

101
652
(1949)

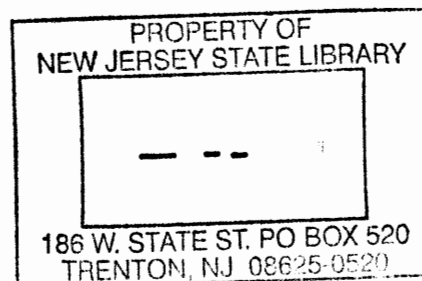
REPORT

ON THE

PROTECTION AND PRESERVATION OF THE NEW JERSEY BEACHES AND SHOREFRONT

BY THE

State Beach Erosion Commission



REPORT
TO
GOVERNOR ALFRED E. DRISCOLL
AND THE
LEGISLATURE
OF THE
STATE OF NEW JERSEY
ON THE
**Protection and Preservation of the New Jersey
Beaches and Shorefront**
BY THE
STATE BEACH EROSION COMMISSION

J. STANLEY HERBERT, *Chairman*
Senator from Monmouth County

ANDREW HENRY, *Vice-Chairman*

WALTER A. KEPPLER, *Secretary*

FRANK S. FARLEY
Senator from Atlantic County

GEORGE A. REDDING
Senator from Cape May County

MERRILL H. THOMPSON
Assemblyman from Monmouth County

JAMES F. FRASER
Assemblyman from Atlantic County

NATHANIEL C. SMITH
Assemblyman from Cape May County

WILLIAM M. BIRTWELL

JANUARY 14, 1949

STATE OF NEW JERSEY
BEACH EROSION COMMISSION



January 17, 1949.

To GOVERNOR ALFRED E. DRISCOLL and the LEGISLATURE of
the State of New Jersey:

This report is submitted in conformity with Joint Resolution No. 9, P. L. 1948, which created this Beach Erosion Commission and authorized it to investigate and study the subject of the protection and preservation of the beaches and shorefront of the State from erosion and other damage from the elements and to report its findings and recommendations to the Governor and the Legislature of New Jersey.

The Commission organized at its first meeting October 19, 1948, and discussed the aims and procedures which best would serve its assigned functions. It was apparent immediately that the protection and preservation of the beaches and shorefront, generally known as coast protection, was too broad a subject to be investigated fully in the time available before the next legislative session. It was decided to prepare an interim report generally confined to current activities and conditions and to recommend continuance of the Commission to permit full study and recommendations suitable as bases for future State policy and guidance.

This report, therefore, deals primarily with the immediate problems of coast protection in New Jersey and introduces general items for discussion leading to better understanding of the subject as preliminary to a more complete future study and report.

Commission Hearings

Hearings and consultations were held in November with shorefront municipal officials and engineers to obtain first hand data on current erosion problems which will have to be met and solved during the coming year and to receive municipal views in general on coast protection.

This was in accord with the existing statutes* governing State-aid for coast protection which require that applications for aid shall originate with the individual municipality and limit such aid to an amount equal to the available municipal funds. The extent of property damage, rate of land erosion, or the degree of emergency are considered only after the municipality has made application for aid and indicated its ability to match State-aid funds.

In the course of these meetings it became clear that substantial State-aid funds would be required during the next fiscal year to match municipal funds if all reported emergency work was to be accomplished. Since the Governor's budget message was then in preparation, a rapid survey was made of the estimated municipal funds available during 1949 as reported by municipal officials. The total of amounts thus obtained was \$2,162,500.00. With the consent of State Budget Director J. Lindsay de Valliere, a list of the municipalities and corresponding amounts was transmitted for the consideration of Governor Alfred E. Driscoll in preparing his budget recommendations for 1949. Under the equal matching formula in existing statutes, the total estimated cost of projects planned for execution in 1949 by shorefront municipalities would be double this amount of local funds or \$4,325,000.00.

* Printed in Appendix.

Municipalities Reporting

Not all of the shorefront municipalities reported at the hearings on the coast protection work envisioned for the immediate execution. To provide a basis for more detailed study in the future, however, all municipalities are included in this report whose shorefront is subject to erosion. This classification is essentially in keeping with the geographical location of shorefronts which are eligible for State-aid. The State's interest in coast protection is defined by statutes as the repair and prevention of damage caused by erosion and storm to the beaches and abutting upland of counties which front on the Atlantic Ocean, Delaware Bay, and Delaware River.

The eligible shorefront includes the coastline from Sandy Hook to Cape May in Monmouth, Ocean, Atlantic and Cape May Counties; the Delaware Bay and river shoreline in Cape May, Cumberland and Salem Counties; but omits the Raritan Bay and Sandy Hook shoreline in Monmouth and Middlesex Counties. The latter condition should be rectified by clarifying amendment to existing statutes. The status of Gloucester, Camden, Burlington, and Mercer Counties, which front on the tidal section of Delaware River, has not been determined. It should be defined specifically by future acts after a study of the effect on other tidal rivers and the possible overlapping into the field of flood and river control.

In outline form the counties from which municipalities report need of coast protection and the related shoreline are:

<i>County</i>	<i>Shoreline</i>
Monmouth	{ Raritan Bay
	{ Sandy Hook Bay
	{ Atlantic Ocean
Ocean	Atlantic Ocean
Atlantic	Atlantic Ocean
Cape May	{ Atlantic Ocean
	{ Delaware Bay
Cumberland	Delaware Bay

In addition to the general shorelines defined in the foregoing table, the statutes include the shorelines of ocean inlets and of inland waters adjacent to such inlets.

The shorefront municipalities of the above five counties are listed in the following table in geographical order north to south. The approximate shorefront of each is given in miles to indicate the extent of municipal frontage. Federal properties at Sandy Hook and Cape May City also are included.

MONMOUTH COUNTY		
List No.	Municipality	Frontage Miles
RARITAN BAY		
1	Matawan Twp.	2.0
2	Keyport Boro.	1.7
3	Union Beach Boro.	3.0
4	Raritan Twp.	0.2
SANDY HOOK BAY		
5	Keansburg Boro.	2.0
6	Middletown Twp.	4.5
7	Atlantic Highlands Boro.	2.8
8	Highlands Boro.	1.4
9	Fort Hancock (Federal)	11.0
ATLANTIC OCEAN		
10	Seabright Boro.	3.7
11	Monmouth Beach Boro.	1.7
12	Long Branch City	4.4
13	Deal Boro.	1.6
14	Allenhurst Boro.	0.3
15	Ocean Twp.	0.2
16	Asbury Park City	0.9
17	Neptune Twp.	0.6
18	Bradley Beach Boro.	0.9
19	Avon-by-the-Sea Boro.	0.5
20	Belmar Boro.	1.4
21	Spring Lake Boro.	2.1
22	Sea Girt Boro.	1.4
23	Manasquan Boro.	1.0

OCEAN COUNTY

List No.	Municipality	Frontage Miles
ATLANTIC OCEAN		
24	Point Pleasant Beach Boro.	1.8
25	Bayhead Boro.	1.3
26	Mantoloking Boro.	2.1
27	Brick Twp.	1.0
28	Dover Twp.	3.4
29	Lavallette Boro.	1.2
30	Seaside Heights Boro.	0.7
31	Seaside Park Boro.	1.7
32	Island Beach Boro.	10.1
33	Barnegat City Boro.	2.0
34	Long Beach Twp.	9.6
35	Harvey Cedars Boro.	1.9
36	Surf City Boro.	1.8
37	Ship Bottom-Beach Arlington Boro.	1.4
38	Beach Haven Boro.	1.9

ATLANTIC COUNTY

ATLANTIC OCEAN		
39	Galloway Twp.	3.2
40	Brigantine City	6.6
41	Atlantic City	4.2
42	Ventnor City	1.6
43	Margate City	1.7
44	Longport Boro.	1.6

CAPE MAY COUNTY

ATLANTIC OCEAN		
45	Ocean City	7.6
46	Upper Twp.	2.0
47	Sea Isle City	4.9
48	Avalon Boro.	4.8
49	Stone Harbor Boro.	2.8
50	North Wildwood City	3.2
51	Wildwood City	1.4
52	Wildwood Crest Boro.	1.8
53	Cape May Coast Guard Base (Federal)	0.9
54	Cape May City	3.1
55	Cape May Pt. Boro.	1.1
DELAWARE BAY		
56	Lower Twp.	6.3
57	North Cape May Boro.	1.0
58	Middle Twp.	9.0
59	Dennis Twp.	1.2

CUMBERLAND COUNTY

List No.	Municipality	Frontage Miles
DELAWARE BAY		
60	Maurice River Twp.	6.5
61	Commercial Twp.	3.5
62	Downe Twp.	12.0
63	Lawrence Twp.	3.0
64	Fairfield Twp.	6.0
65	Greenwich Twp.	4.0

Summary

In summary there are: 4 municipalities fronting for 6.9 miles on Raritan Bay; 4 municipalities fronting for 10.7 miles on Sandy Hook Bay; 45 municipalities fronting for 113.8 miles on Atlantic Ocean; 10 municipalities fronting for 52.5 miles on Delaware Bay; or total of 63 municipalities with frontage of 183.9 miles. In addition there are two Federal properties, Fort Hancock at Sandy Hook and the Cape May Coast Guard Base, which total 11.9 miles frontage. The State Encampment at Sea Girt with a frontage of 0.4 is included with the municipality. The total frontage is 195.8 miles.

The large number of municipalities involved indicates the need for enlargement of this Commission to permit greater division of the future work required to study the needs of each municipality. It is believed that the membership should be increased to twelve.

In the geographical order and numbering of the foregoing list, the reports of individual municipalities are briefed to indicate the current extent of the coast protection problem. The types of coast protection structures mentioned in the municipal reports are seawalls, bulkheads, jetties, and groins. Seawalls and bulkheads are built along and parallel to the shorefront as protection against heavy storm wave action. Seawalls are usually massive quarry stone walls. Bulkheads are usually timber walls anchored at the rear. Jetties and groins are built generally at right angles to the shorefront so as to collect sand. Groins are usually shorter timber or steel walls. Jetties are longer, massive structures built of large quarry stone.

MUNICIPAL REPORTS

MONMOUTH COUNTY

1. *Matawan Township* on Raritan Bay:

The principal shorefront is known as Cliffwood Beach. Erosion in recent years has developed to an extent creating concern on the part of both the landowners directly affected and municipal officials. During the past 18 months more than 15 feet has been lost from the face of the bay front bluffs. Some dwellings are now only 15 feet rearward of the receding bluff edge. The municipal officials describe 1,100 feet frontage as most serious and cite probable loss of the marginal street. Neither physical survey or estimate of local funds are available. The estimated cost of protection reported is \$100,000.00.

2. *Keyport Borough* on Raritan Bay:

Keyport reports its shorefront between Chingarora Creek on the east and Matawan Creek on the west as badly in need of coast protection. No official proposal for such work has been prepared, but the borough is interested in development of a suitable plan and believes it can finance its share of the construction cost over a period of several years.

3. *Union Beach Borough* on Raritan Bay:

Erosion of the low shorefront bluff has been noted for several years past. No municipal report was received.

4. *Raritan Township* on Raritan Bay:

Other than storm damage no reports on beach losses have been received. The municipal attitude and possible future plans are not known.

5. *Keansburg Borough* on Sandy Hook Bay:

The entire 2-mile bay front bears the scars of storm and erosion damage. Planning should cover the entire frontage although execution of the work will require several years to fit municipal finances. The central developed frontage should receive first consideration. As far as possible, protective measures should aid development of beach-front recreational areas in keeping with summer demand. Municipal officials have hazarded \$100,000.00 as the cost of total protection and propose construction in 1949 to cost \$35,000.00. This emergency work as proposed includes a new 200-foot groin and about 1,000 feet of bulkhead.

6. *Middletown Township* on Sandy Hook Bay:

With the exception of the grassed meadow frontage east of Compton Creek, erosion has taken place along the whole township frontage on Sandy Hook Bay. Much of the beach frontage has been bulkheaded and groined for protection and beach building. Material dredged from the entrance channel to Leonardo Harbor was used as beach-fill to fill the adjacent groined frontage. The resulting beach has had marked success and may popularize beach-filling as an adjunct to groin and bulkhead protection along the bayfront. The Commercial Fishing Industry occupies extensive bay frontage at Compton Creek. The Navy Ammunition Depot at Leonardo has relatively small bay exposure and has not been listed separately as Federally owned frontage. Township officials did not describe prospective work.

7. *Atlantic Highlands Borough* on Sandy Hook Bay:

A substantial portion of the shoreline is occupied by the Atlantic Highlands Yacht Basin and the reveted marginal railroad right-of-way. No information has been received on future municipal plans for shore protection or beach development.

8. *Highlands Borough* on Sandy Hook Bay:

Located at the junction of Sandy Hook Bay and the Shrewsbury River, the borough shorefront varies from bay-front beach to bulkheaded river embankment. Disposal of dredged sand from Federal river channel improvements on the bay beaches has been distinctly beneficial. Deterioration of riverfront bulkheads recently aroused local discussion of maintenance and replacement of such protective structures. Municipal aims were not reported.

9. *Fort Hancock*

Fort Hancock is Federal property and occupies Sandy Hook Peninsula with exposure both along Sandy Hook Bay and the ocean. Extensive coast protection structures have been built along both the bay and ocean frontages. It has been necessary to guard against ocean breeches through the narrow peninsula which would isolate the military establishment. Beach and upland erosion losses, if unchecked, would also curtail valuable space and threaten the security of permanent military installations. Possible reduction in the area required for military use has encouraged the idea of a public seashore part at Spermaceti Cove where the peninsula widens north of the Fort entrance. Shrewsbury River navigation interests, also, have proposed an Inlet through the narrow land barrier just north of the Fort entrance to obviate the run around Sandy Hook. The future development and protection of Fort Hancock rests with the Federal Government.

10. *Seabright Borough* on Atlantic Ocean:

Seabright extends for 3.7 miles along the very narrow land barrier between the ocean and the Shrewsbury River. Constant vigilance has been necessary to prevent cutting through of ocean inlets and narrowing of the scanty land width. Oceanfront seawalls and bulkheads stretch almost continuously along the beachfront and provide the only defense against such disaster.

Past loss of oceanfront lands and buildings not only reduced the land width but also destroyed important sources of tax revenue sorely needed to finance further protection. The future coast protection required will include repair and enlargement of the seawall and bulkhead barrier and the creation of frontal beach protection through extension of existing jetties, additional new jetties, and beachfilling. Borough officials class all work as emergency and stress the precarious situation in the Low Moor section at the south end. The immensity of the coast protection problem facing the borough contrasted with its small tax resources has led to hesitancy in projecting an estimated total future cost. The borough has reported its available funds for immediate use as \$10,000.00.

11. *Monmouth Beach Borough* on Atlantic Ocean:

Monmouth Beach has constructed extensive protective works in the past, but there has been little activity in recent years. The borough reports that work is needed but financial resources are lacking. Required construction and repair of jetties is estimated at \$250,000.00. Bulkheading and beachfill have been discussed but not specifically in terms of locations and quantities.

12. *Long Branch City* on Atlantic Ocean:

Long Branch has the longest oceanfront among the Monmouth County municipalities. Physical differences divide it into four sections each with individual characteristics. At the north end for about a mile, there are open, sloping beaches fronted by low water bars which are cut by shallow sloughs. Other than a few minor groins imbedded in the upper beach, the only jetties are two at the northerly end. These jetties were constructed to fill and control a former deeply eroded beach.

The central boardwalk section fronts the northerly end of the Monmouth County headland bluffs which extend south to Asbury Park. Bulkheads along this frontage vary in condition from poor to fair. Jetties have been installed

almost continuously along this section and form the principal defense. In addition to support and protection of the ocean bluff or bank, planning must include security for the boardwalk and Ocean Avenue which are adjacent and parallel. Widening the existing beach is basic for creation of working space as well as defense against storms.

The West End section extends south from the boardwalk to Lake Takanassee. It is partially bulkheaded. The prominent feature is the open, ocean-gouged, bluffs without bulkhead protection. Continuous jetty protection has been built with landward ends butted into the existing bulkheads and bluff faces.

The Elberon section completes the city frontage. It formerly was similar to West End as it is today. In recent years a continuous bulkhead enclosed the entire frontage and protective jetties were built.

The city anticipates a five-year construction program estimated to total \$5,133,000.00. The work is described as completion of bulkheading in the Boardwalk and West End sections; the construction of additional jetties; and extension of existing jetties. During the current year, the city proposes execution of \$400,000.00 of the programmed work.

13. *Deal Borough* on Atlantic Ocean:

The Monmouth County bluffs continue through Deal requiring high, continuous bulkheading. At several locations, extensive sections of storm-damaged bulkhead have not been replaced thus permitting deep, ocean-cut indentations of the bluff. Jetties are spaced across the frontage. Several are in need of repairs and reconstruction. Additional jetties are contemplated to improve and balance the jetty grouping. Current work being planned is estimated at \$200,000.00.

14. *Allenhurst Borough* on Atlantic Ocean:

Allenhurst is at the southerly extremity of the Monmouth County bluffs. The whole frontage is enclosed by seawalls or bulkhead. Principal interest is in repairs to existing

jetties. The projected cost is estimated at \$150,000.00. The borough plans \$80,000.00 of construction this year.

15. *Ocean Township* on Atlantic Ocean:

The Ocean Township oceanfront is usually known as Loch Arbour. Existing groins are in poor condition and recently have not functioned materially to preserve the beach. Sand fill dredged from adjoining Deal Lake early in 1948 has substantially improved the beach. No work is planned this year.

16. *Asbury Park City* on Atlantic Ocean:

Asbury Park's beach is founded upon four major jetties spaced along its one-mile frontage. The width of accumulated beach places only secondary reliance on bulkheads. Repairs to these jetties are estimated at \$290,000.00. A related coast protection problem is the control of run-off from the artificially closed inlets at Deal Lake and Wesley Lake. Outfall construction and repairs are estimated at \$85,000.00. The total cost of proposed work is \$375,000.00 of which \$140,000.00 is planned this year.

17. *Neptune Township* on Atlantic Ocean:

The oceanfront of Neptune Township is known as Ocean Grove. The entire frontage is bulkheaded. A narrow, minimum beach has been maintained by short timber groins. The township proposes the construction of two major stone jetties to provide a wider beach to protect the bulkhead and upland improvements. The estimated cost for the two jetties is \$200,000.00. Both are proposed for construction this year.

18. *Bradley Beach Borough* on Atlantic Ocean:

Bradley Beach is encouraging the development of a wide protective beach supported by a series of major jetties. This is in contrast to the former narrow beach dependent upon short timber groins. The borough advances \$160,000.00 as projected cost of new jetty construction and

repairs. Work is planned this year to cost \$60,000.00. No report was made on need for bulkheading.

19. *Avon-by-the-Sea Borough* on Atlantic Ocean:

Avon-by-the-Sea has bulkheaded its entire oceanfront and constructed a series of major jetties. Local planning is confined to reconstruction and extension of existing jetties. The estimated cost is \$125,000.00. The work is planned for construction this year. The borough's most critical problem, the accumulation of beach on the north or lee side of Shark River Inlet, appears to be solved as an adjunct to Federal Government dredged Shark River Inlet and river and deposited the sand on the borough beach. In the summer of 1948, the State, as part of the new inlet north jetty, constructed a protective spur parallel and off-shore of the beach to encourage sand accumulation and provide shore protection along the critical frontage at the inshore end of the jetty.

20. *Belmar Borough* on Atlantic Ocean:

Belmar has a substantial beach protected by widely spaced major jetties. The narrowest beach is at the south end. Proposed work covers only repair of existing jetties to cost \$150,000.00. This work is planned for this year. Plans have not been advanced for the protection of the south end beachfront although damage to Ocean Avenue is strongly possible.

21. *Spring Lake Borough* on Atlantic Ocean:

Spring Lake has maintained a fairly wide beach based on timber groins except at the north and south ends. In both of these locations bulkheads and additional timber groins are needed to protect Ocean Avenue. The north end in particular, which joins the weakest Belmar Beach, needs attention. The borough plans to start construction of protective bulkheads this year at an estimated cost of \$200,000.00.

22. *Sea Girt Borough* on Atlantic Ocean:

The north end of the Sea Girt beach is in good condition but the central and southerly end is very poor except in front of the State Encampment. Damage to borough property has occurred and may easily become extensive. The borough plans construction of groins this year estimated to cost \$240,000.00. The State Encampment is protected by substantial beaches created by four jetties spaced along its frontage.

23. *Manasquan Borough* on Atlantic Ocean:

Manasquan experienced severe beach loss following the construction of the Manasquan Inlet jetties in 1930-31. By extensive groin and jetty construction, the beach has been restored. The borough's present aims are to protect individual weak beach sections and to maintain the groins and jetties in good condition. The total future expenditure is estimated at \$400,000.00. Work proposed this year is estimated at \$100,000.00.

OCEAN COUNTY

24. *Point Pleasant Beach Borough* on Atlantic Ocean

25. *Bayhead Borough* on Atlantic Ocean

26. *Mantoloking Borough* on Atlantic Ocean

27. *Brick Township* on Atlantic Ocean

28. *Dover Township* on Atlantic Ocean

29. *Lavallette Borough* on Atlantic Ocean

30. *Seaside Heights Borough* on Atlantic Ocean

31. *Seaside Park Borough* on Atlantic Ocean

32. *Island Beach Borough* on Atlantic Ocean

These nine municipalities comprise the coastline from Manasquan Inlet to Barnegat Inlet in Ocean County. Beach and upland erosion are reported. Protective measures have been taken in the past by the municipalities and

property owners without State-aid. Point Pleasant Beach and Lavallette are interested in the development of plans for prevention of further beach erosion. The future plans of the other municipalities are not known.

- 33. *Barnegat City Borough* on Atlantic Ocean
- 34. *Long Beach Township* on Atlantic Ocean
- 35. *Harvey Cedars Borough* on Atlantic Ocean
- 36. *Surf City Borough* on Atlantic Ocean
- 37. *Ship Bottom-Beach Arlington* on Atlantic Ocean
- 38. *Beach Haven Borough* on Atlantic Ocean

These six municipalities occupy Long Beach Island which forms the coastline between Barnegat Inlet and Beach Haven Inlet in Ocean County. Long Beach Township is in several sections interspersed between the other five municipalities.

Beach erosion and upland loss have occurred along the entire island oceanfront represented by these municipalities. Except at populated locations, coast protection structures have not been built. The damage remaining from the 1944 hurricane plus the recent building of large numbers of summer dwellings make clear the necessity of preserving the existing shoreline and protecting the upland for the future. Long Beach Township proposed the building of a jetty to cost \$75,000.00 in the Brant Beach section. The municipalities report that lack of local funds will not permit other needed construction this year along the island oceanfront. Of particular note on Long Beach Island is the success in building and encouraging sand dunes. There is also great interest in hydraulic filling of beach and dune areas although none of this work has been attempted. Local officials are engaged in developing plans to combine hydraulic filling with dredging of inland waterway channels in the bays to the rear of the island.

ATLANTIC COUNTY

39. *Galloway Township* on Atlantic Ocean:

Isolated islands form the Galloway Township ocean frontage. They are not developed. There is no reported interest in shoreline erosion or changes.

40. *Brigantine City* on Atlantic Ocean:

Brigantine occupies the oceanfront island extending 6.6 miles between Brigantine and Absecon Inlets. Erosion of beaches and sand dunes has been extensive. The city has been unable to afford a complete plan to check erosion. Timber groins have been built when possible at critical locations. Current efforts are devoted to extension of existing groins at an estimated cost of \$18,500.00. Future planning is not definite.

41. *Atlantic City* on Atlantic Ocean:

Atlantic City is at the north end of Absecon Island adjoining Absecon Inlet. The city juts oceanward so that its easterly side facing Absecon Inlet also has a long ocean exposure. Erosion has occurred along the inlet frontage and for over a mile south of the inlet along the oceanfront.

Protective work has been executed in the past few years including a major beach-filling project in the spring of 1948. The projected three-year work program to safeguard the beaches and the city is estimated to cost \$4,500,000.00 of which \$1,500,000.00 is planned for execution this year.

The major cause appeared to be the contiguous Absecon Inlet Channel which progressively moved in upon the beaches and induced accelerated erosion. The city shore-front was damaged severely also during the 1944 hurricane.

42. *Ventnor City* on Atlantic Ocean:

Ventnor City appears to have sufficient protective beach and has not reported on plans for future work.

43. *Margate City* on Atlantic Ocean:

Margate City has not reported the need for coast protection along its beachfront.

44. *Longport Borough* on Atlantic Ocean:

Longport through its proximity to Great Egg Inlet on the south has been the scene of large land loss. The southerly end has eroded so that 11th Street is now the first street. Large sums have been spent to hold the remaining land. Future plans are estimated to cost \$500,000.00. The city has resources of \$25,000.00 to match State-Aid.

CAPE MAY COUNTY

45. *Ocean City* on Atlantic Ocean:

Ocean City's 7.6-mile oceanfront extends along the island lying between Great Egg Inlet and Corsons Inlet. Erosion has occurred at the northerly end fronting the most intensively developed business and residential districts. Protective jetties have been built along this frontage. Emphasis on further work was created by the undermining of several dwellings last fall which required their removal to new inland sites. The city for this year is planning additional jetties at the northern end near Great Egg Inlet and a beachfill to restore 2 miles of frontage along the principal residential and business district. The projected cost is \$700,000.00.

46. *Upper Township* on Atlantic Ocean:

Upper Township localities known as Strathmere and Whale Beach were badly damaged during the 1944 hurricane. Beach protection at Strathmere has been discussed locally but future planning is not definite.

47. *Sea Isle City* on Atlantic Ocean:

Sea Isle City cites its main beachfront 3 miles long as an extreme example of advanced erosion. The narrow remaining beach permits serious ocean-wave damage to

existing groins, bulkheads, and boardwalks, as well as shorefront buildings and street ends. To restore protective beach is estimated at \$1,265,000.00. The city cannot finance any work this year.

48. *Avalon Borough* on Atlantic Ocean:

Avalon reports erosion at several locations but stresses the condition of its northerly frontage at Townsend Inlet. This shoreline has been retreating because the borough has been unable to finance protective structures. Undermining of dwellings has been common, leading to abandonment or removal further inland. Minimum future protection cost is estimated as \$500,000.00 minimum. The borough estimates its resources this year for such work at \$3,000.00.

49. *Stone Harbor Borough* on Atlantic Ocean:

Stone Harbor states its developed frontage of about two miles requires restoration. Estimated minimum requirements would cost \$660,000.00. The borough proposes to execute \$200,000.00 worth of such work this year.

50. *North Wildwood City* on Atlantic Ocean:

North Wildwood describes about 1½ miles of ocean-front as badly requiring protection from further erosion. The city proposes a groin system to hold the beach at an estimated cost of \$130,000.00, but will not be able to finance any part of the work this year.

51. *Wildwood City* on Atlantic Ocean:

Wildwood City reports erosion along its entire beach-front of more than a mile. The erosion is most pronounced at the north end. The beach has narrowed an average of 250 feet in eight years. Immediate protection needed along one-third of the beach is estimated to cost \$325,000.00. City funds available this year are \$25,000.00.

52. *Wildwood Crest Borough* on Atlantic Ocean:

Wildwood Crest states its beach is relatively stable and provides satisfactory protection. No coast protection work is anticipated.

53. *Cape May Coast Guard Base*—Federal property:

Since the completion of the Cold Spring Inlet jetties in 1909, marked shoreline recession has occurred along this Federally owned frontage. The Federal authorities are studying remedial plans which would be financed by the Federal Government.

54. *Cape May City* on Atlantic Ocean:

The Cape May City beachfront has experienced severe erosion and deterioration since the completion of the Cold Spring Inlet Jetties in 1909. These jetties extended about 4,500 feet seaward of the high water line and proved an effective barrier to movement of new sand, into the city beaches. With sand supply cut off, progressive erosion has advanced deeply into the upland. Protective bulkhead and jetties have been built and more are needed. The city will be unable to finance additional work this year.

55. *Cape May Point Borough* on Atlantic Ocean:

Cape May Point, the State's southern extremity facing the ocean, has had major losses of land and improvements. Existing protection is not sufficient to stop erosion. Required coast protection work is estimated at \$1,500,000.00. The borough is attempting to provide \$25,000.00 local funds for work this year.

56. *Lower Township* on Delaware Bay

57. *North Cape May Borough* on Delaware Bay

58. *Middle Township* on Delaware Bay

59. *Dennis Township* on Delaware Bay

CUMBERLAND COUNTY

60. *Maurice River Township* on Delaware Bay
61. *Commercial Township* on Delaware Bay
62. *Downe Township* on Delaware Bay
63. *Lawrence Township* on Delaware Bay
64. *Fairfield Township* on Delaware Bay
65. *Greenwich Township* on Delaware Bay

These ten municipalities in Cape May and Cumberland Counties facing Delaware Bay have common physical characteristics including beach and dune loss by erosion. Concern is reported for security of Bayfront villages at: Town Bank and North Cape May in Lower Township; Reeds Beach in Middle Township; Moores Beach, Thompsons Beach, and East Point Beach in Maurice River Township; and Fortescue in Downe Township.

Damage reports cite losses of land and dwellings and express doubt for the future unless protection is provided. Long frontages are involved. No attempt has been made to estimate the cost of individual improvements. Additional study is required. Two municipalities reporting available local funds are Lower Township, \$15,000.00; Middle Township, \$5,000.00.

Municipal Cost Estimates

The cost estimates for coast protection work submitted by the municipalities appear to be based on past experience weighted by current cost trends and are sufficient for general study and judgment at this time. As planning develops and concrete data are obtained verification will be possible. From a review of past projects, it is apparent that coast protection construction costs in New Jersey are reasonably stable at satisfactory levels. Thoughtful planning and active competition by experienced contractors have created a healthful condition in this special construction field.

Historical Shoreline Changes

In considering the municipal erosion damage reports, a question occurs whether shoreline erosion and recession are phenomena of modern times or historic natural trends of current importance because of greatly increased population and development along the State shorefront.

Long-term trends can be determined by comparison of shoreline locations along the oceanfront from Sandy Hook to Cape May which were surveyed and charted by the United States Coast and Geodetic Survey over a period of approximately 80 years. Measurable shoreline fluctuations in terms of both erosion and accretion of beaches indicate a long-term erosion trend along the New Jersey oceanfront. Representative measurements are included in tabular form in the Appendix. The cumulative comparison indicates a net average recession of 202 feet over an average period of 80.1 years. These figures indicate an average erosion loss of 2.5 feet per year. To obtain a correct perspective, however, it is necessary to note that of the 76 locations, where measurements were made, 53 or 70% showed net erosion averaging 6.1 feet. This indicates more truly the balance in favor of erosion along the New Jersey coastline.

Ocean Inlets

The ocean inlets are also historically important. Statute authority for State-aid includes the control of ocean inlets and protection of the adjacent shoreline both inside and outside the inlets. This is recognition of the intimate relationship between the activity of inlets and the fluctuation of the adjacent shoreline.

Old maps show a total of about 36 ocean inlets have existed between Sandy Hook and Cape May. Their locations were not permanently fixed. All appear to have wandered back and forth along the immediate shoreline thus affecting longer stretches of beachfront than their present sizes and locations would indicate. Today, only 12 open inlets remain. The rest are permanently closed or have their only connection to the sea through outfall

flumes. Of the 12 open inlets, 4 are controlled by jetties for navigation improvement. Whether so improved or not the inlets are powerful factors in determining the shoreline changes in their vicinity. The improvement of inlets for navigation, in fact, may introduce a new regime leading to serious recession of adjoining shoreline. Examples are the Cape May City beach loss following the building of the Cold Spring Inlet Jetties or the Manasquan Beach erosion after construction of the Manasquan Inlet Jetties. The existing open inlets listed north to south are:

Shark River	Controlled by jetties
Manasquan	" " "
Barnegat	" " "
Beach Haven	Free
Little Egg	"
Brigantine	"
Absecon	"
Great Egg	"
Corson	"
Townsend	"
Hereford	"
Cold Spring	Controlled by jetties

The closed inlets which now empty into outfall flumes such as Lake Takanassee, Deal Lake, and Wesley Lake, remain as coast protection problems because of local erosion effect due to continuing run-off.

Coast Protection Planning

The phrase "State-wide Comprehensive Coast Protection Plan" is voiced frequently as an objective to be attained. The usual implication is that the erosion problem is present at all points along the State shoreline. This ignores the reality that erosion exists at separated localities not related geographically. The better approach appears to be regional.

Aside from the solid mainland grouping of municipalities in Monmouth County, the coastline is broken by ocean inlets. These physical boundaries must be recognized as natural division points. In addition, other geophysical

characteristics differ from place to place along the shore-front.

The regional concept also groups municipalities and does not recognize political boundaries. This obviates the question of one municipality planning work which may not co-ordinate beneficially with the work of its neighbors. While municipal autonomy is basic, State participation has maintained the regional viewpoint and assured co-ordination of adjacent municipal efforts.

Regional planning, however, does not preclude a State-wide viewpoint in the form of a program rather than a plan. Co-ordination of planning and construction is properly a function of the State. Aside from its over-all financial interest, it can include in planning those municipalities inactive because presently unable to finance erosion projects and thus present a complete view of the State-wide problem.

Planning of active projects is executed jointly by the State and the municipality each bearing its own expense. State program planning will include general office and field work not directly related to active projects which should be paid for by the State. It is considered that the State coast protection appropriation this year should include \$100,000.00 to pay for additional salaries, equipment, traveling expenses, and other expenses required in planning and issuing a State Coast Protection Program.

Coast Protection Structures and Methods

The statutes indicate that all coast protection work given State-aid must be in the nature of a permanent improvement. This limits State-aid to work having a large degree of stability and a low rate of depreciation. The expenditure of State-aid funds thus becomes capital investment in public works. Projects granted State-aid have been planned in keeping with this interpretation.

The types of structures used and general planning reflect the emphasis on meeting the requirements of permanency and capital investment. Quarry stone has been the chief

construction material for jetties, breakwaters, and seawalls designed to withstand the most severe sea-action. Where timber bulkheads and groins have been employed, creosoted timber has been used throughout. Beach filling and dune-building have been considered only where stability is assured to a high degree. This policy is fundamentally sound. It should not be pursued, however, with such rigidity as to preclude assistance to municipalities unable to afford the most highly desirable types of structures and methods or to eliminate critical disaster cases requiring expedient action. The issue is one for administrative judgment rather than legal definition.

Beachfill and Sand Dunes

While the use of bulkheads and groins or jetties is commonly understood, the importance and possibilities of beach-filling and dune-building have not received wide recognition. Where executed beach-filling receives immediate appreciation as for example last year at Atlantic City where bathers enjoyed the restored beach and the danger to upland structures was diminished.

It has been the practice to build groins or jetties and then await the natural accumulation of beach sands. The interim between structure building and full beach accumulation often is fraught with concern for both the stability of the structures and defense of the upland properties. This can be overcome in most instances by providing beach-fill at once after the groins or jetties are completed.

Beach-filling and dune-building also offer low-cost methods of restoring or bolstering eroded frontages in less developed or financially able municipalities.

Methods of obtaining and transporting sand are available for the benefit of nearly all municipalities. The most common is the hydraulic pipe-line dredge which can operate in the inland bays, the ocean inlets, Delaware, Sandy Hook and Raritan Bays, the interior lakes, and to some degree in the ocean. Sea-going hopper dredges have been proposed for direct discharge ashore through pipe-lines. The

benefit of off-shore dumping from hopper dredges was indicated visually several years ago at Atlantic City. The results of experiments last year at Long Branch were not discernible as readily so that evaluation by other factors is being studied for future report. In general, hydraulic transportation of material appears the most economical. Beach-filling and dune-building should be considered in all future municipal planning of coast protection work. The immediate benefits warrant the investment.

Material from Navigation Dredging

Several municipalities on the coastal fringe between Manasquan Inlet and Cape May propose the use of dredged material from navigation channel projects as beach and dune building material. The idea is sound and should be followed where possible. Each case should be studied to determine that the dredged material is suitable for beaches and dunes and that the cost is not excessive. Usually long dredge pipelines may be necessary to transport the material with consequent higher costs.

Study of the State inland waterway system including the authorized Federal intracoastal waterway would be productive in developing the possible locations where both the beaches and the waterways can be improved simultaneously.

Municipal Beach Ownership

While many municipalities own all or a substantial portion of their beachfronts, it is becoming clear to all that municipal ownership and control of beaches and dune areas is fundamental to all parts of the coast protection problem. The beachfront is a basic community asset which should be held in common.

Municipal ownership and conservation of beaches and sand dunes should be encouraged particularly where development and building is expanding rapidly. Neither the land developer or the individual householder can be expected to function alone without municipal guidance and help.

The Recreation Industry

The enactment of chapter 318 in 1920 was the first official recognition by the State at large that the growing public interest in shorefront recreation must be matched with equal concern, for the preservation of the beaches and shoreline. The years until now have witnessed the expanding circle of people seeking shorefront recreation; the building of dwellings in great number from small bungalows to large hotels; the greatly improved and augmented highway system from urban centers to the sea and bays; in short, the blooming of a new industry—the recreation industry, valued at \$1,000,000,000.00 annually.

The recreation industry grew to meet public demand for recreation. It is reported that over 4 million persons annually visit the shore, for a few days or the whole summer season. Available accommodations are estimated to care for about 800,000 persons at one time.

The impact of this huge business is felt throughout the economic life of the State both by supporting industries through purchases and investors, large and small, through income. To properly portray the State-wide value of the recreational industry requires additional collation and re-counting of data not possible in a brief report.

Federal Interest

Federal recognition of the national obligation to preserve and protect the shorefront was had through Public Law No. 727, 79th Congress, approved August 13, 1946. This law states that it is the policy of the United States to assist in the construction of works for the improvement and protection against erosion by waves and currents of the shores of the United States that are owned by States, municipalities, or other political subdivisions. The purpose of this policy is the prevention of damage to public property and promoting and encouraging the healthful recreation of the people.

Federal aid is limited to a maximum of one-third the construction cost of protective works for public property.

Each project must be specifically adopted and authorized by Congress after investigation and study by the Federal Beach Erosion Board of the Army, under provisions of Public Law No. 520, 71st Congress, Section No. 2, approved July 3, 1930. Both the 1930 and 1946 laws are printed in full in the Appendix.

Since Federal procedure requires study and investigation leading to a report to Congress prior to adoption and appropriation of funds in a Federal Public Works Law, it is evident that considerable time will be consumed between the initial application and start of construction. It is doubtful whether emergency aid can be obtained from the Federal Government to cope with pressing cases. Federal spokesmen have indicated that the minimum elapsed time will approximate three years. While Federal procedures may not be geared to function as rapidly as State and municipal activities, it seems proper that Congress consider whether the time element can be resolved in keeping with the urgency of coast protection problems.

Atlantic City and Ocean City are participating in Federal studies under the 1930 law as preliminary to adoption of Federal projects in these municipalities. The Atlantic City study has been in progress for over a year. The Ocean City study started in December. In both cases the cost is shared equally by the Federal Government and the municipality. There has been some agitation for a State-wide study taking in all municipalities. In view of the experience and background, both technical and practical, garnered by the State and the municipalities, over many years, the necessity for such a study is not apparent. The restoration and protection of many miles of beachfront by the State and municipalities is cogent evidence of planning in being far beyond the study stage. The State-wide defense program against shore erosion has been successful and should be carried forward unremittingly.

Ratio State and Local Funds

Municipal planning is greatly affected by the possibility of State-aid. It permits consideration of projects adequate in size to reach security more in keeping with physical erosion changes and damage. The present matching of State and municipal funds is on a 50-50 ratio. In the past, the ratio also has been set in the annual appropriation acts at 60-40 and 70-30 in favor of the municipalities. The granting of State-aid under a matched fund requirement places emphasis on the financial ability of the individual municipality rather than the rate and severity of erosion damage.

Municipalities which have undertaken State-aid projects have emphasized the burden of financing imposed locally and requiring a disproportionate part of local annual budgets. Others report inability to ask State-aid except one more favorable fund matching ratios. The desired municipal obligation has been suggested as between 10% and 30%, the variation being related to the local financial situation. The development of a suitable formula is not simple. It would require a longer time than now available to study and establish the fundamental reasoning required. It is believed that return to the 70-30 ratio would relieve the current situations materially and allow more time to weigh this serious problem. Of \$8,212,592.07 spent in the last 8 years on construction under the State-Aid Coast Protection Program, the municipalities provided \$3,209,585.33 or 39%, and the State \$5,003,006.74 or 61%. Tabular listing of these funds by municipalities is included in the Appendix as Item No. 3.

RECOMMENDATIONS

To carry out the policies and conclusions recommended in the Report, it will be necessary to take the following legislative action:

1. Authorize the creation of a permanent State Beach Erosion Commission of twelve members to make annual studies and reports on the subject of coast protection in New Jersey. The Commission to be composed of four members of the Senate, to be appointed by the President of the Senate; four members of the General Assembly to be appointed by the Speaker thereof; and four members at large to be appointed by the Governor. The Commission members shall serve without remuneration, but shall be reimbursed for all expenses incurred in connection with the work of the Commission.

2. Appropriate the sum of \$100,000.00 for payment of expenses incurred and services required by the State in preparing a State Program for Coast Protection based on the regional planning concept.

3. Authorize the granting of State-aid to municipalities equal to 70% of the construction cost of coast protection structures and work pending the development of a future State-aid formula.

4. Amend existing statutes to include the shorefront of Raritan Bay and Sandy Hook Bay as eligible for State-aid.

Respectfully submitted,

J. STANLEY HERBERT, *Chairman*,
ANDREW HENRY, *Vice-Chairman*,
WALTER A. KEPPLER, *Secretary*,
FRANK S. FARLEY,
GEORGE A. REDDING,
MERRILL H. THOMPSON,
JAMES F. FRASER,
NATHANIEL C. SMITH,
WILLIAM M. BIRTWELL.

NEW JERSEY STATUTES

CHAPTER JR 9, LAWS OF 1948

A JOINT RESOLUTION creating a commission to investigate and study the subject of the protection and preservation of the beaches and shore front of the State from erosion and other damage from the elements.

BE IT RESOLVED by the Senate and General Assembly of the State of New Jersey:

1. There is hereby created a commission to investigate and study the subject of the protection and preservation of the beaches and shore front of the State from erosion and other damage from the elements.

2. In connection with such study the commission shall consider ways and means to protect and preserve the beaches and shore front of the State by the erection and construction of sea walls, bulkheads, jetties, basins and other devices, and the question of dredging and other methods to be employed for said purposes.

The said commission shall also take into consideration the advisability of repairing existing sea walls, bulkheads, jetties and other similar devices.

3. The said commission shall consist of nine members, three of whom shall be members of the Senate, to be appointed by the President of the Senate; three of whom shall be members of the General Assembly, to be appointed by the Speaker thereof; and three of whom shall be members at large to be appointed by the Governor.

4. The members of the commission shall choose one of their number to be chairman, and the several State departments and agencies shall render assistance to the commission in making its study when called upon to do so by the commission.

5. The commission may hold hearings in any part of the State and upon the completion of its study shall embody its findings and recommendations, including planning and other proposals, in a report to the Legislature and to the Governor.

6. This joint resolution shall take effect immediately.

CHAPTER 316, LAWS OF 1938

AN ACT providing for the payment from the State funds, a sum of money to be expended by and under the direction of the Board of Commerce and Navigation for the construction in whole or in part of such works and structures including jetties, bulkheads and seawalls and other approved devices necessary and proper to protect the riparian lands and taxable property of this State in municipalities within any county bordering on the Atlantic ocean from destruction by encroachments of the Atlantic ocean and other destruction agencies of the sea.

WHEREAS, The coast and seashore of New Jersey in many cases, and in many locations has been or is likely to be encroached upon by the Atlantic ocean, thereby causing a great destruction of the riparian lands and to taxable property of great value from which, and from riparian leases, annually, by taxation for State purposes large sums may be and are derived by the State; and

WHEREAS, Such encroachments by the ocean can, in the judgment of the Legislature, be checked and prevented by the construction and maintenance of jetties, bulkheads and seawalls along said ocean and by other approved devices; therefore

BE IT ENACTED by the Senate and General Assembly of the State of New Jersey:

1. There is hereby appropriated and directed to be paid out of the treasury of the State of New Jersey a sum or sums not to exceed in the aggregate three hundred thousand dollars (\$300,000.00), which were included partly or wholly in any appropriation act shall be used and expended under the direction of the Board of Commerce and Navigation of the State of New Jersey, for the construction of such works, jetties, bulkheads, seawalls or sand-tight structures and devices, to be built of units of durable materials, having a weight too great to be lifted, separated or ravelled out and lost from the said structures, and having sufficient penetration into the materials of the sea bottom to insure a stability to stand alone and intact against the pressures of winds and waves and the eroding forces thereof during the severest storms, to permanently protect the riparian lands of this State and/or the public or private properties from which this State or any public political subdivision or agency thereof receives a revenue by taxation, or for rents for riparian leases, bordering upon any municipalities located in any county of this State which borders upon the Atlantic ocean, from the encroachment of the Atlantic ocean, which sum of money, or so much thereof as may be necessary, is to immediately become available and payable. The plans for all such works or work built in whole or in part shall be approved by the Board of Commerce and Navigation of the State of New Jersey, and the selection and designation of the section or sections of the sea coast of New Jersey to be protected shall also be determined by said

board, and said board is hereby empowered to make such rules and regulations respecting the doing of such work and the inspection and approval thereof as it may deem necessary; said board is hereby authorized to assume the construction of any part of or the whole of any work or works approved by it, and provided the cost thereof does not exceed the amount set aside for any such work or works; provided, however, that no greater amount or portion of the sum of money hereby appropriated shall be available and paid out for the purposes of such work or works in any single municipality than is appropriated by such municipality (or any contribution by the county to be added to the share of said municipality) in which or upon the borders of which such work or works are to be constructed, and is available for expenditure therefor.

2. This act shall take effect immediately.

Approved June 14, 1938.

CHAPTER 52, LAWS OF 1940

AN ACT concerning the Board of Commerce and Navigation, and supplementing Title 12, chapter six of the Revised Statutes.

BE IT ENACTED by the Senate and General Assembly of the State of New Jersey:

1. In addition to the powers conferred by the provision of the act to which this act is a supplement, the Board of Commerce and Navigation is hereby authorized and empowered to repair, reconstruct, or construct bulkheads, groins or jetties, on any and every beach front along the Atlantic ocean in the State of New Jersey, to repair damage caused by erosion and storm, or to prevent erosion of the beaches.

2. The Board of Commerce and Navigation is further authorized and empowered to use the facilities and services of any branch of the Federal Government and any funds which may now be available or which may hereafter be appropriated by the Federal Government for the purpose of beach erosion, and beach protection.

3. The Board of Commerce and Navigation is further authorized and empowered to dredge and remove any and all obstructions in every waterway or stream in the State of New Jersey to a depth to be determined by the board.

4. There is hereby appropriated from the State Highway Fund and directed to be paid by the State Treasurer the sum of two hundred fifty thousand dollars (\$250,000.00) for beach protection in the city of Long Branch along the shores of the Atlantic ocean in the county of Monmouth.

5. The specific appropriation herein made for beach protection in the city of Long Branch shall not be expended until the city of Long Branch shall have made available therefor the sum of one hundred thousand dollars (\$100,000.00), and the county of Monmouth shall have made avail-

able therefor the sum of fifty thousand dollars (\$50,000.00), which shall be used in conjunction with the appropriation in this act authorized.

6. There is hereby further appropriated from the State Highway Fund and directed to be paid by the State Treasurer the sum of one hundred forty-five thousand dollars (\$145,000.00) for beach protection, and dredging in the counties of Ocean, Atlantic, Cape May and Cumberland.

7. The Director of the Board of Commerce and Navigation shall apportion the specific appropriation herein made under paragraph six to the counties outlined, and shall be empowered to accept and spend in conjunction with the State of New Jersey as appropriations such sums of money as may be allotted by the counties, and municipalities in the counties for dredging and beach protection.

8. All moneys so appropriated by the State of New Jersey, the Federal Government, the city of Long Branch, and the counties of Monmouth, Ocean, Atlantic, Cape May and Cumberland shall be used by the Board of Commerce and Navigation and expended under the direction of its director for the aforesaid purposes.

9. This act shall take effect immediately.

Approved May 1, 1940.

CHAPTER 93, LAWS OF 1944

AN ACT for the protection of New Jersey beaches against erosion; declaring an emergency to exist with respect to the problem of erosion; providing for the administration and enforcement of this act by the Governor and the Department of Commerce and Navigation, and supplementing Title 12 of the Revised Statutes.

BE IT ENACTED by the Senate and General Assembly of the State of New Jersey:

1. In furtherance of the public policy of the State and to meet the pressing problem of beach erosion this statute is deemed and declared to be emergency legislation.

2. There is hereby appropriated to the Department of Commerce and Navigation the sum of one million two hundred and fifty thousand dollars (\$1,250,000.00) to be expended by said department, upon projects to be approved by the Governor, designed to prevent and control erosion on New Jersey beach fronts.

3. Subject to the conditions in this act contained any county or local municipal government, whose beach fronts are threatened by erosion may participate in the benefits of this act.

4. The Board of Commerce and Navigation shall prepare a general and comprehensive plan, to be approved by the Governor, designed to prevent and control beach erosion and receive applications for benefits hereunder from any such county or local municipal government desiring to participate herein. Such applications shall be on forms approved by

the department and shall detail the project or projects to be undertaken and completed as contemplated by this act. The department upon determining that such project or projects conform to the general and comprehensive plan shall, on approval thereof by the department and the Governor, make an allotment or allotments not in excess of fifty per centum (50%) of the cost thereof to the proper governing body.

5. The applicant shall bear the remaining fifty per centum (50%) or such excess thereof of the cost of such project or projects and shall detail the proper county or municipal appropriation from which its share of the cost of the project shall be paid.

6. Upon approval of the project as aforesaid and the entering into of a contract or contracts for the project, which contract or contracts shall likewise be approved by the department, there shall be made available the State's share of the cost thereof.

7. Appropriations made by any county or local municipal government, in meeting its share of the cost of any project or projects so undertaken, shall be deemed emergency appropriations.

8. This act shall take effect immediately.

Approved April 13, 1944.

CHAPTER 258, LAWS OF 1946

AN ACT to amend "An act concerning the Board of Commerce and Navigation, and supplementing Title 12, chapter six, of the Revised Statutes," approved May first, one thousand nine hundred and forty (P. L. 1940, c. 52).

BE IT ENACTED by the Senate and General Assembly of the State of New Jersey:

1. Section one of the act of which this act is amendatory, is amended to read as follows:

1. In addition to the powers conferred by the provisions of the act to which this act is a supplement, the State Department of Conservation, through the Division of Navigation, is hereby authorized and empowered to repair, reconstruct, or construct bulkheads, breakwaters, groins or jetties, on any and every beach front along the Atlantic ocean, or any beach front along the Delaware bay and Delaware river, or at any inlet or any inland waters adjacent to any inlet along the coast of the State of New Jersey, to repair damage caused by erosion and storm, or to prevent erosion of the beaches and to stabilize the inlets.

2. Section two of the act of which this act is amendatory is amended to read as follows:

2. The Division of Navigation is further authorized and empowered to use the facilities and services of any branch of the Federal Government or of the State Government, or of any county or municipality within the State, and any funds which may now be available or which may hereafter

be appropriated by the Federal Government, or any division of the State Government, or of any county or municipality within the State for the purpose of beach erosion, and beach protection.

3. Section three of the act of which this act is amendatory is amended to read as follows:

3. The Division of Navigation is further authorized and empowered to dredge and remove any and all obstructions in every waterway or stream in the State of New Jersey to a depth and width to be determined by the council of the Division of Navigation and to erect such bulkheads, breakwaters, groins or jetties as are necessary to prevent erosion and stabilize the shore in the vicinity of any inlet along the coast of the State of New Jersey.

4. This act shall take effect immediately.

Approved May 2, 1946.

ESTIMATED MUNICIPAL COAST PROTECTION FUNDS
REPORTED UP TO NOVEMBER 30, 1948, AS AVAILABLE
TO MATCH STATE-AID FUNDS DURING NEXT
FISCAL YEAR

Municipality	Amount
Keansburg	\$17,500.00
Seabright	10,000.00
Long Branch	200,000.00
Deal	100,000.00
Allenhurst	40,000.00
Asbury Park	70,000.00
Neptune Twp.	50,000.00
Bradley	30,000.00
Avon	62,500.00
Belmar	75,000.00
Spring Lake	100,000.00
Sea Girt	50,000.00
Manasquan	50,000.00
Brigantine	9,250.00
Atlantic City	750,000.00
Longport	25,000.00
Ocean City	350,000.00
Avalon	3,000.00
Stone Harbor	100,000.00
Wildwood	25,000.00
Cape May Point	25,000.00
Lower Twp.	15,000.00
Middle Twp.	5,000.00
Total	\$2,162,250.00

HISTORIC SHORELINE CHANGES PRIOR TO 1920 ALONG THE
COAST OF NEW JERSEY FOR EACH MINUTE OF LATITUDE
FROM SOUTH TO NORTH BETWEEN CAPE MAY AND
SANDY HOOK

<i>Plus—Accretion</i>			<i>Minus—Erosion</i>				
	<i>Parallel of Latitude</i>		<i>Net Changes Over Period</i>		<i>Years Period</i>	<i>Average Yearly Change</i>	
			<i>Plus</i>	<i>Minus</i>		<i>Plus</i>	<i>Minus</i>
Cape May .....E	38°	56'	950	....	78	12.20	....
W		56	....	600	78	....	7.70
Cold Spring Inlet ..		57	....	1140	78	....	14.62
		58	....	....	78	....	....
		59	655	....	78	8.40	....
N. Wildwood	39°	0'	....	....	..	....	....
		1	....	....	..	....	....
		2	490	....	78	6.28	....
		3	550	....	78	7.05	....
Stone Harbor		4	280	....	78	3.59	....
	39°	5'	....	100	78	....	1.28
Avalon		6	610	....	78	7.82	....
		7	....	....	..	....	....
		8	500	....	78	6.41	....
		9	....	230	78	....	2.95
Sea Isle City	39°	10'	....	400	78	....	5.14
		11	....	360	78	....	4.62
		12	....	....	..	....	....
		13	....	....	..	....	....
		14	185	....	78	2.38	....
	39°	15'	170	....	78	2.18	....
		16	500	....	78	6.41	....
Ocean City		17	1450	....	78	1.86	....
Great Egg Inlet		18	....	....	..	....	....
		19	....	400	79	....	5.06
	39°	20'	....	....	79	3.54	....
		21	285	....	79	3.61	....
		22	100	....	79	1.26	....
Atlantic City		23	....	....	..	....	....
		24	....	1450	79	....	18.36

		<i>Plus—Accretion</i>		<i>Minus—Erosion</i>			
		<i>Parallel of Latitude</i>		<i>Net Changes Over Period</i>		<i>Years</i>	
				<i>Plus</i>	<i>Minus</i>	<i>Period</i>	
						<i>Average Yearly Change</i>	
						<i>Plus</i>	<i>Minus</i>
Brigantine	39°	25'	....	600	79	....	7.60
		26	....	980	79	....	12.40
		27	....	....	..	....	....
		28	....	....	..	....	....
		29	....	....	..	....	....
	39°	30'	....	....	..	....	....
		31	....	....	..	....	....
		32	....	800	80	....	10.00
		33	....	....	80	....	....
		34	340	....	80	4.25	....
Beach Haven	39°	35'	225	....	80	2.81	....
		36	....	60	81	....	0.74
		37	....	90	81	....	1.11
		38	....	710	81	....	8.76
		39	....	1058	81	....	13.06
Surf City	39°	40'	....	1175	81	....	14.50
		41	....	1015	81	....	12.53
		42	....	675	81	....	8.33
		43	....	500	81	....	6.17
		44	....	590	81	....	7.28
Barnegat	39°	45'	....	470	81	....	5.80
		46	....	....	81	....	....
		47	550	....	81	6.79	....
		48	....	500	81	....	6.17
		49	....	500	81	....	6.17
	39°	50'	....	660	81	....	8.15
		51	....	660	81	....	8.15
		52	....	650	81	....	8.02
		53	....	470	81	....	5.80
		54	....	350	81	....	6.79
Seaside Heights ...	39°	55'	....	380	81	....	4.69
		56	....	....	81	....	....
		57	355	....	81	4.38	....
		58	202	....	81	4.49	....
		59	....	150	81	....	1.85

<i>Plus—Accretion</i>		<i>Minus—Erosion</i>			<i>Average</i>	
	<i>Parallel of Latitude</i>	<i>Net Changes Over Period</i>		<i>Years Period</i>	<i>Yearly Change</i>	
		<i>Plus</i>	<i>Minus</i>		<i>Plus</i>	<i>Minus</i>
	40° 0'	....	150	81	....	1.85
	1	....	190	81	....	2.35
	2	....	202	81	....	4.49
Mantoloking	3	....	210	81	....	2.59
Bay Head	4	....	341	81	....	4.21
	40° 5'	....	460	81	....	5.68
	6	....	190	81	....	2.35
Manasquan	7	....	405	81	....	5.00
Sea Girt	8	....	135	81	....	1.67
Spring Lake	9	81	....	81	1.00	....
	40° 10'	....	95	81	....	1.17
Belmar	11	....	160	81	....	1.98
	12	....	460	81	....	5.68
	13	....	185	81	....	2.28
Asbury Park	14	....	379	81	....	4.68
	40° 15'	....	542	81	....	6.69
	16	....	585	81	....	7.22
	17	....	370	81	....	4.57
Long Branch	18	....	345	81	....	4.26
	19	....	605	81	....	7.47
	40° 20'	....	420	81	....	5.19
	21	....	404	81	....	4.99
Sea Bright	22	....	500	84	....	5.95
	23	....	595	84	....	7.09
Highlands	24	....	....	..	....	....
	40° 25'	245	....	20	11.75	....
	26	240	....	50	4.80	....
	27	196	....	50	3.92	....
	28	....	....	..	....	....

SUMMARY STATEMENT OF FUNDS SPENT UNDER STATE-AID
COAST PROTECTION PROGRAM 1940-1948

Municipalities	State Funds	Local Funds
Middleton Township	\$69,114.89	\$40,053.09
Seabright Borough and Monmouth County	346,787.97	346,787.97
Long Branch City	2,459,254.85	1,370,576.14
Deal Borough	209,498.42	190,039.45
Allenhurst Borough	31,447.53	13,477.52
Asbury Park City	54,116.19	54,116.19
Bradley Beach Borough	88,373.09	67,712.42
Avon-by-the-Sea Borough	229,883.23	13,349.78
Belmar Borough	96,399.04	18,020.69
Sea Girt Borough	241,119.50	16,274.19
Manasquan Borough	48,371.63	32,247.76
Long Beach Township	61,210.33	61,210.33
Beach Haven Borough	34,815.82	34,815.83
Brigantine City	4,400.00	4,400.00
Atlantic City	514,551.31	514,551.31
Ocean City	200,755.79	178,375.10
Sea Isle City	7,093.00	7,093.00
Stone Harbor Borough	27,391.71	11,739.30
Cape May City	214,737.36	214,737.36
Cape May Point Borough	46,685.08	20,007.89
Sub-totals	\$5,003,006.74	\$3,209,585.35
Grand Total		\$8,212,592.07

FEDERAL STATUTES

Public Law No. 520, Seventy-first Congress, Section 2, Approved 3 July 1930. "The Chief of Engineers of the United States Army, under the direction of the Secretary of War, is authorized and directed to cause investigations and studies to be made in co-operation with the appropriate agencies of various States on the Atlantic, Pacific, and Gulf coasts and on the Great Lakes, and the Territories, with a view of devising effective means of preventing erosion of the shores of coastal and lake waters by waves and currents; and any expenses incident and necessary thereto may be paid from funds appropriated for examinations, surveys, and contingencies for rivers and harbors: Provided, That the War Department may release to the appropriate State agencies information obtained by these investigations and studies prior to the formal transmission of reports to Congress: Provided further, That no money shall be expended under authority of this section in any State which does not provide for co-operation with the agents of the United States and contribute to the project such funds and or services as the Secretary of War may deem appropriate and require; that there shall be organized under the Chief of Engineers United States Army, by detail from time to time from the Corps of Engineers and from the engineers of State agencies charged with beach erosion and shore protection, a board of seven members, of whom four shall be officers of the Corps of Engineers and three shall be selected with regard to their special fitness by the Chief of Engineers, from among the State agencies co-operating with the War Department. The board will furnish such technical assistance as may be directed by the Chief of Engineers in the conduct of such studies as may be undertaken and will review the reports of the investigations made. In the consideration of such studies as may be referred to the board by the Chief of Engineers, the board shall, when it considers it necessary and with the sanction of the Chief of Engineers, make, as a board or through its members, personal examinations of localities under investigation: Provided further, That the salary of the civilian members shall be paid by their respective States, but the traveling and other necessary expenses connected with their duties on the board shall be paid in accordance with the law and regulations governing the payment of such expenses to civilian employees of the Engineering Department."

Public Law No. 727, Seventy-ninth Congress, Approved 13 August 1946. "An Act authorizing Federal participation in the cost of protecting the shores of publicly owned property.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That with the purpose of preventing damage to public property and promoting and encouraging the healthful recreation of the people, it is hereby declared to be the policy of the United States to assist in the construction, but not the maintenance, of works for the improvement and protection against erosion by waves and currents of the shores of the United States that are owned by States, municipalities, or other political subdivisions: Provided, That the Federal contribution toward the construction of pro-

tective works shall not in any case exceed one-third of the total cost: Provided further, That where a political subdivision has heretofore erected a sea wall to prevent erosion, by waves and currents, to a public highway considered by the Chief of Engineers sufficiently important to justify protection, Federal contribution toward the repair of such wall and the protection thereof by the building of an artificial beach is authorized at not to exceed one-third of the original cost of such wall, and that investigations and studies hereinafter provided for are hereby authorized for such localities: Provided further, That the plan of protection shall have been specifically adopted and authorized by Congress after investigation and study by the Beach Erosion Board under the provisions of section 2 of the River and Harbor Act approved July 3, 1930, as amended and supplemented.

"Sec. 2. When the Chief of Engineers shall find that any such project has been constructed in accordance with the authorized plans and specifications he shall cause to be paid to the State, municipality, or political subdivision the amount authorized by Congress.

"Sec. 3. The Chief of Engineers may, in his discretion, from time to time, make payments on such construction as the work progresses, but these payments, including previous payments, if any, shall not be more than the United States pro rata part of the value of the labor and materials which have been actually put into such construction in conformity to said plans and specifications: Provided, That the construction of improvement and protective works may be undertaken by the Chief of Engineers upon the request of, and contribution of required funds by, the interested State, municipality or other political subdivision.

"Sec. 4. As used in this Act, the word "shores" includes all the shore lines of the Atlantic and Pacific Oceans, the Gulf of Mexico, the Great Lakes, and Lakes, estuaries and bays directly connected therewith."

