



2020 Beach Monitoring Survey

TOWN OF SULLIVAN'S ISLAND, SC

Elko Coastal Consulting, Inc. | June 2020



Technical Report

2020 Beach Monitoring Survey: Town of Sullivan's Island, SC

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Cover Photo: June 2020 Ground photo of Monument 3065 near Station 26, looking southwest

Contents

Technical Report	1
1. Executive Summary	1
2. Introduction	1
3. Survey Methodology	2
Other data utilized in this study	3
4. Shoreline and Volume Change Analysis	5
3.1 MHW Position Relative to the OCRM Baseline: 2014-2020	5
3.2 Volumetric Analysis	6
3.2.1 Unit volume to DOC by Monument: 2014-2020	7
3.2.2 Island-wide Volume Change Estimates	8
3.3 Beach Conditions by Monument	10
3010	10
3020	13
3035	16
3050	19
3065	22
3080	25
3083	28
3085	31
3090	34
3092	37
3095	40
5. Summary of 2020 Beach Monitoring Survey	43

1. Executive Summary

Annual beach monitoring began on Sullivan's Island in 2016 to better understand the beach performance on the island. In addition to data collected in this study effort, beach profile data collected by the state in 2014 and 2015 were also used. Over the last seven years (since 2014), the beach has been relatively stable with some erosion along the northeast end of the island and accretion along the central and southwest end.

The healthy sand supply along Isle of Palms and net longshore transport into the Charleston Entrance Bight have produced frequent, large-scale, shoal bypassing across Breach Inlet. These sand bar attachment events, which are common on Sullivan's Island, were documented by this monitoring in 2014 and 2018-19. In general, the updrift spit at Breach Inlet overextends the channel entrance and periodically breaches, triggering a shoal-bypassing event¹.

Sediment from the 2018-19 attachment supplied sand to the center of the island in 2019 and in 2020 the sand was transported in both directions alongshore. Unfortunately, this sediment has not yet been transported to the eroding east end. Continued monitoring of the beach, and in particular, the erosional conditions on the east end is important.

On average, the shoreline eroded 13.5 ft between 2019 and 2020 (landward movement) along the island. The average volume change during this time period was only -1.5 cy/ft, indicating that the island was very stable during the last year.

2. Introduction

The purpose of this work is to provide an annual condition survey to monitor the Sullivan's Island beach. The intention is to survey the beach annually at the beginning of hurricane season in order to monitor changes to the beach from normal and/or storm conditions. Annual monitoring not only provides baseline conditions for each storm season, but also a comparison of past year's monitoring data that yields change rates important for understanding beach performance over time.

The beach on Sullivan's Island has generally been accretional due to its location on the updrift side of the Charleston Harbor jetties (Figure 1). As a result, little data had been collected to quantify and understand the physical coastal processes as is common on barrier islands with erosion problems. The Town's Local Comprehensive Beach Management Plan² provides an overview of the studies to date.

¹ Timothy W. Kana, Steven B. Traynum, Dan Gaudio, Haiqing L. Kaczowski, and Trey Hair, 2013. *The Physical Condition of South Carolina Beaches 1980–2010*, *Journal of Coastal Research*, sp iss 69.

² ATM, 1992. *Local Comprehensive Beach Management Plan, Town of Sullivan's Island*, May 1992, 233 p.

This effort continues an annual data collection and analysis plan for the Town of Sullivan's Island that started in 2016. In early 2018, a beach nourishment project placed about 1.7 million cubic yards of sand on the neighboring Isle of Palms. This influx of sediment to the barrier island system updrift of Charleston Harbor will likely have an impact on Sullivan's Island but thus far, it is unclear what the effect will be.

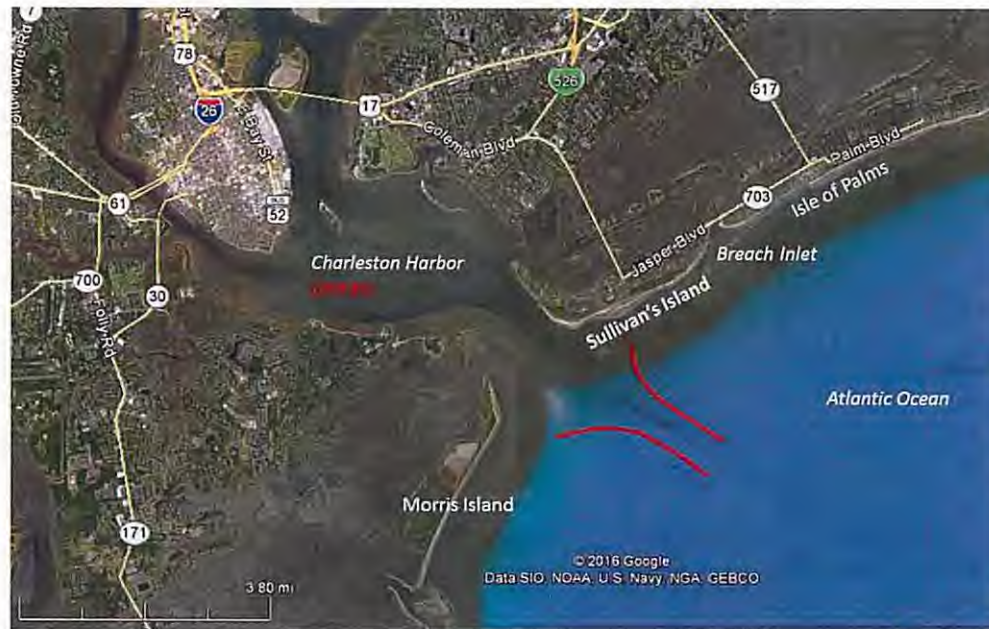


Figure 1. Location map of Sullivan's Island (image modified from Google Earth).

3. Survey Methodology

Topographic and hydrographic data collection (beach profile surveys) occurred on June 2, 2020. A total of 11 profile surveys were measured at existing Coastal Council/OCRM Monuments (Figure 2). On Sullivan's Island, the OCRM Monument spacing ranges from approximately 500 to 2,000 ft.

The monuments are survey benchmarks, which are permanent metal disks in the ground with information stamped on the face that mark a specific point that can be consistently reoccupied. On Sullivan's Island, these survey benchmarks begin with Monument 3010 at the southwest end of the island adjacent to the Entrance to Charleston Harbor and end at Monument 3095 at Breach Inlet. The lines illustrated in Figure 2 extending offshore from the monuments are the profile lines along which surveyors collect elevation measurements. These measured beach profiles describe a cross-section of the topography and bathymetry of the sand surface along the dry beach and nearshore/sand bar regions (e.g., Figure 7). By surveying the same line routinely, scientists can measure the change in sand volume or shoreline position, for example.



Figure 2. 2015 aerial photo illustrating the eleven (11) beach profile lines and corresponding SCDHEC-OCRM Monuments on Sullivan's Island. The solid black line running parallel to the shoreline through the dunes is the OCRM Baseline.

Surveys out to the “depth of closure” were collected in order to appropriately calculate volume changes along the beach. The depth of closure represents the offshore location where measurable sediment transport ceases. Here, closure depth is roughly -12 ft NAVD88.

Each profile extended from the OCRM Monument to either -14 NAVD88 or 1,400 feet from the toe of the dune, whichever was more landward. In some cases, this meant extending the profile lines up to 4,000 ft offshore to capture the nearshore sand bar feature and reach the depth of closure (e.g., Figure 3 and Figure 4).

The upland portion of the profiles was conducted by RTK GPS standard land surveying techniques and extended seaward to a wading depth deep enough to overlap with the offshore portion of the profile survey. Profile data points were collected at a maximum interval of 25 feet and at all significant elevation changes such as dunes, berms, scarp lines, seawalls, or sand bars.

The offshore portion of the survey was conducted by hydrographic techniques using a vessel mounted fathometer along with kinematic GPS. The survey equipment and methodology complied with USACE standards for hydrographic surveying.

OTHER DATA UTILIZED IN THIS STUDY

Beach profile data was also collected during the summer of 2014 and 2015 by SCDHEC OCRM and served to the general public through the S.C. Beach Erosion and Monitoring ([BERM Explorer](#)) application. The combination of these data and the survey data collected for this work provides seven years of data over a study period of 2014 to 2020.

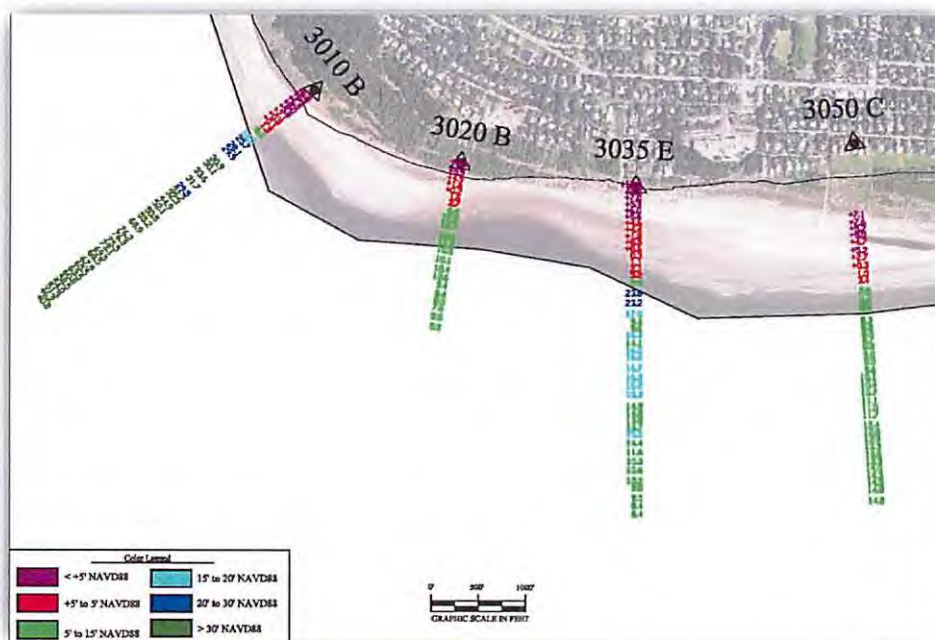


Figure 3. Topographic and bathymetric 2020 survey data illustrating the measured elevation along each line for the southwest end of Sullivan's Island.

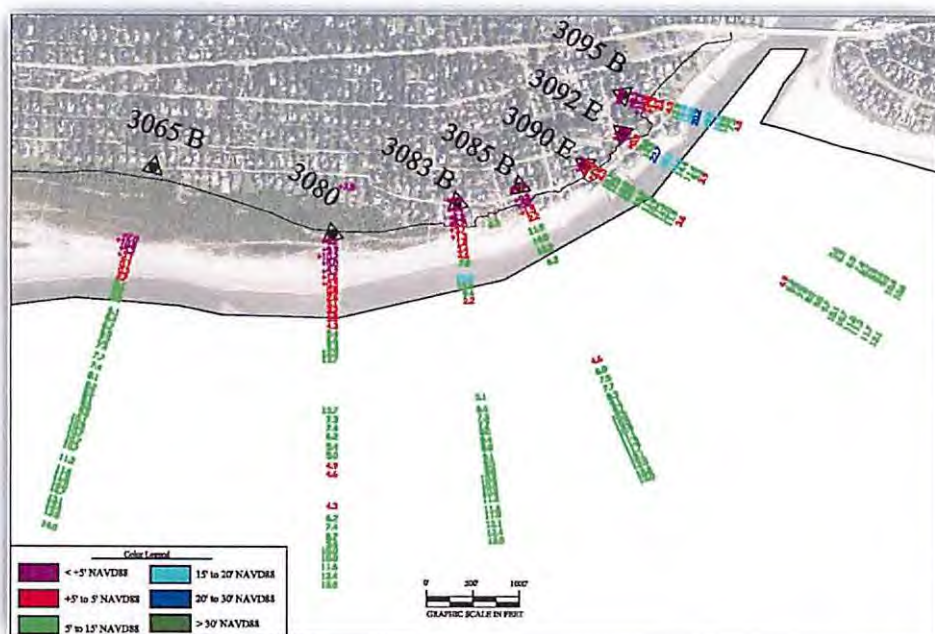


Figure 4. Topographic and bathymetric 2020 survey data illustrating the measured elevation along each line for the northeast end of Sullivan's Island.

4. Shoreline and Volume Change Analysis

The shoreline change analysis was conducted by measuring the position of the Mean High Water (MHW) contour (2.03 ft NAVD88) relative to the OCRM baseline. The volume change analysis was conducted by measuring the volume of sand on the profile from the seawardmost dune crest to the depth of closure (-12ft NAVD88) when possible.

3.1 MHW POSITION RELATIVE TO THE OCRM BASELINE: 2014-2020

The position of MHW relative to the baseline is a useful measurement (Figure 5) because it illustrates both the change in shoreline position from year to year, as well as the distance between the shoreline and baseline – an indicator of the level of storm damage protection provided by the beach/dune system at each monument.

During the study period, the Sullivan's Island shoreline changed dramatically between 2014 and 2015. Between 2015 and 2019, the shoreline gradually recovered back to near the 2014 position in most cases (Figure 5). During the last year, between 2019 and 2020, the shoreline along the northeastern 2/3 of the island retreated again to near 2015 conditions. Average shoreline change between 2019 and 2020 was 13.5 ft of landward movement (erosion). Several areas were flagged in previous monitoring reports and are discussed below.

The northeast end of the island, between Monuments 3090 and 3095 and adjacent to Breach Inlet, was flagged in the 2016 report. It is under continual erosional pressure due to the southwesterly migration of Breach Inlet, but has been stabilized by erosion control structures. Minor shoreline change has occurred along this northeastern end between 2015 and 2019 (i.e., stability); however, shoreline erosion was measured during the last year of monitoring between 2019 and 2020 (Figure 5). The small distance between the shoreline and the OCRM baseline suggests erosional pressure and the need for continued monitoring. There is little storm damage protection at this location.

During the last year, shoreline advancement was measured at Monuments 3083 and 3085. This is a result of the longshore spreading of the sand that attached to the central portion of the island in 2018 and 2019. Note that the shoreline along the central portion of the island, between Station 31 and 22 (between OCRM Monuments 3050 and 3085), tends to fluctuate in response to Breach Inlet shoal attachment events³ (Figure 5).

Downdrift of this region, in the vicinity of the Charleston Harbor jetty, the shoreline has been stable to accretional over the last five years.

At the sandbar attachment point, near Station 26 (OCRM Monument 3065), the shoreline moved about 140 ft landward between 2019 and 2020. This location is represented by the bottom of the curve of the lines near 8,000 ft alongshore (Figure 5). This suggests that a sandbar attachment event occurred in 2018 and 2019, and that sand is now spreading out

³ ATM, 1992. LCBMP (see Footnote 1).

alongshore. Notice that the 2020 MHW shoreline position line is similar to the 2015 shape, suggesting that the island is in a one-year post-attachment phase.

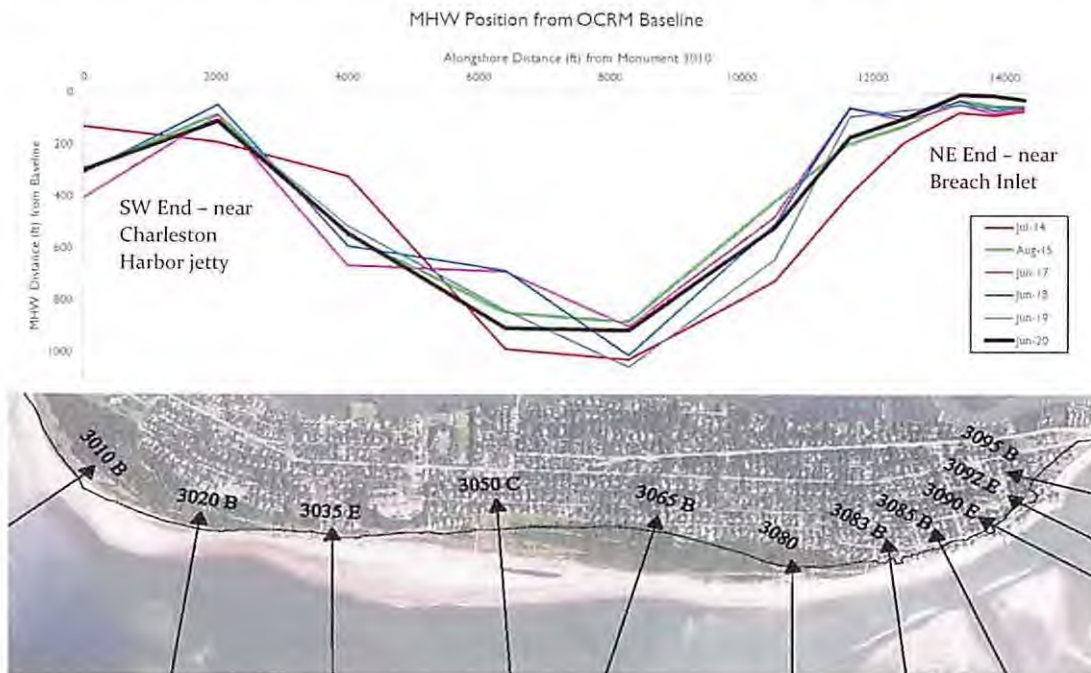


Figure 5. Annotated MHW Position graph aligned with the aerial photo from Figure 2, illustrating the change in shoreline position from 2014 to 2020, as well as the distance between the shoreline and baseline. Note the scale shows wider (larger) shoreline widths toward the bottom to correspond with the map.

Perhaps most interesting observation is that the only location on the island that has exhibited shoreline advancement since 2014 is the area close to Charleston Harbor (Monuments 3010 & 3035). Thus, with the exception of the beach adjacent to Charleston Harbor, the Sullivan's Island shoreline has not been advancing seaward since 2014. In other words, the island is not endlessly growing seaward. The shoreline has reached a dynamic equilibrium.

3.2 VOLUMETRIC ANALYSIS

As noted above, the volume change analysis was conducted by measuring the volume of sand on the profile from the seawardmost dune crest to the depth of closure (~12ft NAVD88) when possible. These two locations were selected to approximate the limits of measurable sand movement across the beach portion of the profile. The nearshore sand bar was intentionally left out of the calculations when possible because the bar often complicates beach profile volume calculations. When the profile does not "close" at or before -12 ft, volume is calculated out to the location where the lines intersect (i.e., the visible depth of closure).

There is no doubt that the nearshore sand bar and the beach exchange sediment, but in order to understand the beach volume change, an effort was made to separate the beach profile from the nearshore sand bar when the bar was separated by a deep channel and not welding to the beach face. The volume of the nearshore bar can be approximated in the future if necessary.

3.2.1 Unit volume to DOC by Monument: 2014-2020

As suggested in the MHW analysis, northeastern Sullivan's Island has less storm protection in place than the rest of the island. Despite the narrowing beach, the average unit volume to the depth of closure (DOC) has been stable at near 130 cubic yards per foot (cy/ft) from 2016 to 2020. The rest of the island has at least 200 cy/ft of volume along each measured profile (Figure 6).

The other end of the island, near Charleston Harbor, has exhibited remarkably stable unit volume measurements over the last four years. Between monuments 3020 and 3035 (Sta. 19 west to the Sand Dunes Club), very little volume change has been measured. As is expected adjacent to inlets, monument 3010, closest to the channel is more dynamic.

During this monitoring period, as in 2015, the central portion of the island (between Monuments 3050 and 3080) lost volume as sediment from the sand bar attachment event spread out. However, volume did not decrease to the 2015 level. This suggests that while the island is not building (prograding) seaward in terms of shoreline position, it is gaining volume along the central portion. Most of this volume increase is due to sand accumulation in the dunes and backbeach. The next section details this volume increase and other specific changes using beach profile data from each monument.

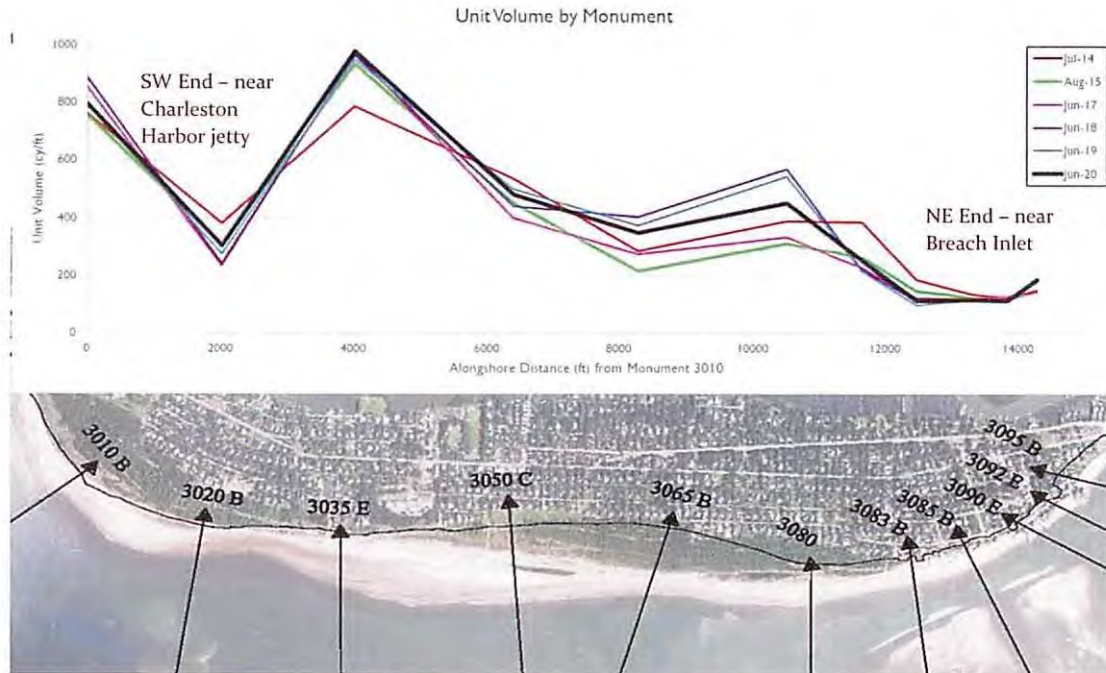


Figure 6. Annotated Unit Volume graph illustrating the change in unit volume at each profile from 2014 to 2020. Note the scale shows larger volumes toward the top of the plot.

3.2.2 Island-wide Volume Change Estimates

Due to the large distance between OCRM Monuments on Sullivan's Island, it is difficult to calculate total volume statistics for the island using data from only 11 profiles. Small fluctuations in volume at a single beach profile translate to relatively large volume change statistics when applied over long distances. Thus, the volume change estimates provided in Table 1 should be treated as approximations.

From 2016 to 2020, the total volume change was a gain of 226,373 cy (Table 1). Half of the island is gaining sand, and half is losing sand volume. Between Charleston Harbor and Station 26 (Monument 3065), sand volume is increasing. Between Station 26 and Breach Inlet, sand volume is decreasing. In the last year, the island lost 68,423 cy (erosion) with the most volume loss occurring in the center of the island at Station 28 (Monument 3080). This volume loss was the result of sand from the 2018-2019 sand bar attachment event spreading out.

Table 1. Volume change estimate for Sullivan's Island from 2016 to 2020 and for 2019 to 2020.

Monument	2016-2020		2019-2020	
	Avg. Change Between Profiles (cy/ft)	Total Between Profiles (cy)	Avg. Change Between Profiles (cy/ft)	Total Between Profiles (cy)
3010 B				
	23.0	61,980	14.3	38,620
3020 B				
	19.1	39,296	28.8	59,218
3035 E				
	50.6	123,113	5.8	14,106
3050 C				
	44.7	78,167	-21.5	-37,696
3065 B				
	-3.8	-8,694	-58.5	-135,367
3080				
	-21.6	-31,579	-27.6	-40,367
3083 B				
	-20.4	-20,607	23.7	23,988
3085 B				
	-10.3	-9,865	6.0	5,701
3090 E				
	-7.7	-4,179	1.2	666
3092 E				
	-2.6	-1,259	5.6	2,709
3095 B				
Total Volume Change (cy)		226,373		-68,423

3.3 BEACH CONDITIONS BY MONUMENT

In addition to survey data collection, this study also conducted a beach condition assessment by taking ground photographs at each OCRM Monument and noting the condition of the beach. This section includes the condition assessment information and a beach profile data plot for each OCRM Monument.

Heavy recreational use of the beach had been limited for several weeks at the time of the survey due to a local exercise-only regulation enacted during the COVID-19 pandemic. As such, the dunes accumulated significant amounts of sand and were building seaward overall.

3010

This is the southwesternmost OCRM Monument on Sullivan's Island, located along the long beach access path at Station 16 with the nature trail. The beach is located on the Charleston Harbor side ("inside") of the jetty. Consistent with the measured beach profile data (Figure 7), observations indicated that the dunes had advanced seaward up to 50 feet as compared to the 2019 conditions (Figure 8). However, the beach was narrow at about 15 feet wide and eroding with a small 6-inch scarp. Significant storm rack had accumulated along the back beach, all the way up to the toe of the dune (Figure 9). No dune overtopping was evident. According to the 2020 volume calculation, this profile has a unit volume of 793 cy/ft. This is the same unit volume as in 2019.

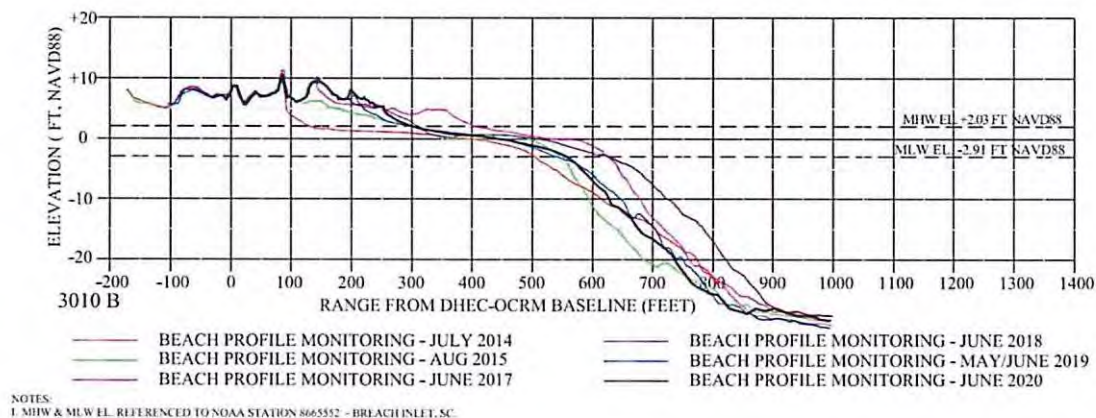


Figure 7. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3010.



Figure 8. Ground photo taken at Monument 3010 looking east on June 6, 2019 (top) and June 2, 2020 (bottom). Note the narrower beach but increased vegetation on the dune in 2020.



Figure 9. Ground photo taken at Monument 3010 looking west on June 6, 2019 (top) and June 2, 2020 (bottom). Note the higher elevation of the backbeach in 2020.

3020

Monument 3020 is located along the long beach access path at the Sand Dunes Club. Significant erosion had taken place here since 2014 that included loss of a large dune and submerged nearshore sand body (Figure 10). Considerable recovery occurred during this monitoring interval (2019-2020). A dune has been reestablished farther landward of the eroded 2014 dune and the beach berm and nearshore sand body accreted.

Beach observations confirmed that the recovery that began in 2019 continued in 2020 with a 2-ft high dune advancing seaward along the back beach to the high tide line. Dead trees along the dune line were buried with sand. The beach was accreting with at least 35 ft of dry beach at high tide. A sand bar had attached to the updrift beach and the beach berm accreted (Figure 11). Dune recovery continued (Figure 12).

According to the 2020 volume calculation, this profile has a unit volume of about 305 cy/ft, which is in stark contrast to the surrounding accretional areas. This monument is influenced by its location downdrift of the Charleston Harbor jetty.

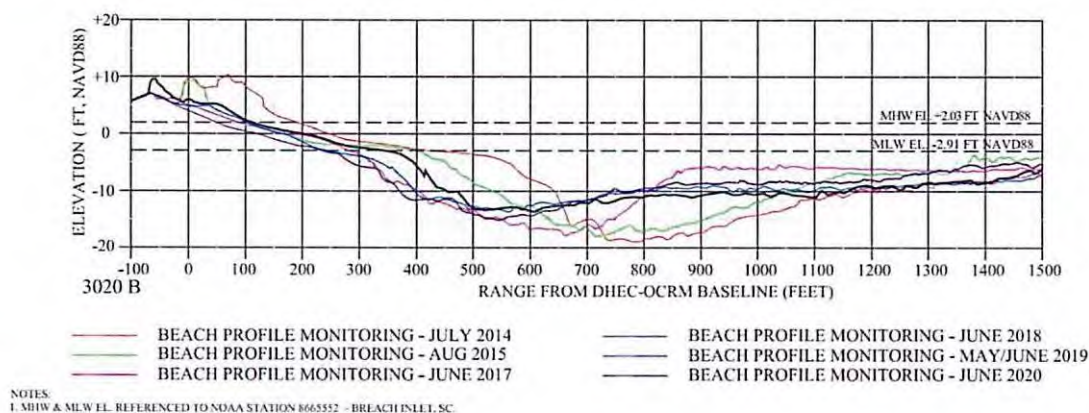


Figure 10. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3020.



Figure 11. Ground photo taken at Monument 3020 looking northeast on June 6, 2019 (top) and June 2, 2020 (bottom). Notice the evolution of the sand bar attachment on the beach to the northeast.



Figure 12. Ground photo taken at Monument 3020 looking southwest on June 6, 2019 (top) and June 2, 2020 (bottom). Note the recovery of dune vegetation to the southwest in 2020.

3035

Monument 3035 is located along the long beach access path at Station 19. This area has been the beneficiary of recent sandbar attachment events (Figure 13). The beach has been wide and accreting for the last several years. A new primary dune has formed since 2014. In 2020, beach observations confirmed that a wide backbeach with a distinct berm slope break existed (Figure 14 and Figure 15). Additionally, the backbeach was covered with incipient dunes in the form of small, hummocky mounds seaward of the primary dune line. Evidence of past ponding landward of this area was observed, which is common at this location.

According to the 2020 volume calculation, this profile has a unit volume of 980 cy/ft. The beach profile at this monument is influenced by the sediment trapping effect of the Charleston Harbor jetty.

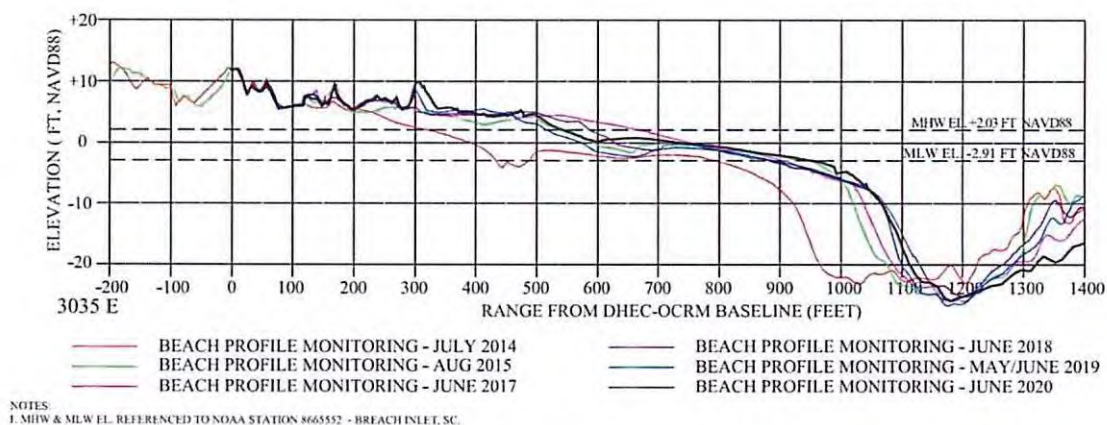


Figure 13. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3035.



Figure 14. Ground photo taken at Monument 3035 looking northeast on June 6, 2019 (top) and June 2, 2020 (bottom). Note increased elevation of the backbeach.



Figure 15. Ground photo taken at Monument 3035 looking southwest June 11, 2019 (top) and June 2, 2020 (bottom). Note the higher berm elevation.

3050

Monument 3050 is located along the long beach access path at Station 22.5 in the center of the island. Beach profile data indicate the onshore transport of the recent sand bar attachment events that occurred here in 2014 and 2018-19 (Figure 16). Over the last five years, sediment from these attachment events have welded to the shoreface and resulted in the 2020 beach which includes a wide berm and new, tall primary dune.

The beach observations confirm that the 2020 beach was over 100 ft wide and accretional. The dunes were healthy with new growth and the backbeach was covered with incipient dunes and coppice mounds (small starter dune-like features). Evidence of past backbeach ponding was observed.

According to the 2020 volume calculation, this profile has a unit volume of 480 cy/ft. The beach profile at this monument benefits from its location updrift of the Charleston Harbor jetty. Sand volume has been relatively stable at this profile fluctuating between 400 and 500 cy/ft and the shoreline position has also fluctuated considerably. The data indicate stability rather than uninhibited accretion and progradation.

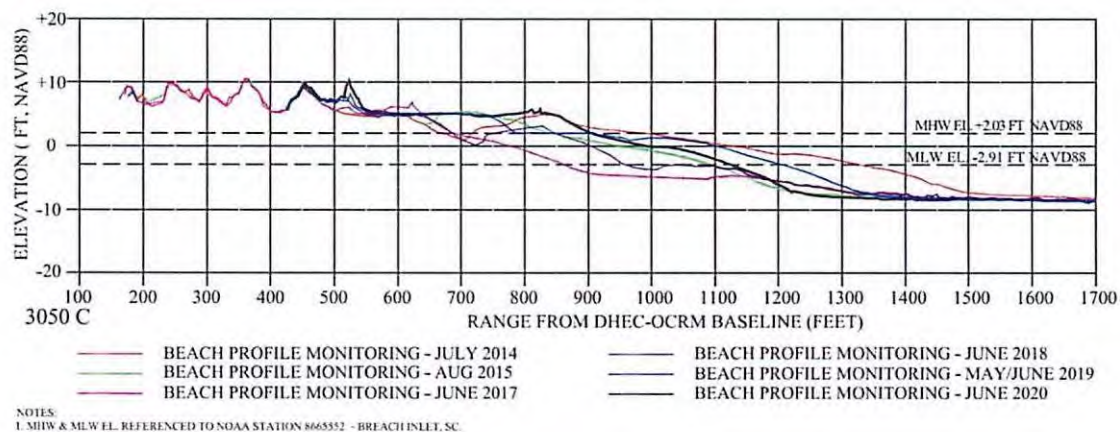


Figure 16. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3050.



Figure 17. Ground photo taken at Monument 3050 looking northeast on June 6, 2019 (top) and June 2, 2020 (bottom). Note the sandbar attachment in 2019.



Figure 18. Ground photo taken at Monument 3050 looking southwest June 6, 2019 (top) and June 2, 2020 (bottom). Note the sandbar attachment in 2019.

3065

Monument 3065 is located along the long beach access path at Station 26, which traverses a beachfront marsh environment containing significant standing water. Shoreline and beach profile data indicate that this is the widest maritime forest, beachfront marsh, dune and beach system on the island.

This monument is near the sandbar attachment point, which fluctuates but in 2019 was located near Sta. 27.5. The bar comes onshore and then begins to spread in both directions alongshore.

The profile goes through cycles of erosion and accretion as new sand bars attach and the sand is dispersed alongshore. For example, past beach profile data indicated substantial beachface erosion following the 2014 attachment event (Figure 19) as the sediment spread along the beach. In 2020, beach width was reduced considerably as sand from the 2019 sand bar attachment spread downdrift.

Beach observations confirm that the beach had narrowed to about 70 ft wide at high tide (Figure 20 and Figure 21). Consistent with the other profiles on the island, the primary dune was building seaward with new growth and no sign of overtopping despite considerable rack debris along the back beach. According to the 2020 volume calculation, this profile has a unit volume of 350 cy/ft.

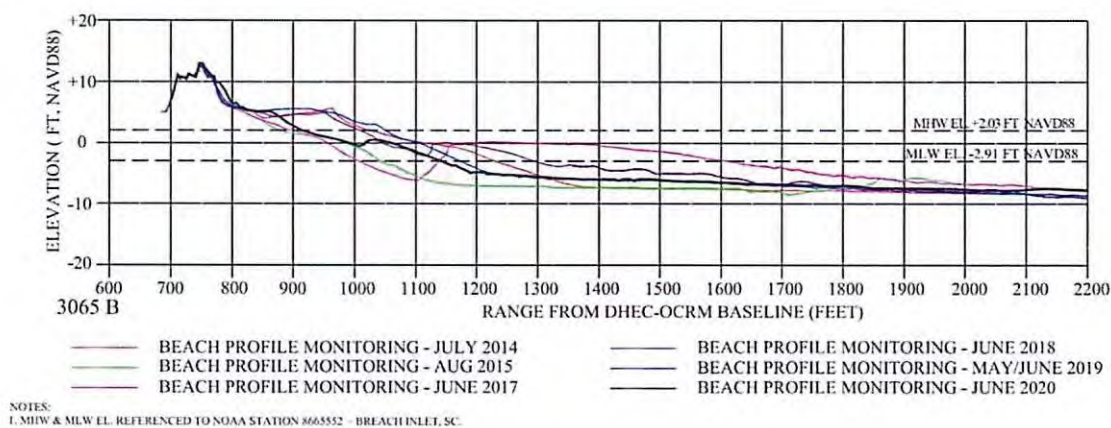


Figure 19. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3065.



Figure 20. Ground photo taken at Monument 3065 looking northeast on June 6, 2019 (top) and June 2, 2020 (bottom). Note the sandbar attachment point.



Figure 21. Ground photo taken at Monument 3065 looking southwest on June 6, 2019 (top) and June 2, 2020 (bottom). Note the incipient dunes on the backbeach in 2020.

3080

Monument 3080 is located along the long beach access path at Station 28.

The sand bar attachment point was located just to the west of this monument in 2019. In 2020, the sand bar had attached to the shoreface and was spreading out (Figure 22). The primary dune and the beach berm both accumulated sand and advanced seaward.

Beach observations confirm that the beach at this location was 90 ft wide at high tide, the primary dune was advancing, and incipient dunes were developing along the back beach (Figure 23 and Figure 24). There was evidence of past back beach ponding, but none was observed in 2020 and no signs of dune overtopping were observed.

According to the 2020 volume calculation, this profile has a unit volume of 450 cy/ft. This profile displayed the largest volume loss over the last year due to sand from the attachment event spreading out alongshore.

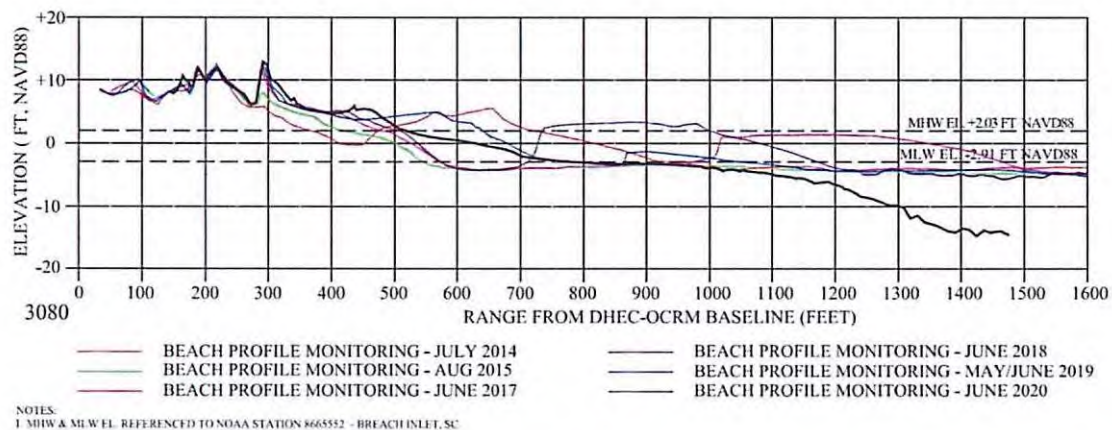


Figure 22. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3080.



Figure 23. Ground photo taken at Monument 3080 looking northeast on June 11, 2019 (top) and June 2, 2020 (bottom). Note the sand bar attachment in 2019.



Figure 24. Ground photo taken at Monument 3080 looking southwest on June 6, 2019 (top) and June 2, 2020 (bottom).

3083

Monument 3083 is located near Station 29 and is in an area of critical erosion. This profile represents the southwest end of the groin field along northeastern Sullivan's Island. The shoreline here has retreated nearly 300 ft since the last sand bar attachment event in 2014 (Figure 25), including the loss of three rows of low sand dunes. In 2020, some beach recovery was measured. The shoreline advanced 80 ft seaward between 2019 and 2020 due to sand from the most recent attachment event migrating to this area. The backbeach accumulated a significant amount of sand covering the previously exposed seawall and sand bags that had been placed and/or exposed at the toe of the dune scarp (Figure 26). Groins and seawalls continue to dominate this portion of the island, but recovery was observed.

This location marks the transition between the northeast end of the island, which has been stabilized with erosion control structures and the wide, fluctuating beach of the central portion of the island to the southwest (Figure 27).

According to the 2020 volume calculation, this profile has a unit volume of 252 cy/ft, about 40 cy/ft larger in 2019.

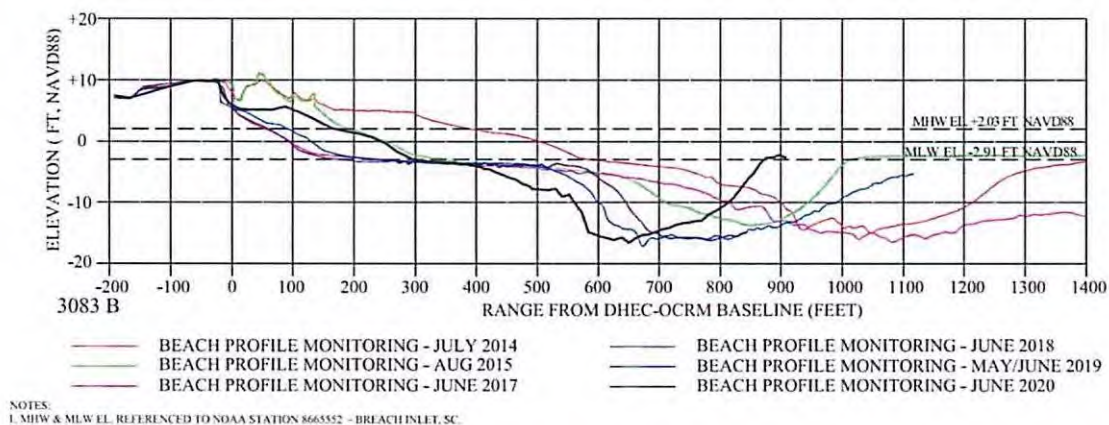


Figure 25. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3083.



Figure 26. Ground photo taken at Monument 3083 looking northwest on June 6, 2019 (top) and June 2, 2020 (bottom). Note the increased beach width in 2020.

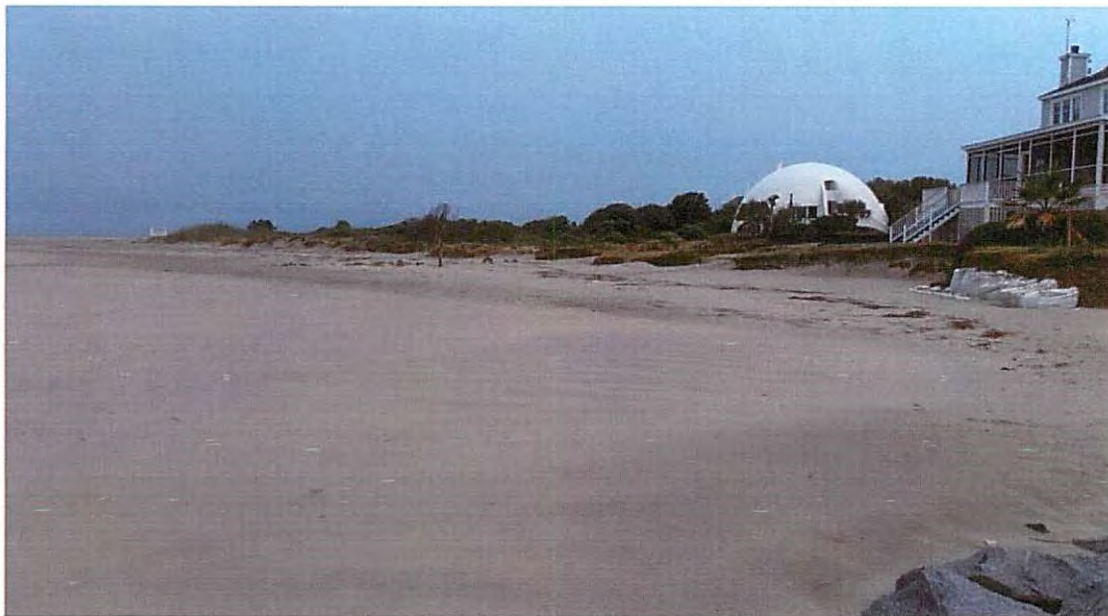


Figure 27. Ground photo taken at Monument 3083 looking southwest on June 6, 2019 (top) and June 2, 2020 (bottom). Note the increased beach width in 2020 and exposed sand bags.

3085

Monument 3085 is located near Station 30. This area had been eroding since the sand bar attachment event in 2014, but some accretion was measured during this monitoring period. Beach profile data indicates evidence of some backbeach recovery between 2019 and 2020 (Figure 28).

Beach observations indicate that despite some measured recovery, the high tide line remains under the decks of the homes in this area. There is very little dry beach at high tide. Some dune recovery was observed and no dune overtopping has occurred recently.

This pocket beach between groins is highly erosional. No dunes are present in front of the houses. Despite the structures, erosion continues to dominate this portion of the island between sandbar attachment events (Figure 29). Erosion has become so severe in this area that a historic cannon structure which has been buried under the beach became exposed on the beachface in 2019 (Figure 30). This profile will be monitored closely.

According to the 2020 volume calculation, this profile has a unit volume of 111 cy/ft, a slight increase from the 2019 volume.

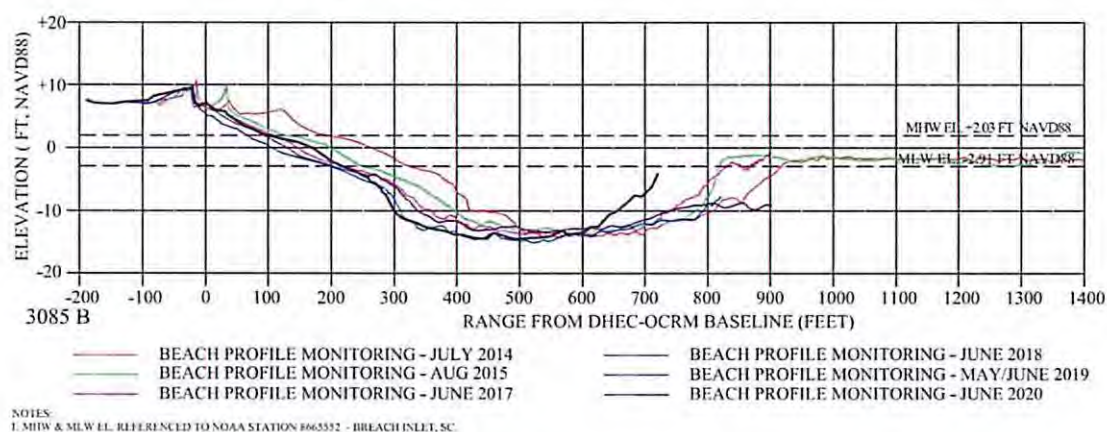


Figure 28. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3085.



Figure 29. Ground photo taken at Monument 3085 looking northwest on June 6, 2019 (top) and June 2, 2020 (bottom). Notice the profile deflation under the deck in 2019 and backbeach recovery in 2020.



Figure 30. Ground photo taken at Monument 3085 looking southwest on June 11, 2019 (top) and June 2, 2020 (bottom). Note the exposed cannon structure in 2019 and some back beach recovery in 2020.

3090

Monument 3090 is located just south of Station 31 on northeastern Sullivan's Island near Breach Inlet. It represents a small (<250 ft long) pocket beach between two groins. The beach is nearly completely armored. The beach profile has exhibited erosion despite the stabilization structures (Figure 31). No dry beach is exposed at high tide and no dunes are present (Figure 32 and Figure 33).

Beach observations in 2020 confirm these measurements, but some aeolian sand transport had been trapped in the dune area between the road and access path. Upland erosion was less significant than in years past.

According to the 2020 volume calculation, this profile has a unit volume of 118 cy/ft, nearly the same as 2019.

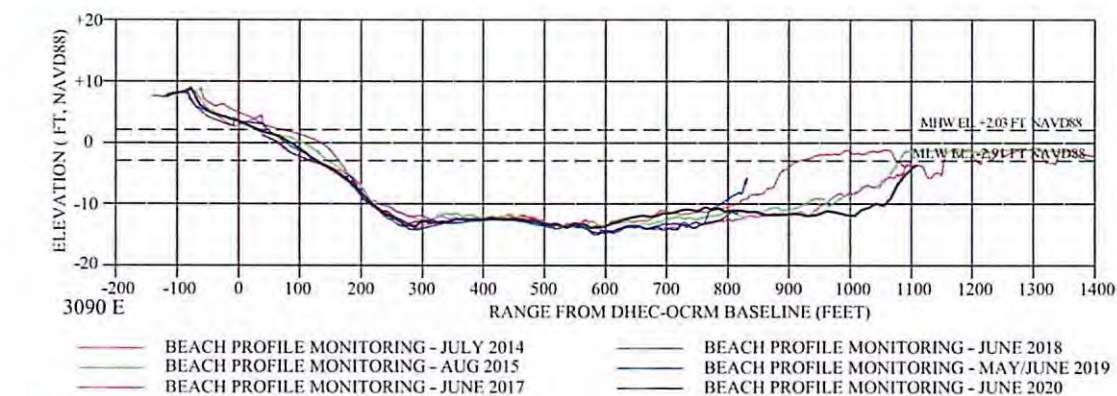


Figure 31. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3090.



Figure 32. Ground photo taken at Monument 3090 looking north on June 6, 2019 (top) and June 2, 2020 (bottom).



Figure 33. Ground photo taken at Monument 3090 looking southwest on June 6, 2019 (top) and June 2, 2020 (bottom).

3092

Monument 3092 is located south of Station 32 on northeastern Sullivan's Island near Breach Inlet. This profile line represents a section of the island that has been armored with erosion control structures. During this monitoring interval, the profile continued to deflate in this region (Figure 34). The recent sand bar attachment event has not resulted in sediment being transported to this area. Profile data indicates dune growth, but this was not natural accumulation, rather a private dune restoration project.

The 2020 beach observations confirmed that no high tide beach existed. The recent private, small-scale dune restoration project is intact. The structures have somewhat stabilized this portion of the beach, but erosion continues (Figure 35 and Figure 36).

According to the 2020 volume calculation, this profile has a unit volume of 112 cy/ft, nearly the same as in 2019.

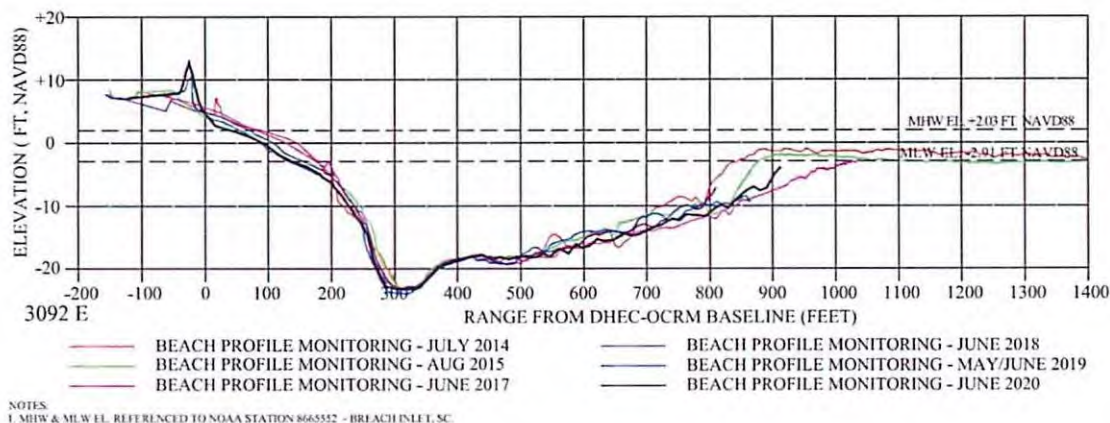


Figure 34. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3092.



Figure 35. Ground photo taken at Monument 3092 looking north on June 6, 2019 (top) and June 2, 2020 (bottom).



Figure 36. Ground photo taken at Monument 3092 looking south on June 6, 2019 (top) and June 2, 2020 (bottom).

3095

Monument 3095 is located on Station 32 at the northeastern tip of Sullivan's Island on Breach Inlet. It represents a cusped beach anchored by erosion control structures (groins). The beach profile has exhibited little change over time due to the stabilization structures (Figure 37). During this monitoring interval, a small amount of sand was trapped along the dune/upland region of the beach profile.

The June 2020 beach observations indicate that the upland "bluff" on the southwest side of the pocket beach, which had retreated significantly in 2019, had gained a veneer of beach sand. The spring high tides are reaching the toe of vegetation and about 10 ft of dry beach exists high tide beach (Figure 38 and Figure 39).

According to the 2020 volume calculation, this profile has a unit volume of 187 cy/ft, about 10 cy/ft greater than 2019.

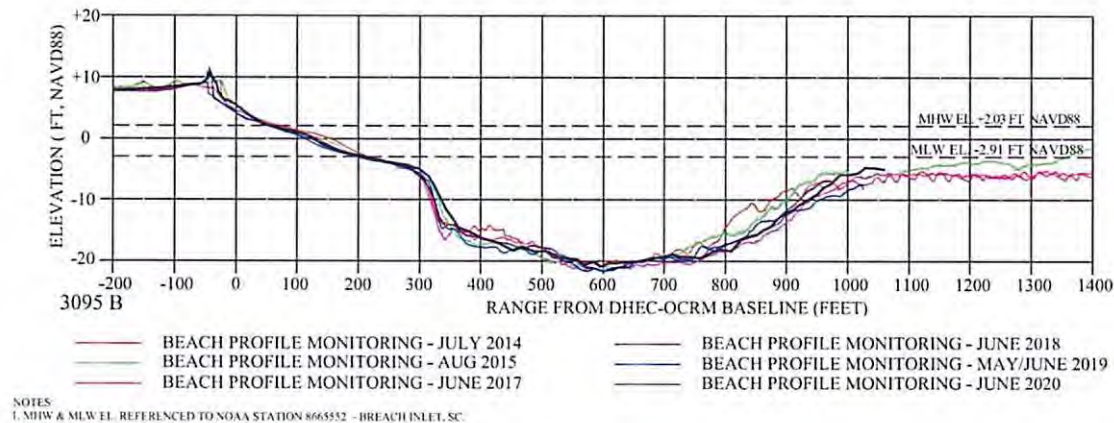


Figure 37. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3095.



Figure 38. Ground photo taken at Monument 3095 looking north on June 6, 2019 (top) and June 2, 2020 (bottom).



Figure 39. Ground photo taken at Monument 3095 looking south on June 6, 2019 (top) and June 2, 2020 (bottom). Note that the clay bluff has been covered with some sand in 2020.

5. Summary of 2020 Beach Monitoring Survey

This report provides an annual condition survey to monitor the Sullivan's Island beach. Beach profile data collected during August 2016, June 2017, June 2018, June 2019, and June 2020 were compared to beach profile data collected by SCDHEC-OCRM in the summers of 2014 and 2015.

Analyses of the mean high water (MHW) position relative to the SCDHEC-OCRM Baseline and unit volume by monument were conducted. These analyses documented that overall, the beach and, in particular, the dune and backbeach accumulated sand along most of the island between 2019 and 2020. This may have been partially influenced by reduced recreational beach use due to an exercise-only regulation enacted during the COVID-19 pandemic. To date, there is no indication that the shoreline has advanced seaward since 2014. Between 2019 and 2020, a volume loss of 68,423 cy (erosion) with the most volume loss occurring in the center of the island at Station 28 (Monument 3080).

The northeast end of the island, between Monuments 3083 and 3095, has little protective beach and dune system in place. Despite armoring with erosion control structures, erosion continues along this stretch of Sullivan's Island. Here, beachfront homes are located either on or seaward of the primary dune in vulnerable positions. Despite sand bar attachment events, sediment has not been delivered to this section in recent years.

The data documented a sandbar attachment event in 2014 and another in 2018-19. Most of the sediment from the 2014 attachment event has been transported downdrift, toward southwestern Sullivan's Island and the Charleston Harbor jetty. Data from 2020 indicate that sand bar attachment events result in a pattern of accretion and erosion along the central portion of the island.

The beach at Station 19 is extraordinarily wide with a unit volume of 978 cy/ft and growing due to the Charleston Harbor jetty. While the shoreline is not advancing seaward, sand volume continues to increase as the primary dune and backbeach prograde and increase in elevation.

If the present management strategy is maintained, additional dune, beachfront marsh, and maritime forest progradation (seaward movement) may continue in the central portion of the island. It seems that the more frequent occurrence of king tides (specifically the higher than predicted high tides) may be controlling additional dune progradation somewhat. Continued annual monitoring is recommended. By better understanding the beach performance following sandbar attachment events, improved management strategies may become obvious.

In addition to the wide, accreting beaches in the central portion of the island, Sullivan's Island also has beach management challenges on the northeast end related to narrow beach widths and minimal storm protection. Several hot spots are being closely scrutinized.