



Aerial view looking north along the region of Mantoloking devastated by Hurricane Sandy following yet another moderate nor'easter coastal storm in January 2017. This storm caused extensive beach erosion exposing the steel wall installed following Sandy. On 6/1/17, the area used to be a 200-foot long beach. After the storm, the beach was reduced to a 100-foot long beach, removing a dry beach in this region.

As the beach recovered the USACE awarded Weeks Marine Inc. with a contract for the federal beach project, construction in Mantoloking began in late fall 2017. The project will expand the dune and beach widths and height to reduce coastal storm damage to local property and infrastructure. Sand source for the project is an offshore borrow site. Weeks Marine is using multiple dredges, including a cutter head dredge and several hopper dredges to transport the sand from the offshore borrow zone to the nearshore discharge stations. Current construction is ongoing in the southern section of Mantoloking expected completion is April 2018, to be followed by construction in Brick Township where completion is expected by mid-July 2018. For the northern section of Mantoloking, construction estimates are startup in mid-July and continue through mid-September. The northern project construction schedule has work starting near Lyman Street initially placing sand to the south, blending into the previous work zone then flip and pump sand north from Lyman Street into Bay Head.

During initial project construction in Mantoloking, the beach profile at Princeton Avenue completed by January 19, 2018, included in the fall survey data analysis showed the following dune and beach enhancements. The dune height increased approximately 3 feet from 19 to 22 feet NAVD88, its width at the toe increased from 130 feet to 200 feet and the beach width from the seaward dune toe to the zero elevation-datum shoreline position increased from 80 feet to 250 feet. The overall footprint of the dune and beach system increased from 210 feet to 460 feet. This does not include the massive gain of sand below the zero elevation-datum found nearshore and offshore that continued to the traditional survey limits near closure, 700 feet seaward of the profile reference location.

Compared to recent years 2017 was a relatively quiet year for coastal storm frequency and intensity. A moderate

project to build beaches and dunes in northern Ocean County. Contractor Weeks Marine Inc. began pumping sand in Ortley Beach in summer 2017 initially working south towards Seaside. Work in Mantoloking commenced in fall 2017 and has continued into April 2018 within the initial base area. The northern Mantoloking section extends from approximately 2000 feet north of Herbert Street to the Bay Head border, scheduled to begin in mid-July following the Brick Township section. Northern Mantoloking should be complete by mid-fall 2018.

The identified National Economic Development (NED) plan, which is the plan that maximizes beneficial contributions to the nation while meeting planning objectives, provides a degree of storm damage protection, which is greater than the cost of implementation. For Mantoloking that plan calls for a dune crest with elevation of 22ft NAVD88 with a crest width of 25 feet, dune slope is 1V:5H. The beach berm in front of the dune is 75 feet wide at elevation 8.5 feet NAVD88, beachface slope design is 1V:10H. This 75-foot distance is not the constructed berm width as the constructed berm width includes advanced nourishment to compensate for the offshore portion of the profile template. The constructed berm width will vary with existing conditions but will likely be more than double the design width. Example, the constructed berm width at Princeton Avenue extended approximately 150 feet from the seaward dune toe to the berm crest at elevation 8.5 feet NAVD88.

This method of construction known as "overbuilding method," places the required design quantity at the proposed berm elevation, but with additional berm width added. The seaward slope of the construction berm is often equal to or steeper than the natural slope. The constructed berm is "overbuilt" so coastal processes can readjust the profile to a natural equilibrium state. This adjustment between slopes, known as compensating slopes, uses excess sand to achieve the desired beach and nearshore template. In this case, much of the overbuilt berm sand moves offshore to form the intended design profile nearshore while still achieving the 75-foot designed beach berm width that will support the expanded dune footprint.

Post-project monitoring will capture this process as the constructed beach profile template adjusts over time to the local wave climate. Beach profile monitoring will help the officials assess short and long-term project performance, quantify shoreline and sand volume losses throughout the Borough and help guide planning of periodic nourishment intervals to maintain adequate storm protection for the community. Monitoring will allow the community to assess storm damages to the beach and dune to advocate for possible emergency nourishment to maintain community storm preparedness between regular scheduled maintenance cycles.

There are five sites in the Borough that have been monitored by the CRC on a quarterly schedule over the last 24 years, ensuring a continuous and coherent data set, which provides the Borough with a valuable resource tool when determining coastal management issues. The monitoring shifted to semi-annual with the 2016 contract and continued with this schedule in 2017. The following is a list of the selected sites and locations:

- Mant-1: Beach access path at Carrigan Place
- Mant-2: Beach access path at 1041 Ocean Avenue
- Mant-3: 1117 Ocean Avenue (NJBPN site #153)*

Mant-4: Princeton Avenue street end

Mant-51: Beach access path at 1543 Ocean Avenue**

* 1117 Ocean Avenue established on private land in 1986 for the New Jersey Beach Profile Network

** Replaced Mant-5 formerly located on private property at 1547 Ocean Ave. following that property's sale.

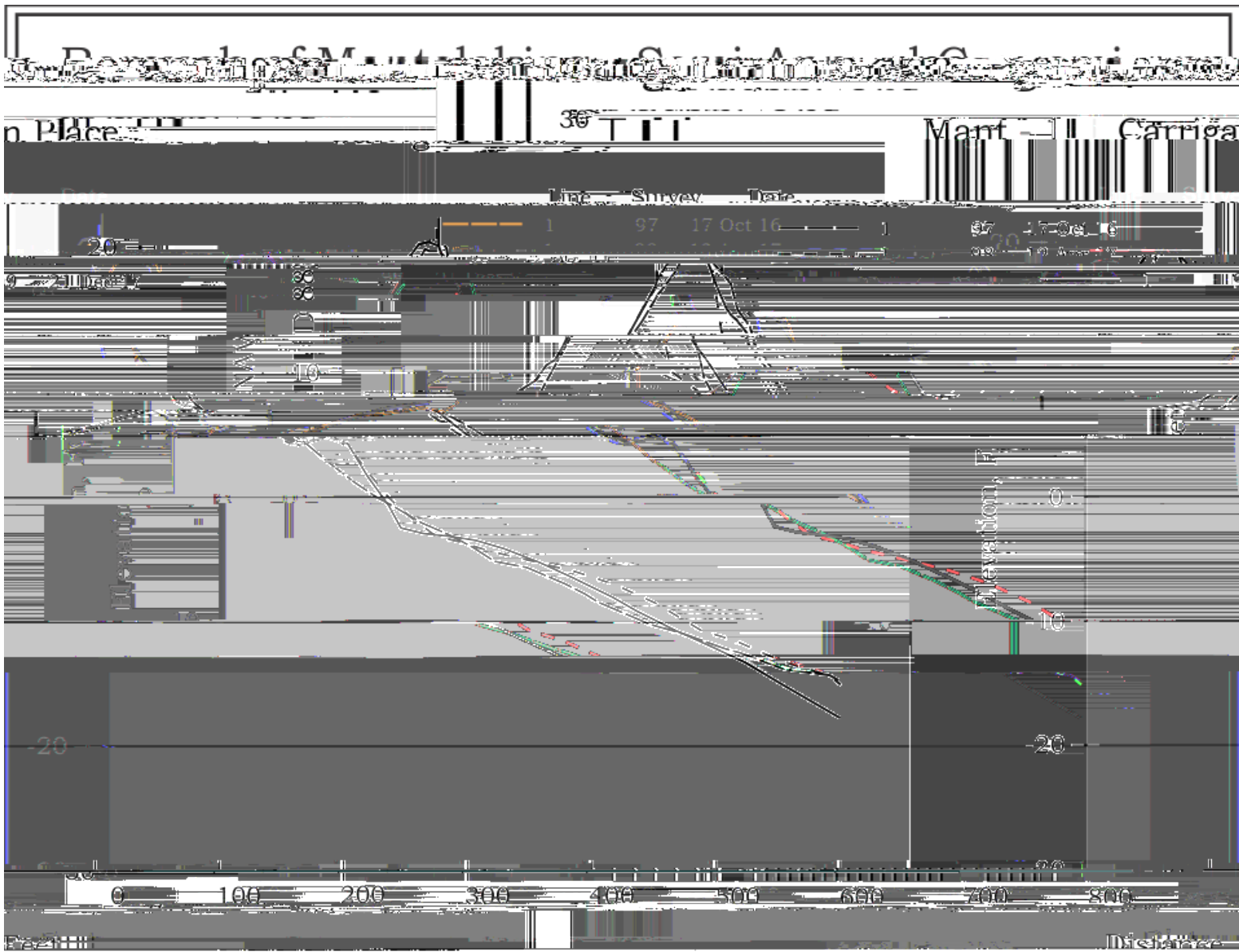
This monitoring program intended to provide municipal officials with a periodic review of shoreline stability, beach/dune erosion or accretion and changes to the vegetation and sand collecting systems installed by individual property owners and if continued help assess the federal project performance over time. The CRC completed the semi-annual surveys for 2017 on the following dates:

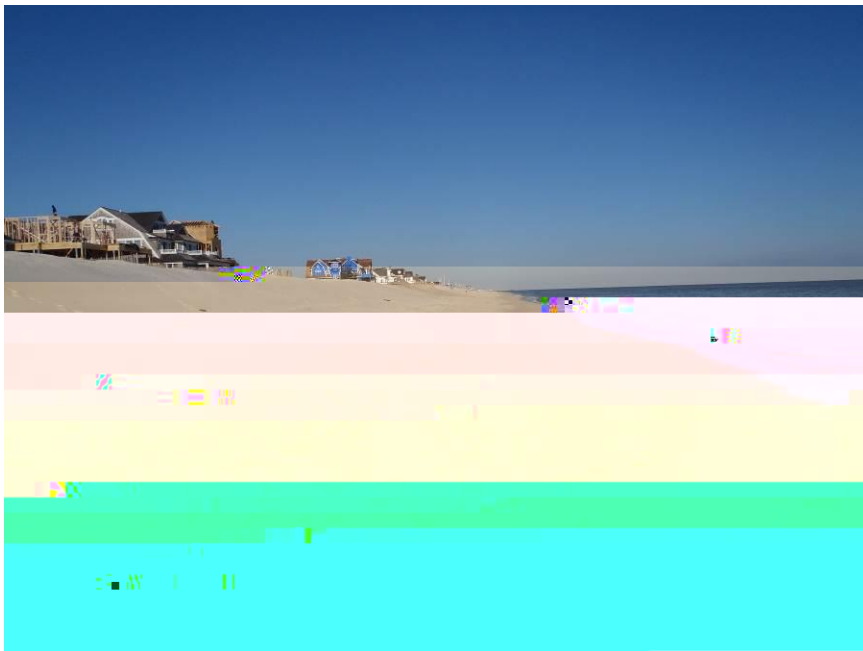
Spring Survey #

project's influence on sand volume changes and shoreline positions became apparent as the sites at 1117 Ocean Ave (Mant-3) and Princeton Ave (Mant-4) both showed massive sand volume gains and shoreline advancements. At both project locations, the shoreline position jumped seaward over 200 feet with the addition of 80.08 yds³/ft. of sand (Mant-3) and 173.65 yds³/ft. of sand at (Mant-4). These project numbers skewed the natural recovery volumes and shoreline changes during this period. Net result was a massive sand gain of 59589.78 cubic yards of sand from 000 April 2017 to 792 December 2017. The USACE project start up. The three sites not influenced by the project (Mant-1, Mant-2 and Mant-51) showed a more typical pattern of modest sand volume and shoreline position changes.

Table 2 shows shoreline and sand volume changes that occurred between October 17, 2016 (Survey #97) and December 21, 2017 (Survey #99). The shoreline and volume changes represent an annual assessment of changes to the Mantoloking shoreline. Shoreline changes shown measured in feet while sand volume changes are in cubic yards per foot (yds³/ft.). Individual profile changes averaged with adjacent sites and multiplied by the distance between sites determine a net cell volume change. Total volume change for the Borough is determined by summing the net cell volume changes.

between the nearshore and beach. Shoreline position changes at these three sites reflected the sand gain onshore advancing seaward the zero datum location from four to 33 feet. By comparison, the federal projects influence on volume and shoreline change is extremely obvious with 64.02 yds³





Mant-2 Photographs 2a and 2b. All views are to the north. Photos a and c were taken from the berm. Photo c taken along the seaward base of the steel wall.

Photograph 2a. shows a steep, narrow beach resulting from Hurricane Hermine and a late September storm event that exposed 5.5 feet of the steel sheet wall along a 400-foot section.

Photograph 2b. shows the winter storms prevented any significant sand recovery along the steel wall but lower on the beach natural processes pushed sand onshore expanding the beach width. The thin strip of sand seaward of the wall provided minimal beach access in this section.

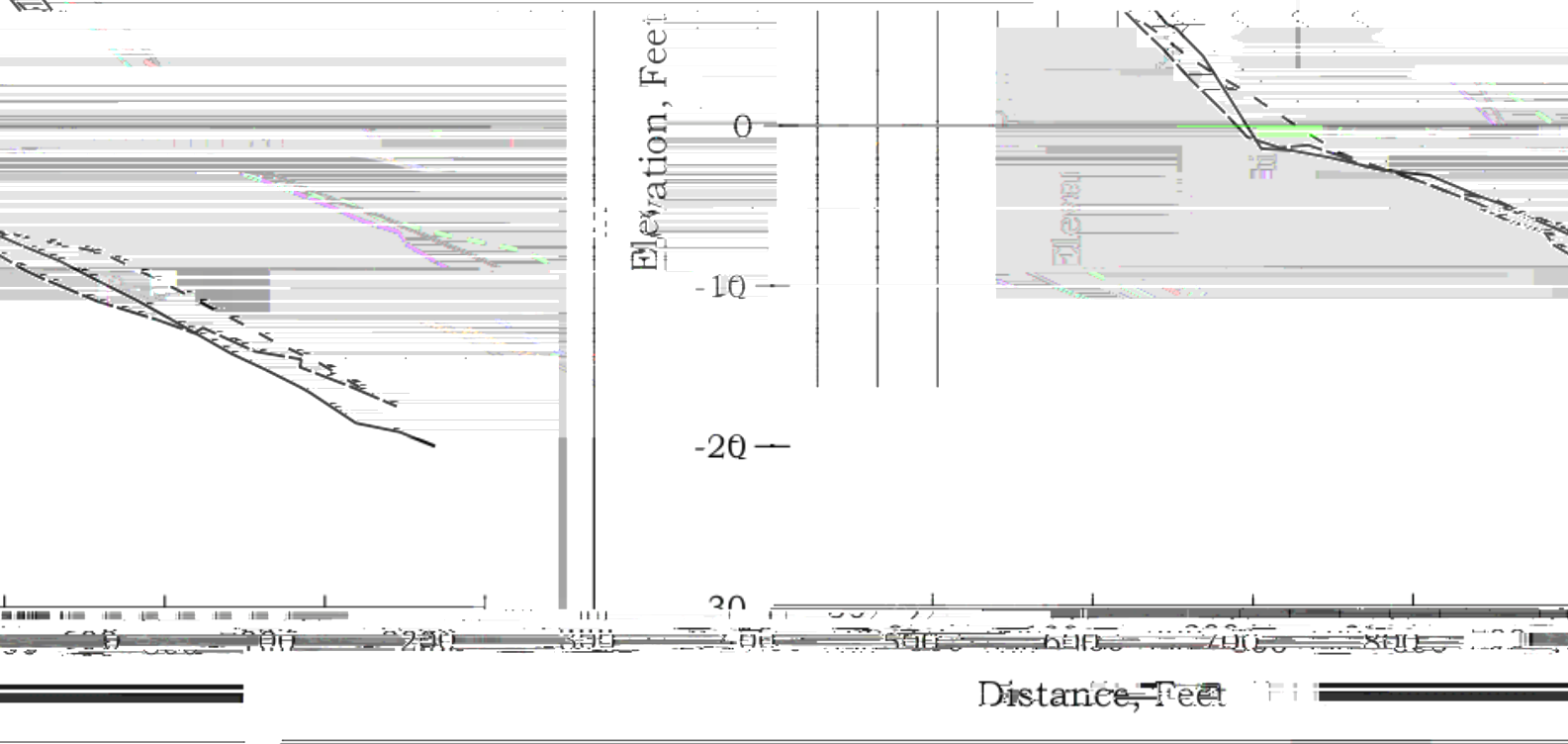
Photograph 2c. Natural sand recovery occurred over the summer and fall as sand moved landward cross-shore from the offshore slope. Maintenance efforts moved sand onto the seaward dune slope covering the steel wall, restoring the seaward slope and a modest recreational beach.

Report of Measurements

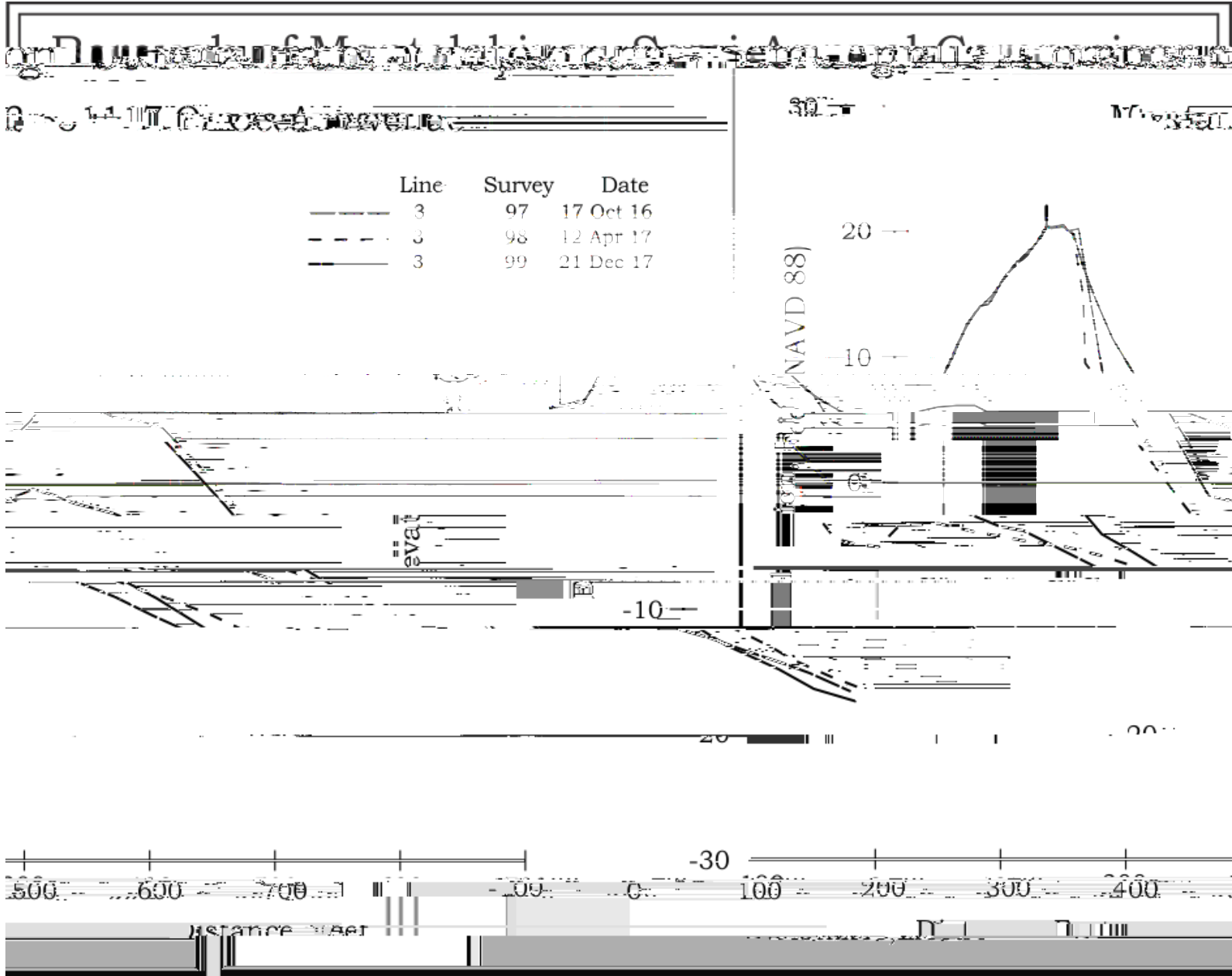
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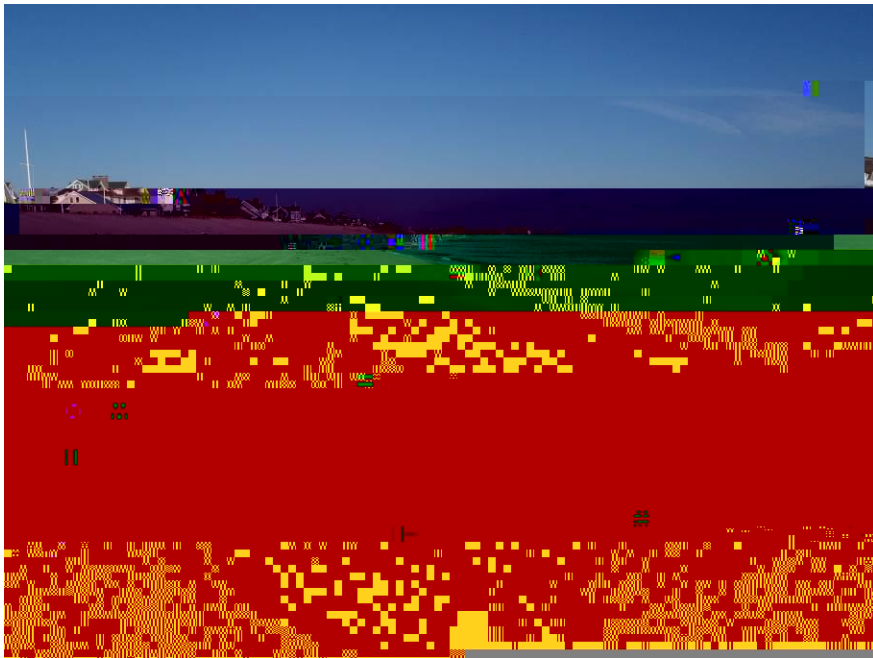
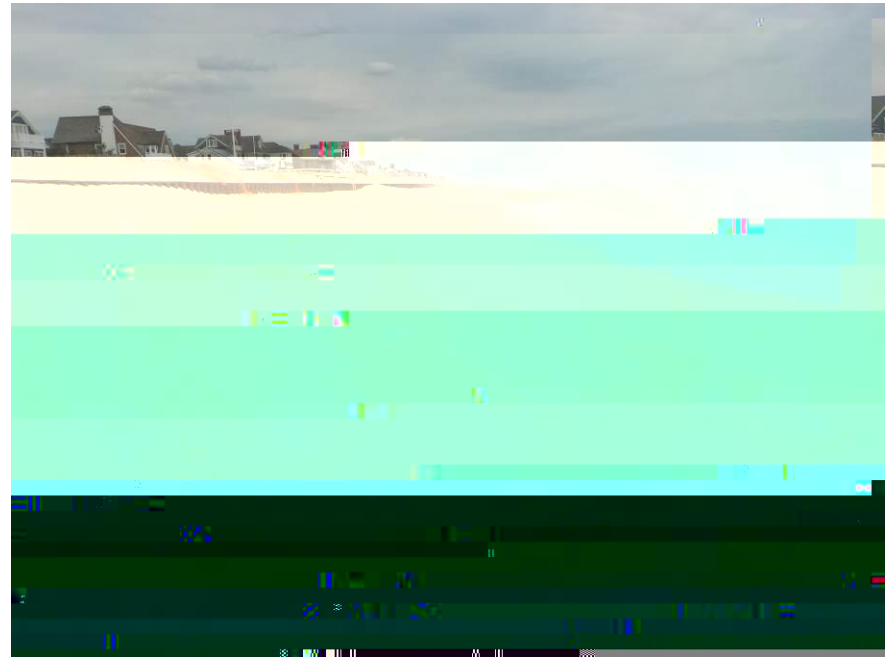
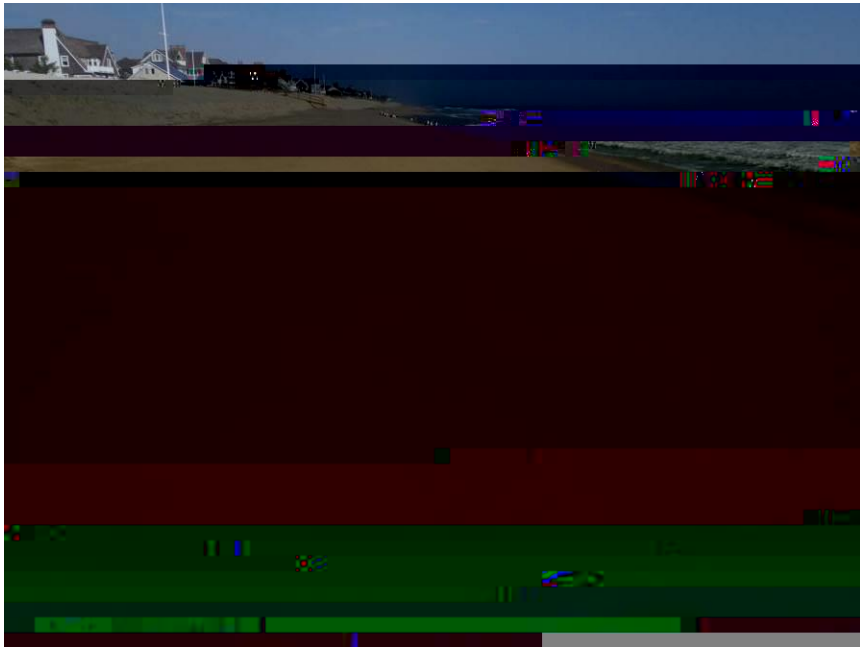
Date	Line	Survey	
Oct 16 20	3	07 17	
	2	98	12 Apr 17
	2	99	21 Dec 17

VD 88



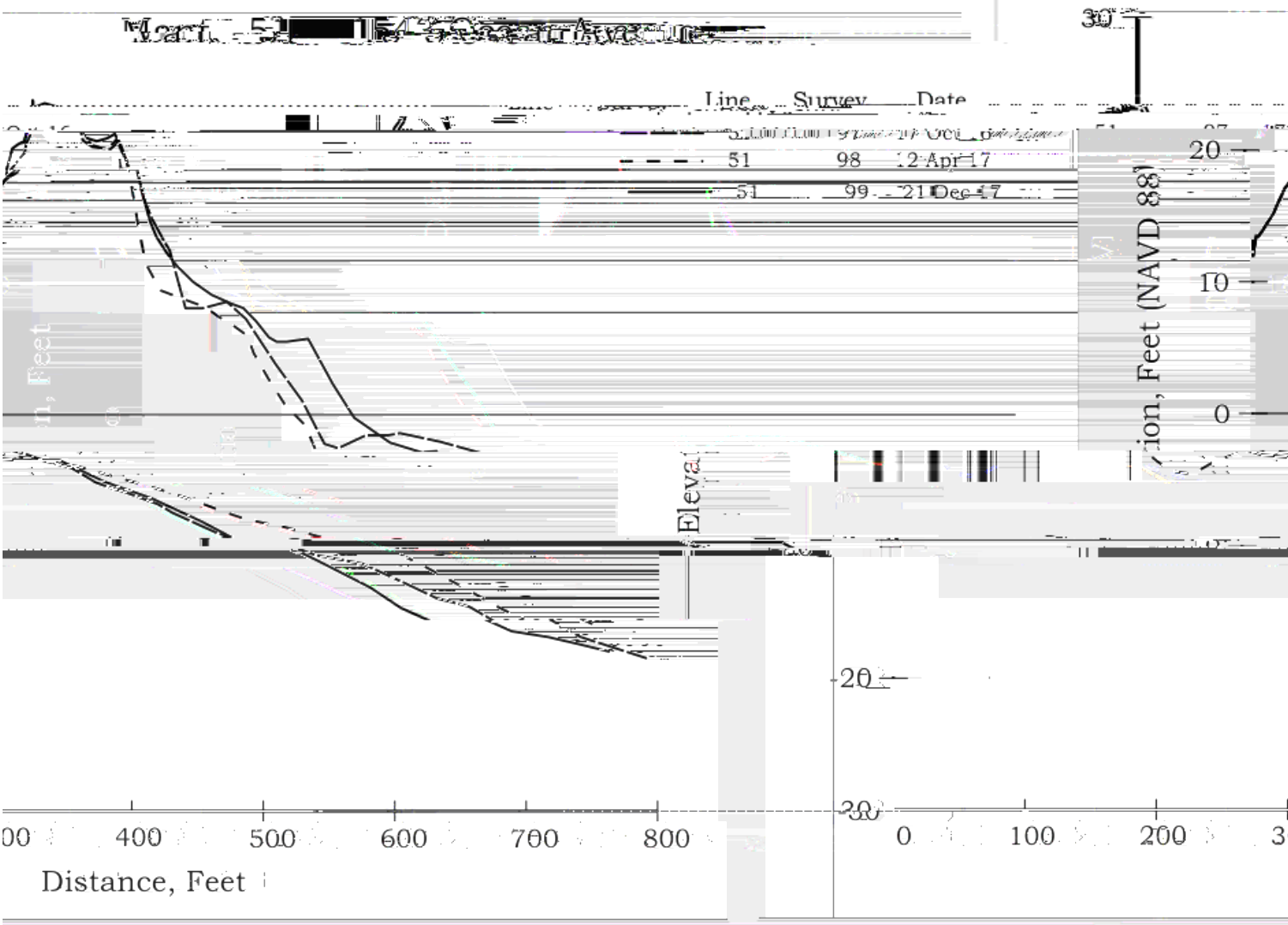
The #1117 Ocean Avenue monitoring site is located on private property. This site, originally established in 1986, is included in the State of New Jersey's coastal monitoring program (NJBPN). The site was later included in the beach-monitoring program in Mantoloking because of the pre-existing data collected for the State at this location. The profile line was set along the former home's dune walkover to minimize damage to the dune vegetation. Positioned nearly in the center of the municipal shoreline, this site has shown





Mant-51 Photographs 5a to 5c.

Borough of Mantoloking, Cross-Sectional Comparison



Northern Ocean County is unique in NJ in that the duration and velocity of sand movement tends to balance over extended time-periods absent of large storm events. The CRC's extensive research and monitoring along the Mantoloking shoreline indicates that the project material will remain within the Mantoloking regional sand budget and beach system for a longer duration than is normally associated with barrier island beach nourishment. Sand will continue to erode during modest and moderate storm events and be transported cross-shore to the nearshore bars then migrate landward during summer naturally restoring the beach, creating relative equilibrium in the shoreline and balance in the overall sand budget. Larger storm events will transfer sand seaward into deeper water beyond the normal transport capabilities of the typical spring summer beach building wave climate to move sand back towards the beach, resulting in a loss of sand to the system. Over-time, littoral currents will also move sand north but with the entire northern Ocean County shoreline, receiving sand through the USACE project equilibrium between beaches should persist for some time to come. Continued monitoring will allow officials to assess short and long-term project performance, plan for periodic nourishment intervals and emergency responses to storm damage to maintain community storm preparedness. By fall 2018, the transformation of the Mantoloking shoreline should be complete as the USACE project continues north towards Pt. Pleasant