

**2016 ANNUAL REPORT ON
THE CONDITION OF THE MUNICIPAL BEACHES FOR
THE BOROUGH OF STONE HARBOR, CAPE MAY COUNTY, NEW JERSEY**



View of the beach at the low tide line looking south following two Northeast storms in January and early February 2016. The photo shows the condition of the municipal shoreline two days following northeast storm Nacio on February 9, 2016. Erosion was particularly severe in Cape May County during these events with tidal flooding exceeding that from Hurricane Sandy.

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Introduction:

Four years have passed since Hurricane Sandy. The late January 2016 northeaster named Jonas was the first storm since Sandy to generate a Federal Disaster Declaration by President Obama. However, since the Stone Harbor oceanfront coastline is managed under a US Army Corps of Engineers (USACE) Shore Protection Project, there is no obligation by FEMA to reimburse for beach/dune damage under the presidential declaration. However, there is a pending maintenance project in the works for Seven Mile Island with a 2017 start date for the “2nd Periodic Nourishment Cycle” (USACE Philadelphia District Fact Sheet on the Townsends Inlet to Cape May Inlet, NJ project). Although the 100% Federally-funded project that commenced within six months following Hurricane Sandy was completed by August 2013, storms since then have depleted the beach sand volume by 73.4% as of the fall 2015 survey. In January 2016, northeast storm Jonas passed the New Jersey coast and was followed by two days of strong northeast winds on February 7th and 8th. As a result, beach elevations decreased and scarps cut into dunes extended the entire length of the Stone Harbor coastline. The worst dune loss was found at the 123rd Street site where a 15-foot high scarp left no easy access to the beach with the high tide washing right to the scarp’s toe. Minor recovery added sand as a berm at the scarp toe, but no dune restoration has occurred at the 123rd Street location.

Annual shoreline and sand volume changes between Surveys #45 and #48 are presented in Table 1 and semi-annual changes (Surveys #47 to #48) are presented in Table 2.

2016 Weather Events;

As mentioned above, northeast storm Jonas occurred January 23 & 24, 2016 and eventually triggered a Federal Disaster Declaration. It was followed February 8 & 9, 2016 by named storm Nacio (the Weather Channel has taken to naming northeast storms recently). Following these two events, the weather cooperated with minimal further northeast events leading into the summer. Hurricane Hermine passed the Mid-Atlantic coast in early September with surf and onshore winds that eroded some of the summer’s sand accumulation. Another long duration, but low intensity northeast event occurred September 28-30, 2016 that added to the berm damage. The fall beach survey occurred October 13 & 14, 2016 and shows loss to the berm, but no further dune erosion. Since then things have been quiet up to the end of November.

Beach Monitoring Program Methodology

The CRC established the Borough’s beach monitoring program in June of 1996 to address the shoreline changes along the 13,077 feet of municipal oceanfront beaches. Eight permanent beach profile-monitoring sites were established to gather data initially on a quarterly basis, but shifted to a semi-annual survey in 2007. Each profile starts at a fixed reference position behind the dunes, crosses the dunes, beach and extends over 600 feet into the water, ending at a depth of 12-16 feet. Each of the groin compartments or cells along the Borough beachfront contains one profile line. Work continues on the semi-annual monitoring schedule.

The following is a list of the profile locations:

◆ SH-82	82 nd Street	Border with Avalon – 84 th St. groin
◆ SH-90	90 th Street	84 th St. groin – 92 nd St. groin
◆ SH-95	95 th Street	92 nd St. groin – 98 th St. groin
◆ SH-103	103 rd Street	98 th St. groin – 106 th St. groin
◆ SH-108	108 th Street	106 th St. groin – 111 th St. groin
◆ SH-112	112 th Street (paper street)	111 th St. groin – 114 th St. groin
◆ SH-116	116 th Street	114 th St. groin – 122 nd St. groin
◆ SH-123	123 rd Street (paper street)	122 nd St. groin – terminal groin

Surveys Completed

The CRC completed four surveys between October 2015 and October 2016

- ◆ **Survey 45** represents a full dune, beach, and nearshore survey at all sites and is considered the Fall 2015 survey for measuring annual changes.
- ◆ **Survey 46** represents an emergency survey of the dune and beach at all sites following northeast storm Jonas on January 24, 2016 and Nacio that followed shortly after (completed February 10, 2016)
- ◆ **Survey 47** represents a full dune, beach and nearshore survey at all sites for the spring of 2016.
- ◆ **Survey 48** represents a full dune, beach and nearshore survey at all sites for the fall of 2016.

Stone Harbor Engineered Beach Performance

Initial construction of the Federal shore protection project began in 2002 and was completed in the Borough in 2003. Since placement, the USACE engineered beach sustained several significant storm events but maintained its storm protection value to the community during Hurricanes Irene and Sandy by preventing major flooding by storm waves and dune breaches.

In April 2013, the emergency beach fill commenced and added 674,224 CY (USACE reported pay volume) of sand to the Borough's 13,077 feet of oceanfront shoreline (completed in July 2013). As a result of PL 113-2 passed by Congress in January 2013, the USACE completed this emergency work at no cost to either the State of NJ or Stone Harbor. This was an average gain of 54.70 yds³/ft. Fill volumes tapered to the south as net sand transport along the Borough's shoreline is to the south and required less sand to restore the template. The total net sand volume changes over late summer and early fall of 2013 was a modest loss of 22,287 CY of sand from across the entire Stone Harbor oceanfront including the dunes, beaches and offshore seafloor (CRC, 2014).

Tables 1 through 3 provide shoreline and volume change information for each of the ocean beach profile locations within the Borough of Stone Harbor. Shoreline changes were calculated by comparing the zero datum positions for the 2015-2016 monitoring period. Sand volume changes across the length of the survey line were calculated for each individual profile site by computing the cut and fill cell changes in the profile with the previous survey or, were calculated from the annual surveys. These values are expressed in cubic yards of sand per linear foot of beachfront (yds³/ft.) the total beach volume change is calculated using this value. The distance (cell width) between groins along the beachfront of Stone Harbor was measured between the centerlines of adjacent groins. Each cell's net sand volume change is computed by multiplying each cross section volume change by its corresponding groin cell width.

Table 1 represents the annual changes in shoreline position and across profile volume changes (from Fall 2015 [Survey 45] to Fall 2016 [Survey 48]).

Table 1
Stone Harbor
Fall 2015 (#45) to Fall 2016 (#48)
Annual Shoreline and Profile Sand Volume Changes

Profile Number	Shoreline Change (feet)	Volume Change (yds³/ft)	Cell Distance (feet)	Cell Volume Change (yds³)
SH-82	-35	58.57	1,381	80,888
SH-90	-84	-39.15	2,240	-87,703
SH-95	4	0.23	1,680	385
SH-103	-30	-52.21	2,208	-115,273
SH-108	-7	-18.57	1,433	-26,605
SH-112	2	-18.51	804	-14,884
SH-116	-37	-51.16	2,273	-116,278
SH-123	10	-12.68	1,058	-13,419
Total Volume Change =				-292,889

Since the completion of the federal project in 2013 the annual sand volume losses the first year were 188,886 cubic yards for the Borough's ocean beaches and nearshore. The second year 305,672 cubic yards of sand were lost from the Borough beaches. This year the loss amounts to 292,889 cubic yards taking the total to 787,447 cubic yards. This volume results in 116.8% of the pay volume placed on the beaches following Sandy in 2013 (674,224 cubic yards placed vs. 787,447 lost since). CRC surveys showed that the USACE placed 715,346 cubic yards on the beach, so the deficit is closer to 110% loss. Jonas and Nacio had particularly extensive impacts on the municipal oceanfront that was not recovered naturally this past summer.

A detailed look at the numbers show that for the annual comparison, if one looks only at the dune and beach to the zero NAVD 1988 elevation position, one finds that the annual change was positive in the amount of 21,365 cubic yards. Offshore, below the zero elevation, the loss was larger than that for the entire extent of the profiles, equaling 314,255 cubic yards. Sand moved onto the beach as the berm built naturally, but the offshore region shed material in a large measure due to the two early 2016 storm events. The September 2016 three-day storm is also included in these data since the fall survey occurred in mid-October.

Interestingly, the only offshore site to gain sand was SH-82 where over 55 yds³/ft. were deposited offshore while just 2.62 yds³/ft. appeared on the beach and dune. All other sites were in negative territory by double digits. 82nd Street is part of the Avalon reach of beach without any hard structures present and perhaps is kept at a better sand volume condition with sand moved south close to the shoreline from Avalon. As sand proceeds further south passing the groins forces a majority of it further seaward beyond the limit of CRC surveys. Also, there is no lack of sand arriving on the ebb-tidal shoals of Hereford Inlet (observed from CRC bathymetric monitoring).

Table 2, below shows the summer accretion across the entire profile extent with the change positive between May and October at nearly a hundred thousand cubic yards across the entire oceanfront.

Table 2
Stone Harbor Semi-Annual Survey
Spring 2016 (#47) to Fall 2016 (#48)
Shoreline and Total Sand Volume Changes

Profile Number	Shoreline Change (feet)	Volume Change (yds³ / ft)	Cell Distance (feet)	Cell Volume Change (yds³)
SH-82	-26	9.83	1,381	13,570
SH-90	-49	10.39	2,240	23,265
SH-95	-28	31.56	1,680	53,028
SH-103	-39	-1.79	2,208	-3,941
SH-108	-15	10.04	1,433	14,389
SH-112	-10	11.82	804	9,501
SH-116	-52	-11.55	2,273	-26,253
SH-123	3	11.54	1,058	12,207
Total Volume Change =				95,764

The semi-annual comparison (Table 2) shows that the shoreline retreated at all but one of the Borough's profile locations. Since this comparison occurred after the two northeast storms in January/February, the cause for double digit shoreline retreat is due to a steeper beach and the impact of shoreline erosion during the three-day September 2016 northeast event. Between the spring survey in May and the fall survey in October, the beach gained sand from offshore yielding positive sand volumes at all but two sites (SH-103 and SH-116). The net change to the Borough's beaches was 95,764 cubic yards, which is substantial, but spread across 13,077 feet of oceanfront beach is only 7.32 yds³/ft. added to each foot of the oceanfront. The summer accretion is always beneficial, but the need for the 2nd USACE maintenance beach nourishment is clear and present.

Individual Site Descriptions:

This section describes the changes documented at each of the beach profile locations from October 2015 to October 2016. All of the sites are located within the Federal shore protection project limits and all received sand to return the sites to the 2002-2003 original design template. The spring 2013 post-Hurricane Sandy restoration project commenced in April and worked from south to north to repair storm damages. The project finished its northern section in late July 2013.

SH-82 is located at 82nd Street along 1st Avenue and seaward of the 82nd Street recreation area. The profile line is set approximately midway between the Avalon border and the groin at 84th Street. This site is included in the Borough’s monitoring program to represent typical beach conditions on the Borough’s only stretch of beach without a groin (in the northern section of the community). The profile is located about 800 feet south of the Avalon border and about 1,350 feet south of the USACE federal project taper. This site consists of 200 feet of primary dune width seaward of the asphalt promenade that is set on top of the revetment from its landward offset at 83rd Street to 80th Street.

The dune remained unaffected by storm events until Jonas where the seaward toe was cut back and the berm flattened. Recovery was slow, so that by May 2016, the beach was still flat, but the dune toe adjusted to the new configuration.

Site SH-82 – 82nd Street (Photoplates 1a-1c)



Photoplate 1a - Photo taken February 11, 2016 following both Jonas and Nacio. View to south along the dune toe from 82nd Street. The dune fence installed after the USACE project to capture aeolian sand was destroyed.



Photoplate 1b - Photo taken May 23, 2016 showing that the dune sand slumped seaward, re-generating the seaward slope, without new fencing. The beach was still relatively flat.



Photoplate 1c – Taken October 14, 2016 showing that the -0.57 yds³/ft. sand volume seen above the zero datum was, in fact, quite real. The beach remained flat with little new material at the dune.

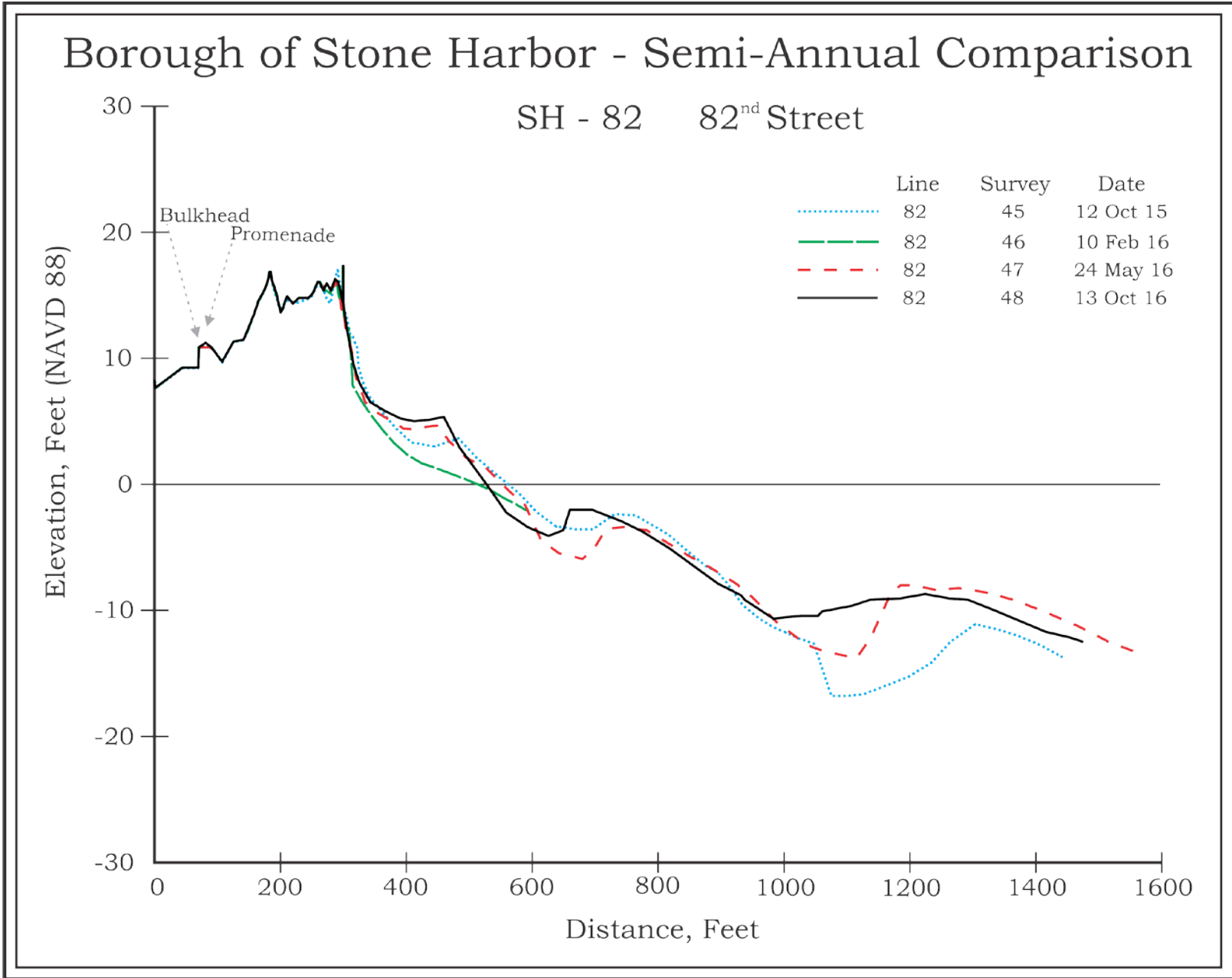


Figure 1a. These cross sections bracket northeast storm Jonas (survey #46) and show the dramatic difference among surveys far offshore where major troughs develop and then fill with sand. The beach reflects the severe flattening seen in Jonas with post-storm berm development producing an above datum recovery. The 55 yds³/ft. gain seen offshore is due to the filling of the trough with a bar feature present one year following the October 2015 survey.

SH-90, is located at 90th Street and was originally established in 1986 as a survey site for the New Jersey Beach Profile Network (NJBPN). The profile line is set north of the public beach access path to provide a typical cross-sectional representation of the dune and beach that is bounded by groins at 84th Street and 92rd Street. The dune system consists of two ridges approximately 150 feet wide extending from the street end revetment to the seaward dune toe.

The beach remained at a constant width between the dune toe and the zero elevation location, but lost elevation during early seasonal northeast storms. The situation stabilized, but that ended with NE storm Jonas in late January 2016.

Site SH-90 – 90th Street (Photoplates 2a-2c)



Photoplate 2a - Photo taken February 11, 2016 following Jonas and a second event two weeks later. The wrack line reached the beach entrance at the dune toe making a small scarp in places. The dune fence was still unaffected at this location



Photoplate 2b - Photo taken May 16, 2016 following the spring. No additional storm activity affected the site, the debris had been cleaned up and a minor addition of sand was made to the dune toe.



Photoplate 2c – By October 13, 2016 the beach was narrower than a year earlier, but with a berm developed with a gentle slope up to the dunes.

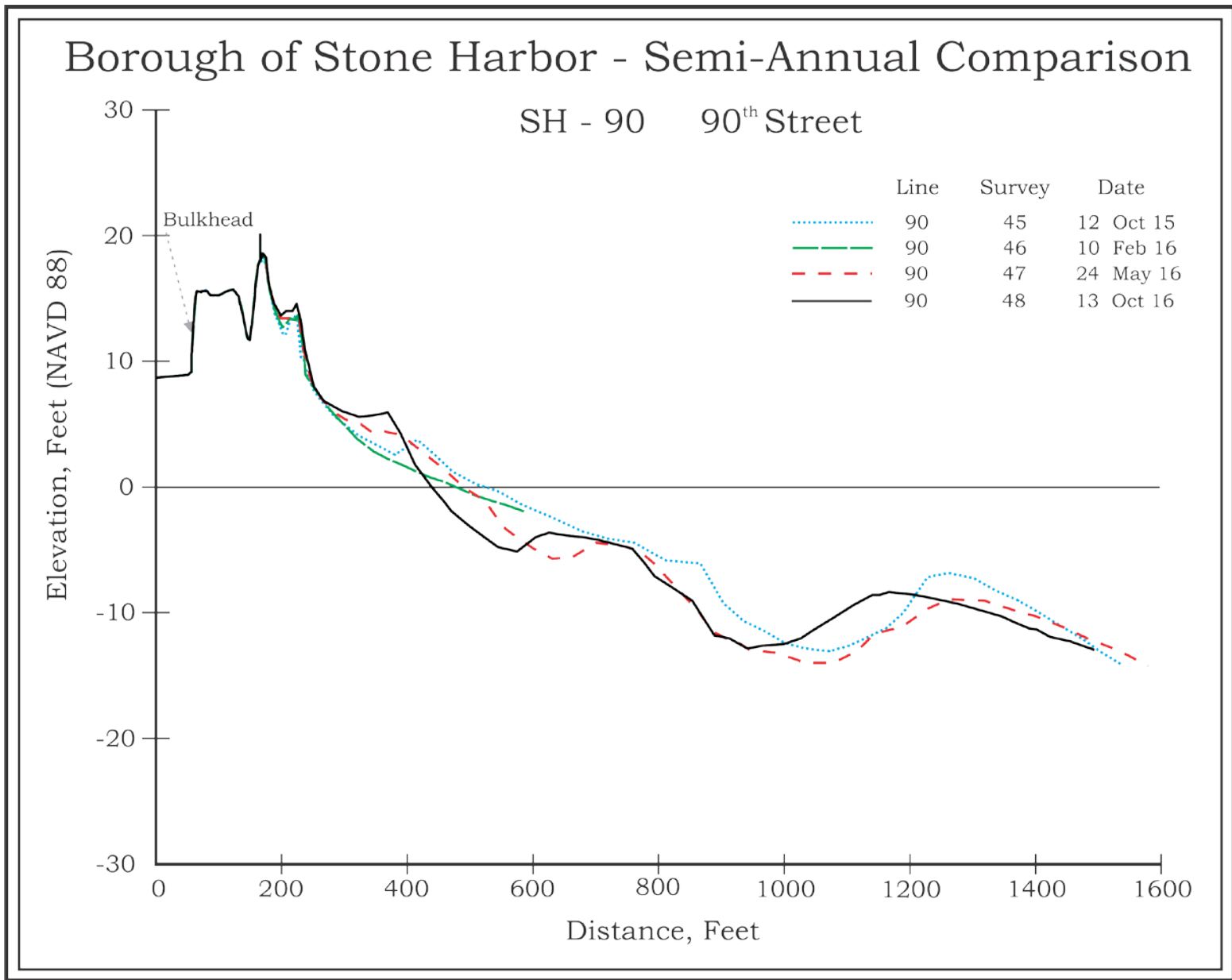


Figure 2a. There was a loss in elevation between the offshore bar and the beach berm over the year. Elevations just offshore decreased and the beach became 83 feet narrower as the beachface steepened. Perhaps the late September 2016 storm event that lasted three days cut into the nearshore material because the event was relatively mild, but long in duration.

SH-95, is located at 95th Street site was established along the north side of 95th Street and the beach access path. The profile line crosses the municipal parking lot, a wooden bulkhead, access ramp and dune located just north of the municipal beach observation platform. The dune system is essentially a single ridge that extends seaward 140 feet from the street end revetment to the seaward dune toe with a crest elevation of 15 feet NAVD88. Damage was considerable during Jonas with dune retreat and beach erosion.

Site SH-95 – 95th Street (Photoplates 3a-3c)



Photoplate 3a - Photo taken January 25, 2016 following Jonas. The access ramp was undercut and exposed. The last segment of the railing was gone, otherwise the structure was fine. The dune fencing was destroyed in both directions with 25 feet of seaward slope erosion beyond the fencing position.



Photoplate 3b – By May 24, 2016 the dune scarp had blended into the seaward slope again, but the loss under the access ramp is still clear from the edge of the grass outward.



Photoplate 3c – October 13, 2016 found a berm developed on the beach, but the dune loss is still evident in the distance. The beach is approximately the same width it was a year ago but there is a pronounced trough just offshore.

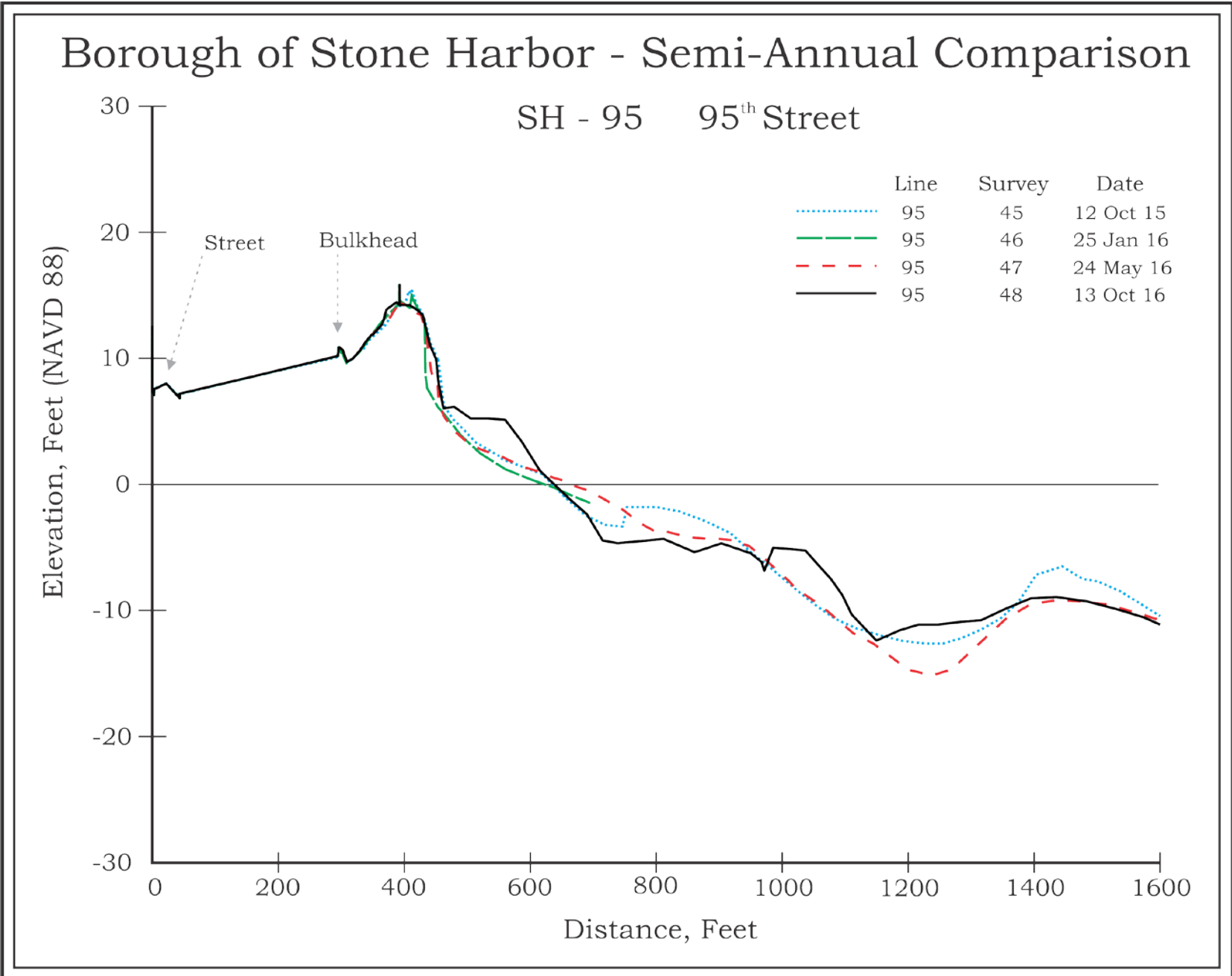


Figure 3a. At 95th Street the Jonas storm impact shows as dune erosion between surveys 45 and 46. Sand blew back into the void restoring the seaward slope almost completely as the berm developed at the shoreline with bar material advancing landward to a small degree.

SH-103, is located at 103rd Street and was established for the Borough's beach monitoring program at the seaward end of 103rd Street along the north sidewalk. When the site was originally established in 1996, the profile crossed the bulkhead and dropped to the rock revetment at the toe of the bulkhead. An extremely narrow beach just seaward of the rocks provided limited recreational area for beach patrons. Storm waves and surge would overtop the revetment and cause local flooding. This beach continued to erode until by 1998 no dry beach existed seaward of the rock revetment. Sand was placed here during the 1998 municipal beach fill re-establishing a dry beach berm and dune ridge. In 2003 the initial Federal project enhanced the width of both the dune and beach. Several subsequent projects have been required to provide periodic beach maintenance that included the 2009 state/municipal project, the spring/summer 2011 federal project, and the summer 2013 H. Sandy emergency beach fill.

The early October storm severely reduced the elevation on the berm, cutting a minor scarp in the toe of the dune made significantly worse by Jonas in January 2016. Since Jonas the beach has recovered, but not at the dune and the annual comparison shows that the offshore bar trough is deeper.

Site SH-103 – 103rd Street (Photoplates 4a-4b)



Photoplate 4a - Photo taken May 24, 2016 showing grading work taking place around the access pathway. There was erosion at the dune toe during Jonas that slowly recovered as sand was blown toward the dune from the beach.



Photoplate 4b - Photo taken October 13, 2016 looking along the seaward dune toe location. The berm regrew and some sand was added to the dune toe making up for Jonas's erosion.

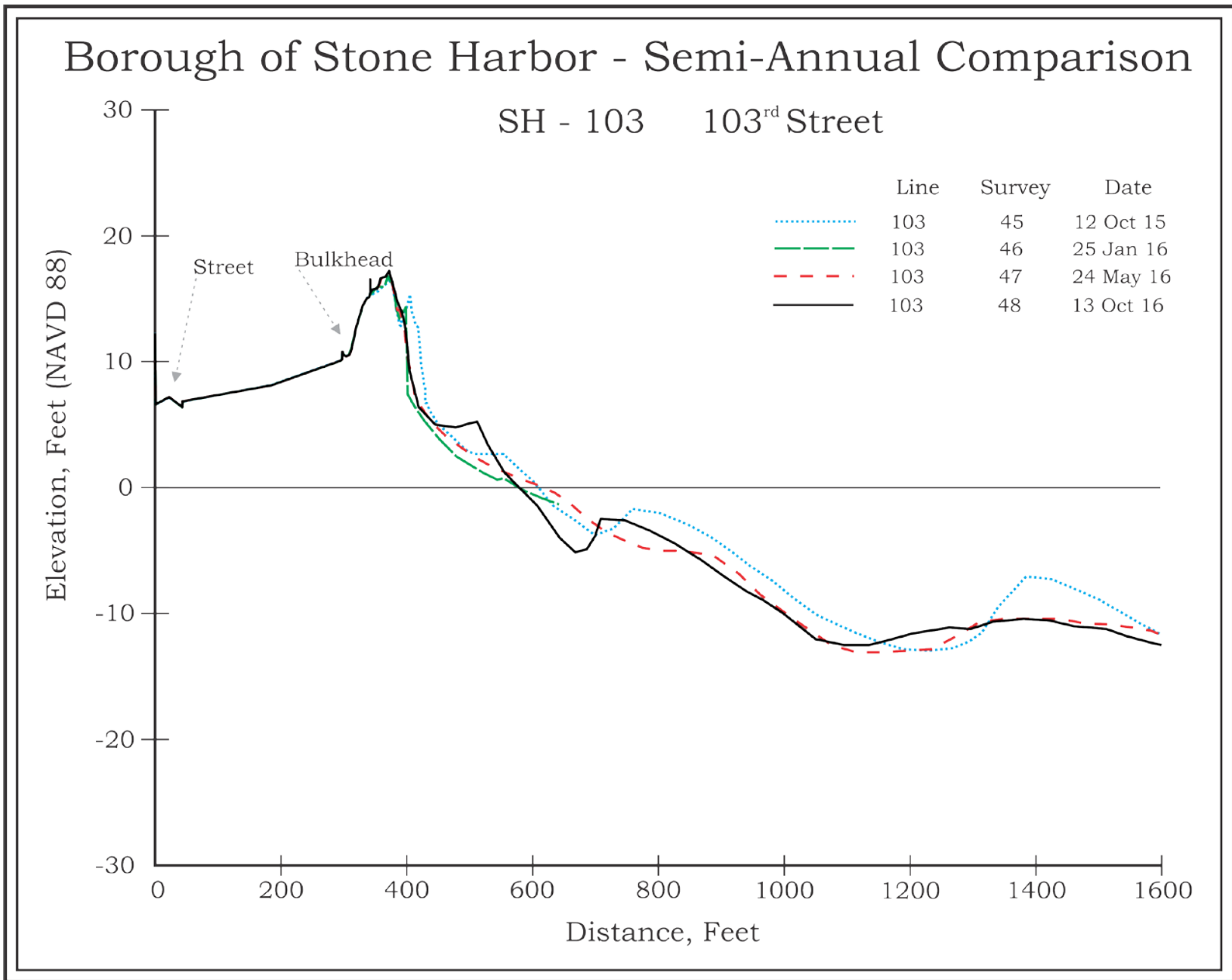


Figure 4a. Dune toe losses were not recovered after the late January NE storm Jonas. Offshore, loss mounted as the bar moved landward and diminished in size. The berm was small and the zero elevation position retreated 30 feet.

SH-108, is located at the end of 108th Street and was placed near the middle of this groin cell. The history here is similar to site SH-103. When the site was originally established in 1996, the profile crossed the bulkhead and dropped to the rock revetment at the toe of the bulkhead. An extremely narrow beach just seaward of the rocks provided limited recreational area for beach patrons. Exposure of the rocks accelerated the beach erosion as waves refracted off the hard structure and scoured the sandy beach. Larger storm waves and surge would overtop the revetment and cause local flooding. Sand was also placed here during the 1998 municipal beach fill re-establishing a dry beach berm and dune ridge. In 2003 the initial Federal project enhanced the width of both the dune and beach. Several severe storms have impacted the Stone Harbor beaches since 2009 including Hurricanes Irene in 2011 and Sandy in 2012. The post-Sandy project in 2013 covered both hurricane losses, but new events have cut into the beach's sand supply.

Berm erosion and the cutting of a scarp into the dunes by the relatively minor event in early October 2015 left the site vulnerable to larger losses during the January 2016 event (Jonas). Since then the beach has remained relatively constant gaining just 0.734 yds³/ft. gained above the zero datum elevation. Bar losses were responsible for the negative sand volume change this past year.

Site SH-108 – 108th Street (Photoplates 5a-5c)



Photoplate 5a - Photo taken January 25, 2016 showing the dune scarp at 108th Street looking south along the cut. The beach was wet to the toe of the scarp from the last high tide. Two weeks later addition erosion took place. All the dune fencing was destroyed with the storm taking all the recent deposition as well.

Photoplate 5b – Photo taken May 24, 2016 following sand slumping and wind deposition up to the scarp cut by Jonas. The beach remained narrow and storm surge waves can easily reach the dune toe at the present time.



Photoplate 5c – By October 13, 2016 the dune and beach had recovered some berm elevation with sand transported to the dune toe. The loss in dune width was still evident in the plots.

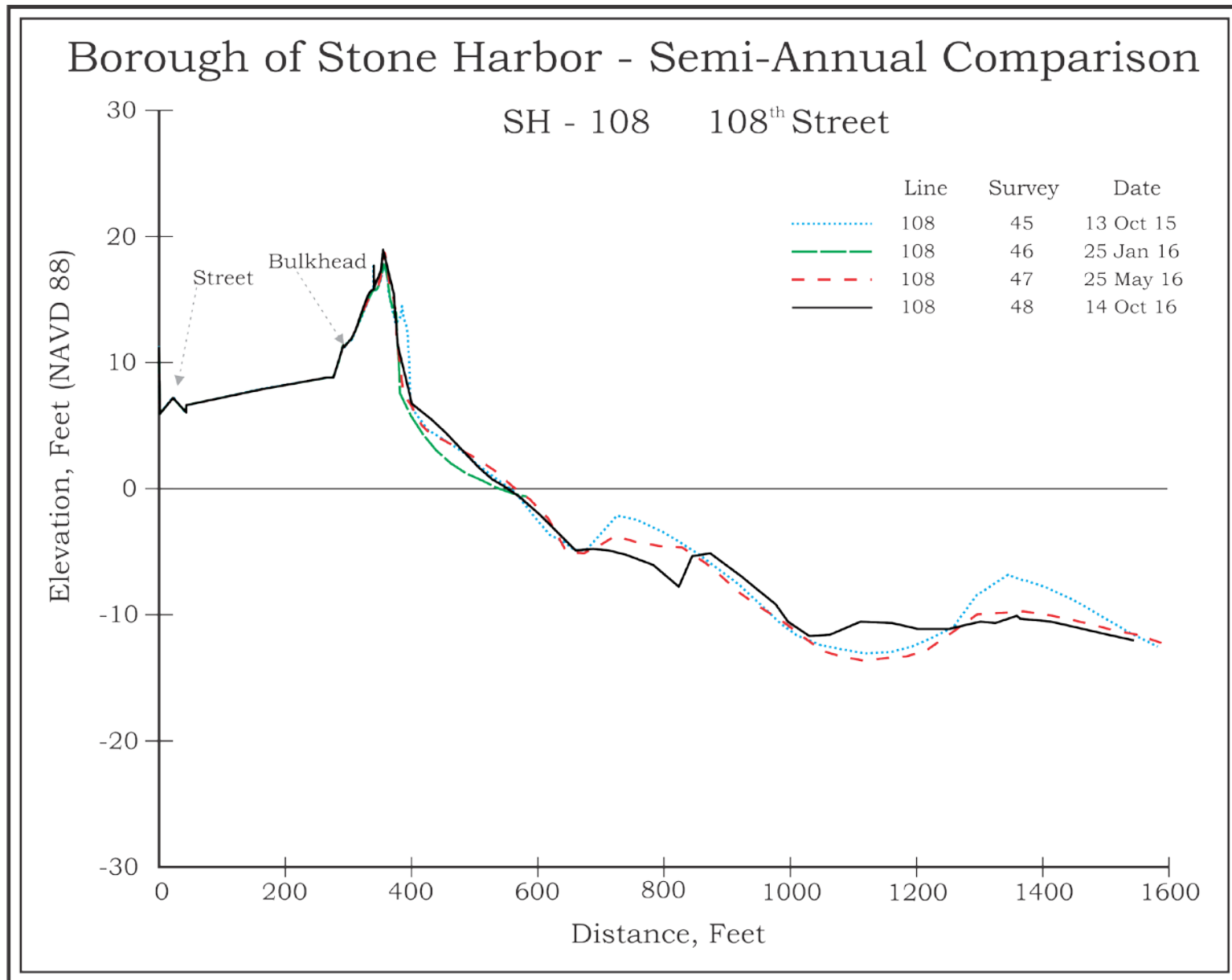


Figure 5a. The dune loss shows between survey #45 and the post-Jonas survey (#46). Recovery over the year developed a berm and some sand deposited at the toe of the scarp from the storm. Offshore the bar elevations decreased making the net change negative for this site.

SH-112 is located on the open lot adjacent to the Villa Maria Catholic retreat that occupies the paper location of 112th Street. The profile line extends landward to a reference location along 2nd Avenue. An open grass lot occupies the city block between 2nd Avenue and the wooden bulkhead revetment. The wooden revetment runs parallel to the beach the entire length of the Borough along the oceanfront property lines and seaward street ends. The bulkhead is significantly offset landward at 111th Street, providing additional area for dune development to occur naturally. As a result, the width of the primary dune was nearly 200 feet from the bulkhead to the seaward dune toe.

This location has a very significant primary dune largely due to the limited oceanfront development on this parcel. Occupied by the Catholic Church as a retreat for over a century, the site has no structures directly at the landward dune toe. The dunes spill over the bulkhead and occupy most of the original dry beach that existed prior to the USACE project in 2004. Jonas did carve into the seaward dune toe to the established grasses on the dune. The vertical scarp slumped over time and the slope appears more normal later in the year.

Site SH-112 – 112th Street

(Photoplates 6a-6c)



Photoplate 6a - Photo taken February 11, 2016 following Jonas and a second storm February 7, 2016. Note the 3 to 4-foot scarp cut into the seaward dune toe slope and the flat beach showing high tide wave activity nearly to the scarp days later. The newly accumulated foredune was removed back into the established grasses.

Photoplate 6b - Photo taken May 24, 2016 with a berm redeveloped and the sand slope from the dune grass muted from the vertical cut after Jonas into a more typical slope angle. Sand was deposited at the dune toe and upper berm over the summer.



Photoplate 6c – By October 13, 2016 the beach width was approximately the same as it was earlier, but as the picture shows, the wave run-up reached almost to the dune toe meaning that future storm action would produce additional erosion.

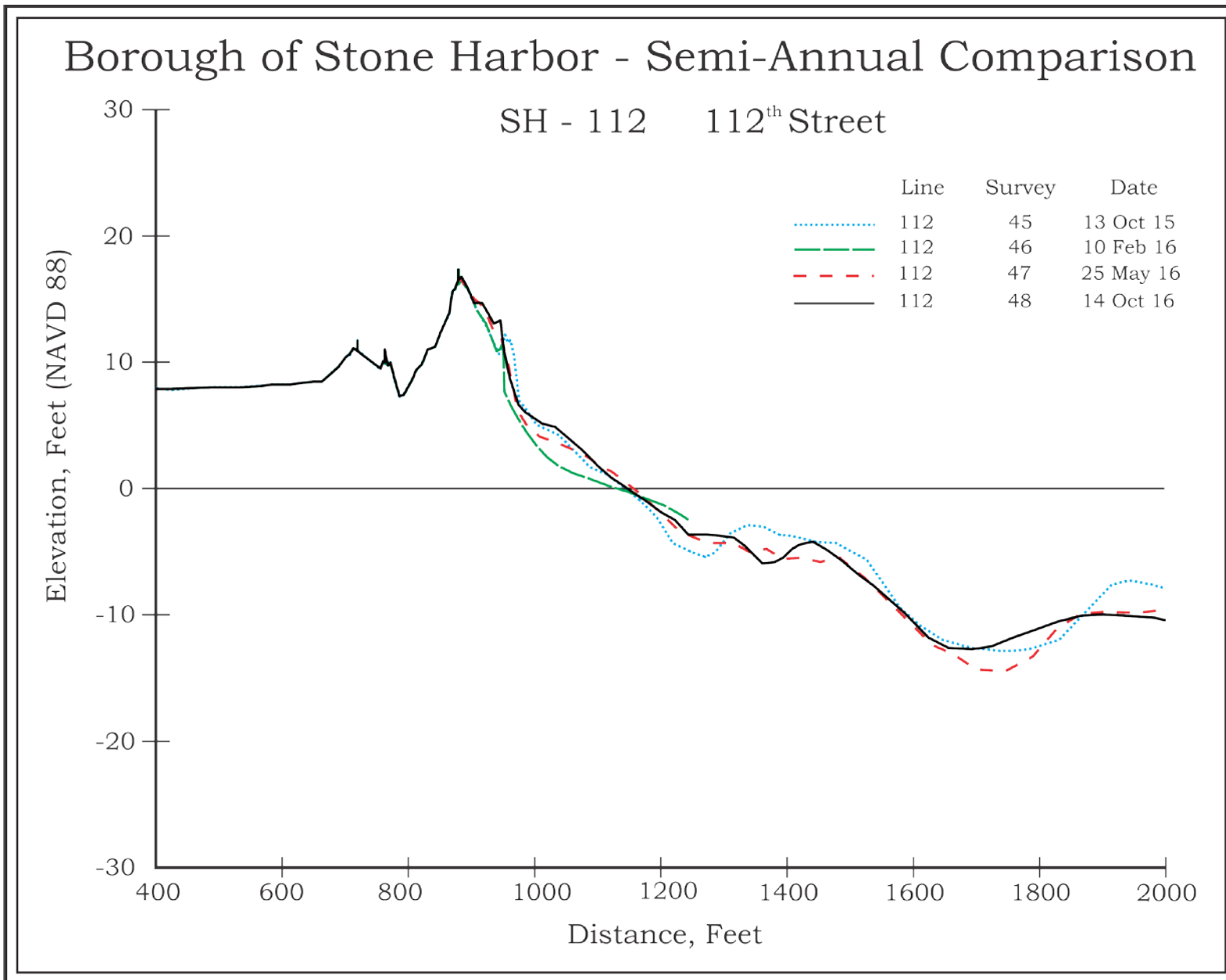


Figure 6a. The storm erosion is apparent looking at the cut in the dunes on February 10, 2016. Sand did accumulate at the scarp and a berm developed over the summer. The shoreline position did not change much and offshore some bar elevation reduction did occur, but on a more minimal scale at this site.

SH-116 is located along the west side of 2nd Avenue and 116th Street. Seaward of the bulkhead at 116th Street is the best-established natural dune system in the Borough. A landward offset in the bulkhead just north of this site produced the area on which this dune developed, sheltered from storm overwash by the 114th Street groin and the bulkhead offset to the west. The dune system consists of two distinct ridges with a combined width of nearly 300 feet from the street end bulkhead to the seaward dune toe with a crest elevation of 16.5 feet NAVD88.

This location did not suffer severe berm erosion, in spite of a 56-foot shoreline retreat since May 2015. The January 2016 storm reached the dunes and deposited debris at the seaward toe, but no damage. Some sand accumulated at the dune toe over the year with the berm developed, but 37 feet landward at the zero elevation position.

Site SH-116 – 116th Street

(Photoplate 7a-7b)



Photoplate 7a - Photo taken February 1, 2016 following Jonas and a second, smaller northeast storm two weeks later. Note the wrack line at the toe of the dunes making the beach wet to the toe following the storms. The dune damage was relatively minor at this site.

Photoplate 7b - Photo taken October 14, 2016 with the same perspective as that on the left. Sand has accumulated among the clumps of dune grass and the dry beach has accumulated a bar at the water's edge.

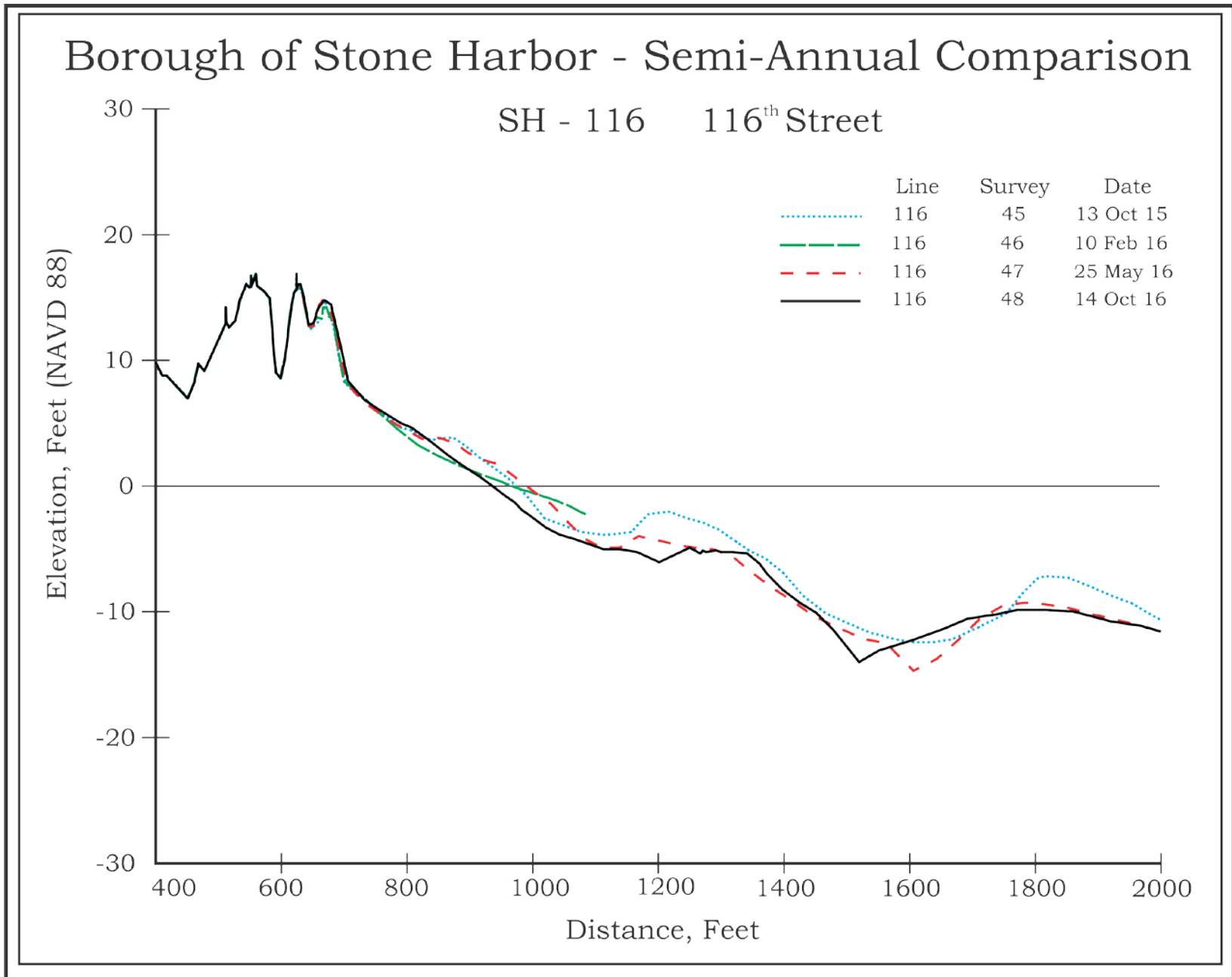


Figure 7a. 116th Street has an excellent double dune system with a wider beach naturally that adds stability. The Jonas event did not impact the dune in any way with debris piled up at the toe of the dune. Sand added to the seaward slope this year and a minor berm developed. Offshore the elevation loss accounted for the decline in sand volume recorded (-51.16 yds³/ft. with just 2.94 yds³/ft. of that loss coming from the dune/beach above zero elevation.

SH-123 is located at 123rd Street south of the developed part of town and just north of the terminal groin originally constructed by the Philadelphia District of the U.S. Army Corps of Engineers. In 1994, the site was added to the NJBPN as part of an expansion of the State's monitoring project and as a replacement cross section for former site #112 that was erased from South Pointe by weather events in 1990 where the entire natural zone south of the terminal groin was eroded to a shoal below low tide. Because of this prior history of data collection and its proximity to Hereford Inlet, this site was included in the Borough's beach monitoring project. The profile reference marker is located in a dense stand of bayberry west of a vehicle access path to the Hereford Inlet terminal groin.

This region has benefited tremendously since the completion of the initial USACE project both from direct sand placement and from longshore currents that have carried a substantial volume of sand shed from the northern project beaches south toward South Pointe. The result has been a larger dune system that now completely buries the revetment once exposed along this beach and the formation of an expansive point that stretches over a mile from the terminal groin into Hereford Inlet. However, like the other Borough project beaches this location suffered significant erosion of the dry beach berm and dune during Hurricanes Irene and Sandy and several northeasters.

This problem continued in 2015 and into 2016 as two northeast storms acting to cut a steep scarp into the dune, and remove the berm elevation leaving a broad, flat beach instead. Sand was transferred offshore into multiple bars and produced a net loss of 20.96 yds³/ft. The 62-foot shoreline retreat was the second highest value after the 95th Street loss of 67 feet. The storm damage was substantial with 6 weeks of winter yet to go.

Site SH-123 – 123rd Street (Photoplate 8a-8b)



Photoplate 8a - Photo taken January 25, 2016 following Jonas. The scarp was 8 to 10 feet high and the seaward dune toe was cut back to within 20 feet of the bench up to the crest. The beach was flat and wet to the toe on the last high tide.



Photoplate 8b – Photo taken September 14, 2016 a few days after Hurricane Hermine passed the coast. The scarp has muted due to sand sloughing off the crest and wind deposition at the toe. A new sand fence was added and has started sand capture. There is a bar on the beach as a result of summer accumulation of sand.

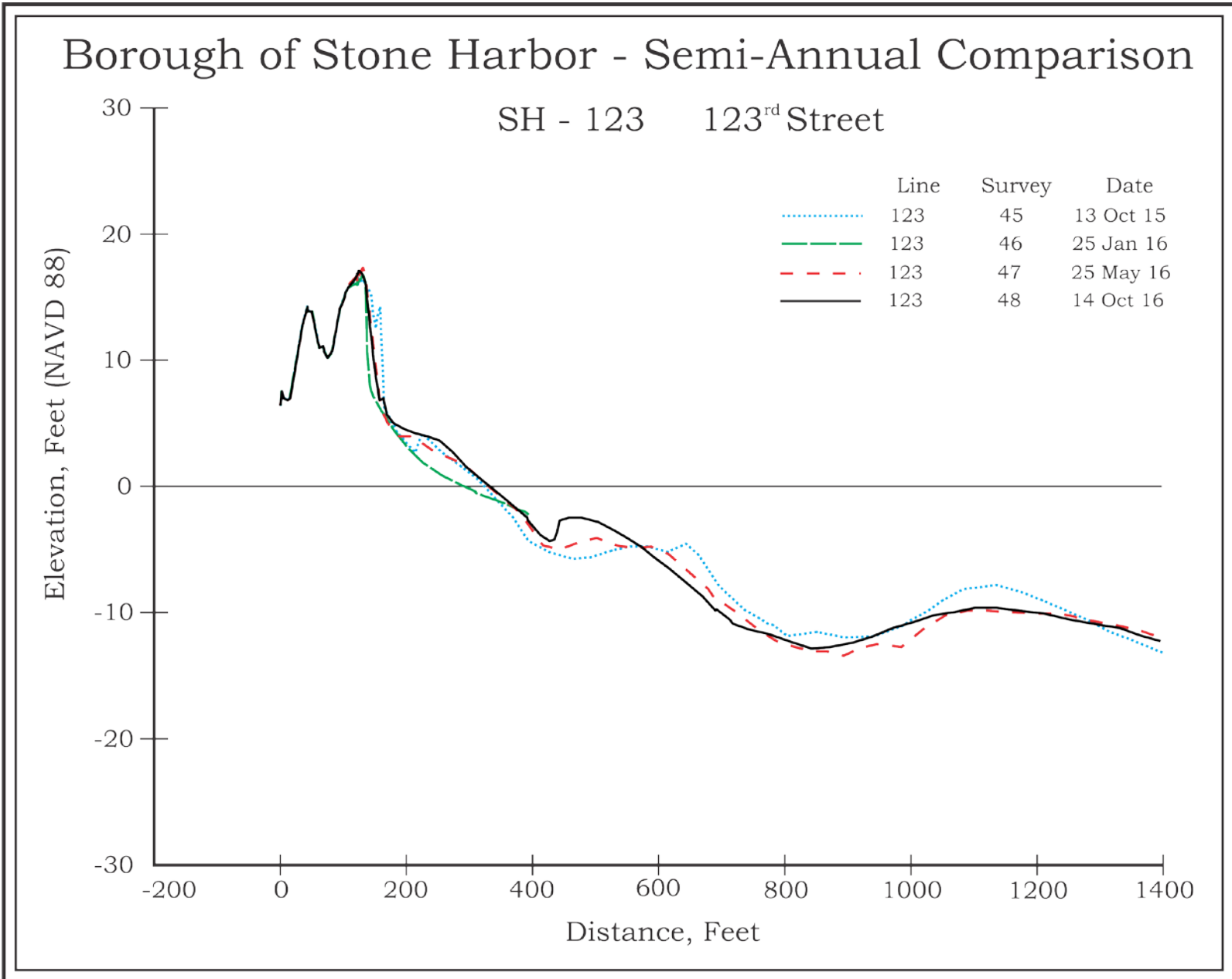


Figure 8a. 123rd Street suffered dune erosion during Jonas taking the vertical scarp to 10-foot heights into the established dune grass. The flat, post-storm beach was wet at high tide to the scarp afterwards. Since the slumping of sand from the dune combined with wind deposition along the toe has generated a gentle slope and a deposit of berm sand on the beach. A bar was migrating onto the low tide zone by October 14, 2016. Losses further offshore yielded a net loss for the year of 12.68 yds³/ft.

Summary

The beaches suffered from what has been determined to be a 10-year event in late January 2016 named Jonas. Jonas had 65 MPH winds and occurred during a spring tide producing the worst tidal flooding since Hurricane Sandy. Hurricane Sandy accounted for the removal of 380,859 cubic yards of sand from just the dune and beach not including nearshore losses. Much of the eroded sand moved south to Hereford Inlet extending the South Pointe beaches into the inlet to a point just 450 feet from the revetment rocks in North Wildwood's side of Hereford Inlet. Jonas compounded the loss by adding another 292,889 cubic yards to that total so that as of November 2016 the Borough's oceanfront is down by 116% of the fill volume the USACE placed on the municipal shoreline following Hurricane Sandy in 2012. The dunes have survived as the beach narrowed, but storm impacts could adversely affect them in the future.

Jonas completely overwashed bird nesting elevation sand pads built on South Point last season to try and limit tidal flooding of the nests. Work is currently in progress to re-establish similar pads a foot or so above mean high tide to increase nesting success.

The emergency re-nourishment effort by the USACE for Stone Harbor was initially authorized following Irene then expanded to include damages suffered during Hurricane Sandy. Work to restore the project to its original template design commenced within six months of Sandy. During late spring and summer 2013, Norfolk Dredging Company contracted by the USACE completed work on the municipal beaches. Surveys conducted by the CRC before and after the project show a placement volume of 715,346 CY of sand (211,850 CY of sand above the pre-Sandy conditions). Beach berm elevations were raised to 7.5 feet NAVD88 and extended seaward from the dune toe by up to 220 feet. Public Law 113-2 (June 2013) allowed the USACE to fully fund the re-nourishment with federal dollars saving the state and local governments from covering the project cost. The emergency funding also financed planting dune grass, installing sand fencing, and beach crossover work in the project area.

Effort is in progress to provide restoration funding related to northeast storm Jonas and its aftermath because the dunes end at a beach elevation barely above normal high tide. The goal is to build a berm that will protect the dune into the future. The combination of storm activity has reduced the beach volume by 110% of the profiled sand volume following the July 2013 completion of post-Sandy federal beach nourishment project.

Conclusions & Recommendations:

This year's winter's storm erosion of the federal project demonstrates the need to provide regular maintenance of beach nourishment projects to maintain a higher level of storm preparedness. The recommendation from previous years to recycle the sand from a rapidly growing South Pointe remains valid and is the best alternative to continued reliance on large scale nourishment projects triggered only after the beaches degrade to a critical level to warrant federal (USACE) maintenance projects. This concept is relatively easy to engineer, but terribly difficult to permit due to the reluctance of state and federal wildlife agencies to allow any diminution to the nesting habitat on South Point.

The CRC conducts annual surveys of Hereford Inlet and the surrounding shoreline as part of an ongoing monitoring program for the State of NJDEP DCE (Division of Coastal Engineering). These surveys have revealed that the South Pointe spit continues to grow in width, elevation and length as additional sand shed from project beaches in the north moves south carried by the dominant direction of littoral currents. The point has continued to grow at a rate of about 500 feet a year accumulating in an advance of 7,200 feet since 2006, and is now well over a mile long stretching from the terminal groin south of 123rd Street to the tip of the point.

Recommendations as result of recent events have not changed significantly from previous reports.

- The worst dune loss occurred in the cell defined by 123rd Street cross section. Here the dune was eroded back to essentially the crest elevation with a 10-foot scarp along the segment.
- The zigzag pattern of the installed fence forced deposition of the wind-transported sand seaward and lower in elevation on the upper seaward toe slope of the dunes. This pattern prevents excessive elevation to the primary dune. Fence installation should follow recommendations summarized in past CRC reports as obtained from the USDA circular defining the installation of fence and planting of American beach grass. CRC could provide additional copies if needed.
- New regular interval maintenance efforts including sand harvesting and transfer from South Pointe to the project area should be considered to maintain the beach near its full design template through recycling longshore erosional losses to reduce the frequency of large scale beach nourishment projects and increase the resiliency of Stone Harbor's dune and beaches in future storm events.
 - Issues would be: Determining the regions on South Point least likely to impact the bird habitat.
 - Depths of excavation into the beachface allowed.
 - Sand volume extracted from each excavation zone on the beach.
 - Extent along the beachface for each excavation zone.
 - Timing of the work to allow natural shoreline adjustment to erase the impacts before March 1st.
 - Designing a project palatable to both the NJ Endangered Species Program and the US Fish & Wildlife Service.
 - We do not expect enthusiastic support from the USF&WS or NJ Endangered Species program staff for any South Point sand harvesting, but it might be worth the effort to make an initial request.
- It is recommended to deposit all maintenance sand on the northern portion of groin cells because sand tends to move south between the cells fairly quickly.
- Finally, the CRC recommends that the Borough act forcefully and in concert with the City of North Wildwood to seek the restoration of Federal agencies ability to access the Hereford Inlet borrow zone for major shore protection projects. Department of the Interior attorneys have re-interpreted exceptions to the Coastal Barrier Resource Act (CBRA) restrictions on spending federal dollars within such areas with the effect to eliminate the US Army Corps of Engineers ability to fund future beach maintenance activity in Stone Harbor or allow FEMA to fund storm damage to the North Wildwood project using federal funds to mine sand from the ebb-tidal delta borrow zone in Hereford Inlet. In 1996 a determination was made that taking Hereford Inlet sand was acceptable for federal funding to support USACE projects adjacent to the CBRA unit. A dispute arose when North Wildwood sought to piggyback on the federal restoration of Sandy damage to their project using FEMA Category "G" reimbursement funds that was settled in their favor by congressional intervention. Subsequently, the USACE has been firmly told that the latest group of lawyers to examine this statute have decided that the three noted exceptions to using federal money in a CBRA unit - to alter the environment or extract sand - is not to be allowed unless Congress changes the law or Stone Harbor gets slammed by another Hurricane Sandy. This news came to the USACE the very day they opened the bids to undertake a scheduled maintenance restoration of the project on Seven-Mile-Island. The CRC is willing to assist the Borough in drafting a letter to the NJ congressional delegation and the two NJ State Senatorial offices.