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Little Pikes Inlet, Westhampton, New York

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ABSTRACT

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Two barrier island breaches were formed in Westhampton, New York, in December of 1992, following an extratropical storm. The December 1992 Nor'easter along with the Blizzard of 1993 severely impacted the barrier island, causing extensive erosion and the loss of many homes. Two breaches broke through the island, eventually creating an opening larger than the neighboring inlets.

One breach closed within two months by natural processes and with the aid of mechanical dredging. The other breach remained open for eight months, growing the entire time. Emergency actions to close the breach were initiated in July 1993. The closure project consisted of placing 1.5 million cubic yards of sand fill (from an offshore source) and installing 1,800 linear feet of steel sheeting. The project was completed in November 1993.

ADDITIONAL INDEX WORDS: *Inlet closure, beach renourishment, tidal delta, beach erosion.*

INTRODUCTION

The Westhampton barrier island is located on the south shore of Long Island approximately 90 miles east of New York City (Figure 1). The barrier island is an inherently changing beach and dune system typical of Eastern Long Island which vacillates through time as the result of coastal storms, seasonal trends, and cyclical meteorological patterns. Beaches in this area typically fluctuate by about 150′ from summer to winter, and the seaward line of dune crests migrates landward or seaward over periods of years by a similar distance (COVELLO, 1993). Dominant littoral transport is from east to west at approximately 200,000 cubic yards annually. However, littoral reversals are common in the summer months (PANUZIO, 1968).

The barrier island has been manipulated with engineering structures, including stabilized inlets at the east and west ends and a series of 15 stone groins in the middle of the island. These groins were constructed as part of a hurricane storm-protection project in two increments of work. The easternmost eleven groins were constructed from 1965–1966, and the remaining four (located on the western end of the field) constructed in 1970. A third increment of work, which would have completed the project westward to Moriches Inlet (the downdrift point of closure) was not constructed for political reasons (NERSESIAN *et al.*, 1992). This paper documents the formation, growth, and closure of the two barrier island breaches in Westhampton, New York, formed west (downdrift) of the 15 groin field by the December 1992 nor'easter.

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METHODS AND DATA COLLECTION

Data on the formation, growth and closure of the two breaches was extracted from monthly metric vertical aerial photographs of the area. The low tide shorelines of the barrier island were plotted onto a base map with state plane coordinates. Measurements of the width of the breach along Dune Road and across the throat (narrowest section) of the breach, for each date of observation, were scaled from the base maps. These data were compiled into a table which was used to calculate the differing rates of inlet growth during a seven month period (Figure 5).

The thirteen shorelines were then segregated into two groups to ease interpretation of the data. The first group depicts the opening of the breach between December 1992 and July 1993 (Figure 3). The second group depicts the closure of the breach between August and December 1993 (Figure 4).

DATA DISCUSSION

The barrier island west of the groin field ranges from 150 feet to 1,800 feet wide. Moriches Inlet is approximately 3.2 miles west of the last groin. The westernmost breach was called "Pikes Inlet", because it was located in the same general area

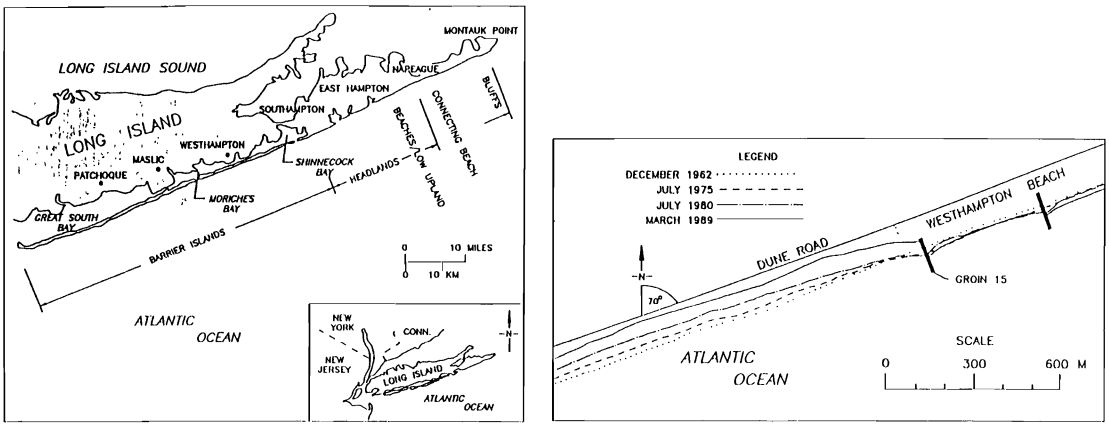

Figure 1. Location map of the Westhampton barrier island showing Moriches and Shinnecock Inlets.

as the Southampton Town beach of the same name. Pikes Inlet was located 4,500 feet to the west of the groin. The initial area of washover was approximately 1,000 feet wide and shallow (less than 1 foot). The breach channel was significantly smaller (100 feet) and meandering (Figure 3).

Pikes Inlet was closed by early February through a combination of natural and manmade actions. There was weak flow through the breach which allowed for an accumulation of sand in the throat of the inlet. Pikes Inlet, located 4,800 feet west of the last groin, was outside the most severe downdrift erosional shadow of the groins. Thus, the breach was able to receive more of the natural supply of sand transported west around the groin. This natural deposition was augmented with additional sand dredged by the Army Corp of Engineers from a channel to the north of the breach.

The second breach was named "Little Pikes Inlet", because it was initially the smaller of the two, approximately 100 feet. The initial breach was only 1,000 feet west of the last groin, and thus within the most severe portion of the erosion shadow created by the groins. This breach grew to 5,000 feet, or more than 5 times the width of nearby Moriches Inlet (Figure 3).

The eastern shore of the breach did not erode significantly in comparison to the western shoreline. It had a blunt shape, with the breach cutting across the island at a near 90 degree angle. The eastern shoreline was deprived of natural sediment flow usually transported east to west by longshore drift. However, the eastern shoreline was also protected from wave attack by the groins.

Moreover, Little Pikes Inlet altered sand flow normally transported into this erosional zone by summer waves (east to west). This sand was deposited as an ebb tidal shoal, further protecting the eastern shoreline. A great deal of this sediment was also deposited in the bay as a flood tidal delta and emergent sand spit.

A sand spit was created from the western shoreline extending northeastward into Moriches Bay as a result of littoral transport from May to July (Figure 4). The tip of the spit migrated in a northwest direction, but the connection to the barrier island remained more or less fixed. This created a hinge type feature at the shoreline with the spit swinging northwest back into the bay. The ocean shoreline of the barrier island continued to erode landward during this period, but much more slowly than the spit migration.

The geomorphical characteristics of Little Pikes Inlet were different from those of Pikes Inlet and allowed Little Pikes Inlet to stay open and grow. The channel through the barrier island ran deep (18 feet, U.S. Army Corps of Engineers, 1993) and narrow. During ocean high tides, tidal currents flowed through the breach into the bay, eroding the east and west shorelines. During ocean low tides, tidal currents flowed in the reverse direction into the ocean. The two way flow of water through this deep, narrow passage caused erosion on both sides of the breach, allowing it to grow and create extensive flood and ebb tidal deltas.

Emergency measures to close this breach were initiated in August 1993. The emergency project consisted of 1.5 million cubic yards of sand and

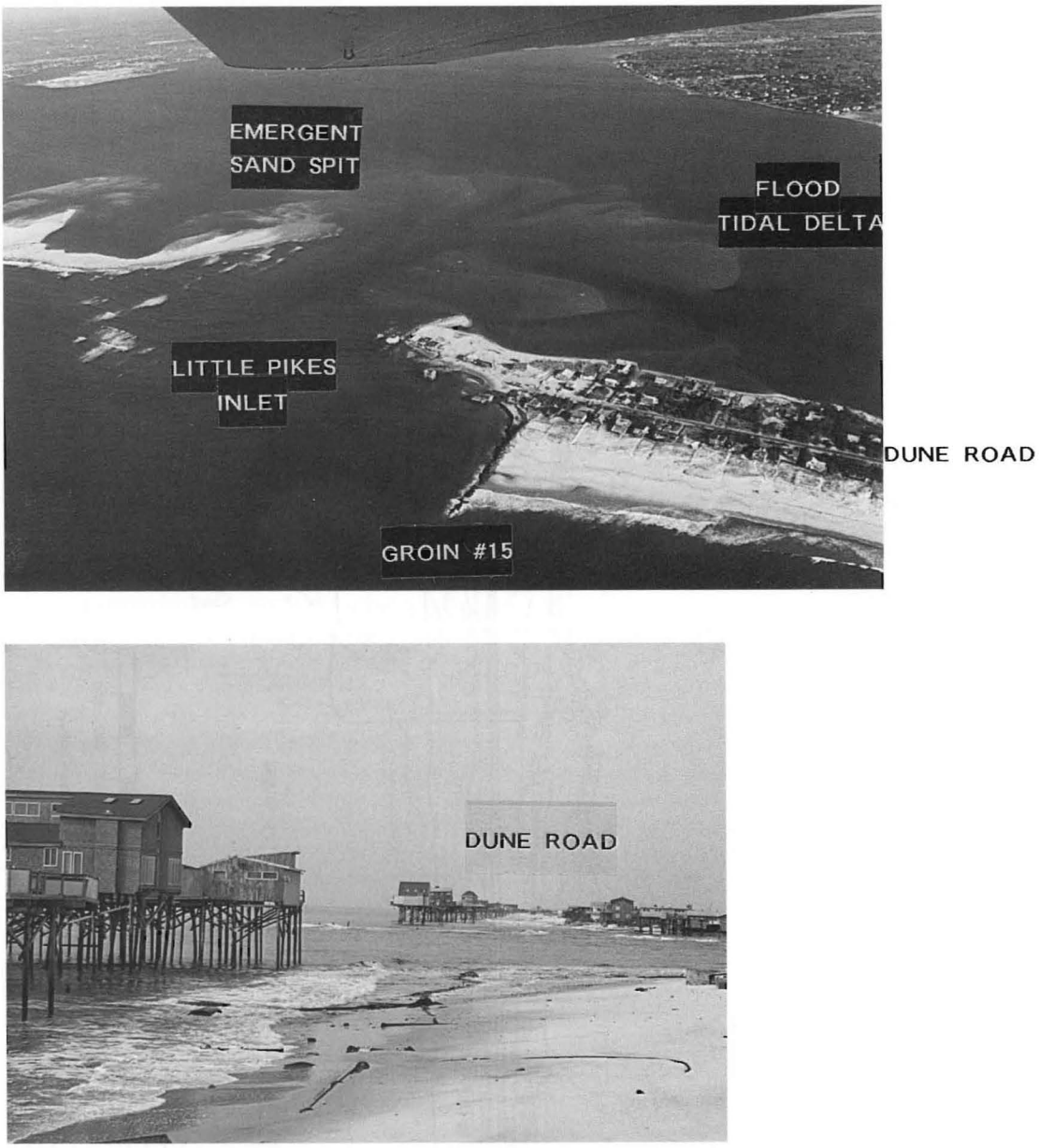

Figure 2. (top) Aerial photo of Little Pikes Inlet (July 1993). (bottom) Ground photo looking west across Little Pikes Inlet (April 1993).

1,800 linear feet of steel sheeting. The project area extended 10,000 feet west of the last groin. The closure project proceeded from the eastern shore across to the western shore. Sand was constantly pumped from an offshore borrow site (1 mile). The sand was pumped to a staging area at the east end of the breach. Filling proceeded to the west via a 30-inch steel pipeline. The sand fill was augmented with steel sheet pilings. Eighteen hundred linear feet of 30-foot steel sheets were driven

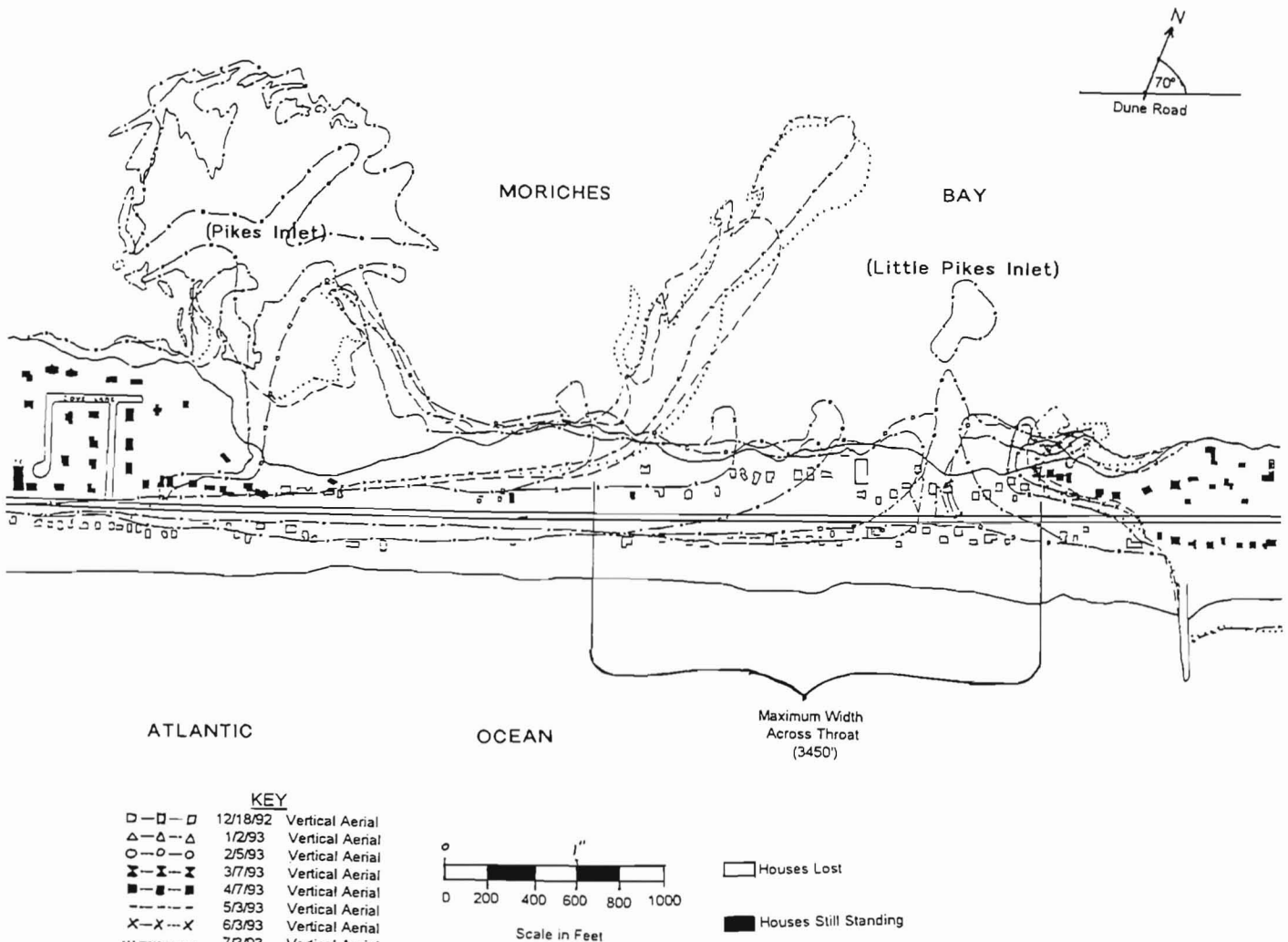

Figure 3. Opening shorelines.

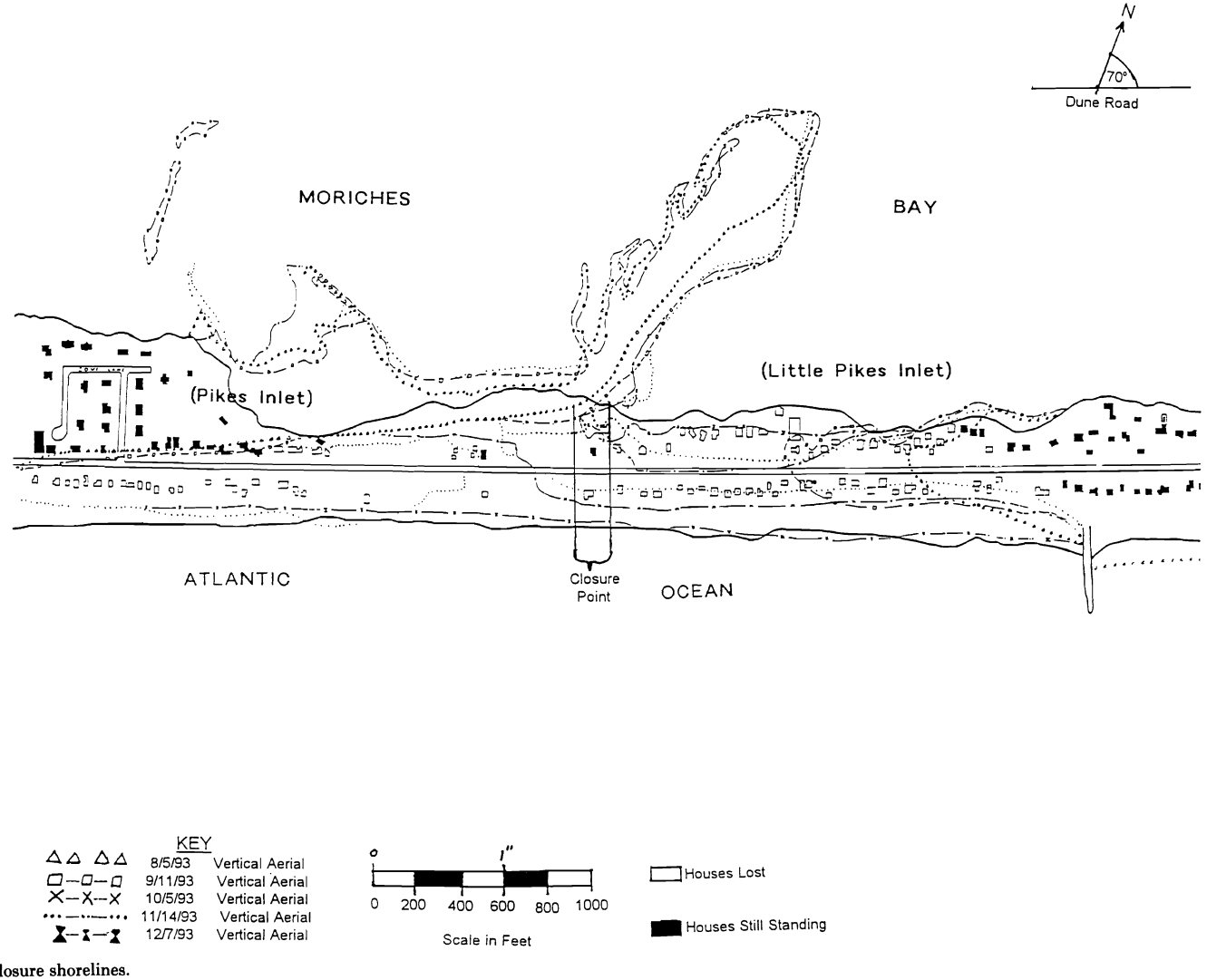

Figure 4. Closure shorelines.

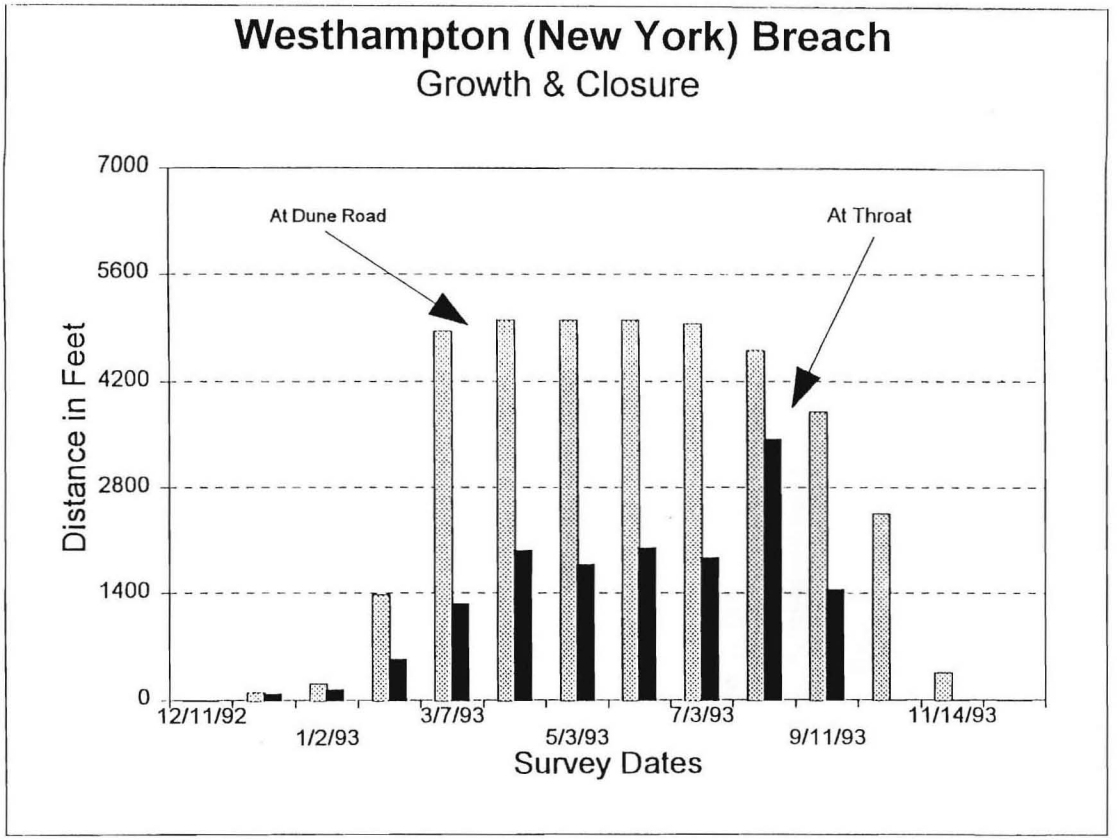

Figure 5. Compilation of inlet widths at the throat and along Dune Road for Little Pikes Inlet.

in an east to west direction to reduce sand losses during fill and protect against future breaching.

In the final stages of closing the breach, the sand fill (which had been proceeding to the west) changed abruptly to the north and connected to the shoreline off the western spit (Figure 4, 10/5/93). The change in fill direction allowed for immediate closure of the breach. Subsequently, the remainder of the fill was placed by pipeline onto the west shore proceeding east.

RATES OF GROWTH

Little Pikes Inlet growth rate displays an exponential pattern. Growth was slow in the beginning, increased greatly, and stabilizing at 5,000 feet (Figure 5). A lag in growth rate was detected between the width of the inlet along Dune Road and across the throat of the inlet.

The growth rate along Dune Road was 14 feet/day during the first seven days. In the next fifteen days (January 1993) it grew at a rate of 8 feet/day. From mid January to February the rate increased dramatically to 38 feet/day. The growth rate increased to 116 feet/day from February to March, reaching its maximum. The growth rate started to level off from March to April, slowing to 4 feet/day. From April until the closure project was started in August the inlet width remained stable.

Growth rate across the throat was 13 feet/day during the first seven days. During the next fifteen days the rate was 4 feet/day. The increase in growth rate started during the January to February interval, rising to 15 feet/day. The growth rate reached its maximum from March to April, increasing to 24 feet/day. During April to May the growth rate continued at 23 feet/day. May through July showed a nearly stable growth rate, with a

large increase in August due to the landward migration of the western shore. Measurement across the throat at this time no longer measured to the tip of the western shoreline. The tip migrated north, exposing a point farther to the west as the shoreline across the throat to be measured to. There was a lag time of approximately one month between the maximum growth rates measured along Dune Road and across the inlet throat.

CONCLUSION

Two barrier island breaches were formed downdrift of the 15 groin field in Westhampton, New York, during the December 1992 Nor'easter. The low-lying and unprotected barrier was breached by high water during the extratropical storm which lasted four days.

The Nor'easter struck the barrier island during two full moons, during which water and waves eroded the island without normal beach recovery. The breach area was also in close proximity and downdrift of the fifteen groin field, which interrupted the natural sand transport system.

The initially larger breach, Pikes Inlet, lasted only one and a half months. It was filled in by a combination of natural and artificial means (dredging). The breach was 70 feet wide during low tide and grew to roughly 800 feet wide during high tide. The breach was characterized by a broad, shallow overwash area and a meandering breach channel. The breach was located more distant from the groin field than the other breach, which allowed for some natural sand accumulation in the inlet. This natural accumulation was augmented with additional sand from a dredging maintenance project.

The second breach, Little Pikes Inlet, grew at a dramatic rate after breaching and eventually had to be filled in by dredging fill from an offshore source. The initial breach at Little Pikes Inlet was a straight tidal channel across the barrier island that allowed large volumes of water to move directly from the ocean to the bay and back. Swift tidal currents rapidly eroded the shoreline and there was little natural sand transport to close the inlet.

The breach grew along Dune Road from an initial width of 100 feet to 5,000 feet by August 1993. During its growth stage it grew at an average rate of 43 feet/day, but peaked at 116 feet/day. Across the throat of the inlet, the breach grew from 90 feet initially to 2,000 feet by August. During its growth period, the throat grew at an average of 17 feet/day, peaking at 24 feet/day. The closure project began in August and was completed in October. Closure supplied 1.5 million cubic yards of sand filling the breached area to an average width of 500 feet.

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