

STOCKTON UNIVERSITY COASTAL RESEARCH CENTER



Hereford Inlet, Cape May County, March 10, 1991, seven years prior to the initial NJ State and municipally funded beach restoration. Bird habitat consisted of four large intertidal shoals situated between the 123rd Street groin in Stone Harbor and the rock revetment protecting North Wildwood. 25 years and 4.8 million cubic yards of beach restoration later, nesting habitat had expanded into a 7,500 foot long spit extending to a point south of the third shoal in the photo.

An Analysis of Thirty Years' Study of Sand Redistribution and Shoreline Changes in New Jersey's Four Coastal Counties Raritan Bay, the Atlantic Ocean Coast, and Delaware Bay Fall 1986 Through Fall 2016

VOLUME 3 of 4 ATLANTIC COUNTY

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New Jersey Beach Profile Network

Atlantic County

Little Egg Inlet
to Great Egg Harbor Inlet

NJBPN Profile #'s
134 - 126

New Jersey Beach Profile Network Atlantic County Site Locations

There are 10 NJBPN survey sites on the Atlantic County shoreline. The beach profile sites are located in the City of Brigantine, Atlantic City, the City of Ventnor, the City of Margate, and the Borough of Longport. The Atlantic County coastline consists of three barrier islands. Little Beach is part of the Forsythe National Wildlife Refuge and is not surveyed. Brigantine Island is south of Brigantine Inlet, the northern third of which remains undeveloped as part of North Brigantine Natural Area managed by the NJ Division of Lands and Forest. The Absecon Island communities, Atlantic City, Ventnor, Margate, and Longport, are all highly developed. There are six beach profile survey sites in the communities of Absecon Island.

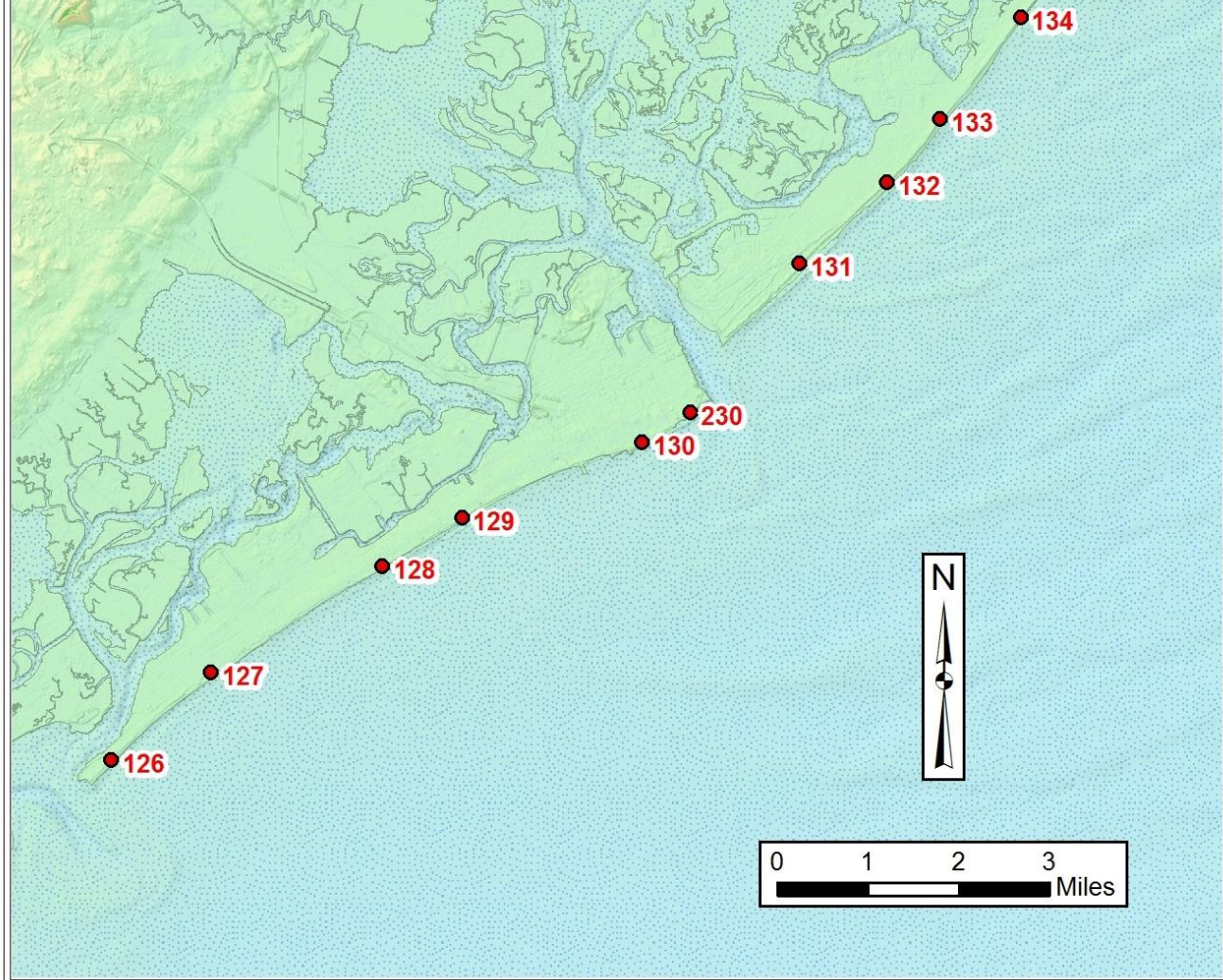


Figure 389. Locations of the 10 NJBPN profile sites in Atlantic County, NJ.

Atlantic County Summary

Data collected at the 10 oceanfront NJBPN beach profile locations cover the municipal beaches from the City of Brigantine Beach to the Borough of Longport. While a relatively high percentage of the Atlantic County shoreline is undeveloped and protected (Forsythe National Wildlife Refuge (Little Beach) and the Brigantine natural area), the intensity and density of the existing development along the remaining shoreline makes this the most developed of the NJ coastal counties. Only 1 of the 10 profile sites is located in a natural area the remainder cover the developed sections of the county oceanfront shoreline. Absecon Island, due to property density and low elevation, flood prone regions has a moderate storm exposure risk. The southern two thirds of Brigantine Island has a lower storm damage risk due to wider dunes and beaches, a consequence of extending the north jetty at Absecon Inlet to 3,727 feet in 1952. Sand capture at the north Absecon Inlet jetty resulted in wider beaches by hundreds of feet and multiple ridges of dunes between 15th Street South and the jetty. The combination of extending the north jetty and the extension of the south jetty at Oriental Avenue in Atlantic City to 1,177 feet has help to stabilize the Absecon channel but reduced natural sand bypass rates so the sand gets trapped on the north side of the north jetty and only slowly enters the Absecon Inlet channel. The sand that does enter the inlet channel resides along the south side of the north jetty as wet beach at low tide that gradually grades up landward to a vegetated dune zone near the landward toe of the jetty.

Because of the density of development and storm exposure risk both Absecon Island and Brigantine Island have a long history of beach nourishment shore protection projects. The first record of large beach nourishment activities in Atlantic City started before World War II with projects from 1936 to 1938. Several large scale federal nourishment projects occurred during and immediately following the war adding several million cubic yards of sand to the beaches. Projects of various size in Atlantic City continued through the 50's, 60's, 70's and 80's with at least nine projects from 1956 to 1986 adding an additional 2.5 million cubic yards of sand to the system. Brigantine Island received several beach nourishment efforts in 1962, 1963 and 1966 totaling approximately 700,000 cubic yards of sand. In 1990, the State and municipality of Longport placed 250,000 cubic yards of sand in Longport followed in 1997 by State co-sponsored or municipal projects in Brigantine and Atlantic City. Brigantine received 1.2 million cubic yards and established an engineered beach that received an additional 614,000 cubic yards storm maintenance project in 2001.

In 2002-3 the US Army Corps of Engineers (USACE), Philadelphia District, conducted a Shore Protection project from Absecon Inlet, south to the Ventnor City/Margate City boundary on Absecon Island adding millions of cubic yards to the beaches. The design was for a 150-foot wide beach in Atlantic City and a 100 foot beach width in Ventnor backed up by a 14.5-foot elevation at the dune crest that was vegetated and fenced with sand fencing and pedestrian access pathways to the beach. Since Margate and Longport declined to participate, their municipal shorelines did not receive direct sand placement.

In 2006, the USACE took over and expanded sand placement on the Brigantine engineered beach adding 700,000 cubic yards of sand to Brigantine's northern developed shoreline. The USACE project for Brigantine was focused on the northern third of the developed shoreline. A feeder beach was designed into the project that starts at the Brigantine Blvd Promenade and extended 1,600 feet north to the natural area. The project continues south to 5th Street South where it tapers into existing beach conditions. In 2011, an emergency maintenance was completed under the Flood Control and Coastal Emergencies funding program using trucked-in sand. The Brigantine portion of Atlantic County's post-Sandy recovery was complete as a result of project maintenance in 2013, funded under PL-113-2. Brigantine has not received sand since 2013 but is scheduled for maintenance in fall 2017.

Maintenance cycles for the USACE Absecon Island project were delayed until 2011 when the USACE returned to place sand on the northern portion of the Atlantic City shoreline. As an adjunct to the 2012 beach restoration, an offshore, submerged breakwater structure was constructed seaward of the new Revel Casino between the Massachusetts avenue groin and new low profile groin adjacent to the north side of Gardner Pier. The existing groin at Massachusetts Avenue and Vermont Avenue were refurbished and extended seaward. The objective

was to more effectively impound the local sand supply to increase residence time at this relatively erosional segment of the Absecon Island shoreline. An emergency beach maintenance effort began in July 2013 to restore beaches to project design conditions following Hurricane Sandy. Separate from the oceanfront beach, an Absecon Inlet project to rebuild the inlet rock revetment moved to construction under USACE jurisdiction, debris removal was completed in May 2014 with construction started in 2015. The project will improve upon the old revetment by building to a uniform standard and remove over a century of accumulated debris from along the inlet sand beach.

Both the Absecon Island and Brigantine Beach USACE shore protection projects have been re-supplied with sand following Sandy from the authorized borrow zones and restored back to each project's design dune and beach cross section using PL 113-2 funding at 100% federal cost. Despite obvious storm protection benefits that communities with healthy dune systems and wide beaches received during Sandy multiple oceanfront owners in Margate City, with municipal consent filed litigation in Superior Court, seeking relief from having dunes constructed as part of the USACE shore protection project within City oceanfront limits. The case went to trial in February 2016, with a decision rendered April 11, 2016, affirming the Corps design and the relevance of dunes to the protection levels sought by the project. With this decision, the full USACE project design template for Absecon Island will finally go to construction starting in 2017 and for the first time include all four communities.

Individual Profile Site Descriptions

Natural Area, Brigantine (Site 134):

The northern-most profile site on the Island of Brigantine is located on the undeveloped northern end of the island. This section is owned by the State of New Jersey and administered by the NJ Division of Parks and Forestry designated as the "North Brigantine Natural Area". As one of New Jersey's last remaining undeveloped beaches, North Brigantine Natural Area provides breeding sites for the piping plover and least terns while sea beach amaranth also periodically inhabits the region. The small island visible at the north end across Brigantine Inlet is Little Beach, (part of the Forsythe National Wildlife Refuge) the only uninhabited barrier island left in New Jersey. There are no NJBPN profile sites on Little Beach. The North Brigantine Natural Area does not directly receive sand from the federal project and no efforts are made to install dune fence to enhance growth. The dune elevation, at approximately 10 ft NAVD88, is currently 4 to 5 feet lower than average for Brigantine. Consequently, this location is subject to periodic storm overwash by waves from the ocean into the bay marshes. The December 1992 northeaster and Hurricane Sandy both caused extensive dune overwash in this region. Vegetation survived behind the dune ridge, so re-growth was assured, but at a more landward location and lower elevation resulting in slow shoreline regression. This process over time has produced an apparent counterclockwise "rotation" in the Brigantine Island shoreline, in that the northern end is retreating during storms, as the southern half advances seaward due to accretion at the Absecon Inlet jetty.

From spring 2015 to fall 2016, the dune and beach were relatively stable, the shoreline position advanced seaward 4 feet while nearshore and offshore sand was scoured from the seafloor partially offset by seasonal offshore bar development. This site had a net loss of -21.99 yds³/ft. of sand during this recent study interval. A thirty year comparison of survey data from fall 1986 to fall 2016 showed the net impact of major storms and the recessive nature of this region. The shoreline position at this site has retreated just over -172 feet, averaging -5.7 feet per year over thirty years. Similarly, the net volume change at this location over thirty years was a massive loss of -116.43 yds³/ft. of sand, averaging -3.88 yds³/ft. of sand per year. The thirty year comparison provides an indication of the natural erosion rate along the northern shoreline without periodic beach nourishment.

4th Street North, Brigantine (Site 133):

Development begins at approximately 14th Street North; this site is located approximately 10 blocks south. The beach has been erosional due to the orientation difference between the physical infrastructure and the long-term changes in the shoreline and regression of the natural area to the north. This region was the focus of the city's

original engineered beach project area and the subsequent federal project, both included a part of the natural shoreline where sand is placed to act as a feeder beach to the worst of the erosional segment. Site #133 is located south of the promenade and seaward of an oceanfront condominium where dune development provides enhanced shore protection. As part of the original State engineered beach and federal project this site periodically receives sand. Efforts towards initial nourishment began in 1993 following the December 1992 northeaster with construction eventually occurring during spring 1996 with placement of just under 1 million cubic yards. Following storms in 1998 that resulted in a federal disaster declaration and eventual FEMA funding a second maintenance nourishment project was undertaken in early spring 2001 with placement of 614,000 cubic yards of sand. The initial USACE federal project was completed by March 2006 with placement of 691,400 cubic yards of sand. In fall 2011, the USACE conducted maintenance nourishment using a mainland sand source delivered by trucks to add 228,000 cubic yards to the federal project area. A third federal maintenance nourishment project occurred during 2013, placing 917,000 cubic yards of sand on the project beaches to restore the design template following Hurricanes Irene and Sandy. No additional sand placement has occurred on Brigantine's engineered beach over the last three years.

Accelerated erosion rates continued to plague this "hotspot" region following sand placement. The focus of the "hotspot" erosion is along the northern promenade perched on a rock revetment that replaced a timber bulkhead destroyed in 1992. Site 133 is located just south of the end of the promenade and experiences significant erosion rates. From spring 2015 to fall 2016 this location lost -39.84 yds³/ft. of sand with -133 feet of shoreline retreat. The beach was lower in elevation and narrower but remained sufficiently wide enough to allow continued dune growth through this recent study period. Despite the addition of nearly 3.5 million cubic yards of sand since 1997 the thirty year comparison of survey data from fall 1986 to fall 2016 shows this region has only retained a small volume of the placement sand. Over the thirty year interval the shoreline position has retreated landward -79 ft with a moderate net volume gain of 9.53 yds³/ft. of sand. Without periodic beach nourishment it is unlikely that this region would maintain a dune system as the beach would erode landward to the revetment as it frequently does just to the north seaward of the promenade.

15th Street South, Brigantine (Site 132):

This site is located at a nodal point for the City beaches from a sand deposition versus erosion perspective. Here, over about a 1,000 ft range the Brigantine beach transitions from an erosional zone in the north to a depositional zone to the south. As a result this site is located south of the federal project area design taper and has not directly received sand during any of the beach nourishment cycles. At 15th Street South, the dune is absent as the near continuous dune system is interrupted by the Legacy Vacation Club Resort (old Brigantine Hotel, built in 1929) that abuts against the exposed wooden bulkhead between 14th and 15th Street South. North of 14th Street South and south of 15th Street South the bulkhead is buried below a well-developed dune system. This bulkhead elevation is low at approximately 8 feet NAVD88, exposing this area without the dune to episodes of storm overwash and street flooding. The approximately 375 ft of beach width seaward of the bulkhead does provide modest storm protection but with berm elevations limited to between 4 - 6.5 ft NAVD88 the beach is subject to wave run up, storm surge overwash and flooding that periodically allows storm waves to overtop the bulkhead. The point to be made is the fact that the repeated beach restoration efforts to the north have resulted in the average beach width at this location increasing by 150 ft between 1986 and 2016. Surveys at this site go back to 1971 during coastal studies related to a proposed offshore nuclear power plant seaward of Little Egg Inlet.

Traditionally this site benefits from longshore and cross-shore sediment transport moving sand to this section of shoreline through a series of bars. In the last two years this site had been variable with sand accumulating on the recreational beach berm while the beach face slope and offshore regions eroded. Net change from spring 2015 to fall 2016 was a modest net volume loss of -4.91 yds³/ft. of sand with -26 ft of shoreline retreat. Despite this modest study interval loss, overall the region has accumulated sand as material shed from the project beaches to the north is carried by predominant littoral currents south through natural longshore transport. This is demonstrated by comparison of the thirty year data from fall 1986 to fall 2016, that shows the accumulation of 97.32 yds³/ft. of sand and 151 feet of seaward shoreline position advancement. The influx of sand from north

to south provides stability to this shoreline and has allowed for modest beach width and dune growth in this region over the last thirty years.

43rd Street, Brigantine (Site 131):

This site was established in 1986, located in the southern area dominated by the sand retention characteristics of the Absecon Inlet jetty. Sand collects along this beach segment from the Absecon Inlet jetty to about 15th Street South. The sand accumulation results in the expansion of the southern section of beach and dune system. In 1986, the street end was where the beach started with little or no dune growth. Today the street end reference position lies 640 feet landward of a huge dune system that extends to where the shoreline position (zero datum) was in 1986. The present shoreline position is 1,500 feet seaward of the street end. A massive dune system occupies nearly 900 feet of width between the development and the toe of the foredune.

During the recent study interval this site gained another 10.41 yds³/ft. of sand but with -45 ft of shoreline retreat. A comparison of the fall 1986 to fall 2016 data showed a massive net volume gain of 385.71 yds³/ft. of sand with 585 feet of advancement in the shoreline position. This vast quantity of sand has been transferred to this region through natural southerly longshore transport largely derived from sand shed off the north end erosional “hotspot” and engineered beaches. As a result of the backfilling and perpetual movement of sand from north to south this region has become a potential sand source for sustainable harvesting and back-passing of sand from this beach to the erosional zone utilizing high-capacity trucks to haul it north along the beach.

Rhode Island Avenue, Atlantic City (Site 230):

This site was established in spring of 2010. The site is located approximately 1,500 ft south of the Oriental Avenue Absecon Inlet south jetty. This site is bracketed by two rehabilitated and extended rock groins (Massachusetts and Vermont Avenues) as part of the Atlantic City North End Shore Protection project constructed in 2012. Hurricane Sandy impacted the beach in October 2012 while the project was under construction slowing progress. Emergency funding was available using Public Law 113-2 to restore the beach to pre-Sandy conditions and design template, completed in 2013. The third periodic maintenance cycle of the federal project is approved and funded, scheduled to begin in 2017.

Absecon Island remains one of the most densely developed shorelines in New Jersey. Beach nourishment has been a part of the shoreline management strategy since the 1930's with a federal project in place since 2003. The dunes were constructed to an elevation of 14.5 ft NAVD88 and were just high enough to withstand the wave run-up during Sandy. The oceanfront beach lost width and elevation, but the dunes prevented damage to the City's famous boardwalk. Emergency maintenance nourishment was completed in 2013 restoring the beach to full template. The restored beach berm width was nearly 250 ft.

This restored beach rapidly eroded with almost half the project beach width lost in the first year. The erosional trend continued but the rate slowed through 2015 and 2016. Longshore transport appears to dominate with no detected accumulation of eroded beach sand on the nearshore slope. The site's proximity to Absecon Inlet and the associated tidal currents appear to rapidly carry sand away from this erosional area. By June 2015, the beach berm width had been reduced to less than 50 ft of dry beach seaward of the dune toe. Storm surge and waves in fall 2015, flattened the remaining beach berm and severely cut into the seaward dune slope, removing 30 ft of the dune width and nearly half the sand volume. Winter storm waves and surge including those from Jonas continued to cut into the beach and dune, cutting away another 25 ft of dune width that removed the remaining dune crest. By the end of 2016, the beach had been reduced from 250 ft of dry beach width to a narrow strip of sand 25-30 feet wide, while the dune width was cut landward from a base width of 100 feet to less than 40 feet in width. From spring 2015 to fall 2016, the shoreline position retreated -42 feet, with a net volume loss of 57.55 yds³/ft. of sand. The beach and slope elevation diminished from the dune crest to the seaward limit of the profile.

Despite the dramatic post project losses the site has retained sand. Over the six years of monitoring since 2010 the site direct comparison from spring 2010 to fall 2016 shows the shoreline advanced 76 feet with a net volume gain of 95.85 yds³/ft. of sand.

North Carolina Avenue, Atlantic City (Site 130):

North Carolina Avenue beach is located adjacent to the Resort Casino and just south of the Steel Pier. The pier has been operational since 1898, its maximum length was nearly 2,300 feet, but currently is approximately 1,000 feet in length. In addition to the pier structure, there are several timber outfall pipelines and a rock groin located just north of the pier, all affecting sediment transport and retention in the immediate vicinity. This site is located towards the southern end of the chronic erosional zone and to the south, the beach slowly widens. This site received sand in 1997 through a municipal nourishment project and in 2003-2004 during the federal project for Absecon Island that placed sand from Absecon Inlet through Ventnor City. Maintenance nourishment occurred in 2012, followed by emergency nourishment in 2013 to repair damages caused during Hurricane Sandy.

From June 2015 to October 2016, the shoreline position retreated -74 ft with a net volume loss of -54.32 yds³/ft. of sand. Scouring occurred nearshore cutting a shallow trough, while the depth of the offshore slope increased each survey, indicating little cross-shore sediment transfer and predominate longshore sand movement.

Looking at the 30 year trend at North Carolina Avenue the benefits of the federal project are clear, despite erosional losses that continue to occur in this region. This site has shown a net volume gain of 56.39 yds³/ft. of sand. Although the shoreline position has changed little (-10 ft) the formation of a dune has enhanced this site. In addition to the dune feature, the beach berm elevation has increased over time, improving the recreational beach. Combined, the dune feature and federal project beach have improved shore protection in this region since 1986.

Raleigh Avenue, Atlantic City (Site 129):

Located at the south end of Atlantic City this site has traditionally had a wider beach. The taper for the 1997 municipal nourishment project was located in this region but the site did not directly receive sand. Sand was directly placed here during the 2003 initial federal nourishment project that continued from Absecon Inlet south through Ventnor. This site has required little subsequent maintenance as littoral currents naturally transfer sand north to south through this site allowing for a relatively stable to accretive dune and beach. Prior to the federal project this site was accumulating sand. In 1986, there was no dune present but with installation of sand fence a dune steadily developed through natural aeolian processes. The USACE dune and beach template was constructed in 2003. The project expanded on the natural dune footprint and raised the elevation of the dune crest and beach berm while pushing the shoreline position seaward. Following construction this site has continued to accumulate sand.

This accretive trend continued from June 2015 through December 2016. A new foredune ridge continued to develop and accumulate sand along the seaward slope of the primary dune. The beach berm accumulated sand forming a steeper beachface slope with a higher berm ridge. Cross-shore movement of sand from offshore towards the beach added sand onshore and formed a more uniform slope nearshore and offshore. Sand influx was relatively uniform across the beach profile resulting in a net volume gain of 17.85 yds³/ft. of sand. The shoreline position advanced seaward 20 feet during the same time interval.

A comparison of the survey data over 30 years shows the impact of the federal project and natural sediment transport of sand through this region. This site has seen a massive increase in sand volume with 209.62 yds³/ft. of sand either added or accumulating on this beach. The impressive volume gain has resulted from development of an enhanced dune system and beach that has expanded the shoreline seaward 164 ft from 1986 to 2016.

Dorset Avenue, Ventnor City (Site 128):

Ventnor chose to participate in the 2003 federal beach restoration project. Dorset Avenue is located just north of the fishing pier and near the southern terminus of the current federal project. Unfortunately, the community of Margate chose not to participate in the initial project. This resulted in significant end-effect losses to the Ventnor project beaches south of Dorset Avenue and the fishing pier. The original federal project was designed to include all four communities on Absecon Island. Ventnor and Atlantic City benefited from the additional shore protection provided by the federal beach project during Hurricane Sandy. Although the beaches suffered erosion, the boardwalk, oceanfront infrastructure and properties were protected from the storm surge and waves while Margate City and Longport suffered structural damages to public and private property.

Similar to Raleigh Avenue this site also consists of a concrete seawall as the landward shore protection feature, with a wide dune seaward of the boardwalk. The beach berm extends approximately 200 feet seaward of the seaward dune toe. The beach face slope initially suffered significant erosion and was cut landward 70 feet between June and November 2015. From November 2015 to September 2016, the beach berm and shoreline position has remained relatively stable to slightly accretive. For the study interval the net change was -50 ft of shoreline retreat. The net change in volume was a loss of -29.52 yds³/ft of sand.

The 30 year trend shows an influx of sand since completion of the federal project in 2003-2004. In 1986, there was no dune present at this site. Shore protection relied on the concrete seawall and a relatively narrow and low elevation beach. Over time, aeolian processes developed a small dune footprint around installed fence from 1986 to 2003. The federal project enhanced the dune with a higher and wider feature while expanding the beach berm width and elevation. The net volume change over thirty years of monitoring shows a huge gain of 130.49 yds³/ft of sand while the shoreline position advance seaward 125 ft.

Benson Avenue, Margate City (Site 127):

This site did not have an established dune system in 1986. The town of Margate declined to join the initial federal project. As a result no sand has been placed here in any significant quantity during the monitoring history. A few segments of the back beach have developed sizable vegetated “island” dunes. Storm surge and waves during larger storm events, including Sandy and Jonas, have sent water between the dune segments and over-topped the street end bulkhead revetment that serves as the primary shore protection feature in this region, with resulting flooding and property damages. During 2015, some street-end oceanfront bulkheads were raised to elevation 13.0 ft NAVD88 in an attempt to mitigate future storm flooding.

Although no sand has been placed directly, this site has benefited from longshore transport, moving sand south from the project beaches. Located approximately 1.25 mi south of the federal beach taper, project end effect erosion has still supplied a source of sand from the Ventnor beaches to feed the beaches in Margate. As a result the Benson Avenue site has remained stable to slightly accretive.

From spring 2015 to fall 2016, a small sand ridge on the beach berm was flattened and spread landward towards the bulkhead. Nearshore and offshore scouring removed sand from the toe of the beachface slope to the offshore bar. A new bar system developed closer to shore filling a trough present in 2015. Cross-shore transport dominated during this time, resulting in a volume gain of 2.53 yds³/ft of sand, while loss nearshore resulted in a 39 ft shoreline retreat.

The thirty year comparison shows a modest influx of sand over time, dramatically increasing in 2006 shortly after the federal project was completed up-drift in Ventnor City. A direct comparison of the survey data from fall 1986 to fall 2016 shows a net volume gain of 57.42 yds³/ft of sand with a seaward advance in the shoreline position of 65 ft. These gains were all derived naturally through longshore and cross-shore transport of sediment without any direct sand placement.

17th Street, Borough of Longport (Site 126):

The beach at 17th Street is located about 1,750 ft north of the 11th Street jetty for Great Egg Harbor Inlet. In 1990, a state and local beach nourishment project placed approximately 250,000 cubic yards of sand on the Longport Beach. Longport declined to participate in the initial federal project in 2003 so no sand has been placed at this site since 1990. Beach stability and configuration is influenced by inlet dynamics due to its proximity and the sand retention capacity of the 11th Street jetty. Primary shore protection is an old concrete seawall with rock toe revetment. There is no dune and the beach is narrower and lower in elevation than elsewhere on Absecon Island. During Sandy waves flooded the beach and over topped the wall with water pouring down most of the Longport streets into Atlantic Avenue. Development is dense and immediately landward of the wall, which resulted in property and infrastructure damages. Recent local agreement has resulted in Longport's inclusion in the next phase of the USACE Absecon Island's shore protection project with construction expected in 2017.

During 2015 through 2016 the beach eroded both in width and elevation. The recreational beach berm extended approximately 125 feet seaward of the seawall. Elevation of the beach at the base of the wall was less than 6 ft NAVD88 with the berm ridge below 4 ft NAVD88. Rocks along the base of the seawall have remained buried through this study interval. The shoreline position retreated -60 ft with a net volume loss of -44.24 yds³/ft of sand.

The thirty year trend shows a modest net sand volume gain, marked with episodes of erosion largely storm related, with periods of recovery between storm events. The shoreline position trend also demonstrated the correlation to storm events and recovery that result in a moderate net shoreline position advance. In 1986, the beach elevation was deflated, revetment rocks were exposed, and beach elevation at the rocks was below 4 feet NAVD88 and very narrow in berm width (less than 50 ft). A direct comparison between the fall 1986 and fall 2016 surveys show the site has gained just 6.76 yds³/ft of sand with a shoreline position advance of 93 ft.

One important issue related to the coming federal project is tied to the terminal rock jetty at 11th Street in Longport. Built decades ago, this structure is too short to retain the sand supply designed to be pumped onto the beach in Longport. The resulting loss rate into Great Egg Inlet will be very high as sand moves south along the beach. In 2001, the USACE proposed a series of alternatives as betterments for the beach restoration project, but their jurisdiction ends and the north edge of the 11th Street jetty. NJ State and local interests would need to address the jetty's shortcomings in order to avoid project loss rates and inlet shoaling problems certain to follow beach project construction in Longport. The evidence supporting this thesis is found by examining air photographs following the 1990 Longport sand placement when beaches on the south side of the jetty appeared immediately, but persisted for only a brief interval as the sand supply on the beach dwindled.

**INSTRUCTIONS FOR USING THE GRAPHICAL ILLUSTRATIONS PROVIDING INFORMATION
ON EACH OF THE 107 NEW JERSEY COASTAL SITES DEVELOPED SINCE 1986
(OR A MORE RECENT ESTABLISHMENT DATE)**

1. The initial page for each survey location is a full page photograph showing the beach condition as it existed during the fall survey season of 2016.
2. The second page is a pair of beach photographs showing the comparison from the fall survey season of 2015 with the corresponding view taken during the survey season completed in the fall of 2016 with descriptive comments below the two photographs.
3. The third page is the cross section plot for the site showing the most recent four surveys dating from spring 2015, fall 2015, spring 2016 and fall 2016 accompanied with a text description of pertinent changes to the dune, beach or offshore segment.
4. The fourth page is a shoreline position and sand volume trend analysis showing each fall survey since the profile was established in 1986 or a later date for some sites. The bars represent annual shoreline position changes and sand volume gain or loss combined with a pair of lines showing the cumulative effect of the annual change data. Major projects always appear the year they are constructed and subsequent years of change that follow.
5. The fifth page is a presentation of all profile surveys at the specific site color-coded by date of survey. Initial surveys are plotted in blue, shifting green, then yellow, finally to orange and red colors for the most recent years. The plots show the evolution of the profiles over the complete 30-years of measured data, with the ability to see the dramatic impact of major beach restoration efforts as a significant alteration to the pattern. Colors progressing from blue to red in the seaward direction indicate an accretional pattern and colors progressing from blue to red in the landward direction indicate an erosional pattern. The thick black line displays the mean profile shape, which is calculated by taking the average of all measured profiles from each site.
6. The sixth and final page shows a pair of aerial photographs paired with a cross-section plot of the site. The aerial photographs are composed of a historical aerial from around the year 1995 and a more recent aerial from around the year 2015 (exact years are indicated on the plot). The cross-section plot displays the profile view of the site from the same years as displayed in the aerial photographs and both the plots and aerials are set to the same distance scale. This figure shows the change over time at each profile site as presented by an aerial image comparison and a cross-sectional comparison. Combining these two different means of data presentation allows for changes in topographic features, vertical elevations, and shoreline positions to be displayed simultaneously in the same figure.

NJBPN 134 – Green Acres, Brigantine (October 12, 2016)



Figure 390. NJBPN site 134 is located in the North Brigantine Natural Area. This photo was taken on October 12, 2016 looking north along the seaward dune slope. The beach is flat, narrow and lower in elevation allowing higher tides to approach the dune toe. A wide low elevation dune has recovered naturally following storm overwash during Sandy. This site is well north of the engineered beach, no direct sand placement occurs here.

NJBPN 134 – Green Acres Area, Brigantine



Figure 391a & 391b. This site is located in the North Brigantine Natural Area preserve on the northern segment of Brigantine Island and managed by the State of New Jersey. No dune fence has been placed to enhance dune growth. On the left (October 16, 2015) the photo shows the natural dune growth is limited vertically. Right photo was taken on October 12, 2016 showing modest aeolian sand accumulation around plants colonizing the seaward dune slope. Natural processes can take decades to restore a dune system. This dune system was washed landward by the December 1992 northeast storm. A single line of fencing was installed that was the locus for the replacement naturally developing dune that followed the storm. Hurricane Sandy washed that dune into the marshes further landward, resulting in the present feature now 5 years in development.

New Jersey Beach Profile Network

#134 - Green Acres Area, Brigantine, Atlantic County

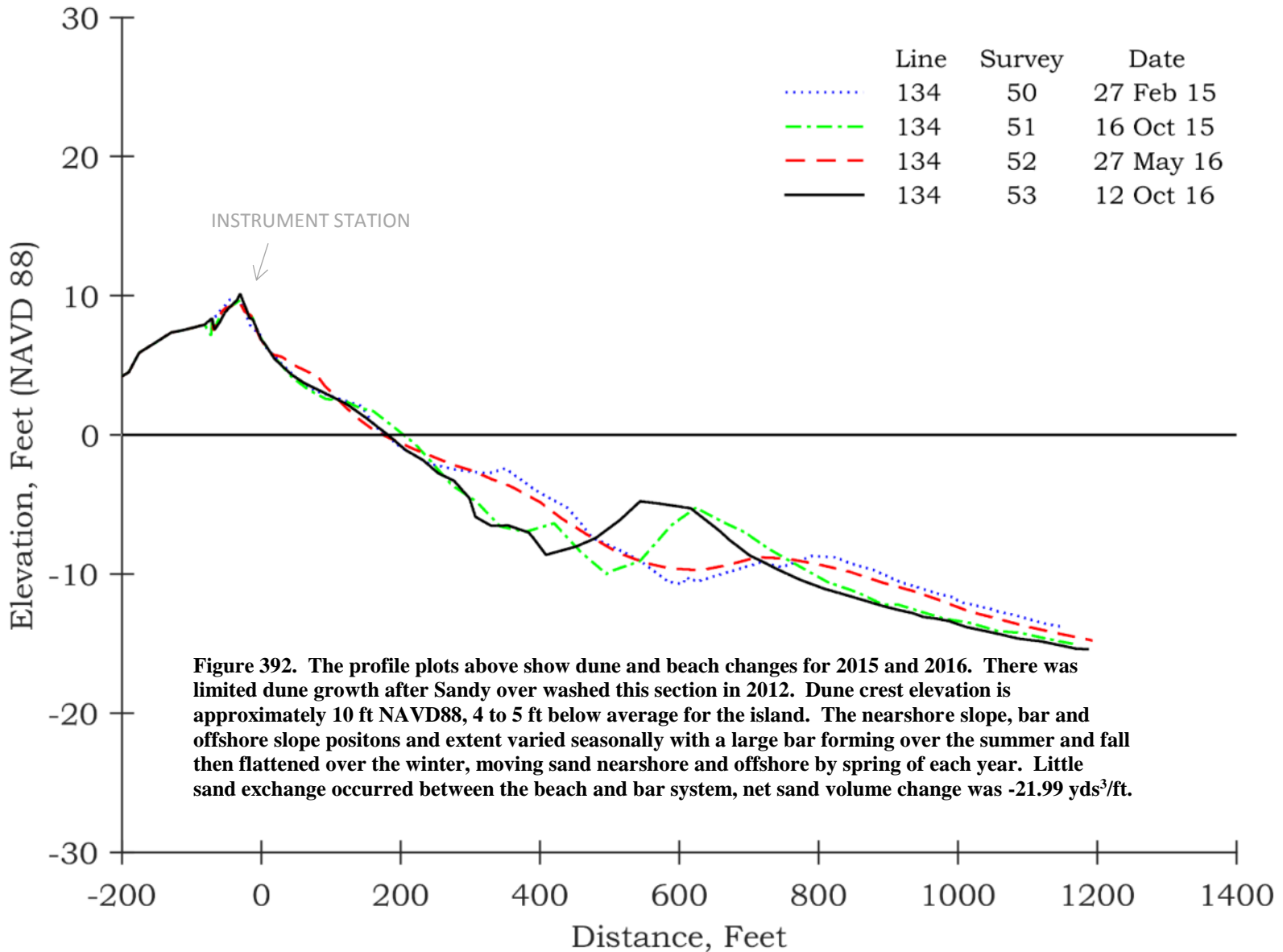


Figure 392. The profile plots above show dune and beach changes for 2015 and 2016. There was limited dune growth after Sandy over washed this section in 2012. Dune crest elevation is approximately 10 ft NAVD88, 4 to 5 ft below average for the island. The nearshore slope, bar and offshore slope positions and extent varied seasonally with a large bar forming over the summer and fall then flattened over the winter, moving sand nearshore and offshore by spring of each year. Little sand exchange occurred between the beach and bar system, net sand volume change was -21.99 yds³/ft.

30-Year Coastal Changes at Site 134, Green Acres Area, Brigantine, Atlantic Co.

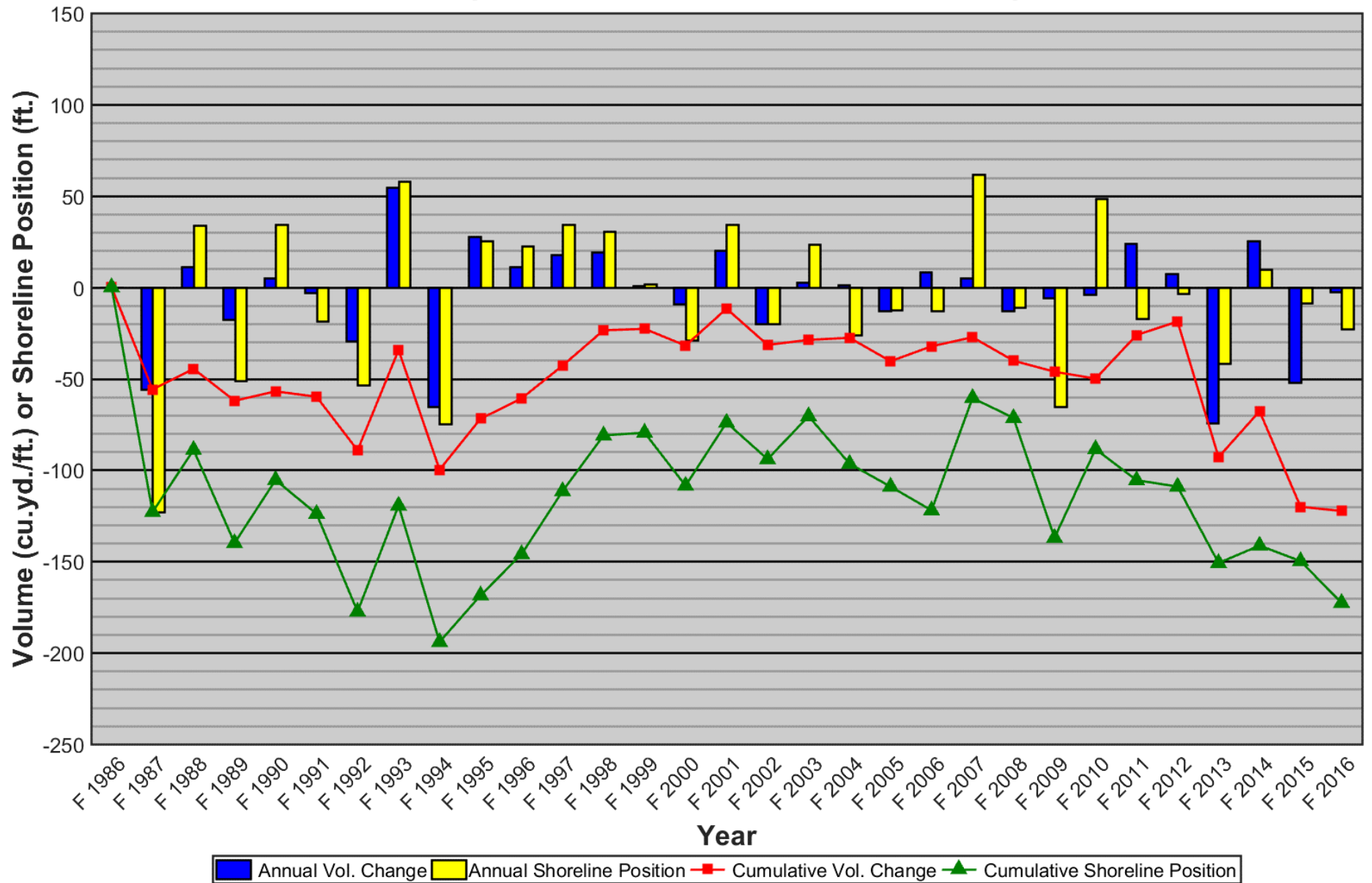


Figure 393. The storms of the early 1990's produced substantial shoreline recession that slowly reversed until 2007. Hurricane Sandy produced additional overwash and shoreline retreat leading to a 30-year total of 121 yds³/ft in sand volume loss and a 172 ft shoreline retreat.

30-Year Ensemble Mean Profile at Site 134, Green Acres Area, Brigantine, Atlantic Co.

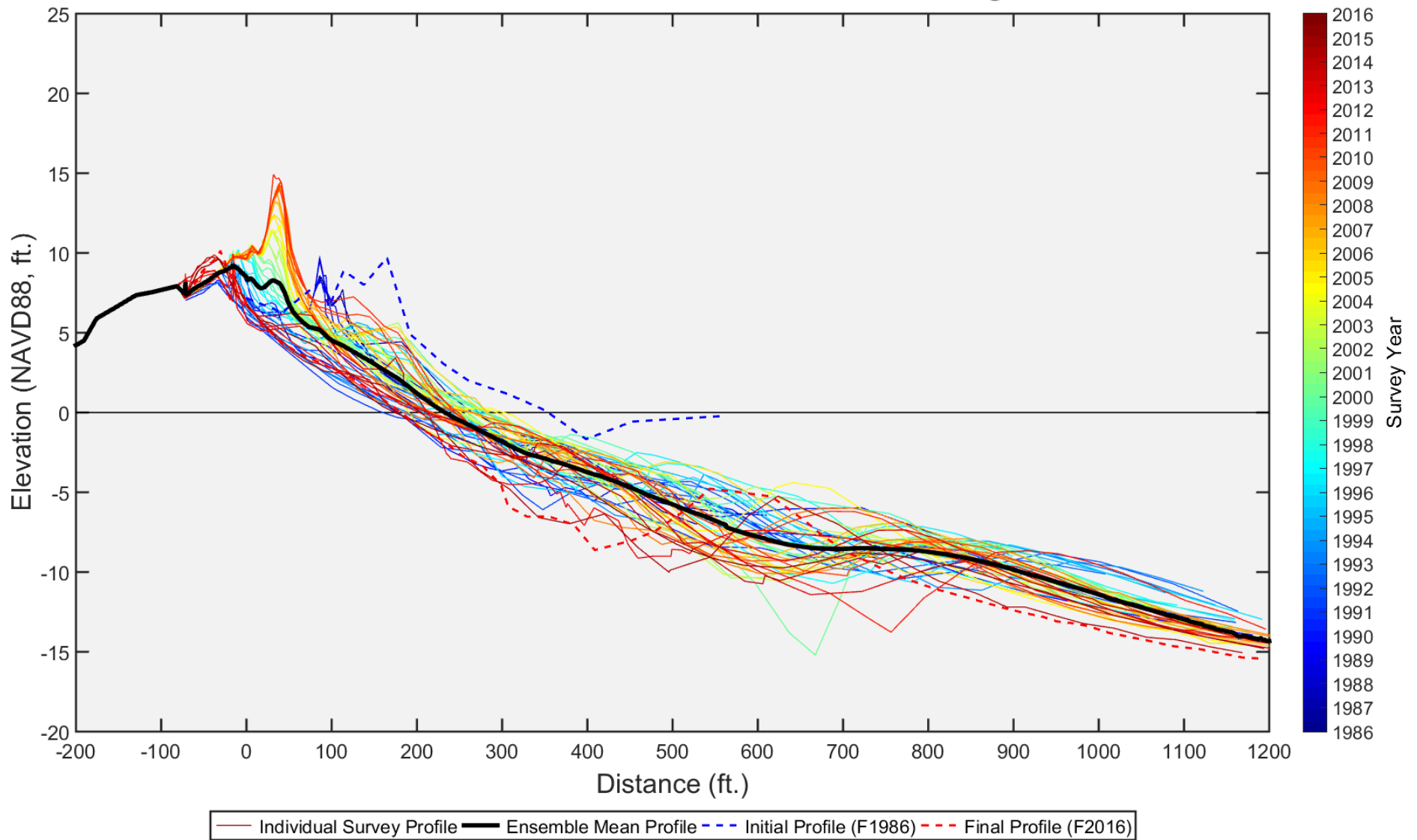


Figure 394. The initial profile in 1986 was eroded landward by successive storms leading to the worst case seen in 1992 where the entire northern end of the island was completely overwashed to the bay. A single row of fencing was established and became the new dune that grew by 2011 to 15 ft elevations. Hurricane Sandy washed this dune landward allowing the new, low feature to appear in the red line cross sections. Therefore, the new, red dune lies nearly 200 ft landward of the one present in 1986.

#134 - Green Acres Area, Brigantine, Atlantic County
Comparison of 1995 to 2015

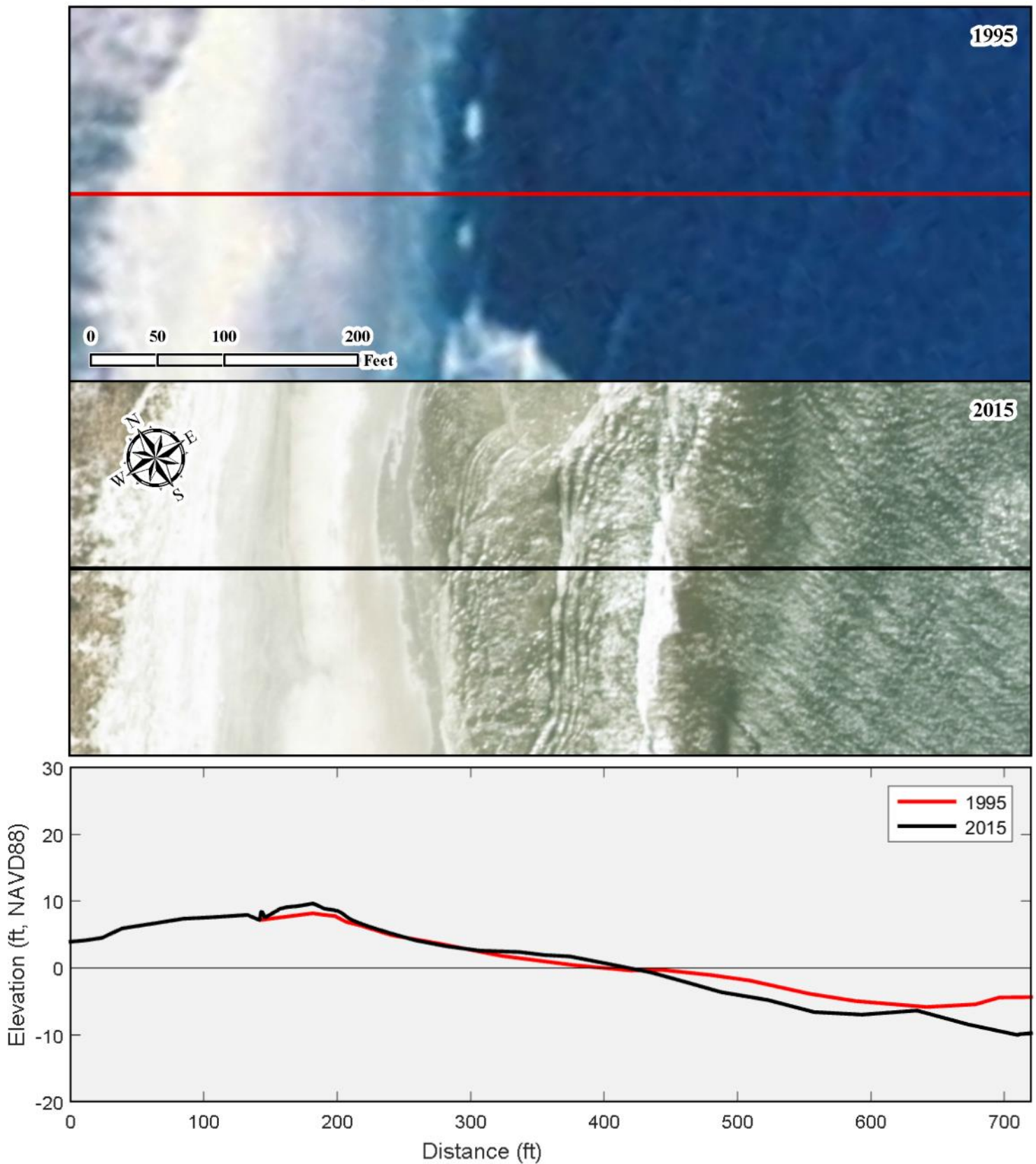


Figure 395. There has been a storm related series of shoreline retreats interspersed with an influx of sand derived from sediment by-passing the Brigantine Inlet ebb-tidal delta a short distance to the north. This comparison of the situation in 1995 with 2015 does show a slightly bigger dune and a shoreline position with little net change over 20 years largely due to the fact that both surveys follow major storm events.

NJBPN 133 – 4th Street North, Brigantine (October 11, 2016)



Figure 396. NJBPN site 133 is located at 4th Street North in Brigantine. This site served as documentation for part of the beach restoration work in 1996, 2001, and during the initial federal project in 2006. Periodic maintenance nourishment has maintained a beach and dune system seaward of the oceanfront properties.

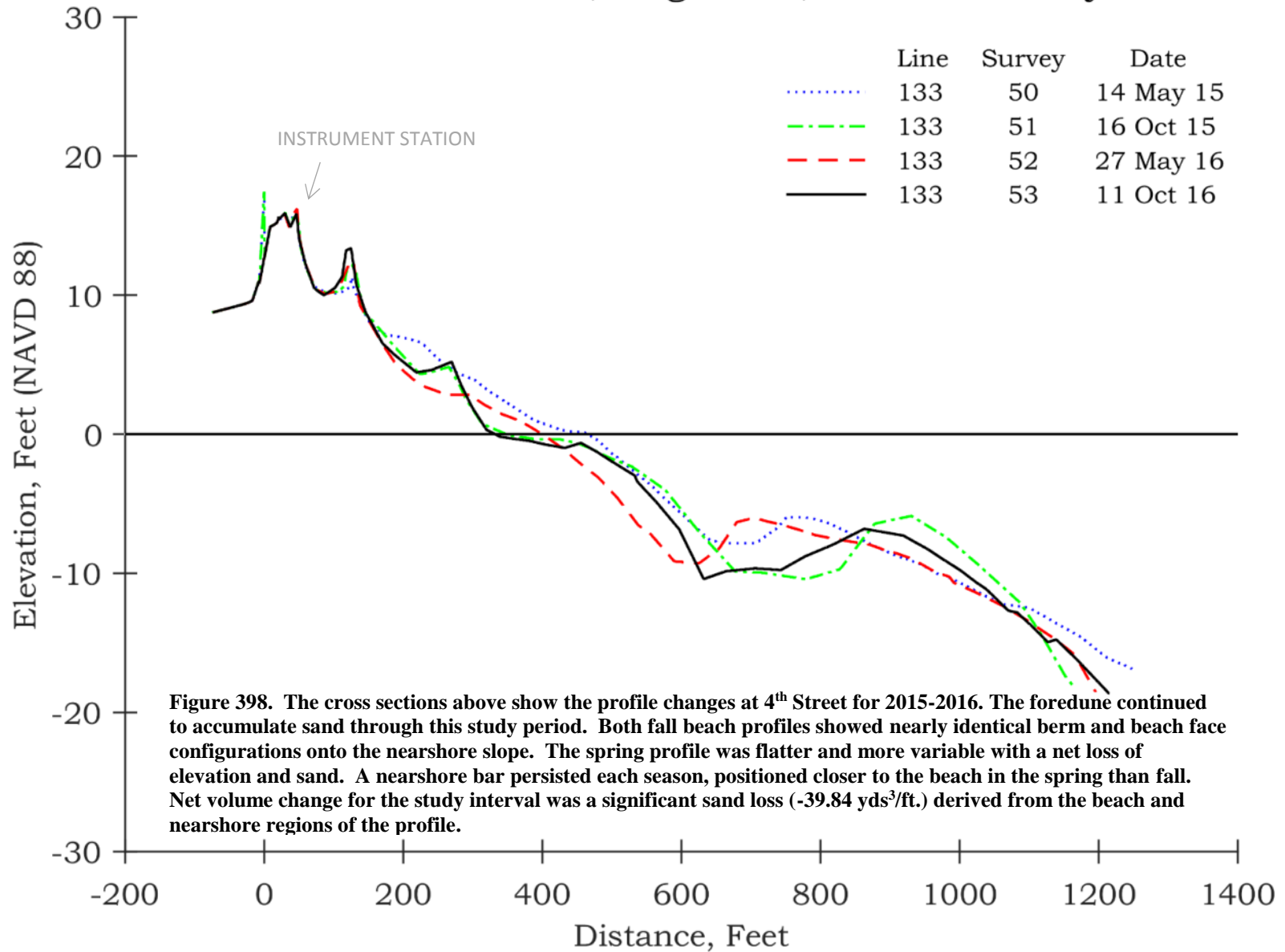
NJBPN 133 – 4th Street North, Brigantine



Figure 397a & 397b. This site is located within the engineered beach and federal project area. Positioned near the northern limit of development this site is just south of the erosional “hotspot”. Photo on the left was taken on October 16, 2015 shows a wide dry recreational beach. On the right (October 11, 2016), is the same view, one year later, shows little change in beach width or dune position.

New Jersey Beach Profile Network

#133 - 4th Street North, Brigantine, Atlantic County



30-Year Coastal Changes at Site 133, 4th Street North, Brigantine, Atlantic Co.

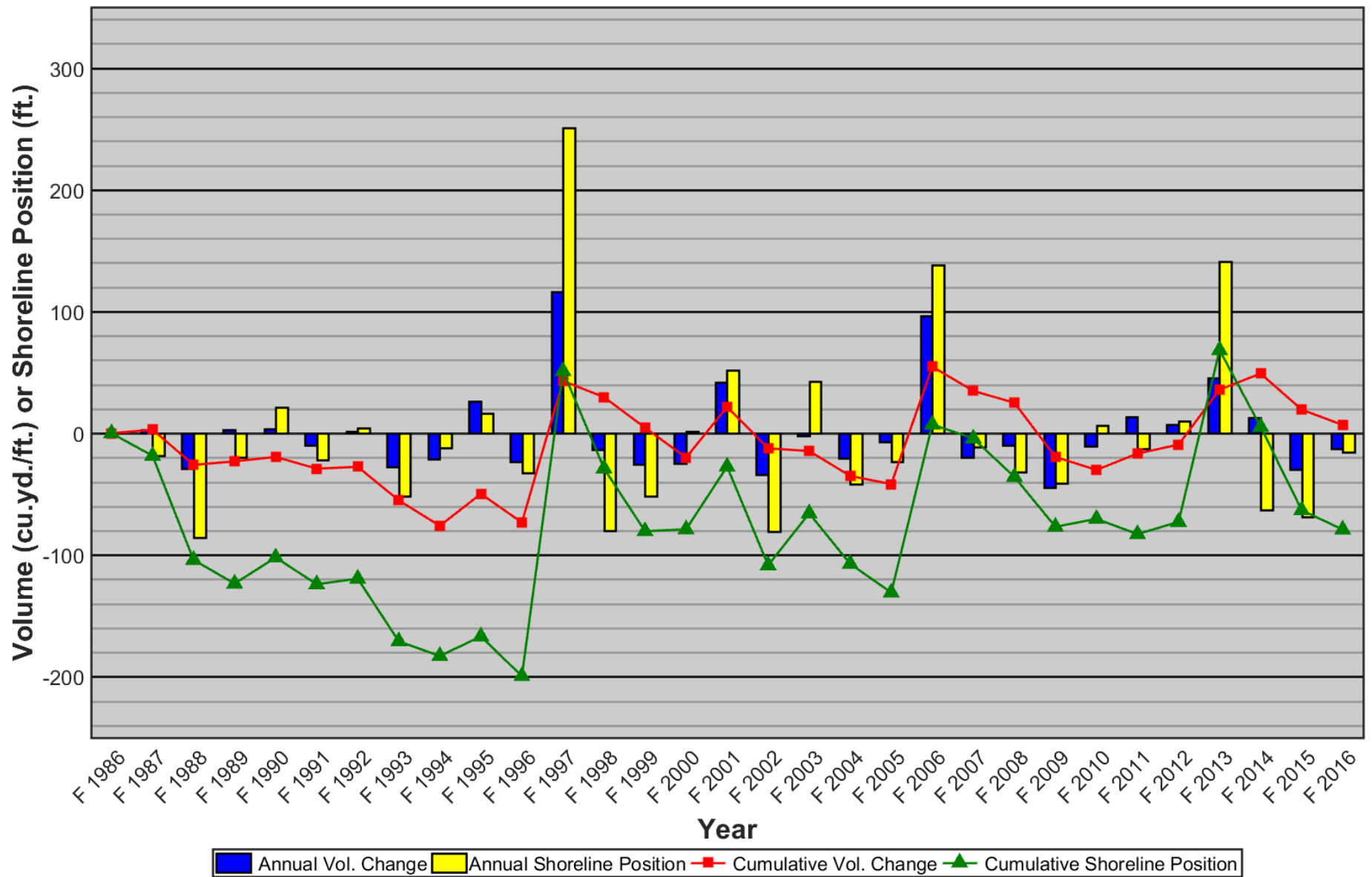


Figure 399. The initial NJ State and local fill occurred in 1996, again in 2001. In 2006 the USACE initiated their federal project, returning in 2013 after Hurricane Sandy. The shoreline is 79 feet landward of its 1986 position while the dune and beach support a sand volume slightly greater than that present in 1986.

30-Year Ensemble Mean Profile at Site 133, 4th Street North, Brigantine, Atlantic Co.

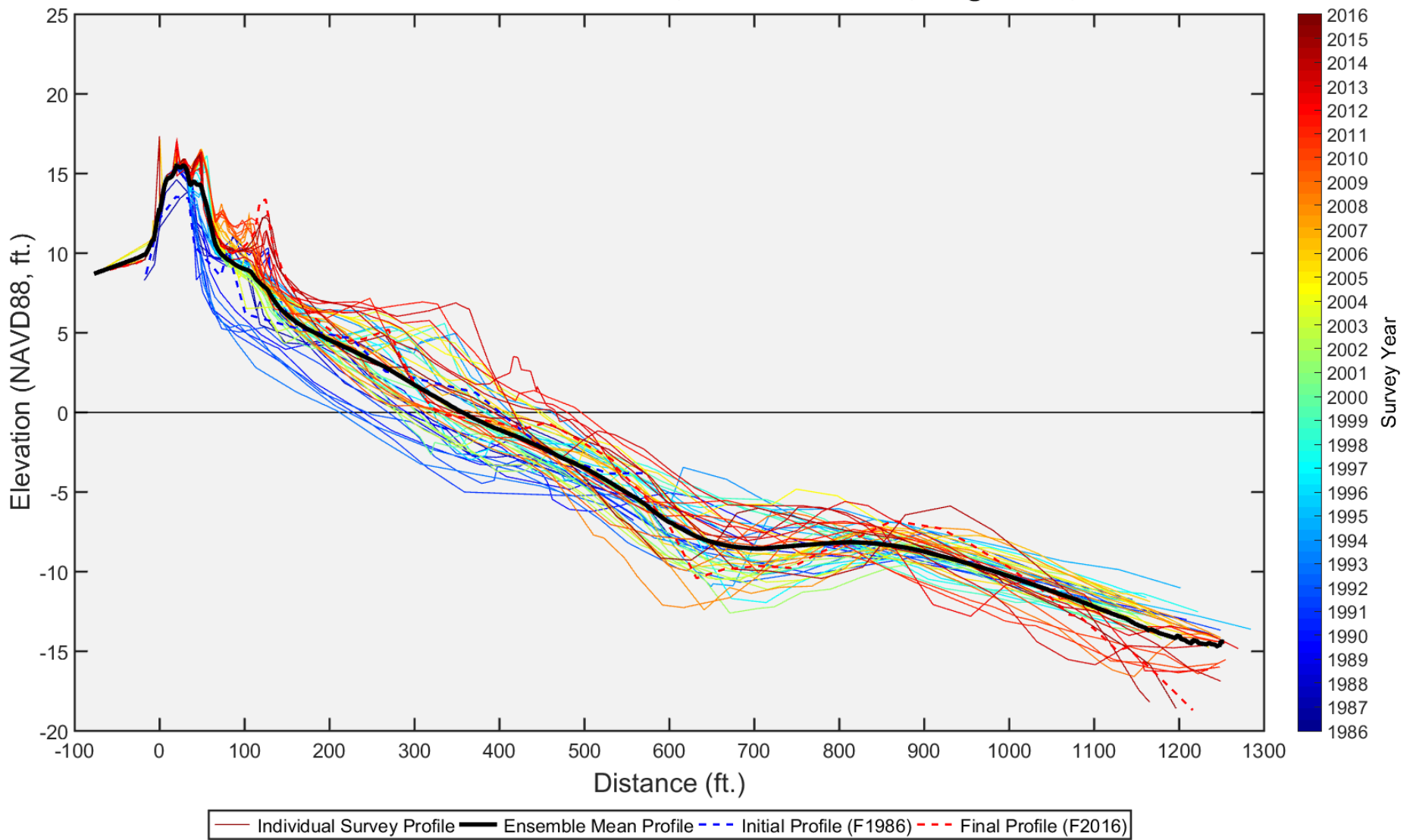


Figure 400. The early profile lines in blue show the net sand volume advance produced by the multiple northern beach fill efforts starting in 1996, taken over by the USACE in 2006 as part of the Brigantine Inlet to Great Egg Inlet Shore Protection project.

#133 - 4th Street North, Brigantine, Atlantic County
Comparison of 1995 to 2015

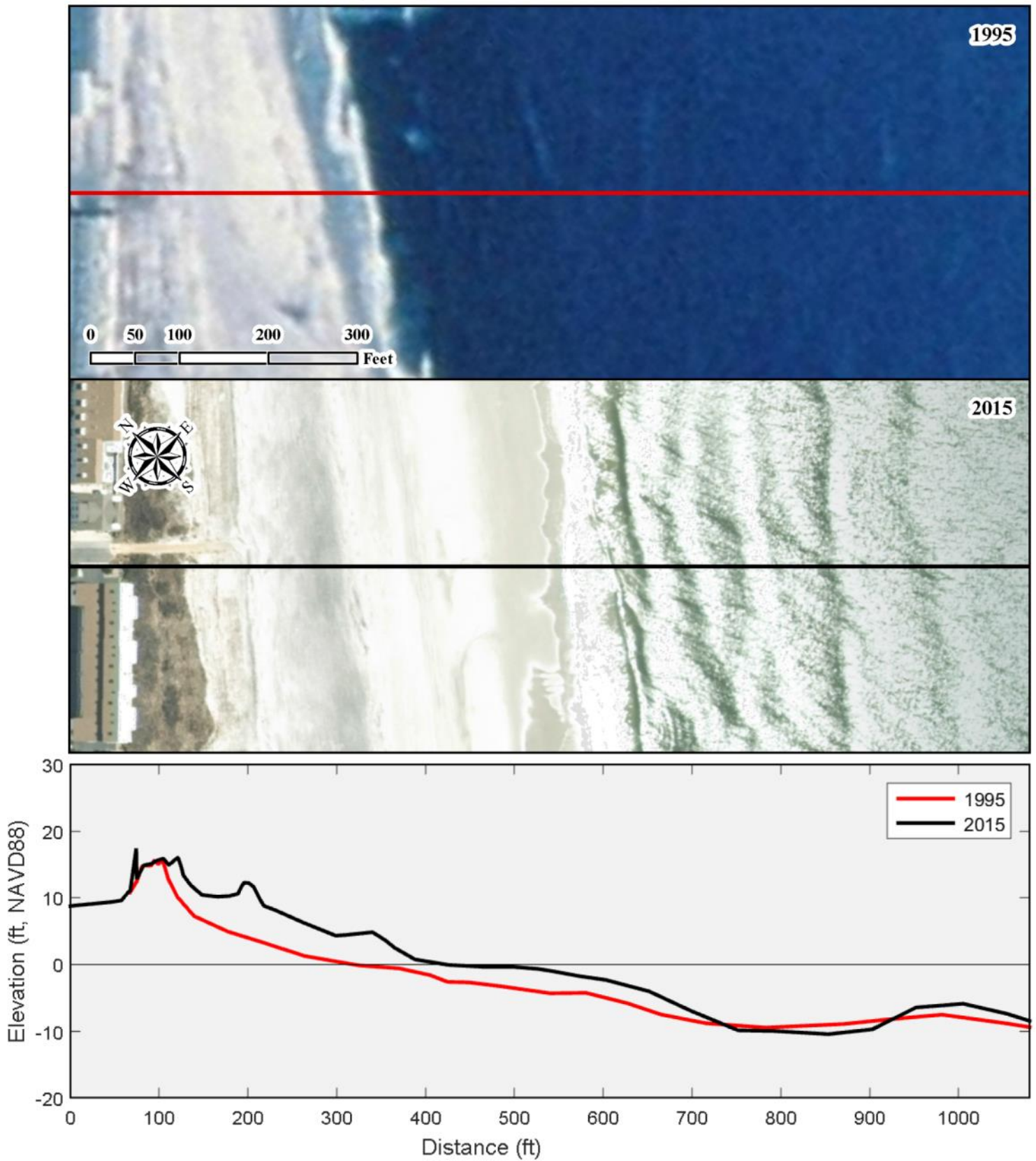


Figure 401. Beach nourishment is responsible for this shoreline advance. NJ State and local projects started in 1996 and repeated in 2001 followed by the USACE efforts beginning in 2006

NJBPN 132 – 15th Street South, Brigantine (October 11, 2016)



Figure 402. NJBPN site 132 is located at 15th Street South in Brigantine. Looking north along this beach, the influx of sand from the various beach fill projects enhanced this site by hundreds of feet in beach width.

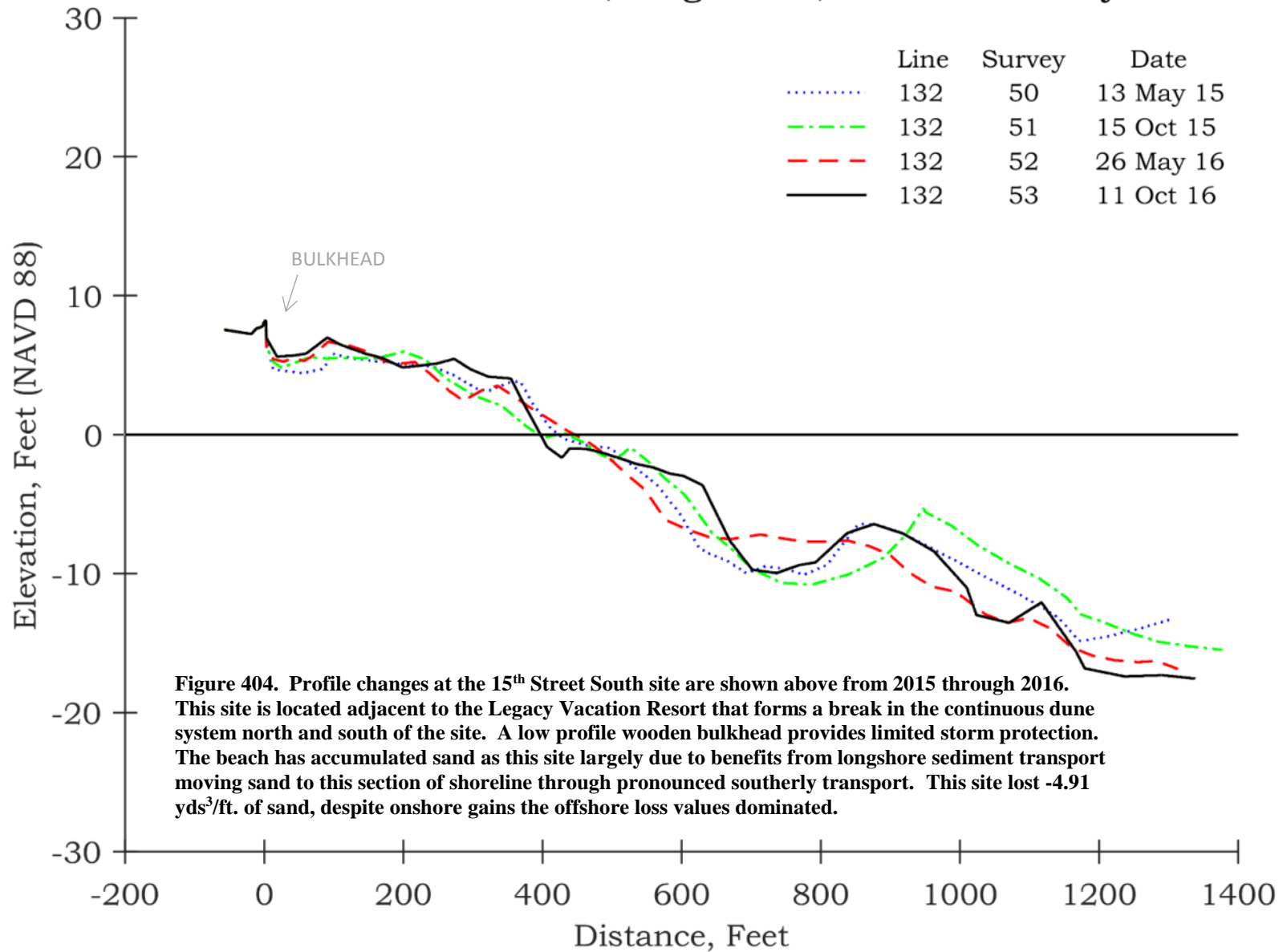
NJBPN 132 – 15th Street South, Brigantine



Figure 403a & 403b. The left photo was taken on October 15, 2015 from along the seaward dune toe. The dune is absent on the profile but is extensive south and north of the site. Photo on the right was taken October 10, 2016 from the same position gives an indication of the rate of sand accretion on the seaward dune slope over one year's time.

New Jersey Beach Profile Network

#132 - 15th Street South, Brigantine, Atlantic County



30-Year Coastal Changes at Site 132, 15th Street South, Brigantine, Atlantic Co.

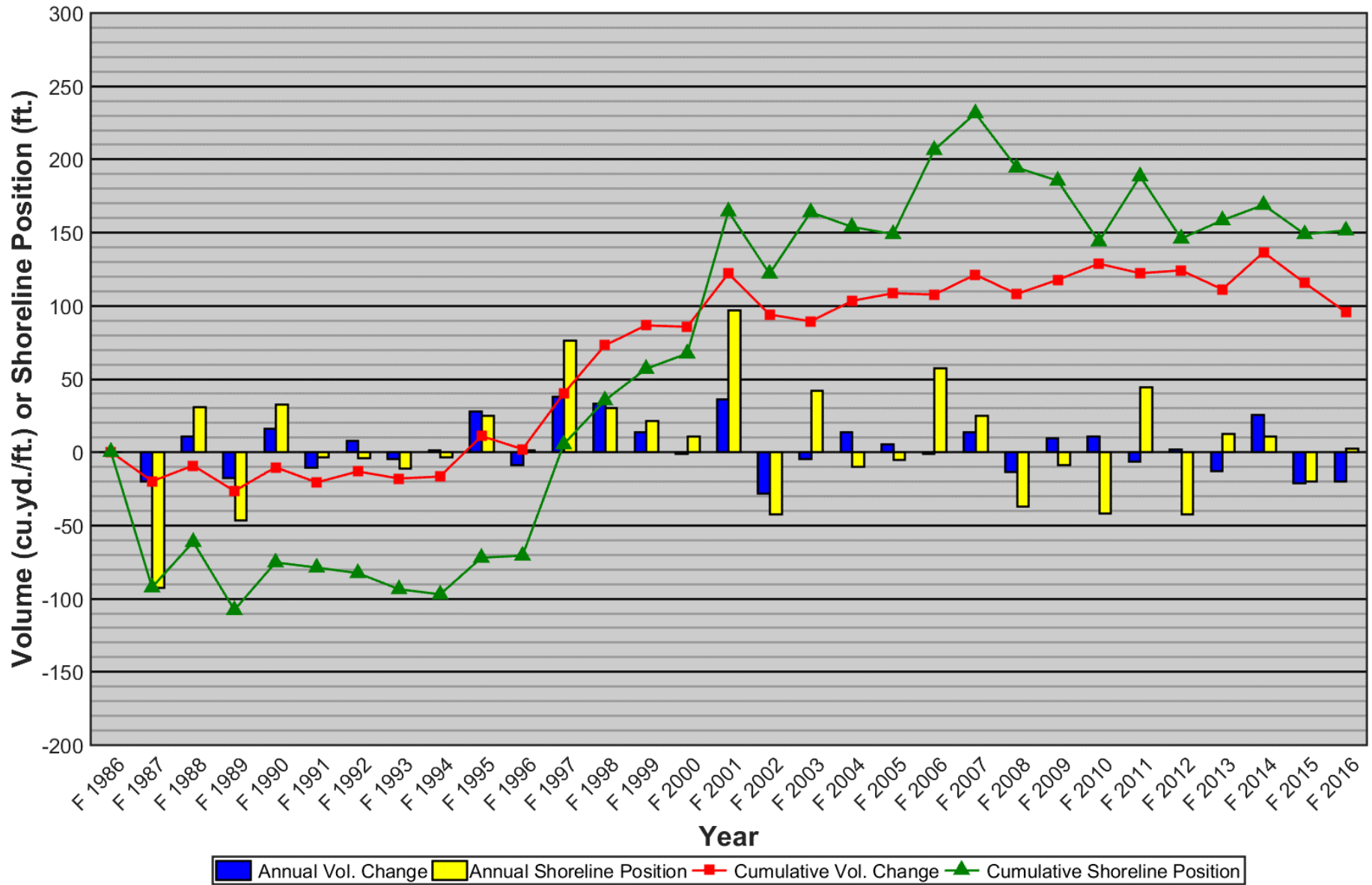


Figure 405. Sand arrived here almost immediately after the spring of 1996 project that ended about 20 city blocks north of this site. Sand volumes exceeded 100 yds³/ft since 2001 with a shoreline advance averaging about 150 ft. The secondary benefit from beach nourishment in Brigantine extends well beyond the southern limit of sand placement 10 city blocks north of 15th Street South.

30-Year Ensemble Mean Profile at Site 132, 15th Street South, Brigantine, Atlantic Co.

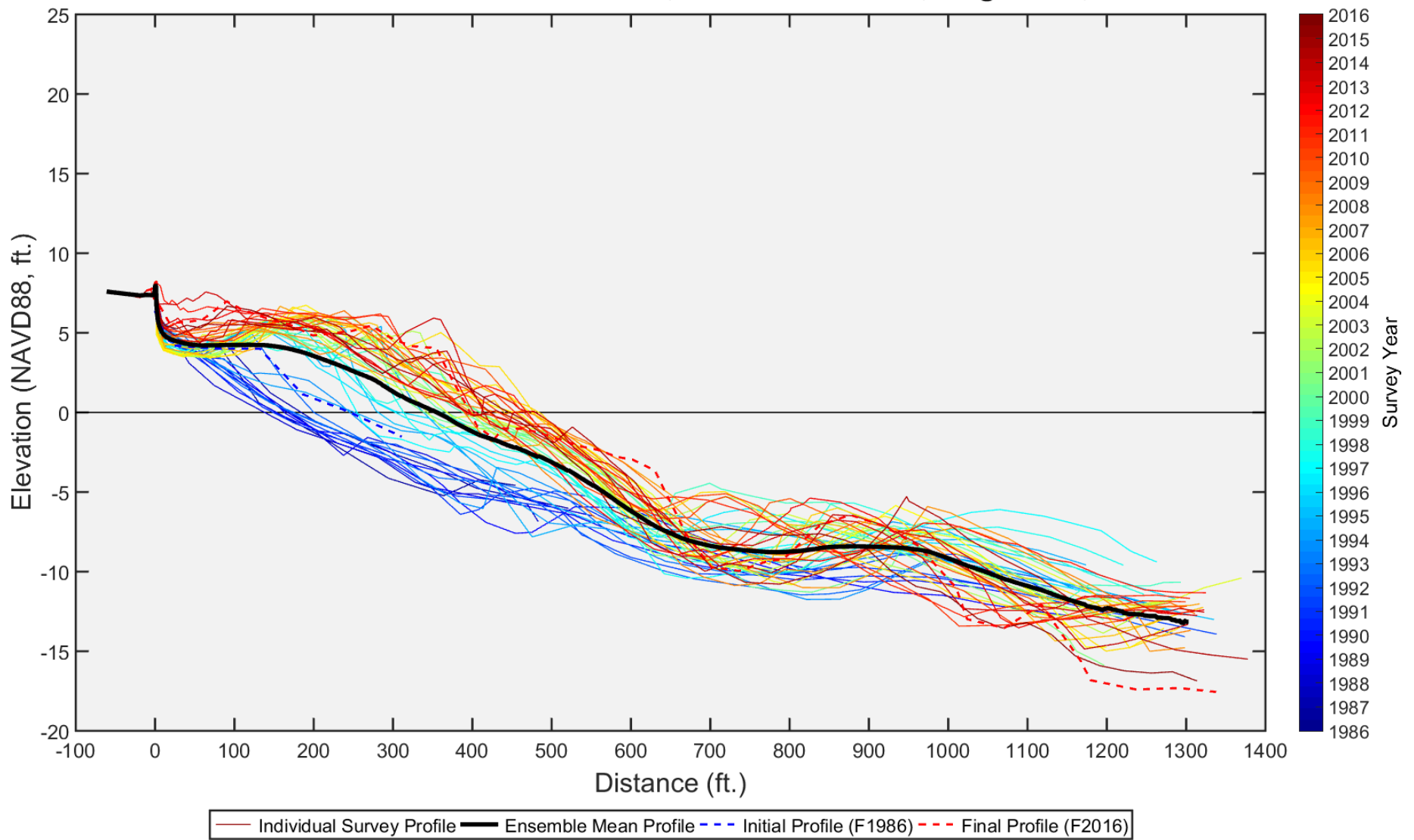


Figure 406. The successive accumulation of sand at this site can be seen in the color shift from blue lines lower in elevation to the left trending to green lines in the middle and orange and red lines at the higher elevations and to the right indicating progressive sand accretion at 15th Street South.

#132 - 15th Street South, Brigantine, Atlantic County
Comparison of 1995 to 2015

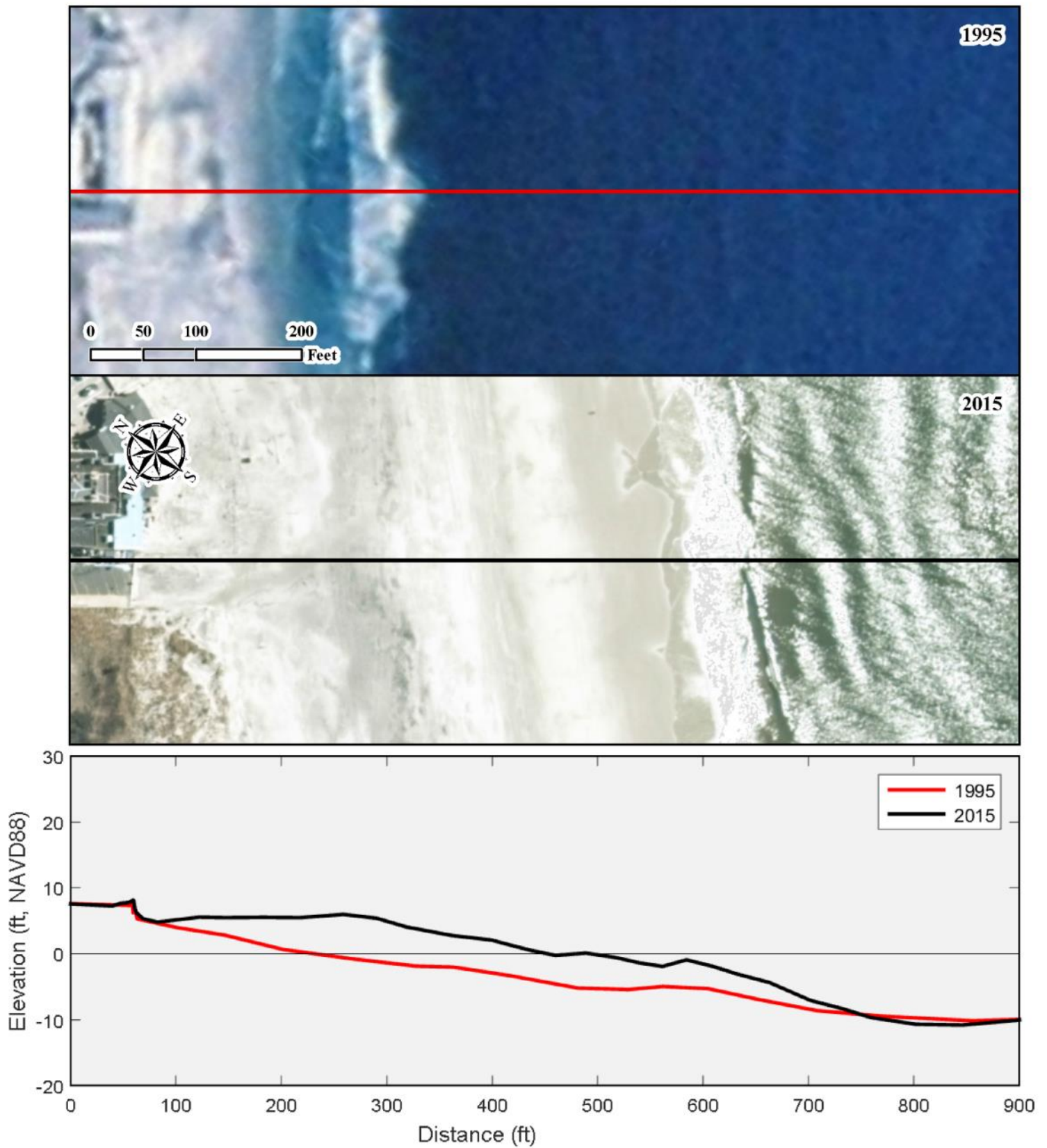


Figure 407. Littoral transport is solely responsible for this site’s accretional development as sand moved south from the beach enhancement projects completed to the north. Sand initially appeared at this site just 6 months after the 1996 fill was completed.

NJBPN 131 – 43rd Street South, Brigantine (October 10, 2016)



Figure 408. NJBPN site 131 is located at 43rd Street South in Brigantine. The 600 ft of beach width shown in this photo has all accumulated through natural processes no direct sand placement has occurred here, however, the north end nourishment projects have fed sand into this region through littoral currents.

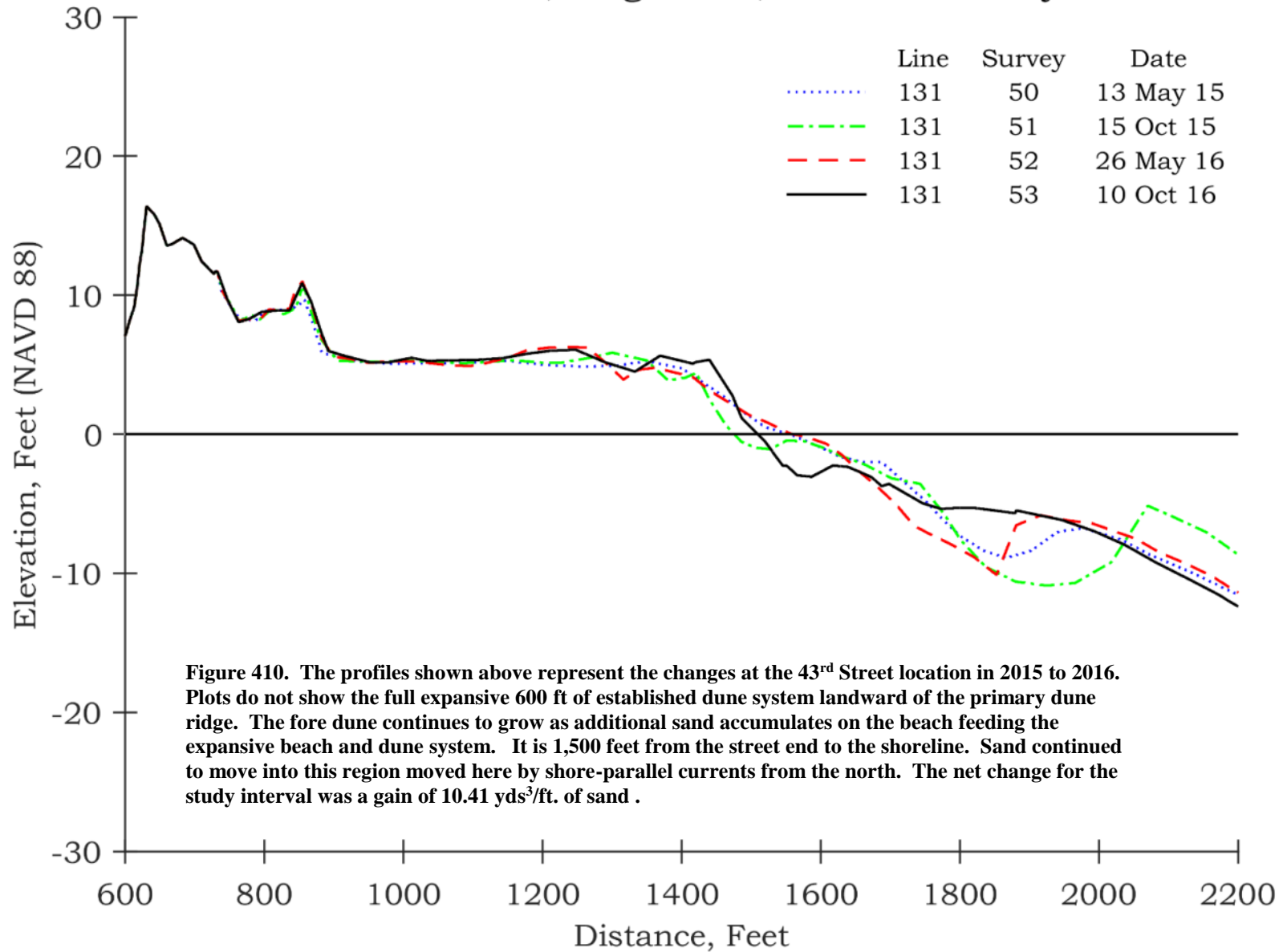
NJBPN 131 – 43rd Street South, Brigantine



Figure 409a & 409b. The photo on the left is a view to the south taken from the upper berm (October 15, 2015). This extensive 600 ft of dry beach width has accumulated here naturally since 1986. The right photo was taken on October 10, 2016 looking south from lower on the beach and shows the seaward segment of the wide beach and beach face, with waves breaking on a nearshore bar.

New Jersey Beach Profile Network

#131 - 43rd Street, Brigantine, Atlantic County



30-Year Coastal Changes at Site 131, 43rd Street, Brigantine, Atlantic Co.

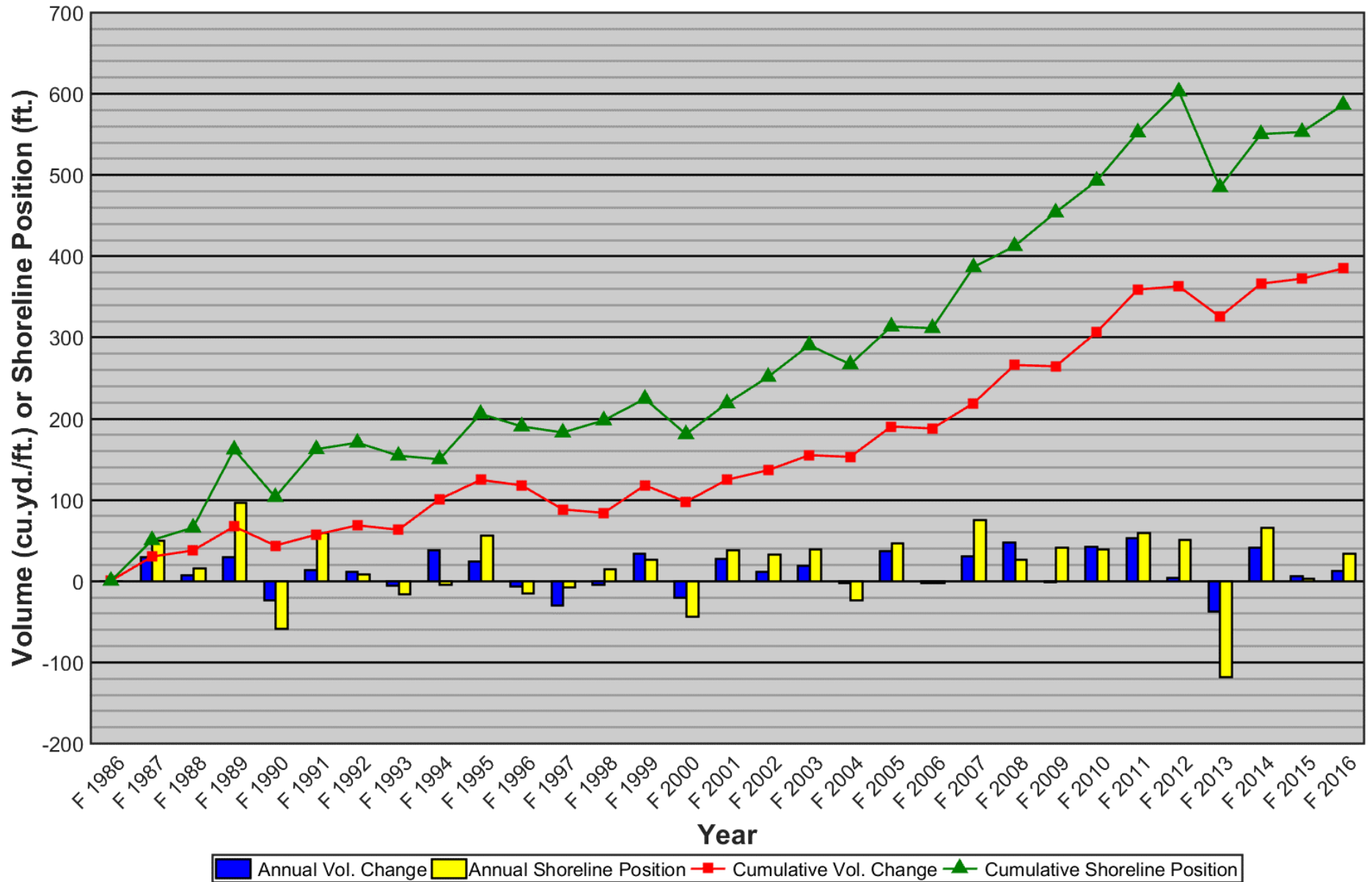


Figure 411. Ever since the initial survey in 1986, this location has gained sand every year with few exceptions. Quantities are substantial (385 yds³/ft for sand volume gains and 585 ft of shoreline advance by 2016). These numbers are equal in magnitude to the largest man-made beach enhancements on record for New Jersey.

30-Year Ensemble Mean Profile at Site 131, 43rd Street, Brigantine, Atlantic Co.

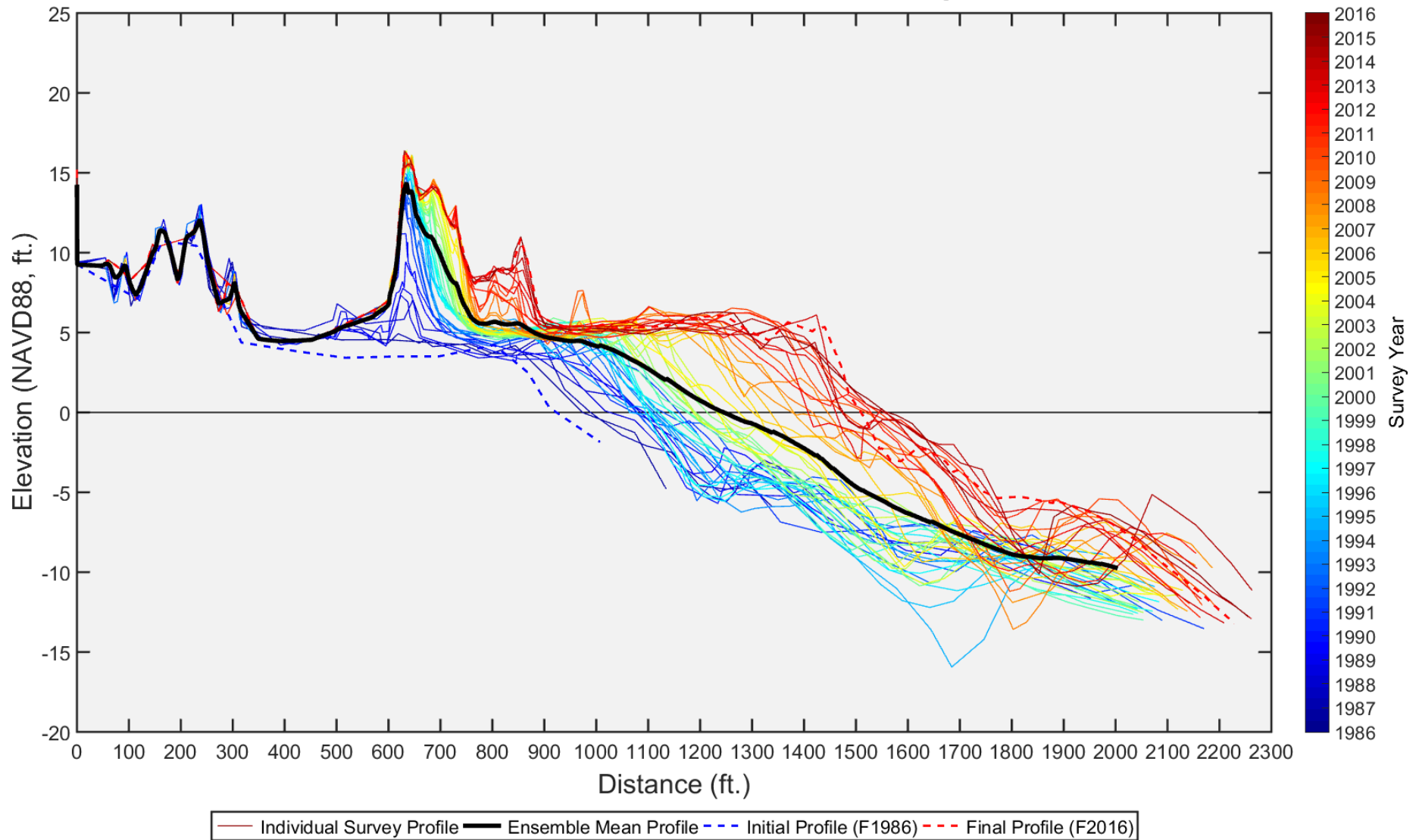


Figure 412. This is one of the classic examples of a New Jersey beach site where sand accretion is the rule with successive surveys moving ever seaward and dunes following along building wider and higher with time. This growth represents the equivalent of two city blocks added to the oceanfront in 30 years.

#131 - 43rd Street South, Brigantine, Atlantic County
Comparison of 1995 to 2015

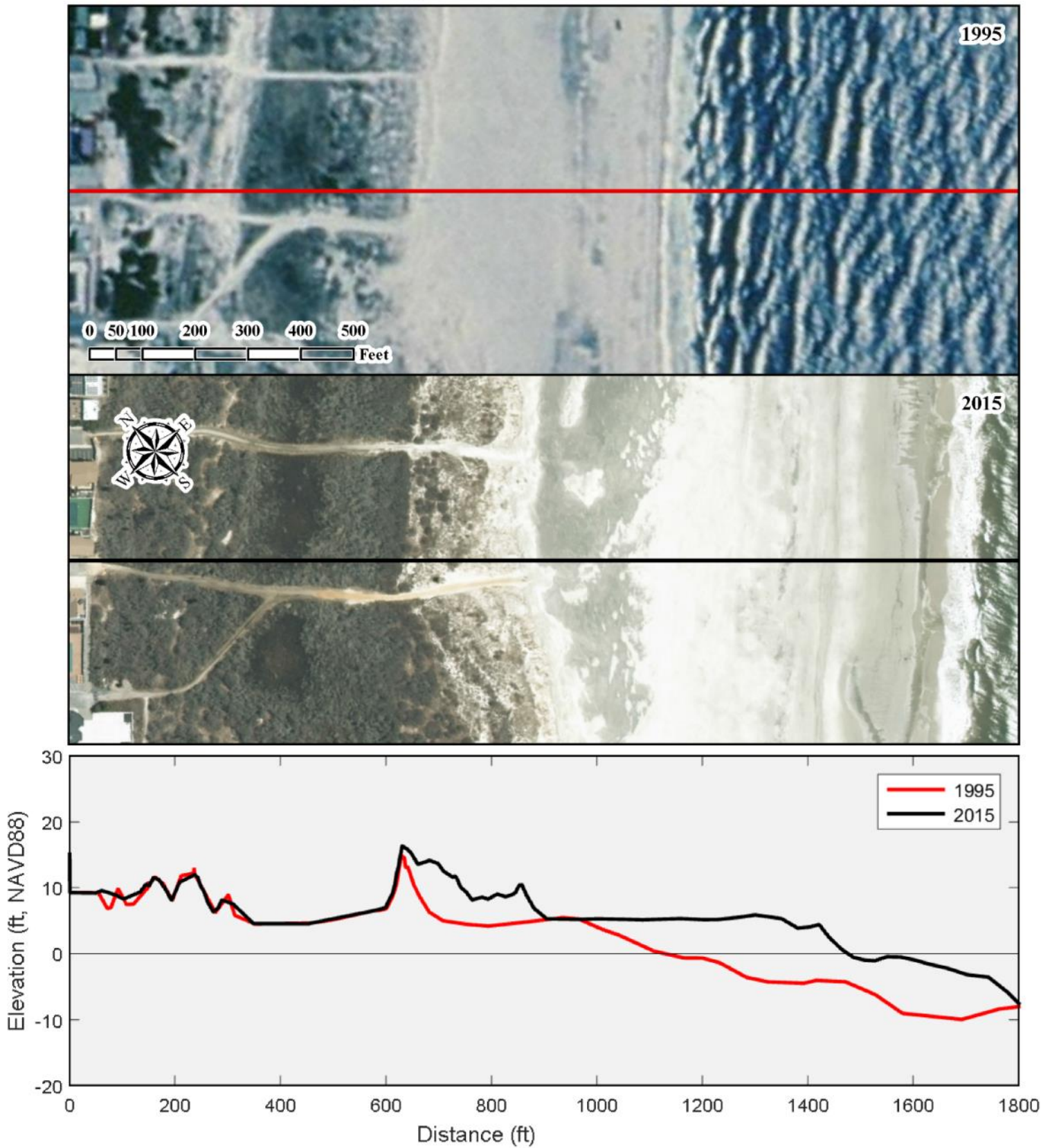


Figure 413. Sand moves south along the Brigantine beachfront only to remain trapped against the north jetty for Absecon Inlet. The resulting shoreline advance is among the most impressive anywhere in NJ. Between 1986 and 1995, the seaward dune was developed on the profile and grew much larger over time.

NJBPN 230 – Rhode Island Avenue, Atlantic City (December 15, 2016)

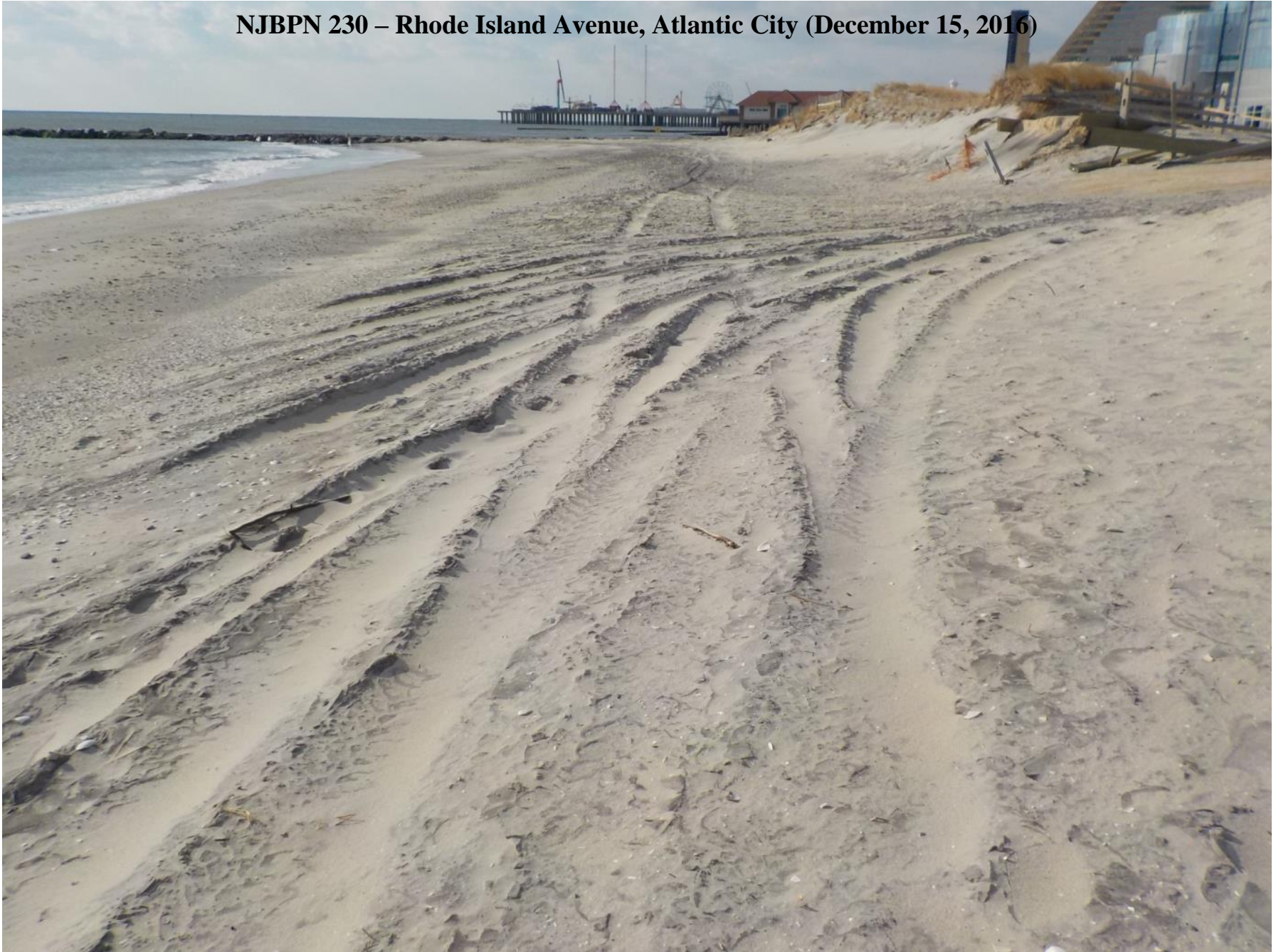


Figure 414. NJBPN site 230 is located at Rhode Island Avenue in Atlantic City. View is to the south toward Steel Pier and shows the results of beach and dune erosion. The beach is narrow, seaward dune slope scarped and the dune walkover from the boardwalk to the beach damaged.

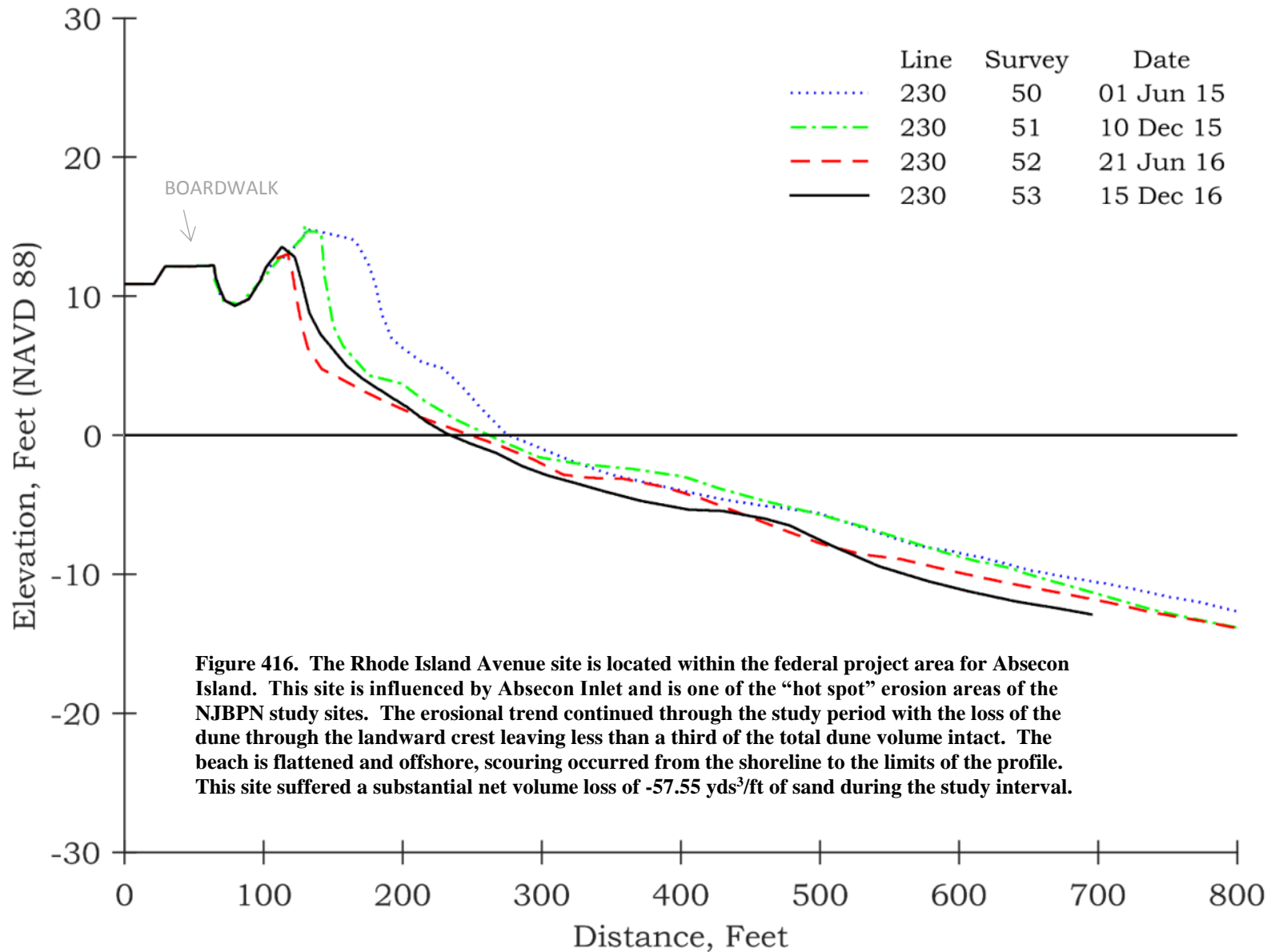
NJBPN 230 – Rhode Island Avenue, Atlantic City



Figure 415a & 415b. This profile site is located near Absecon Inlet in the second groin cell south of the jetty. The December 10, 2015 (left, view to the south) shows an erosional shoreline with a scarp cut into the dune. The right photo (taken December 15, 2016) shows continued erosion, the dune scarp cut landward another 35 ft through the landward crest reducing shore protection.

New Jersey Beach Profile Network

#230 - Rhode Island Ave., Atlantic City, Atlantic County



6-Year Coastal Changes at Site 230, Rhode Island Ave., Atlantic City, Atlantic Co.

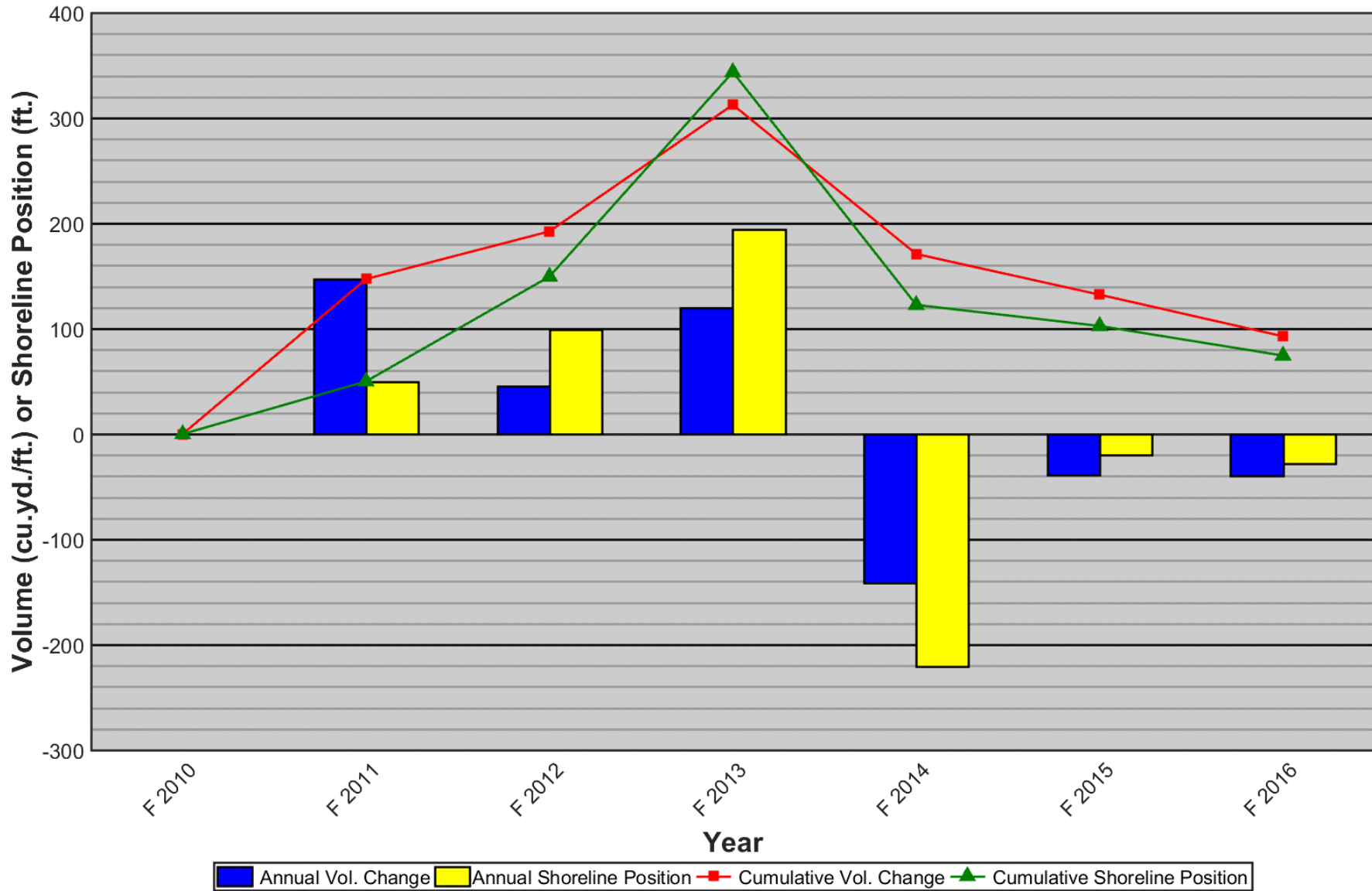


Figure 417. Established to provide data closer to Absecon Inlet, this site was part of the Federal shore protection project from 2003, receiving sand in 2010 and in 2013.

6-Year Ensemble Mean Profile at Site 230, Rhode Island Ave., Atlantic City, Atlantic Co.

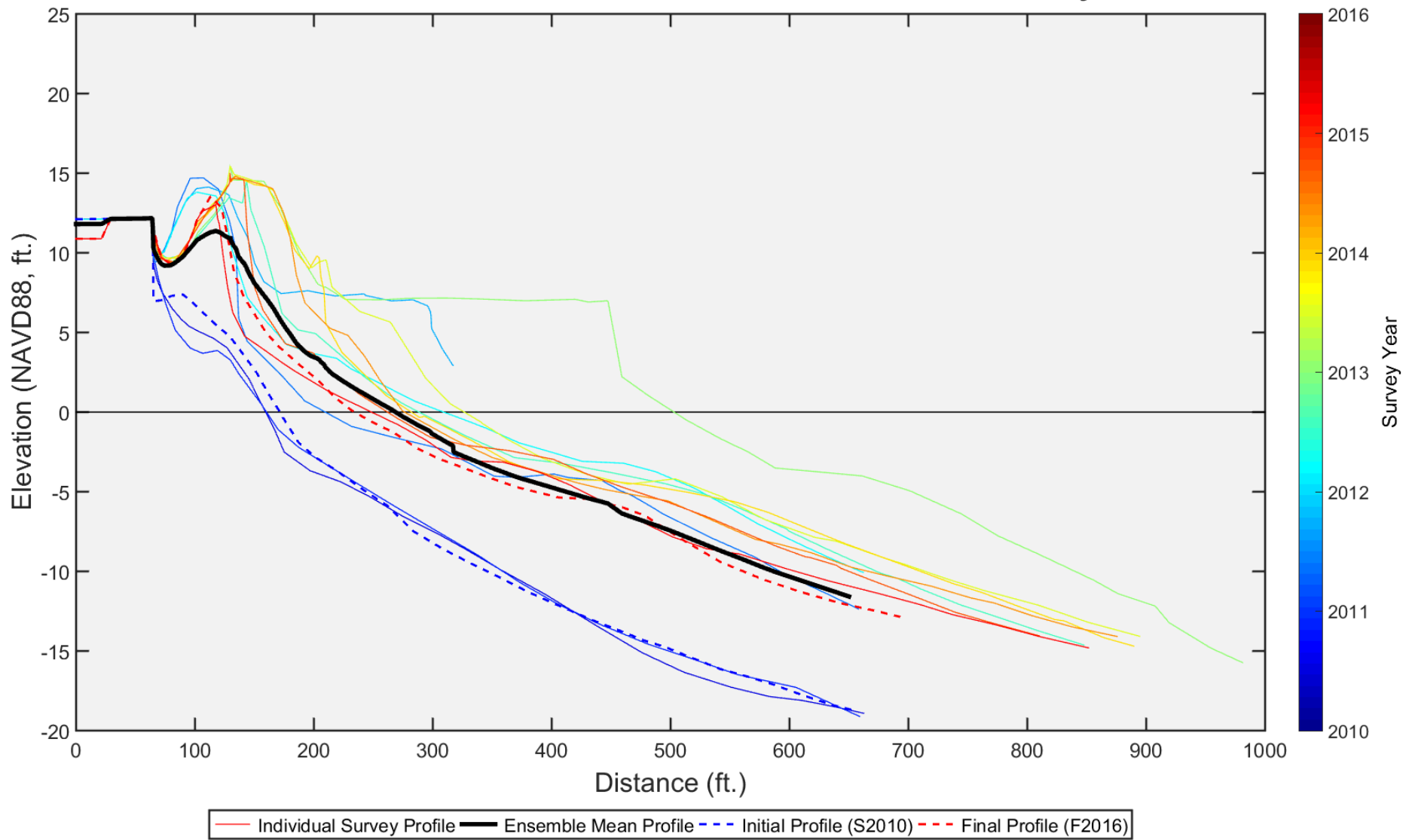


Figure 418. The initial surveys were prior to the maintenance effort with the 2013 cross section the most extensive cross section seaward. A maintenance effort is in the works for 2017 so expect to see a wider beach soon. The short profile between the envelope and the very wide beach represents an immediate post-Sandy survey showing the storm's impact on the newly maintained beach.

#230 - Rhode Island Avenue, Atlantic City, Atlantic County
Comparison of 2010 to 2015

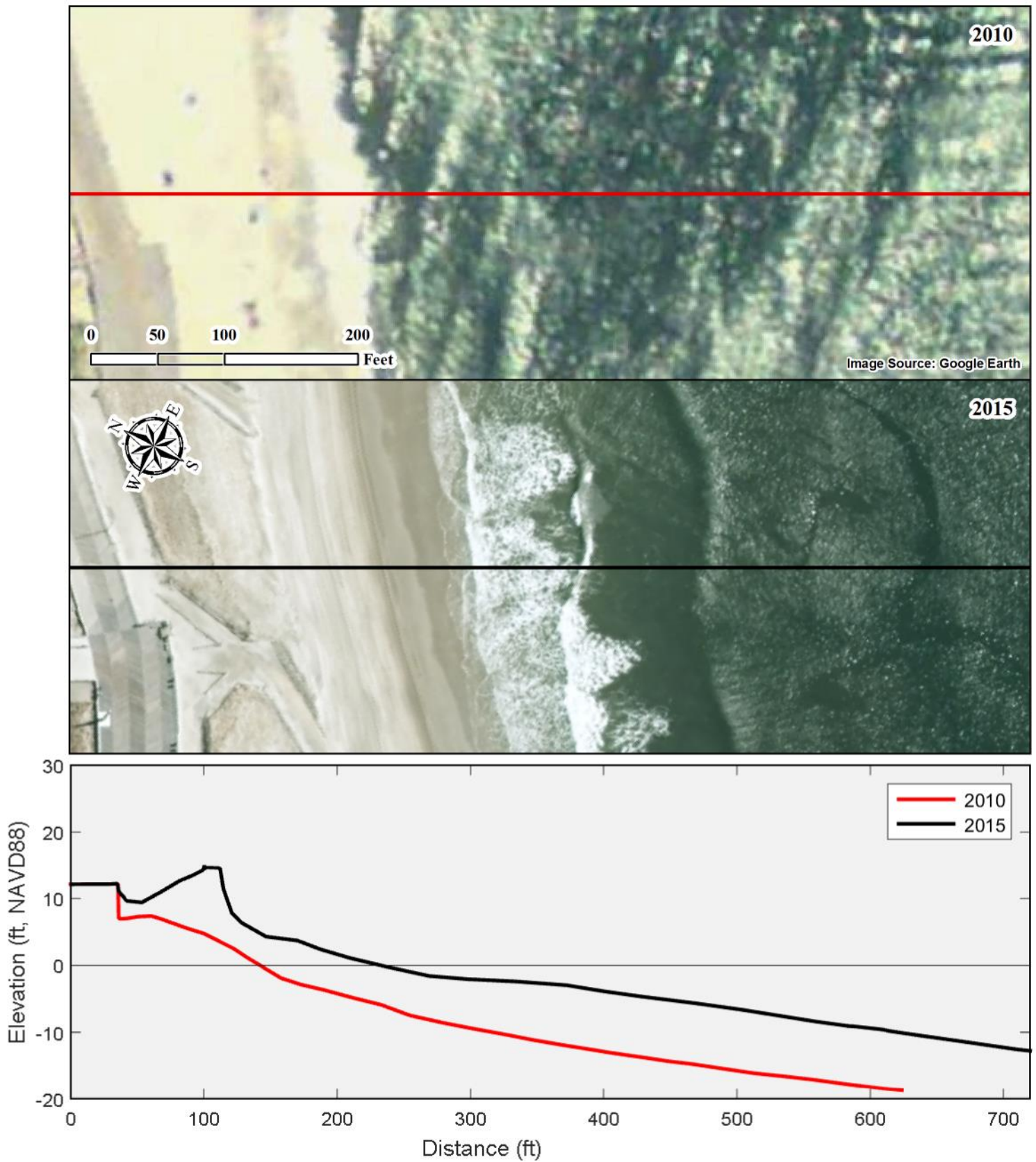


Figure 419. This comparison depicts differences generated by post-Hurricane Sandy beach restoration efforts by the USACE in 2013 and 2014 to restore the storm damage to their project.

NJBPN 130 – North Carolina Avenue, Atlantic City (October 12, 2016)



Figure 420. NJBPN site 130 is located at North Carolina Avenue in Atlantic City. View is along the seaward dune toe to the north with the Steel Pier in the background. The beach has eroded but still remains wide enough to support the dune in its current location and configuration.

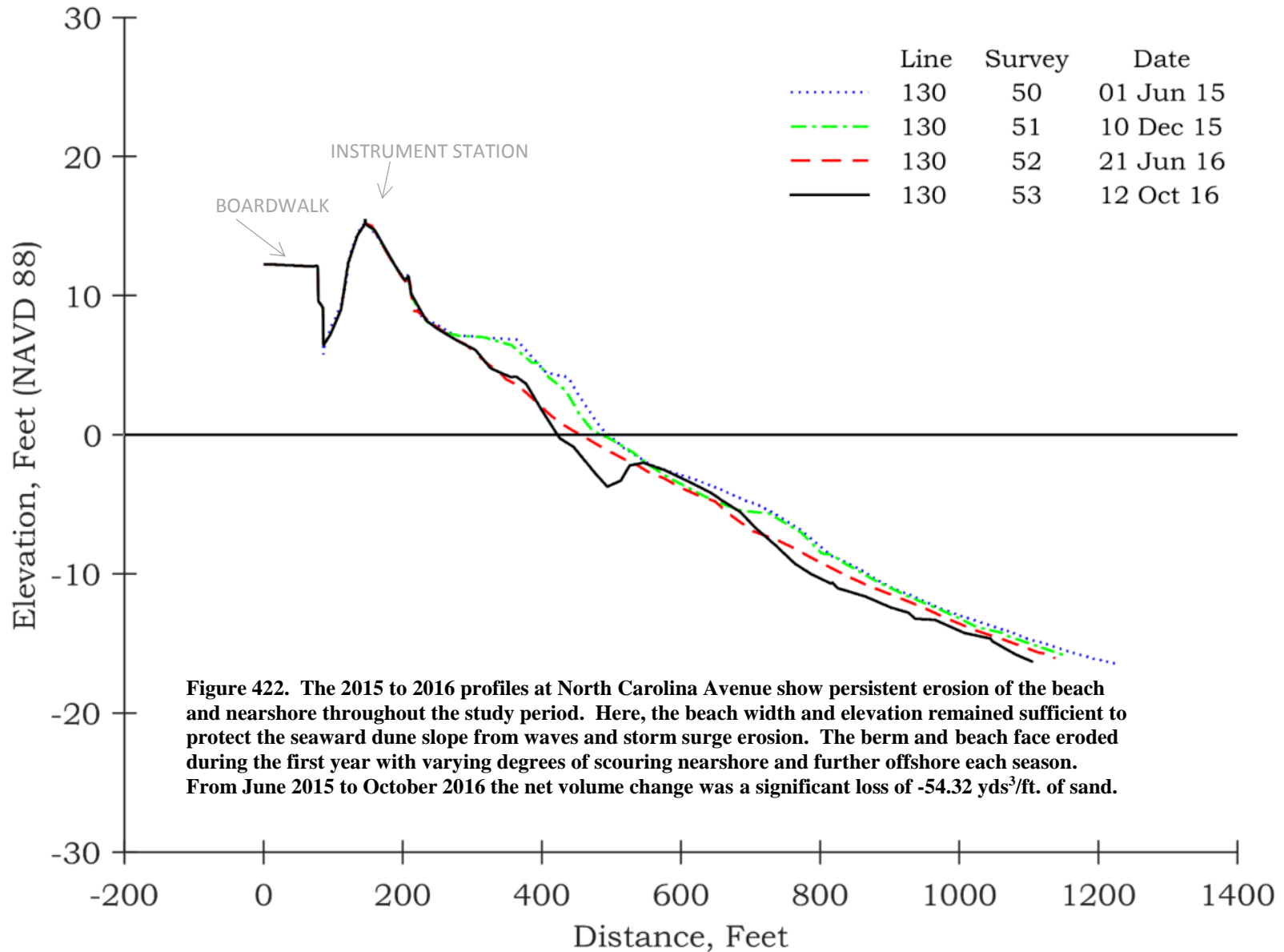
NJBPN 130 – North Carolina Avenue, Atlantic City



Figure 421a & 421b. This beach is located near the north end of the Absecon Island Federal shore protection project. The shoreline in this region is subject to accelerated erosion rates creating a less stable beach. The left photo (December 10, 2015) shows the beach looking north. The right photo, was taken October 12, 2016, shows a significantly narrower and lower beach berm.

New Jersey Beach Profile Network

#130 - North Carolina Ave., Atlantic City, Atlantic County



30-Year Coastal Changes at Site 130, North Carolina Ave., Atlantic City, Atlantic Co.

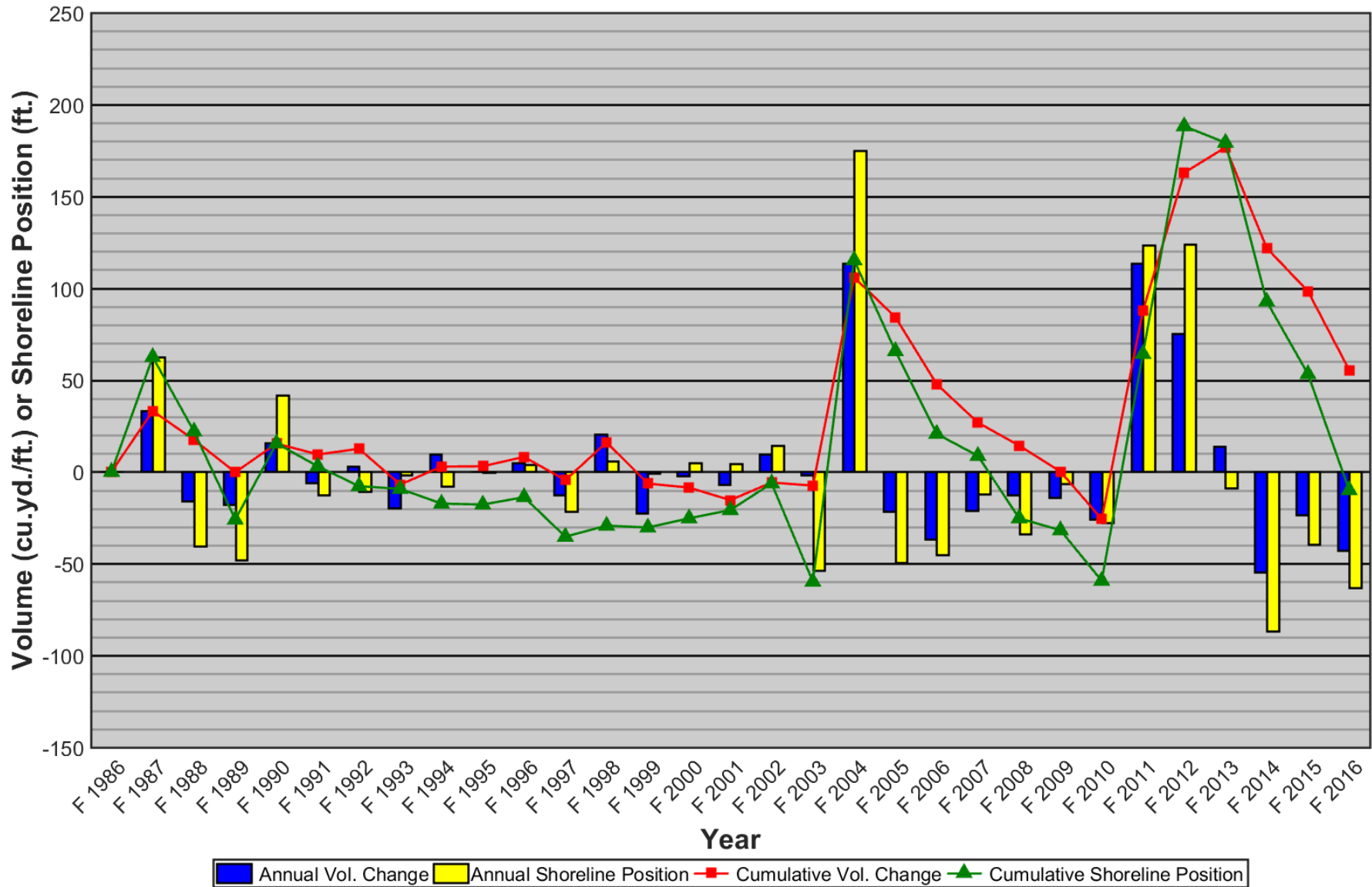


Figure 423. From 1986 to 2003 this site slowly lost a little sand accompanied by a 45 to 50-foot shoreline retreat. In 2003 the federal project arrived and by the 2004 survey the positive impact was apparent. The site progressively lost material until more was added in 2011 and 2012. Subsequent erosion has again reduced the sand volume substantially and returned the zero elevation shoreline back to the 1986 position.

30-Year Ensemble Mean Profile at Site 130, North Carolina Ave., Atlantic City, Atlantic Co.

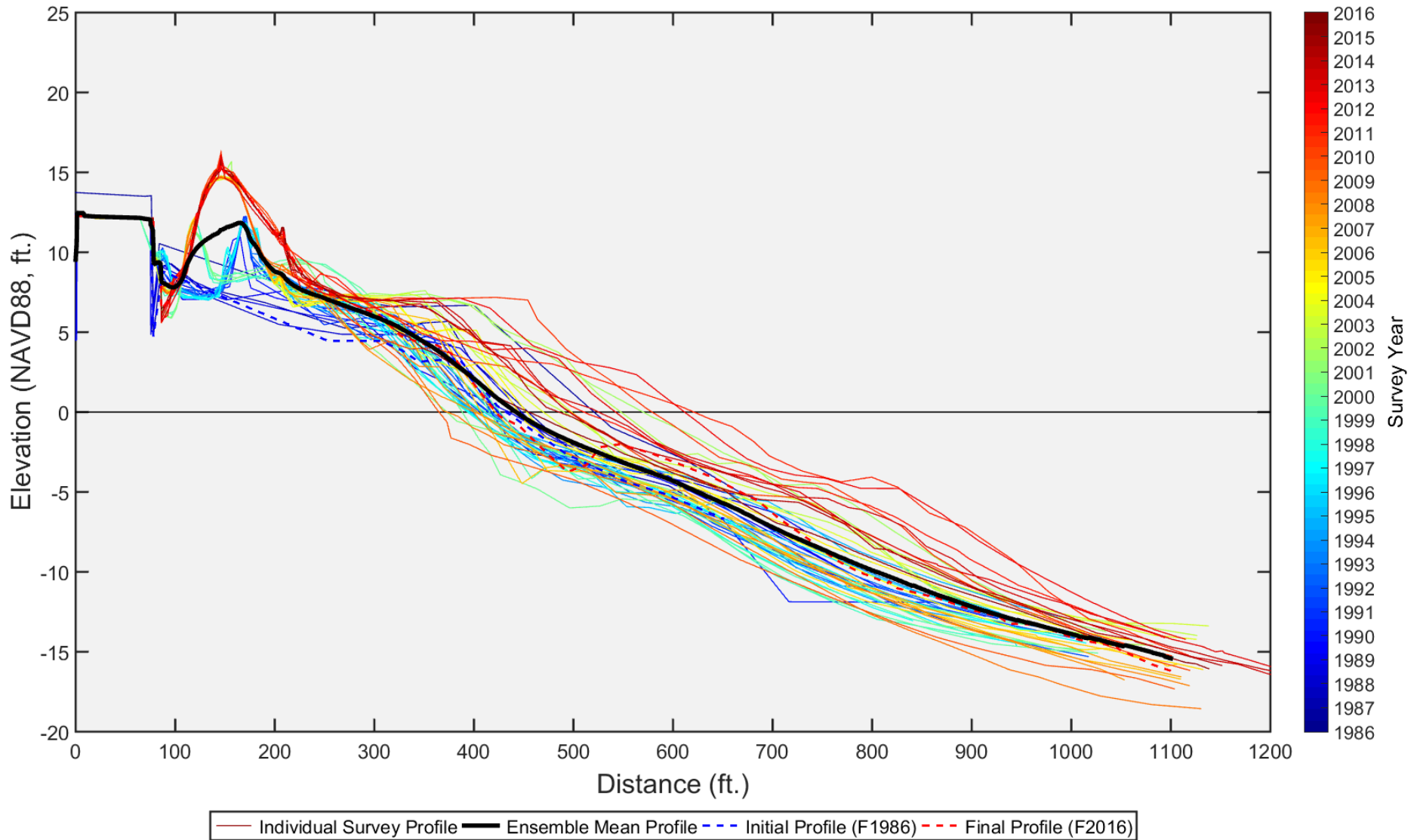


Figure 424. The envelope of surveys show the enhancement made by the federal project, while the dune was stable and slowly accumulating sand, the beach and nearshore remained erosional going forward.

#130 - North Carolina Avenue, Atlantic City, Atlantic County
Comparison of 1995 to 2015

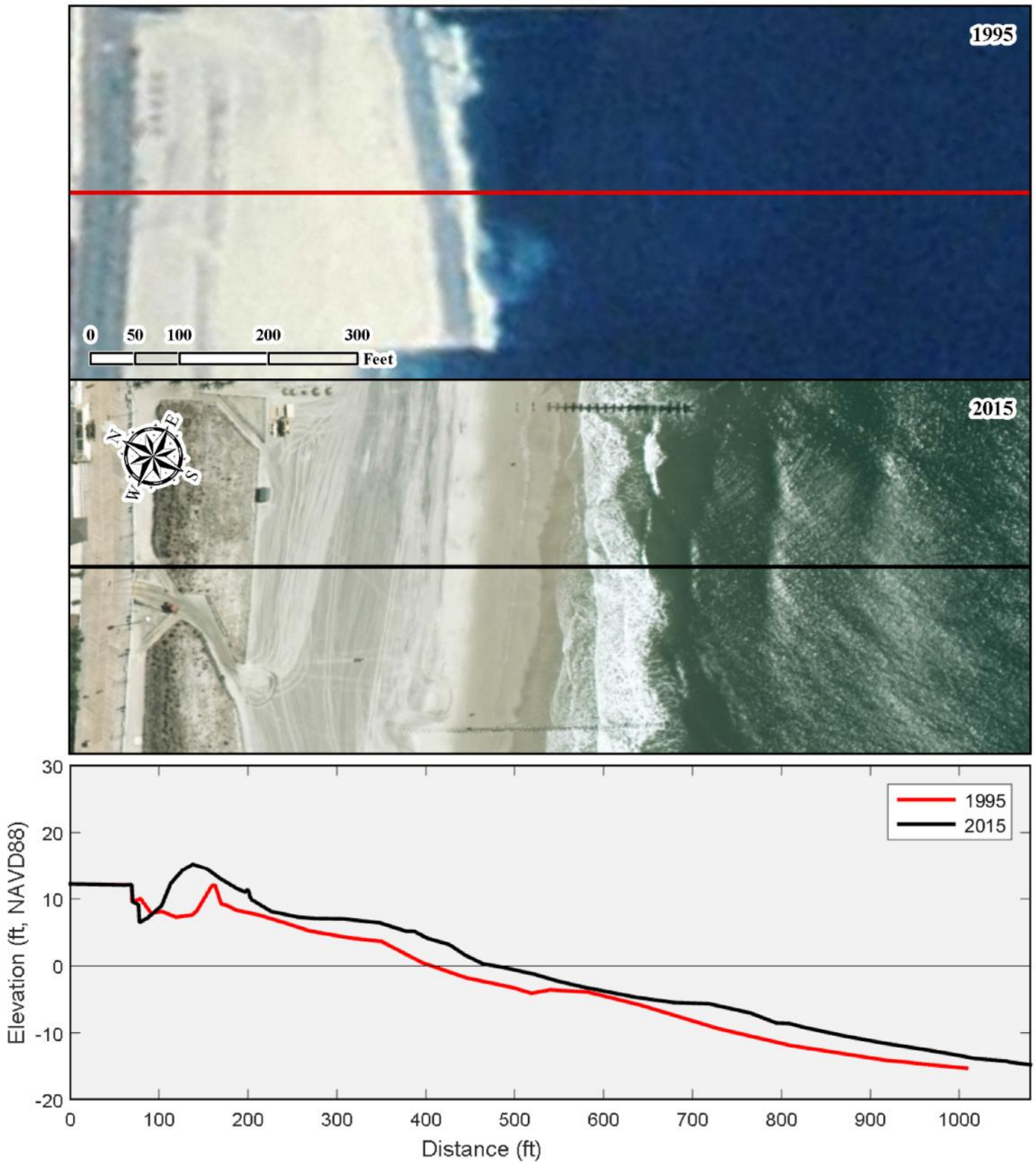


Figure 425. The northern Atlantic City beaches have been subject to sand placement since the 1930's with the federal project initiated in 2003. This comparison shows the beach prior to a local project in 1997 and the initial federal work in 2003, and following the restoration effort after Hurricane Sandy.

NJBPN 129 – Raleigh Avenue, Atlantic City (December 15, 2016)



Figure 426. NJBPN site 129 is located at Raleigh Avenue in Atlantic City. View is taken looking north along the dune crest. The beach width increases moving north to south along the Atlantic City shoreline. The wider beach here supports a healthy primary dune with modest foredune development through aeolian processes.

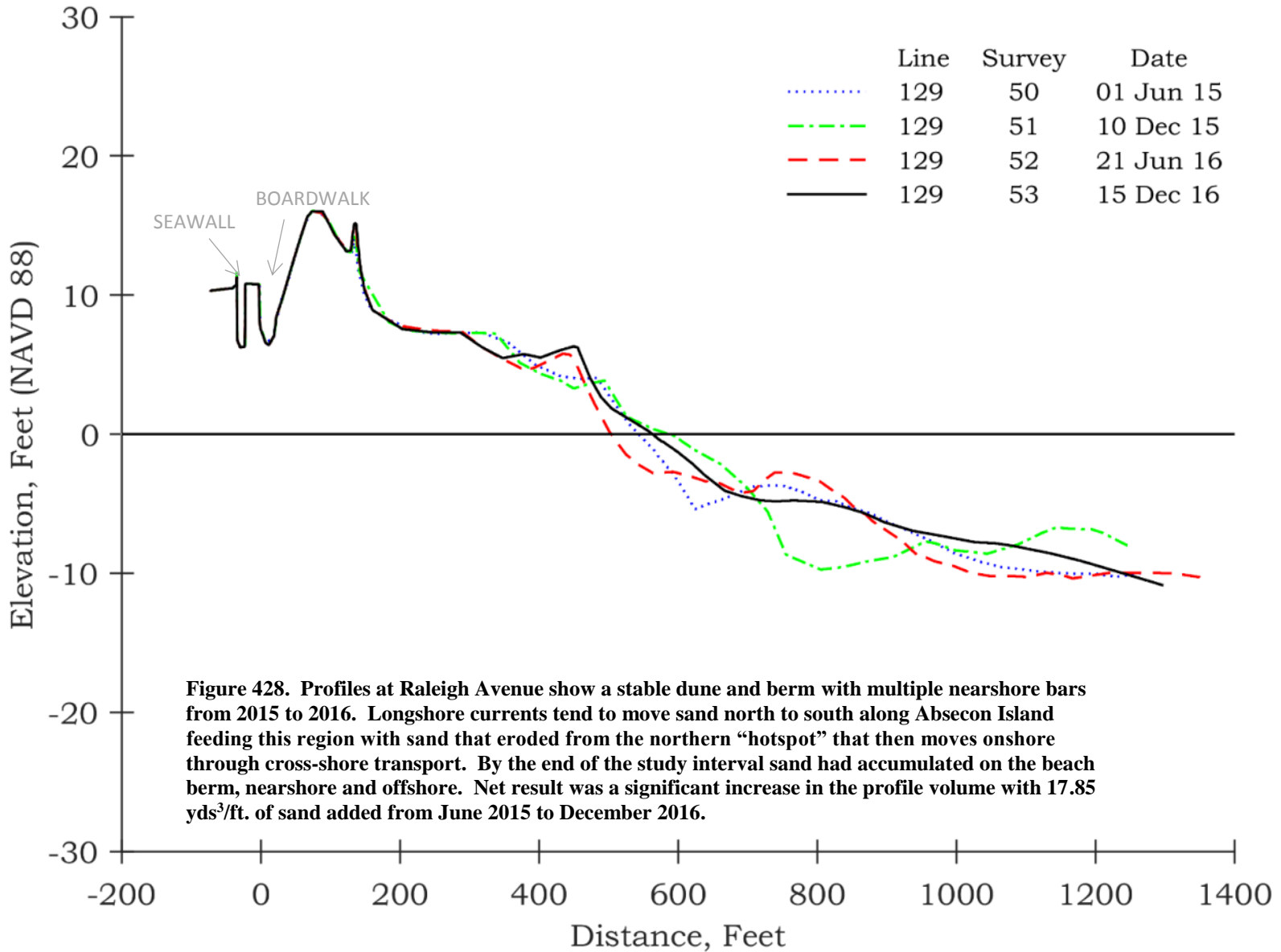
NJBPN 129 – Raleigh Avenue, Atlantic City



Figure 427a & 427b. Raleigh Avenue is located near the middle of the federal shore protection project on Absecon Island, the dune and beaches are relatively stable. The photo on the left (December 10, 2015) is taken looking north along the well-developed seaward dune toe. The photo on the right was taken December 15, 2016 and shows sand accumulated along the seaward dune fence.

New Jersey Beach Profile Network

#129 - Raleigh Avenue, Atlantic City, Atlantic County



30-Year Coastal Changes at Site 129, Raleigh Avenue, Atlantic City, Atlantic Co.

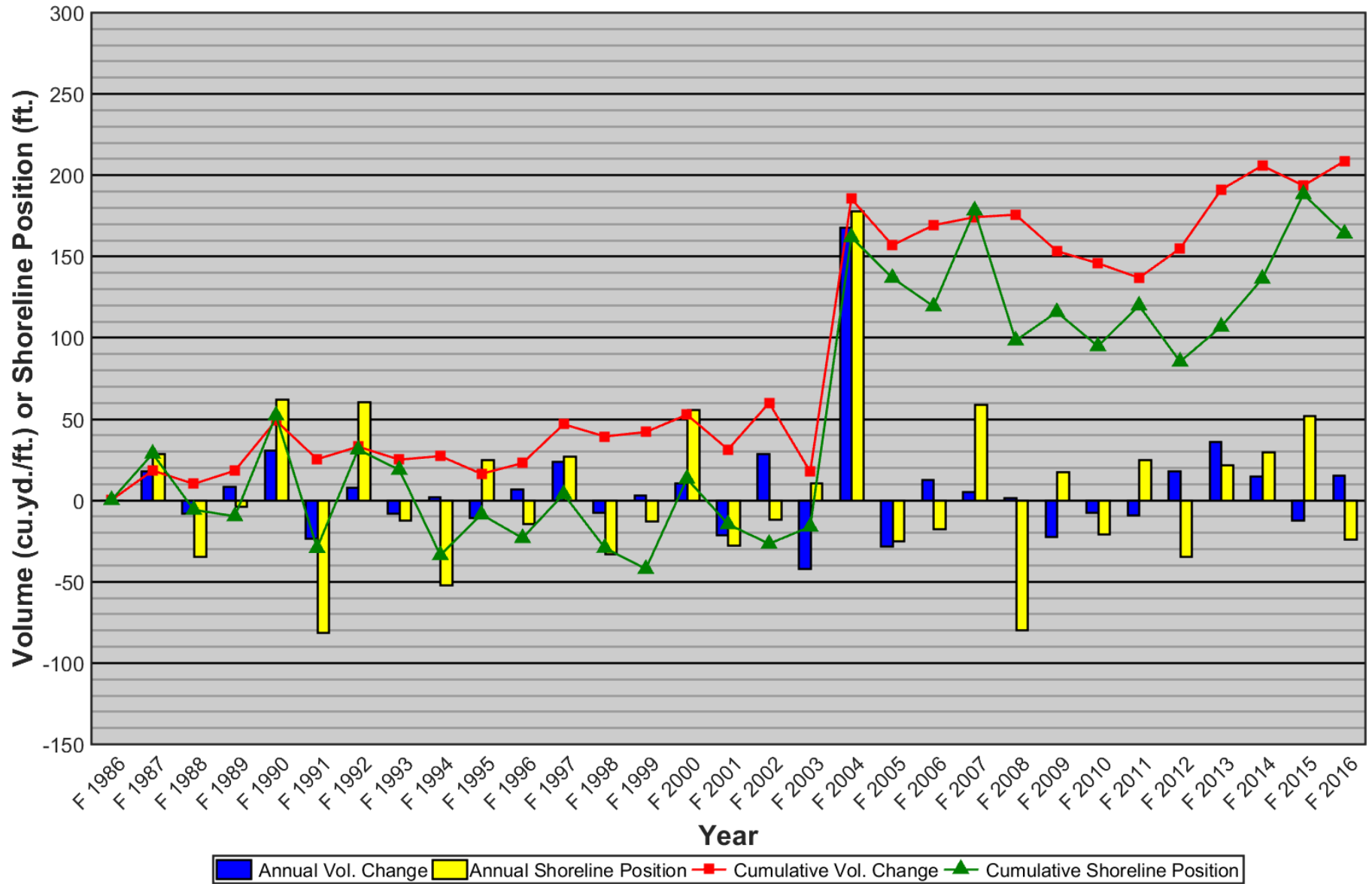


Figure 429. The Raleigh Avenue site has maintained its sediment supply after the 2003 federal project. This is another example of the mid-island effect where sand resides preferentially in the middle of any barrier island. Prior to the federal project a modest amount of sand volume was added following the 1997 local project.

30-Year Ensemble Mean Profile at Site 129, Raleigh Avenue, Atlantic City, Atlantic Co.

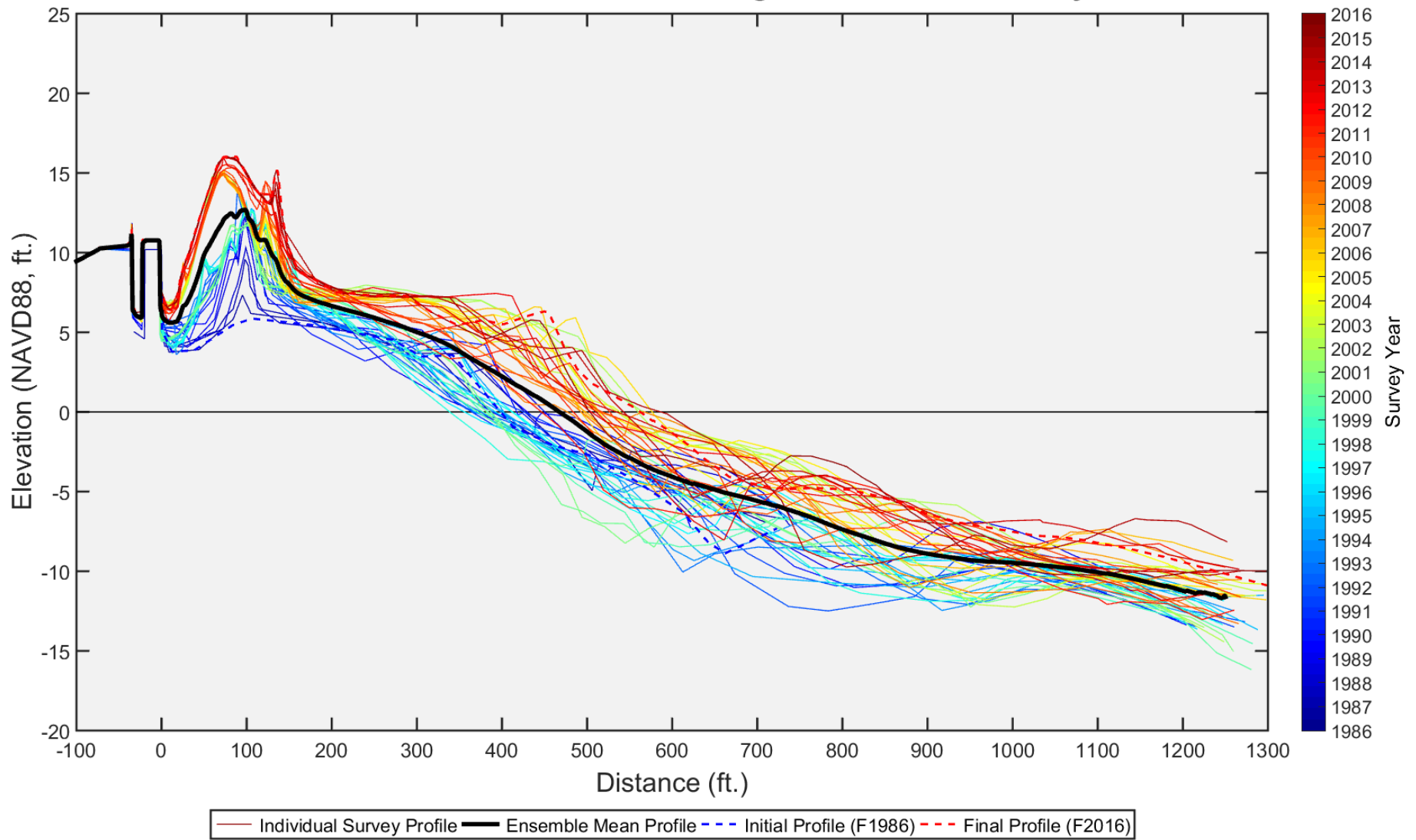


Figure 430. The federal project is represented by a clear cluster of cross sections following the 2003 project that do not overlap those done prior to the project which included an enhanced dune.

#129 - Raleigh Avenue, Atlantic City, Atlantic County
Comparison of 1995 to 2015

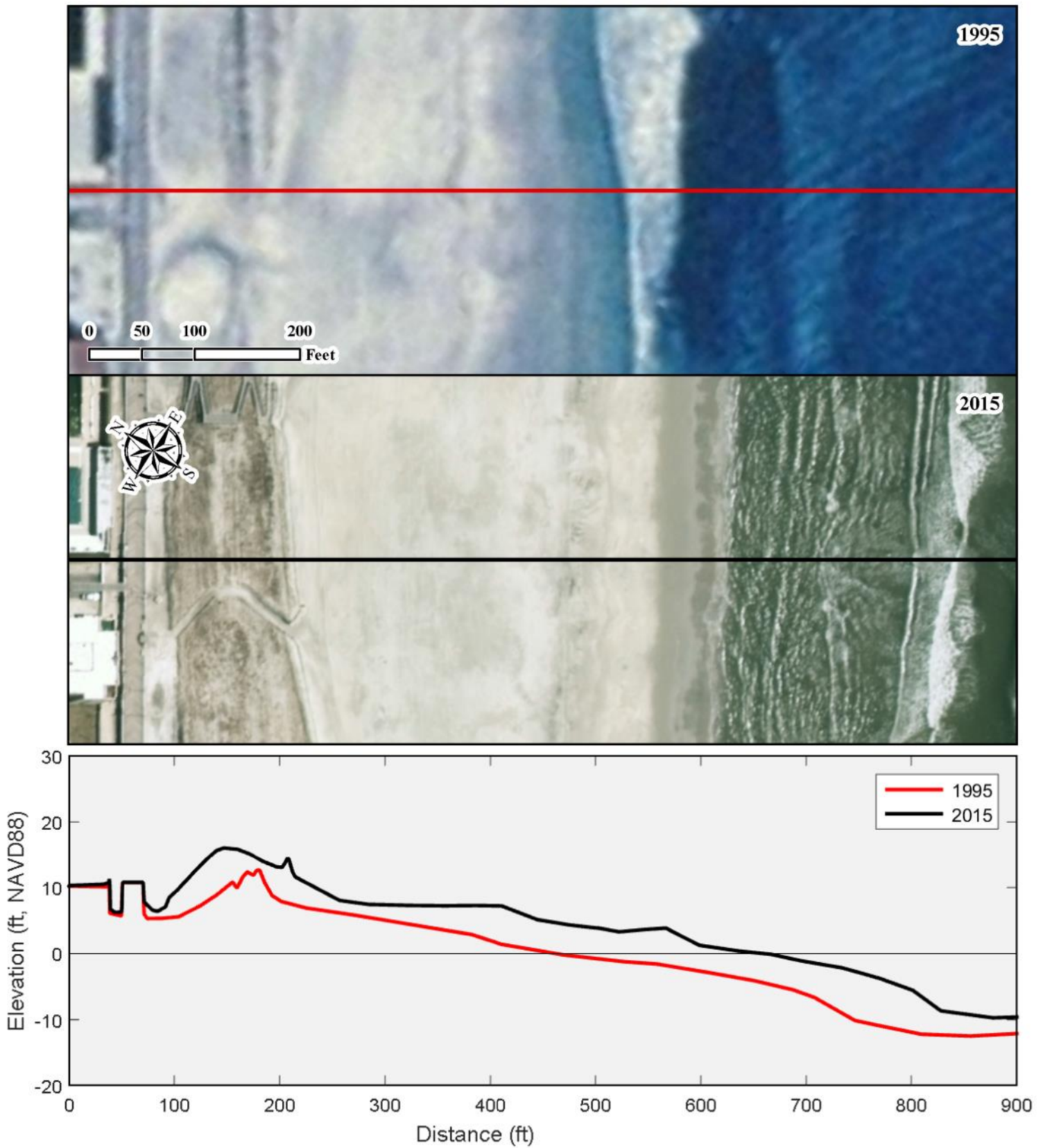


Figure 431. At Raleigh Avenue the 2003 federal project is the primary reason for the enhancement to the dunes, the wider beach, and the seaward shoreline advance.

NJBPN 128 – Dorset Avenue, Ventnor City (December 6, 2016)



Figure 432. NJBPN site 128 is located at Dorset Avenue in Ventnor City. The view here is looking south along the Ventnor City beach with the fishing pier in the background. The dry recreational beach berm width is over 200 ft here supporting a developed dune that enhances shore protection for the City.

NJBPN 128 – Dorset Avenue, Ventnor City



Figure 433a & 433b. The Dorset Avenue site is located within the completed federal shore protection project southern area. The site has a developed dune with a wide stable beach. Left photo taken November 25, 2015 looking north along the seaward dune toe. The right photo is from September 20, 2016 and shows the extent of the wide recreational beach berm.

New Jersey Beach Profile Network

#128 - Dorset Avenue, Ventnor, Atlantic County

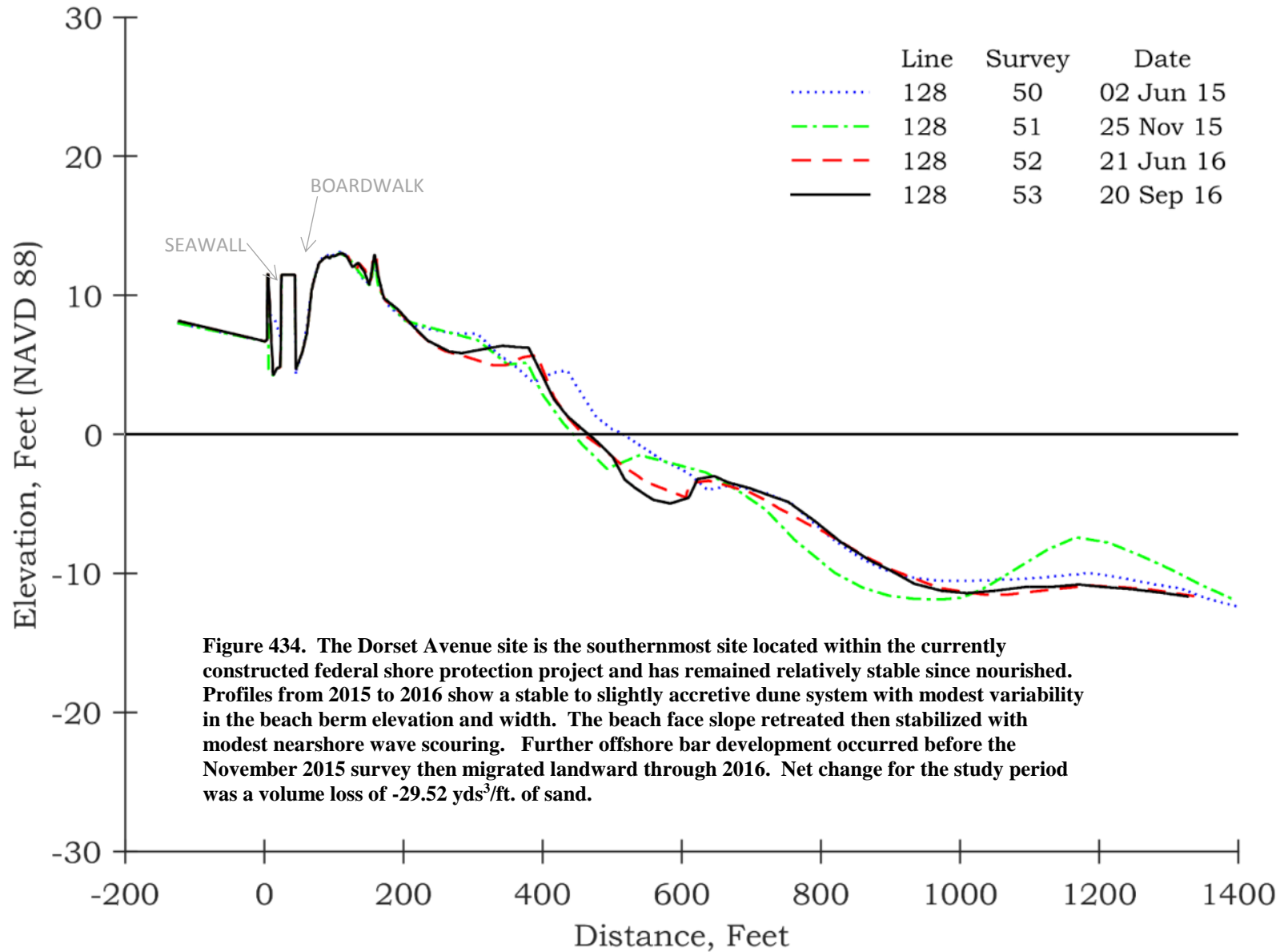


Figure 434. The Dorset Avenue site is the southernmost site located within the currently constructed federal shore protection project and has remained relatively stable since nourished. Profiles from 2015 to 2016 show a stable to slightly accretive dune system with modest variability in the beach berm elevation and width. The beach face slope retreated then stabilized with modest nearshore wave scouring. Further offshore bar development occurred before the November 2015 survey then migrated landward through 2016. Net change for the study period was a volume loss of -29.52 yds³/ft. of sand.

30-Year Coastal Changes at Site 128, Dorset Avenue, Ventnor, Atlantic Co.

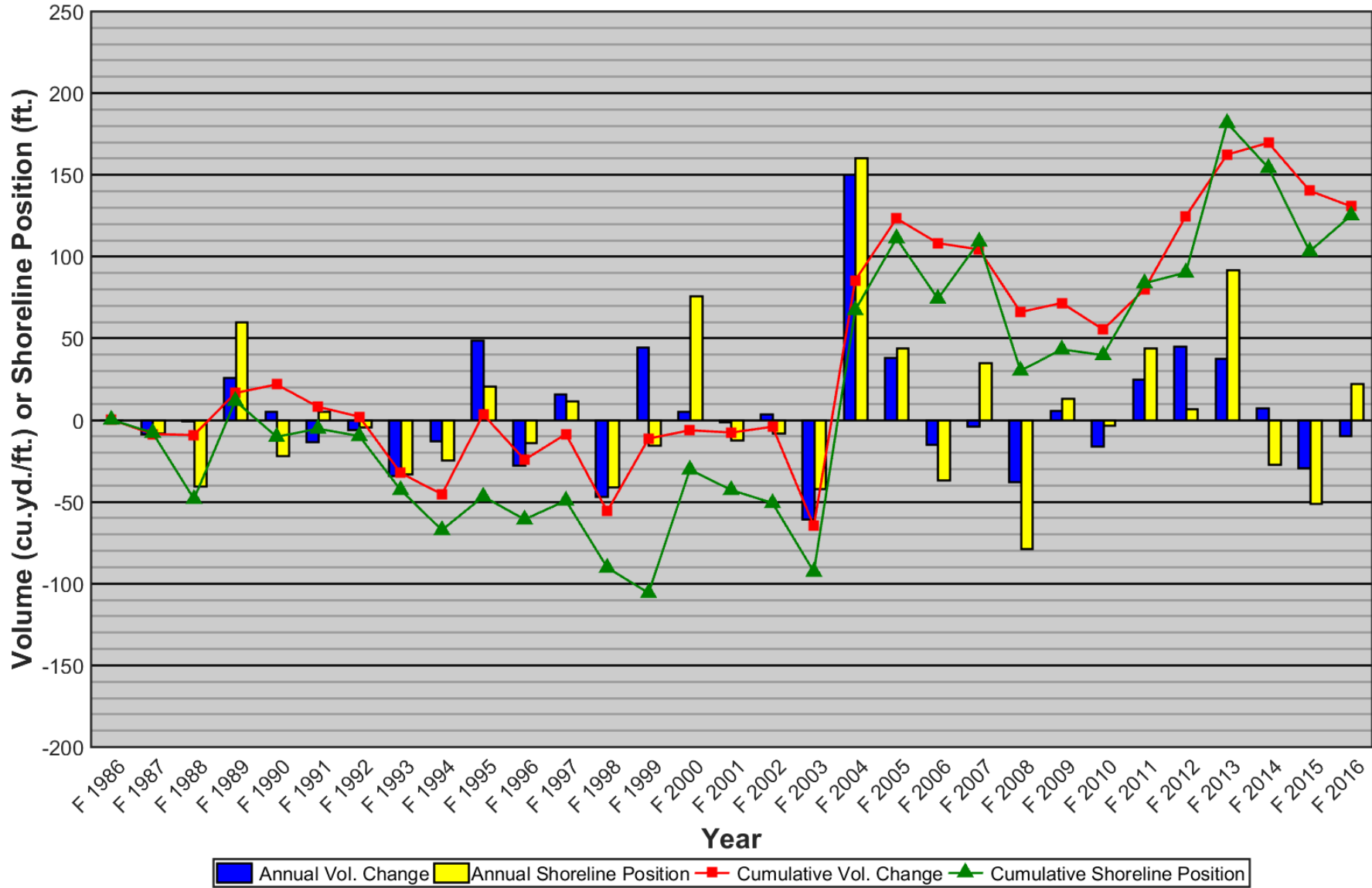


Figure 435. Dorset Avenue was erosional to a degree until 2003 when it received 150 yds³/ft., and then continued to slowly lose sand. Federal maintenance produced recovery at the site in 2013 following Sandy. Dorset Ave. remained positive by 2016 with 130 yds³/ft. in added sand volume above that present in 1986 combined with a 125-foot shoreline advance.

30-Year Ensemble Mean Profile at Site 128, Dorset Avenue, Ventnor, Atlantic Co.

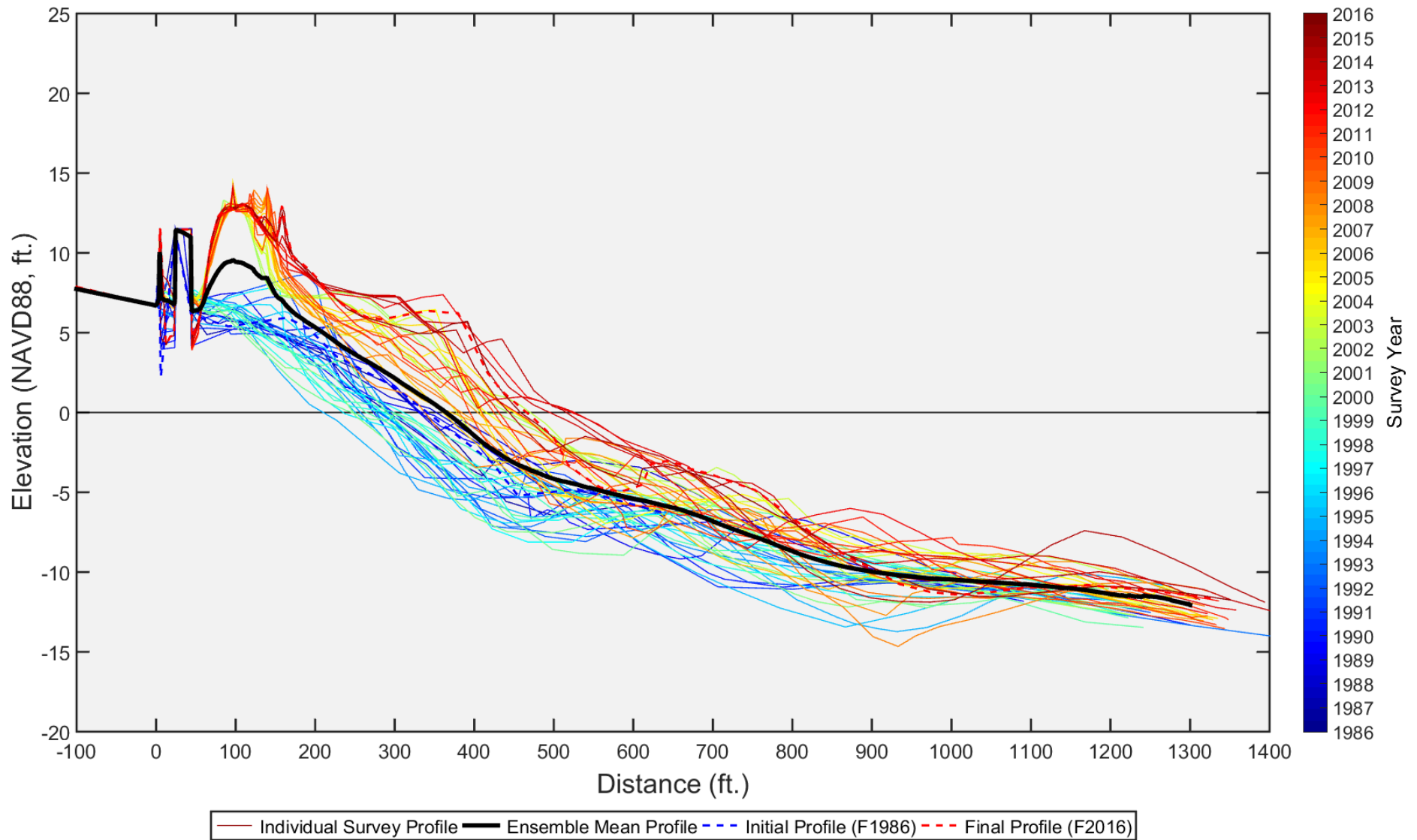


Figure 436. Dorset Avenue has been relatively stable since 1986, losing sand and shoreline position prior to the federal project in 2003. The project produced a much larger dune and a wider beach that did remain stable with only minor sand added following Hurricane Sandy in 2013.

#128 - Dorset Avenue, Ventnor City, Atlantic County
Comparison of 1995 to 2015

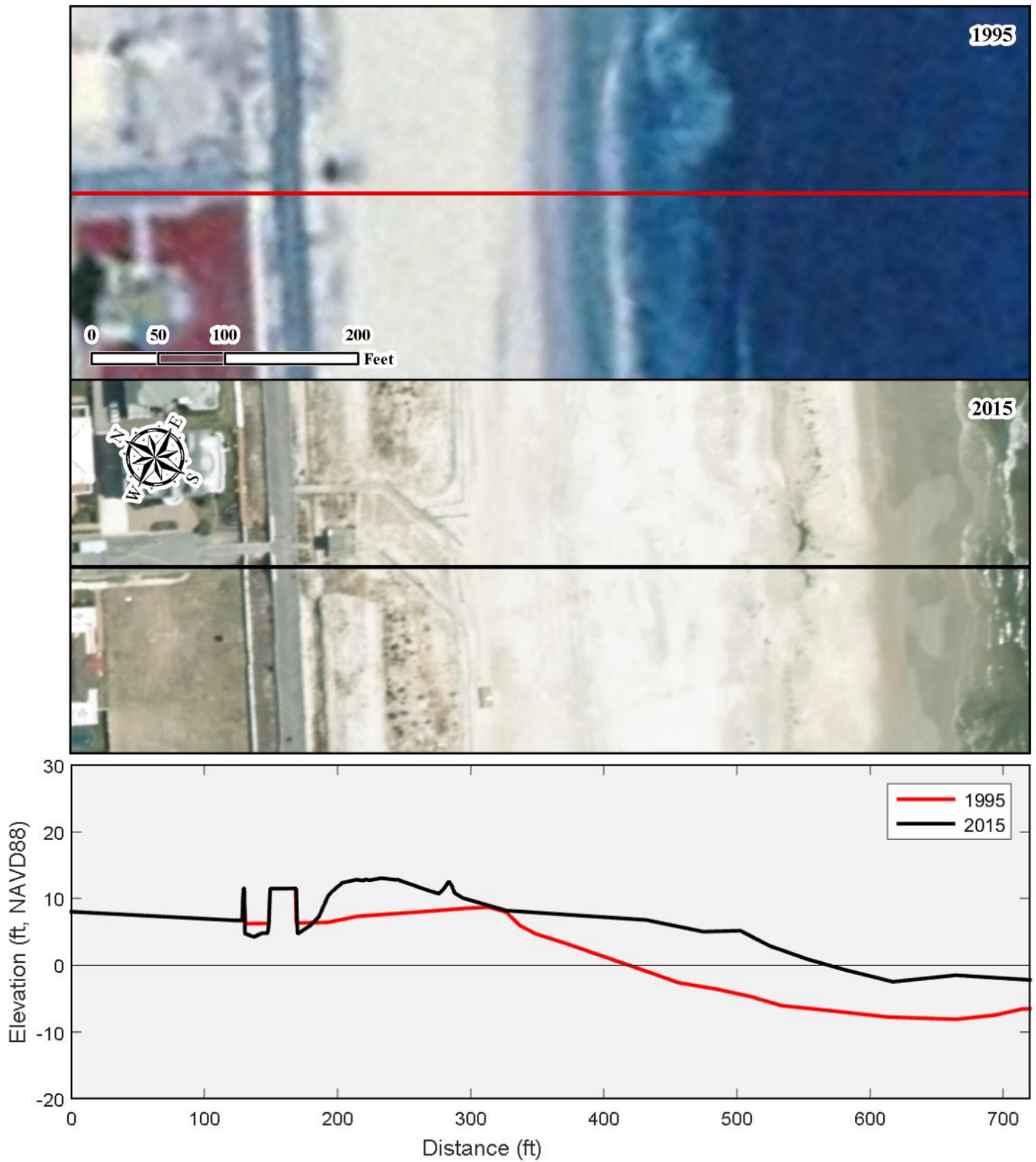


Figure 437. The Dorset Avenue site has a far superior dune and a much wider beach following the 2003 federal project.

NJBPN 127 – Benson Avenue, Margate City (September 20, 2016)



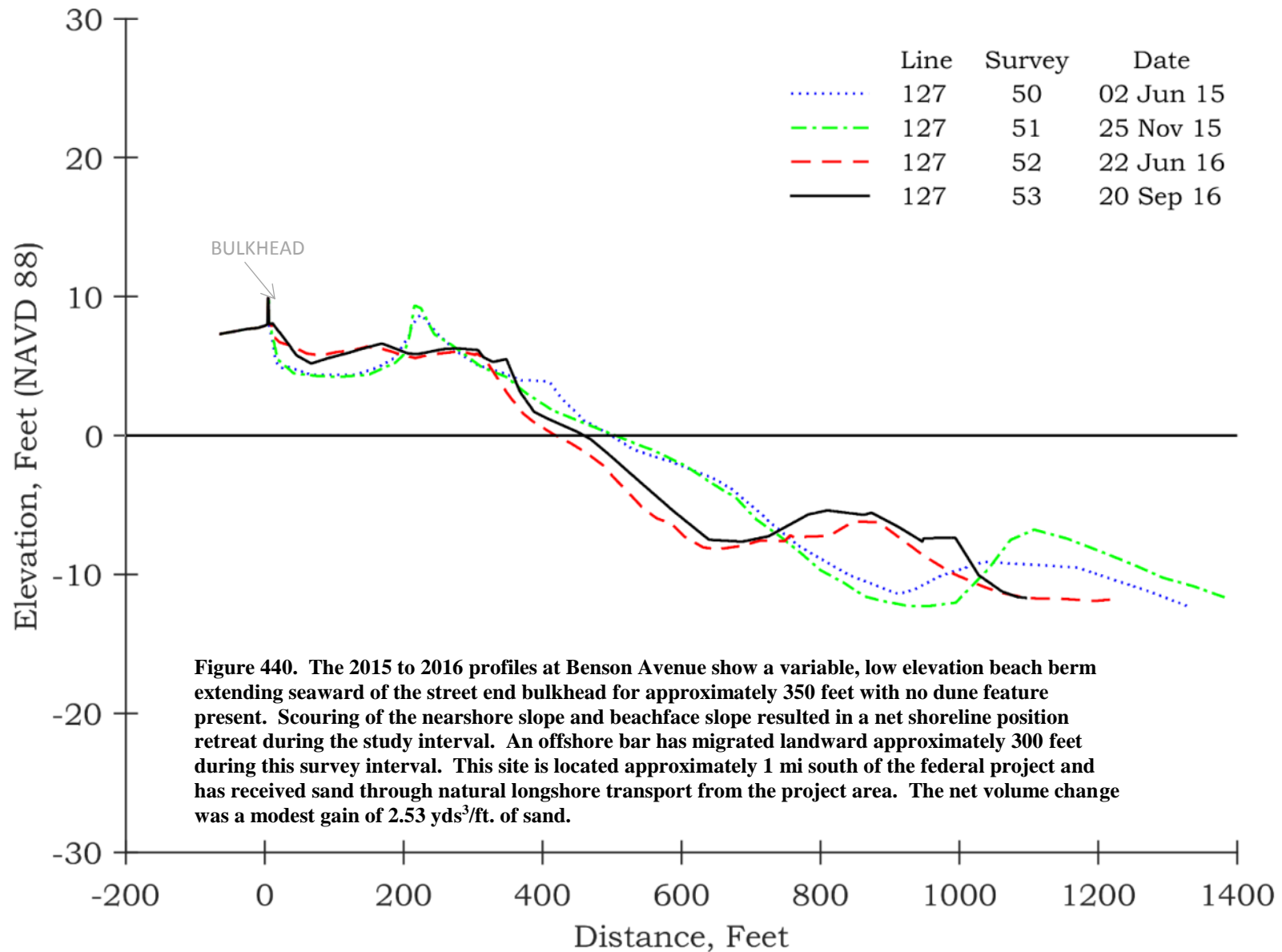
Figure 438. NJBPN site 127 is located at Benson Avenue in Margate City. View here is looking north along the Margate City beach. There is approximately 350 ft of dry recreational beach width seaward of the street end bulkhead/revetment but with no dune development along this profile transect.

NJBPN 127 – Benson Avenue, Margate City



Figure 439a & 439b. The Benson Avenue site has not directly received sand during the federal shore protection project but its proximity to the project's southern taper (about 1 mi) allows beneficial sand accumulation to this region. The left photograph was taken November 25, 2015 following a fairly high tide leaving little dry beach. The right photo is a similar view taken September 20, 2016 with a wider dry beach.

New Jersey Beach Profile Network #127 - Benson Avenue, Margate, Atlantic County



30-Year Coastal Changes at Site 127, Benson Avenue, Margate, Atlantic Co.

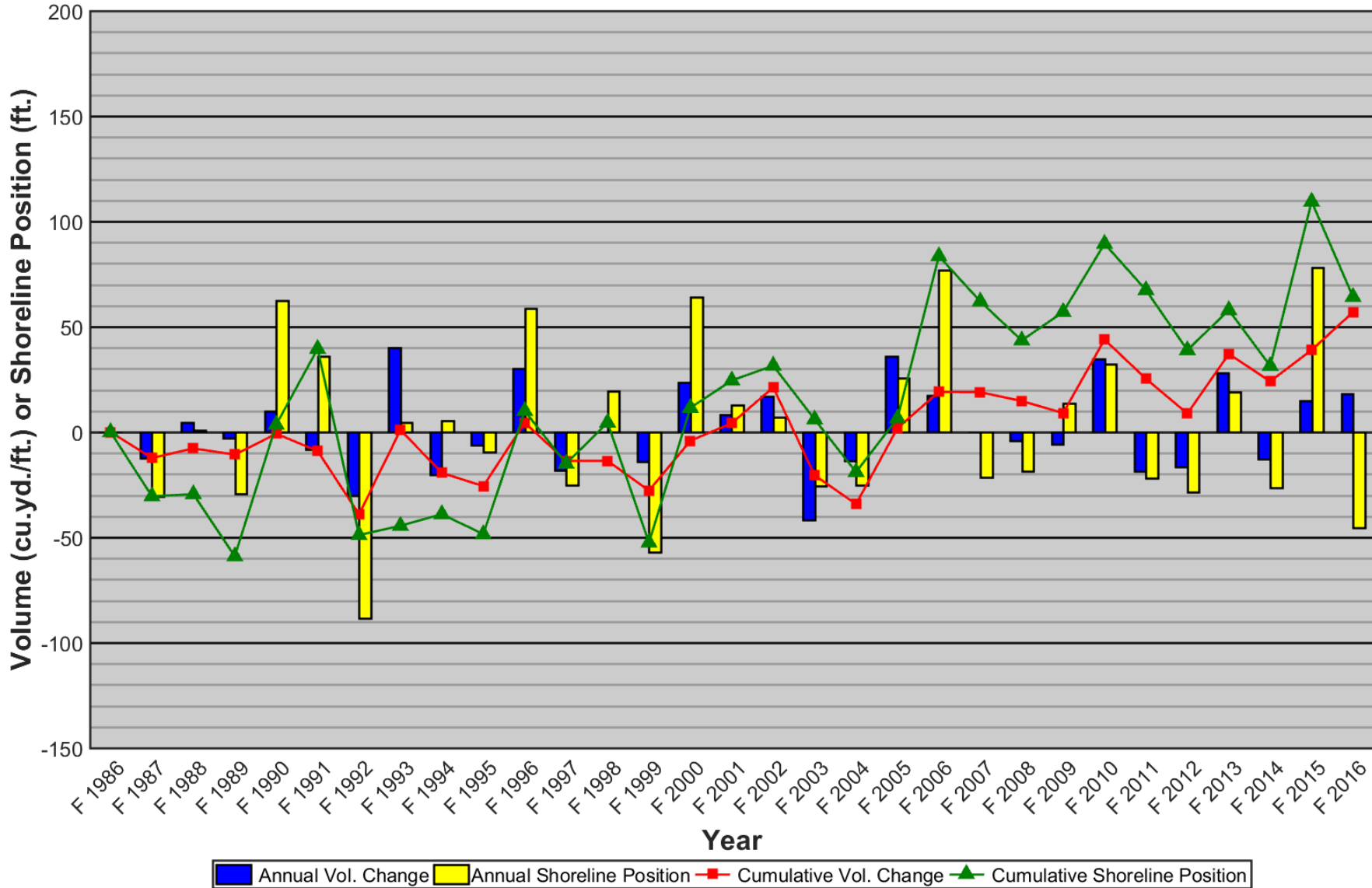


Figure 441. Benson Avenue in Margate City was not part of the 2003 USACE beach fill project. However, sand appears to have moved south along the oceanfront adding slowly to the quantity present. By 2016 the site was ahead by 57 yds³/ft. accompanied by an 65-foot shoreline advance. The lion's share of this sand volume arrived following the 2003 project construction (2006 and later).

30-Year Ensemble Mean Profile at Site 127, Benson Avenue, Margate, Atlantic Co.

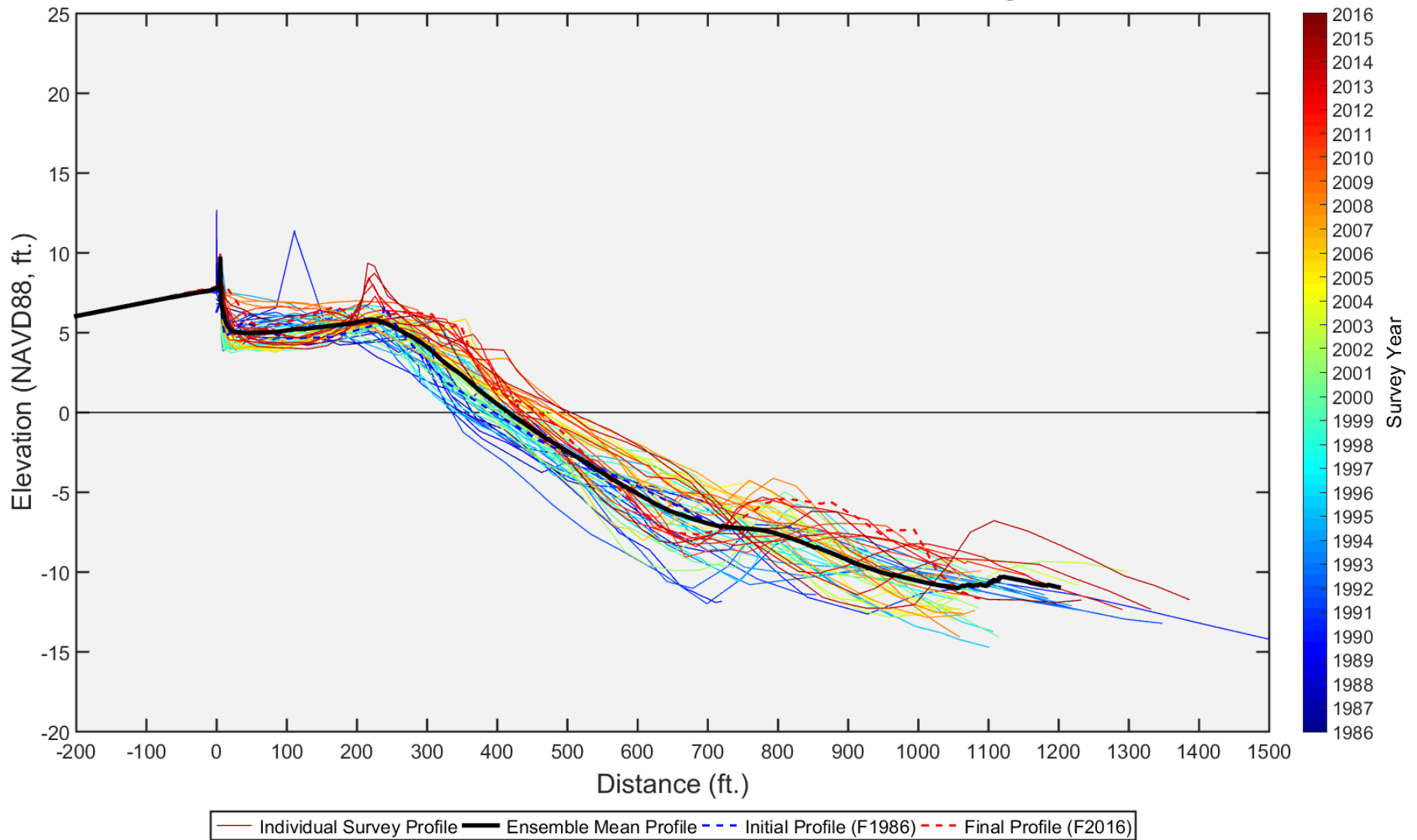


Figure 442. There are no dunes on this profile line, but island dunes exist to the north and south. The beach is wider with time as the color shift shows. The blue “spike” was a pile of sand put in place than graded out.

#127 - Bensen Avenue, Margate City, Atlantic County
Comparison of 1995 to 2015

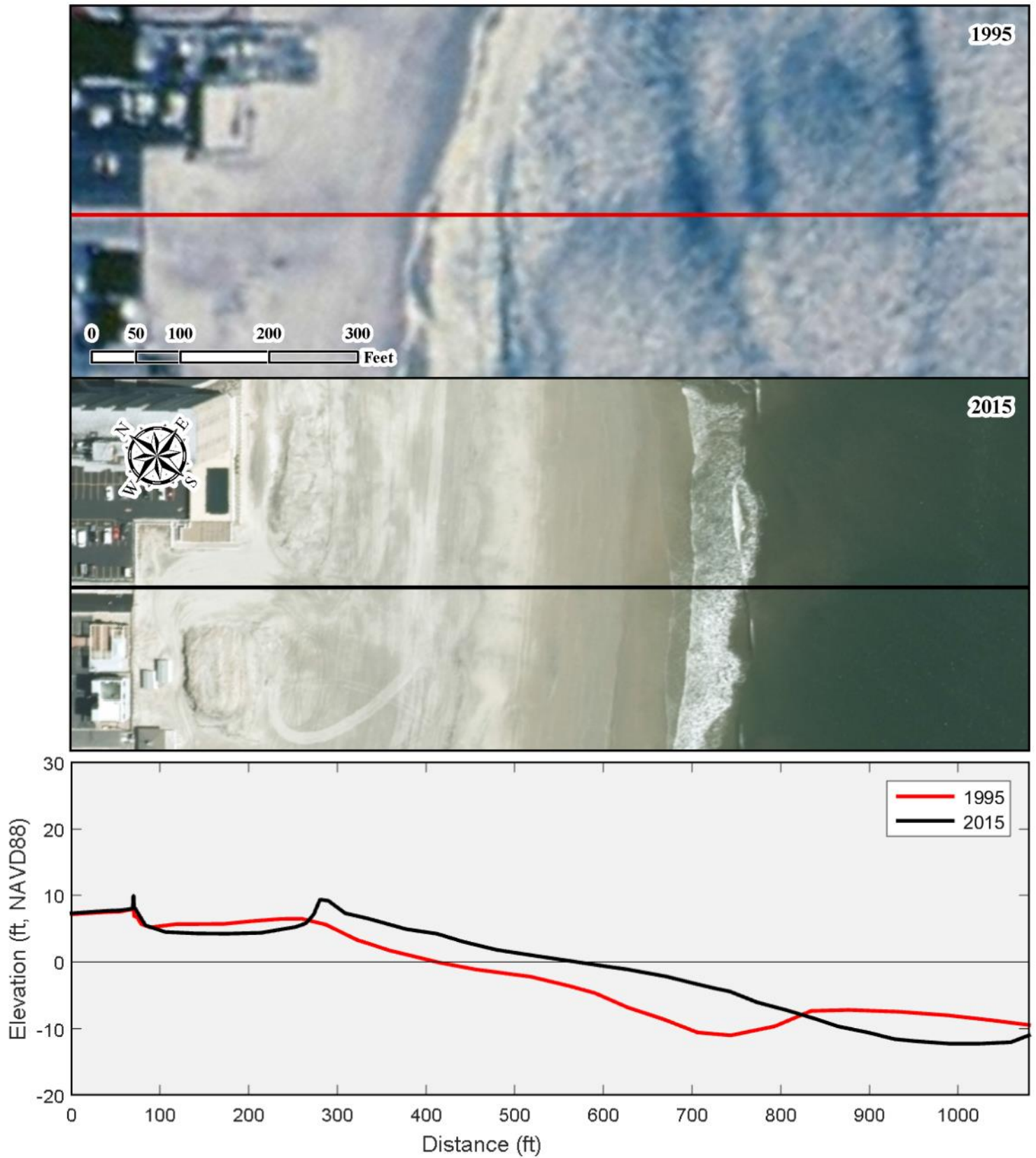


Figure 443. While Margate declined to participate in the initial federal beach project, the Benson Avenue site has benefitted from sand migration south from the fill area adding to the beach width substantially.

NJBPN 126 – 17th Street, Longport (December 6, 2016)



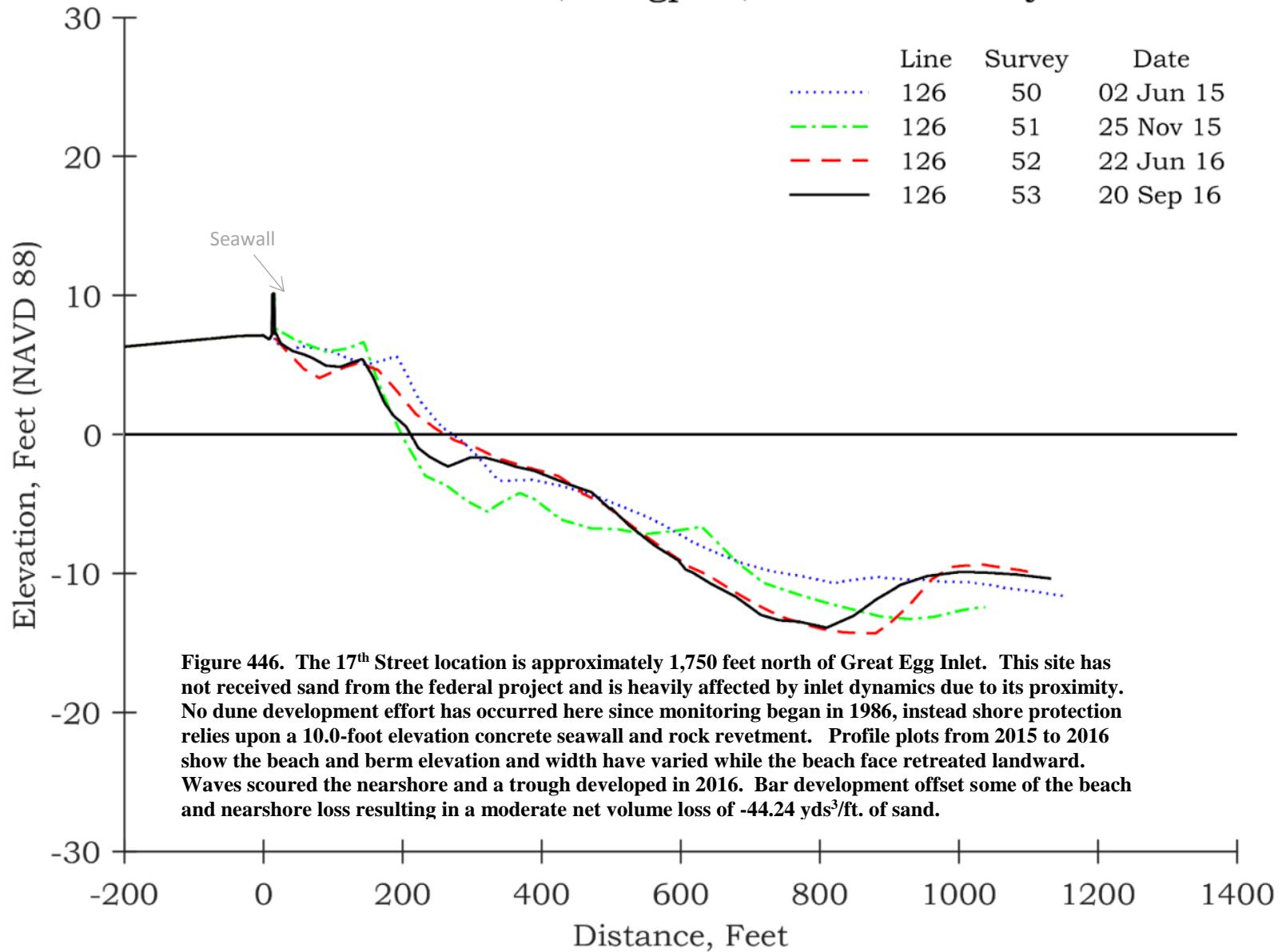
Figure 444. NJBPN site 126 is located at 17th Street in Longport. The view here is looking south along the Longport beach toward the terminal rock groin at 11th Street. There is approximately 150 ft of dry recreational beach seaward of the seawall/revetment, no attempt has been made to establish a dune feature in this region.

NJBPN 126 – 17th Street, Longport



Figure 445a & 445b. The 17th Street profile is located about 6 blocks north of the Great Egg Inlet jetty. No sand has been placed in this region to date during the federal project. A concrete seawall serves as the primary shore protection with no dune feature established. A modest fill was completed by the State of NJ for Longport in 1990. The photo on the left (November 25, 2015) shows a view north along the seaward seawall. The beach here varies seasonally in width by a factor of up to 50%. The right photo, taken September 20, 2016, shows the beach width is similar but with a new berm ridge in the process of being built resulting in modest back berm ponding (top-right).

New Jersey Beach Profile Network #126 - 17th Street, Longport, Atlantic County



30-Year Coastal Changes at Site 126, 17th Street, Longport, Atlantic Co.

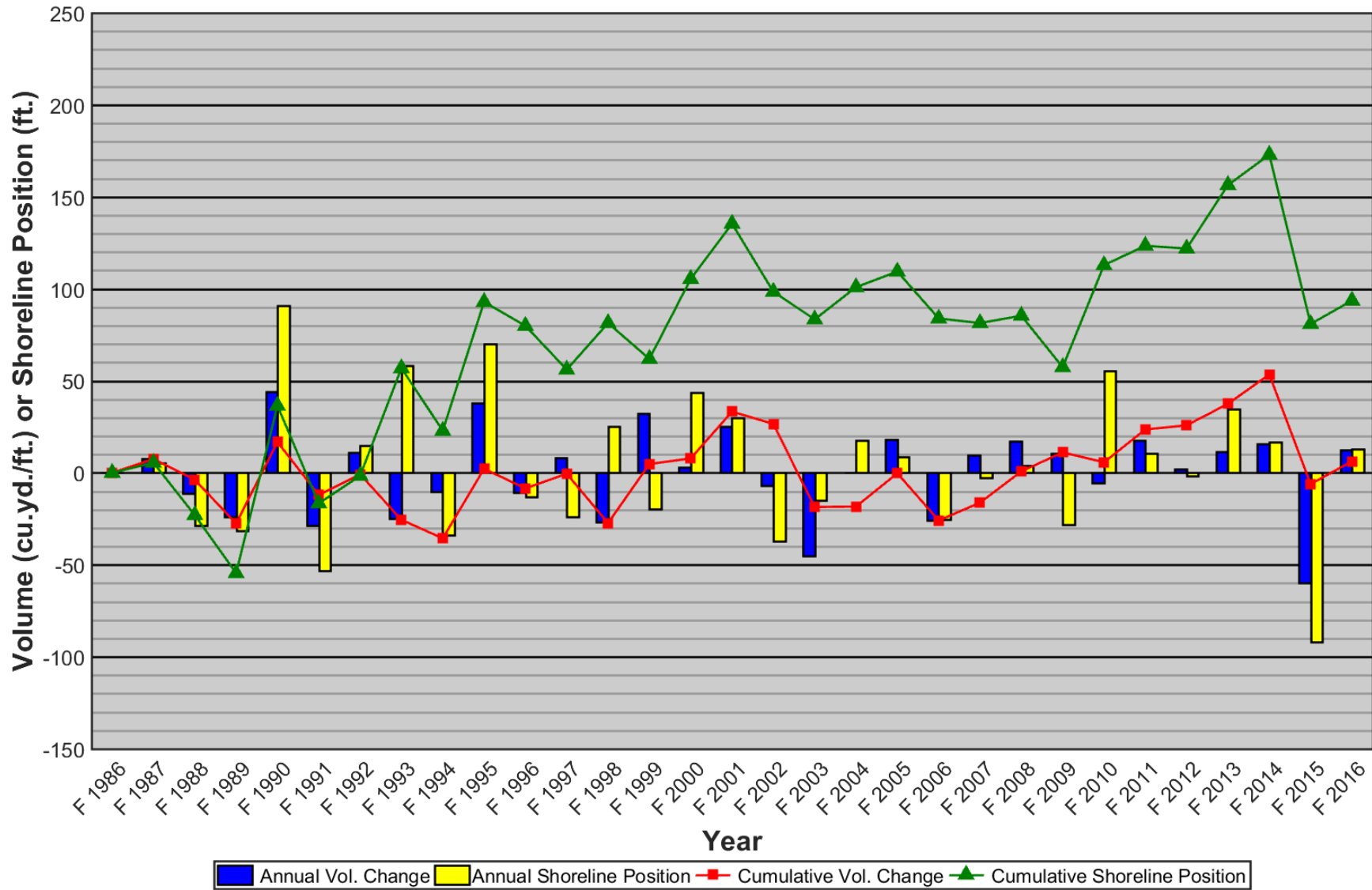


Figure 447. The southernmost Atlantic County cross section received sand directly back in 1990, but not in the 2003 project since Longport chose not to participate. Some accumulation of material has made a difference in the shoreline position if not the total quantity of sand present in 2016 versus the amount present in 1986.

30-Year Ensemble Mean Profile at Site 126, 17th Street, Longport, Atlantic Co.

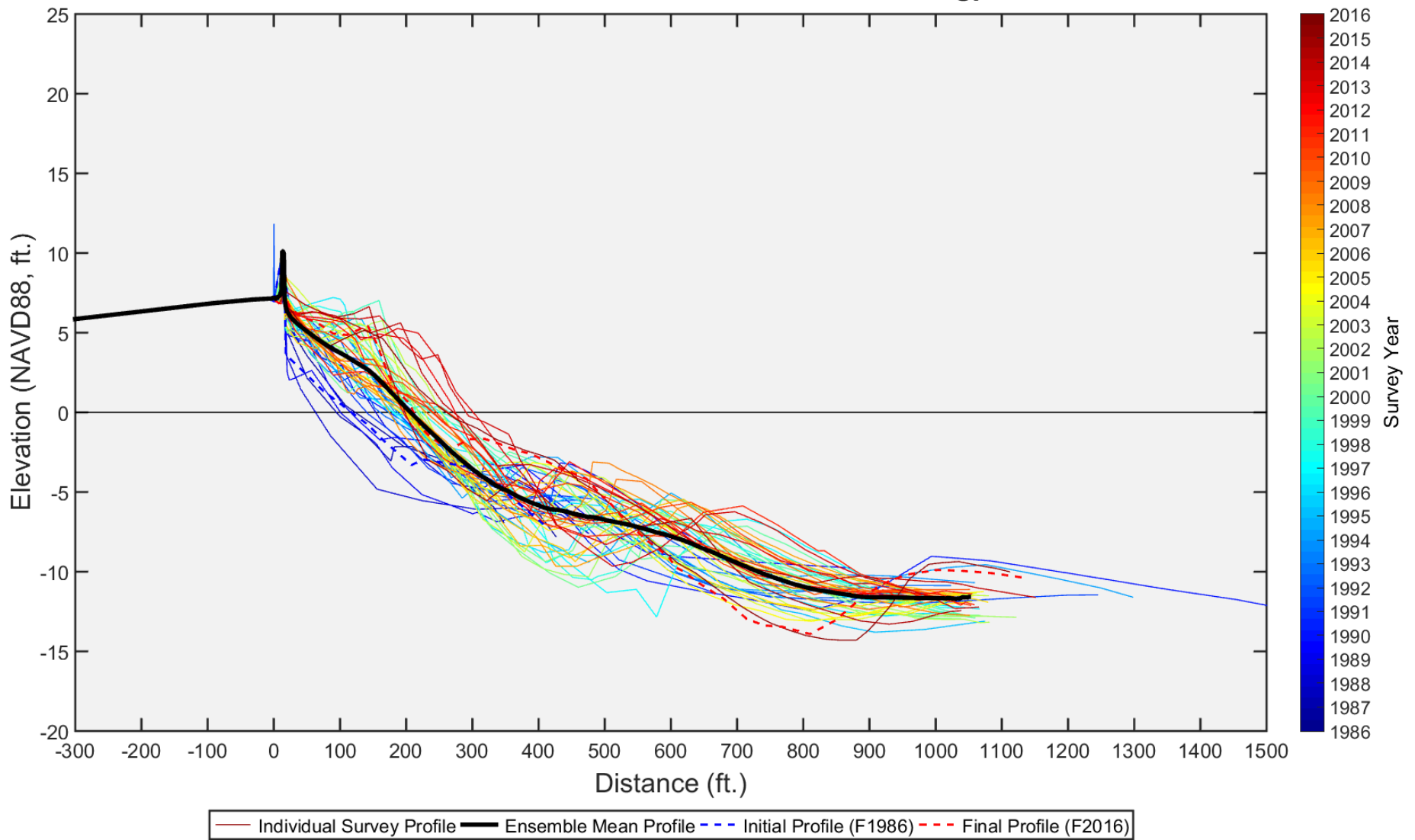


Figure 448. This site is close to the 11th Street jetty on Great Egg Inlet and sand escapes into the channel fairly easily because the jetty is short. The beach's shoreline is further seaward in 2016 than it was in 1986, but not by a significant amount to be storm resilient.

#126 - 17th Street, Longport Borough, Atlantic County
Comparison of 1995 to 2016

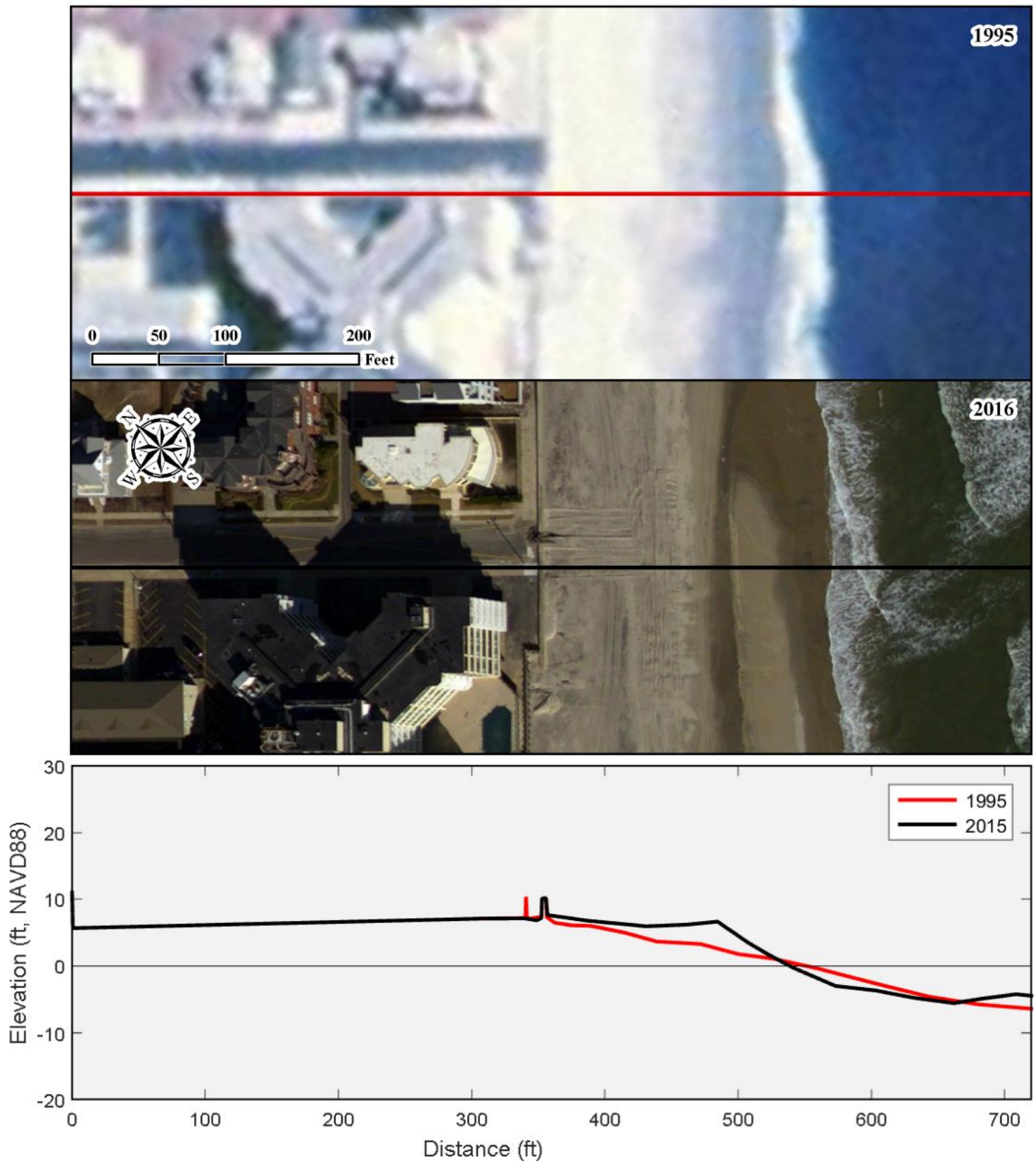


Figure 449. Longport declined to participate in the 2003 federal project and any enhancement from littoral transport from the federal project has been considerably less at the south end of Absecon Island. While sand was once directly placed on this site in 1990, the short terminal jetty to Great Egg Inlet allows much of the material to escape into the inlet channel.

Summary & Conclusions

Atlantic County has experienced moderate storm damage over the past five years from northeast events and Hurricanes Irene and Sandy. The USACE has taken over the Brigantine Island engineered beach and extended the coverage south to 5th Street South. Following a Superior Court battle with Margate residents over extending the Absecon Island shore protection project south covering Margate and Longport, the court's decision was to allow the project to proceed. That work is scheduled for 2017 and would move the entire Absecon Island oceanfront shoreline under the federal project. Negative feelings and attitudes remain among oceanfront Margate residents, but the project will be completed in 2017. The determination of what to do about the terminal groin end effects at 11th Avenue in Longport remain to be seen as abundant sand supplies move toward Great Egg Inlet's north side jetty in Longport.

The bar graph below shows the variable nature of the two islands. Brigantine saw both shoreline retreat and sand volume loss at the undeveloped northern end of the island (site 134) and that showed as shoreline retreat at site 133 with little in the way of sand volume change in spite of being part of the federal and earlier state beach fill projects. The southern two profile sites dramatically demonstrate the effect of the combined dominant southerly littoral transport and an effective barrier to sand entering Absecon Inlet caused by the north jetty to the inlet. Site 131 has been one of three NJ sites where sand has accumulated in quantity and consistency over 30 years.

Atlantic County, Beach Volume & Shoreline Position Change Over 30 Years

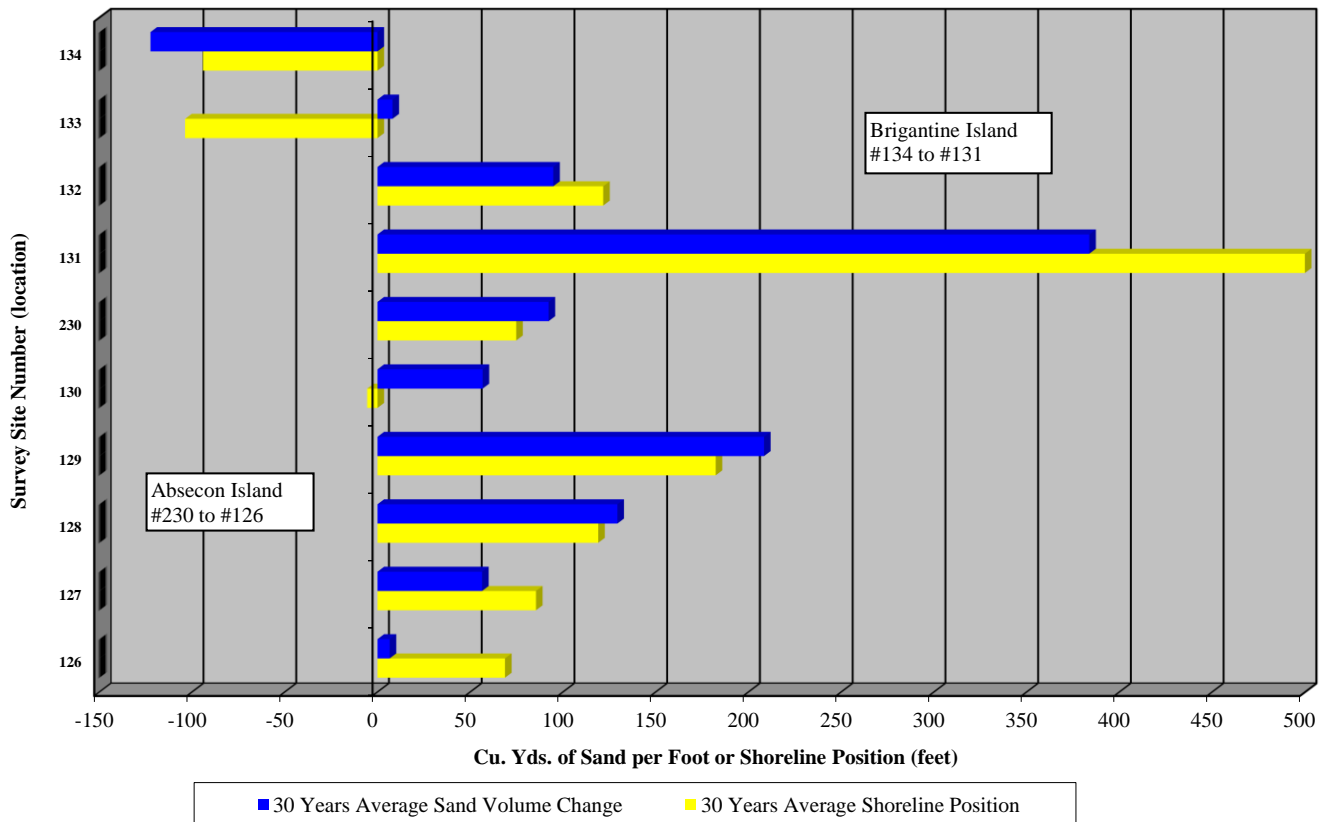


Figure 450. The two barrier islands in Atlantic County behaved in different ways where Brigantine appears to have lost sand and moved landward along the northern coastline and added large sand volumes and extended the shoreline seaward at the south end by almost 500 ft. While Absecon Island received federal sand deposited from site 230 south to site 128, with sand transport benefitting the two southern sites (127 & 126).

Absecon Island reflects the placement of sand on the island limited to Atlantic City and Ventnor. A declining sand volume moving south to Longport is a result of the project stopping a mile north of the Benson Avenue site 127 while the Longport location is nearly 2.7 mi south of the project's initial terminus.

A massive federal inlet revetment re-construction was completed along the Absecon Inlet on the Atlantic City side. This work replaced aging timber and rock structures and the storm-damaged inlet boardwalk which shoreline retreat had gradually located beyond the low tide shoreline. Extensive debris extraction accompanied the start of the reconstruction to rid the area of over 100 years of prior human development. The top of the new revetment will serve as a new public walkway to Gardner's Basin. The inlet beach will be re-developed with modest sand placement that would follow revetment construction.

The State is considering a betterment to the terminal groin at 11th Street in Longport to prevent the sand placed on the southern beaches from depositing into Great Egg Inlet. This is not part of the USACE's project planning and must be funded by the non-federal partner.

Thirty years of monitoring efforts have shown the tremendous benefits of beach nourishment efforts on both Brigantine Island and Absecon Island. The increased sand volumes deposited in the island's littoral systems have extended shorelines seaward, enhanced the recreational beach berm width and raised the elevations. While perhaps the most significant benefit, demonstrated during Sandy, was the formation and development of a continuous dune system in three of the five oceanfront municipalities. This feature has protected and reduced storm damages to the boardwalk, public infrastructure and oceanfront properties despite an increase in storm frequency and intensity over time. With Longport and Margate City joining the Absecon Island shore protection project in 2017, this enhanced level of shore protection benefits will be extended to the entire developed oceanfront shoreline in Atlantic County.

The island of Little Beach continues to be part of the Forsythe National Wildlife Refuge and the only barrier island in New Jersey, New York or Delaware without any human activity or development. A few 19th Century cottages and fishing shacks once dotted Little Beach and a US Life Saving Station was built on the island prior to the 20th Century. However, practically all human development traces have been eliminated by time and the wildlife refuge managers. Current refuge management is seeking habitat evaluation and enhancement as part of continued improvement of the island for coastal wildlife.