Property of the United States Government USCEC,

MP 3 - 69

PIPE PROFILE DATA and WAVE OBSERVATIONS FROM THE CERC BEACH EVALUATION PROGRAM January - March 1968

by

H. D. Urban and C. J. Galvin, Jr.

MISCELLANEOUS PAPER NO. 3 - 69
SEPTEMBER 1969



U. S. ARMY, CORPS OF ENGINEERS
COASTAL ENGINEERING
RESEARCH CENTER

This document has been approved for public release and sale;
its distribution is unlimited.

Reprint or re-publication of any of this material shall give appropriate credit to the U. S. Army Coastal Engineering Research Center.

Limited free distribution of this publication within the United States is made by the U. S. Army Coastal Engineering Research Center, 5201 Little Falls Road, N. W., Washington, D. C. 20016.

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

PIPE PROFILE DATA
and
WAVE OBSERVATIONS
FROM THE CERC
BEACH EVALUATION PROGRAM
January - March 1968

by

H. D. Urban and C. J. Galvin, Jr.

MISCELLANEOUS PAPER NO. 3 - 69
SEPTEMBER 1969



U. S. ARMY, CORPS OF ENGINEERS
COASTAL ENGINEERING
RESEARCH CENTER

This document has been approved for public release and sale;
its distribution is unlimited.

ABSTRACT

Observations of sand levels at pipes placed at 50-foot intervals from dune to low tide terrace along two profile lines on each of five Atlantic Coast beaches proved to be a feasible substitute method of surveying beach profiles. For 1-week intervals during January, February, and March 1968, the maximum changes in sand level at any pipe on the five beaches was 5.7 feet of erosion and 4.7 feet of accretion. Changes in sand level were more likely at pipes located in the beach face than at pipes located below mean sea level. When significant erosion occurred between successive surveys on any profile, there was a tendency for the maximum decrease in sand level to occur at locations high on the earlier of the two surveys. Pipe profile data showed that beach steepness and fluctuations in sand level usually decrease in a north-to-south direction for the five beaches studied (from Westhampton Beach, N. Y., through Ludlam Island, N. J.), in a way that appears related to decreases in wave height and the sediment size on the same beaches. Five appendixes to this paper contain the pipe profile data obtained during the 1968-69 winter, both in tables and in four types of graphs. A sixth appendix contains the daily visual wave observations obtained at seven Atlantic Coast beaches, including the five beaches with pipe profiles, during the same time.

FOREWORD

This study was made possible by the cooperation of the Philadelphia and New York Districts, U.S. Army Corps of Engineers, and the volunteered observations, often made under unpleasant weather conditions, of Messrs. Neil Ackerson, Robert Badger, Joseph Benedetto, William Daniels, Peter Kief, Howard Wright, F. W. Zimmer and U. S. Coast Guard personnel at the Merrimack River and Watch Hill stations. Mr. Joseph M. Caldwell, Technical Director, CERC, suggested the use of the pipe profiles.

The following public and private groups contributed to this study: First and Third Districts of the U. S. Coast Guard (USCG), Suffolk County, (N. Y.) Department of Public Works, Long Island (N. Y.) State Park Commission, the firm of Fernandez, Jorlett, Kief, and Tracy of Ship Bottom, N. J., City Engineer's Office, Atlantic City, N. J., and the City of Sea Isle City, N. J.

On the beaches with pipe profiles, the wave observers were the same as the pipe-profile observers. Observations at the Watch Hill Coast Guard Station were under the supervision of Mr. William Clark, keeper. Most of the observations on Plum Island were made by personnel of the Merrimack River Coast Guard Station, Mr. Donahue and Mr. Mead, Officers in Charge. Other observations on Plum Island were made by members of the Department of Geology of the University of Massachusetts under the direction of Professor Miles O. Hayes.

Cyril J. Galvin, Jr. is an oceanographer in the Research Division at CERC, and Harry D. Urban is an undergraduate in physics at Drexel Institute of Technology at Philadelphia. The project was under the general supervision of Thorndike Saville, Jr., Chief of the Research Division. At the time of publication, Lieutenant Colonel Edward M. Willis was the Director of CERC; Joseph M. Caldwell was the Technical Director.

NOTE: Comments on this paper are invited. Discussion will be published in the next issue of the CERC Bulletin.

This report is published under authority of Public Law 166, 79th Congress, approved July 31, 1945, as supplemented by Public Law 172, 88th Congress, approved November 7, 1963.

CONTENTS

	Page
Section I. INTRODUCTION	1
1. Background	1
2. Purpose	1
3. Procedure	1
4. Period Covered	3
Section II. METHODS OF PIPE INSTALLATION	7
1. New Jersey Beaches	7
2. Long Island Beaches	7
Section III. ANALYSIS OF PIPE PROFILE DATA	9
1. Basic Data	9
2. Profile Shape	9
3. Maximum Single-pipe Erosion and Accretion	9
4. Correlation of Data	11
5. Profile Fluctuations	16
Section IV. WAVE OBSERVATIONS	16
1. Procedure	16
2. Height Histograms	16
3. Effects on Sand Level Changes	19
Section V. SUMMARY	20
LITERATURE CITED	21

ILLUSTRATIONS

Figure	
1. Location Map	vi
2. Beach Evaluation Program Pipe Profile Report Form	4
3. Comparison of Beach Profiles Obtained by Pipe Profile Observations and Standard Survey Methods on Three New Jersey Beaches	5
4. Comparison of Beach Profiles Obtained by Pipe Profile Observations and Standard Survey Methods on Two Long Island Beaches	6

Figure Page

5. Pipe Profile at Indiana Avenue, Atlantic City, New Jersey Top, January 1968; bottom, March 1969 8

6. Profiles from Pipe Profile Data for Five Atlantic Coast Beaches (Generalized from Appendix D) 10

7. Erosion and Accretion Maximums on Five Atlantic Coast Beaches 13

8. Maximum, Single, 1-week Erosion vs. Sand Elevation Just Before Erosion. 14

9. Attempts to Correlate Sand Level Changes 15

10. Wave Observation Form 17

11. Wave Height Histograms for Seven North Atlantic Localities . 18

Table

I. Summary of Pipe Profile Program - FY 1968 2

II. Maximum, Single-pipe, 1-Week and 3-Month, Vertical Changes in Sand Level on 10 Pipe Profiles, January-March, 1968 . . 12

III. Sand Levels and Environmental Factors 19

Appendix A: Sand Elevation Data

Appendix B: Sand Elevation vs. Time

Appendix C: Running Average Sand Elevation vs. Time

Appendix D: Histograms of Sand Elevations

Appendix E: Histograms of Sand Elevation Changes

Appendix F: Wave Observations



Figure 1. Location Map

Section I. INTRODUCTION

1. Background.

One program of the U. S. Army Coastal Engineering Research Center (CERC) for studying wave and beach characteristics of U.S. coasts is the Beach Evaluation Program (BEP). The BEP is a study of eight beaches from southern New Jersey to Rhode Island by periodic resurveys of 91 profile lines on these beaches.

In fiscal year 1968, the BEP included an experimental project to test whether beach profiles could be surveyed by observing sand levels on pipes located at 50-foot intervals along selected profile lines. If the project proved successful, the pipe profile data could be used both as an auxiliary method of obtaining beach profiles, and as a surveillance procedure that would permit fewer traditional engineering surveys, but would alert the surveyors to changes in the beach requiring a complete survey.

Background information concerning the BEP (earlier known as the Storm Warning Program) is given by Darling (1965-66 and 1969) and Galvin (1968b). Part of the data in the present paper was discussed earlier by Galvin (1968a) and it is intended to elaborate on this work in the future.

Along with the pipe profile data, wave observations were obtained following a procedure that had been developed earlier in the CERC-USCG Cooperative Surf Observation Program (Darling, 1968).

2. Purpose.

The primary purpose of this paper is to present data. Weekly observations of sand levels along 10 pipe profiles during January, February, and March, 1968, are presented in Appendixes A, B, C, D, and E, and nearly daily wave observations from the same beaches for the same three months are presented in Appendix F. In addition, some of the more evident relations among the data are discussed, but a more complete discussion is reserved for a future paper.

3. Procedure

The pipe-profile work was done in cooperation with the Philadelphia and New York Districts of the Corps of Engineers and unpaid local observers. Two profile lines on each of the three beaches in southern New Jersey (Long Beach Island, Atlantic City, and Ludlam Island, all in Philadelphia District) and two beaches on the south shore of Long Island (Jones Beach and Westhampton Beach, both in the New York District) were used in the experimental program. Note that Long Beach Island, one of the New Jersey beaches, is not the same as the Long Island beaches (Jones and Westhampton). Table I lists these beaches, together with the names of the observers, the number of pipes emplaced and destroyed, the dates of

TABLE I

SUMMARY OF PIPE PROFILE PROGRAM - FY 1968

Locality and Observer	Profile Number		Number of Pipes		Date		Pipe Length	
	CERC	Surveyors	Emplaced	Destroyed	Emplaced	Withdrawn	Total	Initially Buried
Westhampton Beach, N. Y. Joseph Benedetto and William Daniels of Suffolk Co. Dept. of Public Works.	04	40-75E	6	3	3 Nov 67	-	15	10
	08	39+54W	6	4	3 Nov 67	-	15	10
Jones Beach, N. Y. F. W. Zimmer and Neil Ackerson of Long Island State Park Commission.	07	15	7	2	3 Nov 67	21 Apr 68	15	10
	11	11	6	2	3 Nov 67	29 Apr 68	21	13
Long Beach Island, N. J. Peter Kief of Fernandez, Jorlett, Kief, & Tracy.	13	N	6	0	8 Dec 67	21 May 68	21	13
	16	R	5	0	8 Dec 67	21 May 68	21	13
Atlantic City, N. J. Robert Badger of City Engineers Office, Atlantic City.	05	E	11	0	8 Dec 67	14 May 68	21	13
	07	G	11	0	8 Dec 67	14 May 68	21	13
Ludlam Island, N. J. Howard Wright, City Superintendent, Sea Isle City, N.J.	05	E	9	0	8 Dec 67	-	21	13
	18	T	10	1	8 Dec 67	-	21	13

emplacement and removal, and the pipe lengths. Profiles are numbered in this paper according to CERC's numbering system designed for computer usage. The correspondence between CERC's profile numbers and the profile identification used by the surveyors in the field is shown in columns 2 and 3 of Table I. Pipes are numbered in this paper consecutively from the land towards the sea.

It was necessary to request permission from local authorities to place the pipes on the beaches. Permission was granted in all cases, usually subject to the condition that the pipes be removed before the summer tourist season. Unpaid local observers (Table I), enlisted by the New York and Philadelphia Districts, observed the sand levels on the pipes at approximately 1-week intervals. These observations were recorded on forms (Figure 2) which were mailed weekly to CERC. At CERC, the sand elevations with respect to the pipes were converted to elevations above MSL, using a template overlay on the form.

To check accuracy of the method, reduced values of the observed sand elevations on each pipe profile were plotted against elevations obtained by normal surveying methods on the same profile for the same date (Figures 3 and 4). Agreement between surveys and sand levels observed on the pipes was good on the New Jersey beaches (Figure 3) and Westhampton Beach, but was questionable on Jones Beach (Figure 4). No explanation is available for the lack of agreement shown at profile 07 on Jones Beach, in Figure 4. Although sand levels at the pipes on profile 11 of Jones Beach agree well with the survey, the 50-foot pipe spacing on a steep beach gives a poor indication of the surveyed sand levels between the pipes (Figure 4).

4. Period Covered

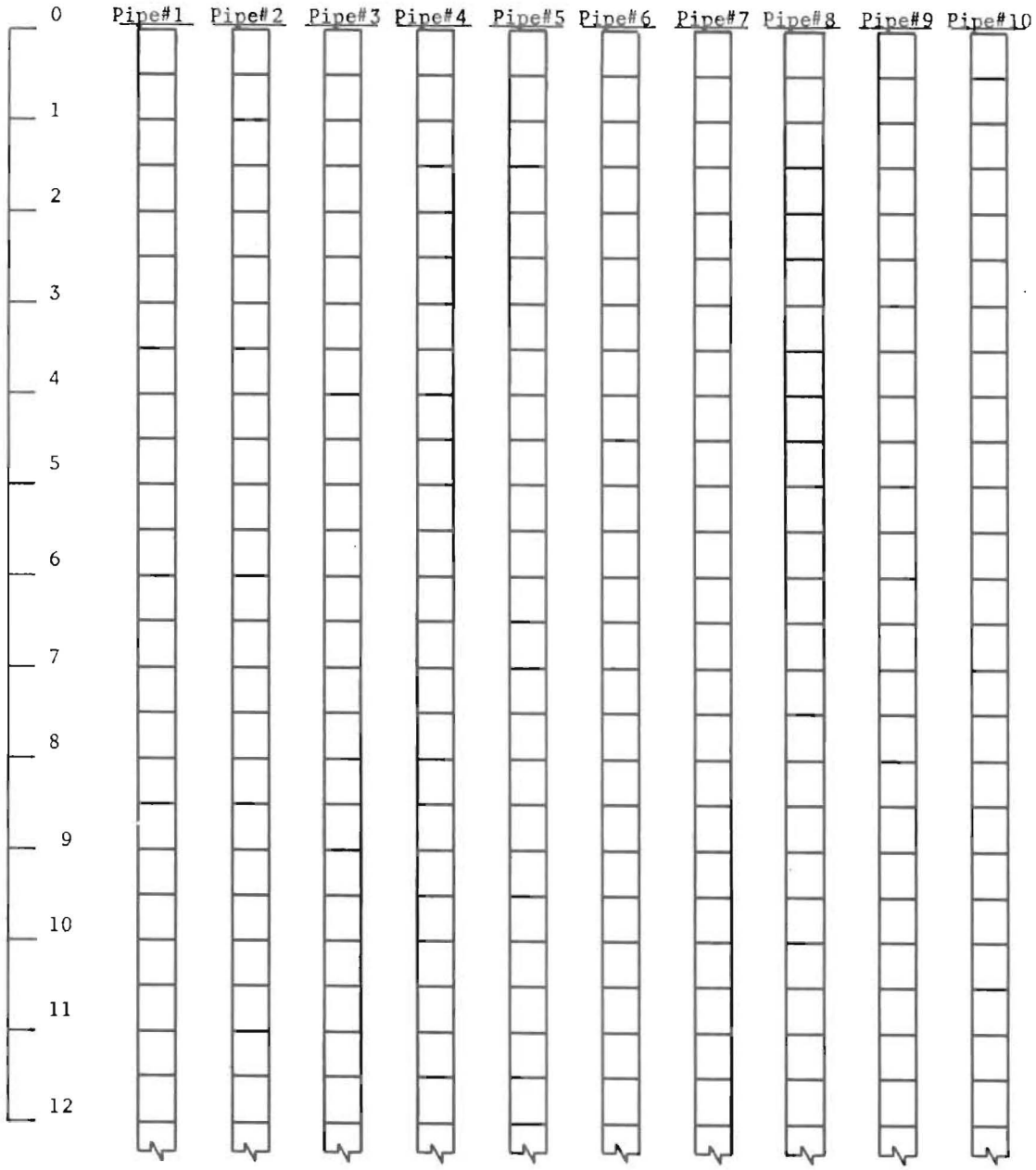
The main period of interest for this report is the 3-month interval from January through March 1968. However, the earliest pipe range survey was on 17 November 1967, at Jones Beach. Before summer 1968, the pipes were removed from Long Beach Island, Atlantic City, and Jones Beach. Readings continued all year at Westhampton Beach, but were discontinued at Ludlam Island, although most of the pipes remained in place there.

The time interval between successive observations of sand levels on the pipes are referred to as "1-week" intervals. Actually, although most readings were taken at 7-day intervals, the interval between observations ranged from 3 days to 3 weeks. The exact time intervals are in Appendix A.

PIPE RANGE DATA - BEACH EVALUATION PROGRAM

REPORT NO._____ ATLANTIC CITY DATE:_____

PROFILE G - RAYLEIGH AVE.



REMARKS:_____

_____

UNUSUAL WAVES OR TIDES SINCE LAST OBSERVATION:_____

SUBMITTED BY:_____

Figure 2. BEP Pipe Profile Report Form, as used in FY 1968

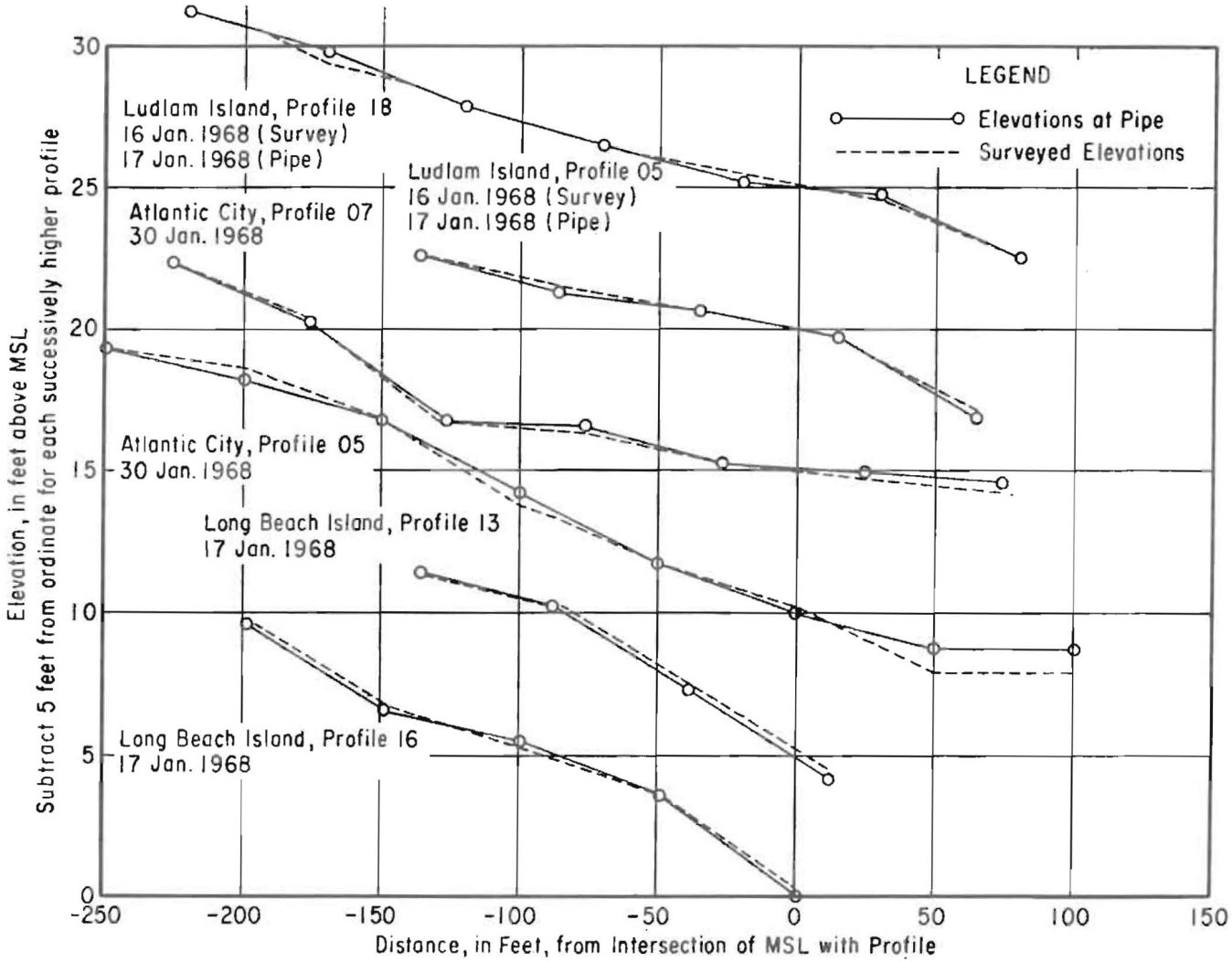


Figure 3. Comparison of Beach Profiles Obtained by Pipe Profile Observations and Standard Survey Methods on Three New Jersey Beaches.

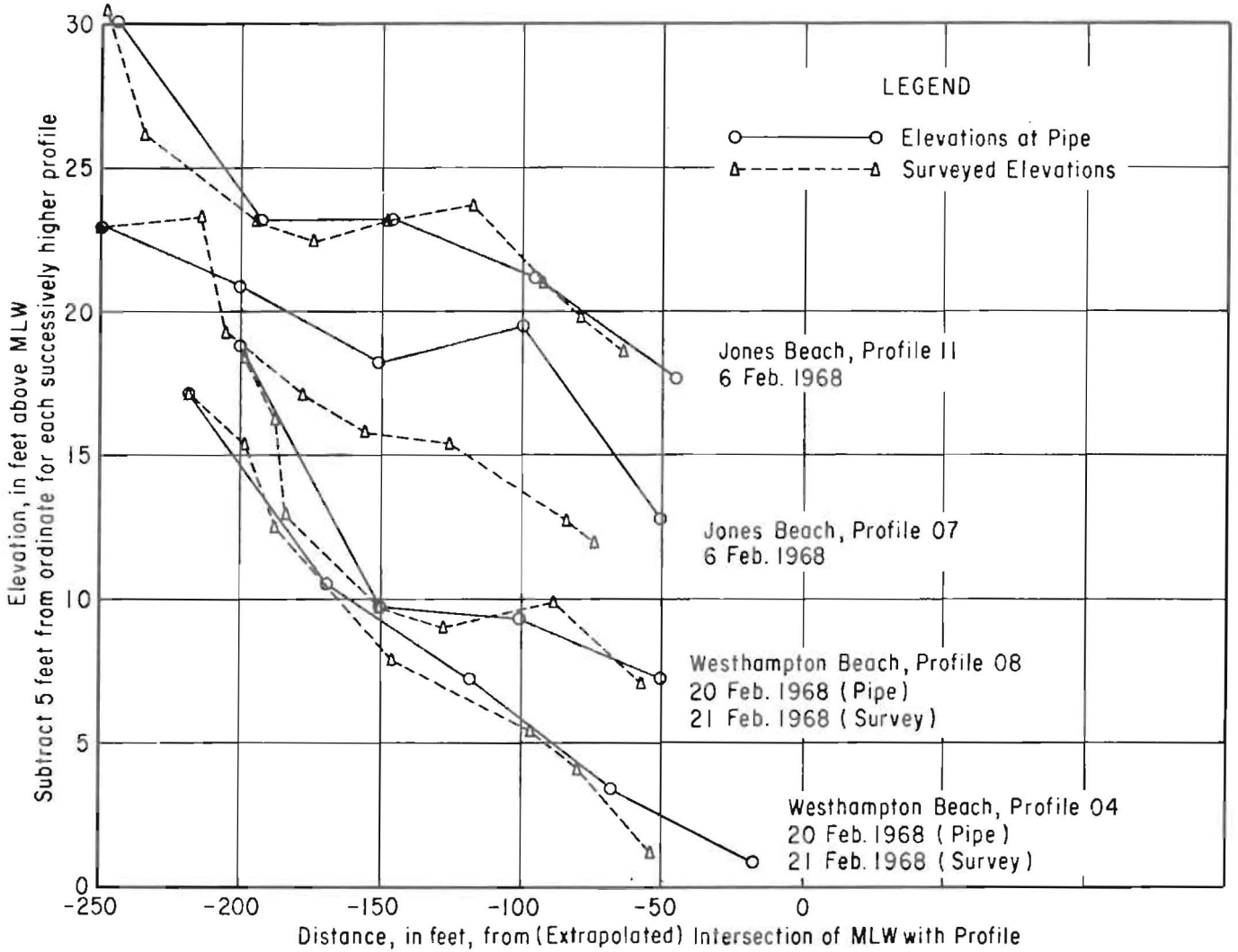


Figure 4. Comparison of Beach Profiles Obtained by Pipe Profile Observations and Standard Survey Methods on Two Long Island Beaches.

Section II. METHODS OF PIPE INSTALLATION

1. New Jersey Beaches

On the New Jersey beaches, the pipes used were 21 feet long (standard pipe length), 1½-inch diameter galvanized iron. Standard pipe caps were fitted temporarily on the pipe, and the pipes were marked at the 2-, 4-, 6-, and 8-foot points, measured from the top of the caps. At these intervals, the pipes were drilled and tapped for a 3/8-inch hex head bolt, and the distance (in feet) from the cap top was stamped on the bolts.

After removing the cap, the pipes were jetted into the sand using water under pressure. Usually, water from fire hydrants was used. At Atlantic City, as much as 1,200 feet of hose was necessary, some of which was loaned by the Atlantic City Fire Department. At Ludlam Island, the pipes were too far from a hydrant, but the local fire department (Sea Isle City) loaned a pump truck that maintained the pressure needed to emplace the pipes. Sixty pounds of pressure was usually adequate. On Long Beach Island, there was some difficulty in maintaining sufficient water pressure because of a permeable layer in the sand, associated with a muck layer about 3 to 4 feet below the surface.

In a typical installation, two men held the pipe, one man held the hose, one man with a transit kept the pipe in line, and one man controlled the water supply. On the New Jersey beaches, the pipes were jetted 13 feet into the sand at 50-foot intervals. After emplacement, government-property signs were wired to the pipe, and reflecting tape was attached. No pipes were lost in winter, but in the summer two pipes were lost from the dune end of a profile on Ludlam Island. Pipes were removed (from Long Beach Island and Atlantic City) by using wrenches; the pipes came out easily with a twisting motion.

2. Long Island Beaches

At 50-foot intervals along four profiles on Long Island, 10-foot pipe lengths were pounded into the beach to ground level; then 5-foot lengths were coupled to the top of the buried lengths. Probably because of stress concentration at the couplings, the pipes on the Long Island beaches had a tendency to fail. Also, the Long Island beaches had more trouble from vandals who tampered with or removed pipes, necessitating their resetting by the surveyors. New Jersey beaches had no reported vandalism during the period of data collection. There were times on all beaches when data could not be collected at the most seaward pipes because erosion had left them too deep in the water to allow a reading of sand level.

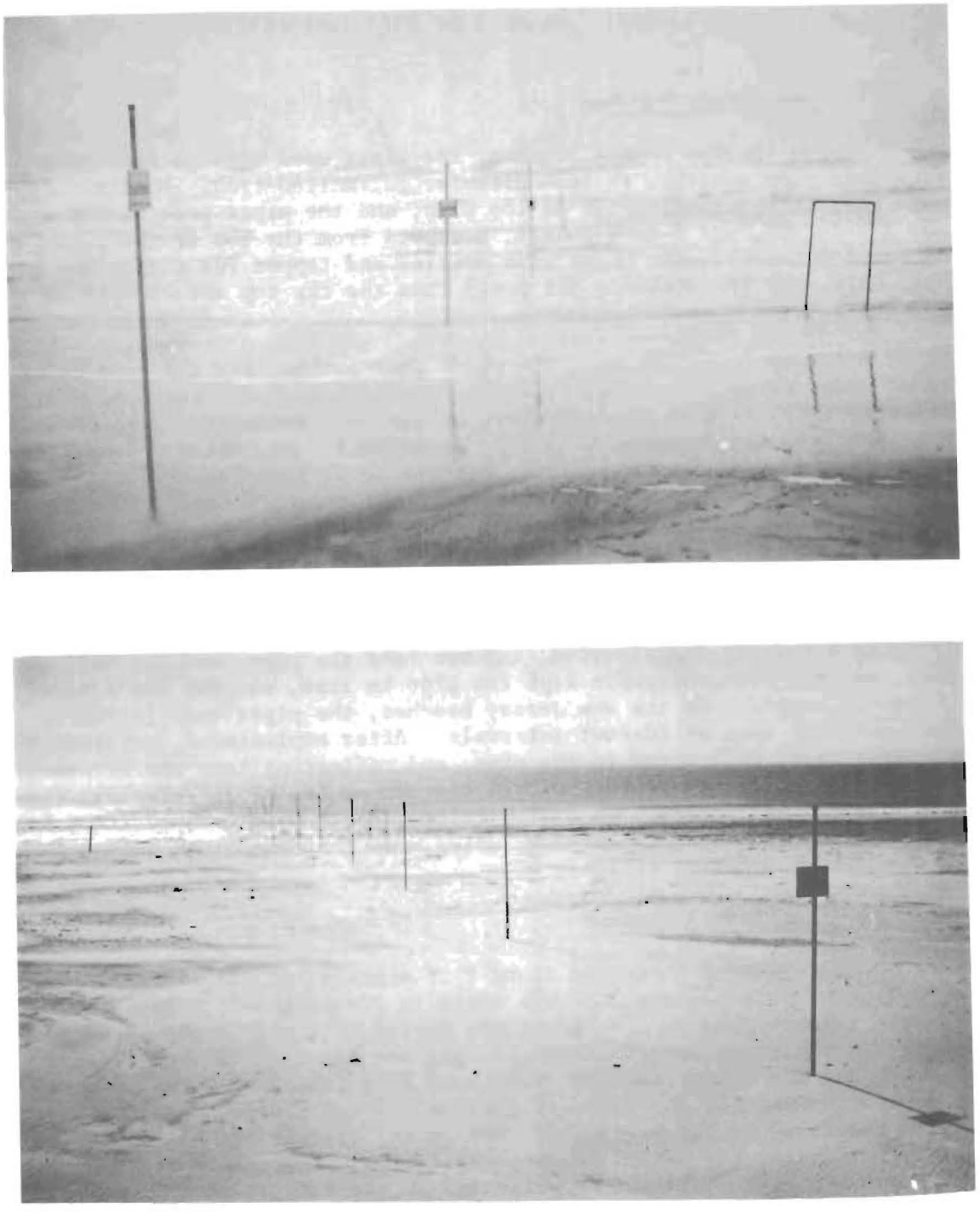


Figure 5. Pipe Profile at Indiana Avenue, Atlantic City, New Jersey. Top, January 1968; bottom, March 1969

Section III. ANALYSIS OF PIPE PROFILE DATA

1. Basic Data

The basic data of this study are the sand elevations at the pipes; these are tabulated in Appendix A with reference to local datum Then, for each profile, the sand elevations at the pipes, referenced to MSL, were plotted against time in two ways: plots of individual observations (Appendix B), and plots of three-point running averages against mean dates (Appendix C). The three-point running averages were computed in order to better indicate mean trends. They are obtained by plotting the average elevation of three successive sand elevations, at a given pipe, against a date midway between the dates of the first and third observations. According to this process, each observation in Appendix A, except for the first and last two of any series, will contribute to three successive points on the plots in Appendix C. In addition to plots of the basic data, histograms were constructed to show the frequency distribution of the sand elevations (Appendix D) and the frequency distribution of the 1-week changes in elevation (Appendix E). The histograms of sand elevations (Appendix D) are, in effect, plots of the pipe profiles, and the histograms of sand elevation changes (Appendix E) are plots of all 1-week changes in sand level.

2. Profile Shape

The approximate weighted averages of the histograms of each pipe in Appendix D have been combined into time-averaged beach profiles in Figure 6. The 10 average profiles obtained in this way (Figure 6) show a progressive flattening of the profile shape, from the most northern (Westhampton Beach) to the most southern (Ludlam Island) of the five beaches studied.

On a smaller scale, physical features of beach profiles, such as beach faces, scarps, or berms, can be interpreted from the basic data plots (Appendix B) and the 3-point running average plots (Appendix C). Closely spaced lines on these plots indicate a nearly flat surface; widely spaced lines indicate an abrupt change in elevation or a steeply dipping surface. For example, at Jones Beach there is a scarp on profile 07, at approxir ely 8 feet above MSL which appeared near the end of February 1968. Atlantic City, profile 07, there is a berm at approximately 7.5 fe above MSL (see Appendix B).

3 Maximum Single-pipe Erosion and Accretion

By examining data from each pipe in Appendix A, the maximum 1-week and 3-month values of erosion and accretion were determined for each of the 10 pipe profiles. This resulted in four maximum changes at each profile for the 3-month period (Table II): the greatest 1-week erosion at any one pipe on the profile; the greatest 3-month erosion at any one pipe on the profile; the greatest 1-week accretion at any one pipe on the profile; and the greatest 3-month accretion at any one pipe on the

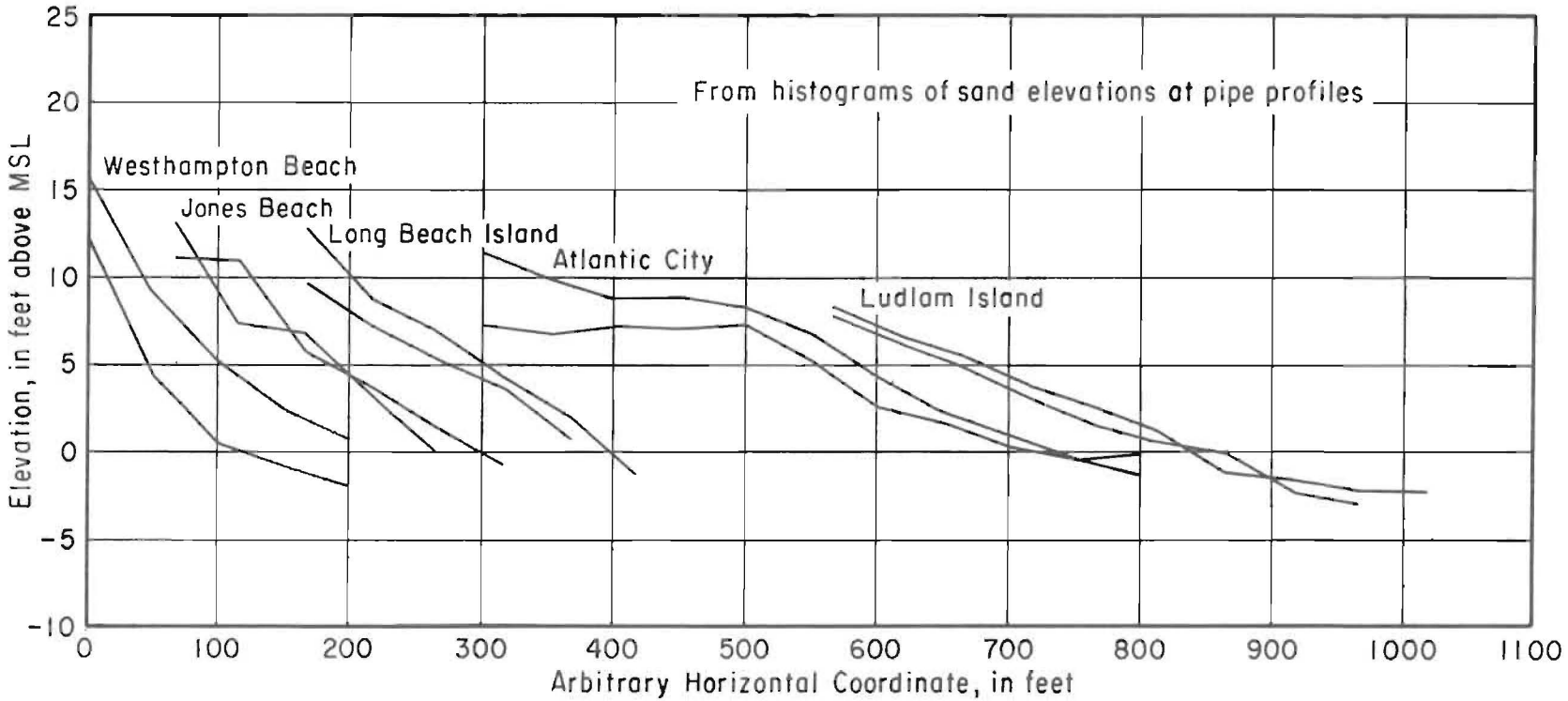


Figure 6. Profiles from Pipe Profile Data for Five Atlantic Coast Beaches (Generalized from Appendix D)

profile. These maximum changes are compiled in Table II, along with the dates between which the changes occurred, and the sand elevations at the pipes just before the maximum change occurred. The single-pipe maximums from the two profiles on each beach are averaged and plotted as four bar graphs in Figure 7.

For the five beaches during January, February, and March, 1968, the data in Table II show the following:

(1) The maximum of all 1-week changes for all pipes on the 10 profiles was 5.7 feet of erosion and 4.7 feet of accretion, both occurring on profile 07 of Jones Beach, and on successive weeks.

(2) The maximum of all 3-month changes for all pipes was 3.0 feet of erosion on profile 05 of Atlantic City, and 3.6 feet of accretion, again on profile 07 of Jones Beach.

(3) Maximum 1-week erosion appears correlated with the sand elevation at the start of the 1-week interval (Figure 8).

(4) For 10-profile averages of the maximum erosion and accretion, the 1-week average changes exceed the 3-month average changes by 55% for erosion and by 77% for accretion. (See bottom of Table II.)

(5) On the average, the two Long Island beaches significantly exceeded the three New Jersey beaches in 1-week erosion, and 1-week and 3-month accretion, but the Long Island beaches were somewhat less than the New Jersey beaches in 3-month erosion.

(6) Of the two Long Island beaches, Jones Beach had somewhat greater maximum changes in sand level than Westhampton Beach, both for 1-week and for 3-month intervals.

(7) Between the three New Jersey beaches, there appeared to be no significant difference in maximum erosion or accretion.

(8) Of the 10 values of maximum 1-week erosion, five occurred in January, five occurred in February, and none occurred in March. Of the 10 values of maximum 1-week accretion, two occurred in January, five occurred in February, and three occurred in March.

4. Correlation of Data

To test qualitatively whether changes in sand elevations could be correlated from place to place, sand elevations at one pipe, as plotted in Appendix B, were visually compared with sand elevations at pipes on the same profile, on the other profile of the same beach, and on different beaches. There was little consistent evidence of positive correlation of sand level changes, and some of the best correlation was in the negative sense. Examples of the better observed correlations are shown in Figure 9

TABLE II

Maximum, Single-Pipe, 1-Week and 3-Month, Vertical Changes in Sand Level On 10 Pipe Profiles, January-March, 1968

		EROSION						ACCRETION					
		1-Week Maximum			3-Month Maximum			1-Week Maximum			3-Month Maximum		
Beach	Pro-file	Date	Start*	Erosion	Date	Start*	Erosion	Date	Start*	Accre-tion	Date	Start*	Accre-tion
Westhampton Beach, N.Y.	04	23Jan 1Feb	1.8	1.8	2Jan 26Mar	1.4	0.5	23Jan 1Feb	2.4	2.5	2Jan 26Mar	0.0	3.0
	08	20Feb 27Feb	2.9	2.6	2Jan 26Mar	5.6	2.1	13Feb 20Feb	0.2	3.0	2Jan 26Mar	0.6	0.2
Jones Beach N. Y.	07	9Feb 16Feb	7.6	5.7	5Jan 29Mar	3.5	1.5	6Feb 9Feb	6.6	4.7	5Jan 29Mar	5.6	3.6
	11	9Feb 16Feb	4.3	2.4	5Jan 29Mar	8.0	0.8	23Feb 2Mar	1.9	2.3	5Jan 29Mar	12.9	1.4
Long Beach Island, N.J.	13	23Jan 26Jan	5.2	2.7	2Jan 27Mar	6.2	2.0	12Mar 21Mar	0.8	2.0	2Jan 27Mar	6.4	0.0
	16	23Jan 26Jan	5.8	2.5	2Jan 27Mar	0.7	2.0	26Jan 31Jan	4.0	2.5	2Jan 27Mar	6.6	1.0
Atlantic City, N. J.	05	9Jan 16Jan	5.7	3.0	9Jan 26Mar	5.6	3.0	6Feb 13Feb	-1.8	2.6	9Jan 26Mar	-1.8	1.0
	07	21Feb 27Feb	3.7	2.0	9Jan 26Mar	1.1	0.5	6Feb 13Feb	1.7	2.0	9Jan 26Mar	-1.5	1.0
Ludlam Island, N.J.	05	9Jan 17Jan	1.7	1.0	4Jan 25Mar	1.2	2.0	14Mar 25Mar	-4.1	1.5	4Jan 25Mar	4.2	1.5
	18	20Feb 27Feb	2.6	1.0	4Jan 25Mar	-0.3	1.5	14Mar 25Mar	-3.9	2.0	4Jan 25Mar	-3.4	1.5
Averages for:	Long Island			3.13			1.23			3.13			2.05
	New Jersey			2.03			1.83			2.10			1.00
	All profiles			2.47			1.59			2.51			1.42

*Elevation of sand above MSL for first date. All values are in feet.

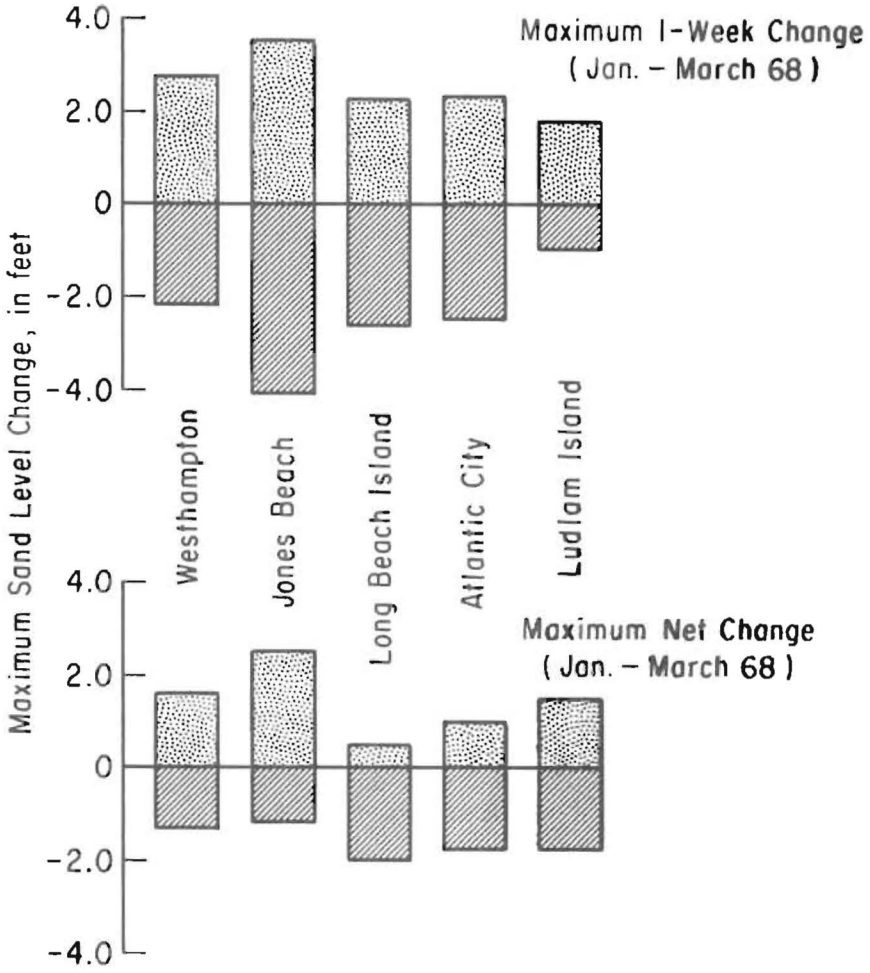


Figure 7. Erosion and Accretion Maximums on Five Atlantic Coast Beaches.

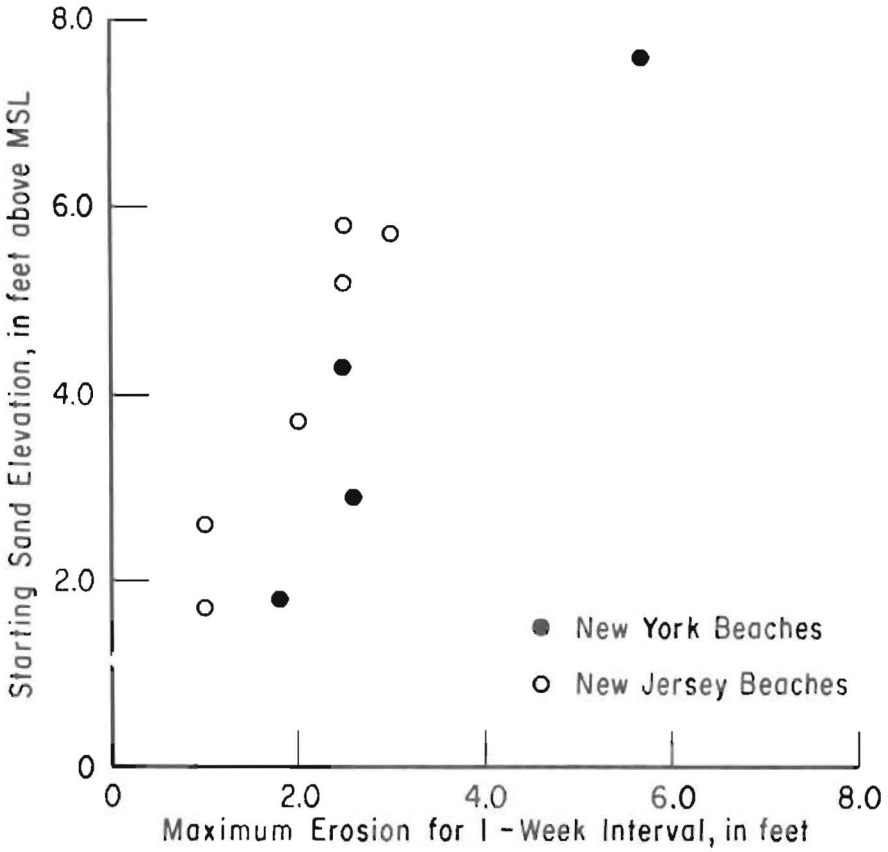


Figure 8. Maximum, Single-pipe, 1-Week Erosion vs. Sand Elevation Just Before Erosion

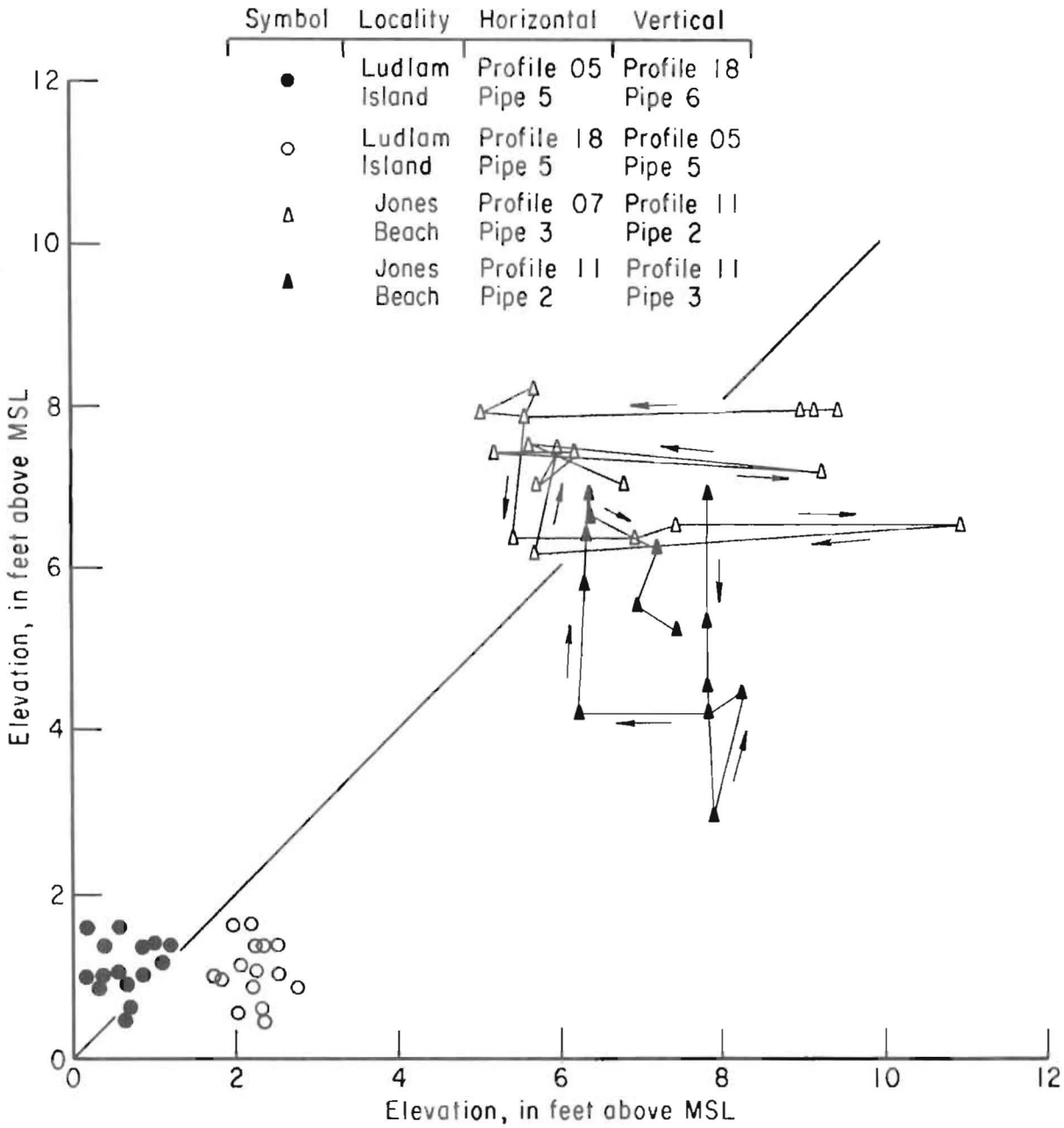


Figure 9. Attempts to Correlate Sand Level Changes

(arrows indicate the chronological order of the data points). Attempts to correlate changes in sand elevations between Jones Beach and Ludlam Island gave results which, at best, resembled the two correlations plotted near the origin in Figure 9. Correlation between beaches was usually poor.

5. Profile Fluctuations

The histograms of sand level changes (Appendix E) show that the greatest fluctuations in sand level usually do not occur at the most seaward pipe. As typical examples, on Jones Beach at profile 07, pipes 3 and 4 show a greater range of sand level changes than pipe 5, the most seaward pipe, and on Ludlam Island at profile 18, pipes 7 and 8 show more variable sand levels than pipes 9 and 10 (Appendix E). Probably the greatest fluctuations occur at the pipe intermittently located in the beach face, since here is the steepest segment of the profile where vertical changes due to any erosion will be most exaggerated.

Section IV. WAVE OBSERVATIONS

1. Procedure

In addition to the weekly observations of sand levels at the pipes, visual observations of wave height, period, direction, and breaker type were made approximately daily during January, February, and March, 1968. These observations are tabulated in Appendix F. Since the main purpose of this paper is to present data, this appendix contains, as far as possible, exact duplication of data reported, with no attempt at evaluation.

The instructions for making the observations, and the forms for recording them are shown in Figure 10. These forms, which were adapted from those used in the CERC-USCG Cooperative Surf Observation Program (Darling, 1968), were filled out by unpaid local observers and mailed weekly to CERC where they were tabulated. Wave observations were taken on the five beaches containing pipe profiles, as well as at localities on Plum Island, Massachusetts, and Watch Hill (near Misquamicut Beach), Rhode Island. All Plum Island data were obtained on the northern half of the island, but well south of Merrimack River Inlet.

The data near Misquamicut Beach were taken at the U. S. Coast Guard Station at Watch Hill, Rhode Island, west of Misquamicut Beach, but because Watch Hill is a rocky promontory, waves observed there may differ somewhat from waves on the sand beach at Misquamicut.

2. Height Histograms

The most characteristic feature of a wave is its height. Figure 11 contains wave-height histograms compiled from Appendix F for the seven

COASTAL ENGINEERING RESEARCH CENTER
5201 Little Falls Road, N. W.
Washington, D. C. 20016

WAVE OBSERVATION FORM						Please See Reverse Side for Instructions	
LOCATION:							
Date 1	Time 2	Period 3	Height 4	From 5	Type 6	Remarks 7	Observer 8
YEAR:							
MONTH:							
DAY:							
MONTH:							
DAY:							
MONTH:							
DAY:							
MONTH:							
DAY:							
MONTH:							
DAY:							
MONTH:							
DAY:							
MONTH:							
DAY:							

CERC Form 13a
Jan 1968

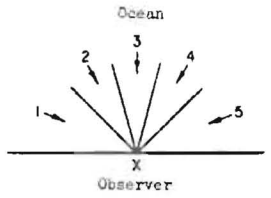
Signature: _____

FORM INSTRUCTIONS

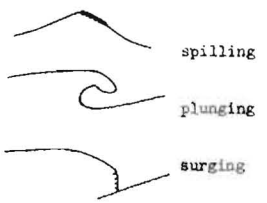
Column

1. Date — Give year, name of month, and day of month.
2. Time — Give time that observation took place. We need at least one per day, but we will be glad to receive more, if possible.
3. Period — Give time in seconds for eleven breaker crests to pass a point. Eleven crests will include ten complete breakers (crests plus troughs). Crest 1 is zero time, crest 11 is cut time.
4. Height — Give average height from crest to trough in feet for highest third of breakers. If less than 1/2 foot record "0".
5. From — Use one of the five numbers in the diagram below left to record direction from which waves are coming before they break.
6. Type — Use SP for spilling breakers, PL for plunging breakers, and SU for surging breakers. Spilling breakers break at their crest and "spill" foam and white water down the front face of the wave. Plunging breakers curl over at their crest and "plunge" into the toe of the wave with a big splash. Surging breakers break near their toe close to the beach and "surge" up the beach. See diagram at bottom right. Spilling usually lasts longer than plunging and both usually last longer than surging. If most waves break more than once on their way to the beach, mention this in remarks (Column 7).
7. Remarks — Give any information which will help someone miles away and days later to understand your surf at the time of observation. If everything is normal and there is nothing to say, leave blank. Typical entries might be: extremely high or low tide; strong onshore or offshore wind; shore ice; two lines of breakers; etc.
8. Observer — Give last name or full initials of wave observer.

5. From



6. Type



Forward completed form each week to Storm Warning Program, Coastal Engineering Research Center, 5201 Little Falls Road, N.W., Washington, D. C., 20016, in envelopes provided for this purpose.

Figure 10 Wave Observation Form. Left side is the front; right side is the back of the 8 by 10 1/2-inch sheet.

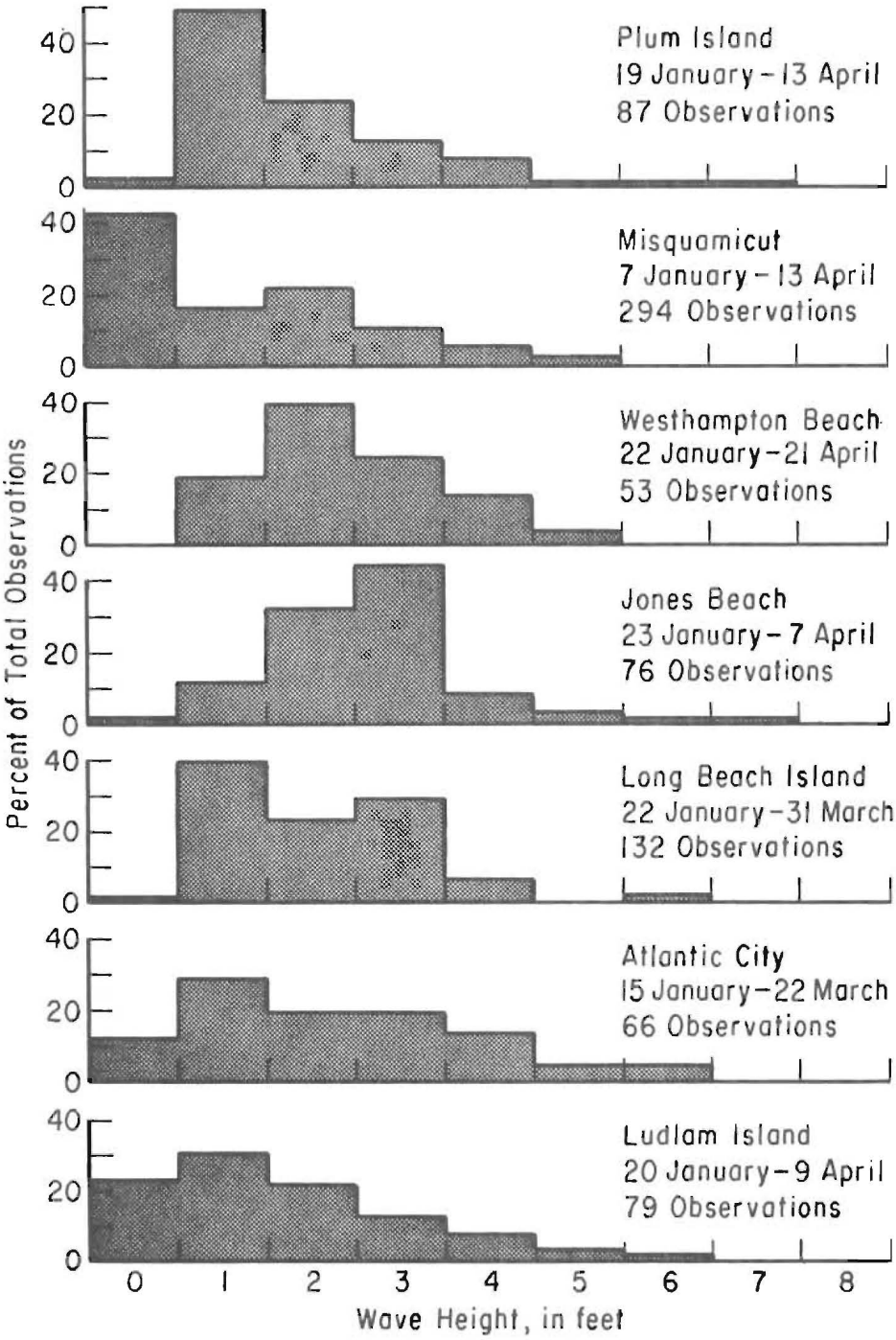


Figure 11. Wave Height Histograms for Seven North Atlantic Localities.

localities. Most heights were recorded to the nearest foot as requested in the form instructions, but where heights were recorded to fractions of a foot, they are rounded off in the office to the next highest foot. Among other things, the histograms indicate the following:

(1) Typical wave heights along the northern half of the U. S. Atlantic coast are low. For the seven localities averaged as a whole, the mode (the most frequently observed wave height) is only 1 foot, and the mean is 2.0 feet. This mean of 2.0 can be compared with the mean of 1.7 feet during the same 3 months obtained for this same area in the CERC-USCG Cooperative Surf Observation Program.

(2) The largest mode of any histogram is 3 feet (Jones Beach), and the maximum observed wave height is 7 feet (Jones Beach and Plum Island).

(3) Heights are generally greater on Long Island beaches than on New Jersey beaches. In this region, the percentage of calm conditions (0 wave height) increases progressively to the south.

3. Effects on Sand Level Changes

By comparing the height histograms in Figure 11 with maximum erosion and accretion in Table II or on Figure 7, a positive correlation is apparent between mean wave height and maximum, 1-week, sand level

TABLE III

SAND LEVELS AND ENVIRONMENTAL FACTORS

Locality	Beach Slope	Maximum 1-Week Erosion	Modal Wave Height	Mean Wave Height	Sand Size	Mean Tidal Range
Westhampton Beach	0.061	2.2	2	2.3	medium to fine	2.9
Jones Beach	0.059	4.0	3	2.7	medium to fine	3.6
Long Beach	0.049	2.6	1	2.1	medium to fine	4.1
Atlantic City	0.032	2.5	1	2.2	fine	4.1
Ludlam Island	0.033	1.0	1	1.7	fine to very fine	3.8

NOTE: Beach slope is from Figure 6 between 0 and plus 5 feet MSL. Maximum 1-week erosion is from average of two profiles in Table II. Modal wave height is from Figure 11. Mean wave height is from Appendix F. Except for beach slope, all values are in feet.

changes. These data are compiled in Table III along with the tidal ranges and qualitative estimates of sand size and profile steepness for the five beaches. The beach slope, or the maximum 1-week sand level change are dependent variables that presumably depend on such environmental factors as the mean wave height, sand size, and tidal range. The occurrence of storm tides is probably one of the more important environmental factors but there is little information on this factor for the localities and time of this study.

Section V. SUMMARY

Basic data are presented in Appendix A for changes in sand level at points along 10 pipe profiles on the five beaches during January, February, and March, 1968. These basic data are plotted to show change in sand level at a pipe with time (Appendix B), changes in running-average sand level with time (Appendix C), histograms of sand elevations at pipes along the profiles (Appendix D), and histograms of sand elevation changes at pipes along the profiles (Appendix E).

In addition, for the same 3 months, visual estimates of wave height, period, direction, and breaker type on seven beaches (including the five with pipe profiles) are given in Appendix F.

For the five beaches with pipe profiles, the data available indicate:

(1) Beaches on the south shore of Long Island have a more severe wave climate and have greater sand elevation changes than do beaches on the Atlantic coast of New Jersey.

(2) During normal winter conditions, short-term vertical changes in sand level at one point will rarely exceed 4 feet on the south shore of Long Island, or 3 feet on the Atlantic coast of southern New Jersey.

(3) To the extent that the data permit comparison between submerged and subaerial parts of the profiles, the maximum, short-term, sand level changes occurred more often in the vicinity of the beach face, or higher on the subaerial part of the beach profile, rather than seaward of the beach face.

(4) Beach profiles tend to be flatter and sand size smaller on the southerly beaches.

LITERATURE CITED

Darling, John M. (1964), Seasonal Changes in Beaches of the North Atlantic Coast of the United States, Proceedings of the Ninth Conference on Coastal Engineering, American Society of Civil Engrs, pp. 236-248.

Darling, John M. (1965-66), Study of Pilot Beaches in New England for the Improvement of Coastal Storm Warning, U.S. Army Coastal Engineering Research Center Bulletin, Vol. II, pp. 30-46.

Darling, John M. (1968), Surf Observations along the United States Coasts, Journal of the Waterways and Harbors Division, American Society of Civil Engineers, Vol. 94, WW1. pp. 11-21

Galvin, Cyril J., Jr. (1968a), CERC Beach Evaluation Program: 1962-1968 Background. Unpublished paper at the U.S. Army Coastal Engineering Research Center, 17 July 1968, 30 pp.

Galvin, Cyril J., Jr. (1968b), Winter Profile Fluctuations on Four Atlantic Coast Beaches (abstract), Geological Society of America Program, 1968 Annual Meeting, pp. 106-7.

APPENDIX A

Sand elevations at the pipes are *referenced to local datum.* Tables are arranged in north-to-south order: Westhampton Beach, Jones Beach, Long Beach Island, Atlantic City, Ludlam Island. Pipes are numbered from land to the sea.

WESTHAMPTON BEACH

Sand Elevations at Pipes on Profiles 04 and 08, in Feet above MLW
(Subtract 1.45 to correct to MSL)

	Profile 04						Profile 08					
Date	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5	Pipe 6	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5	Pipe 6
1Nov67	17.5	11.2	7.0	8.2	2.2	-1.3						
2Nov67							13.7	6.0	2.5	1.1	-0.1	-2.3
14Dec67	17.0	10.7	5.5	0.9			13.4	4.9	1.4			
20Dec67	17.2	10.9	5.7	1.9	-1.6		13.5	5.7	4.5	0.75	3.2	
27Dec67	17.4	10.9	6.2	3.2	0.2		13.6	7.0				
2Jan68	17.3	10.9	5.7	1.5	2.8		13.5	7.1	2.1	-0.3		
9Jan68	17.2	10.9	5.7	3.8	2.5		13.55	6.6	4.1	-0.3		
16Jan68	17.2	10.6	6.2	3.5	1.4		13.5	5.5	2.5	-0.3	4.8	
23Jan68	17.3	10.5	6.1	3.8	3.2		13.5	6.3		0.6		
1Feb68	17.5	10.6	6.1	6.3	1.5		13.25	4.25	0.5	-0.3	-1.0	
6Feb68	17.2	9.5	7.1	4.9	2.3		13.4	4.3	-0.8	0.3	-1.0	
13Feb68	17.2	10.5	6.8	3.2	0.8		13.3	4.5	1.6	-0.6	-2.1	
20Feb68	17.2	10.5	7.6	3.4	0.9		13.7	4.6	4.3	2.3	0.2	
27Feb68	17.2	10.4	7.6	3.9	0.9		13.4	6.5	1.7	0.5	-0.7	
19Mar68	17.2	9.3	7.5	4.3	0.7	-0.7	13.4	6.4	1.5	0.3	-0.9	
26Mar68	17.5	10.5	6.6	4.4	2.4		13.3	5.1	2.3	0.3		
1Apr68	17.5	12.2	7.0	7.3			13.7	5.8	1.3	-2.6	-2.1	
8Apr68	17.2	11.7	8.2	8.4			14.0	5.4	1.4	-2.7	-3.0	
15Apr68	16.9	9.4	6.2	5.9			14.1	5.3	1.5	-0.5	0.0	
23Apr68	16.3	9.3	6.5	5.3			14.0	5.2	1.3	-0.7	-0.2	
29Apr 68	16.8	6.8	5.5	7.3			14.1	5.2	2.5	-2.1	1.2	
13May68	15.1	8.9	6.5	7.0			14.2	5.2	2.5	-2.0	-0.6	
20May68	18.1	10.5	7.6	5.0	3.4		11.4	3.6	1.4	0.2		

JONES BEACH

Sand Elevations at Pipes on Profiles 07 and 11, in Feet above MLW
(Subtract 1.8 to correct to MSL)

	Profile 07							Profile 11				
Date	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5	Pipe 6	Pipe 7	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5
17Nov67	12.7	10.9	11.0	8.2	3.4	-	-	14.0	8.0	8.8	4.7	
24Nov67	12.7	10.9	11.0	7.2	3.4	-	-	14.2	7.8	9.2	5.6	
1Dec67	12.6	11.0	11.0	7.8	4.3	1.8		14.2	7.8	8.7	5.2	2.0
8Dec67	12.7	10.9	11.2	8.0	4.0			14.4	9.7	8.6	4.0	
15Dec67	12.7	10.9	11.0	4.0	3.0	1.3		14.4	9.7	6.7	3.4	1.8
22Dec67	12.6	10.9	10.9	4.2	3.5			14.4	9.7	7.0	4.9	
29Dec67	12.8	10.9	6.8	3.2	2.6	1.9		14.5	9.7	4.6	2.5	2.4
5Jan68	12.8	11.0	7.4	5.3	2.2			14.6	9.8	6.2	3.7	1.5
12Jan68	12.8	11.0	7.4	5.4	3.7	-0.5		15.4	9.7	6.0	4.6	1.9
19Jan68	12.7	11.0	7.3		2.7	0.3		14.7	7.9	6.0	4.9	2.0
26Jan68	12.9	11.1	8.0	9.6[1]	3.9			15.1	8.1	7.4	5.0	2.4
6Feb68	13.1	11.0	8.4	9.5	3.0	0.5		15.0	8.1	8.1	6.1	2.6
9Feb68	13.0	11.1	13.1	9.4	3.5			15.2	8.1	8.6	6.0	1.7
16Feb68	12.9	13.9	7.7	3.7[2]	2.0	1.5	-2.3	15.8	8.1	8.3	3.6	1.7
23Feb68	12.8	13.9	7.5	4.0	1.6	1.3	-1.3	16.4	8.2	8.1	3.7	1.2
2Mar68	13.0	14.0	7.7	5.5	1.6	0.3		16.5	9.0	7.9	6.0	
9Mar68	12.9	13.9	7.5	6.5	2.7			16.7	8.8	7.8	6.7	
16Mar68	13.0	14.0	8.0	4.7	1.9			16.8	9.2	7.5	6.2	
23Mar68	13.0	14.0	7.0	3.2				16.5	9.2		5.6	1.7
29Mar68		13.9	11.0	3.8	2.1	0.4		16.1	9.1			1.7
7Apr68	12.9	14.0	7.3	6.0	2.4			15.0	9.0		5.6	
14Apr68	13.0	14.1	8.9	5.7	1.9			14.9	8.7		2.5	

[1] 5-foot length broken off at coupling

[2] Pipe replaced.

LONG BEACH ISLAND

Sand Elevations at Pipes on Profiles 13 and 16, in Feet above MSL

	Profile 13						Profile 16				
Date	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5	Pipe 6	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5
8Dec67	12.8	8.8	6.4	2.8	2.7	0.7	9.5	6.6	4.5	1.8	1.2
26Dec67	12.8	8.8	6.4	5.2	3.3	-0.3	9.5	6.6	4.5	3.8	0.7
29Dec67	12.8	8.8	6.4	3.6	2.3	0.2	10.0	6.6	4.5	2.8	1.2
2Jan68	12.8	8.8	6.4	6.2	2.7	-0.3	10.0	6.6	5.5	4.3	1.2
9Jan68	12.8	8.8	6.4	6.2	3.3	0.7	10.0	6.6	5.5	3.8	1.2
17Jan68	12.8	8.8	6.4	5.2	2.8	-0.8	9.5	6.6	5.5	3.8	0.2
23Jan68	12.8	8.8	6.4	5.2	3.8	-1.3	9.5	6.6	5.0	5.8	0.7
26Jan68	12.8	8.8	6.4	2.8	3.3	-0.8	9.5	6.6	4.0	3.3	0.2
31Jan68	12.8	8.8	6.9	3.6	1.7	-0.4	9.5	7.1	6.5	2.8	0.7
6Feb68	12.8	8.8	7.4	5.2	1.3	-1.8	9.5	7.1	7.0	4.3	0.7
13Feb68	12.8	8.8	5.9	4.6	0.7	-2.8	9.5	7.1	4.5	4.8	0.2
21Feb68	12.8	8.8	5.9	4.6	1.3	-3.3	9.5	7.6	5.0	4.8	0.7
28Feb68	12.8	8.8	6.9	3.7	0.8	-1.8	9.5	7.1	5.5	3.3	0.7
6Mar68	12.8	8.8	6.9	4.2	0.8	-1.8	9.5	7.6	5.5	4.3	0.2
12Mar68	12.8	8.8	6.9	4.2	0.8	-1.3	9.5	7.6	5.5	2.3	-0.3
21Mar68	12.8	8.8	6.4	4.2	2.8	-0.8	9.5	7.6	5.0	2.3	-0.3
27Mar68	12.8	8.8	6.4	4.2	2.8	-0.8	10.0	7.6	5.0	2.8	-0.8
4Apr68	12.8	8.8	6.4	5.2	2.8	-0.8	10.0	7.6	6.0	2.8	-0.8
8Apr68	12.8	8.8	6.4	5.2	3.8	-0.8	10.0	7.1	6.0	2.8	0.2
17Apr68	12.8	8.8	7.4	3.7	-0.2	-3.3	10.0	7.6	6.0	3.3	-0.3
25Apr68	12.8	8.8	7.4	3.2	-0.8	-3.8	10.0	7.6	6.5	1.3	-1.3
1May68	12.8	8.8	7.9	3.2	-0.3	-3.3	10.0	7.6	6.0	1.3	-1.3
8May68	12.8	8.8	7.9	3.2	0.3	-3.3	10.0	7.6	5.5	1.8	-0.8
14May68		8.8	8.4	3.2	0.8	-2.8	10.0	7.6	4.4	1.8	-0.3
21May68					2.7	-1.3					

ATLANTIC CITY

Sand Elevations at Pipes on Profiles 05 and 07, in Feet above MSL

Profile 05

Date	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5	Pipe 6	Pipe 7	Pipe 8	Pipe 9	Pipe 10	Pipe 11
9Jan68	11.3	9.8	9.4	9.4	8.2	7.3	5.6	5.7	2.3	-0.3	-1.8
16Jan68	11.3	9.8	9.4	9.4	8.2	6.3	4.5	2.7	1.3	-0.8	-3.4
23Jan68	11.3	9.8	9.4	9.4	8.2	6.3	4.5	3.7	1.3	-0.8	-3.3
30Jan68	11.3	9.8	9.4	9.4	8.2	6.8	3.5	1.6	0.3	-1.3	-1.4
6Feb68	11.3	9.8	9.4	9.4	8.2	6.8	4.0	2.2	0.3	-0.8	-1.4
13Feb68	11.3	9.8	9.4	9.4	8.2	6.7	4.1	1.7	0.7	0.2	-0.4
21Feb68	11.3	9.8	9.4	9.4	8.2	6.7	4.1	2.2	0.8	0.2	-0.4
27Feb68	11.3	9.8	9.4	9.4	8.2	6.7	4.0	2.1	1.3	0.2	-0.8
5Mar68	11.3	9.8	9.4	9.4	8.2	6.7	4.1	2.6	1.3	0.2	-0.8
12Mar68	11.3	9.8	9.4	9.4	8.2	6.7	4.1	2.7	1.3	0.2	-0.8
19Mar68	11.3	9.8	9.4	9.4	8.2	7.3	4.1	2.7	1.3	-0.3	-0.8
26Mar68	10.8	9.8	9.4	9.4	8.2	6.7	4.6	2.6	1.3	0.2	-0.8
2Apr68	10.8	9.8	9.4	8.9	8.2	7.3	4.6	2.6	1.3	0.2	-0.8
9Apr68	11.3	9.8	9.4	9.4	8.2	6.7	4.5	3.7	1.3	0.2	-0.4
16Apr68	11.3	9.8	9.4	9.4	8.2	6.7	3.6	2.7	1.3	0.2	-0.4
23Apr68	11.3	9.8	9.4	9.4	8.2	7.3	3.5	2.1	1.3	0.7	-0.4
30Apr68	11.3	9.8	9.4	9.4	8.2	7.3	4.6	2.7	1.8	0.7	-0.4
7May68	11.3	9.8	9.4	9.4	8.2	6.7	5.1	4.2	2.3	0.7	-0.4
14May68	11.3	9.8	9.4	8.9	8.2	6.8	5.1	3.7	2.3	0.2	-0.8

ATLANTIC CITY (Cont.)

Sand Elevations at Pipes on Profiles 05 and 07, in Feet Above MSL

Profile 07

Date	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5	Pipe 6	Pipe 7	Pipe 8	Pipe 9	Pipe 10	Pipe 11
9Jan68	7.4	6.9	6.9	7.5	7.4	4.8	1.7	1.1	1.1	-0.8	-1.5
16Jan68	7.4	6.9	6.9	7.5	7.4	4.7	1.2	1.6	0.1	-0.8	-1.0
23Jan68	7.4	6.9	6.9	7.5	7.4	4.8	3.2	1.6	0.1	-1.3	0.0
30Jan68	7.4	6.9	6.9	7.0	7.4	5.3	1.7	1.6	0.1	-0.3	-1.0
6Feb68	7.4	6.9	6.9	7.5	7.4	5.3	1.7	1.1	0.1	-0.3	-0.5
13Feb68	7.4	6.9	6.9	7.5	7.4	5.3	3.6	1.6	-0.5	-0.8	0.0
21Feb68	7.4	6.9	6.9	7.5	7.4	4.8	3.7	1.6	-0.4	-1.3	0.0
27Feb68	7.4	6.9	6.9	7.0	7.4	5.3	1.7	1.1	-0.4	-0.3	-0.5
5Mar68	7.4	6.9	6.9	7.0	7.4	5.3	1.7	2.1	0.1	-0.4	0.5
12Mar68	7.4	6.9	6.9	7.0	7.4	5.3	2.2	1.6	0.1	0.2	0.5
19Mar68	7.4	6.9	6.9	7.0	7.4	5.3	1.7	1.6	0.6	-0.3	-0.5
26Mar68	7.4	6.4	6.9	7.0	7.4	5.3	2.2	1.6	0.6	-0.3	-0.5
2Apr68	7.4	6.4	6.4	7.0	7.4	5.3	2.2	1.6	0.6	0.2	-0.5
9Apr68	7.4	6.4	6.9	7.0	6.9	5.3	2.2	2.1	1.1	0.2	-0.5
16Apr68	7.4	6.4	6.9	7.0	6.9	5.3	2.2	2.1	1.1	-0.2	-1.0
23Apr68	7.4	6.4	6.9	7.0	7.4	5.3	2.2	1.6	1.1	-0.8	-2.0
30Apr68	7.4	6.4	6.4	7.0	7.4	5.3	2.2	1.6	0.6	0.2	-1.0
7May68	7.4	6.4	6.9	7.0	7.4	5.3	2.6	2.1	1.1	0.7	-0.5
14May68	7.4	6.4	6.9	7.0	7.4	5.8	2.6	1.1	1.6	0.3	0.0

LUDLAM ISLAND

Sand Elevations at Pipes on Profiles 05 and 18, in Feet above MSL

Profile 05

Date	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5	Pipe 6	Pipe 7	Pipe 8	Pipe 9
19Dec67	7.4	6.0	4.2	2.6	1.4	1.2	0.7	-0.6	-2.1
27Dec67	7.4	6.0	4.2	2.6	1.3	1.2	-0.3		
4Jan68	7.4	5.5	4.2	2.6	1.4	1.2	0.2	-2.1	
9Jan68	6.9	5.5	4.2	2.6	1.4	1.7	0.2	-2.6	-3.6
17Jan68	7.4	6.0	3.7	2.6	1.4	0.7	-0.3	-3.1	
24Jan68	7.4	6.0	4.2	3.2	1.9	0.2	-0.3	-2.6	
30Jan68	7.4	6.0	4.2	2.6	1.4	0.7	-0.3		
7Feb68	7.4	6.0	4.2	2.6	0.9	0.2	-0.3	-2.6	
12Feb68	7.4	6.0	4.2	2.6	0.8	0.2	-0.4	-2.1	-3.6
20Feb68	7.4	6.0	4.2	2.6	0.8	0.2	-0.4	-3.1	
28Feb68	7.4	6.0	4.2	2.6	1.4	0.7	-0.4	-3.1	
5Mar68	7.4	6.0	4.2	2.6	1.4	-0.3	-0.3		
14Mar68	7.4	6.0	4.7	3.7	0.4	-0.8	-0.3	-4.1	-4.1
25Mar68	7.4	6.0	5.7	3.6	-0.1	-0.8	-0.3	-2.6	-3.1
9Apr68	7.4	6.0	5.7	3.7	0.9	-0.3	-0.3	-2.6	-3.1
30Apr68	7.4	6.0	5.7	3.1	0.9	0.2	-0.3	-2.6	
9May68	7.4	6.0	5.7	3.2	0.9	-0.3	-0.3	-4.1	-3.6
20May68	7.4	6.0	5.7	2.6	1.4	0.2	-0.3	-1.6	-2.6

LUDLAM ISLAND (Cont.)

Sand Elevations at Pipe Profiles 05 and 18, in Feet above MSL

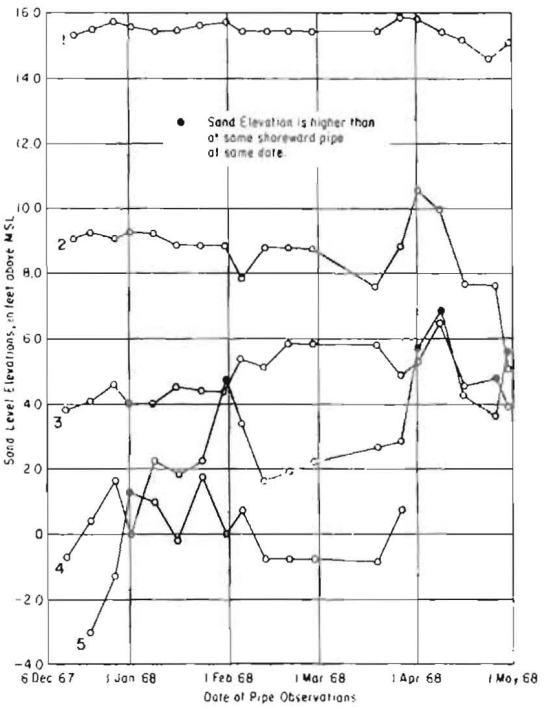
Profile 18

Date	Pipe 1	Pipe 2	Pipe 3	Pipe 4	Pipe 5	Pipe 6	Pipe 7	Pipe 8	Pipe 9	Pipe 10
19Dec67	8.0	6.2	4.8	3.4	2.0	0.4	0.7	-0.5	-2.9	-2.6
27Dec67	8.0	6.2	4.8	3.4	2.5	1.4	0.2	-1.5		
4Jan68	8.0	6.2	4.8	3.4	2.5	1.4	-0.3	-2.5	-3.4	
9Jan68	8.0	6.2	4.8	3.4	2.5	1.4	-0.8	-2.5	-2.9	-3.1
17Jan68	8.0	6.2	4.8	2.9	1.5	0.4	-0.3	-2.5		
24Jan68	8.0	6.2	4.3	3.4	2.5	-0.1	-1.8			
30Jan68	8.0	6.2	4.8	3.4	2.0	0.4	-1.3	-3.0		
7Feb68	8.5	6.7	5.3	3.4	3.0	0.9	-1.8	-2.5		
12Feb68	8.0	6.7	4.8	2.9	2.5	-0.1	-2.3	-3.0	-2.9	-3.1
20Feb68	8.0	6.7	4.8	3.4	2.5	0.4	-2.4	-3.5		
28Feb68	8.0	6.2	4.8	2.9	1.5	0.4	-1.3	-3.0	-3.4	-4.1
5Mar68	8.0	6.2	4.8	2.9	2.0	0.9	-1.8			
14Mar68	8.0	6.7	4.8	3.4	1.5	0.4	-1.3	-3.0	-3.9	-2.6
25Mar68	8.5	6.7	4.8	3.4	2.5	0.9	-1.8	-3.5	-1.9	-1.6
9Apr68	8.5	6.7	4.8	3.9	3.0	0.9	-2.3	-1.0	-1.4	-2.6
30Apr68		6.7	5.8	3.4	1.5	0.4	0.2	-0.5	-1.9	-2.1
9May68		6.7	5.8	3.9	2.0	1.4	0.2	-1.0	-1.9	-2.6
20May68		6.7	5.8	3.9	2.0	1.4	0.2	-1.0	-1.9	-2.6

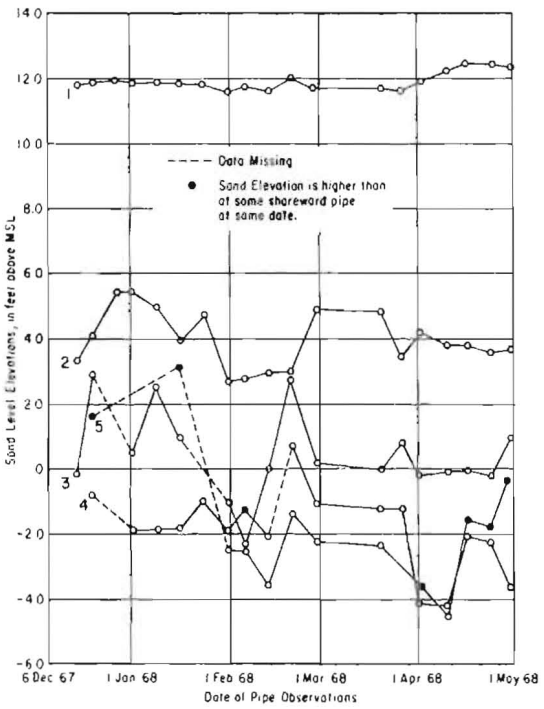
APPENDIX B

SAND ELEVATION VS. TIME, JANUARY THROUGH MARCH 1968

Sand elevations at pipes, *referenced to MSL*, plotted against time. Figures are arranged in north-to-south order: Westhampton Beach, Jones Beach, Long Beach Island, Atlantic City, Ludlam Island. Curves are identified by pipe number.

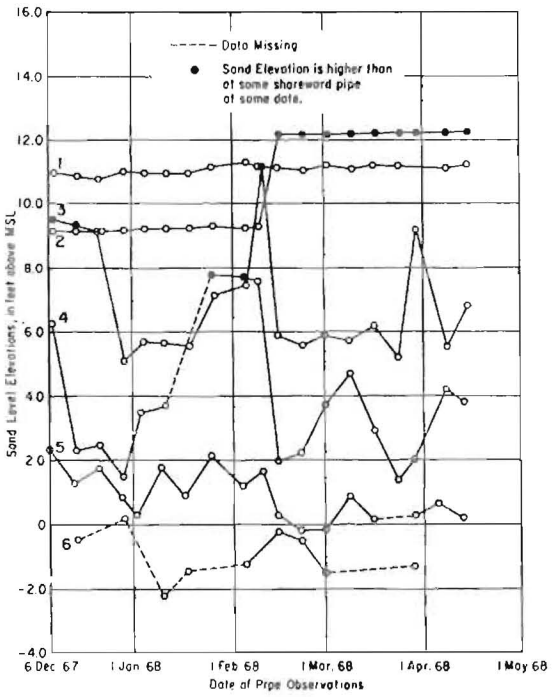


Profile 04

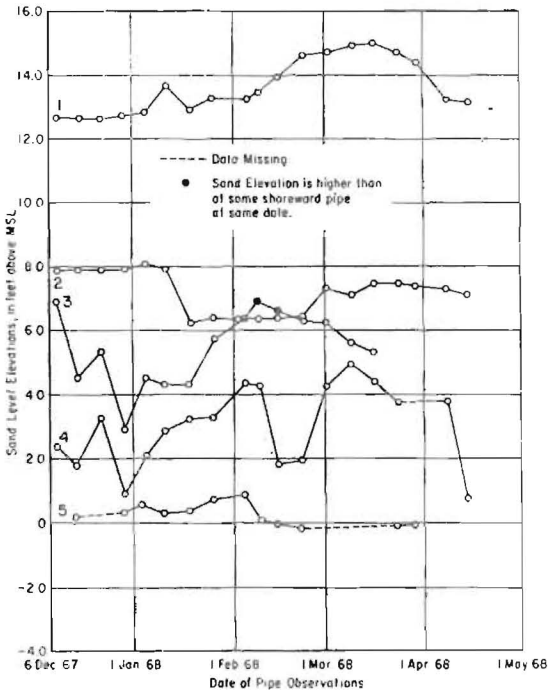


Profile 08

WESTHAMPTON BEACH

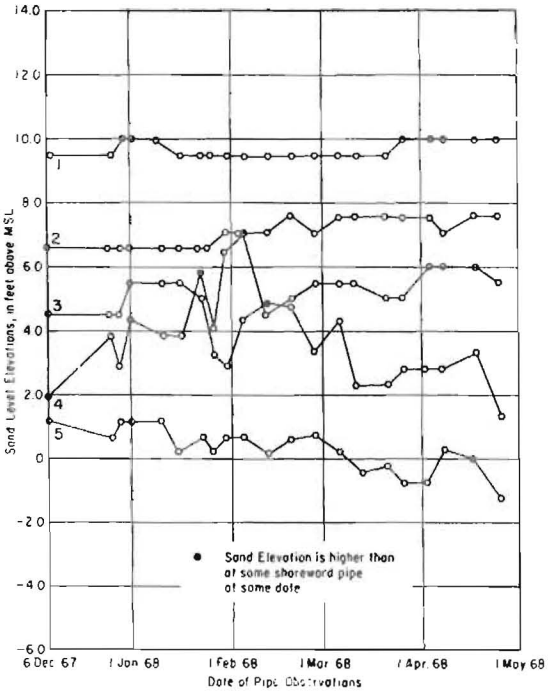


Profile 07

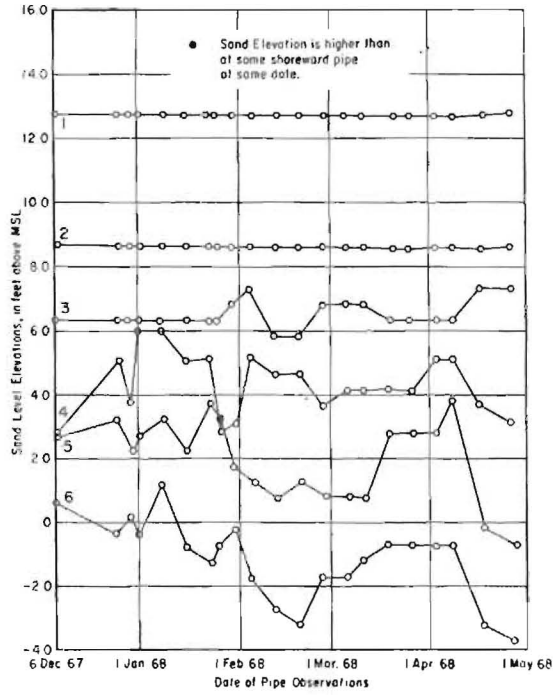


Profile 11

JONES BEACH

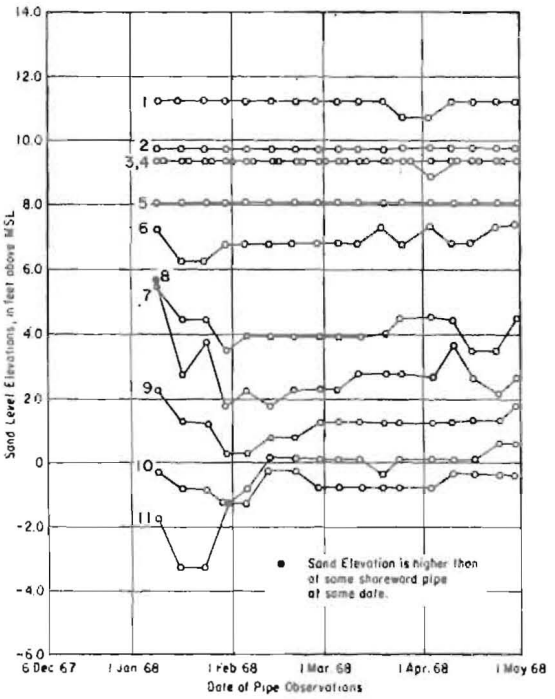


Profile 16

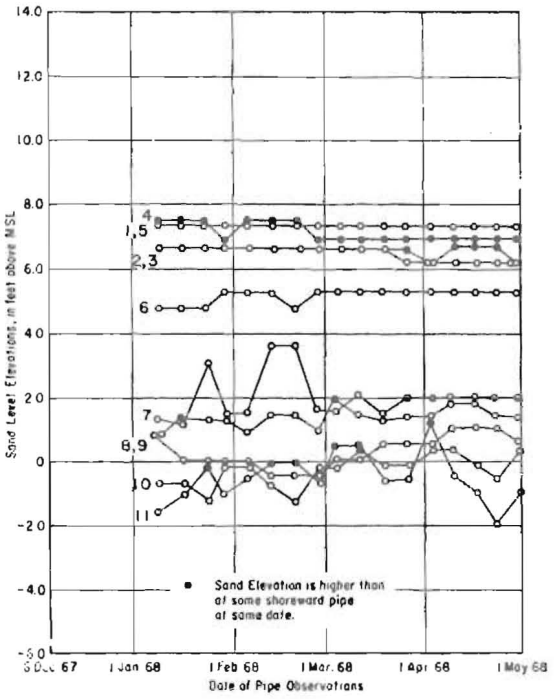


Profile 13

LONG BEACH ISLAND

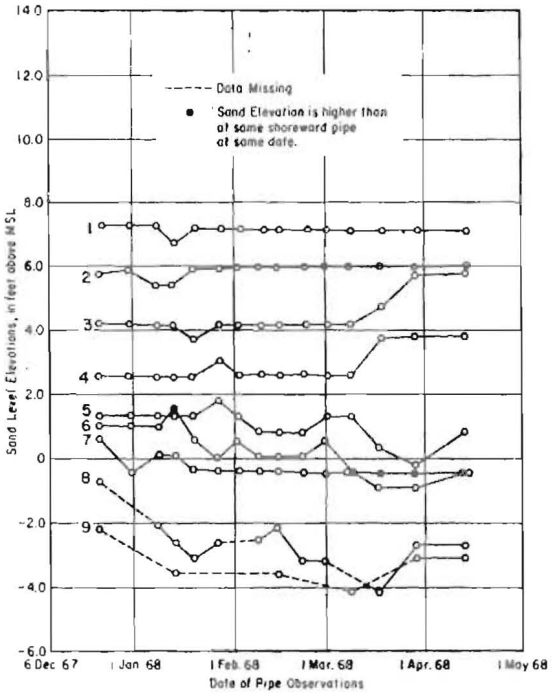


Profile 05

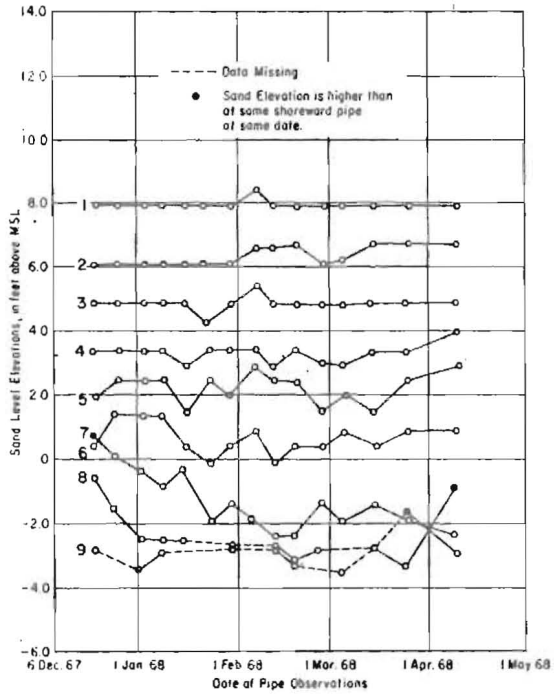


Profile 07

ATLANTIC CITY



Profile 05



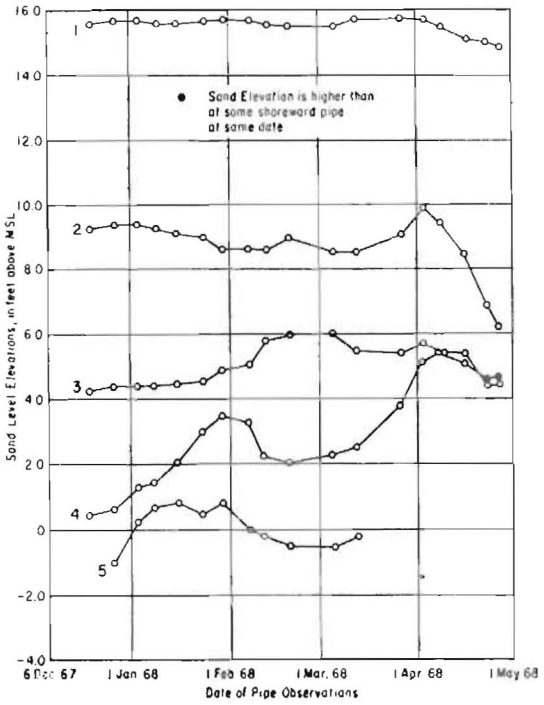
Profile 18

LUDLAM ISLAND

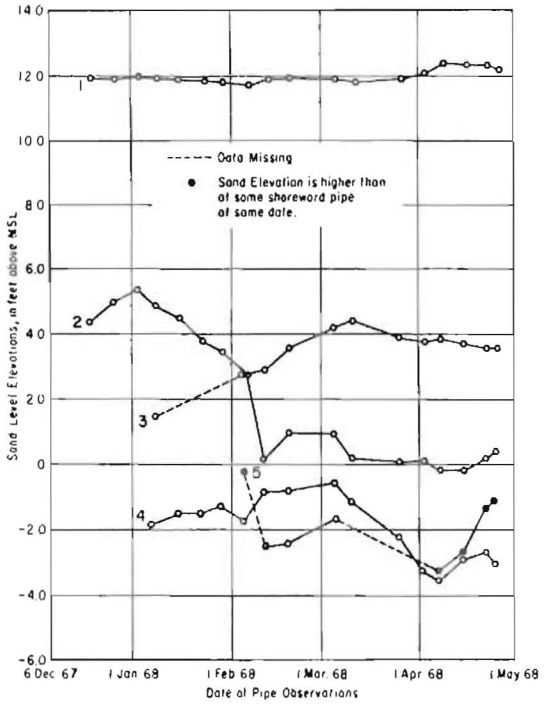
APPENDIX C

RUNNING AVERAGE SAND ELEVATION VS. TIME, JANUARY THROUGH MARCH 1968

Three-point running averages of sand elevation, *referenced to MSL*, plotted against time. Figures are arranged in north-to-south order: Westhampton Beach, Jones Beach, Long Beach Island, Atlantic City, Ludlam Island. Curves are identified by pipe number.

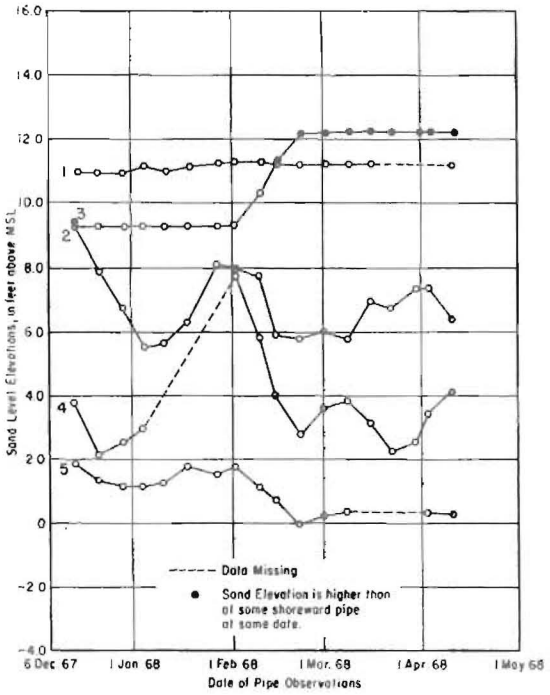


Profile 04

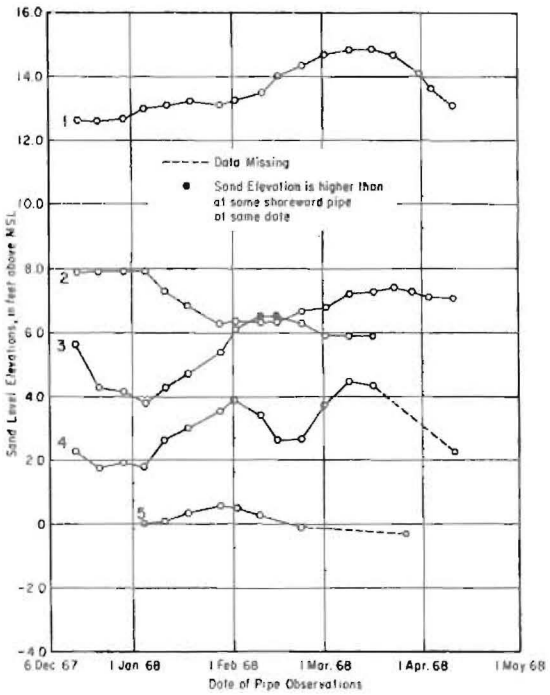


Profile 08

WESTHAMPTON BEACH

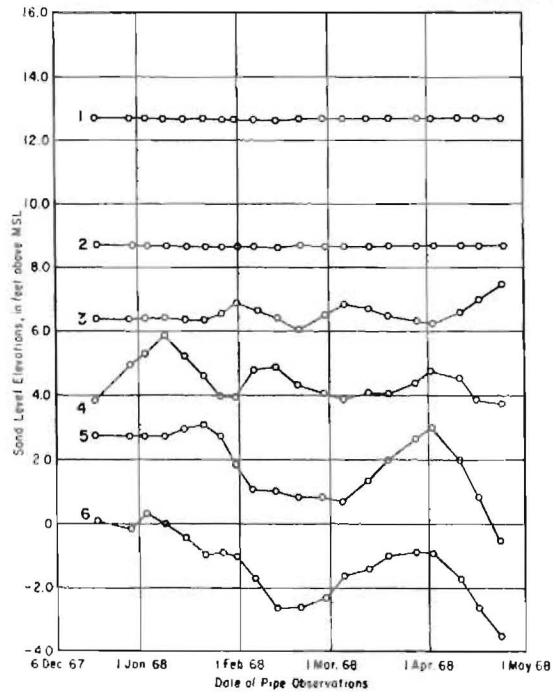


Profile 07

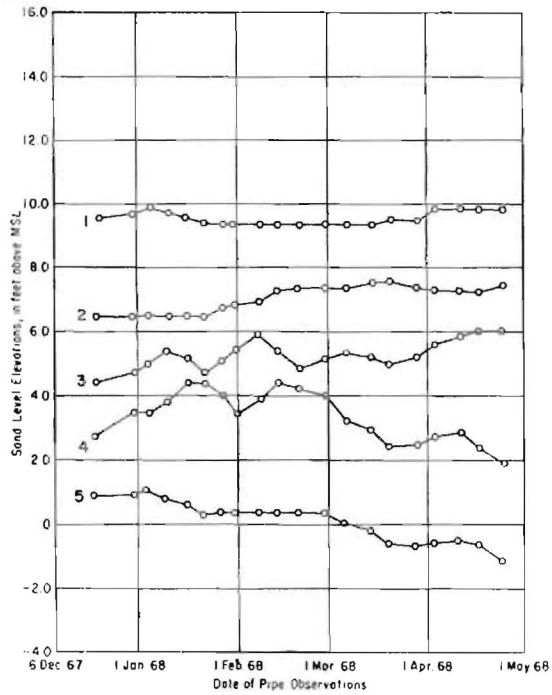


Profile 11

JONES BEACH

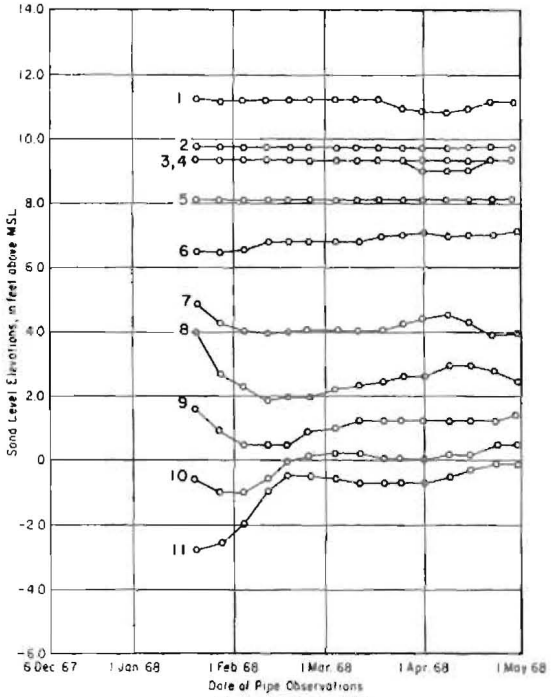


Profile 13

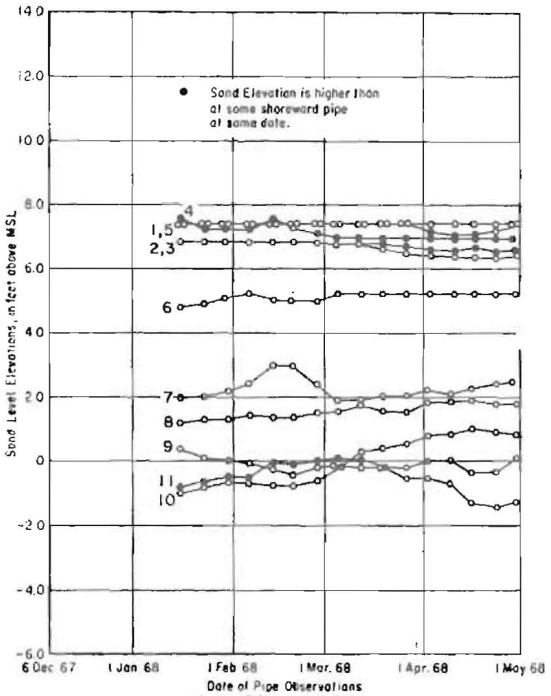


Profile 16

LONG BEACH ISLAND

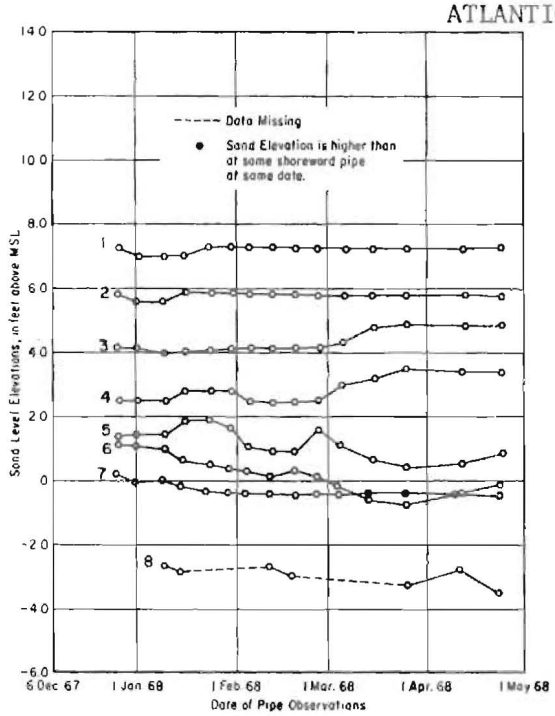


Profile 05

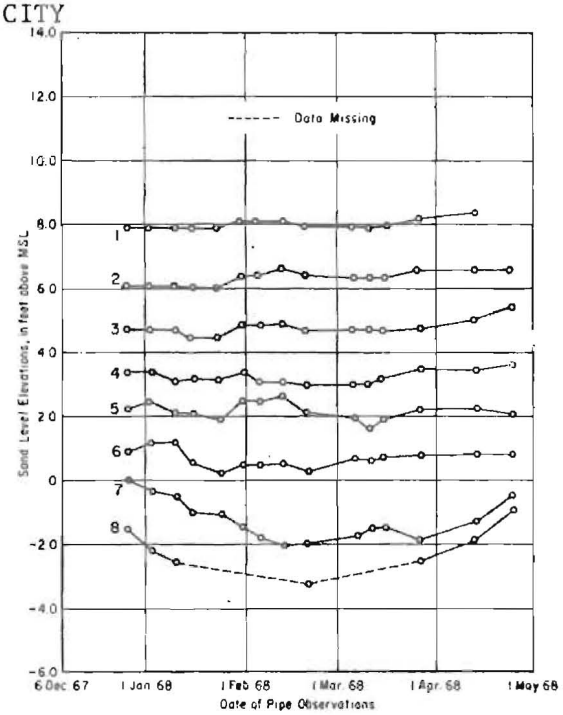


Profile 07

ATLANTIC CITY



Profile 05



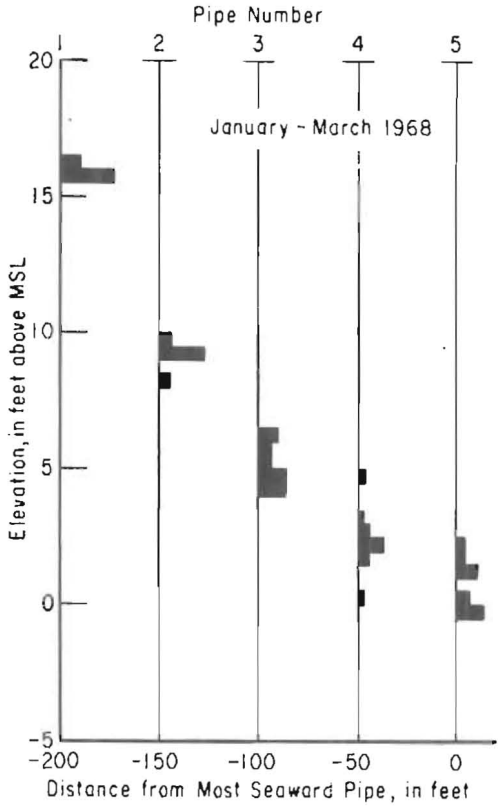
Profile 18

LUDLAM ISLAND

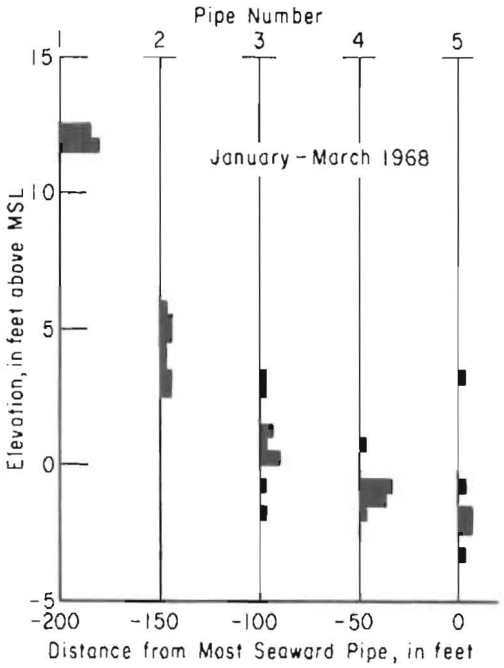
APPENDIX D

HISTOGRAMS OF SAND ELEVATIONS, JANUARY THROUGH MARCH 1968

Frequency distribution of sand elevations, *referenced to MSL*. Figures are arranged in north-to-south order: Westhampton Beach, Jones Beach, Long Beach Island, Atlantic City, Ludlam Island. Pipes are numbered from land to the sea.

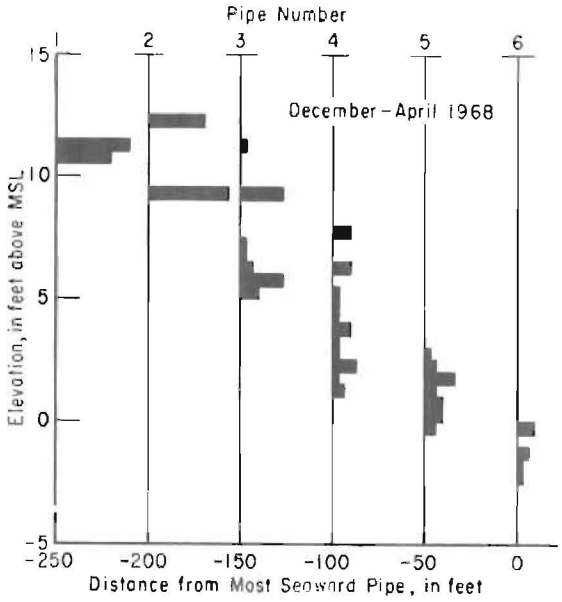


Profile 04

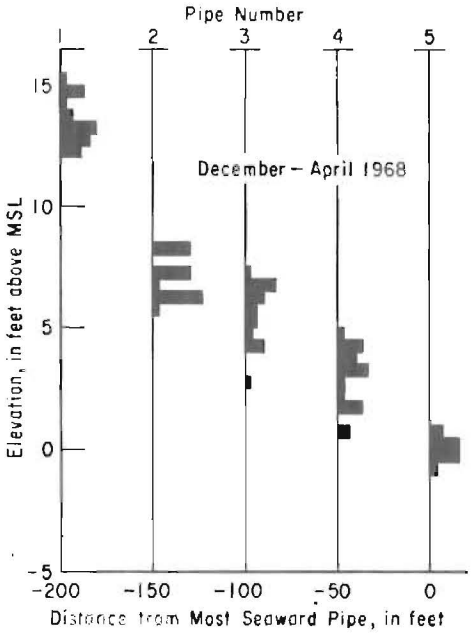


Profile 08

WESTHAMPTON BEACH

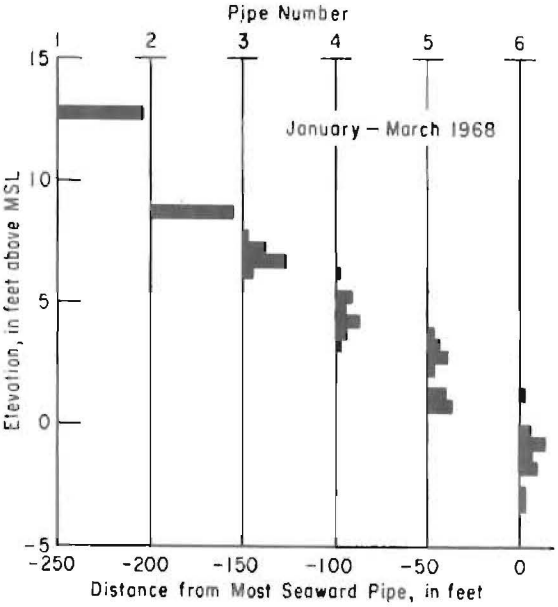


Profile 07

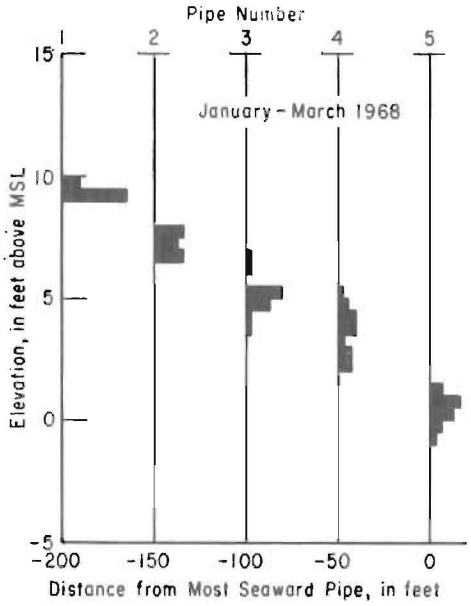


Profile 11

JONES BEACH

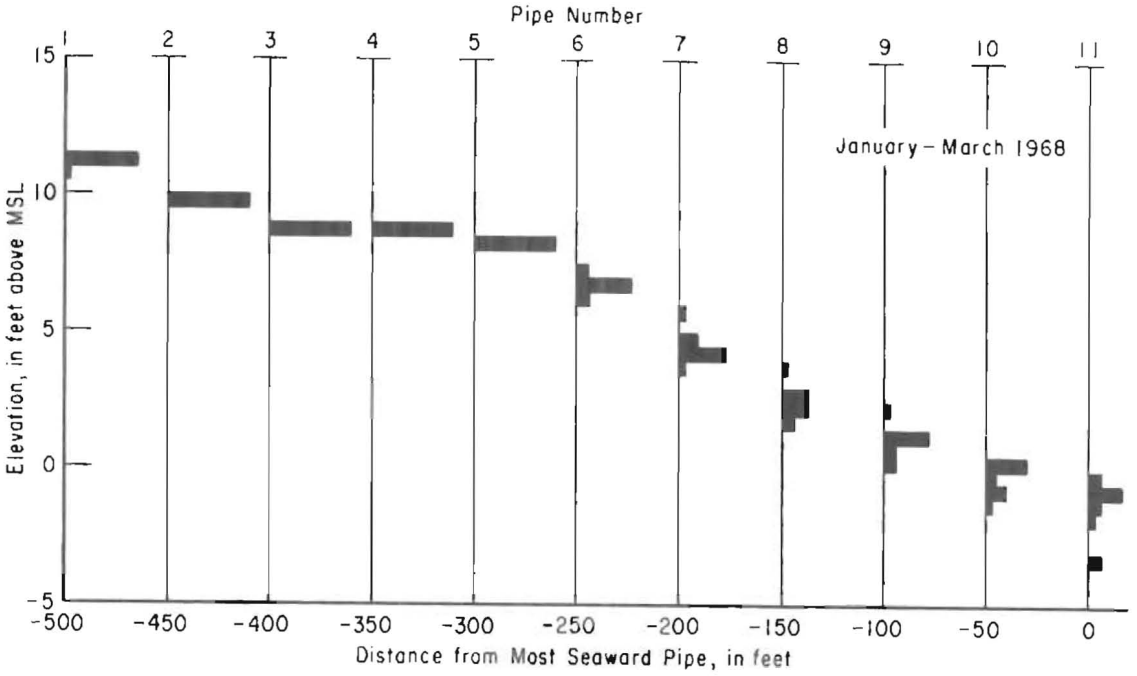


Profile 13

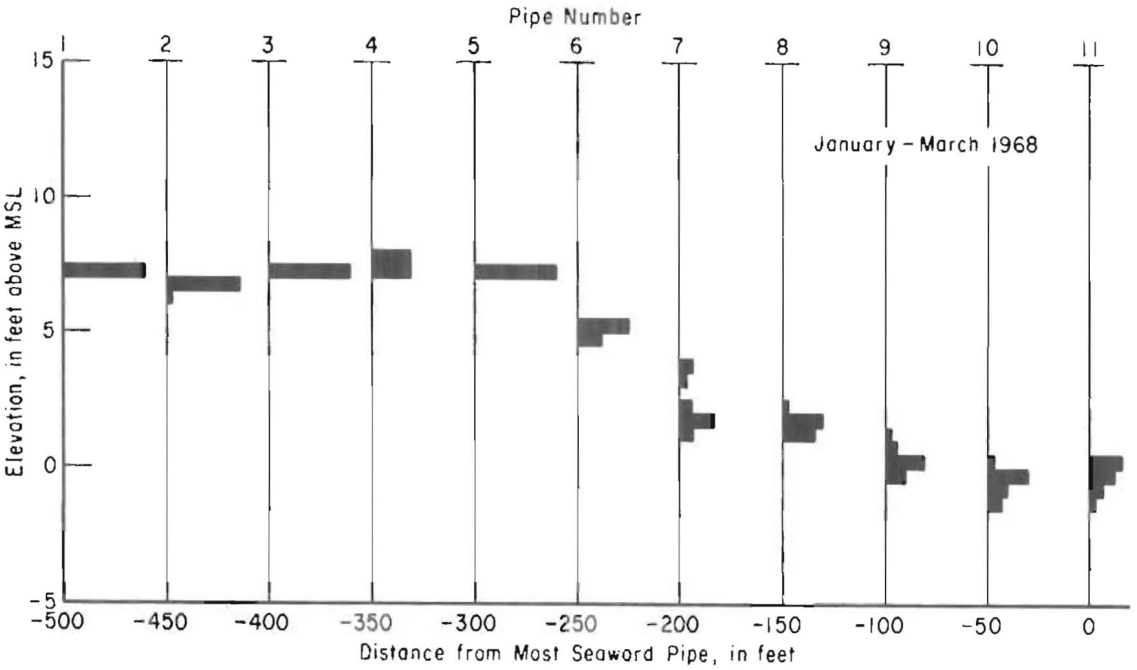


Profile 16

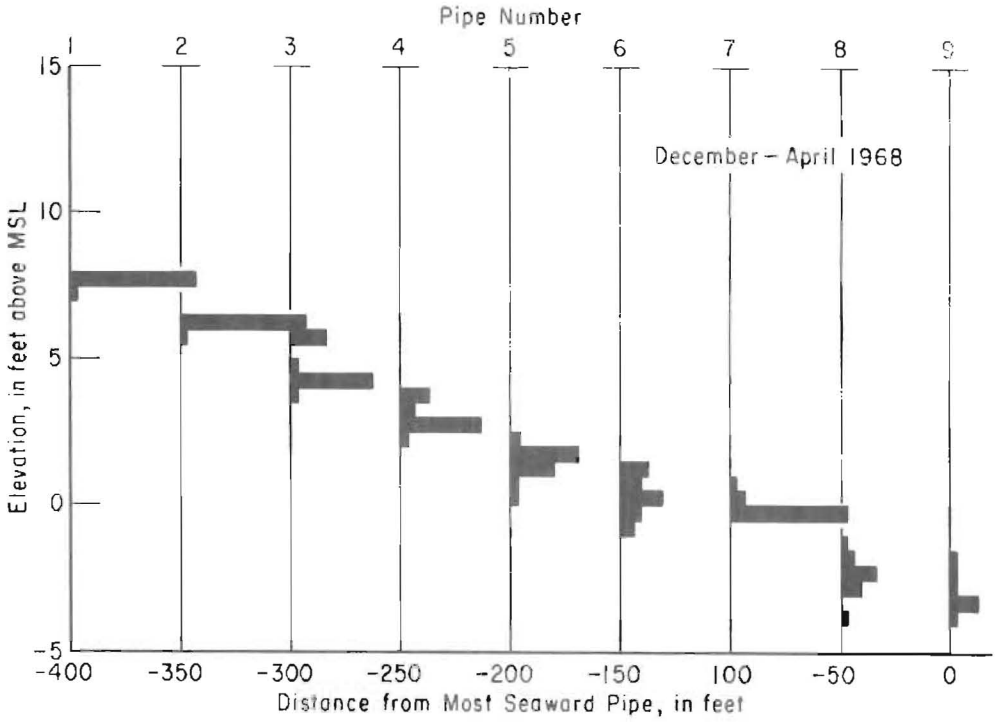
LONG BEACH ISLAND



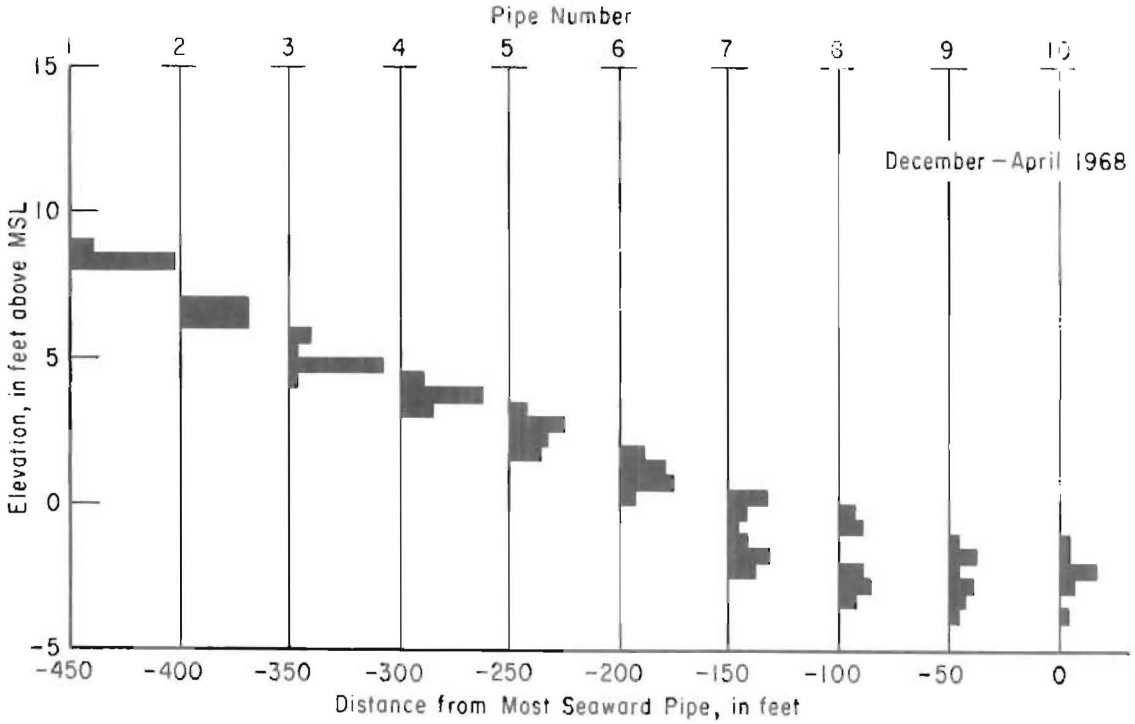
Profile 05 - ATLANTIC CITY



Profile 07 - ATLANTIC CITY



Profile 05 - LUDLAM ISLAND

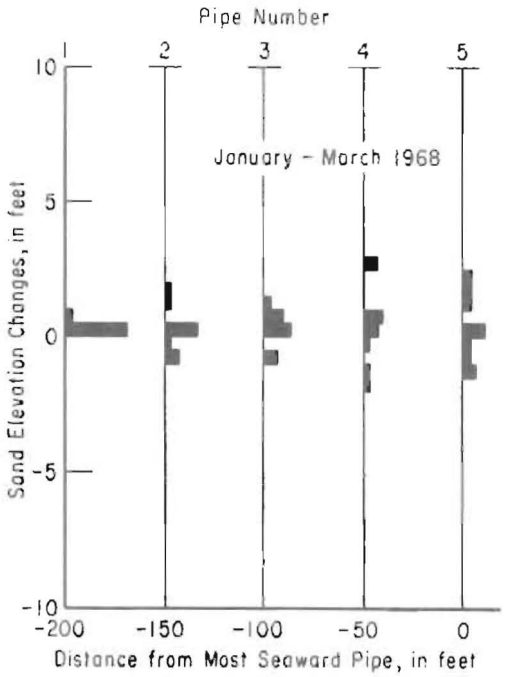


Profile 18 - LUDLAM ISLAND

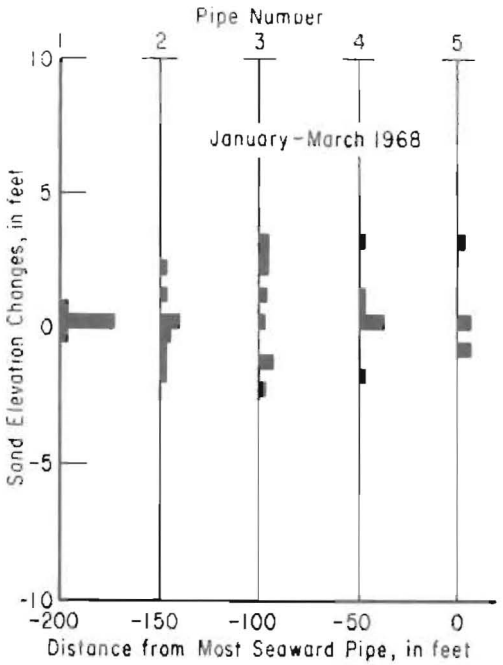
APPENDIX E

HISTOGRAMS OF SAND ELEVATION CHANGES, JANUARY THROUGH MARCH 1968

Frequency distribution of weekly sand elevation changes. Figures are arranged in north-to-south order: Westhampton Beach, Jones Beach, Long Beach Island, Atlantic City, Ludlam Island. Pipes are numbered from land to the sea.

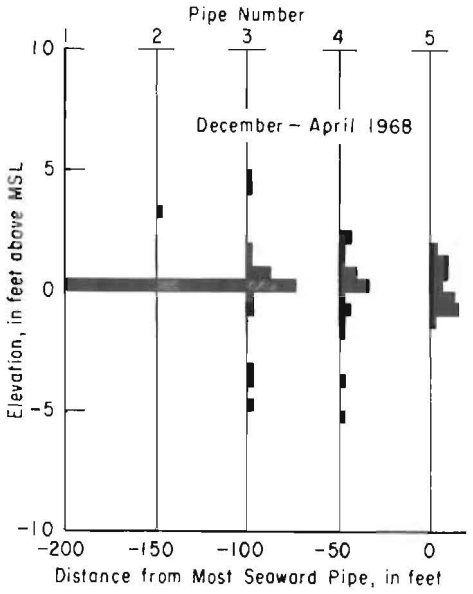


Profile 04

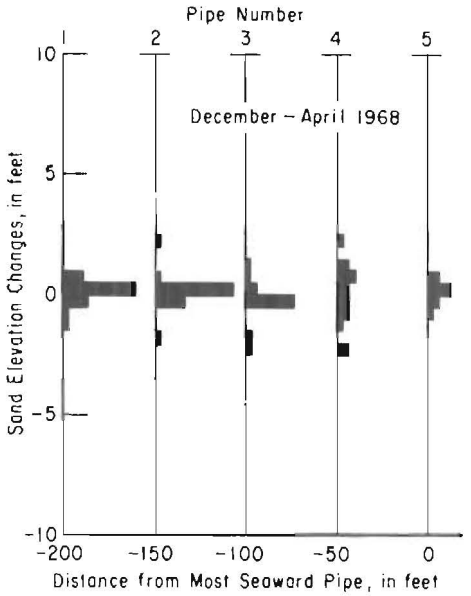


Profile 08

WESTHAMPTON BEACH

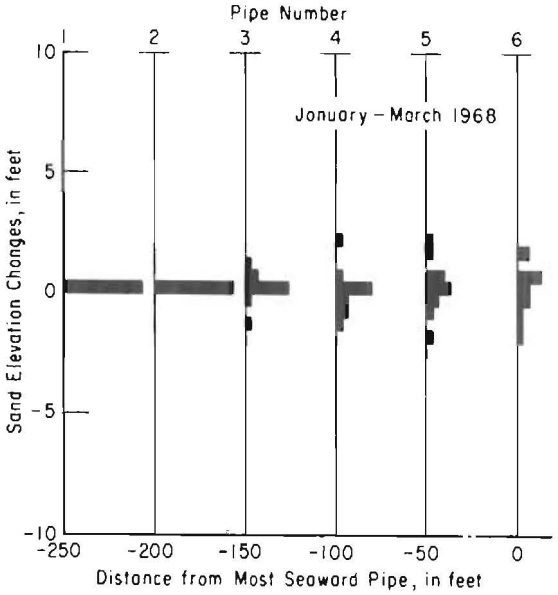


Profile 07

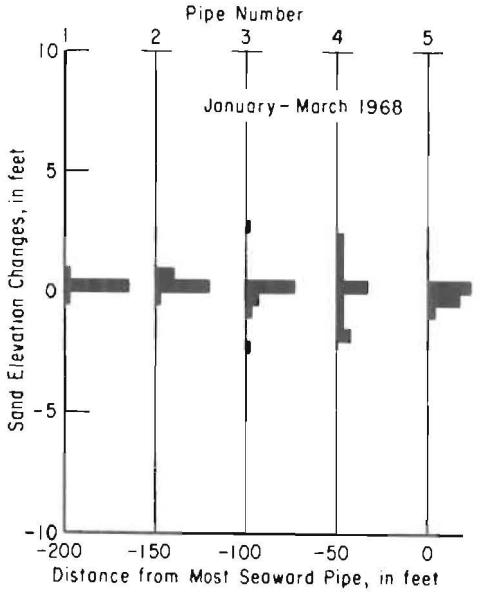


Profile 11

JONES BEACH

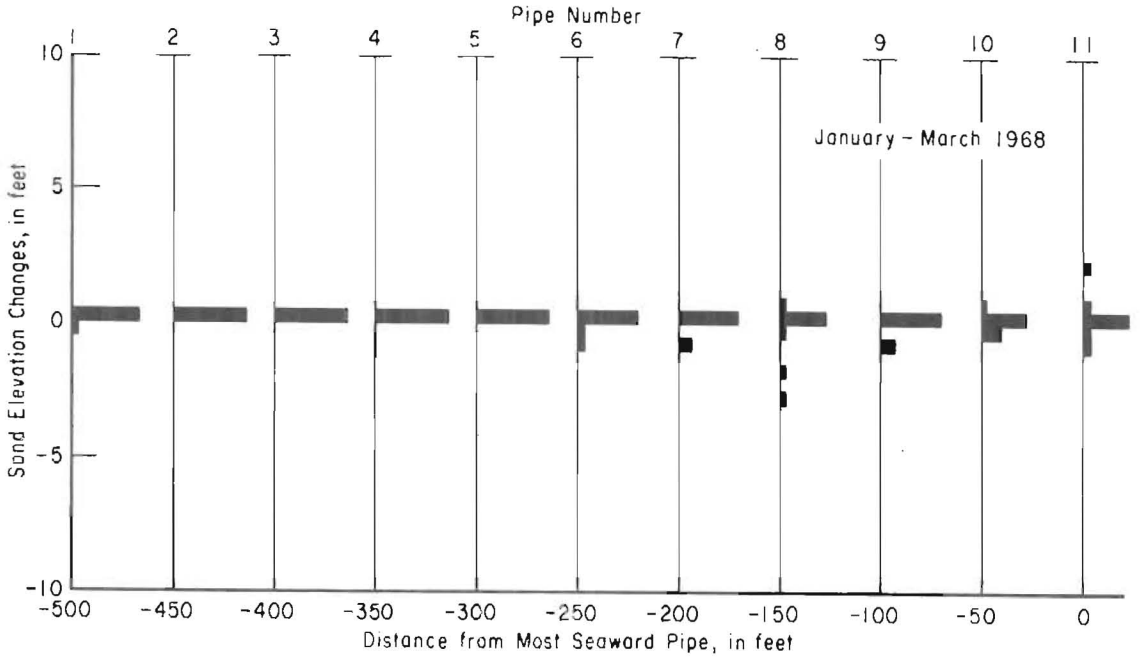


Profile 13

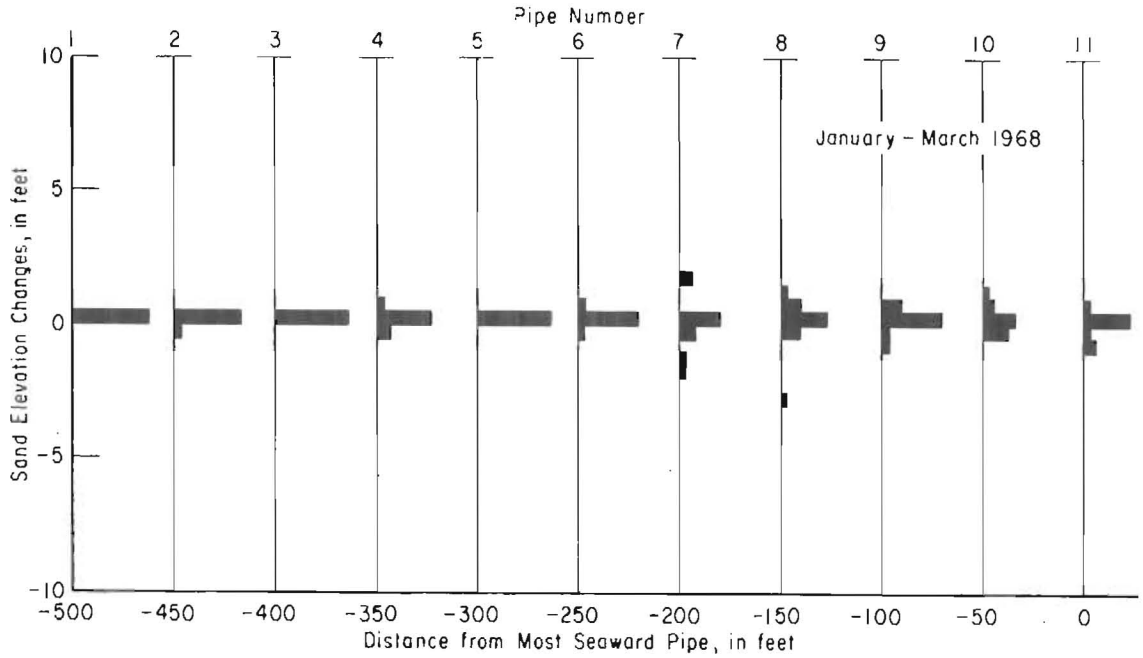


Profile 16

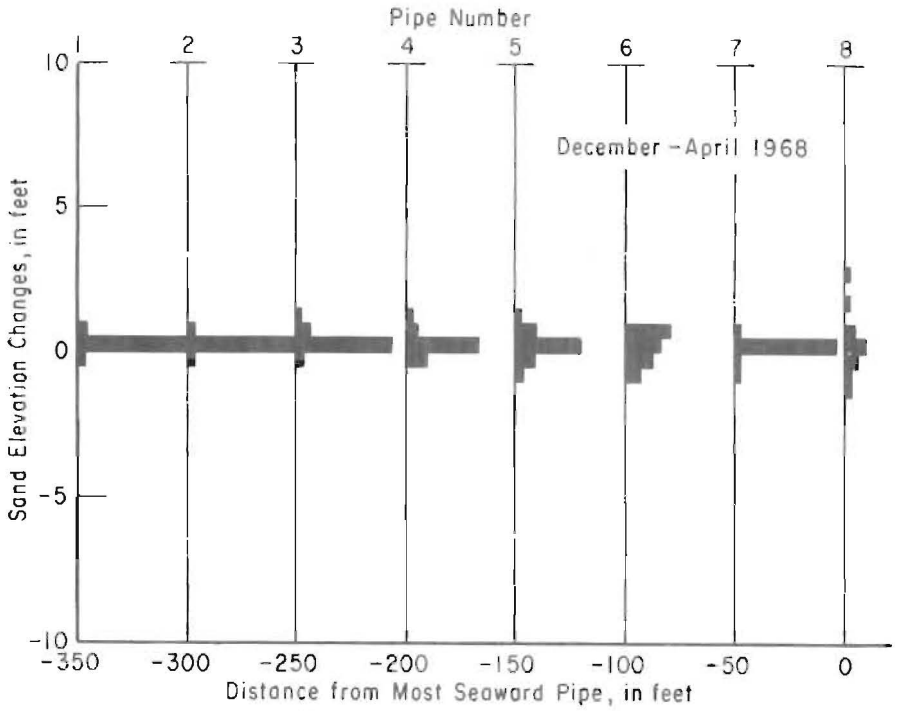
LONG BEACH ISLAND



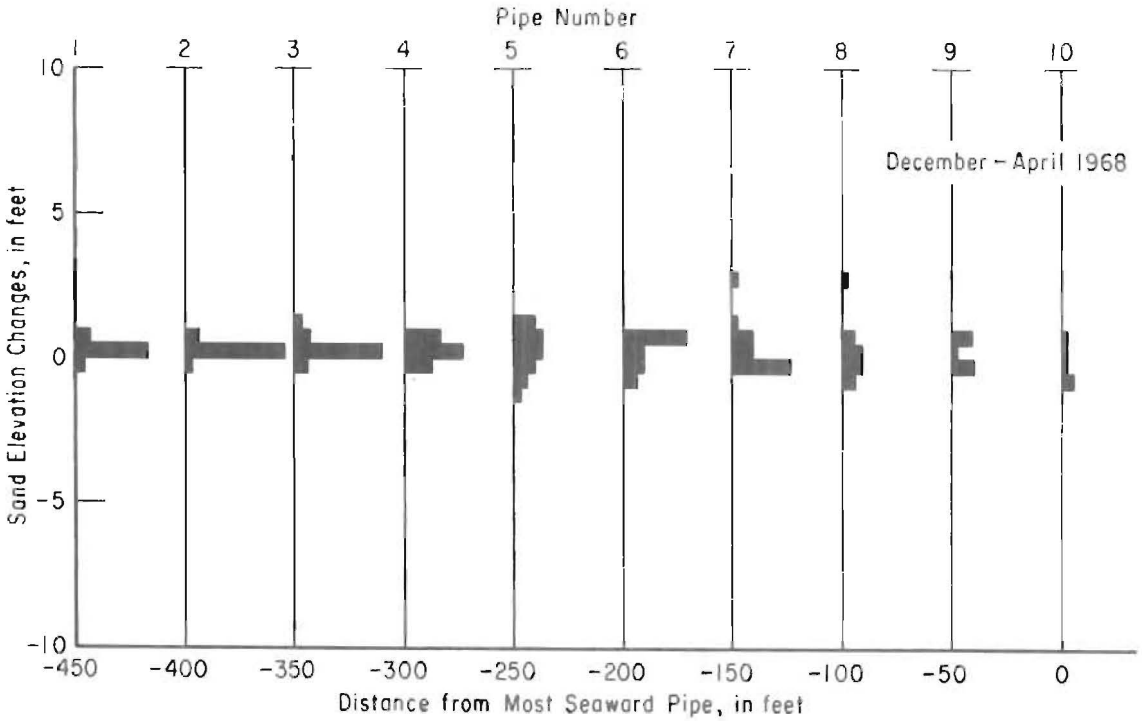
Profile 05 - ATLANTIC CITY



Profile 07 - ATLANTIC CITY



Profile 05 - LUDLAM ISLAND



Profile 18 - LUDLAM ISLAND

APPENDIX F

VISUAL WAVE OBSERVATIONS, JANUARY THROUGH MARCH 1968

Visual estimates of wave height, period, direction, and breaker type at seven Atlantic coast localities. Tables are arrange in north-to-south order: Plum Island, Massachusetts; Misquamicut, Rhode Island; Westhampton Beach and Jones Beach, New York; Long Beach Island, Atlantic City, and Ludlam Island, New Jersey.

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
NORTH PLUM ISLAND, MASSACHUSETTS

Date	Time	Period	Height	Direction	Type	Remarks
19Jan68	1210	4.2	1	4.5	PL	Superimposed chop 4" high
20Jan68	1209	6.0	1.5	4	PL	
21Jan68	1715	6.5	1	2	PL	Light NW wind
22Jan68	1600	7.1	1	4	PL	
23Jan68	1710	6.0	0	3.5	PL	Rain and fog
24Jan68	1715	5.7	2	4	PL	
25Jan68	0823	7.5	3	4	SP	Overcast, stormy, wind out of N 25 kts.
26Jan68	1600	6.5	5	2	SP	Clear, winds from NW.
27Jan68	1144	10.0	3	3	SP	
28Jan68	0926	6.9	1	2.5	SP	Overcast slight breeze.
29Jan68	1655	6.5	0.5	4	SP	Overcast
30Jan68	1115	8.5	3.5	3.9	SP	Flood tide
31Jan68	1300	7.0	3.5	2	SP	Flood tide, clear, NE wind.
01Feb68	0705	7.5	0.5	3	SP	Overcast, tide out.
01Feb68	1400	7.6	4	3	SP	Overcast, high tide, Light wind.
02Feb68	1430	8.2	2	3	SP	Overcast, fog and rain, no wind.
03Feb68	1436	7.1	3	3	SP	High tide, light wind.
04Feb68	1617	6.7	2	2	SU	
05Feb68	1700	7.0	2	2	SU	
06Feb68	1725	7.2	2	2	SU	Clear, NW wind
07Feb68	1745	7.0	3	2	SU	Clear, NW wind
08Feb68	0707	8.5	4	2	SP	Cloudy, high NE wind, flood tide.
09Feb68	0805	9.5	4	2	SP	Clear, NW wind
10Feb68	0830	9.0	4	2	SP	Snow, NW wind
11Feb68	1000	8.2	1	3	SP	West wind, clear
12Feb68	1020	7.2	1	2	SU	Clear, light wind
13Feb68	1230	7.2	1.5	2.7	SU	
14Feb68	1300	6.8	1	2	SU	Cloudy
15Feb68	1330	6.7	1	3	SU	
16Feb68	1400	6.9	2	3	SU	
17Feb68	1430	7.0	1	3	SU	Superimposed waves
18Feb68	1430	6.9	1	3	SU	
19Feb68	1430	7.0	1	3	SU	
20Feb68	1745	7.0	2	3	SU	
21Feb68	1200	7.0	0.5	4.5	PL	
22Feb68	1210	7.0	0.5	4.5	SP	
23Feb68	1950	6.7	0.5	4.7	SU	
24Feb68	0900	6.9	0.5	2.5	SP	
25Feb68	0844	7.0	1	4	PL	
26Feb68	1700	7.5	2	3	PL	
27Feb68	1200	7.4	3	2	PL	
28Feb68	1230	9.0	2	3	PL	Overcast
29Feb68	1300	7.3	3	3	SP	

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
NORTH PLUM ISLAND, MASSACHUSETTS

Date	Time	Period	Height	Direction	Type	Remarks
01Mar68	1400	8.5	4	3	SP	Overcase, snow, high wind.
02Mar68	1430	6.7	6	2	PL	
03Mar68	1500	8.1	1	2.5	PL	
04Mar68	1600	10.0	0.5	3	PL	
05Mar68	1745	10.0	1	3	SU	
06Mar68	1700	8.9	1.5	2	PL	
07Mar68	1200	7.5	1	4	PL	
08Mar68	1500	6.9	2	3	SU	
09Mar68	1730	9.0	1	2.5	PL	
10Mar68	1600	10.0	0.5	3	SP	Heavy fog
11Mar68	0745	8.3	1.5	3	SP	
12Mar68	0800	7.5	3	2	SP	NE wind, superimposed chop.
13Mar68	1055	7.3	7	2	SP	NE wind, rain, snow.
14Mar68	1055	7.7	2	3	PL	
15Mar68	1030	7.5	1	3	SP	SW wind, clear.
16Mar68	1300	6.0	1	3	SP	S wind, overcast, haze.
17Mar68	1530	6.5	2.5	2.3	SP	Heavy rain, low visibility
18Mar68	1530	7.0	3	3	SP	Fog, mist
19Mar68	1300	7.5	3	3	SP	Fog, mist
20Mar68	1030	7.2	3	3	SP	Fog, mist
21Mar68	1130	8.0	2	3	SP	Fog, mist
22Mar68	0630	8.0	2	3	SP	Fog, mist
23Mar68	0745	8.1	2	3	SP	Fog, mist
24Mar68	0840	8.4	2	3	SU	Superimposed chop
25Mar68	0925	8.6	1	3	SU	Winds out of NW
26Mar68	0930	9.0	0.5	4	SU	Wind out of SW
27Mar68	1600	7.5	1	4	SU	Wind out of SSW
28Mar68	1200	8.5	0.5	3	SP	Wind out of NNW
29Mar68	1200	9.5	0.5	4	PL	Calm wind
30Mar68	0800	8.0	1	4	SU	Wind out of SE
31Mar68	1230	8.9	1	3	SU	
01Apr68	1630	9.0	1	4	SU	
02Apr68	1200	8.6	1	3	SU	
03Apr68	1545	7.9	0.5	3	SU	
04Apr68	1418	8.7	0.5	4	SU	
05Apr68	1200	9.0	0.5	3	SU	
06Apr68	1330	7.9	1	4	SP	
07Apr68	1021	7.6	1	3	SU	
08Apr68	1200	8.0	1	4	SU	
09Apr68	0822	7.5	1	3	SU	
10Apr68	0920	7.9	1	3	SP	
11Apr68	1045	8.2	2	3	SU	
12Apr68	1130	7.0	0		SP	
13Apr68	1145	7.9	2	3	SU	

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
MISQUAMICUT, RHODE ISLAND

Date	Time	Period	Height	Direction	Type	Remarks
07Jan68	0800	0	0	CA		
07Jan68	1200	11.5	1	2	SP	From S
07Jan68	1600	7.8	2	2	SP	From S
08Jan68	0800	0	0	CA		Wind WNW to NW off land, no sea to beach.
08Jan68	1200	14.0	1	2	SP	Strong offshore from S wind 50 kts from NW.
08Jan68	1600	13.5	1	2	SP	Strong offshore from S wind 50 kts from NW.
09Jan68	0800	0	0	CA		Wind NW water calm - no motion at all.
09Jan68	1200	0	0	CA		
09Jan68	1600	0	0	CA		Wind WNW; no seas.
10Jan68	0800	0	0	CA		Wind NW; no sea.
10Jan68	1200	0	0	CA		Wind NNW; no sea.
10Jan68	1600	0	0	CA		Wind NNW: no sea.
11Jan68	0800	0	0	CA		Wind NNW; no sea.
11Jan68	1200	0	0	CA		Wind NNW; no sea.
11Jan68	1600	0	0	CA		Wind NNW; no sea.
12Jan68	0800	0	0	CA		Wind NNW; no sea.
12Jan68	1200	0	0	CA		Wind NNW; no sea.
12Jan68	1600	0	0	CA		Wind NNW; no sea.
13Jan68	0800	0	0	CA		Wind N; no sea.
13Jan68	1200	9.5	0.5	2	SP	From S
13Jan68	1600	0	0	CA		Wind NNE, no sea.
14Jan68	0800	6.7	3	2	SP	From SE
14Jan68	1200	5.4	4	2	SP	From SE
14Jan68	1600	9.5	4	2	SP	From SE
15Jan68	0800	9.3	5	2	SP	From SE
15Jan68	1200	9.5	5	2	PL	From SE unusually high tides, rough seas.
15Jan68	1600	14.0	5	2	PL	From SE breaking more than once before reaching the beach.
16Jan68	0800	9.8	3	2	SP	From SE
16Jan68	1200	10.8	2	2	SP	From SE
16Jan68	1600	9.0	3	2	SP	From SE
17Jan68	0800	0	0	CA		Calm; no sea; slight wind from NW.
17Jan68	1200	0	0	CA		Calm
17Jan68	1600	0	0	CA		Calm
18Jan68	0800	0	0	CA		Offshore winds; no seas.
18Jan68	1200	0	0	CA		Offshore winds; no seas.
18Jan68	1600	0	0	CA		Offshore winds; no seas.
19Jan68	0800	0	0	CA		Offshore winds; no seas.
19Jan68	1200	9.0	0.7	SE	SP	With small roll.

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
MISQUAMICUT, RHODE ISLAND

Date	Time	Period	Height	Direction	Type	Remarks
19Jan68	1600	9.3	1	SE	SP	
20Jan68	0800	0	0	CA		
20Jan68	1200	0	0	CA		Winds W off land; no seas.
20Jan68	1600	0	0	CA		Offshore wind - no seas.
21Jan68	0800	0	0	CA		
21Jan68	1200	0	0	CA		Wind offshore 20 MPH
21Jan68	1600	0	0	CA		Very tiny roll
22Jan68	0800	0	0	CA		Wind offshore 8 MPH
22Jan68	1200	0	0	CA		Wind offshore 5 MPH
22Jan68	1600	0	0	CA		Wind offshore 5 MPH
23Jan68	0800	5.4	1	1	SP	From SE
23Jan68	1200	5.8	0.5	1	SP	From SE very little roll.
23Jan68	1600	5.4	[illegible]	1	SP	From SE very little roll.
24Jan68	0800	6.7	1	1	SP	From SE wind NW off land - light swell SP on beach.
24Jan68	1200	0	0	CA		Very light swell
24Jan68	1600	6.5	2	1	SP	From SE wind N off land - light swell SP on beach.
25Jan68	0800	7.4	2	1	SP	From SE wind from N - slight swell.
25Jan68	1200	6.5	2	1	SP	From SE slight swell
25Jan68	1600	6.8	2.5	1	SP	From SE swell about 3 ft.
26Jan68	0800	9.3	1.5	1	SP	From SE 3' swells.
26Jan68	1200	8.6	1.5	1	SP	From SE 2'-3' swells
26Jan68	1600	8.4	1.5	1	SP	From SE 1'-2' swells
27Jan68	0800	12.4	1	1	SP	From SE mostly calm
27Jan68	1200	11.5	1.5	1	SP	From SE mostly calm
27Jan68	1600	10.0	1.5	1	SP	From SE mostly calm.
28Jan68	0800	0	0	CA		Wind N off land - no seas.
28Jan68	1200	0	0	CA		Wind N off land - no seas.
28Jan68	1600	0	0	CA		Offshore winds.
29Jan68	0800	8.5	2	1	SP	From SE wind E 10 knots.
29Jan68	1200	8.3	2	1	SP	From SE NNE Wind 20 knots.
29Jan68	1600	7.8	1.5	1	SP	From SE
30Jan68	0800	4.8	3	1	SP	From SE
30Jan68	1200	5.4	3	1	SP	From SE
30Jan68	1600	5.9	1.5	1	SP	From SE
31Jan68	0800	5.6	1.5	1	SP	From SE
31Jan68	1200	5.2	1.5	1	SP	From SE
31Jan68	1600	4.8	1	1	SP	From SE
01Feb68	0800	7.3	1	1	SP	From SE
01Feb68	1200	6.8	2	1	SP	From SE
01Feb68	1600	6.4	1.5	1	SP	From SE
02Feb68	0800	5.2	3	1	SP	From SE
02Feb68	1200	5.4	3	1	SP	From SE
02Feb68	1600	5.2	3	1	SP	From SE
03Feb68	0800	10.5	4	1	SP	From SE

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
MISQUAMICUT, RHODE ISLAND

Date	Time	Period	Height	Direction	Type	Remarks
03Feb68	1200	10.0	3	1	SP	From SE
03Feb68	1600	12.0	3.5	1	SP	From SE
04Feb68	0800	9.8	2	1	SP	From SE
04Feb68	1200	10.4	1	1	SP	From SE
04Feb68	1600	10.5	1	1	SP	From SE
05Feb68	0800	10.0	0.5	1	SP	From SE
05Feb68	1200	0	0	CA		
05Feb68	1600	0	0	CA		
06Feb68	0800	0	0	CA		
06Feb68	1200	0	0	CA		
06Feb68	1600	9.4	1.5	1	SP	From SE wind from West
07Feb68	0800	0	0	CA		Offshore winds
07Feb68	1200	0	0	CA		Offshore winds
07Feb68	1600	0	0	CA		
08Feb68	0800	7.4	3.5	1	SP	From SE
08Feb68	1200	6.8	3.5	1	SP	From SE wind from the North 20 knots.
08Feb68	1600	6.0	3.5	1	SP	From SE
09Feb68	0800	10.5	1	1	SP	From SE
09Feb68	1200	9.8	1	1	SP	From SE
09Feb68	1600	8.8	1	SE	SP	
10Feb68	0800	9.4	1	SE	SP	With small roll.
10Feb68	1200	9.0	1	S	SP	
10Feb68	1600	8.6	1	S	SP	High winds
11Feb68	0800	6.8	1	3	SP	From S
11Feb68	1200	8.0	1.5	3	SP	From S
11Feb68	1600	7.4	1.5	3	SP	From S
12Feb68	0800	6.0	1	3	SP	From S
12Feb68	1200	0	0	CA		Offshore winds
12Feb68	1600	0	0	CA		Offshore winds
13Feb68	0800	0	0	CA		Offshore winds
13Feb68	1200	0	0	CA		Offshore winds
13Feb68	1600	0	0	CA		Offshore winds
14Feb68	0800	6.5	2	2	SP	From S
14Feb68	1200	6.1	2	2	SP	From S
14Feb68	1600	6.8	2	3	SP	From S
15Feb68	0800	6.3	1.5	3	SP	From S
15Feb68	1200	7.0	2	3	SP	From S
15Feb68	1600	6.8	2	2	SP	From SE
16Feb68	0800	0	0	CA		Offshore winds
16Feb68	1200	0	0	CA		Offshore winds
16Feb68	1600	0	0	CA		Offshore winds
17Feb68	0800	5.6	2.5	3	SP	From S
17Feb68	1200	5.2	2.5	3	SP	From S
17Feb68	1600	9.0	1.5	3	SP	From S high winds to SE.
18Feb68	0800	5.6	2	3	SP	From S

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
MISQUAMICUT, RHODE ISLAND

Date	Time	Period	Height	Direction	Type	Remarks
18Feb68	1200	6.0	2.5	3	SP	From S
18Feb68	1600	5.4	1.5	3	SP	From S
19Feb68	0800	10.5	0.5	3	SP	From S
19Feb68	1200	10.2	0.7	3	SP	From S
19Feb68	1600	9.4	1	3	SP	From S
20Feb68	0800	5.4	2	4	SP	From SW
20Feb68	1200	4.9	2	4	SP	From SW
20Feb68	1600	0	0	CA		Offshore wind
21Feb68	0800	0	0	CA		
21Feb68	1200	0	0	CA		Offshore wind
21Feb68	1600	0	0	CA		Offshore wind
22Feb68	0800	6.2	1	4	SP	From SW West wind
22Feb68	1200	7.0	1.5	4	SP	From SW West wind at 40 knots.
22Feb68	1600	6.6	1.5	4	SP	From SW West wind at 40 knots.
23Feb68	0800	7.4	2	4	SP	From SW
23Feb68	1200	0	0	CA		Offshore wind
23Feb68	1600	0	0	CA		Offshore wind
24Feb68	0800	0	0	CA		
24Feb68	1200	0	0	CA		
24Feb68	1600	0	0	CA		
25Feb68	0800	0	0	CA		
25Feb68	1200	0	0	CA		
25Feb68	1600	6.2	1	3	SP	From S
26Feb68	0800	9.6	2	3	SP	From S
26Feb68	1200	9.4	2	3	SP	From S
26Feb68	1600	9.0	2.5	3	SP	From S
27Feb68	0800	11.0	1.5	3	SP	From S
27Feb68	1200	10.4	1.5	3	SP	From S
27Feb68	1600	11.5	1	2	SP	From S
28Feb68	0800	12.4	1.5	3	SP	From S
28Feb68	1200	13.0	1	3	SP	From S
28Feb68	1600	9.0	2	3	SP	From S
29Feb68	0800	7.0	3	3	SP	From S
29Feb68	1200	5.5	3	3	SP	From S
29Feb68	1600	12.5	3	3	SP	From S small ground swells.
01Mar68	0800	12.6	6	2	SP	From SE large swells
01Mar68	1200	12.4	5	2	SP	From S
01Mar68	1600	10.0	4.5	2	SP	From S large swells.
02Mar68	0800	9.2	2	2	SP	From S
02Mar68	1200	8.4	2	2	SP	From S light swell
02Mar68	1600	10.7	1.5	2	SP	From S light swell
03Mar68	0800	0	0	CA		High offshore winds
03Mar68	1200	0	0	CA		High offshore winds
03Mar68	1600	0	0	CA		High offshore winds.

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
MISQUAMICUT, RHODE ISLAND

Date	Time	Period	Height	Direction	Type	Remarks
04Mar68	0800	0	0	CA		
04Mar68	1200	0	0.7	SE		Surf: Chop Winds to West at 30
04Mar68	1600	0	0	CA		
05Mar68	0800	0	0	CA		
05Mar68	1200	0	0	CA		
05Mar68	1600	0	0	CA		
06Mar68	0800	0	0	CA		Wind offshore 10 MPH
06Mar68	1200	0	0	CA		
06Mar68	1600	0	0	CA		
07Mar68	0800	0	0	CA		Wind N offshore 15 MPH
07Mar68	1200	0	0	CA		Wind N offshore 15 MPH
07Mar68	1600	6.9	1	3	SP	From S slight swell
08Mar68	0800	0	0	CA		
08Mar68	1200	0	0	CA		
08Mar68	1600	0	0	CA		
09Mar68	0800	0	0	CA		
09Mar68	1200	0	0	CA		
09Mar68	1600	0	0	CA		
10Mar68	0800	0	0	CA		
10Mar68	1200	0	0	CA		
10Mar68	1600	0	0	CA		
11Mar68	0800	16.0	2	2	SP	From SE
11Mar68	1200	10.5	1.5	2	SP	From SE
11Mar68	1600	9.2	2	2	SP	From SE
12Mar68	0800	6.2	1.5	2	SP	From SE
12Mar68	1200	5.8	2.5	2	SP	From SE
12Mar68	1600	5.0	3.5	2	SP	From SE
13Mar68	0800	5.8	3.5	2	SP	From SE
13Mar68	1200	6.4	3	2	SP	From SE
13Mar68	1600	7.8	3.5	SE	SP	
14Mar68	0800	6.6	2	SE	SP	
14Mar68	1200	7.5	2.5	SE	SP	
14Mar68	1600	0	0	CA		Wind from offshore
15Mar68	0800	0	0	CA		
15Mar68	1200	5.2	1.5	SE	SP	
15Mar68	1600	6.8	1.5	SE	SP	
16Mar68	0800	5.7	1.5	SE	SP	
16Mar68	1200	5.8	1	SE	SP	
16Mar68	1600	5.5	1	SE	SP	
17Mar68	0800	11.2	3	2	SP	From SE
17Mar68	1200	10.6	2.5	2	SP	From SE
17Mar68	1600	10.0	2.5	2	SP	From SE
18Mar68	0800	16.1	5	2	SP	From SE
18Mar68	1200	16.5	4.5	2	SP	From SE
18Mar68	1600	10.5	2.5	2	SP	From SE

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
MISQUAMICUT, RHODE ISLAND

Date	Time	Period	Height	Direction	Type	Remarks
19Mar68	0800	15.7	4	2	SP	From SE
19Mar68	1200	13.8	3.5	2	SP	From SE
19Mar68	1600	0	0	CA		
20Mar68	0800	16.1	2	2	SP	From SE
20Mar68	1200	15.4	1	2	SP	From SE
20Mar68	1600	12.0	1	2	SP	From SE
21Mar68	0800	16.4	1	2	SP	From SE
21Mar68	1200	16.9	1.5	2	SP	From SE
21Mar68	1600	0	0	CA		
22Mar68	0800	16.0	1	2	SP	From SE
22Mar68	1200	15.4	1.5	2	SP	From SE
22Mar68	1600	15.8	1	2	SP	From SE
23Mar68	0800	6.9	1	3	SP	From S
23Mar68	1200	11.9	3	2	SP	From SE
23Mar68	1600	12.8	2.5	2	SP	From SE
24Mar68	0800	7.1	3.5	S	SP	
24Mar68	1200	8.1	3.5	SW	SP	
24Mar68	1600	8.8	3	SW	SP	
25Mar68	0800	0	0	CA		
25Mar68	1200	0	0	CA		
25Mar68	1600	0	0	CA		
26Mar68	0800	0	0	CA		
26Mar68	1200	0	0	CA		
26Mar68	1600	13.2	0.7	2	SP	From SW
27Mar68	0800	0	0	CA		
27Mar68	1200	0	0	CA		
27Mar68	1600	0	0	CA		
28Mar68	0800	0	0	CA		
28Mar68	1200	0	0	CA		
28Mar68	1600	0	0	CA		
29Mar68	0800	0	0	CA		
29Mar68	1200	0	0	CA		
29Mar68	1600	0	0	CA		
30Mar68	0800	0	0	CA		
30Mar68	1200	0	0	CA		
30Mar68	1600	0	0	CA		
31Mar68	0800	0	0	CA		
31Mar68	1200	0	0	CA		
31Mar68	1600	0	0	CA		
01Apr68	0800	10.0	1.5	3	SP	From S
01Apr68	1200	0	0	CA		Offshore winds
01Apr68	1600	0	0	CA		Offshore winds
02Apr68	0800	0	0	CA		Offshore winds
02Apr68	1200	0	0	CA		Offshore winds
02Apr68	1600	0	0	CA		Offshore winds

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
MISQUAMICUT, RHODE ISLAND

Date	Time	Period	Height	Direction	Type	Remarks
03Apr68	0800	0	0	CA		
03Apr68	1200	0	0	CA		
03Apr68	1600	0	0	CA		
04Apr68	0800	5.7	1.5	3	SP	From S
04Apr68	1200	4.4	2.5	3	SP	From S
04Apr68	1600	5.2	2.5	3	SP	From S
05Apr68	0800	5.5	2.5	3	SP	From S
05Apr68	1200	9.9	2.5	3	SP	From S
05Apr68	1600	9.2	2.5	3	SP	From S
06Apr68	0800	0	0	CA		
06Apr68	1200	8.2	1.5	2	SP	From SE
06Apr68	1600	11.0	1	2	SP	From SE
07Apr68	0800	0	0	CA		
07Apr68	1200	0	0	CA		
07Apr68	1600	9.2	1	3	SP	From S
08Apr68	0800	8.0	1	2	SP	From SE
08Apr68	1200	6.8	1	2	SP	From SE
08Apr68	1600	7.6	1	2	SP	From SE
09Apr68	0800	6.9	2	3	SP	From S
09Apr68	1200	7.6	1.5	SE	SP	
09Apr68	1600	8.1	2	2	SP	From SE
10Apr68	0800	0	0	CA		
10Apr68	1200	0	0	CA		
10Apr68	1600	0	0	CA		
11Apr68	0800	0	0	CA		
11Apr68	1200	0	0	CA		
11Apr68	1600	0	0	CA		
12Apr68	0800	17.0	2	2	SP	From SE
12Apr68	1200	13.8	1.5	2	SP	From SE
12Apr68	1600	12.4	2	2	SP	From SE
13Apr68	0800	10.5	4	3	SP	From S
13Apr68	1200	9.4	4.5	3	SP	From S
13Apr68	1600	10.1	4	3	SP	From S

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
WESTHAMPTON BEACH, NEW YORK

Date	Time	Period	Height	Direction	Type	Remarks
22Jan68	1100	8.5	2	3	SP	High tide - Sunny, no wind
23Jan68	1245	7.5	3	4	PL	High tide - Winds 5-7 MPH from NW, cloudy - winds from NW.
23Jan68	1330	5.9	1.5	4	PL	Fair, onshore wind.
24Jan68	1400	9.5	2	3	SU	High tide - wind 15 MPH, cloudy cold winds from NW.
25Jan68	1500	10.5	5	3	PL	Winds 30 MPH cloudy snow winds from NW.
26Jan68	1000	10.5	3	3	PL	Low tide - cold sunny winds 10-12 MPH from NW.
29Jan68	1430	6.3	1	3	PL	Wind from SE 5-8 MPH, cloudy, low tide.
30Jan68	0930	12.0	4	3	PL	Winds calm, cloudy, high tide.
31Jan68	1410	9.3	3.5	2	PL	Wind SEE 20 MPH, low tide.
01Feb68	1400	7.0	2.5	2	PL	Strong offshore breakers, east wind.
01Feb68	1500	9.8	3.5	2	PL	Wind NE 5-10 MPH, low tide
02Feb68	0830	10.5	3.5	3	SU	Wind 3-5 NE MPH, foggy, rain, high tide.
05Feb68	1100	12.8	2	2	SP	Fair day wind 4-6MPH, winds from NE.
06Feb68	1300	11.5	2	3	PL	Winds from NE 8-10 MPH, fair day, cold.
06Feb68	1330	6.0	1	4	PL	Southwest wind
07Feb68	1000	10.4	3	3	PL	Winds NW 15 MPH
08Feb68	1600	11.0	5	2	PL	Winds NNW 35 MPH, waves breaking twice offshore and close to shore.
09Feb68	1030	10.3	3.5	2	PL	Wind - NW - smaller waves offshore.
12Feb68	1330	8.5	1	4	SU	Cloudy, winds 15 MPH from SW, low tide.
13Feb68	1330	6.9	1	3	PL	Strong N wind avg. 20 MPH
13Feb68	1445	6.9	1.5	4	SP	Wind from W 25 MPH, low tide, cloudy.
14Feb68	1200	7.0	3	4	SP	Winds from SW 30 MPH, 2' of ice on shore, low tide.
15Feb68	1315	6.2	2.5	4	PL	Dead low tide, two lines of breakers, wind 15 MPH from West.
16Feb68	0830	5.2	1	4	SU	High tide - wind NW at 15 MPH.
19Feb68	1400	8.0	2.5	4	PL	Clear - low tide - winds SW 12-15.

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
WESTHAMPTON BEACH, NEW YORK

Date	Time	Period	Height	Direction	Type	Remarks
20Feb68	1330	5.5	2	4	PL	Offshore breakers, NW wind
20Feb68	1630	5.7	3	4	PL	Clear - midtide - winds WSW 25-30 MPH
21Feb68	1100	5.0	2	4	PL	Tide +1.5 MLW - winds 30-35 NW
26Feb68	1200	8.5	2	3	SU	Winds - W 8-10
27Feb68	1330	6.0	2	2	PL	Waves breaking on outer bar. Low tide.
27Feb68	1400	15.0	3	2	PL	Wind 3-5 MPH from SW
28Feb68	1045	9.0	3	3	PL	Wind 4 MPH from S
29Feb68	1400	8.2	4	2	PL	Wind 15-20 MPH from NE
01Mar68	1100	7.6	4	3	PL	Wind 30 MPH from NE - tides running 3 to 4 ft above normal.
04Mar68	1215	7.0	2	4	SP	Clear - low tide - winds NW 6-8
05Mar68	1000	6.5	2	4	SP	Winds NW 6-8, clear, low tide.
06Mar68	1200	6.7	2	2	PL	Wind NW at 10 MPH, waves breaking close to shore.
07Mar68	1600	8.7	2	2	PL	Wind 5-10 MPH from the NW low tide.
08Mar68	1000	7.9	1	2	PL	Low tide - seas flat - wind NW 5 MPH.
11Mar68	1100	13.5	1	3	PL	Winds from NW 8-10 MPH
12Mar68	1000	12.6	1.5	2	PL	Wind from NW 15-20 MPH
13Mar68	1200	10.3	2	3	PL	Wind from West 10-12 MPH
14Mar68	1000	7.2	2.5	3	PL	Wind from West 10-15 MPH
15Mar68	1315	9.7	2	4	PL	Wind S 10 MPH
19Mar68	1220	7.5	3	2	PL	Medium Northeast wind. Rolling sea.
22Mar68	1100	7.2	2.5	2	SP	Low tide - wind east at 15 MPH.
25Mar68	1415	7.2	1.5	4	SP	Low tide - wind SW 8-10 - clear.
26Mar68	1300	7.0	2	4	PL	Southwest wind medium strength. Breaking near shore.
26Mar68	1500	11.7	1	4	SP	Wind from South 5-8 MPH.
27Mar68	0900	8.8	1	3	SP	Wind - var 10-12 - clear - low tide.
28Mar68	1000	6.4	1	3	SU	Wind 3-4 MPH SE - low tide.
29Mar68	1225	7.7	1.5	3	SP	Low tide, winds SW 5-8.
01Apr68	1230	8.5	2.5	3	PL	Strong offshore wind. Sea flat, waves breaking close to shore.

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
JONES BEACH STATE PARK, WANTAGH, N. Y.

Date	Time	Period	Height	Direction	Type	Remarks
23Jan68	1200	5.8	2	3	PL	None
24Jan68	1430	8.8	1	2	SU	Very calm seas.
25Jan68	1545	8.1	4	1	PL	Had spilling waves all day - changed to plunging just before high tide.
26Jan68	1630	7.3	3	3	SP	None
27Jan68	1630	9.3	2	3	SU	None
28Jan68	1620	8.3	2	3	PL	None
29Jan68	1600	6.7	2.5	2	SP	Strong eastward current - 3 lines of breakers.
30Jan68	0800	7.5	3	2	SU	None
31Jan68	0830	6.7	3	2	PL	None
01Feb68	0900	7.1	3	2	PL	None
02Feb68	1000	7.8	3	3	PL	None
03Feb68	1030	7.5	4.5	3	PL	Rough seas with 4 lines of breakers.
04Feb68	1130	7.1	2.5	3	SP	None
05Feb68	1230	7.0	2	3	SU	Very calm seas
06Feb68	1300	5.3	1	5	SU	None
07Feb68	1330	5.1	0	2	SU	None
08Feb68	1430	7.8	5	3	SP	Gale force winds from out of north.
09Feb68	1530	11.7	3	2	SP	None
10Feb68	1552	5.5	2	5	PL	2 lines of breakers - ocean very rough.
11Feb68	1630	7.5	2.5	5	PL	3 lines of breakers - ocean moderate.
12Feb68	1700	5.4	2.5	4	SP	4 lines of breakers.
13Feb68	1700	6.8	3	4	PL	None
14Feb68	1730	5.0	1	4	SP	Strong winds from NW
15Feb68	0900	5.0	3	4	PL	Strong winds from NW
16Feb68	1000	5.8	2	4	SP	Strong winds from East
17Feb68	1030	6.0	4	4	SP	3 Lines of breakers - ocean moderate.
18Feb68	1030	4.7	2	4	SP	None
19Feb68	1130	4.0	1.5	4	SP	None
20Feb68	1200	5.0	3	4	SP	Easterly winds moderate.
21Feb68	1300	5.2	3	4	SP	Easterly winds moderate.
22Feb68	1415	5.5	3	5	SP	WSW heavy winds.
23Feb68	1530	5.5	1	4	SP	None
24Feb68	1700	5.8	1	4	SP	None
25Feb68	1745	6.1	3	2	SP	None
26Feb68	1830	6.3	3	2	SP	Very calm seas.
27Feb68	0800	10.3	3	3	SP	Very calm seas - no wind.
28Feb68	0800	9.6	2	3	SP	Very calm seas - no wind.
29Feb68	0800	9.6	3	3	SP	3 lines of breakers.

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
JONES BEACH STATE PARK, WANTAGH, N. Y.

Date	Time	Period	Height	Direction	Type	
01Mar68	0830	10.5	7	3	SP	Extremely rough seas - strong wind from north.
02Mar68	0915	6.8	3	4	PL	2 lines of breakers
03Mar68	1000	9.5	3	4	SP	
04Mar68	1030	5.0	2	4	SP	None
05Mar68		6.9	3	2	SP	None
06Mar68		5.8	2	2	SP	3 lines of breakers.
07Mar68		5.1	1.5	2	SU	Very calm seas.
08Mar68		5.3	1.5	3	SU	
09Mar68		7.5	2	3	PL	2 lines of breakers.
10Mar68		8.0	2	3	SP	
11Mar68	1700	6.8	3	2	SP	None
12Mar68	1730	5.4	3	1	SP	4 lines of breakers.
13Mar68	0800	7.2	4	3	SP	Very rough seas. Strong winds from northwest.
14Mar68	0800	8.7	4	3	SP	Strong northerly winds.
15Mar68	0800	5.1	1.5	3	SU	None
16Mar68	0815	4.7	1.5	3	SU	Very calm seas.
17Mar68	0930	5.3	3.5	3	PL	None
18Mar68	1000	9.9	3	3	SP	Rough seas and strong winds from north.
19Mar68	1100	6.7	3	3	SP	None
20Mar68	1200	8.5	2	3	SP	None
21Mar68	1215	7.4	2	3	SP	None
22Mar68	1330	7.6	2.5	3	SP	None
23Mar68	1315	6.9	6	3	SP	Ocean unusually rough, many lines of breakers.
24Mar68	1615	8.5	2.5	4	SP	
25Mar68	1630	11.0	1.5	3	SP	None
26Mar68	1700	4.1	1	3	SU	Very calm seas.
27Mar68	0900	9.5	1	3	SU	None
28Mar68	0800	8.8	1.5	3	SP	None
29Mar68	0800	7.9	3	3	SP	None
30Mar68	0900	7.4	2	3	SP	None
31Mar68	0930	8.0	1.5	3	SP	None
01Apr68	0930	6.6	3	3	SP	3 lines of breakers.
02Apr68	1000	4.6	1	5	SU	Winds out of the West
03Apr68	1030	7.7	3	3	SP	None
04Apr68	1115	4.8	4	4	SP	Very rough seas, lines of breakers, strong S winds.
05Apr68	1145	6.8	3	3	SU	Rough and violent seas.
06Apr68	1230	7.4	2	3	SP	4 lines of breakers.
07Apr68	1330	8.0	2	3	SP	

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
LONG BEACH ISLAND, NEW JERSEY

Date	Time	Period	Height	Direc-tion	Type	Remarks	Profile
22Jan68	1200	4.5	0.7	2	PL	No wind - calm sea	13
22Jan68	1215	4.5	0.7	2	PL	No wind - calm sea	16
23Jan68	1400	6.5	3	4	PL	Moderate offshore wind, beach scouring.	13
23Jan68	1415	6.8	3	4	PL	Moderate offshore wind, beach scouring.	16
24Jan68	1530	4.0	2.5	1	PL	Strong NE'ly winds parallel to beach.	13
24Jan68	1545	4.0	2.5	1	PL	Strong NE'ly winds parallel to beach.	16
25Jan68	1530	4.5	3	2	PL	Strong NE'ly winds parallel to beach.	13
25Jan68	1545	4.3	3	2	PL	Strong NE'ly winds parallel to beach.	16
26Jan68	1500	8.0	3	3	PL	Moderate NE'ly winds	13
26Jan68	1515	7.5	3	3	PL	Moderate NE'ly winds	16
29Jan68	1040	6.5	2	3	SP		13
29Jan68	1055	6.5	2	3	SP		16
30Jan68	1615	6.0	2	3	PL	Moderate NE'ly wind parallel to beach.	13
30Jan68	1630	6.0	2	3	PL	Moderate NE'ly wind parallel to beach.	16
31Jan68	1600	7.0	2.5	3	SP	Strong NE'ly winds	13
31Jan68	1615	7.0	2.5	3	SP	Strong NE'ly winds	16
01Feb68	1545	6.5	2.5	2	SP	Strong NE'ly winds	13
1Feb68	1600	6.5	2.5	2	SP	Strong NE'ly winds	16
02Feb68	0930	8.0	3.5	3	PL	Moderate S'ly winds	13
02Feb68	0945	8.0	3.5	3	PL	Moderate S'ly winds	16
03Feb68	1100	6.0	3	3	PL	Moderate W'ly winds	13
03Feb68	1115	6.0	3	3	PL	Moderate W'ly winds	16
04Feb68	1200	9.0	1.5	3	SP	Moderate W'ly winds	13
04Feb68	1215	9.0	1.5	3	SP	Moderate W'ly winds	16
05Feb68	1300	10.0	1	3	SP	Wind continues moderate westerly.	13
05Feb68	1315	10.0	1	3	SP	Wind continues moderate westerly.	16
06Feb68	1445	12.0	1	3	PL	Still moderate W'ly. Note period difference.	13
06Feb68	1500	8.0	1	3	PL	Note period difference. Still moderate W'ly.	16
07Feb68	1500	5.5	3	2	SP	Strong NE'ly winds	13
07Feb68	1515	5.0	3	2	SP	Strong NE'ly winds	16

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
LONG BEACH ISLAND, NEW JERSEY

Date	Time	Period	Height	Direction	Type	Remarks	Profile
08Feb68	1615	8.0	4	2	PL	Strong NE'ly winds	13
08Feb68	1630	8.0	4	2	PL	Strong NE'ly winds	16
09Feb68	1700	11.0	2	2	PL	Strong NW'ly winds	13
09Feb68	1645	9.0	2	2	PL	Strong NW'ly winds	16
10Feb68	0800	10.0	1.5	3	PL	Strong W'ly winds	13
10Feb68	0815	10.0	1.5	3	PL	Strong W'ly winds	16
11Feb68	0800	9.0	1	3	PL	Strong W'ly winds	13
11Feb68	0815	9.0	1	3	PL	Strong W'ly winds	16
12Feb68	0800	9.0	1	3	PL	Strong W'ly winds	13
12Feb68	0815	9.0	1	3	PL	Strong W'ly winds	16
13Feb68	0900	7.0	1	3	PL	Strong W'ly winds	13
13Feb68	0915	4.0	1	3	PL	Strong W'ly winds	16
14Feb68	0945	4.0	0.5	4	PL	SW'ly winds - very little wave action	13
14Feb68	1000	4.0	0.5	4	PL	Very little wave action, SW'ly winds	16
15Feb68	0900	5.0	1	4	PL	Strong W'ly winds	13
15Feb68	0845	5.0	1	4	PL	Strong W'ly winds	16
16Feb68	0915	4.0	0.5	2	SU	Strong W'ly winds	13
16Feb68	0900	4.0	0.5	2	SU	Strong W'ly winds	16
17Feb68	1030	6.5	2	5	PL	Gale force W'lies	13
17Feb68	1045	4.5	2	5	PL	Gale force W'lies	16
18Feb68	1200	6.0	1	5	PL	Moderating W'lies	13
18Feb68	1215	6.0	1	5	PL	Moderating W'lies	16
19Feb68	1100	4.5	0.5	4	PL	Moderate W'ly wind	13
19Feb68	1045	4.5	0.5	4	PL	Moderate W'ly wind	16
20Feb68	1145	4.0	0.7	4	PL	Moderate to strong S'lies	13
20Feb68	1130	5.5	0.7	4	PL	Moderate to strong S'lies	16
21Feb68	1330	6.5	0	3	SU	Strong W'ly winds. Wave action minimal.	13
21Feb68	1315	8.5	0	3	SU	Strorg W'ly winds. Wave action minimal.	16
22Feb68	1250	3.0	0.5	4	SU	Strong W'ly winds	13
22Feb68	1310	6.0	0.5	4	SU	Strong W'ly winds	16
23Feb68	1430	4.0	0.7	4	PL	Moderating W'ly wind	13
23Feb68	1445	5.0	0.7	4	PL	Moderating W'ly wind	16
24Feb68	1600	4.5	1	3	PL	Moderating W'ly wind	13
24Feb68	1615	4.5	1	3	PL	Moderating W'ly wind	16
25Feb68	1645	5.0	1.5	3	PL	Wind swinging around to N	13
25Feb68	1700	5.0	1.5	3	PL	Wind swinging around to N	16
26Feb68	0845	5.0	2.5	3	PL	Winds N to NE	13
26Feb68	0900	6.0	2.5	3	PL	Winds N to NE	16
27Feb68	0930	5.0	3	3	PL	Very light SE'ly winds	13
27Feb68	0945	5.0	3	3	PL	Very light SE'ly winds	16
28Feb68	0830	4.0	1.5	3	PL	No wind	13

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
LONG BEACH ISLAND, NEW JERSEY

Date	Time	Period	Height	Direction	Type	Remarks	Profile
28Feb68	0845	4.0	1.5	3	PL	No wind	16
29Feb68	1615	5.5	2.5	2	PL	Strong NE wind and rain	13
29Feb68	1630	5.5	2.5	2	PL	Strong NE wind and rain	16
01Mar68	0945	8.5	6	3	PL	Gale force NW'ly winds	13
01Mar68	0930	7.0	6	3	PL	Gale force NW'ly winds	16
02Mar68	1100	5.5	1.5	4	PL	Moderating W'ly wind	13
02Mar68	1030	6.0	1.5	4	PL	Moderating W'ly wind	16
03Mar68	1130	4.5	0.5	2	PL	Strong W'ly wind	13
03Mar68	1145	4.5	0.5	3	PL	Strong W'ly wind	16
04Mar68	1430	6.0	1	3	PL	Moderate W'ly winds	13
04Mar68	1445	6.0	1	3	PL	Moderate W'ly winds	16
05Mar68	1430	5.0	1	4	PL	Moderate W'ly winds	13
05Mar68	1415	7.0	1	4	PL	Moderate W'ly winds	16
06Mar68	1345	5.0	3	2	SP	Strong N'ly winds	13
06Mar68	1330	5.0	3	2	SP	Strong N'ly winds	16
07Mar68	1130	5.0	3	2	SP	Strong N'ly winds	13
07Mar68	1300	5.0	3	2	SP	Strong N'ly winds	16
09Mar68	1130	5.0	2	4	SP	Moderate SE'ly winds	13
09Mar68	1145	5.0	2	4	SP	Moderate SE'ly winds	16
11Mar68	1530	6.0	2	3	PL		13
11Mar68	1545	6.0	2	3	PL		16
12Mar68	1630	6.0	2.5	2	SP	Strong NE'ly winds and heavy rain	13
12Mar68	1645	6.0	2.5	2	SP	Strong NE'ly winds and heavy rain	16
13Mar68	1500	4.5	3	3	PL	Strong W'ly winds & snow	13
13Mar68	1515	4.5	3	3	PL	Strong W'ly winds & snow	16
14Mar68	1430	6.0	1	3	PL	Light W'ly winds	13
14Mar68	1445	5.0	1	3	PL	Light W'ly winds	16
15Mar68	0900	4.0	0.5	4	SP	Strong SE'ly winds	13
15Mar68	0915	4.0	0.5	4	SP	Strong SE'ly winds	16
16Mar68	1000	4.0	1	4	SP		13
16Mar68	1015	4.0	1	4	SP		16
17Mar68	0900	5.0	2	3	PL	Heavy Rain - no wind	13
17Mar68	0915	5.0	2	3	PL	No wind - heavy rain	16
18Mar68	0945	6.0	4	2	SP	Strong NE'ly winds & rain	13
18Mar68	1000	6.0	4	2	SP	Strong NE'ly winds & rain	16
19Mar68	1045	5.5	3	2	SP	Moderate N'ly wind	13
19Mar68	1030	5.5	3	2	SP	Moderate N'ly wind	16
20Mar68	1130	4.0	3	3	SP	Moderate SE'ly wind	13
20Mar68	1145	4.0	3	3	SP	Moderate SE'ly wind	16
21Mar68	1330	4.0	3	3	PL	Moderate NE'ly winds	13
21Mar68	1315	4.0	3	3	PL	Moderate NE'ly winds	16

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
LONG BEACH ISLAND, NEW JERSEY

Date	Time	Period	Height	Direction	Type		Profile
22Mar68	1400	4.0	3	4	PL	SE'ly winds	13
22Mar68	1415	4.0	3	4	PL	SE'ly winds	16
23Mar68	1515	3.5	3.5	4	SP	Strong SE'ly winds, short choppy sea.	13
23Mar68	1530	3.5	3.5	4	SP	Strong SE'ly winds, short choppy sea.	16
24Mar68	1630	5.0	2	3	SP	Very strong NW'ly winds	13
24Mar68	1615	5.0	2	3	SP	Very strong NW'ly winds	16
25Mar68	1515	6.0	1	3	PL	Strong SE'ly winds	13
25Mar68	1530	6.0	1	3	PL	Strong SE'ly winds	16
26Mar68	1630	4.0	1	3	SP	Strong SE'ly winds	13
26Mar68	1645	4.0	1	3	SP	Strong SE'ly winds	16
27Mar68	1000	4.0	1	3	SP	Moderate SE'ly winds	13
27Mar68	1015	4.0	1	3	SP	Moderate SE'ly winds	16
28Mar68	0830	4.0	1	3	PL	Moderate SE'ly winds	13
28Mar68	0845	4.0	1	3	PL	Moderate SE'ly winds	16
29Mar68	0900	4.5	1	4	PL	Moderate SE'ly winds	13
29Mar68	0915	4.5	1	4	PL	Moderate SE'ly winds	16
30Mar68	1015	6.5	1.5	3	PL	Light SE'ly winds	13
30Mar68	1030	5.5	1.5	3	PL	Light SE'ly winds	16
31Mar68	1100	6.0	1.5	3	PL	Light SE'ly winds	13
31Mar68	1115	6.0	1.5	3	PL	Light SE'ly winds	16

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
ABSECON ISLAND (ATLANTIC CITY, N. J.)

Date	Time	Period	Height	Direction	Type	Remarks
15Jan68	1120	5.0	4.5	3	SP	Very rough surf - breakers for 1/2 mile out - strong SE wind 10 to 15 MPH.
16Jan68	0900	10.1	4	3	PL	Normal
16Jan68	1330	11.1	3	3	PL	Normal
17Jan68	0920	22.5	2	3	PL	Normal
18Jan68	0910	19.0	1	3	SP	Normal
19Jan68	0930	15.3	1	3	SP	Normal
20Jan68	1000	14.1	0	3	SP	Normal
21Jan68	1100	15.4	1	3	PL	Normal
22Jan68	1200	13.0	1	3	PL	Normal
23Jan68	0910	10.1	1	3	SP	Normal
24Jan68	1045	9.8	1	2	SP	Calm surf - fair northerly wind - 10 MPH.
24Jan68	1430	11.5	2	3	PL	Normal
25Jan68	1445	8.5	5	2	PL	Normal
26Jan68	1530	11.5	4	2	PL	Normal
27Jan68	1630	15.5	2	3	PL	Normal
28Jan68	1810	15.1	2	3	PL	Normal
29Jan68	1800	14.7	4	2	PL	Normal
30Jan68	1400	13.4	4	3	PL	
30Jan68	1500	9.0	3.5	2	SP	Light SSE wind - 5 MPH.
31Jan68	0900	14.7	4	2	SP	Waves broke twice on shore, wind 25 MPH.
01Feb68	0940	11.8	3	2	SP	Normal
02Feb68	1000	8.9	5	3	SP	Normal - 4 of 10 PL 6 SP
03Feb68	1000	14.8	6	3	SP	Normal
04Feb68	1100	13.5	4	3	SP	Normal
05Feb68	1200	12.8	3	3		Normal
06Feb68	1330	18.1	3	3	PL	4 of 10 waves were 3' and followed each other 10 seconds apart - the other 6 waves of period were 1'.
07Feb68	1440	8.2	1	2	SP	4 of 10 at most = 1' - the rest whitecaps under 1'.
08Feb68*	0920	12.7	7	2	SP	Rough surf - strong NW winds 20-25 MPH.
08Feb68	1440	12.0	6	2	PL	5 of 10 spilled, re-formed and plunged.
09Feb68	1510	13.0	2	3	PL	Normal
10Feb68	1600	12.0	2		PL	Normal
11Feb68	1600	10.1	1		PL	Normal

*George A. Cronin

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
ABSECON ISLAND (ATLANTIC CITY, N. J.)

Date	Time	Period	Height	Direction	Type	Remarks
12Feb68	0910	8.0	1	3	PL	5 of 10 waves were 1 foot
13Feb68	1255	0	0	3	PL	Shore ice (like a lake) - strong offshore wind.
14Feb68	0910	0	0	4		White caps under 1 foot.
15Feb68	0930	0	0	3		White caps under 1 foot.
15Feb68	1500	9.3	1	4	SP	Calm surf - fair SSW wind 10 to 15 MPH.
16Feb68	1000	0	0	3		White caps under 1 foot.
17Feb68	1600	12.0	1	3	PL	Strong offshore wind.
18Feb68	1030	11.9	1	3	PL	Strong offshore wind.
19Feb68	1420	10.5	1	3	PL	Normal
20Feb68	1500	10.0	1	3	PL	Normal
21Feb68	0825	7.8	1	3	SP	Calm surf - strong NW wind - 15-20 MPH.
21Feb68	1500	9.8	1	3	PL	Normal
22Feb68	1500	0	0	3	PL	White caps
23Feb68	1630	0	0	3	SP	Like a lake
24Feb68	1530	0	0	2	SP	White caps like a lake.
25Feb68	1610	11.5	4	2	SP	Normal
26Feb68	1115	11.0	3	2	SP	Light NW wind - 03 MPH.
26Feb68	1600	13.0	3	2	SP	Normal
27Feb68	1300	14.5	3	3	SP	Normal
28Feb68	0900	8.0	3	3	SP	Normal
29Feb68	0930	11.5	3	3	SP	Normal - snow predicted tonight.
01Mar68	0930	14.0	6	3	PL	Strong offshore wind - snow last night.
02Mar68	1050	12.0	2	3	PL	Normal.
03Mar68	1100	10.0	1	3	PL	Normal
04Mar68	1700	7.5	1	3	PL	Normal
05Mar68	1700	8.1	1	3	PL	Normal
06Mar68	1600	9.5	2	2	SP	Normal
07Mar68	0810	7.3	2.5	2	SP	Calm surf - fair NW wind 5-10 MPH.
07Mar68	1345	9.8	2	2	SP	Normal
08Mar68	1400	10.5	3	2	SP	Normal
09Mar68	1400	9.8	2	3	PL	Normal
10Mar68	1110	10.1	2	3	PL	Normal
11Mar68	1200	8.6	3	3	PL	Normal
13Mar68	1220	11.0	3.5	3	SP	Rough surf - strong NW wind - 20-25 MPH.
22Mar68	0845	10.7	1.5	3	SP	Calm surf - light NE wind.

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
LUDLAM ISLAND, NEW JERSEY*

Date	Time	Period	Height	Direction	Type	Remarks
20Jan68	1200	7.5	1	3	SP	Very smooth
21Jan68	0700	8.5	0.5	3	SP	NW wind very smooth
22Jan68	1200	8.0	1	2	SP	NW wind very smooth
23Jan68	1500	5.0	1	4	PL	South wind, short sloppy seas.
24Jan68	1100	7.0	1.5	2	PL	NE wind, smooth
25Jan68	1100	6.0	3	2	PL	NE wind - the NE roll had been started in on the beach.
26Jan68	0900	7.5	3.5	2	PL	Smoothing off beyond the breakers, cut beach over night approximately 6".
27Jan68	1000	7.5	4	2	PL	Smoothing off beyond the break. East wind.
29Jan68	1000	7.5	4	2	PL	East wind, heavy sea in on the beach - smooth outside.
30Jan68	1400	8.0	3	2	PL	South wind, tide is back to normal and smoothing along the beach front.
31Jan68	1500	6.5	3	2	PL	NE winds, higher than normal tide.
01Feb68	1400	8.0	4	2	PL	NE wind, high tide above normal - lost beach all along, 93rd St. area more.
02Feb68	1000	10.5	6	3	PL	S wind, high tides - beach cutting bad.
03Feb68	0900	8.5	5	3	PL	NW light wind, sea is beginning to subside.
04Feb68	1000	8.0	3	3	PL	NW light wind.
05Feb68	1000	10.5	1.5	2	PL	NW very light wind. Smooth along beach and outside.
06Feb68	1100	9.5	1	2		Very smooth, NW winds.
07Feb68	0800	7.5	0.5	3	SP	Very smooth N to NW wind.
08Feb68	1400	9.5	5	2	PL	Very big sea - beach is washing out bad again - NE winds.
09Feb68	0900	8.5	4	2	PL	NW wind, smooth outside of the break but heavy break.
10Feb68	0800	11.0	1	3	SP	NW wind very smooth along the beach. We have lost a lot of sand in the 41st St. area - down to sod.

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
LUDLAM ISLAND, NEW JERSEY

Date	Time	Period	Height	Direction	Type	Remarks
11Feb68	0800	10.0	1	3	SP	NW wind very smooth
12Feb68	0800		0	3		NW wind very smooth
13Feb68	0800		0			Hard NW wind, very smooth.
14Feb68	0800	0	0	3		NW wind 10 to 15 MPH.
15Feb68	0800	0	0	3		NW wind 10 to 15 MPH.
16Feb68	0800	0	0	3		South wind direction very smooth.
17Feb68	0900	7.5	1.5	4	PL	South wind.
18Feb68	0800	0	0	3		NW winds, very low tides.
19Feb68	0800	0	0	3		NW winds, very low tides.
20Feb68	0800	0	0	4		SW wind
21Feb68	0800	0	0	3		NW winds, very very smooth.
22Feb68	1500	0	0	4		South wind, calm along beach front.
23Feb68	0800	0	0	CA		NW wind, very calm.
24Feb68	0800	7.0	1	2	PL	Light wind from NE.
25Feb68	0700	7.5	1.5	2	PL	North wind.
26Feb68	0800	9.0	3	2	PL	NNE wind.
27Feb68	1100	9.0	3	2	PL	SE wind.
28Feb68	1100	8.5	2.5	3	PL	SE light wind.
29Feb68	1800	7.0	2.5	2	PL	NE winds, light snow.
01Mar68	0800	9.0	4	2	PL	NW wind blowing strong - high tides
02Mar68	0800	6.0	1.5	4	PL	SW light wind - smooth
03Mar68	0800		0	3		Hard NW winds.
04Mar68	0800		0	3		NW winds.
05Mar68	0800		0	3		Light NW wind
07Mar68	1300	5.5	1.5	2	PL	NE winds - short seas.
08Mar68	1000	7.5	1	2	PL	SW light winds.
09Mar68	0800	8.0	1	2	PL	North wind.
10Mar68	0800	9.5	1.5	2	PL	East wind.
11Mar68	0800	0	0	3		NW light wind.
12Mar68	1100	6.0	1.5	2	PL	NE winds.
13Mar68	1100	7.5	2	3	PL	NW wind.
14Mar68	1330		0	3		NW wind, very low tide.
15Mar68	1000	8.0	0.5	3		South wind, calm.
16Mar68	1000	6.0	0.5	3		South wind, smooth.
17Mar68	1230	6.0	0.5	3		NW wind, smooth, rain.
18Mar68	0900	8.5	4.5	2	PL	NE wind and rain, high tides.
19Mar68	0830	8.5	3	2	PL	NE wind - higher than normal tides.
20Mar68	1600	8.5	2	3	PL	SW wind
21Mar68	1100	8.0	2	2	PL	S wind.
22Mar68	1000	10.0	1.5	2	PL	SE wind, smooth

WAVE OBSERVATIONS 10-WEEK STUDY BEACH EVALUATION PROGRAM
LUDLAM ISLAND, NEW JERSEY

Date	Time	Period	Height	Direction	Type	Remarks
23Mar68	0900	6.0	1.5	4	PL	W wind
24Mar68	0700	8.0	1	4	PL	NW wind wo MPH, big tide out.
25Mar68	1200	0	0	3		NW wind, big tide out.
26Mar68	0900	10.5	0.5	3		South wind - smooth
27Mar68	0800	9.0	1	3	PL	SW wind - smooth
28Mar68	0800	10.0	1	3	PL	SW wind - smooth
29Mar68	1200	7.0	1	4	PL	SW wind - smooth
30Mar68	1000	7.0	1	4	PL	SW wind - smooth
31Mar68	0700	9.0	1	3	PL	S wind - smooth
01Apr68	0800	10.0	1.5	3	PL	Smooth outside N wind
02Apr68	1600	10.5	0.5	3		West wind very smooth
03Apr68	1000	7.5	1	4	PL	South wind - smooth
04Apr68	1000	7.0	1.5	4	PL	SW wind.
05Apr68	1000	7.5	1.5	4	PL	NW wind.
06Apr68	0900	7.0	2.5	2	PL	NE wind.
07Apr68	0900	7.0	2	4	PL	S wind
08Apr68	1000	5.5	1	4	PL	S wind - smooth
09Apr68	1100	0	0	3		NW wind - very smooth

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)	2a. REPORT SECURITY CLASSIFICATION
Coastal Engineering Research Center (CERC) Corps of Engineers, Department of the Army Washington, D. C. 20016	UNCLASSIFIED
	2b. GROUP

3. REPORT TITLE

PIPE PROFILE DATA AND WAVE OBSERVATIONS FROM THE CERC BEACH EVALUATION PROGRAM, JANUARY-MARCH 1968.

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

5. AUTHOR(S) *(First name, middle initial, last name)*

H. D. Urban
C. J. Galvin, Jr.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
September 1969	74	5

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO.	MISCELLANEOUS PAPER 3-69
c.	9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)*
d.	

10. DISTRIBUTION STATEMENT

This document has been approved for public release and sale; its distribution is unlimited.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY

13. ABSTRACT

Observations of sand levels at pipes placed at 50-foot intervals from dune to low tide terrace along two profile lines on each of five Atlantic Coast Beaches proved to be a feasible alternate method of surveying beach profiles. For 1-week intervals during January, February, and March 1968, the maximum changes in sand level at any pipe on the five beaches was 5.7 feet of erosion and 4.7 feet of accretion. Changes in sand level were more likely at pipes located in the beach face than at pipes located below mean sea level. When significant erosion occurred between successive surveys on any profile, there was a tendency for the maximum decrease in sand level to occur at locations high on the earlier of the two surveys. Pipe-profile data showed that beach steepness and fluctuations in sand level usually decrease in a north-to-south direction for the five beaches studied (from Westhampton Beach, N. Y., through Ludlam Island, N. J.), in a way that appears related to decreases in wave height and the sediment size on the same beaches. Five appendixes show pipe-profile data in tables and graphs. A sixth appendix contains wave observations.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

UNCLASSIFIED

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Beach Surveying						
Shore Processes						
Ocean Waves						
Long Island, N. Y.						
New Jersey						

U. S. ARMY COASTAL ENGRG RESEARCH CENTER, CE.
WASHINGTON, D. C. 20016

PIPE PROFILE DATA AND WAVE OBSERVATIONS FROM THE CERC BEACH EVALUATION PROGRAM, JANUARY-MARCH 1968, by H. D. Urban and C. J. Galvin, Jr. 74 pp. including 3 Tables, 11 Figures and 6 Appendixes. September 1969.

MISCELLANEOUS PAPER 3-69 UNCLASSIFIED

Observations of sand levels at pipes placed from dune to low tide terrace along profile lines on five beaches proved a feasible method of surveying beach profiles. For 1-week intervals, January-March 1968, maximum changes at any pipe were 5.7 feet of erosion and 4.7 feet of accretion. Changes in sand level were more likely at pipes on the beach face than at those below mean sea level. Data showed beach steepness and fluctuations in level usually decrease in a north-to-south direction for beaches studied (from Westhampton Beach, N. Y. through Ludlam Island, N. J.), in a way that appears related to decreases in wave height and sediment size. Appendixes show profile data and wave observations.

1. Beach Surveying
2. Shore Processes
3. Ocean Waves
4. Long Island, N. Y.
5. New Jersey

I Title
II Urban, H. D.
III Galvin, C. J. Jr.

U. S. ARMY COASTAL ENGRG RESEARCH CENTER, CE.
WASHINGTON, D. C. 20016

PIPE PROFILE DATA AND WAVE OBSERVATIONS FROM THE CERC BEACH EVALUATION PROGRAM, JANUARY-MARCH 1968, by H. D. Urban and C. J. Galvin, Jr. 74 pp. including 3 Tables, 11 Figures and 6 Appendixes. September 1969.

MISCELLANEOUS PAPER 3-69 UNCLASSIFIED

Observations of sand levels at pipes placed from dune to low tide terrace along profile lines on five beaches proved a feasible method of surveying beach profiles. For 1-week intervals, January-March 1968, maximum changes at any pipe were 5.7 feet of erosion and 4.7 feet of accretion. Changes in sand level were more likely at pipes on the beach face than at those below mean sea level. Data showed beach steepness and fluctuations in level usually decrease in a north-to-south direction for beaches studied (from Westhampton Beach, N. Y. through Ludlam Island, N. J.), in a way that appears related to decreases in wave height and sediment size. Appendixes show profile data and wave observations.

1. Beach Surveying
2. Shore Processes
3. Ocean Waves
4. Long Island, N. Y.
5. New Jersey

I Title
II Urban, H. D.
III Galvin, C. J. Jr.

U. S. ARMY COASTAL ENGRG RESEARCH CENTER, CE.
WASHINGTON, D. C. 20016

PIPE PROFILE DATA AND WAVE OBSERVATIONS FROM THE CERC BEACH EVALUATION PROGRAM, JANUARY-MARCH 1968, by H. D. Urban and C. J. Galvin, Jr. 74 pp. including 3 Tables, 11 Figures and 6 Appendixes. September 1969.

MISCELLANEOUS PAPER 3-69 UNCLASSIFIED

Observations of sand levels at pipes placed from dune to low tide terrace along profile lines on five beaches proved a feasible method of surveying beach profiles. For 1-week intervals, January-March 1968, maximum changes at any pipe were 5.7 feet of erosion and 4.7 feet of accretion. Changes in sand level were more likely at pipes on the beach face than at those below mean sea level. Data showed beach steepness and fluctuations in level usually decrease in a north-to-south direction for beaches studied (from Westhampton Beach, N. Y. through Ludlam Island, N. J.), in a way that appears related to decreases in wave height and sediment size. Appendixes show profile data and wave observations.

1. Beach Surveying
2. Shore Processes
3. Ocean Waves
4. Long Island, N. Y.
5. New Jersey

I Title
II Urban, H. D.
III Galvin, C. J. Jr.

U. S. ARMY COASTAL ENGRG RESEARCH CENTER, CE.
WASHINGTON, D. C. 20016

PIPE PROFILE DATA AND WAVE OBSERVATIONS FROM THE CERC BEACH EVALUATION PROGRAM, JANUARY-MARCH 1968, by H. D. Urban and C. J. Galvin, Jr. 74 pp. including 3 Tables, 11 Figures and 6 Appendixes. September 1969.

MISCELLANEOUS PAPER 3-69 UNCLASSIFIED

Observations of sand levels at pipes placed from dune to low tide terrace along profile lines on five beaches proved a feasible method of surveying beach profiles. For 1-week intervals, January-March 1968, maximum changes at any pipe were 5.7 feet of erosion and 4.7 feet of accretion. Changes in sand level were more likely at pipes on the beach face than at those below mean sea level. Data showed beach steepness and fluctuations in level usually decrease in a north-to-south direction for beaches studied (from Westhampton Beach, N. Y. through Ludlam Island, N. J.), in a way that appears related to decreases in wave height and sediment size. Appendixes show profile data and wave observations.

1. Beach Surveying
2. Shore Processes
3. Ocean Waves
4. Long Island, N. Y.
5. New Jersey

I Title
II Urban, H. D.
III Galvin, C. J. Jr.