FINAL REPORT FOR 2020
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. This view remains the best oblique photograph of the City the Coastal Center has making it worth a second year as cover photo. The increased beach width south of the Legacy Vacation Resort building at 15th Street south is also readily apparent. The alignment of oceanfront development defines Brigantine's shoreline prior to the construction of the Absecon Inlet jetty. All the dune and beach area south of Legacy Resort has been generated as a result of sand trapping by the inlet jetty. ***(photo by Ted Kingston 2019)***

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February 5, 2021

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Annual Report for 2020 to the City of Brigantine Beach on the Condition of Municipal Ocean Beaches

Introduction:

The nine survey locations established along the Brigantine oceanfront beaches were surveyed twice during 2020 under the current contract with Stockton University's Coastal Research Center. This report reviews the condition and status of the beaches from October 2019 to October 16, 2020. Storm frequency during 2020 was low and those that did occur were of low intensity. The only tropical system to impact the Jersey shore was Tropical Storm Isaias that passed on an inland track with 65 MPH wind gusts in early August. The fall was likewise relatively calm with mild storms and a final pair of northeasters on Dec. 16th and Dec. 24th that generated some erosional damage to the beach berm, but not to the dunes.

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). The recently completed work has raised the total to providing 3,867,000 CY of new sand to the Brigantine shoreline since 1996. Absecon Island received a general beach maintenance during 2020 using ebb-tidal delta sand supplies seaward of Absecon Inlet. Brigantine was not included in this effort.

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 2019 and October 2020.

- October 15 & 17, 2019 Survey 94
- April 27 & 28, 2020 Survey 95
- October 16 & 19, 2020 Survey 96

Annual & Seasonal Beach Changes:

Table 2 displays sand volume changes expressed in cubic yards per foot of beach ($yds^3/ft.$), 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 (yds^3) 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.

The annual oceanfront beach survey comparison shows a modest sand volume loss of 97,213 cubic yards of material. Four of the nine sites had annual positive sand accumulations through 2020, but with small volumes, even at 43rd Street (24.06 $yds^3/ft.$). Twelfth Street North lost the most sand (53.63 $yds^3/ft.$). A year earlier the Brigantine oceanfront gained 66,798 cubic yards of sand as material was moved from offshore onto the beach envelope that year. The key site controlling this year's negative sand volume was an unexpected shoreline retreat and sand volume loss at the 27th Street South site (-22.55 $yds^3/ft.$). While a relatively modest loss, this affects over 7,000 feet of oceanfront between 15th and 43rd Streets. Coupled with the 14.27 $yds^3/ft.$ sand volume loss at 15th Street South, the average value was negative across the 3,000-foot distance between the two sites. This meant that losses seen along the northern shoreline were not entirely offset by sand volume gains south of 15th Street South this year. The only area to gain sand was the region somewhere south of 27th Street South including 43rd Street to the Absecon Inlet jetty.

Table 2
Brigantine Shoreline and Sand Volume Changes
Fall 2019 to Fall 2020

Profile	Shoreline Change (feet)	Volume Change ($yds^3/ft.$)	Avg. Volume Change ($yds^3/ft.$)	Distance Between (feet)	Net Volume Change (yds^3)
Brig-134	-25	8.54			
			-10.767	3,122	-33,615
Brig-220	-121	-30.07			
			-41.350	1,860	-76,910
Brig-12	-59	-52.63			
			-34.839	1,951	-67,971
Brig-4	-99	-17.05			
			-2.938	1,805	-5,302
Brig-5	93	11.18			
			-1.546	2,729	-4,218
Brig-15	-12	-14.27			
			-18.408	3,042	-55,996
Brig-27	-145	-22.55			
			0.759	4,132	3,134
Brig-43	16	24.06			
			22.407	5,855	131,193
Brig-1	29	20.75			
			20.751	601	12,471
Absecon Jetty					
			Total Volume Change =		**-97,213**

Table 3
Brigantine Shoreline and Volume Changes
April 20, 2020 to October 20, 2020

Profile	Shoreline Change (feet)	Volume Change ($yds^3/ft.$)	Avg. Volume Change ($yds^3/ft.$)	Distance Between (feet)	Net Volume Change (yds^3)
Brig-134	-13	-6.07			
			-4.327	3,122	-13,509
Brig-220	-63	-2.58			
			-15.481	1,860	-28,794
Brig-12	-38	-28.38			
			-19.486	1,951	-38,016
Brig-4	15	-10.59			
			-3.424	1,805	-6,179
Brig-5	49	3.75			
			-2.231	2,729	-6,088
Brig-15	-38	-8.21			
			-7.037	3,042	-21,407
Brig-27	-129	-5.87			
			4.108	4,132	16,974
Brig-43	114	14.08			
			7.922	5,855	46,383
Brig-1	-12	1.76			
			1.761	601	1,058
Absecon Jetty					
			Total Volume Change =		**-49,577**

Table 3 shows the summer into the fall seasonal trend. Modest loss was seen at 12th Street North with half the amount lost from 4th Street North. 5th Street South had a sand volume gain, but two unusual sand volume losses at 15th and 27th Streets South generated the net loss of 49,577 cubic yards for the six months. This is usually a season where beach accretion generally occurs. The loss between 12th and 4th Street North amounted to 38,016 cubic yards that was relatively small, but still half the total annual loss (67,971 yds^3). The beach between the end of the development south to 5th Street South is a zone of constant erosion that has produced the need for successive beach restorations since 1996.

Individual Profile Descriptions

This section describes the changes documented at each of the beach profile locations starting with the March 2019 survey, the October 2019 survey, the March of 2020 survey and the October 2020 survey and includes annual 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 District, 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 primary dune ridge generated. Each survey shows more sand accumulating on the dune increasing its storm resistance. The beach remained quite stable with the greatest shifts in elevation occurring offshore as the bar trough deepened and the offshore bar grew by October 2019 and then filled in the trough as the bar flattened out.

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

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

Figure 1b taken October 13, 2020 shows continued vegetation growth with modest sand accumulation in evidence.

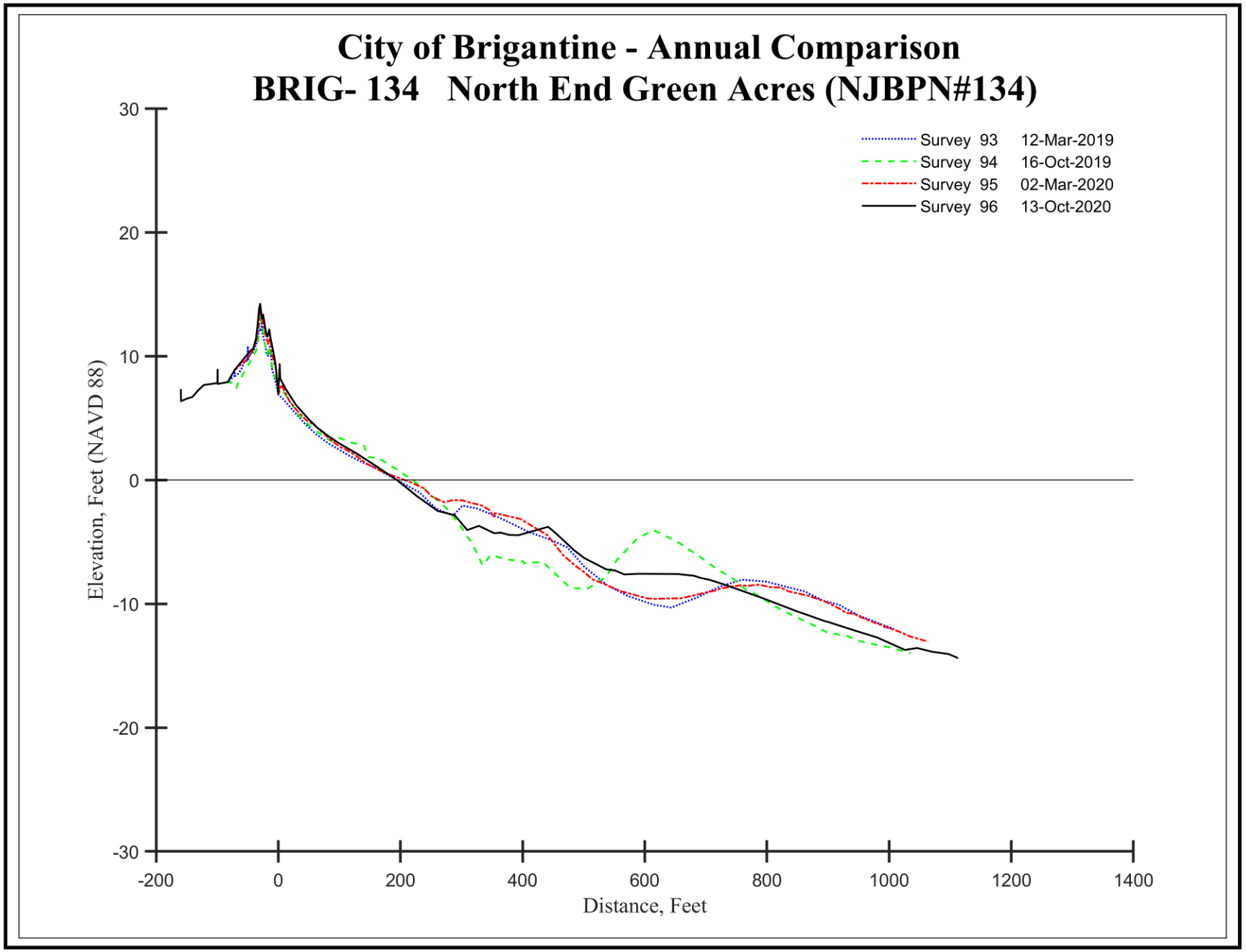

Figure 1c – The natural area beach has seen general sand accumulation on the dune and beach, while sand shifted dramatically offshore between a gentle slope into deeper water to a cross section with a deep trough seaward of the beach (Oct. 2019) and a very large offshore bar that generated 8.54 $yds^3/ft.$ in added sand. This bar flattened out with some sand shifting to the nearshore and on the beach.

- **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 repetitively documented and the feeder beach has performed better than expected since its initial construction, providing 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 in Oct. 2019 that flattened out with sand filling the trough. As of Oct. 2020, there was a sizable ridge of sand located close to the shoreline that would add significant material to the beach if it succeeds in marching onto the berm and beachface.

Profile Brig-220: Feeder Beach - Line 00+1200 (Figures 2a & 2b)

Figure 2a taken October 16, 2019 from the crest of the foredune, shows excellent grass growth seaward following several northeast storms.

Figure 2b taken October 13, 2020 and shows the dune grass propagating onto the upper dry beach. There have been no events impacting this dune in 2020.

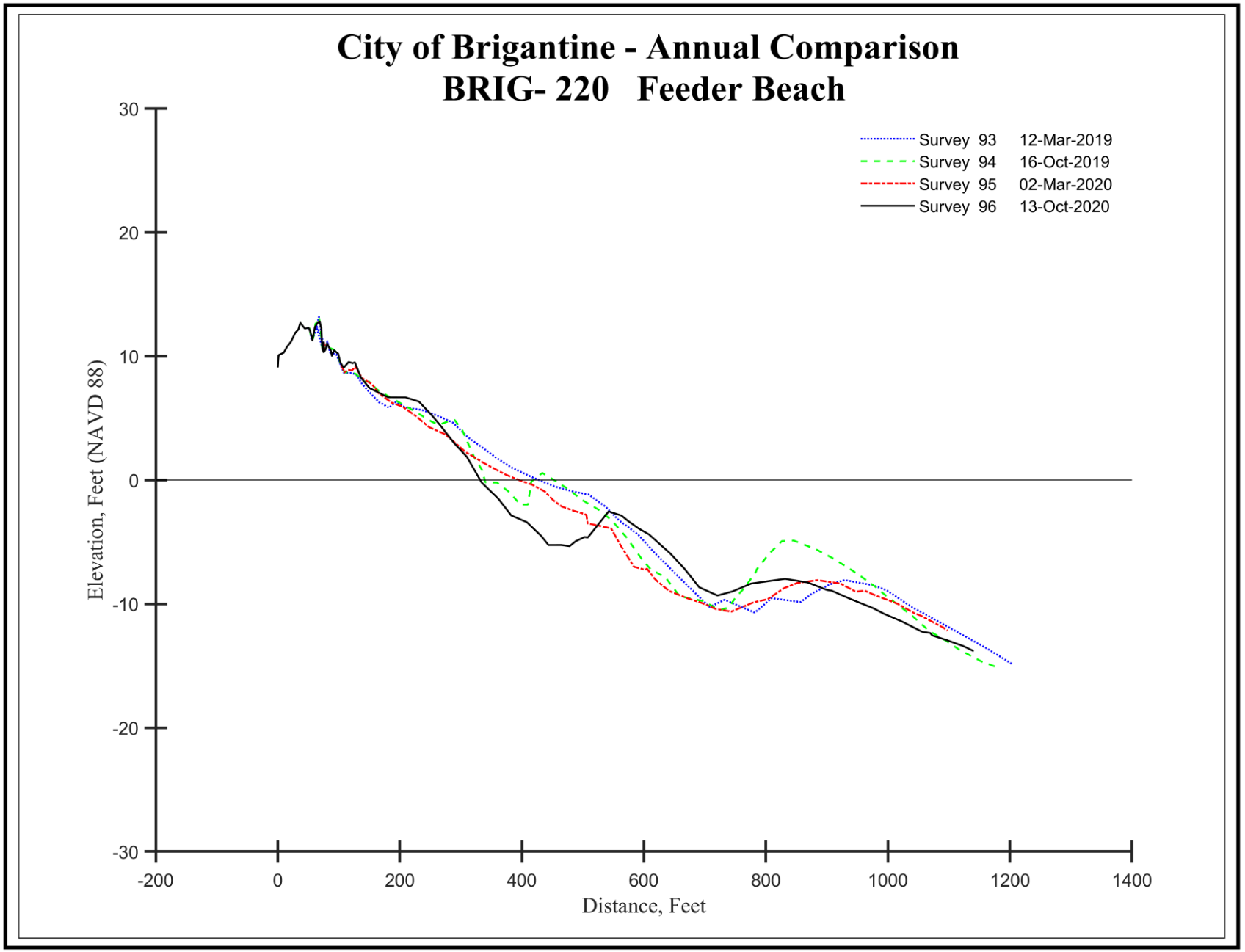

Figure 2c - Sand placed here by the USACE has remained stable between the dune and the beachface while extensive changes occurred offshore where the trough became deeper and a large bar and a nearshore ridge of sand appeared in the October 2019 survey. The net annual volume change was 30.07 yds^3/ft. October 2019 to October 2020, and the shoreline retreated 121 feet landward.

- **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 yds^3/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. 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 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 June 2019 berm had already been reduced in width from the initial project placement of sand. By April 2020 only a minimal berm was left which was eroded away to the sand fencing installed about 25 feet from the top of the wall by October 2020.

Profile Brig-12: 12th Street North **(Figures 3a & 3b)**

Figure 3a 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 in 2018 by the USACE.

Figure 3b taken October 13, 2020 with the sand fence at the swash limit and only about 25 feet of berm left to the promenade wall. The rocks remain buried at this moment.

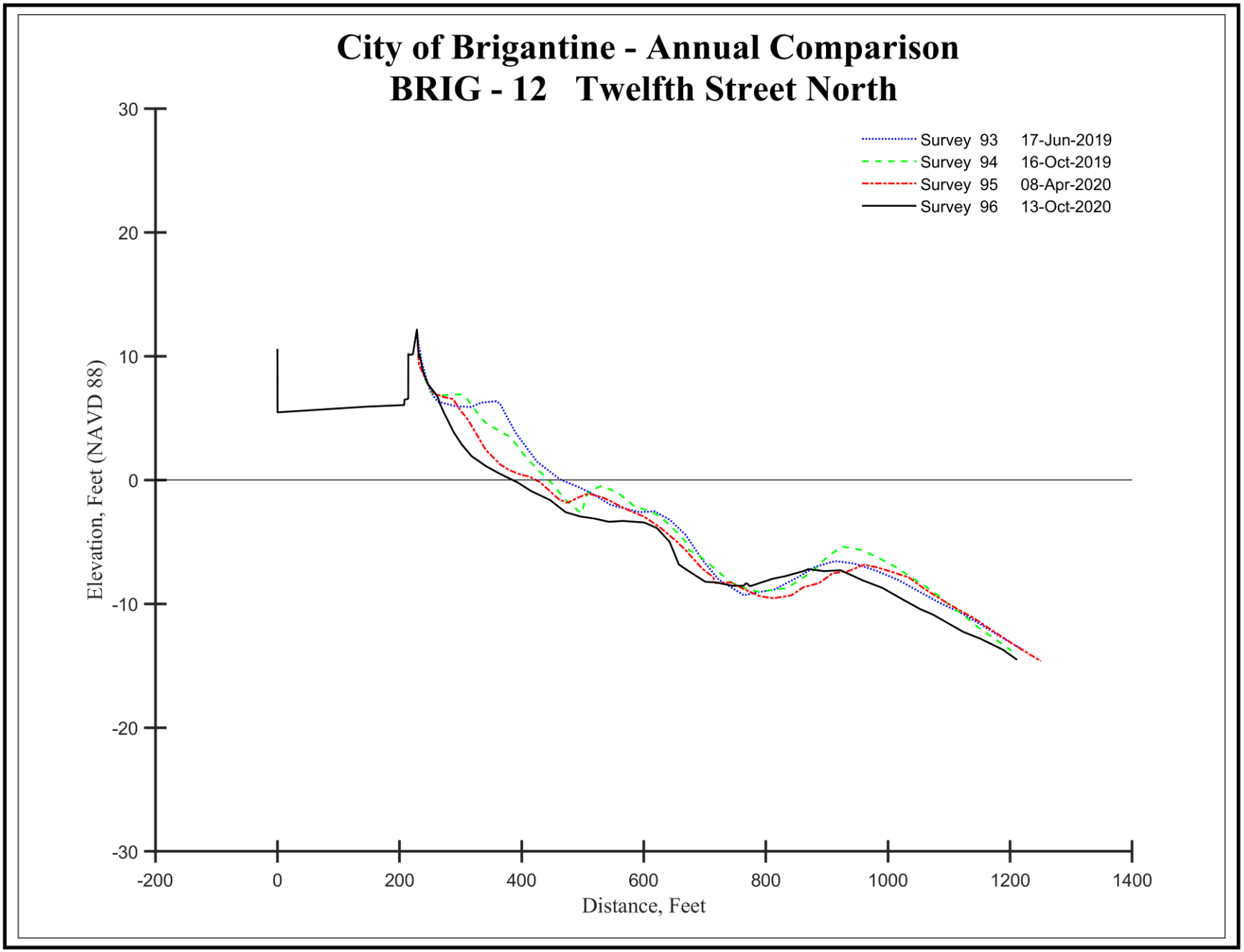

Figure 3c - This profile site was restored by the USACE project with 160.43 yds^3/ft. The summer of 2018 saw general beachface retreat, which continued through 2020. The remaining dry beach is 25 to 35 feet wide reducing the shore protection considerably. The annual change of 2019-2020 saw -52.63 yds^3/ft. with a 59-foot shoreline retreat by October 2020).

- **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 yds^3/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 yds^3/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 yds^3/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 15, 2019 with the view to the south, showing a stable beach and few changes at the toe of the dunes.

Figure 4b taken October 14, 2020 from the foredune crest shows the beach width and extensive area between the old primary dune to the right and this newer deposit of wind transported sand derived from the beach nourishment work.

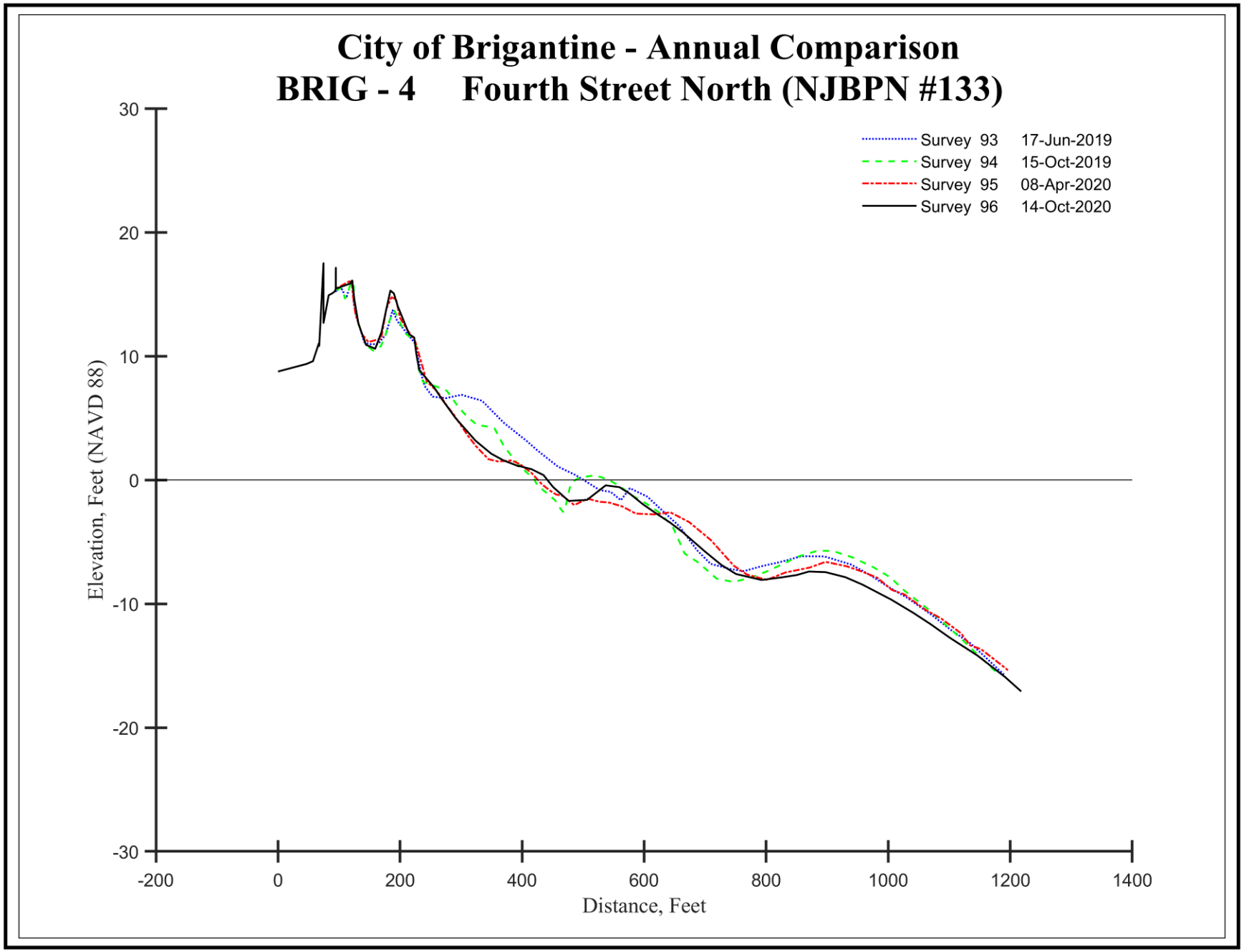

Figure 4c - Located south of the promenade, this site received sand in 2018, but lost beach width incrementally up to the April 2020 survey. The annual change was -17.05 yds^3/ft. accompanied by a 99-foot shoreline retreat.

- **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.

During 2020 the site managed modest sand volume gains (+11.18 yds^3/ft. for the year and +3.75 yds^3/ft. since March 2020) with generous shoreline advances seaward (+93 feet for the year and +49 feet since March 2020).

Profile Brig-5: 5th Street South **(Figures 5a & 5b)**

Figure 5a photo on 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 5b photo taken October 14, 2020 shows evidence of wind deposition on the foredune seaward slope with an unchanged beach width stretching seaward.

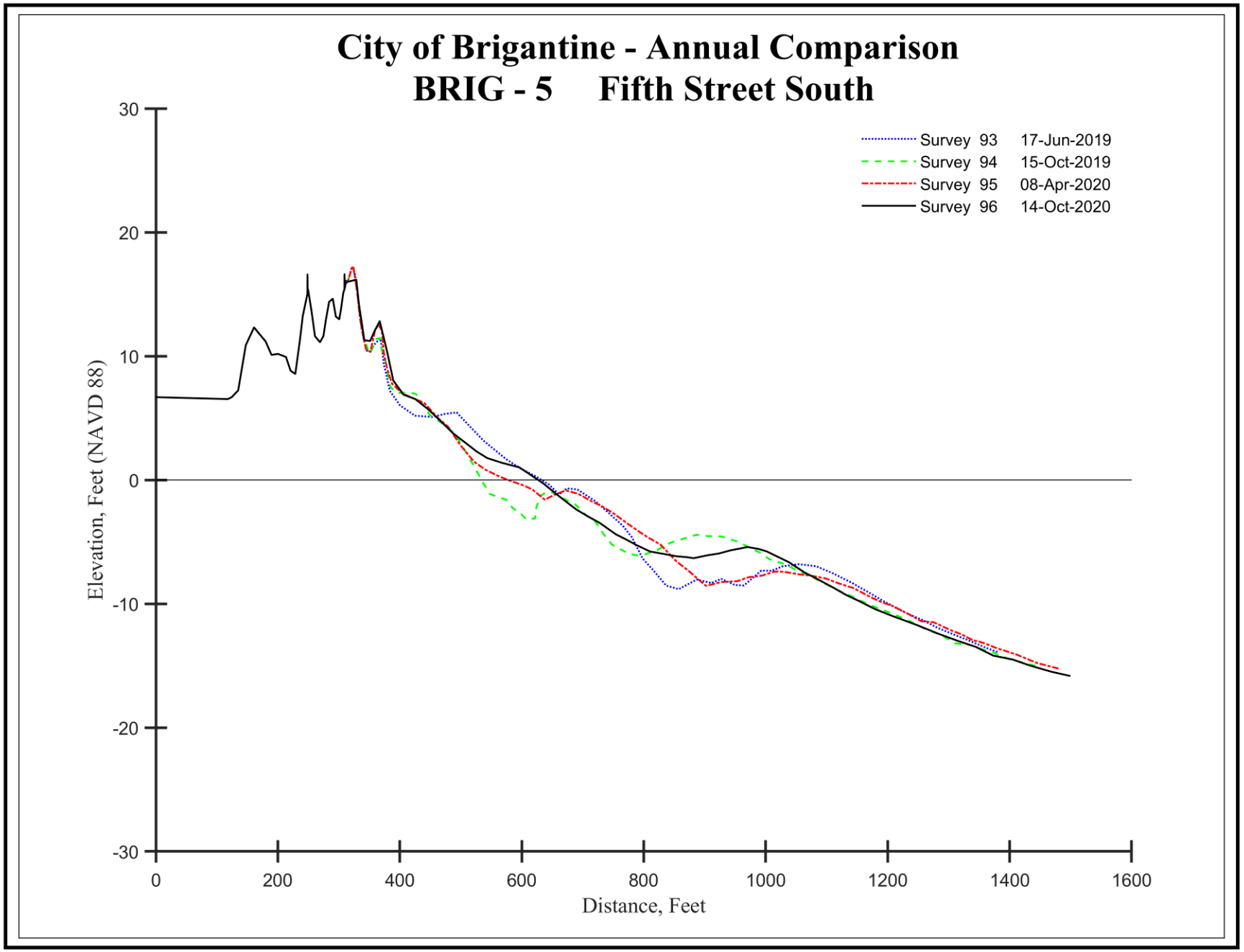

Figure 5c - The 5th Street South site had dune growth documented in the small foredune area. The beach remained neutral between June 2019 and October 2020. Offshore gained sand. The annual change amounted to a sand volume 11.18 yds^3/ft. and a 93-foot shoreline advance seaward.

- **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 any 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.

During 2020 modest sand volume losses dominated the site (-14.27 yds^3/ft. for the year and -8.21 yds^3/ft. since March 2020. The shoreline retreated as well (-12 feet over 12 months and -38 feet during the past six months).

Profile Brig-15: 15th Street South **(Figures 6a & 6b)**

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

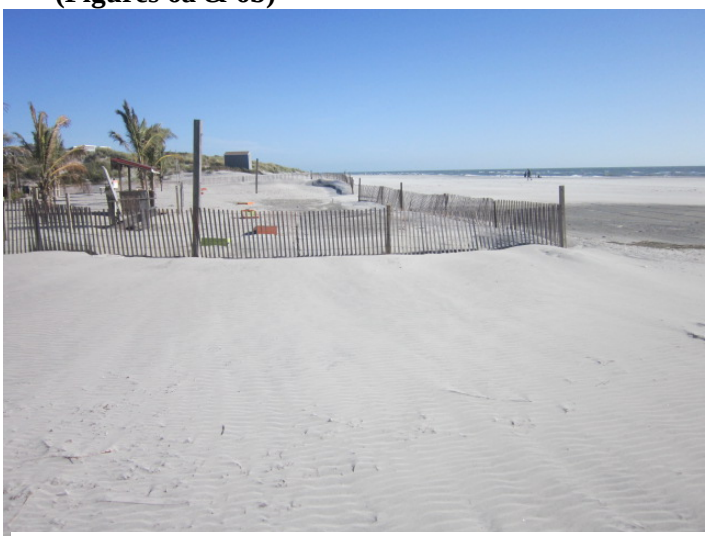

Figure 6b taken October 15, 2020 back near the bulkhead showing the beach modifications made by the Resort near the bulkhead in front of the building. The beach width remains 2-3 times that present in 1996.

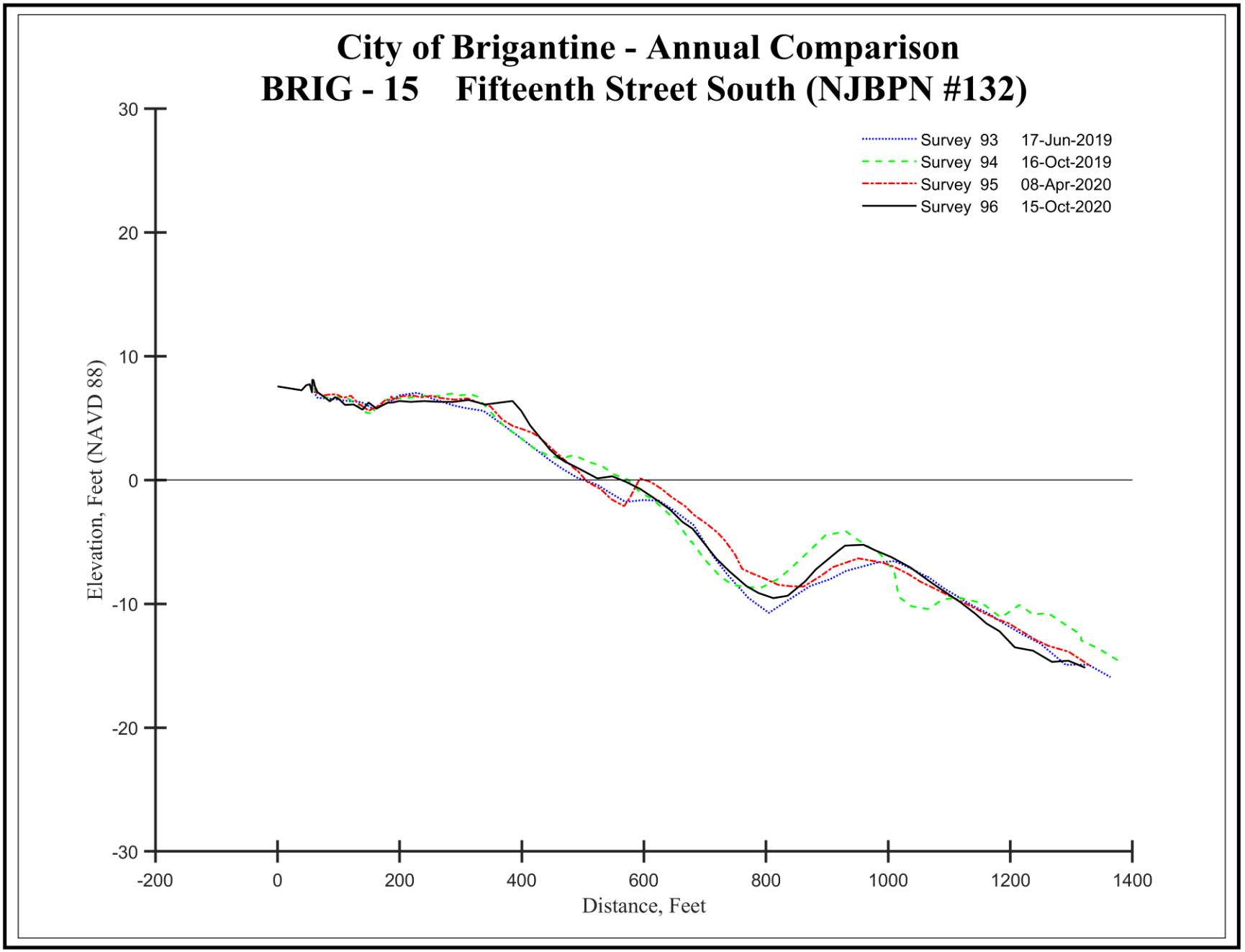

Figure 6c - At 15th Street South sand has been transported south to this location derived from the beach nourishment efforts further north since 1996. The offshore bar is extremely large for this location. 14.27 yds^3/ft. in sand was deposited annually and the beach advanced 27 feet seaward between October 2019 and October 2020.

- **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.

That said, 2020 was a year where this site lost both sand volume and suffered shoreline retreat dominated by the March to October 2020 interval. The shoreline retreat of 129 feet looks worse than it was because the profile from Oct. 2020 declines from the berm crest to a point below the zero-elevation datum while the March survey shows an offshore sand ridge that is higher than zero in elevation making it appear as if that shoreline point is where the beachface was. The actual retreat in the beachface slope was about 35 feet between March and October 2020. Sand volumes were negative which is unusual for this location.

Profile Brig-27: 27th Street South **(Figures 7a & 7b)**

Figure 7a Photo taken October 15, 2019 showing excellent grass growth over time. This profile shows the expanse of sand extending south toward Absecon Inlet in the distance.

Figure 7b Photo taken October 15, 2020 presents the same perspective as last year with a dune system most NJ shore towns would envy. The beach remains of significant width.

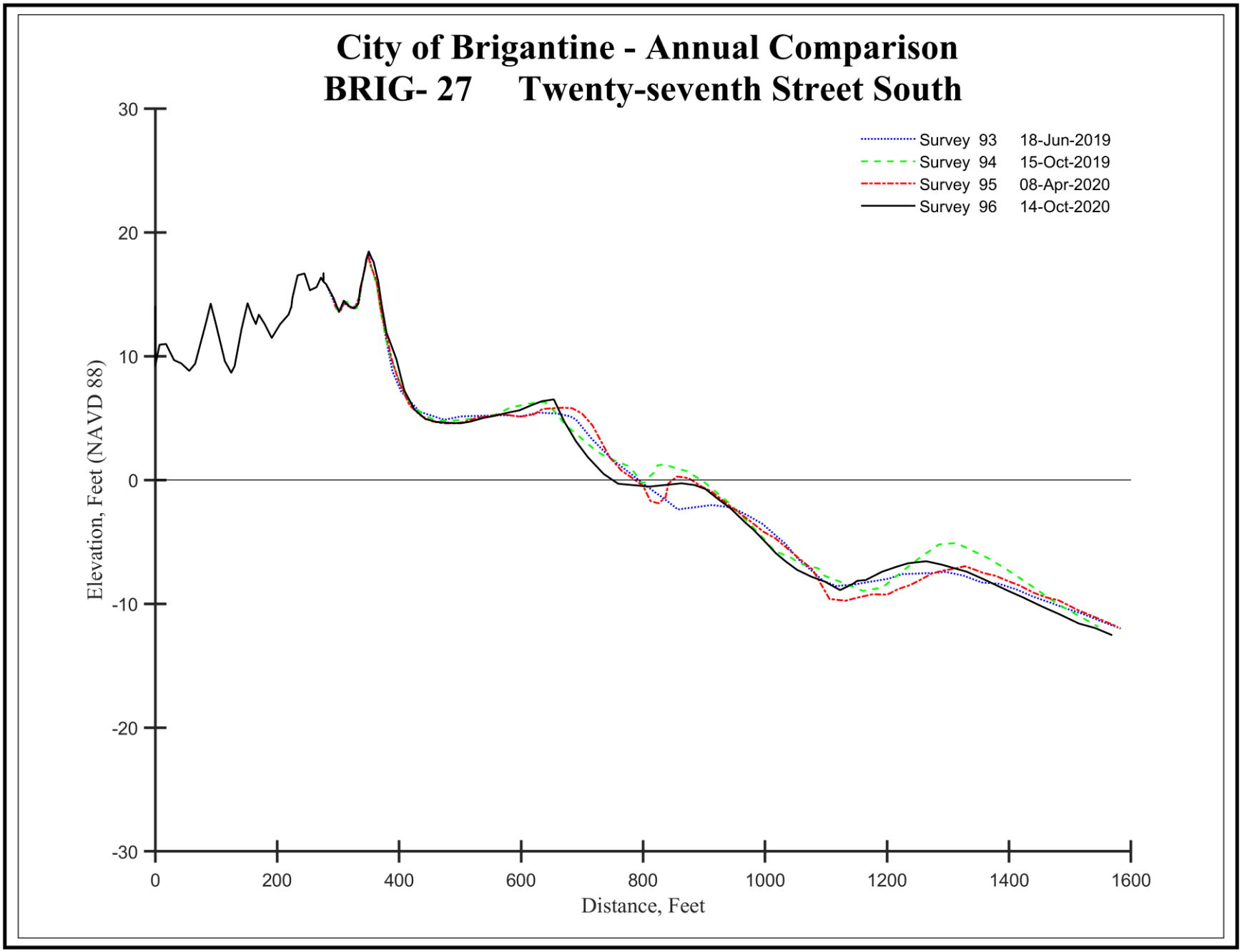

Figure 7c - 27th Street South survey saw beach retreat and sand volume losses this year for the first time in a long time, especially without significant storm activity. The site lost 22.55 yds^3/ft. while the shoreline point retreated 145 feet.

- **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.

The site did not fail to perform in accumulating additional sand quantities this year. Between this and the final site to the south, 131,193 cubic yards of sand were added to the reach between them (distance of 5.855 feet). The jetty continues to trap sediment and slowly feed it south into the Absecon Inlet area.

Profile Brig-43: 43rd Street South (Figures 8a & 8b)

Figure 8a 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.

Figure 8b Photo taken October 15, 2020 from a bit closer to the dune shown on the left. Sand blows across a 500-foot wide beach and streams into the dune system adding to the shore protection every year.

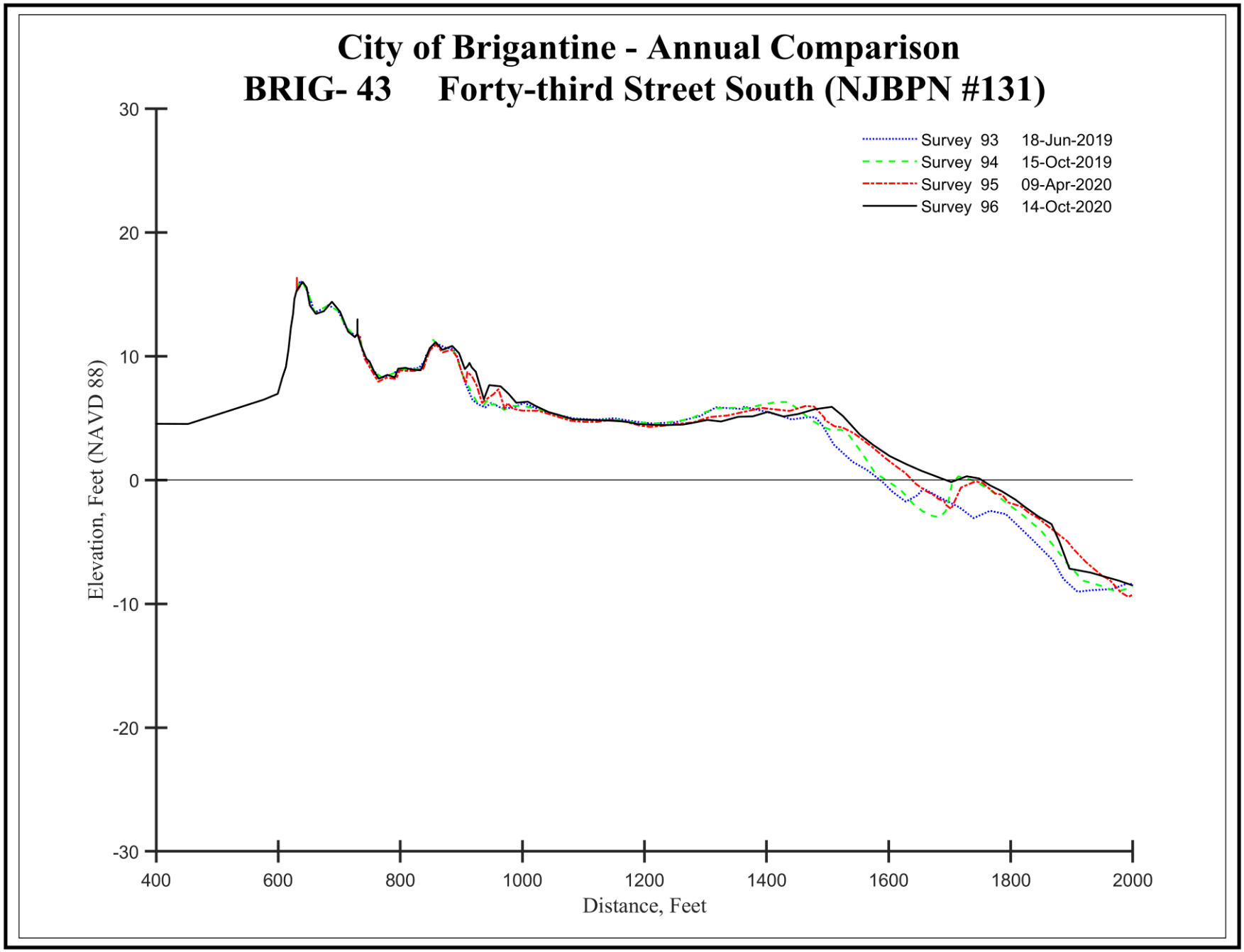

Figure 8c – This site continued to add sand to the beach, dunes and offshore areas. The annual sand volume increase was 24.06 yds^3/ft. with a 16-foot shoreline advance. Sizeable sand volumes were added to the offshore bar system during the summer and into the fall of 2020.

- **Profile Brig-1: South Beach** **(Figure 9a, 9b & 9c)**

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

Between January and April of 2020, the beach accumulated sand and increased its width. This width remained in place through the October 2020 survey. The annual sand volume change was 20.75 yds^3/ft. while the April to October addition was just 1.76 yds^3/ft.

Profile Brig-1: South Beach **(Figure 9a, 9b & 9c)**

Figure 9a Photo taken on 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 9b Photo taken October 14, 2020 near the seaward toe of the dunes looking at Atlantic City across the dry beach. Annually, the shoreline moved 29 feet seaward in 2020.

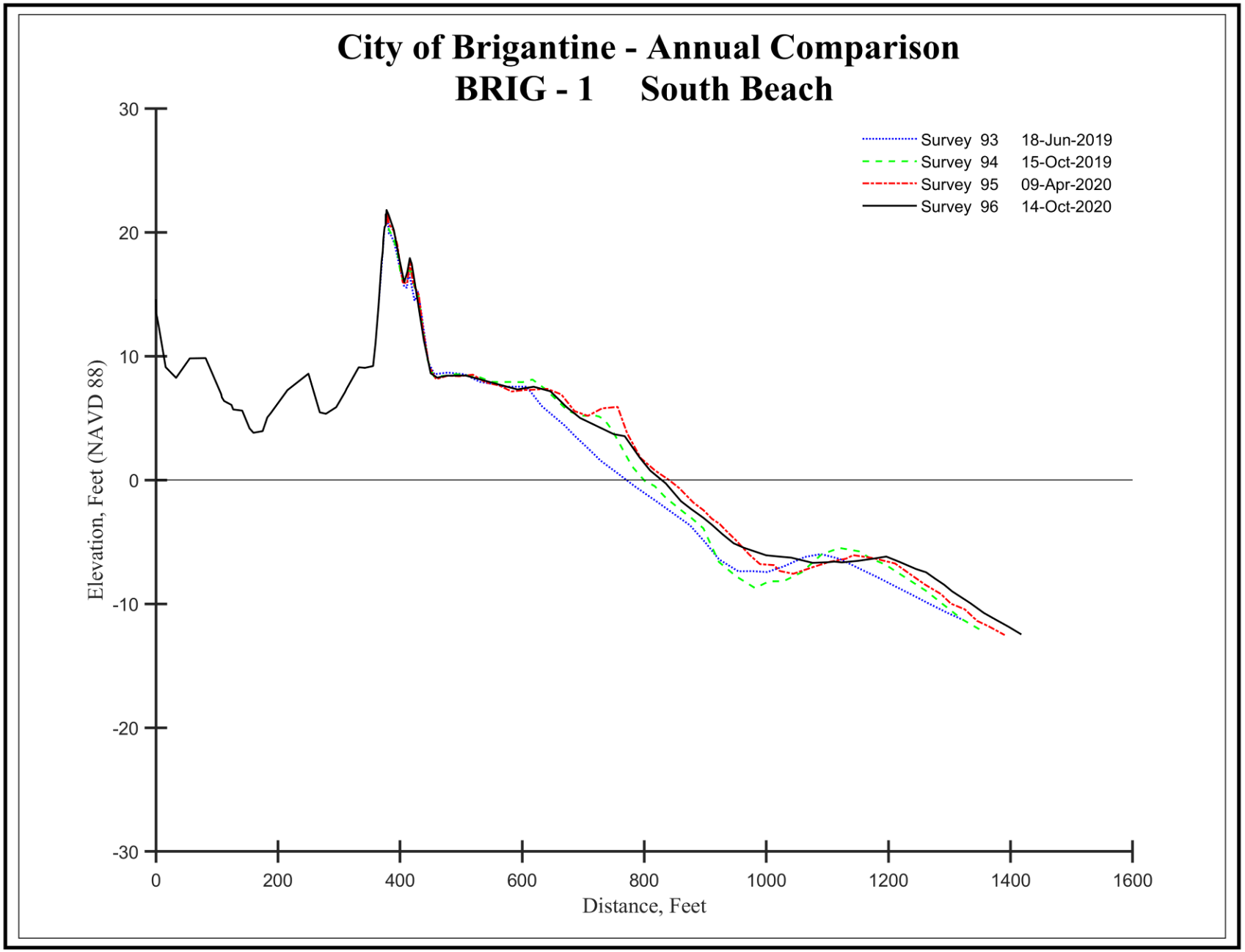

Figure 9c – Positioned 600 feet north of the inlet jetty, this site has seen sand accumulate over the past 12 months perhaps because there have been few serious northeast storms to drive bar sand into Absecon Inlet. The beach and nearshore regions gained most of the 20.75 $yds^3/ft.$ allowing the shoreline to advance 29 feet seaward.

Summary:

In 2018 the USACOE 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. Since that event the municipal shoreline reacted under local wave conditions to have sand shifted south from the feeder beach zone and pass through the segment defined by the rock and bulkhead protected promenade from 14th Street North south to 8th Street North. Sand still lies between the rocks and the high tide line on the beach, but at a 25 to 35-foot remaining width.

The beach between 15th and 27th Streets South suffered an unusual bout of erosion in 2020. The annual oceanfront beach lost 97,213 cubic yards of sand with this segment losing 55,996 of those yards of material. The remainder was shed between the feeder beach and 4th Street North. This trend continued between April and October of 2020 where the entire oceanfront lost 49,577 cubic yards of sand with the 15th to 27th Street segment loosing 21,407 yards, again with the remainder of the semi-annual loss moved south from the feeder beach and 4th Street North. The remaining beach at both 27th and 15th is still wide with 27th defended by an extensive dune system that has seen no damage to date.

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