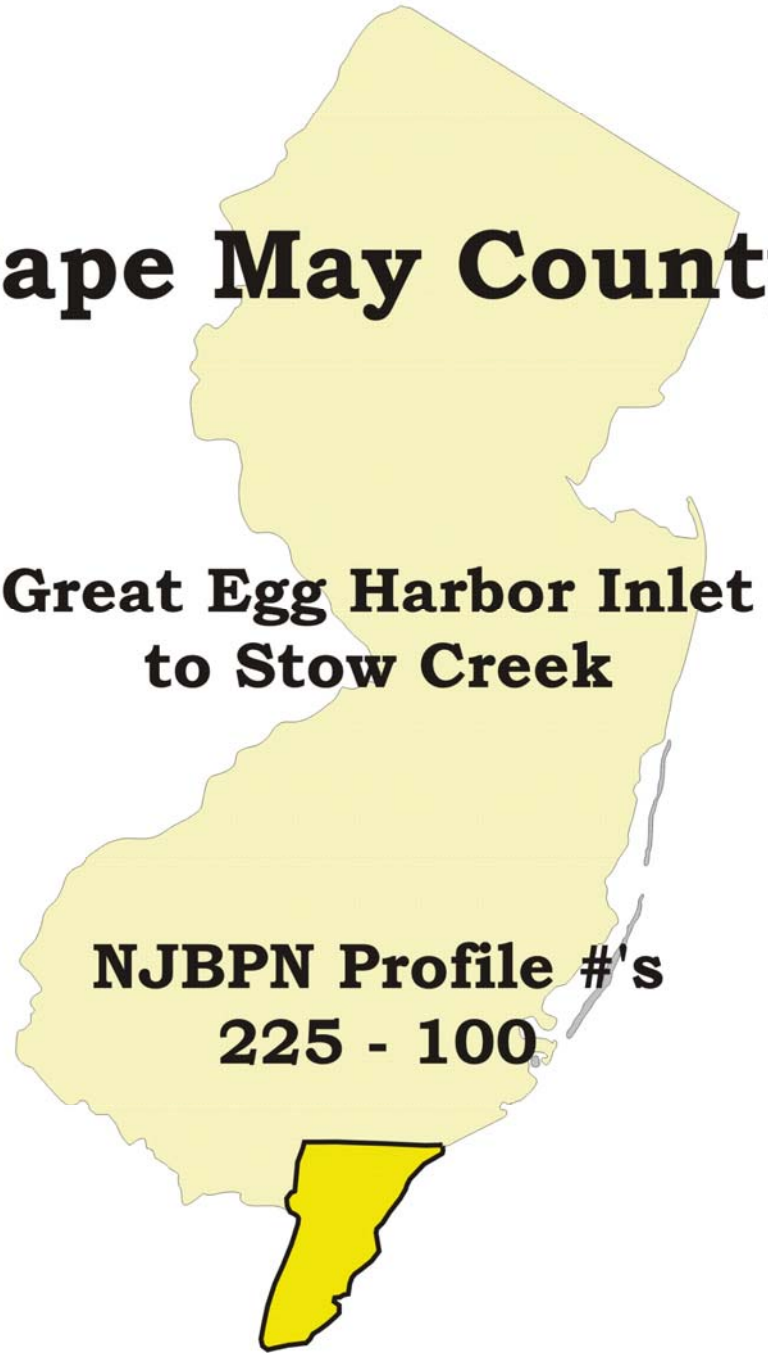
New Jersey Beach Profile Network

Cape May County

Great Egg Harbor Inlet to Stow Creek



NJBPN Profile #'s 225 - 100

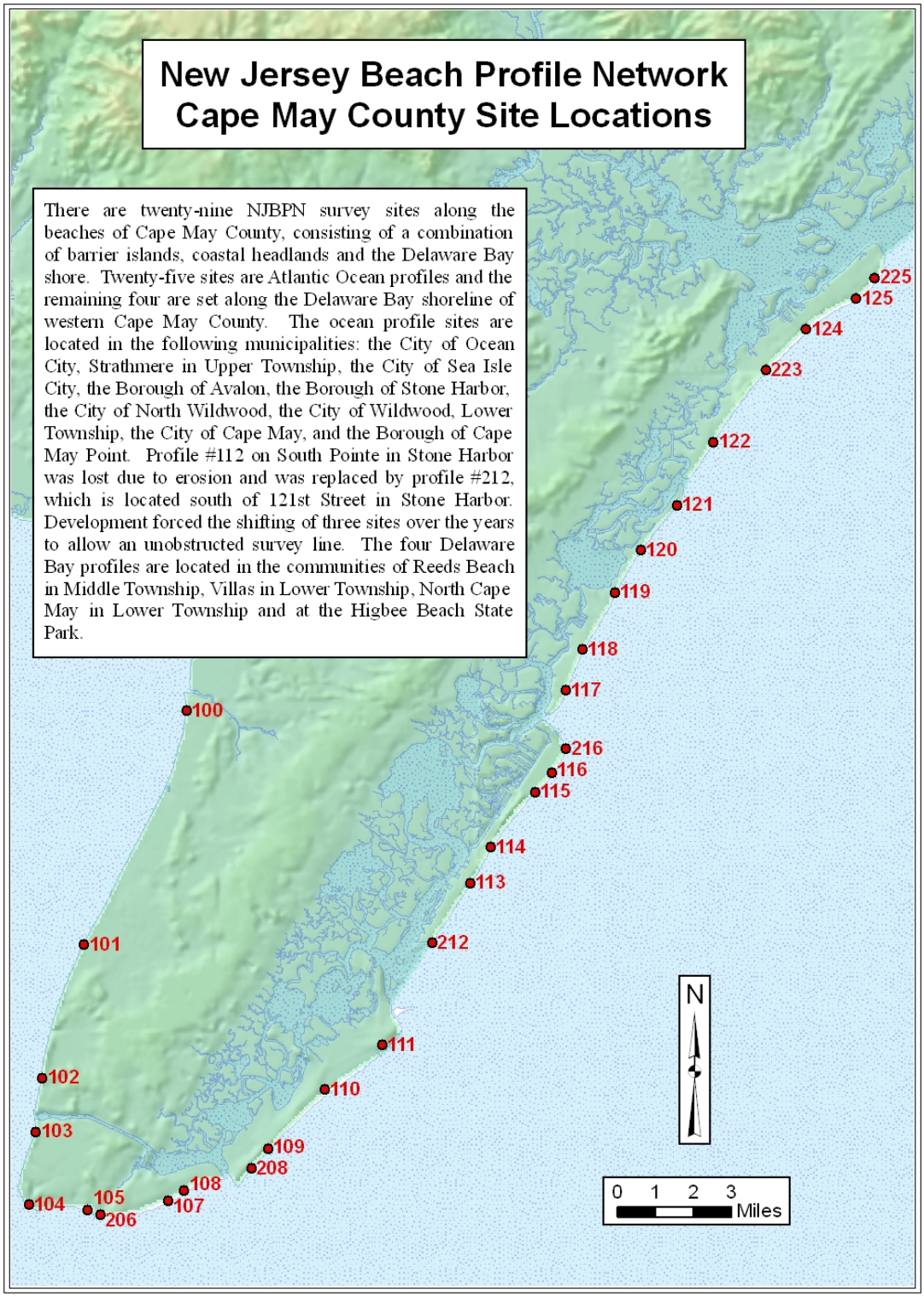


Figure 87. Locations for the 29 NJBPN profile sites in Cape May County, NJ

CAPE MAY COUNTY SPRING 2007 to FALL 2008

Cape May County has the honor of the most coastal restoration projects of the four coastal counties. There are five coastal projects involving Federal cooperation with the State of New Jersey and the local municipality. These are Ocean City (northern two thirds of the island), Avalon, Stone Harbor, Cape May City, Cape May Meadows/Cape May Point. The balance of Peck's Beach (Ocean City) is a NJ State/local project. Reeds Beach is a State project with beach restoration a side benefit from a navigation improvement at Bidwell Creek. The Federal Reeds Beach to Pierces Point project is an ecological restoration project primarily to benefit migratory shorebirds and horseshoe crab egg-laying with a one-time beach restoration. This project awaits sufficient funding at the moment.

The State funding has brought a major project to the construction stage by the beginning of 2009. The municipalities of Upper Township (Strathmere), Sea Isle City, the City of North Wildwood and the Borough of Stone Harbor are jointly cooperating with the State for shore protection this coming year. The Strathmere erosion problem has been related to dynamic changes in the tidal channel geometry of Corson's Inlet that when combined with even minor northeast storms produce a serious threat to the northernmost development on Ludlam Island. During 2008 the situation spiraled out of control to the point where the property owners were forced to install a 30-foot steel bulkhead along their inlet shoreline and the municipality funded $1.2 million for a rock revetment at the base of the steel wall. The beach restoration project should restore much of the 30 acres of State open space that vanished from the north end of Ludlam Island.

Starting in 1998, inlet dynamics have negatively impacted the City of North Wildwood. Sand from the ocean beach has moved into Hereford inlet as a result of shifts in the tidal channel away from the City of North Wildwood's inlet shoreline. This allowed oceanfront sand to flow into the inlet creating a large sand spit along the inlet revetment. The beach narrowed by 1,054 feet at the 15th Street survey site between 1998 and 2005. This brought the City's beachfront infrastructure within easy reach of stronger northeast storms and beach restoration was instituted. The NJ State project is designed to augment the beach between the inlet to 24th Street by widening the beach by 300 feet (base bid) and building a dune with a consistent elevation of 14.75 feet NAVD88. The past three years of surveys have shown that the rate of shoreline retreat has diminished and stabilized at the 15th Street site.

Federal funding is expected in 2009 for Ocean City and the maintenance of that project between 12th and 34th Streets. This follows work completed in 2008 by the State and Ocean City to replenish severely eroded beaches between the Longport Bridge and 12th Street with 900,825 cubic yards placed on the beach. The State is expected to attempt to fund a "betterment" of the ACOE project by piggybacking onto the Federal effort with a continuation using State and local funding for the beach from 34th south to 56th Street. Avalon qualifies for maintenance, but no funds are currently available. In 2007 Avalon trucked 86,212 cubic yards of sand for critical access to the northern beach between 10th and 15th Streets. In 2008 the Borough contracted for hydraulic dredging of Townsend's Inlet sand to provide summer access in the same area with 253,287 cubic yards delivered between 9th and 18th Streets.

All but Ludlam Island and the Wildwoods have benefited from either NJ State beach projects or Federally sponsored work. The two illustrations below cover annual changes in sand supply observed since 1986 at a central location in Ocean City and a similar site in Cape May City. Both sites have retained all the emplaced sand or added additional volume as littoral processes moved more sand to the site. There are locations on each project where stability is lacking, but restoration sand volumes have been far less than the initial nourishment effort. The Delaware Bay shoreline has historically retreated about 2-feet per year as the thin deposit of sand is forced eastward onto the eroding edge of the salt marsh. Higbee Beach is typical of this process.

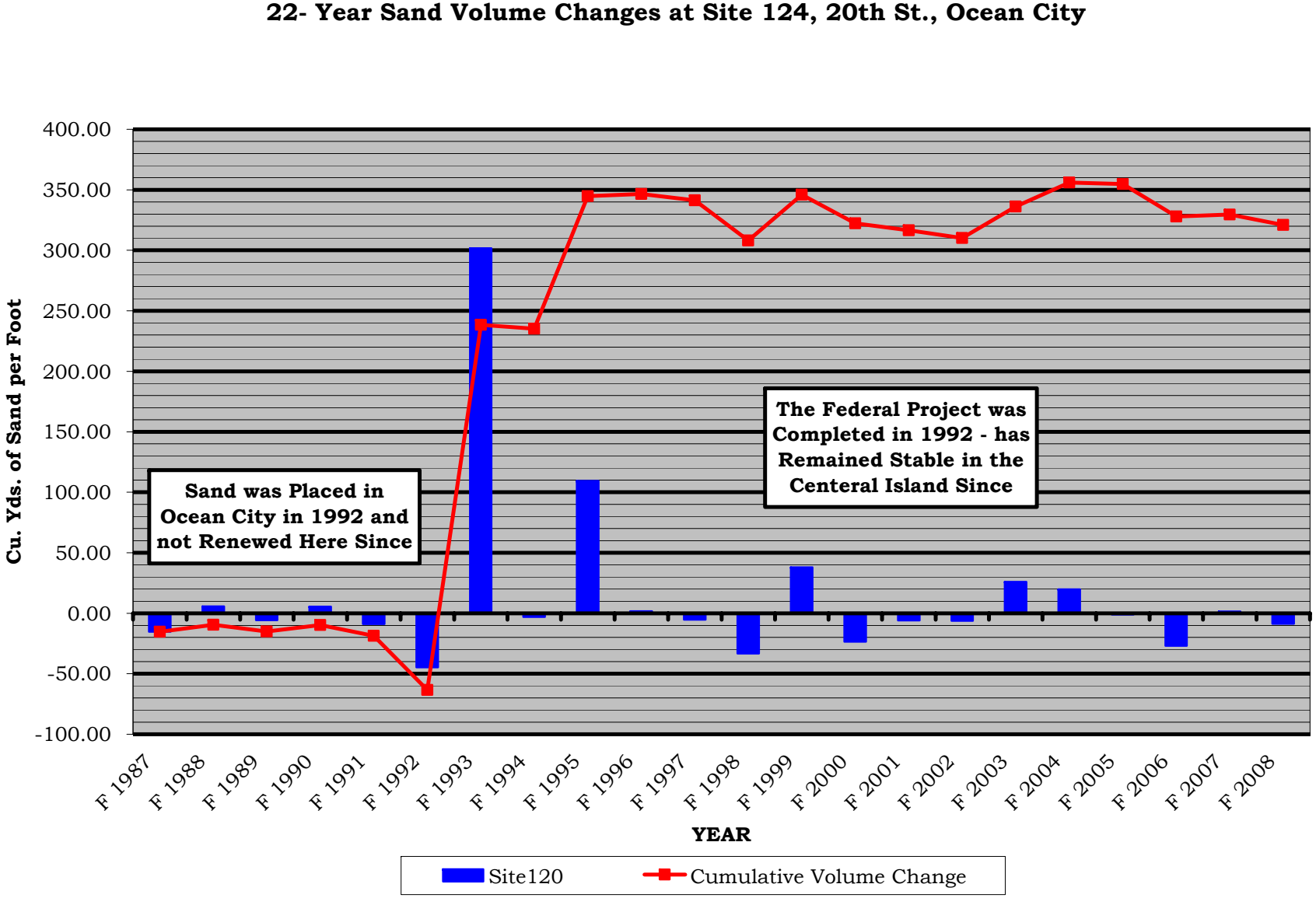


Figure 88. The sediment supply present along this segment of the Ocean City shoreline between 1986 and 1991 was so meager that high tide was landward of the boardwalk. The Halloween Storm of 1991 demolished the boardwalk north of this site for 5 blocks. The initial nourishment occurred in the summer of 1992 and that following December a more serious storm did zero damage to the municipal oceanfront infrastructure. Sand continued to arrive following the initial year of the project because new sand has been added 8 times at the northern erosional "hot-spot" at 6th Street. Today this site supports a massive dune system and is very stable.

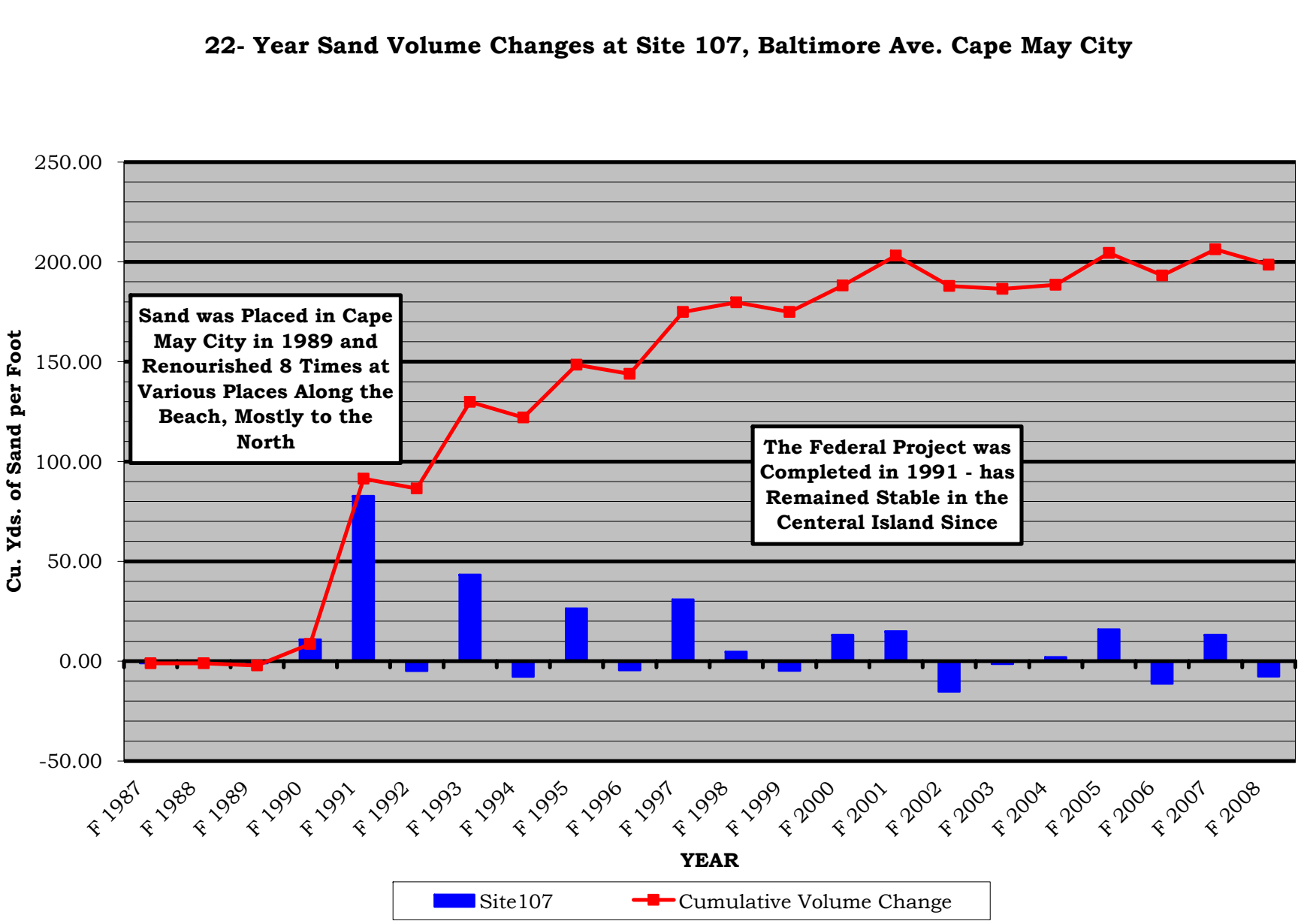


Figure 89. Beach nourishment was started in Cape May City in 1989 as the initial Federal project in New Jersey. Initially this beach was wet to the rock revetment defending Ocean Avenue along Cape May City. The lack of change was understandable until sand pumping provided sand in 1990 and 1991. There have been 8 maintenance efforts since 1989, each one augmenting the total volume present here. With about 200 yds^3/ft. in additional sand volume, the Baltimore Avenue beach is a model for this project.

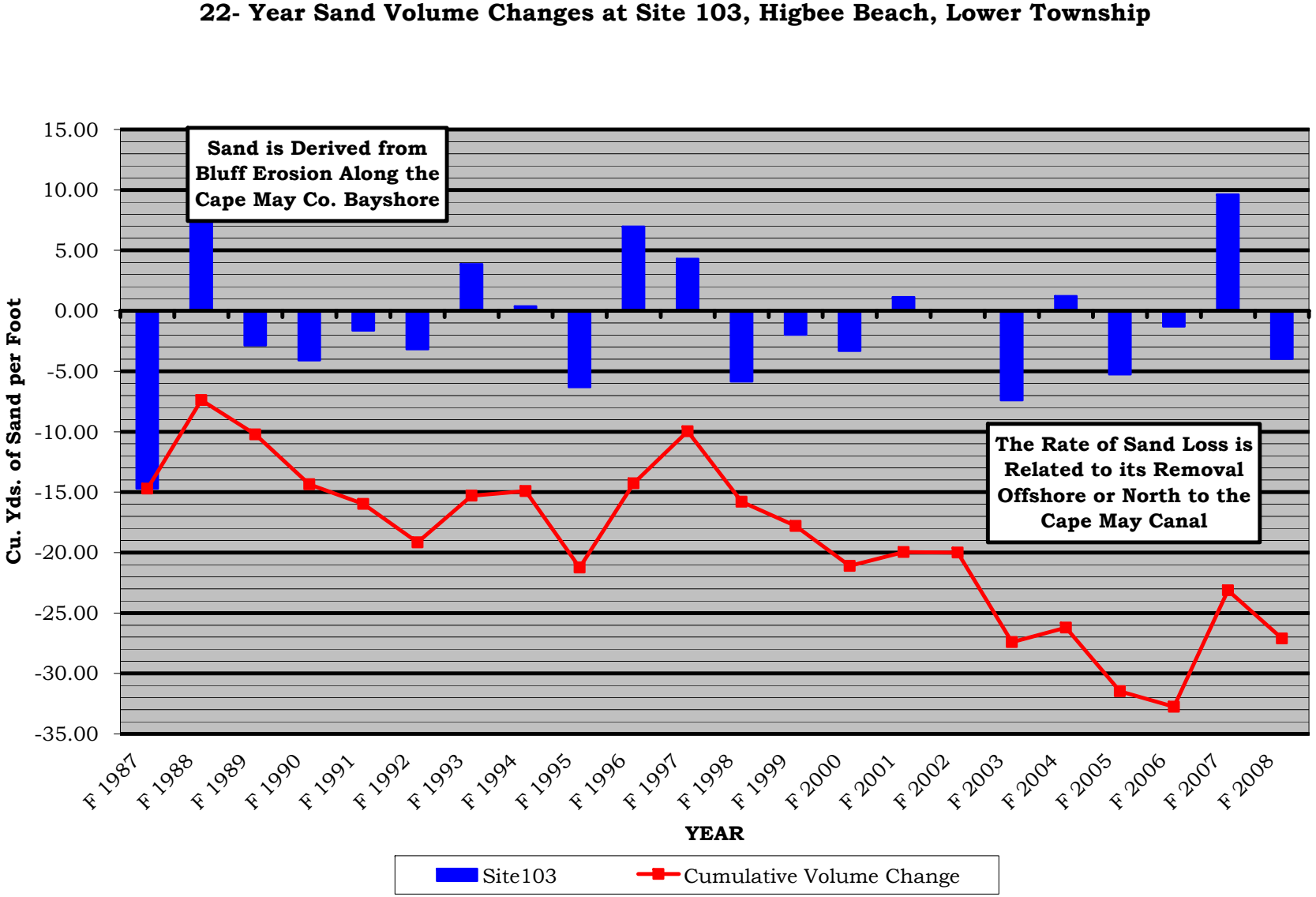


Figure 90. The four sites on Delaware Bay in Cape May County display far smaller changes each year due to the far smaller wave energy available to change things. Higbee Beach is a natural area in the southern part of this western bay shoreline and consists of a sandy vegetated bluff which erodes when storms raise the tide or strong northwest winds at high tide raise big waves on Delaware Bay. The derived sand becomes part of the beach and travels north to the jetties confining the Cape May Canal or moves offshore onto the Delaware Bay floor as a thin layer spread over a several hundred-foot range seaward of the low tide line. It took 21 years to double the initial year's sand loss volume recorded.

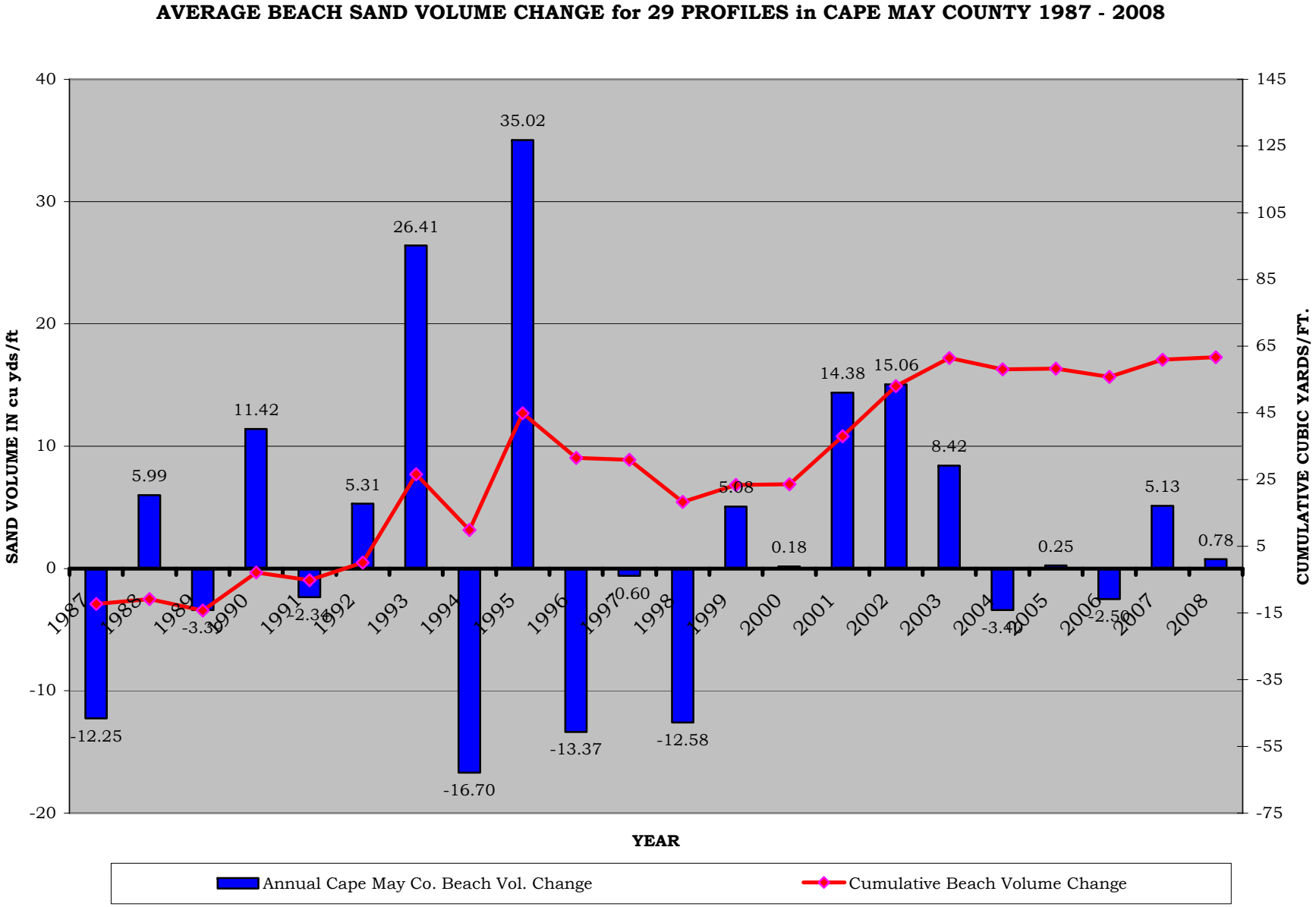


Figure 91. The average sand volume present on Cape May County beaches is clearly associated with the many major projects conducted within the County. Starting in 1889 the communities of Ocean City and Cape May City along with Avalon provided large volumes of sand to the municipal beach. The ACOE is involved in Ocean City, Avalon, Stone Harbor, Cape May City and Cape May Point with the State placing sand in Strathmere in 2001. These projects have produced the rising trend line for the County shoreline.

Congressional funding for the ACOE to institute or maintain existing projects has been quite limited. The passage of a new Water Resources Development Act in 2007 included authorization for the continuation of existing projects and the implementation of two new ocean beach projects in Cape May County, but Congress did not appropriate the money to fund the work in either FY 08 or FY 09, which ends September 30, 2009. Debate is ongoing as to whether or not "stimulus money" can be spent in FY 10 for beach restoration work without special Congressional budgetary "Add-Ons" for such work. The ACOE has funding to continue monitoring of existing projects and to up-date studies (Limited Reevaluation Report) of designs, costs and benefits for proposed projects. They also have money to develop, approve and execute the Project Partnership Agreement with the State of New Jersey. The local issues related to real estate, state permits, and ancillary parts of the project (dune grass, monitoring and fencing) are funded by the State/local partnership.

The Cape May Point 227 experimental reef project continued to have a positive impact on the shorelines of those cells where the concrete structures were placed between groins defining the two cells. Older installations at two other cells in the community continued to maintain a perched beach as well. These installations show that if the area landward of the line of reef units is closed by groins at each end, the beach sand remains in place longer than if the line of reef units is open at one or both ends. Monitoring has been reduced to once per year with the cancellation of experimental 227-type projects by the ACOE. The State has undertaken the annual review of this project.

GARDENS ROAD, OCEAN CITY - SITE 225

The Gardens Road site has suffered erosion beginning in 2005 as the sand supply from the northern end of the oceanfront beach receiving beach nourishment periodically declines with time. The last effort was the 4th renourishment done by the ACOE by Feburary 2004 (1.6 million cubic yards). Funding has been absent to continue until the NJ State completed a project in late 2008. This May 16, 2007 photograph shows a vertical scarp with moderate sand slumping as drying occurred between erosional episodes. There is a narrow beach and little tendency to develop a berm.

By October 8, 2008 the beach was a little wider, but the scarp was still present in spite of renewed sand placement along the oceanfront in the fall of 2008. The dunes and shoreline are sufficient to protect the development until the shoreline wraps more deeply into the inlet opening. There the homes are built closer to the shoreline and are more vulnerable to inlet coastal erosion. The reaction to the beach nourishment was a 48.32 yds^3/ft. sand volume gain by March 6, 2008 as the shoreline advanced 117 feet. The summer produced a 33.33 yds^3/ft. sand volume loss as the shoreline retreated 143 feet. This occurred by October 8th.

New Jersey Beach Profile Network

#225 - Gardens Road, Ocean City, Cape May County

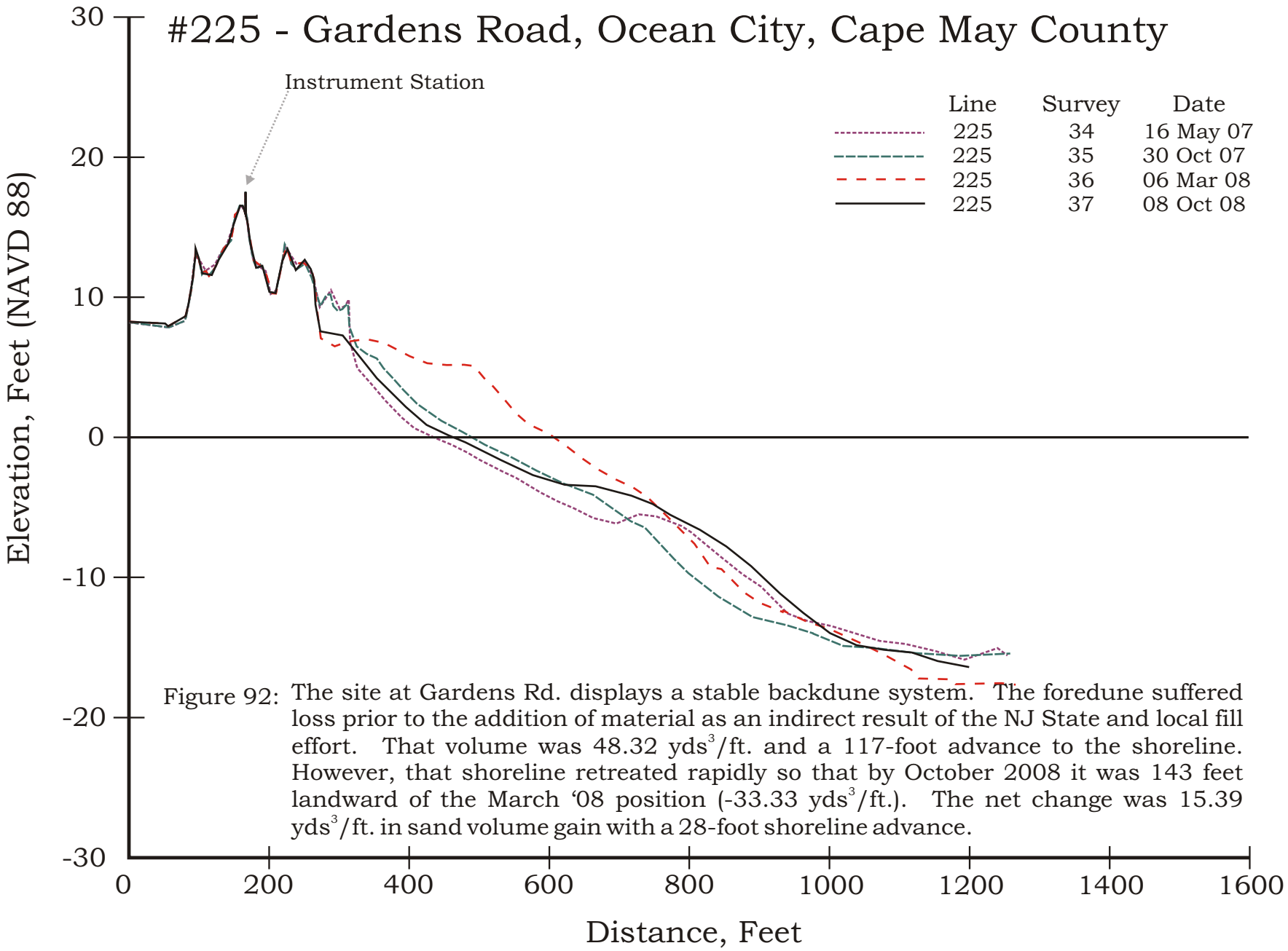


Figure 92: The site at Gardens Rd. displays a stable backdune system. The foredune suffered loss prior to the addition of material as an indirect result of the NJ State and local fill effort. That volume was 48.32 yds^3/ft. and a 117-foot advance to the shoreline. However, that shoreline retreated rapidly so that by October 2008 it was 143 feet landward of the March '08 position (-33.33 yds^3/ft.). The net change was 15.39 yds^3/ft. in sand volume gain with a 28-foot shoreline advance.

6th STREET, OCEAN CITY - SITE 125

At 6th Street the beach was shrinking in width causing dune erosion by May 16, 2007. The remainder of the dune shows to the south as a remnant left between the beach and the Ocean City boardwalk. The sand volume change was -10.18 yds^3/ft. between May and October 2007, followed by the beach replenishment effort.

By October 8, 2008 the beach was wider due to a project financed by the State of NJ and the local municipality. This occurred as a result of a lack of Federal funding for the Corps District to continue its maintenance program in Ocean City. The photograph shows the new beach and snow fencing erected to begin the process of rebuilding the dunes in the gap where erosion took all the material. Sand placement produced 119.99 yds^3/ft. and a 204-foot shoreline advance by the March 6, 2008 survey and the site lost 21.56 yds^3/ft. during the following summer as the shoreline retreated 106 feet. Clearly this location continues as an erosional "hot spot" on Pecks Beach.

New Jersey Beach Profile Network

#125 - 6th Street, Ocean City, Cape May County

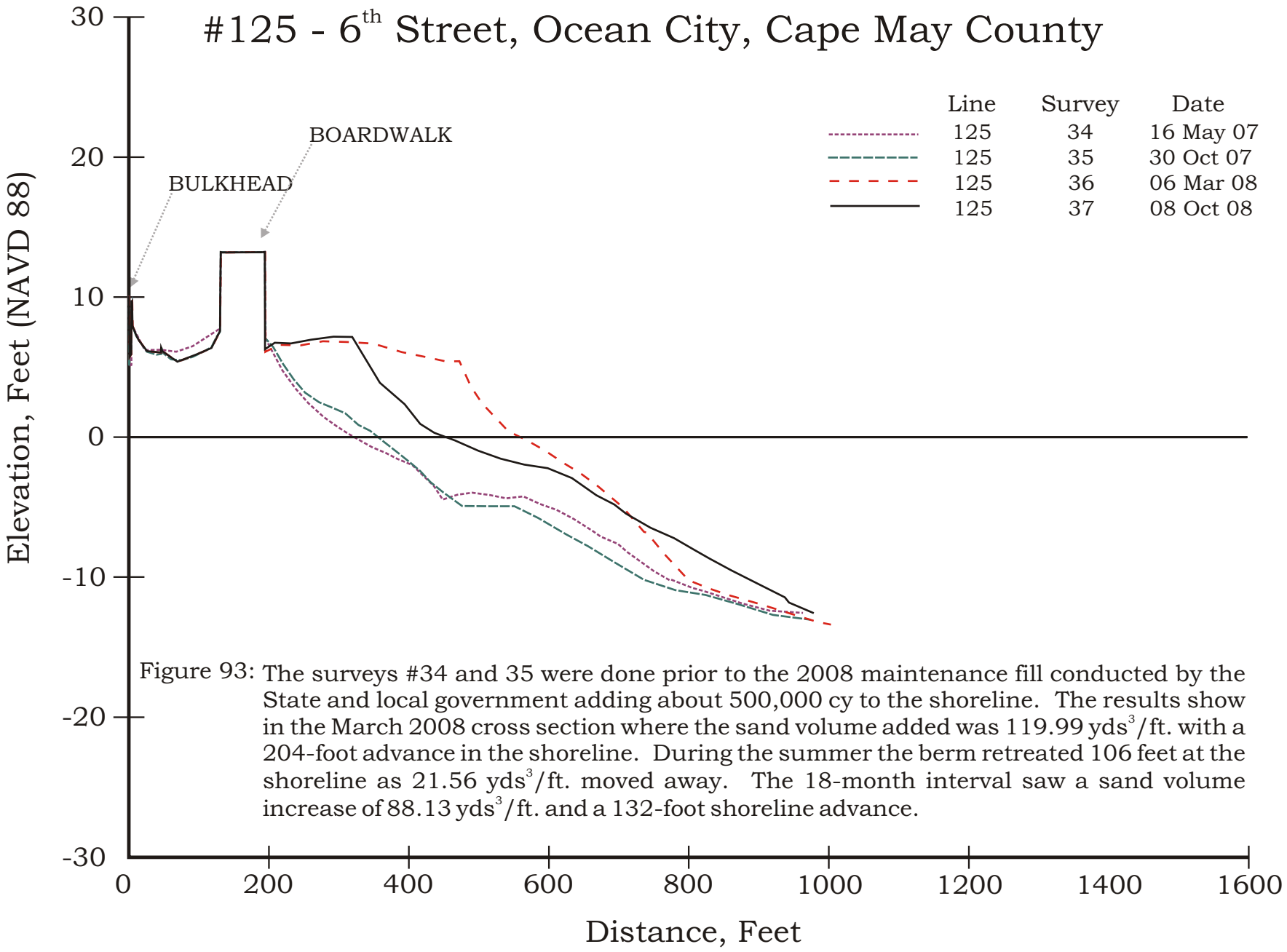


Figure 93: The surveys #34 and 35 were done prior to the 2008 maintenance fill conducted by the State and local government adding about 500,000 cy to the shoreline. The results show in the March 2008 cross section where the sand volume added was 119.99 yds^3/ft. with a 204-foot advance in the shoreline. During the summer the berm retreated 106 feet at the shoreline as 21.56 yds^3/ft. moved away. The 18-month interval saw a sand volume increase of 88.13 yds^3/ft. and a 132-foot shoreline advance.

20th STREET, OCEAN CITY - SITE 124

The 20th Street profile is a dramatic example of beach nourishment success. The photograph to the left was taken February 27, 2007 toward the foredune position on the beach. Prior to the 1992 initial construction of this project, the photographer would have been swimming far beyond the limit allowed by life guards. The high tide position was under the boardwalk some 400 feet westward.

The October 8, 2008 shot was closer to the beach and shows the summer grass growth and the gradational transition to the dry beach. The homes barely show in the distance to the left of the photograph 16 years following the initial nourishment. The added sand has come from the losses seen north of 12th Street in Ocean City. The 18-month study found a 2.23 yds^3/ft. sand volume loss with a 16-foot shoreline advance.

New Jersey Beach Profile Network

#124 - 20th Street, Ocean City, Cape May County

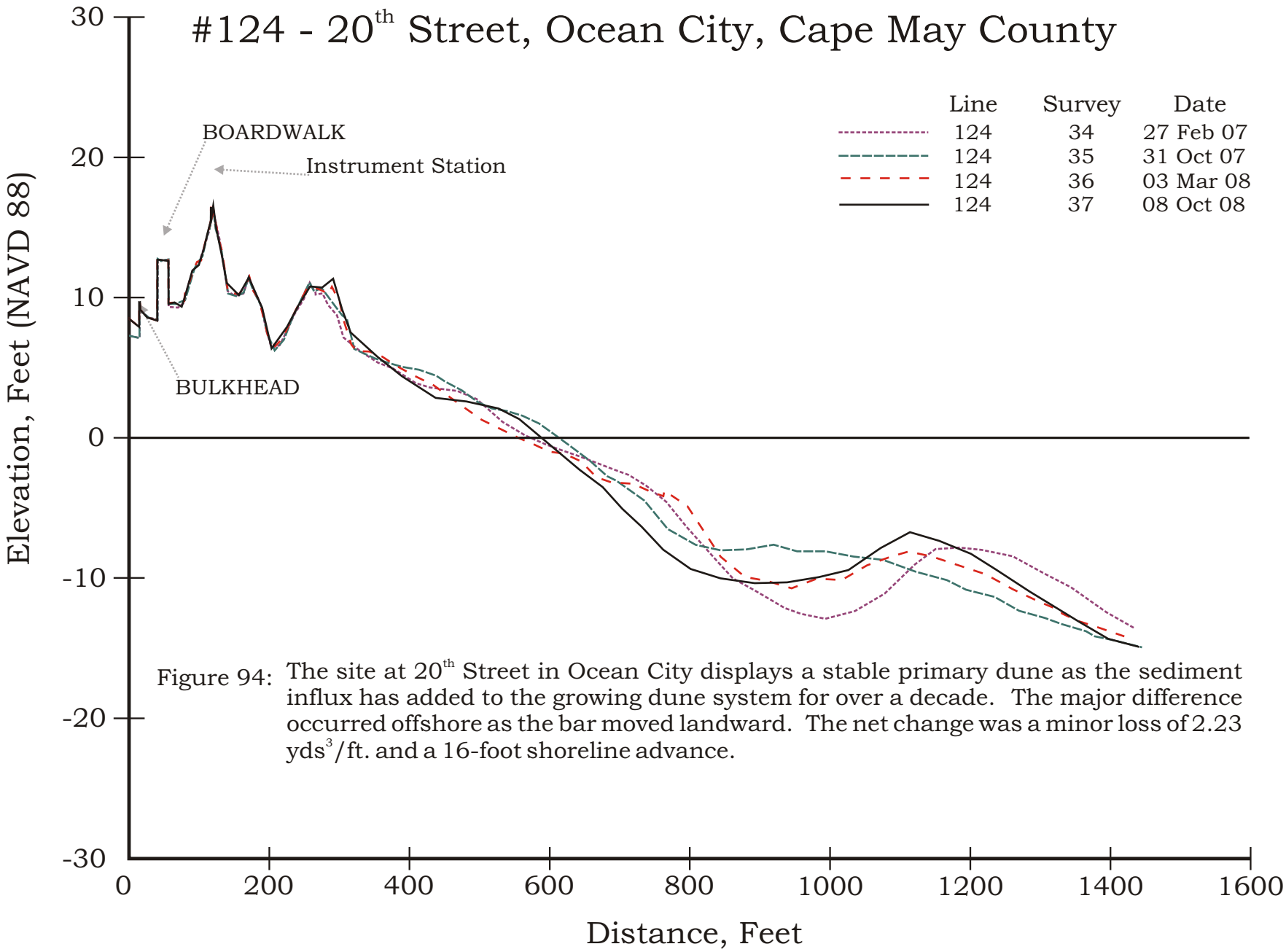


Figure 94: The site at 20th Street in Ocean City displays a stable primary dune as the sediment influx has added to the growing dune system for over a decade. The major difference occurred offshore as the bar moved landward. The net change was a minor loss of 2.23 $yds^3/ft.$ and a 16-foot shoreline advance.

34th STREET, OCEAN CITY - SITE 223

The Federal portion of the Ocean City beach restoration ends at 34th Street. A State-local project completed the work south to 59th Street showed in this March 27, 2007 view. This site was shifted south to cover the growth in the dune since the dune is not present at the street end because it is an emergency vehicle entrance to the beach. Note the essentially buried snow fencing at the seaward edge of the dune.

By October 10, 2008 the grass had migrated across the buried fence and colonized the dune to the toe at the dry beach berm. This site is much wider due to the nourishment activities than it was prior to 1995 when the State portion was completed. Modest change occurred as 6.73 yds^3/ft. of sand were added to the beach, but only a foot of shoreline position change occurred seaward.

New Jersey Beach Profile Network

#223 - 34th Street, Ocean City, Cape May County

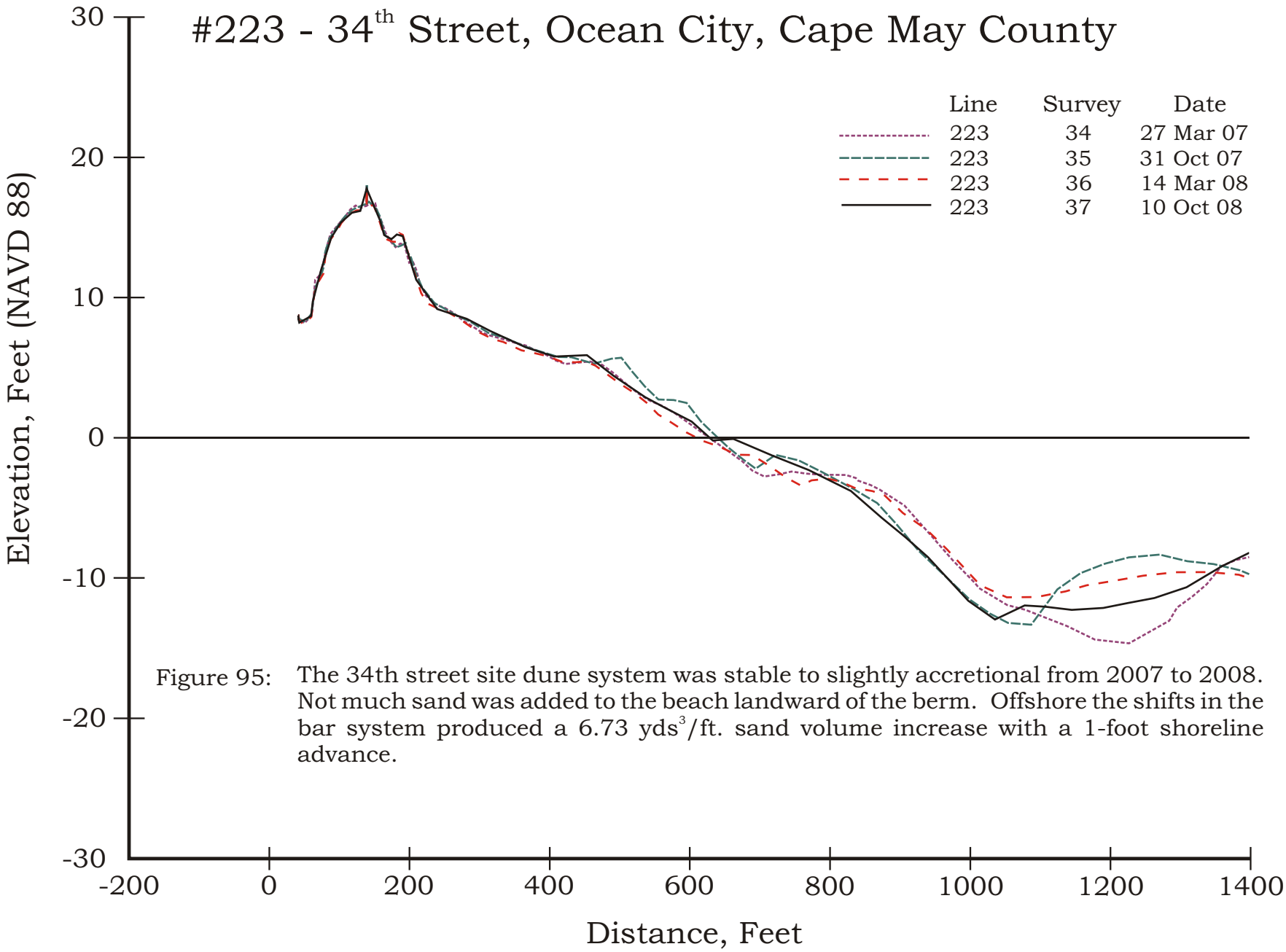


Figure 95: The 34th street site dune system was stable to slightly accretional from 2007 to 2008. Not much sand was added to the beach landward of the berm. Offshore the shifts in the bar system produced a 6.73 yds^3/ft. sand volume increase with a 1-foot shoreline advance.

56th STREET, OCEAN CITY - SITE 122

The southern part of the developed part of Ocean City has a narrower beach, but a substantial dune shown here as of March 27, 2007. The slow erosion has reduced the initial 1995 beach width to the point where restoration is presently working through the permitting process. The State will maintain this section of the beach for the first time since 1995.

By October 10, 2008 grass growth has made the dune look more impressive, but the width and height is substantially the same. The beach is stable if narrow. The sand volume confirms this observation (-0.56 yds^3/ft. with a 2-foot advance in the shoreline).

New Jersey Beach Profile Network

#122 - 56th Street, Ocean City, Cape May County

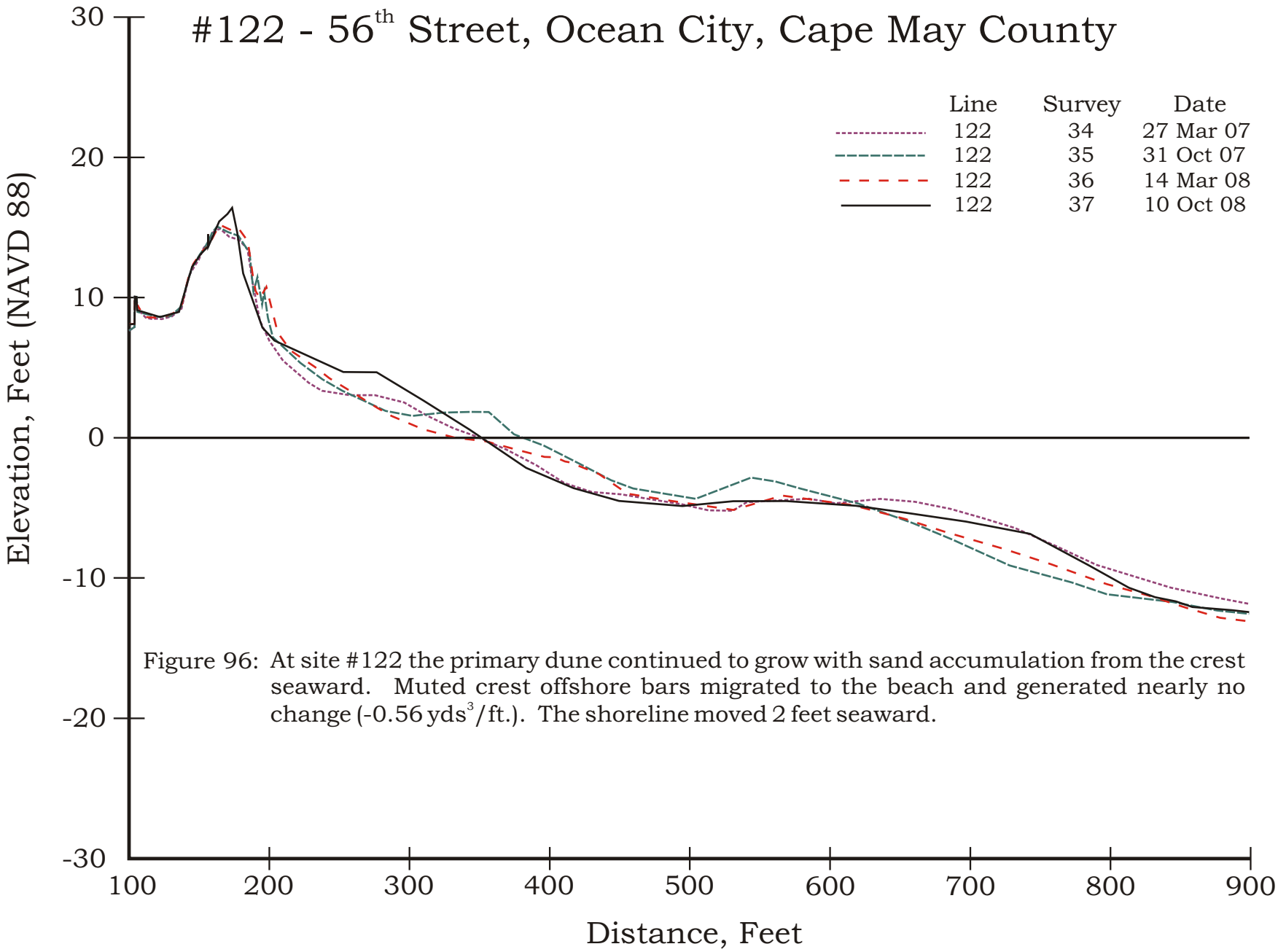


Figure 96: At site #122 the primary dune continued to grow with sand accumulation from the crest seaward. Muted crest offshore bars migrated to the beach and generated nearly no change (-0.56 $yds^3/ft.$). The shoreline moved 2 feet seaward.

WILLIAMS ROAD, STRATHMERE - SITE 121

The beach at Williams Road was still wide enough to prevent dune erosion by high tides November 5, 2007. The issues that plagued the local municipality during 2008 were just beginning to appear. North of the groin that just barely shows down the beach erosion was carving away at the sand from that point to the inlet.

By October 22, 2008 the loss was beginning to affect this site as well. Note that the dune is scarped and the debris is pushed up against the dune toe where it lay out on the beach a year earlier. Normal high tide is still coming short of the dune toe, but any sort of tide elevation enhancement allows the waves to reach the dune. Note that far more of the old timber groin is exposed in the distance. Serious loss occurred during the winter 2007 to 2008, (-86.92 yds^3/ft.) but recovery restored nearly all the loss by the fall 2008 survey (-13.69 yds^3/ft. in decreased sand volume, but a 160-foot advance seaward in the shoreline).

New Jersey Beach Profile Network

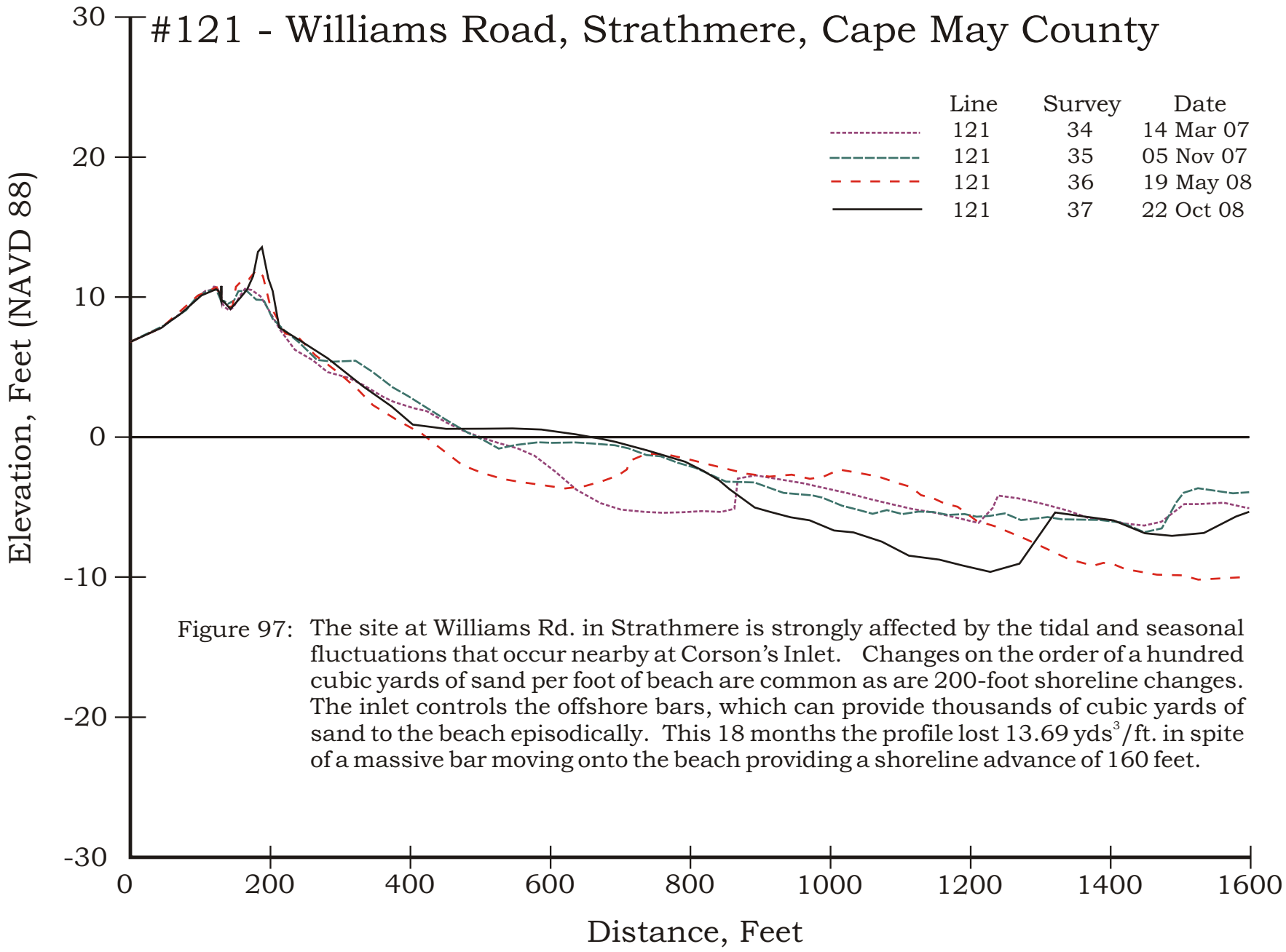


Figure 97: The site at Williams Rd. in Strathmere is strongly affected by the tidal and seasonal fluctuations that occur nearby at Corson's Inlet. Changes on the order of a hundred cubic yards of sand per foot of beach are common as are 200-foot shoreline changes. The inlet controls the offshore bars, which can provide thousands of cubic yards of sand to the beach episodically. This 18 months the profile lost 13.69 yds^3/ft. in spite of a massive bar moving onto the beach providing a shoreline advance of 160 feet.

1st STREET, SEA ISLE CITY - SITE 120

This central island location has a sand starvation problem that shows in the narrow beach, low, narrow dune where the tide reaches the dune almost every day. The photograph was taken November 5, 2007 during relatively calm weather and the beach was entirely wet during the previous high tide. There is a 10-foot diameter geo-tube located in the dune that is exposed to the south, but not right at the profile cross section or to the north.

Conditions were slightly better by May 19, 2008, but only with a 20-foot wide buffer between the last high tide and the dune toe. The lack of serious storms have allowed this site to remain undamaged. The sand volume increased 10.53 yds^3/ft., but the shoreline retreated 44 feet. over the 18-month interval.

New Jersey Beach Profile Network

#120 - 1st Street, Sea Isle City, Cape May County

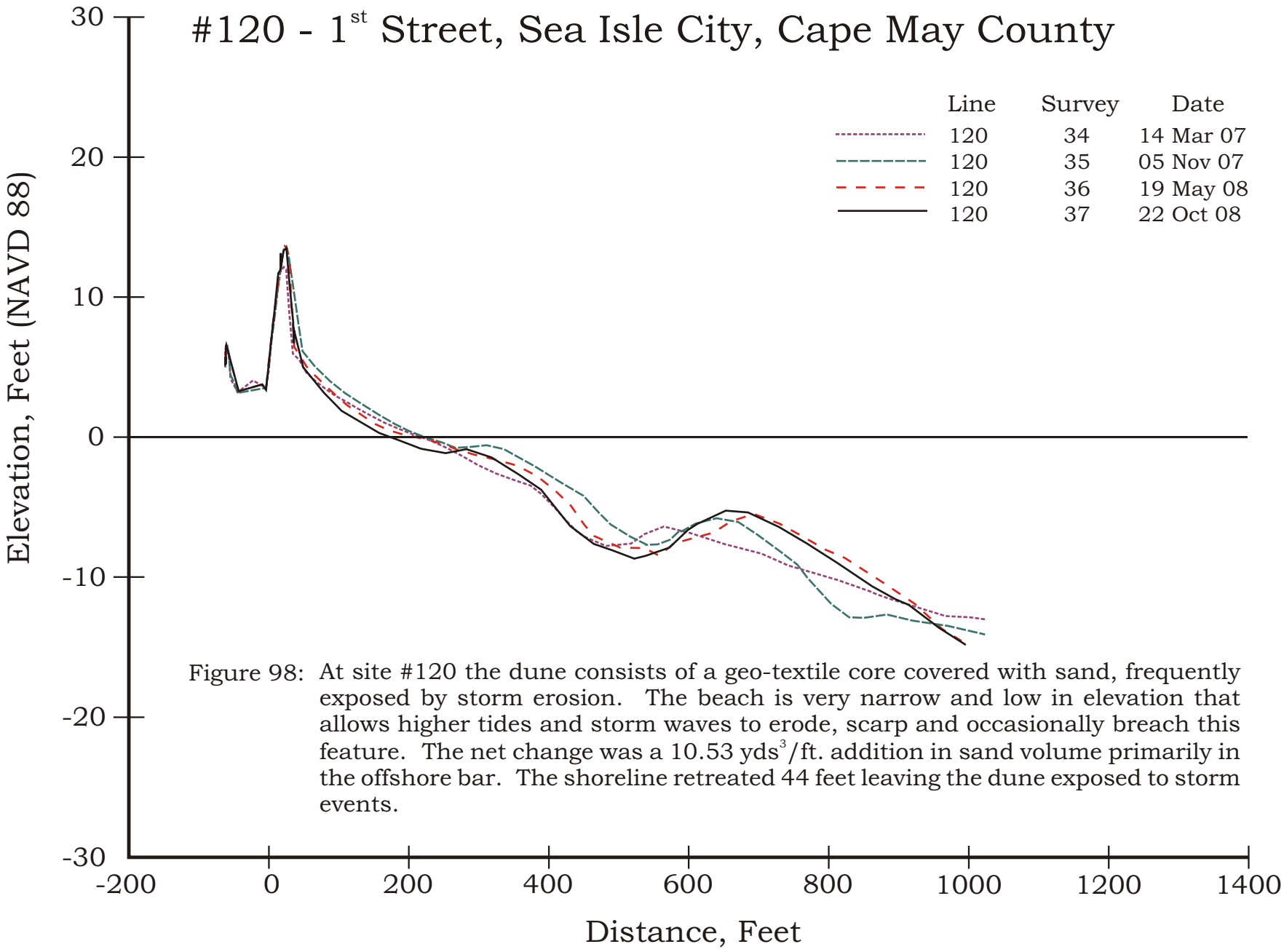


Figure 98: At site #120 the dune consists of a geo-textile core covered with sand, frequently exposed by storm erosion. The beach is very narrow and low in elevation that allows higher tides and storm waves to erode, scarp and occasionally breach this feature. The net change was a 10.53 yds^3/ft. addition in sand volume primarily in the offshore bar. The shoreline retreated 44 feet leaving the dune exposed to storm events.

25th STREET, SEA ISLE CITY - SITE 119

Conditions improved in terms of beach elevation, width and dune dimensions further south in Sea Isle City. This March 15, 2007 photograph shows the beach and dune with sufficient width to preclude wave impact on the dunes.

In September 18, 2008 the beach was recovering as the offshore sand bar was welding to the beach. The trough shown is termed a “runnel” and the sand seaward is the “ridge”. This is the climax of summer accretion as the sand in the bar migrates onto the beach. The sand volume decreased by 9.49 yds^3/ft. and the shoreline retreated 14 feet.

New Jersey Beach Profile Network

#119 - 25th Street, Sea Isle City, Cape May County

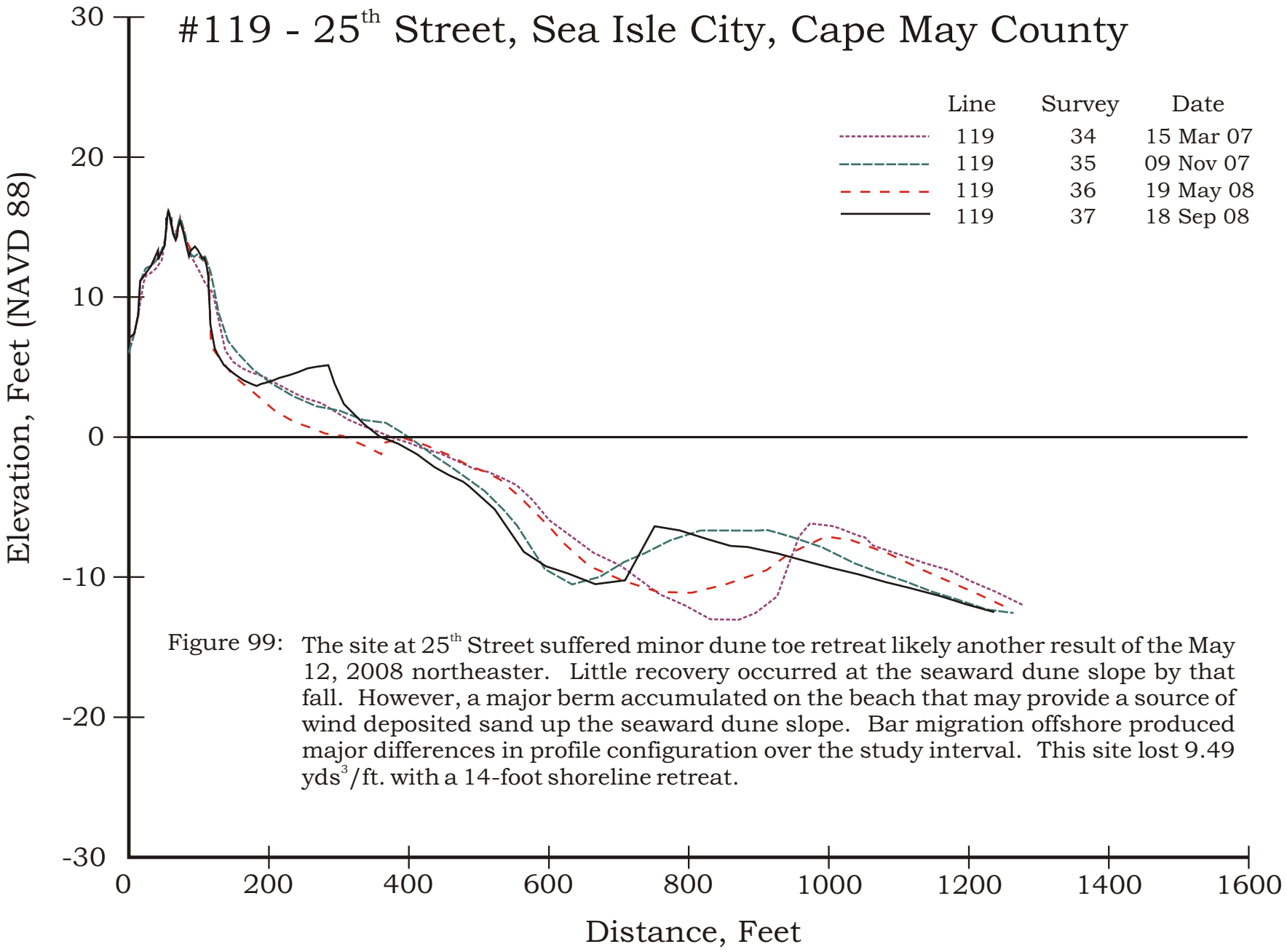


Figure 99: The site at 25th Street suffered minor dune toe retreat likely another result of the May 12, 2008 northeaster. Little recovery occurred at the seaward dune slope by that fall. However, a major berm accumulated on the beach that may provide a source of wind deposited sand up the seaward dune slope. Bar migration offshore produced major differences in profile configuration over the study interval. This site lost 9.49 yds^3/ft. with a 14-foot shoreline retreat.

57th STREET, SEA ISLE CITY - SITE 118

The heavy-use section of the Sea Isle City beach remains reasonably stable with a dune between the promenade and the beach. The March 21, 2007 photograph shows the beach at the dune toe following the winter storm events.

By September 18, 2008 a wider dry beach is present as sand moved onto the shoreline. The dune toe is still about the same with minor additions to the seaward slope. Substantial sand accumulation occurred on the beach as 41.89 yds^3/ft. was added to the sand volume and the shoreline advanced 87 feet without any new sand added to the system from human activity.

New Jersey Beach Profile Network

#118 - 57th Street, Sea Isle City, Cape May County

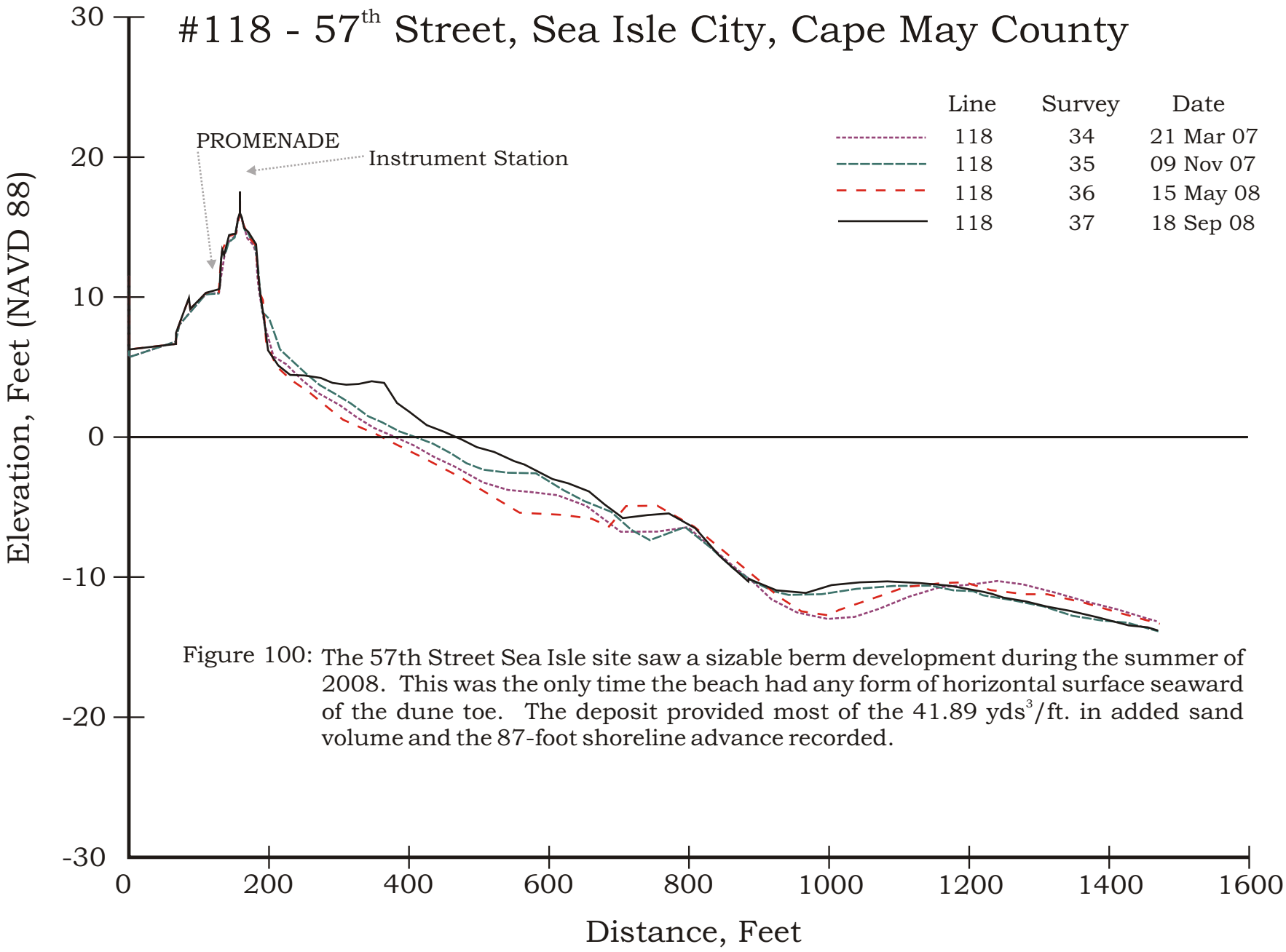


Figure 100: The 57th Street Sea Isle site saw a sizable berm development during the summer of 2008. This was the only time the beach had any form of horizontal surface seaward of the dune toe. The deposit provided most of the 41.89 yds^3/ft. in added sand volume and the 87-foot shoreline advance recorded.

80th STREET, SEA ISLE CITY - SITE 117

The southern segment of Sea Isle City was slightly impacted with dune scarping in March 27th 2007. The fencing was torn from the posts leaving the steel posts sticking up out of the sand.

By September 15, 2008 the results from the May 12, 2008 northeast storm are evident in the sharp rise in the dune toe slope. The storm was relatively minor, but reached the dune toe in many places with narrow beaches. The shoreline advanced 11 feet, but the sand volume decreased by 6.64 yds^3/ft.

New Jersey Beach Profile Network

#117 - 80th Street, Sea Isle City, Cape May County

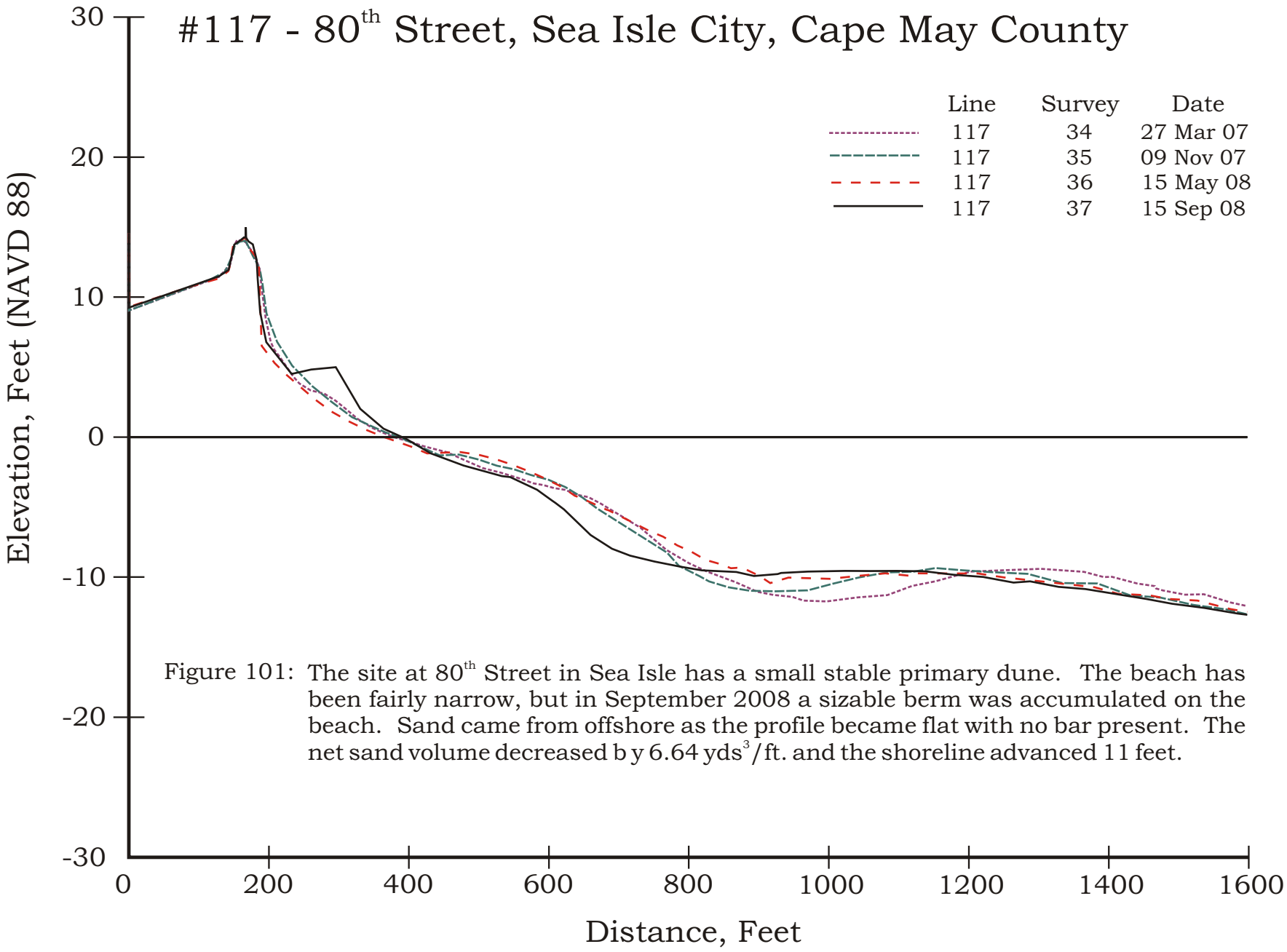


Figure 101: The site at 80th Street in Sea Isle has a small stable primary dune. The beach has been fairly narrow, but in September 2008 a sizable berm was accumulated on the beach. Sand came from offshore as the profile became flat with no bar present. The net sand volume decreased b y 6.64 yds^3/ft. and the shoreline advanced 11 feet.

9th STREET, AVALON - SITE 216

The June 11, 2007 survey followed the completion of truck hauling about 80,000 cubic yards of quarry sand to the beach between 10th and 17th Streets. The slight yellow cast to the dry beach is the clue that this occurred.

By September 16, 2008 the beach was significantly wider following the hydraulic pumping of 242,637 cubic yards of sand from Townsend's Inlet onto the shoreline between 10th and 18th Streets. This provided a successful summer recreational season for the Avalon citizens. 2007 saw losses during that summer and winter, but sand replacement added 53.68 yds^3/ft. of sand by the December 17, 2008 survey date. The shoreline advanced 125 feet as well.

New Jersey Beach Profile Network

#216 - 9th Street, Avalon, Cape May County

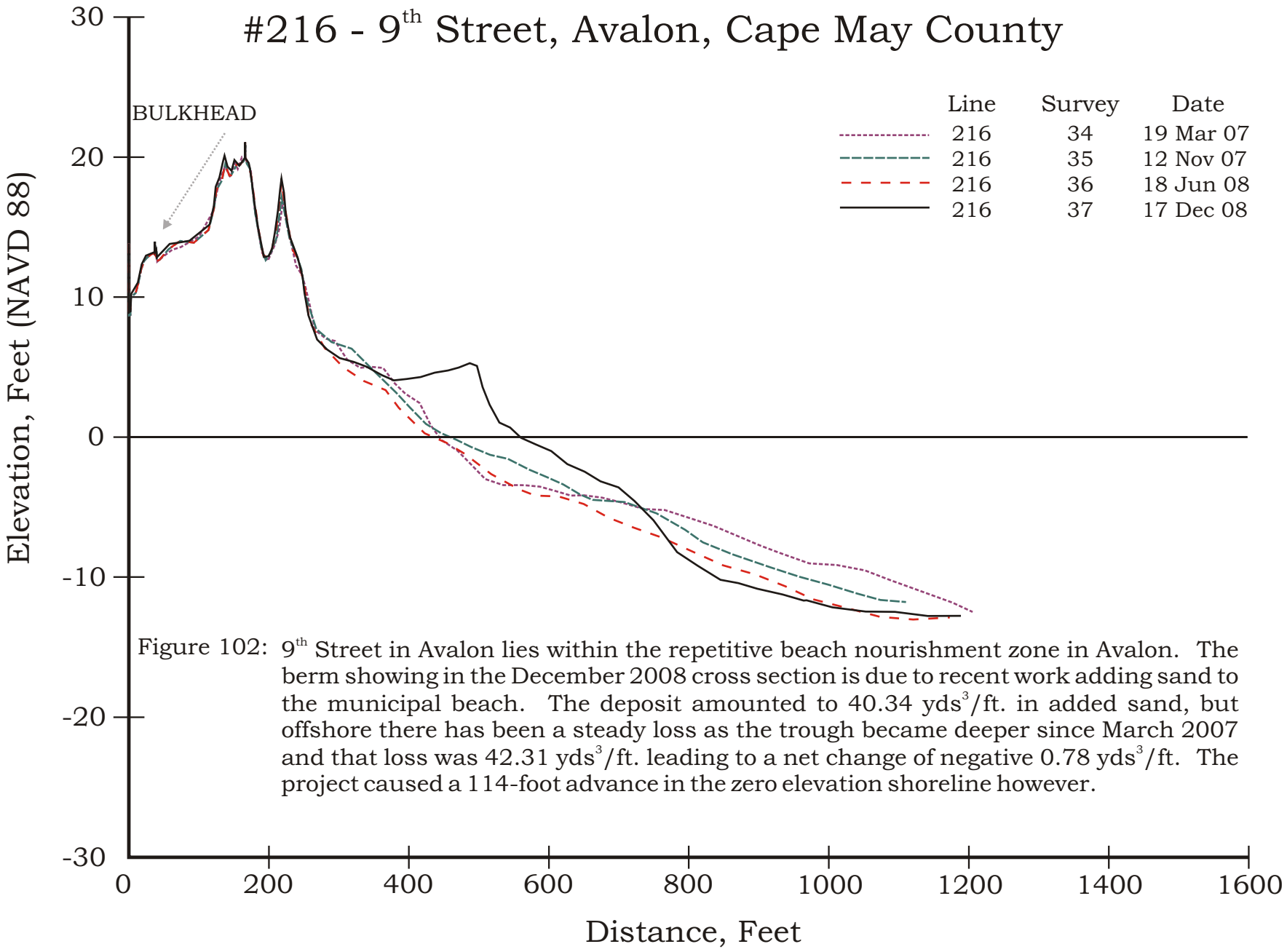


Figure 102: 9th Street in Avalon lies within the repetitive beach nourishment zone in Avalon. The berm showing in the December 2008 cross section is due to recent work adding sand to the municipal beach. The deposit amounted to 40.34 yds^3/ft. in added sand, but offshore there has been a steady loss as the trough became deeper since March 2007 and that loss was 42.31 yds^3/ft. leading to a net change of negative 0.78 yds^3/ft. The project caused a 114-foot advance in the zero elevation shoreline however.

23rd STREET, AVALON - SITE 116

the beach on November 12, 2007 showed significant narrowing as the high tide line was approaching the toe of the dunes. The berm was reduced as the wet/dry line in the picture shows.

By September 16, 2008 some accretion had returned a dry beach berm as the height of the supports to the storm water outfall line show in the distance when compared to the earlier picture. The dune toe slope is uniform and has traces of wind transported sand spread across it. Following the various efforts at beach augmentation further north, the net result here was a 1.43 yds^3/ft. increase in sand volume with a 14-foot shoreline retreat.

New Jersey Beach Profile Network

#116 - 23rd Street, Avalon, Cape May County

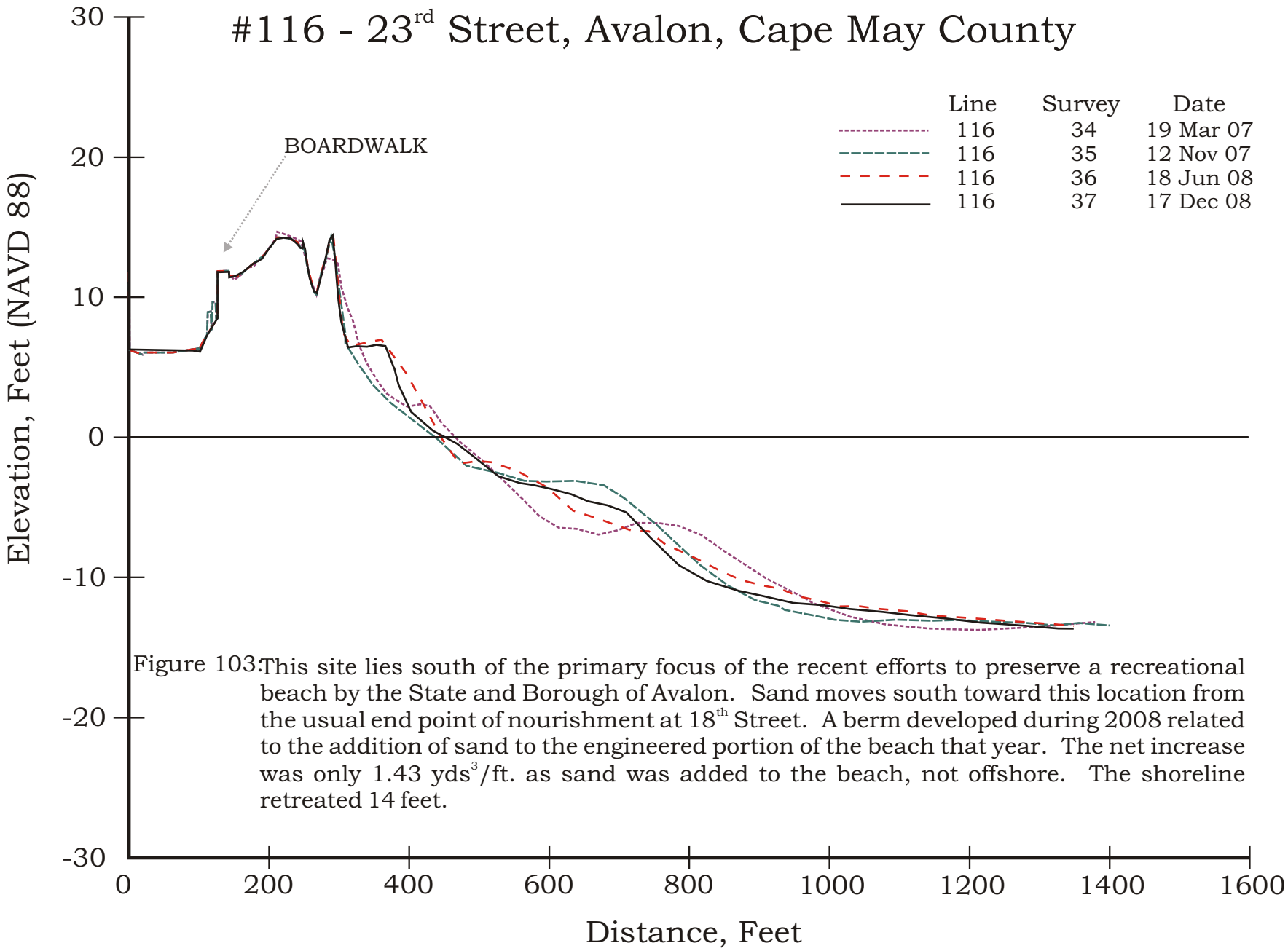


Figure 103: This site lies south of the primary focus of the recent efforts to preserve a recreational beach by the State and Borough of Avalon. Sand moves south toward this location from the usual end point of nourishment at 18th Street. A berm developed during 2008 related to the addition of sand to the engineered portion of the beach that year. The net increase was only 1.43 yds^3/ft. as sand was added to the beach, not offshore. The shoreline retreated 14 feet.

35th STREET, AVALON - SITE 115

South of 28th Street the Avalon beach becomes wide and the dune system grows to be the largest anywhere along the NJ shoreline. With elevations reaching 55 feet and a width between the dune toe and the development exceeding 1,000 feet there is no better protection along the coast. The fortuitous accident leading to public ownership of the majority of the dune area between 32rd and 56th Streets is a major bonus to the Borough of Avalon. In November 12, 2007 the dune toe was 235 feet from the thigh tide line at 35th Street with a beach that reached the horizon.

By September 17, 2008 the grass was a bit more lush and had moved slightly seaward onto the dry sand. The beach and dune system was essentially the same adding modest quantities of material. The sand volume increased 10.51 yds^3/ft. as the shoreline advanced 39 feet.

New Jersey Beach Profile Network

#115 - 35th Street, Avalon, Cape May County

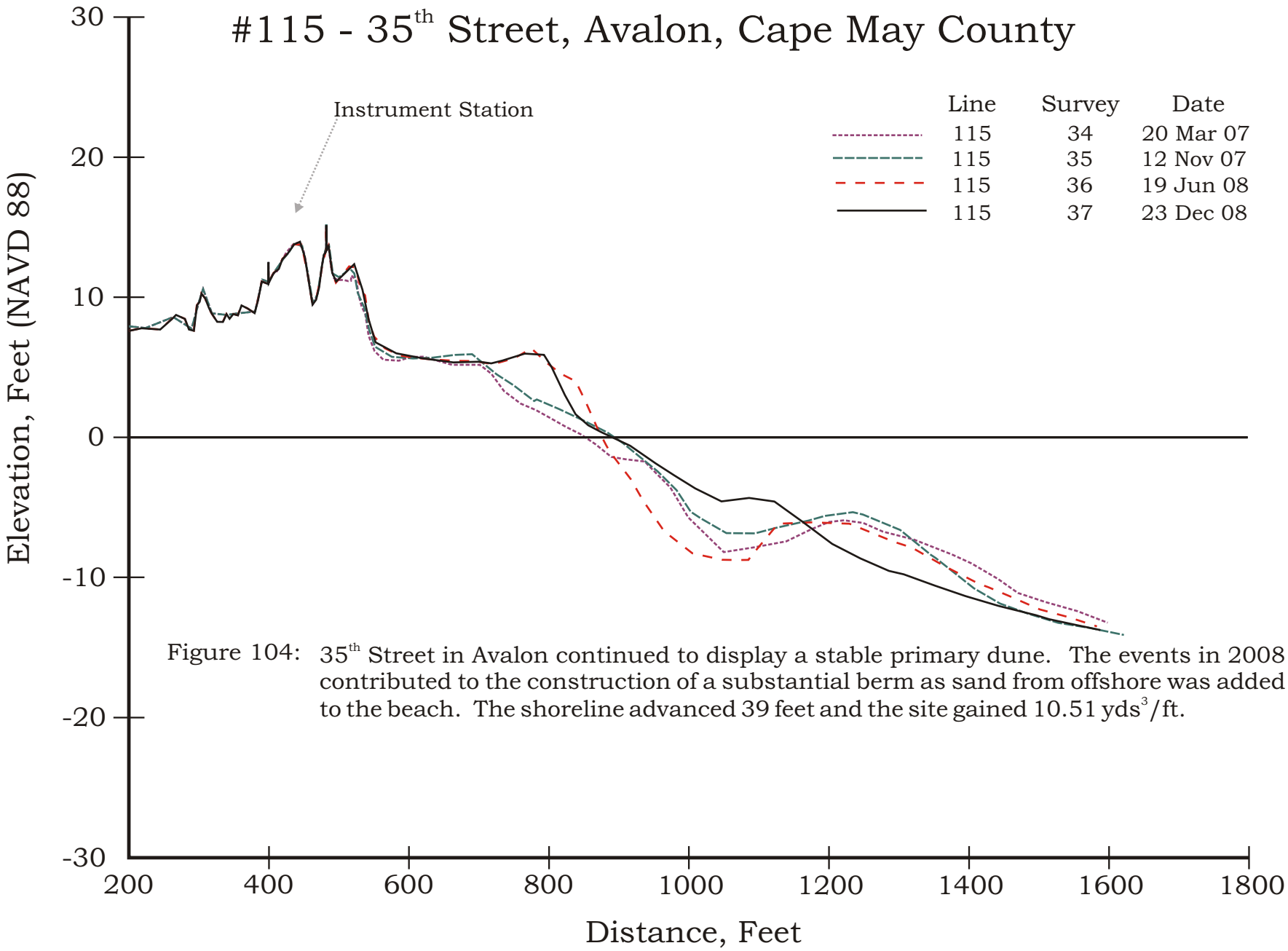


Figure 104: 35th Street in Avalon continued to display a stable primary dune. The events in 2008 contributed to the construction of a substantial berm as sand from offshore was added to the beach. The shoreline advanced 39 feet and the site gained 10.51 yds^3/ft.

70th STREET, AVALON - SITE 114

The beach in southern Avalon has a significant dune and a wide beach in spite of development east of Dune Drive. The November 14, 2007 photograph shows the sharp wet/dry line from the last high tide. The line is well seaward of the dune toe.

A similar situation prevailed on September 17, 2008 as the beach remained essentially constant. The sand volume increased by 26.98 $yds^3/ft.$ almost all of which appeared offshore in a pair of bars and the shoreline advanced 44 feet due to the proximity of the bar closest to the beach.

New Jersey Beach Profile Network

#114 - 70th Street, Avalon, Cape May County

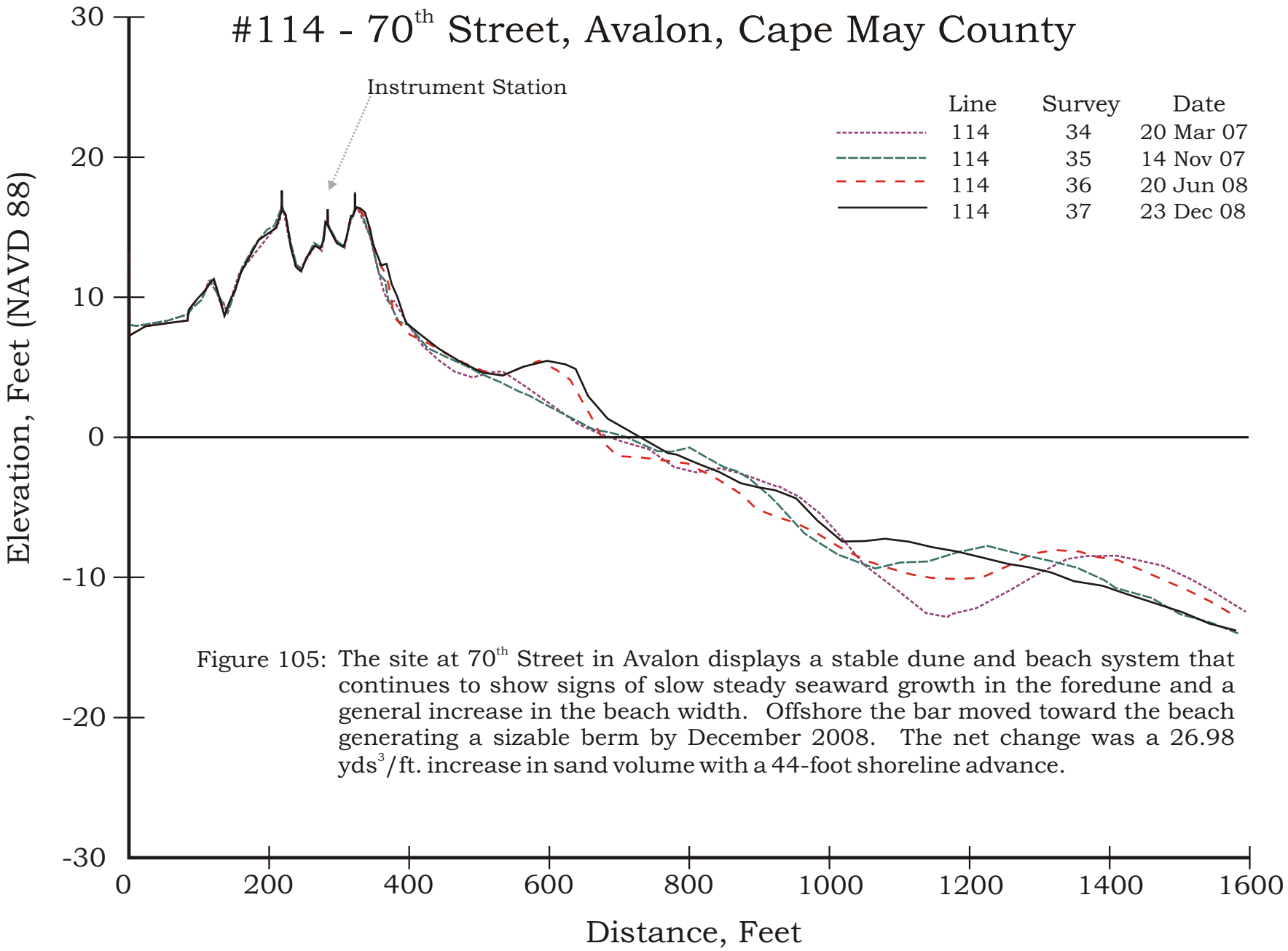


Figure 105: The site at 70th Street in Avalon displays a stable dune and beach system that continues to show signs of slow steady seaward growth in the foredune and a general increase in the beach width. Offshore the bar moved toward the beach generating a sizable berm by December 2008. The net change was a 26.98 $yds^3/ft.$ increase in sand volume with a 44-foot shoreline advance.

90th STREET, STONE HARBOR - SITE 113

Stone Harbor conducted a beach restoration in 1998 and participated in a Federally-sponsored project in 2003. The beach width as of June 8, 2007 continued to show a significant amount of sand on the beach. Both projects resulted in dramatic increases in the sand volume present in the dunes.

By September 30, 2008 the beach had narrowed somewhat, but low storm intensity and frequency has prevented any wave damage to the dunes. The situation is approaching the moment when re-nourishment will be needed to preclude dune erosion during storms. In the middle of the Borough the sand loss was just 1.55 yds^3/ft. and the shoreline retreated 17 feet.

New Jersey Beach Profile Network

#113 - 90th Street, Stone Harbor, Cape May County

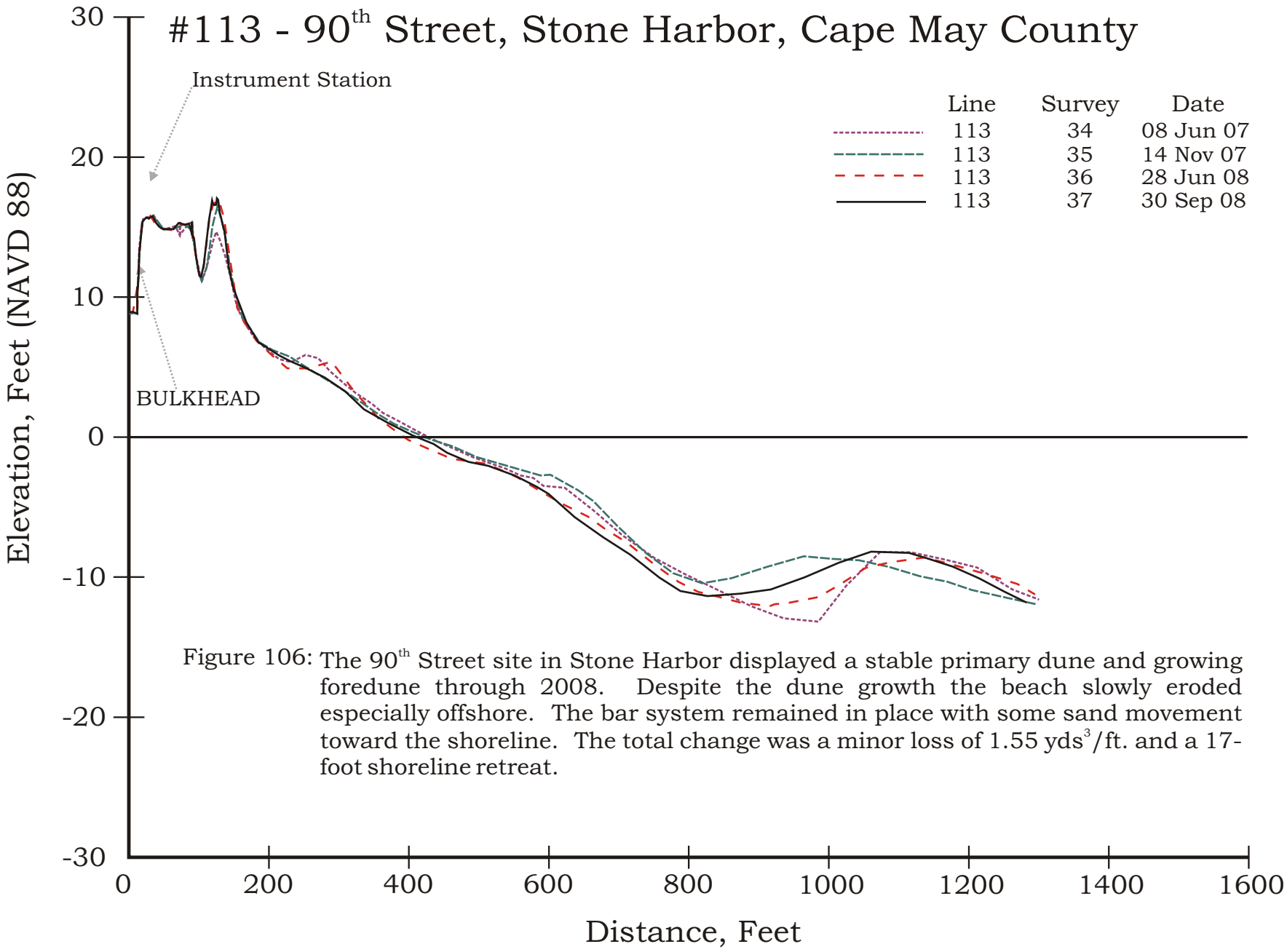


Figure 106: The 90th Street site in Stone Harbor displayed a stable primary dune and growing foredune through 2008. Despite the dune growth the beach slowly eroded especially offshore. The bar system remained in place with some sand movement toward the shoreline. The total change was a minor loss of 1.55 yds^3/ft. and a 17-foot shoreline retreat.

SOUTH END, STONE HARBOR - SITE 212

This beach is entirely composed of nourishment sand since the stone revetment was the principle barrier to wave damage prior to 1998. This June 8, 2007 picture shows that the rocks are buried and a dune grows over the revetment. The beach width has decreased slowly since 2003.

By September 22, 2008 the beach width continued to decline bringing the dune toe within easy reach of potential storm waves The primary use of the beach is storage of the small sail craft used in the surf and just offshore during the summer. The sand volume loss was 31.18 yds^3/ft. and the shoreline retreated 44 feet.

New Jersey Beach Profile Network

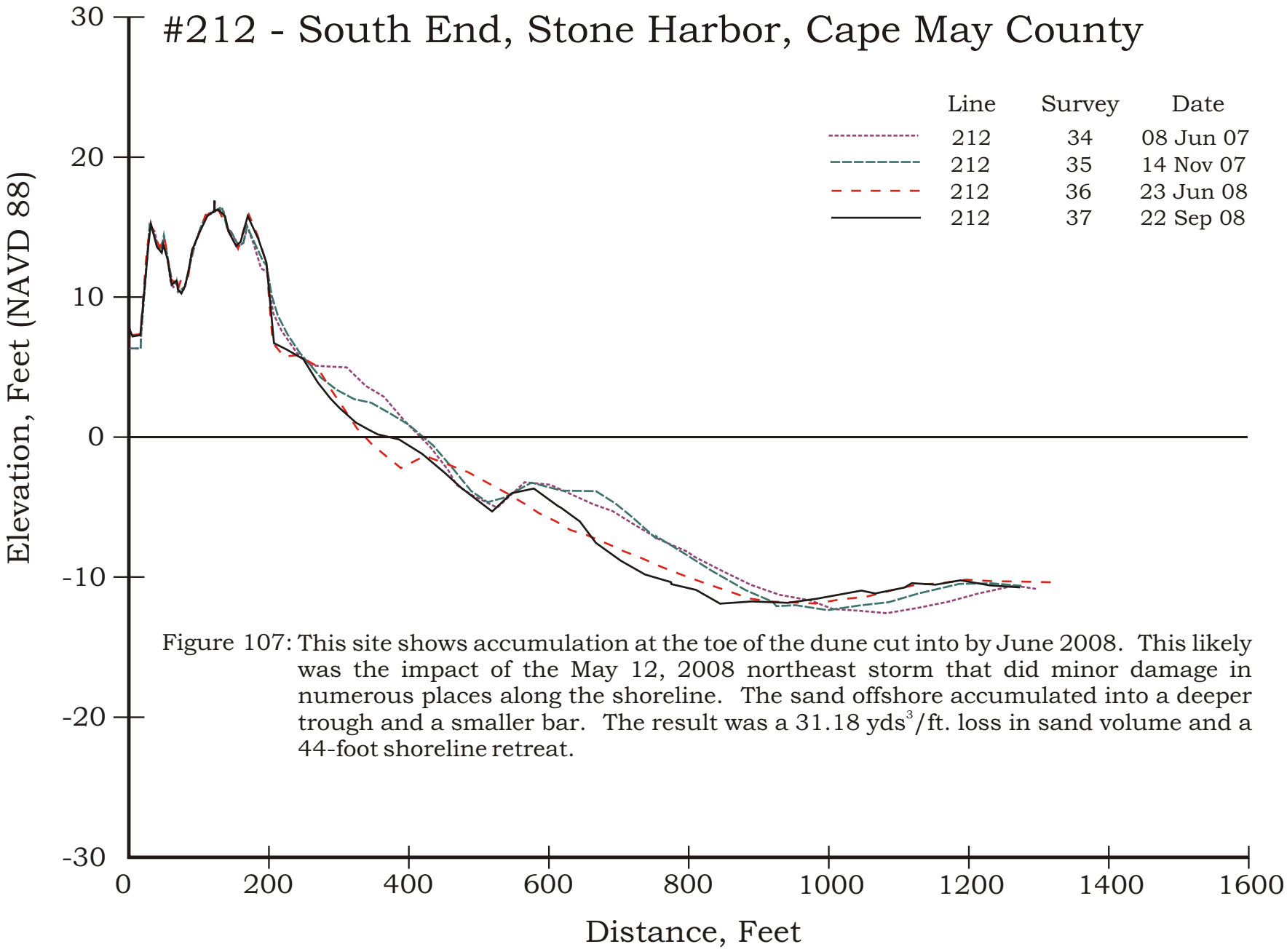


Figure 107: This site shows accumulation at the toe of the dune cut into by June 2008. This likely was the impact of the May 12, 2008 northeast storm that did minor damage in numerous places along the shoreline. The sand offshore accumulated into a deeper trough and a smaller bar. The result was a 31.18 yds^3/ft. loss in sand volume and a 44-foot shoreline retreat.

15th AVENUE, NORTH WILDWOOD - SITE 111

This beach has retreated over a thousand feet since 1998 due to dramatic change in the tidal flow pattern into and out of Hereford Inlet. This March 28, 2007 picture shows a dune system surviving with a low-gradient beach seaward of it. This location is far landward of the shoreline in 1998. The rate of retreat appears to have slowed at this point.

By September 30, 2008 the dune was trimmed a little, but the beach width had not declined since 2007. The NJ State is in cooperation with the local municipality to conduct a major beach restoration project in the City during 2009. Since 2006 this profile has remained stable following a dramatic 1,000-foot retreat in the shoreline position. The sand volume only declined by 2.37yds^3/ft. and the shoreline advanced 3 feet.

New Jersey Beach Profile Network

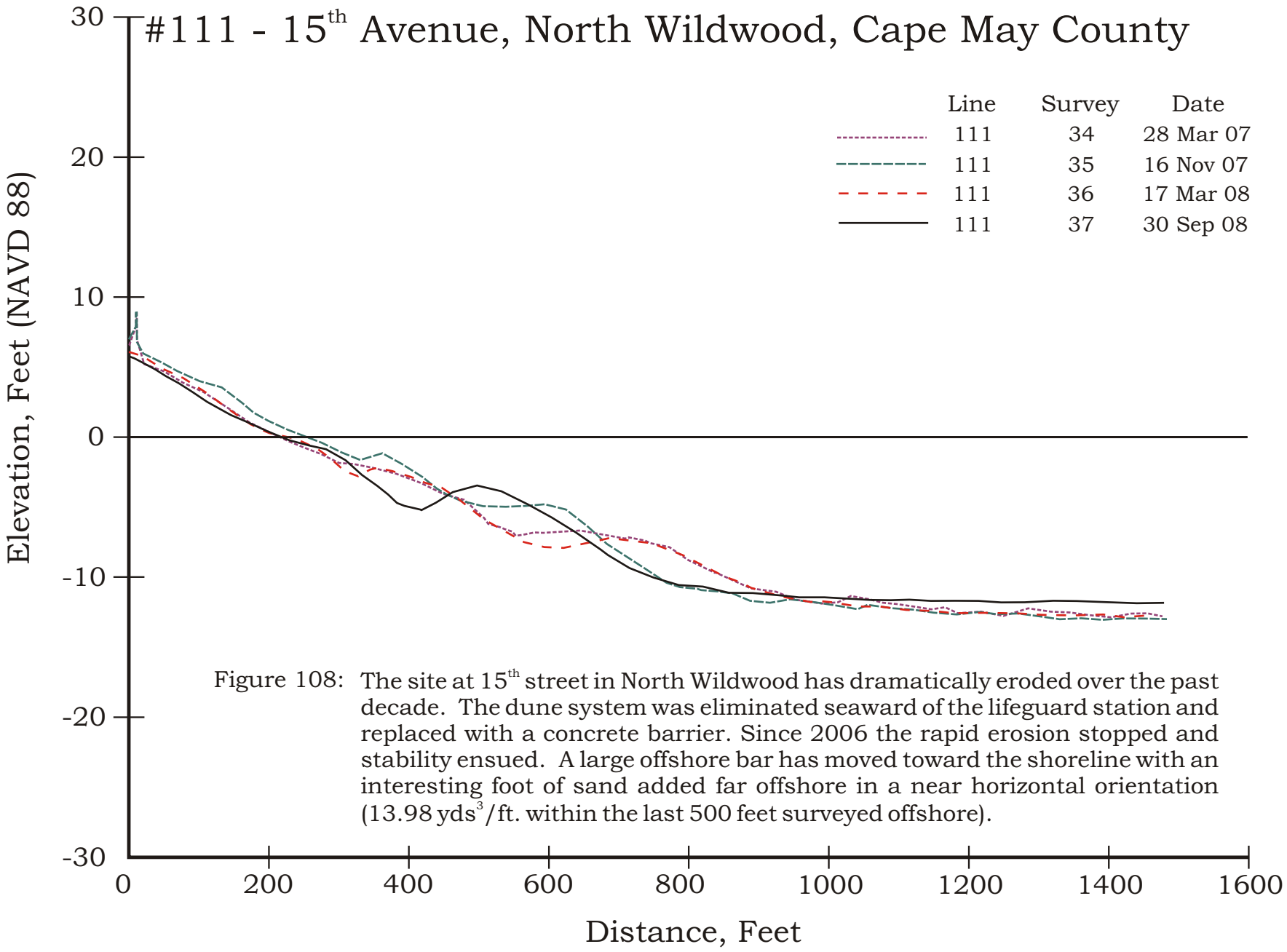


Figure 108: The site at 15th street in North Wildwood has dramatically eroded over the past decade. The dune system was eliminated seaward of the lifeguard station and replaced with a concrete barrier. Since 2006 the rapid erosion stopped and stability ensued. A large offshore bar has moved toward the shoreline with an interesting foot of sand added far offshore in a near horizontal orientation (13.98 yds^3/ft. within the last 500 feet surveyed offshore).

CRESSE AVENUE, WILDWOOD - SITE 110

The Cresse Avenue site has grown 500 feet wider over the same period that the North Wildwood beach eroded. This March 28, 2007 view shows the wide, wind-swept dry beach between the boardwalk and the shoreline.

Conditions changed little between 2007 and September 30, 2008. The lines are left from the beach raking machine used to extract litter and natural debris. The sand volume change was positive at 21.11 yds^3/ft. and the shoreline advanced 67 feet as sand was deposited at this location in a continuation of the past decade's sediment movement pattern on this barrier island.

New Jersey Beach Profile Network

#110 - Cresse Avenue, Wildwood, Cape May County

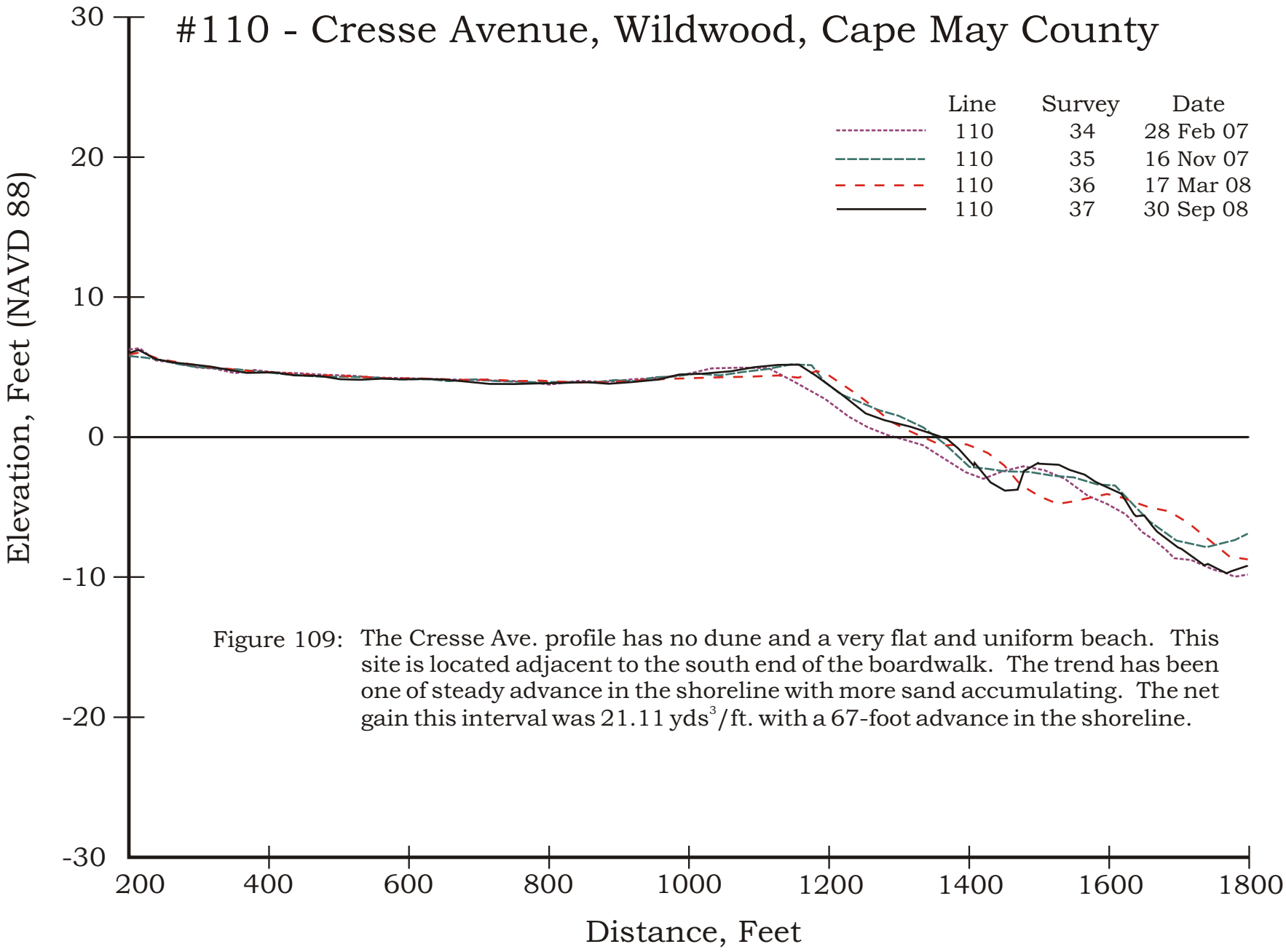


Figure 109: The Cresse Ave. profile has no dune and a very flat and uniform beach. This site is located adjacent to the south end of the boardwalk. The trend has been one of steady advance in the shoreline with more sand accumulating. The net gain this interval was 21.11 $yds^3/ft.$ with a 67-foot advance in the shoreline.

RALEIGH AVENUE, LOWER TOWNSHIP - SITE 109

Wide beaches and sizable dunes mark the southern part of this shoreline. The March 14, 2007 photograph shows a rolling set of dunes and the Cape May Wildlife Refuge in the distance. This beach is wide and dry and relatively storm resistant.

This view taken October 27, 2008 shows a green dune grass growth cycle following the summer with a significant development of dune field potential. The sand volume change was positive at 32.75 yds^3/ft. and the shoreline advanced 20 feet as sand was deposited at this location.

New Jersey Beach Profile Network

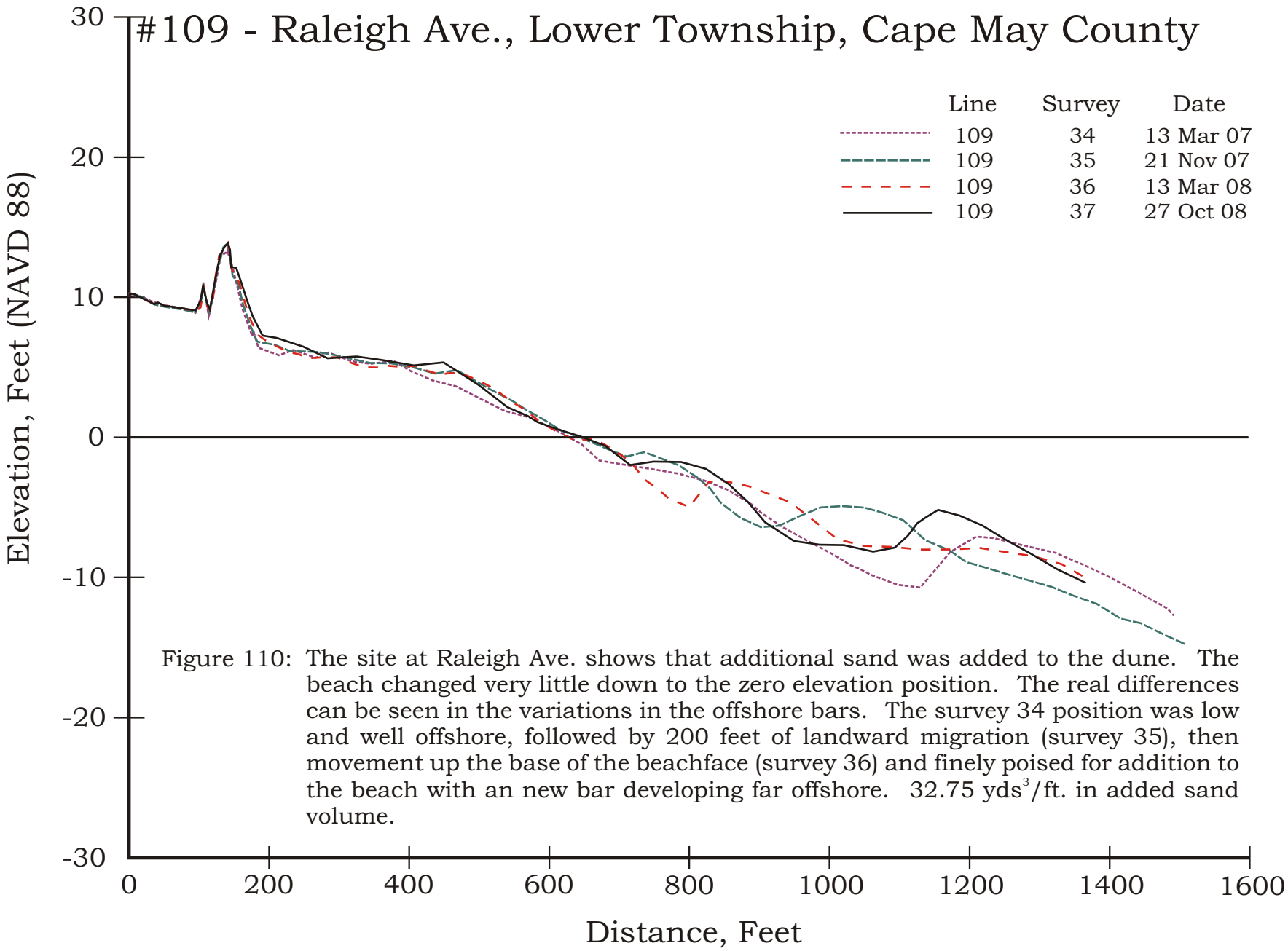


Figure 110: The site at Raleigh Ave. shows that additional sand was added to the dune. The beach changed very little down to the zero elevation position. The real differences can be seen in the variations in the offshore bars. The survey 34 position was low and well offshore, followed by 200 feet of landward migration (survey 35), then movement up the base of the beachface (survey 36) and finely poised for addition to the beach with an new bar developing far offshore. 32.75 yds^3/ft. in added sand volume.

CAPE MAY NATIONAL WILDLIFE REFUGE - SITE 208

The refuge site was established in 1994 to have a better handle on the changes close to the inlet. The November 21, 2007 view shows the gradual transition between the primary dune and the dry beach. The sand volume gets trapped behind the Cold Springs Inlet jetty and creates a wide beach situation.

By October 27, 2008 this area simply gained more wind-transported sand and more abundant grass growth. There are few bathers and off-season, fewer visitors to observe this excellent beach ecosystem. This interval saw slow and relatively minor sand accumulation at this site with a 4.79 yds^3/ft. and a 10-foot shoreline retreat.

New Jersey Beach Profile Network

#208 - Cape May NWR, Lower Township, Cape May County

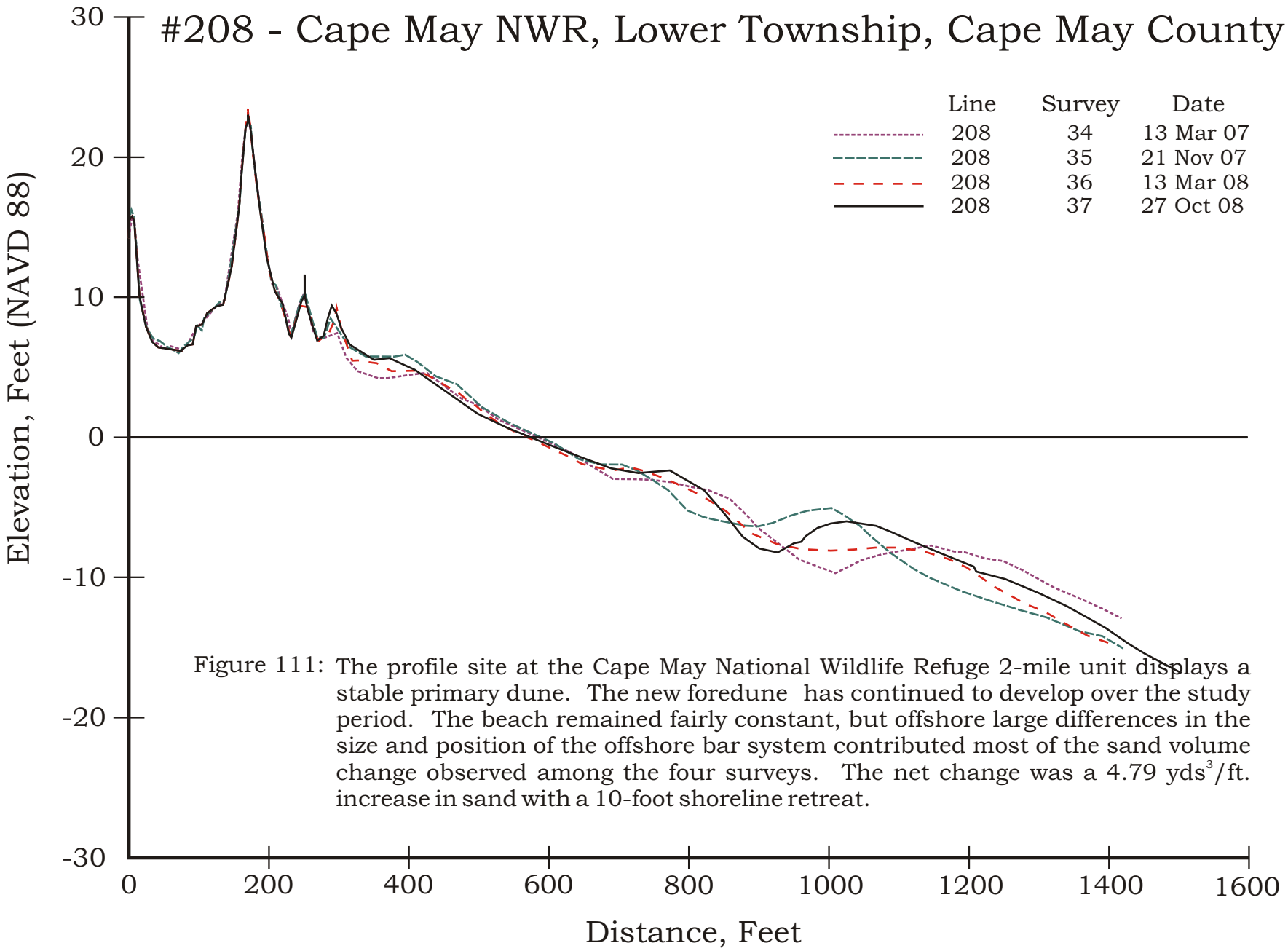


Figure 111: The profile site at the Cape May National Wildlife Refuge 2-mile unit displays a stable primary dune. The new foredune has continued to develop over the study period. The beach remained fairly constant, but offshore large differences in the size and position of the offshore bar system contributed most of the sand volume change observed among the four surveys. The net change was a 4.79 $yds^3/ft.$ increase in sand with a 10-foot shoreline retreat.

CAPE MAY BEACH CLUB - SITE 108

The Beach Club site was renourished in 1989 as the Cape May City project got underway. This February 28, 2007 photograph shows the sand built up on the berm following a period of quiet weather during the winter. The fill project placed sufficient sand to prevent easy wave attack on the local development.

By September 11, 2008 the situation was essentially the same without additional sand volume added by artificial means. The dune development is proceeding slowly since little human effort has been undertaken to speed up the process. Sand volume changes and shoreline shifts were minor (2.48 yds^3/ft. and -18 feet) as this beach was quite stable.

New Jersey Beach Profile Network

#108 - Cape May Beach Club, Cape May County

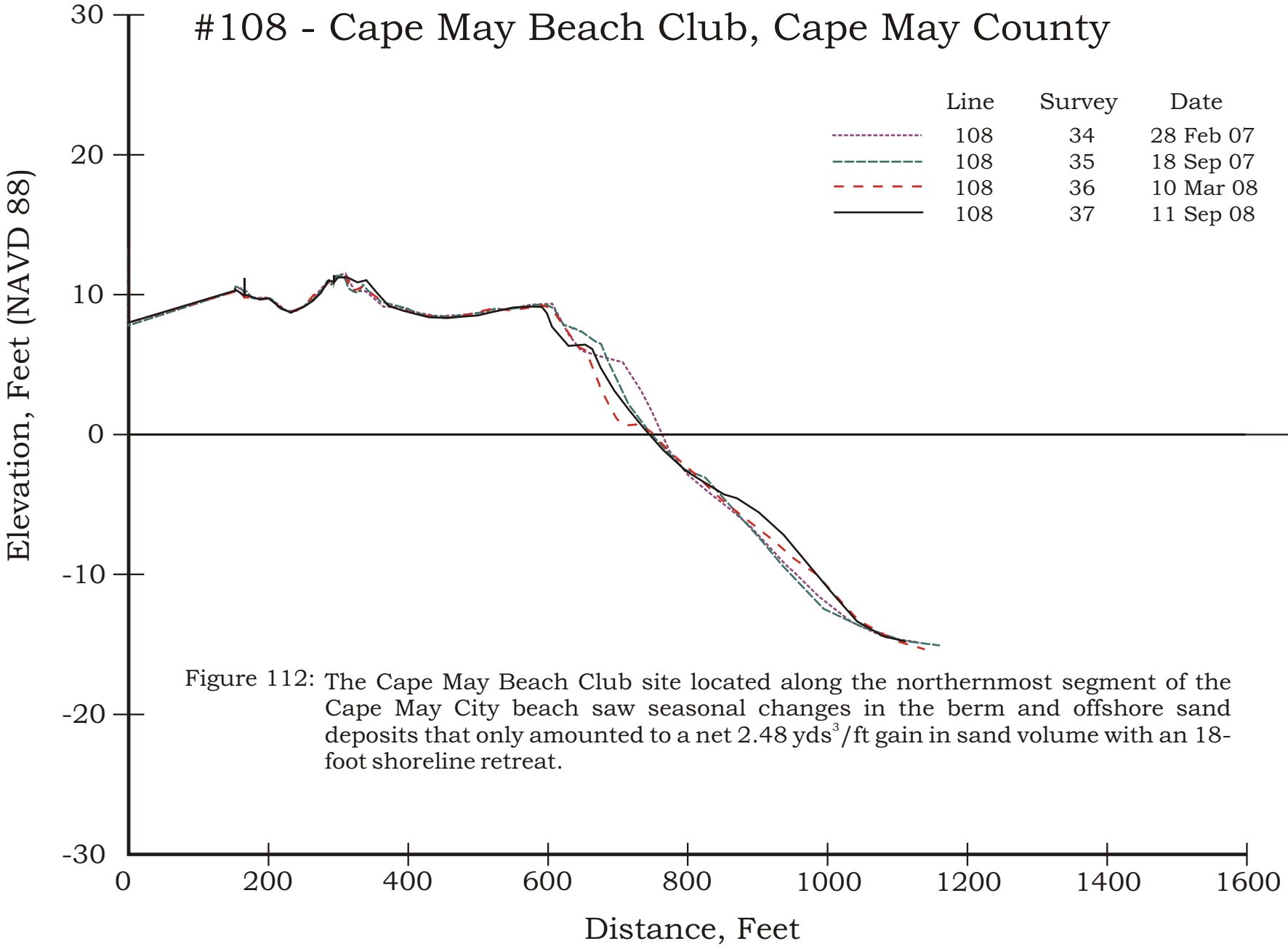


Figure 112: The Cape May Beach Club site located along the northernmost segment of the Cape May City beach saw seasonal changes in the berm and offshore sand deposits that only amounted to a net 2.48 yds^3/ft gain in sand volume with an 18-foot shoreline retreat.

BALTIMORE AVENUE, CAPE MAY CITY - SITE 107

The photograph looks northeast along the berm and gives an idea of the distance back to the development. In 1989 the photographer would have been in water over 10 feet deep since at that time the waves broke on the revetment rocks located just east of Ocean Avenue. This March 29, 2007 picture shows the tips of the groins exposed, but the beach has remained stable for over 20 years.

The September 11, 2008 photograph shows some beach flattening, but the total sand volume is quite stable. Sand volume changes and shoreline shifts were minor (-5.65 yds^3/ft. and -11 feet) as this beach was quite stable.

New Jersey Beach Profile Network

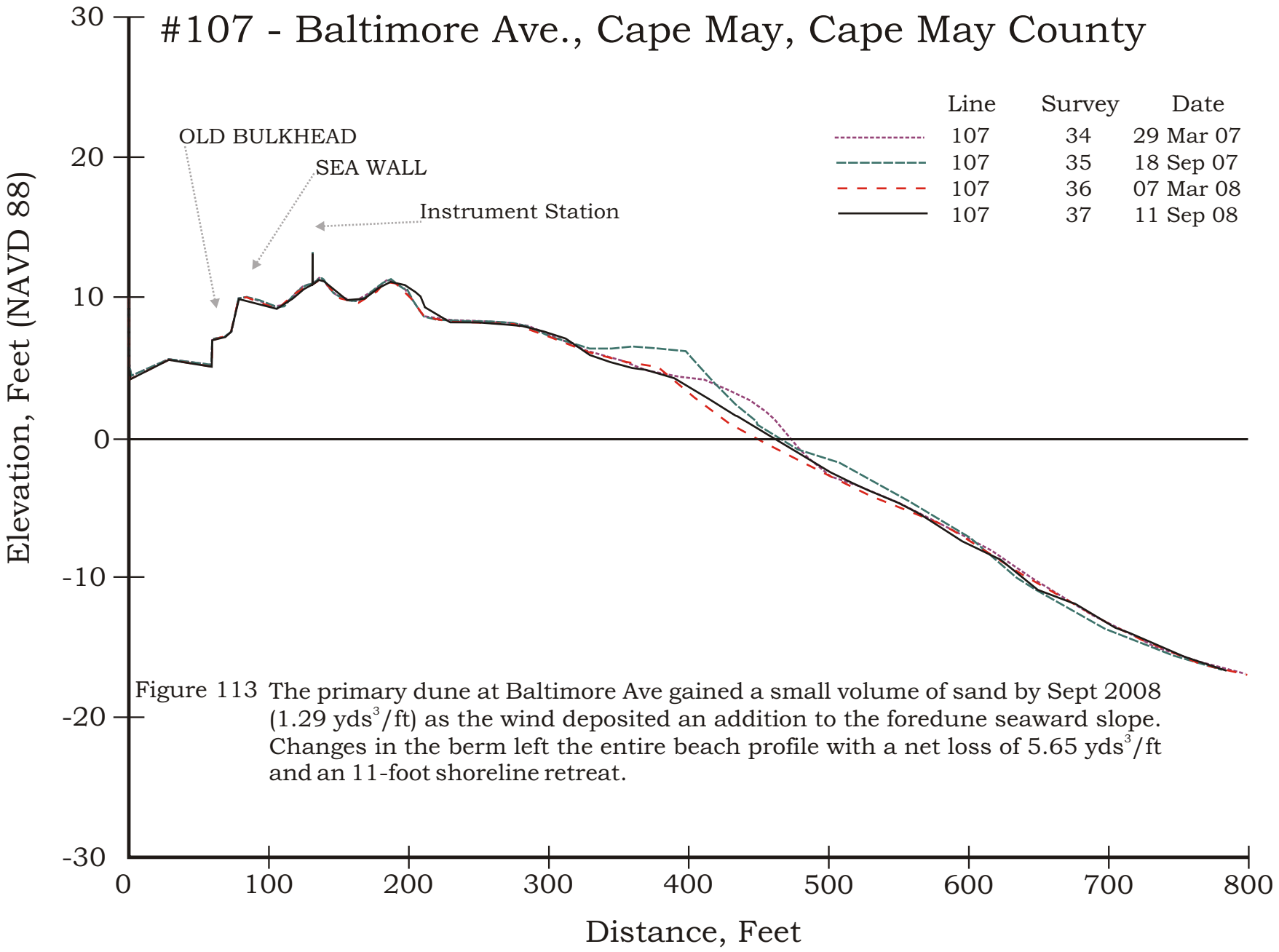


Figure 113 The primary dune at Baltimore Ave gained a small volume of sand by Sept 2008 (1.29 yds^3/ft) as the wind deposited an addition to the foredune seaward slope. Changes in the berm left the entire beach profile with a net loss of 5.65 yds^3/ft and an 11-foot shoreline retreat.

BROADWAY AVENUE, CAPE MAY CITY - SITE 206

This is the main recreational beach area in Cape May City and was restored in 1990. This September 18, 2007 photograph shows the recreational beach as an expanse of dry sand held in place by the terminal groin to the south of this northeast view.

By September 10, 2008 the beach was in similar condition since there has been very few storms. The groin in the picture is a little more exposed, but not significantly so. The survey data indicates a minuscule sand volume change of 0.04 yds^3/ft. coupled with a 17-foot shoreline advance.

New Jersey Beach Profile Network

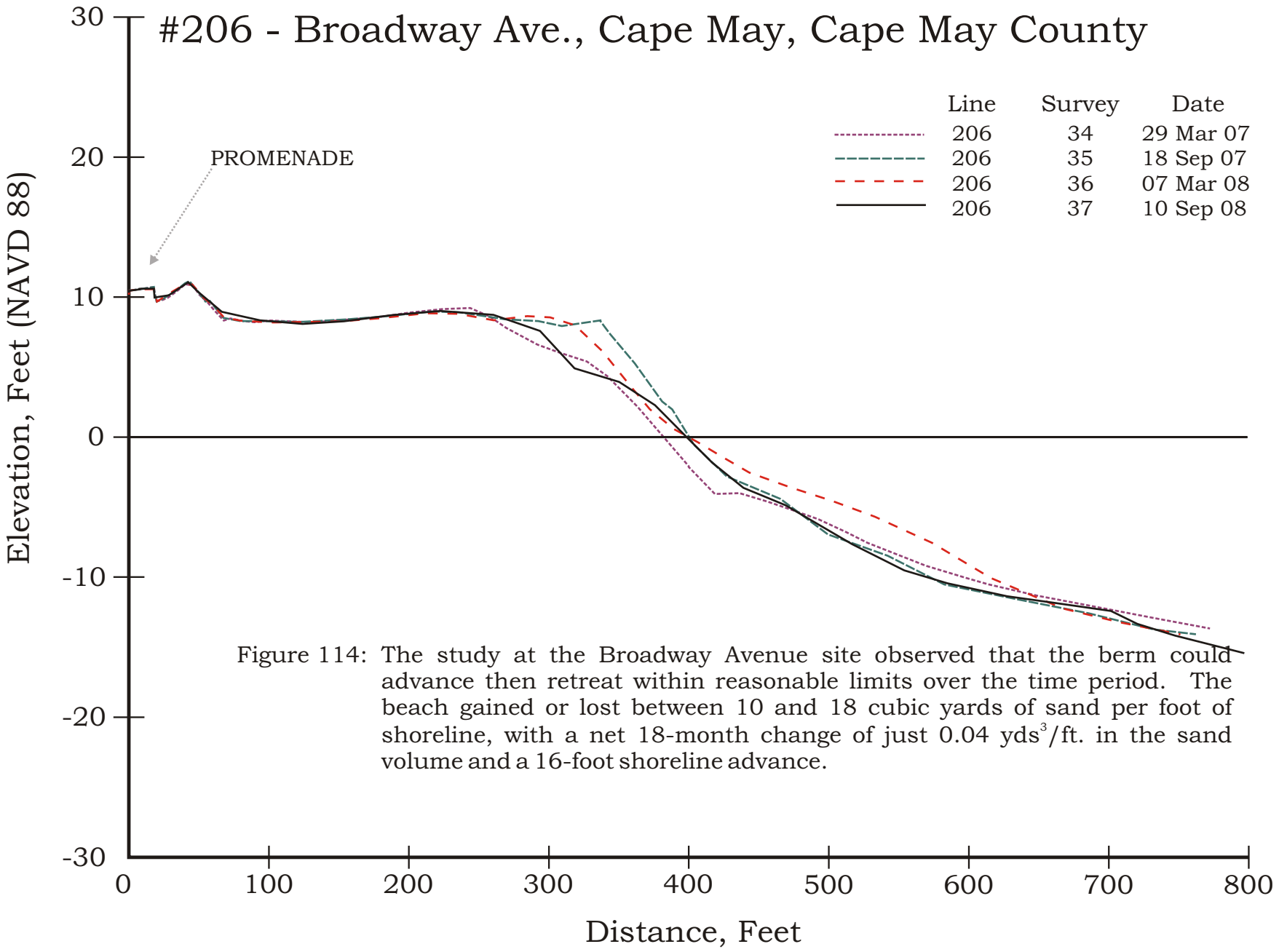


Figure 114: The study at the Broadway Avenue site observed that the berm could advance then retreat within reasonable limits over the time period. The beach gained or lost between 10 and 18 cubic yards of sand per foot of shoreline, with a net 18-month change of just 0.04 $yds^3/ft.$ in the sand volume and a 16-foot shoreline advance.

NATURE CONSERVANCY, CAPE MAY - SITE 105

Sand shed from Cape May City is deposited along this beach segment. The Cape May City terminal groin located at Third Avenue shows in the distance along the curve of the shoreline. The photograph is from February 28, 2007 and is in a long sequence of shoreline advances seaward since 1990.

By September 10, 2008 the beach was the subject of a ACOE project to restore the southern section of this natural area with about a quarter million cubic yards of sand hauled in by truck from an upland quarry. The beach shows a small scarp in the berm as the survey was completed. The sand was distributed on the south end at the State Park land so the change recorded here was negative in the quantity of 17.44 yds^3/ft. of sand, but the shoreline advanced 10 feet seaward.

New Jersey Beach Profile Network

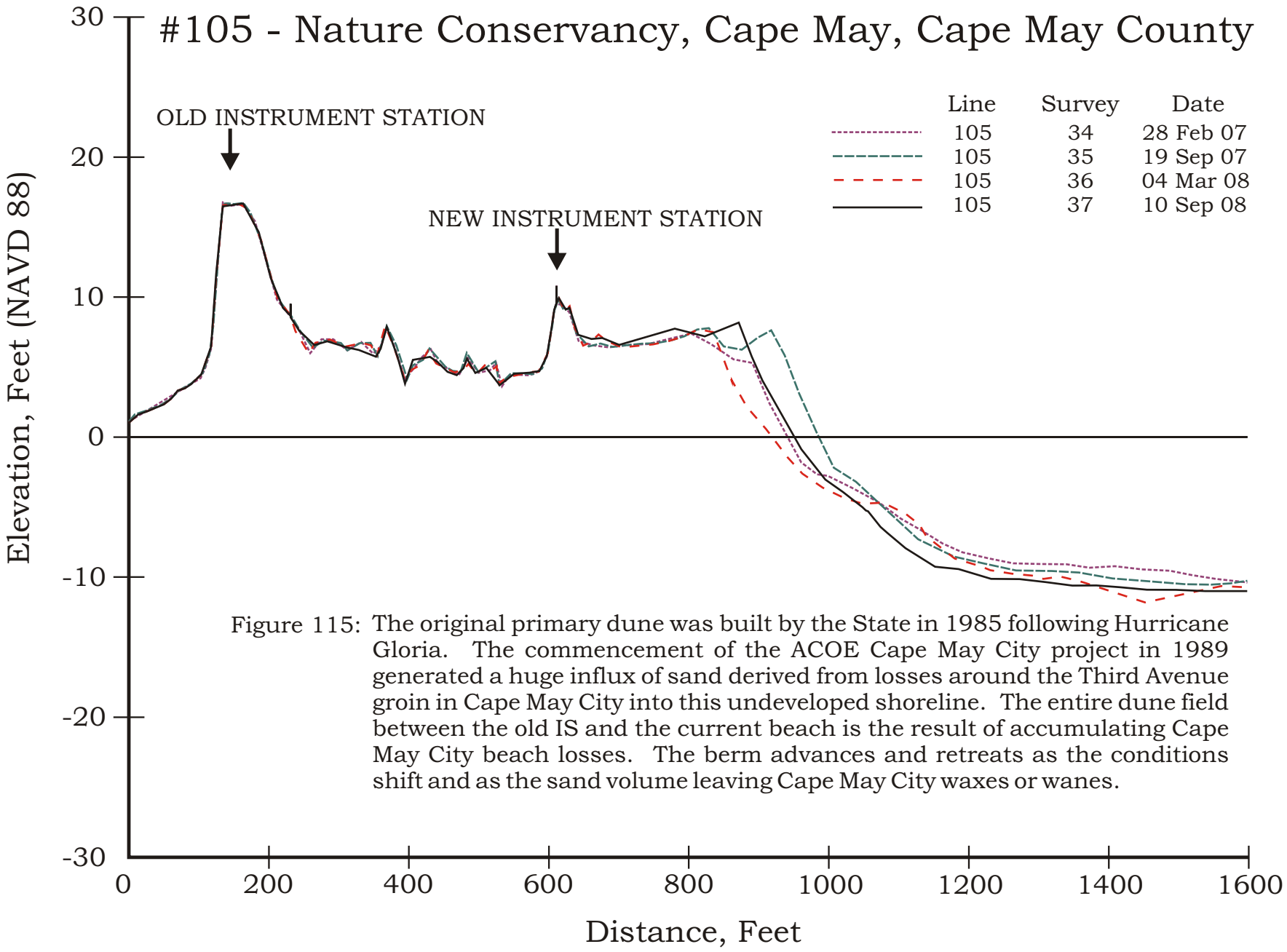


Figure 115: The original primary dune was built by the State in 1985 following Hurricane Gloria. The commencement of the ACOE Cape May City project in 1989 generated a huge influx of sand derived from losses around the Third Avenue groin in Cape May City into this undeveloped shoreline. The entire dune field between the old IS and the current beach is the result of accumulating Cape May City beach losses. The berm advances and retreats as the conditions shift and as the sand volume leaving Cape May City waxes or wanes.

LAKE DRIVE, CAPE MAY POINT - SITE 104

Located at the extreme southern tip of the Cape May County peninsula in the Borough of Cape May Point, this site was nourished in 2005 by the ACOE. By September 19, 2007 the shoreline had retreated by about half the initial deposit of sand, much of which was re-deposited on the beaches to the west beyond the groin in the photograph.

A year later on September 11, 2008, the ACOE truck in project brought additional sand to this site advancing the shoreline back to the 2005 position. This sand came from excavating the two cells to the east along the shoreline because excess deposition had pushed the shoreline so close to the offshore submerged breakwater reef structure that swimming had to be restricted during the summers of 2007 and 2008. The loss seen during the summer of 2007 was recovered with a 17.43 yds^3/ft. sand volume gain over the winter of 2007 to 2008. The shoreline advanced 9 feet as well. The accumulation continued during the following summer.

New Jersey Beach Profile Network

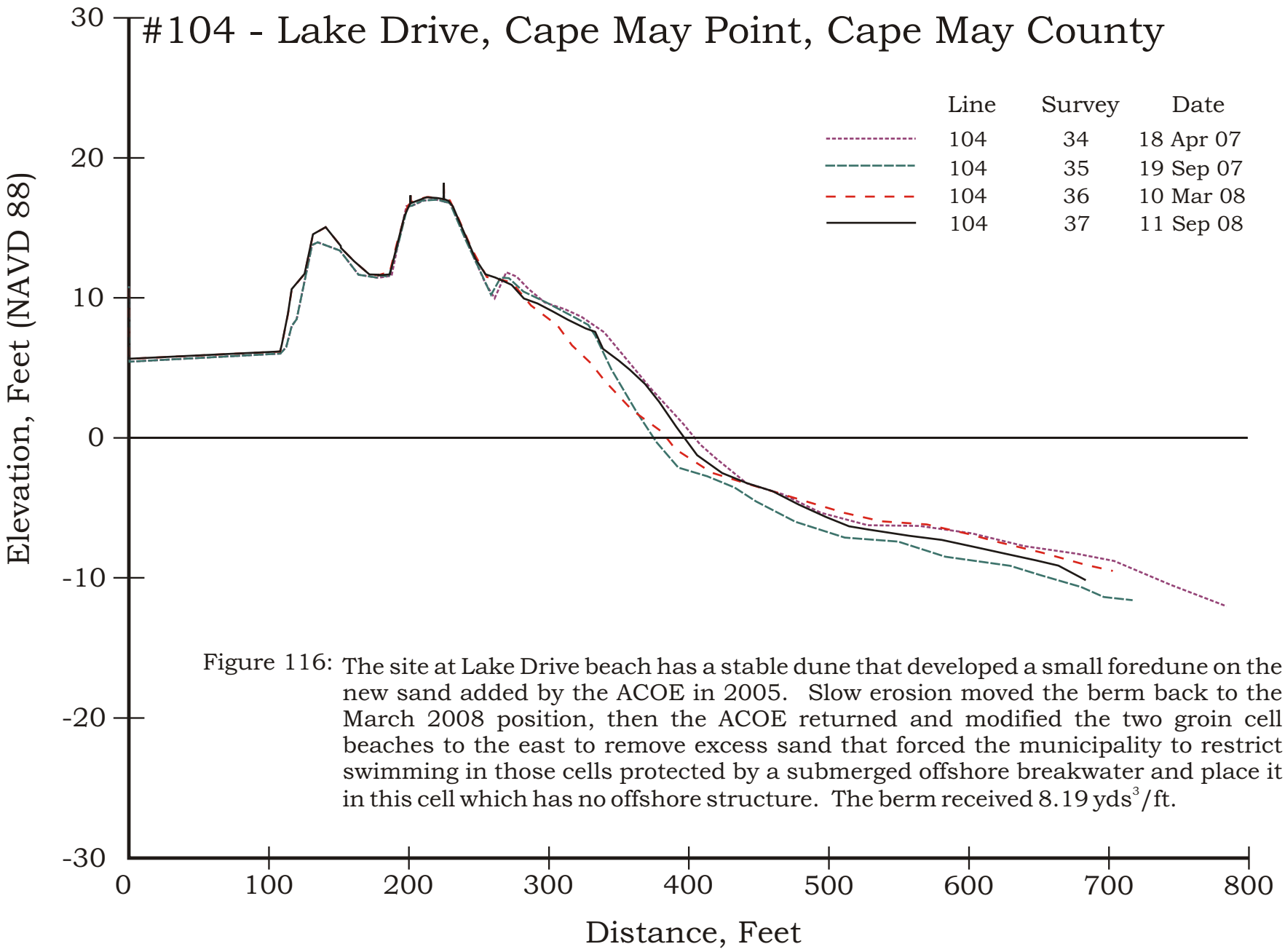


Figure 116: The site at Lake Drive beach has a stable dune that developed a small foredune on the new sand added by the ACOE in 2005. Slow erosion moved the berm back to the March 2008 position, then the ACOE returned and modified the two groin cell beaches to the east to remove excess sand that forced the municipality to restrict swimming in those cells protected by a submerged offshore breakwater and place it in this cell which has no offshore structure. The berm received 8.19 yds^3/ft.

HIGBEE BEACH - SITE 103

This is a natural area without any development. The changes to the shoreline are driven by southwest winds and the strong northwest winds that follow winter northeast events. The view is to the northwest along the berm toward the Cape May Ferry terminal at the Cape May Canal entrance into Delaware Bay on February 28, 2007. Sand is excavated from the bluff and much of it is carried offshore. Long shore transport redistributes the sand toward the canal entrance or south toward Cape May Point. Long periods of quiet weather produces a berm and small bars near the low tide line.

By September 19, 2008 the grass growth is in evidence and the absence of bluff erosion shows in the advance of the vegetation down the slope. The survey data confirms the photographic evidence with a 2.31 yds^3/ft. sand volume increase as the shoreline advanced 6 feet.

New Jersey Beach Profile Network

#103 - Higbee Beach, Cape May County

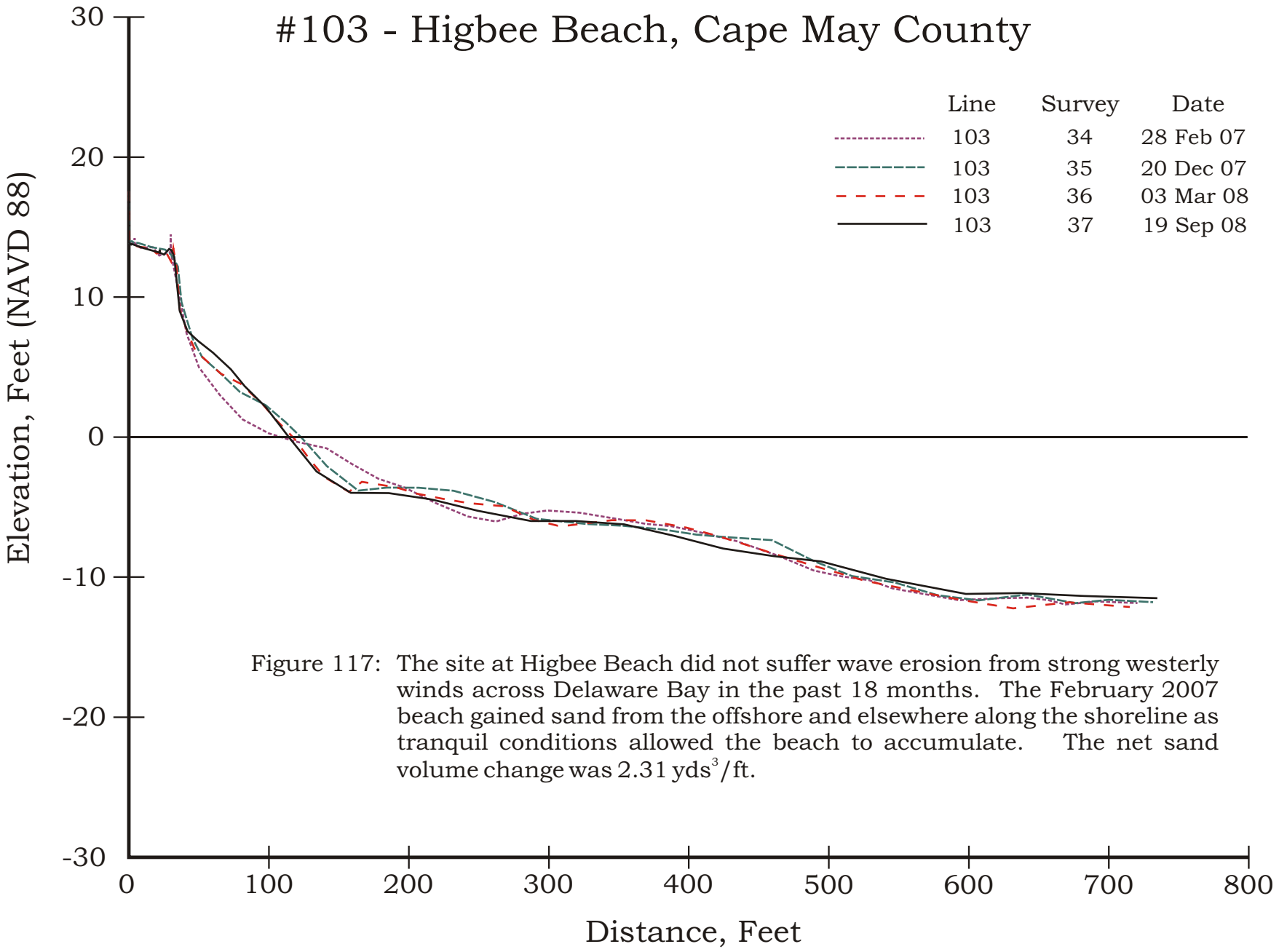


Figure 117: The site at Higbee Beach did not suffer wave erosion from strong westerly winds across Delaware Bay in the past 18 months. The February 2007 beach gained sand from the offshore and elsewhere along the shoreline as tranquil conditions allowed the beach to accumulate. The net sand volume change was 2.31 yds^3/ft.

WHITTIER AVENUE, NORTH CAPE MAY - SITE 102

The final three sites are within Delaware Bay and are only influenced by westerly winds. This picture was taken May 17, 2007 and shows the dry beach with a line of debris from a higher-than-normal tide. Some debris is as far up the beach slope as the grass line.

Extensive change is absent, but sand does move along the shoreline as this September 19, 2008 view shows. The berm is higher and grass has moved onto the upper slope. A 2.99 yds^3/ft. sand volume loss was combined with a 16-foot shoreline advance over the 18-month study interval.

New Jersey Beach Profile Network

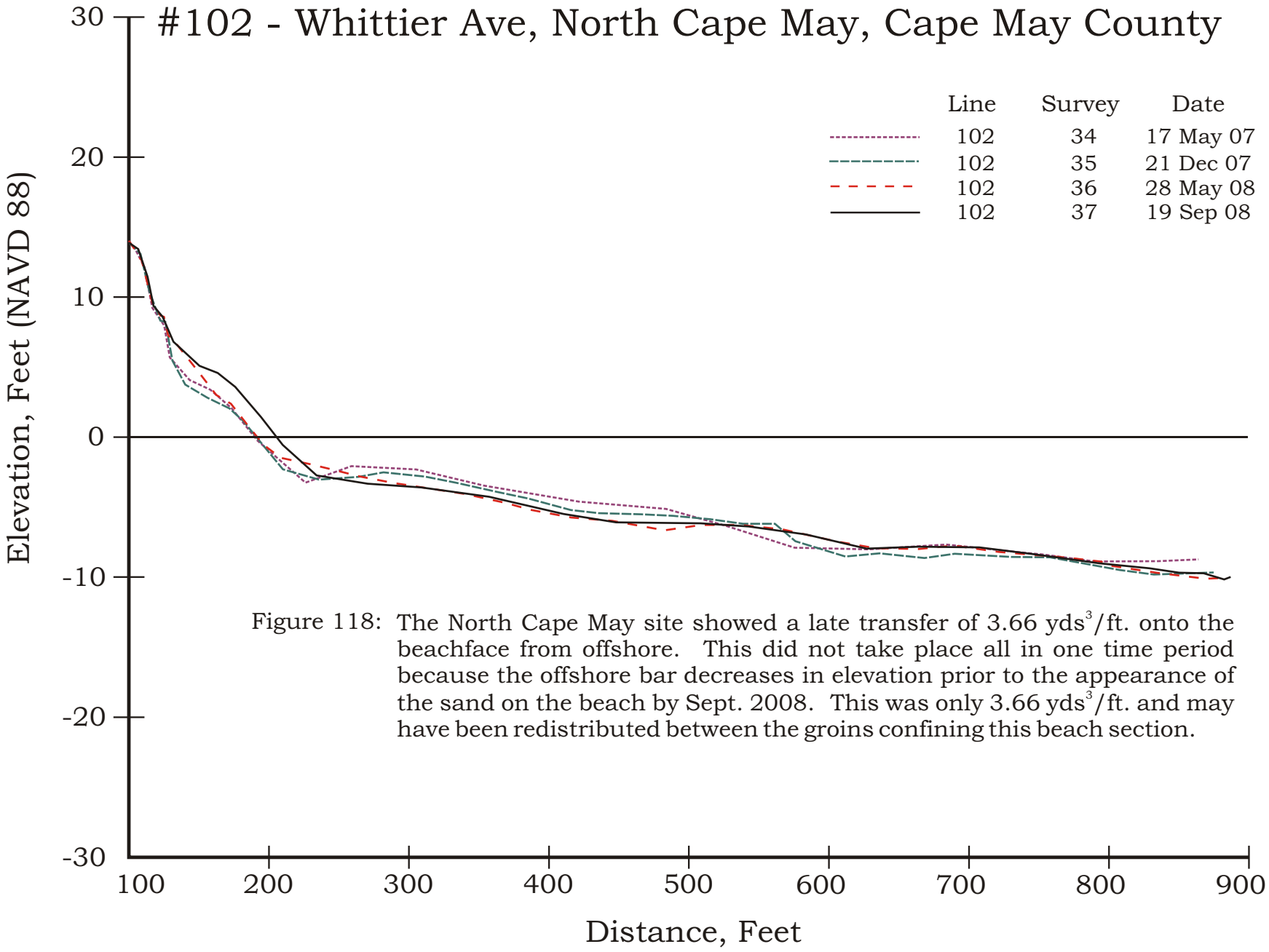


Figure 118: The North Cape May site showed a late transfer of 3.66 yds^3/ft. onto the beachface from offshore. This did not take place all in one time period because the offshore bar decreases in elevation prior to the appearance of the sand on the beach by Sept. 2008. This was only 3.66 yds^3/ft. and may have been redistributed between the groins confining this beach section.

PACIFIC AVENUE, VILLAS - SITE 101

The Villas site has few major changes. This May 14, 2007 photograph shows a series of debris lines from different tidal elevations. Offshore there is a wide, shallow terrace veneered by sand, but composed of compact bay mud left as the shoreline retreats about 2 feet per year over time. The bay margin is a thin veneer of sand over the marsh which is tens of feet thick. Bay erosion of the shoreline only reaches the effective base of the wave action so the terrace is flat and graded to an elevation of about zero NAVD 88. The gradient actually slopes toward the bay over a 1,400-foot distance that mirrors sea level rise somewhat. The slow erosion rate combined with the homogeneous sediment type has generated this wide terrace all along this part of the western Cape May County shoreline.

By October 20, 2008 some shoreline erosion is evident and the berm present above is now almost a scarp at the toe of the grass. The entire time period between the spring of 2007 and the fall of 2008 saw only 2.46 yds^3/ft. in sand volume change with a 3-foot shoreline advance.

New Jersey Beach Profile Network

#101 - Pacific Avenue, Villas, Cape May County

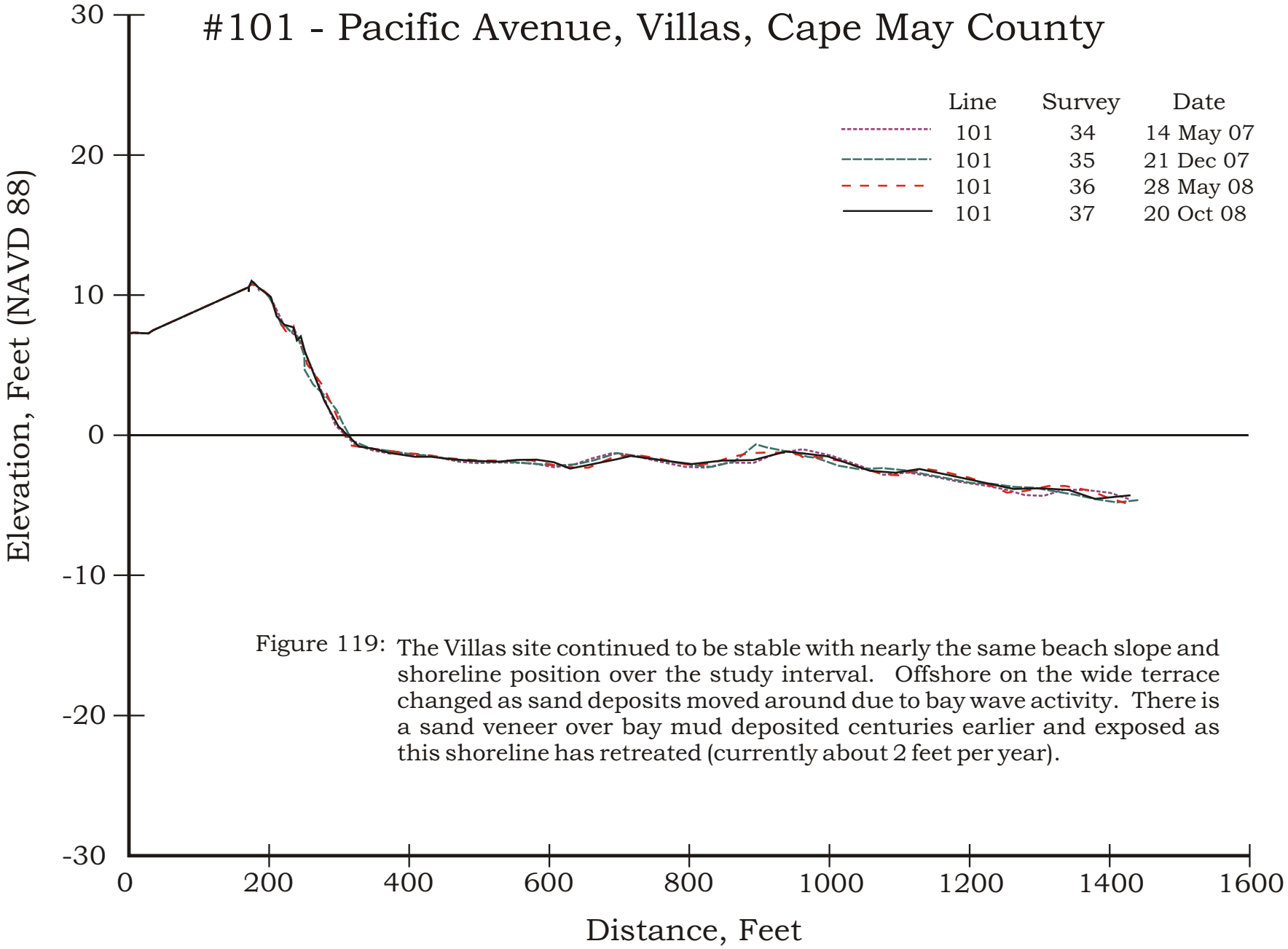


Figure 119: The Villas site continued to be stable with nearly the same beach slope and shoreline position over the study interval. Offshore on the wide terrace changed as sand deposits moved around due to bay wave activity. There is a sand veneer over bay mud deposited centuries earlier and exposed as this shoreline has retreated (currently about 2 feet per year).

REEDS BEACH - SITE 100

The Reeds Beach location has been erosional over the past 20 years, but not to the point of property loss. This May 8, 2007 view to the south shows the segment of undeveloped shoreline chosen for the survey site location.

Dredging for navigation purposes at Bidwell Creek, located north of this site, used the sand derived from the creek to enhance the Reeds Beach shoreline as shown in this October 20, 2008 photograph. A new 4-foot high dune was built to keep sediment off the road, and the beach was extended 60 feet into the bay following completion of the dredging project. This has been the most significant change to this shoreline since monitoring began in 1986. The project deposited 23.57 yds^3/foot of shoreline by the survey completed Oct 20, 2008. The shoreline advanced 52 feet into the bay reclaiming area lost due to erosion over the past decade.

New Jersey Beach Profile Network

#100 - Reeds Beach, Cape May County

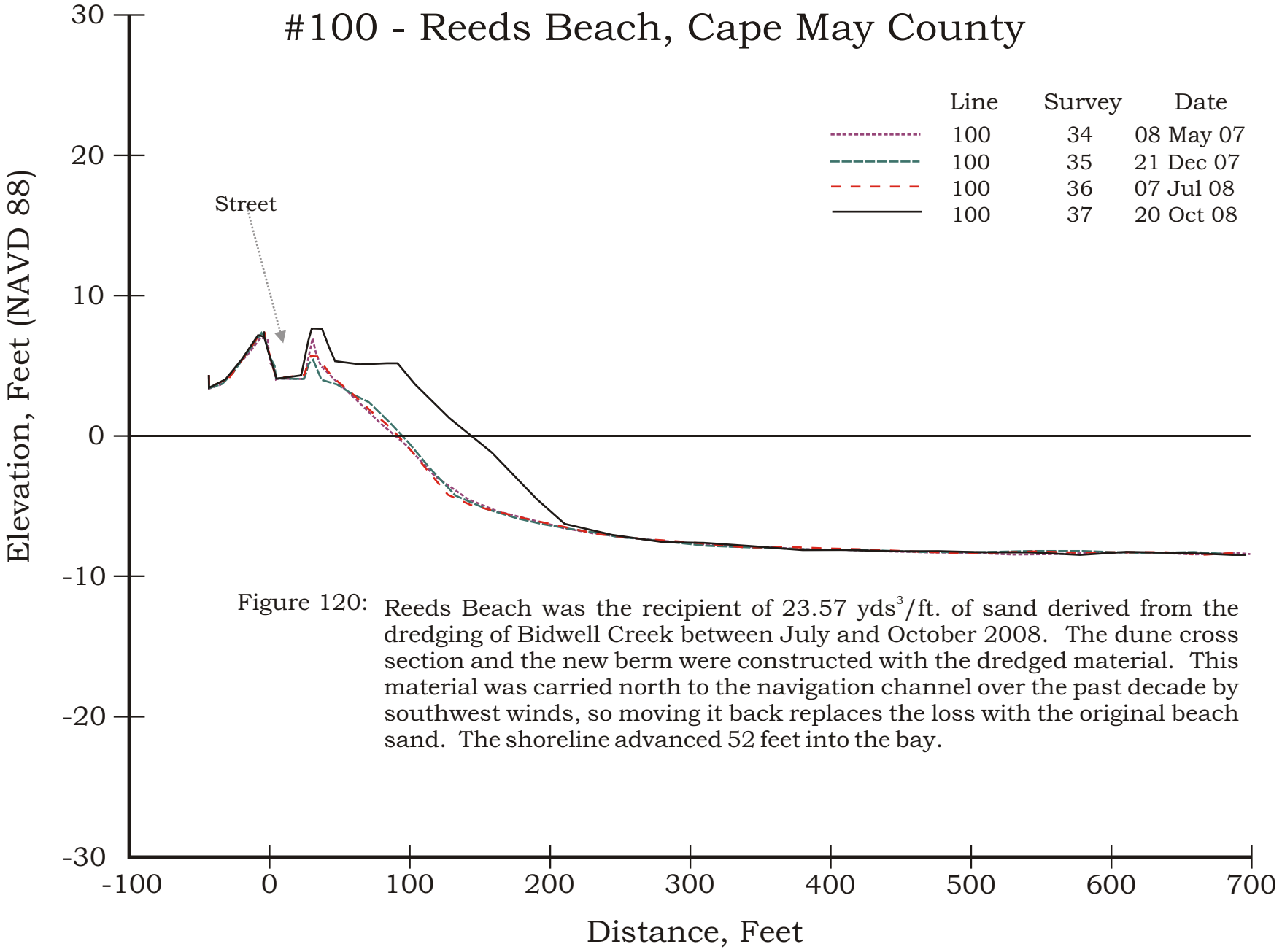


Figure 120: Reeds Beach was the recipient of 23.57 yds^3/ft. of sand derived from the dredging of Bidwell Creek between July and October 2008. The dune cross section and the new berm were constructed with the dredged material. This material was carried north to the navigation channel over the past decade by southwest winds, so moving it back replaces the loss with the original beach sand. The shoreline advanced 52 feet into the bay.