title: *Railroad Service Map*

Source Agency: *New Jersey Department of Transportation* Phone: *(609) 292-7080*
Person: *Kevin Kyte*

Address: *Department of Transportation*

Use Data Prepared For: *Common Carrier Planning*

Informed Sources/Knowledgeable People:

Date Compiled: *1978* Date Published: *1978*

Data Format: *map*

Scale: *1:250,000*

Measurement Units: *feet*

Type of Data: (check one)
Qualitative X Quantitative ___
Spatial X Non-Spatial ___

Computer Encoded? Yes ____ No X

Geographic Unit: *Railroad Tracks*

Geographic Area Covered: *Entire state*

Source Data Categories/Map Legend:
-passenger station
-passenger and freight line
-rapid transit
-freight service
-abandoned lines

Reliability & Accuracy:
The data presented on this map is reliable and accurate.

Usefulness of Data:
This factor is useful in locating areas suitable for sports, warehousing and various industries dependent on rail transportation.

Comments:
This factor was mapped at a scale of 1:250,000 for this study. The legend displays the following proximities: 0-1, 1-3, 3-5, and 5+ miles.

Source Citation:
New Jersey Department of Transportation, 1978 Railroad Service Map, Trenton, NJ.

Rogers & Golden

Factor Information Sheet 4

Factor: ACCESS TO ELECTRIC POWER TRANSMISSION LINE

Source Map Title: *Utility Map Series - Electric Services Overlay*

Source Agency: *Bureau of Geology and Topography* Phone: *292-2576*
N.J. Department of Environmental Protection
Person: *Kemble Widmer, State Geologist*

Address: *1474 Prospect Street, Trenton, New Jersey*

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: *1977* Date Published: *1977*

Data Format: *map*

Scale: *1:250,000*

Measurement Units:

Type of Data: (check boxes)
Qualitative X Quantitative ___
Spatial X Non-Spatial ___

Computer Encoded? Yes ____ No X
If yes, what format?

Geographic Unit: *Electrical power lines*

Geographic Area Covered: *entire state*

Data Categories/Map Legend:
generating station - nuclear
generating station - fossil fuel
generating station - pump storage
transmission substation
electric transmission right of way with number of overhead lines and voltage
proposed electric transmission line
underground electric
utility company service area boundaries

Reliability & Accuracy:
Information may be out of date. This factor will require periodic updating as changes are made in electric transmission grids.

Usefulness of Data:
This factor locates areas where various industries and major ports may locate.

Comments: *This factor was mapped at a scale of 1:250,000 for this study. The legend shows proximities of 0-1, 1-3, 3-5, 5-10 and 10+ miles.*

Source Citation:
N.J. Department of Environmental Protection, Bureau of Geology and Topography. 1977. Utility Map Series, Electrical Services Overlay, Trenton, New Jersey.

Rogers & Golden

Factor Information Sheet 5

Factor: ACCESS TO ELECTRIC POWER DISTRIBUTION LINE

Source Map Title:

Source Agency: *Board of Public Utilities* Phone: *(201) 221-3733*

Person: *George H. Barbow (President)*

Address: *1100 Raymond Boulevard, Newark, NJ*

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: Date Published:

Data Format:

Scale:

Measurement Units:

Geographic Unit:

Geographic Area Covered:

Type of Data: (check one)
Qualitative ____ Quantitative ____
Spatial ____ Non-Spatial ____

Computer Encoded? Yes ____ No ____

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *This factor is used to locate areas for residential, commercial and industrial land uses.*

Comments: *See note on following page.*

Rogers & Golden

Factor Discussion Sheet 5

Factor: ACCESS TO ELECTRIC POWER DISTRIBUTION LINE

Electric power distribution lines are the final link in the delivery system by which electric power is conveyed from the generating plant to the end users. Most uses require electricity. Therefore, the location of existing distribution lines is a consideration, since proximity to existing lines minimizes the cost of connecting to the system.

Distribution lines cover the state quite densely. There are a number of variables in distribution lines. Among these are voltage of the line, amperage, and phase, and whether the line is overhead or underground. To map all these variables for the entire study area at a scale of 1:250,000 would be impossible. Too much information is involved, and it is too dense to be revealed at that scale.

Sources:

Beckman, David. 1979. Transmission Section, Atlantic City Electric Company, Atlantic City. Personal communication.

Klem, Nick. 1979. Residential and Commercial Distribution, Atlantic City Electric Company, Atlantic City. Personal communication.

Thayer, Edward H. 1979. Supervisor-Area Engineering, Jersey Central Power and Light Company, Asbury Park. Personal communication.

Factor Information Sheet 6

Factor: ACCESS TO CHANNEL

Source Map Title: *Nautical Charts 12314, 12316, 12324, 12326: New Jersey Intracoastal Waterway and Delaware Bay*

Source Agency: *National Oceanic and Atmospheric Administration* **Phone:**

Person:

Address:

Use Data Prepared For: *National Ocean Survey*

Informed Sources/Knowledgeable People: *Michael Hochman*

Date Compiled: *1975* **Date Published:** *1975*

Data Format: *map*

Type of Data: (check one)
Qualitative _X_ Quantitative ____
Spatial _X_ Non-Spatial ____

Scale: *1:40,000*

Measurement Units: *Miles*

Computer Encoded? Yes ____ No _X_

Geographic Unit: *Channels*

Geographic Area Covered: *Little Egg Harbor to Cape May*

Source Data Categories/Map Legend: *Navigation aids, bottom characteristics, dangers, light characteristics.*

Reliability & Accuracy: *This information is reliable and accurate, but should be checked and updated periodically.*

Usefulness of Data: *This factor is used to locate areas suitable for Major and Minor Ports, Commercial Fishing Docks and Marinas.*

Comments: *This factor was mapped at a scale of 1:250,000 for this study. The legend shows those areas having access to 6 foot, 12 foot, 16 foot and 35 foot channels.*

Source Citation: *U.S. Department of Commerce, National Oceanic and Atmospheric Administration. 1975. Nautical Chart 12316 New Jersey Intracoastal Waterway: Little Egg Harbor to Cape May. Washington, DC*

Rogers & Golden

Factor Information Sheet 7

Factor: MARINE ACCESS

Source Map Title: *Nautical Chart 12316: New Jersey Intracoastal Waterway: Little Egg Harbor to Cape May.*
Source Agency: *National Oceanic and Atmospheric Administration.* **Phone:**
Person:

Address:

Use Data Prepared For: *National Ocean Survey*

Informed Sources/Knowledgeable People: *Michael Hochman*

Date Compiled: *1975* **Date Published:** *1975*

Data Format: *map*

Type of Data: (check one)
Qualitative _x_ Quantitative ____
Spatial _x_ Non-Spatial ____

Scale: *1:40,000*

Measurement Units:

Computer Encoded? Yes ____ No _x_

Geographic Unit: *Channels*

Geographic Area Covered: *Little Egg Harbor to Cape May*

Source Data Categories/Map Legend: *Navigation aids, bottom characteristics, dangers, light characteristics.*

Reliability & Accuracy: *This data is reliable and accurate.*

Usefulness of Data: *This factor is needed to locate potential developments sites for major and minor ports.*

Comments: *This factor was mapped at a scale of 1:250,000 for this study.*

Source Citation: *U. S. Department of Commerce, National Oceanic and Atmospheric Administration. 1975. Nautical Chart 12316 New Jersey Intracoastal Waterway: Little Egg Harbor to Cape May. Washington, D.C.*

Rogers & Golden

Factor Information Sheet 8

Factor: PROXIMITY TO METROPOLITAN SERVICE CENTERS

Source Map Title: *Proximity to Metropolitan Service Centers*

Source Agency: *Rogers and Golden* Phone: *(215) 563- 4220*

Person: *Joanne Jackson*

Address: *1427 Vine Street, Philadelphia, PA 19102*

Use Data Prepared For: *New Jersey Coastal Development Potential Study*

Informed Sources/Knowledgeable People:

Date Compiled: *1979* Date Published: *1979*

Data Format: *Map*

Type of Data: (check boxes)
Qualitative X Quantitative ___
Spatial X Non-Spatial ___

Scale: *1:250,000*

Measurement Units: *Miles*

Computer Encoded? Yes ___ No X
If yes, what format?

Geographic Unit: *Zone of influence*

Geographic Area Covered: *Coastal Study Area*

Source Data Categories/Map Legend:

0-15 miles *30-45 miles* *60+ miles*
15-30 miles *45-60 miles*

Reliability & Accuracy:
This data is reliable and accurate.

Usefulness of Data:
This factor aids in the location of areas desired for various housing, commercial and industrial land uses.

Comments:
This factor locates those areas having a population of more than 1,500,000 and the proximities to those areas.

Rogers & Golden

Factor Discussion Sheet 8

Factor: PROXIMITY TO METROPOLITAN SERVICE CENTERS

Proximity to to various goods and services is a prime consideration in the siting of many land uses. Those goods and services involved in this study originally considered individual services: proximity to health care facilities, proximity to shopping, proximity to employment, proximity to schools, proximity to recreation, and proximity to religious and cultural activities. As the study progressed it became evident that both developers and house buyers did not weigh these individual factors in making the decision to site a housing development or buy a house. Instead, the total range of goods and services do tend to cluster in more populated areas.

As a result those factors that are clustered in urban areas were not considered as separate entities and assigned bonus values or deficiency costs. However, distinctions were made between levels of service. Those areas have a population of greater than 1,500,000 were designated as Metropolitan Service Centers. Those areas with a seasonal population of more than 7,000 or which are County Seats were called Regional Service Centers. Community Service Centers are those areas which have a population of less than 7,000, but which do offer some services.

Only two cities qualified for the designation of Metropolitan Service Centers - Philadelphia and New York. Although both of these cities are outside of New Jersey, their role in shaping the development of New Jersey is undeniable.

After service centers were categorized, their drawing power was assigned. It was assumed that the greater number of services available within a service center, the greater its appeal. The rationale is that bigger places with unique services can attract people from greater distances. Metropolitan Service Centers in New Jersey were assumed to have a drawing power radius of 60 miles.

Sources:

Craig, William J. 1978. "Accessibility Measurement and Use in Land-Use Planning." Journal of Environmental Systems. Vol. 8 (3) 201-217.

Isard, Walter. 1956. Location and Space - Economy. Cambridge, MA: The MIT Press.

Olsson, C. 1965. Distance and Human Interaction. Bibliography Series, No. 2. Philadelphia: Regional Science Institute.

Rand McNally and Company. 1972. Standard Reference Map and Guide of New Jersey. Chicago.

U.S. Geologic Survey. 1962 revised 1976. Topographic Maps at 1:250,000 of Scranton PA, NY and NJ; Newark, NJ, PA; Wilmington, DE and NJ. Reston, VA.

Factor Information Sheet 9

Factor: PROXIMITY TO REGIONAL SERVICE CENTER$

Source Map Title: *Proximity to Regional Service Centers*

Source Agency: *Rogers and Golden* Phone: *(215) 563-4220*

Person: *Joanne Jackson*

Address: *1427 Vine Street, Philadelphia, PA 19102*

Use Data Prepared For: *New Jersey Coastal Development Potential Study*

Informed Sources/Knowledgeable People:

Date Compiled: *1979* Date Published: *1979*

Data Format: *map*

Scale: *1:250,000*

Type of Data: (check boxes)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Measurement Units: *Feet*

Computer Encoded? Yes ____ No X
If yes, what format?

Geographic Unit: *Zone of Influence*

Geographic Area Covered: *Coastal Study Area*

Data Categories/Map Legend:

0-2 miles	*7-15 miles*
2-7 miles	*15+ miles*

Reliability & Accuracy:

This map is accurate, however since no distinction has been made of type or size of Regional Service Centers, some Regional Service Centers may have a greater influence than that indicated by the map legend.

Usefulness of Data:
This factor aids in the location of areas suitable for various housing types, hotels and motels.

Comments:
This factor locates those areas having a population of 7,000 (can be seasonal) and county seats. These areas are presumed to offer a variety of services, including stores, higher education facilities, health care facilities, cultural and religious facilities and employment opportunities.

Rogers & Golden

Factor Discussion Sheet 9

Factor: PROXIMITY TO REGIONAL SERVICE CENTERS

Those areas with a population of 7,000, but less than a million and a half have been designated as Regional Service Centers. Though this category seems unusually broad, it reflects the distinctions made by builders and developers in New Jersey. Regional Service Centers may only have a seasonal population of more than 7,000, or they may be County Seats.

All areas termed Regional Service Centers are assumed to have a post office, several banks, a high school, a newspaper (daily or weekly), a new car dealer, a public library and at least one medical doctor. Most Regional Service Centers influence development within a 15 mile radius.

Sources:

Craig, William J. 1978. "Accessibility Measurement and Use in Land-Use Planning", Journal of Environmental Systems. Vol. 8(3) 201-217.

Isard, Walter. 1956. Location and Space Economy. Cambridge, MA: The MIT Press.

Olsson, C. 1965. Distance and Human Interaction. Bibliography Series No. 2. Philadelphia, PA: Regional Science Institute.

Rand McNally Company. 1972. Standard Reference Map and Guide to New Jersey. Chicago, IL: Rand McNally Press.

U.S. Geological Survey. 1962 (revised 1976). Topographic Maps at 1:250,000 of Scranton, PA, NY, and NJ; Newark, NJ, PA, and NY; Wilimington DE, NJ, PA and MD; Salisbury, MD, DE, NJ

Factor Information Sheet 10

Factor: PROXIMITY TO COMMUNITY SERVICE CENTERS

Source Map Title: *Proximity to Community Service Centers*

Source Agency: *Rogers and Golden* Phone: *(215) 563-4220*

Person: *Joanne Jackson*

Address: *1427 Vine Street, Philadelphia, PA 19102*

Use Data Prepared For: *New Jersey Coastal Development Potential Study*

Informed Sources/Knowledgeable People:

Date Compiled: *1979* Date Published: *1979*

Data Format: *map*

Type of Data: (check one)
Qualitative _X_ Quantitative ____
Spatial _X_ Non-Spatial ____

Scale: *1:250,000*

Measurement Units: *miles*

Computer Encoded? Yes ____ No _X_

Geographic Unit: *Zone of Influence*

Geographic Area Covered: *Coastal Study Area*

Source Data Categories/Map Legend:

0 1 mile	*3-5 miles*
1-3 miles	*5 + miles*

Reliability & Accuracy: *This data has not been thoroughly field checked.*

Usefulness of Data: *This factor is useful in locating potential sites for various housing types.*

Comments: *This factor locates those areas offering minimal services.*

Rogers & Golden

Factor Discussion Sheet 10

Factor: PROXIMITY TO COMMUNITY SERVICE CENTERS

Those areas that have banks, post offices and full size supermarkets-but that are not County Seats and have populations less than 7,000-were designated as Community Service Centers.

This type of service center is of importance in siting residential land uses. They affect development within a radius of 5 miles.

Source:

Craig, William J. 1978. "Accessibility Measurement and Use in Land-Use Planning." Journal of Environmental Systems. Vol. 8 (3), 201-217.

Isard, Walter 1956. Location and Space - Economy. Cambridge, MA: The MIT Press.

Olsson, C. 1965. Distance and Human Interaction Bibliography Series, No. 2. Philadelphia: Regional Science Institute.

Rand McNally & Company. 1972. Standard Reference Map and Guide of New Jersey Chicago.

U.S. Geologic Survey, 1962 (revised 1976). Topographic Maps at 1:250,000 of Scranton PA, N.Y. and NJ; Newark, NJ, PA; Wilmington, DE and NJ Reston, VA.

Factor Information Sheet 11

Factor: PROXIMITY TO FISHING COMMUNITIES

Source Map Title: *Proximity to Fishing Communities*

Source Agency: *Rogers and Golden* **Phone:** *(215) 562-4220*

Person: *John Rogers*

Address: *1427 Vine Street, Philadelphia, Pa. 19102*

Use Data Prepared For: *New Jersey Coastal Development Potential Study*

Informed Sources/Knowledgeable People:

Date Compiled: *1979* **Date Published:** *1979*

Data Format: *map*

Scale: *1:250,000*

Type of Data: (check one)
Qualitative *x* Quantitative ____
Spatial *x* Non-Spatial ____

Measurement Units: *feet*

Computer Encoded? Yes ____ No *x*

Geographic Unit: *communities*

Geographic Area Covered: *Coastal study area*

Source Data Categories/Map Legend: *Fishing communities and distances from them, 0-1, 1-3, 3-5, 5 + miles.*

Reliability & Accuracy: *This information is reliable and accurate.*

Usefulness of Data: *This factor is used to locate areas suitable for commercial fishing docks.*

Comments: *This factor was mapped for this study at a scale of 1:250,000.*

Rogers & Golden

Factor Discussion Sheet 11

Factor: PROXIMITY TO FISHING COMMUNITIES

The major percentage of commercial fishing boats currently sail from three coastal counties - Ocean, Atlantic and Cape May. Others sail from Cumberland, Monmouth, Salem and Bergen Counties. The principal commercial fishing communities within each county are Belford and Highlands, Monmouth County; Point Pleasant and Barnegat Light; Ocean County; Wildwood and Cape May; Cape May County; and Port Norris and Bivalve, Cumberland County.

Other potential areas along coastally linked navigation channels which contain entertainment (i.e., restaurants and tap rooms), and services (i.e., boat maintenance, ice making and freezer storage) have potential as major fishing communities.

Source:

Bonsall, Susan. 1977. The Fishing Industry of New Jersey. Rutgers, NJ: Rutgers, NJ: Rutgers University, Center for Coastal and Environmental Studies.

Factor Information Sheet 12

Factor: PROXIMITY TO RESORT COMMUNITIES

Source Map Title: *Proximity to Resort Communities*

Source Agency: *Rogers and Golden* Phone: *(215) 563-4220*

Person: *Joanne Jackson*

Address: *1427 Vine Street, Philadelphia, PA 19102*

Use Data Prepared For: *New Jersey Coastal Development Potential Study*

Informed Sources/Knowledgeable People:

Date Compiled: *1979* Date Published: *1979*

Data Format: *map*

Scale: *1:250,000*

Measurement Units: *feet*

Geographic Unit: *Resorts*

Type of Data: (check boxes)
Qualitative ___ Quantitative ___
Spatial X Non-Spatial ___

Computer Encoded? Yes ___ No X
If yes, what format?

Geographic Area Covered: *Coastal Study Area*

Source Data Categories/Map Legend: *0-1, 1-2, 2-3, 3 + miles*

Reliability & Accuracy: *See note on following page.*

Usefulness of Data: *This factor is useful in identifying areas where hotels and motels may wish to locate.*

Comments: *This factor was mapped at a scale of 1:250,000 for this study. The legend shows distance from resort communities.*

Rogers & Golden

Factor Discussion Sheet 12

Factor: PROXIMITY TO RESORT COMMUNITIES

New Jersey has long been famous for its resort communities. There is great diversity among these communities. Atlantic City is known for glitter and flash, while Cape May City is recognized for Victorian elegance. Still others are virtually unknown even though their summertime population may be several times greater than their winter population. This last category serves families who own homes or who rent them for the season and they have little to offer the weekender or two-week vacationers. This map identifies only those communities which cater to day trippers and weekenders.

Source:

Bell, J. and Clark, Hazel F. 1978. What to Do in New Jersey. Chappaqua, N.Y.: What to Do County Publications, Inc.

Mole, Michela M. 1976 (4th ed.) Away We Go! New Brunswick, NJ.: Rutgers University Press.

Rand McNally and Company, 1978 Mobil Travel Guide: Middle Atlantic States. Chicago: Rand McNally Travel Research Center.

Factor Information Sheet 13

Factor: PROXIMITY TO PUBLIC TRANSPORTATION

Source Map Title: *Existing Bus Transportation System*

Source Agency: *New Jersey Department of Transportation* **Phone:** *(609) 292-8340*

Person: *Wade Lawson*

Address: *Lawrence Shopping Center, Trenton, NJ*

Use Data Prepared For:

Informed Sources/Knowledgeable People: *James T. Gallagher*

Date Compiled: *1972-1973* **Date Published:** *1972-1973*

Data Format: *maps*

Type of Data: (check one)
Qualitative *x* Quantitative ____
Spatial *x* Non-Spatial ____

Scale: *varies by county*

Measurement Units: *Miles*

Computer Encoded? Yes ____ No *x*

Geographic Unit: *county*

Geographic Area Covered: *Entire state*

Source Data Categories/Map Legend:

Bus routes by number.

Reliability & Accuracy:

This information is outdated in some instances.

Usefulness of Data:

This factor is used to determine desirable locations for most residential land uses.

Comments:

This factor was mapped at a scale of 1:250,000 for this study. The legend shows distances from bus routes at 0-1, 1-2, 2-3 and 3+ miles.

Source Citation:

New Jersey Department of Transportation. Existing Bus Transportation Systems. Trenton, NJ.

Rogers & Golden

Factor Information Sheet 14

Factor: PROXIMITY TO MARINAS AND BOAT LAUNCHING RAMPS

Source Map Title: *Anglers' Guide to the United States Atlantic Coast, Section III*

Source Agency: *National Marine Fisheries Service* Phone:

Person: *Bruce L. Freeman and Lionel A. Walford*

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: Date Published: *1974*

Data Format: *maps*

Type of Data: (check one)
Qualitative ____ Quantitative *X*
Spatial *X* Non-Spatial ____

Scale: *1" = 3 1/2 nautical miles*

Measurement Units: *nautical miles*

Computer Encoded? Yes ____ No *X*

Geographic Unit: *Marinas and Boat landings*

Geographic Area Covered: *Block Island to Cape May*

Source Data Categories/Map Legend: *Types of fish, and types of boating facilities by location*

Reliability & Accuracy:
This information may be slightly outdated.

Usefulness of Data:
This factor is useful in locating areas for sport fishing.

Comments:
This factor was mapped at 1:250,000 for this study with proximities of 0-1, 1-3, 3-5, 5-10, and 10+ miles.

Source Citation: *National Marine Fisheries Service, National Oceanic and Atmosphere Administration, 1974. Anglers Guide to the United States Atlantic Coast, Section III. Washington, D.C. U.S. Government Printing Office.*

Rogers & Golden

Factor Information Sheet 15

Factor: PROXIMITY TO PARKING

Source Map Title: *not mapped*

Source Agency: *Rogers & Golden* **Phone:**

Person:

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: **Date Published:**

Data Format:

Scale:

Type of Data: (check one)
Qualitative ____ Quantitative ____
Spatial ____ Non-Spatial ____

Measurement Units:

Computer Encoded? Yes ____ No ____

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *This fact is a consideration in locating areas having development potentials for Beach Bathing.*

Comments: *See Factor Discussion Sheet.*

Factor Discussion Sheet 15

Factor: PROXIMITY TO PARKING

For most uses that require parking, the required area has been included in the land requirement. The only use for which parking areas are a significant consideration, and for which a land requirement for parking cannot reasonably be included in the use description, is Beach Bathing. Other things being equal, beaches which have parking areas nearby will have a higher potential for development than beaches which do not have nearby parking.

Information on existing parking facilities, on a state-wide basis, does not exist. In addition, since a bathing beach may be of any size, it is impossible to know how many parking spaces will be require in the absence of information about a particular beach. Finally, most of the areas along New Jersey's ocean front are exteneively developed, and this study does not address itself to the analysis of developed lands. Therefore, parking lots in developed areas cannot be identified.

Source: *New Jersey Department of Environmental Protection, Office of Environmental Review, 1973. Outdoor Recreation in New Jersey: New Jersey Statewide Comprehensive Outdoor Recreation Plan. Trenton.*

Factor Information Sheet 16

Factor: PROXIMITY TO COMMERCIAL FISHING DOCKS

Source Map Title: *Proximity To Commercial Fishing Docks*

Source Agency: *Rogers and Golden* Phone: *(215) 563-4220*

Person: *John Rogers*

Address: *1427 Vine Street*

Use Data Prepared For: *New Jersey Coastal Development Potential Study*

Informed Sources/Knowledgeable People: *Susan Bonsall (Marine Advisory Service)*

Date Compiled: *1979* Date Published: *1979*

Data Format: *map*

Scale: *1:250,000*

Measurement Units: *miles*

Type of Data: (check one)
Qualitative ____ Quantitative _x_
Spatial _x_ Non-Spatial ____

Computer Encoded? Yes ____ No _x_

Geographic Unit: *Fishing Docks*

Geographic Area Covered: *Coastal Area*

Source Data Categories/Map Legend: *The location of fishing docks and distances to them, 0-5, 5-10, 10-20 and 20 + miles, were mapped for this study at 1:250,000.*

Reliability & Accuracy: *This information is reliable and accurate. It should be updated periodically.*

Usefulness of Data: *This data is useful in locating areas for Fish Processing Plants.*

Comments: *See Factor Discussion Sheet.*

Rogers & Golden

Factor Discussion Sheet 16

Factor: PROXIMITY TO COMMERCIAL FISHING DOCKS

Most commercial fishing boats sail from Ocean County, Atlantic County or Cape May County. There are additional commercial fishing docks in Cumberland, Monmouth, Salem, and Bergen Counties. Distance between a commercial fishing dock and a fish processing plant is an important consideration in siting processing plants. Operating costs will vary depending on location and mode of transportation.

Source:

Bonsall, Susan. 1979. Rutgers University, Center for Coastal and Environmental Studies.

Factor Information Sheet 17

Factor: PROXIMITY TO PUBLIC OPEN SPACE

Source Map Title: *Major Public Open Space and Recreation Areas in New Jersey*

Source Agency: *Green Acres Program* Phone: *609-292 2455*
NJ Dept. Of Environmental Protection
Person: *Ken Bosted*

Address: *Green Acres, 1301 Parkside Ave, Trenton, NJ*

Use Data Prepared For: *New Jersey Statewide Comprehensive Outdoor Recreation Plan*

Informed Sources/Knowledgeable People:

Date Compiled: *1977* Date Published: *1977*

Data Format: *map*

Type of Data: (check one)
Qualitative _X_ Quantitative ____
Spatial _X_ Non-Spatial ____

Scale: *1"= 4 miles*

Measurement Units: *Miles*

Computer Encoded? Yes ____ No _X_

Geographic Unit: *State*

Geographic Area Covered: *Entire State*

Source Data Categories/Map Legend:
Federal Open Space and Recreation Areas *Watershed Areas.*
Interstate Open Space and Recreation Areas
County Open Space and Recreation Areas

Reliability & Accuracy:
This map only show large areas - over 100 acres - of open space.

Usefulness of Data:
This factor locates areas where campgrounds may desire to locate.

Comments:
This factor was mapped at 1:250,000 for this study with proximity mapped in the following increments: 0-1, 1-3, 3-5, 5-10, 10 + miles.

Source Citation:
N.J. Department of Environmental Protection, 1977 State Comprehensive Outdoor Recreation Plan, Major Public Open Space and Recreation Areas in New Jersey (map), Trenton , N.J.

Factor Discussion Sheet 17

Factor: PROXIMITY TO PUBLIC OPEN SPACE

This factor is used in siting only one use, Campgrounds. Therefore, the 1:250,000 map portrays only large (over 100 acres) areas of public open space. In the event that Proximity to Public Open Space becomes a factor for other land uses or for studies mapped at a larger scale, there are sources that provide lists of all public open space.

Sources:

New Jersey Department of Community Affairs. 1975. Federally Owned Real Property. Trenton: Division of State and Regional Planning.

New Jersey Department of Community Affairs. 1974. County Owned Real Property in New Jersey. Trenton: Division of State and Regional Planning.

New Jersey Department of Community Affairs. 1973. State Owned Real Property in New Jersey. Trenton: Division of State and Regional Planning.

Factor Information Sheet 18

Factor: PROXIMITY TO DISPOSAL SITES

Source Map Title: *Sewage, Landfill overlay*

Source Agency: *N.J. Department of Environmental Protection, Bureau of Geology and Topography.* **Phone:** *(609)292-2576*
Person: *Kemble Widmer, State Geologist*

Address: *1414 Prospect Street, Trenton, NJ*

Use Data Prepared For: *State environmental overlay series*

Informed Sources/Knowledgeable People:

Date Compiled: *1975* **Date Published:** *1975*

Data Format: *map*

Type of Data: (check one)
Qualitative _x_ Quantitative ____
Spatial _x_ Non-Spatial ____

Scale: *1:63,360*

Measurement Units: *Miles*

Computer Encoded? Yes ____ No _x_

Geographic Unit: *Landfill Sites*

Geographic Area Covered: *Entire state*

Source Data Categories/Map Legend: *Area served by public sewage, area not presently served by sewage, sanitary landfills, sewage treatment plants (less than and greater than 0.3 mgd), major sewage transmission lines, township, county and state boundaries.*

Reliability & Accuracy: *Relies wholly upon county comprehensive plans, master plans, and sewerage studies. Information may be outdated in some cases. Drafting transfer from the original county maps and reports is inaccurate.*

Usefulness of Data: *This factor locates those areas where fish processing plants and other industrial uses may locate.*

Comments: *This factor was mapped at a scale of 1:250,000 for this study. The legend displays the following distances to sanitary landfills: 0-5, 5-10, 10-20, 20 + miles.*

Source Citation: *N. J. Department of Environmental Protection, Bureau of Geology and Topography. 1975. Sewage, Landfill Overlay, sheets 21-37. Trenton, New Jersey.*

Rogers & Golden

Factor Information Sheet 19

Factor: PROXIMITY TO PORTS

Source Map Title: *Ports and Navigable Waterways of New Jersey*

Source Agency: *New Jersey Department of Labor and Industry, Division of Economic Development* **Phone:** *(201) 648-3518*
Person: *J.F. Brody*

Address:

Use Data Prepared For: *Resource document*

Informed Sources/Knowledgeable People:

Date Compiled: *unknown* **Date Published:** *unknown*

Data Format: *map*

Type of Data: (check one)
Qualitative _x_ Quantitative ____
Spatial _x_ Non-Spatial ____

Scale: *1"=16 miles*

Measurement Units: *Miles*

Computer Encoded? Yes ____ No _x_

Geographic Unit: *Ports*

Geographic Area Covered: *Entire state*

Source Data Categories/Map Legend:
Major ports, minor ports, and channels

Reliability & Accuracy:
This information may be outdated.

Usefulness of Data:
This factor is needed to find locations for warehousing.

Comments:
This factor was mapped at a scale of 1:250,000 for this study. The legend shows distances to ports 0-1, 1-5, 5-10, 10-15, and 15+ miles.

Source Citation:
New Jersey Department of Labor and Industry, Division of Economic Development. Date unknown. Ports and Navigable Waterways of New Jersey. Trenton, NJ.

Rogers & Golden

Factor Information Sheet 20

Factor: PROXIMITY TO AIRPORTS

Source Map Title: *New Jersey State Airport System Plan*

Source Agency: *Bureau of Aviation Planning* Phone: *(609) 292-3052*
New Jersey Department of Transportation

Person:

Address:

Use Data Prepared For: *1975 Summary Report for the New Jersey Airport System Plan, 1975-1980*

Informed Sources/Knowledgeable People:

Date Compiled: Date Published: *1975*

Data Format: *map*

Type of Data: (check one)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Scale: *1"=20 mi.*

Measurement Units: *Miles*

Computer Encoded? Yes ____ No X

Geographic Unit: *Airports by type*

Geographic Area Covered: *entire state*

Data Categories/Map Legend:

basic utility
general utility
basic transport
air carrier
proposed airports
commuter airports
military airports

Reliability & Accuracy:

Scale of map too small to allow accurate spatial location of facilities. This factor will require periodic updating as airports are expanded and new facilities built.

Usefulness of Data:

This factor locates areas where warehousing and various industries may locate and where communication structures will not locate.

Comments:

This factor was mapped at a scale of 1:250,000 for this study. The legend categories show proximities of 0-1, 1-5, 5-10, 10-15, and 15 + miles.

Source Citation:

New Jersey Department of Transportation, Bureau of Aviation Planning. 1975. Summary Report of the New Jersey State Airport System Plan, Plate III-1, Trenton, New Jersey.

Rogers & Golden

Factor Information Sheet 21

Factor: PRIME OPEN AGRICULTURAL LAND

Source Map Title: *Prime Open Agricultural Land*

Source Agency: *State Soil Conservation Committee and the USDA Soil Conservation Service* Phone: *(201) 246-1205*

Person: *Carl Eby*

Address: *Soil Conservation Service, 1370 Hamilton Street, Somerset, N.J. 08873*

Use Data Prepared For: *Regional and spatial location of prime agricultural soils*

Informed Sources/Knowledgeable People:

Date Compiled: *1971* Date Published: *1971*

Data Format: *map*

Type of Data: (check one)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Scale: *1"=4 mi.*

Measurement Units: *capability classes*

Computer Encoded? Yes ____ No X

Geographic Unit: *state*

Geographic Area Covered: *entire state*

Source Data Categories/Map Legend: *Soil of Land Capability Classes I and II, Soil of Land Capability Class III, Soil Used for Special Crops . The SCS is preparing a soils map of the state(1:250,000). Important Farmland maps are also scheduled to be prepared (1:50,000).*

Reliability & Accuracy: *Map represents generalized location of prime agricultural soils. Information accurate and reliable given the scale of the map.*

Usefulness of Data: *This factor is necessary in locating areas suitable for Field Crops, Fresh Market Vegetables, Nurseries and Orchards.*

Comments: *This factor was mapped at 1:250,000 for this study. The map legend displays the following categories: Capability Class I and II Soils, Capability Class III, and Soils for Special Crops*

Source Citation: *State Soil Conservation Committee, Division of Rural Resources of the New Jersey Department of Agriculture. 1971. Primary Agricultural Lands, Trenton, New Jersey.*

Rogers & Golden

Factor Information Sheet 22

Factor: WOODLAND SUITABILITY GROUP

Source Map Title: *County Soil Survey*

Source Agency: *Soil Conservation Service and the N.J. Agricultural Experiment Station* Phone: *(201) 246-1205*

Person: *Carl Eby*

Address: *Soil Conservation Service, 1370 Hamilton Street, Somerset, NJ 08873*

Use Data Prepared For: *resource document*

Informed Sources/Knowledgeable People:

Date Compiled: *varies* Date Published: *varies*

Data Format: *county reports, with maps*

Type of Data: (check one)
Qualitative _X_ Quantitative ___
Spatial _X_ Non-Spatial ___

Scale: *1:15,840*

Measurement Units: *soil series and phases* Computer Encoded? Yes ___ No _X_

Geographic Unit: *county*

Geographic Area Covered: *entire state*

Source Data Categories/Map Legend: *Soils mapped by series and phases. Descriptions of each soil series within the text contains a woodland suitability rating.*

Reliability & Accuracy: *Most accurate source of soils related information available. Accuracy of the mapped data varies from county to county.*

Usefulness of Data: *This factor is useful in locating suitable areas for forestry.*

Comments:

Source Citation: *U.S. Department of Agriculture, Soil Conservation Service, and the New Jersey Agricultural Experiment Station, County Soil Surveys, U.S. Government Printing Office, Washington, D.C.*

Rogers & Golden

Factor Discussion Sheet 22

Factor: WOODLAND SUITABILITY GROUP

Woodland Suitability is traditionally considered to be a factor in selecting areas suitable for forestry. However, many foresters feel the woodland suitability rankings given in soil surveys are inaccurate. This is especially true in New Jersey because those areas suitable for white cedar would appear as having the lowest ranking. When siting areas for forests it may be wise to determine the tree type before deciding on development potential factors.

Source:

Perry, John E. 1979. Regional Forester. Burlington and Ocean Counties, New Jersey Bureau of Forestry, Lonoka Harbor, New Jersey. Personal communication.

Factor Information Sheet 23

Factor: SOIL ASSOCIATIONS

Source Map Title: *County Soil Survey*

Source Agency: *Soil Conservation Service and the New Jersey Agricultural Experiment Station* Phone: *(201) 246-1205*

Person: *Carl Eby*

Address: *Soil Conservation Service, 1370 Hamilton Street, Somerset, NJ 08873*

Use Data Prepared For: *Resource document*

Informed Sources/Knowledgeable People:

Date Compiled: *varies* Date Published: *varies*

Data Format: *map, with text*

Scale: *1:126,720*

Measurement Units:

Geographic Unit: *Soil Associations*

Geographic Area Covered: *entire state*

Type of Data: (check boxes)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Computer Encoded? Yes ____ No X
If yes, what format?

Source Data Categories/Map Legend: *Soil associations by physiographic region*

Reliability & Accuracy: *Due to extremely small scale of this map, this information should be regarded as generalized and not site-specific.*

Usefulness of Data: *These data are useful in locating areas generally suitable for blueberry, cranberry, field crop and vegetable farming. A statewide map is being prepared at a scale of (1;250,000).*

Comments: *This factor has been mapped at a scale of 1:250,000 for this study. The legend shows the Atsion-Muck-Sandy alluvial soil association, which is the soil required for cranberry and blueberry farming.*

Source Citation: *U.S. Department of Agriculture Soil Conservation Service and the N.J. Agricultural Experiment Station, County Soil Surveys. U.S. Government Printing Office, Washington, D.C.*

Rogers & Golden

Factor Information Sheet 24

Factor: FLOODING

Source Map Title: *Drainage Basin Overlay*

Source Agency: *New Jersey Department of Environmental Protection, Bureau of Geology and Topography* Phone: *(609) 292-2576*

Person: *Kemble Widmer, State Geologist*

Address: *1474 Prospect Street, Trenton, NJ*

Use Data Prepared For: *State environmental overlay series*

Informed Sources/Knowledgeable People: *George J. Halasi-Kun*

Date Compiled: *1976 to Present* Date Published: *1976 to Present*

Data Format: *Map*

Scale: *1:63,360*

Measurement Units:

Type of Data: (check one)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Computer Encoded? Yes ____ No X

Geographic Unit: *Flood-prone Areas*

Geographic Area Covered: *The only drainage basin overlay sheet that has been published at this time is Sheet 25.*

Source Data Categories/Map Legend:
drainage basin boundary
river basin boundary
drainage basin name
streams and rivers
flood prone areas

Reliability & Accuracy:
This map must be updated as additional information is made available. In some areas flood plains are distinct. In other areas they are more difficult to locate.

Usefulness of Data:
This factor is used to identify flood prone areas for residential land uses.

Comments:
The one published overlay sheet was used in the mapping of this factor at a scale of 1:250,000. Other flood-prone area maps are available from the USGS (scale, 1:24,000)

Source Citation:

New Jersey Department of Environmental Protection, Bureau of Geology and Topography. 1976. Drainage Basin Overlay, Sheet 25. Trenton, NJ.

USDA Northeast TCS. 1979. Floodplain delineation using the "Combination Method". Engineering Bulletin No. N-40-9-31.

Rogers & Golden

Factor Information Sheet 25

Factor: SLOPE

Source Map Title: *Slope Maps*

Source Agency: *Office of Environmental Analysis* **Phone:** *(215) 563-4220*

Person: *Michael Hockman*

Address:

Use Data Prepared For: *Resource Document*

Informed Sources/Knowledgeable People:

Date Compiled: *1975* **Date Published:** *1975*

Data Format:

Scale: *1:24,000*

Measurement Units: *percent slope*

Geographic Unit: *slope*

Geographic Area Covered: *Entire state*

Type of Data: (check one)
Qualitative X Quantitative ___
Spatial ___ Non-Spatial X

Computer Encoded? Yes ___ No X

Source Data Categories/Map Legend:

COASTAL ZONE	OUTSIDE COASTAL ZONE
0-2%	0-2%
2-5%	2-8%
5-10%	8-15%
10-15%	15-25%
15+%	25+%

Reliability & Accuracy: *Photo-mechanical determinations were used. This technique is very accurate except in ridge and valley areas where steeper slopes may be shown.*

Usefulness of Data: *This factor is useful for locating areas having developmental potential for all uses that require the construction of buildings, and for all transportation facilities.*

Comments:

Source Citation: *Department of Environmental Protection, Office of Environmental Analysis. 1975. Slope Maps. Trenton, NJ.*

Rogers & Golden

Factor Information Sheet 26

Factor: SHALLOW FOUNDATION SUITABILITY

Source Map Title: *County Soil Surveys*

Source Agency: *Soil Conservation Service (SCS) and The New Jersey Agricultural Experiment Station* **Phone:** *(201) 246-1205*

Person: *Carl Eby*

Address: *Soil Conservation Service, 1370 Hamilton Street, Somerset, N.J. 08873*

Use Data Prepared For: *Resource Document*

Informed Sources/Knowledgeable People:

Date Compiled: *varies* **Date Published:** *varies*

Data Format: *Maps, with text*

Scale: *1:15,840*

Measurement Units: *Soil properties*

Geographic Unit: *Soil series*

Geographic Area Covered: *Entire state, each county is published separately*

Type of Data: (check one)
Qualitative X Quantitative ___
Spatial X Non-Spatial ___

Computer Encoded? Yes ___ No X

Source Data Categories/Map Legend:
Slight
Moderate
Severe

Reliability & Accuracy:

Usefulness of Data:

For houses of three stories with or without a basement and small industrial, commercial and institutional buildings

Comments:

This data should be considered on site. The SCS is currently developing a statewide soils map useful for general planning purposes (scale 1:250,000)

Source Citation:

U.S. Department of Agriculture, Soil Conservation Service and the New Jersey Agricultural Experiment Station. County Soil Surveys. U.S. Government Printing Office. Washington, D.C.

Rogers & Golden

Factor Information Sheet 27

Factor: SOIL LOAD BEARING CAPACITY

Source Map Title: *Not mapped.*

Source Agency: *Dames and Moore* **Phone:** *(201) 272-8300*

Person: *Jim Cool*

Address: *6 Commerce Drive, Cranford, NJ*

Use Data Prepared For: *New Jersey Development Potential Study*

Informed Sources/Knowledgeable People: *Phil Hopkins*

Date Compiled: **Date Published:**

Data Format:

Scale:

Measurement Units:

Geographic Unit:

Geographic Area Covered: *Entire state*

Type of Data: (check one)
Qualitative *x* Quantitative ____
Spatial ____ Non-Spatial *x*

Computer Encoded? Yes ____ No *x*

Source Data Categories/Map Legend:

Reliability & Accuracy:
Soil load bearing capacity is useful for roads, small buildings and other light uses. It is not useful for multi-story buildings or heavy commercial or industrial uses.

Usefulness of Data:
This factor is a consideration in locating areas having development potential for highrise structures such as hotels, apartment buildings, and communication structures, and for railroads and highways.

Comments:
See Factor Discussion Sheet.

Rogers & Golden

Factor Discussion Sheet 27

Factor: SOIL LOAD BEARING CAPACITY

Bearing capacity of the soil is a critical factor in determining a given site's capability to support built structures. It is therefore imperative to consider soil load bearing capacity for those land uses which involve construction of buildings and for highways.

Existing sources of information consist of the U.S. Department of Agriculture's County Soil Surveys and the Engineering Soil Surveys for New Jersey published by Rutgers University. Specifically, Table 6 of the Soil Surveys list the AASHTO (American Association of State Highway and Transportation Officials) classifications for each soil series.

Recommended Mapping Procedure:

1. *Locate the AASHTO classifications for the soil series in the appropriate county soil survey or in the Engineering Soil Survey.*
2. *Categorize each soil series' AASHTO classification as high, medium or low bearing capacity (example: A-1 through A-3 as high capacity; A-4 through A-5 as medium capacity; A-6 through A-7 as low capacity).*
3. *Locate and map the soil series by category.*

Sources:

U.S. Department of Agriculture, Soil Conservation Service. County Soil Surveys. Washington, D.C.: U.S. Government Printing Office.

Rutgers University. 1954. Engineering Soil Surveys for New Jersey. Rutgers University, New Brunswick, NJ.

(This publication has both maps (scale 1:63,360) and text on soils for engineering use. Unfortunately the accuracy of this data is very suspect. It does however, cover the entire state. It is not recommended for use here.)

Factor Information Sheet 28

Factor: DEEP FOUNDATION SUITABILITY

Source Map Title:

Source Agency: *Dames and Moore* **Phone:** *(201) 272-8300*

Person: *Jim Cool*

Address: *6 Commerce Drive, Cranford, New Jersey*

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: **Date Published:**

Data Format: **Type of Data: (check one)**
Qualitative ____ **Quantitative** ____
Scale: **Spatial** ____ **Non-Spatial** ____

Measurement Units: **Computer Encoded? Yes** ____ **No** ____

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data:

This factor is a consideration in locating larger structures such as industrial building, hotels and motels.

Comments:

The Soil Conservation Service is preparing a soil map for the entire state that will be useful for general planning purposes.

Source Citation:

Rogers & Golden

Factor Discussion Sheet 28

Factor: DEEP FOUNDATION SUITABILITY

Deep foundation suitability applies to major industrial uses and structures which will be over 3 to 4 stories tall. The soil survey data is reliable only down to 60 inches. Therefore, deep foundation suitability is not directly mapped.

Recommended Mapping Procedure:

1. *Using the State Geologic Map and the underlying formations noted in the Engineering Soils Survey of New Jersey determine:*

   a - depth to bedrock
   b - parent material

2. *Interpret (Qualified Soils Engineer Required) and indicate initial, planning assessment of foundation suitability. Well core data, if available, is also needed. It should be emphasized that on-site investigations are the only accurate way to assess deep foundation suitability.*

Factor Information Sheet 29

Factor: AVAILABILITY OF MINERAL RESOURCES

Source Map Title: *State Atlas Sheet (in progress)*

Source Agency: *Bureau of Geology and Topography* **Phone:**

Person:

Address:

Use Data Prepared For: *General*

Informed Sources/Knowledgeable People: *Kimble Widmer*

Date Compiled: *in progress* **Date Published:**

Data Format: *Map*

Scale: *1:63,360*

Measurement Units: *importance of mineral deposit*

Geographic Unit: *Formation*

Geographic Area Covered: *Entire state*

Type of Data: (check one)
Qualitative ____ **Quantitative** ____
Spatial ____ **Non-Spatial** ____

Computer Encoded? **Yes** ____ **No** ____

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data:

Extraction industry location

Comments:

Source Citation:

Rogers & Golden

Factor Discussion Sheet 29

Factor: AVAILABILITY OF MINERAL RESOURCES

The location of mineral resources is requisite for understanding the potential location of extraction industry. State Atlas Sheets are being prepared which will show the location of major mineral resources.

Recommended Mapping Procedure:

1. *Using the State geology maps locate major mineral bearing formations. (Sand is not mapped in the coastal zone because it is so prevalent).*
2. *The Mineral Yearbook published by the Bureau of Mines, Department of Interior, gives verbal location descriptions of major mineral resources which are currently being worked.*
3. *Combining these two sources of information would produce a map showing locations of commercially viable mineral operations (mines, gravel pits, etc.).*
4. *Expand knowledge of important mineral deposits through interviews with informed sources.*

Widmer, K. 1979. State Geologist. (personal communication).

Factor Information Sheet 30

Factor: THICKNESS OF OVERBURDEN

Source Map Title: *County Geology and Groundwater Resource Circulars*

Source Agency: *Dames & Moore* **Phone:** *(201) 272-8300*

Person: *Jim Cool*

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: **Date Published:**

Data Format:

Scale:

Measurement Units:

Geographic Unit:

Geographic Area Covered:

Type of Data: (check one)
Qualitative X Quantitative ___
Spatial X Non-Spatial X

Computer Encoded? Yes ___ No X

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data:

This factor is useful for locating the volume of economic deposits for extraction industry.

Comments:

Source Citation:

Rogers & Golden

Factor Discussion Sheet 30

Factor: THICKNESS OF OVERBURDEN

Overburden is a very inexact term; it could mean anything from the total amount of soil and unconsolidated materials over bedrock to amount of soil lying over a level of gravel desired to be mined. It is, however, a concept used in the extraction industry.

Recommended Mapping Procedure:

1. *Use Geology and Groundwater Resources circular for each county to determine:*
   - *a - generalized surface geology*
   - *b - depth contours for bedrock*
   - *c - configuration (including thickness) of major formations*
   - *d - type of deposit by formation*

2. *By combining the descriptions of these major formations with the surface map of major geologic formations, an estimate of the thickness of overburden can be determined .*

Factor Information Sheet 31

Factor: SOILS SUITABLE FOR ON-SITE DISPOSAL SYSTEMS

Source Map Title: *not mapped*

Source Agency: Phone:

Person:

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: Date Published:

Data Format: Type of Data: (check one)
Qualitative ____ Quantitative ____
Scale: Spatial ____ Non-Spatial ____

Measurement Units: Computer Encoded? Yes ____ No ____

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *This factor is used to locate areas suitable for housing and campgrounds in those areas not served by public sewerage.*

Comments: *See comments on Factor Discussion Sheet.*

Source Citation:

Rogers & Golden

Factor Discussion Sheet 31

Factor: SOILS SUITABLE FOR ON-SITE DISPOSAL SYSTEMS

Soil absorption of septic tank effluent has been the usual process by which domestic liquid waste is disposed in areas beyond the reach of municipal sewerage facilities. Although the U.S. Department of Agriculture's County Soil Surveys do list soils suitable for septic systems, this information is not very accurate. Soil percolation tests should be conducted whenever a septic system is being considered.

Recently a number of alternatives to septic systems and municipal sewerage facilities have been developed. Most noted of these are package treatments and lagoons, however a number of other innovative systems exist. At the present time there is no source of mappable data that will identify soil suitabilities for all of the available systems.

Sources:

Bauma, J. et al. 1972. Soil Absorption of Septic Tank Effluent. Madison, WI: University of Wisconsin.

Leckie, J. et al. 1975. Other Homes and Garbage. San Francisco: Sierra Club Books.

U.S. Department of Agriculture, Soil Conservation Service. County Soil Surveys. Washington, DC: U.S. Government Printing Office.

J. Tourbier and R. W. Pierson, Jr., eds., Biological Control of Water Pollution, Philadelphia: University of Pennsylvania Press, 1976.

Factor Information Sheet 32

Factor: SURFACE WATER AVAILABILITY

Source Map Title: *Not mapped*

Source Agency: *Dames and Moore* Phone: *(201) 272-8300*

Person: *Jim Cool*

Address: *6 Commerce Drive, Cranford, NJ*

Use Data Prepared For: *New Jersey Development Potential Study*

Informed Sources/Knowledgeable People: *Phil Hopkins*

Date Compiled: Date Published:

Data Format:

Type of Data: (check one)
Qualitative x Quantitative ___
Spatial ___ Non-Spatial x

Scale:

Measurement Units:

Computer Encoded? Yes ___ No x

Geographic Unit:

Geographic Area Covered: *Entire state*

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data:

This factor is a consideration in locating areas having development potential for most harvest uses, and for golf courses.

Comments:

See comments on Factor Discussion Sheet.

Factor Discussion Sheet 32

Factor: SURFACE WATER AVAILABILITY

Land uses requiring surface water availability considerations generally are those which require irrigation, processing water, or municipal water supply. Among these uses are Fresh Market Vegetables, Nurseries, Orchards, Cranberries, Golf Courses, and Standard Industrial Classifications.

To determine minimum safe yields and storage capacity for potential surface water supplies, historical data and estimates should be obtained from public and private local water supply companies. Daily flow, seasonal fluctuations in flow and drainage basin areas of streams may be determined by consulting the appropriate U.S. Geological Survey stream gauging station data.

Recommended Mapping Procedure:

1. *Map water bodies according to storage and safe yields.*
2. *Estimate allowable pumping or use of surface water resources in mgd (million gallons per day) based on local demand and per capita use rates (including potential industrial and commercial users). Locate these rates on the map.*

Sources:

N.J. Department of Geology. Map of New Jersey's Surface Waters (1:250,000). Trenton, NJ.

U.S. Geological Survey. Stream Gauging Station Data. Reston, VA.

Factor Information Sheet 33

Factor: GROUNDWATER AVAILABILITY

Source Map Title: *Not mapped*

Source Agency: *Dames & Moore* Phone: *(201) 272-8300*

Person: *Jim Cool*

Address: *6 Commerce Drive, Cranford, New Jersey*

Use Data Prepared For: *New Jersey Development Potential Study*

Informed Sources/Knowledgeable People: *Phil Hopkins*

Date Compiled: Date Published:

Data Format:

Scale:

Measurement Units:

Type of Data: (check one)
Qualitative X Quantitative ____
Spatial ____ Non-Spatial X

Computer Encoded? Yes ____ No X

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *This factor is useful for locating areas having development potential for most harvest uses, and for golf courses.*

Comments: *See comments on Factor Discussion Sheet.*

Source Citation:

Rogers & Golden

Factor Discussion Sheet 33

Factor: GROUNDWATER AVAILABILITY

Groundwater availability is an alernative to surface water availability in the siting of many harvest uses. Existing documentation of groundwater resources are special reports issued jointly by the United States Geological Survey and the New Jersey Department of Environmental Protection (Division of Water Resources). These reports list the location of aquifers and existing yields (safe sustained yields sometimes included) for wells drawing from various aquifers. The yield of the aquifer is usually given in gallons per minute per foot of drawdown. In determining groundwater availability the maps and well log data are compiled and the units are converted from gallons per minute (gpm) to gallons per day (mgd).

Recommended Mapping Procedure:

1. *Use geologic maps and groundwater resource publications to map the location of known aquifers which are likely to be used.*
2. *Use well logs to identify existing yields in mgd/aquifer.*
3. *Supplement these data with estimates of yields contained in the geology and groundwater resources publications.*
4. *Map estimated yields of known aquifers.*

Factor Information Sheet 34

Factor: ACCESS TO PUBLIC SEWERAGE

Source Map Title: *Sewage, Landfill Overlay*

Source Agency: *N.J. Department of Enviromental Protection, Bureau of Geology and Topography* Phone: *(609) 292-2576*
Person: *Kemble Widmer, State Geologist*

Address: *1474 Prospect Street, Trenton, NJ*

Use Data Prepared For: *State environmental overlay series*

Informed Sources/Knowledgeable People:

Date Compiled: *1975* Date Published: *1975*

Data Format: *Map*

Scale: *1:63,360*

Measurement Units: -

Geographic Unit: *State*

Geographic Area Covered: *Entire State*

Type of Data: (check boxes)
Qualitative X Quantitative ___
Spatial X Non-Spatial ___

Computer Encoded? Yes ___ No X
If yes, what format?

Source Data Categories/Map Legend: *Area served by public sewerage, area not presently served by public sewage service, sanitary landfills, sewage treatment plants (<.3 mgd, ≥. 3 mgd capacity), major sewage transmission lines, township boundaries, county boundaries, states boundaries.*

Reliability & Accuracy:
Relies wholly upon county comprehensive plans and master plans. Information may be outdated in some cases. Drafting transfer from the original country maps and reports is inaccurate.

Usefulness of Data:
This factor locates those areas where various housing types and assorted industries may locate.

Comments:
This factor was mapped at a scale of 1:250,000 for this study. The legend displays the following distances to public sewerage: 0-½, ½-1½, 1½-3, 3+ miles.

Source Citation:
N.J. Department of Environmental Protection Bureau of Geology and Topography, 1975, Sewage Landfill Overlay, sheets 21 through 37, Trenton, NJ

Rogers & Golden

Factor Information Sheet 35

Factor: ACCESS TO PUBLIC WATER SUPPLY

Source Map Title: *Water Supply Overlay*

Source Agency: *N.J. Department of Environmental Protection, Bureau of Geology and Topography* Phone: *(609) 292-2576*
Person: *Kemble Widmer, state geologist*

Address: *1474 Prospect Street, Trenton, N.J.*

Use Data Prepared For: *State environmental overlay series*

Informed Sources/Knowledgeable People:

Date Compiled: *1975* Date Published: *1975*

Data Format: *map*

Scale: *1:63,360*

Measurement Units:

Geographic Unit: *state*

Geographic Area Covered: *entire state*

Type of Data: (check boxes)
Qualitative X Quantitative ___
Spatial X Non-Spatial ___

Computer Encoded? Yes ___ No X
If yes, what format?

Source Data Categories/Map Legend: *area served by private water service companies, area served by regionally owned water service companies, area served by municipally owned water service companies, area not served by water service, public supply wells, surface water intake, major water basins, township, county, and state boundaries.*

Reliability & Accuracy: *Data may be outdated in some areas.*

Usefulness of Data: *This factor is needed in the location of various housing types as well as many industrial and recreational land uses.*

Comments: *This factor was mapped at a scale of 1:250,000 for this study. The legends show the following distances to public water supply: 0-½, ½-1½, 1½-3, and 3+ miles.*

Source Citation: *New Jersey Department of Environmental Protection, Bureau of Geology and Topography. 1975. Water Supply Overlay, Sheets 21-37. Trenton, New Jersey.*

Rogers & Golden

Factor Information Sheet 36

Factor: POTABLE WATER SUPPLY

Source Map Title: *not mapped*

Source Agency: *NJ Department of Environmental Protection, Bureau of Geology* **Phone:** *(609) 292-2576*

Person: *Kemble Widmer, State Geologist*

Address: *1414 Prospect Street, Trenton, NJ*

Use Data Prepared For: *Resource Documents*

Informed Sources/Knowledgeable People: *Carol Lucy/Steve Johnson*

Date Compiled: *varies 1960-1970* **Date Published:** *varies 1960-1970*

Data Format: *data is on file*

Type of Data: (check one)
Qualitative ____ Quantitative X
Spatial X Non-Spatial ____

Scale:

Measurement Units:

Computer Encoded? Yes ____ No X

Geographic Unit:

Geographic Area Covered: *entire state*

Source Data Categories/Map Legend:

Reliability & Accuracy: *generally reliable*

Usefulness of Data: *This factor is used to locate areas suitable for housing and camp grounds in those regions not served by public sewerage.*

Comments: *See comments on Factor Discussion Sheet.*

Source Citation: *Well Files Bureau of Geology. Department of Environmental Protection. Trenton, NJ.*

Rogers & Golden

Factor Discussion Sheet 36

Factor: POTABLE WATER SUPPLY

The Bureau of Geology has considerable data on Potable Water Supply. There are summaries of ground water conditions for most counties that have been prepared by U.S.G.S., in addition to the well files maintained by the Bureau. The well files are updated constantly.

Source: *Johnson, Steve. 1979. Bureau of Geology. Department of Environmental Protection. Trenton, NJ. Personal Communication.*

Factor Information Sheet 37

Factor: DEPTH TO WATER TABLE

Source Map Title: *County Soil Surveys*

Source Agency: *Soil Conservation Service* **Phone:** *(201) 246-1205*

Person: *Carl Eby*

Address: *Soil ConservationService, 1370 Hamilton Street, Somerset, N.J. 08873*

Use Data Prepared For: *Resource Document*

Informed Sources/Knowledgeable People:

Date Compiled: *varies* **Date Published:** *varies*

Data Format: *Map, with text*

Scale: *1:15,840*

Measurement Units:

Type of Data: (check one)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Computer Encoded? Yes ____ No X

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:
Feet below soil surface

Reliability & Accuracy:

Usefulness of Data:
This factor is useful in any facility which has potential groundwater contamination problems, or where dewatering is necessary

Comments:

Source Citation:
U.S. Department of Agriculture, Soil Conservation Service and the New Jersey Agricultural Experiment Station. County Soil Surveys. U.S. Government Printing Office. Washington, D.C.

Rogers & Golden

Factor Information Sheet 38

Factor: MAJOR ECOSYSTEMS

Source Map Title: *Land Type Areas of New Jersey*

Source Agency: *New Jersey Agricultural Experiment station and the Soil Conservation Service.* **Phone:**

Person: *G. A. Quakenbush and J.C.F. Tedrow*

Address:

Use Data Prepared For: *Reference document*

Informed Sources/Knowledgeable People:

Date Compiled: *1954* **Date Published:** *1954*

Data Format: *map*

Scale: *1 inch = 8 miles*

Measurement Units:

Type of Data: (check one)
Qualitative x Quantitative ____
Spatial x Non-Spatial ____

Computer Encoded? Yes ____ No x

Geographic Unit: *physiographic/geologic provinces*

Geographic Area Covered: *Entire state*

Source Data Categories/Map Legend:
Younger glacial material regions, older glacial material region, inner coastal plain, outer coastal plain, miscellaneous.

Reliability & Accuracy: *This map should be updated.*

Usefulness of Data: *This factor is useful in locating areas suitable for natural areas and rivers.*

Comments: *This factor was maped at 1:250,000 for this study.*

Source Citation: *U. S. Department of Agriculture, Soil Conservation Service and New Jersey Agricultural Experiment Station, 1954. Land type areas of New Jersey, Washington, D.C: U.S. Government Planning Office.*

Rogers & Golden

Factor Information Sheet 39

Factor: FREE-FLOWING CHARACTERISTICS

Source Title: *Amount of Corridor in Natural Condition*

Source Agency: *Heritage Conservation and Recreation Service* **Phone:** *(215) 597-7385*
Person: *Glenn Eugster*

Address: *Federal Building, 600 Arch Street, Room 9310, Philadelphia, PA 19106*

Use Data Prepared For: *Wild and Scenic River System*

Informed Sources/Knowledgeable People:

Date Compiled: *1977-1978* **Date Published:**

Data Format: *Data Sheets*

Type of Data: (check one)
Qualitative ___ Quantitative X
Spatial X Non-Spatial ___

Scale:

Measurement Units:

Computer Encoded? Yes ___ No X

Geographic Unit:

Geographic Area Covered: *New Jersey river corridors*

Source Data Categories/Map Legend: *Miles with 100% of corridor in natural condition, Miles with 75% of corridor in natural condition, Miles with 50% of corridor in natural condition, Miles with 25% of corridor in natural condition.*

Reliability & Accuracy: *This data is reliable and accurate.*

Usefulness of Data: *This factor is used to locate Natural Areas and Rivers.*

Comments: *See notes on Factor Discussion Sheet.*

Factor Discussion Sheet 39

Factor: FREE-FLOWING CHARACTERISTICS

The Free-Flowing Characteristics of a river may be an important factor in evaluating a river for The National Wild and Scenic Rivers System Study (P.L. 95-625) or in New Jersey's decision to preserve a section of a river corridor as a Natural Area. The Studies Division of the Northeast Regional Office of the Heritage Conservation and Recreation Service has prepared data sheets for rivers within the state. These data sheets note the percentage of river corridor in natural condition.

Sources:

Eugster, Glenn. 1979. Studies Division, Heritage Conservation and Recreation Service. U.S. Department of the Interior. Philadelphia, Personal communication.

McKenzie, Ricki. 1979. State Planning Division, Heritage Conservation and Recreation Service. U.S. Department of the Interior. Philadelphia. Personal communication.

Boated, Ken. 1979. Green Acres, New Jersey Department of Environmental Protection. Trenton. Personal communication.

Factor Information Sheet 40

Factor: HABITATS OF RARE AND VANISHING SPECIES

Source Title *Rare and Endangered Species*

Source Agency *Heritage Conservation and Recreation Service* **Phone:** *(215) 597-7385*

Person: *Glenn Eugster*

Address: *Federal Building, 600 Arch Street, Room 9310*
Philadelphia, PA 19106

Use Data Prepared For: *Wild and Scenic River System*

Informed Sources/Knowledgeable People:

Date Compiled: *1977-1978* **Date Published:**

Data Format: *Data sheets*

Type of Data: (check one)
Qualitative ____ Quantitative X
Spatial X Non-Spatial ____

Scale:

Measurement Units:

Computer Encoded? Yes ____ No X

Geographic Unit:

Geographic Area Covered: *New Jersey river corridor*

Source Data Categories/Map Legend:

Presence of rare and endangered species
Absence of rare and endangered species

Reliability & Accuracy:

This data is incomplete.

Usefulness of Data:

This factor is used to locate Natural Areas and Rivers

Comments:

See notes on following page.

Rogers & Golden

Factor Discussion Sheet 40

Factor: HABITATS OF RARE AND VANISHING SPECIES

The existence of rare or endangered species may be an important factor in evaluating a river for The National Wild and Scenic Rivers System Study (P.L. 95-625) or in New Jersey's decision to preserve a parcel of land as an Natural Area. The Studies Division of the Northeast Regional Office of the Heritage Conservation and Recreation Service has prepared data sheets for many rivers within the state. These data sheets note the presence or absence of rare and endangered species within one mile segments of each river corridor.

Sources:

Eugster, Glenn. 1979. Studies Division, Heritage Conservation and Recreation Service. U.S. Department of the Interior. Philadelphia. Personal communication.

McKenzie, Ricki. 1979. State Planning Division, Heritage Conservation and Recreation Service. U.S. Department of the Interior Philadelphia. Personal communication.

Bosted, Ken. 1979. Green Acres, New Jersey Department of Environmental Protection. Trenton. Personal communication.

Factor Information Sheet 41

Factor: RIVER ACCESSIBILITY

Source Title: *Kinds of Access*

Source Agency: *Heritage Conservation and Recreation Service* Phone: *(215) 597-7385*

Person: *Glenn Eugster*

Address: *Federal Building, 600 Arch Street, Room 9310*
Philadelphia, PA 19106

Use Data Prepared For: *Wild and Scenic River System*

Informed Sources/Knowledgeable People:

Date Compiled: *1977-1978* Date Published:

Data Format: *Data sheets*

Type of Data: (check one)
Qualitative ____ Quantitative *X*

Scale:

Spatial *X* Non-Spatial ____

Measurement Units:

Computer Encoded? Yes ____ No *X*

Geographic Unit:

Geographic Area Covered: *New Jersey river corridors*

Source Data Categories/Map Legend: *Miles with public road in corridor, Miles with public road within ½ mile of corridor, Number of bridge crossings, Number of road endings in corridor, Number of railroad crossings, other*

Reliability & Accuracy:
Very reliable and accurate

Usefulness of Data:
This factor is used to locate Natural Areas and Rivers.

Comments:
See notes on following page.

Factor Discussion Sheet 41

Factor: RIVER ACCESSIBILITY

Type of access to a river is an important factor in evaluating a river for The National Wild and Scenic Rivers System Study (P.L. 95-625). The Studies Division of the Northeast Regional Office of the Heritage Conservation and Recreation Service has prepared data sheets for many rivers within New Jersey. These sheets note the type and frequency of access within one mile segments of each river corridor.

Sources:

Eugster, Glenn. 1979. Studies Division. Heritage Conservation and Recreation Service. U.S. Department of the Interior. Philadelphia, Personal communication.

McKenzie, Ricki. 1979. State Planning Division. Heritage Conservation and Recreation Service. U.S. Department of the Interior. Philadelphia. Personal communication.

Bosted, Ken. 1979. Green Acres, New Jersey Department of Environmental Protection. Trenton. Personal communication.

Factor Information Sheet 42

Factor: SHORELINES OF RIVERS

Source Title: *Characteristics of Shoreline Conditions*

Source Agency: *Heritage Conservation and Recreation Service* **Phone:** *(215) 597-7385*
Person: *Glenn Eugster*

Address: *Federal Building, 600 Arch Street, Room 9310*
Philadelphia, PA 19106
Use Data Prepared For: *Wild and Scenic River System*

Informed Sources/Knowledgeable People:

Date Compiled: *1977-1978* **Date Published:**

Data Format: *Data sheets*
Scale:

Type of Data: (check one)
Qualitative ___ Quantitative _X_
Spatial _X_ Non-Spatial ___

Measurement Units:

Computer Encoded? Yes ___ No _X_

Geographic Unit:

Geographic Area Covered: *New Jersey river corridors*

Source Data Categories/Map Legend: *Miles with continuous natural corridor, Miles ½ mile or more from public road, Miles with 50% or more forest land, Miles with significant topographic diversity*

Reliability & Accuracy:
This data is reliable and accurate.

Usefulness of Data:
This factor is used to locate Natural Areas and Rivers.

Comments:
See notes on following page.

Rogers & Golden

Factor Discussion Sheet 42

Factor: SHORELINES OF RIVERS

The type, or types, of shoreline of a river may be an important factor in evaluating a river for The National Wild and Scenic Rivers System Study (P.L. 95-625) or in New Jersey's decision to preserve a section of a river corridor as a Natural Area. The Studies Division of the Northeast Regional Office of the Heritage Conservation and Recreation Service has prepared data sheets for many rivers within the state. These data sheets note the number of miles of shoreline with a continuous natural corridor, the number of miles of shoreline more than a ½ mile from a public road, the number of miles of shoreline with 50 percent or more forest land, and the number of miles of shoreline with significant topographic diversity.

Sources:

Eugster, Glenn. 1979. Studies Division, Heritage Conservation and Recreation Service, U.S. Department of the Interior. Philadelphia. Personal communication.

McKenzie, Ricki. 1979. State Planning Division. Heritage Conservation and Recreation Service, U.S. Department of the Interior. Philadelphia, Personal communication.

Bosted, Ken. 1979. Green Acres, New Jersey Department of Environmental Protection. Trenton. Personal communication.

Factor Information Sheet 43

Factor: BIOTIC TYPES

Source Title: *Vegetation - Diversity of Plant Communities*

Source Agency: *Heritage Conservation and Recreation Service* **Phone:** *(215) 597-7385*

Person: *Glenn Eugster*

Address: *Federal Building, 600 Arch Street, Room 9310 Philadelphia, PA 19106*

Use Data Prepared For: *Wild and Scenic River System*

Informed Sources/Knowledgeable People:

Date Compiled: *1977-1978* **Date Published:**

Data Format: *Data sheets*

Type of Data: (check one)
Qualitative ___ Quantitative _X_
Spatial _X_ Non-Spatial ___

Scale:

Measurement Units:

Computer Encoded? Yes ___ No _X_

Geographic Unit:

Geographic Area Covered: *New Jersey river corridors*

Source Data Categories/Map Legend:
High diversity
Moderate diversity
Low diversity

Reliability & Accuracy:
This factor is reliable and accurate.

Usefulness of Data:
This factor is used to locate Natural Areas and Rivers.

Comments:
See notes on following page.

Factor Discussion Sheet 43

Factor: BIOTIC TYPES

The existence of common biotic types and/or atypical biotic types may be an important factor in evaluating a river for The National Wild and Scenic Rivers Systems Study (P.L. 95-625) or in New Jersey's decision to preserve a parcel of land as a Natural Area. The best way to judge biotic types is by on-site inspection, there is no up to date source of information that covers the entire coastal zone. The most current data for river corridors in New Jersey has been assembled by the Studies Division of the Northeast Regional Office of the Heritage Conservation and Recreation Service. One topic covered on their data sheets, Vegetation - Diversity of Plant Communities, notes high diversity, moderate diversity, or low diversity.

Sources:

Eugster, Glenn. 1979. Studies Division, Heritage Conservation and Recreation Service. U.S. Department of the Interior. Philadelphia. Personal communication.

McKenzie, Ricki. 1979. State Planning Division, Heritage Conservation and Recreation Service. U.S. Department of the Interior. Philadelphia, Personal communication.

Bosted, Ken. 1979. Green Acres, New Jersey Department of Environmental Protection. Trenton. Personal communication.

Factor Information Sheet 44

Factor: GEOLOGIC TYPES

Source Title: *Prominent Natural Features Characteristic of the Physiographic Region*
Source Agency: *Heritage Conservation and Recreation Service* **Phone:** *(215) 597-7385*
Person: *Glenn Eugster*

Address: *Federal Building, 600 Arch Street, Room 9310 Philadelphia, PA 19106*
Use Data Prepared For: *Wild and Scenic River System*

Informed Sources/Knowledgeable People:

Date Compiled: *1977-1978* **Date Published:**

Data Format: *Data sheets*

Type of Data: (check one)
Qualitative ____ Quantitative X
Spatial X Non-Spatial ____

Scale:

Measurement Units:

Computer Encoded? Yes ____ No X

Geographic Unit:

Geographic Area Covered: *New Jersey river corridors*

Source Data Categories/Map Legend:
Many examples *Few examples*
Some examples *No examples*

Reliability & Accuracy:
Very reliable and accurate

Usefulness of Data:
This factor is used to locate Natural Areas and Rivers.

Comments:
See notes on following page.

Rogers & Golden

Factor Discussion Sheet 44

Factor: GEOLOGIC TYPES

The existence of common geologic types or atypical geologic types or both may be an important factor in evaluating a river for The National Wild and Scenic Rivers System Study (P.L. 95-625). The Studies Division of the Northeast Regional Office of the Heritage Conservation and Recreation Service has prepared data sheets for many rivers within New Jersey. One topic covered by these data sheets, Prominent Natural Features Characteristic of the Physiographic Region, notes the existence of many examples, some examples, few examples, or no examples, within one mile segments of each river corridor.

There is an alternative to the use of data collected by the Heritage Conservation and Recreation Service. The Geologic Overlays, prepared for the New Jersey State Atlas Series by the Bureau of Geology and Topography of the Department of Environmental Protection, could be used in making assessments of geologic types within the coastal zone.

Sources:

Eugster, Glenn. 1979. Studies Division. Heritage Conservation and Recreation Service. U.S. Department of the Interior. Philadelphia. Personal communication.

McKenzie, Ricki. 1979. State Planning Division. Heritage Conservation and Recreation Service. U.S. Department of the Interior. Philadelphia. Personal communication.

Bosted, Ken. 1979. Green Acres, New Jersey Department of Environmental Protection. Trenton. Personal communication.

Widmer, Kemble. 1979. Bureau of Geology and Topography, New Jersey Department of Environmental Protection. Trenton. Personal communication.

Factor Information Sheet 45

Factor: PROXIMITY TO OCEAN BEACH FRONTAGE

Source Map Title: *Water Body Types*

Source Agency: *NJ Department of Environmental Protection, Office of Coastal Zone Management* Phone: *(609) 292-9765*

Person: *Michael Hochman*

Address: *New Jersey Department of Environmental Protection, Office of Coastal Zone Management, P.O. Box 1889, Trenton, NJ 08625*

Use Data Prepared For:

Informed Sources/Knowledgeable People: *Stewart McKenzie*

Date Compiled: *1975* Date Published: *1977*

Data Format: *Map*

Type of Data: (check one)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Scale: *1 inch equals 15 miles*

Measurement Units: *Water body types*

Computer Encoded? Yes ____ No X

Geographic Unit: *Water body*

Geographic Area Covered: *Entire state*

Source Data Categories/Map Legend:
-open bay
-semi-enclosed and back bay
-inland basins
-man-made harbor
-inlets

Reliability & Accuracy: *This data is reliable and accurate.*

Usefulness of Data: *This factor is desired by most housing and recreation types.*

Comments: *This factor was mapped for this study at a scale of 1:250,000. The map shows distances from the ocean of: adjacent, 0-½, ½-5, 5-15 and 15+ miles.*

Source Citation: *Office of Coastal Zone Management. 1977. A Coastal Management Strategy for New Jersey. New Jersey Department of Environmental Protection.*

Rogers & Golden

Factor Information Sheet 46

Factor: PROXIMITY TO RIVER AND BAY SHORE FRONTAGE

Source Map Title: *Water Body Types*

Source Agency: *Office of Coastal Zone Management* Phone: *(609) 292-9765*

Person: *Michael Hochman*

Address: *New Jersey Department of Environmental Protection, Office of Coastal Zone Management, P.O. Box 1889, Trenton, NJ 08625*

Use Data Prepared For:

Informed Sources/Knowledgeable People: *Stewart McKenzie*

Date Compiled: *1975* Date Published: *1977*

Data Format: *map*

Type of Data: (check one)
Qualitative x Quantitative ____
Spatial x Non-Spatial ____

Scale: *1"=15 miles*

Measurement Units: *water body types*

Computer Encoded? Yes ____ No x

Geographic Unit:

Geographic Area Covered: *Entire state*

Source Data Categories/Map Legend:
open bay
semi-enclosed and back bay
inland basins
man made harbor
large river
inlets

Reliability & Accuracy:
This data is reliable and accurate.

Usefulness of Data:
This factor is required by most housing and recreational types.

Comments:
This factor was mapped for this study at a scale of 1:250,000. The map also shows distances from rivers and bays at 0-1/2, 1/2-1, and 1+ mile distances.

Source Citation:
Office of Coastal Zone Management. 1977. A Coastal Management Strategy of New Jersey. New Jersey Department of Environmental Protection. Trenton, NJ.

Rogers & Golden

Factor Information Sheet 47

Factor: MINIMUM NEED FOR BRIDGES AND TUNNELS

Source Map Title: *Not mappable*

Source Agency: Phone:

Person:

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: Date Published:

Data Format:

Scale:

Type of Data: (check one)
Qualitative ____ Quantitative ____
Spatial ____ Non-Spatial ____

Measurement Units:

Computer Encoded? Yes ____ No ____

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *This factor is of consideration when siting roads and railroads.*

Comments: *See Factor Discussion Sheet.*

Rogers & Golden

Factor Discussion Sheet 47

Factor: MINIMUM NEED FOR BRIDGES AND TUNNELS

In planning alignments for transportation facilities, such as highways and railroads, it is important to bear in mind that the cost per linear foot for either tunnel construction or bridge construction can be several times more expensive than construction on grade. Thus, in connecting two points with either a highway or a railroad, it may be less expensive to construct a long facility that avoids the need for a bridge or tunnel, rather than to construct the shortest alignment with a bridge or tunnel. The process of trading off the cost of increased linear distance against the cost of tunnel or bridge construction is a complex one, and cannot be done without knowledge of the starting and end points of the proposed facility. Since these points are not known, this factor cannot be mapped.

Source: *Paquette, Radnor J., et al. 1972. Transportation Engineering: Planning and Design. New York: Ronald Press.*

Factor Information Sheet 48

Facto EMBAYMENTS

Source Map Title: *Water Body Types*

Source Agency: *Office of Coastal Zone Management* Phone: *609-292-2765*

Person: *Michael Hochman*

Address: *New Jersey Dept. of Environmental Protection, Office of Coastal Zone Management, P.O. Box 1889, Trenton, New Jersey 08625*

Use Data Prepared For:

Informed Sources/Knowledgeable People: *Stewart McKenzie*

Date Compiled: *1976* Date Published: *1977*

Data Format: *Map*

Scale: *1 inch equals 16 miles*

Measurement Units: *Water body type*

Geographic Unit: *Water body*

Geographic Area Covered: *Entire State*

Type of Data: (check boxes)
Qualitative X Quantitative ___
Spatial X Non-Spatial ___

Computer Encoded? Yes ___ No X
If yes, what format?

Data Categories/Map Legend:
-*open bay*
-*semi-enclosed and back bay*
-*inland basins*
-*man-made harbor*
-*large river*
-*inlets*

Reliability & Accuracy:
reliable and accurate

Usefulness of Data:
This factor locates areas where marinas may locate which have relatively few probleme with water movement. This factor is required for marine locations.

Comments:
This factor was mapped at a scale of 1:250,000 for this study. The legend category shows embayments.

Source Citation:
Office of Coastal Zone Management. 1977. A Coastal Management strategy for New Jersey. New Jersey Department of Environmental Protection.

Rogers & Golden

Factor Information Sheet 49

Factor: VISIBILITY FROM ROAD

Source Title: *National Forest Landscape*

Source Agency: *Rogers & Golden* Phone: *(215) 563-4220*

Person: *John Rogers*

Address: *1427 Vine Street, Philadelphia, PA 19102*

Use Data Prepared For: *New Jersey Coastal Development Potential Study*

Informed Sources/Knowledgeable People:

Date Compiled: *1979* Date Published: *1979*

Data Format: *Map*

Scale: *1:250,000*

Measurement Units: *Feet*

Geographic Unit: *Set-back line*

Geographic Area Covered: *Coastal Study Area*

Type of Data: (check one)
Qualitative X Quantitative ___
Spatial X Non-Spatial ___

Computer Encoded? Yes ___ No X

Source Data Categories/Map Legend: -*area visible from road*

Reliability & Accuracy: *Areas within one quarter of a mile are considered in the foreground of the landscape and easily discernible. The only case where this factor would not be totally reliable is if there is a barrier screening the view of the observer.*

Usefulness of Data: *This factor is required in the location of regional shopping centers. Developers of Shopping Centers feel visibility from at least one road is requisite in siting a regional Shopping Center.*

Comments: *This factor was mapped at a scale of 1:250,000 for this study. The set-back line is one quarter of a mile from collector roads excluding collector roads. The quarter mile set-back assumption for visibility is based on the U.S. Forest Service Study cited below.*

Source Citation: *Forest Service, U.S. Department of Agriculture. 1975. Chapter 1, The Visual Management System in National Forest Landscape. Washington, DC. U.S. Government Printing Office.*

Rogers & Golden

Factor Information Sheet 50

Factor: DREDGING MAINTENANCE

Source Map Title: *Not mapped*

Source Agency: *Dames and Moore* **Phone:** *(201) 272-8300*

Person: *Jim Cool*

Address: *6 Commerce Drive, Cranford, NJ*

Use Data Prepared For: *New Jersey Development Potential Study*

Informed Sources/Knowledgeable People: *Phil Hopkins*

Date Compiled: **Date Published:**

Data Format:

Scale:

Measurement Units:

Geographic Unit:

Geographic Area Covered: *Entire state*

Type of Data: (check one)
Qualitative x Quantitative ___
Spatial ___ Non-Spatial x

Computer Encoded? Yes ___ No x

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data:

This factor is a consideration in locating areas having development potential for major and minor ports.

Comments:

See comments on Factor Discussion Sheet.

Rogers & Golden

Factor Discussion Sheet 50

Factor: DREDGING MAINTENANCE

Information concerning Dredging Maintenance will be available shortly for the entire state. Michael Hockman in the Division of Coastal Resources is an informal source.

Land uses concerned with this factor include Ports, Marinas, Commercial Fishing Docks and the like. The frequency and amount of dredging maintenance required at any given site are determined by accessibility status (type of shoaling and/or accessibility at low tide), the intensity of boating activity; local bathymetry, turbidity, river and for harbor currents, river flow, topography of the upstream watershed, erodibility of soils in the watershed degree to which the watershed has been developed.

Recommended Mapping Procedure:

Mapping of the necessity or frequency of dredging required involves the following:

1. *Determine sediment roads and runoff characteristics of the streams in question, based on topography and soil characteristics of the watershed.*
2. *Determine the streamflow (cfs) with the estimated soil load and turbidity.*
3. *Check with existing marinas, harbormasters, and the U.S. Army Corps of Engineers to estimate historic deposition rates, dredging frequencies and type and amount of use.*
4. *After all harbors have been given an estimate of yearly sediment accumulation, assign each to a high, medium and low maintenance category (high every 5 years and less; medium every 5-10 years; low every 15 years or more).*

Sources:

U.S. Department of Agriculture, Soil Conservation Service. County Soil Surveys. Washington, D.C.: U.S. Government Printing Office.

U.S. Geological Survey. Surface Water Supply Records. Washington, D.C.: U.S. Government Printing Office.

Factor Information Sheet 51

Factor: ACCEPTABLE WATER QUALITY

Source Map Title: *New Jersey Surface Water Classification Map*

Source Agency: *NJDEP Division of Water Resources* **Phone:**

Person:

Address:

Use Data Prepared For: *Surface Water Quality Standards*

Informed Sources/Knowledgeable People:

Date Compiled: *1972* **Date Published:** *1974*

Data Format: *Map*

Type of Data: (check one)
Qualitative ___ Quantitative X
Spatial X Non-Spatial ___

Scale: *1:250,000*

Measurement Units: *Water Quality Criteria* **Computer Encoded?** Yes ___ No X

Geographic Unit: *Classifications*

Geographic Area Covered: *Entire State*

Source Data Categories/Map Legend:

FW-1	*TW-1*	*CW-1*
FW-2	*TW-2*	*CW-2*
FW-3	*TW-3*	

Reliability & Accuracy:

The map is an approximation

Usefulness of Data:

Helpful in determining water supply location and recreation potential of areas

Comments:

This map was traced directly onto mylar: the legend is the same as the source map.

Source Citation:

New Jersey Department of Environmental Protection, Division of Water Resources, 1974. N.J.A.C., 7:9-4 et. seq. Surface Water Quality Standards. Docket No. DEP 012-74-11

Rogers & Golden

Factor Discussion Sheet 51

Factor: ACCEPTABLE WATER QUALITY

Surface waters of New Jersey are identified as Fresh (FW), Tidal (TW), and Coastal (CW). This includes both interstate and intrastate waters. The uses which the different classes are suitable for are listed below.

SUITABILITY	*(FW1)*	*(FW2)*	*(FW3)*	*(TW1)*	*(TW2)*	*(TW3)*	*(CW1)*	*(CW2)*
PROTECTION	X							
PUBLIC WATER SUPPLY		X		X	X			
POTABLE PUBLIC WATER SUPPLY (TREATED)		X		X	X			
MAINTENANCE, MIGRATION AND PROPAGATION OF NATURAL AND ESTABLISHED BIOTA		X		X				
MAINTENANCE, MIGRATION AND PROPAGATION OF FISH POPULATIONS					X	X		
MIGRATION OF ANADROMOUS FISH					X	X		
PRIMARY RECREATION		X		X			X	
SECONDARY RECREATION					X	X		X
INDUSTRIAL AND AGRICULTURAL WATER SUPPLY		X		X			X	
OTHER REASONABLE USES		X	X	X	X	X	X	X
MAINTENANCE OF WILDLIFE					X	X		
SHELLFISH HARVESTING WHERE PERMITTED				X			X	X
WATERS 1500 FEET FROM MEAN LOW TIDE SHORELINE OR TO A DEPTH OF 15 FEET BELOW MEAN LOW TIDE							X	
ATLANTIC OCEAN WATERS BEYOND THOSE ESTABLISHED UNDER CW1 TO THE THREE MILE LIMIT								X

Factor Information Sheet 52

Factor: ON-SITE AMENITIES

Source Map Title: *Not mappable*

Source Agency: Phone:

Person:

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: Date Published:

Data Format:

Scale:

Measurement Units:

Geographic Unit:

Geographic Area Covered:

Type of Data: (check one)
Qualitative ____ Quantitative ____
Spatial ____ Non-Spatial ____

Computer Encoded? Yes ____ No ____

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *This factor is a consideration in the location of all housing types.*

Comments: *See comments on Factor Discussion Sheet.*

Rogers & Golden

Factor Discussion Sheet 52

Factor: ON-SITE AMENITIES

On-Site Amenities are defined as vegetation for the purposes of this study. Vegetation can consist of anything from a stand of White Cedar trees to a patch of day lilies left in place by a developer. Though these On-Site Amenities do represent a fairly significant cost consideration, they are too small in scale to be mapped for this study.

Sources:

Harper, D. and Warbach, J. 1976. Visual Quality and the Coastal Zone. Syracuse, NY: SUNY , College of Environmental Science and Forestry.

Zube, E.H., et al. 1975. Landscape Assessment. Stroudsburg, PA: Dowden, Hutchinson and Ross, Inc.

Factor Information Sheet 53

Factor: CHARACTER OF SURROUNDING AREA

Source Map Title: *not mapped*

Source Agency: Phone:

Person:

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: Date Published:

Data Format:

Type of Data: (check one)
Qualitative ___ Quantitative ___

Scale:

Spatial ___ Non-Spatial ___

Measurement Units:

Computer Encoded? Yes ___ No ___

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data:

Comments: *See Factor Discussion Sheet*

Source Citation:

Rogers & Golden

Factor Discussion Sheet 53

Factor: CHARACTER OF SURROUNDING AREA

Most builders and developers interviewed for this study maintain that the Character of the Surrounding Area is an important factor in siting housing developments. Yet the term seems to have a variety of meanings. Some builders define Character of Surrounding Area as having to do with the price of existing housing. To others it has to do with crime rates.

Rogers & Golden interpreted Character of Surrounding Area as either compatible or not compatible land uses in the case study that was performed for this report. Uncompatible land uses for housing were defined as industrial land uses, sewage treatment plants and airports. This factor was only mapped at 1:24,000.

Factor Information Sheet 54

Factor: VISUAL AMENITIES

Source Map Title: *Not mappable*

Source Agency: Phone:

Person:

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: Date Published:

Data Format: Type of Data: (check one)
Qualitative ____ Quantitative ____
Scale: Spatial ____ Non-Spatial ____

Measurement Units: Computer Encoded? Yes ____ No ____

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *This factor is a consideration in the location of all housing types.*

Comments: *See comments on Factor Discussion Sheet.*

Rogers & Golden

Factor Discussion Sheet 54

Factor: VISUAL AMENITIES

Visual Amenities are determined, in part, by the type of land use being considered. For Rural Housing, Visual Amenities can consist of a view of a forest or woodland, an agricultural landscape, or visually interesting topography. For High Rise Housing, a townscape may be a visual amenity. In addition, Visual Amenities are determined by location and the siting of a particular house or development. Therefore, it is impossible to map visual amenities for this study.

Sources:

Harper, D. and Warbach, J. 1976. Visual Quality and the Coastal Zone. Syracuse, NY: SUNY ., College of Environmental Science and Forestry.

Zube, E.H., et al. 1975. Landscape Assessment. Straudsburg, PA: Dowden, Hutchinson and Ross, Inc.

Factor Information Sheet 55

Factor: SHORT DISTANCE BETWEEN TRIP ORIGINS AND DESTINATIONS

Source Map Title:

Source Agency: Phone:

Person:

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: Date Published:

Data Format:

Scale:

Measurement Units:

Type of Data: (check one)
Qualitative ____ Quantitative ____
Spatial ____ Non-Spatial ____

Computer Encoded? Yes ____ No ____

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *This factor is of consideration when siting roads and railroads.*

Comments: *See Factor Discussion Sheet.*

Rogers & Golden

Factor Discussion Sheet 55

Factor: SHORT DISTANCE BETWEEN TRIP ORIGINS AND DESTINATIONS

In planning highway or railway alignments, it is useful to bear in mind that the shortest distance between two points is a straight line. Other things being equal, a straight line between two areas to be connected by transportation facility will present the least cost. However, without knowing which areas are to be connected it is impossible to map the shortest distance between them. Many factors, such as topography, soils, existing land use and drainage patterns, may suggest other than a straight-line alignment. These can only be addressed on a case-by-case basis, when the starting point and end point of proposed facility are known.

Source: *Paquette, Radnor J., et. al. 1972. Transportation Engineering: Planning and Design. New York: Ronald Press.*

Factor Information Sheet 56

Factor: JETTIES, GROINS AND PIERS

Source Map Title: not mapped

Source Agency: **Phone:**

Person:

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: **Date Published:**

Data Format:

Scale:

Measurement Units:

Geographic Unit:

Geographic Area Covered:

Type of Data: (check one)
Qualitative ____ Quantitative ____
Spatial ____ Non-Spatial ____

Computer Encoded? Yes ____ No ____

Source Data Categories/Map Legend: present, not present

Reliability & Accuracy:

Usefulness of Data: This factor is used in locating areas suitable for Sport Fishing.

Comments:

Source Citation:

Rogers & Golden

Factor Discussion Sheet 56

Factor: JETTIES, GROINS AND PIERS

Jetties, Groins and Piers is a factor in locating areas for surf fishing. Though this factor is not mapped at present, it could easily be done. U.S.G.S. topographic quad sheets (1:24,000) do not show the location of such structures.

Factor Information Sheet 57

Factor: BRIDGES OVER STREAMS

Source Map Title: *New Jersey Highway Map and Guide*

Source Agency: *New Jersey Department of Transportation* Phone: *(609) 292-8501*

Person:

Address: *1035 Parkway, Trenton, NJ*

Use Data Prepared For:

Informed Sources/Knowledgeable People: *Dave Cox*

Date Compiled: *1978* Date Published: *1979*

Data Format: *Map*

Type of Data: (check one)
Qualitative X Quantitative ___
Spatial X Non-Spatial ___

Scale: *1:250,000*

Measurement Units: *miles and kilometers*

Computer Encoded? Yes ___ No X

Geographic Unit:

Geographic Area Covered: *Entire state*

Source Data Categories/Map Legend: *State highways, toll highways, other divided highways, secondary roads, connecting roads, local roads.*

Reliability & Accuracy: *This data is very reliable and accurate.*

Usefulness of Data: *This factor is of consideration in locating areas suitable for Recreational Fishing.*

Comments: *This factor was mapped at 1:250,000 for this study. The legend shows the location of bridges.*

Source Citation: *New Jersey Department of Transportation. 1978. New Jersey Official Highway Map and Guide. New Jersey Department of Transportation.*

Rogers & Golden

Factor Information Sheet 58

Factor: POPULATION DENSITY

Source Map Title: *Population Overlay*

Source Agency: *New Jersey Department of Environmental Protection, Bureau of Geology and Topography* Phone: *(609) 292-2576*

Person: *Kemble Widmer, State Geologist*

Address: *1474 Prospect Street, Trenton, NJ*

Use Data Prepared For: *State Environmental Overlay Series*

Informed Sources/Knowledgeable People:

Date Compiled: *1976* Date Published: *1976*

Data Format: *Map*

Type of Data: (check one)
Qualitative ___ Quantitative X
Spatial X Non-Spatial ___

Scale: *1:63,360*

Measurement Units: *persons per square mile*

Computer Encoded? Yes ___ No X

Geographic Unit: *state*

Geographic Area Covered: *entire state*

Source Data Categories/Map Legend: *County boundary, municipal boundary, population density in persons/sq. mi., area in sq. mi., % area of municipality on map, marked roads, urbanized areas, state boundary.*

Reliability & Accuracy: *Mapped information taken wholly from U.S. Census Bureau, 1970 Census of Population and Housing; this is the most accurate source of population information available. It should be updated to reflect population changes.*

Usefulness of Data: *This factor locates areas where industries, shopping centers, liquid waste, and water supply facilities may wish to locate.*

Comments: *This factor was mapped at 1:250,000 for this study. The legend shows populations of 0-200, 200-500, 500-1000, 1000-2500, 2500-5000, and 5000+ per square miles.*

Source Citation: *New Jersey Department of Environmental Protection Bureau of Geology and Topography. 1976. Population Overlay, Sheets 31 through 37, Trenton, New Jersey.*

Rogers & Golden

Factor Information Sheet 59

Factor: LABOR FORCE AVAILABILITY

Source Map Title: *not mapped*

Source Agency: *Department of Labor and Industry* **Phone:** *(609) 292-2423*
Division of Planning & Research
Person: *Don Scarry*

Address: *Department of Labor and Industry, Research Division, Labor and Industry Building, Trenton, NJ*
Use Data Prepared For: *Resource Document*

Informed Sources/Knowledgeable People:

Date Compiled: **Date Published:**

Data Format: **Type of Data: (check one)**
Qualitative ____ **Quantitative** ____
Scale: **Spatial** ____ **Non-Spatial** ____

Measurement Units: **Computer Encoded? Yes** ____ **No** ____

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *This factor is useful in locating various industrial land uses.*

Comments: *See Factor Discussion Sheet.*

Rogers & Golden

Factor Discussion Sheet 59

Factor: LABOR FORCE AVAILABILITY

Labor Force Availability is a complex factor that is composed of at least three variables--the size of the labor force, the size of the work force and the amount of unemployment. The Department of Labor and Industry has a number of publications that deal with these variables. Economic Indicators is a monthly publication that presents statistics on the labor force, the work force and unemployment. In addition, each labor market area (labor markets are usually counties) has a monthly newsletter. These publications are available from Robert Dunkel, Department of Labor and Industry, Division of Planning and Research, Office of Publications, Box 2765, Trenton, NJ.

For long range planning, population projections may also be useful. This type of information is available from Shirley Getz, Department of Labor and Industry, Office of Demographic and Economic Research, Labor and Industry Building, Trenton, NJ.

Source: *Scarry, Don. 1979. Division of Research and Planning, Department of Labor and Industry. Trenton, NJ. Personal Communication.*

Factor Information Sheet 60

Factor: MINOR TIDES

Source Title: *Tide Table of East Coast and North and South America*

Source Agency: *National Oceanic and Atmospheric Administration* Phone:

Person:

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People:

Date Compiled: *annually* Date Published: *annually*

Data Format:

Type of Data: (check one)
Qualitative ____ Quantitative ____
Spatial ____ Non-Spatial ____

Scale:

Measurement Units:

Computer Encoded? Yes ____ No ____

Geographic Unit:

Geographic Area Covered: *East coast and North and South America*

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data:

Comments:

Source Citation:

Rogers & Golden

Factor Discussion Sheet 60

Factor: MINOR TIDES

The best source of information on tides is found in NOAA's tide tables. These are printed annually. However, the figures given on the tide tables must be interpolated to determine minor tides.

Factor Information Sheet 61

Factor: SOIL DRAINAGE

Source Map Title: *County Soil Survey*

Source Agency: *Soil Conservation Service and the New Jersey Agricultural Experiment Station* **Phone:** *(201)-246-1205*

Person: *Carl Eby*

Address: *Soil Conservation Service, 1370 Hamilton Street, Somerset, N.J. 08873*

Use Data Prepared For: *Resource document*

Informed Sources/Knowledgeable People:

Date Compiled: *varies* **Date Published:** *varies*

Data Format: *Maps, with text*

Scale: *1:15,840*

Type of Data: (check one)
Qualitative X **Quantitative** ____
Spatial X **Non-Spatial** ____

Measurement Units: *soil properties*

Computer Encoded? Yes ____ No X

Geographic Unit: *soil series or types*

Geographic Area Covered: *entire state; each county is published separately*

Source Data Categories/Map Legend:

Soils are mapped by series and phases.

Reliability & Accuracy:

Most accurate source of soil drainage information available is the County Soil Surveys.

Usefulness of Data:

Comments:

This data should be mapped on site. The SCS is currently developing a statewide soils map useful for general planning purposes (scale 1:250,000)

Source Citation:

U.S. Department of Agriculture, Soil Conservation Service and the New Jersey Agricultural Experiment Station. County Soil Surveys. U.S. Government Printing Office. Washington, D.C.

Rogers & Golden

Factor Information Sheet 62

Factor: FOREST COVER

Source Map Title: *Forest Cover of New Jersey*

Source Agency: *NJDEP - Bureau of Forestry* **Phone:** *(609) 292-2733*

Person: *Tom Taylor*

Address: *DEP, 1301 Parkside Avenue, Trenton, NJ 08625*

Use Data Prepared For: *Forest Management*

Informed Sources/Knowledgeable People:

Date Compiled: *1978 - 1979* **Date Published:** *due 1980 (late)*

Data Format: *Map and summary*

Scale: *1:24,000*

Type of Data: (check one)
Qualitative ____ **Quantitative** X
Spatial X **Non-Spatial** ____

Measurement Units: *Acres*

Computer Encoded? Yes ____ No X

Geographic Unit: *Dominant species/acre*

Geographic Area Covered: *State*

Source Data Categories/Map Legend: *Dominant species*

Reliability & Accuracy: *Since this map has not been completed it is impossible to comment on the accuracy of the map. However, it is known that LANDSAT land cover assessment was supported by ground truth evidence.*

Usefulness of Data: *This factor is used in siting areas suitable for Forestry and may be useful when compiling a map for Visual Amenities and On-Site Amenities.*

Comments: *This factor should be included in the Department of Coastal Resources map collection when completed.*

Source Citation: *N.J. Department of Environmental Protection, Bureau of Forestry, Division of Parks and Forestry. In press. Forest Cover of New Jersey. Trenton, New Jersey.*

Rogers & Golden

Factor Information Sheet 63

Factor: HISTORIC SITES

Source Map Title: *Not mapped*

Source Agency: *NJDEP* **Phone:** *(609) 292-2023*

Person: *Judith Blood, Chief*

Address: *DEP, Office of Historic Preservation, P.O. Box 1420, Trenton NJ 08625*

Use Data Prepared For: *State and Federal Registers*

Informed Sources/Knowledgeable People: *Bill McCrey*

Date Compiled: *Annual* **Date Published:** *Annual up-date*

Data Format: *Booklet*

Type of Data: (check one)
Qualitative X Quantitative ___
Spatial ___ Non-Spatial X

Scale:

Measurement Units:

Computer Encoded? Yes ___ No X

Geographic Unit:

Geographic Area Covered:

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data:

Comments:

Rogers & Golden

Factor Discussion Sheet 63

FACTOR: HISTORIC SITES

Though not currently used as a factor for any land use in this study, this factor may be useful in determining Character of Surrounding Area for various housing types. The report published by the Office of Historic Preservation is updated semi-annually and includes the addresses of the various sites.

SOURCE:

DEP, Office of Historic Preservation, 1979. State and National Historic Places. Trenton, New Jersey.

Factor Information Sheet 64

Factor: ARCHEOLOGICAL SITES

Source Map Title:

Source Agency: *DEP - Office of Environmental and Cultural Services* **Phone:** *(609) 324-3829*
Person: *Laurance Schmidt*

Address:

Use Data Prepared For:

Informed Sources/Knowledgeable People: *Olga Chesler*

Date Compiled: **Date Published:**

Data Format:
Scale:
Measurement Units:
Geographic Unit:
Geographic Area Covered:

Type of Data: (check one)
Qualitative ____ **Quantitative** ____
Spatial ____ **Non-Spatial** ____

Computer Encoded? Yes ____ **No** ____

Source Data Categories/Map Legend:

Reliability & Accuracy:

Usefulness of Data: *May be useful in locating areas for Parks or Natural Areas.*

Comments: *See Factor Discussion Sheet.*

Rogers & Golden

Factor Discussion Sheet 64

Factor: ARCHEOLOGICAL SITES

Although not currently used as a factor for any land use in this study, this factor may be useful in locating suitable sites for Parks and Natural Areas. The information for this factor is found in two locations. DEP's Office of Environmental and Cultural Services (P.O. Box 1330, Trenton, NJ) has mapped (1:24,000) those areas of the state that have been surveyed for cultural resources. These maps show both archeologic and historic sites. The New Jersey State Museum (205 West State Street, Trenton, NJ) has mapped (1:63,360) all historic and archeologic sites. Dr. Lorraine Williams is curator of the State Museum collection.

Source: *Chesler, Olga. 1979. Office of Environmental and Cultural Resources. Department of Environmental Protection. Trenton, NJ. Personal Communication.*

Factor Information Sheet 65

Factor: ACCESS TO GAS PIPE LINES

Source Map Title: *Utility Map Series, Gas Pipeline Overlay*

Source Agency: *Bureau of Geology and Topography* **Phone:** *(609) 292-2576*

Person: *Kemble Widmer*

Address:

Use Data Prepared For: *Reference document*

Informed Sources/Knowledgeable People:

Date Compiled: *1977* **Date Published:** *1977*

Data Format: *map*

Scale: *1:250,000*

Measurement Units: *miles/kilometers*

Type of Data: (check one)
Qualitative X Quantitative ____
Spatial X Non-Spatial ____

Computer Encoded? Yes ____ No X

Geographic Unit: *gas pipe lines*

Geographic Area Covered: *entire state*

Source Data Categories/Map Legend: *Gas pipeline (w/diameters of pipeline), Service Area Boundary, Gate Station. Gas Company names appear on pipelines and metering stations.*

Reliability & Accuracy: *Information may be out of date. This factor will require periodic updating as changes are made in gas transmission.*

Usefulness of Data: *This factor locates areas where various industries may locate.*

Comments: *This factor was mapped at a scale of 1:250,000 for this study. The legend shows proximities of 0-1, 1-3, 3-5, 5-10, and 10+ miles.*

Source Citation: *N.J. Department of Environmental Protection, Bureau of Geology and Topography. 1977. Utility Map Series, Gas Pipeline Overlay. Trenton, New Jersey.*

Rogers & Golden

Development Potential Ana. sis, or for that matter any other planning .ool, is only as good as the data used to produce the results. Unfortunately, the data needs of this study extended beyond the available data. If this approach is to be implemented as a useful tool for decision makers, additional efforts in data collection, analysis and formatting are required.

In several cases, the data were several years old or were compiled at different times for different areas. When the data is relatively static in nature, as is the case with soils and geology data, the difference in time is not significant. However, with data on sewer and water facilities, land use and other changeable factors, this limitation can become important and can affect the reliability of the data across the study area.

Many of the available data are updated by different local, state and federal agencies on a regular basis. The data base should be updated as the data become available.

For certain factors, data are available but could not be used for this study: they are either not compiled for planning purposes or usefully formatted, or both. Factors that need work include Proximity to Public Transportation, Soil Load Bearing Capacity, Deep Foundation Suitability, Availability of Mineral Resources, Thickness of Overburden, Character of Surrounding Areas, Soil Drainage, Access to Electric Power Distribution Lines, and Acceptable Water Quality. Of particular importance is Groundwater and Surface Water Availability.

Soils data also falls into this category. Most of the information contained in soil surveys is very useful in land planning. Unfortunately, there currently is no established base map for the entire state with data categories detailed enough to be used in siting and planning studies. The Soil Conservation Service is developing a map for the entire state at a scale of 1:250,000. This map will begin to fill the need.

Another data consideration is that very little effort has been expended in maintaining up-to-date functional capacity information. In many instances, data are available on the location of roads, landfills, sewer and water lines and treatment plants, power lines and gaslines. However, the functional capacities for these facilities to support increased use are not well documented. Although an effort was made in this study to include functional capacities, the data available were insufficient to allow this to be done.

To assure confidence in the results of the Development Potential Analysis data, managers must keep the data up-to-date, fill the necessary data gaps and include functional capacities as part of the data base. Without a strong commitment by the State in these areas, the Development Potential Analysis will lose its usefulness as a decision making tool.

Chapter 4
Case Studies

This chapter presents three case studies--Marinas, Fish Processing Plants and Single Family Detached Housing--to illustrate the Development Potential Analysis Method. Lower Cape May County was chosen as the case study area because it is representative of the coastal zone in terms of development pressures, physiographic features, and growth potential, and because it has a complete data base mapped at a common scale (1:24,000).

The mapping for the case studies was done at two separate scales (1:250,000 and 1:24,000). The smaller-scale maps (1:250,000) were used only for factors that were necessary or mandatory for siting the development. These necessary factors are shown as dots in Table 6. Mapping them first enabled us to eliminate areas that were not feasible for siting a facility. The study of desirable factors for each use then focused on the feasible areas only. The 1:250,000 maps for each case study are shown in Figure 3. These three maps illustrate how the necessary factors influence the study of different uses. Factors considered as necessary in siting a given use can be very restrictive, as in the case of Marinas; they may be moderately restrictive, as in the case of Fish Processing Plants; or they may offer few to no restrictions, as in the case of Single Family Detached Housing.

After the 1:250,000 maps were completed, further study was done at a more detailed scale (1:24,000). All factors considered desirable were studied at this scale. Desirable factors for each use are shown as circles in Table 6. Examples of 1:24,000 scale maps are shown in Figures 4 through 8. (A detailed description of the Development Potential Method is found in the Appendix.)

Factors / Uses	Marinas	Fish Processing Plant	Single Family Detached Housing
Undeveloped Land	●	●	●
Access to Local Road	●		●
Access to Collector Road		○	
Access to Railroad		○	
Access to Electric Power Distribution Line		●	○
Proximity to Metropolitan Service Center		○	○
Proximity to Regional Service Center			○
Proximity to Community Service Center		○	○
Soil Load Bearing Capacity		○	
Proximity to Public Transportation			○
Character of Surrounding Area			○
Visual Amenities			○
Soil Drainage			○
Slope		○	○
Soils Suitable for On-Site Disposal			○
Access to Public Water Supply System	○	○	○
Potable Water Supply		○	○
Access to Public Sewerage	○	○	○
Proximity to River or Bay Shore Frontage	●		○
Proximity to Ocean Beach Frontage			○
Proximity to Fishing Community		○	
Flooding			○
Access to 6-foot Channel	●		
Embayments	●		
Light Currents	○		
Minor Tides	○		

TABLE 6. FACTORS USED IN CASE STUDIES

● Necessary
○ Desirable

Single Family Detached Housing

Fish Processing Plants

Marinas

FIGURE 3. MAPS OF NECESSARY FACTORS USED IN CASE STUDIES

NOTE: THESE MAPS WERE ORIGINALLY MAPPED AT A SCALE OF 1: 250,000 AND REDUCED FOR PURPOSES OF PUBLICATION

The Development Potential Analysis Method was applied to the site-types delineated using the 1:24,000 maps. The Development Potential Method, as diagrammed in Figure 2, can be described as a series of steps. Each of the steps is presented in more detail in the case studies. A general description follows.

Summary of Development Potential Analysis Method

Step 1. Define Use.

For this study, land uses were grouped into seven major categories: housing, commerce, industry, utilities, infrastructure, harvest and recreation. Each of these is defined and described in detail in Chapter 2. The list of 182 uses presented here can be updated or supplemented as needed.

Step 2. Establish Relevant Development Potential Factors for Each Use.

With each land use description in Chapter 2 is a list of Development Potential Factors. Factors may be added or omitted as use definitions are updated or changed.

Step 3. Define Factor Distribution.

Each factor used in the analysis was mapped at the 1:250,000 scale where possible. The factors used in the case studies were mapped at 1:24,000, as mentioned above. Five examples of the factor maps used in the case studies are shown in Figures 4 through 8. These maps were chosen to represent the different types of factors used in the analysis.

Step 4. Assign Cost to Factor Distribution.

Each factor was divided into data categories (for example, the factor Access to Roads was divided into four data categories--0-$\frac{1}{2}$ mile, $\frac{1}{2}$-1$\frac{1}{2}$ miles, 1$\frac{1}{2}$-3 miles and 3+ miles). The factor maps were drafted according to data categories, and costs were assigned to each data category. The cost reductions associated with interdependent factors (for example, road and sewer construction that occur at the same time) were not considered in the case studies.

Step 5. Overlay Maps and Sum Factor Costs.

As each factor map was overlaid, new boundaries were drafted. After all the overlays were completed, the map delineated many site-types of varying sizes and shapes. Each site-type showed a combination of factors in terms of data categories. The costs associated with all data categories in a site-type were summed to determine the development cost.

Step 6. Rank Development Potential.

Once the development costs were determined for each site-type, the development costs could be compared and ranked on a relative scale as having high, medium or low development potential. The decisions on where to establish the cutoffs for high, medium and low were arbitrary; however, by arranging development costs vs number of sites on a histogram, general trends in cost could be noted. These should help in siting decisions.

A more detailed description of the Development Potential Analysis Method is found in the Appendix. The method in the Appendix is intended for use once site-types are known.

The Case Studies

Each of the three case studies presented here contains a written discussion of the steps taken in Development Potential Analysis (see Figure 2), including any assumptions made as the method was applied.

Each of the land uses considered in the case study is portrayed in several fashions. There are sample data tables, histograms (bar graphs) and maps to demonstrate development potential rankings.

The sample data tables show how Deficiency Costs and Bonus Values influence the Baseline Cost and therefore determine Development Potential. Columns marked with an (X) indicate the data category that corresponds to the site-type in question.

The histograms give the range of development costs for the land use, the distribution of site-types by development cost, the baseline cost [indicated by an asterisk (*)] and Development Potential Ranks of high, medium and low.

A Development Potential Map was drafted for each of the three land uses to show the spatial distribution of high, medium, and low development potentials in the case study (shaded areas). The unshaded areas include developed and publically owned land, water, and areas with no development potential for the land use being considered.

Figure 4

Access to Local Road

0 - ½

½ - 1½

1½ - 3

3+ MILES

FACTOR INFORMATION SHEET: 2

1/10 1/2 1 Miles 2

1/10 1/2 1 Kilometers 2

Acres
91.83
22.96
5.74

Coastal Development Potential Study

New Jersey Department of Environmental Protection
Division of Coastal Resources

Lower Cape May County

Rogers & Golden 1979

Figure 5

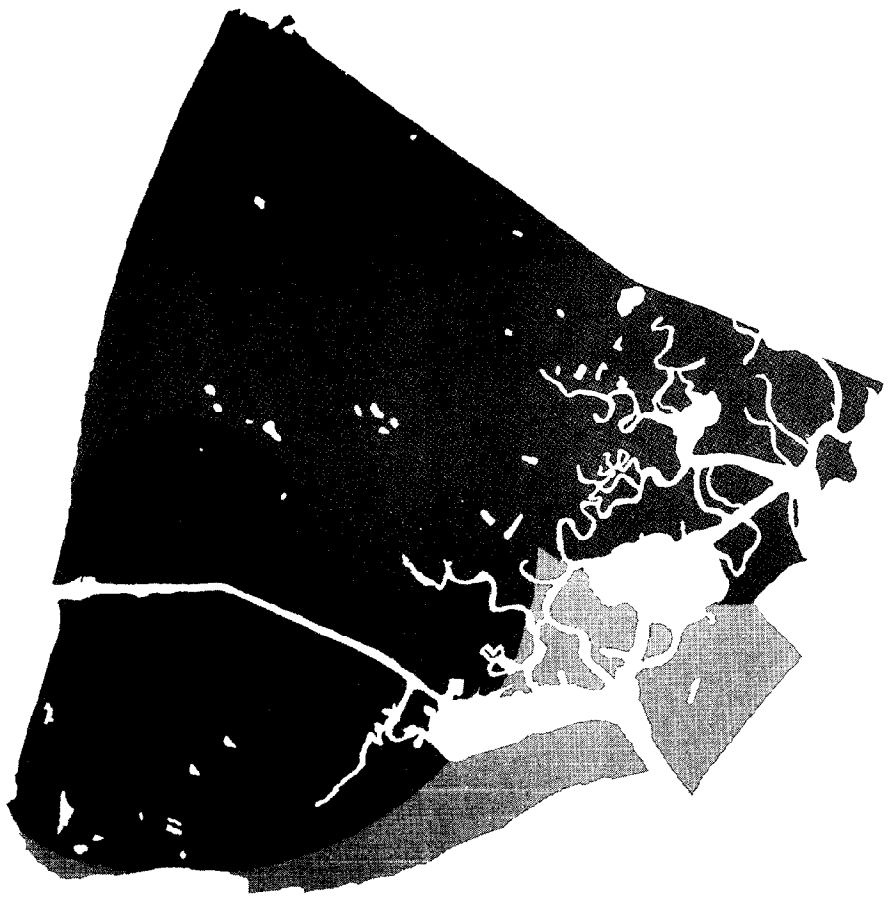
Proximity to Community Service Center

0 - 1

1 - 3

3+ MILES

FACTOR INFORMATION SHEET: 10



Lower Cape May County

Coastal Development Potential Study

New Jersey Department of Environmental Protection
Division of Coastal Resources

Rogers & Golden

1979

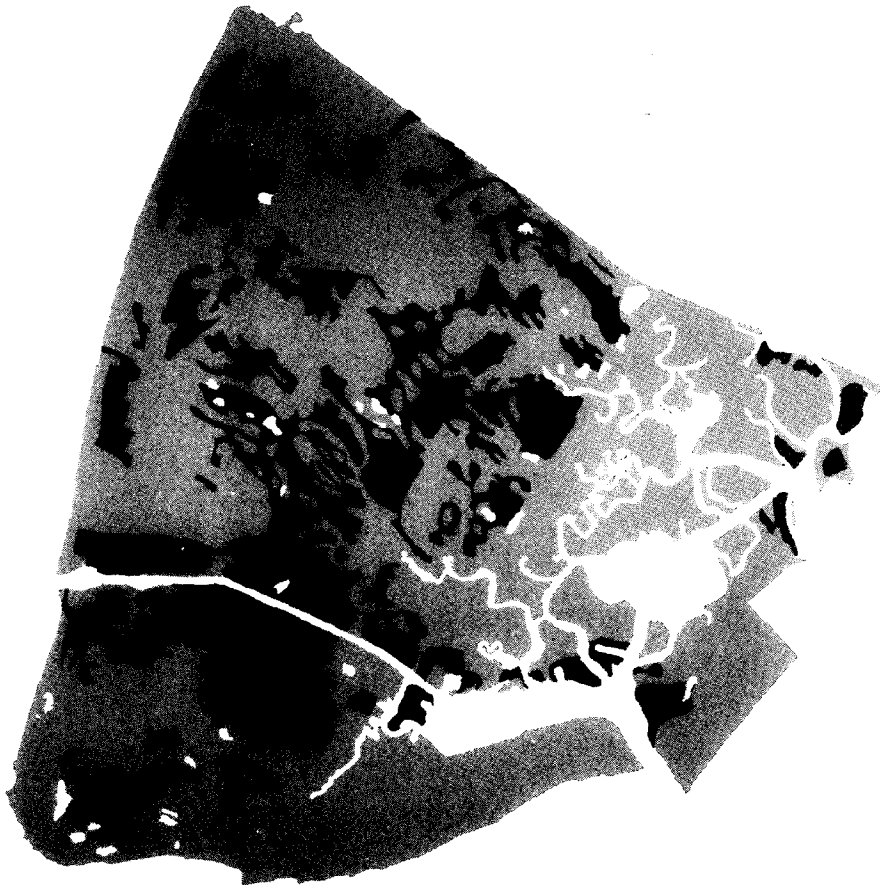
Figure 6

Soil Load Bearing Capacity

HIGH

MEDIUM

LOW



0 1/10 1/2 1 Miles 2

0 1/10 1/2 1 Kilometers 2

Acres
91.83
22.96
5.74

Coastal Development Potential Study

New Jersey Department of Environmental Protection
Division of Coastal Resources

Lower Cape May County

Rogers & Golden 1979

FACTOR INFORMATION SHEET: 27

Figure 7

Access to Public Sewerage

0 - ½

½ - 1½

1½ - 3

3+ MILES

FACTOR INFORMATION SHEET: 34

1/10 1/2 1 0 1/2 1 Miles
1/10 1/2 1 Kilometers
91.83 Acres
22.96
5.74

Coastal Development Potential Study

New Jersey Department of Environmental Protection
Division of Coastal Resources

Lower Cape May County

Rogers & Golden

1979

Figure 8

Access to 6-Foot Channel and Embayments

FACTOR INFORMATION SHEET: 6,48

Coastal Development Potential Study

New Jersey Department of Environmental Protection
Division of Coastal Resources

Lower Cape May County

Rogers & Golden 1979

Marina Case Study

DEFINITION OF USE

For the purposes of this case study, a marina can be either privately or publicly owned and can provide facilities to either the public or a private clientele. The marina would provide boat launching and storage facilities, boating supplies, and service for boat operation and maintenance. It would have parking facilities for cars and trailers and would have 100 slips. Approximately five acres of land is required and the baseline unit cost for facilities would amount to $750,000.

DEVELOPMENT POTENTIAL FACTORS

- ● Undeveloped Land
- ● Access to Local Roads
- ● Access to 6-foot Channel
- o Access to Public Sewerage
- o Access to Public Water Supply
- ● Proximity to River and Bay Shore Frontage
- ● Embayments
- o Minor Tides

FACTOR DISTRIBUTION

Maps were drafted for each factor except Minor Tides. For Minor Tides there was insufficient data available to allow discrimination between water bodies.

ASSIGN COSTS TO FACTOR DISTRIBUTION

The costs for each factor data category are shown across the top of the axis of the accompanying data table.

OVERLAY MAPS AND SUM FACTOR COSTS

At this stage each site-type was given a number. The numbers for each site-type are listed in the left-hand column of the data table. A total of eighty-three site-types was delineated. The development costs for each site-type were then determined. These development costs are shown in the right-hand column of the data table.

RANK DEVELOPMENT POTENTIAL

The development potential for all sites was determined by comparing the number of sites for each total cost in a histogram. Two sites had no deficiency costs, and twenty-five other sites fell within a 53% increase in development cost. These sites were considered to have high development potential. Twenty-nine sites were within an 80% increase in cost so these were considered to have a medium development potential rank. Twenty-seven sites were shown to have greater than an 80% increase in cost, so they were considered to have a low development potential. The cutoffs are arbitrary but do represent a relative ranking of sites.

The Development Potential Map for Marinas shows how development potential for Marinas is distributed across the study area.

The photograph below is of one of the high development potential site-types for marinas by the Development Potential Analysis Method.

Figure 9

Development Potential: Marinas

HIGH

MEDIUM

LOW

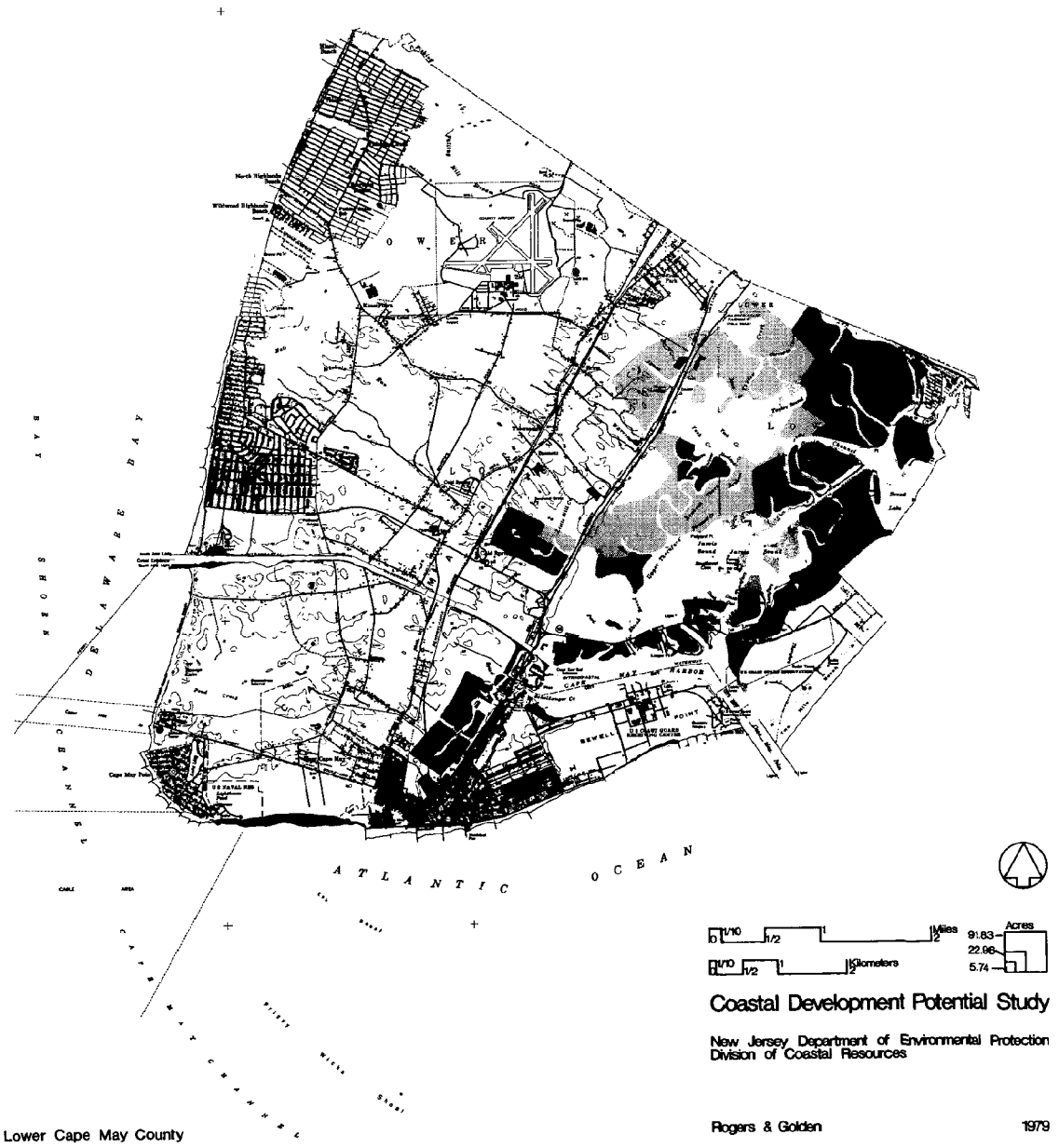
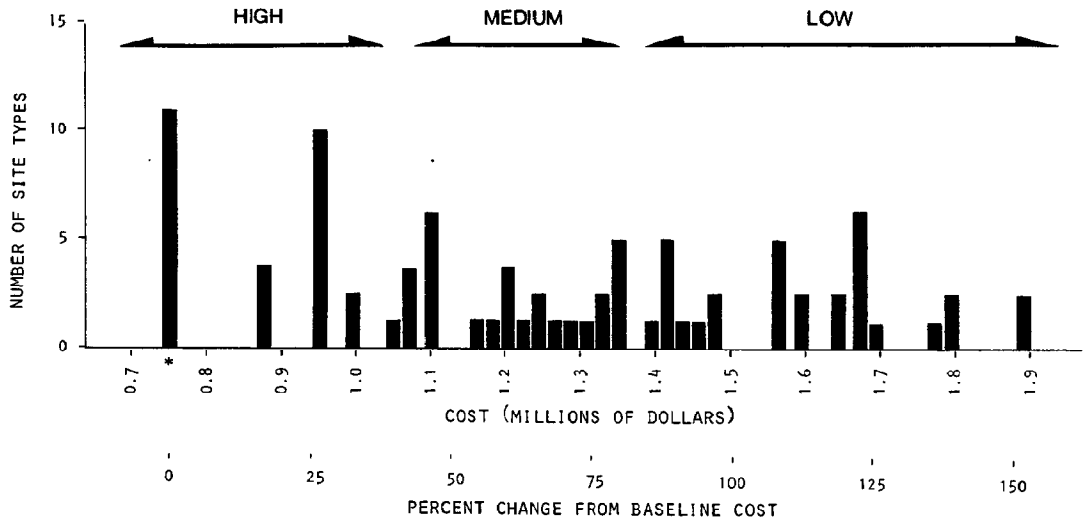


FIGURE 9. DEVELOPMENT POTENTIAL: MARINAS



* Baseline cost

TABLE 7. MARINA CASE STUDY DATA

BASELINE COST: $750,000

DEVELOPMENT SIZE: 100 Slips, 5 Acres

SITE NUMBER	UNDEV. LAND	EMBAY-MENT	SHORE FRONTAGE	ACCESS TO LOCAL ROADS				ACCESS TO 6 FT. CHANNEL				ACCESS TO PUB. SEWERAGE				ACCESS TO PUB. WATER SUPPLY				MINOR TIDES		TOTAL DE-VELOPMENT COST	
				0-1/2 mi. ($0)	1/2- 1 mi. (-$150,000)	1 - 3 mi. (-$300,000)	3+ miles (-$450,000)	0-1/2 mi. ($0)	1/2- 1 mi. (-$120,000)	1 - 2 mi. (-$240,000)	2+ miles (-$320,000)	0-1/2 mi. ($0)	1/2- 1 mi. (-$100,000)	1 - 3 mi. (-$200,000)	3+ miles (-$300,000)	0-1/2 mi. ($0)	1/2- 1 mi. (-$100,000)	1 - 3 mi. (-$200,000)	3+ miles (-$300,000)	2 feet or less ($0)	2 feet + ($-50,000)		
1				X						X		X				X						990,000	H
2				X						X		X					X					1,190,000	M
3				X						X		X				X						990,000	H
4				X					X			X				X						870,000	H
5				X					X			X				X						870,000	H
6				X					X				X				X					1,070,000	M
7				X				X				X				X						750,000	H
8				X				X				X				X						750,000	H
9				X				X				X				X						750,000	H
10				X				X				X				X						750,000	H
11				X				X					X				X					950,000	H
12				X				X				X				X						750,000	H
13				X				X					X				X					950,000	H
14				X				X				X				X						750,000	H
15				X				X				X				X						750,000	H
16				X				X					X				X					950,000	H
17				X				X					X				X					950,000	H
18				X				X				X				X						750,000	H
19				X				X				X				X						750,000	H
20				X				X					X				X					950,000	H
21				X					X				X				X					1,070,000	M
22				X					X			X				X						870,000	H
23				X				X				X				X						750,000	H
24				X				X					X				X					950,000	H
25				X				X					X				X					950,000	H
26					X			X					X				X					1,100,000	M
27					X			X					X				X					1,100,000	M
28				X				X				X				X						750,000	H
29					X			X					X				X					1,100,000	M
30				X				X					X				X					950,000	H
31				X				X					X				X					950,000	H
32				X				X					X					X				1,050,000	H
33				X				X					X				X					950,000	H

Detached Housing Case Study

DEFINITION OF USE

Although there is a considerable range in the cost associated with Single Family Detached Housing, we assumed a Baseline Unit Cost of $50,000 for the case study. This cost is based on a two-story house with a full basement and an area of 2,000 square feet. The development contains four units; therefore, the Baseline Development Cost is $200,000.

DEVELOPMENT POTENTIAL FACTORS

- ● Undeveloped Land
- ● Access to Local Road
- ● Access to Electric Power Distribution Line
- o Proximity to Metropolitan Service Center
- o Proximity to Regional Service Center
- o Proximity to Community Service Center
- o Proximity to Public Transportation
- o Slope
- o Soil Drainage
- o Access to Public Water Supply
- o Potable Water Supply
- o Access to Public Sewerage
- o Soils Suitable for On-Site Disposal System
- o Proximity to Ocean Beach Frontage
- o Proximity to River or Bay Shore Frontage
- o On-Site Amenities
- o Character of Surrounding Area
- o Visual Amenities
- o Flooding

FACTOR DISTRIBUTION

All factors for this land use were mapped with the exceptions of Access to Electric Power Distribution Line and Potable Water Supply.

ASSIGN COSTS TO FACTOR DISTRIBUTION

The costs given on the factor cost sheet for Detached Housing (in Chapter 2) were employed. These costs are also shown on the top of the axis of the Detached Housing Data Table. Costs are not given for Flooding because of the site-specific nature of such costs.

OVERLAY MAPS AND SUM FACTOR COSTS

When all factor maps had been overlaid, a total of 561 site-types were delineated. Deficiency Costs and Bonus Values were summed separately. Because the factor Soils Suitable for On-Site Disposal Systems and the Proximity to Public Sewerage factor are linked (a developer may choose either one), the system that cost the least was chosen. For example, if Public Sewerage was within a half mile of a given site-type, it was assumed that any housing built on that site-type would hook up to the public sewerage system. But if a given site-type was more than one-half mile from public sewerage it was assumed that an on-site disposal system would be used.

The development costs for Single Family Detached Housing ranged from $6,750 to $598,000. The vastness of the range is attributed to the high Bonus Value given to Proximity to Ocean Beach Frontage.

RANK DEVELOPMENT POTENTIAL

The Single Family Detached Housing histogram compares the number of site-types for each total development cost. For this use the baseline cost plus 25% was used to determine the high development potential ranking and the baseline unit cost plus 50% was used to establish the low development potential ranking. Therefore 104 site-types were considered to have a high development potential because development costs were less than $250,000. Site-types with development costs between $250,000 and $300,000 were considered to have a medium development potential, and those with development costs of more than $300,000 (baseline cost plus 50%) were given a low development potential ranking. These rankings are displayed in Figure 10.

Figure 10

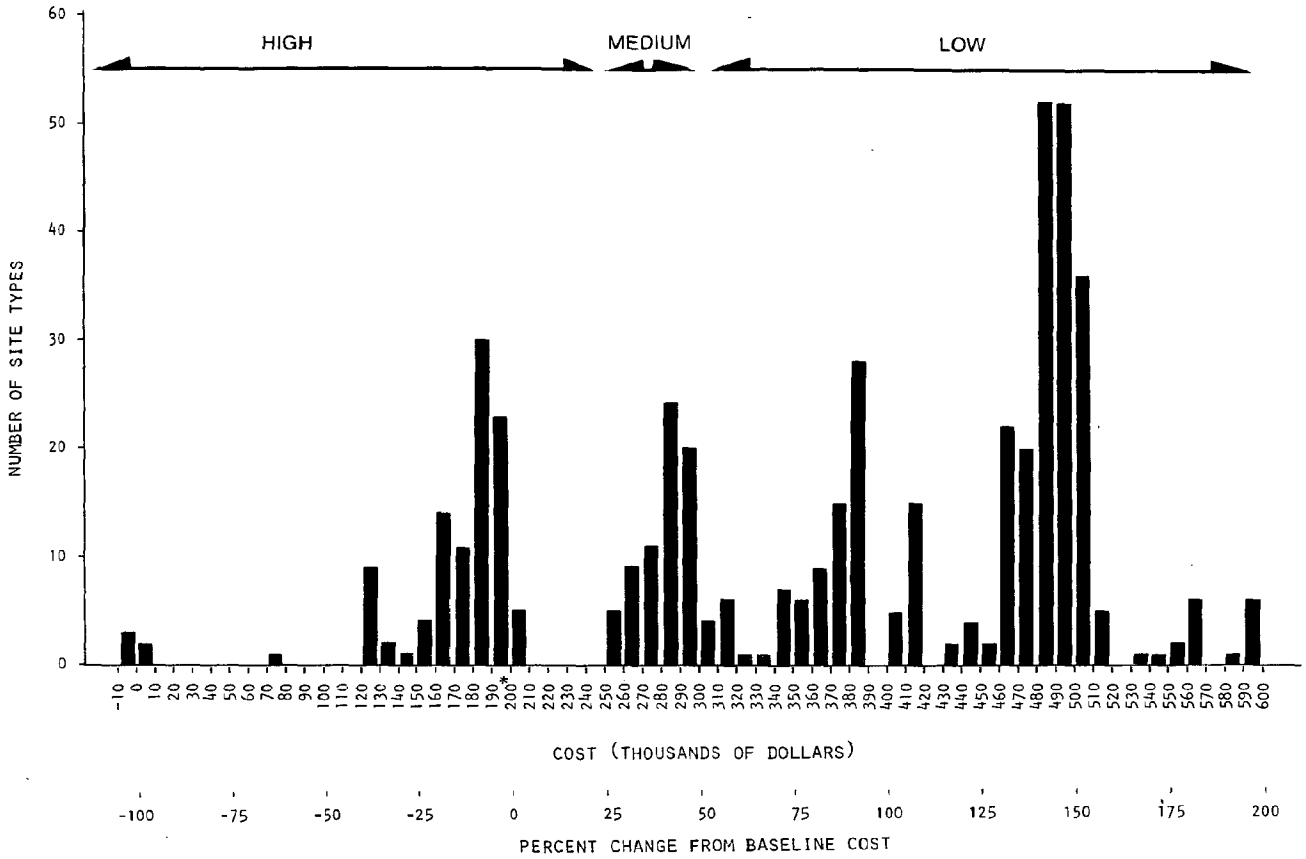
Development Potential: Detached Housing

HIGH

MEDIUM

LOW

FIGURE 10. DEVELOPMENT POTENTIAL: DETACHED HOUSING



* Baseline cost

TABLE 8. DETACHED HOUSING CASE STUDY DATA

BASELINE COST: $200,000

DEVELOPMENT SIZE: 4 Units, 1 Acre

Site Number	Access to Local Road	Slope	Character of Sur Area	Soil Drainage	On Site Sewage Disposal	Public Sewerage	Public Water Supply	Potable Water Supply	Access to Electric Power Distribution Line	Flooding	TOTAL DEFICIENCY COST	Proximity to Metro Service Center	Proximity to Regional Shopping Center	Proximity to Commercial Shopping Center	Proximity to Public Transportation	On-Site Amenities	Visual Amenities	Proximity to Ocean Beach Frontage	Proximity to River or Bay	TOTAL BONUS VALUE	DEVELOPMENT COST
1		X		X			X		X		$606,750		X	X	X	X			X	$90,000	$466,750
2		X	X	X		X	X		X		$215,750		X	X	X				X	$92,000	$299,750
3		X		X		X	X		X		$315,750		X	X	X				X	$52,000	$281,750
4		X		X		X X	X		X		$ 15,750		X	X	X		X		X	$16,000	$181,750
5	X	X		X	X	X	X		X		$527,750		X	X	X	X			X	$90,000	$356,750
6	X	X	X	X		X X	X		X		$ 11,750		X	X	X	X			X	$11,500	$181,750
7	X	X		X	X	X X	X		X		$ 37,750		X X		X	X			X	$27,000	$208,250
8	X	X		X	X	X	X		X		$251,750		X X		X				X	$27,000	$314,250
9	X	X		X		X	X		X		$315,750		X X		X	X			X	$33,000	$382,750
10	X	X		X	X		X		X		$406,750		X X		X	X			X	$91,000	$370,750
11		X		X	X	X	X		X		$277,750		X X		X	X	X		X	$26,500	$351,250
12	X	X		X	X	X	X		X		$ 6,750		X	X	X	X			X	$90,000	$166,750
13	X	X		X	X	X	X		X		$521,750		X	X	X	X			X	$40,000	$347,750
14	X	X		X	X	X	X		X		$312,750		X	X	X	X			X	$40,000	$287,750
15	X	X		X	X	X	X		X		$427,750		X	X	X	X	X		X	$54,000	$492,750
16	X	X		X	X	X	X		X		$106,750		X	X	X	X	X		X	$34,000	$172,750
17	X	X		X	X	X X	X		X		$ 21,750		X	X	X	X			X	$28,000	$195,750
18		X		X	X	X	X		X		$631,750		X	X	X	X			X	$24,000	$407,750
19	X	X		X	X	X	X		X		$515,750		X	X	X	X	X		X	$26,000	$489,750
20		X		X	X	X	X		X		$727,750		X	X	X	X	X		X	$32,000	$598,250
21		X		X	X	X	X		X		$477,750		X	X	X	X			X	$62,000	$415,750
22		X		X	X	X	X		X		$377,750		X X		X	X			X	$61,100	$416,650
23		X		X	X	X	X		X		$527,750		X	X	X	X			X	$61,100	$466,650
24	X	X	X	X	X	X X	X		X		$ 25,750		X X		X	X			X	$61,100	$150,650
25	X	X		X	X	X X	X		X		$ 15,750		X	X	X	X			X	$84,000	$123,750
26	X	X		X	X	X	X		X		$215,750		X X		X	X			X	$65,000	$250,750
27		X		X	X	X	X		X		$621,750		X	X	X	X			X	$32,000	$489,750
28	X	X	X	X	X	X	X		X		$285,750		X	X	X	X	X		X	$61,100	$264,650
29	X	X		X	X	X	X		X		$421,750		X X		X	X			X	$33,000	$388,750
30	X	X		X	X	X	X		X		$306,750		X	X	X	X	X		X	$14,000	$192,750

Fish Processing Plant Case Study

DEFINITION OF USE

The fish processing plant studied here was assumed to have a baseline unit cost of $3,000,000. The plant would have two production lines and would be capable of processing 12 million pounds of fish per year. The $3,000,000 includes equipment for fish waste disposal. With parking facilities for employees, the plant would occupy 4 acres of land.

DEVELOPMENT POTENTIAL FACTORS

- ● Undeveloped Land
- ● Access to Collector Road
- ● Access to Electric Power Distribution Line
- o Proximity to Commercial Fishing Dock
- o Proximity to Metropolitan Service Center
- o Slope
- o Soil Load Bearing Capacity
- o Access to Public Water Supply
- o Access to Public Sewerage
- o Flooding

FACTOR DISTRIBUTION

All development potential factors for this use were mapped with the exception of Access to Electric Power Distribution Line. Figures 6 and 7 are reductions of two of the factor maps used to determine site-types for a Fish Processing Plant.

ASSIGN COST TO FACTOR DISTRIBUTION

The costs for each factor data category are shown across the top of the axis of the data tables for Fish Processing Plants. Costs are not given for Flooding because no costs for this factor were established during this study. Costs are not given for Proximity to Metropolitan Service Center or Commercial Fishing Dock because costs associated with these factors are more accurately regarded as operating expenses. Of the factors that were assigned costs, all were Deficiency Costs except Access to Railroad, which was considered a Bonus Value.

OVERLAY MAPS AND SUM FACTOR COSTS

All cost maps were overlaid to define site-types. Three hundred and eighty-one site types were identified. The Deficiency Costs and Bonus Values were then filled in on the data tables. It was then possible to add Deficiency Costs to the Baseline Unit Cost and subtract the Bonus Values from the subtotal. The resulting figure is the Development Potential Cost for each site-type. Development Potential Costs for the Fish Processing Plant ranged from $2,400,000 to $4,000,000.

RANK DEVELOPMENT POTENTIAL

A histogram was constructed to compare the number of site-types for each total cost. Relative Developmental Potentials could then be established. Ninety-eight site-types had a Development Potential Cost between $2,400,000 and $2,700,000. These sites were considered to have a high development potential. One hundred five sites had costs between $2,700,000 and $3,300,000: these site-types were considered to have a medium development potential. Those sites with development potential cost of more than $3,300,000 were given a low development potential ranking. For this use, the Baseline Cost plus or minus 10% was assumed to represent medium development potential. These cutoffs are arbitrary: they only present a relative ranking of site-types.

Figure 11

Development Potential: Fish Processing Plants

HIGH

MEDIUM

LOW

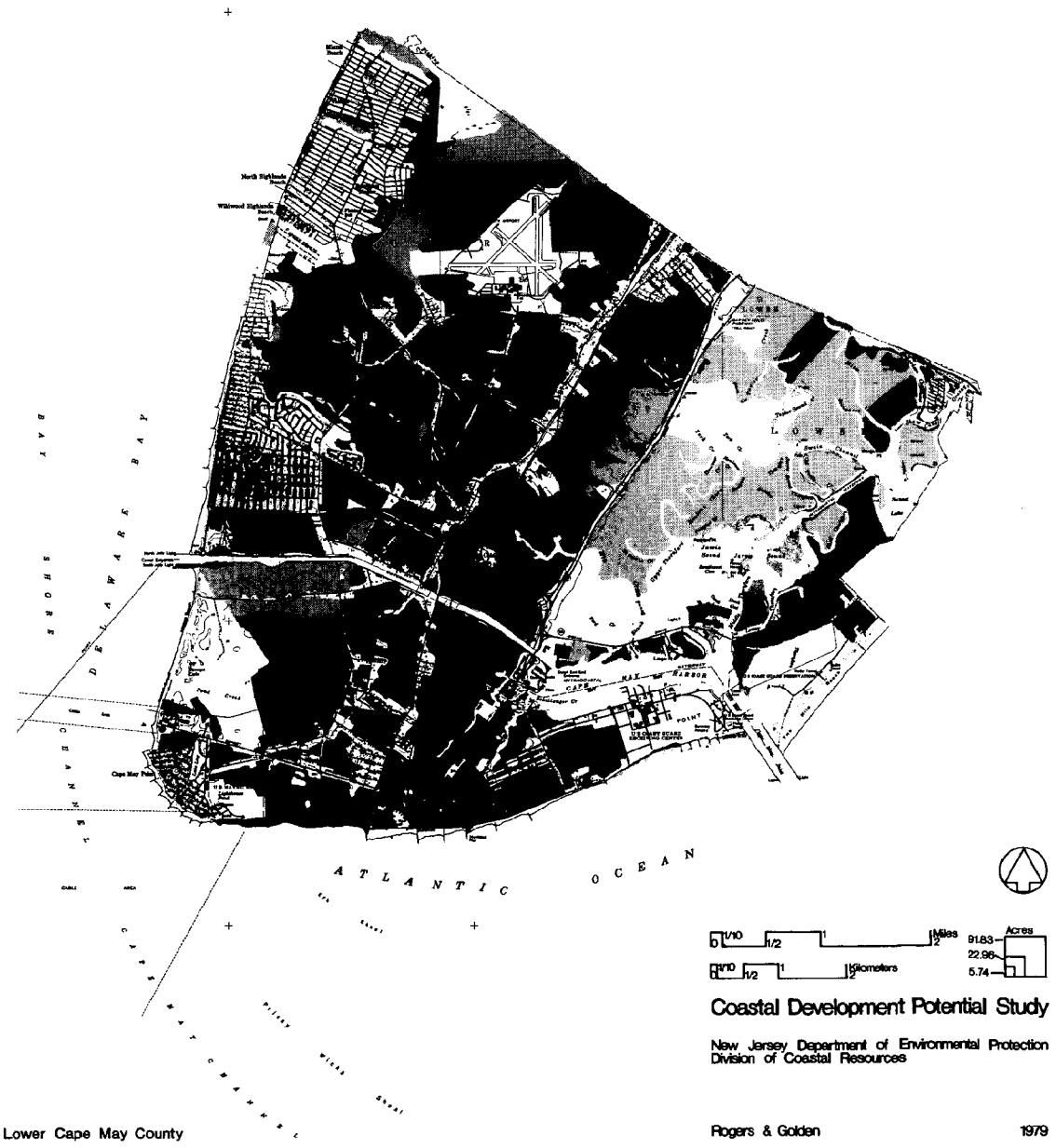
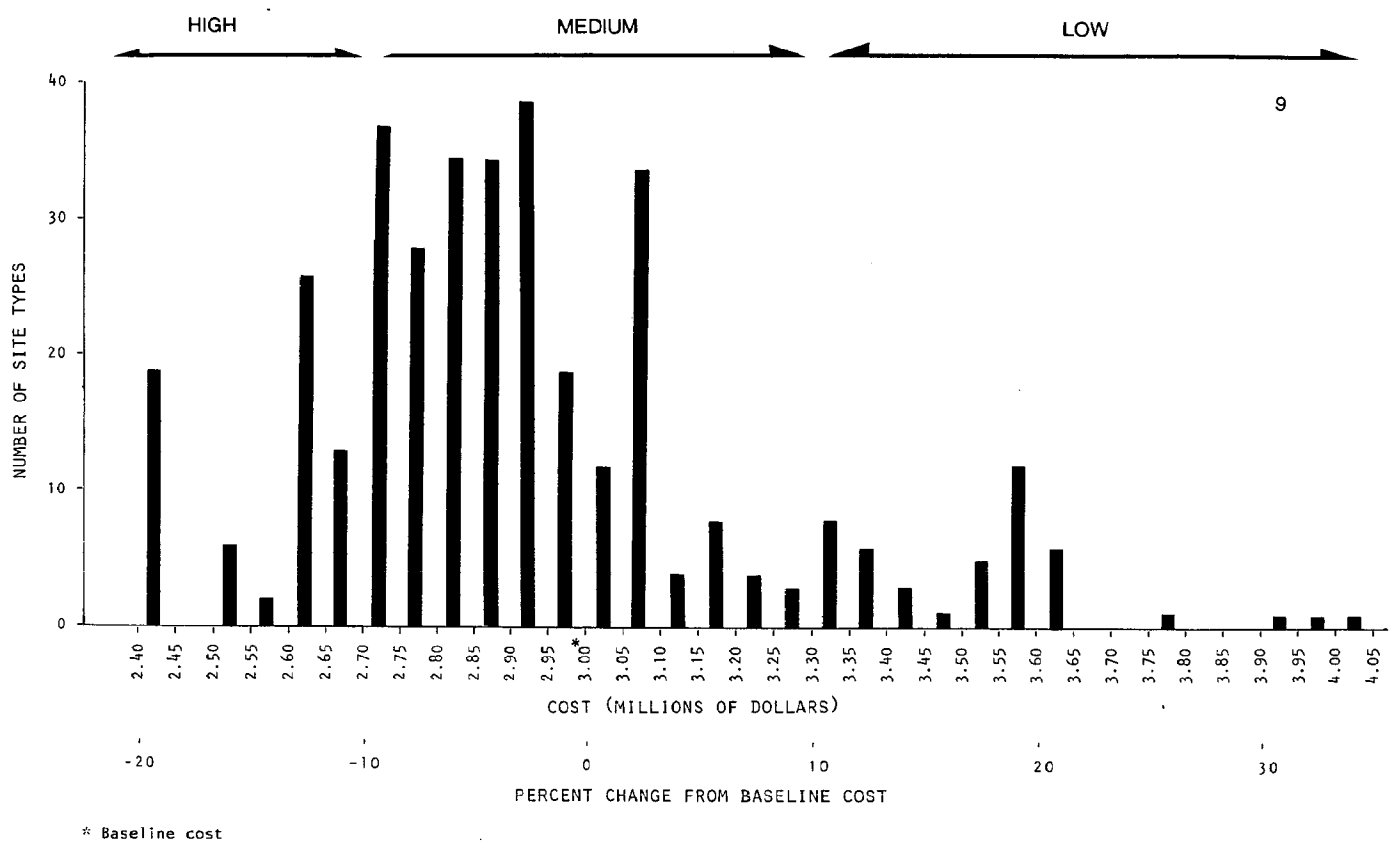


FIGURE 11. DEVELOPMENT POTENTIAL: FISH PROCESSING PLANTS



* Baseline cost

TABLE 9. FISH PROCESSING PLANT CASE STUDY DATA

BASELINE COST: $3,000,000

DEVELOPMENT SIZE: 1 Plant, 4 Acres

Site Number	Undeveloped Land	Flooding		Access to Collector Road					Access to Electric Power Distribution Line					Slope				Soil Bearing Capacity			Public Water Supply				Public Sewerage				TOTAL DEFICIENCY COST	Access to Railroad				Proximity to Commercial Fishing Port			Proximity to Metro Center					TOTAL BONUS VALUE	DEVELOPMENT COST	DEVELOPMENT POTENTIAL
		In	Out	0 - ½ mi. ($0)	½ - 1½ mi. (-$150,000)	1½ - 3 mi. (-$300,000)	3+ miles (-$450,000)		0 - ½ mi. ($0)	½ - 1½ mi. (-$48,000)	1½ - 3 mi. (-$96,000)	3+ miles (-$144,000)		0 - 3 percent ($0)	4 - 8 percent (-$30,000)	8 - 15 percent (-$110,000)	15+ percent (-$185,000)	High	Medium	Low	0 - ½ mile ($0)	½ - 1½ mi. (-$115,000)	1½ - 3 miles (-$230,000)	3+ miles (-$345,000)	0 - 1 miles ($0)	1 - 1½ mi. (-$100,000)	1½ - 3 miles (-$200,000)	3+ miles (-$300,000)		0 - 1 mile ($0)	1 - 3 miles (-$600,000)	3 - 5 miles (-$1,200,000)	5+ miles (-$1,500,000)	0 - 2 miles	2 - 5 miles	5 - 10 miles	10+ miles	0 - 15	15 - 30	30 - 45	45 - 60	60+ miles			
35	X			X					X					X				X				X				X				$215,000	X				X							X	$600,000	$2,615,000	H
36	X			X					X					X				X				X				X				$215,000	X				X							X	$600,000	$2,615,000	H
37	X			X					X					X				X				X				X				$215,000	X				X							X	$600,000	$2,615,000	H
38	X			X					X					X						X	X				X				$166,000	X					X						X	$600,000	$2,566,000	H
39	X			X					X					X						X	X				X				$166,000	X					X						X	$600,000	$2,566,000	H
40	X			X					X					X						X	X				X				$166,000	X				X							X	$600,000	$2,566,000	H
41	X			X					X					X						X	X				X				$166,000	X											X	$600,000	$2,566,000	H
42	X			X					X					X				X				X				X				$215,000	X				X							X	$600,000	$2,615,000	H
43	X			X					X					X						X		X				X				$231,000	X				X							X	$600,000	$2,631,000	H
44	X			X					X					X				X				X				X				$215,000	X				X							X	$600,000	$2,615,000	H
45	X				X				X					X						X		X				X				$219,000	X				X							X	$600,000	$2,781,000	M
46	X			X					X					X				X				X					X			$205,000	X					X						X	$600,000	$2,795,000	M
47	X			X					X					X				X					X				X			$170,000	X				X							X	$600,000	$2,850,000	M
48	X			X					X					X				X					X				X			$170,000	X				X							X	$600,000	$2,830,000	M
49	X			X					X					X				X					X					X		$170,000	X					X						X	$600,000	$2,830,000	M
50	X			X					X					X				X					X					X		$170,000	X					X						X	$600,000	$2,830,000	M
51	X			X					X					X				X					X			X				$270,000	X					X						X	$600,000	$2,730,000	M
52	X			X					X					X				X					X					X		$170,000	X					X						X	$600,000	$2,830,000	M
53	X			X					X					X				X					X					X		$170,000	X				X							X	$600,000	$2,830,000	M
54	X			X					X					X						X			X				X			$155,000	X					X						X	$600,000	$2,840,000	M
55	X			X					X					X						X			X				X			$155,000	X				X							X	$600,000	$2,840,000	M
56	X				X				X					X				X					X					X		$ 20,000	X				X							X	$600,000	$2,980,000	M
57	X				X				X					X				X					X					X		$580,000		X			X							X	$500,000	$3,280,000	L
58	X				X				X					X				X					X						X	$680,000		X				X						X	$300,000	$3,380,000	L
59	X				X				X					X						X			X						X	$690,000		X			X							X	$300,000	$3,390,000	L
60	X			X					X					X				X					X					X		$430,000		X			X							X	$300,000	$3,130,000	L
61	X				X				X					X				X					X						X	$680,000		X				X						X	$300,000	$3,380,000	L
62	X			X					X					X				X					X					X		$170,000	X					X						X	$600,000	$2,830,000	M
63	X			X					X					X				X					X					X		$430,000		X				X						X	$300,000	$3,130,000	L
64	X			X					X					X				X					X						X	$513,000		X			X							X	$300,000	$3,213,000	L
65	X			X					X					X				X							X				X	$645,000		X			X							X	$300,000	$3,345,000	L

Appendix
Development Potential Analysis Method

The Development Potential Analysis Method is described here in detail as a step-by-step process for a potential user. Figure 2 outlines the six major steps involved in the method. The method is designed for use with one or several sites or for regional or statewide planning. The technique described here is useful when considering one location among its potential alternatives. A computer program will also be available that can handle multiple site calculations. This computer program can be obtained from the Division of Coastal Resources and can be run either in batch or interactive mode.

Each factor identified during the original use surveys was considered. Most factors were mapped. However, some factors were too site-specific to be accurately mapped at a regional scale. Each factor which can be reasonably mapped and which has data available was mapped on transparent mapping material at a scale of 1:250,000 (one inch equals four miles). This data was mapped in a format suitable for mechanical digitization. When the data base is computerized the comparison of multiple locations, which could be done as part of a planning study, will be much less laborious than the existing manual method.

The following six forms are provided to assist the user in performing manual calculations to assess the development potential of various locations for a given use. These forms contain simple procedures for computing the deficiency costs and bonus values in determining total development costs associated with each of a number of potential locations. In addition, a procedure is provided to compare the locations both relative to each other and to a standard (baseline) cost for the type of use considered.

Space is provided on these forms for a comparison of up to 15 locations. For purposes of clarity, it is recommended that the user not attempt to compare more than 15 locations at any one time. Because of the nature of the analysis, however, the user may compare any number of locations in the following way.

Suppose the user is interested in comparing 45 potential locations for a given use. He or she should divide the 45 locations into 3 groups of 15 each. The forms provided may then be used to determine the best location in each of the three groups of 15. Finally, the forms may be used to determine which of those three locations is the best overall.

The forms presented here have been filled in with information collected during the Detached Housing Case Study performed in Lower Cape May County. Completed forms were provided rather than blank ones to make the method more readily understandable.

Material and labor costs in recent years have been on an upward trend. Material and labor indexes such as LSI and Dodge showed a rise of 0.8% per month for 1978. Currently there exists a seller's market in construction. Increases of 10 to 11% are expected for 1979, unless tight money and rising interest rates bring a halt to the booming construction industry (Saylor 1979).

To keep the cost data in this report current, the user should evaluate and correct these data for inflation on at least an annual basis. Information on how to make these corrections can be found in the LSI or Dodge Current Construction Cost manuals or in other comparable publications.

Step 1 - Define Use

Form 1 is provided as both a master sheet for the assessment process and as a reference guide for the steps to follow. Parts 1 through 5 are straightforward. Part 6 (comments) is provided for the user's convenience.

STEP 1

FORM 1. DEFINE USE

1. WHAT USE IS BEING CONSIDERED (SEE USE LIST) Single Family Detached
2. BASELINE UNIT COST (AS A NEGATIVE NUMBER) -$200,000
3. WHAT IS THE TOTAL ACREAGE OF THIS DEVELOPMENT 1
4. HOW MANY UNITS ARE THERE IN THIS DEVELOPMENT 4
5. COMMENTS:

Step 2 - Establish Relevant Factors

Form 2 is provided to give the user a reference of the factors in the steps to follow. All factors needed in the use under study should be included in Form 2. It should be noted that, in the case of linked factors, only one of them should be entered on Form 2. For example, either "soil suitable for on-site disposal" or "access to public sewer" should be entered, but not both. It should be noted that bonus factors and deficiency factors are to be entered separately on this form.

Per Development factors are those which have a given cost for the development as a whole and do not depend on the number of units of development. An example of a Per Development factor is an access road.

Per Unit of Development factors are those which have a cost which increases with the size of the development (i.e., the cost of the factor is given per unit of development). An example of this type of factor is soil drainage.

A Set of Interdependent factors is a number of factors which, when taken together, represent a savings over what each factor would cost separately. An example of this would be constructing a road and sanitary sewer pipeline together. Since clearing would only have to be done once, there would be a substantial savings in doing the two together.

STEP 2

FORM 2. ESTABLISH RELEVANT DEVELOPMENT POTENTIAL FACTORS

ENTER BELOW THE RELEVANT DEVELOPMENT POTENTIAL FACTORS (SEE USE DESCRIPTION).

CHECK THE APPROPRIATE COST STRUCTURE BOX FOR EACH FACTOR.

	FACTOR	(COST STRUCTURE) PER DEVELOPMENT	PER UNIT OF DEVELOPMENT	INTER-DEPENDENT
DEFICIENCY	Access to Local Road	✓		
	Slope		✓	
	Character of Surf. Area		✓	
	Soil Drainage		✓	
	On Site Sewage Disposal		✓	
	Public Water Supply	✓		
	Access to Power Line	✓		
BONUS	Proximity to Metro.		✓	
	Proximity to Regional		✓	
	Proximity to Commercial		✓	
	Proximity to Public Trans.		✓	
	On-Site Amenities		✓	
	Visual Amenities		✓	
	Proximity to Ocean		✓	
	Proximity to River		✓	
		C FACTORS	V FACTORS	

Step 3 - Describe Factor Distribution

Form 3 is provided for the user's convenience to assist in determining the proper data categories for each of the factors. This involves looking at the factor maps and determining the data categories useful for the locations being considered. The section labelled "notes" is provided to detail any assumptions related to the data base.

STEP 3

FORM 3. DESCRIBE FACTOR DISTRIBUTION

1. SELECT RELEVANT FACTOR MAPS
2. DETERMINE RELEVANT FACTOR DATA CATEGORIES FROM OBSERVING FACTOR MAPS.
3. OVERLAY MAPS AND NAME OR NUMBER EACH SITE TYPE.
4. ENTER TOTAL NUMBER OF SITE TYPES 561

NOTES:

Step 4 - Describe Factor Distribution

Forms 4(A), 4(B) and 4(C) are provided to determine the cost, by factor type (described in Step 2), of all factors in each site being considered. If element costs for any given factor are to be added to the analysis, the difference between the cost included as part of the baseline cost and the actual cost should be entered in one of these forms as a factor depending on the type of that factor. For example, if brush and shrub is assumed as the data category for clearing and the actual location is densely wooded, the difference in cost between the two should be entered in Form 4(A).

Form 4(A) Per Development Factors

This form is to be completed for each location to be considered. For each Per Development factor listed on Form 2, fill in the name of the factor and the relevant data category for the location in question. The cost associated with this data category should be entered in the total cost column. Finally the user should sum the total cost column to get the cost of all Per Development factors for this location. In the factor lists, Per Development factors are denoted by the letter "C".

STEP 4

FORM 4.(a) ESTABLISH FACTOR COSTS (PER DEVELOPMENT FACTORS)

1. WHAT IS THE SITE TYPE NAME OR NUMBER Site 7

2. FOR EACH FACTOR WITH A ONE-TIME COST PER DEVELOPMENT (C FACTORS), FILL IN THE BOXES BELOW:

	FACTOR	RELEVANT FACTOR DATA CATEGORY	** NO. OF UNITS OF THE FACTOR	ELEMENT COST ** PER UNIT	TOTAL* COST OF FACTOR
DEFICIENCY	Access to Local Road	0-½			0
	Public Water	0-½			0
	Access to Power Line	0-½			0

3. SUM TOTAL COSTS FOR EACH DEFICIENCY FACTOR TO GET TOTAL COST OF DEFICIENCY PER DEVELOPMENT FACTORS 0

BONUS					

* FOR ELEMENT COSTS, MULTIPLY THE NUMBER OF FACTOR UNITS TIMES THE ELEMENT COST PER FACTOR UNIT TO ARRIVE AT THE TOTAL COST OF THE FACTOR.

4. SUM TOTAL COSTS FOR EACH BONUS FACTOR TO GET THE TOTAL VALUE OF BONUS PER DEVELOPMENT FACTORS.

** THESE COLUMNS ARE USED ONLY FOR ELEMENT COSTS.

Form 4(B) Per Unit of Development Factors

This form is very similar to Form 4(A), described above. Form 4(B) should also be filled in for each location to be considered.

For each Per Unit of Development factor listed on Form 2, fill in the name and cost of the factor as in Form 4(A), except that the costs are now for one unit of development rather than for the development as a whole. Again sum the total costs of the factors to get the cost of all factors per unit of development. Finally, multiply this by the number of units of development to get the total cost of Per Unit of Development factors for this location. The user should note that for purposes of clarity, the deficiency costs and bonus values have been separated on this form. In the factor lists, Per Unit of Development Factors are denoted by the letter "V". It should be noted that bonus factors and deficiency factors are to be entered separately on this form.

STEP 4

FORM 4 (b) ESTABLISH FACTOR COSTS
(PER UNIT OF DEVELOPMENT FACTOR)

1. WHAT IS THE SITE TYPE NAME OR NUMBER SITE 7
2. FOR EACH FACTOR DEPENDENT ON THE NUMBER OF UNITS OF DEVELOPMENT (V FACTORS), FILL IN THE BOXES BELOW:

	FACTOR	RELEVANT FACTOR DATA CATEGORY	NUMBER OF ** UNITS OF THE FACTOR PER UNIT OF DEVELOPMENT	** COST PER UNIT OF FACTOR	* TOTAL COST PER UNIT OF DEVELOPMENT
DEFICIENCY	Slope	0-3			-1687
	Character of Surf. Area	Compatible			0
	Soil Drainage	Low			-3000
	On-Site Sewer	Severe Limitations			-2250

3. SUM DEFICIENCY TOTAL COSTS TO GET THE TOTAL COST PER UNIT OF DEFICIENCY PER DEVELOPMENT FACTORS. [ ]
4. ENTER UNITS OF DEVELOPMENT (FORM 1). [ ]
5. MULTIPLY 3 X 4 TO GET THE TOTAL COST OF DEFICIENCY PER UNIT OF DEVELOPMENT FACTORS. [ ]

BONUS	Proximity to Metro	60+ Miles			0
	Proximity to Region	0-2			1500
	Proximity to Commercial	1-3			1500
	Proximity to Pub. Trans.	0-1			250
	On-Site Amenities	Other			0

* FOR ELEMENT COSTS, MULTIPLY THE NUMBER OF FACTOR UNITS OF THE FACTOR PER UNIT OF DEVELOPMENT TIMES THE ELEMENT COST PER UNIT OF THE FACTOR TO ARRIVE AT THE TOTAL COST PER UNIT OF DEVELOPMENT.

6. SUM BONUS TOTAL COSTS TO GET THE TOTAL VALUE PER UNIT OF BONUS PER DEVELOP- DEVELOPMENT FACTORS [ ]
7. ENTER THE NUMBER OF UNITS PER DEVELOPMENT (FORM 1) [ ]
8. MULTIPLY (6) TIMES (7) TO GET THE TOTAL VALUE OF BONUS PER UNIT OF DEVELOPMENT FACTORS [ ]

** THESE COLUMNS ARE USED ONLY FOR ELEMENT COSTS.

STEP 4

FORM 4 (b) ESTABLISH FACTOR COSTS
(PER UNIT OF DEVELOPMENT FACTOR)

1. WHAT IS THE SITE TYPE NAME OR NUMBER Site 7 (Cont'd)
2. FOR EACH FACTOR DEPENDENT ON THE NUMBER OF UNITS OF DEVELOPMENT (V FACTORS), FILL IN THE BOXES BELOW:

	FACTOR	RELEVANT FACTOR DATA CATEGORY	NUMBER OF ** UNITS OF THE FACTOR PER UNIT OF DEVELOPMENT	** COST PER UNIT OF FACTOR	* TOTAL COST PER UNIT OF DEVELOPMENT
DEFICIENCY					

3. SUM DEFICIENCY TOTAL COSTS TO GET THE TOTAL COST PER UNIT OF DEFICIENCY PER DEVELOPMENT FACTORS. -6937
4. ENTER UNITS OF DEVELOPMENT (FORM 1). 4
5. MULTIPLY 3 X 4 TO GET THE TOTAL COST OF DEFICIENCY PER UNIT OF DEVELOPMENT FACTORS. -27748

BONUS	Urban Amenities	Other			0
	Proximity to Ocean	½ - 5			3000
	Proximity to River	½ - 1			500

* FOR ELEMENT COSTS, MULTIPLY THE NUMBER OF FACTOR UNITS OF THE FACTOR PER UNIT OF DEVELOPMENT TIMES THE ELEMENT COST PER UNIT OF THE FACTOR TO ARRIVE AT THE TOTAL COST PER UNIT OF DEVELOPMENT.

6. SUM BONUS TOTAL COSTS TO GET THE TOTAL VALUE PER UNIT OF BONUS PER DEVELOP- DEVELOPMENT FACTORS 6750
7. ENTER THE NUMBER OF UNITS PER DEVELOPMENT (FORM 1) 4
8. MULTIPLY (6) TIMES (7) TO GET THE TOTAL VALUE OF BONUS PER UNIT OF DEVELOPMENT FACTORS 27000

** THESE COLUMNS ARE USED ONLY FOR ELEMENT COSTS.

Form 4(C) Interdependent Factors

This form should be filled in for each location to be considered, and for each set of interdependent factors for a given location.

The data category and cost figures refer to the set of factors as a whole. The cost can be either per unit of development, or for the development as a whole, in which case a "1" should be entered as the number of units of development. It should be noted that bonus factors and deficiency factors are to be entered separately on this form.

STEP 4

FORM 4 (c) ESTABLISH FACTOR COSTS (INTERDEPENDENT FACTORS)

1. WHAT IS THE SITE TYPE NAME OR NUMBER Site 7
2. LIST INTER-DEPENDENT FACTORS None
3. ENTER RELEVANT DATA CATEGORY
4. ENTER NUMBER OF FACTOR UNITS OF THE FACTORS (FOR EACH UNIT OF DEVELOPMENT, IF A PER-UNIT OF DEVELOPMENT LIST OF FACTORS)
5. ENTER COMBINED ELEMENT COST PER FACTOR UNIT OF THE FACTORS
6. MULTIPLY 4 X 5 to GET TOTAL COST PER UNIT OF DEVELOPMENT
7. ENTER NUMBER OF UNITS OF DEVELOPMENT FROM FORM 1 (ENTER 1 IF A PER-DEVELOPMENT LIST OF FACTORS)
8. MULTIPLY 6 X 7 TO GET TOTAL COST PER DEVELOPMENT

Step 5 - Summarize Factor Costs

Form 5 is used to determine the total cost of each location under study. This form should be filled in for each location to be considered. In Part 4, space is provided for up to five sets of interdependent factors. If less are used, simply leave the remaining spaces blank. The rest of the form is straightforward. Note that Form 5 is separated into two parts, Form 5(a) and Form 5(b). Form 5(a) is for bonus factors, and Form 5(b) is for deficiency factors.

STEP 5

FORM 5 (a) SUMMARIZE FACTOR COSTS (DEFICIENCY)

1.	WHAT IS SITE TYPE NAME OR NUMBER	Site 7
2.	ENTER DEFICIENCY COST OF PER DEVELOPMENT FACTORS (LINE (3), FORM 4(a))	0
3.	ENTER DEFICIENCY COST OF PER-UNIT OF DEVELOPMENT FACTORS (LINE (5), FORM 4(b))	-27748
4.	ENTER TOTAL COST OF EACH SET OF INTERDEPENDENT FACTORS (FORM 4(c))	a. _____ b. _____ c. _____ d. _____ e. _____
5.	SUM 2, 3, 4 TO GET TOTAL DEFICIENCY COSTS FOR THIS SITE	-27748
6.	ENTER BASELINE COST (STEP 1)	-200000
7.	DIVIDE 5 BY 6 TO GET THE PERCENTAGE OVER BASELINE COST	.13874

STEP 5

FORM 5 (b) SUMMARIZE FACTOR COSTS (BONUS)

1. WHAT IS SITE TYPE NAME OR NUMBER	Site 7
2. ENTER BONUS VALUE OF PER DEVELOPMENT FACTORS (LINE (4), FORM 4(a))	0
3. ENTER BONUS VALUE OF PER-UNIT OF DEVELOPMENT FACTORS (LINE (8), FORM 4(b))	27000
4. SUM 2, 3 TO GET TOTAL BONUS VALUE FOR THIS SITE	27000
5. ENTER BASELINE COST (STEP 1)	-200000
6. DIVIDE 4 BY 5 TO GET THE PERCENTAGE OVER BASELINE COST	-.135

Step 6 - Rank Development Potential

This form is used to compare the locations both to each other and to the baseline cost. In Part 1, Med./High Cutoff % represents the cutoff between locations of high development potential and locations of medium development potential. For example, if locations of high development potential are considered to be those in which the cost is less than 25% above the baseline cost, 1.25 should be entered. Similarly, Med./Low cutoff % represents the cutoff between locations of medium and low development potential. Part 2 is straightforward and requires no further explanation.

The determination of high, medium and low development potential is a judgment which can be guided by the use of a histogram. The relative distribution of location by cost shown in a histogram similar to that shown below may be helpful in showing sharp differences in costs between locations.

STEP 6

FORM 6. RANK DEVELOPMENT POTENTIAL OF SITES

CHECK 1: DEFICIENCY___ BONUS ✓ BOTH___

PART 1. ASSIGN PERCENTAGE CUTOFFS BETWEEN HIGH/MEDIUM/LOW

1. ENTER MED./HIGH CUTOFF % 25%
2. ENTER MED./LOW CUTOFF % 50%

PART 2. FILL IN BOXES BELOW, IN ORDER FROM LEAST COST TO GREATEST COST. CHECK HIGH, MEDIUM, OR LOW BOXES ACCORDING TO THE DOLLAR CUTOFFS ABOVE:

	Site Name (Number)	Percentage Over Baseline Cost*	High	Medium	Low
1.	Site 7	-13.5%	✓		
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					

* IF ANALYZING DEFICIENCY COSTS, ENTER THE PERCENTAGE FROM (7) ON FORM 5 (a).
IF ANALYZING BONUS VALUES, ENTER THE PERCENTAGE FROM (6) ON FORM 5 (b).
IF ANALYZING BOTH TOGETHER, ENTER THE DIFFERENCE BETWEEN THESE TWO.

STEP 6

FORM 6. RANK DEVELOPMENT POTENTIAL OF SITES

CHECK 1: DEFICIENCY___ BONUS___ BOTH ✓

PART 1. ASSIGN PERCENTAGE CUTOFFS BETWEEN HIGH/MEDIUM/LOW

1. ENTER MED./HIGH CUTOFF % 25%
2. ENTER MED./LOW CUTOFF % 50%

PART 2. FILL IN BOXES BELOW, IN ORDER FROM LEAST COST TO GREATEST COST. CHECK HIGH, MEDIUM, OR LOW BOXES ACCORDING TO THE DOLLAR CUTOFFS ABOVE:

	Site Name (Number)	Percentage Over Baseline Cost*	High	Medium	Low
1.	Site 7	0.374%	✓		
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					

* IF ANALYZING DEFICIENCY COSTS, ENTER THE PERCENTAGE FROM (7) ON FORM 5 (a).
IF ANALYZING BONUS VALUES, ENTER THE PERCENTAGE FROM (6) ON FORM 5 (b).
IF ANALYZING BOTH TOGETHER, ENTER THE DIFFERENCE BETWEEN THESE TWO.

STEP 6

FORM 6. RANK DEVELOPMENT POTENTIAL OF SITES

CHECK 1: DEFICIENCY ✓ BONUS___ BOTH___

PART 1. ASSIGN PERCENTAGE CUTOFFS BETWEEN HIGH/MEDIUM/LOW

1. ENTER MED./HIGH CUTOFF % 25%
2. ENTER MED./LOW CUTOFF % 50%

PART 2. FILL IN BOXES BELOW, IN ORDER FROM LEAST COST TO GREATEST COST. CHECK HIGH, MEDIUM, OR LOW BOXES ACCORDING TO THE DOLLAR CUTOFFS ABOVE:

	Site Name (Number)	Percentage Over Baseline Cost*	High	Medium	Low
1.	Site 7	13.874%	✓		
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					

* IF ANALYZING DEFICIENCY COSTS, ENTER THE PERCENTAGE FROM (7) ON FORM 5 (a).
IF ANALYZING BONUS VALUES, ENTER THE PERCENTAGE FROM (6) ON FORM 5 (b).
IF ANALYZING BOTH TOGETHER, ENTER THE DIFFERENCE BETWEEN THESE TWO.

Glossary

ACCESS: ability to enter and leave a place.

ACCESS FACTORS: elements of a site's location with respect to infrastructure required by any given land use. Access factors have in common the fact that they represent a direct outlay by the developer.

ACRE-FOOT: quantity of water required to cover 1 acre to a depth of 1 foot. An acre-foot is equivalent to 43,560 cubic feet or 326,000 gallons.

ADVANCED SEWAGE TREATMENT: waste water treatment beyond the secondary or biological stage; removal of nutrients (phosphorus, nitrogen), residual biochemical oxygen demand and suspended solids.

AMENITY FACTORS: elements of a site's location, or contiguous elements, that enhance the site's value for a particular use. Amenity factors reflect the dollar value that the developer would be willing to pay for the presence of the given amenity.

AREA: More than one location from which a site or a site-type can be chosen for a particular land use.

BASELINE DEVELOPMENT COST: constant that represents the cost of constructing a baseline development on a baseline site type.

BASELINE DEVELOPMENT SIZE: the number of units characteristically built together as a single development.

BASELINE SITE TYPE: site-type with no bonus values and no deficiency costs.

BASELINE UNIT COST: baseline cost of constructing each unit in a baseline development.

BEACH FRONTAGE: location on the sand or pebble-covered shore of a body of water.

BONUS VALUE: amount derived from site factor data category. Bonus value increases the value of the land use.

CHARACTER OF SURROUNDING AREA: nature and quality of places in close proximity to a site.

CLAM: acronym for Coastal Location Acceptability Method, a planning tool developed for New Jersey's Coastal Zone management program. This Development Potential Study is one component of CLAM.

CLAY: fine-grained, natural, earthy material composed primarily of hydrous aluminum silicates.

COMBINED SEWER SYSTEM: sewerage system that carries sanitary sewage and storm water.

DATA CATEGORY: one of the mutually exclusive divisions of data within a data factor. For example, the data factor Access to Railroads has 4 data categories: 0-1, 1-3, 3-5, and 5+ miles.

DATA FACTOR: see Development potential factor.

DEEP FOUNDATION SUITABILITY: ability of geologic materials to support building foundations.

DEFICIENCY COST: amount derived from site factor data that represents additional expense to the developer.

DEVELOPMENT POTENTIAL: capability of an area to be developed for a specific use. In this study, development potential refers to cost considerations, as opposed to environmental and socio-economic factors.

DEVELOPMENT POTENTIAL ANALYSIS: process whereby various locations for a specific land use in a given area are ranked by total cost of development.

DEVELOPMENT POTENTIAL FACTORS: elements or characteristics of the built or natural environment that are required for successful development of a land use, or that are desirable and enhance the attractiveness of a location for development.

DREDGING: removal of soils (mineral deposits) from under water, using the water as a means of transportation for the soils.

DRY MINING: extraction of mineral and rock deposits where deposits are above the water table.

EMBAYMENT: water protected from extremes of wind and wave action.

ELECTRIC POWER TRANSMISSION LINES: distribution network of power lines carrying electric service up to 34,500 volts.

ELECTRIC POWER TRANSMISSION GRID: network of power lines carrying electric service of at least 69 kilovolts (KV).

FACTOR COST SHEET: table presenting the deficiency cost or bonus value of each data category for every development potential factor important to a particular land use.

FACTOR MAP: map that displays each data category of a development potential factor.

FORCE MAIN: pipe that conveys sewage under pressure against the flow of gravity.

GARBAGE: animal and vegetable waste resulting from the handling, preparation, cooking and serving of food.

GRAVEL: fragments of rock worn by the action of wind and/or water, that are larger and coarser than sand. Fragments range in size from 2 millimeters (.079 inch) to 80 millimeters (3 inches).

GROUNDWATER: volume of subsurface water that occupies the zone of saturation. The retention and movement of groundwater are governed by the laws of saturated flow.

INCINERATOR: combustion apparatus in which solid, semi-solid, or gaseous combustible wastes are ignited and burned to carbon dioxide, water vapor, and other gases, and from which the solid residues contain little or no combustible material.

INTERDEPENDENT FACTORS: group of factors whose associated total cost is less than the sum of its individual factor costs due to cost savings accruing during integrated construction.

LOCATION: a site or a site-type.

MAJOR HIGHWAY INTERSECTION: intersection of an arterial and one or more collector roads; intersection of two or more arterial roads; or interchange of a limited access road.

MARINE ACCESS: ability to travel by boat or ship between a location and open water unimpeded by fixed bridges.

MGD: million gallons per day. MGD is usually used to indicate the treatment capacity of a waste water or a municipal drinking water treatment plant.

MINERAL SANDS: mineral and rock fragments derived from pre-existing rocks.

MINOR TIDES: tides of 5 feet or less.

MODAL SPLIT: distribution of traffic volume according to mode of transportation.

ON-SITE AMENITIES: conditions or features on a site that give pleasure or are conducive to material comfort or convenience, e.g., water, vegetation, rolling topography.

OVERBURDEN: material overlying a deposit of useful geologic materials.

PROXIMITY FACTORS: development potential factors whose distance from development of a given land use is important, i.e., a developer would be willing to pay more to be near them.

PUBLIC OPEN SPACE: government-owned undeveloped land and recreation areas.

RECREATION AREAS: locations such as parks and playgrounds which provide opportunities for sport, play, or relaxation.

RESOURCE RECOVERY: reclamation of waste materials.

ROAD, ARTERIAL: major road serving trip lengths and travel densities characteristic of interstate, statewide, or intercounty travel; frequently multi-lane.

ROAD, COLLECTOR: intermediate road linking the local road system to the arterial road system, serving trips of moderate length, at moderate speeds.

ROAD, LOCAL: road primarily providing access to adjacent land, serving trips of short length, at low speeds.

SAND: individual rock or mineral fragments in soils having diameters ranging from .05 to 2.0 millimeters. Most sand grains consist of quartz, but they may have any mineral composition.

SANITARY LANDFILL: method of waste disposal in which refuse is deposited by plan on a specified portion of open land, compacted and then covered by a layer of earth or other suitable covering material.

SECONDARY SEWAGE TREATMENT: waste water treatment beyond primary treatment providing at least 85% removal of biochemical oxygen demand and total suspended solids. The most common method is the activated sludge process.

SEWERAGE: the system of sewers and physical facilities employed to transport, treat, and discharge sewage.

SITE FACTORS: intrinsic physical characteristics of a location, primarily soil and subsoil conditions.

SITE: land area confined by property lines.

SITE-TYPE: land area whose boundaries are defined by a particular combination of data categories from specified development potential factor maps.

SOIL LOAD BEARING CAPACITY: ability of surficial soils to bear building loads.

SOLID WASTE: useless, unused or discarded materials, including solids, liquids, and gases.

TRIP ORIGINS AND DESTINATIONS: starting and ending points of journeys on a transportation facility such as a road or railroad.

TOTAL DEVELOPMENT COST: baseline development cost plus any bonus values and/or deficiency costs.

UNDEVELOPED LAND: land on which there are no structures, or land that can be readily redeveloped.

UNIT OF DEVELOPMENT: smallest element divisible from a land use, e.g., one dwelling unit, a marina, a factory.

WATER TABLE: in unconfined groundwater bodies, upper surface of a zone of saturation.

WET MINING: extraction of mineral and rock deposits that lie below the water table.

References

General

Chiara, Joseph D.E. and L. Koppleman. 1975. Urban Planning and Design Criteria. New York: Van Nostrand Reinhold Company.

Class, Robert Allan and Robert E. Koehler (eds.) 1976. Current Techniques in Architectural Practice. Washington, D.C.: The American Institute of Architects.

Construction Publishing Co. 1979. Building Cost File 1979. New York: Van Nostrond-Reinhold Co.

Cunningham, John T. 1978. This is New Jersey. New Brunswick, NJ: Rutgers University Press.

Goodman, William and Eric Freud (eds.), 1968. Principles and Practices of Urban Planning. Washington, D.C.: International City Managers Association.

Isard, Walter. 1965. Location and Space-Economy. Cambridge. MA: The MIT Press.

Laird, Raymond T., et al. 1979. Quantitative Land-Capability Analysis. Geological Survey. Professional Paper 945. Washington, D.C.: U.S. Government Printing Office.

McGraw-Hill Information Systems Company. 1977. 1977 Dodge Guide to Public Works and Heavy Construction Costs. New York: McGraw-Hill.

McGraw-Hill Information Systems Company. 1978. 1979 Dodge Guide Construction Systems Costs. New York: McGraw-Hill.

McKenzie, S., K. Hess and R. Kull. 1977. Land and Water Use Classification for Use in the New Jersey Coastal Zone Planning Method. Office of Coastal Zone Management, NJDEP.

New Jersey Coastal Area Facility Review Act (CAFRA). Chapter 185, Laws of 1973. N.J.S.A. 13: 19-1 et seq.

New Jersey Office of Historic Preservation 1978. State and National Registers of Historic Places. Trenton: New Jersey Department of Environmental Protection. Division of Parks and Forestry.

New York State Department of Environmental Conservation. 1975. Natural Resource Inventory: A Guide to the Process. Albany: NYSDED.

Office of Coastal Zone Management. 1978. A Method of Coastal Resource Management: A Pilot Study of Lower Cape May County. Trenton: Department of Environmental Protection.

Olsson, C., 1965. Distance and Human Interaction. Bibliography Series, No. 2. Philadelphia: Regional Science Institute.

Rand McNally. 1972. Standard Reference Map and Guide of New Jersey. New York: Rand McNally and Company.

Robert Snow Means Co. 1978. Building Construction Cost Data 1978. Duxburg, MA: Robert Snow Means Co.

Rogers and Golden. 1978. Maryland Major Facilities Study: Regional Screening and Conflict Resolution. Philadelphia: Rogers and Golden.

Tourbier, J., R.W. Pierson, S. McKenzie, et al. 1976. The Coastal Zone of Delaware: A Method for the Allocation of Land and Water Uses. Philadelphia: University of Pennsylvania, the Center for Ecological Research in Planning and Design.

Urban Systems Research & Engineering, Inc. 1976. The Growth Shapers: The Land Use Impacts of Infrastructure Investments. Washington, DC: Council on Environmental Quality.

Housing

Allen, Muriel. 1968. New Communities: Challenge for Today. Washington, DC: American Institute of Planners

Gascoyne, Paul. 1979. Director of Residential Consumer Services, Jersey Central Power & Light Company, Morristown, New Jersey. Personal communication.

Huntoon, M.C. 1971. P.U.D.: A Better Way for the Suburbs. Washington, DC: Urban Land Institute.

Institute of Rational Design. 1973. Manual: Design and Control of Land Development in Suburban Communities. New York.

Land Design/Research, Inc. 1976. Cost Effective Site Planning: Single Family Development. Washington, D.C.: National Association of Home Builders.

McKeever, J.R. 1974. Apartment Development: A Strategy for Successful Decision Making. Washington, DC: Urban Land Institute.

Real Estate Research Corporation. 1974. The Costs of Sprawl: Environmental and Economic Costs of Alternative Residential Development Patterns at the Urban Fringe. Washington, DC: CEQ, HUD, EPA.

Saylor, Lee. 1979. Current Construction Costs. Walnut Creek, CA: Lee Saylor, Inc.

Urban Land Institute. 1978. Residential Development Handbook (Community Builders Handbook Series). Washington, DC

Witherspoon, R.E., et al. 1976. Mixed-Use Developments: New Ways of Land Use. Washington, DC: Gladstone Associates for Urban Land Institute

Commerce And Service

Barton-Aschman Associates, Inc. 1977. "Parking Demand at the Regionals." Urban Land, 36 (5), May 1977: 3-11.

Bell, Curtis C. 1975. Shopping Center Development Guide. Washington, DC: National Association of Home Builders

Bessire, Howard D. 1970. The Practice of Industrial Development. El Paso: Hill Printing Company.

Howard, Dick, ed. 1972. Guide to Industrial Development. Englewood Cliffs, N.J.: Prentice-Hall.

International Council of Shopping Centers. 1965. Enclosed Mall Shopping Centers. New York.

Lapidus, Alan. 1979. Architect, New York, New York. Personal Communication.

Lion, Edgar. 1976. Shopping Centers: Planning, Development and Administration. New York: John Wiley & Sons.

Mills, Kim. 1979. American Hotel and Motel Association, New York, New York. Personal communication.

Peters, C.H. 1978. Pre-opening marketing analysis for hotels. Cornell Hotel and Restaurant Administration Quarterly, 19(1), May 1978: 15-22.

Trifari, Richard. 1979. Director, Hotel Association of New Jersey. Tenafly, New Jersey. Personal Communication.

Urban Land Institute. 1975. Industrial Development Handbook (Community Builders Handbook Series). Washington, DC

Urban Land Institute. 1977. Shopping Center Development Handbook (Community Builders Handbook Series). Washington, DC

Witherspoon, R.E., et al. 1976. Mixed-Use Developments: New Ways of Land Use. Washington, DC: Gladstone Associates for Urban Land Institute.

Yareen, Leonard C. 1960. Plant Location. Revised edition. New York: American Research Council.

Young, Toni. 1979. Leventhal-Horwath. Philadelphia, Pennsylvania. Personal communication.

Industrial

Bauer, Anthony M. 1965. Simultaneous Excavation and Rehabilitation of Sand and Gravel Sites. Silver Spring, MD: National Sand and Gravel Association.

Conway, H.M. and L.L. Linton. 1976. Industrial Facilities Planning. Atlanta, Ga.: Conway Publication Inc.

Delaware State Planning Office. 1974. Local Impact and Requirements of Manufacturing Industries. Dover, Delaware.

Greenberg, Michael R., et al, 1979. A Primer on Industrial Environmental Impact. Piscataway, NJ: Rutgers University, The Center for Urban Policy Research.

Harper, Dave. 1979. New Jersey Department of Environmental Protection, Bureau of Geology. Personal Communication.

Hess, Kenneth. 1977. Upland Mineral Resources and the Coast: A Staff Working Paper. Trenton, NJ: New Jersey Department of Environmental Protection. Division of Marine Services, Office of Coastal Zone Management.

Industrial Location Service, EDA. 1978. Vineland, Bridgeton and Millville, NJ.

New Jersey Bureau of Operation Statistics and Reports, Division of Planning and Research. 1979. Computer search.

Urban Land Institute. 1975. Industrial Development Handbook (Community Builders Handbook Series). Washington, DC

U.S. Bureau of the Budget. 1972. Standard Industrial Classification Manual. Washington, DC: U.S. Government Printing Office.

U.S. Department of Commerce, Economic Development Administration. 1973. Industrial Location Determinants 1971-1975. Washington, DC

United States Department of the Interior. 1977. Mineral Yearbook, Volume III, Area Reports: Domestic. Washington, D.C.: U.S. Government Printing Office.

Infrastructure

American Society of Civil Engineers. 1971. Airports: Key to Air Transportation System. New York.

Antoniou, Jim. 1971. Environmental Management: Planning for Traffic. New York: McGraw-Hill Book Company.

Birgeles, Joseph. 1979. Supervising Transportation Planner, Port Authority of New York and New Jersey, New York, New York. Personal communication.

New Jersey Department of Transportation. 1972. A Master Plan for Transportation. Trenton.

New Jersey Department of Transportation. 1977. New Jersey State Airport System Plan: 1975 Summary Report. Trenton.

Paquette, Radnor J., et al. 1972. Transportation Engineering: Planning and Design. New York: Ronald Press.

Robinson, John. 1971. Highways and Our Environment. New York: McGraw-Hill Book Company.

U.S. Department of Transportation. 1971. National Transportation Planning Manual 1970-1990. Washington, DC: U.S. Government Printing Office.

U.S. Department of Transportation, Federal Highway Administration. 1974. Highway Functional Classification: Concepts, Criteria and Procedures. Transmittal 155, Volume 20, Appendix 12. Washington, DC: U.S. Government Printing Office.

Weiner, Paul and Edward J. Deak. 1972. Environmental Factors in Transportation Planning. Lexington, MA: Health Books.

Whiteneck, L.L., John S. Wilson, et al. 1973. Port Planning Design and Construction, Washington, D.C.: The American Association of Port Authorities.

Utilities

American Public Works Association. 1961. Municipal Refuse Disposal. Public Administration Service.

Collucci, Carmen. 1979. Director of Engineering, New Jersey Public Broadcasting Authority, Trenton. Person Communication.

Dames & Moore. 1978. Analysis of Operations and Maintenance Costs for Municipal Wastewater Treatment Systems. US Environmental Protection Agency.

Dames & Moore. 1978. Construction Costs for Municipal Wastewater Treatment Plants: 1973-1977. US Environmental Protection Agency.

Dames and Moore. 1978. Power Plant Site Selection Study for Delmarva Power and Light Company. Cranford, NJ.

Goodland, Robert, ed. 1973. Power Lines and the Environment. Millbrook, NY: Cary Arboretum.

Klem, Nick. 1979. Atlantic City Electric Company. Personal Communication.

Miller, Stanton S. 1973. Solid Wastes - II. American Chemical Society.

Mortens, James H. 1956. Industrial Sands of New Jersey. Rutgers University, Bureau of Mineral Research.

Greenberg, Michael R. and Robert M. Hardau. 1976. Water Supply Planning: A Case Study and Systems Analysis. Piscataway, NJ: Rutgers University, The Center for Urban Policy Research.

National Academy of Sciences. 1975. Mineral Resources and the Environment: Resource Recovery from Municipal Solid Waste. Washington, DC: National Research Council.

National Association of Home Builders. 1974. Land Development Manual. Washington, DC.

National Center for Resource Recovery. 1974. Santitary Landfill: A State-of-the-Art Study. Lexington, MA: Lexington Books.

Research and Education Association. 1978. Modern Pollution Control Technology. New York.

Ross, R.D. 1968. Industrial Waste Disposal. Van Nostrand Reinhold.

"Solid Waste: Asset or Liability?" 1979. Consulting Engineer, March.

"Solid Waste Treatment and Disposal." 1979. Chemical Engineering, 86 (3), January 29.

Tabors, Richard, Michael Shapiro and Peter Rogers. 1976. Land Use and the Pipe. Lexington, MA: Lexington Books.

Thomas, L.J. An Introduction to Mining: Exploration, Feasibility, Extraction, Rock Mechanics.

Tourbier, J. and R. W. Pierson, Jr., eds. 1976. Biological Control of Water Pollution. Philadelphia: University of Pennsylvania Press.

Weiss, Samuel. 1974. Sanitary Landfill Technology. Noyes Data Corporation.

Harvest

Bonsall, Susan. 1977. The Fishing Industry in New Jersey. Coastal Notes No. R-4. Center for Coastal and Environmental Studies, Rutgers University. New Brunswick, N.J. in cooperation with NJDEP Office of Coastal Zone Management. Trenton, New Jersey.

Brown, Bernard G. 1979. Governor's Office of Policy and Planning, Trenton, New Jersey. Personal communication.

Ferguson, R.H. and C.E. Mayer. 1974. Timber Resources of New Jersey. USDA Forest Service Resource Bulletin NE-34.

Figley, W.M. 1976. Fisherman Access In New Jersey's Marine Environment. N.J.D.E.P. Bureau of Fisheries. Nacote Creek Res. Stat.

Glaser, Sidney. 1978. Tenth Report of Data from FA-1 Farms for 1978 Tax Year: Farmland Assessment Act of 1964. Trenton, NJ: Division of Taxation.

Kantor, Richard A. 1977. Ocean Resources: Living, A Staff Working Paper. NJDEP. Office of Coastal Zone Management. Trenton, New Jersey.

Kantor, Richard A. 1977. Estuarine and Wetland Resources: Staff working paper. NJDEP. Office of Coastal Zone Management. Trenton, New Jersey.

Kirkham, Wendell. 1979. Soil Conservation Service, Somerset, New Jersey. Personal communication.

Koch, Dr. A. Robert. 1979. Department of Agricultural Economics, Cook College, Rutgers University. New Brunswick, New Jersey. Personal communication.

Mahn, Fred. 1979. District Conservationist, USDA Soil Conservation Service, Mount Holly, New Jersey. Personal communication.

Marucci, Philip. 1979. New Jersey Agricultural Experiment Station, Rutgers University, New Brunswick, New Jersey. Personal communication.

New Jersey Bureau of Forestry. N.d. New Jersey's Forest Resources--Present and Future Trenton.

O'Brien, Thomas. 1979. Department of Environmental Protection, Division of Fish, Game and Shellfisheries, Trenton, New Jersey. Personal communication.

Perry, John E. 1979. Regional Forester, Burlington and Ocean Counties, New Jersey Bureau of Forestry, Lanoka Harbor, New Jersey. Personal communication.

Pyle, L. B. 1979. New Jersey Department of Environmental Protection, Bureau of Fisheries, Trenton, New Jersey. Personal communication.

Samulis, Ray. 1979. County Agricultural Agent, Burlington County. Mount Holly, New Jersey. Personal communication.

Smith, Norman. 1979. County Agricultural Agent. Cumberland County, Bridgeton, New Jersey. Personal communication.

The State Farmland Evaluation Advisory Committee. 1978. The Fifteenth Report of the State Farmland Evaluation Advisory Committee. Trenton, NJ: Division of Taxation. Local Property and Public Utility Branch.

Stretch, Dr. Allan. 1979. Plant Pathologist, USDA, Cook College, Rutgers University, New Brunswick, New Jersey. Personal communication.

Thatch, Daymon W. and Sharon D. Foss. 1976. New Jersey Agricultural Transportation Study. New Brunswick: Rutgers.

U.S. Department of Agriculture, Soil Conservation Service. 1971. Soil Survey of Burlington County, New Jersey. Washington, DC

U.S. Department of Agriculture, Soil Conservation Service. 1978. National Soils Handbook Notice 31. Washington, DC

Waldman, Mike. 1979. Department of Environmental Protection, Division of Fish, Game and Shellfisheries, Trenton, New Jersey. Personal communication.

Washer, Richard. 1979. Senior County Agricultural Agent, Burlington County, Mount Holly, New Jersey. Personal communication.

Recreation

Beil, J. and Hazel F. Clark. 1978. What to Do in New Jersey. Chappaqua, NY; What to Do County Publications, Inc.

Bullard, W.E. 1974. Water Related Land Use Planning Guidelines. Bethesda, MD: Interstate Commission on the Potomac River Basin.

Cape May County Planning Board. N.d. Campground Study. Cape May Court House.

Chubb, Michael and Eric Bauman. 1976. The RIVERS Method: A Piolet Study of River Recreation Potential Assessment. :Michigan State University

Dattner, Richard. 1969. Design for Play. Cambridge, Mass: MIT Press.

Ducsik, Dennis W. 1974. Shoreline for the Public: A Handbook of Social, Economic and Legal Considerations. Cambridge: MIT Press.

Jones, R.L. and G.L. Rando. 1974. Golf Course Development. Technical Bulletin 70. Washington, DC: Urban Land Institute.

Lilton, Burton, and Robert Tetlaw. 1974. Water and the Landscape. Port Washington, NY: Water Information Center.

New Jersey Department of Environmental Protection, Green Acres Program. 1977. Statewide Comprehensive Outdoor Recreation Plan. Trenton.

New Jersey Department of Environmental Protection, Office of Environmental Review. 1973. Outdoor Recreation in New Jersey: New Jersey Statewide Comprehensive Outdoor Recreation Plan. Trenton.

New Jersey Department of Labor and Industry. 1978. A Listing of New Jersey Campsites. Trenton: Division of Travel and Tourism.

New Jersey Division of Travel and Tourism. 1978. Boat Basins in New Jersey. Trenton.

New Jersey Division of Travel and Tourism. 1978. A Listing of New Jersey Campsites. Trenton.

Rand McNally and Company. 1978. Mobile Travel Guide: Middle Atlantic States. Chicago: Rand McNally Travel Research Center.

Urban Research and Development Corporation. 1977. An Approach to Identifying and Evaluating Natural Recreation Resources. Washington, DC: Department of the Interior - Heritage Conservation and Recreation Service.

U.S. Departments of the Army, Navy and Air Force. 1975. Planning and Design of Outdoor Sports Facilities. Washington, DC: U.S. Government Printing Office.

U.S. Department of the Interior, Bureau of Outdoor Recreation. 1977. National Urban Recreation Study: Philadelphia, Wilmington, Trenton. Denver: National Park Service.

United States Golf Association. 1969. Golf Committee Manual and USGA Golf Handicap System. U.S. Golf Association, New York.

Whitaker, Ben and Kenneth Browne. 1973. Parks for People. New York: Schocken.

Credits

COVER DESIGN: Sandy Dechert

PHOTOGRAPHS:
Joanne Jackson (Rogers & Golden)
20, 24, 40, 124, 192, 204
John Rogers (Rogers & Golden)
22, 26, 28, 32, 38, 92, 100
John Monroe (Jack McCormick & Associates)
30, 36, 42, 44, 58, 62, 64, 66, 68, 70, 76, 78, 80, 82, 86, 88, 94, 96, 98, 102, 112, 114, 116, 118, 120
New Jersey Department of Transportation
72
Princeton Nurseries (1974)
90
Urban Land Institute, Environmental Comment
108, 122
Golf Magazine, September 1979
110

SITE PLANS:
G. Hossein Oliai, Rogers & Golden
20
Land Design Research, Inc., 1976
22, 24, 26
Mobile Home Manufacturers Assoc., Land Development Division
30
Carl Massara and Associates, 1974
32
Urban Land Institute, 1977
36, 42
Land Subdivision Regulations, Housing and Home Finance Agency, Washington, D.C.
38
Guidelines for New Systems of Urban Transportation, Vol. 1, Urban Needs and Potentials, Barton Aschman Assoc., Inc., 1968
40
Policy of Arterial Highways in Urban Areas, American Association of State Highway Officials, Washington, D.C., 1960
64
American Association of Port Authorities, Port Planning Design and Construction, 1973
68, 70, 102
Small Airports, Federal Aviation Agency
72
Drainage of Agricultural Land, Soil Conservation Service, USDA Water Information Center, Inc. Port Washington, N.Y., 1976
86
DeChiara and Koppelman, 1975
108
Ira B. Lykes, National Park Service, USDI in DeChiara and Koppelman, 1975
114
Park and Recreation Structures, Part III, Overnight and Organized Camp Facilities, Albert H. Good, USDI-NPS, 1938
116
Frederick Law Olmsted, 1891
118
Roy Mann Associates, Long Island Sound Study
124