

**2015 ANNUAL REPORT - TO THE CITY OF NORTH WILDWOOD  
ON THE  
CONDITION OF THE CITY BEACHES**



*Aerial view of North Wildwood looking south from the Hereford Inlet perspective on June 24, 2015. The main channel is shown as the darker, smoother water running parallel to the North Wildwood Inlet beaches and along the rock revetment wall. A smaller secondary channel can be seen in this photo on the northern side of Champagne Island. Waves can be seen breaking on the shoal system at the northern portion of the oceanfront beaches. (Aerial photo taken by Ted Kingston)*

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# 2015 ANNUAL REPORT - TO THE CITY OF NORTH WILDWOOD ON THE CONDITION OF THE CITY BEACHES

## **Introduction:**

This annual report presents the status of the beaches within the City of North Wildwood for 2015. Smaller maintenance projects had taken place over the course of the year, including a sand backpassing effort from the Wildwood storm drains conducted in April and the dredging and placement of Beach Creek sediment on the northern beaches in October. A little over three years since Hurricane Sandy, the NJ coast is being negatively impacted by an El Nino winter where northeast storms are occurring with regularity and some degree of intensity. Storm data was limited to a long duration event just prior to the final survey in 2015. This early October event was followed by an extended period of mild, even warm weather until the New Year. January brought northeast storm Jonas followed by two days of northeast winds February 7<sup>th</sup> and 8<sup>th</sup>. Loss to beach elevation, scarps cut into dunes extended virtually the entire length of the North Wildwood coastline. The worst losses were observed at the north end beaches between 2<sup>nd</sup> and 5<sup>th</sup> Avenues, where beach and dune losses were extensive undermining the Gazebo and exposing the access manhole on the outflow pipe located at 3<sup>rd</sup> Ave.

In January 2013, following Hurricane Sandy, Congress passed Public Law 113-2 (Disaster Relief Appropriations Act of 2013) to restore all Federal shore protection projects (including beaches and dunes) within the impacted area. In North Wildwood those efforts included a beach nourishment project completed by Norfolk Dredging by July 2, 2013 to restore the municipal shoreline with the placement of 150,530 cubic yards of sand on the beaches and dunes at the south end and north end of the North Wildwood engineered beach.

## **2015 Weather Events:**

The spring of 2015 was unsettled with no major storms. There was a beneficial summer season of beach berm and dune building. There were no near miss hurricanes in 2015 with all east coast storms moving well offshore and out into the Atlantic. The first northeast event commenced in early October and lasted three days with 25 to 30 MPH wind gusts. The seas built to erosional levels and confined their damage to berm erosion. Following this event the weather turned warm, lasting through December. December has since been labeled the warmest December ever recorded. The winter 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. A lesser storm occurred February 7<sup>th</sup> and continued the erosion of the dune toe, easily done because the berm was still reduced in elevation. Both storms occurred in coincidence with a spring tide, so tidal surge flooding was significant and impacted bayside residents still recovering from Sandy.

This is an El Nino winter and the temperature increases in the central Pacific are some of the most extreme ever recorded. Expect the storm pattern to continue into early spring 2016.

## **North Wildwood Engineered Beach History/Performance:**

Included here is a brief description of the engineered beach timeline of events since construction in the fall of 2009. The initial beach nourishment project several years in development was co-sponsored by the City and the New Jersey Department of Environmental Protection (NJDEP) started in fall 2009 and was just short of the completion of construction when it was interrupted by the November 2009 northeast storm. The dredging company, Great Lakes Dredge and Dock, Inc. (GLDD), was forced off the beach by the storm (the third in a

nine-storm series) on November 11, 2009 with under 70,000 cubic yards of sand left to pump. That storm produced a US Presidential disaster declaration (DSR-NJ 1867) on December 22, 2009. This allowed the Federal Emergency Management Agency (FEMA) to review the losses to the community including the new beach (covered under Category "G" loss to parks and recreation facilities). Since the project was funded initially by a cooperative agreement with the NJDEP (75% of cost) and the City (25% of cost), the project qualified for 75% of the cost to replace the sand lost to the storm as a recovery, when and if the City determined to restore the project. GLDD completed the initial 2009 fill project during the fall of 2009; placing 1,400,000 cubic yards (cy) of sand between a point 600 feet west along the Hereford Inlet shoreline eastward to 2<sup>nd</sup> Avenue groin and tapered south 600 feet into the City of Wildwood. That winter had a particularly active storm season and as a result, the northeast beaches suffered substantial erosion as sand from the inlet area was moved to the area south of 6<sup>th</sup> Avenue. Another northeast storm in March 2010 removed an additional volume of sand impacting the southern end of the City (DR-NJ 1897).

In the spring of 2010, the City of North Wildwood entered into a restoration maintenance contract with GLDD to pump sand from the same borrow area and place some sand from 2<sup>nd</sup> Avenue south to 6<sup>th</sup> Avenue (the shoreline adjacent to Hereford Inlet and most affected by the storms). This work was partially funded by FEMA disaster relief money as a result of the two declared northeast storm events. Pumping resumed at 11<sup>th</sup> Avenue and continued south to the City of Wildwood boundary. Data collected by GLDD showed that the northern section of the beach received 58,000 CY of sand while the area to the south received 406,000 CY for a total of 464,000 cubic yards. This work was completed by July 10, 2010.

The El Nino phenomenon that dominated the 2009-2010 winters' strong northeast storm season abated and in the winter of 2010-2011 there were fewer northeasters or significant storms. One of the more memorable storms that affected the Cape May County shoreline during the winter of 2010-2011 was the Christmas Blizzard (Dec. 26<sup>th</sup>) which brought high winds and water levels and caused some beach erosion in parts of the county. Hurricane Irene made landfall in New Jersey on August 29, 2011 the engineered beach lost 82,252 cubic yards of sand. In response to losses from Irene the city once again made a commitment to restore eroded sand from the engineered beach. The City under FEMA DR-NJ 4021 incorporated a claim for Category "G" reimbursement. During the spring of 2012 the city proceeded with a sand back pass program to haul up to 96,000 cubic yards of sand from Wildwood Crest to the northern erosional zone between 2nd and 7th Avenues.

Hurricane Sandy made landfall near Atlantic City on October 29, 2012, resulting in North Wildwood losing 153,000 cubic yards of sand from the beaches. Norfolk Dredging commenced beach nourishment work on June 12, 2013 and by July 2, 2013 had placed 150,530 cubic yards of sand in North Wildwood. The project restored the beach to approximately 83% of the initial fill template volume. As such the project would again be eligible for FEMA reimbursement under Category "G" losses to an engineered beach project.

The 2013 beach project placed sand at the south end and north end of the North Wildwood engineered beach. The region in between was at or above design template and required no action to restore. In addition, natural recovery added to the placed sand totaling an amount of 283,285 cubic yards to the beach and the dunes. This means that the North Wildwood engineered beach recovered over half the 519,853 cubic yards of sand lost since Irene from the 2009 design template that was created originally. The placement of sand plus the natural recovery has brought the beach back to just 236,578 cubic yards below the 1.4 million cubic yard initial sand volume placed in 2009 (83.1% of the initial fill). Much of this reduced volume results from limits placed on the initial project beach extents. Regulatory agencies have curtailed further work along the Hereford Inlet portion of the initial project for endangered and threatened species reasons, plus the City of Wildwood had requested that the project end at 65+38 some 762 feet less than the original project extent. This reduction in project extent reduced the sand quantity necessary to restore the full design template. Therefore, the re-

defined North Wildwood beach project appeared to be near its revised design template as a result of both natural recovery and the sand placement volume calculated to restore the direct impacts of Hurricane Sandy by the end 2013.

Unfortunately rapid erosion occurred during the fall 2014 likely related to the 72 hours of onshore winds in October. By November the beach berm widths and elevations were dramatically reduced and the seaward dune slope exposed to wave run up in the recent project areas. At the northend waves cut into the dune slope along the seaward dune toe leaving a modest scarp. In front of the southern piers a similar trend occurred that intensified north to south. At 21<sup>st</sup> Street the dune remained stable and gained a veneer of sand but at 23<sup>rd</sup> Street a 2-3 foot high scarp was cut and by 26<sup>th</sup> Street the scarp increased to 6-7 feet as the seaward slope was cut landward to the crest. This erosion returned the beach to essentially its pre-Sandy configuration.

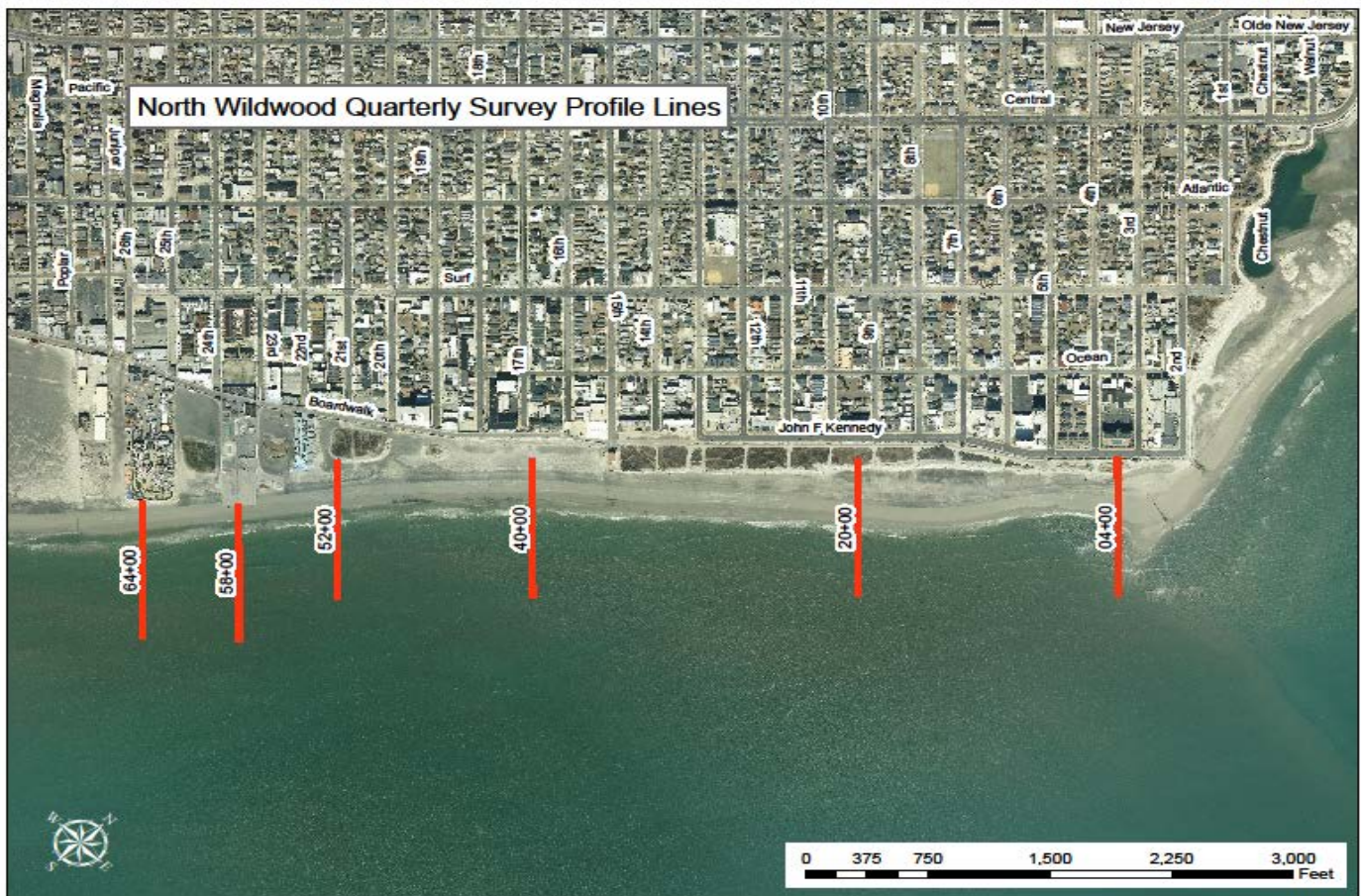
2015 was bookended with beach restoration projects that began in the first quarter of the year with a backpassing project with source materials coming from excess sand seaward of the Wildwood outflow pipes that were placed on the eroded northern beaches of North Wildwood (35,364 cubic yards). During the fall the much anticipated NJ Department of Transportation funded dredging of Beach Creek, located on the backside of Herford Inlet, was completed with the sand mined from this project placed on the northern oceanfront portions of North Wildwood's beaches (approximately 40,000 cubic yards), between the 2<sup>nd</sup> Avenue jetty and 7<sup>th</sup> Avenue.



## Oceanfront Beach Surveys:

The CRC surveyed shoreline changes at all 54 oceanfront profile stations two times in 2014 and two times in 2015 to depict 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-foot 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**; 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 erosional zone, the middle two sites show that sand has been deposited in the mid-section and the southern two sites document the changes in around the four piers south of 21<sup>st</sup> 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 surveys:

- Survey 20 April 2014
- Survey 21 November 2014
- Survey 23 April 2015
- Survey 25 October 2015



**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 April 2014 to November 2015. For each of the six profile stations descriptions and cross sections are provided to show typical changes over the year.



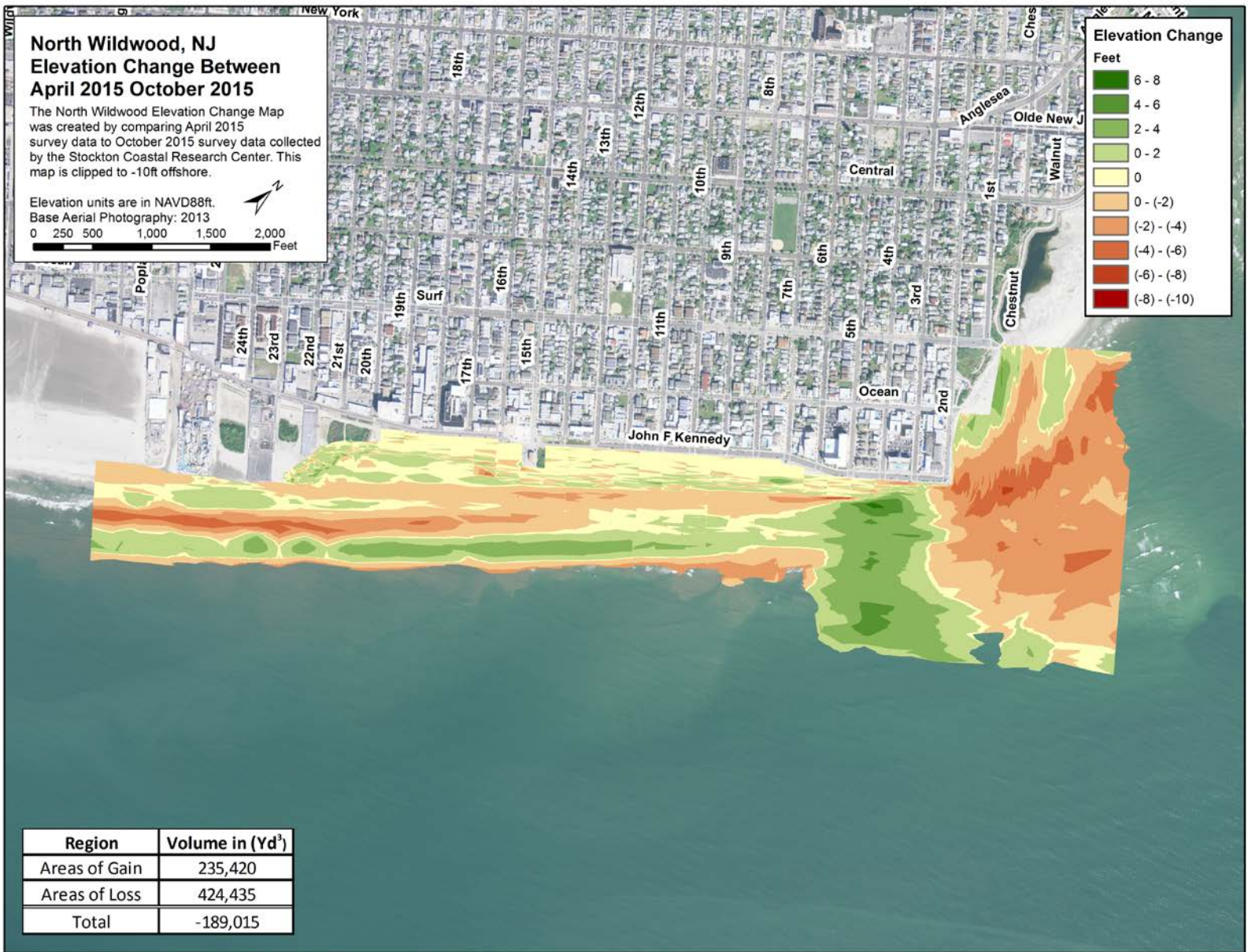


Figure 2. A digital elevation change map for the North Wildwood City shoreline. This elevation difference map of the North Wildwood City engineered beaches shows the change in elevations between April 2015 and October 2015 surveys. There is a dark green area of accretion concentrated around 4<sup>th</sup> Avenue. The reddish band that comprises much of the surveyed inlet area to the north of the 2<sup>nd</sup> Avenue jetty displays the significant losses experienced through 2015. A breakdown by region of sand volume gains vs losses is include in the volume change table on the map. Cumulative volume losses for the this time period amounted to 189,015 cubic yards concentrated in front of the southern piers and north of the 2<sup>nd</sup> Avenue jetty.



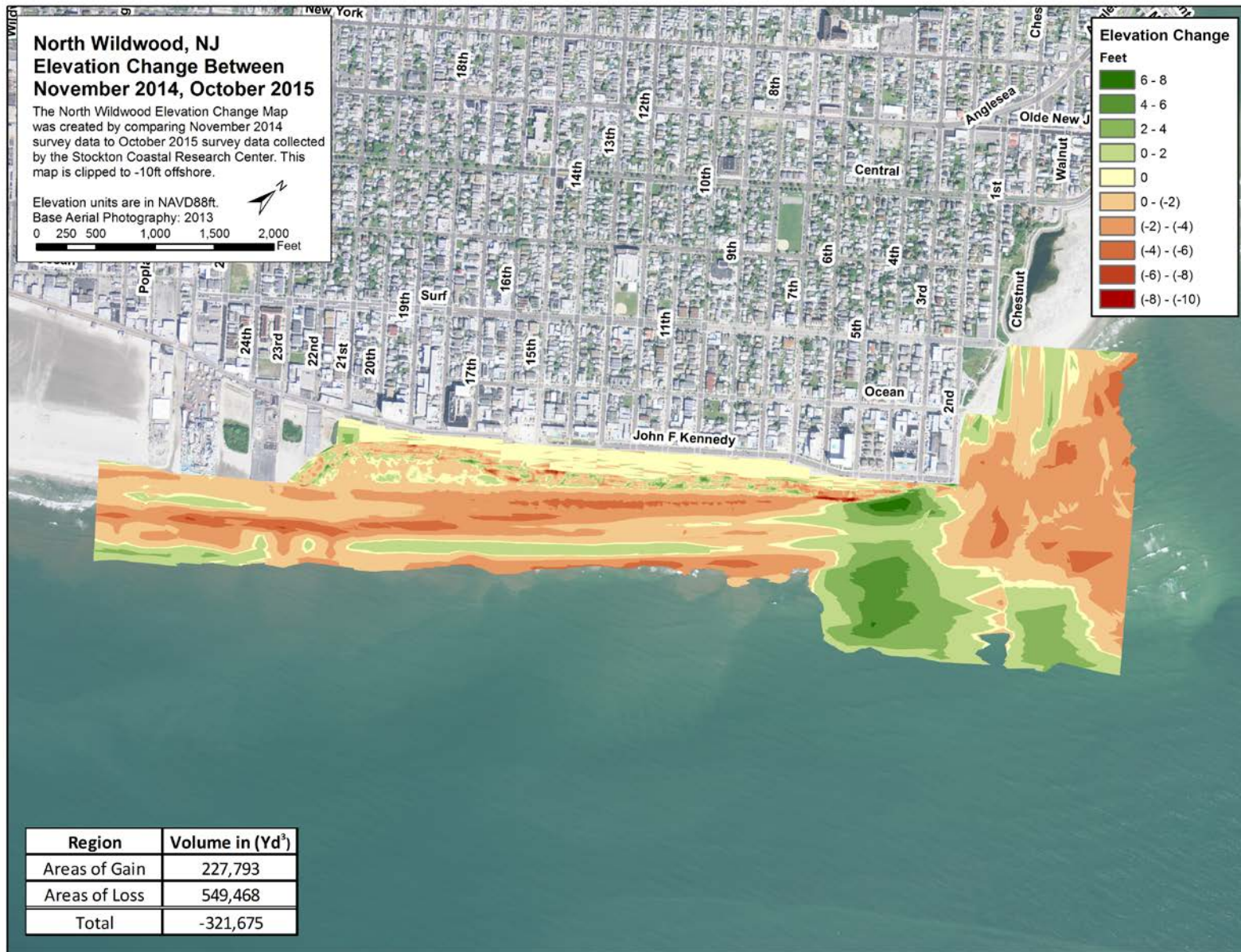


Figure 3. A digital elevation change map for the North Wildwood City shoreline showing the conditions of the engineered beach between the fall 2014 survey through the fall 2015 survey. Losses were concentrated in the nearshore regions along virtually the entire oceanfront beaches. Overall the beaches showed a loss of 321,675 cubic yards of sand for this annual comparison. The shades of color intensify with the magnitude of the change both positive and negative, with the yellow color showing regions with no change over the time interval.



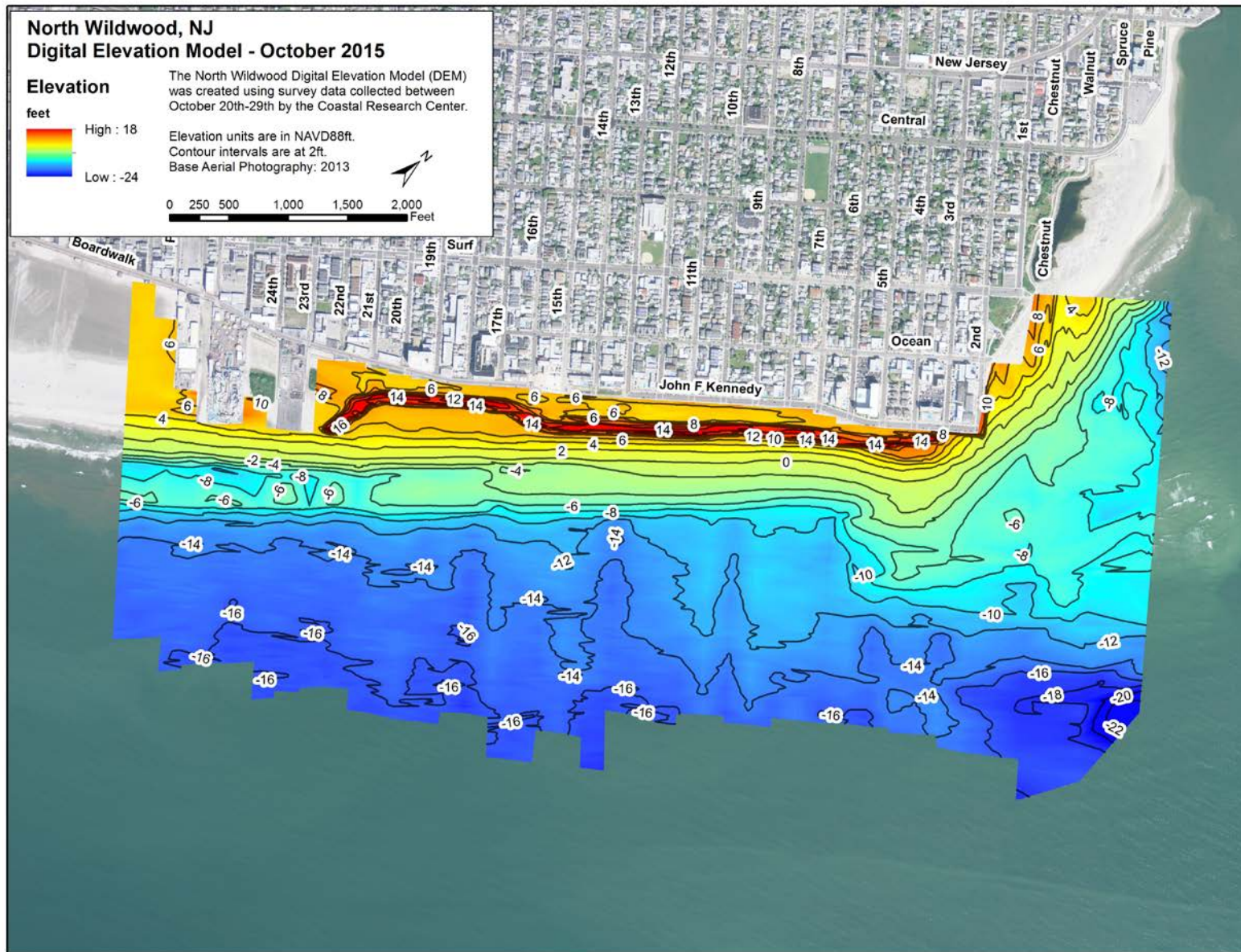


Figure 4. A digital elevation model for the North Wildwood City Shoreline. The higher elevations are colored red/orange and outline the dune and recreational beach regions. The green/blue colors represent the lower elevations nearshore and offshore. The darker blue colors in the upper right portion of the map just begin to clip the southern edges of the main inlet channel position as of October 2015.

## **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 2015. Beach volume and shoreline changes were calculated from November 2014 to October 2015.

### **Site 04+00 (between 3<sup>rd</sup> and 4<sup>th</sup> Avenues)**

The site is located in the northern portion of the island adjacent to Hereford Inlet 400 feet south of the 2<sup>nd</sup> Avenue jetty. This area has typically been an erosional shoreline due to the proximity to the inlet and the impact from northeast storms. During the 2013 restoration project to repair erosion caused by Sandy, Norfolk Dredging Company placed 83,022 cubic yards of sand in this region from the 2<sup>nd</sup> Avenue jetty to approximately 6<sup>th</sup> Avenue. Erosion occurred rapidly with a 3-foot high scarp cut into the beach berm on July 2, 2013 just as the project was completed.

From November 2013 through November 2014 the survey line at 04+00 and its surrounding areas remained relatively stable following the initial losses from the 2013 restoration project. Cumulative gains during this period amounted to 6.39 yds<sup>3</sup>/ft. with a negligible loss in shoreline position (0.15 feet) recorded. Throughout 2014, the inlet ebb-tidal flow has produced a substantial deposit of sand extending north into the inlet beyond the extent of the North Wildwood municipal development. Inlet surveys documented a far shallower platform extending well over a thousand feet seaward at elevations ending at -6.0 feet elevation during this time frame. The feature formed a submerged spit that could be walked at low tide to points 600 to 800 feet north of the jetty. These processes are likely related to the spectacular growth of South Point at Stone Harbor. The restricted tidal flow towards North Wildwood shoreline deposits sand in this location.

2015 was bookended with beach restoration projects that began with a backpassing project with source materials coming from excess sand seaward of the Wildwood outflow pipes that were placed on the eroded northern beaches of North Wildwood (35,364 cubic yards). During the fall the much anticipated NJ Department of Transportation funded dredging of Beach Creek, located on the backside of Herford Inlet, was completed with the sand mined from this project placed on the northern oceanfront portions of North Wildwood's beaches (approximately 40,000 cubic yards), between the 2<sup>nd</sup> Avenue jetty and 7<sup>th</sup> Avenue. Cumulative gains during this period, directly related to the Beach Creek project, amounted to a gain of 130.54 yds<sup>3</sup>/ft. with a significant gain in shoreline position of 165 feet recorded.



**Figure 5. View from 5th Avenue looking north taken on November 7, 2014 displaying trucked-in piles of sand at the seaward dune toe. Nearshore bar gains had taken place since April 2014 while the dune and beachface remained stable. From November 2013 to November 2014 the shoreline remained virtually unchanged while below datum gains of 8.81 yds<sup>3</sup>/ft. were recorded.**

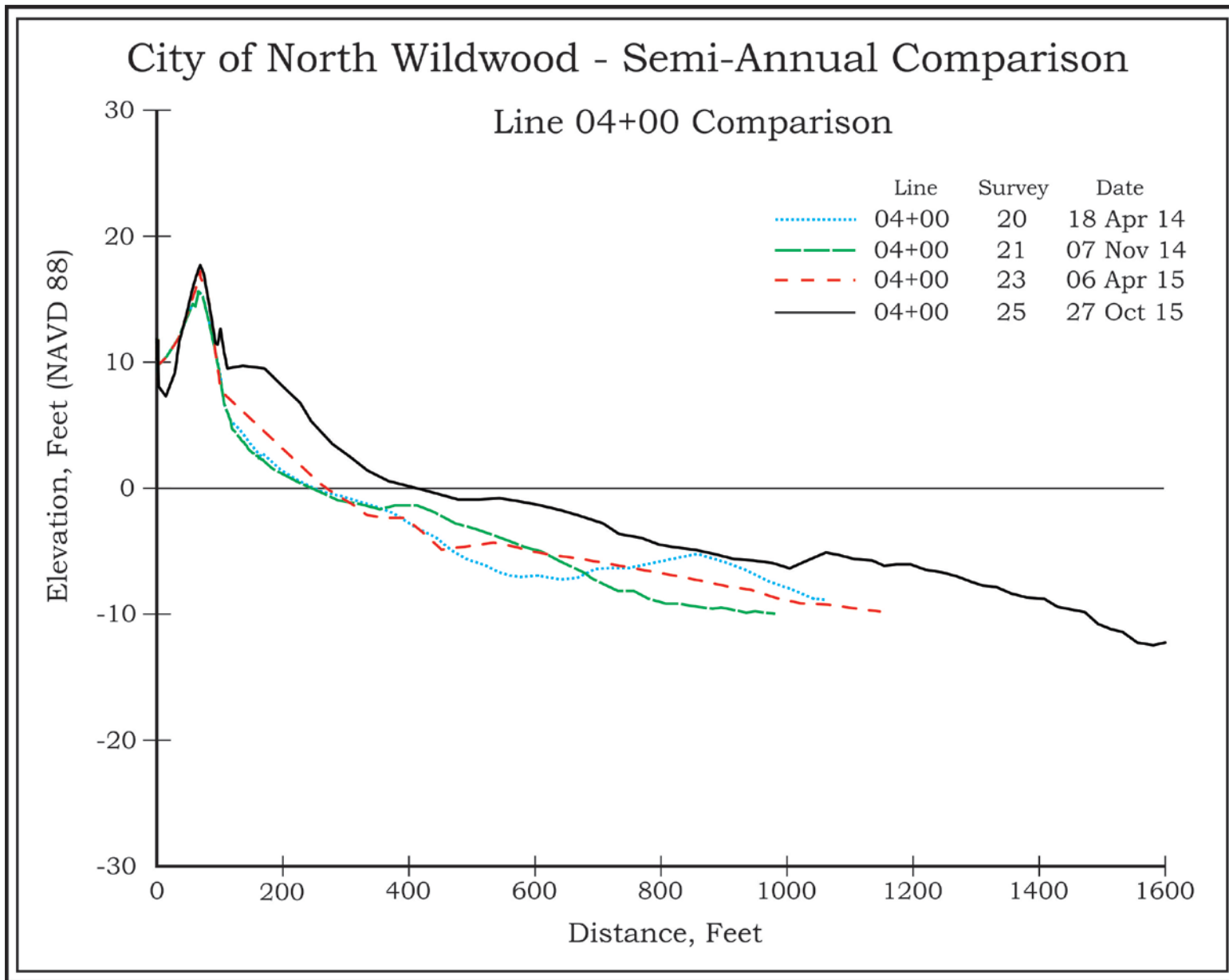


**Figure 6. View from 5<sup>th</sup> Avenue looking north taken on April 6, 2015. The primary dune configuration mirrors the November 2014 configuration while the beachface increased in elevation from the sand backpassing project from Wildwood beaches. Aeolian processes deposited sand along the seaward duneslope.**





**Figure 7. View from 5<sup>th</sup> Avenue looking north taken on October 3, 2015 following the northeast storm events and Hurricane Joaquin. A significant scarp in the seaward duneface is shown along with recreational beach elevation and shoreline losses observed.**



**Figure 8.** The dune and beach profile remained vulnerable through the November 2014 survey. By April 2015 the backpassing efforts can be seen on the elevation of the primary dunecrest and the recreational beach configuration. The placement of the Beach Creek dredged material is clearly seen by Survey 25, with significant increases in elevation to virtually the entire profile. The annual comparison from the fall 2014 to the fall 2015 revealed a cumulative volume gain of 130.54 yds<sup>3</sup>/ft. and a shoreline gain of 165 feet directly related to the Beach Creek dredging project.

**Site 20+00** (between 9<sup>th</sup> and 10<sup>th</sup> 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. Hurricane Sandy had temporarily reversed this trend as the storm waves and surge severely eroded the beachface and recreational beach berm that reduced the overall dry beach width by 160 feet. The dune was unaffected by the storm due to the 400-foot wide beach attenuating the breaking waves and absorbing the energy before they reached the dunes. Despite the severe erosion the beach remained over 250 feet wide and supports recreational activities and continued to provide sufficient storm protection for the dune and oceanfront properties and infrastructure. The beach was still within the design template configuration parameters. As a result no sand was placed in this region during the 2013 maintenance project.

The profile site at 20+00 benefited from downdrift material from the northern end of North Wildwood beaches advancing its shoreline position and recreational beaches. However, from November 2013 through November 2014 the survey line at 20+00 and its surrounding areas were dominated by erosional processes. The berm, beachface, and nearshore region had lost material to the offshore.

This erosional trend continued through the spring and fall surveys conducted by the CRC in 2015. The recreational beach and berm were significantly reduced with the material shifting outside our profile limits. The annual comparison from the fall 2014 to the fall 2015 yielded a shoreline retreat of 52 feet and cumulative losses of 70.07 yds<sup>3</sup>/ft.



**Figure 9. View to the north taken from the berm at 13<sup>th</sup> Avenue on November 10, 2014. The beachface began to erode from the berm seaward but maintained an elevation around 6ft NAVD 88 in the recreational beach region.**

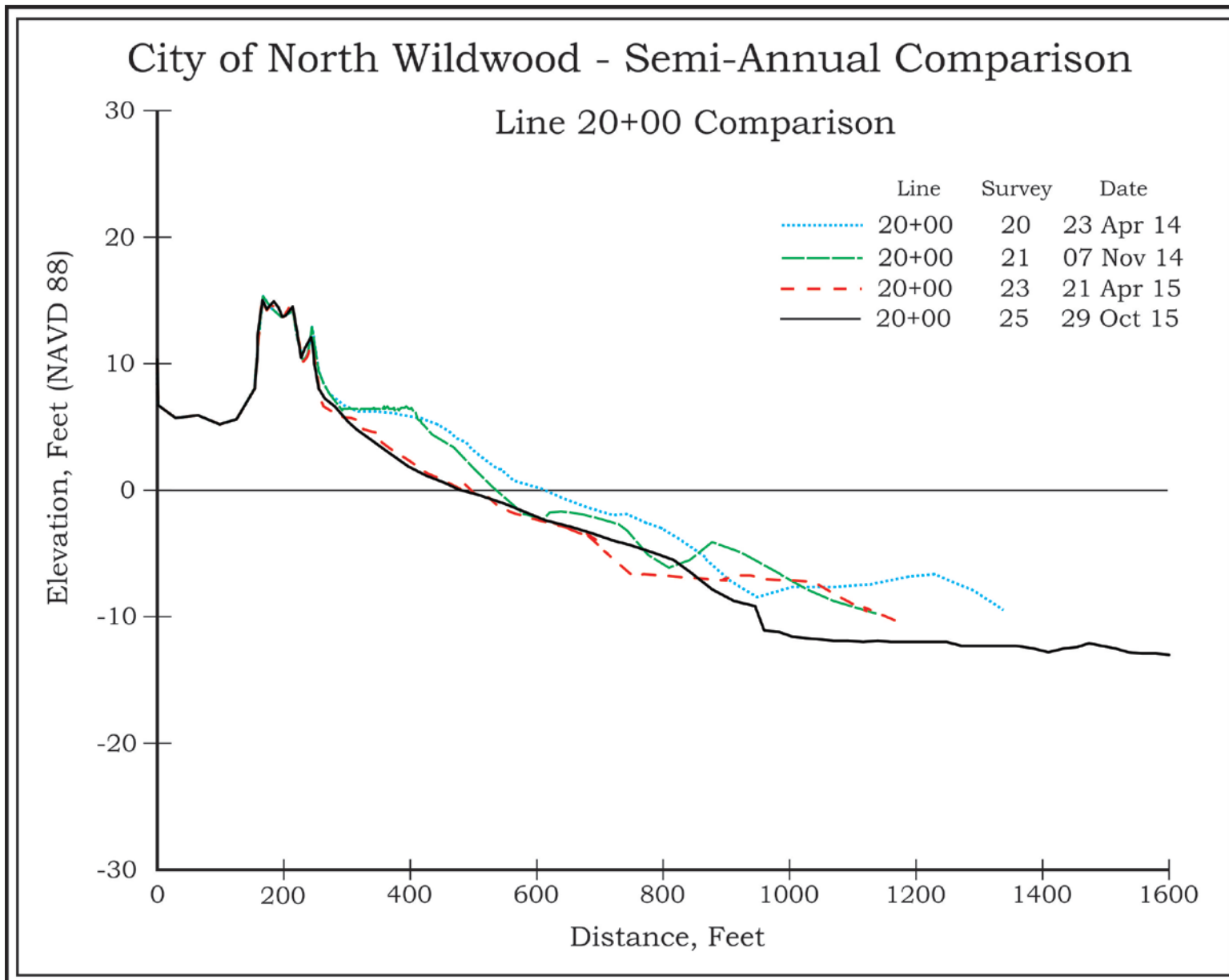




**Figure 10. View to the north taken from the foredune at 12<sup>th</sup> Avenue on April 21, 2015. The foredune toe, recreational beach, and beachface eroded significantly with sand shifting outside the profile limits.**



**Figure 11. View to the north taken from the foredune at 13<sup>th</sup> Avenue on November 2, 2015. The beachface eroded slightly from the April survey. For the November 2014 to October 2015 comparison the shoreline position retreated 52 feet with material shifting offshore.**



**Figure 12.** The beachface and nearshore regions were dominated by erosion throughout 2015. Material continued to shift offshore beyond the survey limits of this profile. The foredune toe also displayed erosional effects by Survey 23. Overall from Survey 21 to Survey 25 the shoreline retreated 52 feet and recorded volume losses of 70.07 yds<sup>3</sup>/ft.

**Site 40+00** (between 18<sup>th</sup> and 19<sup>th</sup> Avenues)

Positioned 4,000 feet south of the 2<sup>nd</sup> 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 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. Prior to Sandy the beach width extended seaward of the dune system approximately 575 feet.

From November 2013 through November 2014 the survey line at 40+00 and its surrounding areas remained relatively stable. By the spring 2014 survey a marginal scouring had taken place at the seaward dunetoe which remained through the subsequent survey. A landward repositioning of the offshore bar had taken place by the fall 2014 survey as well as nearshore elevation gains. From the fall 2013 to the fall 2014 survey interval the shoreline retreated 24 feet and minimal volume losses (10.30 yds<sup>3</sup>/ft.) were recorded.

Both the primary dune and foredune remained stable through both the spring 2015 and fall 2015 surveys. Although the beachface and nearshore regions eroded throughout 2015, the upper recreational beach (approximately 250 feet from the seaward dunetoe) remained relatively stable. The annual comparison from the fall 2014 to the fall 2015 yielded a shoreline retreat of over 85 feet and cumulative losses of 64.17 yds<sup>3</sup>/ft.

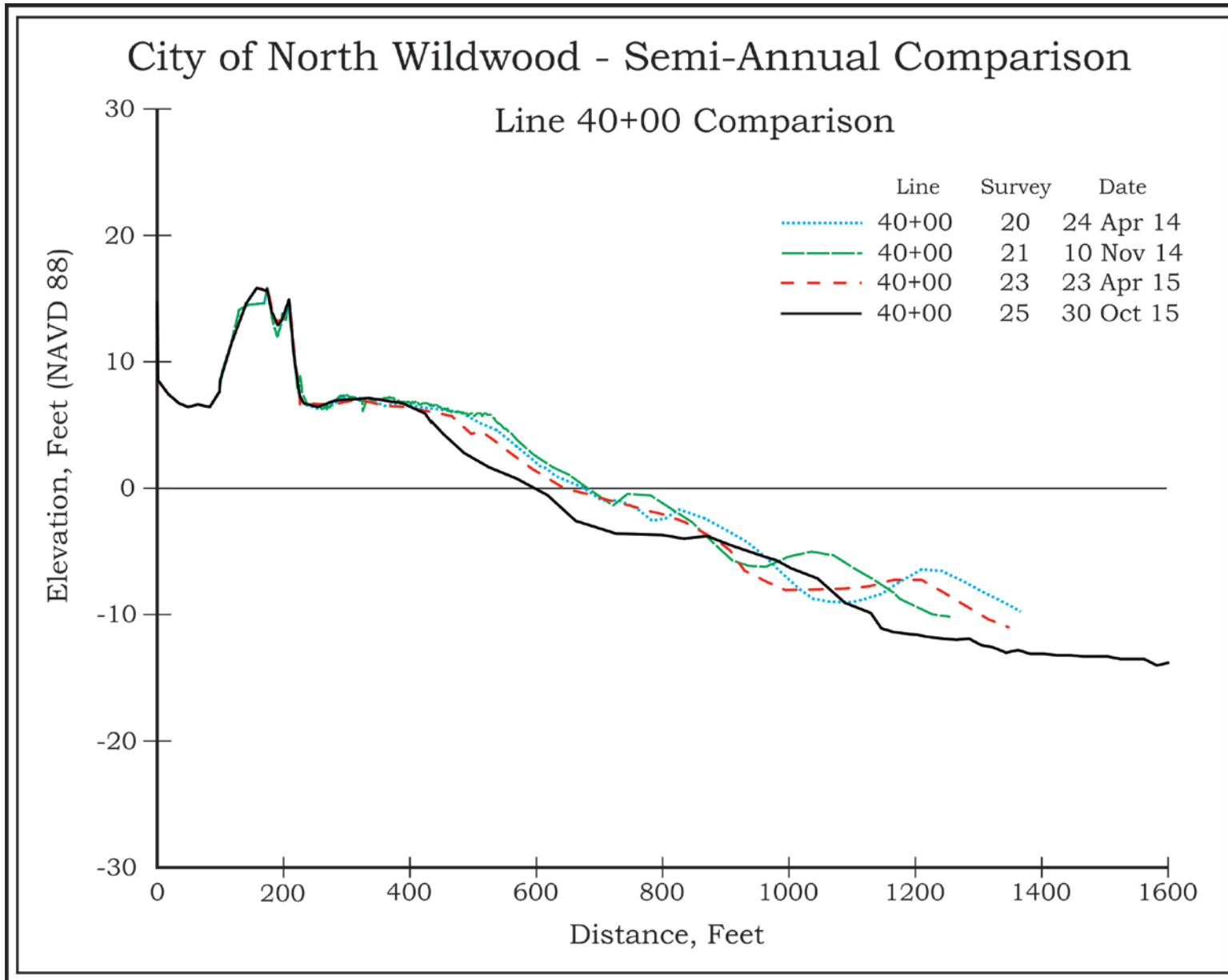


**Figure 13.** View to the north from the beach located near 18<sup>th</sup> Avenue on April 25, 2014. The recreational beach berm width is massive extending seaward approximately 300 feet from the dune toe at between elevations 6-7 feet NAVD88.





**Figure 14. View to the north from the beach located near 19<sup>th</sup> Avenue on October 30, 2015. The berm and recreational beach had eroded over 100 feet since the fall 2014 survey with sand shifting beyond the profile limits.**



**Figure 15.** For the annual comparison (Survey 21 to Survey 25) the recreational beach and berm position remained relatively stable. Cumulative volume losses of 64.17 yds<sup>3</sup>/ft. were recorded with a modest shoreline retreat of 85 feet. The offshore bar had migrated outside the profile limits by the October 2015 survey.

**Site 52+00** (between 21<sup>st</sup> and 23<sup>rd</sup> Avenues)

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 initially begun its seaward jog in its alignment from just seaward of the boardwalk to run seaward of the eastern ends of the southern piers.

Located just north of the northern fill taper of the pier section for the 2013 project this site did not receive sand directly but likely benefited from sand runoff from the project area. By the end of June 2013 the beachface accumulated sand that expanded the beach berm width nearly 40 feet. Sand also filled in the nearshore scour trough cut by Sandy and Saturn over the summer and fall as sand moved longshore and cross-shore towards this beach. During the second half of 2013 the site gained a net 13.25 yds<sup>3</sup>/ft. of sand added both onshore and nearshore as well as Aeolian sand added to the seaward dune slope.

The primary dune accreted sand through both the spring 2015 and fall 2015 surveys while the recreational beach and beachface eroded material during this time. By Survey 25 the nearshore and offshore regions experienced significant losses of sand beyond the end of the surveyed profile. The annual comparison from the fall 2014 to the fall 2015 yielded a shoreline retreat of over 40 feet and cumulative losses of 60.86 yds<sup>3</sup>/ft. (52.71 yds<sup>3</sup>/ft. below the datum).

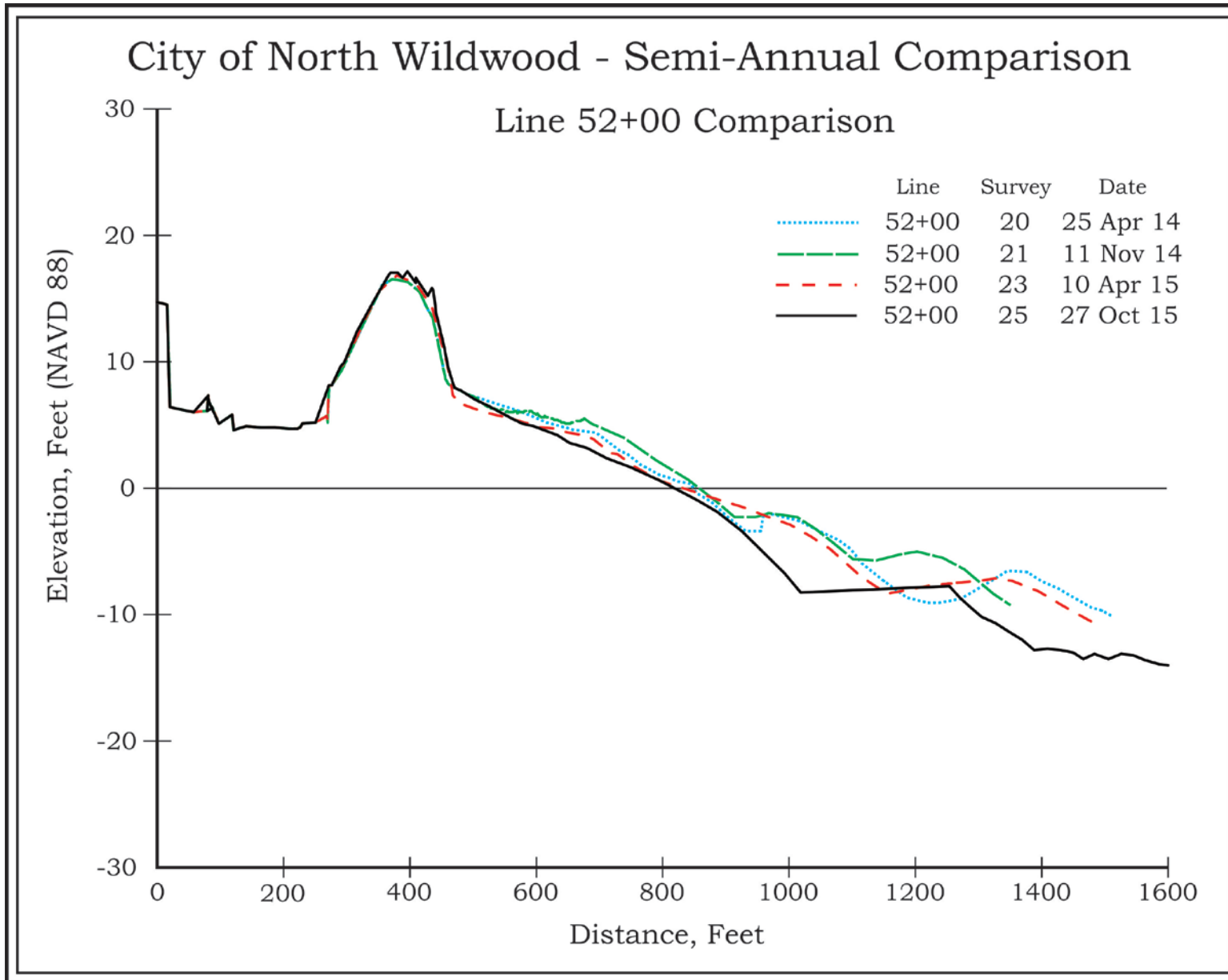


**Figure 16.** View to the south from the beach located near 22<sup>nd</sup> Avenue on April 25, 2014. This location did not receive any sand directly during the 2013 beachfill. Erosional processes prevailed in 2014 overall but the wider beach width seaward of the dune allowed for Aeolian sand to be deposited at the dunecrest.





**Figure 17.** View to the south taken from the beachface at 21<sup>st</sup> Avenue on April 23, 2015. The recreational beach and beachface began to erode at this time and continued throughout the remainder of 2015.



**Figure 18. The recreational beach and beachface experienced an erosional trend overall during 2015. Aeolian accretion at the dune crest and seaward dune face can be seen by Survey 23. For the November 2014 to October 2015 comparison the net volume change was a loss of 60.86 yds<sup>3</sup>/ft. of sand with a moderate shoreline position retreat of 40 feet.**

**Site 58+00 (24<sup>th</sup> Avenue)**

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 seaward jog in the dune system has made them vulnerable 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 feature suffered severe erosion. During Sandy the proximity of the dunes to the shoreline, made them no match for this event. Dunes were entirely washed away south of 22<sup>nd</sup> Avenue and the beachface and berm flattened by the storm waves and surge.

As a result of this damage the city initiated a beach maintenance project in 2013 to restore the engineered beach seaward of the piers. Norfolk dredging placed 67,508 cubic yards of sand in this region to rebuild the dune and beach to approximate design template. The dune was reconstructed to a crest elevation of 12 feet NAVD88 and approximately 100 feet wide at the toe. A recreational berm was built that extended over 100 feet seaward of the dune toe at elevation 7 NAVD88. Again rapid erosion followed the project and by the end of June 2013 a 2.5 foot high beach scarp was cut into the berm as the beachface retreated under the wave climate.

By the spring 2014 survey (April 25<sup>th</sup>) the dune had been eroded to a point where the City was forced to reposition this feature landward of the easternmost point of the piers. This allotted for a wider beach area configuration seaward of the dune system to capture Aeolian sand transported to the duneface and aligned with planned federal project specifications.

Over the 2014 and into the 2015 winter months the recreational beach in front of the 24<sup>th</sup> Avenue pier had begun to erode and lose elevation. By the April 2015 survey the beach and beachface recorded an elevation loss of around 2 feet. The milder weather patterns over the summer months allowed for a minor shoreline advance by the October survey (Survey 25). The annual comparison from the fall 2014 to the fall 2015 yielded a minimal shoreline retreat of 10 feet and cumulative losses of 28.45 yds<sup>3</sup>/ft.

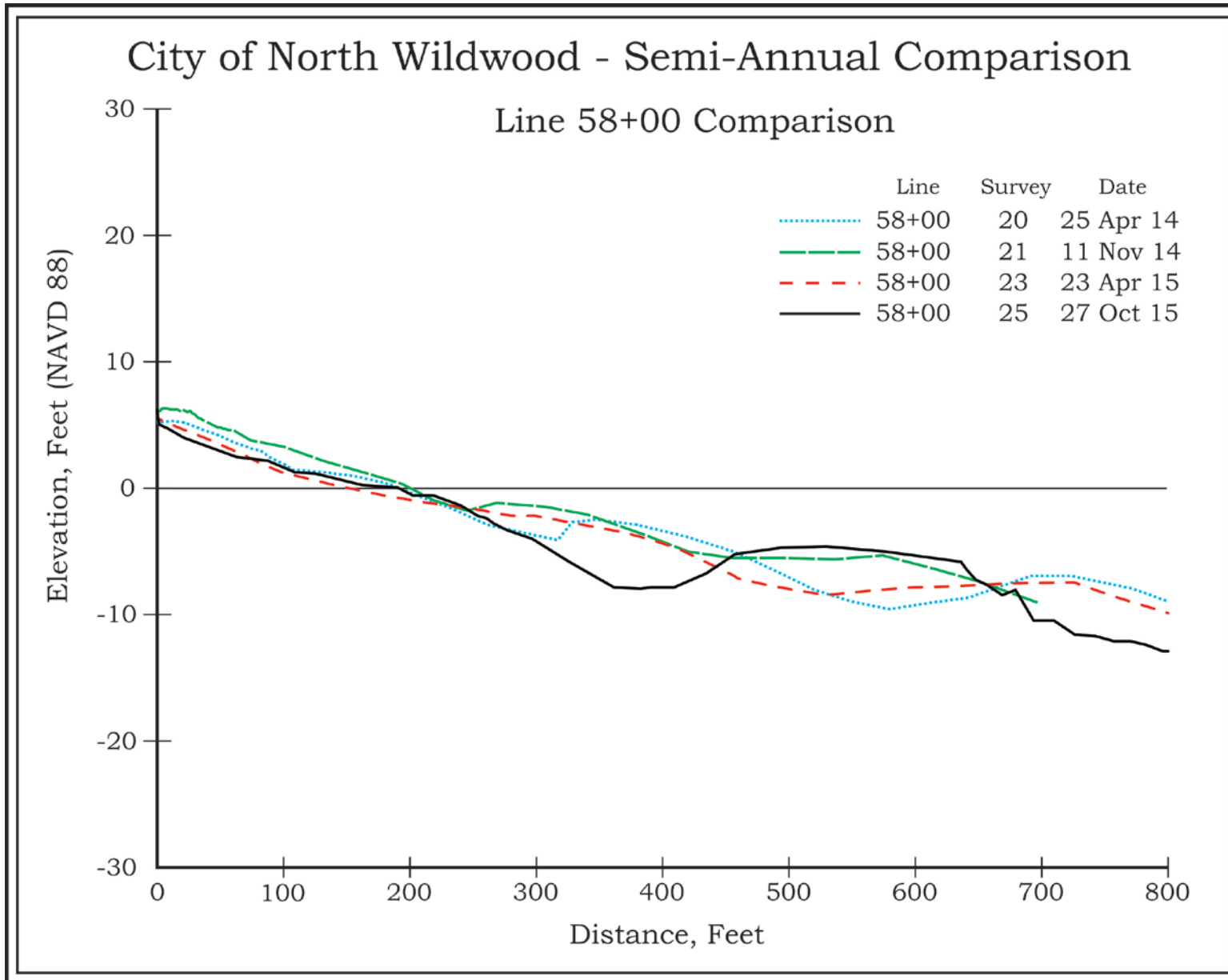


**Figure 19. View to the north taken on November 11, 2014 near 25<sup>th</sup> Avenue showing the configuration of the beachface. The two surveys conducted in the spring and fall 2015 revealed approximately a 2-foot lower elevation in this region than that pictured above.**





**Figure 20.** A close up view of the dune looking to the south from the berm located near 23<sup>rd</sup> Avenue on October 30, 2015. The low elevation of the beach is clearly displayed resulting in a small scarp to the seaward dune toe.



**Figure 21. Natural erosion of the constructed dune system forced the landward repositioning of this feature in early 2014. By the April 2014 survey there is no visible remnants of the original dune. The nearshore and offshore bars shifted landward by Survey 21 adding to the beach elevation. This added elevation was eroded throughout 2015 which resulted in total annual volume losses of 28.45 yds<sup>3</sup>/ft. and a minor shoreline retreat of 10 feet.**

**Site 64+00** (between 25<sup>th</sup> and 26<sup>th</sup> 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 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 has resulted in multiply 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.

Hurricane Sandy struck the New Jersey shoreline following completion of restoration efforts to replace losses suffered during Hurricane Irene. A narrow lower elevation dune ridge was rebuilt with a modest beach berm to help protect the pier steel bulkhead from wave impact. Sandy's waves and storm surge flattened the beach and dune but the steel bulkhead held and protected the pier and water park from direct wave impact once the sand eroded under the fury of the storm.

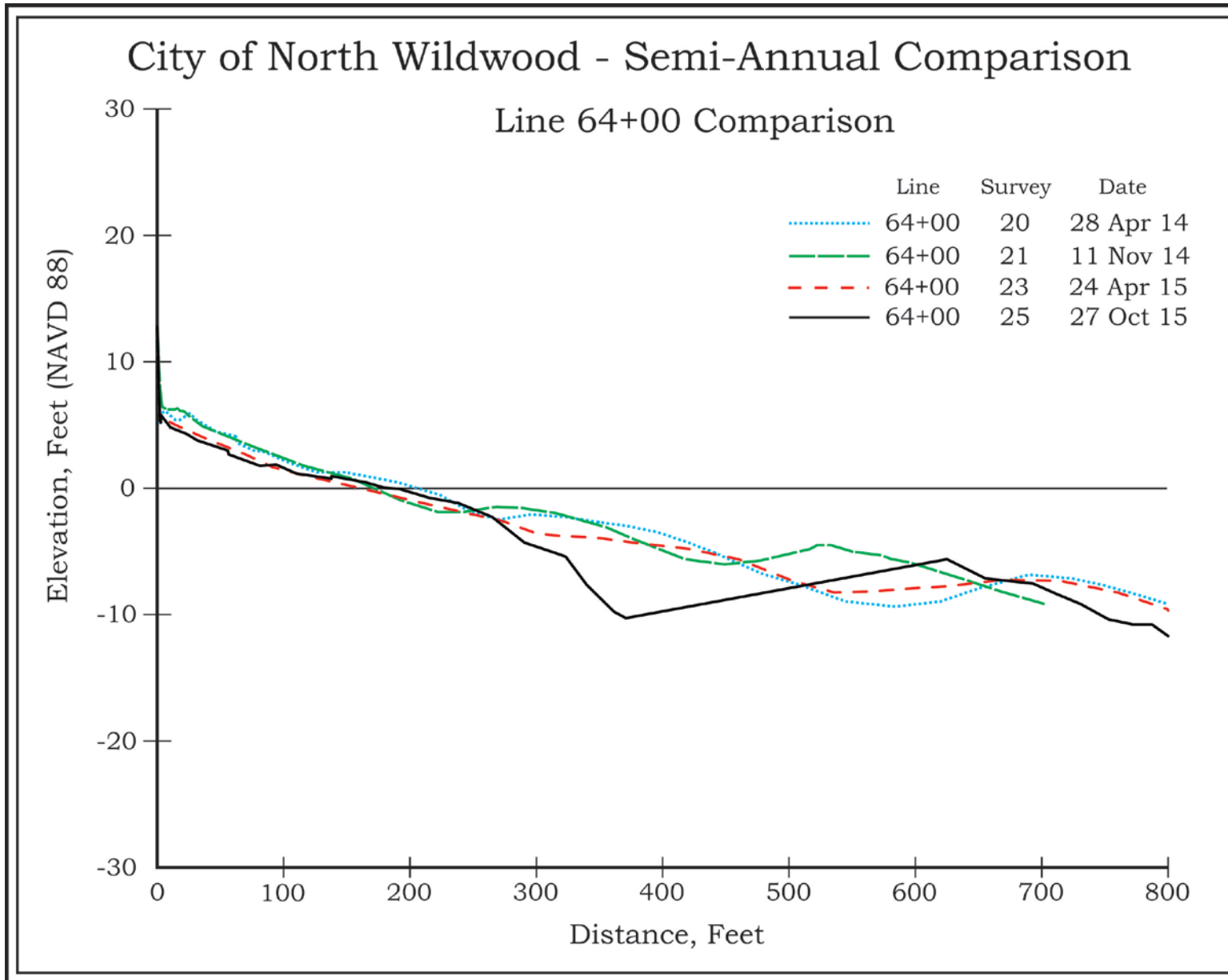
Like the profile at Line 58+00 located to the north, by the spring 2014 survey (April 25<sup>th</sup>), the dune had been eroded to a point where the City was forced to reposition this feature landward of the easternmost point of the piers. This also allotted for a wider beach area configuration seaward of the dune system to capture Aeolian sand transported to the duneface. From June 26, 2013 to November 11, 2014 the shoreline continued to retreat (156 feet overall).

Similar to profile 58+00 located to the north, the early 2015 winter months eroded the recreational beach at this location. By the April 2015 survey the beach recorded an elevation loss of between 1 and 2 feet. The milder weather patterns over the summer months allowed for a minor shoreline advance by the October survey (Survey 25). The annual comparison from the fall 2014 to the fall 2015 yielded a minimal shoreline retreat of 14 feet and cumulative losses of 39.68 yds<sup>3</sup>/ft.



**Figure 22. View to the north taken on April 28, 2014 from near 26<sup>th</sup> Avenue showing the extent of dune erosion and repositioning of the initial dune system landward of the eastern-most portion of the southern piers. As a direct result of the initial position of this protection feature being constructed seaward of the piers, by February 2014 the majority of the dune system had eroded.**





**Figure 23. Natural erosion of the constructed dune system forced the landward repositioning of this feature in early 2014. The 2015 survey seasons were marked by erosional process both on the beach and into the offshore regions of this profile. Although the shoreline did advance 14 feet for the annual comparison, 39.68 yds<sup>3</sup>/ft. were lost.**

**Winter Storm Jonas:**

Table 1 below summarizes the shoreline and volume changes to North Wildwoods’ oceanfront beaches recorded by the Coastal Research Center immediately following Winter Storm Jonas. Survey 25 (October 2015) was compared to Survey 26 (January 2016) and clearly displays the erosional zone at the northern portion between 2<sup>nd</sup> and 4<sup>th</sup> Avenues (Lines 00+00 to 08+00). The gains observed between lines 08+00 to 20+00 were a direct result of the NJ Department of Transportation funded placement of Beach Creek dredge materials in the immediate area. Continuing south, this erosional trend returned down to line 48+00 near 20<sup>th</sup> Avenue.

<b>Table 1: NORTH WILDWOOD OCEANFRONT</b>					
<b>Survey 25 (October 2015) vs. Survey 26 (January 2016 - Post - Jonas) - (00+00 - 68+00)</b>					
<b>Profile Number</b>	<b>Shoreline Change (feet)</b>	<b>Volume Change (yds<sup>3</sup>/ft)</b>	<b>Avg. Volume Change (yds<sup>3</sup>/ft)</b>	<b>Cell Distance (feet)</b>	<b>Net Volume Change (yds<sup>3</sup>)</b>
00+00	-82	-74.369			
			-111.5465	400	-44618.6
04+00	-178	-148.724			
			-62.474	400	-24989.6
08+00	75	23.776			
			52.726	400	21090.2
12+00	220	81.675			
			49.780	400	19,912
16+00	31	17.884			
			7.839	400	3,135
20+00	-28	-2.207			
			-9.335	400	-3,734
24+00	-42	-16.462			
			-16.838	400	-6,735
28+00	-47	-17.213			
			-16.113	400	-6,445
32+00	-42	-15.013			
			-15.456	400	-6,182
36+00	-34	-15.898			
			-17.607	400	-7,043
40+00	-42	-19.315			
			-14.808	400	-5,923
44+00	-41	-10.301			
			-13.485	400	-5,394
48+00	-64	-16.668			
			-0.657	400	-263
52+00	-65	15.354			
			12.887	400	5,155
56+00	-35	10.419			
			14.071	400	5,628
60+00	-50	17.723			
			16.402	400	6,561
64+00	-86	15.081			
			-10.572	400	-4,229
68+00	-110	-36.225			
<b>Total Volume Change for Oceanfront Beaches in cubic yards =</b>					<b>-54,074</b>



**Figure 24. A close up view of the exposed seawall looking to the south at 2<sup>nd</sup> Avenue on January 25, 2016. Winter Storm Jonas eroded sand in this area completely exposing the wall at virtually all stages of the tide cycle.**



**Figure 25. View to the north following Jonas taken at 5<sup>th</sup> Avenue on January 25, 2016. The storm caused severe erosion to the beach and dune system creating the large scarp seen in the dune and the remainder of the sand from the Beach Creek dredge material pile.**





**Figure 26. A close up view of the dune looking to the north from the beach located near 22<sup>nd</sup> Avenue on January 27, 2016. Jonas caused severe erosion to the dune where a large scarp can be seen.**

## **Summary/Conclusions:**

Two smaller beach restoration projects that began in the first quarter of the year with a backpassing project with source materials coming from excess sand seaward of the Wildwood outflow pipes that were placed on the eroded northern beaches of North Wildwood (35,364 cubic yards). During the fall the much anticipated NJ Department of Transportation funded dredging of Beach Creek, located on the backside of Herford Inlet, was completed with the sand mined from this project placed on the northern oceanfront portions of North Wildwood's beaches (approximately 40,000 cubic yards), between the 2<sup>nd</sup> Avenue jetty and 5<sup>th</sup> Avenue.

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 gained material continuously throughout 2015 (figures 2 and 3). However, losses were concentrated in the beachface and nearshore regions along virtually the entire oceanfront beaches yielding a cumulative volume loss of 321,675 cubic yards from November 2014 to October 2015 (figure 3).

2015 began with no major northeast storms, few minor events through late summer, and no near miss hurricanes with all east coast storms moving well offshore and out into the Atlantic. None the less, sand volume losses dominated the winter to spring survey data. Accretion was limited to the northern most portions of the municipal oceanfront beaches aided by the bulldozing effort conducted in the spring. By April 2015, the vast majority of the sites showed negative sand volume changes with substantial loss spread across the municipal beachfront. In total, cumulative losses amounted to 182,026 cubic yards for the semi-annual comparison (November 2014 to April 2015).

The first significant northeast event commenced in early October and lasted three days with 25 to 30 MPH wind gusts. The seas built to erosional levels and confined their damage to berm erosion. Following this event the weather turned warm, lasting through December. December has since been labeled the warmest December ever recorded. The winter 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 should there be a disaster declaration.

Winter Storm Jonas left its mark at the north end with significant erosion concentrated between 2<sup>nd</sup> and 4<sup>th</sup> Avenues. A loss of 54,074 cubic yards to the oceanfront beaches from this event were recorded (Table 1). Areas of gain between lines 08+00 to 20+00 were a direct result of the NJ Department of Transportation funded placement of Beach Creek dredge materials in the immediate area. This material buffered the wave approach and acted as a barrier to protect the vulnerable dune system.

The oceanfront engineered beach and inlet spring survey for 2016 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.