

**FINAL REPORT FOR 2019
ON THE CONDITION OF THE MUNICIPAL BEACHES
IN
THE CITY OF BRIGANTINE BEACH, ATLANTIC COUNTY, NEW JERSEY**



View as of December 8, 2019 showing the entire City of Brigantine from a point over the Brigantine Inlet. The 2018 US Army beach maintenance sand placement is still very evident between the feeder beach north of development and points south of 4th Street North. The expanse of dunes and sand south of 15th Street South are also readily apparent. *(photo by Ted Kingston 2019)*

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Annual Report for 2019 to the City of Brigantine Beach on the Condition of Municipal Ocean Beaches

Introduction:

This report reviews the condition and status of the beaches within the City of Brigantine Beach from October 2018 to October 2019. The winter storm season commenced with three northeast storms in December 2018, all of which were mild events with winds between 20 and 30 MPH. The storms happened starting December 9th, 16th and 21st. In 2019, January and February were cold and relatively quiet in terms of storms. March, April and May, provided three storms, all mild starting March 22nd, April 2nd and 3rd, and finally on May 12th (Mother's Day). The summer accretion favored the beach berms raising the elevation as sand moved ashore. There were two Atlantic Ocean hurricanes that passed the mid-Atlantic coast close enough to produce waves at the beach. Fall storms were few and relatively mild, so cut into the summer deposition, but did little damage.

The 2013 USACE post-Sandy restoration project was conducted in two phases (phase one 667,000 cubic yards [CY], January 2013 and phase two 250,000 CY, July 2013) and placed a reported 917,000 CY of sand on the project beaches. The US Army Corps of Engineers (USACE) completed its most recent maintenance work on their Brigantine shore protection project in 2018 to replace sand along the engineered segment of the Brigantine beach from the feeder zone north of development, to approximately Roosevelt Boulevard along the oceanfront. The dredge pumped the sand slurry along a submerged pipeline from the inlet to the discharge locations along the project beach. The 2018 effort placed 767,000 CY of material to the north end beach was complete by the end of March 2018 (Erik Rourke, USACE-NAP project manager).

Beach Monitoring Program Methodology

The CRC established a coastal monitoring program for the City of Brigantine in June 1992, commencing research on the beaches between two major northeast events that affected the Jersey shore in October 1991 and December 1992. The program collects data from nine shoreline-perpendicular beach profile stations, initially monitored on a quarterly basis, to analyze beach changes. Starting in 2008 the program was resumed at a survey frequency of twice annually. Beginning at a fixed reference position, a profile includes the dune system, beach, berm, nearshore and offshore to a water depth of approximately -15.0 feet (NAVD88). Table 1 lists the Brigantine sites where cross sections, photographs and field notes are presented.

**Table 1:
Beach Profile Locations**

- **Brig 134** - North end Green Acres undeveloped area (NJBPN #134)
- **Brig 220** - At the north end of the feeder beach, 1200 feet from road end
- **Brig 12** - 12th Street North
- **Brig 4** - 4th Street North (NJBPN #133)
- **Brig 5** - 5th Street South
- **Brig 15** - 15th Street South (NJBPN #132)
- **Brig 27** - 27th Street South
- **Brig 43** - 43rd Street South (NJBPN #131)
- **Brig 1** - 'South Beach' 600 feet north of the Absecon Inlet Jetty

Surveys Completed

The CRC completed three surveys between October 2018 and October 2019.

- October 31, 2018 Survey 92
- March 12, 2019 Survey 93
- October 15 & 17, 2019 Survey 94

Beach Performance

Brigantine's last major beach fill project occurred in 2018 as USACE maintenance work placed 767,000 CY of sand on the engineered beach and restored the federal project beach template. The recently completed work has raised the total to providing 3,867,000 CY of new sand to the Brigantine shoreline since 1996.

Annual & Seasonal Beach Changes:

Table 2 displays sand volume changes expressed in cubic yards per foot of beach (yds³/ft.), while shoreline changes are given in feet. Calculating the average volume change between adjacent profiles and multiplying by the distance separating the sites yields a net volume change expressed in cubic yards (yds³) for the distance between the two sites. Adding the cumulative volume change provides a net volume for the entire City of Brigantine beach over the entire length of surveyed cross section. Shoreline position changes are measured as the horizontal movement (toward the ocean (+) or toward land (-)) in the zero elevation point on each profile.

This table presents the annual change in shoreline positions and the net sand volume change across the entire length of the profile survey. While the northernmost survey line over a mile north of Brigantine's development lost a marginal amount of sand volume this year, the shoreline retreated just 5 feet. The majority of the loss occurred offshore. However, the feeder beach and the next three sites to the south suffered significant losses averaging in the range of 33 yds³/ft. The southern four sites all gained substantially counterbalancing the losses to the north. The annual sand volume was a net gain of 66,798 cubic yards across the entire Brigantine City oceanfront. The loss along the northern beaches was 187,268 cubic yards, meaning the southern four sites gained sand shed from the recent federal fill at the 293,894 cubic yard level. Therefore, not counting the change seen between the northern Green Acres site and the feeder beach, the developed City oceanfront gained 106,626 cubic yards of sand between 5th and 15th Streets South and the Absecon Inlet jetty.

Table 2
Brigantine Shoreline and Sand Volume Changes
Fall 2018 to Fall 2019

Profile	Shoreline Change (feet)	Volume Change (yds³/ft.)	Avg. Volume Change (yds³/ft.)	Distance Between (feet)	Net Volume Change (yds³)
Brig-134	-5	2.46			
			-12.757	3,122	-39,827
Brig-220	-11	-27.97			
			-40.415	1,860	-75,172
Brig-12	-163	-52.86			
			-37.612	1,951	-73,380
Brig-4	-8	-22.36			
			-21.450	1,805	-38,716
Brig-5	-99	-20.54			
			10.485	2,729	28,614
Brig-15	39	41.51			
			24.623	3,042	74,902
Brig-27	20	7.74			
			14.461	4,132	59,753
Brig-43	140	21.18			
			20.314	5,855	118,938
Brig-1	37	19.45			
			19.446	601	11,687
Absecon Jetty					
			Total Volume Change =		66,798

Table 3
Brigantine Shoreline and Volume Changes
June 18, 2018 to October 31, 2019

Profile	Shoreline Change (feet)	Volume Change (yds³/ft.)	Avg. Volume Change (yds³/ft.)	Distance Between (feet)	Net Volume Change (yds³)
Brig-134	25	-4.55			
			-1.735	3,122	-5,417
Brig-220	25	1.08			
			0.839	1,860	1,560
Brig-12	-21	0.60			
			-7.654	1,951	-14,932
Brig-4	40	-15.91			
			-12.184	1,805	-21,991
Brig-5	-98	-8.46			
			12.605	2,729	34,399
Brig-15	73	33.67			
			27.105	3,042	82,452
Brig-27	102	20.54			
			20.595	4,132	85,096
Brig-43	150	20.65			
			21.146	5,855	123,807
Brig-1	29	21.64			
			21.641	601	13,006
Absecon Jetty					
			Total Volume Change =		297,980

Table 3 shows the summer seasonal trend. Modest loss was seen at 4th Street North and 5th Street South, but gains occurred at the other six sites within the developed oceanfront zone. The accumulation was the greatest between 15th and 43rd Streets South as 304,361 cubic yards of sand appeared on those sites between June and October 2019. The net change across the entire island's oceanfront was a gain of 297,980 cubic yards. This did not appear to come at the expense of the 2018 USACE beach maintenance done over a year ago. Losses at the fill sites amounted to 36,923 cubic yards between the 12th Street North and 5th Street South across a distance of 3,756 feet.

Individual Profile Descriptions

This section describes the changes documented at each of the beach profile locations from March and October 2018 through October 2019 and includes photographs and cross-sections that show the semi-annual and annual comparisons (Figures 1 – 9).

• **Profile Brig-134: Green Acres - North end** (Figures 1a, 1b & 1c)

The profile line is located 4,752 feet north of the promenade at the north end of Brigantine Avenue. Located within the NJ Green Acres Park, there has been no sand added to the site during any of the past nourishment projects. The closest sand placement activity occurred at the “feeder beach” almost 3,500 feet south of this location. This region is typically influenced by the changes associated with the Brigantine Inlet to the north. Aperiodic episodes of sand volumes being transported across the inlet from Little Beach and moving south adds to the beach in this region.

The dune has naturally been restored since Sandy as material has slowly increased the dune elevation and grasses have propagated on the ridge generated. The beach remained quite stable with the greatest shifts in elevation occurring offshore as the bar trough deepened and the offshore bar grew in size by October 2019.

Profile Brig-134: Green Acres - North end

(Figures 1a & 1b)



Figure 1a taken on October 30, 2018 looking south along the edge of the dunes: a minor storm on the 28th and 29th clipped the seaward slope and left debris at the base of the grass. The beach became flatter in profile slope as well.

Figure 1b taken October 16, 2019 demonstrates excellent grass recovery from storm damage as growth progressed onto the upper beach by fall 2019.

City of Brigantine - Annual Comparison BRIG- 134 North End Green Acres (NJBPN#134)

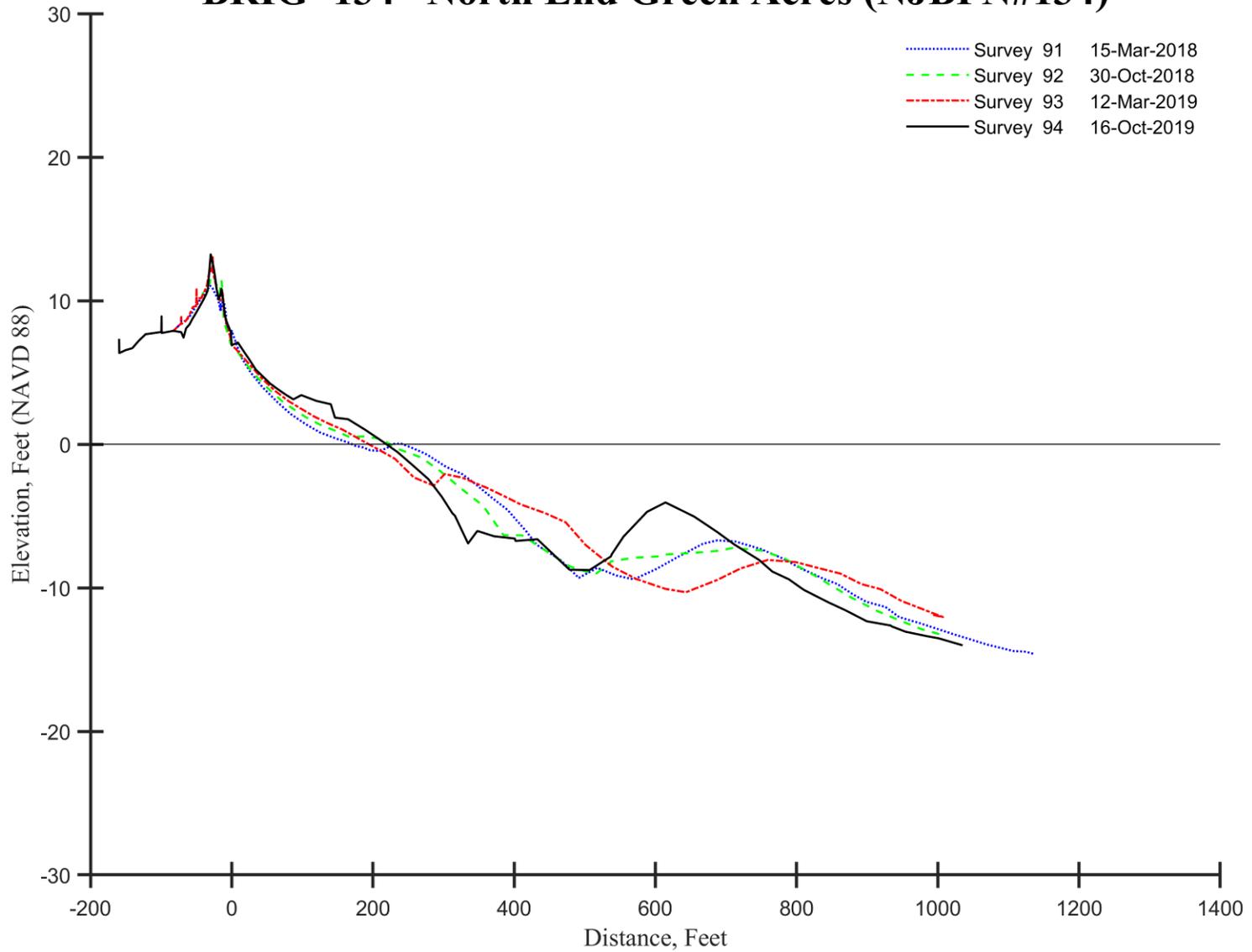


Figure 1c – The natural area beach has seen general sand accumulation on the dune and beach, while sand shifted dramatically offshore between a gentle slope into deeper water to a cross section with a deep trough seaward of the beach and a very large offshore bar that generated 28.32 yds³/ft. in added sand.

• **Profile Brig-220: Feeder Beach - Line 00+1200**

(Figures 2a, 2b & 2c)

The site defines the “feeder beach” portion of Brigantine’s engineered beach, and is located 1,200 feet north of the promenade in the natural area. Sand shed from this location provides advance nourishment to the downdrift erosional “hotspot” that is located to the south along the revetment/promenade. Established in 1996 during the very first municipal beach project between the NJDEP and the City of Brigantine, the goal for this section of beach was to provide an available sand source for recreational beaches to the south. This sand source was intended to erode and move south into the developed portion of the project area to slow the rate of erosion in front of the revetment to a more sustainable loss and extend project benefits for a longer period. This process has been documented and the feeder beach has performed better than expected since initial construction, provided sufficient sand volume remains in this segment of beach. Once the “feeder beach” erodes landward of the promenade the benefits diminish.

The dunes and beach performed quite well over the past year gaining sand in both locations. Offshore the same pattern seen at Site 132 to the north produced a deep trough with a ridge about to attach to the beachface as of October 16, 2019.

Profile Brig-220: Feeder Beach - Line 00+1200

(Figures 2a & 2b)



Figure 2a was taken October 30, 2018 following the weekend northeast storm. The debris shows into the lower dune slope grass along with a piling that washed up.



Figure 2b taken October 16, 2019 from the crest of the foredune, shows excellent grass growth seaward over the past 12 months.

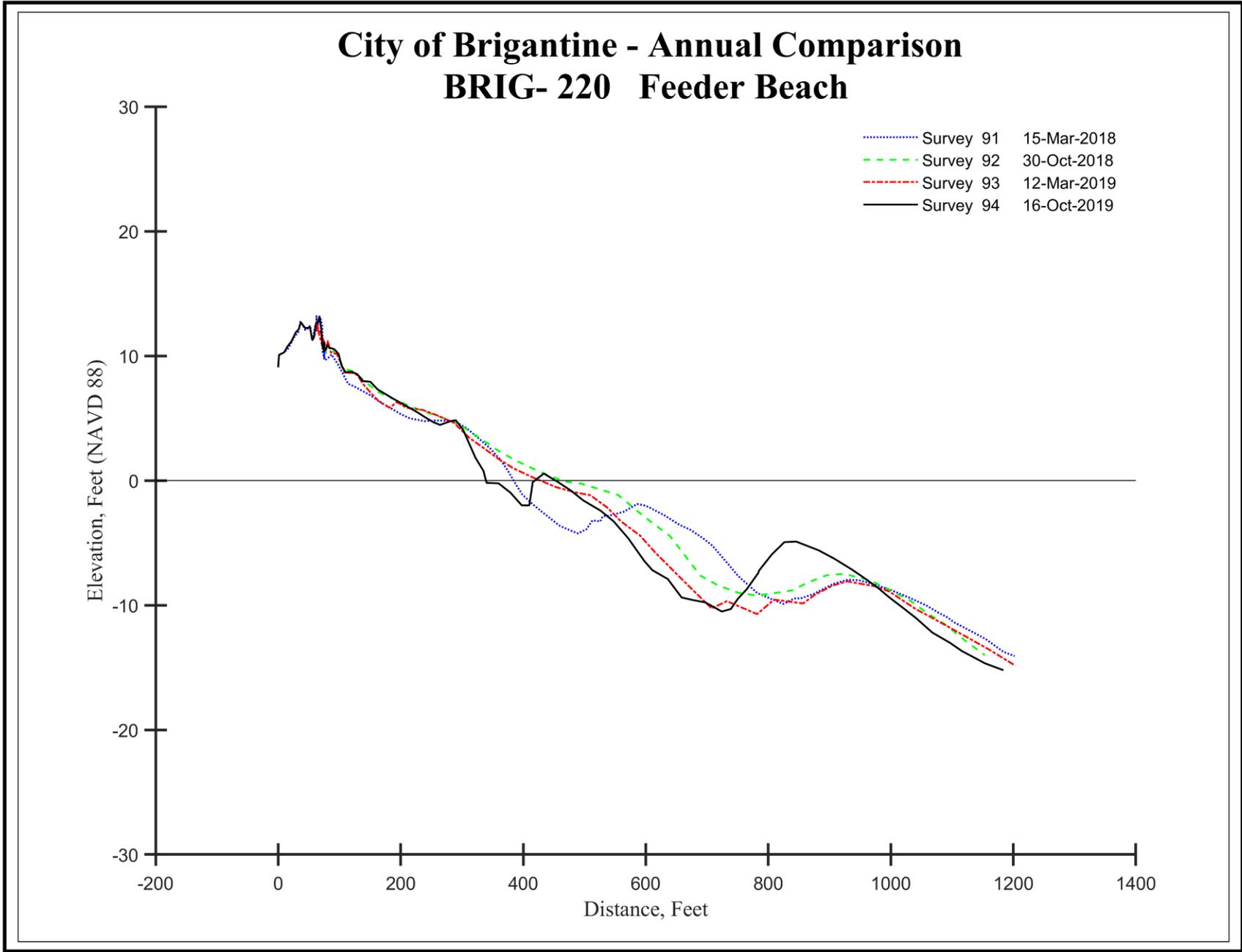


Figure 2c - Sand placed here by the USACE has remained stable between the dune and the beachface while extensive changes occurred offshore where the trough became deeper and a large bar and a nearshore ridge of sand appeared in the October 2019 survey. The net volume change was just 1.008 yds³/ft. June to October 2019, but the shoreline advanced 25 feet seaward.

• **Profile Brig-12: 12th Street North**

(Figures 3a, 3b & 3c)

This profile site was established June 1992 along the north side of 12th Street North. The profile includes the road, promenade and bulkhead revetment structure that was completely reconstructed prior to the 1997 beach nourishment project. The Federal project placed sand here in February 2006, eventually adding 171.45 yds³/ft. of sand to the beach. This site is within a region of chronic erosion due to the orientation of the beach and revetment that protects the north end of Brigantine Blvd. The offset in the alignment of development with the shoreline shows in the report cover photograph where the boulevard extends onto what is the dry beach north and south of this area. As the beach retreats to the promenade the rock revetment protection is exposed. The hard structure revetment reflects wave energy, so return flow scours the beach elevation downward rapidly. Left unchecked, the erosion spreads rapidly south along the revetment towards oceanfront development near 8th Street North. The “feeder beach” was designed to alleviate this from occurring by providing advanced sand nourishment to this region in order to maintain a minimal beach seaward of the revetment and prevent exposure of the hard structure.

The April 2018 survey shows the sand volume put in place by the federal maintenance work with subsequent surveys defining an erosion and shoreline retreat rate. The greatest loss occurred during the winter of 2018 to 2019. Offshore, the bar system provided increased sand volume and a ridge developed close to the beach in October 2019 indicating sand movement onto the beachface.

Profile Brig-12: 12th Street North

(Figures 3a & 3b)



Figure 3a taken October 30, 2018 shows the completed work on the beach by the USACE. The bulldozer pushed up material to the top of the bulkhead while the rocks were covered during sand slurry placement.

Figure 3b taken October 16, 2019 is a view from the beach berm crest looking south showing that the beach has retained most of the sand placed last year by the USACE.

City of Brigantine - Annual Comparison BRIG - 12 Twelfth Street North

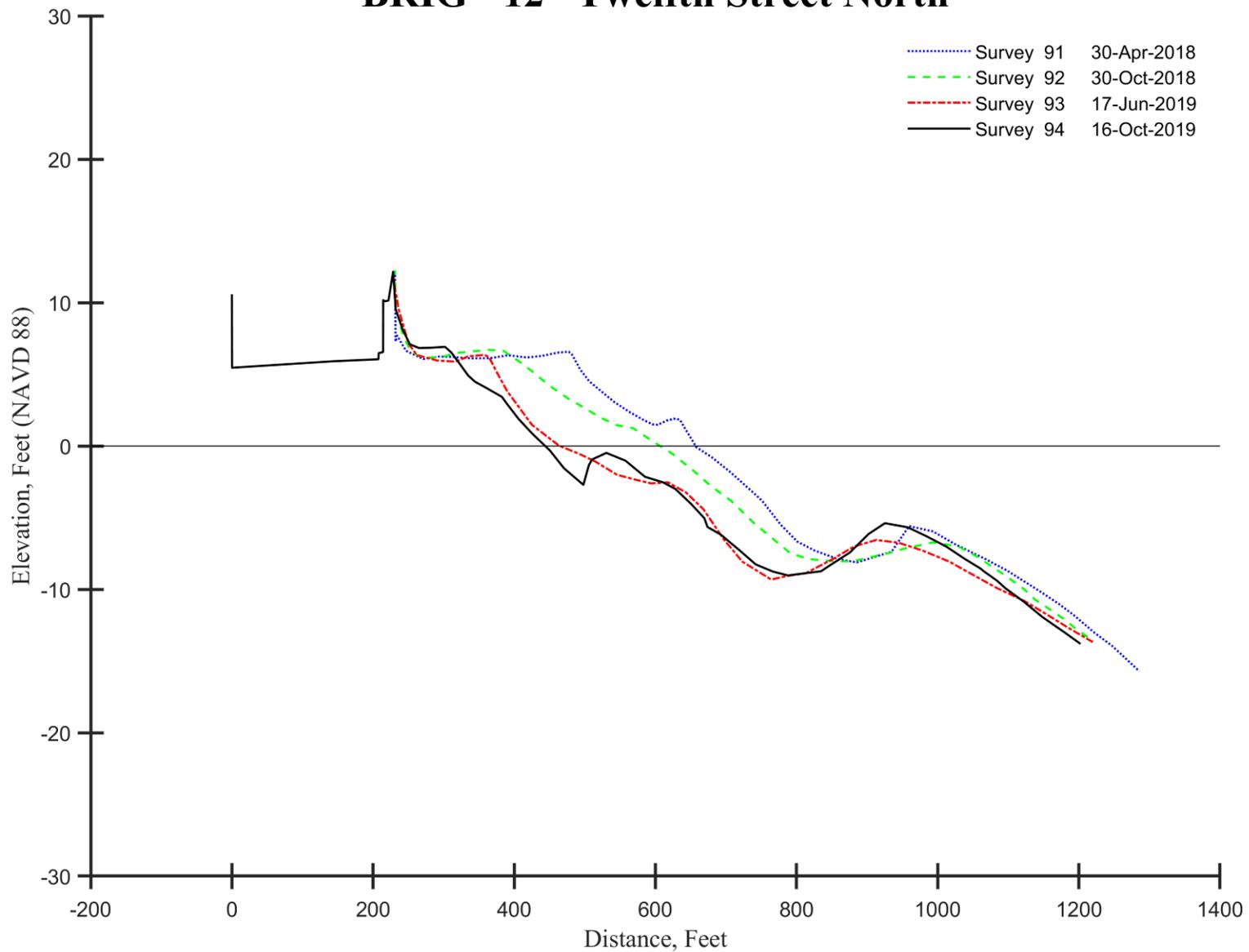


Figure 3c - This profile site was restored by the USACE project with 160.43 yds³/ft. The summer of 2018 saw general beachface retreat. The winter of 2018-2019 saw the largest volume loss and shoreline retreat (-52.86 yds³/ft. with a 163-foot shoreline retreat by October 2019).

- **Profile Brig-4: 4th Street North**

(Figures 4a & 4b)

Brig-4 was established as part of the New Jersey Beach Profile Network in 1986, and was included in the City's monitoring project in June 1992. The location is at the southern end of the original city engineered beach nourishment project area approximately 100 feet south of station 2800-00. The initial Federal project extended further south and placed 80.57 yds³/ft. of sand at this site.

Dune erosion has been relatively rare here since beach nourishment began in 1997. The beach slope remains gentle and allows waves to dissipate over a fairly wide distance, so the dunes are not frequently affected. Sand was added in 2018 increasing the beach width (Survey 91, April 2018). Subsequent surveys show some beach retreat with the June to October 2019 retreat the largest (-15.49 yds³/ft. in sand volume loss between 210 and 420 feet from the reference point. The entire comparison for this survey (#93 to #94) found a -15.91 yds³/ft. in sand volume loss, therefore most of the change was seen at the beachface.

Profile Brig-4: 4th Street North

(Figures 4a, 4b & 4c)

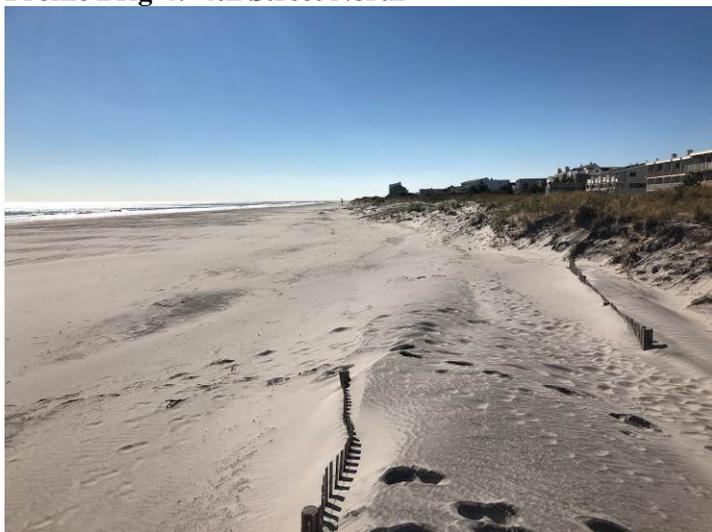


Figure 4a taken October 30, 2018 along the dune toe where wind transport has already deposited new sand. The USACE project had a positive impact here as well.

Figure 4b taken October 15, 2019 with the same perspective as last year, showing a stable beach and few changes at the toe of the dunes.

City of Brigantine - Annual Comparison BRIG - 4 Fourth Street North (NJBPN #133)

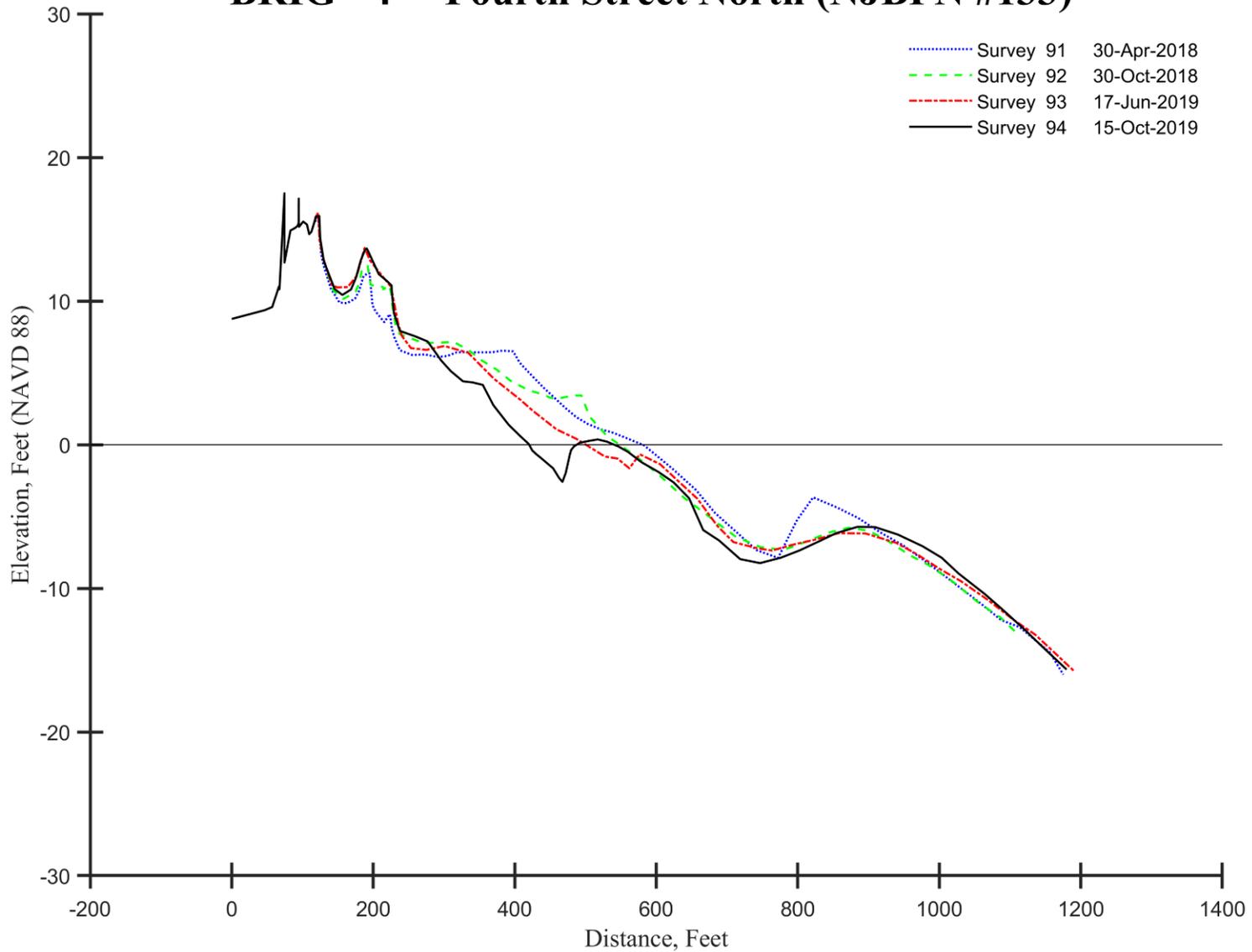


Figure 4c - Located south of the promenade, this site received sand in 2018, but lost beach width incrementally over the next three surveys. The annual change was -22.36 yds³/ft. accompanied by an 8-foot shoreline retreat (the computer counts the nearshore ridge as the “shoreline” because it rises above zero elevation).

- **Profile Brig-5: 5th Street South**

(Figures 5a, 5b & 5c)

This profile station was selected and established at 5th Street South in December 1998. The location is approximately midway between the end of the initial (1997) project beach at 4th Street North and the established site at 15th Street South. This site has a well-developed dune system composed of three significant ridges. The dune system is more expansive than along the northern engineered beach at approximately 225 feet in width. The initial Federal project placed a small volume of sand on this beach in 2006 and no sand was placed this far south during any subsequent USACE maintenance projects.

Following the April 2018 survey, the beach gained sand during each of the next two time intervals (October 2018 and June 2019) only to lose sand between June and October 2019. The beach above the zero datum, lost 7.67 yds³/ft. while offshore lost only 0.79 yds³/ft. The shoreline retreated 98 feet after essentially no change since April 2018.

Profile Brig-5: 5th Street South

(Figures 5a & 5b)



Figure 5a photo on October 30, 2018 looking north along the dune toe. The beach width was unaffected by the northeast storm two days earlier, but the water did reach nearly to the dune toe slope.



Figure 5b photo taken October 15, 2019 looking north along the seaward toe of the dunes showing the sand added to the dune slope and a wide, stable beach seaward.

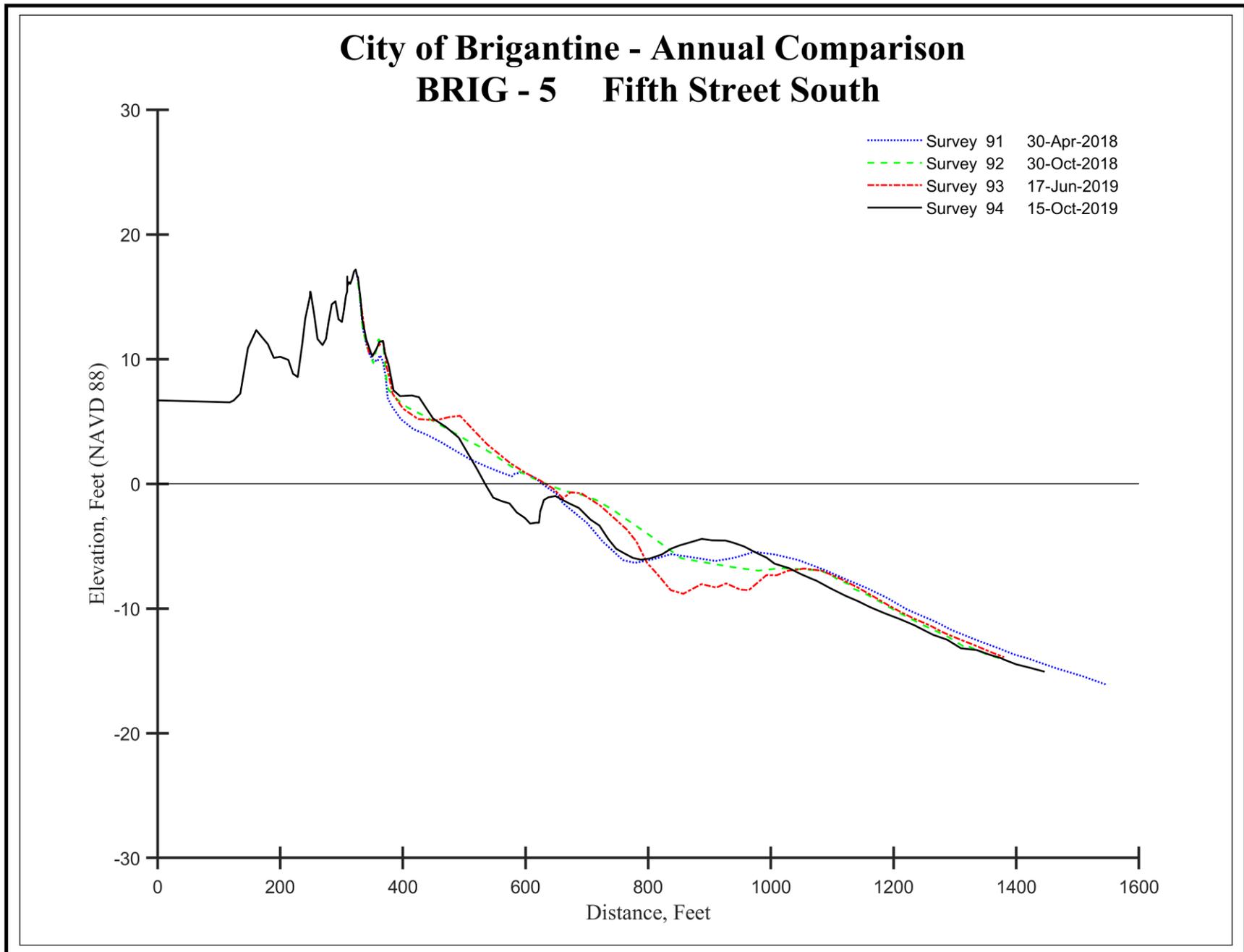


Figure 5c - The 5th Street South site had dune growth documented in the small foredune area. The beach remained accretional between April 2018 and June 2019, then retreated 98 feet as sand moved offshore and formed into a nearshore ridge immediately seaward and a larger offshore deposit.

• **Profile Brig-15: 15th Street South**

(Figures 6a, 6b & 6c)

At 15th Street South, the dune is interrupted by the Legacy Vacation Resort. Shore protection for the oceanfront properties is limited in this section between 14th and 15th Street South to the aging exposed wooden bulkhead. North of 14th Street South and south of 15th Street South any bulkhead is buried below a well-developed dune system that provides significant storm protection for oceanfront properties. This site was located near the nodal point for the City beaches both from a geographical location and sand deposition and erosion perspective. No sand has been placed here directly during previous beach nourishment efforts as natural sand accumulation due to southerly littoral transport has been sufficient to produce an increasingly wider beach since 1997. Beach nourishment has shifted the original node between erosion and deposition further north to approximately 5th Street South.

This year the set of surveys begins to demonstrate sand accumulation on the beach derived from the 2018 federal maintenance effort further north. The October 2019 survey shows the widest beach with a very large offshore bar deposit.

Profile Brig-15: 15th Street South

(Figures 6a & 6b)



Figure 6a taken October 31, 2018 closer to the bulkhead and resort beach development. The flat beach remains over 200 feet wide to the berm crest, but at a low elevation susceptible to storm wave approach.

Figure 6b taken October 15, 2019 further seaward to the beach berm crest looking north across the entire beach width at this site.

City of Brigantine - Annual Comparison BRIG - 15 Fifteenth Street South (NJBPN #132)

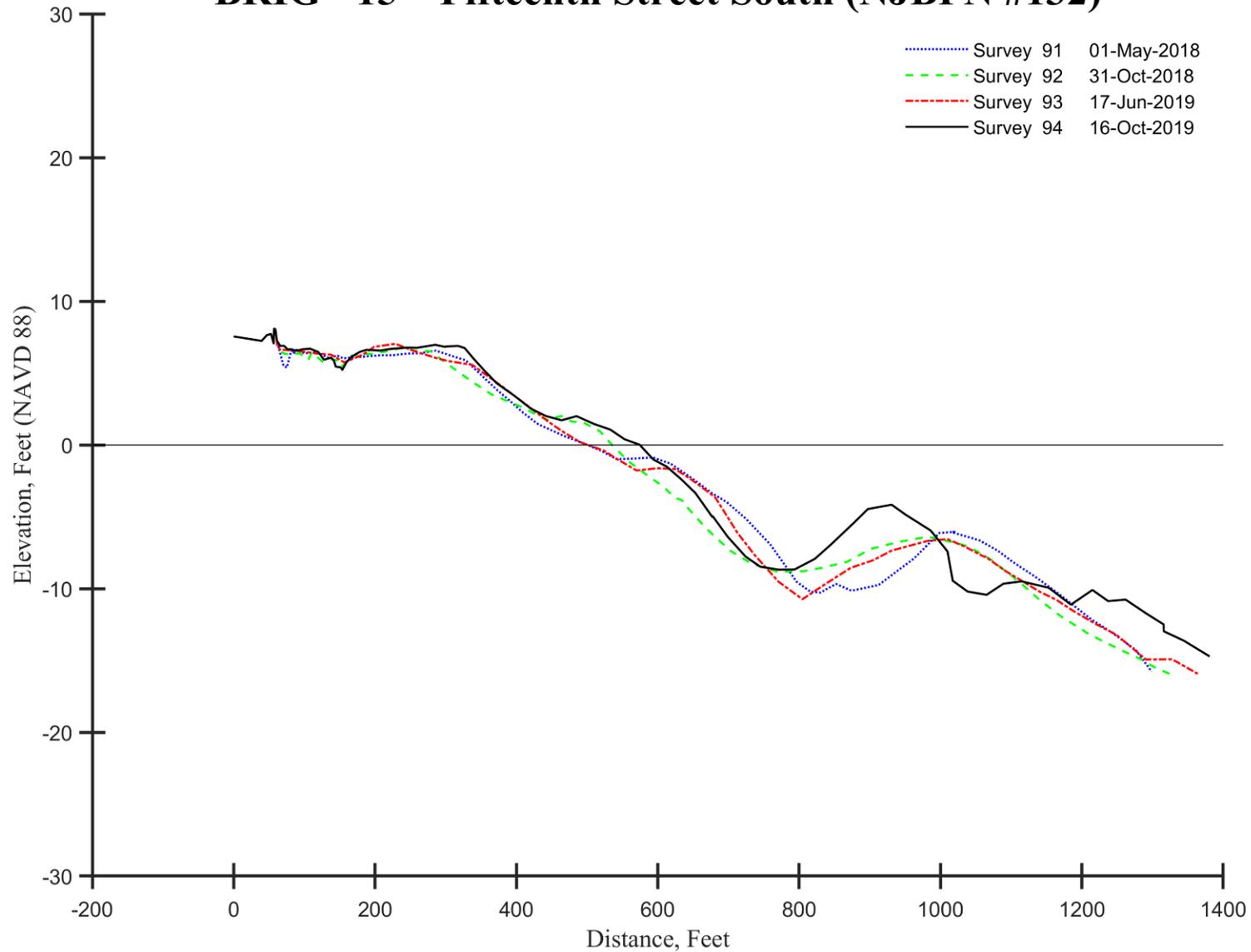


Figure 6c - At 15th Street South sand continues to be transported south to this location derived from the beach nourishment efforts further north. The offshore bar is extremely large for this location and sand appeared at the distal end of the survey. 33.67 yds³/ft. in sand was deposited between June and October 2019. The beach gained 7.15 yds³/ft. while offshore accumulated 26.52 yds³/ft. and the shoreline advanced 73 feet seaward.

• **Profile Brig-27: 27th Street South**

(Figures 7a, 7b & 7c)

This site was established in 1992 for the city's beach monitoring program. The location was selected to fill a void between two pre-existing NJBPN sites, located at 15th Street South and 43rd Street south. In contrast to 15th Street South, Brig-27 has a well-established dune system nearly 400 feet wide supported with a 300-foot wide beach. Multiple dune ridges provide significant storm protection against storm wave damage to the oceanfront properties. The Absecon Inlet jetty has created a region of sand accumulation that extends north past this site. The jetty will continue to trap sand moving south transported by longshore currents towards the inlet providing a source of sand to feed this dune system and continue seaward growth of the beach for the foreseeable future.

The 27th Street South beach added sand to the dune's seaward slope, on the beach itself, and with a series of offshore bars providing an additional 7.74 yds³/ft. in sand volume in the past year with 20.54 yds³/ft. added between June and October 2019. The shoreline this past summer advanced 102 feet seaward due to the actual addition of a nearshore bar system adding to the base of the beach near the zero-elevation position.

Profile Brig-27: 27th Street South

(Figures 7a & 7b)



Figure 7b Photo taken October 31, 2018, from the primary dune crest looking south. The beach width is evident as is the extensive width of the dune system.

Figure 7b Photo taken October 15, 2019, once again, showing excellent grass growth over the past 12 months. This profile shows the expanse of sand extending south toward Absecon Inlet in the distance.

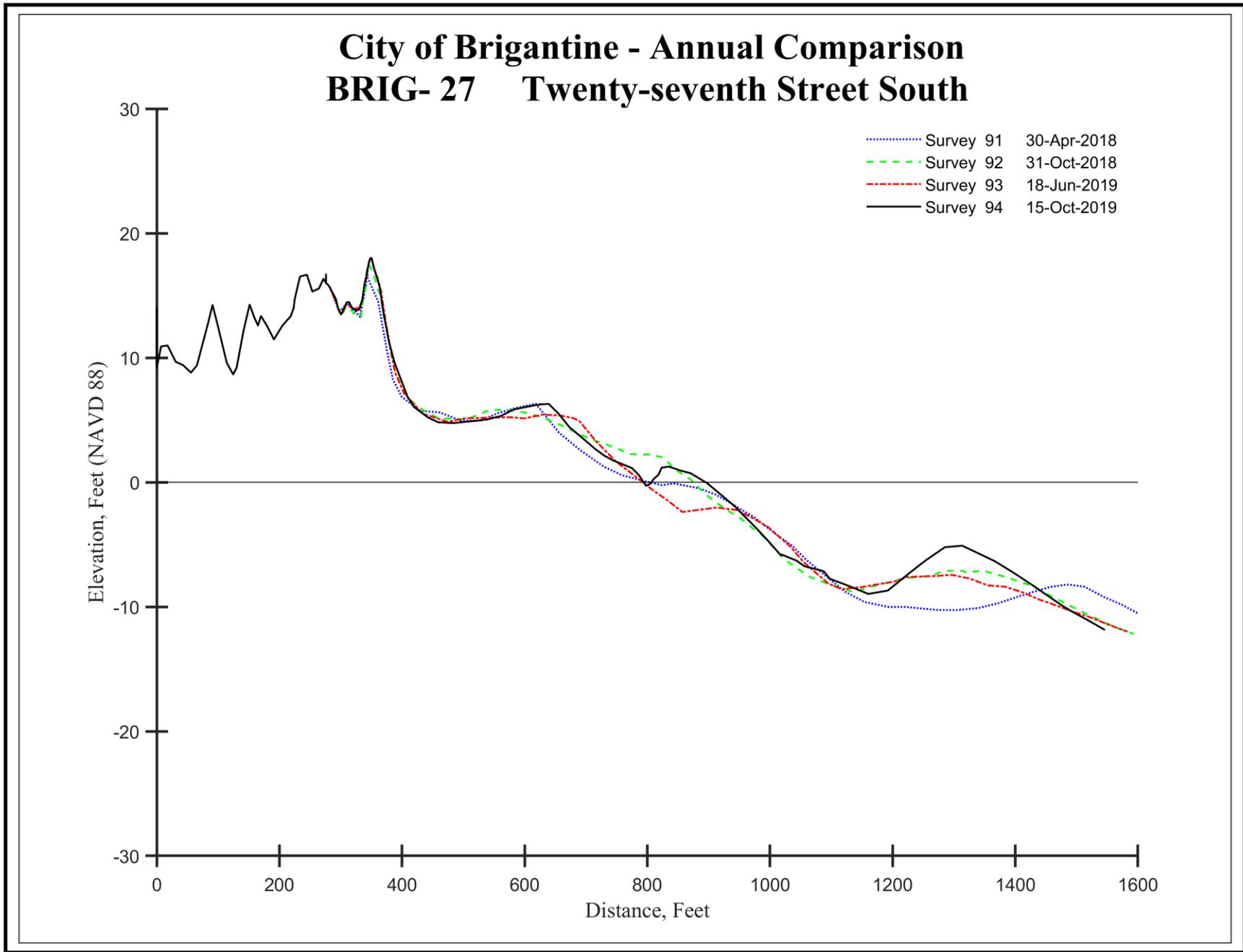


Figure 7c - 27th Street South survey site continued to accumulate sand on the seaward dune slope and on the beach. Offshore a ridge was in the act of attaching itself to the beachface and there was an extensive accumulation as a distant offshore bar as well. Above the zero elevation the gains were limited to 2.49 yds³/ft. while 20.54 yds³/ft. in sand volume were added below the zero elevation.

- **Profile Brig-43: 43rd Street South**

(Figures 8a, 8b & 8c)

This site was established in 1986 as part of the New Jersey Beach Profile Network and was incorporated in the City's monitoring project in June 1992. The profile is in an area dominated by the sand retention characteristics produced by the Absecon Inlet jetty. Sand retention benefits extend from the Absecon Inlet jetty to about 5th Street South. In 1986 the end of 43rd Street was the start of the dry beach with little dune growth. The present shoreline here is almost a half mile seaward of the shoreline position before the inlet jetty was built in 1944. The dune system occupies over 800 feet of width between the development and the seaward toe of the dune. The current recreation beach berm extends over 600 feet seaward of the dune toe.

Change was seen in the seaward-most foredune and in the advance seaward by the beachface by October 2019. Offshore a ridge was forming and could provide more sand to the beach if it successfully moved onto the beach after the October 15, 2019 survey.

Profile Brig-43: 43rd Street South

(Figures 8a & 8b)



Figure 8a. Photo taken October 31, 2018 approximately in the middle of the vast beach surface at 43rd Street South. Water sat here during the northeast storm as indicated by the wind-generated ripple marks on the surface, but no



Figure 8b. Photo taken October 15, 2019 looking north along the seaward toe of the dune system. The extent of the dunes and beach are only comprehensible from an aerial view, but this does show that at this location, development appears non-existent.

City of Brigantine - Annual Comparison BRIG- 43 Forty-third Street South (NJBPN #131)

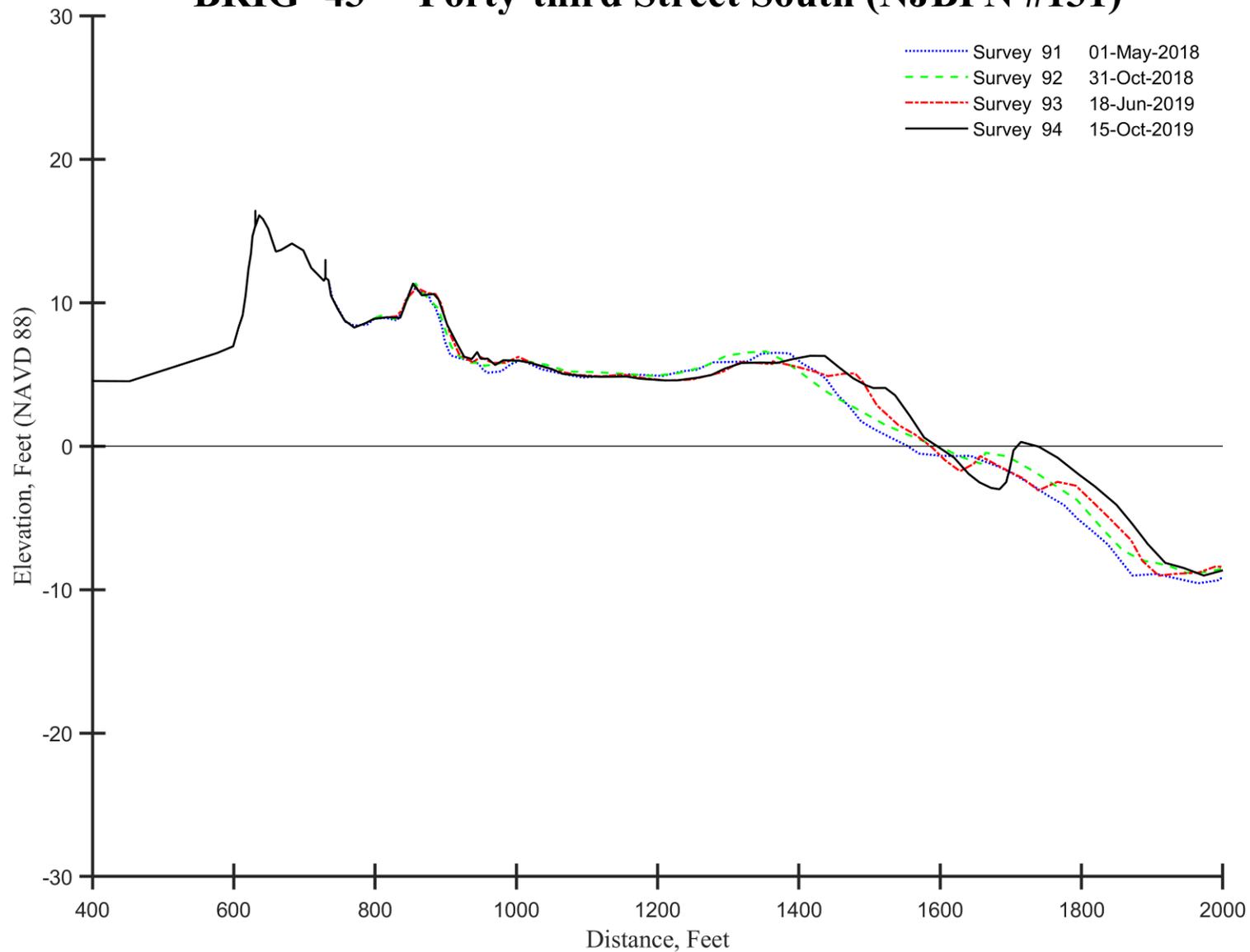


Figure 8c – This site has tripled its width over the 34-year monitoring history. Sand added to the beachface (6.18 yds³/ft. and offshore (14.47 yds³/ft.) since June 2019. Annual changes were only slightly larger (21.18 yds³/ft. for the entire cross section). The shoreline moved 140 feet seaward since 2018.

- **Profile Brig-1: South Beach**

(Figure 9a, 9b & 9c)

This site is located just 600 feet from the jetty, established to determine if sand is retained, eroded and or bypasses the structure. After years of observation around this structure including the inlet shoreline, sand moves around the Absecon jetty in cycles of retention, erosion then bypassing of the jetty. The current jetty configuration and length has essentially reached its capacity to retain new sand moving into the system. Once the beach width has expanded seaward to near the seaward end of the jetty and is exposed to storm erosion the sand moves offshore to the ebb shoal system or onto the inlet shoreline inside the jetty. Current dune configuration at this site extends over 1000 feet seaward of the development with approximately 300 feet of additional dry beach width.

The dune added material to its seaward slope over the interval of study. The largest change was seen between June and October 2019 where 21.64 yds³/ft. in sand volume were added as the shoreline moved 29 feet seaward. The annual change was in the same order of magnitude with a sand volume gain of 19.45 yds³/ft. and a shoreline advance of 37 feet.

Profile Brig-1: South Beach

(Figure 9a, 9b & 9c)

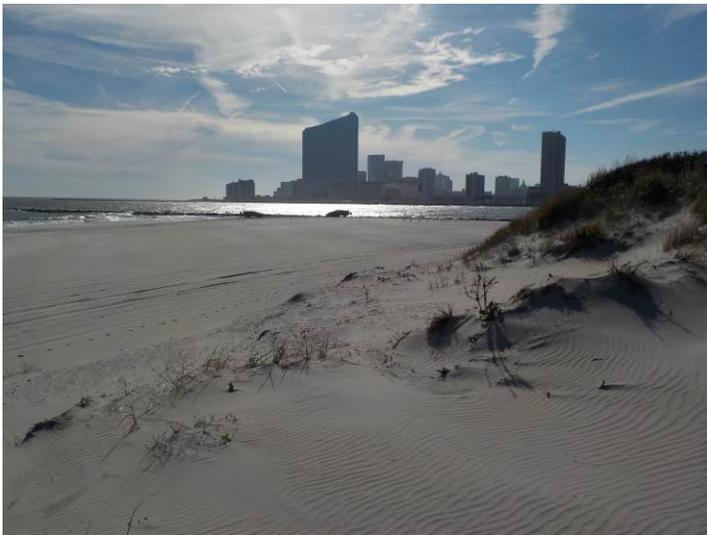


Figure 9a Photo taken on October 31, 2018 looking southeast toward Atlantic City with the dune in the foreground. The beach has advanced to within 200 feet of the end of the inlet jetty, but storm waves do move sand around and over the structure.



Figure 9b Photo taken October 15, 2019 from the survey instrument setup position looking toward Absecon Inlet and Atlantic City. The beach here, is extensively used by recreational vehicles in all but the harshest seasonal weather.

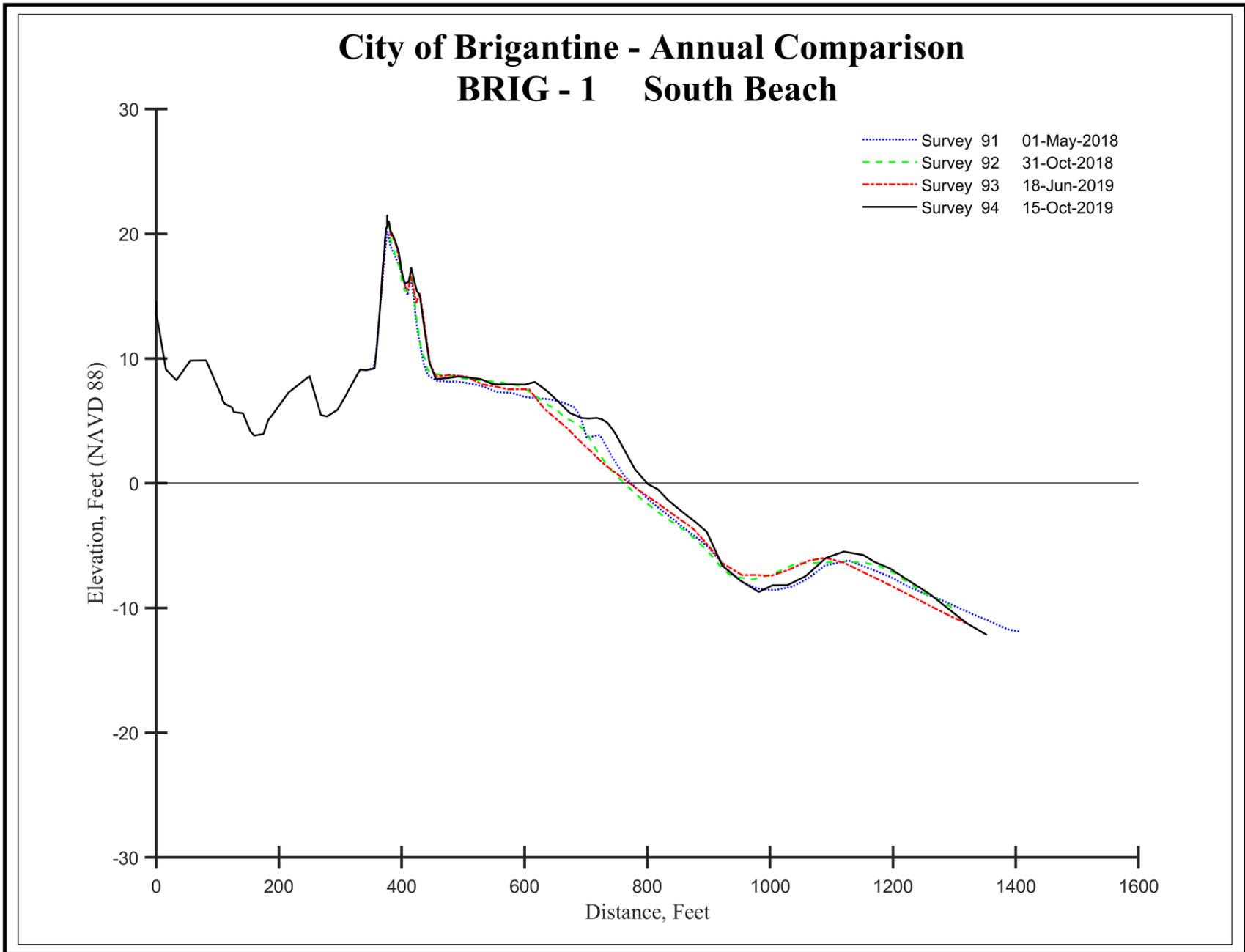


Figure 9c – Positioned just 600 feet north of the inlet jetty, this site has seen sand accumulate over the past 18 months perhaps because there have been few serious northeast storms to drive it into Absecon Inlet. Offshore was relatively quiet as contrasted with the extensive growth of bar systems elsewhere along the City’s oceanfront shoreline.

Summary:

The net gain during 2019 was 66,798 cubic yards as the 2018 federal beach maintenance project adjusted to wave conditions. Northern beaches shed sand in modest quantities, while the beaches south of 5th Street South captured material in relatively large amounts. The USACE added 767,000 cubic yards of new sand derived from Brigantine Inlet borrow site deposited from the “feeder beach” north of development to a point south of 4th Street North. The municipal oceanfront accumulated sand in large amounts between 15th Street South and the Absecon Inlet jetty. The loss along the northern beaches was 187,268 cubic yards, meaning the southern four sites gained sand shed from the recent federal fill in the amount of 293,894 cubic yards. Therefore, not counting the change seen between the northern Green Acres site and the feeder beach, the developed City oceanfront gained 106,626 cubic yards of sand largely deposited offshore, but within the envelope of the surveys.

The appearance of large offshore deposits as a bar system is not new, but this year the size and scale of these bars is extraordinary and most likely related to the absence of multiple northeast storm events.

The case for discussing using the extensive deposits along the southern Brigantine shoreline to augment the erosional shore protection beaches without the need to mobilize a hydraulic dredge and its support crew remains open should the City decide to become involved in the case for sand back-passing.