

**2017 TOWN OF DUCK
SHORELINE & VOLUME MONITORING REPORT**

EXECUTIVE SUMMARY

The Town of Duck is located on the Outer Banks of North Carolina roughly 27 miles south-southeast of the North Carolina and Virginia border. The Town extends along 5.9 miles of Atlantic Ocean shoreline from the Dare County and Currituck County line south to the Town of Southern Shores.

Data collected in December 2017 was used to update shoreline and volume change analyses that have been conducted since 2013 including the feasibility study (CPE-NC, 2013), the design analysis associated with the beach nourishment project (CPE-NC, 2015), and the 2015 Town-wide monitoring (CPE-NC, 2016).

In addition to providing information on the general condition and behavior of the Duck shoreline, the monitoring program is also designed to track the performance of the beach fill project constructed between May and June 2017. The beach fill project placed a total of 1,263,181 cubic yards along 1.6 miles of the Town’s shoreline between profile stations D-10 and D-19. For purposes of monitoring the performance of the beach fill, the December 2017 survey was adopted as the starting point to which future changes will be referenced. Based on a comparison of the Pre-construction survey obtained in April 2017 and the December 2017 monitoring survey, the volume of beach fill material on the active profile in December 2017 was 966,300 cubic yards.

The following summarizes shoreline changes between October 1996, September 2013, May 2015, and December 2017 and volumetric changes measured between September 2013, May 2015, and December 2017.

Average Mean High Water (+1.2’ NAVD) Shoreline Changes (feet/year)

	<u>Sept. 2013 to May 2015</u>	<u>May 2015 to Dec. 2017</u>	<u>Oct 1996 to Dec. 2017</u>
Project Area (D-10 to D-19)	2.2	44.0	4.4
Monitoring Area (PI-17 to SS-02)	-2.6	13.5	1.2

Volumetric Changes above -24’ NAVD (cubic yards/ft./year)

	<u>May 2015 to Dec. 2017</u>	<u>Sept. 2013 to Dec. 2017</u>
Project Area (D-10 to D-19)	46.2	26.7
Monitoring Area (PI-17 to SS-02)	14.7	6.6

Volumetric Changes above -24' NAVD (cubic yards)

	<u>May 2015 to Dec. 2017</u>	<u>Sept. 2013 to Dec. 2017</u>
Project Area (D-10 to D-19)	1,039,200	1,027,100
Monitoring Area (PI-17 to SS-02)	1,343,100	947,400

In general, the shoreline change analysis showed the monitoring area (PI-17 to SS-02) experienced a net positive change in the position of the MHW shoreline from May 2015 to December 2017. As delineated in the table above, the monitoring area advanced seaward at an average shoreline change rate of 13.5 ft./yr., while the shoreline within the project area (D-10 to D-19) experienced an advance of 44.0 ft./yr., primarily as a result of the beach nourishment project that was completed in June 2017.

The total volumetric change measured between May 2015 and December 2017 above the -24.0 ft. NAVD contour within the monitoring area (Stations PI-17 to SS-02) was a gain of 1,343,100 cubic yards, or 519,800 cubic yards per year. This translates into an average volume change rate of 14.7 cy/ft./yr. (accretion) throughout the monitoring area. The volume change within the project area (Stations D-10 to D-19) was a gain of approximately 1,039,200 cubic yards in the 2.6 year span.

The long-term volumetric change measured over the 4.3-year period between September 2013 and December 2017 within the monitoring area (PI-17 to SS-02) was a gain of 947,000 cubic yards, or 222,900 cubic yards per year above the -24.0 ft. NAVD contour. This translates into an average volume change rate of 6.6 cy/ft./yr. (accretion) throughout the monitoring area. Again, this gain is largely influenced by the beach nourishment project completed in June 2017. The long-term changes within the project area (D-10 to D-19) over the 4.3-year period was a volumetric gain of approximately 1,027,100 cubic yards.

The previous Town-wide monitoring report (CPE-NC, 2016) updated the SBEACH storm vulnerability analysis based on the May 2015 beach profile survey data. The updated analysis identified the beach areas between Stations D-9 to D-11 (Pelican Way to Ocean Pines Dr.) and D-25 to D-29 (Sea Colony Dr. to Ocean Front Dr.) as having experienced an increase in the number of vulnerable structures. The recent changes computed between May 2015 and December 2017 show the D-9 to D-11 shoreline advanced seaward at 18.5 ft./yr. and gained approximately 197,500 cubic yards. The recent changes are a reversal from the changes measured between September 2013 and May 2015 in which the area was experiencing a shoreline recession rate of -0.9 ft./yr. and a volume loss rate of -29.8 cy/ft./yr. This reversal is primarily driven by the construction of the beach fill project, completed in June 2017. The beach from D-25 to D-29 experienced shoreline advance at 1.4 ft./yr. and an approximate gain of 189,900 cubic yards between May 2015 and December 2017. These recent changes between Stations D-25 to D-29, which are not likely related to the beach fill project, are a reversal from the -11.3 ft./yr. average shoreline recession rate and -25.2 cy/ft./yr. average volume change rate measured between September 2013 and May 2015. The SBEACH vulnerability analysis was not updated for this report, however, the recent positive trends in the two areas has likely reduced the number of vulnerable structures previously identified.