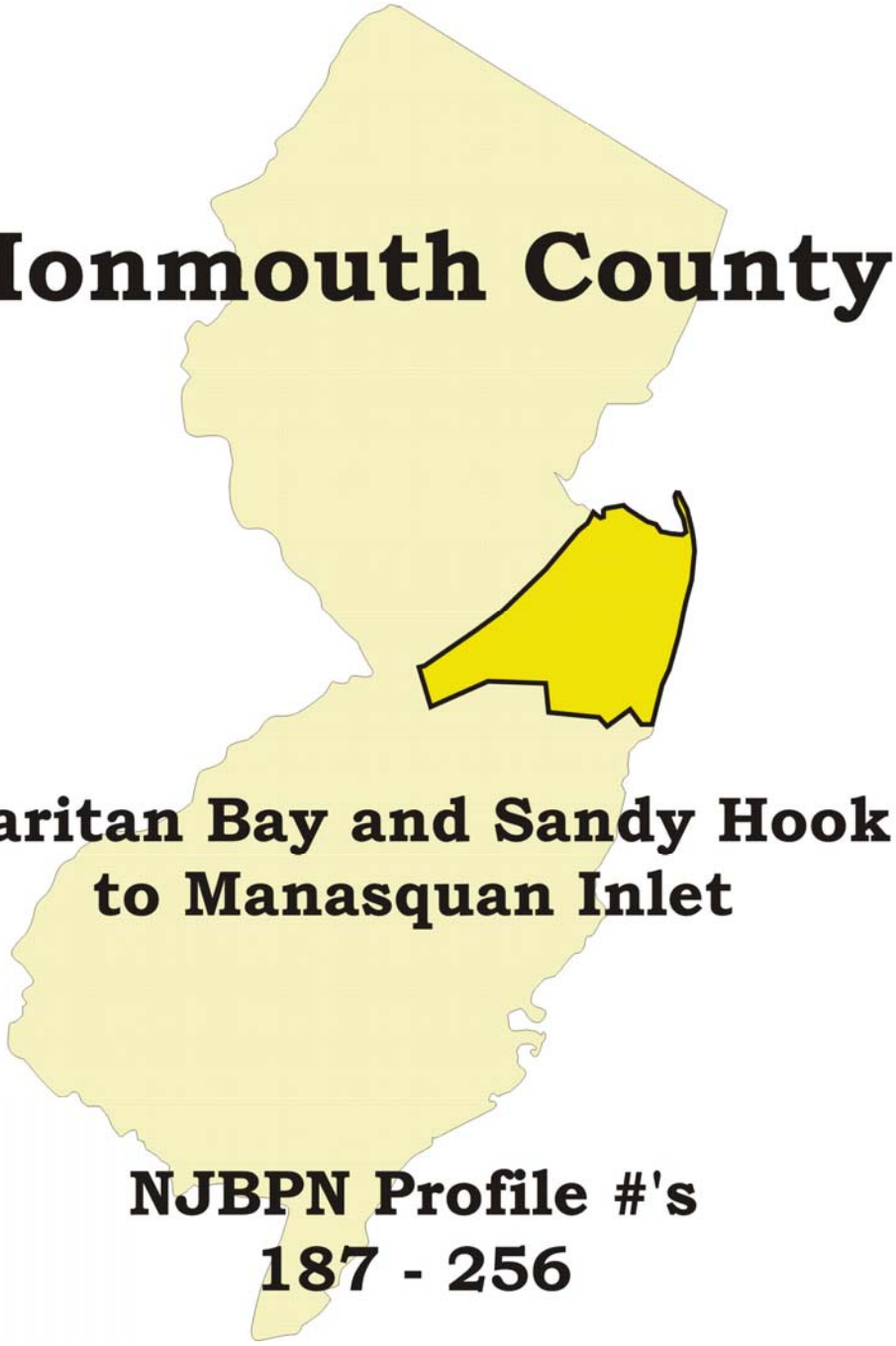
New Jersey Beach Profile Network

# Monmouth County



## Raritan Bay and Sandy Hook to Manasquan Inlet

## NJBPN Profile #'s 187 - 256

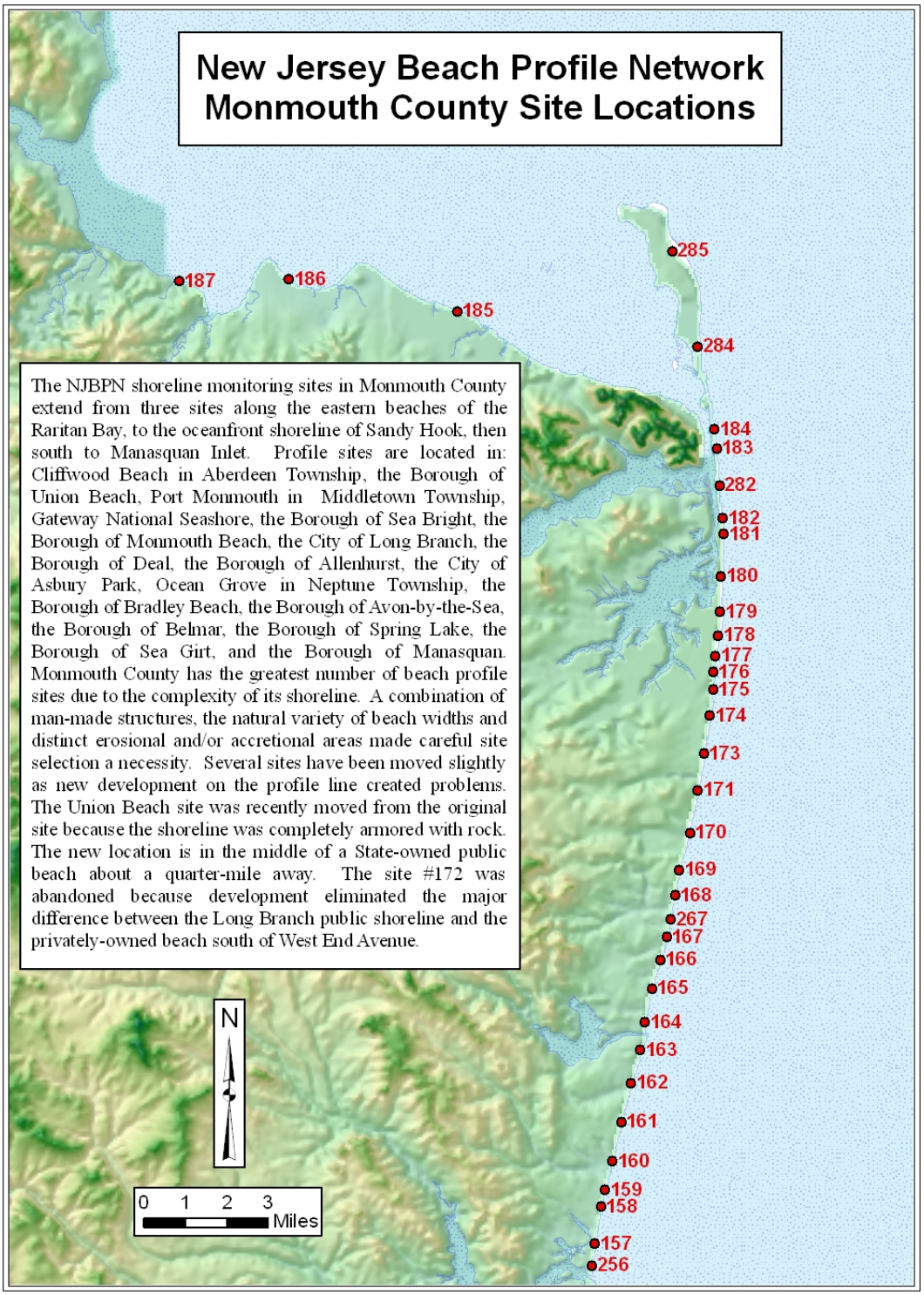



**Figure 1. Location map for the 35 NJBPN profiles in Monmouth County, NJ**

## MONMOUTH COUNTY SPRING 2007 to FALL 2008

Monmouth County contains 35 profile stations for two reasons, first there are three sites along the Raritan Bay shoreline in the county and second, the complexity of coastal construction demanded a denser array of profile stations to cover the variety of coastal shoreline features present in Monmouth County. The 35 sites are covered with 2 photographs each plus four survey plots showing changes since the spring of 2007 to the fall of 2008.

Monmouth County received the benefit of the largest, most expensive and most comprehensive beach nourishment project ever in the United States beginning in 1994. Completed by the New York District Army Corps of Engineers (ACOE) for $210,000,000, this project continued in three phases until the year 2000. In all, 21 miles of the county shoreline were restored with a 100-foot wider berm and a dune system built in all locations where practical. 6.1 million cubic yards of sand were applied to the 21 miles of beach. The only gaps in the entire project were the communities of Loch Arbor, Allenhurst, Deal and Elberon because these communities would not provide the necessary real estate easements and permissions from owners. This fact divides the restored shoreline into two filled segments from the Sandy Hook National Seashore, south to the Long Branch/Elberon boundary, then no fill to the Asbury Park boundary, and the second segment complete to the Manasquan Inlet. The national park service also piggybacked onto the Federal project operations to pump sand onto the erosional zone within the park boundary, thus adding to the length of the fill.

Maintenance fills have been completed following two strong storms in 1998, hot-spot erosion in Monmouth Beach in 1997 and 2002, and finally a modest fill project proposed to go to construction using FY 2008 money in southern Long Branch that was completed in 2009. As this report was written the southern Long Branch work was complete, extending south of West End Avenue and north toward Broadway Avenue. Funds in the amount of $2,961,000, $3,305,000 and $1,316,000 were appropriated for Fiscal Years 2006, 2007 and 2008, respectively. This funding was used to design and construct approximately 2400 linear feet of beach re-nourishment in South Long Branch. This work was completed by March 2009. Since completion in 2001, the southern segment (Asbury to Manasquan) has not required maintenance.

This year the lack of northeast storms appears to have influenced the rate of northerly sand transport. The groins in Sea Bright have sand deposits along their south sides and the site at Cottage Road in Monmouth Beach has eroded rapidly to the point where the dune has been cut back to the rock seawall just north of the cross section line #179. The profile plots show a rapid retreat in the dune scarp with six-month loss rates over 30 cubic yards of sand per foot of shoreline regardless of season. This sand moves north up the beach, but is not replaced because very little sand can move around the rock groins defending the Monmouth Beach Club property just south of the Cottage Road site.

The Monmouth County erosion rate picked up in general this past 18 months with the county average of all 35 sites losing 6.02 $yds^3$/ft combined with a shoreline advance of just 0.36 feet. These losses are up from those in last year's report by 50%. Sand volume loss was dominant for any of the five comparisons done. The summer of 2007 saw the smallest average loss rate -0.63 $yds^3$/ft. The winter to winter or summer to summer profile comparisons were similar at -3.23 and -5.39 $yds^3$/ft. respectively. Looking at just the 8 sites between Sandy Hook National Seashore and Long Branch, the average rate of change was eighty five times the average rate seen for the 13 sites between Asbury Park and Manasquan Inlet (-25.39 vs. -0.3 $yds^3$/ft). This northerly sand movement trend appeared at Allenhurst (+40.11 $yds^3$/ft as sand moved north from Asbury Park); showed up at Shark River Inlet where the Avon profile has a much smaller gain than did the Belmar side; and the sand volume changes seen at the three sites north of the Manasquan Inlet went from a 32.42 $yds^3$/ft. gain to a -30.54 $yds^3$/ft. loss from Trenton Avenue in Sea Girt to the inlet. The equilibrium wave climate is extremely important to the impact seen along the Monmouth County shoreline due to the competition between the

northeast winds from storm events and the southeast winds that dominate the summer seasons. Dominance by either one of these opposing forces strongly shifts the equilibrium beach configuration to produce erosion or deposition near major structural complexes that have been built along this shoreline.

Two figures below were selected to illustrate the extremes in the massive Monmouth County beach restoration project undertaken by the New York District of the US Army Corps of Engineers. The two areas subject to erosion were located at Cottage Road in Monmouth Beach and at the south end of the Long Branch section of the project. The artificial termination of the work at West End Avenue in Long Branch promoted end-effect losses in the fill cross section in the southern Long Branch beach. Sand moved south into Elberon and deposited offshore and seldom was observed on the beach as permanent improvements to the sand supply in Elberon. The Cottage Road situation is caused by extensive rock groin structures placed at the north end of the Monmouth Beach Club property. Sand simply is unable to pass around the structure to reach the Cottage Road beach segment. Since the sea has been dominated by southeast winds in the past two winters, the tendency for sand to move south under northeast storm influence has been limited. With no sand coming north around the groins, the southern beaches with sand cannot provide the sand which would produce equilibrium at Cottage Road. The net effect is rapid erosion to the Cottage Road site to the point where the dune has been stripped away. Northeast storm conditions would transport sand from Sea Bright south to the groin where it would be trapped and build the beach at Cottage Road.

In Asbury Park the nourishment project arrived during 1999. The placement volume was about 167 cubic yards of sand per foot of shoreline. Since then there has been no added nourishment work. The beach has gained and lost sand in no particular pattern. In 11 years the beach has lost 30 cubic yards of sand per foot or about 18% of the placed volume. The southern portion from Asbury Park to Manasquan Inlet has remained at or above 75% sand remaining after 9 years following its placement. Some sand has moved north to augment Loch Arbor and Allenhurst beaches, but groins prevent distribution into Deal and beyond. The beaches in Deal remain as they were prior to the project.

The third illustration shows the 22-year change at the westernmost cross section established along the Monmouth County Raritan Bay shoreline. Wave activity on the bay is generated by northeast storms and strong northwest winds following storms. The bay is at most 7 miles wide, so the fetch limits the wave height and period so erosional impact is limited to about two feet below low tide. Surveys continue offshore, but there has never been any change to the outer 500 feet or so of any of the three cross sections. The Cliffwood Beach site remained stable after a three-year sand volume increase early in the program.

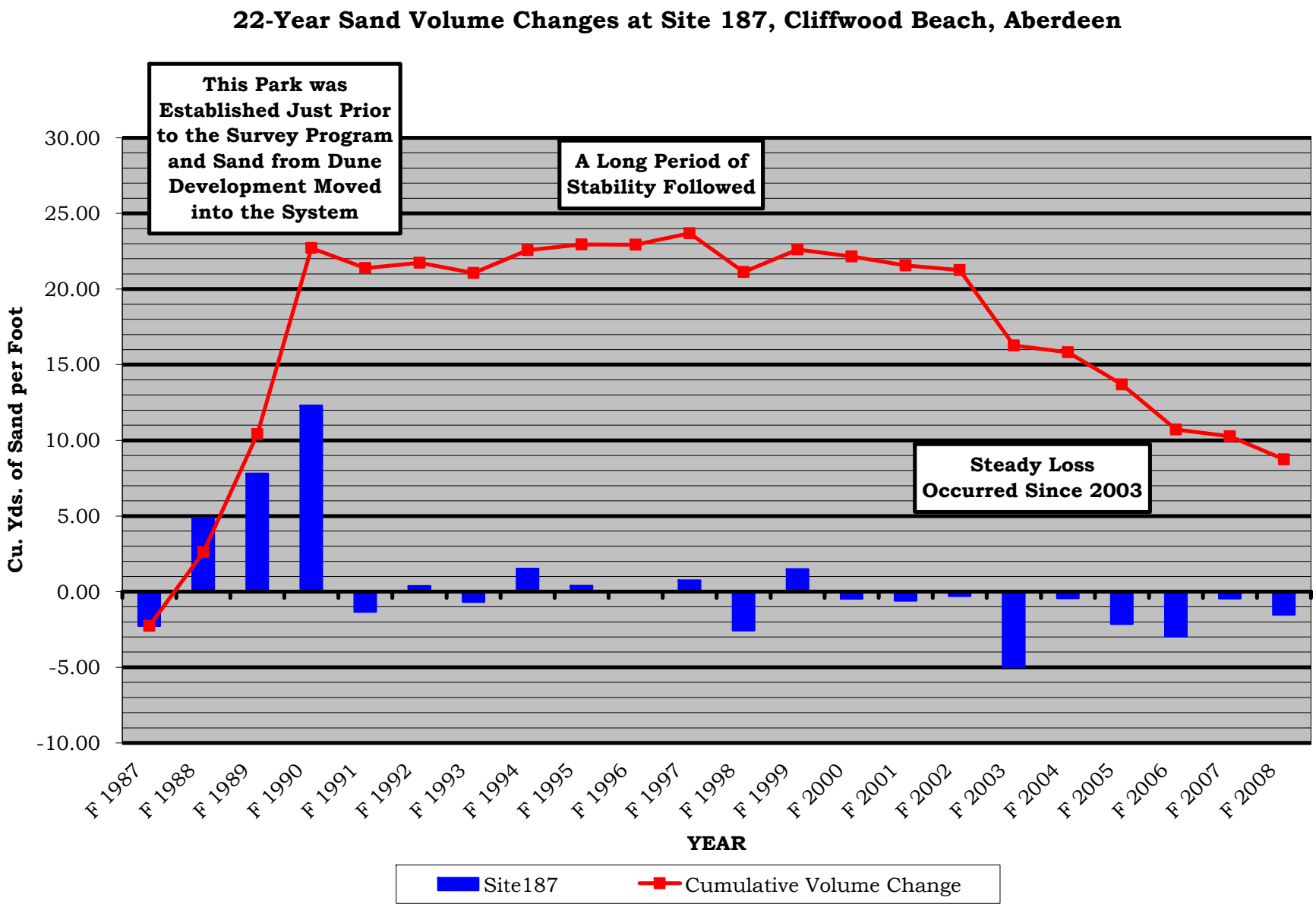



**Figure xx. There are three sites along the eastern Raritan Bay shoreline in Monmouth County where Cliffwood Beach is the westernmost of the three. Located in a park created just before the establishment of the NJBPN program, the sand available in the system added to the beach/dune system during the three years following the initial pair of surveys. During the next 12 years the shoreline was stable in spite of northeast storms and other events. In 2003 a slow sand loss commenced that reduced the net gain by half by 2008.**

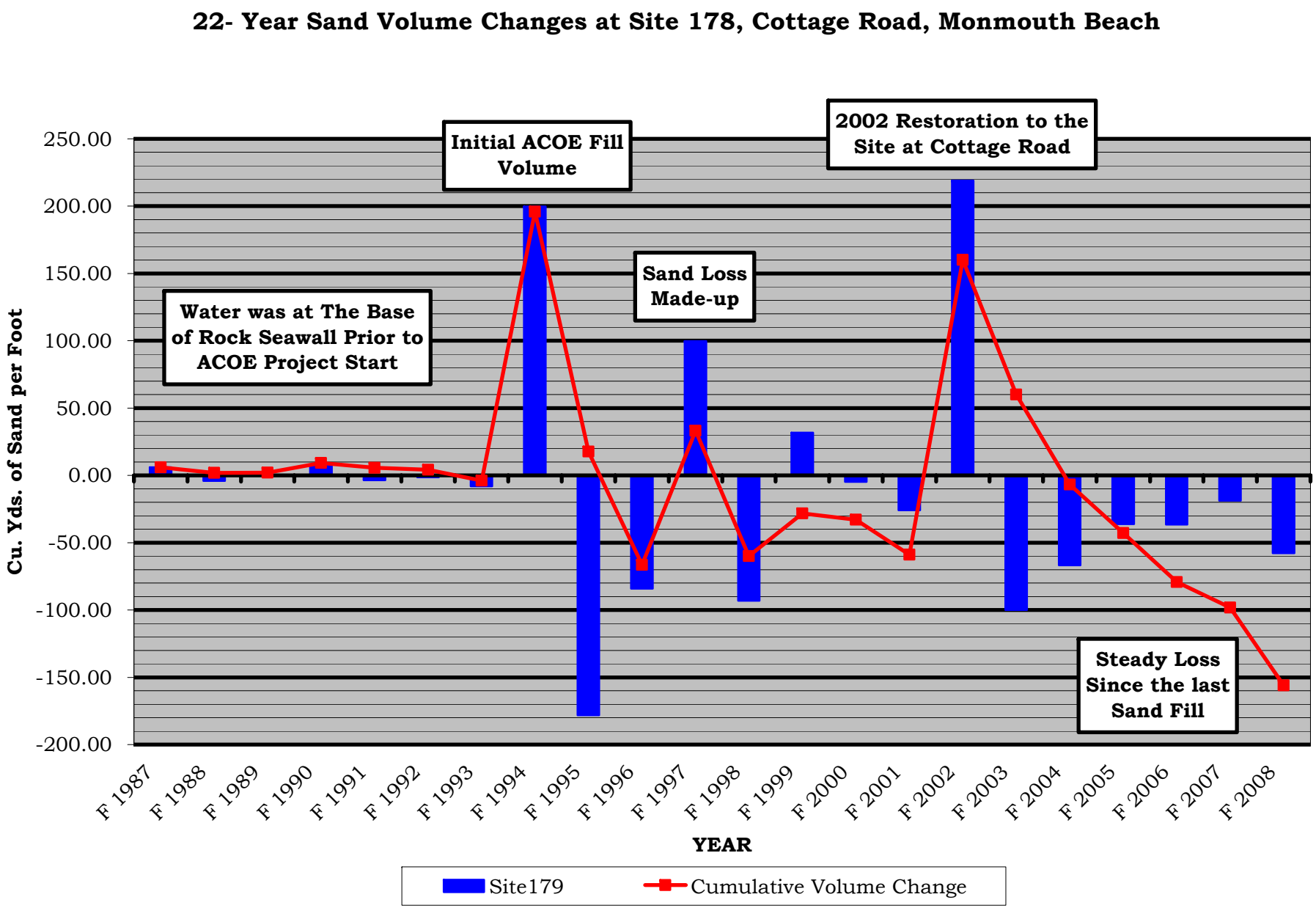



**Figure xx. Site #178 at Cottage Road in Monmouth Beach initially had several feet of water at the seaward base of the seawall rocks prior to the ACOE project starting in 1994. Storm losses were made up in 1997 followed by maintenance work in 2002. Chronic losses have piled up because the groins once the sole protection for the Monmouth Beach Club now prevent sand from reaching this site from the south.**

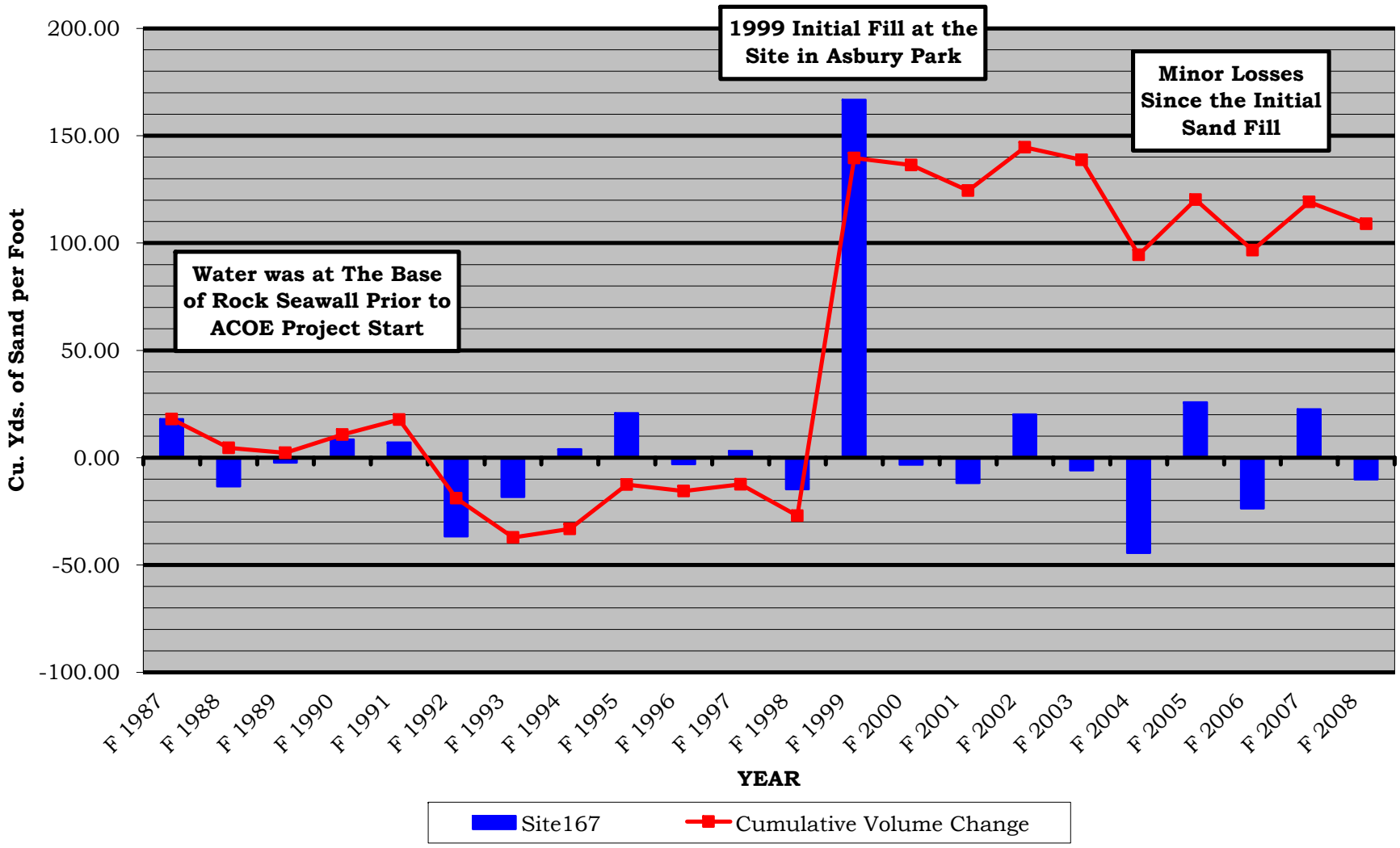



**Figure xx. The Third Avenue location in Asbury Park received the Federal beach nourishment in 1999. No additional work has been required since. Three of the nine years since saw additional natural accretion that helped keep the beach near the ACOE sand placement volume seen in 1999.**

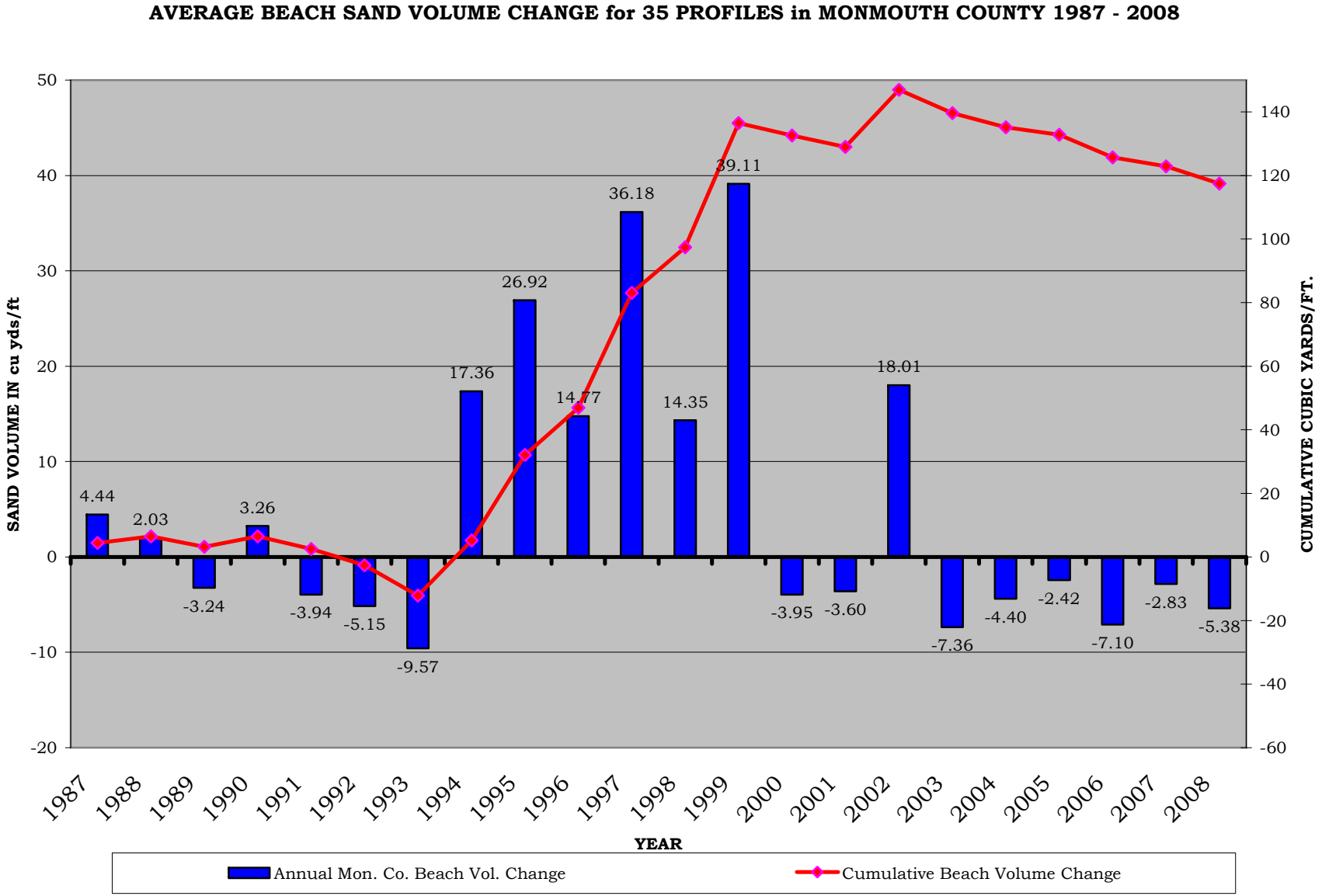



**Figure 5. The final bar graph illustrates the trend and each year's average sand volume change for all 35 of the Monmouth County survey sites. Between 1994 and 1999 the ACOE project was underway along 21 miles of the county shoreline adding 140 yds$^3$/ft. in average cumulative sand volume to the county's beaches. Maintenance work was performed in 2002, but none since until 2009's work in Long Branch. In the absence of major storms, loss rates have been quite small.**

Congressional failure to appropriate funding for 2007 and 2008 for maintenance and new construction of beach nourishment projects did not allow major programs for Monmouth County to proceed. The NY District pieced together the funding package to maintain the Long Branch segment in 2009. No other beach restoration projects have been authorized by local municipal governments. A number of towns have commenced designing and building dune systems to augment the level of storm protection and prevent sand from blowing into Ocean Avenue or other infrastructure.

The Raritan Bay shoreline continues to erode slowly at two of the three sites with no impact seen below a depth of 2 feet in the bay due to short-period, low-amplitude waves attacking at the point of breaking on the shoreline depending only on the stage of the tide for where sand gets moved around. Monmouth County parks system is preparing to restore the scrap and rubble cored dune along the park shoreline at site #185. The New York District has plans in various states of readiness for Port Monmouth, Leonardo (flooding), Union Beach, Highlands (flooding) and Keyport (flooding) shorelines and associated low-lying areas. These projects have been authorized by the WRDA of 2007, but no appropriations have come from Congress to proceed to construction. These five Raritan Bay projects have the majority of the funds slated for flood abatement and storm surge associated with strong northeast storms.

# CLIFFWOOD BEACH - SITE 187

There has been some shoreline retreat that has exposed an old timber structure on the beach June 26th 2007. The toe of the dune was trimmed back by erosion too.

By September 24th 2008 the dune toe was restored by new sand, but the beach was slightly lower. The sand volume change was a loss of 2.77 $yds^3$/ft. and a 5-foot shoreline advance. These bayshore sites do not change drastically and almost never show any differences below the -2.0 foot contour. The short period waves on Raritan Bay do not impact the bottom in water more than a foot deep.

# New Jersey Beach Profile Network

## #187 - Beach Park, Cliffwood Beach, Monmouth County

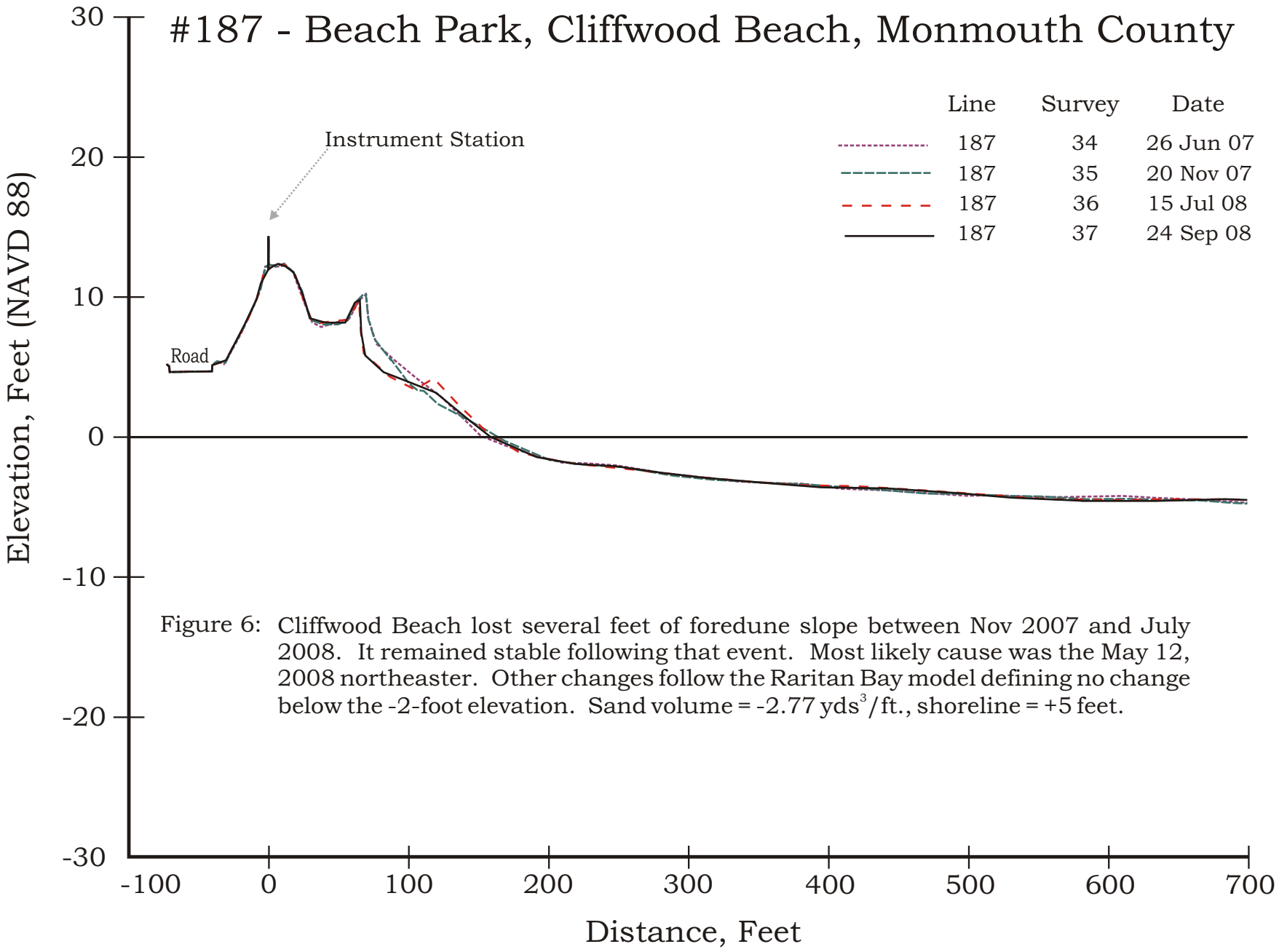



Figure 6: Cliffwood Beach lost several feet of foredune slope between Nov 2007 and July 2008. It remained stable following that event. Most likely cause was the May 12, 2008 northeaster. Other changes follow the Raritan Bay model defining no change below the -2-foot elevation. Sand volume = -2.77 $yds^3/ft.$, shoreline = +5 feet.

# UNION BEACH - SITE 186

This shoreline was upgraded with hard structures about a decade ago. This November 20th 2007 photograph shows the new bulkhead/railing and pedestrian walkway with an apron of medium stone extending to the low tide line. Since changes rarely occur beyond the low tide line in the 22 years of study, this site has become an exercise in futility to continue surveying.

The September 9th 2008 view was taken at a slightly lower stage of the tide, but all other parameters are identical to those shown above. Following consultation with the staff at the Bureau of Engineering and Construction at the NJDEP, the site was moved about a quarter mile to the northwest along the shoreline to a public bathing beach so that more normal shoreline changes could be followed. The new site is near the intersection of Beach and Front Streets in Union Beach.

The last comparison calculation to be done on this site found that the sand volume changed by -1.31 $yds^3$/ft. and the shoreline retreated 2 feet. In 2009 the new site's data will replace this location going forward.

# New Jersey Beach Profile Network

## #186 - Union Avenue, Union Beach, Monmouth County

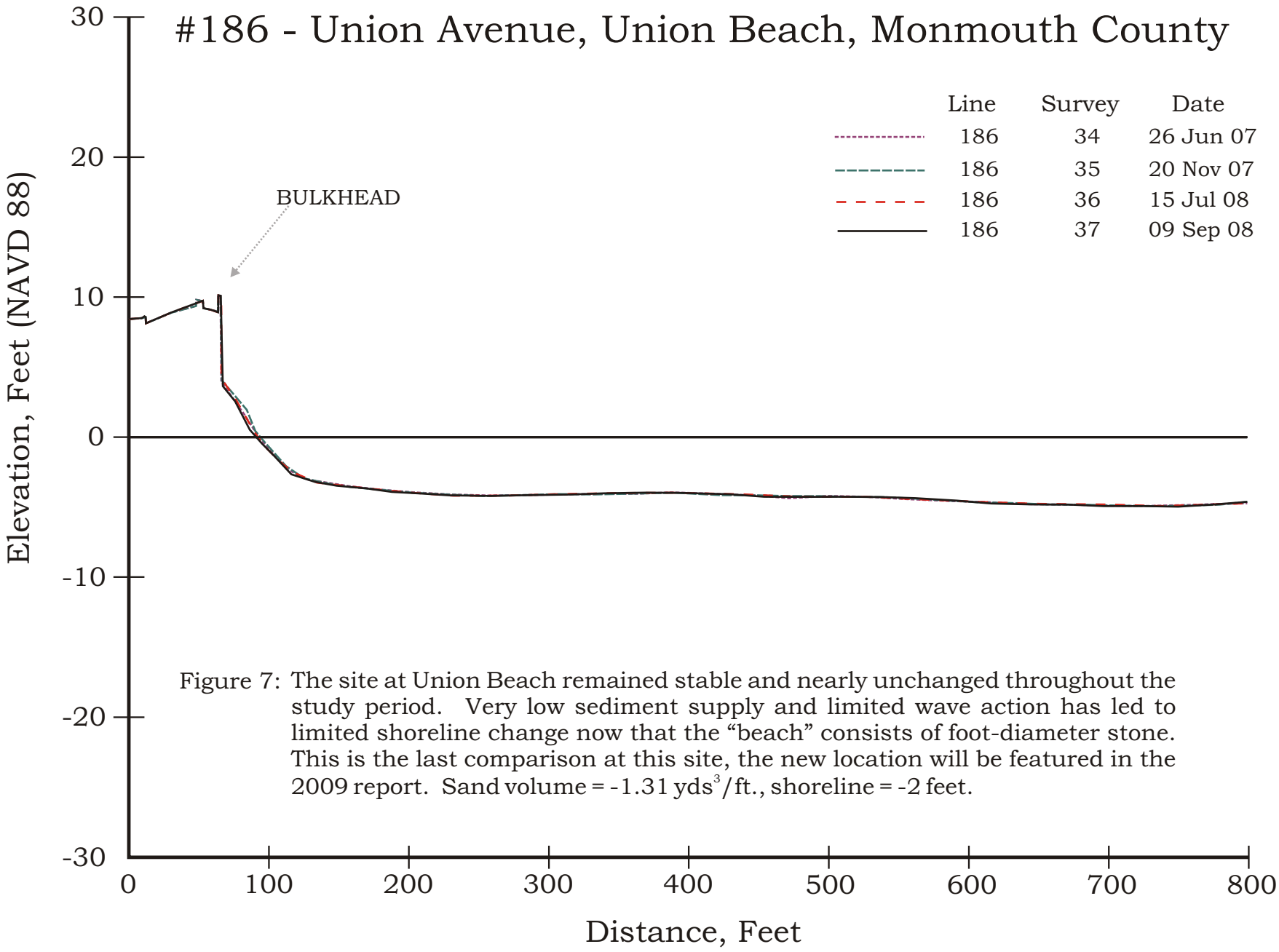



Figure 7: The site at Union Beach remained stable and nearly unchanged throughout the study period. Very low sediment supply and limited wave action has led to limited shoreline change now that the "beach" consists of foot-diameter stone. This is the last comparison at this site, the new location will be featured in the 2009 report. Sand volume = -1.31 $yds^3/ft.$, shoreline = -2 feet.

# SPY HOUSE MUSEUM - SITE 185

The museum site contains a bluff with wind blown sand mantling it. The beach has retreated over the years, but has been pretty stable for some time due to a lack of either frequent or intense northeast storms. The waves impacting the shoreline are just those generated by the 16-mile fetch across Raritan Bay, not oceanic waves. The picture was taken June 26th 2007 showing the new fishing pier and an old structure exposed near the low tide line.

By September 24th 2008 the beach had recovered a minor amount of sand, but thus far the proposed re-construction of the bluff and dune by the County Park Service has not occurred. The shoreline retreated less than a half foot while the sand volume declined by 13.54 $yds^3$/ft.

# New Jersey Beach Profile Network

## #185 - Spy House, Port Monmouth, Monmouth County

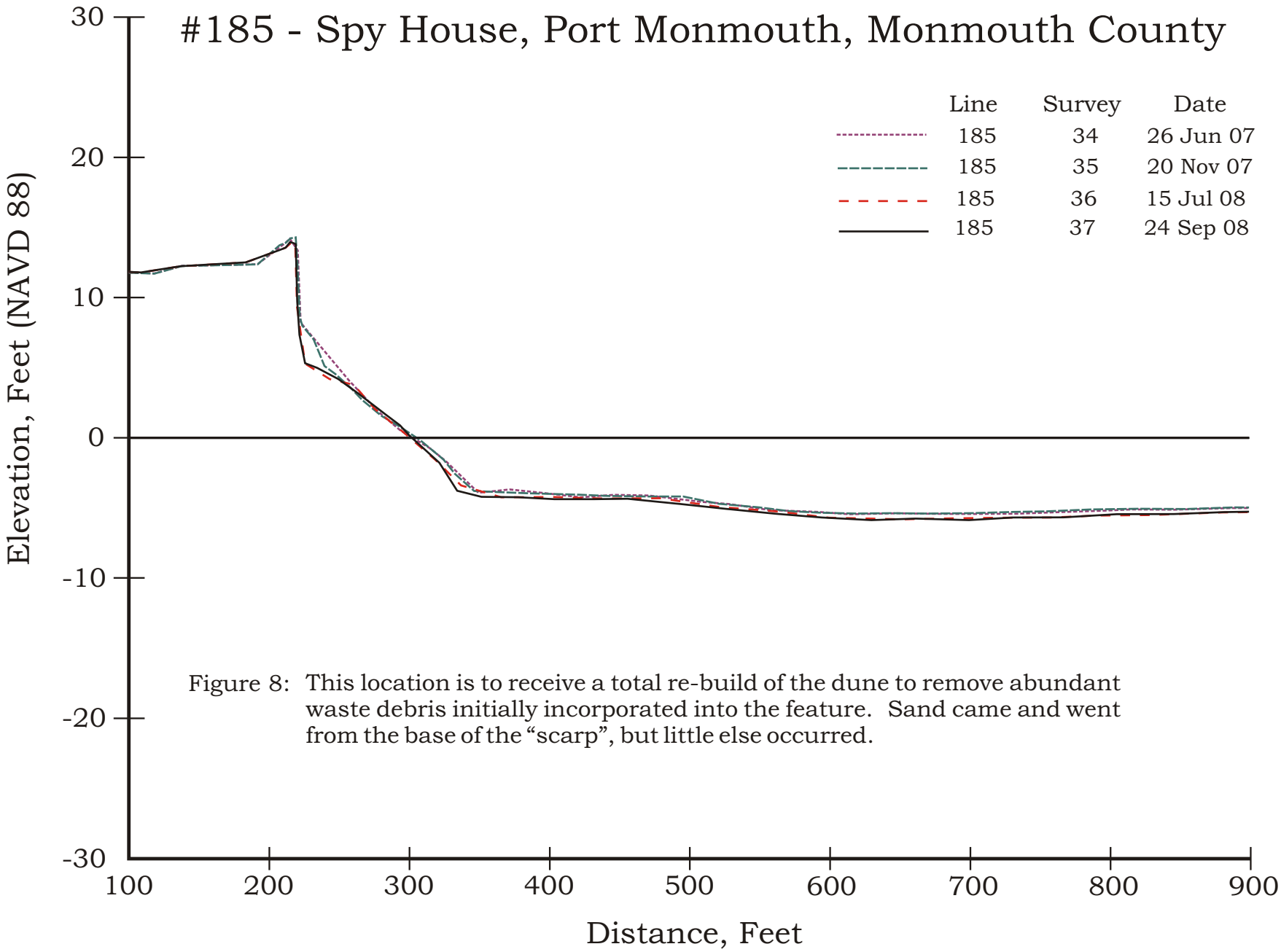



Figure 8: This location is to receive a total re-build of the dune to remove abundant waste debris initially incorporated into the feature. Sand came and went from the base of the "scarp", but little else occurred.

# SANDY HOOK NATIONAL SEASHORE - SITE 285

The northern end of the Sandy Hook spit looks like a vast sand plain that seems to grow ever wider. The view to the left was taken on March 1st 2007 looking toward the northeast across the berm and beachface. The dry beach is 1,200 feet wide between here and the seaward toe of the dunes. The net gain for the study interval was 16.05 $yds^3$/ft. and a 54-foot shoreline retreat as the beach grew steeper.

This November 3rd 2008 view shows the same shoreface with a bit more sand distributed across the dry upper beach and a higher berm elevation. The material is being carried north from the ACOE project extending south into Sea Bright. This spit growth inside the National Seashore will continue until all the millions of cubic yards of sand pumped onto the beach between the park entrance and Long Branch are moved north to this shoreline.

# New Jersey Beach Profile Network

## #285 - Gunnison Beach, Sandy Hook, Monmouth County

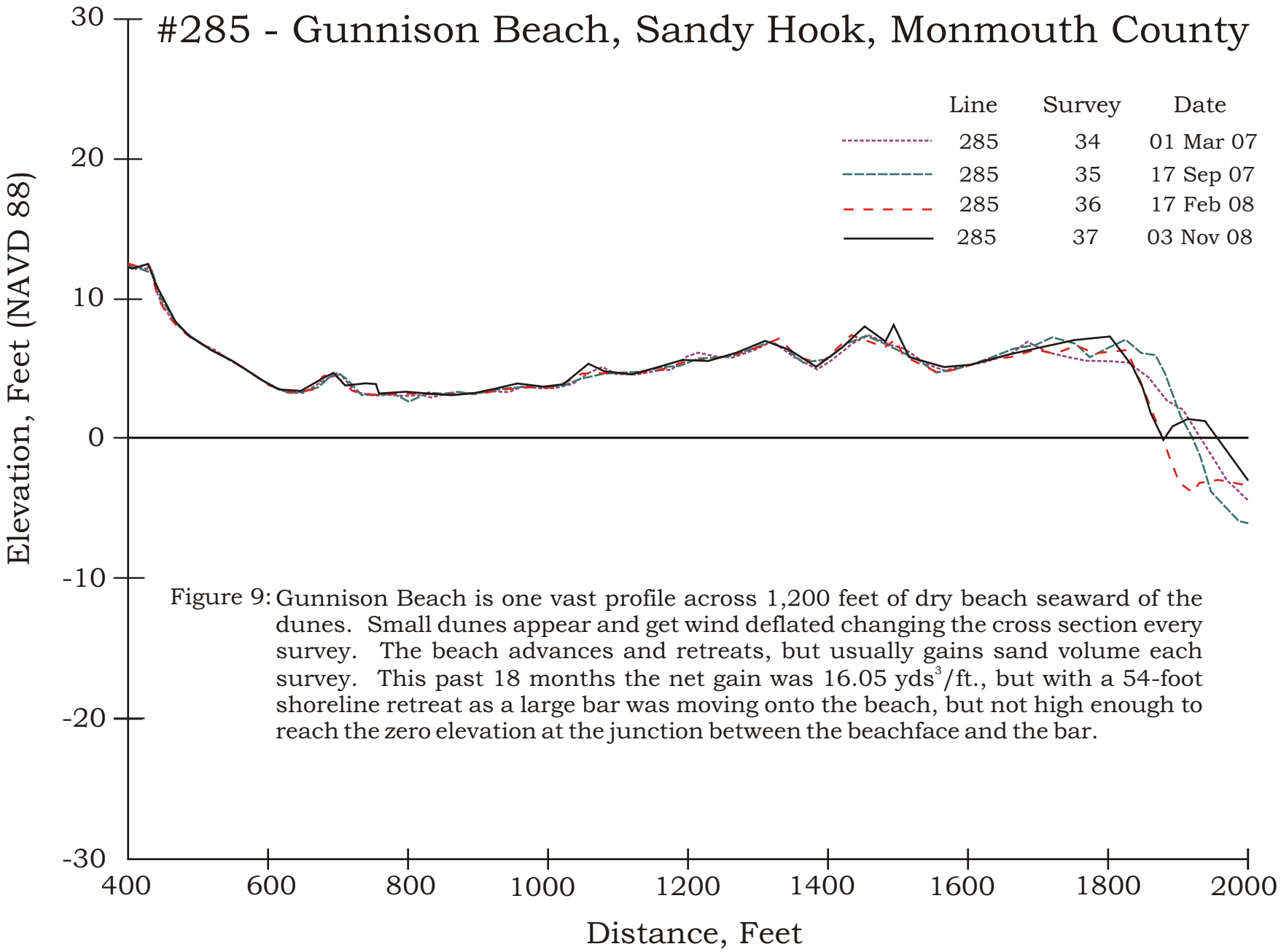



Figure 9: Gunnison Beach is one vast profile across 1,200 feet of dry beach seaward of the dunes. Small dunes appear and get wind deflated changing the cross section every survey. The beach advances and retreats, but usually gains sand volume each survey. This past 18 months the net gain was 16.05 $yds^3/ft.$, but with a 54-foot shoreline retreat as a large bar was moving onto the beach, but not high enough to reach the zero elevation at the junction between the beachface and the bar.

# SANDY HOOK NATIONAL SEASHORE, PARKING LOT E - SITE 284

March 1st 2007 looking south along the toe of the dunes at the major bathing beach parking area about a mile north of the entrance to Sandy Hook National Seashore.

By November 3rd 2008 expansion of the grass plants had covered the foredune with new growth. The beach was 19 feet wider and 19.78 $yds^3$/ft. of new sand had been added to the surveyed cross section. Loss to the south in Sea Bright contributed to these gains seen in the Sandy Hook park.

# New Jersey Beach Profile Network

## #284 - Parking Lot E, Sandy Hook, Monmouth County

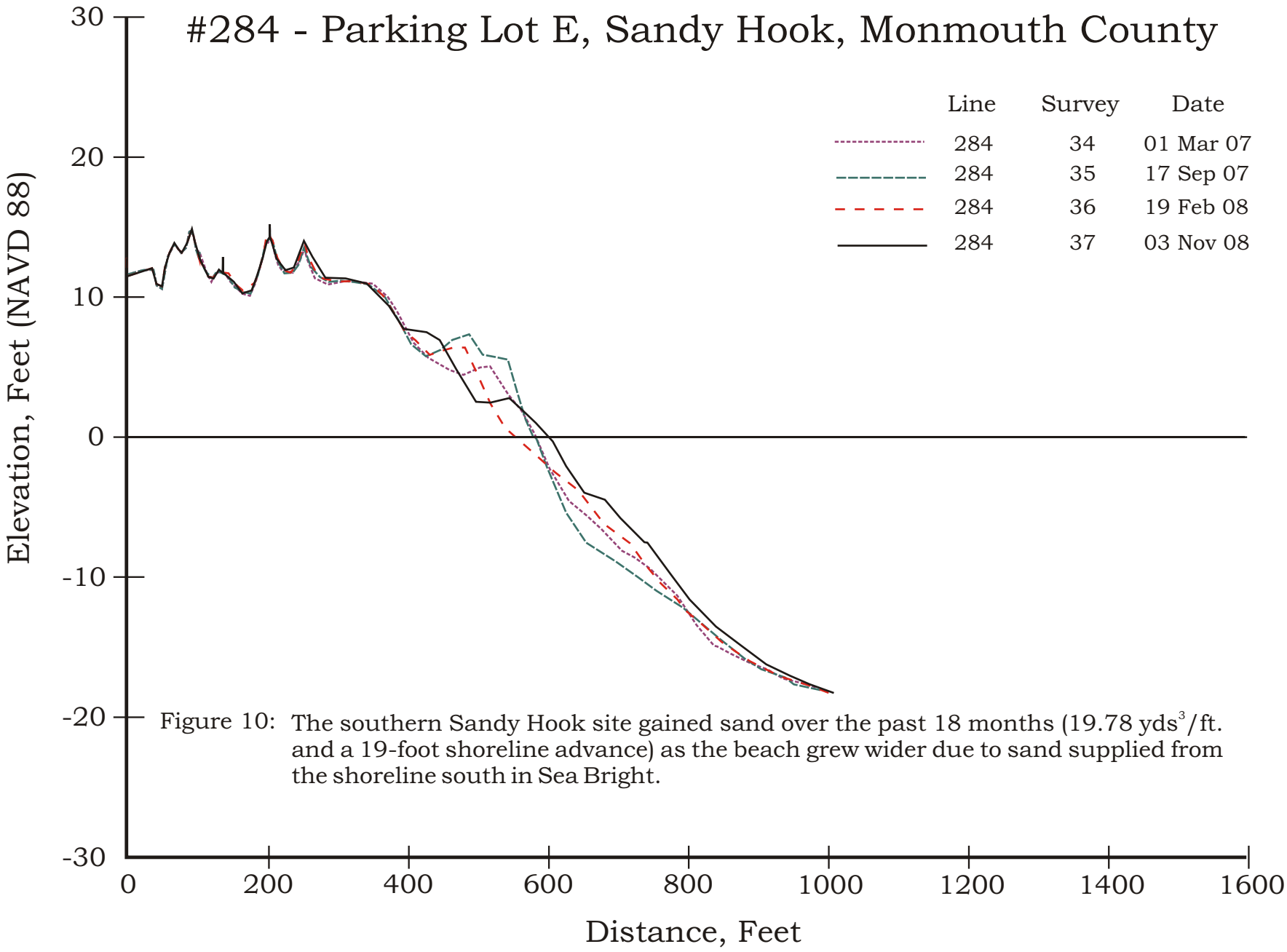



Figure 10: The southern Sandy Hook site gained sand over the past 18 months (19.78 $yds^3$/ft. and a 19-foot shoreline advance) as the beach grew wider due to sand supplied from the shoreline south in Sea Bright.

# SANDY HOOK, HIGHLANDS BEACH - SITE 184

At the north end of the Sea Bright sea wall the beach still looked pretty good with this view to the south on March 1st 2007. The berm and dry beach maintained a constant width with dune growth continuing.

On November 3rd 2008 the beach had advanced 13 feet but the sand volume on the beach had declined by 9.11 $yds^3/ft$. These changes were minimal because the site is transitional between Sandy Hook where the sand is depositing and further south where it is being removed for transport north.

# New Jersey Beach Profile Network

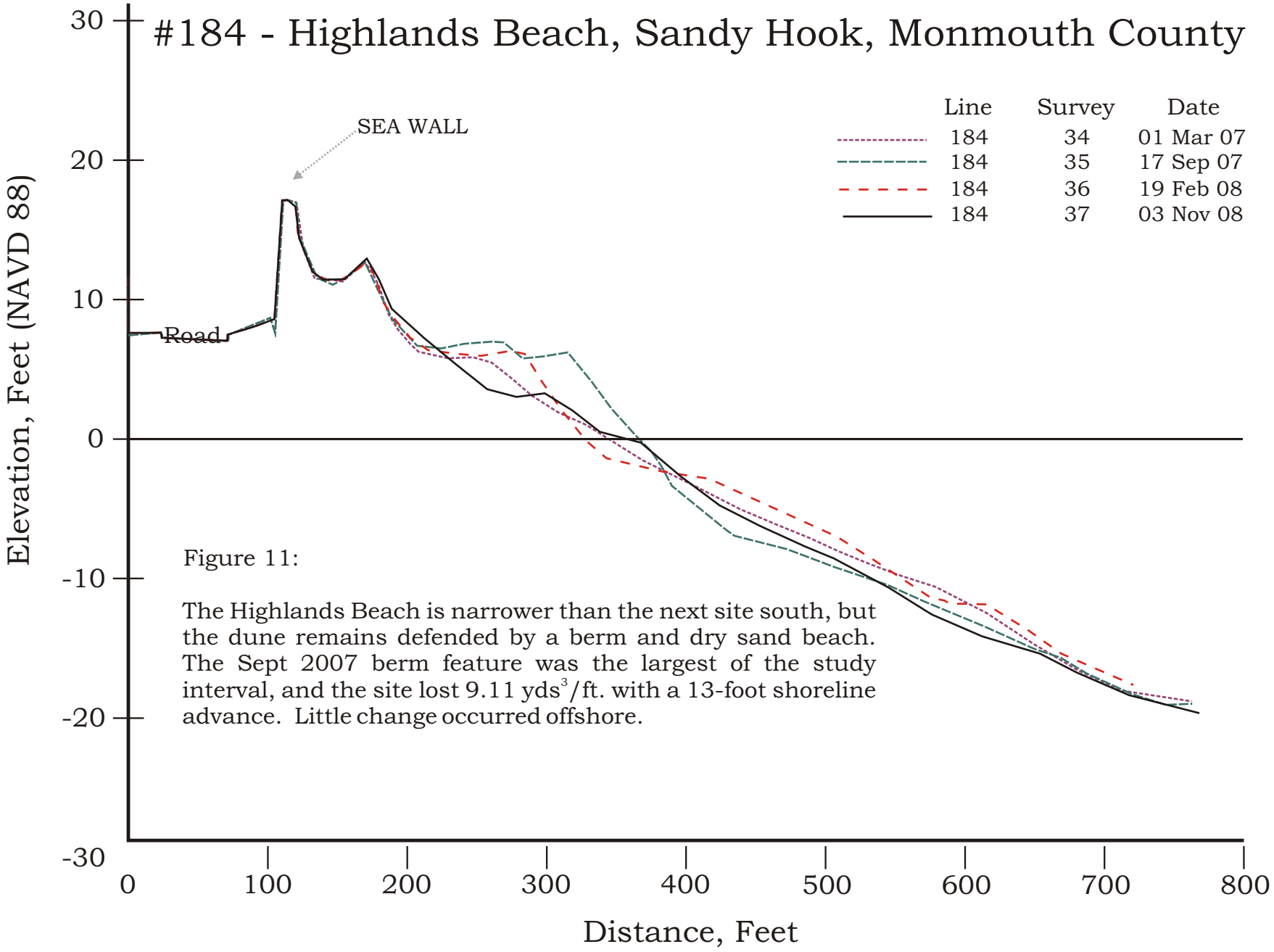



Figure 11:

The Highlands Beach is narrower than the next site south, but the dune remains defended by a berm and dry sand beach. The Sept 2007 berm feature was the largest of the study interval, and the site lost 9.11 $yds^3$/ft. with a 13-foot shoreline advance. Little change occurred offshore.

# VIA RIPA STREET, SEA BRIGHT - SITE 183

The Via Ripa Street site also has a nice dune system that has been growing natrually since 1998. The municipality provided a row or two of snow fencing following the completion of the beach fill and that has been all. Grass is now advancing nicely across the dunes and this shoreline is far different from the pre-fill version. The view to the left was taken April 3rd 2007.

November 4th 2008 finds the beach 6 feet narrower to the zero elevation line with 16.12 fewer cubic yards of sand on each foot of the shore. This loss is insignificant, but the absence of strong northeast storms has helped preserve the stability of this shoreline.

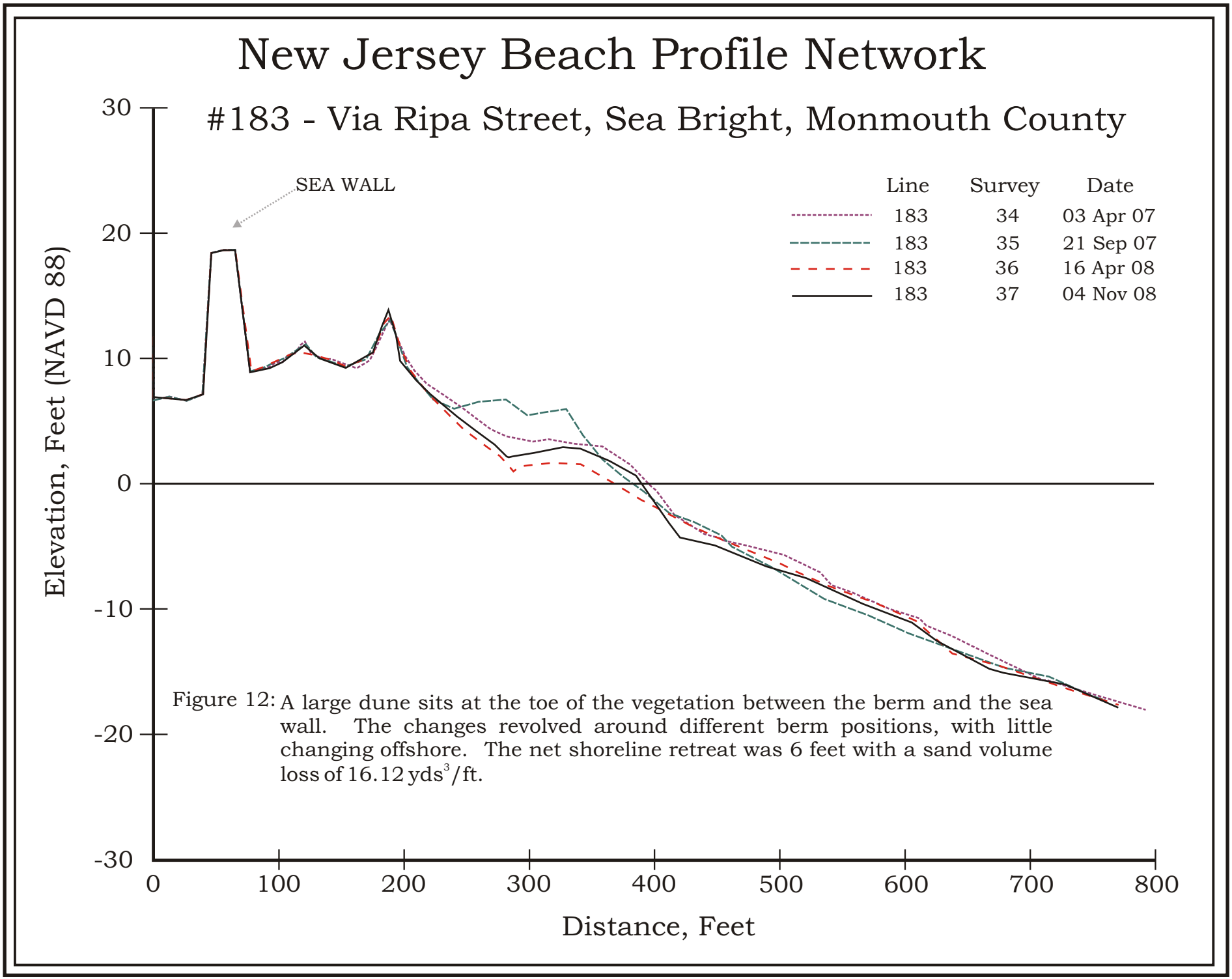



Figure 12: A large dune sits at the toe of the vegetation between the berm and the sea wall. The changes revolved around different berm positions, with little changing offshore. The net shoreline retreat was 6 feet with a sand volume loss of 16.12 $yds^3/ft$.

# SHREWSBURY WAY, SEA BRIGHT - SITE 282

This is a wider beach than the two sites to the north. The dune system is low, but wide and provides a distinct separation from the traffic on the other side of the sea wall. The view is from April 3rd 2007.

Eighteen months of change produced a net gain of 10.12 $yds^3$/ft. and a 63-foot shoreline advance at this site. The view was taken November 4th 2008.

# New Jersey Beach Profile Network

## #282 -Shrewsbury Way, Sea Bright, Monmouth County

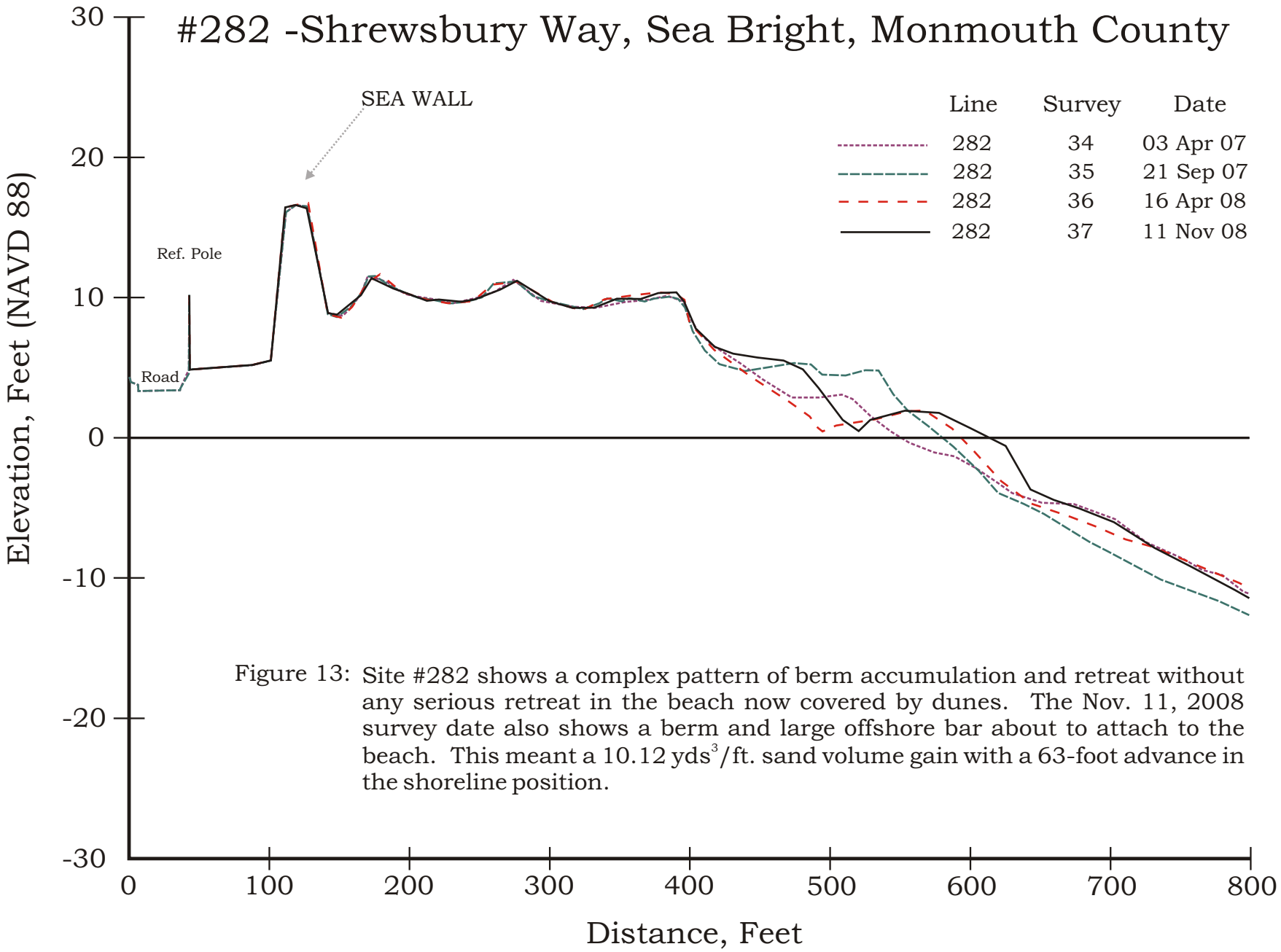



Figure 13: Site #282 shows a complex pattern of berm accumulation and retreat without any serious retreat in the beach now covered by dunes. The Nov. 11, 2008 survey date also shows a berm and large offshore bar about to attach to the beach. This meant a 10.12 $yds^3$/ft. sand volume gain with a 63-foot advance in the shoreline position.

# PUBLIC BEACH, SEA BRIGHT - SITE 182

The beach was added to the public ownership listing about 20 years ago. The shortage of parking is the largest problem for extensive use. This view on April 3rd 2007 shows the dunes and the transition to a dry beach.

By December 1st 2008 the dune grass had been defined by fencing, but grass growth had filled in all bare spots on the dune. This site lost 22.72 $yds^3$/ft. and the shoreline retreated 70 feet. This retreat was oriented toward the fall of 2008 because there was a 4-foot advance in shoreline position by spring 2008.

# New Jersey Beach Profile Network

## #182 - Public Beach Lot, Sea Bright, Monmouth County

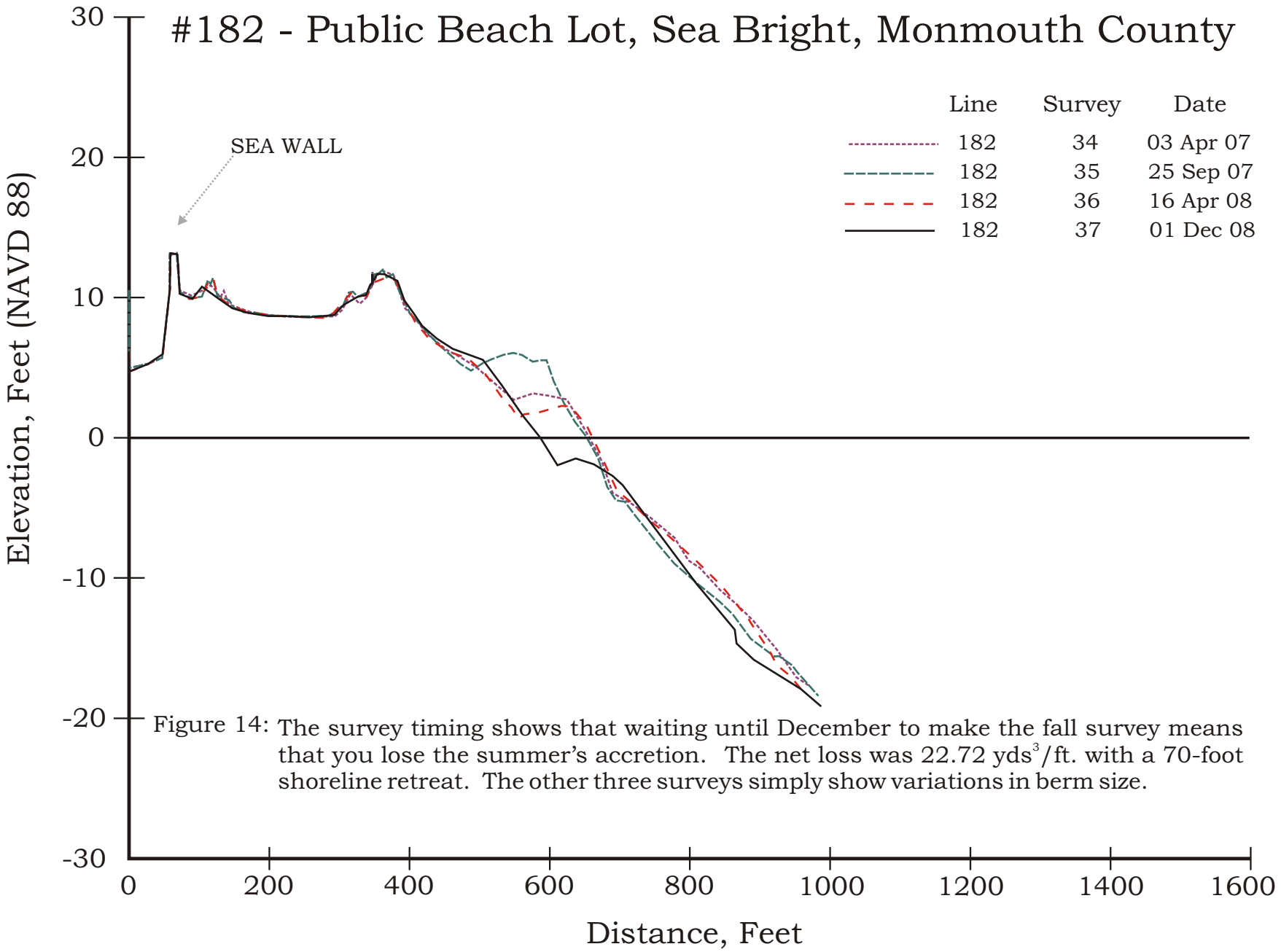



Figure 14: The survey timing shows that waiting until December to make the fall survey means that you lose the summer's accretion. The net loss was 22.72 $yds^3$/ft. with a 70-foot shoreline retreat. The other three surveys simply show variations in berm size.

# MUNICIPAL BEACH, SEA BRIGHT - SITE 181

The municipal beach has heavy use each summer, but still supports a dune system developed to each side of the central pathway to the water's edge and lower dry beach where the blankets are spread out. This view on April 3, 2007 looks to the north toward the dune section on the north side of this beach. Note the sand elevation on the far side of the groin.

Eighteen months later on December 1, 2008 the dune had another row of fencing around it and the grass had matured considerably. The sand elevation on the far side of the groin in the distance had dropped considerably as evidenced by the white water showing where the picture above shows dry sand. The net change at this site was a sand volume loss of 25.05 $yds^3$/ft. with a 44-foot shoreline retreat.

# New Jersey Beach Profile Network

## #181 - Municipal Lot, Sea Bright, Monmouth County

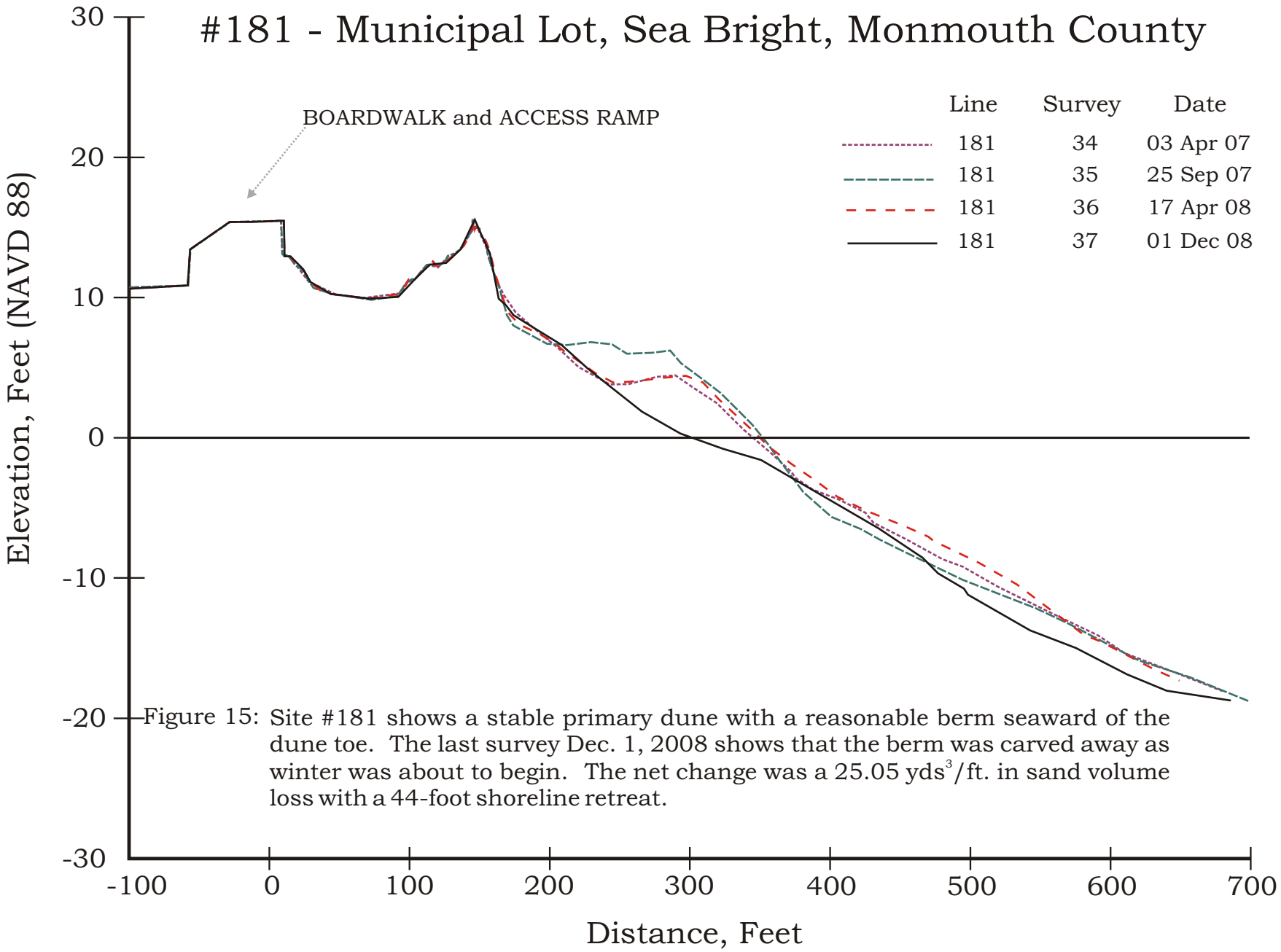



Figure 15: Site #181 shows a stable primary dune with a reasonable berm seaward of the dune toe. The last survey Dec. 1, 2008 shows that the berm was carved away as winter was about to begin. The net change was a 25.05 $yds^3$/ft. in sand volume loss with a 44-foot shoreline retreat.

# SUNSET COURT, SEA BRIGHT - SITE 180

Moving into south Sea Bright, the beach appears to slope upward to the toe of the dune on April 5, 2007.

On November 21, 2008 the dunes are still doing well and the beach appears to be flatter and wider, but that is not the case. The shoreline retreated 10 feet while the sand volume declined by 42.13 $yds^3$/ft. These beaches in the south are the source for material being transported north during episodes when the southeast wave climate dominates the littoral system. The past 24 months have been deficient in northeast storms with an impact showing in the pattern of deposition and erosion along the Monmouth County shoreline.

# New Jersey Beach Profile Network

## #180 - Sunset Court, Sea Bright, Monmouth County

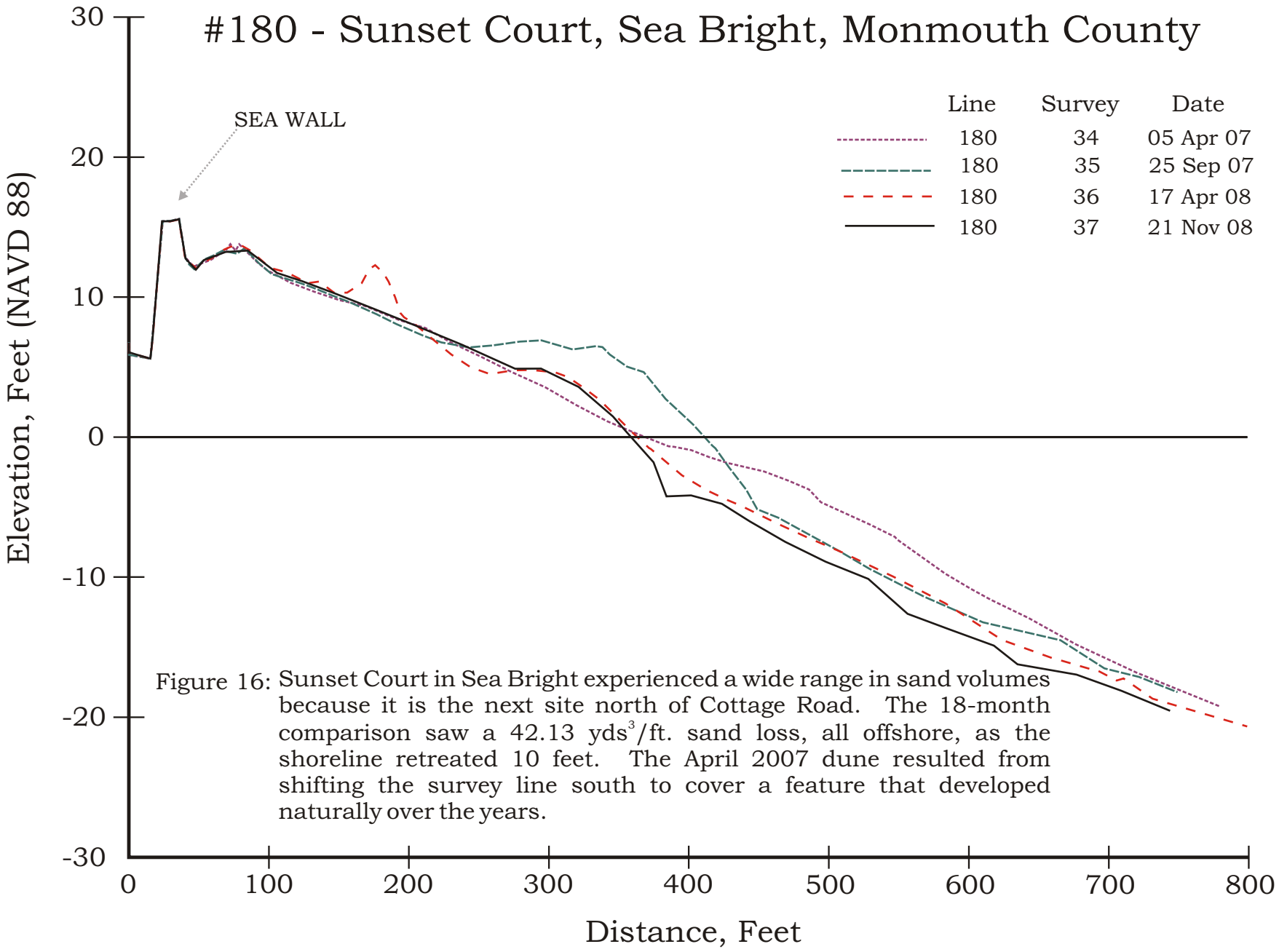



Figure 16: Sunset Court in Sea Bright experienced a wide range in sand volumes because it is the next site north of Cottage Road. The 18-month comparison saw a 42.13 $yds^3$/ft. sand loss, all offshore, as the shoreline retreated 10 feet. The April 2007 dune resulted from shifting the survey line south to cover a feature that developed naturally over the years.

# COTTAGE ROAD, MONMOUTH BEACH - SITE 179

Cottage Road is the southern source area for sand when littoral currents are moving north toward Sandy Hook. This April 5, 2007 view shows a scarp in the dune toe and a narrow beach stretching to the north. The losses were just beginning at the end of 2006 and became considerably worse as the year moved along into 2008.

By November 21, 2008 the erosion had pushed the dune back to within 30 feet of the rock sea wall. The loss in just the dune was -2.90; -26.51; and -10.05 $yds^3$/ft. at each of the six-month intervals between April 2007 and November 2008. The same interval total sand volume change was -40.46; -30.33; and -28.52 $yds^3$/ft. for a total sand volume loss of 98.66 $yds^3$/ft. Shoreline retreat was -7-feet; -47-feet; and +28-feet each interval. The last advance in shoreline was related to the flattening of the profile slope.

The last northeast storm was May 12, 2008, the fourth in a short series of mild storms that started in early April. There have been few instances with winds in excess of 20 MPH since 2005, so the balance of transport has shifted to sand movement from south to north, but the blocker is the groin system originally built to protect the Monmouth Beach Club from northeast storms prior to the beach fill. Today, little sand from the south can come around these structures, leaving site #179 as the source.

# New Jersey Beach Profile Network

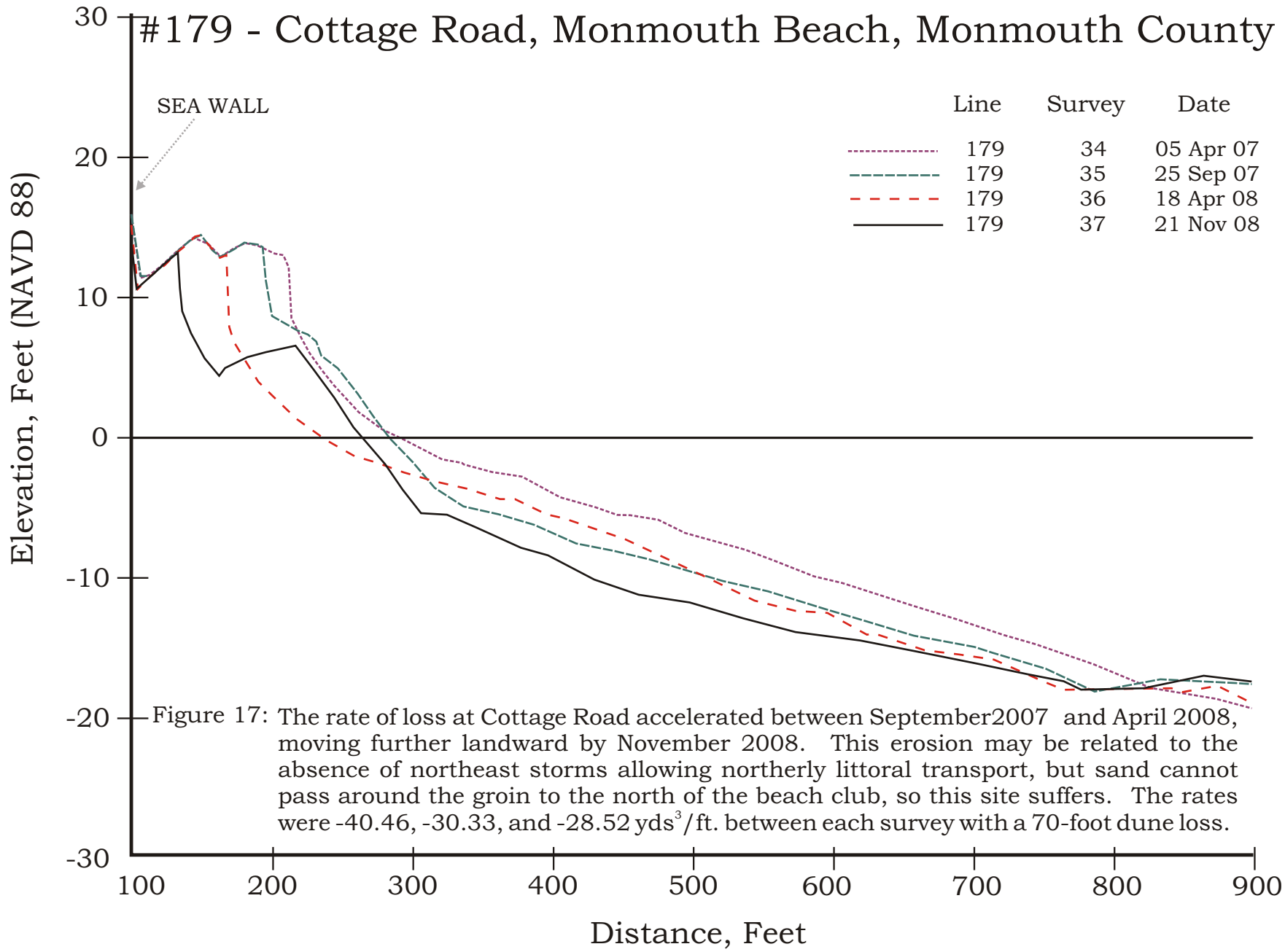



Figure 17: The rate of loss at Cottage Road accelerated between September2007 and April 2008, moving further landward by November 2008. This erosion may be related to the absence of northeast storms allowing northerly littoral transport, but sand cannot pass around the groin to the north of the beach club, so this site suffers. The rates were -40.46, -30.33, and -28.52 $yds^3/ft.$ between each survey with a 70-foot dune loss.

# MONMOUTH BEACH CLUB, MONMOUTH BEACH - SITE 178

The Monmouth Beach Club shoreline lies south of the big groin complex just south of Cottage Road. Here the beach gained sand between April 5, 2007 and November 20, 2008 (0.55 $yds^3$/ft. with a 5-foot shoreline advance). While not terribly significant in terms of sand volume increases, this gain would indicate that something is radically different from conditions experienced about 5,000 feet north at Cottage Road.

By November 20, 2008 the dune was re-fenced and the beach lost a 5.21 $yds^3$/ft. sand volume from the berm to the offshore regions. The net change was very small, but still positive. Sand transport around the Monmouth Beach Club area has been continuously difficult since the ACOE project was built.

# New Jersey Beach Profile Network

## #178 - Monmouth Beach Club, Monmouth County

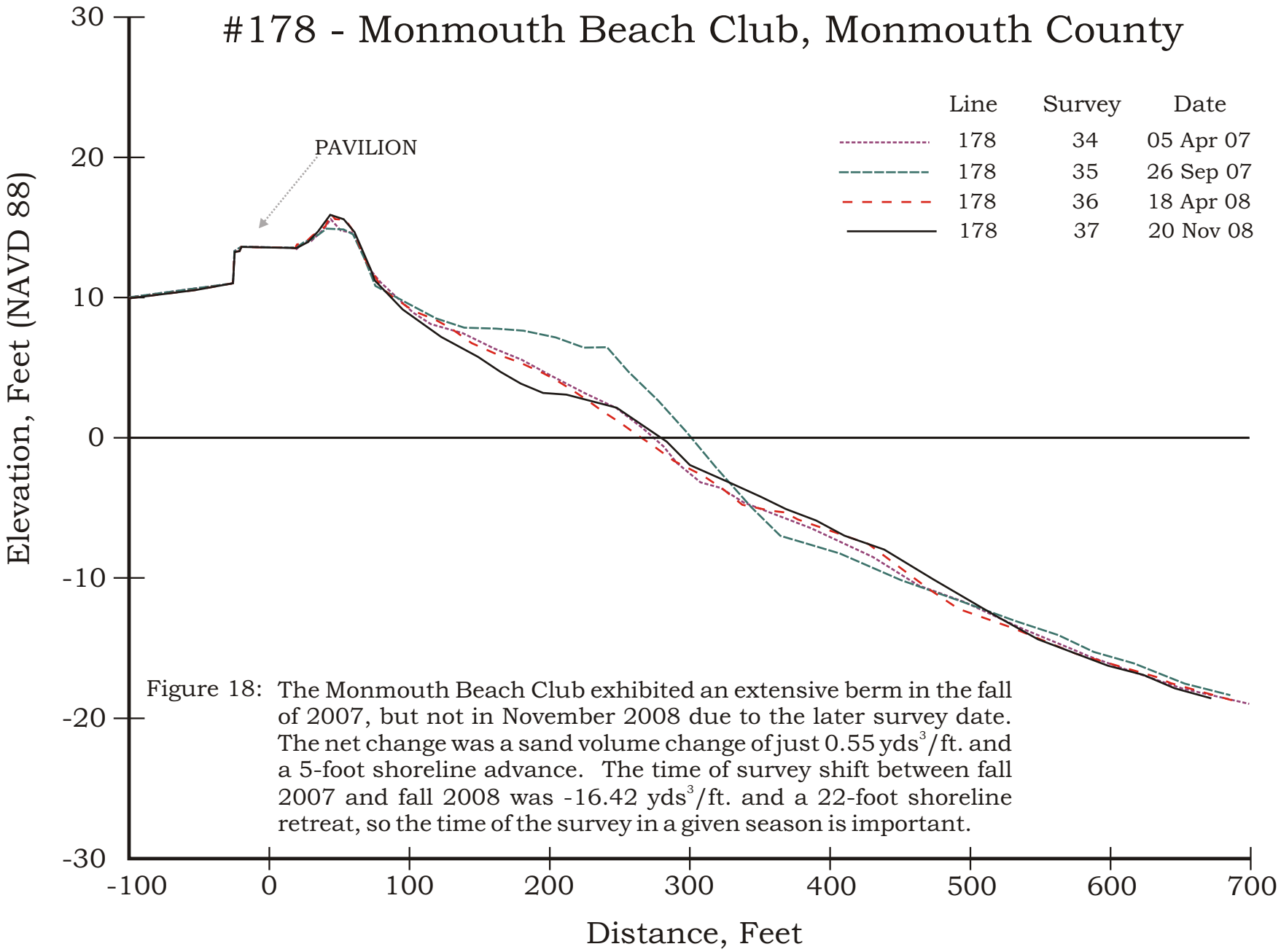



Figure 18: The Monmouth Beach Club exhibited an extensive berm in the fall of 2007, but not in November 2008 due to the later survey date. The net change was a sand volume change of just 0.55 $yds^3$/ft. and a 5-foot shoreline advance. The time of survey shift between fall 2007 and fall 2008 was -16.42 $yds^3$/ft. and a 22-foot shoreline retreat, so the time of the survey in a given season is important.

# 404 OCEAN AVENUE, LONG BRANCH - SITE 177

Relative stability has prevailed at site #177 since September 26, 2007. The beach and dune system are stable. Low recreational activity leaves the dune grass free to extend onto the beach, moving the dune seaward.

Changes up to November 20, 2008 resulted in a shoreline advance of less than a half foot, but a sand volume loss of 7.19 $yds^3$/ft. made for a slight reduction in material. The site was essentially stable over this study interval.

# New Jersey Beach Profile Network

## #177 - Ocean Avenue, Long Branch, Monmouth County

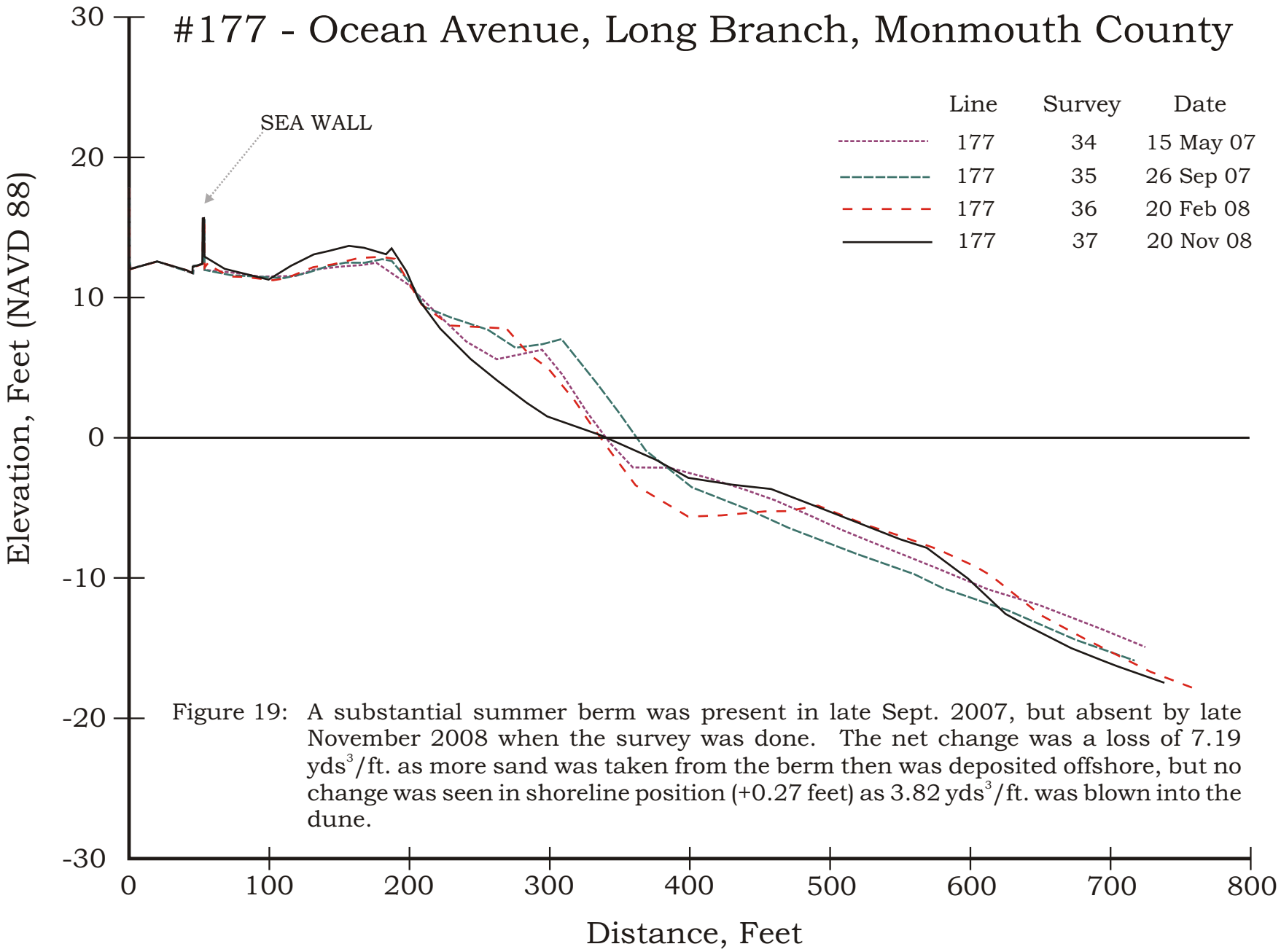



Figure 19: A substantial summer berm was present in late Sept. 2007, but absent by late November 2008 when the survey was done. The net change was a loss of 7.19 $yds^3/ft.$ as more sand was taken from the berm then was deposited offshore, but no change was seen in shoreline position (+0.27 feet) as 3.82 $yds^3/ft.$ was blown into the dune.

# SEVEN PRESIDENTS PARK, MONMOUTH BEACH - SITE 176

At the Seven Presidents Park the beach had a broad flat slope to the water from a narrow segment of flat dry beach. The dunes grew somewhat as well. This view was taken May 15, 2007.

This November 17, 2008 view shows the same configuration after 18 months, but the beach was 14 feet narrower as the shoreline moved landward and 17.86 $yds^3$/ft. of sand volume moved elsewhere. The rate of loss was relatively low.

# New Jersey Beach Profile Network

## #176 - Seven Presidents Park, Monmouth County

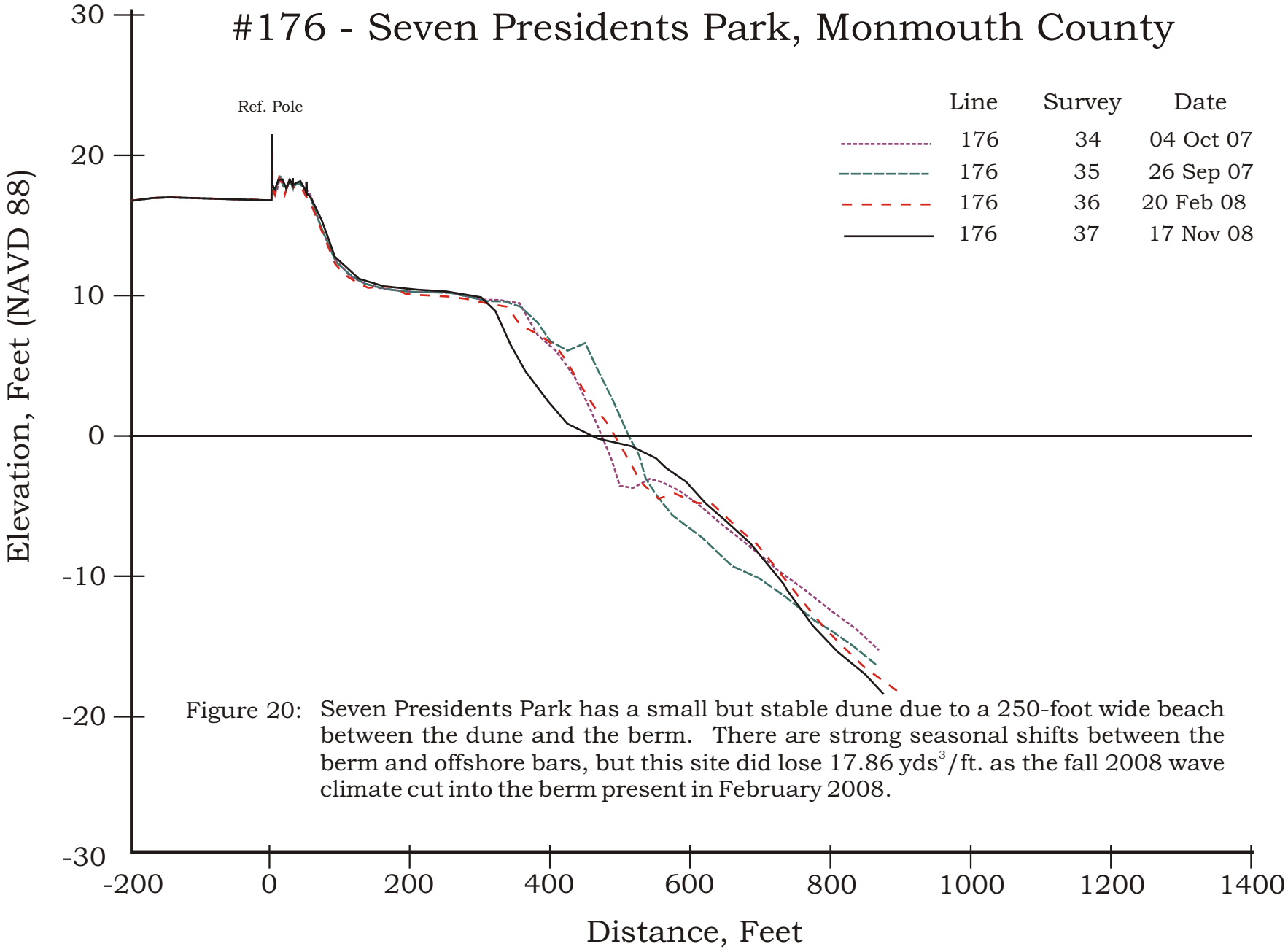



Figure 20: Seven Presidents Park has a small but stable dune due to a 250-foot wide beach between the dune and the berm. There are strong seasonal shifts between the berm and offshore bars, but this site did lose 17.86 $yds^3$/ft. as the fall 2008 wave climate cut into the berm present in February 2008.

# BROADWAY AVENUE, LONG BRANCH - SITE 175

The old rusted steel showing in both photographs is the top of the 70-year old vertical steel bulkhead used to defend the uplands bluff. The view taken May 15, 2007 shows the sand ramped up to the top of the wall where it was once over 15 feet straight down to a tiny beach. No dunes ever developed at this site due to extensive recreational activity.

By November 17, 2008 the shoreline had advanced by 10 feet, but the sand volume had declined by 16.61 $yds^3/ft$. This beach has narrowed since completed in 1997, but sand was placed to this point in 2009 as the ACOE performed a maintenance designed to offset the end effect losses from here south in Long Branch.

# New Jersey Beach Profile Network

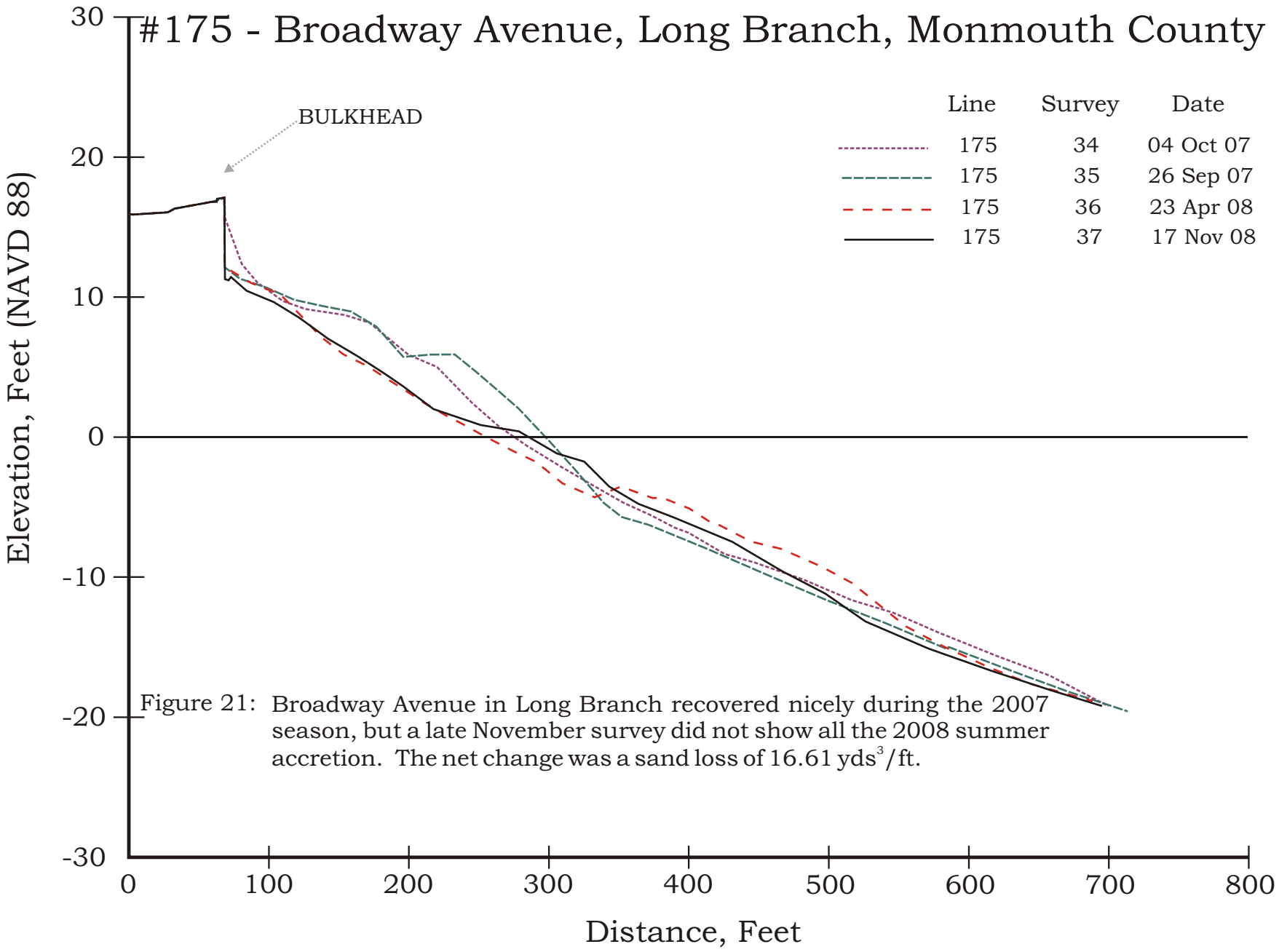



Figure 21: Broadway Avenue in Long Branch recovered nicely during the 2007 season, but a late November survey did not show all the 2008 summer accretion. The net change was a sand loss of 16.61 $yds^3$/ft.

# MORRIS AVENUE, LONG BRANCH - SITE 174

This central area of the Long Branch municipal beach is defended by both groins and a rock sea wall at the bluff. Some retreat has occurred here since the artificial end of the project is but one additional survey site away to the south. This May 30, 2007 view shows the rocks and stray grass plants that have established up the slope toward the pedestrian walk.

The November 17, 2008 view shows nearly a similar sight with a sand loss of 11.96 $yds^3$/ft. and a 32-foot shoreline retreat. This area received sand in 2009 as the ACOE performed a maintenance on the southern end of the Long Branch beaches.

# New Jersey Beach Profile Network

## #174 - Morris Avenue, Long Branch, Monmouth County

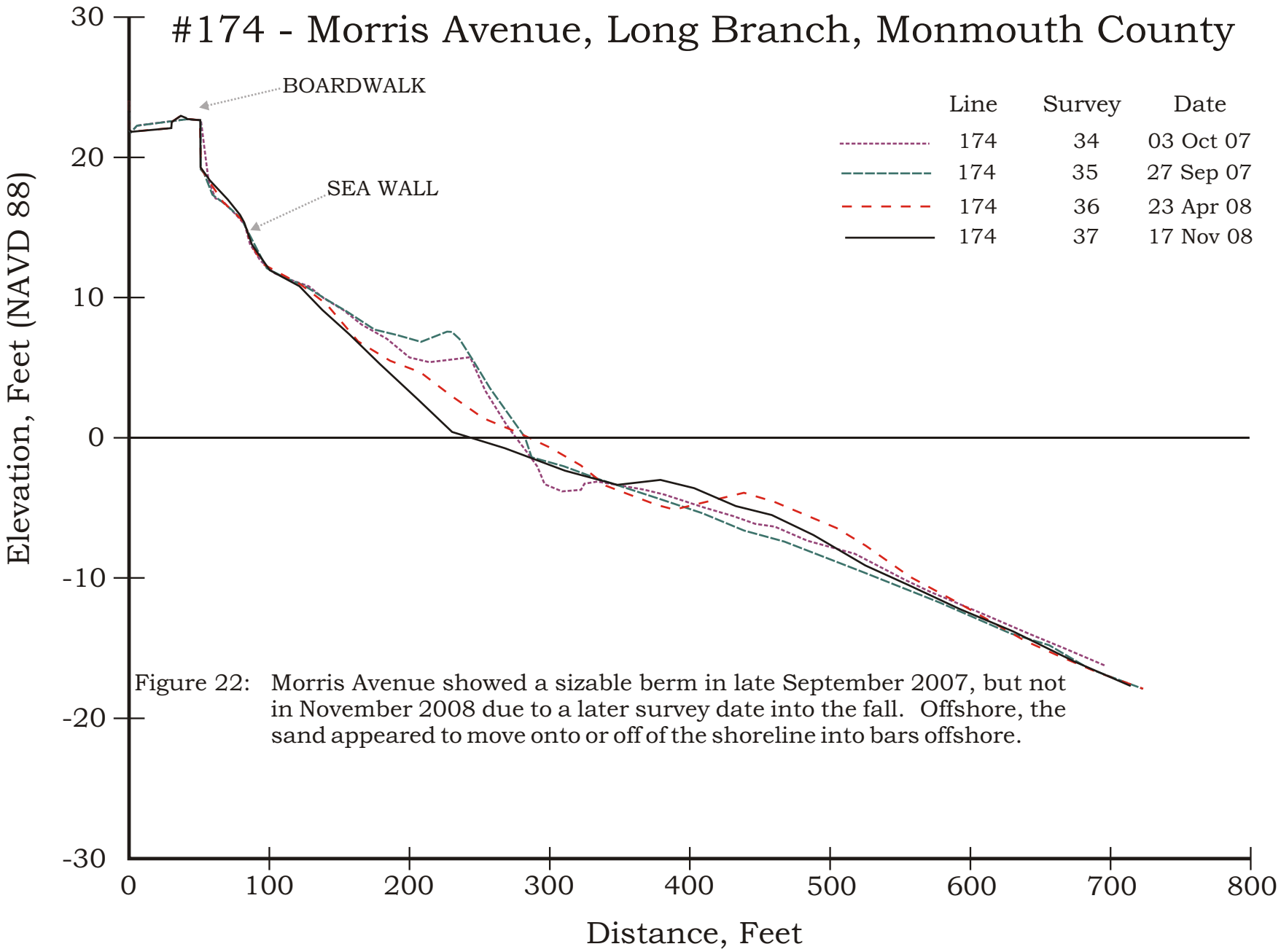



Figure 22: Morris Avenue showed a sizable berm in late September 2007, but not in November 2008 due to a later survey date into the fall. Offshore, the sand appeared to move onto or off of the shoreline into bars offshore.

# WEST END AVENUE, LONG BRANCH - SITE 173

This is the southernmost survey site within the Long Branch to Sandy Hook segment of the Monmouth County beach fill. The deposition stopped just south of here due to real estate issues along privately owned oceanfront tracts in Elberon and Deal into Allenhurst. This view was taken May 30, 2007 and shows the top of the bluff, the rock sea wall and the remaining beach between the groins.

This view on November 12, 2008 shows that some changes did occur with a loss of 12.53 $yds^3$/ft. and a 0.23-foot shoreline retreat. These losses were not terrific due to the presence of a strong shift in the equilibrium toward northern sand movement over the past 24 months. The 2009 beach restoration maintenance fill augmented this site substantially by March 2009.

# New Jersey Beach Profile Network

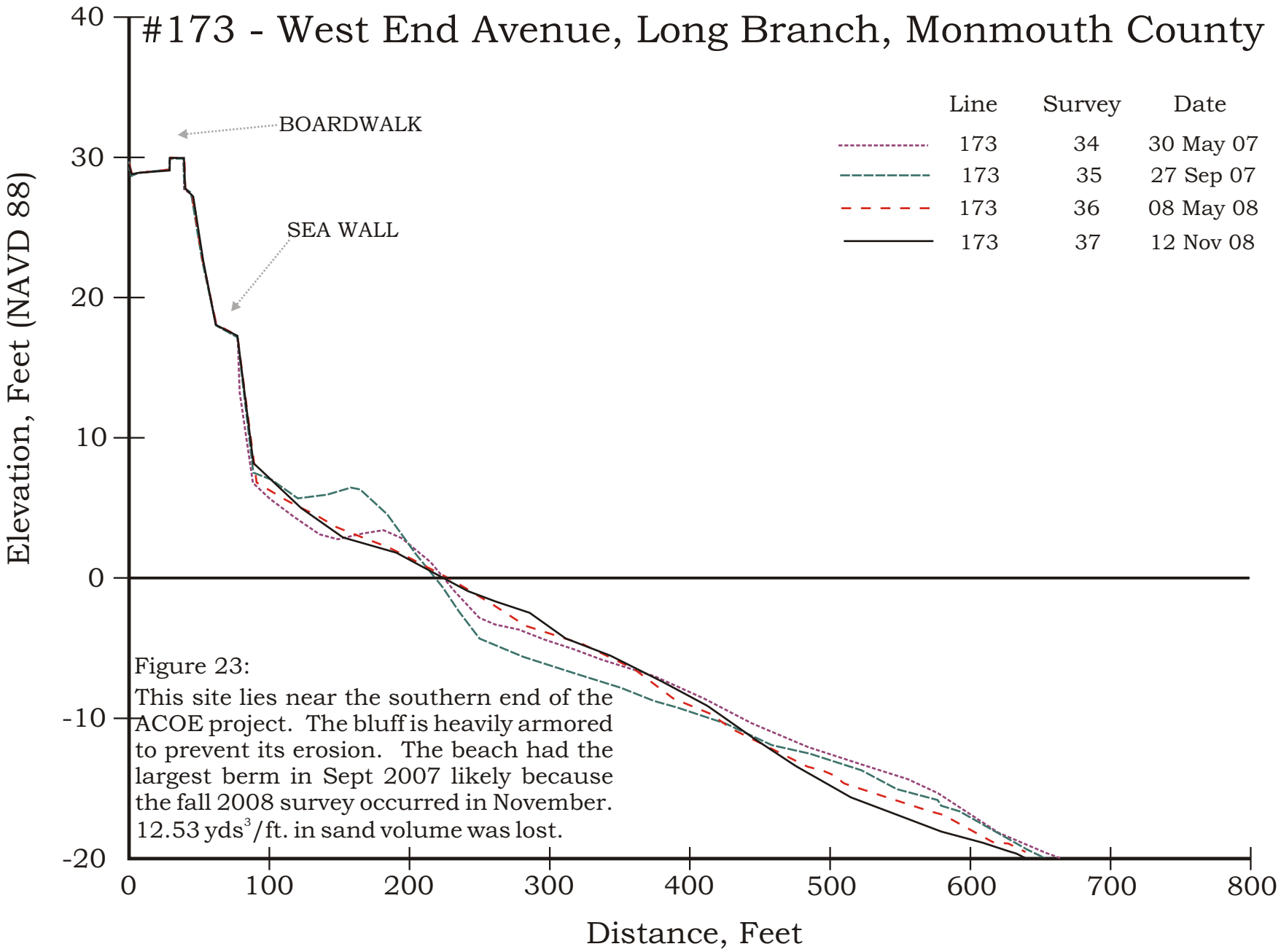



Figure 23:
This site lies near the southern end of the ACOE project. The bluff is heavily armored to prevent its erosion. The beach had the largest berm in Sept 2007 likely because the fall 2008 survey occurred in November. 12.53 $yds^3/ft.$ in sand volume was lost.

# PULLMAN AVENUE, ELBERON - SITE 171

Located on the highest elevation along the Monmouth County bluff, this site lies about a mile south of the southern end of the beach fill in Long Branch. On May 31, 2007 the waves were breaking just short of the rock revetment placed seaward of the ancient steel bulkhead at the bluff. Occasionally since the project was completed, there has been sand at the base of these rocks at high tide. The material comes and goes to the offshore.

On November 10, 2008 the view shows the entire bluff, the flat terrace between the steel bulkhead and the bluff and a relative distant view of the shoreline. This area lost 3.91 $yds^3$/ft. and saw a 1-foot shoreline advance in the zero elevation position. Change is relatively limited without any sizable source of sand.

# New Jersey Beach Profile Network

## #171 - Pullman Avenue, Elberon, Monmouth County

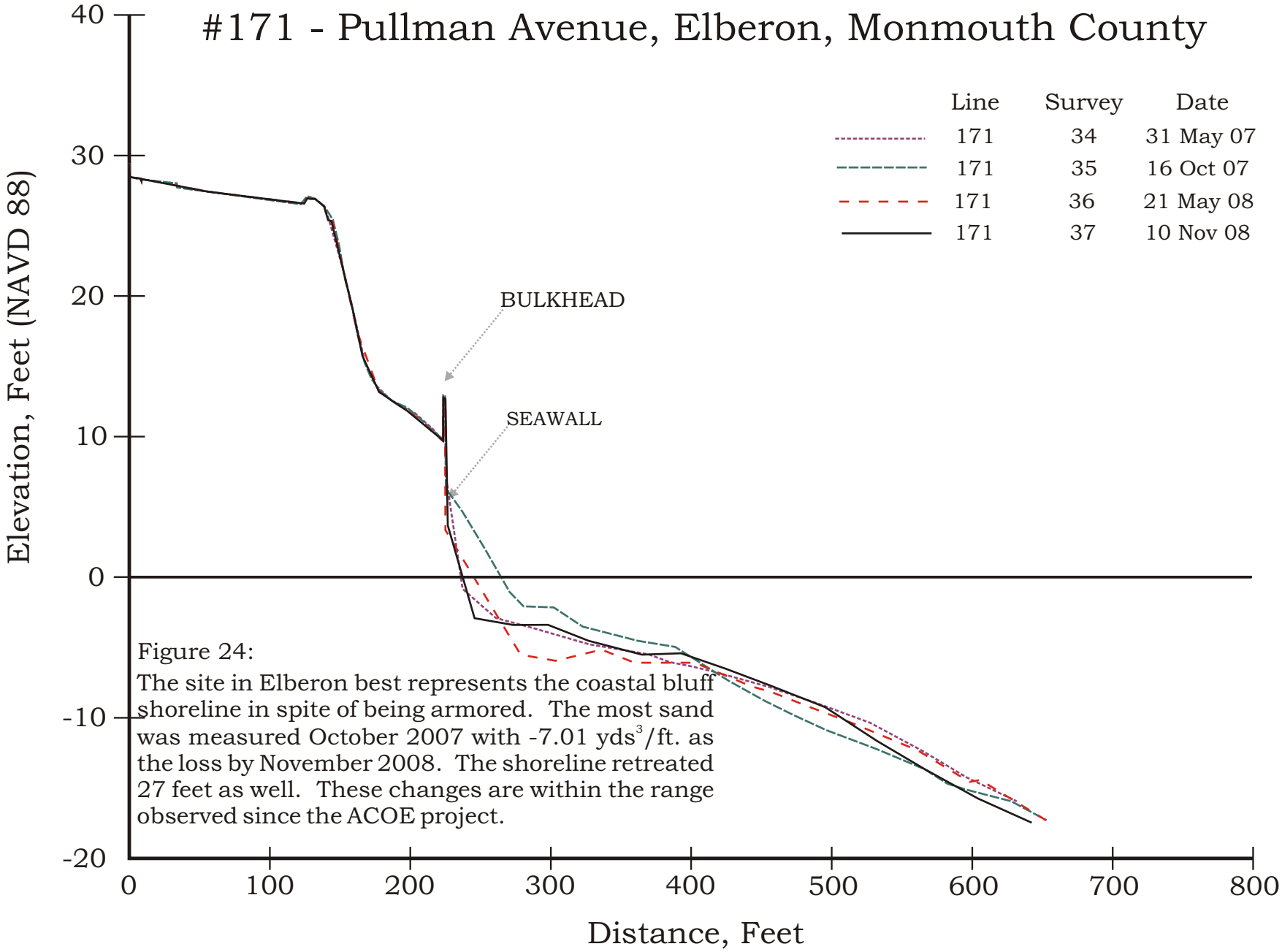



Figure 24:
The site in Elberon best represents the coastal bluff shoreline in spite of being armored. The most sand was measured October 2007 with -7.01 $yds^3/ft.$ as the loss by November 2008. The shoreline retreated 27 feet as well. These changes are within the range observed since the ACOE project.

# ROOSEVELT AVENUE, DEAL - SITE 170

This view to the north along the rock-armored shoreline of Deal shows a small sand pocket trapped against the northern groin in the cell being surveyed on May 31, 2007. Sand shifts north to south within the cell, but little new material can move laterally along the shoreline. Groins every 700 to 1,000 feet make that impossible.

The November 10, 2008 view with the same perspective shows a pocket filled with a little additional sand. The net change in sand volume was 3.17 $yds^3$/ft. The shoreline position at the profile line moved 7 feet seaward at the zero elevation. The seasonal comparisons showed small losses between May and October 2007 and between October 2007 and May 2008, followed by an 11.78 $yds^3$/ft. gain between May and November 2008.

# New Jersey Beach Profile Network

## #170 - Roosevelt Avenue, Deal, Monmouth County

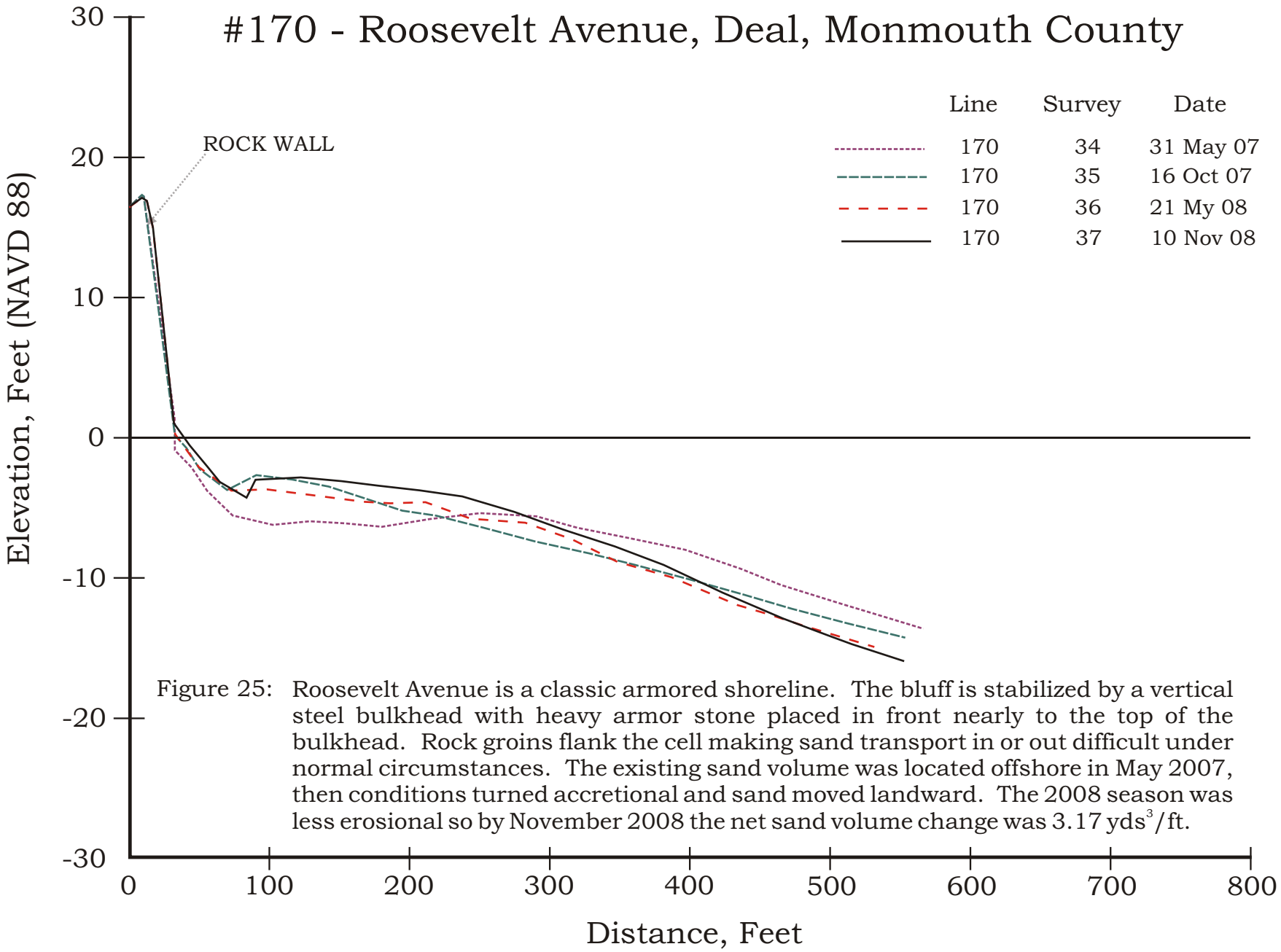



Figure 25: Roosevelt Avenue is a classic armored shoreline. The bluff is stabilized by a vertical steel bulkhead with heavy armor stone placed in front nearly to the top of the bulkhead. Rock groins flank the cell making sand transport in or out difficult under normal circumstances. The existing sand volume was located offshore in May 2007, then conditions turned accretional and sand moved landward. The 2008 season was less erosional so by November 2008 the net sand volume change was 3.17 $yds^3/ft$.

# DARLINGTON AVENUE, DEAL - SITE 169

Darlington Avenue in Deal has the best preserved bluff shoreline anywhere along the Monmouth County coast. On May 30, 2007 the beach had a berm protecting the toe of the bluff. The sand had ramped up the slope and was vegetated. Recently, owners have placed rock along the toe of the bluff to the south of the line at Darlington Avenue.

The 18 months of study found a sand volume gain of 4.78 $yds^3$/ft. and a 12-foot shoreline advance by November 12, 2008. The groin complex to the south is in Allenhurst and effectively prevents any sand escaping from the Asbury Park to Manasquan segment of the Monmouth County project from ever reaching this site.

# New Jersey Beach Profile Network

## #169 - Darlington Avenue, Deal, Monmouth County

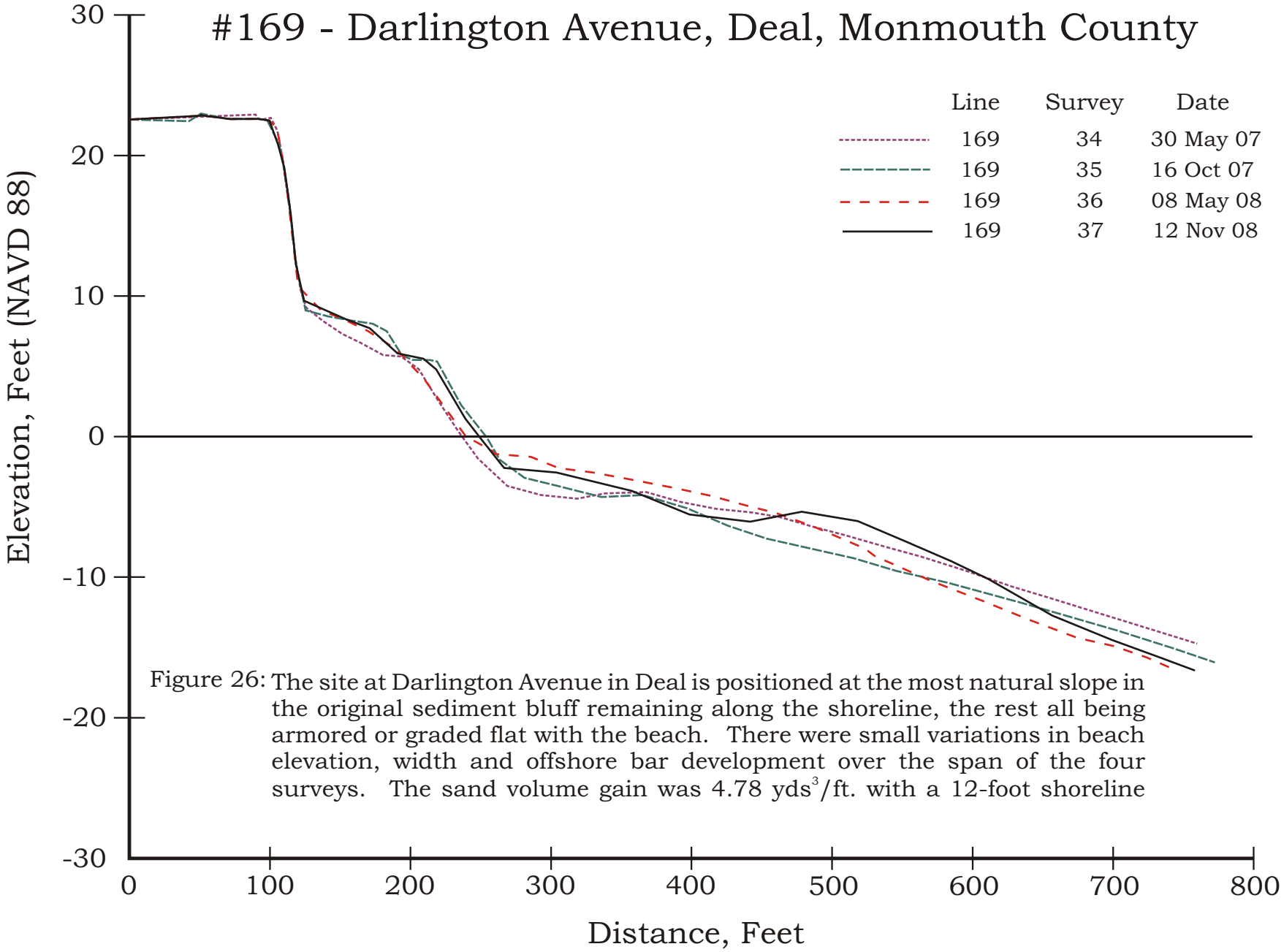



Figure 26: The site at Darlington Avenue in Deal is positioned at the most natural slope in the original sediment bluff remaining along the shoreline, the rest all being armored or graded flat with the beach. There were small variations in beach elevation, width and offshore bar development over the span of the four surveys. The sand volume gain was 4.78 $yds^3$/ft. with a 12-foot shoreline

# CORLIES AVENUE, ALLENHURST - SITE 168

The Allenhurst beach is located in front of an old concrete seawall built to protect the easily eroded bluff years ago. It has survived many storms. By May 31, 2007 the beach was wider than it had been in decades due to sand escape from the groin seen to the south that retains the Asbury Park section of the Federal fill. For some reason neither Loch Arbor (a one-block wide oceanfront community) nor Allenhurst chose to participate in the US Army Corps Monmouth County project.

By October 31, 2008 the beach had gained 40.11 $yds^3/ft.$ while the shoreline advanced 11 feet. The upper photograph looks as if the beach were wider, but that photograph was zoomed in considerably compared to the one to the left. Sand has been trickling in from Asbury Park since 1999 as the past several years of monitoring has detected.

# New Jersey Beach Profile Network

## #168 - Corlies Avenue, Allenhurst, Monmouth County

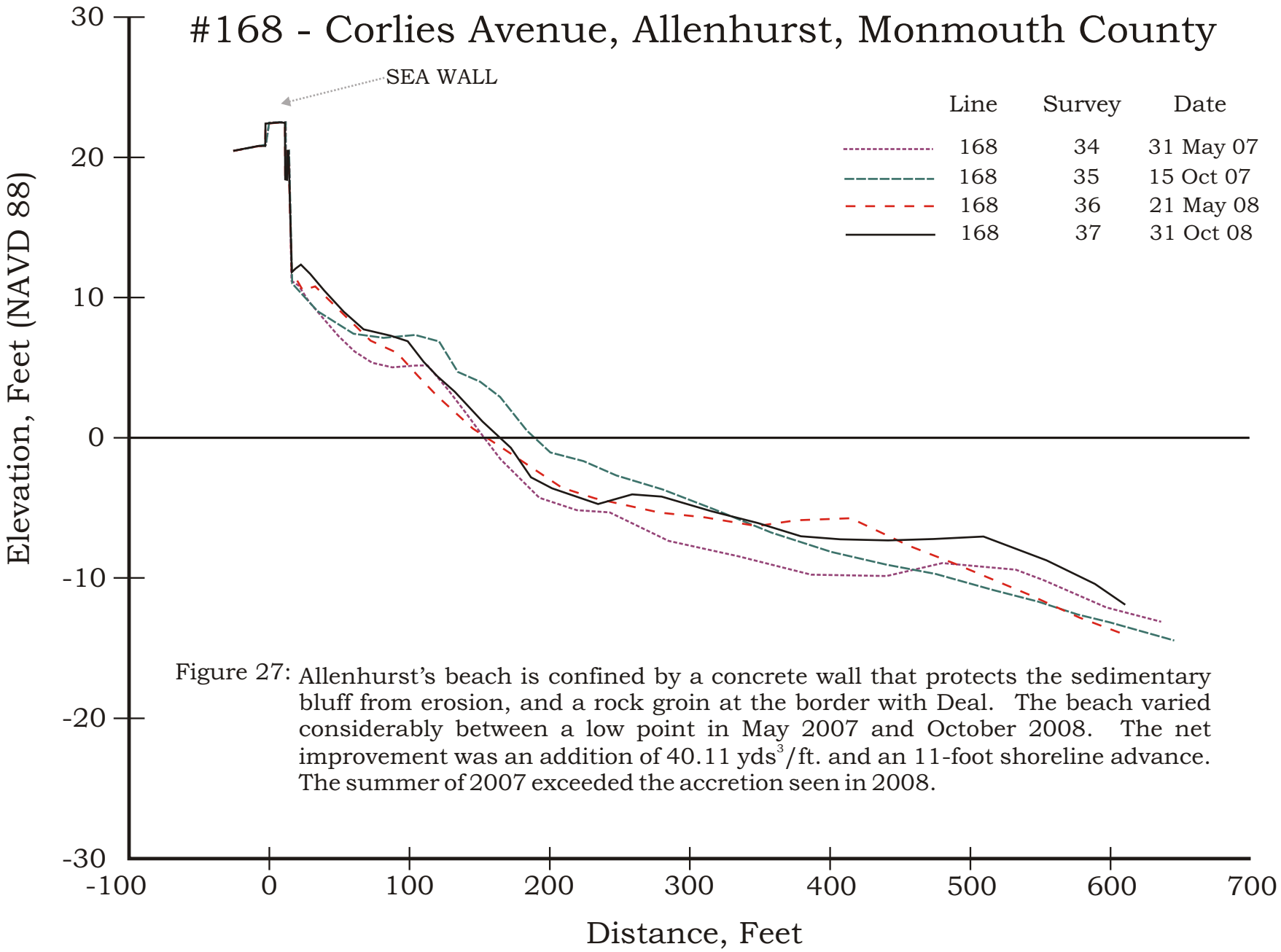



Figure 27: Allenhurst's beach is confined by a concrete wall that protects the sedimentary bluff from erosion, and a rock groin at the border with Deal. The beach varied considerably between a low point in May 2007 and October 2008. The net improvement was an addition of 40.11 $yds^3$/ft. and an 11-foot shoreline advance. The summer of 2007 exceeded the accretion seen in 2008.

# 7th AVENUE, ASBURY PARK - SITE 267

Located at the northern end of the south segment of the Monmouth County project, this Asbury Park beach has retained most of the initial deposit of sand. No maintenance has been done since completion in 1999. This June 7, 2007 photograph shows no dune was ever created following the fill.

This beach lost 5.04 $yds^3$/ft. by this October 31, 2008 photograph and the shoreline retreated less than a foot (-0.41 ft.). The rate of loss has been very low given that the groin is all that holds in the northern end of the fill project.

# New Jersey Beach Profile Network

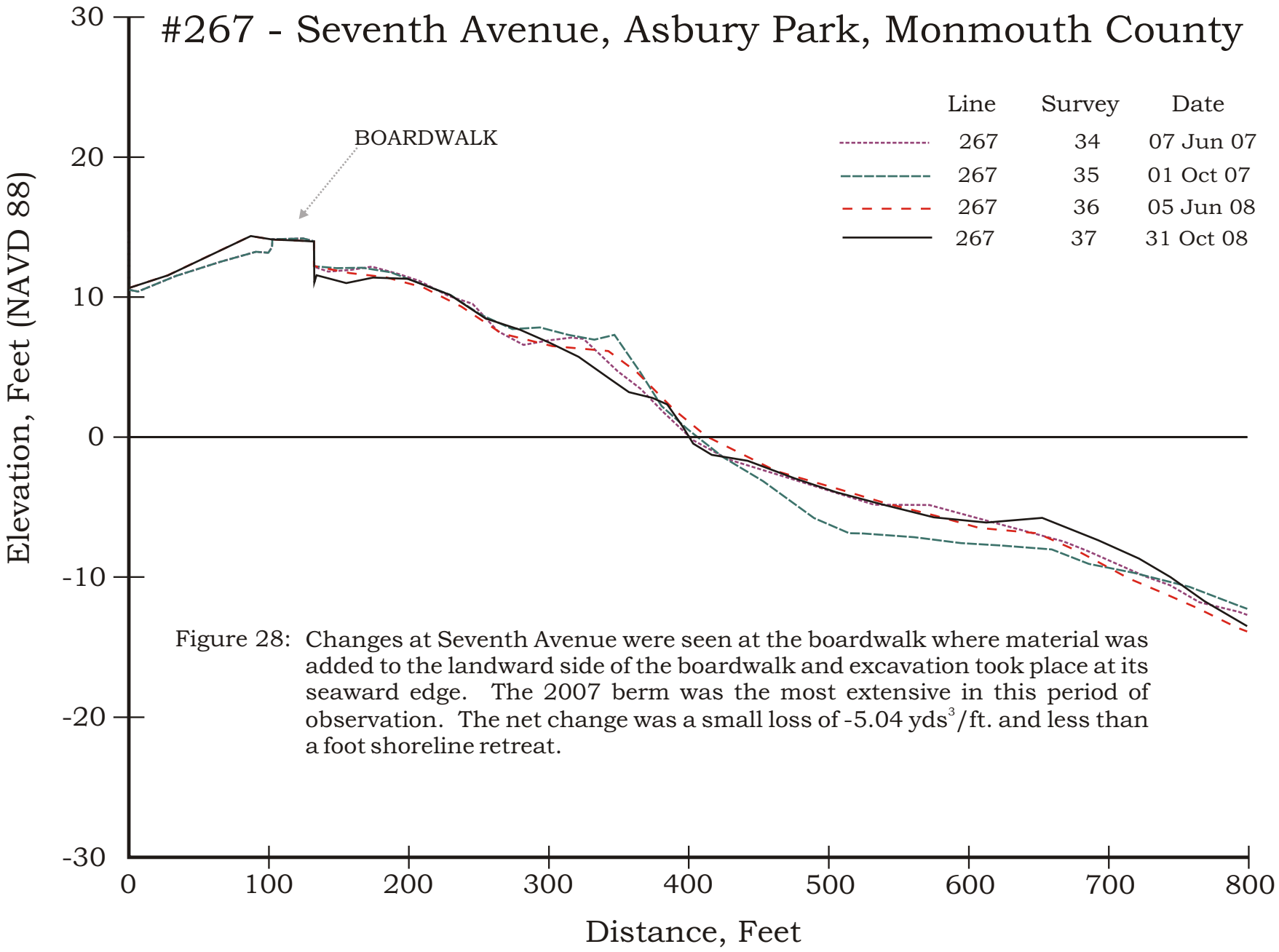



Figure 28: Changes at Seventh Avenue were seen at the boardwalk where material was added to the landward side of the boardwalk and excavation took place at its seaward edge. The 2007 berm was the most extensive in this period of observation. The net change was a small loss of -5.04 $yds^3$/ft. and less than a foot shoreline retreat.

# 3rd AVENUE, ASBURY PARK - SITE 167

The middle of the Asbury Park beach is wide and very flat with no dune. The recreational use precludes a natural dune from forming and no municipal work was done to force a dune to grow near the boardwalk. The photograph was taken June 7, 2007.

By October 31, 2008 the site had lost 8.57 $yds^3$/ft. with a 1.5-foot retreat in the shoreline position.

# New Jersey Beach Profile Network

## #167 - Third Avenue, Asbury Park, Monmouth County

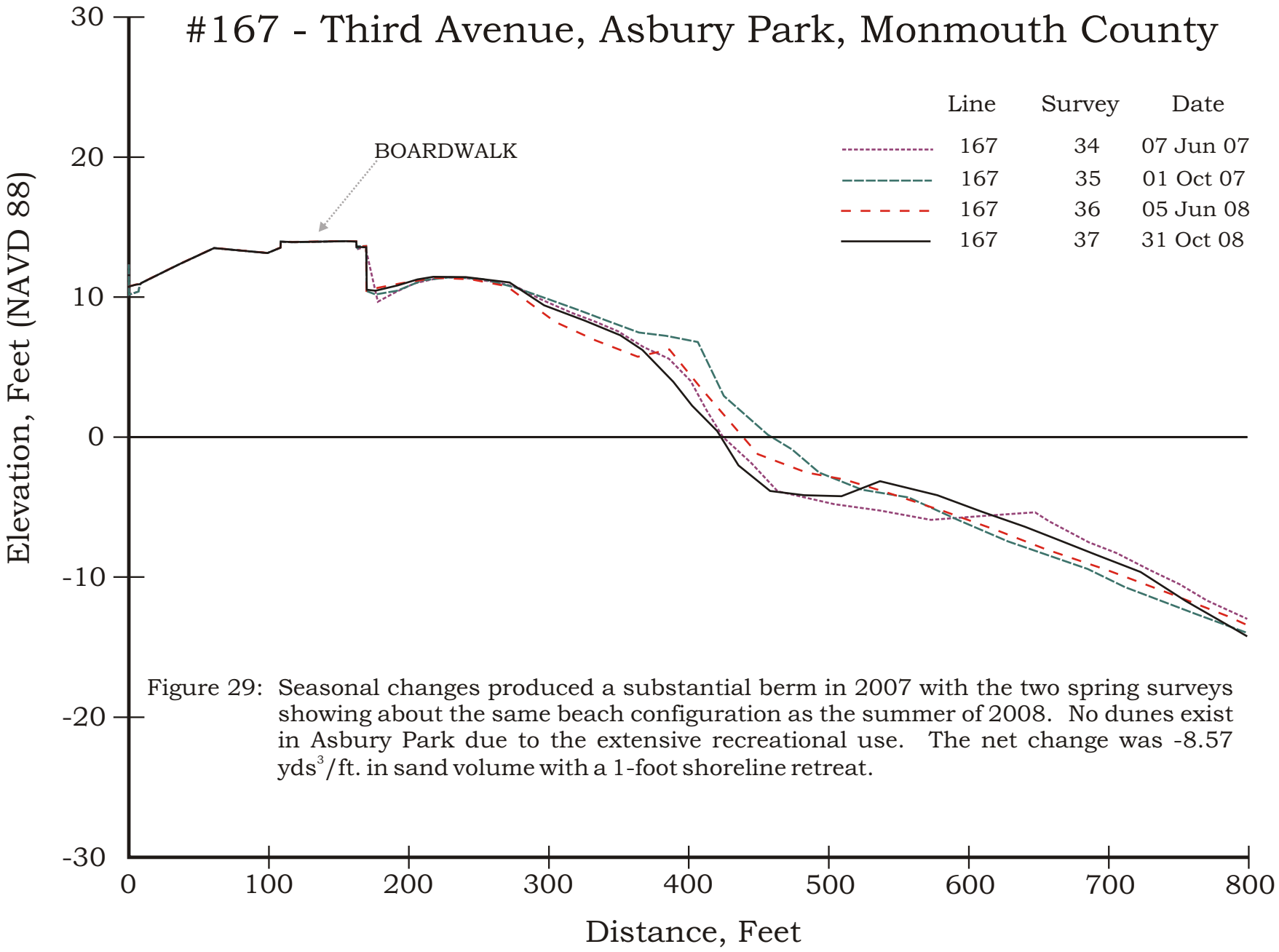



Figure 29: Seasonal changes produced a substantial berm in 2007 with the two spring surveys showing about the same beach configuration as the summer of 2008. No dunes exist in Asbury Park due to the extensive recreational use. The net change was -8.57 $yds^3/ft.$ in sand volume with a 1-foot shoreline retreat.

# OCEAN PATHWAY, OCEAN GROVE - SITE 166

Ocean Grove has an equally wide beach as Asbury Park, but took steps to create a dune between the beach and the boardwalk. This June 7, 2007 photograph shows just the berm and beachface looking north.

October 30, 2008 shows a small loss of 3.33 $yds^3$/ft., but the shoreline advanced 10 feet seaward over 18 months. The beach width has remained nearly constant in width since 1999.

# New Jersey Beach Profile Network

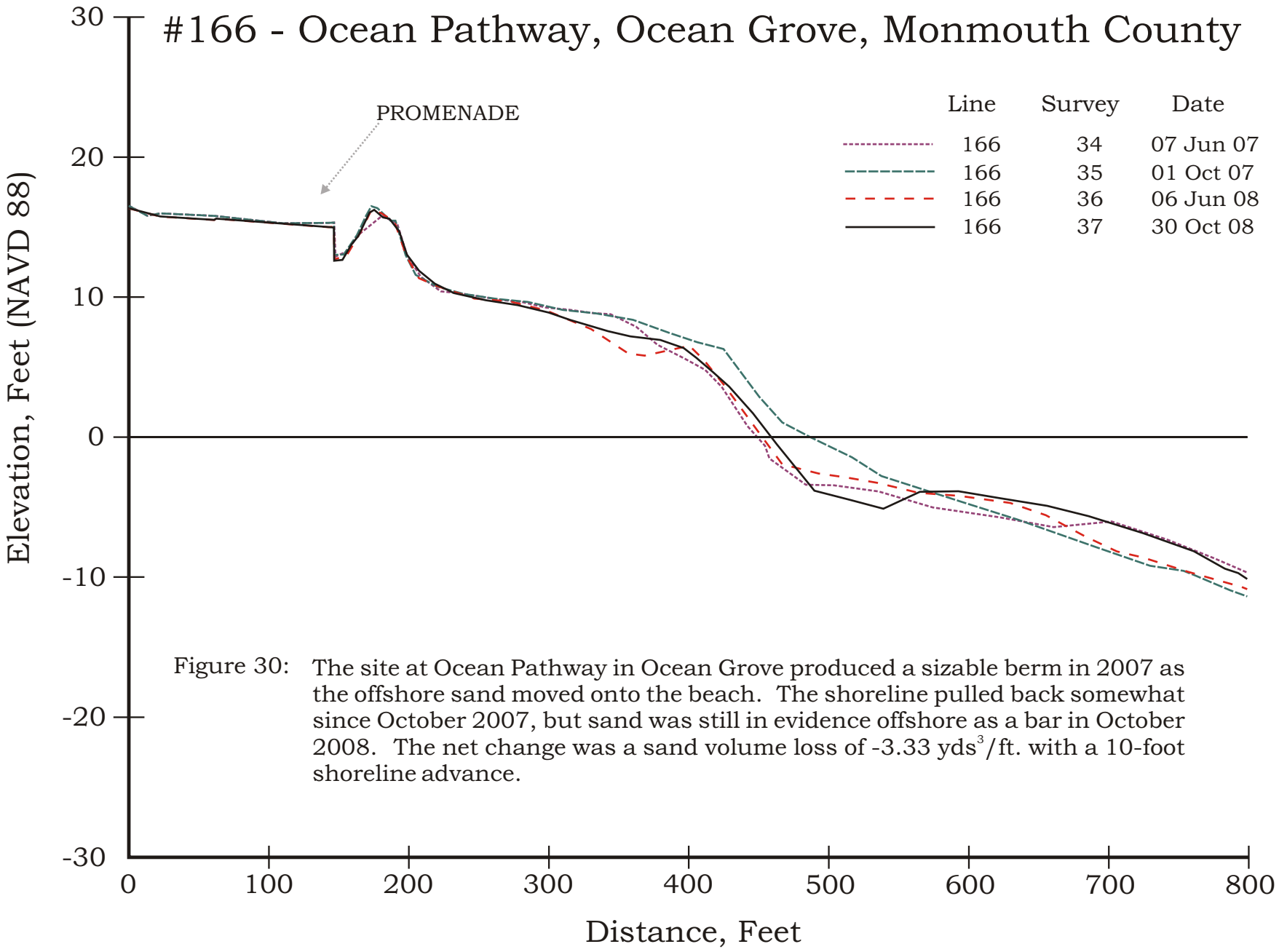



Figure 30: The site at Ocean Pathway in Ocean Grove produced a sizable berm in 2007 as the offshore sand moved onto the beach. The shoreline pulled back somewhat since October 2007, but sand was still in evidence offshore as a bar in October 2008. The net change was a sand volume loss of -3.33 $yds^3$/ft. with a 10-foot shoreline advance.

# McCABE AVENUE, BRADLEY BEACH - SITE 165

This location is far different from what it was in 1996 before the beach fill. The first step the community made was to pull the boardwalk back off the beach and replace it with a paver promenade on the top of the bluff between Ocean Avenue and the boardwalk. This provided an additional 40 feet of badly needed beach width. By this June 5, 2007 photograph the dune was well developed where the boardwalk once was and the filled beach extended 230 feet further seaward to the berm.

18 months later on October 30, 2008 the dune had grown substantially as can be seen by looking at the buried fence to the right and compare it to the view of the fence shown above-left. The beach retained its width, advancing 5 feet further seaward as 1.95 $yds^3$/ft. of additional sand volume was deposited along this shoreline. A very stable beach near the center of the project.

# New Jersey Beach Profile Network

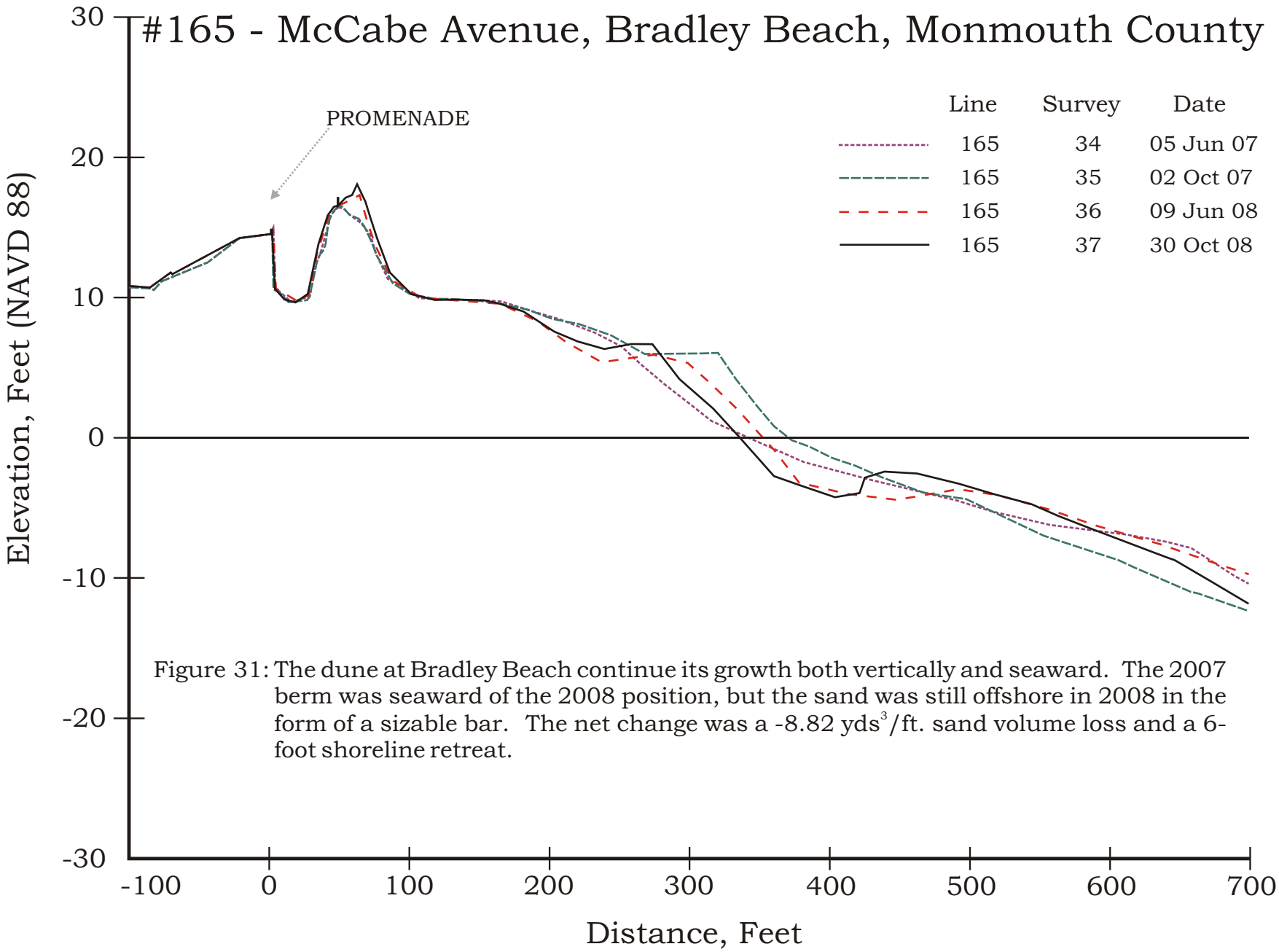



Figure 31: The dune at Bradley Beach continue its growth both vertically and seaward. The 2007 berm was seaward of the 2008 position, but the sand was still offshore in 2008 in the form of a sizable bar. The net change was a -8.82 $yds^3$/ft. sand volume loss and a 6-foot shoreline retreat.

# SYLVANIA AVENUE, AVON BY THE SEA - SITE 164

This June 5, 2007 shot of the beach just prior to the summer tourist season shows the beach just north of the Shark River Inlet. This is the most significant barrier to the free movement of sand along this southern Monmouth County fill segment. No dune was built along this community's shoreline so all the fill-widened beach is available for blankets in the summer.

On October 30, 2008 the municipality had erected a shoreline-parallel fence to intercept wind-blown sand before it could be blown onto the boardwalk and across it into Ocean Avenue. In spite of its location, north of Shark River Inlet, this site managed a small 1.95 $yds^3$/ft. sand volume gain with a 5-foot shoreline advance.

# New Jersey Beach Profile Network

## #164 - Sylvania Avenue, Avon By The Sea, Monmouth County

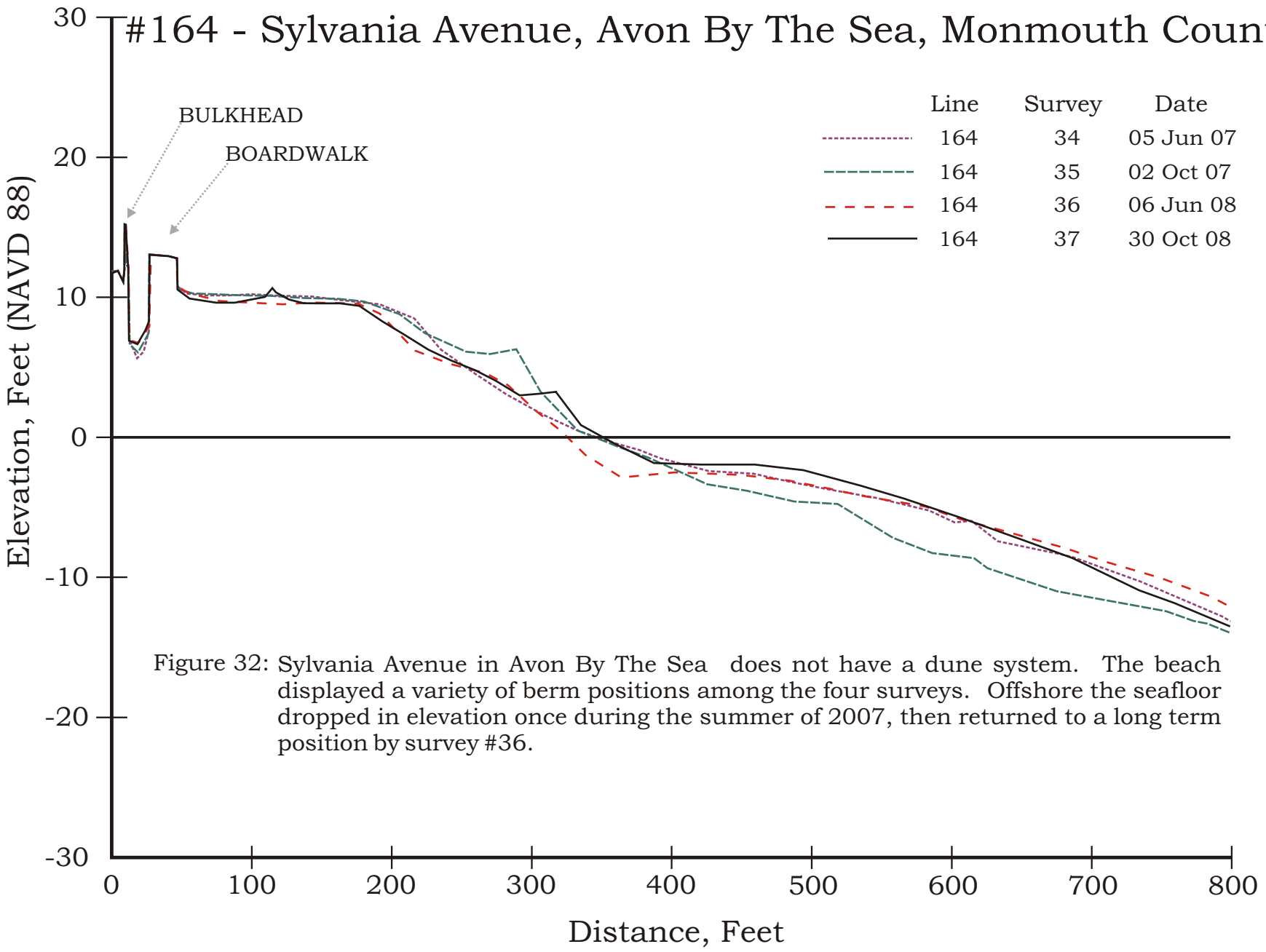



Figure 32: Sylvania Avenue in Avon By The Sea does not have a dune system. The beach displayed a variety of berm positions among the four surveys. Offshore the seafloor dropped in elevation once during the summer of 2007, then returned to a long term position by survey #36.

# 5th AVENUE, BELMAR - SITE 163

The northern Belmar beach lies just south of the Shark River Inlet and has historically trapped sand moving north. The northeast storms move it back south, but lately there have been few with any power. This photograph was taken June 1, 2007 and illustrates the 350-foot wide, flat beach with a token dune just east of the boardwalk.

By October 21, 2008 the shoreline had gained 8.82 $yds^3$/ft. as the beach widened by 30 feet. This picture was taken near the dune at the fence newly installed. This should dramatically widen the dune as sand gets trapped at the fence.

# New Jersey Beach Profile Network

## #163 - 5th Avenue, Belmar, Monmouth County

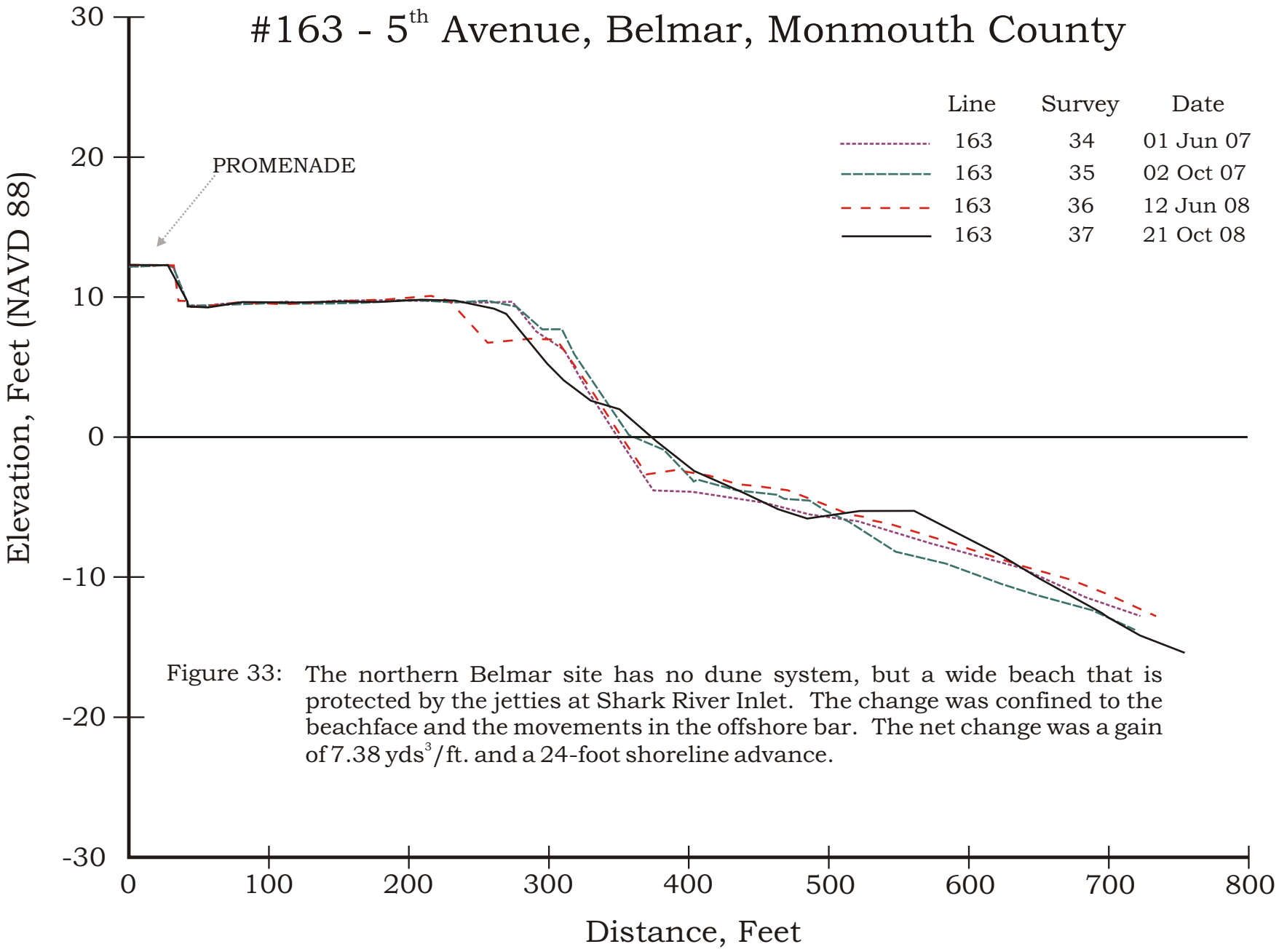



Figure 33: The northern Belmar site has no dune system, but a wide beach that is protected by the jetties at Shark River Inlet. The change was confined to the beachface and the movements in the offshore bar. The net change was a gain of 7.38 $yds^3/ft.$ and a 24-foot shoreline advance.

# 18th AVENUE, BELMAR - SITE 162

In southern Belmar the beach is a little narrower, but the "dune" represents a landscaping endeavor rather than the sand trapping/shore protection feature that is usually considered a dune. The picture to the right was taken June 1, 2007 as the summer season was just getting started.

By October 21, 2008 the municipality had installed three rows of fencing designed to trap sand out on the beach and provide an access pathway along the "landscaped" section shown above. Note how the landscaping plants have selectively taken over the planted section due to the demanding environment for growth in dry quartz sand. This beach gained 8.82 $yds^3$/ft. as the shoreline advanced seaward by 30 feet.

# New Jersey Beach Profile Network

## #162 - 18th Avenue, Belmar, Monmouth County

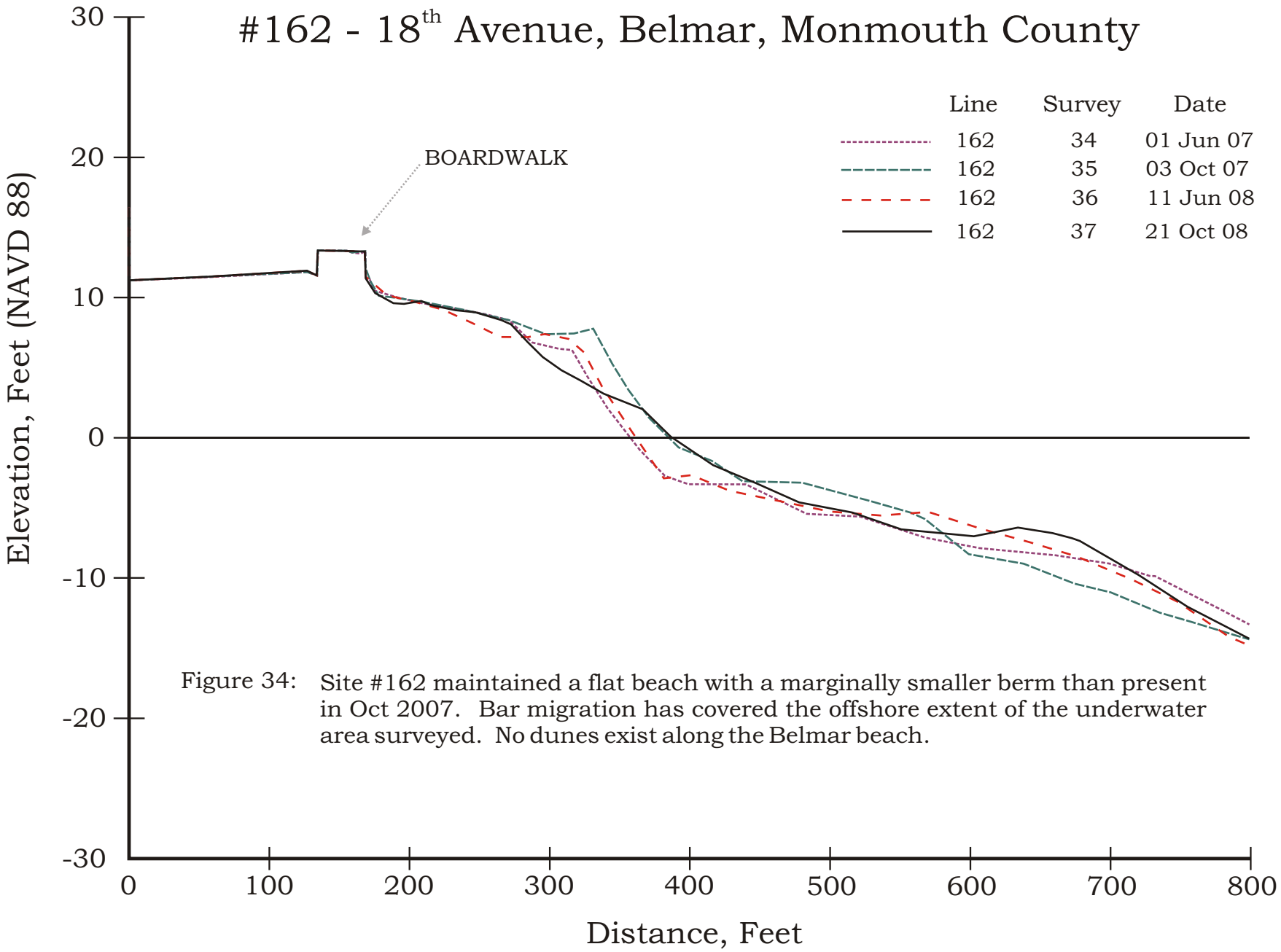



Figure 34: Site #162 maintained a flat beach with a marginally smaller berm than present in Oct 2007. Bar migration has covered the offshore extent of the underwater area surveyed. No dunes exist along the Belmar beach.

# BRIGHTON AVENUE, SPRING LAKE - SITE 161

The Spring Lake beach always had a dune located between the boardwalk and Ocean Avenue. This June 1, 2007 photograph was taken looking south in the middle of the berm. The beach here remains stable.

By October 17, 2008 the shoreline had gained 15.03 $yds^3$/ft. as the shoreline advanced 29 feet seaward. Sand filled in a gap between the boardwalk and the original dune to the point where it is encroaching on the western side of the walkway.

# New Jersey Beach Profile Network

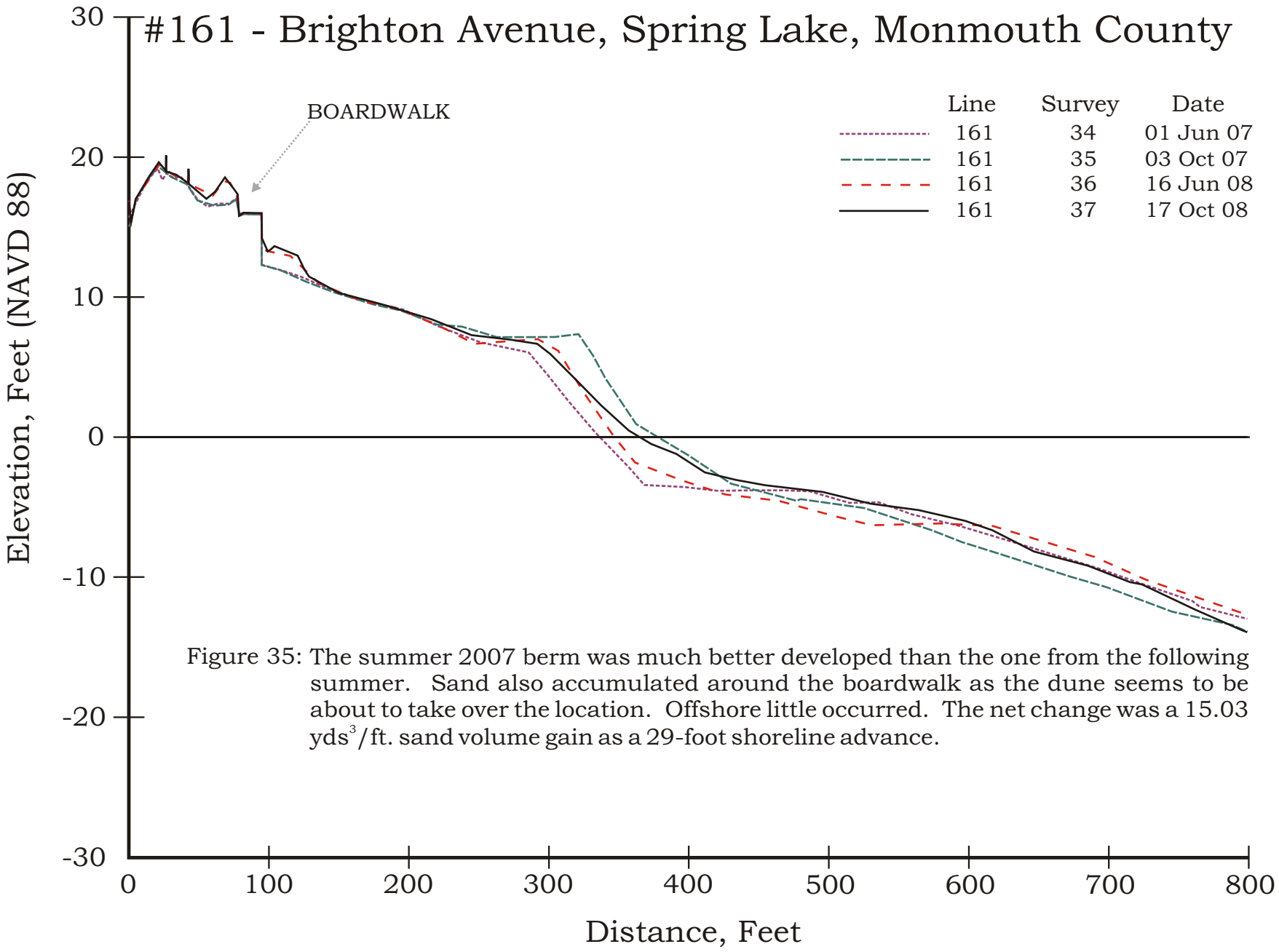



Figure 35: The summer 2007 berm was much better developed than the one from the following summer. Sand also accumulated around the boardwalk as the dune seems to be about to take over the location. Offshore little occurred. The net change was a 15.03 $yds^3/ft.$ sand volume gain as a 29-foot shoreline advance.

# SALEM AVENUE, SPRING LAKE - SITE 160

Southern Spring Lake had a similar configuration to the site #161 on April 2, 2007.

By October 17, 2008 the shoreline retreated just 6 feet and the total sand volume was only a tiny 0.76 $yds^3$/ft. decline in quantity. The same sand deposition was filling in the gap between the boardwalk and the dune. This is also a stable beach.

# New Jersey Beach Profile Network

## #160 - Salem Avenue, Spring Lake, Monmouth County

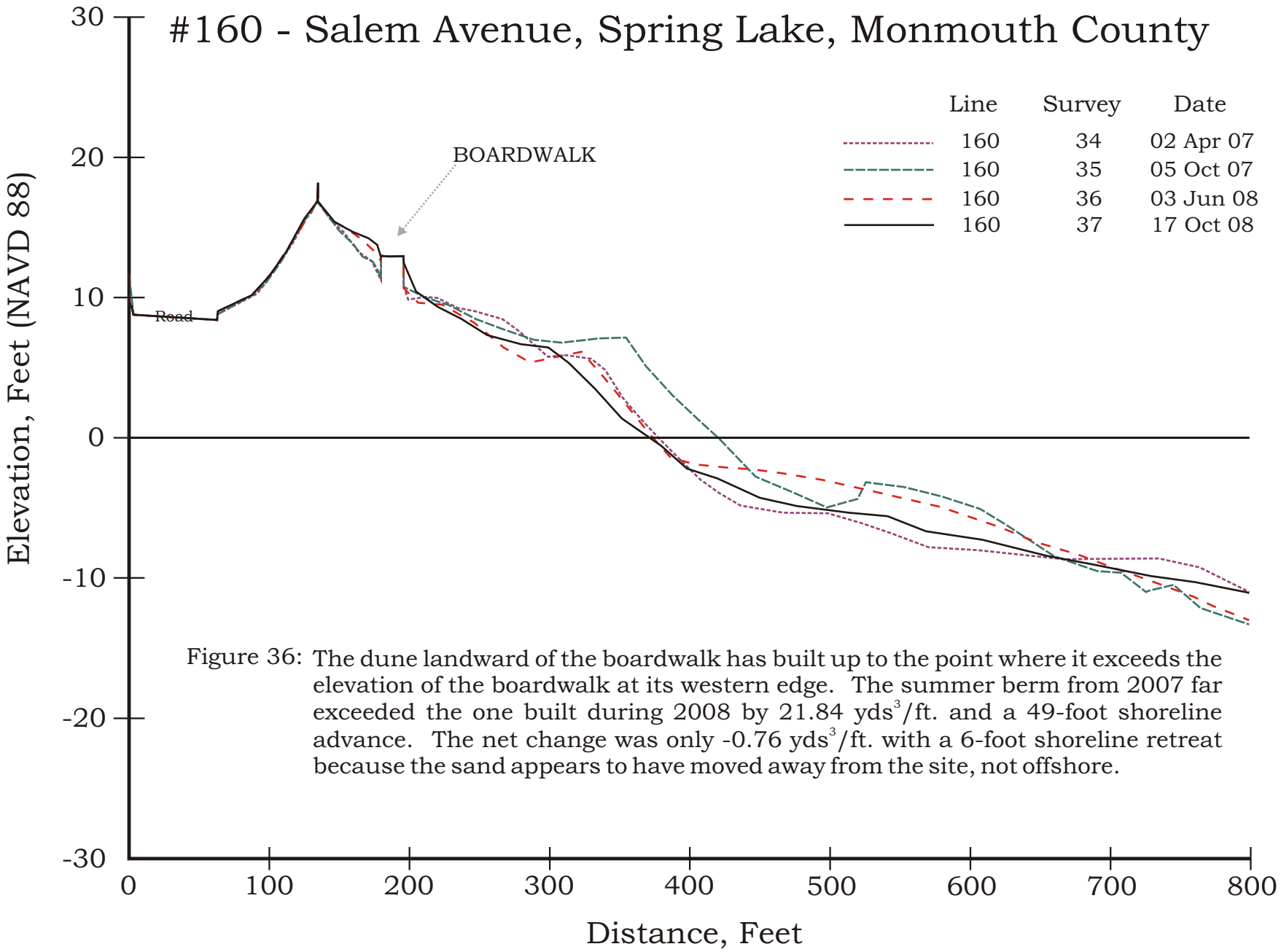



Figure 36: The dune landward of the boardwalk has built up to the point where it exceeds the elevation of the boardwalk at its western edge. The summer berm from 2007 far exceeded the one built during 2008 by 21.84 $yds^3$/ft. and a 49-foot shoreline advance. The net change was only -0.76 $yds^3$/ft. with a 6-foot shoreline retreat because the sand appears to have moved away from the site, not offshore.

# NEW YORK AVENUE, SEA GIRT - SITE 159

New York Avenue is located in the public recreational section of the Sea Girt shoreline. This April 2, 2007 view to the north shows the beach and boardwalk. A dune is planned because wind transport is moving sand onto and under the boardwalk causing degradation of the structure. Sand also blows into Ocean Avenue and needs to be picked up annually.

By October 17, 2008 the shoreline had lost 13.71 $yds^3$/ft. and just over 4 feet of shoreline retreat. The dune has yet to be constructed due to conflict over design and issues with the NJDEP.

# New Jersey Beach Profile Network

## #159 - New York Avenue, Sea Girt, Monmouth County

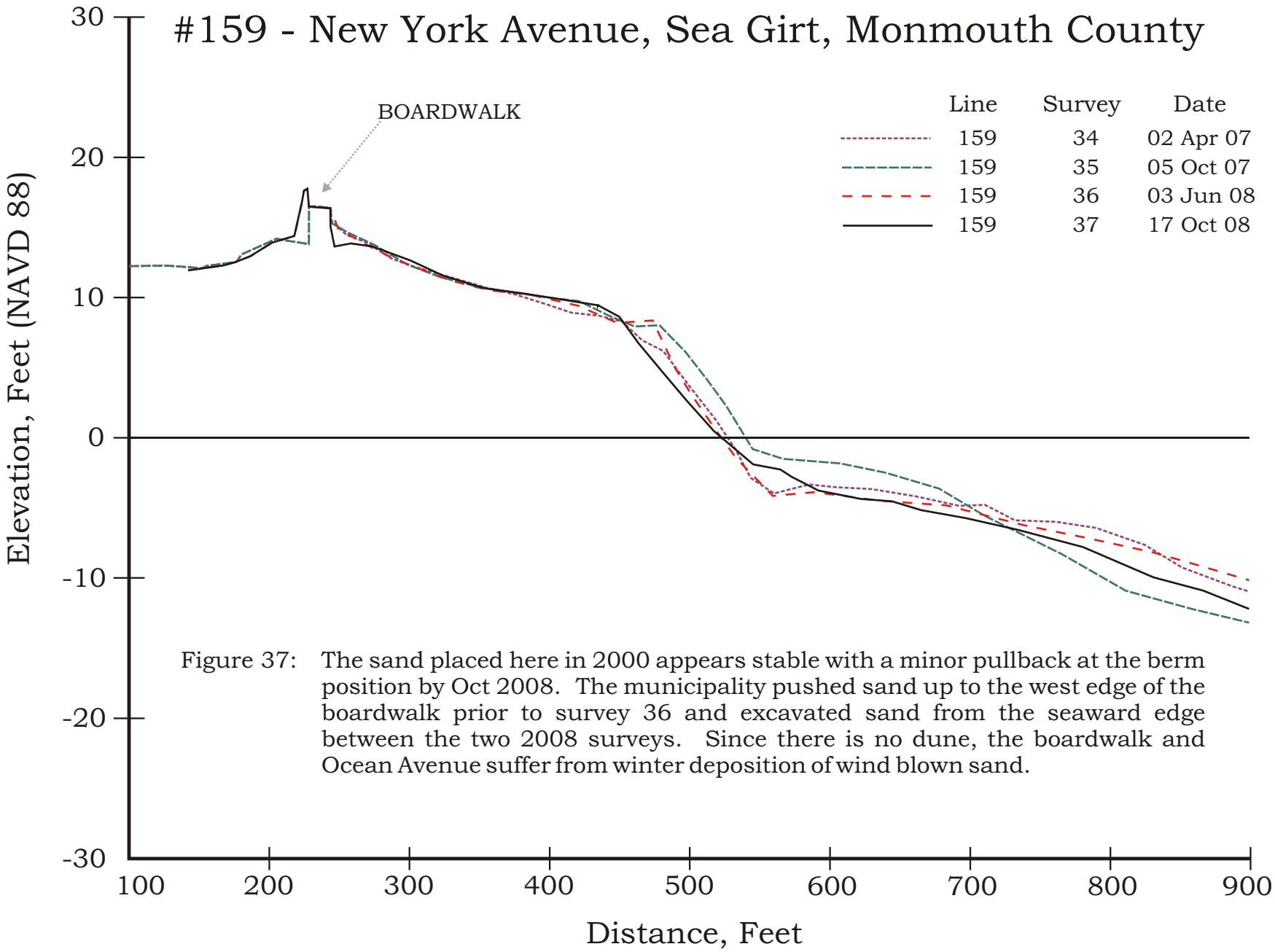



Figure 37: The sand placed here in 2000 appears stable with a minor pullback at the berm position by Oct 2008. The municipality pushed sand up to the west edge of the boardwalk prior to survey 36 and excavated sand from the seaward edge between the two 2008 surveys. Since there is no dune, the boardwalk and Ocean Avenue suffer from winter deposition of wind blown sand.

# TRENTON AVENUE, SEA GIRT - SITE 158

The Trenton Avenue site is near the southern boundary of Sea Girt and the NJ State Police training center between Sea Girt and Manasquan. The beach width is substantial as this view to the south on April 2, 2007 shows. The boardwalk has large dunes between it and the uplands bluff that was last touched by storm erosion during the December 1992 event. Since then the Federal beach restoration project has allowed accretion of dunes and the growth of grass reaching seaward of the elevated boardwalk.

By October 16, 2008 the beach was wider by 40 feet and the sand volume increased by 32.41 $yds^3$/ft. The dune in the middle of the picture gained volume and produced a denser growth of grass.

# New Jersey Beach Profile Network

## #158 - Trenton Avenue, Sea Girt, Monmouth County

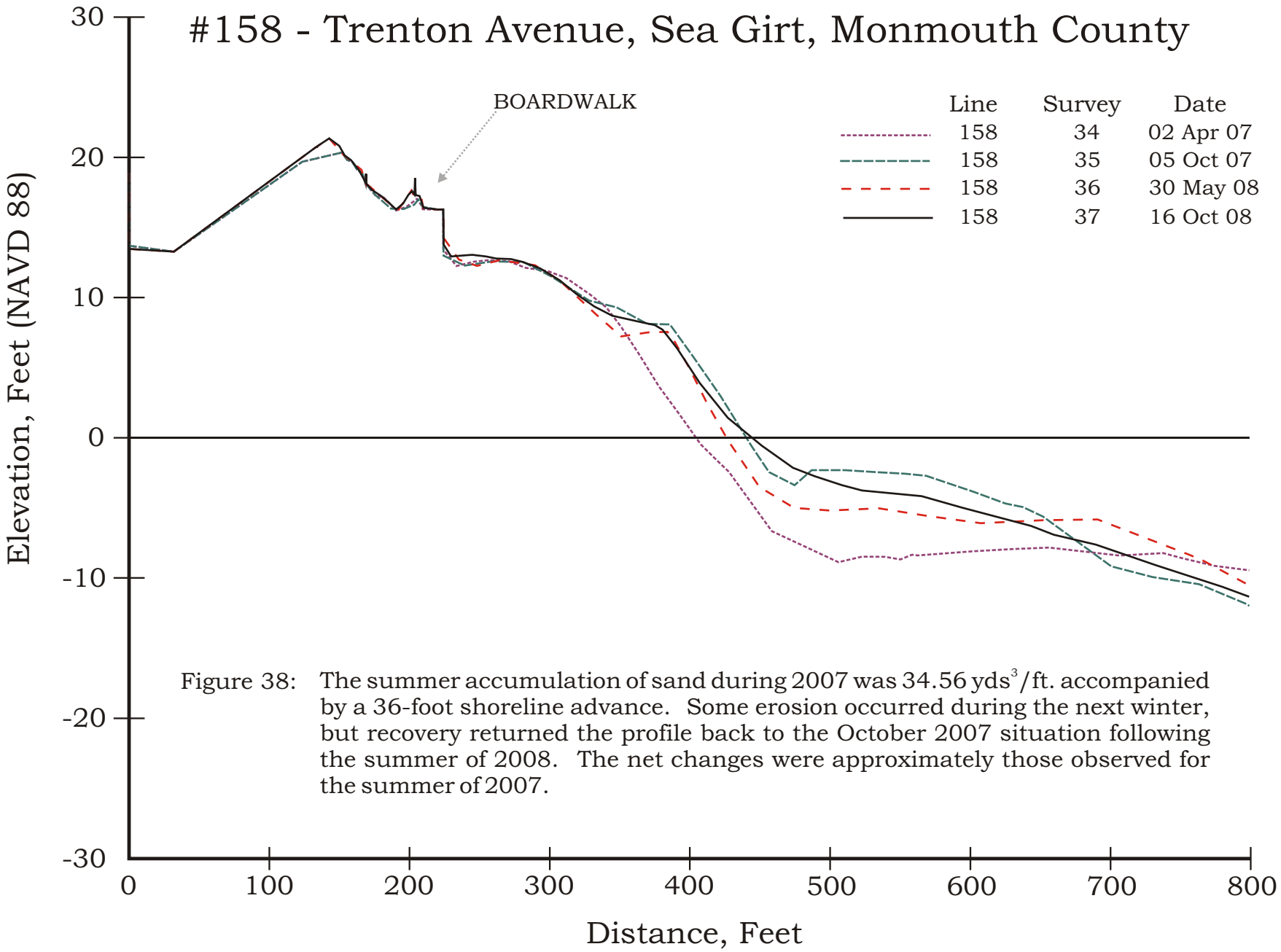



Figure 38: The summer accumulation of sand during 2007 was 34.56 $yds^3$/ft. accompanied by a 36-foot shoreline advance. Some erosion occurred during the next winter, but recovery returned the profile back to the October 2007 situation following the summer of 2008. The net changes were approximately those observed for the summer of 2007.

# RIDDLE WAY, MANASQUAN - SITE 157

Located in the middle of the Manasquan shoreline, Riddle Way has a dune that dates from prior to the December 1992 storm. Today it is five times the size and sand volume as the system that barely survived that storm. The beach on May 29, 2007 shows a sparsely vegetated dune with a substantial dry beach seaward of the dune fence.

By October 26, 2008 the dune vegetation had grown substantially vertically at the fence line shown above. Minor sand volume was added (0.84 $yds^3$/ft.) to the entire profile cross section. The municipality installed a line of fencing to trap sand on the beach during the coming winter. This is in an attempt to prevent the dunes from continually increasing in elevation and blocking the view of the ocean at the line of private homes landward of a paved promenade between the dune and the homes. This fence array will be removed in the late spring of 2009.

# New Jersey Beach Profile Network

## #157 - Riddle Way, Manasquan, Monmouth County

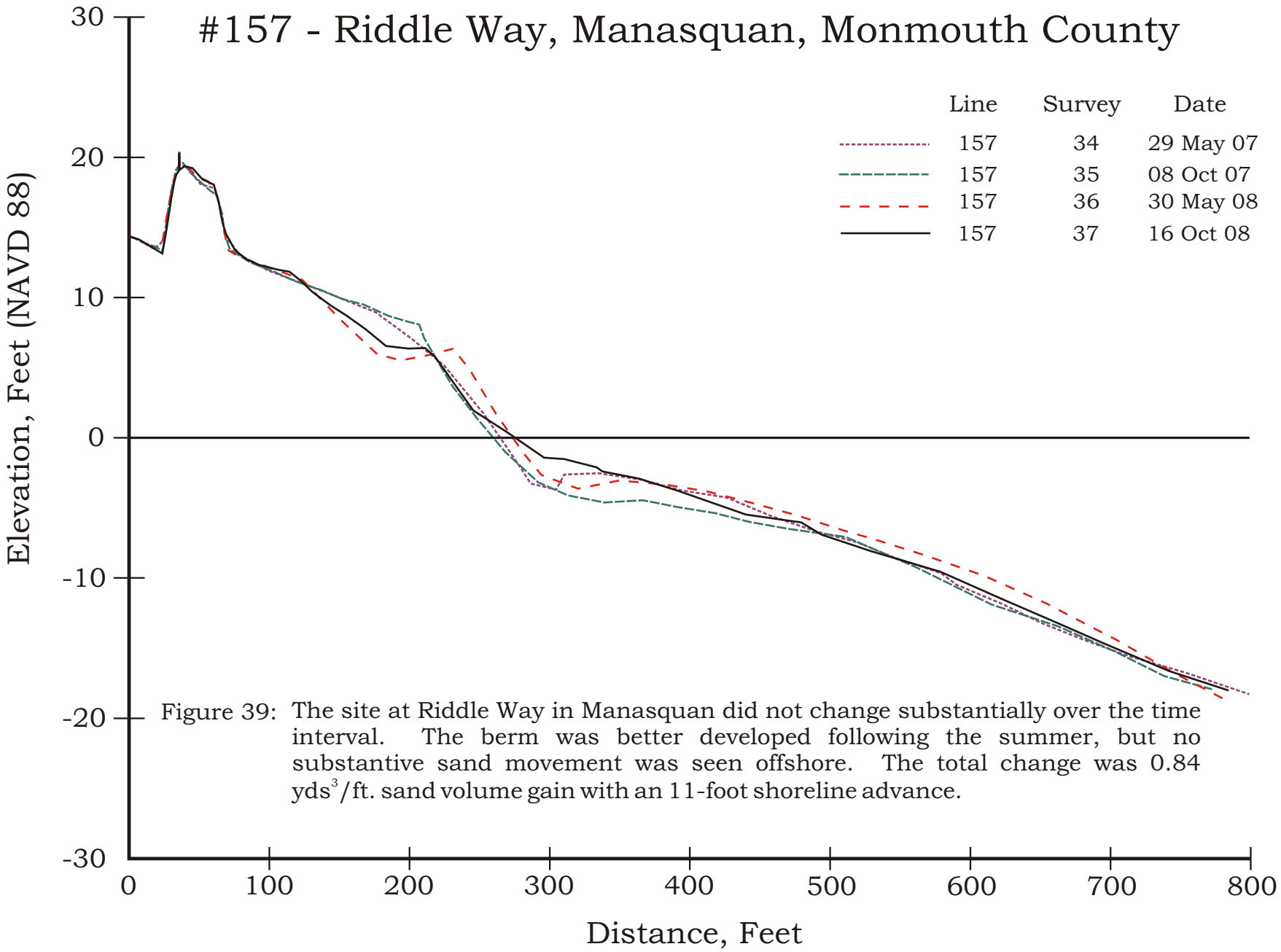



Figure 39: The site at Riddle Way in Manasquan did not change substantially over the time interval. The berm was better developed following the summer, but no substantive sand movement was seen offshore. The total change was 0.84 $yds^3/ft.$ sand volume gain with an 11-foot shoreline advance.

# POMPANO AVENUE, MANASQUAN - SITE 256

This site was established following dramatic changes observed after the 1992 northeast storm. Sites near both sides of each inles were needed to follow the more dynamic changes noted at the 11 NJ inlets. Pompano Avenue is two - three blocks from the north jetty to Manasquan Inlet. This May 29, 2007 picture is a view to the north along the middle of the berm. The dune appears to the left and the beach extends across the field of view.

On October 15, 2008 the sand had ramped up to the dune fencing and the Borough erected a row of fence about 50 feet seaward of the existing fence to trap the sand prior to it adding to the dune volume. The 18-month change observed just in the dune covers 308 feet of the cross section to elevation 11.34 feet at the seaward dune toe. The sand volume change was just -0.07 $yds^3$/ft. for that time period across that distance. Most of the citizen complaints appear to have resulted from a banner year of grass growth, not a large volume of added sand increasing the dune height.

The entire cross section lost 30.54 $yds^3$/ft. as the shoreline retreated 7 feet. The loss was confined to the offshore portion of the profile from the high tide line to a point 1,014 feet from the reference point (-26.69 $yds^3$/ft.). The loss rate was the worst during both summer periods and declined to zero during the winter. Summer southeast winds tend to transport sand north away from the inlet jetty.

# New Jersey Beach Profile Network

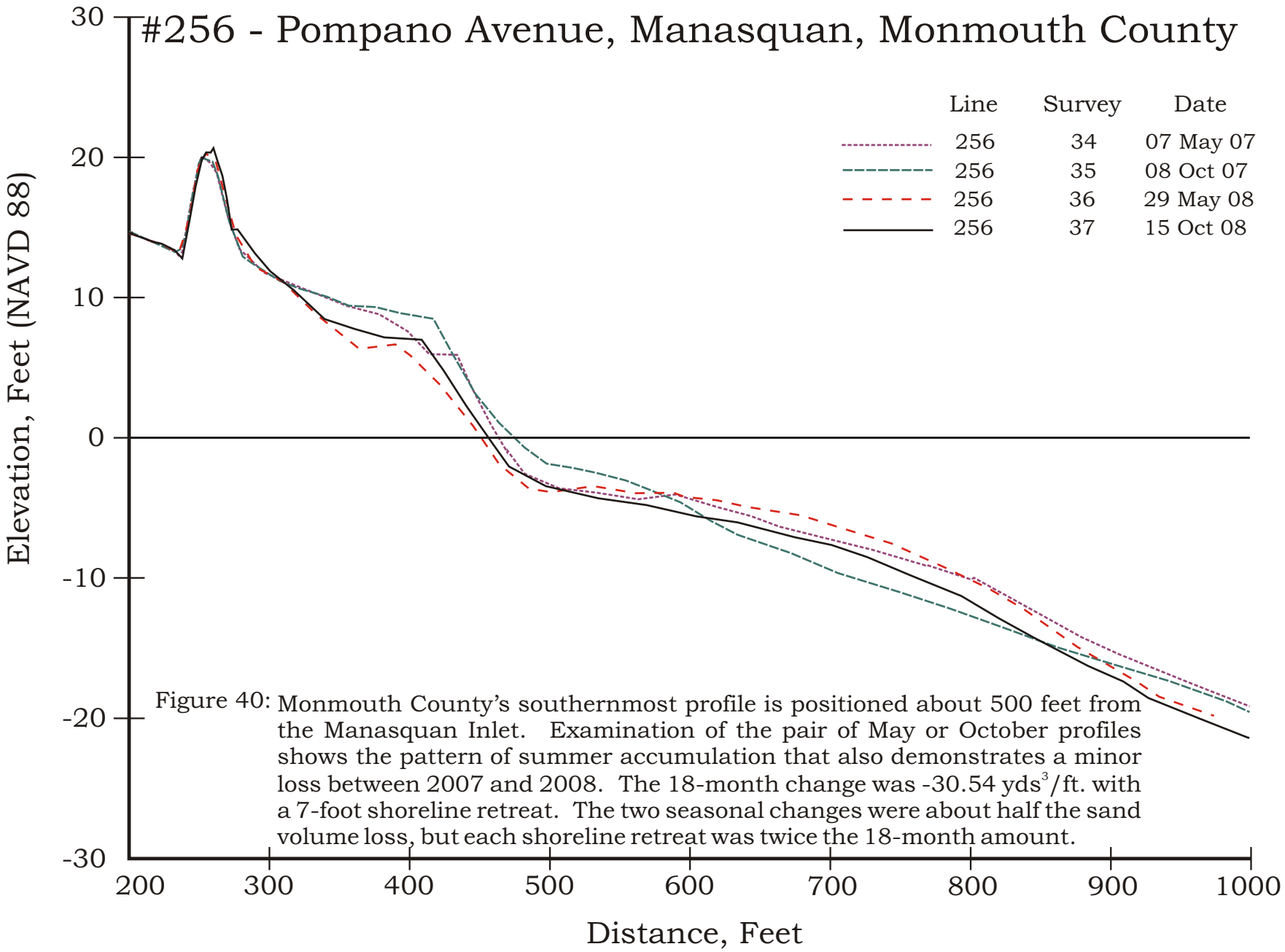



Figure 40: Monmouth County's southernmost profile is positioned about 500 feet from the Manasquan Inlet. Examination of the pair of May or October profiles shows the pattern of summer accumulation that also demonstrates a minor loss between 2007 and 2008. The 18-month change was -30.54 $yds^3/ft.$ with a 7-foot shoreline retreat. The two seasonal changes were about half the sand volume loss, but each shoreline retreat was twice the 18-month amount.