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Annual Report for 2020
On the
Mantoloking
Oceanfront Municipal Shoreline

Executive Summary:

Coastal Research Center (CRC) at Stockton University completed a 2nd year monitoring effort along the municipal shoreline in Mantoloking. (v)-4g 648.24 Tm ()Te57tettT 648.24 Tm ()Tj.87(P(v)-4e(e573e>>BDC /

This method of construction known as “overbuilding the berm,” 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 profile. 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. This design is utilized because the hydraulic placement/mechanical grading methodology can only proceed to the low tide line where the slurry discharge distribution stops at the wave edge. This leaves later wave action to redistribute the sand into the preferred slope based on wave period, wave height and sand grain sizes. The berm erodes and retreats somewhat as sand moves seaward to generate an offshore terrace where the bar system appears later on.

This effect can be clearly seen in the three cross sections at Carrigan Place (MAN-TT). The retreat in the berm was significant, but nearly balanced by the deposition of sand offshore creating a shallower terrace seaward than existed immediately following sand placement (survey 100, page 9).

Beach Monitoring Program Methodology:

There are five sites in the Borough that have been monitored by the CRC on a quarterly schedule over the last 27 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 a semi-annual schedule with the 2016 contract and continued with this schedule in 2017. CRC monitoring was suspended during the USACE construction phase in 2018, resuming as an annual survey in the fall of the past two years. The following is a list of the selected sites and locations:

- i Mant-1: Beach access path at Carrigan Place
- i Mant-2: Beach access path at 1041 Ocean Avenue
- i Mant-3: 1117 Ocean Avenue (JBPN site #153)*
- i Mant-4: Princebn Avenue street end
- i 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

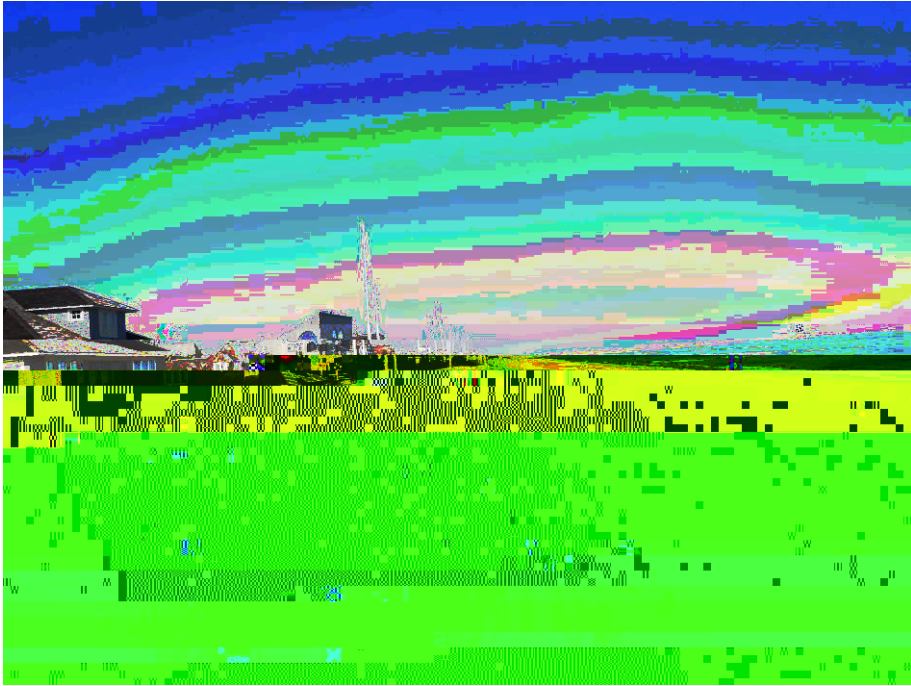
** Replaced Mant-5 formerly located on private property at 1547 Ocean Ave. following that property's sale.

Table 1
 Shoreline & Sand Volumes Changes
 December 21, 2017 to July 25, 2019

Profile Number	Shoreline Change (feet)	Volume Change (yds ³ /ft)	Avg. Volume Change (yds ³ /ft)	Distance Between (feet)	Net Volume Change (yds ³)
Northern Va 0.4 (ds))TJ 0 Tc 0 Tw 5.82465-0 7 8.9497853310 2898218880764258355352149370(927043226521624506)T3 17511.525 689.9781 T(he)10.51e					

Last year's report showed that since the last USACE surveys the beachfront accumulated an additional 180,962 cubic yards of sand entirely between Carrigen Place and Ocean Avenue (Mant-3) between July 25th and Nov. 4th of 2019. This equals an added 15 yds³/ft. added to each foot of the oceanfront beach. This material likely represents additions from sand transport into Mantoloking from the beaches to the north indicated by the volume increases offshore. Wind transport did provide added sand at the dune toe.

Table 2 illustrates the annual changes since Nov. 4, 2019 where 104,869 cubic yards of sand were lost from the Borough oceanfront by November 4, 2020. (062)TJ 0 Tc 0 Tt.00226- 0 Tt.00226cs 0 s1 (e)4 (r)-7 (eo4 (h f)3 (o



1a. December 21, 2007



1b. November 4 2019

1c. November 23, 2020

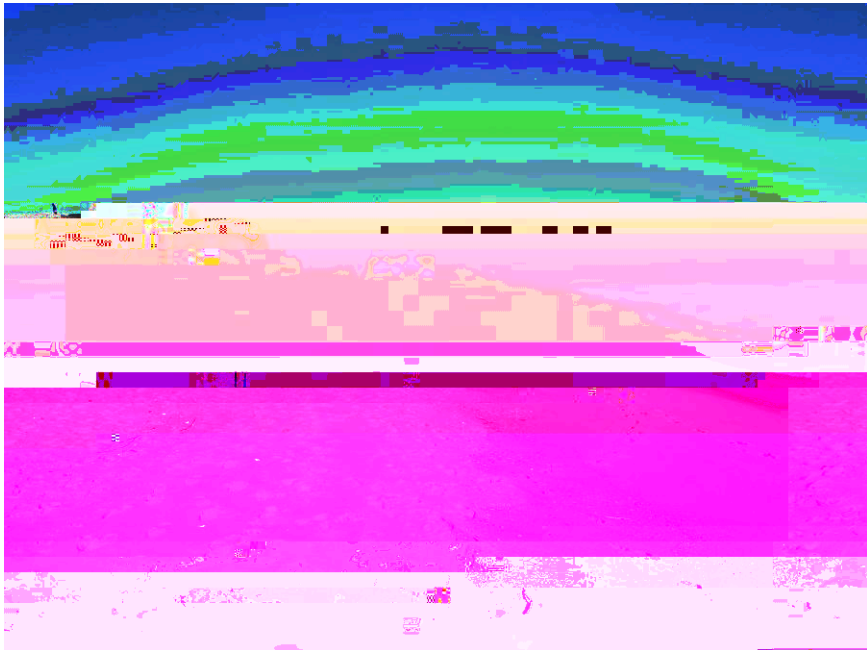
Mant-1 Photographs 1a, 1b, and 1c show views of the north

x Mant-2 #1041 Ocean Avenue

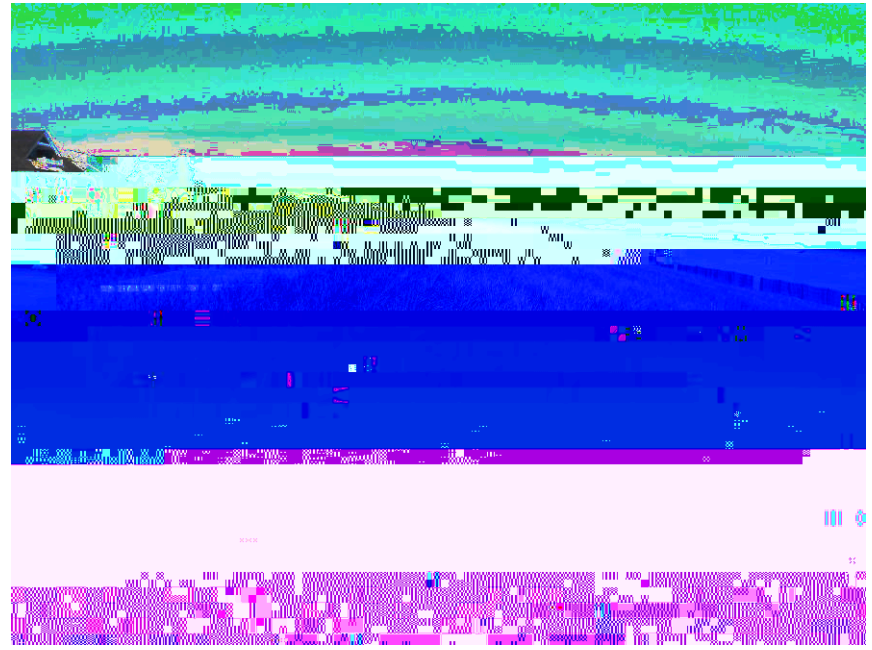
Mant-2 is located along Ocean Avenue on the municipal beach access path between the private residences at #1039 and #1041 Ocean Avenue. The site selection was because of its position approximately midway between Carrigan Place and the existing New Jersey Beach Profile Network site located at #1117 Ocean Avenue and it has public accessibility. The profile starts at a reference monument, midway along the access path 150 feet landward of the landward dune toe

The vertical steel wall installation started in September 2014 at approximately the location of the old dune crest. The profile cycled between erosional wall exposures and built through maintenance efforts. The wall is now buried under the 2-foot elevation dune with several hundred feet of dry sand beach seaward of its position.

The "as-built" USACE surveys demonstrate the scope of beach protection added with 215,415 yds³ added to the site since the CRC surveyed in December 2017. The shoreline moved 224 feet seaward. Since project completion, the sand volume increased by 26.63 yds³/ft. with a 4-foot shoreline retreat. Sand accumulated at the toe of the dune adding some volume. Beach sand moved seaward forming an offshore bar as expected with the advanced nourishment added to the design effort. The diurnal post-project conditions showed sand moving into Mantoloking from Bay Head with considerable quantity deposited offshore. The site went modestly negative in sand volume by Nov. 2020 losing just 9.25 yds³/ft. with a 3-foot shoreline advance seaward.



2a. December 21, 2017



2b. November 4 2019



2c. November 23, 2020

Mant-2 Photographs 2a, 2b and 2c All views are to the north.

Photograph 2a. the 2017 beach was far narrower with a restored dune from maintenance efforts making a CQ > B. 226m Tc 0.2t-0 0 12

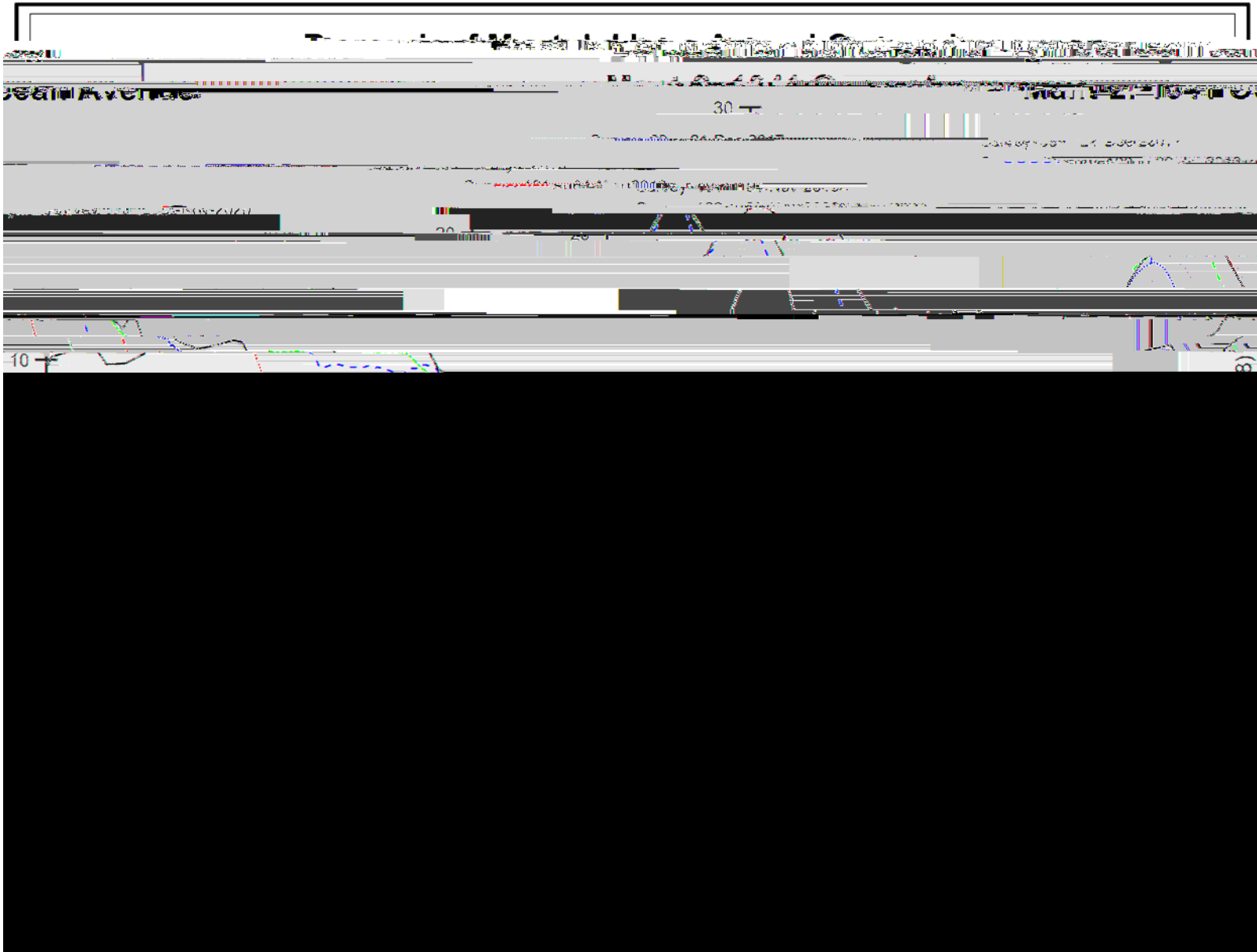
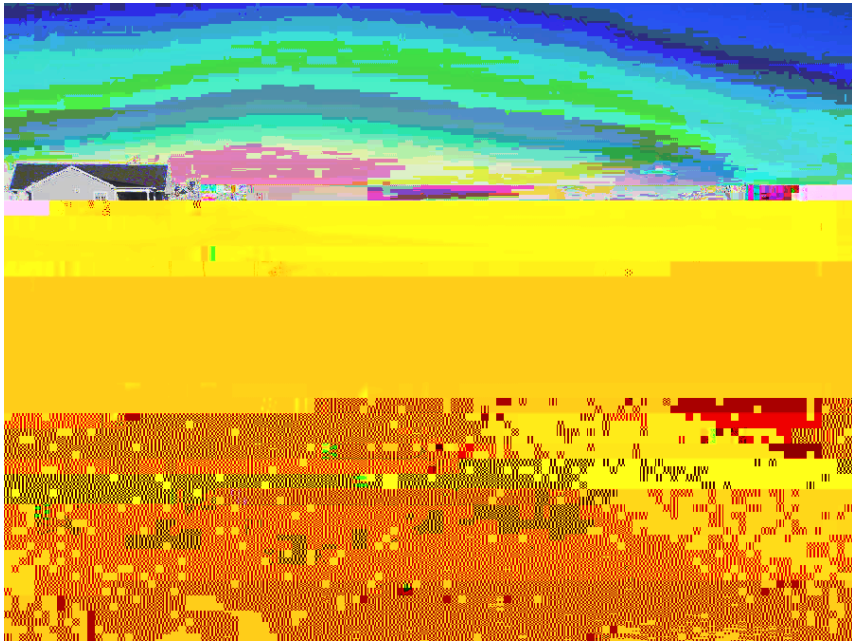


Figure 2d: The profile prior to the federal project shows a much lower dune elevation with less than half the area at the base of the dune. The beach flat berm beach width is now 100 feet, while the beachface slope in 2011 commenced at the toe of the dune. Sand added as a foredune ridge at the USACE dune toe, a berm appeared in 2020 and a bar system has developed offshore from sand accumulated after construction was completed.

x



3a. December 21, 2017

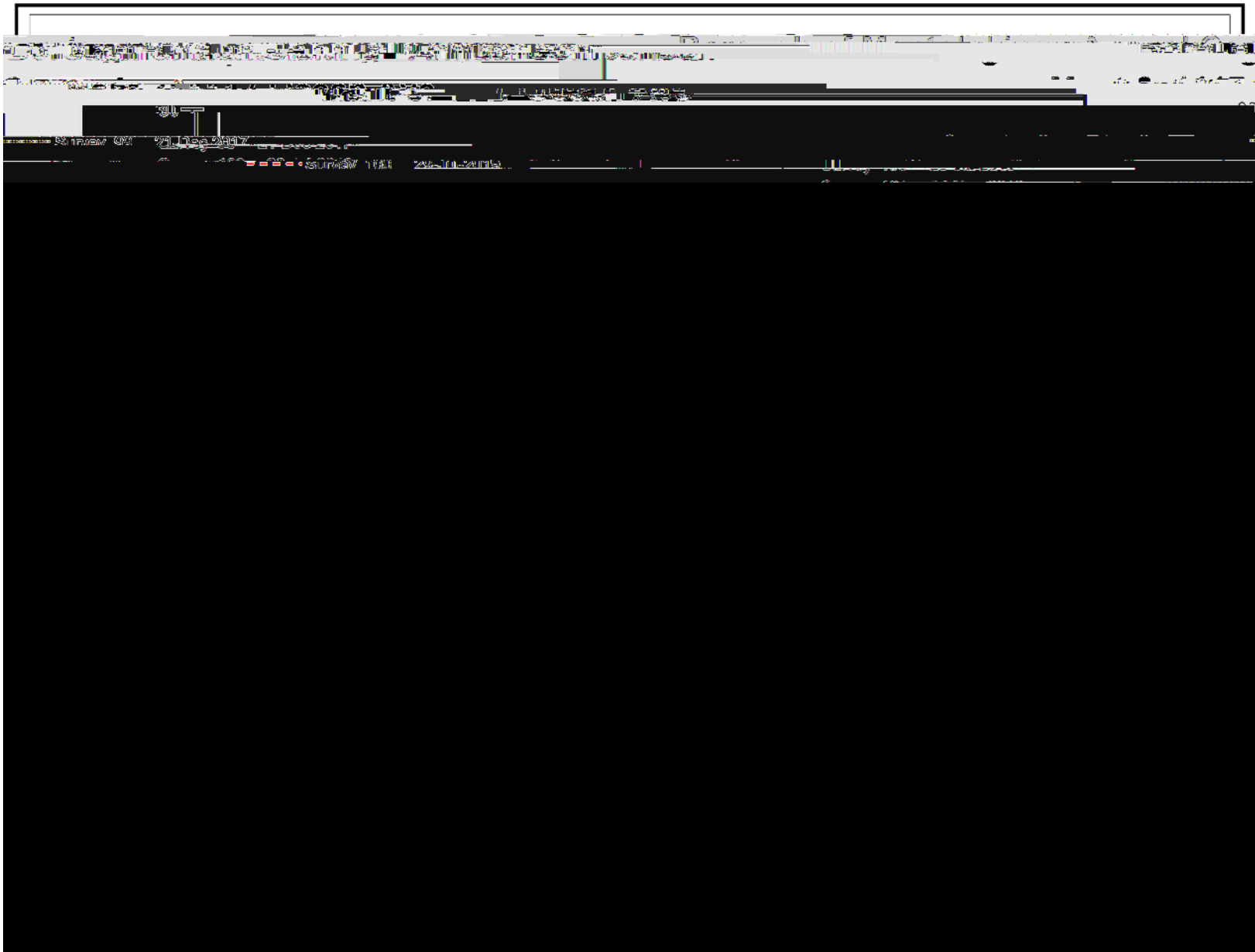


Figure 3d: The pre-federal project dune and beach is displayed in the December 2017 survey but by December 2017,

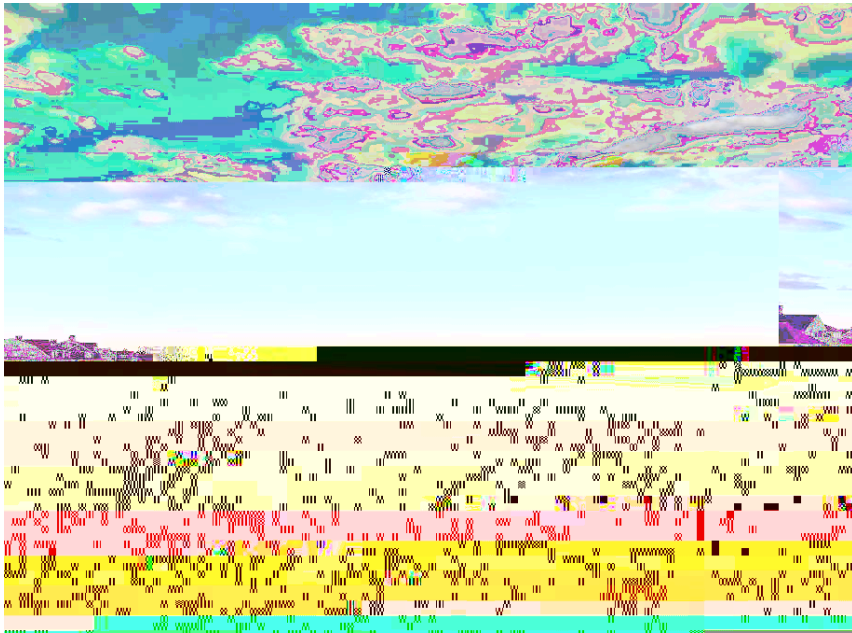
x Mant-4 Princeton Avenue

The Mant4 beach profile is located at the seaward of Princeton Avenue along the municipal dune walkover. This site is located approximately midway between the #1117 and #1543 Ocean Avenue sites and is readily accessible.

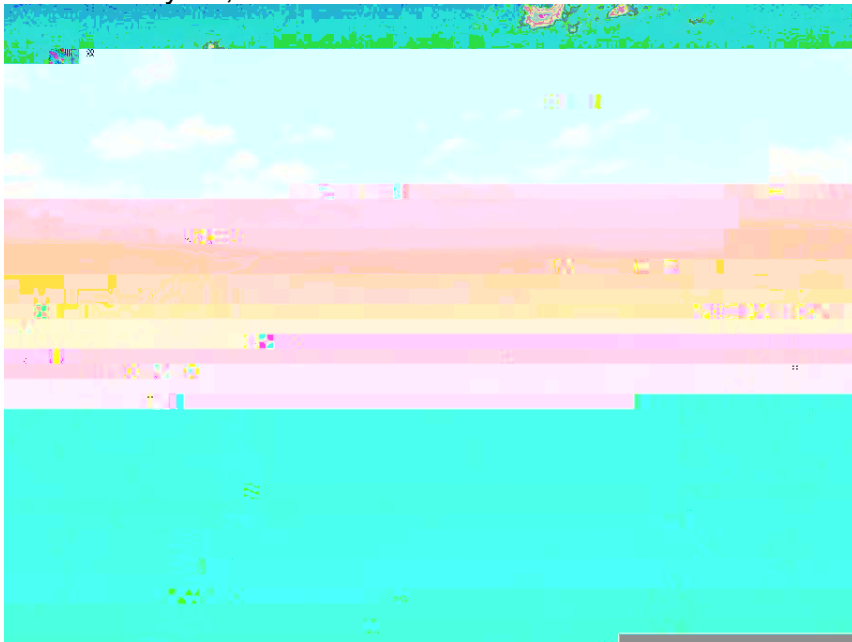
At this location 76.32 yd³/ft. of sand loss occurred, attributed to Sandy Following the storm, restoration efforts rebuilt a smaller dune feature as the beach recovered. In early 2014, installation of the steel wall reached this location. Crests elevation of the dune reached 19 feet while the wall top elevations are just under 15 feet NAVD88.

The USACE project started in this region during late fall, a massive quantity of sand placed by January 19, 2018 masked many natural changes that occurred since April. The dune volume nearly doubled while the crest elevation reached 22 feet and 30 feet wide with a dune toe width of 200 feet. The beach berm width went from approximately 40 feet to over 150 feet seaward of the dune toe but since the dune also expanded the net gain in width was over 250 feet. Sand accumulation continued across the nearshore to the profile limits with 173.65 yd³/ft. of sand added during the project.

Since the January 2018 survey when sand had been deposited as a very wide beach, the completed project saw considerable retreat in the January 2018 elevation position (111 feet) With deposition further seaward reducing the net sand volume loss to 27.1 yd³/ft. with the comparison to July 2019. Since then the site has lost 9 yd³/ft. with a 19 foot further shoreline retreat landward. The offshore slope remained stable and a small foredune developed at the primary dune's landward toe.



4a. January 19, 2018



4b. November 4, 2019

4c. November 20, 2020

Mant-4 Photographs 4a to 4c. All views are to the north from essentially the same location at the Princeton Avenue entrance.

Photograph 4a. The Federal shore protection project, partially completed here by January 19, 2018, added a massive quantity of sand to this site that extended seaward to the profile limits. The dune more than doubled in size and beach

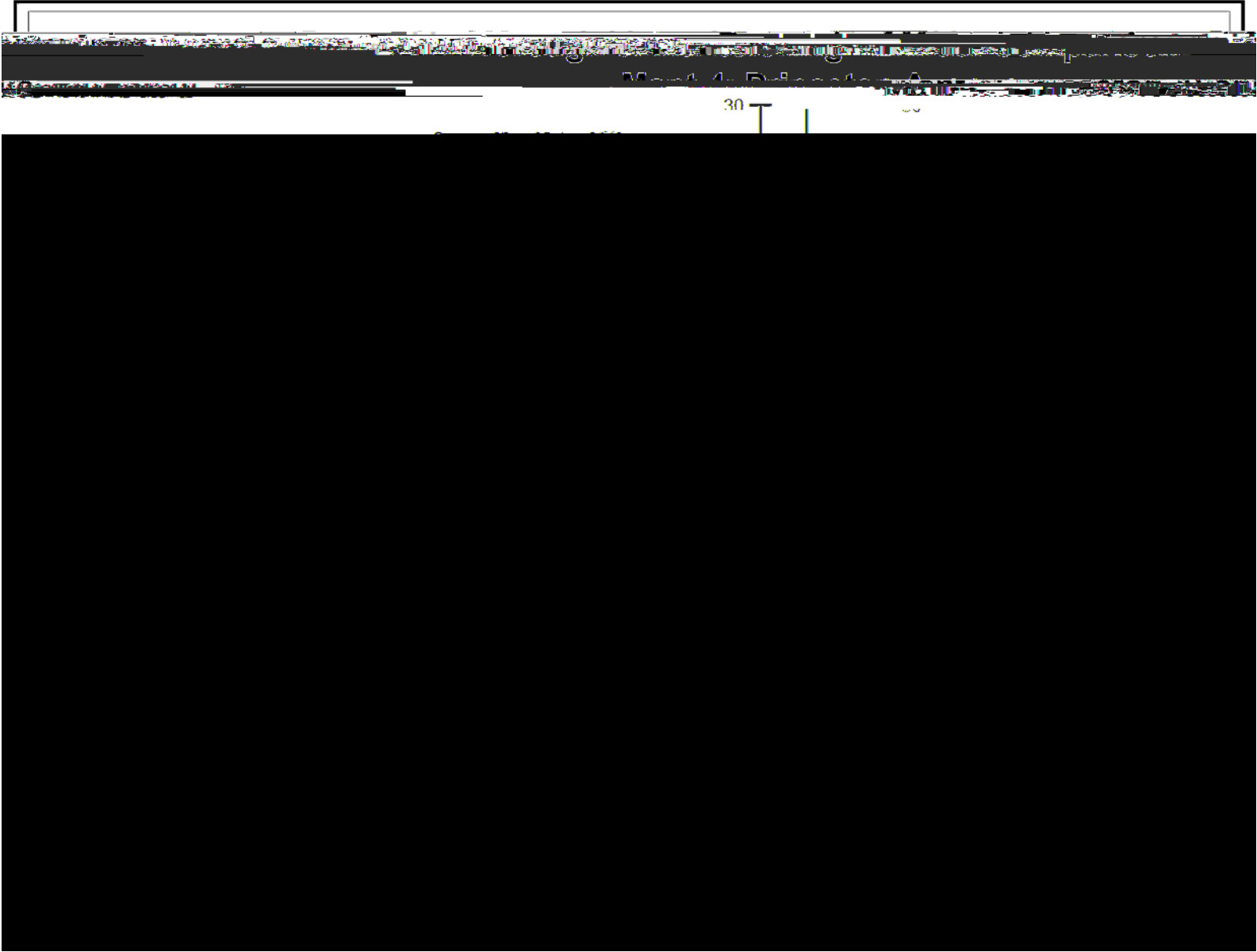


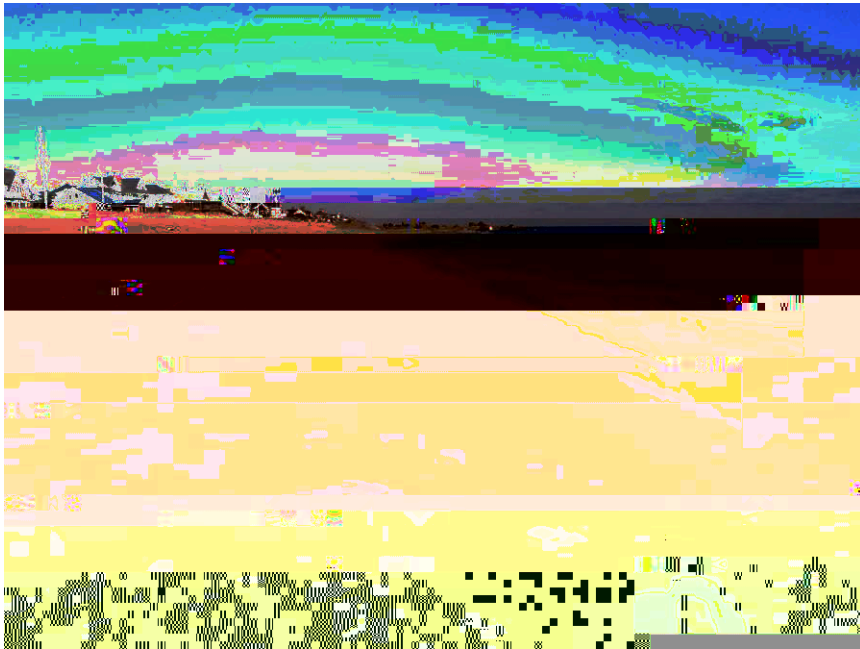
Figure 4d: The Jan. 2018 survey shows the partially completed Princeton Avenue dune and very wide berm. By July 2019 the berm had adjusted to the current width with sand deposited offshore. Since then the dune has been p

x Mant-51 #1543 Ocean Avenue

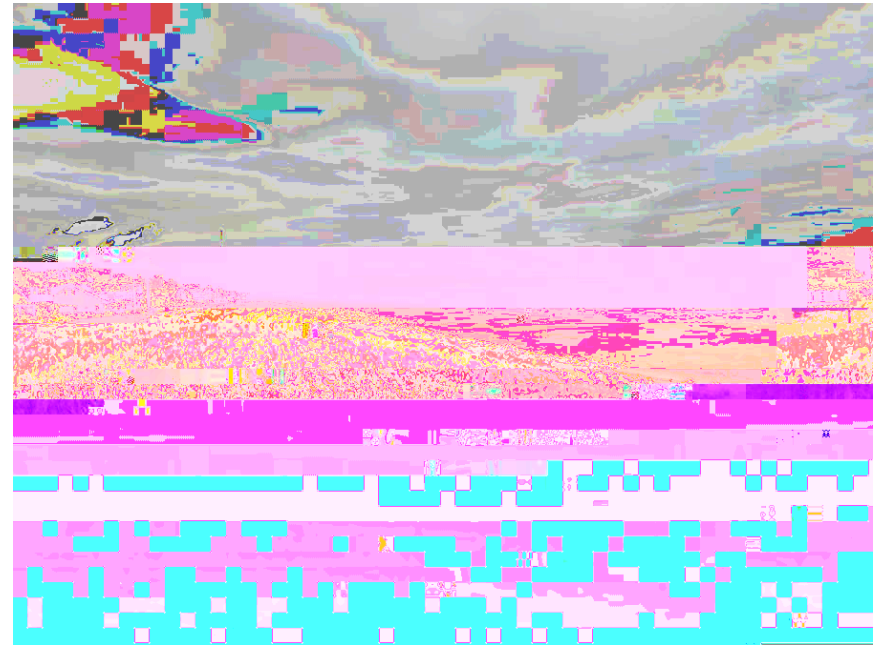
This monitoring site was initially located on private property between the homes at #1547 and #1549 Ocean Avenue. Because of its proximity to the border with Brick Township, this location became the southernmost site for the Borough monitoring program. During 2005, new property owners curtailed accessibility to the private property and the site resulting in its relocation to the public access pathway between #1543 and #1539 Ocean Avenue. The shift in the line's location was 202 feet north.

Prior to the USACE project, the dune system along the southern 1,500 feet of Mantoloking beach was the highest in the municipality. Homes are set back to the natural back slope of the dune. Superstorm Sandy's surge and waves rapidly eroded the narrow beach and cut away a half the dune but the dune elevation at the landward erosional scarp remained above 20 feet and prevented overwash, breach and oceanfront property damage.

Today, following the USACE project construction the dune is approximately the same elevation, but the beach is far wider to the seaward dune toe. Sand volume added amounted to 167,401³/ft. and a 130 foot shoreline advance. Between July 2019 and November 2019, the site lost 157³/ft. with no change to the zero-elevation shoreline position. A year later (Nov. 23, 2020) the site lost 30,228³/ft. accompanied by a 37 foot shoreline retreat. All the loss volume came from berm retreat that produced the 37 foot shoreline retreat. The small foredune was also present at this site. Across the entire Mantoloking ocean front, the offshore remained very constant since July 2019. This means sand losses are comparable to the individual site north or south along the shore and not further offshore.



5a. December 21, 2017



5b. November 4, 2019

Mant-51 Photographs 5a to 5c. All views are to the north from the beach access or the berm at 1543 Ocean Ave.

Photograph 5a. Natural recovery onshore over the summer and fall months restored the beach width by December 2017, with the seaward dune slope regraded through maintenance activity. The ongoing USACE project activity and resulting seaward beach offset is visible in the far distance.

View 5b. The site with a completed dune and planted grass as of Nov. 4, 2019.

View 5c. There has been considerable wind transport into the dune as of Nov. 23, 2020. New dune decks have appeared along the Borough oceanfront as well.

5c. November 23, 2020

Figure 5

Conclusions:

Between December 2017 and July 2019, the use of the US Army Corps of Engineers beach surveys compared to the last survey completed by the CRC five sites found that 1,377,081 cubic yards of new sand had been pumped onto the Mantoloking shoreline from source sites offshore. The entire northern Ocean County project has been sustained by sand supplies never previously available to the modern or historical oceanfront to provide added shore protection. When the sand volume placed prior to the December 2017 CRC surveys is included in the total placement count, the Borough received 2,153,249 cubic yards of sand between April 2017 and July 2019. The US Army "as-built" sand volume was given as 2,571,591 cubic yards of material (with Watson, communication).

The CRC surveys stopped as of December 2017 and did not resume until Nov. 4, 2019 so the 418,342-cubic yard difference is understandable as well as the fact that the BSA survey (e)4 (l)4 (l)4 (-)1.9 (el (el)-5)-50