

**2017 ANNUAL REPORT - TO THE CITY OF NORTH WILDWOOD
ON THE
CONDITION OF THE CITY BEACHES**



Aerial view of North Wildwood looking southeast from Hereford Inlet on July 2, 2017 showing nearly the entire City plus the remainder of the barrier island to Cape May Inlet. The fall loss of beach in the zone five city blocks south from the jetty at 2nd Avenue had yet to occur, but the sand shoal distribution near the jetty does appear relatively sparse as of the summer of 2017. This perspective also explains why the Wildwood and Wildwood Crest beaches are so wide due to development in North Wildwood into Wildwood extending one to two city blocks further seaward from its extent further south. (Aerial photo taken by Ted Kingston)

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Introduction:

The width of the beaches within the City of North Wildwood during 2017 declined in extent concentrated at the northeast corner at the 2nd and Kennedy Boulevard intersection. While North Wildwood maintains a 6,800-foot oceanfront beach and dune system as an engineered beach feature designed back in 2009 with New Jersey Department of Environmental Protection assistance, erosion at the junction between Hereford Inlet and the oceanfront is currently critical. The nourishment history beginning in 2009 has been subject to a series of storms classified as FEMA disaster events and therefore subject to Category “G” reimbursement for losses suffered from a declared storm event. The most recent declaration was for a January 2016 storm named “Jonas” that produced substantial beach erosion and tidal flooding. Following Jonas a sand back-passing effort from the Wildwood storm drains conducted between March and mid-May of 2016, which placed 171,000 cubic yards along the eroded dune scarp and on the beach at the north end of the oceanfront. Work on back-passing started up in early 2017 and continued until May 2017 with about 190,000 cubic yards moved mostly to the northern erosional zone.

The situation worsened in spite of no serious events in the fall of 2017, leaving the wet beach at low tide at the base of the rock revetment guarding the vertical bulkhead protection for Kennedy Boulevard exposed south of 3rd Avenue and just a small remnant of dune and beach sand south to 5th Avenue. Vehicle access to the beach was shifted to 8th Avenue. Available sand on the remaining North Wildwood beach was totally insufficient to allow transfer to the north without returning to the City of Wildwood. Work progresses on renewal of the NJDEP permit to conduct such sand transfers, but the degree of erosion and quantity of sand now eroded from the oceanfront beach makes this methodology somewhat problematic as the primary means of restoration. Hereford Inlet sand supplies are available to the State of NJ and/or the City of North Wildwood in spite of the borrow area lying within Coastal Barrier Resource System site NJ-09. The 1982 Congressional act establishing the Coastal Barrier Resource Systems nationally, precludes the federal government expending funds to extract sand from NJ-09 site excluding US Army Corps of Engineers or FEMA funds from being used to dredge in Hereford Inlet. In 2013, the City won a conflict with the USF&WS (US Fish & Wildlife Service) allowing FEMA to reimburse costs associated with Hurricane Sandy restoration of disaster damage to the engineered beachfront, but since then legal interpretations at the highest levels of this program have come down opposing such efforts in the future. The USACE was precluded from dredging sand for Stone Harbor this year under the USF&WS rules for CBRS utilization.

2017 Weather Events:

The first storm of 2017 occurred on the anniversary date of Jonas on January 24, 2017, but the anniversary event proved far less damaging. A second event occurred March 14, 2017 and was the last spring storm. Very minor periods of northeast winds continued the erosion at the 2nd Avenue jetty, but the summer season did see use of the oceanfront beach by visitors. Sand loss is evident along the southeastern segment of the Hereford Inlet shoreline, as well as dune scarps are present and the beach is demonstrably narrower as of the year’s end. There were no damaging hurricanes passing the NJ coastline in 2017 in spite of three severe events impacting Texas, Florida and Puerto Rico & the US Virgin Islands. In mid-September Hurricane Jose passed offshore stirring up larger than normal waves.

North Wildwood Engineered Beach History/Performance:

The litany of sand placement on the North Wildwood beaches since 2009 was presented in detail last year. During 2017 an early northeast storm exactly a year following “Jonas” did moderate damage to the critical areas between 2nd and 8th Avenues. Additional erosion took place in March 2017 prompting the City to undertake sand trucking from Wildwood yet again extending until just prior to Memorial Day. It was reported that the

trucks hauled upwards of 190,000 cubic yards of sand to the northern oceanfront shoreline adding to the dune toe and dry beach width.

Sand loss accelerated as September 2017 commenced pushing landward between the jetty and the gazebo to the rock revetment leaving a wet beach at low tide. Dune loss continued to the point of consideration of emergency measures for both the hard structure south of the gazebo and for beach sand.

Obtaining several hundred thousand cubic yards of Wildwood sand using back-passing is problematic given current loss rates are sky high and include the inlet shoreline back to Surf Avenue as well. Offshore from the jetty a wide zone of 6-7 foot depths exists, but without any shoals to absorb wave energy. A very large sand deposit has developed just seaward of the inlet beach between Surf and Central Avenue street ends at the inlet. The channel between this shoal and the City beach is greatly restricted forcing the main flow northeast of the large shoal where depths in the channel have increased from 12 to 26 feet since spring 2017. Conditions are rapidly changing surrounding the northeastern corner of North Wildwood, but predicting sand deposition instead of continued erosion is speculative to a large degree.

Sand in quantity does reside in the Wildwood City shoreline, but the NJ individual permit needs to be awarded or an emergency situation must be agreed upon with the NJDEP prior to proceeding. The US Army permit for back-passing work is valid until the end of 2022.

Oceanfront Beach Surveys:

The CRC surveyed shoreline changes at all 54 oceanfront profile stations two times in 2017 to determine annual and seasonal trends. These surveying activities continue a monitoring program that began in 2009 following the initial City/State beach restoration project. The profile stations are spaced 200-feet apart and were established to determine cumulative changes and performance of the beach restoration project. Figure 1 shows the locations of a few selected profile survey locations that were extracted from the 54 profile dataset: Lines **04+00; 20+00; 40+00; 52+00; 58+00; 60+00; and 64+00**. These sites were chosen to show the range of performance changes across the project. The two northern sites document changes in the historically erosional zone, the middle two sites show the changes in the mid-section of the island, and the southern two sites document the changes in around the four piers south of 21st Avenue. A discussion of the changes at each of these locations is provided in a later section of this report. The following is a list of the studies included in this report and the respective survey dates are:

- **Survey 29** **November 2, 2016**
- **Survey 30** **March 23, 2017**
- **Survey 32** **October 19, 2017**



Figure 1. Shown above are locations of six representative profile sites of the 54 profile stations where shoreline changes were measured on the City’s oceanfront from October 2015 to November 2016. For each of the six profile stations descriptions and cross sections are provided to show typical changes over the year. In addition, 6 survey lines are completed along the inlet beach in Hereford Inlet. They are spread non-uniformly from the 2nd Avenue jetty to Central Avenue northwest of the jetty. Four go at 200-foot spacing from the jetty to 600 feet northwest, another at 1,200 feet and the final survey line at 2,400 feet northwest at the end of Central Avenue.

Table 1
Sand Volume Comparison on the North Wildwood Oceanfront Beach
November 2016 to October 2017

Profile	Shoreline Change (feet)	Volume Change (cu yds/ft.)	Avg. Volume (cu yds./ft.)	Distance Between (feet)	Dune/Beach Losses (cu yds)
<i>Hereford Inlet Shoreline</i>					
			-114.54	400	-45,816
4+00	-106	-114.54			
			-85.72	1600	-137,152
20+00	-111	-56.90			
			0.50	2000	1,010
40+00	123	57.91			
			36.16	1200	43,386
52+00	49	14.40			
			10.41	600	6,246
58+00	47	6.42			
			1.20	200	239
60+00	-6	-4.03			
			0.30	400	120
64+00	-2	4.63			
			4.63	400	1852
<i>Wildwood City Border</i>					
			Total Cubic Yards Vol Change		-130,115

The comparison between the sand volume on the beach in the fall of 2016 versus the quantity present in October 2017 shows the concentration of losses focused on the northernmost 2,000 feet of oceanfront beach. The sum of losses reached 182,968 cubic yards by site 20+00, located between 9th and 10th Avenues. During the same time interval the southern 4,800 feet of oceanfront beach actually gained 51,846 cubic yards, most likely derived from sand eroded from the northern beach. Looking into the details, one notices that the beach loss was about half the offshore deficit (-38.74 yds³/ft. from the beach versus -76.16 yds³/ft. offshore below zero NAVD elevation) seen at site 4+00 between 3rd and 4th Avenues.

At site 20+00 (9th & 10th Aves.) the distribution of loss was -15.38 yds³/ft. on the beach versus -41.52 yds³/ft. below the datum offshore. Two thousand feet further south at site 40+00 (17th Avenue), 12.70 yds³/ft. of sand accumulated on the beach above the datum while 45.20 yds³/ft. was deposited offshore below the datum. The shoreline shifted dramatically between loss and gain between 10th and 17th Avenues. The magnitude of gains decreased to the south so that by site 52+00 (21st Avenue), the gain on the beach was just 0.11 yds³/ft. while the gain offshore was 14.29 yds³/ft. At Morey’s Surfside Pier (site 64+00) the beach lost 4.97 yds³/ft. while the offshore region gained 9.60 yds³/ft. for a net positive sand volume change for the year.

The 2017 Back Pass Operation:

Following the March 14, 2017 northeast storm, the City commenced hauling sand from the stormwater discharge points in the City of Wildwood using heavy trucks to move material to the erosion zone at 3rd Avenue. The estimate from truck logs indicated placement of about 190,000 cy of sand by mid-May 2017.

**Table 2
March 23rd to April 17th Sand Volumes Added to the Northernmost 600 Feet of the Beach**

Profile	Shoreline Change (feet)	Volume Change (cu yds/ft.)	Avg. Volume (cu yds./ft.) (cu yds/ft.)	Distance Between (feet)	Dune/Beach Losses (cu yds)
<i>Hereford Inlet Shoreline</i>					
				400	0
0+00	92	31.44			
			34.48	200	6,897
2+00	129	37.53			
			19.21	400	7,683
6+00	24	0.89			

The total sand volume added by mid-April was 14,580 cubic yards which provided a 129-foot shoreline advance at the 200-foot distance south of the jetty at 2nd Avenue. The CRC did not conduct a post-trucking survey in May, however, as work continued adding at a minimum 10 times the sand quantity seen above. However, between March and October 2017, this segment of the beachfront had less sand on it at the 6+00 site than was present in March before sand hauling commenced. The other two locations were about the same as they were in March by October. Subsequently, the shoreline continued to deteriorate to the point where it will take about 200,000 cubic yards to replace the losses from the jetty to 5th Avenue.

The final volume computation takes the March 2017 data set and compares it to that obtained October 19, 2017 to provide a view of summer accumulation areas versus the erosional zone. The 2,000 feet of northern beach lost sand during the summer months in spite of the back-passing effort reaching 89,292 cubic yards at 9th Avenue. This sand was deposited across the next 2,000 feet to the south producing a 99-foot shoreline advance at site 40+00 adding 60.46 yds³/ft. to that profile. The remaining four sites covering the remaining 4,800 feet of oceanfront beach in North Wildwood all gained double digit sand volumes during the summer of 2017. This gain totaled 79,381 cubic yards south of site 20+00 (10th Avenue). This sand volume gain reversed north end losses by 25,068 cubic yards across the entire City oceanfront shoreline.

Table 3
Sand Volume Comparison on the North Wildwood Beach
Between March 23rd and October 19, 2017

Profile	Shoreline Change (feet)	Volume Change (cu yds./ft.)	Avg. Volume (cu yds./ft.)	Distance Between (feet)	Dune/Beach Losses (cu yds)
<i>Hereford Inlet Shoreline</i>					
			-57.43	400	-22,970
4+00	-43	-57.43			
			-41.45	1600	-66,322
20+00	-33	-25.48			
			17.49	2000	34,979
40+00	99	60.46			
			39.79	1200	47,744
52+00	55	19.12			
			15.31	600	9,183
58+00	59	11.49			
			12.79	200	2,557
60+00	45	14.08			
			21.27	400	8,510
64+00	52	28.47			
			28.47	400	11387
<i>Wildwood City Border</i>					
			Total Cubic Yards Vol Change		25,068

While a major hydraulic beach restoration project might serve the City's immediate future needs, this prospect has the issue that Hereford Inlet is part of the Coastal Barrier Resources System NJ-09, that has definite restrictions on spending federal funds to move sand outside the CBRS to North Wildwood. Unless Congress actually changes this 1982 Act, there will be no future federal funds for moving sand from the inlet borrow zone to the beach. The USACE has elected to focus its project for the Wildwoods on sand back-passing in a larger scale because of this restriction on available sand supplies. Mining the very southern extent of this barrier island is also off limits due to the undeveloped section at Cape May Inlet now part of the Cape May Wildlife Refuge. This agency has no interest in allowing sand acquisition either on the beach or offshore related to fears for habitat disturbance by doing so.

The State of NJ and any local or county entity is free to take sand from the CBRS area in Hereford Inlet with appropriate state and federal permits, but the cost to North Wildwood is fixed at 25% of the project cost instead of 8.75% if federal money was involved with a USACE effort and a NJ State partnership.

Oceanfront Beach and Inlet Shoreline Prospects:

As the two pictures below (Figures 2 and 3) show, the 2017 back-pass sand placement did not last until the fall season was shifting into winter. Major sand shoal movement close to North Wildwood's inlet beach prevents the ebb tide from moving as much material in proximity of the 2nd Avenue jetty. Therefore, the beach receives little inlet sand and relies on material moved north toward the inlet. This supply has been depleted, leaving the natural forces free access to the dunes south of 3rd Avenue. Most of the loss appears to have occurred during the fall of 2017 reaching the point of deep concern at present. Construction of an enhanced seawall south of the gazebo should reach basic installation prior to a northeaster arriving March 2, 2018. The digital maps below (Figures 4 - 6) detail the areas of loss and a few zones of sand accumulation.

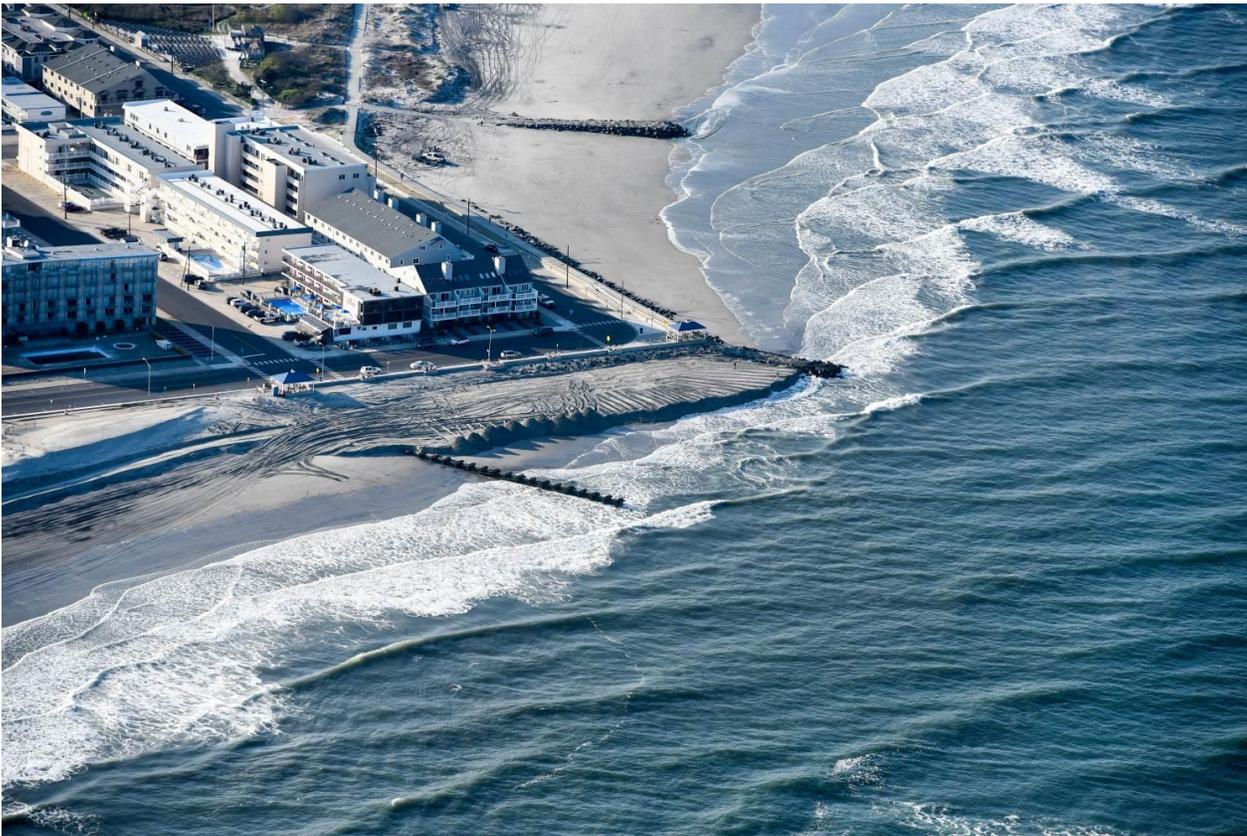


Figure 2. Aerial view of 2nd and Kennedy Blvd. April 26, 2017 as the sand back-passing from the City of Wildwood was underway. The zone of placement was particularly problematic because the beach between 2nd and 3rd Avenues is simply too erosional to sustain any deposit of sediment for any time period due to direct, constant wave attack. There already was a vertical scarp cut into the deposit with the sand either going south along the beach or into Hereford Inlet. By October, the material was gone and some was documented between 10th and 21st Avenues on the oceanfront. In prior years the sand was placed south of 3rd Avenue with some allowed to migrate north into the pocket between the stormwater discharge pipeline and the jetty. The jetty needs to be extended at least twice its current length if it is to retain sand at the inlet oceanfront beach.



Figure 3. View taken by Ted Kingston January 2018, showing the severe depletion of the sand supply surrounding the northeast corner of the City of North Wildwood. While it is high tide in the view, the loss of beach width is serious and will require both natural and manmade assistance to correct.

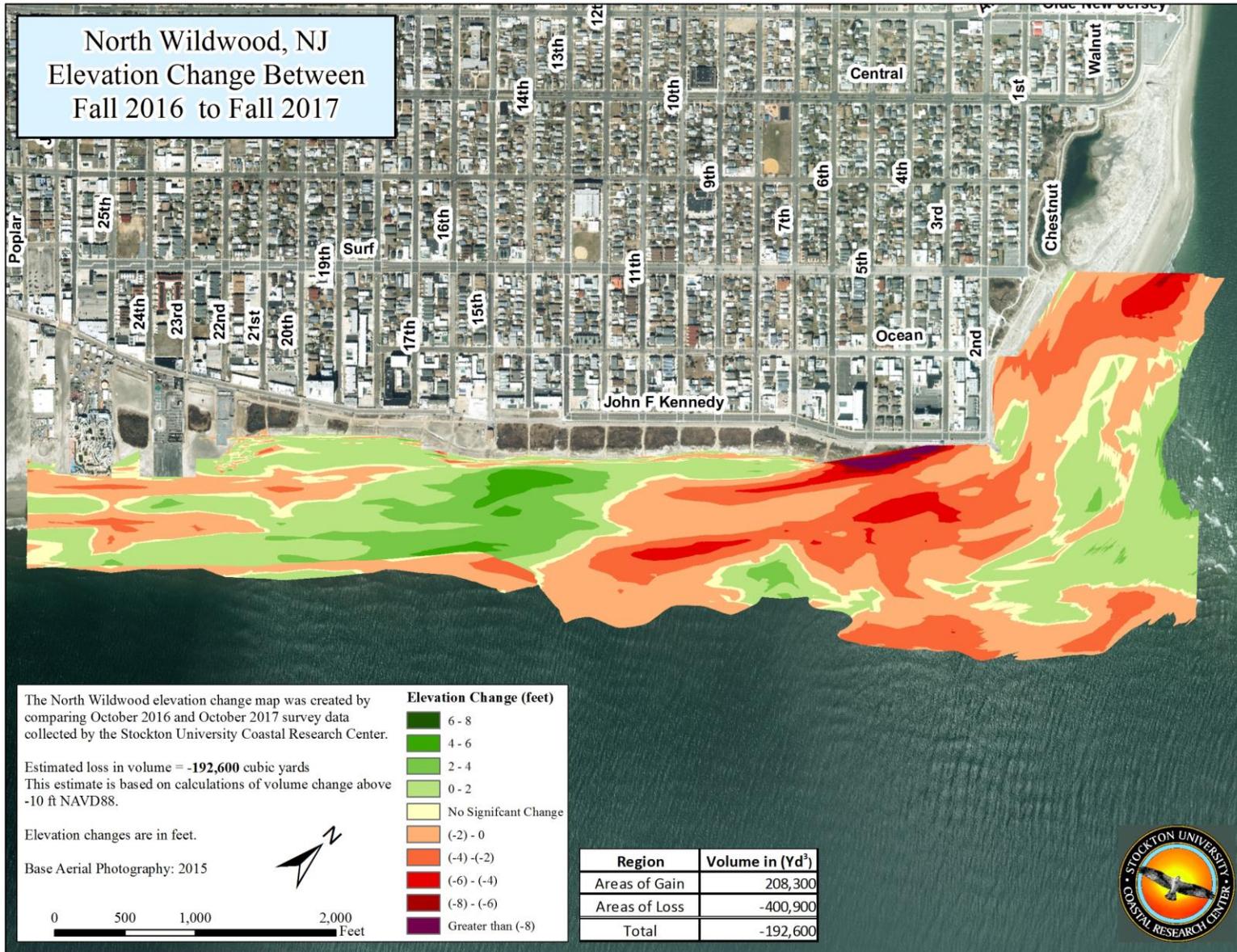


Figure 4. A digital elevation change map for the North Wildwood City shoreline. This elevation difference map of the North Wildwood City engineered beaches shows the change in elevations between October 2016 and the October 2017 surveys. There is a dark green area of accretion concentrated between 11th and 20th Avenues where sand eroded from the northeast corner of the island was redeposited to the south. This region contributed the majority of the 208,300 cubic yard sand volume gain. However, this was far exceeded by the zone of severe loss at the inlet, south to 11th Avenue. The loss volume was 400,900 cubic yards, concentrated between 2nd and 7th Avenue. Vertical changes amounted to greater than -8.0 feet 3rd to 5th Avenues as the dune was stripped away. Some gains did appear to the northeast of the 2nd Avenue jetty, but separated from the beach by 500 feet of turbulent shallow water.

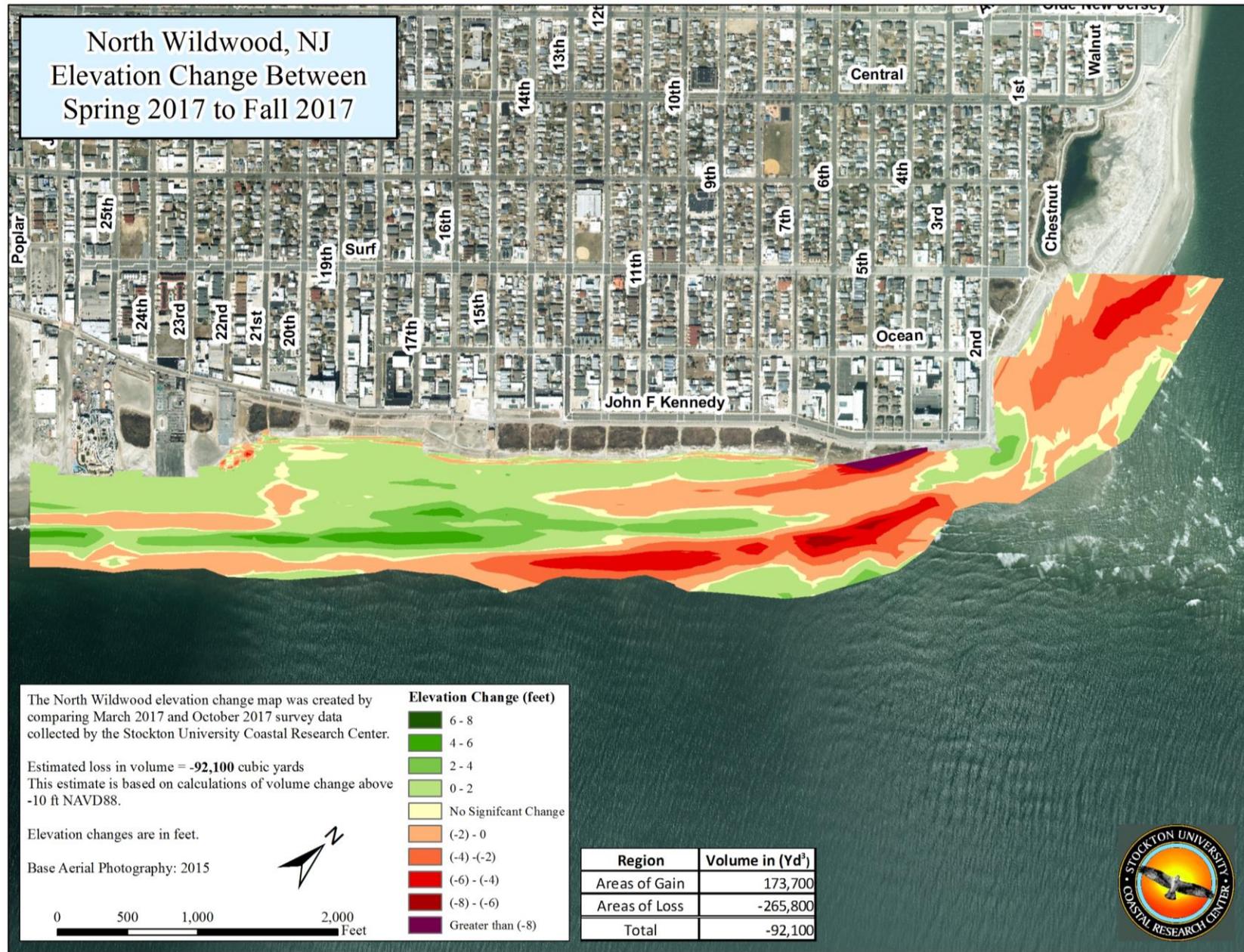


Figure 5. A digital elevation change map for the North Wildwood City shoreline showing the changes limited to between the spring of 2017 versus the fall of 2017. The severe loss at the dunes between March and October was generated during the fall time period. During the summer, sand offshore moved onto the beach leaving a fairly minor regional loss (including the inlet shoreline) of -92,100 cubic yards. The breaking waves to the northeast of the jetty at 2nd Ave. indicate shallow water with an offshore sand supply, but it must move landward to be of any help.

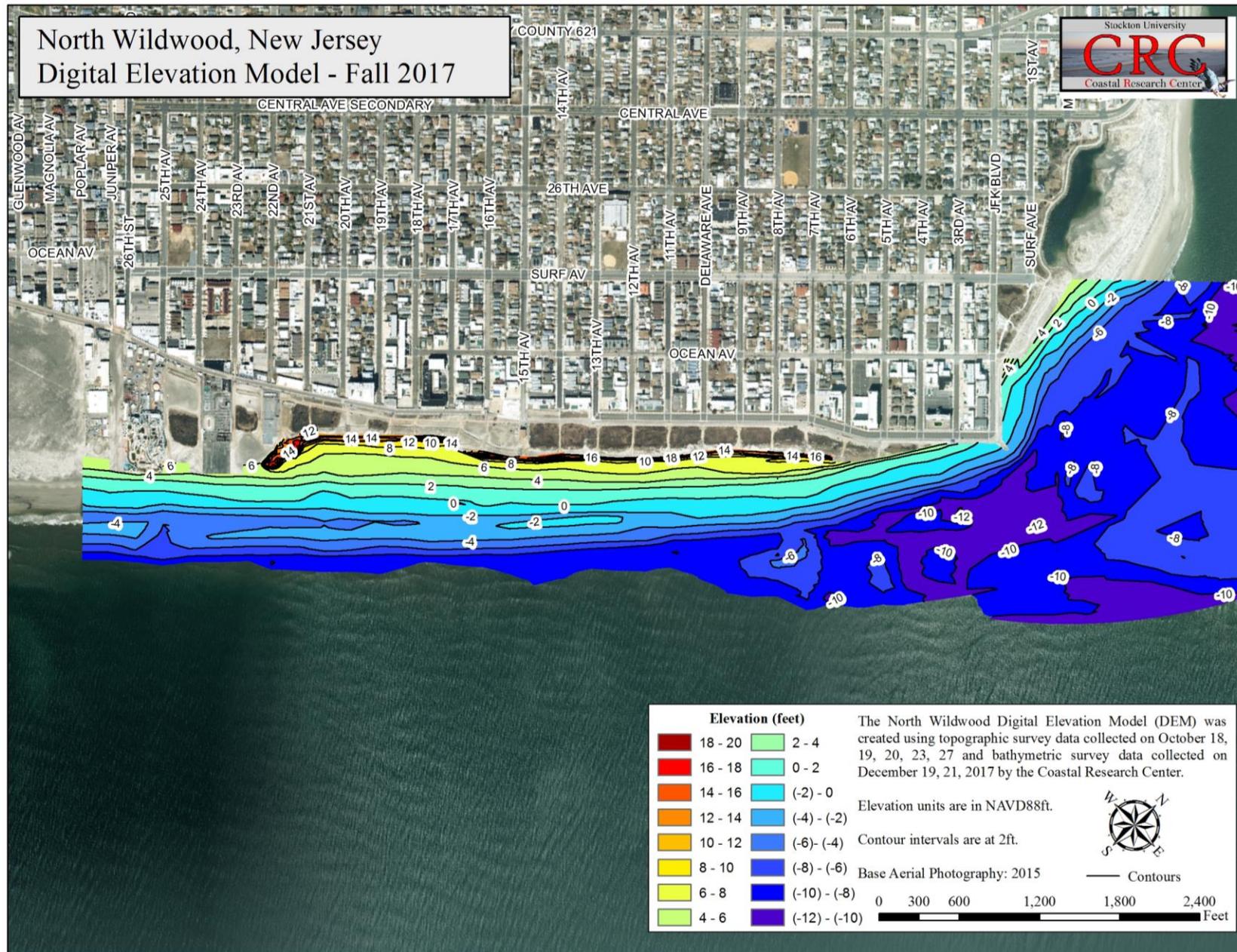


Figure 6. The digital elevation map completed in October 2017 shows the elevation contours for the region. The sand reservoir offshore lies in 8 to 10 feet elevations below NAVD 1988. The zero elevation contour reaches the seawall at the end of 3rd Ave. and continues a short distance along the inlet seawall parallel to 2nd Ave. The dune ends at 6th Avenue.

Individual Site Review:

This section describes the shoreline and volume changes documented at selected profile locations to show general trends in sediment movement along the City's beaches for 2017. Annual beach volume and shoreline changes were calculated from November 2016 to October 2017.

Site 04+00 (between 3th and 4th Avenues)

The site is located in the northern portion of the island adjacent to Hereford Inlet 400 feet south of the 2nd Avenue jetty. This area has typically been an erosional shoreline due to the proximity to the inlet and the direct impact from northeast storms.



Figure 7. View from the 3rd Avenue gazebo looking south taken during the March 14, 2017 northeast storm. A significant scarp in the seaward dune is shown along with observed recreational beach elevation and shoreline losses and waves breaking on the revetment.



Figure 8. View from 4th Avenue looking south on October 19, 2017. The primary dune is cut back to its crest and the scarp extends south of 6th Avenue. No dry beach remains, so waves reach the dune each high tide.



Figure 9. View from offshore December 21, 2017 as the offshore surveys were completed for the year. Emergency work was proceeding between the gazebo and 4th Avenue at the bulkhead. This scarp is positioned between 6th and 7th Avenues, (7th to the left of the stair-stepped condominium in the center). Presently the entire dune has been eroded so that the wet beach goes to the bulkhead to this location and dune erosion extends south to 8th Avenue.

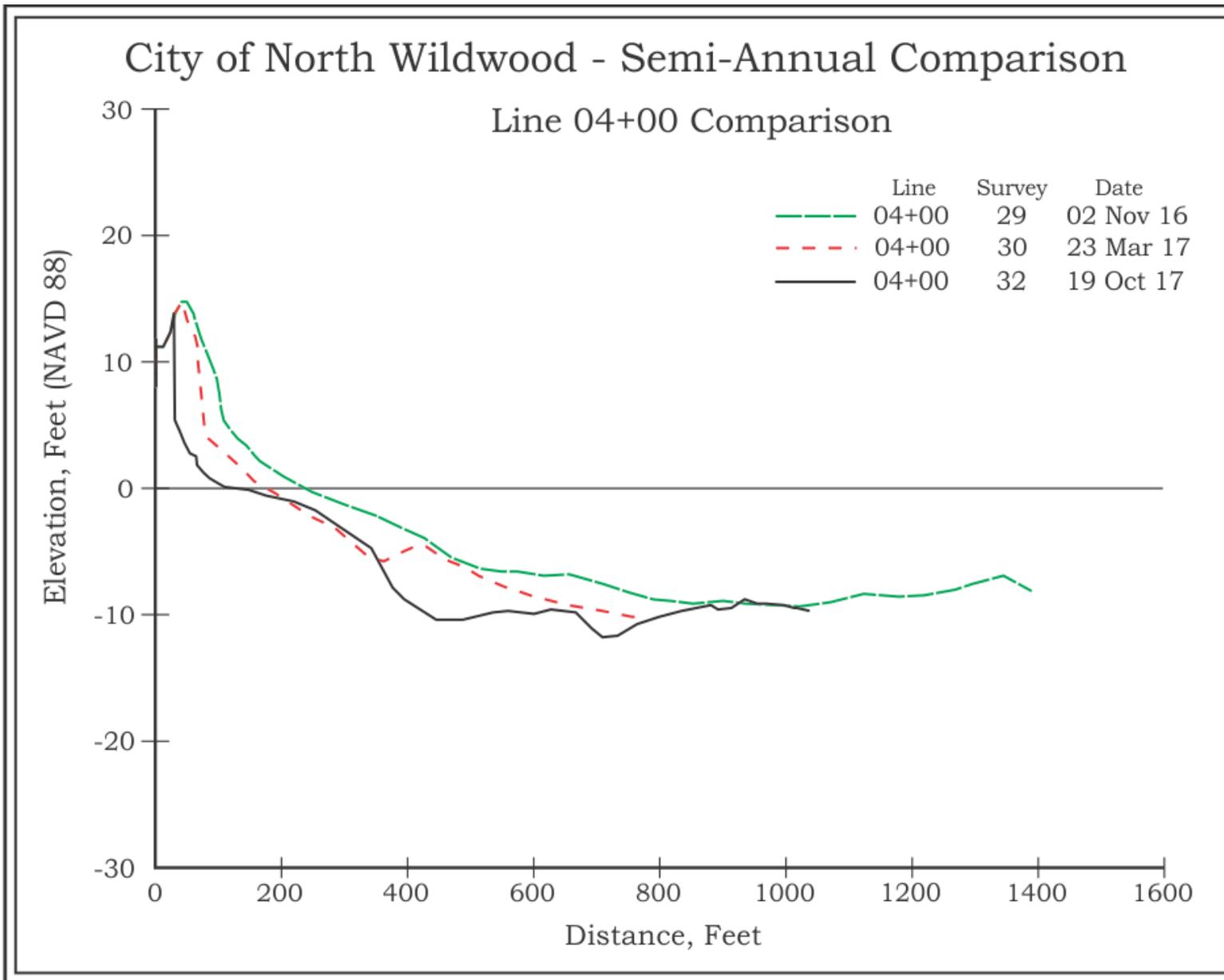


Figure 10. Losses in the dunes increase with each successive survey. The beach elevation declines to the point where the dune toe lies at zero elevation NAVD 1988 by October.

Site 20+00 (between 9th and 10th Avenues)

This site is located approximately 2,000 feet south of the inlet and has represented a transition zone (from erosion to deposition) in previous years. no sand was placed in this region during the 2013 maintenance project. The March 14, 2017 northeaster did significant damage to the beach by reducing the berm elevation and allowing waves to remove the seaward dune toe creating a scarp. The back-passing operation did place sand north of this site as part of the dune restoration effort and to build a higher elevation beach at the dune toe. This site suffered net annual loss approximately a third that seen at site 04+00 above. The loss factor vanished 2,000 feet further south as erosion became equivalent deposition (-56.90 yds³/ft. in losses here versus 57.10 yds³/ft. in sand volume gains at site 40+00, 21st Avenue). The transition from erosion to deposition likely occurred by the 15th Avenue location.



Figure 11. View to the north taken from the beach at 10th Ave. on March 24, 2017. The flat beach following the March 14th northeast storm leads up to a moderate scarp cut into the dunes. This represents the pre-summer survey dataset used to show summer gains.



Figure 12. View to the north taken from the toe of the dunes at 11th Ave. October 19, 2017 following spring sand placement and some accretion at the repaired scarp.

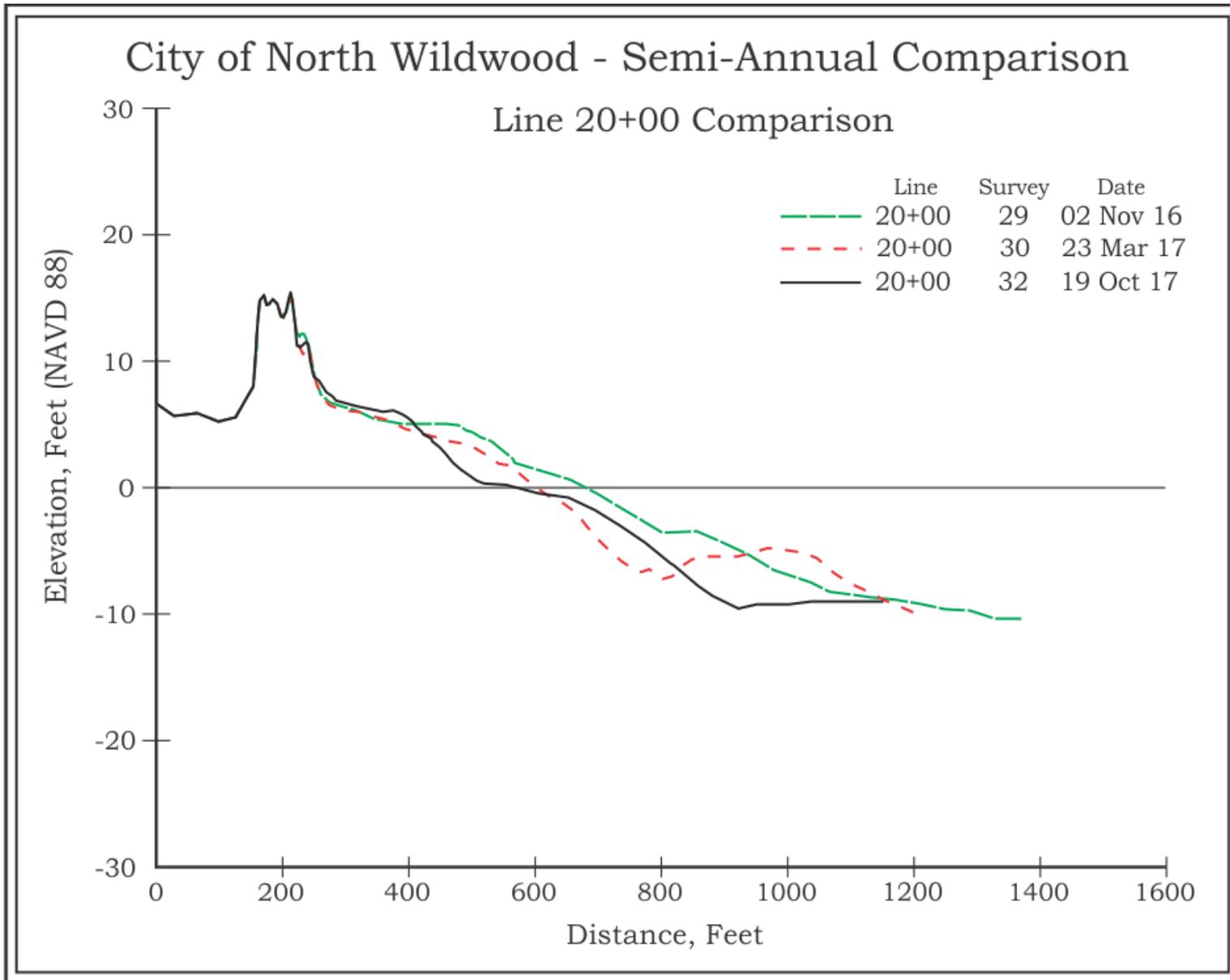


Figure 13. Positioned between 9th and 10th Avenues, this site did not as yet suffer severe dune erosion, but the beach berm pulled back by almost 100 feet and the sand volume declined by 56.90 yds³/ft.

Site 40+00 (17th Avenue)

Positioned 4,000 feet south of the 2nd Avenue jetty, this site is located two blocks south of the lifeguard station in the mid-section of the City's oceanfront beaches. Following initial construction in 2009 this region has remained relatively stable. The wide beach has protected the dune ridge, constructed during the initial project phase, from erosion through multiple storm events including Hurricanes Irene and Sandy. Waves and storm surge from Sandy and winter storm Saturn combined flattened the beachface slope and reduced the recreational beach berm width nearly 180 feet. Although the beach was severely eroded it absorbed the wave energy and effectively provided wave attenuation protecting the dune system, oceanfront properties and public infrastructure for wave damage during Sandy.

Beach erosion occurred during the winter of 2016 into 2017 generating a flat beach by March 23, 2017. Summer accretion generated recovery as sand eroded from northern sites accumulated on this beach producing a 57.91 yds³/ft. sand volume gain and a 123-foot shoreline advance over the year.



Figure 14. View to the south along the seaward dune toe March 23, 2017 as work was in progress pushing sand onto the seaward dune slope. Sand accumulated here during the year adding to the stability.



Figure 15. View to the south on the beach near the dunes October 19, 2017 showing the beach raking and a large number of trash containers still present late in the bathing season. Sand volume gains continued from this point south to the Wildwood City boundary.

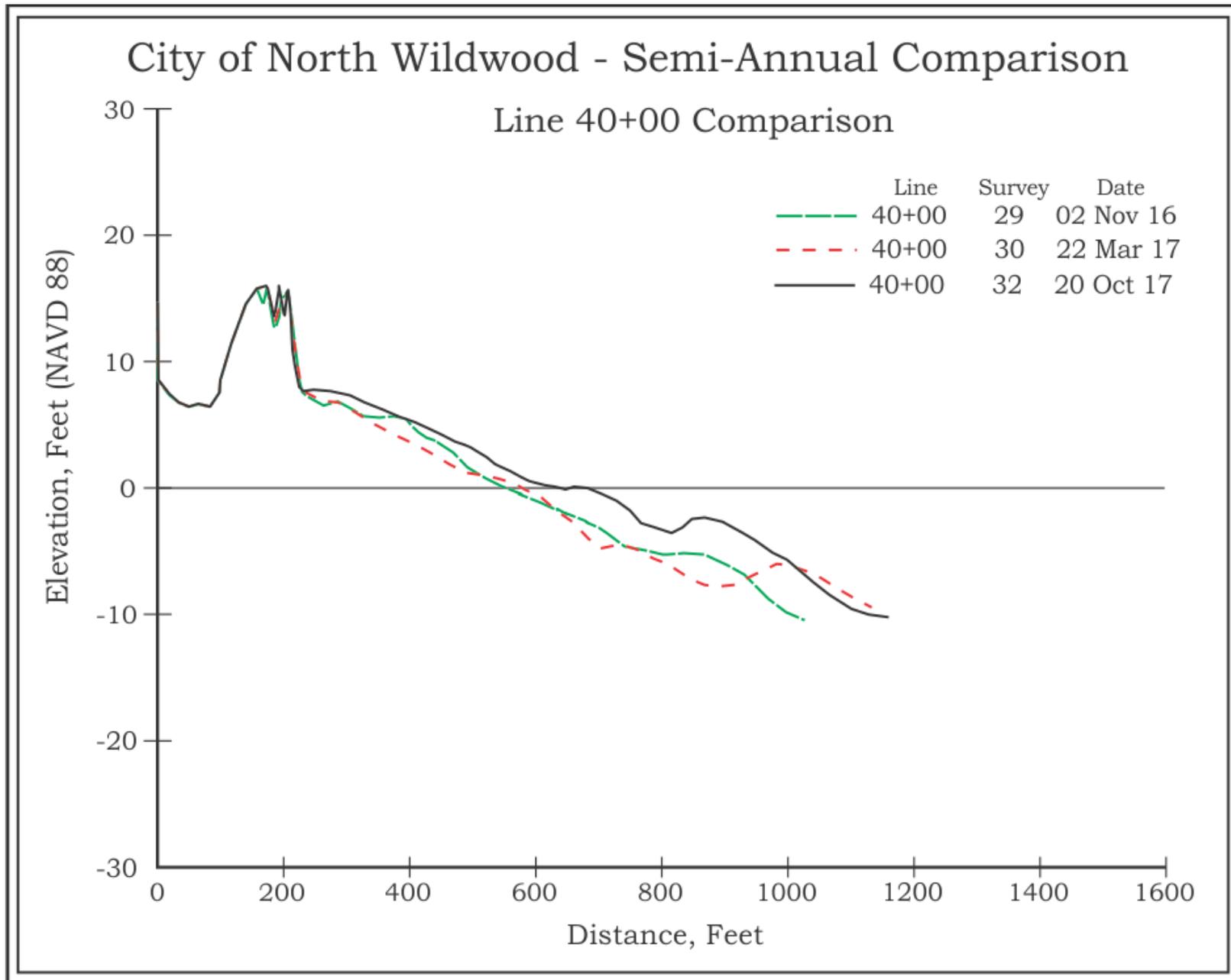


Figure 16. The annual comparison is between survey 29 and survey 32 showing that the entire profile gained material across the area between the toe of the dune and 1,200 feet offshore from the reference position behind the dunes. The gain above the zero elevation was 12.70 yds³/ft. while the gain below zero elevation was 45.20 yds³/ft. The shoreline advanced 123 feet.

Site 52+00 (21st Avenue)

Several hundred feet of dry beach still protected the dune system at this location and to the north, to the south the beach width seaward of the dune was diminished significantly from the initial project design. Immediately south of this location, the engineered dune was initially built with a seaward jog in its alignment from just seaward of the boardwalk to run seaward of the eastern ends of the timber and Morey's piers in North Wildwood.

This element of the original 2009 project was abandoned following Hurricane Sandy which wiped out the dune across the zone occupied by the three ocean piers. Morey's Surfside Pier installed a steel bulkhead fronting their pier, extended along the northeast side for about 100 feet. A new dune system was created landward of the pier ends combining an island dune originally present between the Morey's pier and the adjacent timber pier. No dune was replaced south of Morey's Surfside pier.



Figure 17. View to the north taken from the dune crest at 21st Avenue on March 23, 2017. Sand continued to accumulate at the dune fencing installed after Hurricane Sandy and work in the distance was underway to recover sand from the beach berm to use on pedestrian beach access paths and at the dune toe where needed.



Figure 18. View to the north taken from the dune crest at 21st Avenue on October 20, 2017. Conditions remain stable at this site with wind-transported sand having nearly buried the dune fencing along this section of the oceanfront beach.

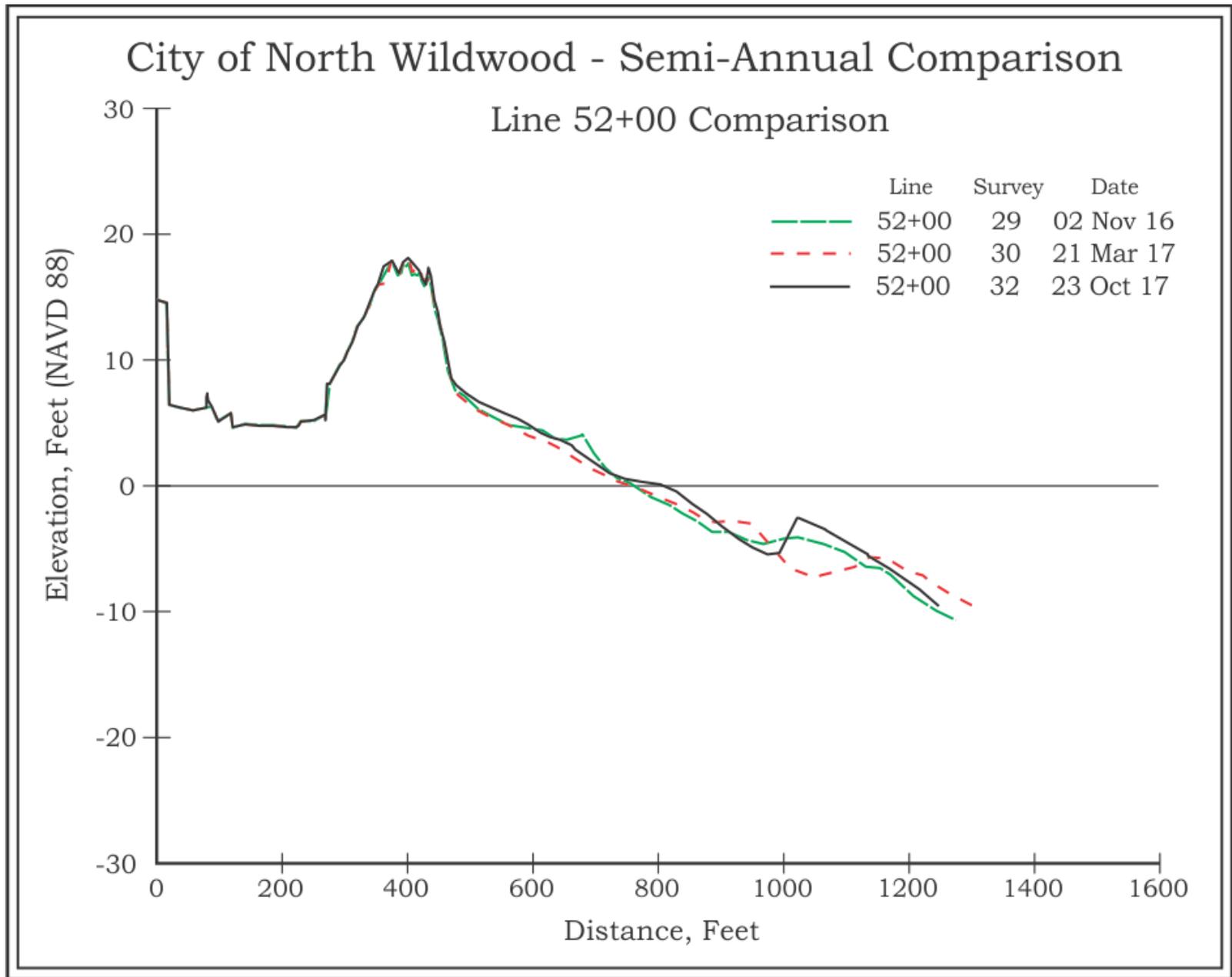


Figure 19. The recreational beach and beachface at 21st Avenue remained stable gaining 14.40 yds³/ft. as the shoreline advanced 49 feet seaward over the year between November 2016 and October 2017.

Site 58+00 (Between 23rd & 24th Avenues)

This site is located in the southern section of the City's oceanfront where the engineered dune system was originally constructed seaward of the piers. The NJDEP mandated seaward jog in the dune system resulted in their vulnerability to the spate of frequent storms since 2009. With limited beach width seaward of the feature to attenuate wave action and absorb the energy before impacting the seaward slope the dune suffered severe erosion. During Sandy the proximity of the dunes seaward of the piers to the shoreline, made them no match for this event. Dunes were entirely washed away south of 22nd Avenue and the beachface and berm flattened by the storm waves and surge.

An effort was made in 2013 to restore the dune, but events in 2014 forced re-positioning the dune system landward between the piers and including a large vegetated island dune that had existed between Morey's Surfside Pier and the adjacent timber pier. The dune was merged with the landward end of the northeast side bulkhead wall put in for defense of the seaward end of the Surfside Pier. Sand was placed beside each timber pier as well to mitigate storm waves reaching boardwalk development.



Figure 20. A close up view of the beach at the very seaward end of the timber pier indicating that no dry beach or dune feature remains at the pier's end (March 2017). Visible between the pier pilings is the re-positioned dune between this pier and Morey's Surfside Pier.



Figure 21. This view to the south October 27, 2017 shows nearly identical conditions at the seaward end of the timber pier between 23rd and 24th Avenues. Waves readily reach under the pier on a very flat beach. The revised dune system shows in the distance beside Morey's Surfside Pier so beach width is critical to this site's ability to moderate wave action.

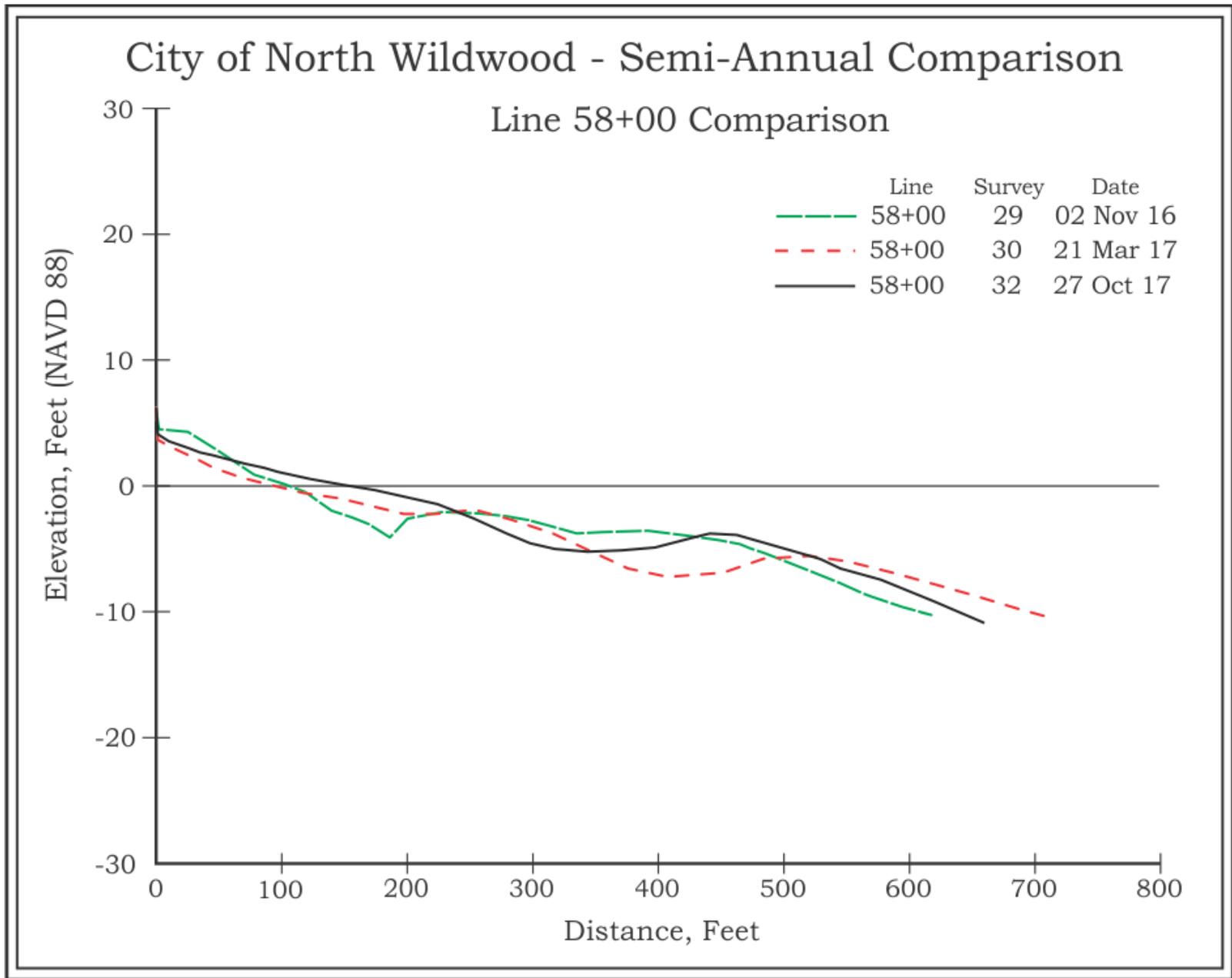


Figure 21. The absence of a dune on the cross section means that there is little or no attenuation of strong waves until the dune line is reached landward of the timber structure’s seaward end. Sand did add to the beach over the summer of 2017, but not sufficiently to reduce storm impacts at the pier ends.

Site 60+00 (24th Avenue)

In an effort to better define the beach zone where piers dominate in North Wildwood, this site was included to show the changes to enhance dune protection since Hurricane Sandy. The main feature is an old dune island likely developed around beach raking debris left in a variety of places when the North Wildwood beach was much wider. In the 1990's multiple island dunes existed from 15th Avenue south to here because sand accumulated among the debris and plant seeds always accompanied the grass stems and other organics washed up onto the shoreline. These germinated, established and trapped more sand enhancing these features. The majority of these features are long eroded away as the beachfront retreated between 1994 and 2009.

The piers originally had the 2009 dune built seaward of the pier ends on the outer beach, but storm erosion starting November 2009 and climaxing with Hurricane Sandy in October 2012 saw complete loss of the dune seaward of the three piers. The existing situation was completed in 2014 and has established quite well. The beach seaward remained stable with minor annual losses in both shoreline position and sand volume (loss of the berm above the zero datum).



Figure 22. Site 60+00 was included this year in the surveys with calculations for sand volume and shoreline changes. The view was taken October 20, 2017. This site lies in proximity to 24th Avenue, between the Surfside Pier in the photograph and the timber pier to the north. This dune toe is part of the older island dune present here for years. The re-positioning process that took place in 2014 created the lower, sparsely vegetated section between the old dune and the pier's northeast side steel bulkhead at its landward end.

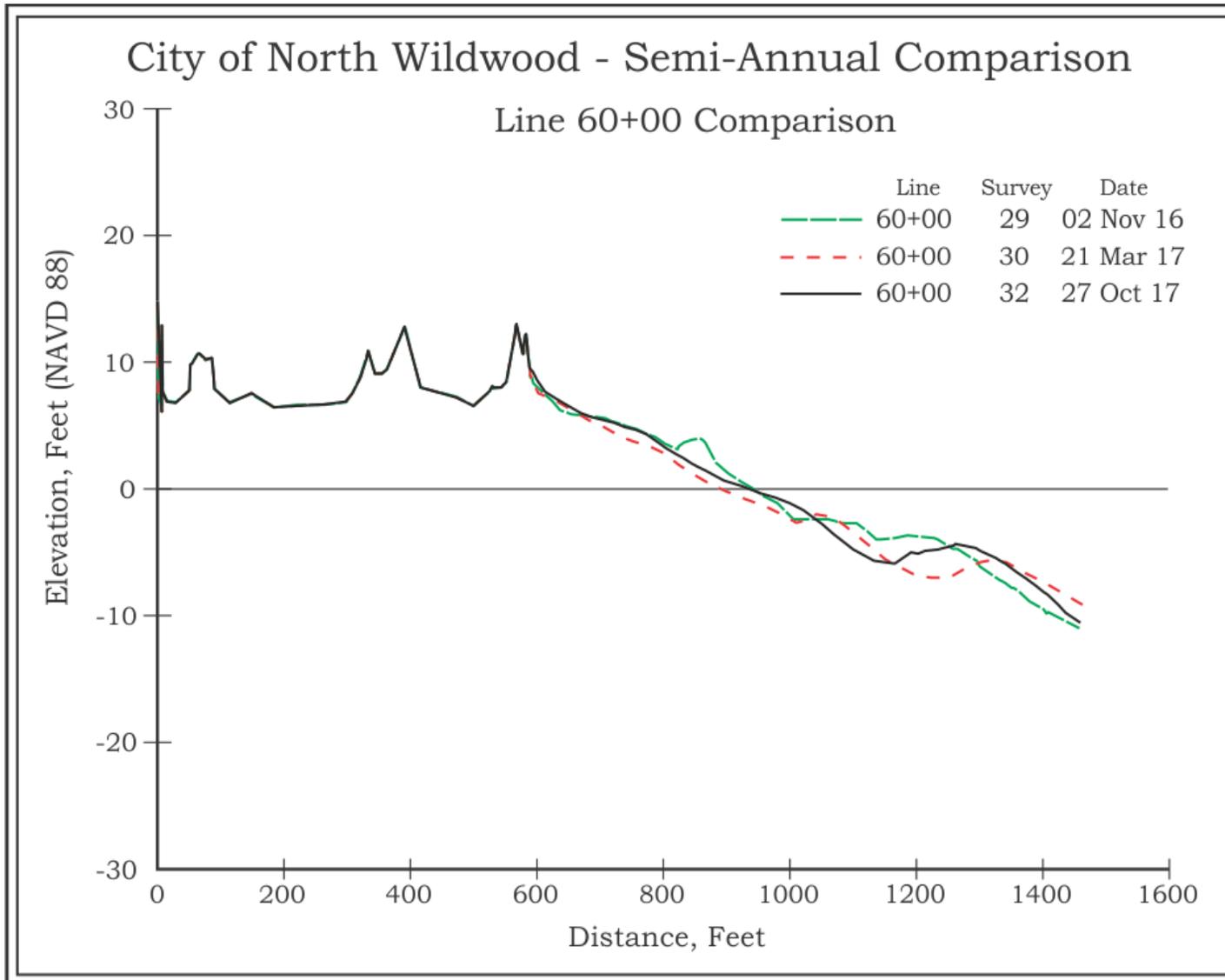


Figure 23. Cross section at 24th Avenue between the Surfside Pier and the timber pier to the north. The island dune developed on beach raking debris initially and has become a robust defense against storms. The feature was extended north and south to connect as well as possible to the pier structures. The Surfside contact is directly to the steel wall bulkhead put in place to defend the pier not built on pilings. The sand is pushed under the timber pier, but not raised up across the entire width of the structure. A bulkhead defends the boardwalk at the landward end of the pier. This beach lost 4.03 yds³/ft. while the shoreline retreated 4 feet. The beachface gained material as the offshore bar system moved seaward.

Site 64+00 (between 25th and 26th Avenues)

This is the southern-most cross section of the selected profiles within the larger database. Located seaward of the Surfside Pier and Ocean Oasis Water Park and Beach Club this site represents conditions at the south end engineered beach and its taper near the Wildwood and North Wildwood border. Initially the engineered beach design template placed the dune feature 30 feet seaward of the pier's steel bulkhead. A series of storm events that followed construction in 2009 resulted in multiple episodes of erosion followed by restoration efforts to maintain this section of dune. The beach seaward of the feature is narrow and prone to storm erosion.

Like the profile at Line 58+00 located to the north of the piers, by the spring 2014 survey (April 25th), the dune had eroded to a point where the City was forced to reposition this feature landward of the easternmost point of the piers. No dune was replaced south of Surfside Pier because the City of Wildwood declined to allow the original design to be re-established. The proximity to Ocean Oasis also mitigated against dune success due to the location in even mild storm wave activity.

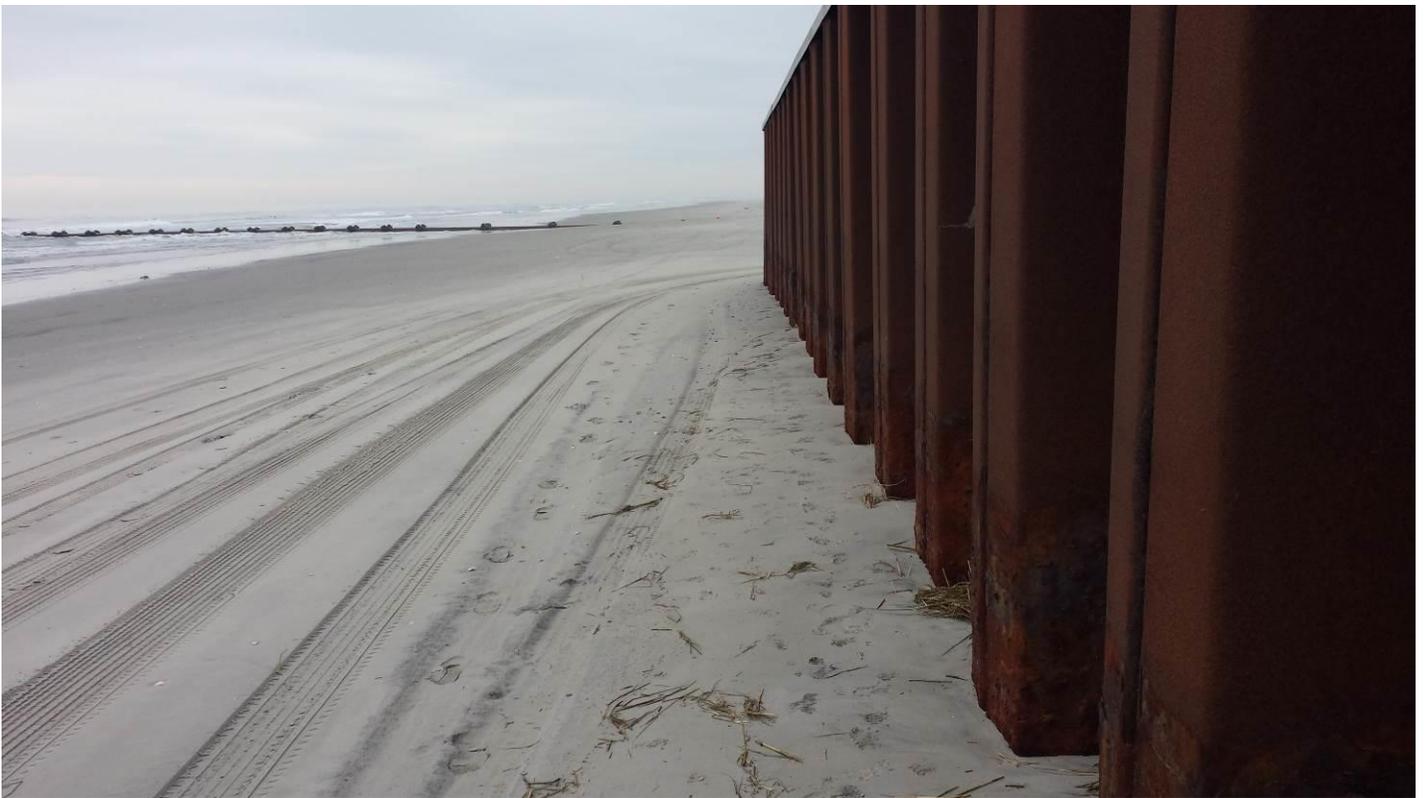


Figure 24. View to the south taken on March 20, 2017 near 26th Avenue showing the beach at the Surfside Pier's seaward end steel bulkhead. Waves easily reach the bulkhead making a dry berm unlikely until the shoreline advances about 100 feet further seaward.



Figure 25. View to the south taken on October 20, 2017 near 26th Avenue following the summer season demonstrates that sand does not accumulate above normal high tide because wave reflection off the wall moves it back into the swash and eventually south into Wildwood. There is a significant bar offshore, but that material has yet to migrate onto the beach.

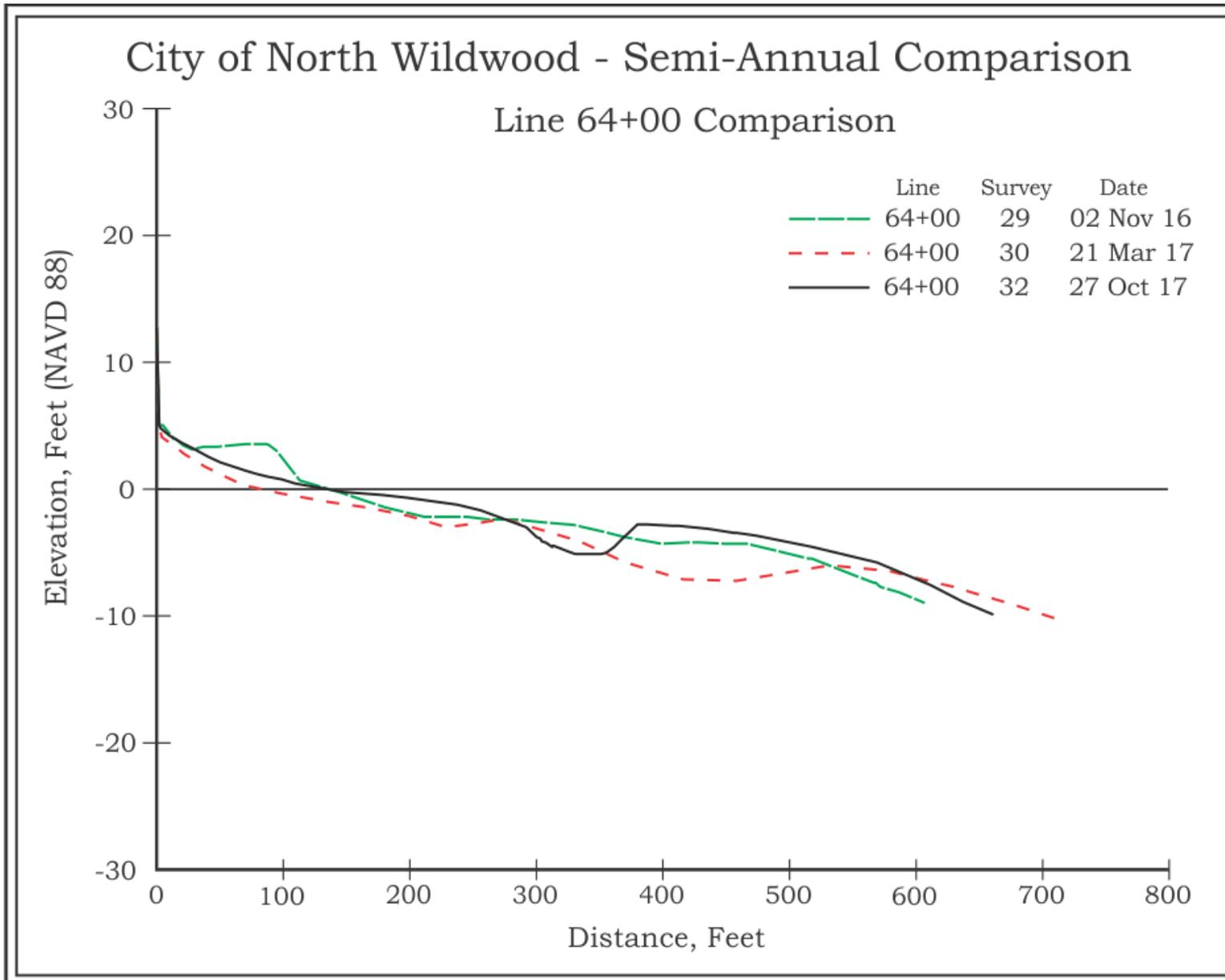


Figure 27. Between March and October, sand did accumulate at the base of the steel bulkhead. The sand volume added amounted to 4.63 yds³/ft. and the shoreline retreated 2 feet since last November. Sediment passes through this location because unless the shoreline advances seaward to the point where a dry beach is possible seaward of the steel bulkhead, no vertical accumulation of material is possible. Waves reflect off the wall and return the sand to the swash. It moves on past not up onto the beach.

Summary/Conclusions:

A previously very mild winter essentially began in mid-January with cold and northeast winds culminating in NE Storm Jonas January 23 and 24, 2016. Labeled a 10-year storm, this event cut into the dunes and stripped the beach elevation so that subsequent high tides still reached the dune scarp. The CRC conducted an emergency survey to document the impact for emergency management purposes in anticipation of the disaster declaration. Winter Storm Jonas left its mark at the north end with significant erosion concentrated between 2nd and 4th Avenues. Total sand volume losses of 115,556 cubic yards to the oceanfront beaches from this event were recorded (Table 1).

As a result, another iteration of the beach back-passing project, with source materials coming from excess sand seaward of the Wildwood stormwater outflow pipes and truck-hauled and placed on the eroded northern beaches of North Wildwood (171,000 cubic yards), was implemented. This project was completed in mid-May and surveyed by the CRC in June 2016. Final sand relocation, using bulldozed existing material, can be seen by the November 2016 survey at the northern oceanfront beaches (profile 04+00), in the form of an elevated and reconfigured dune crest.

At the north end, inlet dynamics, orientation to the northeast and tidal flow exposes this region to near continuous erosional processes associated with its proximity to Hereford Inlet. Offshore, the shoal system on the south side of Hereford Inlet lost significant material continuously throughout 2017 (figures 2 and 3). Areas of sand gain were limited to the central portions of the area, between 11th Ave. and 20th Aves. as well as offshore between 21st Ave. and Poplar Ave. Unfortunately, these sand volume gains (179,080 cubic yards) were offset by the considerable losses (400,730 cubic yards) yielding a cumulative volume loss of 221,650 cubic yards from October 2016 to October 2017 based on the data from the 200-foot cross sections surveyed (photo in Figure 3).

The common solutions between Wildwood's need to clear its eight storm drains on the beach and the sand loss erosion problem at the northern oceanfront beach in North Wildwood has made the sand back-passing operation a cost-effective and far easier methodology to accomplish than contracting with a major dredging company to mine sand from Hereford Inlet. However, permits should also be sought to continue hydraulic beach maintenance going forward on a 5-6 year schedule in the absence of either continued large scale sand recycling or the start of the anticipated US Army Corps of Engineers shore protection project. The NJ Div. of Coastal Engineering should be approached to renew the 2009 project scope, that if done to the level of half the initial sand volume (1.45 million CY), would reset the stage so that a stable oceanfront shoreline could be maintained using the sand back-passing methodology to, perhaps, greatly extend the time between hydraulic dredge projects.

The oceanfront engineered beach and inlet spring survey for 2017 will occur in mid-March, as conditions permit. If you have any questions regarding this report, please contact the Coastal Research Center at (609) 652-4245.