

**2012 ANNUAL REPORT - TO THE CITY OF NORTH WILDWOOD  
ON THE  
CONDITION OF THE CITY BEACHES**



View taken June 15, 2012 showing North Wildwood, Hereford Inlet and Seven-Mile Beach. The back pass operation was complete and the beach stands in bold relief against the dune system backing it up. Note that the shoreline tapers to a minimal width at the Hereford Inlet jetty with sand deposited along the No. Wildwood inlet shoreline. Large ebb-tidal shoals surround Hereford Inlet and are the repository for both island's beach nourishment sand.

**PREPARED FOR: THE CITY OF NORTH WILDWOOD  
901 ATLANTIC AVENUE  
NORTH WILDWOOD, NJ 08260**

**PREPARED BY: THE RICHARD STOCKTON COASTAL RESEARCH CENTER  
30 WILSON AVENUE  
PORT REPUBLIC, NJ 08241  
APRIL 2013**

## TABLE OF CONTENTS

Introduction	1
Impact from Hurricane Irene	2
Hurricane Sandy	2
Oceanfront Beach Surveys	4
Figure 1 Location of six of the 54 profile stations presented in this report	4
Figure 2 Elevation of the dunes, beach, and nearshore following Hurricane Sandy	5
Figure 3 Digital elevation comparison October to November 2012 pre- to post-Sandy	6
Figure 4 Digital elevation comparison for FEMA reimbursement	7
Individual Oceanfront Site Reviews	8
Figures 5, 6, 7 & 8 Site 04+00 photographs and cross sections	8
Figures 9, 10 Site 20+00 photograph and cross sections	12
Figures 11, 12 Site 40+00 photograph and cross sections	14
Figures 13, 14 Site 52+00 photograph and cross sections	16
Figures 15, 16 Site 58+00 photograph and cross sections	18
Figures 17, 18, & 19 Site 64+00 photograph and cross sections	20
Summary	23

# **2012 ANNUAL REPORT - TO THE CITY OF NORTH WILDWOOD ON THE CONDITION OF THE CITY BEACHES**

## **Introduction:**

Over the course of the last four years there has been five Presidential disaster declarations made for New Jersey's coast in response to three northeast storms and two hurricanes, starting with a strong nor'easter November 11-13, 2009 to most recently Hurricane Sandy on October 29, 2012. Hurricane Irene passed over the NJ coastline making the first hurricane landfall since 1903. The North Wildwood beaches had remained relatively stable after Hurricane Irene with erosion concentrated in two zones along the northern shoreline and near the piers while sand accumulated towards the middle of the shoreline prior to Hurricane Sandy.

Following Hurricane Irene, the CRC surveyed the shoreline at each of the 54 profile locations (represented in the September 22, 2011 data). That analysis was submitted to the City and FEMA under DR-NJ 4021 and represented a gross loss of 82,252 cy of sand. This loss was divided unequally between the dune system protecting the piers (1,508 cy) and the northern segment between 2nd Avenue and 6th Avenue (80,809 cy). These losses were communicated to the FEMA disaster team and were incorporated into a claim for Category "G" reimbursement. In response to losses from Irene the city once again made a commitment to restore eroded sand from the engineered beach. 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 2<sup>nd</sup> and 7<sup>th</sup> Avenues.

This past year was dominated by relatively calm weather and seas from December through most of October 2012. Conditions deteriorated rapidly with the approach of Hurricane Sandy and its eventual landfall near Atlantic City, New Jersey about 8 p.m. ET on October 29, 2012. "Post-Tropical Cyclone Sandy", still packed hurricane-force winds as it moved onshore but had lost the characteristics of a tropical storm about an hour before land fall. Sandy was the second named storm to have struck New Jersey in less than two years following Irene which made landfall in August 2011. Sandy's strength, angle of approach and arrival during full moon high tides combined to produce a record storm surge of water into New York City and along the northern New Jersey shoreline. North Wildwood located to the south of the eye putting it on the weaker storm quadrant avoided the full wrath of Sandy's strongest winds that topped 90 mph and storm surge, sparing the community from potentially facing similar devastation of property seen in Ocean and Monmouth Counties. The city also benefited significantly from recent storm preparedness actions taken to bolster the width of the beach and develop a continuous dune system along the oceanfront beaches. As a result Sandy's storm surge and waves caused only modest property and infrastructure damage along the North Wildwood oceanfront compared to the devastation other New Jersey communities suffered. The engineered beach performed as designed absorbing the storm wave energy and surge as it eroded but provided storm protection for oceanfront property and infrastructure and prevented extensive damages.

The North Wildwood (City) municipal shoreline was surveyed by the Richard Stockton College of New Jersey Coastal Research Center (CRC) to document changes in shoreline position and sand volume over the past year. This annual report presents a discussion of shoreline changes and engineered beach performance including the sand back passing project and impacts of Sandy observed by the CRC in 2012.

To review, in the fall of 2009, a beach fill co-sponsored by the City and the New Jersey Department of Environmental Protection (NJDEP) 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 6,800 feet west along the Hereford Inlet shoreline eastward to 2<sup>nd</sup> Avenue groin and 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 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 winter’s 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. The remainder of the winter season resulted in several snowfalls, but the weather patterns spared the coast from significant winds, waves, and storm surges. From December 2010 to June 2011 sand was removed from the beach berm and deposited offshore just inside of the -8.0-foot contour line. Sand moved offshore south of 15<sup>th</sup> Avenue, but stayed in shallower water. Erosion of the dunes seaward of the piers occurred during this time.

### ***Impact from Hurricane Irene;***

Hurricane Irene came ashore in New Jersey August 29, 2011. Following Hurricane Irene, the CRC surveyed the shoreline at each of the 54 profile locations (represented in the September 22, 2011 data). That analysis was submitted to the City and FEMA under DR-NJ 4021 and represented a gross loss of 82,252 cy of sand. This loss was divided unequally between the dune system protecting the piers (1,508 cy) and the northern segment between 2<sup>nd</sup> Avenue and 6<sup>th</sup> Avenue (80,809 cy). These losses were communicated to the FEMA disaster team and were incorporated into a claim for Category “G” reimbursement. These losses were restored in part by using a truck hauling program using excess sand derived from the beach berm in Wildwood Crest and transferring the material back to North Wildwood between 2<sup>nd</sup> and 7<sup>th</sup> Avenues. Sand was placed along the dune toe where the dune passes seaward of the three piers.

### ***Hurricane Sandy;***

Almost exactly a year and two months later another hurricane was born in the Caribbean, moved over Cuba and into the Bahamas before tracking north toward Cape Hattaras. Sandy encountered two other meteorological features that converted a modest, late-season storm into a killer event for New Jersey. A blocking high pressure stalled over Iceland and Greenland that prevented the usual northeast turn at or near Hattaras while a strong cold front moved east and wrapped itself around the hurricane vastly increasing the

diameter of its wind field and turned it west to make a perpendicular land fall near Atlantic City in the evening of October 29, 2012. The City of North Wildwood was fortunate to be on the south side of the storm center so the second high tide occurred with a wind reversal to the south west. TV coverage showed that the entire North Wildwood beach was submerged and white wave bores were rolling across the beach to the toe of the dunes over the entire camera's field of view. However, no waves crossed the dunes between 4<sup>th</sup> and 21<sup>st</sup> Avenues. The northern shoreline was eroded to the bulkhead and the gazebo was badly damaged at 2<sup>nd</sup> Avenue and the beach. The dune passing seaward of the three ocean piers was eroded away allowing wave surge to reach the city streets. The wide beach did reduce the power in the waves so that damage was not extensive. Tidal flooding accompanied this event reaching levels not seen since December 1992.

The CRC reached North Wildwood October 31<sup>st</sup> to conduct a site review that lead to a re-survey of the entire engineered beach November 15, 2012. This time the impact was felt along the entire oceanfront with heaviest damage at the north and south around the piers. The middle beach was substantially eroded flat with some sand pushed landward to the toe of the dunes. This was due to the beach width and the deceleration of the wave intensity it produced. By the end of December, the entire beach had been surveyed, a document prepared for FEMA reimbursement, and the Hereford Inlet borrow zone was surveyed to obtain information known to be necessary for any restoration permits. Several comparisons were required due to the reimbursement conditions provided by FEMA.

The first number was the actual sand volume lost between October 2012 pre-Sandy survey and the post-storm review completed in November 2012 (loss total equaled 278,083 cubic yards, but the mid-section gained 128,457 cubic yards for a **NET loss of 149,626 cubic yards**).

Since the distribution of sand prior to Sandy meant that some areas of the beach had sand deposited in amounts above the design cross sections, these had to be subtracted to arrive at the sand volume subject to FEMA reimbursement (**143,880 cubic yards**).

The final comparison was to compare the post-Sandy beach to the total area within the 2009 initial nourishment project. This sand volume was a loss of **538,070 cubic yards** as compared to the original design used to build the project. Inlet hydrographic changes and the continuous loss of beach width at the north and south ends of the project led to the large value for project restoration. Issues regarding the Endangered Species Program along the inlet beachfront originally included in the project require leaving its restoration out of the equation. Secondly, there will be no attempt to push the shoreline between 6<sup>th</sup> Avenue and the inlet back to the original design location because of the elimination of the Hereford Inlet beach section.

The storm-induced changes are listed below.

1. The oceanfront beaches suffered extensive additional damage between 5<sup>th</sup> Avenue and the 2<sup>nd</sup> Avenue inlet jetty. The gazebo was lost to wave attack and the vintage timber bulkhead was compromised.
2. Sand moved onto the Hereford Inlet shoreline and pushed further west, but the concrete cap on the rocks prevented large-scale sand overwash into North Wildwood.
3. The dune placed seaward of the three piers south of 21<sup>st</sup> Avenue was erased and the sand washed landward. Water did inundate the streets landward of the boardwalk in this region.
4. The beach was eroded landward so that the high tide reached the steel wall built to protect Morey's Surfside Pier at every high tide.
5. In the mid-section of North Wildwood, the shoreline retreated about 50-75 feet with the loss in elevation on the dry beach landward of the berm crest. Some of this sand was transported toward the dunes and deposited as a wedge against the seaward dune toe. No dune breaching occurred in this segment of North Wildwood.



## Oceanfront Beach Surveys:

The CRC surveyed shoreline changes at all 54 oceanfront profile stations four times in 2012 to depict annual and seasonal trends as well as define the impacts caused by Hurricane Sandy. 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**; and **64+00**. These sites were chosen to depict the general elements of 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 cross the eroding dune system that surrounds the ends of 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 quarterly studies included in this report and the dates of the surveys:

- Survey 10                      October 26, 2011
- Survey 12                      April 6, 2012
- Survey 13                      May 29, 2012
- Survey 14                      October 16, 2012
- Survey 15                      November 15, 2012

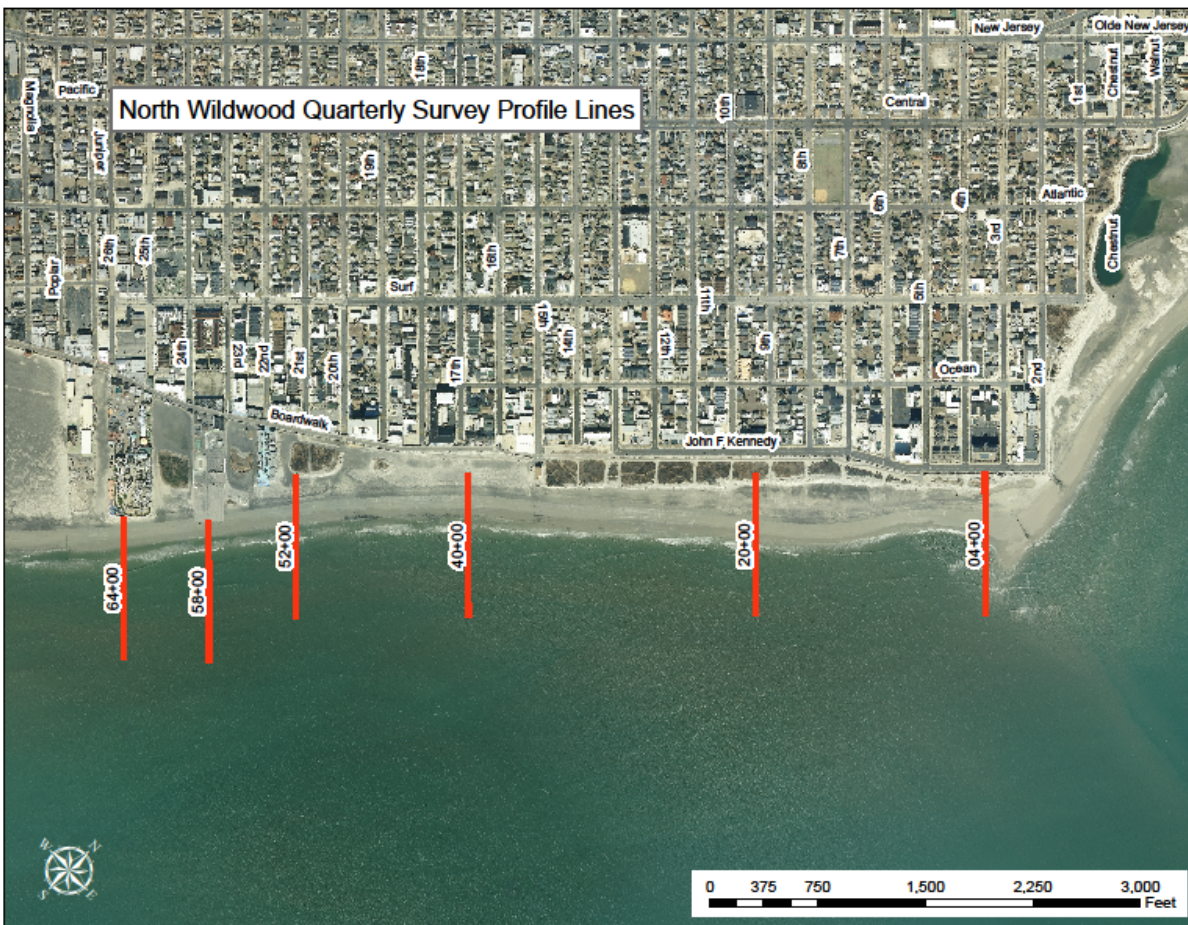
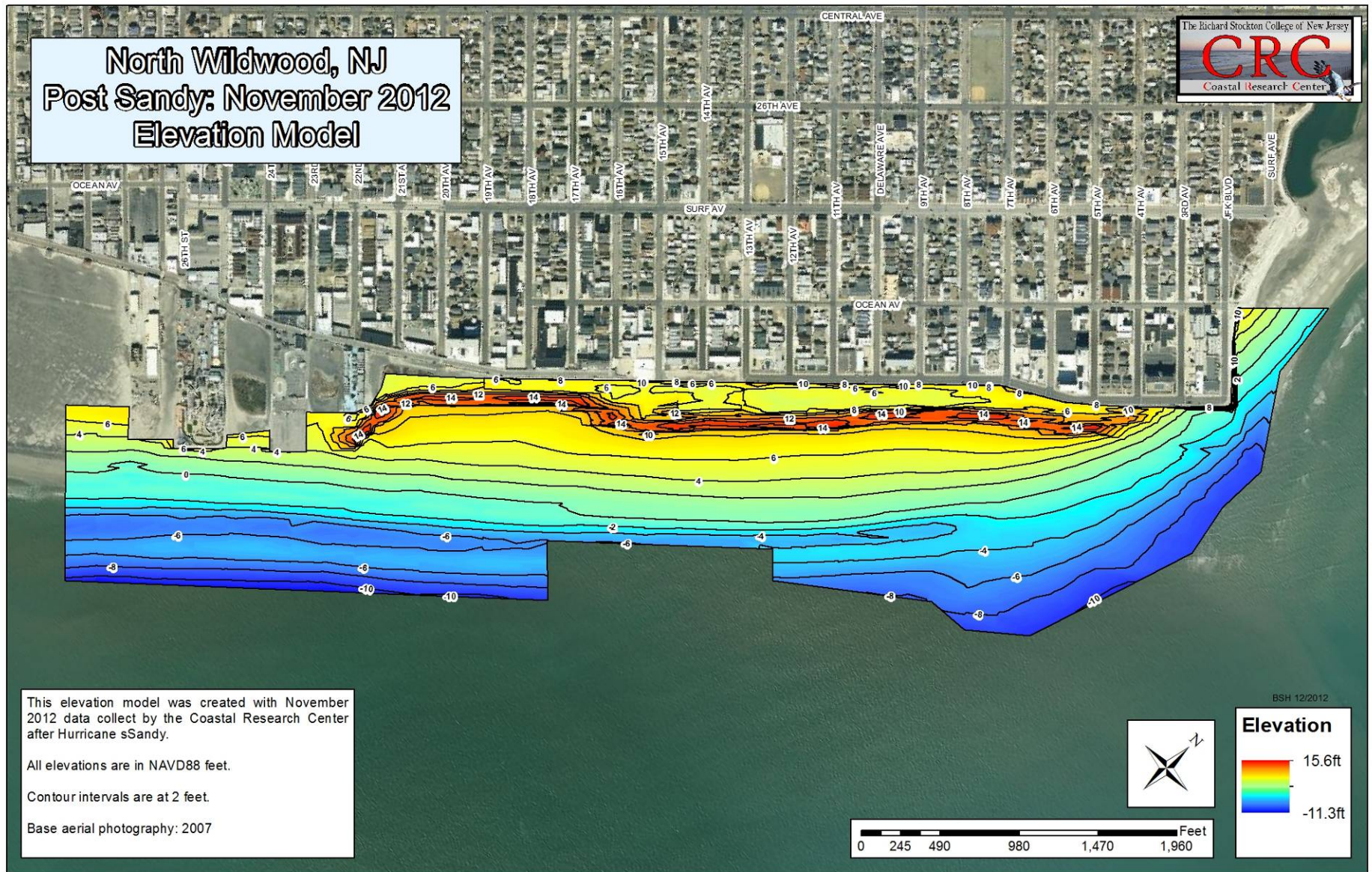


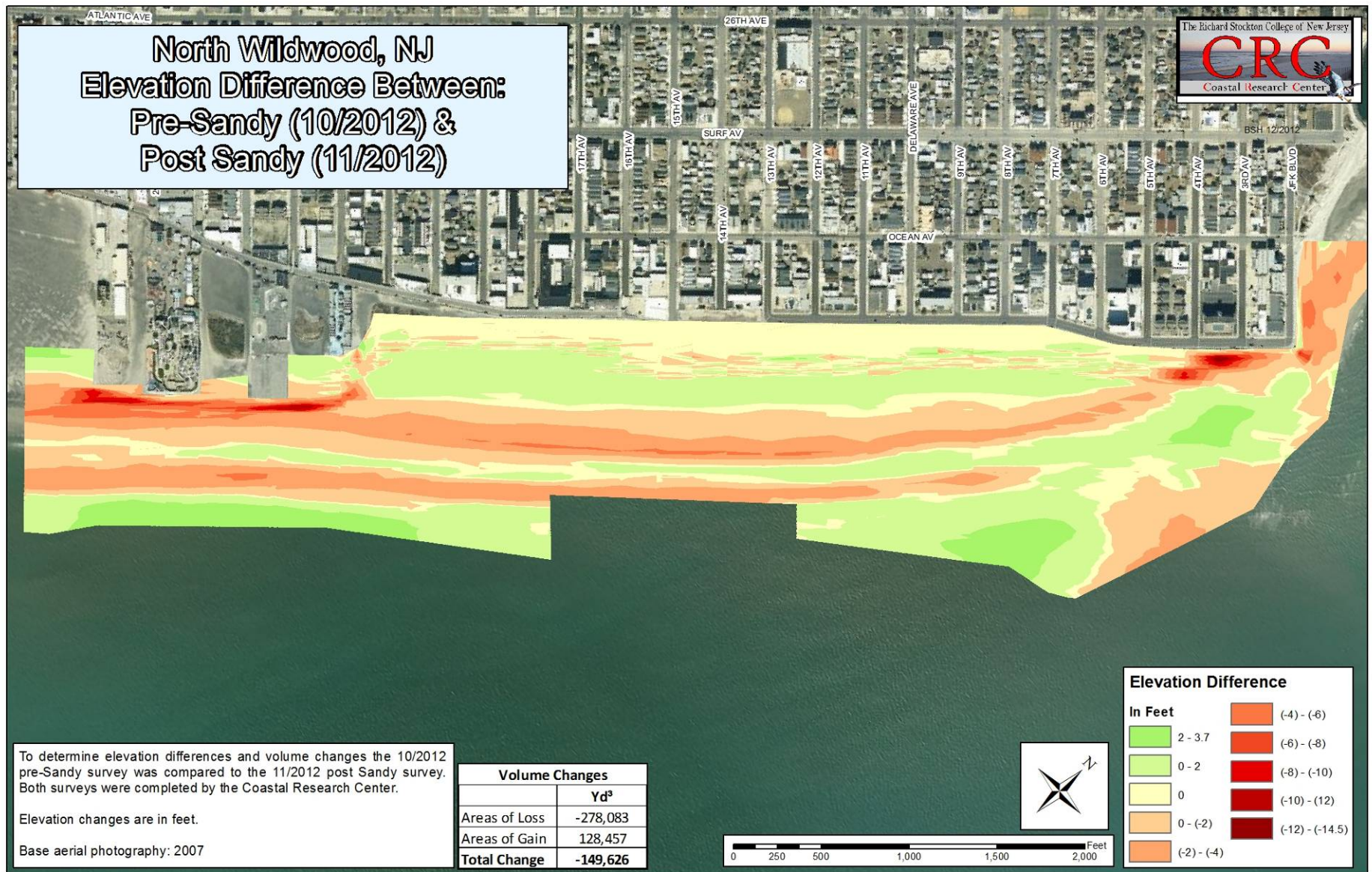
Figure 1. Location of six of the 54 profile stations where shoreline changes were measured on the City's oceanfront from October 2011 to November 2012. For each of the six profile stations descriptions and cross sections are provided to show changes over the year.





**Figure 2.** A digital elevation model for the North Wildwood City shoreline showing the original project extent. Note that the dune ends at 22<sup>nd</sup> Avenue due to storm erosion. The shoreline has progressed toward the 2<sup>nd</sup> Avenue corner of the municipality with low tide elevations existing at the jetty. Restoration efforts will focus on providing a dry beach to the jetty with a dune and restoration of the beach seaward of the piers.





**Figure 3.** An elevation difference map of the North Wildwood City beaches showing the change in elevations between October 16, and November 15, 2012. The dark red areas were those where the storm took the largest cut from the project. The red band that sweeps from end to end was the lost berm sand with a green band between the dunes and the berm where sand was deposited and as the green band offshore where additional sand was transported. The yellow color along the dunes shows where no change took place due to Hurricane Sandy.





**Figure 4.** This map shows the elevation difference in lost sand volume due to Hurricane Sandy which is subject to FEMA reimbursement under DR-NJ-4086. Sand had accumulated along the middle of the municipal oceanfront beach above the design cross sections for this zone. FEMA will reimburse for loss to the project up to but not above the project's design conditions.



## **Individual Site Review:**

This section describes the changes documented at selected profile locations to show general trends in sediment movement along the City's beaches for 2012. Beach volume and shoreline changes were calculated from October 2011 to November 2012.

### **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 direct impact from northeast storms. Sand was hauled by truck to reinforce the beach and add to the dune in an attempt to balance recreational needs with the inevitability that the site is erosional in nature until the inlet tidal dynamics restore the pre-1998 conditions along this part of the shoreline. Following Hurricane Irene, a back-passing project added 93,000 cubic yards of sand most deposited between the jetty and 7<sup>th</sup> Avenue derived from excess beach sand found on the beaches of Wildwood Crest 3 miles south. Hurricane Sandy stripped this material and eroded the dune to the timber bulkhead protecting Kennedy Boulevard.



**Figure 5. View from the ocean back to the combination of the sand piles placed on the beach and the material hauled back from Wildwood Crest's beaches to reinforce the dunes and widen the beach following Hurricane Irene as of May 2012.**



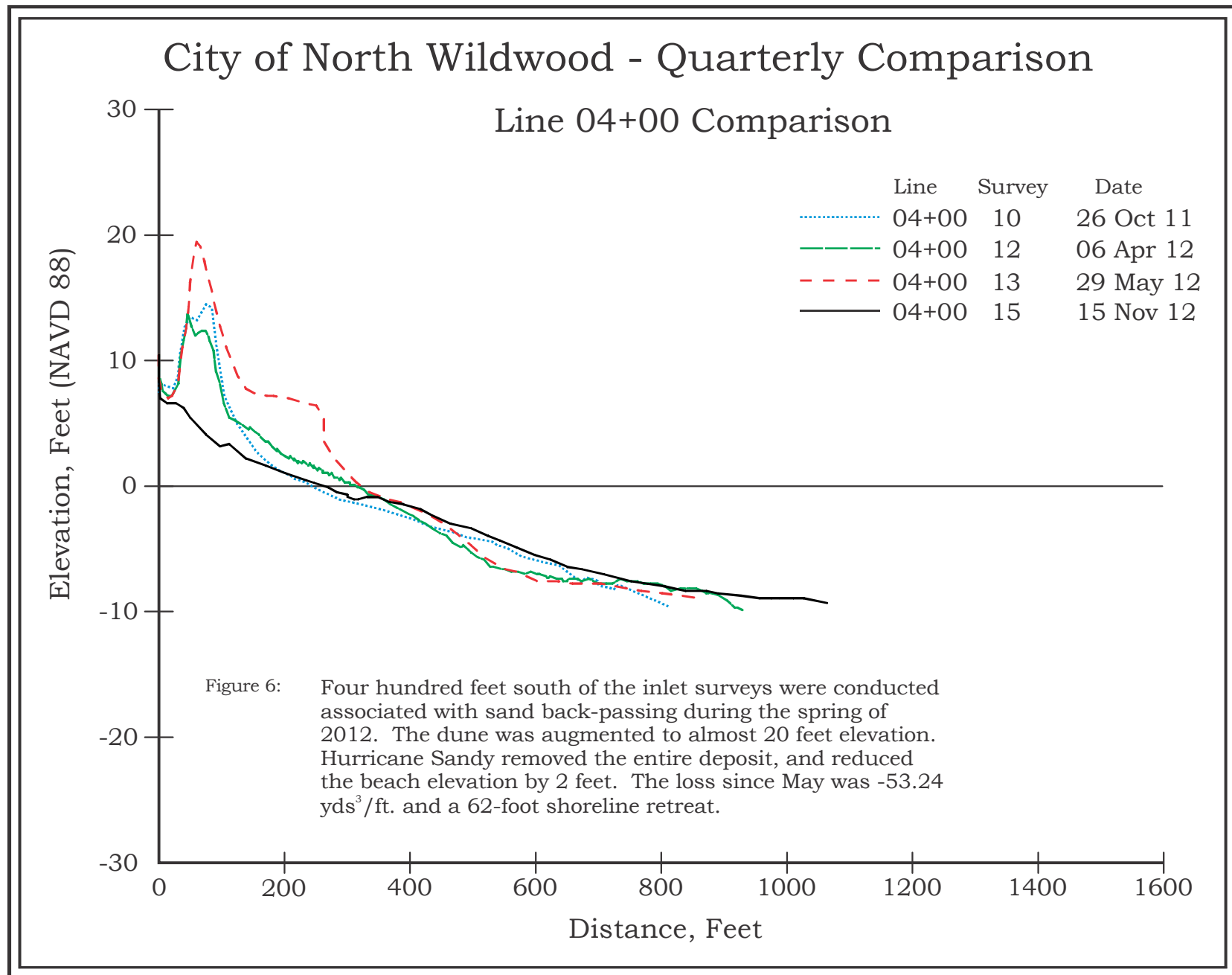


**Figure 6. View to the north along the dune line toward the inlet November 1, 2012 immediately following Hurricane Sandy. The gazebo's foundation is to the right of the yellow vehicles on the concrete rubble revetment and the timber bulkhead is exposed on the wet beach. There had been a dune and dry sand beach here prior to the storm.**



**Figure 7. View of the new bulkhead following the March 6, 2013 northeast storm showing the sand loss at the site when compared to the photograph above. Approximately three additional feet of sand has been removed from this location since Hurricane Sandy. This damage was done during the March 6, 2013 northeast storm.**





**Figure 8.** At a point 400 feet south of the 2<sup>nd</sup> Avenue jetty, the 2009 project included a dune that survived Hurricane Irene with restoration completed with the 2012 back-pass operation (red line). Sandy erased all traces of the restoration but did deposit a volume of sand offshore.

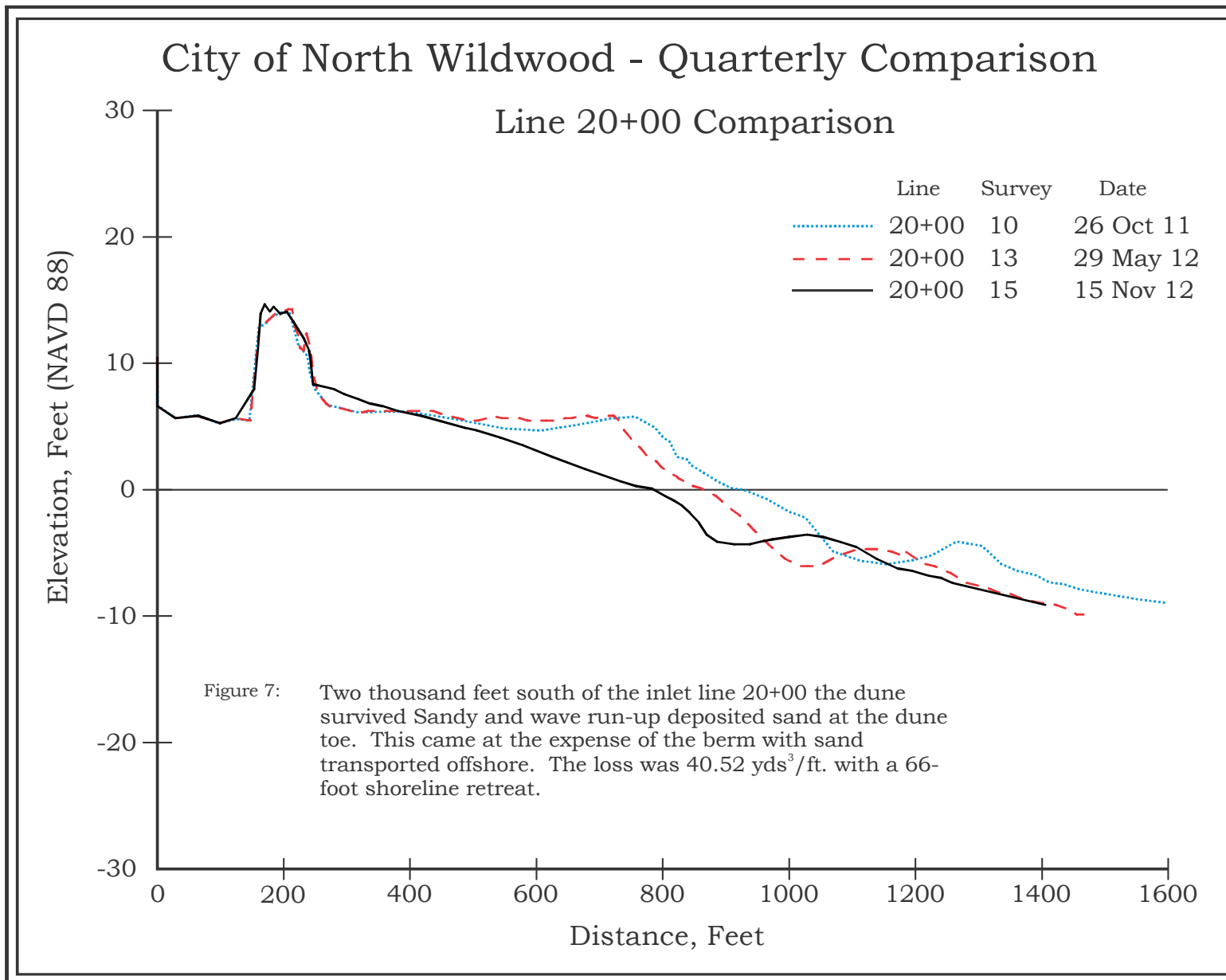
**Site 20+00** (between 9<sup>th</sup> and 10<sup>th</sup> Avenues)

This site is located approximately 2,000 feet south of the inlet and represents a transition zone (from erosion to deposition). This area had a net gain in sand volume due to the deposition of sand eroded from the berm by the waves during Sandy and pushed landward to form a layer between the mid-beach and seaward dune toe. The dune was unaffected by the storm due to the wide beach attenuating the breaking waves before they reached the dunes. Note that there is a very narrow light-colored sand strip immediately in front of the dunes to the left, with the darker gray color representing the very low gradient, wet beach following the storm.



**Figure 9.** View to the north from the berm at 9<sup>th</sup> Avenue two weeks following Hurricane Sandy. The grey sand color is due to having been wet during the storm surge. The incredibly flat slope seaward was created during the surge and breaking of the waves that rolled across the entire beach stopping at the dunes. Since, this photograph was taken; the berm has re-built approximately at the photographer's location as sand carried offshore moved back landward.





**Figure 10.** This site, 2000 feet south of the Hereford Inlet jetty, the dune survived Sandy with a deposit of sand added to the dune toe. The berm loss was substantial including a 66-foot shoreline retreat. The lost sand was moved south or toward the dunes.

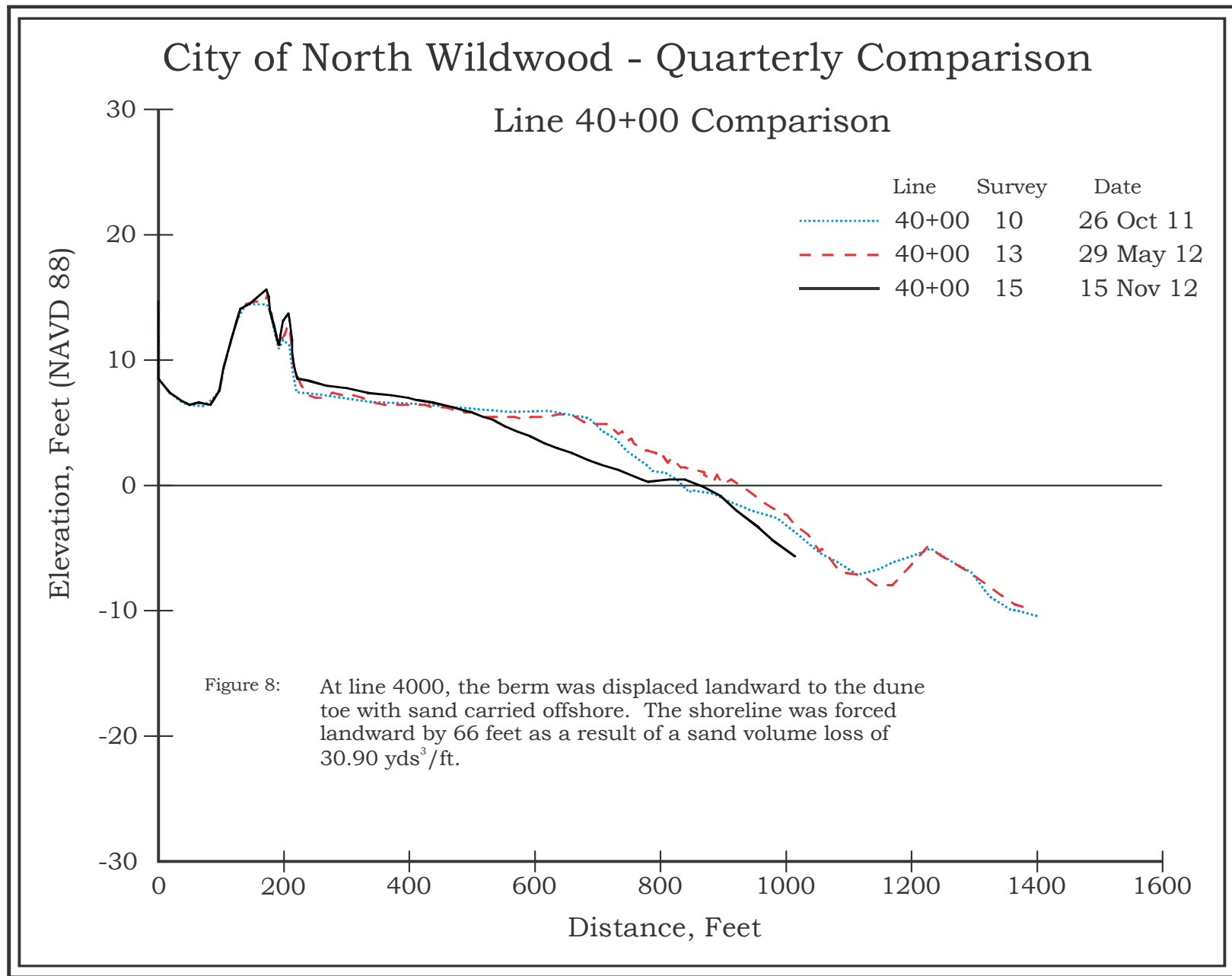
**Site 40+00 (17<sup>th</sup> Ave.)**

Positioned 4,000 feet south of the 2<sup>nd</sup> Avenue jetty, this site is located in the southern part of the mid-section of the City's oceanfront beaches. From here south to the Wildwood border, overall sand volume loss is more common. The quantity is the worst where the dune was eroded away in front of the piers. A percentage of the sand lost from the beachface was washed landward and deposited in a layer in front of the dune system.



**Figure 11. View to the north from the toe of the dunes located near 15<sup>th</sup> Avenue. There was some scarping of the seaward dune slope, but little damage or reduction of the dune protection afforded to property landward. Here the beach has dried out restoring the color, but the very gentle slope seaward in the darker sand to the right is similar to that seen in figure 8 above.**





**Figure 12.** The similar deposition of sand at the dune toe occurred 4000 feet south of the jetty as well. Berm retreat was less with sand transferred offshore and south.

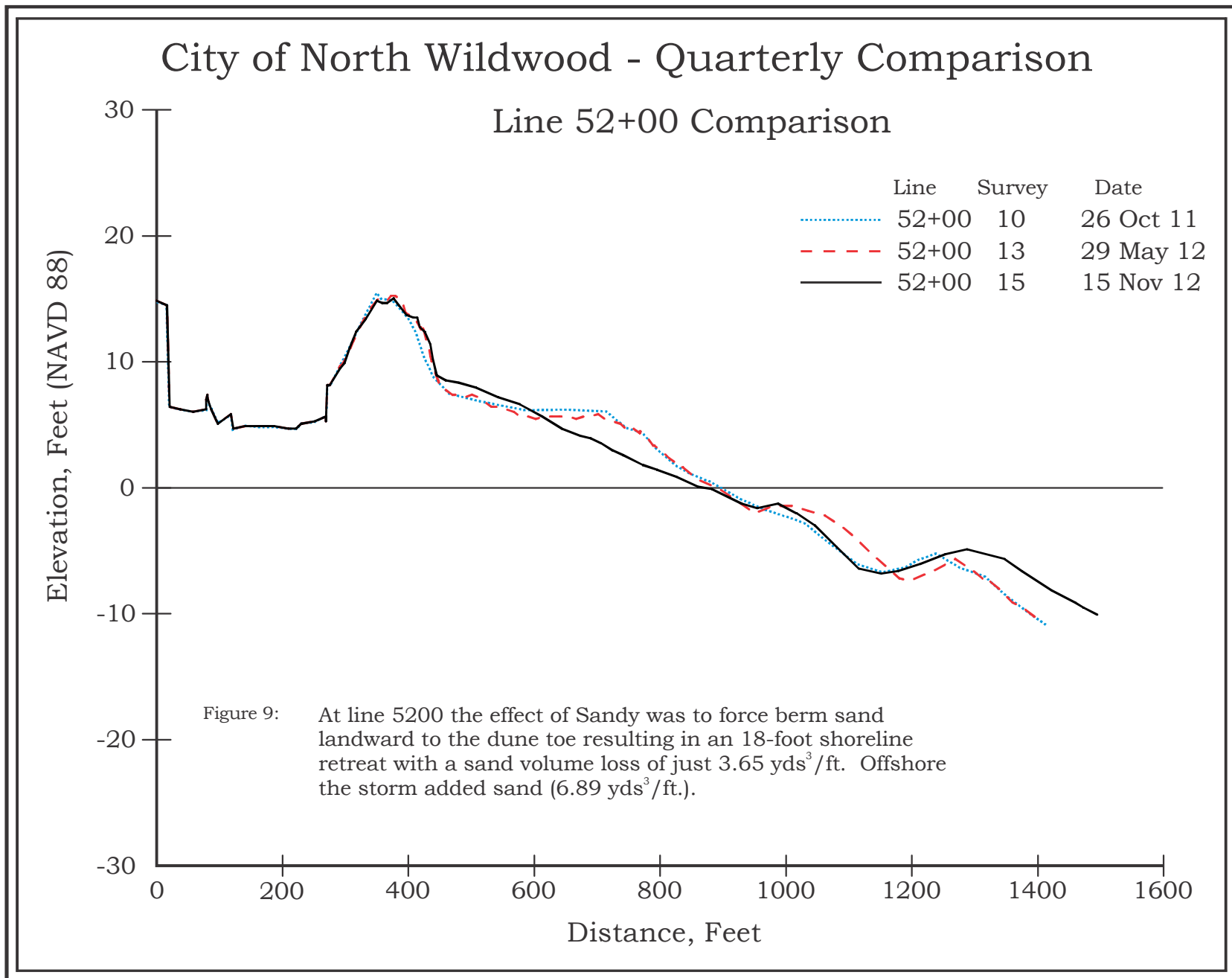
**Site 52+00 (21<sup>st</sup> Ave.)**

At this location, the beach width was reduced by 75 feet with sand equally distributed toward the dunes adding sand at the dune line, and offshore creating a bar that should migrate landward in the absence of further storm activity. The virtual table-top like appearance to the beach was a result of the storm waves rolling across the surface all the way to the dunes. The wide beach acted to reduce the wave energy so that the dune system could function to protect the property landward.



**Figure 13. View to the south from 20<sup>th</sup> Avenue to the piers showing the dune where it begins to shift seaward due to a decision made prior to the 2009 project to have it pass seaward of the ends of the piers in southern North Wildwood. Here the beach is flat as it was elsewhere in the mid-City oceanfront sections and with an extremely flat gradient seaward following Hurricane Sandy.**





**Figure 14.** Near the southern end of the wide beach, the dune was unaffected by Sandy, with a deposit at the dune toe and a sizable bar deposit offshore. This allowed a much lower sand loss rate for this site.

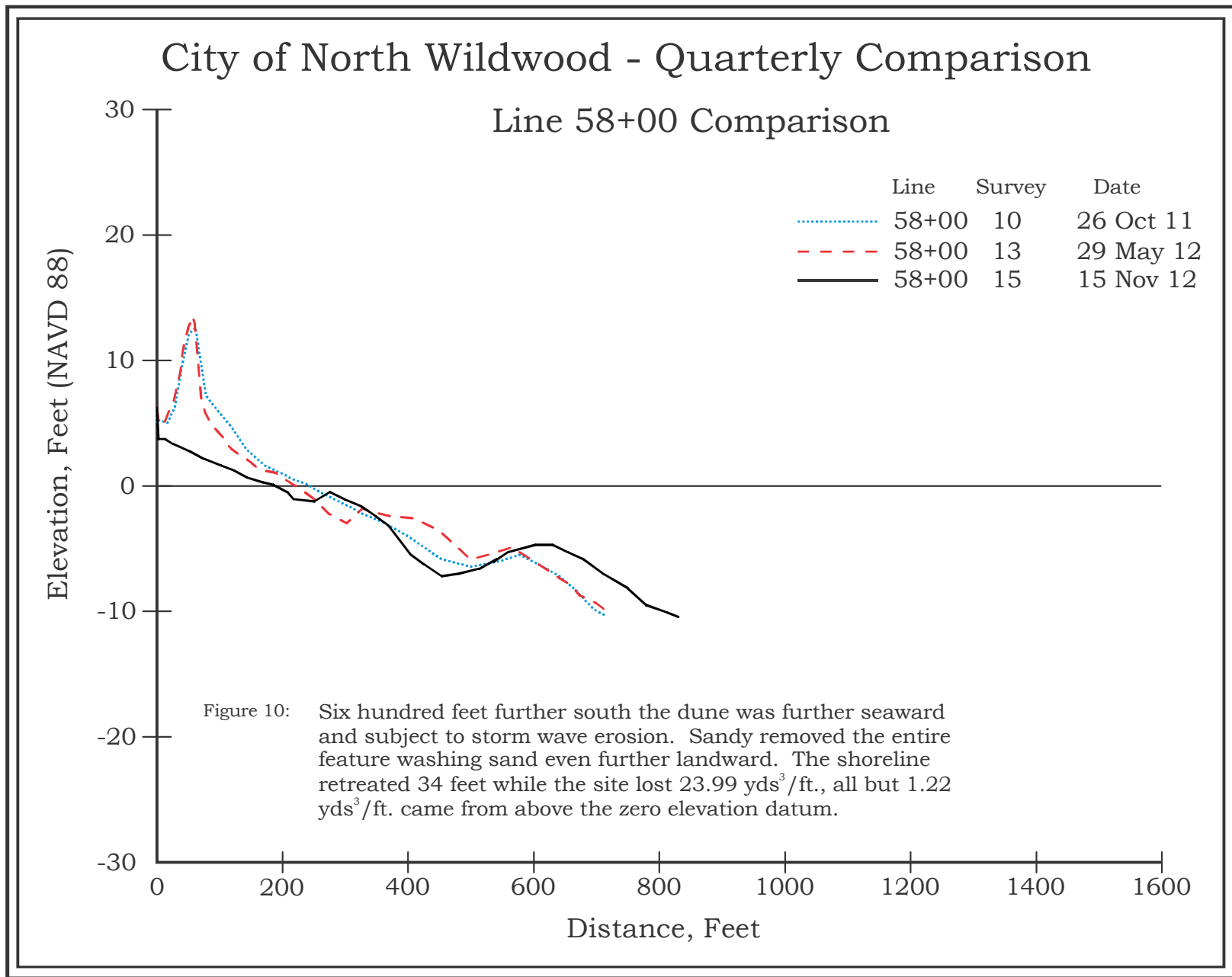
**Site 58+00** (between 23<sup>rd</sup> and 24<sup>th</sup> Aves.)

This site is located in the area of the City's oceanfront where the dune system was built seaward of the piers. The picture from last year showed a dune cut into a vertical scarp by Hurricane Irene. Sand obtained from the City of Wildwood and trucked to the scarp line helped early in the Sandy event, but due to the proximity of the dunes to the shoreline, they were no match for this event. Dunes were entirely washed away south of 22<sup>nd</sup> Avenue.



**Figure 15. View to the south from 24<sup>th</sup> Avenue showing the piers (Morey's Surfside is in the distance) with no remnant of a dune and a very wide intertidal beach seaward of the pier ends. Since Sandy, the beach has accumulated a berm, but the steel bulkhead remains the primary defense for Surfside Pier.**





**Figure 16.** At the 23<sup>rd</sup> Street location, the dune was designed to move seaward so it lay seaward in front of the piers. The effect was to allow easy access to the dune by larger waves and consequently, its complete elimination. Sand did deposit offshore lowering the total loss volume.

**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. Positioned directly in front of the Surfside Pier steel bulkhead, this site was stripped of the dune ridge remaining following restoration from the storm series leading to Hurricane Irene in 2011. Irene damage cut a vertical scarp that was augmented with piles of sand placed in a staggered array along the scarp to help supply sand to the beach and slow down the dune losses. The idea was to continue this operation to maintain a dune in the face of a too-narrow a beach, but use this inexpensive alternative to rebuilding the dune each spring. The methodology did not include a storm of the intensity of Hurricane Sandy.

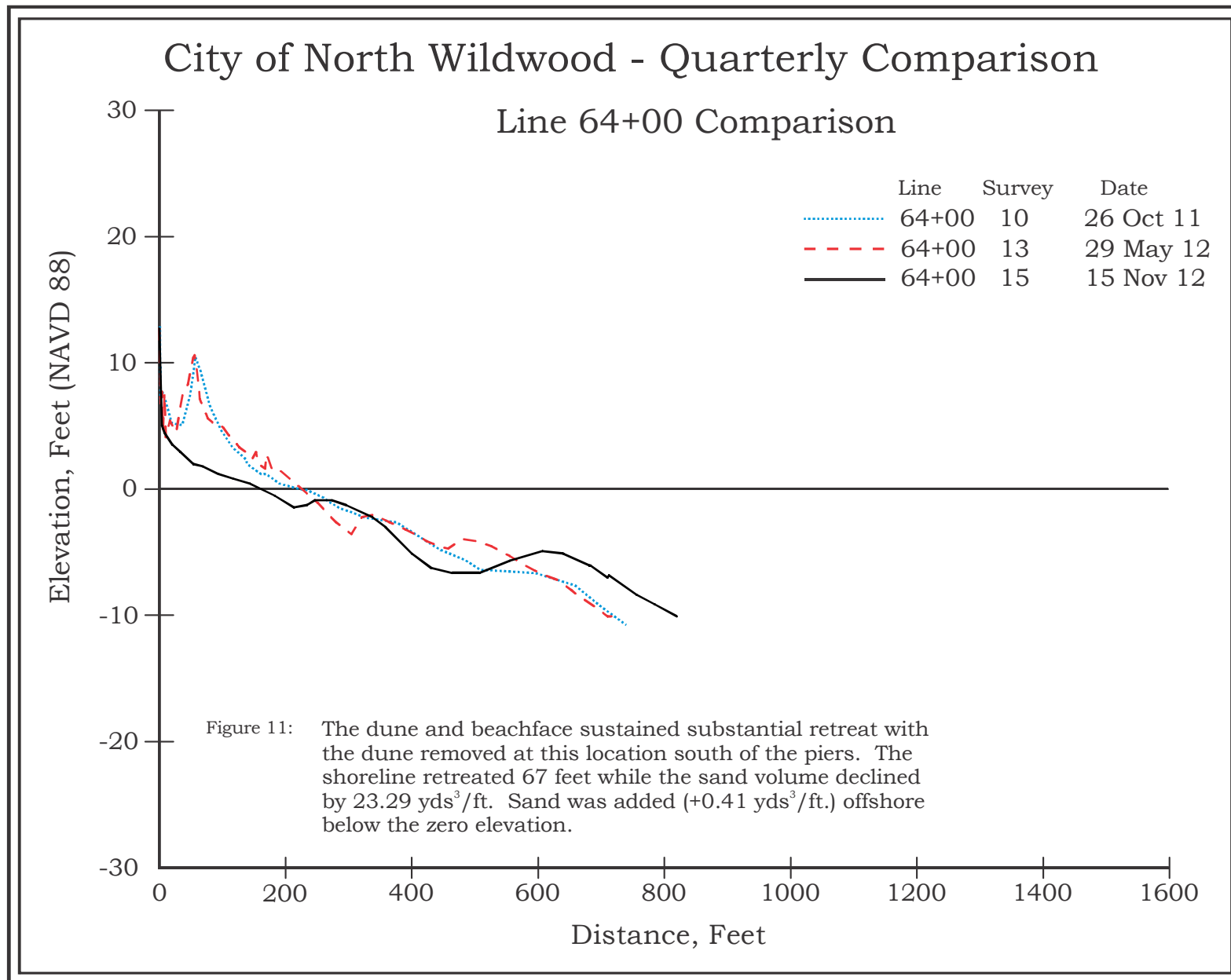


**Figure 17.** View to the north from where the dune crest at profile line location 64+00 existed pre-Sandy. High tide reaches the steel bulkhead every tide and the beach is as narrow as it was prior to the 2009 project. Although sand has accumulated in berm making the beach slightly wider, there is a need for restoration fill here in spite of the difficulty in maintaining any type of dune feature. The source of sand from the two communities down-beach is problematic at present, but perhaps communications and agreement can be achieved over time.





**Figure 18. View of an early set of sand piles trucked north from the City of Wildwood provided from the excavation of the beach storm water discharge pipes that get buried in excess sand. The material is excavated and loaded onto North Wildwood trucks that drive north and drop the loads in a series making a row of piles at the toe of the dune scarp, then stagger the next row centered between the first row of piles. This cheap placement methodology works by making the wave swash rush up the piles, bounce between them and slow down far more rapidly than if the sand was graded into a flat slope up the scarp.**



**Figure 19. This site is positioned directly in front of Surfside Pier, beginning at the steel bulkhead. The post-storm beach was nearly flat with sand deposited offshore. All loss to the cross section came from the area above the zero elevation.**

## Summary

Recovery from 2011's Hurricane Irene was essentially complete with a combination of natural sand recovery and the FEMA reimbursement for 93,000 cubic yards of sand back-passed from Wildwood Crest's beaches. Hurricane Sandy damaged the project with about twice the sand volume loss as occurred with Irene. There is no immediate option to return to the southern beach on this island due to differing views on the back-passing option.

There is a potential source of 45,000 to 50,000 cubic yards of sand dredged from Beach Creek entrance to be pumped to the northern North Wildwood shoreline, but funding is held up at present while the NJ Dept. of Transportation decides which of many dredging projects it will seek to fund in the short term as a result of massive sedimentation by Sandy.

Therefore work is in progress to obtain US Army Corps of Engineers (ACOE) approval of a permit to modify the 2009 project to restore the beach if the dredging companies can be found to do the work prior to mid-June 2013. There is sufficient sand in the Hereford Inlet borrow zone, and the needed volume is not excessive. The DEM graphs above (figures 2, 3 and 4) confirm that 278,083 cubic yards of sand would be needed to restore the gross Sandy sand loss volume, but the net loss was 149,626 cubic yards of sand would be needed to restore the beach to pre-Sandy conditions. Since there were multiple cross sections where the beach had accumulated sand in excess of the 2009 design template for individual cross sections, the FEMA reimbursement would be limited to 143,880 cubic yards.

In the years since the 2009 project the data confirms the fallacy of attempting to maintain the design template beach section around the 2<sup>nd</sup> Avenue Hereford Inlet jetty. The Endangered Species program has indicated that it will not allow sand placement along the Hereford Inlet segment of the shoreline originally within the scope of the project. With this provision precluding adding sand to the inlet shoreline, there is no prospect for maintaining a dry-beach shoreline extending beyond the end of the 2<sup>nd</sup> Avenue jetty. Doing so appears to be futile under current inlet tidal flow conditions in any event.

Therefore, the goal now is to maintain a dry beach of minimal width needed to support a dune to the 3<sup>rd</sup> Avenue Street end and leave the new bulkhead serve as the final line of defense for the northernmost City block to the inlet. The inlet changes are being monitored to see if and when channel shifts will allow a natural wider beach to accumulate at the northeast corner of North Wildwood without the need to constantly move sand north to this site.

When the sand volume lost from Sandy is restored, the effort to restore the dune seaward of the piers will be restricted to a ridge of sand without plants installed in any dense pattern, allow the public to walk over the feature and try and use sand sources to maintain this type of protection. An alternative being discussed is to replace an old bulkhead at the North Wildwood boardwalk and place sand in the form of a ramp up the seaward face of the structure to be a last line of defense should the vulnerable dune position at the piers fail again. There are multiple cuts through the existing bulkhead for convenience that need repair and the entire structure is in need of replacement eventually. The initial work would extend from where the dune exists (21<sup>st</sup> Avenue) south to the Wildwood boundary.