

TOWN OF DUCK
2018 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 June 2018 was used to update shoreline and volume change analyses conducted during the feasibility study (CPE-NC, 2013) and the design analysis associated with the beach nourishment project (CPE-NC, 2015) as well as the previous monitoring report dated May 2018 (APTIM, 2018A).

Between May and June 2017, the Town of Duck constructed a beach nourishment project along 1.6 miles of its ocean shoreline. A total of approximately 1.26 million cubic yards of fill was distributed between Skimmer Way (station D-10) and the northern USACE Field Research Facility (FRF) property boundary (station D-19). As a result of this project, the analysis of shoreline and volume changes in the monitoring area, which extends from station PI-17 (on the south end of Pine Island) to station D-34 located near the southern Duck town limits, was divided into three areas in order to assess the performance of the beach fill project and its impacts on areas north and south of the project. The three areas are designated as: the Project Area (station D-10 to D-19), the area north of the project (PI-17 to D-10), and the area south of the project (D-19 to D-34).

For purposes of tracking the performance of the beach fill, the initial volume of material within the limits of the Project Area is defined as the volume change measured between April 2017 and December 2017. As noted in the report, beach fills undergo an initial period of adjustment during which time material is redistributed by wave action from the upper portion of the profile to deeper portions of the active profile as well as along the shore out of the placement area. This initial adjustment normally takes several months depending of wave conditions. Once the initial adjustments are completed, the beach fill should begin to mimic the behavior of the native beach. The April 2017 and December 2017 surveys were selected to determine the pre- and post-beach fill conditions.

Comparison of profile surveys indicated an increase of 963,100 cubic yards of fill within the limits of the beach nourishment project between April 2017 (Pre-Construction) and December 2017 (Post-Construction). Between December 2017 and June 2018, the beach fill area lost 98,500 cubic yards of material. Approximately 22,400 cubic yards of the fill was believed to have been transported north and deposited between stations D-06 and D-09. While there was some evidence material was also transported south and deposited in the area between D-20 and D-22, an anomalous feature consisting of a wide and deep nearshore trough, was present in the June 2018 D-21 profile which resulted in this area actually experiencing a volume loss. Future monitoring of the project will determine if the anomalous trough is still present or if it was just an ephemeral feature.

The following summarizes long-term shoreline changes measured between October 1996, December 2017 and the updated long-term changes for the October 1996 to June 2018 time period.

Average Long-Term Mean High Water (+1.2' NAVD) Shoreline Changes (feet/year)

	<u>Oct 1996 to Dec 2017</u>	<u>Oct 1996 to Jun 2018</u>
Project Area (D-10 to D-19)	4.4	1.7
North of Project Area (PI-17 to D-10)	0.9	0.1
South of Project Area (D-19 to D-34)	-0.1	-0.2

Long-term volumetric changes above the -24' NAVD contour (cubic yards/ft./year) measured between September 2013 and December 2017 and the updated long-term volume changes measured between September 2013 and June 2018 are provided below.

Volumetric Changes (cy/ft./yr.) above -24 feet NAVD

	<u>Sept 2013 to Dec 2017</u>	<u>Sep 2013 to Jun 2018</u>
Project Area (D-10 to D-19)	26.7	21.8
North of Project Area (PI-17 to D-10)	-3.5	-4.7
South of Project Area (D-19 to D-34)	2.9	-0.6