

THE RICHARD STOCKTON COLLEGE OF NEW JERSEY COASTAL RESEARCH CENTER



Sea Bright, NJ September 26, 2013 as Great Lakes was finishing the shoreline restoration following Hurricane Sandy. Work started in Monmouth Beach and moved north to the Sandy Hook park entrance placing 2,100,000 cubic yards of sand from offshore on the beach to the original design specifications.

New Jersey Beach Profile Network 2013 Annual Report on Shoreline Changes in New Jersey's Four Coastal Counties Raritan Bay to Delaware Bay Spring of 2012 Through Fall of 2013

Prepared for:

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EXECUTIVE SUMMARY

The New Jersey Department of Environmental Protection (NJDEP) authorized the New Jersey Beach Profile Network (NJBPN) project in 1986. The report is divided into four coastal county segments and provides a summary of beach changes for each county. Last year's report focused on the magnitude of Hurricane Sandy's impacts on the Jersey coast. After 18 months of all-out recovery efforts, this year the Coastal Research Center (CRC) will examine where, how and how well the recovery effort fared in returning the shoreline to pre-Sandy conditions.

The US Army Corps of Engineers (ACOE) undertook the restoration to design specifications all federally authorized, and constructed shore protection projects in the State. Funding under Public Law 113-2 allowed 100% federal payment to do restoration of existing projects. Both the New York District (Monmouth County) and the Philadelphia District (Ocean, Atlantic, Cape May Counties, and the tidal Delaware Bay/River shoreline) executed contracts for sand nourishment and structural repairs to existing work from the Hudson River, through Raritan Bay, down the Atlantic coastline and into Delaware Bay. Previous survey data has been compared to situations existing just after Sandy, 6-, and 12-months after the event. Seasonal changes are included, but largely in table form in the appendix. The individual site cross sections show four surveys, starting with April 2012 and ending with the fall of 2013. The direct impact of Hurricane Sandy was published on the Coastal Research Center (CRC) website as soon as it was complete in December 2012. This report attempts to show where intervention produced dramatic recovery results in contrast with other locations where natural recovery has had some influence. The report is also found on the website at www.stockton.edu/crc. Past reports are linked to the site so comparisons can be made to the 2012-2013 observations along the New Jersey coastline.

Key Data Summary Information One Year Post-Sandy:

Tables 1 & 2 in the Monmouth and Ocean County sections were compiled to show that by examining the pre-Sandy survey (either spring or fall 2012) with the spring survey for 2013, the dramatic transfer of beach/dune sand volumes out into the offshore region was substantial in the range of from 35 up to 70 cubic yards per foot of shoreline (yds³/ft.). This offshore deposit, termed the offshore bar, always develops following any storm event. Its proximity to the beach is a function of the storm's intensity or duration. Sandy was intense enough north of the landfall position in Atlantic County that it deposited the bar in between 8 and 22 feet of water offshore. Since the CRC crews commonly conduct surveys into 16 to 18 feet of water the data does not cover the entire deposit at all locations. However, since the amount of sand in the bar is placed so that the majority of it is skewed toward the beach within the bar feature, the surveys covered approximately 85% of the total volume.

The average deposit amounted to 36.25 yds³/ft. removed from the beach/dune region with an average deposit of 26.65 yds³/ft. accounted for in the Monmouth County oceanfront profiles. At sites where no ACOE restoration efforts had occurred by the fall 2013 survey, 60.1% (21.80 yds³/ft.) had returned naturally to the beach by means of cross shore migration. In Ocean County this percentage was 44.4% (18.51 yds³/ft.). So, one year

following Hurricane Sandy natural sand distribution processes at work had restored between 44% and 60% of the sand extracted from the beach/dune area.

The data from the December 1992 NE storm also demonstrated that sand recovery on the beach happens rapidly up to 50%, then declines (in the absence of subsequent severe storms) over time so that 5 years later about 85% of the sand lost from the beach and dunes comes back. Natural recovery in the dunes is much slower, dependent on wind transport that seldom adds more than 3 cubic yards per foot of dune frontage per year.

The survey data was analyzed to show changes in the four county shorelines and sand volume changes for the 18-month study interval. The three-month seasonal average sand volume changes for each county plus the 18-month summary are shown below. Beach nourishment projects in Monmouth, Long Beach Island (Ocean County), Atlantic and Cape May Counties produced the extensive sand volume increases over this study period. These are reflected in the large gains between spring 2013 and fall 2013 when most projects were completed.

	S 12 – F 12 Cu. yds/ft.	F 12 – S 13 Cu. yds/ft.	S 13 – F 13 Cu. yds/ft.	S 12 – F 13 Cu. yds/ft.
Monmouth County	-5.12	1.26	13.72	6.16
Ocean County	1.72	-10.70	15.29	6.58
Atlantic County	13.84	1.36	33.14	48.33
Cape May County	-1.77	10.45	-8.47	1.57

The shoreline change values represent the derived difference in horizontal distance to the zero elevation position (NAVD88) from the reference monument on the two profiles being compared. Advances seaward are positive and retreats landward are negative. Each number shown below is the average change for all the sites in each county. Again, the impact of Hurricane Sandy appears in the fall 2012 to spring 2013 comparison while the recovery (seaward advance) of the shoreline position is reflected in the data for the spring 2013 to fall 2013 comparison.

	S 12 – F 12 Feet	F 12 – S 13 Feet	S 13 – F 13 Feet	S 12 – F 13 Feet
Monmouth County	0.32	-47.47	48.65	54.19
Ocean County	-3.72	-52.43	65.18	9.03
Atlantic County	-6.07	-28.85	55.04	20.12
Cape May County	-13.66	13.11	-14.10	-14.66

The striking shoreline retreat in Ocean and Monmouth Counties between the fall 2012 survey and the spring 2013 survey reflect the damage done by Hurricane Sandy. This was followed by extensive restoration work by the NY District Corps of Engineers along the Monmouth County shoreline while the Ocean County recovery was much less due to work confined to three municipalities on Long Beach Island and reflects the average recovery driven by natural processes of sand migration back onto the beach. The ACOE has more projects in Atlantic and Cape May Counties that all received restoration under PL 113-2 during 2013. Brigantine, Atlantic City, northern Ocean City, Avalon, Stone Harbor and Cape May Meadows into Cape May Point were done. Final design plans and contract documents are ready for Ludlam Island and a sand back-passing program is in the works for the Wildwoods in the near future.

ACKNOWLEDGEMENTS

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INTRODUCTION:

The New Jersey Beach Profile Network (NJBPN) project provides local and regional information on coastal zone changes and is designed to document seasonal and storm-related damage assessments of the New Jersey shoreline. Each site has been visited annually in the fall since 1986. Semiannual visits, each spring and fall, began in 1994 following the passage of Public Law 93. The program was expanded to take surveys every spring following the winter northeasters and in the fall following summer beach accretion. In addition, new sites were established in the gaps of coverage and adjacent tidal inlet shorelines. The information collected consists of photographs of the beach/dune system at each site, a topographic profile of the dune, beach and seafloor to a minimum depth of 14-16 feet, and field notes on significant geologic changes. Also, construction activity is noted and necessary information regarding quantity and duration of such activity is gathered. The field data are used to generate graphical cross section plots, which can be used for comparison across the width of the active coastal zone. The cross section is also used to calculate sand volume and shoreline position changes. The 2013 report follows an analysis of Hurricane Sandy impacts, and an in-depth analysis in 2011 looking across the 25-year history of the project and is the latest in a series of annual reports prepared for the New Jersey Department of Environmental Protection (NJDEP) that began in 1987. The information is arranged by county and sequential profile site location, and includes the survey cross sections, site photographs, and the description of significant changes. The tables of beach volume and shoreline change data are found after the county site descriptions for Cape May County in the appendix. A summary of each county's coastal zone activities follows the county profile site location diagram at the start of each county discussion.

THE NEW JERSEY COASTAL ZONE:

The northern coast in Monmouth County is considered a headland beach (carved into older geologic sedimentary units that created a sandy beach backed by a bluff of the older sediments) which erode during serious storm events. As a matter of fact, the erosion loss to the armored bluff between 1962 and 2012 was very minimal due to the abundance of timber, rock, steel and concrete used to prevent it. The impact of Hurricane Sandy changed much of this by producing over 30-foot breaking waves that damaged or destroyed multiple levels of revetment or bulkhead construction frequently exposing the old sediments of the uplands to erosion. Several locations saw bluff edge retreat in the order of 30 to 50 feet with the sediment distributed along the shoreline just as it has for thousands of years. Centuries of this sort of erosion had created two major sand spits, one to the north from Long Branch (Sandy Hook), and the other to the south from Bay Head (Mantoloking to Barnegat Inlet). To the south of Barnegat Inlet, barrier islands compose the remainder of the NJ coastline where individual islands are separated from the mainland by a series of bays and tidal lagoons. These islands are the local sand supply to the beach and as a result the shoreline moves landward with rising sea level.

Sandy's impact strongly reinforced the time-honored thesis known to coastal geologists that time, storms and sea level rise all result in landward migration of the sand shoreline due to storm impacts. Sand is transported across the barrier beach into the bay or lagoon adding to the landward edge of the barrier and moving the entire coastal landform up the existing coastal plain slope that comprises the four coastal New Jersey counties. New inlets formed, overwash buried the salt marshes on Long Beach Island, and Barnegat Bay received tens of thousands of cubic yards of sand and debris that removed sediments from the beaches and dunes and transported them westward into the bays. Early recovery efforts as the CRC survey crews conducted the post-storm work were focused on removing this sand from the roads and properties on the islands and returning as much as possible to the beaches.

STORM EVENTS IN 2009-2013

Between December 1992 and November 2009, the New Jersey shoreline received just one Federal Presidential Disaster Declaration due to a northeast storm February 6, 1998 (applied only to Cape May and Atlantic Counties). Since the “Nor-Ida” combination storm of November 11, 2009 there have been three northeast disaster declarations and two hurricanes (Irene 2011 and Sandy 2012). The three northeast storms preceded Hurricane Irene, which made landfall in New Jersey as a strong tropical-storm in late August. There was an additional northeaster October 29, 2011, but no declaration for that event. In contrast, during 2013 there were no further disaster declarations for storm events, in fact there were few modest storms confined mostly to a northeaster that lasted 72 hours from 9 to 11 October 2013. This storm raised fears that weakened dunes would fail again and allow serious flooding to already storm-damaged coastal communities, but the lower intensity allowed the damage to be confined to lost berm sand and erosional scarps in a number of dunes.

The Richard Stockton College of NJ Coastal Research Center (CRC) initiated a post-storm survey and assessment of the New Jersey shoreline in response to severe beach erosion resulting from the impact and landfall of Hurricane Sandy. The field work started October 31, 2012 in Cape May County and continued northward into northern Monmouth County by November 26, 2012 as clean-up work continued to remove debris. Any sand excavated from roadways was being returned to the beach and is included in the survey cross section since it is now part of the post-Sandy beach. This year the direct comparison of an additional year since Hurricane Sandy will show where work has been sufficient and where more needs to be done.

Cross sections all show the spring of 2012, fall of 2012, spring of 2013, and fall of 2013. Since the majority of the federal projects took place during 2013, the big differences will appear in the spring of 2013 in the form of wider beaches and restored dunes extending into the fall survey where newer project appear and changes occurred to those already completed. It is expected to see more projects completed into 2014 and beyond as federal funds are expended to complete the extensive Monmouth County project that will include Deal, Elberon, and Allenhurst for the first time. Work is expected between Bay Head and Island Beach State Park as the final segment of Ocean County shoreline comes under federal project control. Extensions will also occur on Long Beach Island creating federal coverage for Beach Haven Borough and Holgate.

JUNE 26, 2014 NJDEP NEWS RELEASE:

“CHRISTIE ADMINISTRATION ANNOUNCES COMPLETION OF MONMOUTH COUNTY BEACH RESTORATION PROJECTS BY ARMY CORPS OF ENGINEERS BEACHES RESTORED TO ORIGINAL PROTECTIVE ENGINEERED DESIGN IN TIME FOR SUMMER TOURISM SEASON

(14/P67) TRENTON - The U.S. Army Corps of Engineers (USACE) has completed its post-Superstorm Sandy beach repair and restoration projects along the Monmouth County coastline prior to the Fourth of July kickoff of the summer tourism season, Department of Environmental Protection (DEP) Commissioner Bob Martin and USACE officials announced today.

The completion of sand fill in Long Branch by USACE's New York District last week returns previously constructed beaches damaged by Sandy from Sandy Hook to Manasquan to their original protection design, dating back to their original construction from 1994 to 2001.

Sand placement operations at all of the U.S. Army Corps' restoration projects in New Jersey, which covered approximately 45 miles of coastline and also included several projects on Long Beach Island and the southern coast of the state, conducted by USACE's Philadelphia District, are now complete.

"These beaches have been repaired and restored to their original design standard, not just to pre-Sandy conditions, and will offer enhanced protection for future storms," Commissioner Martin said. "We're grateful for the expeditious work of the Army Corps of Engineers, particularly as we start another great beach season. We also look forward to the start of other upcoming Army Corps coastal and flood projects which will make New Jersey more resilient along our entire coastline and other waterways."

"From the beginning this has been a team effort," said Brig. Gen. Kent D. Savre, the Commanding General of the U.S. Army Corps of Engineers North Atlantic Division. "Our beaches are a critical resource for our Nation, and we're thankful to have such great partners working with us since 'Day 1' to reduce the risk of future storm events to our coastline communities."

Authorized by the federal Flood Control and Coastal Emergencies (FCCE) Act and the Disaster Relief Appropriations Act of 2013, the Army Corps carried out its post-Sandy coastal restoration work in Monmouth County, and also restored several major beach areas in Ocean, Atlantic and Cape May counties at a cost of \$345 million, which was all federally funded.

These authorities allowed the Corps to not only replace sand lost during Superstorm Sandy, but to restore previously constructed beach projects back to their original design - meaning even more sand was placed, creating larger and wider beaches than many areas have seen in years that results in greater coastal storm risk management.

In New Jersey, USACE's New York District placed more than 7.9 million cubic yards of sand from Sandy Hook to Manasquan. In addition to the recently finished Long Branch section of the project, restoration work was already completed in Sea Bright and Monmouth Beach last November and from Asbury Park to Avon and Belmar to Manasquan in May.

The New York District also completed the placement of 875,000 cubic yards of sand in Keansburg, along Raritan Bay and Sandy Hook Bay, earlier this month, restoring the previously constructed dune and beach berm system there.

USACE's Philadelphia District had completed the beach fill portions of six repair and restoration projects in February. Those efforts saw approximately 10 million cubic yards of sand placed on the beaches of Harvey Cedars, Surf City and Brant Beach on Long Beach Island, Atlantic City and Ventnor on Absecon Island, Brigantine Island, Ocean City, Avalon and Stone Harbor on 7-Mile Island, and Cape May City."