

**2020 FINAL REPORT - TO THE CITY OF NORTH WILDWOOD
ON THE
CONDITION OF THE CITY BEACHES**



Aerial view of North Wildwood looking northeast from just north of the piers on February 6, 2021 showing the City from about 20th Avenue north to Hereford Inlet. Sand was placed as a protective ridge in the foreground with the stockpile of sand showing just north of the 15th Avenue lifeguard station. The ocean has carved a scarp into the deposit following the Feb 1 and 2, 2021 storm. (still photo capture from drone video by Coastal Digital Solutions)

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Introduction:

The final beach survey for 2020 was delayed until January 21, 2021 with the entire oceanfront beach covered at the 200-foot cross section spacing from the jetty at 2nd Avenue, south to the Wildwood boundary. This survey followed two northeast storms in December 2020 and was just prior to a more severe northeaster on February 1 and 2, 2021. Damage to the beach and dunes resulted from these events with the State attempting to provide a state-wide damage assessment that could yield a federal disaster declaration for the February event. North Wildwood is the only New Jersey oceanfront community still eligible for FEMA Category G storm damage reimbursement for its expenses maintaining the “engineered beach”. The sand volume losses resulting could be presented against the expenses incurred during the most recent transport of sand north from the City of Wildwood. There is no dune present south to 7th Avenue and a narrow ridge of sand extending to 15th Avenue. Pictures captured from drone video taken Feb 6, 2021 serve to illustrate the state of the oceanfront. These are contrasted with similar footage taken Sept. 22, 2020 when the oceanfront was subjected to wave approach from the east, northeast at higher breaker height than normal for early fall.



Figure 1. This Feb. 6, 2021 view looking north from a point just north of the first timber pier shows the extent of the damage. The beach is wet to the dune ridges and at the bulkhead/revetment north of 7th Avenue.

The northern two thirds of the North Wildwood beach have been reduced to 20% or less of the 2009 NJ/local beach restoration. A ridge of pushed up sand helps defend the remaining dunes south of the life guard station at 15th Avenue. The plateau of back-pass sand lies with a scarp at the water line for several blocks north of the life guard stand.



Figure 2. A Sept. 22, 2020 view to the north from almost the same perspective as Figure 1. The beach was inundated at this point in time as well, but there was more sand present along the 15th Avenue life guard station and the dunes to the south of the station were not yet affected by storm damage.

The September view over the same segment of the beachfront shows the extent of beach present earlier, but still only a fraction of the 2009 project extent.



Figure 3. Feb. 6, 2021 view of the north end of North Wildwood oceanfront from between 5th and 6th Avenues.

After the northeaster, the waves at mid-tide easily reach the final protection features on the oceanfront. There is no remaining “shore protection” from the beach and dune system.



Figure 4. This Sept 22, 2020 view of the north end beach shows waves at the revetment and at the steel wall on a clear day with sizable surf coming in from the east, northeast.

As far back as late September, there was no shore protection offered by the oceanfront beach and at this point the waves were reflecting off the steel wall with sufficient force to transport sand south away from this beach segment far faster than any amount of material could be trucked into place or move onto the beach naturally.

The absence of renewed beach nourishment activity either by the State of NJ or the US Army Corps of Engineers (Hereford Inlet to Cold Springs Inlet Shore Protection Project, currently authorized, but unconstructed) remains a painful reality for the City. The four still photographs are captured from drone video taken by Coastal Digital Solutions either on Sept. 22, 2020 and Feb. 6, 2021 after a moderate northeast storm. The video footage source can be found at the following link. <https://vimeo.com/510253223>

Sand hauling from the City of Wildwood occurred during the winter of 2020 with placement in extensive stockpiles at and just north of the 15th Avenue life guard headquarters. Material was moved north and shaped into a dune and narrow dry beach. The final tally of sand moved from Wildwood to the beaches of North Wildwood was provided by the municipal engineer at 220,000 cubic yards making this season's transfer the largest thus far in this "in house" effort to restore a recreational and storm protection shoreline during this period of extensive oceanfront beach erosion manifesting itself in North Wildwood since the late 1990's.

The collection of drone snapshots (Figures 1 to 4) are in contrast to the beach extent as of June 13, 2020 where the dry beach extended almost to the 2nd Ave. inlet jetty (Figure 5). The past six months have made a bad situation much worse as the last of the beach width vanished either into Hereford Inlet as a new sand spit extending northwest from the jetty or back south toward Wildwood City.



Figure 5. This view of the North Wildwood oceanfront beach extends from 13th Avenue north to the 2nd Ave. jetty. and shows the steel wall extended to 12th Avenue and the sand added to the oceanfront shoreline derived from the City of Wildwood beaches. Photograph date is June 13, 2020 (photos by Ted Kingston). The scarp at the berm extends between 3rd Avenue and 8th Avenue on the beach.

Beach nourishment summary follows:

1. Beginning in 2009 with a joint North Wildwood and NJ State effort of 1,450,000 cubic yards placed from Surf Avenue to the oceanfront, then south just into Wildwood.
2. The damage from Irene was compensated for by hauling 93,000 cubic yards of sand from the beaches of Wildwood Crest to the northern municipal shoreline.
3. Hurricane Sandy damage was hydraulically restored from Hereford Inlet at 153,000 cubic yards
4. Natural recovery after Sandy added 283,285 cubic yards of sand to the oceanfront
5. Backpassing ramped up in 2016 with 171,000 cubic yards
6. 2017 saw 190,000 added by mid-May 2017
7. Another 153,375 yards were added by Memorial Day 2018
8. The next year saw 162,776 cubic yards brought back from Wildwood City.
9. Finally, in 2020, the total added was in the range of 220,000 cubic yards.

This summary results in a grand total of 1,450,000 cubic yards initially followed by 1,426,436 cubic yards of sand placed on the North Wildwood oceanfront since 2009 either from Hereford Inlet or returned to the City from Wildwood or Wildwood Crest beaches (2,876,436 cy total). The combined cost if pegged at \$10.00 per cubic yard is at least \$30 million over the past 11 years with no convincing clear shift in inlet sand distribution that might mitigate these loss rates.

North Wildwood Engineered Beach History/Performance:

Discussions remain on-going with US Army and NJ State officials to address the rate of sand loss with either a hydraulic operation or a major focus on back-passing the sand that resides along the Wildwood City and Wildwood Crest shoreline. The NJ individual permit was renewed for 5 years in late 2017 in conjunction with the NJ Division of Coastal Engineering, but this renewal was expressly for the hauling of sand from Wildwood City beaches. The US Army permit for back-passing work from Wildwood City is valid until the end of 2022. Any hydraulic dredging for sand from Hereford Inlet will require new permits from both the NJDEP and ACOE. The CBRA issues are not resolved with the Corps even with the Interior Secretary's letter from the fall 2019 lifting the ban on the use of federal funds to take sand from Hereford Inlet ebb-tidal shoals. There is litigation against lifting the ban filed by the National Audubon Society in 2020.

Oceanfront Beach Surveys:

Surveying activities continue a monitoring program that began in 2009 following the initial City/State beach restoration project. The profile stations are spaced 200-feet apart and were established to determine cumulative changes and performance of the beach restoration project. The close spacing is necessary to provide the required sand volume lost during a Federal Disaster Declaration for a damaging storm.

The following is a list of the studies included in this report and the respective survey dates are:

- **Survey 35 June 6, 2019**
- **Survey 36 October 25, 2019**
- **Survey 37 July 7, and July 14, 2020**
- **Survey 38 January 21 and 22, 2021**

Table 1 on page 7 is a composite of all 39 transects (4 on the Hereford Inlet shoreline and 35 on the oceanfront) surveyed at a 200-foot parallel spacing along the shoreline. The area at the 2nd Ave. jetty is considered as an arc between two profile transects extending at a right angle from the jetty base, one into the ocean and the other into the inlet. Sand volumes were computed for the zone above the zero-elevation position, for the offshore area below the zero-elevation position, for the inlet beaches versus the oceanfront.

Each transect was run from the landward dune toe into the ocean to a depth of approximately 12 feet of water. The older dunes have been templated since they do not change materially. Each new dune transect between 4th Ave. and 13th Ave. was surveyed to generate a new template for later surveys. Sand volume were computed between the July 2020 and January 21, 2021 surveys. The values for sand volume changes in cubic yards per foot of shoreline were averaged between adjacent transects, divided by two, then multiplied by 200 to gain the sand quantity in each 200-foot wide cell. This compilation shows sand volume losses or gains between the summer following sand transfer from Wildwood City until immediately prior to the February 1-2, 2021 northeast storm. This January 2021 survey data becomes vital in determining exact sand volume losses on the oceanfront beach due to the February northeaster and could be utilized for damage reimbursement.

In Summary:

1. The back-pass sand appears to reside on transects 54+00 and 56+00 because they are the only profiles with substantial sand volume gains. The next four transects to the south all have modest sand volume gains as well likely derived from the stockpiled sand.
2. The Hereford Inlet shoreline suffered very large shoreline retreat in the zero-elevation position with all but the site in the immediate vicinity of the jetty losing sand volume. A total of 15,906 cubic yards lost across 600 feet of inlet beach.
3. The northern 2,000 feet of oceanfront beach lost 53,106 cubic yards of sand.
4. The next 3,200 feet of oceanfront beach (lines 20+00 to 52+00) lost an accumulated 32,320 cubic yards of sand.

5. Between line 54+00 and the end of surveys at line 68+00, 200 feet south of Juniper Avenue, the beachfront gained 15,443 cubic yards of sand derived from the losses to the north largely from the transferred sand volume.
6. Across the entire North Wildwood inlet and oceanfront, the dunes, beach and offshore lost 79,998 cubic yards. The same calculations for the dunes and beach to elevation zero yielded -69,668 cubic yards or 87.1% of the total sand volume lost during the second half of 2020.
7. The total distance was 7,400 feet of survey that yields 10.81 cubic yards of sand per foot of beachfront.
8. Looking just at the dunes and beach to the zero-elevation position on each profile, the inlet lost 8,924 cubic yards of sand split relatively evenly between the beach and the offshore region (-6,982 cy). Offshore surveys extend from zero elevation out to -12.00 plus or minus on each profile. This includes deposition in offshore bar systems that contain eroded beach sand in storage.
9. The northern 2,000 feet of the oceanfront beach and dunes lost 40,882 representing a majority of the total loss (offshore shed -12,224 cy).
10. The next 3,200 feet of oceanfront lost 30,071 cubic yards from the dunes and beach to zero elevation meaning that the offshore lost just 2,249 cubic yards of the total sand volume.
11. The southern 1,400 feet to Wildwood City beaches gained 4,427 cubic yards of sand on the beach which means offshore accumulated the majority of the total, 10,610 cy.
12. This sand volume loss was between July 2020 and late January 2021 and represents relatively average weather conditions with few mild northeast storms (Dec. 14 and 24, 2020) and Tropical Storm Isais in early August 2020.
13. The Feb storm loss from the oceanfront beach amounted to 70,000 cy between the jetty to 26th Avenue including the dunes, beach out to elevation -4.0 NAVD 1988. (J Verna, personal communication).

Table 1
Sand Volume Comparison on the North Wildwood Oceanfront Beach & Inlet Shoreline
July 2020 to January 2021

Profile	Shoreline Change (feet)	Volume Change (cu yds/ft.)	Avg. Volume (cu yds/ft.)	Distance Between (feet)	Total Profile Losses (cu yds)			
<i>Hereford Inlet Shoreline</i>								
-6+00	-257	-40.35						
			-44.58	200	-8,916	-8,916		
-4+00	-247	-48.81						
			-35.87	200	-7,173	-16,089		
-2+00	-205	-22.92						
			0.92	200	183	-15,906		
-0+00	-65	24.75						
		Arc = 90.0	7.60	2,548	2,548	-13,358		
0+00	-33	-9.54						
			-13.25	200	-2,649	-16,007		
2+00	-72	-16.95						
			-20.42	200	-4,085	-20,092		
4+00	-88	-23.90						
			-26.18	200	-5,237	-25,329	North end & Inlet losses	4th Ave.
6+00	-121	-28.47						
			-31.42	200	-6,285	-31,613		
8+00	-146	-34.38						
			-30.92	200	-6,184	-37,797		
10+00	-129	-27.46						
			-36.65	200	-7,329	-45,127		
12+00	-127	-45.83						
			-43.97	200	-8,795	-53,921		
14+00	-123	-42.11						
			-42.49	200	-8,497	-62,418		
16+00	-100	-42.86						
			-39.59	200	-7,917	-70,335		
18+00	-71	-36.31						
			-32.97	200	-6,594	-69,012		
	-55	-29.63					Northern 200 ft. oceanfront	
			-31.51	200	-6,303	-75,314	-6,303	-53,106
22+00	-57	-33.40						
			-35.22	200	-7,045	-76,057	-7,045	
24+00	-51	-37.05						
			-32.88	200	-6,576	-82,633	-13,621	
26+00	-39	-28.71						
			-27.57	200	-5,515	-81,571	-12,560	11th Ave.
28+00	-26	-26.44						
			-30.06	200	-6,013	-87,584	-18,572	
30+00	-22	-33.69						
			-27.80	200	-5,560	-87,132	-24,133	
32+00	-14	-21.91						
			-21.31	200	-4,262	-91,393	-28,395	
34+00	17	-20.71						
			-16.56	200	-3,312	-90,444	-27,445	
36+00	9	-12.42						
			-9.50	200	-1,899	-92,343	-29,344	
38+00	-19	-6.58						
			-5.32	200	-1,064	-91,508	-28,509	
40+00	-20	-4.06						
			-3.08	200	-615	-92,123	-29,124	
42+00	-5	-2.09						
			-3.43	200	-686	-92,194	-29,195	
44+00	-27	-4.77						
			-4.23	200	-845	-93,039	-30,040	
46+00	-3	-3.69						
			-4.74	200	-948	-93,142	-30,143	
48+00	-9	-5.80						
			-5.17	200	-1,034	-94,175	-31,176	
50+00	6	-4.54						
			-6.33	200	-1,267	-95,442	-32,443	
52+00	7	-8.13						
			10.61	200	2,123	-93,319	2,123	
54+00	5	29.35						
			31.66	200	6,333	-86,987	8,455	
56+00	3	33.97						
			19.21	200	3,843	-83,144	12,298	
58+00	-34	4.46						
			3.01	200	603	-82,541	12,901	
60+00	-37	1.57						
			2.70	200	539	-82,002	13,440	
62+00	-41	3.82						
			3.83	200	765	-81,237	14,205	
64+00	-15	3.83						
			4.65	200	931	-80,306	15,135	Juniper Ave
66+00	-1	5.48						
			1.54	200	308	-79,998	15,443	Sand Gain at the southern beach
68+00	-80	-2.40						

In prior years the offshore regions appeared to sequester sand supplies eroded from the beach/dune system. This was continued in 2020 as the beaches and dunes contributed 87% of the sand volume lost in the entire system, not counting the impact seen from the Feb. 1-2, 2021 northeast storm

Back Pass Operations:

The past four years of major sand harvesting effort using Wildwood City sources commenced in the spring of 2016. By Memorial Day 165,000 cubic yards had been placed in a beach berm parallel to the dune toe from 3rd Avenue, south toward 8th Avenue. Following the March 14, 2017 northeast storm, the City commenced hauling sand from the stormwater discharge points in the City of Wildwood using heavy trucks to move material to the erosion zone at 3rd Avenue. The estimate from truck logs indicated placement of about 190,000 cy of sand by mid-May 2017.

In 2018, material was again harvested (153,375 cu. yds.) from the storm water outfall areas and berm between discharge points and truck hauled up to the zone of serious erosion.

In 2019, the same stormwater outfall locations in the City of Wildwood were excavated and hauled by heavy truck to a 164,776 cubic yard stockpile at the dune toe south of 16th Avenue in North Wildwood.

The State of NJ and any local or county entity is free to take sand from the CBRS area in Hereford Inlet with appropriate state and federal permits, but the cost to North Wildwood is fixed at 25% of the project cost instead of 8.75% if federal money was involved with a USACE effort and a NJ State partnership. The 2009 initial beach restoration effort was a State and local partnership without federal funding. FEMA reimbursed the City at 75% of expenses for repair efforts made following a number of federal storm disaster declarations starting with the Veteran's Day storm of 2009, ending with Hurricane Sandy in 2012. The Jonas northeaster in late January 2016 was incorporated into the initial back passing operation after permits were revised to allow taking sand from Wildwood City beaches.

Sediment harvesting continued in 2020 with nearly 200,000 cubic yards of sand moved north to between 12th and 22nd Avenues. Getting past the timber piers required installing some material as a haul road for high tide periods. Sand distribution was primarily placed as dune ridges seaward of a new steel sheet pile bulkhead between 7th and 12th Avenues. No material was hauled to the jetty since the water was already at the bulkhead at every high tide.

Intercession continues with both the State of New Jersey and the US Army Corps of Engineers for either a repetition of the 2009 state project or the anticipated federal project with either inlet sand or material extracted from the two southern neighboring city beaches. The inlet survey completed in 2020 found an abundance of available material located particularly generously in the NJDEP sections of the Hereford Inlet borrow area dedicated to beach nourishment.

Individual Site Review:

This section describes the shoreline and volume changes documented at selected profile locations to show general trends in sediment movement along the City's beaches among four surveys occurring during the summer 2019, fall 2019, summer 2020 and fall 2020.

Site 00+00 (at the inlet jetty)

The northernmost oceanfront survey line is dominated by sand retention by the jetty with the offshore region exposed to the full impact of northeast storm waves. Sand passes by this location with ease during high wave energy episodes. Flood tides carry material into the inlet shoreline while ebb flows move sand offshore in the expansive ebb tidal shoal system extending over two thousand feet seaward of the jetty.

Each spring/summer survey found a narrow dry sand beach at the revetment and bulkhead as a result of sand backpassing efforts moving material in from Wildwood City beaches. This sand eroded away by the fall survey each of the two years. The last survey in Jan. 2021 shows a severely eroded beach zone but a bar located offshore with some sand volume within its extent.



Figure 6. View to the north taken July 8, 2020 showing the inlet gazebo and inlet jetty beach. The photograph covers the northernmost 200 feet of beachfront following sand placement. In Jan. 2021 no wet sand was exposed even at low tide.

**North Wildwood - Semi-Annual Comparison
Line 00+00 Comparison**

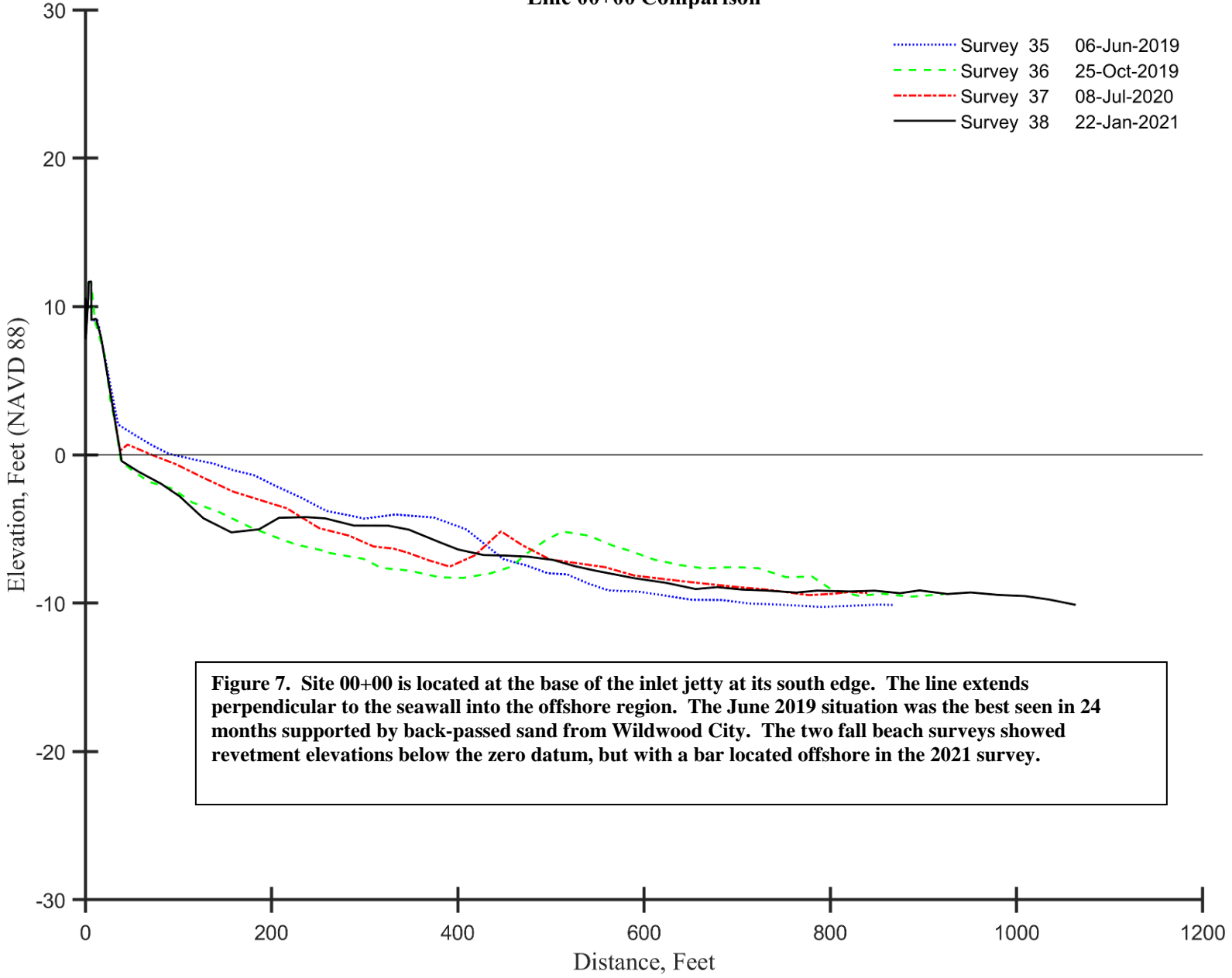


Figure 7. Site 00+00 is located at the base of the inlet jetty at its south edge. The line extends perpendicular to the seawall into the offshore region. The June 2019 situation was the best seen in 24 months supported by back-passed sand from Wildwood City. The two fall beach surveys showed revetment elevations below the zero datum, but with a bar located offshore in the 2021 survey.

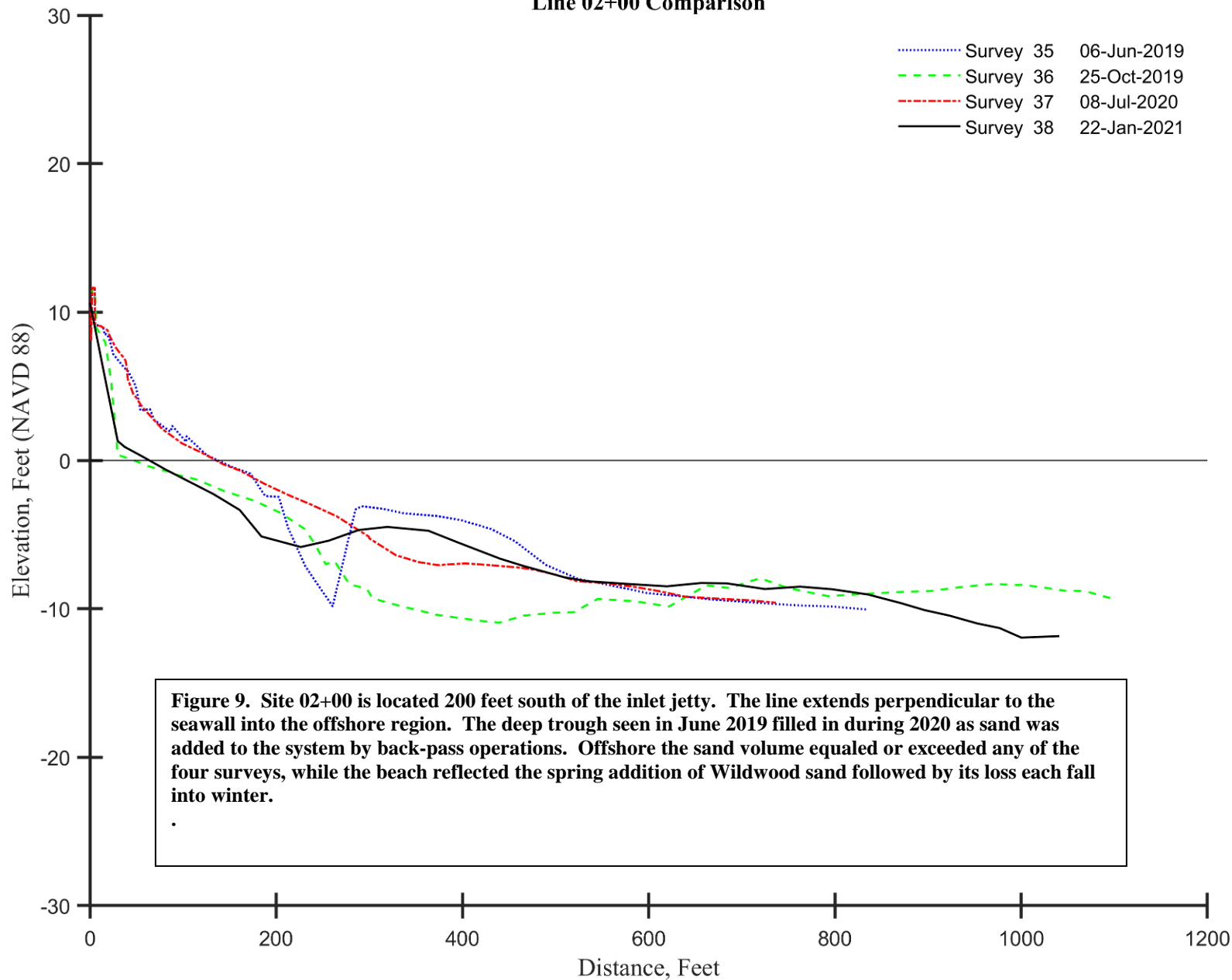
Site 02+00 (about 100 feet south of the inlet gazebo)

Station 02+00 crosses the 3rd Avenue storm water pipeline into the ocean south of it. The backpassing operation provided sand for the summer 2020 season, but fall losses removed enough material to have water at the revetment even at low tide by Jan. 2021.



Figure 8. View to the south across site 02+00 and toward the stormwater pipeline showing the scarp cut into the back-passed sand volume on the beach as of July 8, 2020. There is sand offshore, but not in sufficient elevation or quantity to assist in providing any measure of adequate shore protection.

**North Wildwood - Semi-Annual Comparison
Line 02+00 Comparison**



Site 04+00 (between 3th and 4th Avenues)

The site is in the northern portion of the island adjacent to Hereford Inlet 400 feet south of the 2nd Avenue jetty. This area has typically been an erosional shoreline due to its proximity to the inlet and the direct impact from northeast storms. The sand graded onto this location following both the 2019 and 2020 back pass operations from Wildwood is evident in the dry beach width and the elevation against the bulkhead in the two summer cross sections. The loss of sand by the fall into winter was duplicated each of the two years with more sand present as an offshore bar in 2020 than present in 2019.



Figure 10. View to the south taken from directly in front of the new bulkhead that starts just south of the 3rd Avenue gazebo on Jan. 22, 2021. The beach was wet to the bulkhead and only about 60 feet wide to the water at low tide. Waves reach the hard structures at any elevation of mid tide and higher. During the past summer there was a dry beach composed of Wildwood City sand transported north into the area.

**North Wildwood - Semi-Annual Comparison
Line 04+00 Comparison**

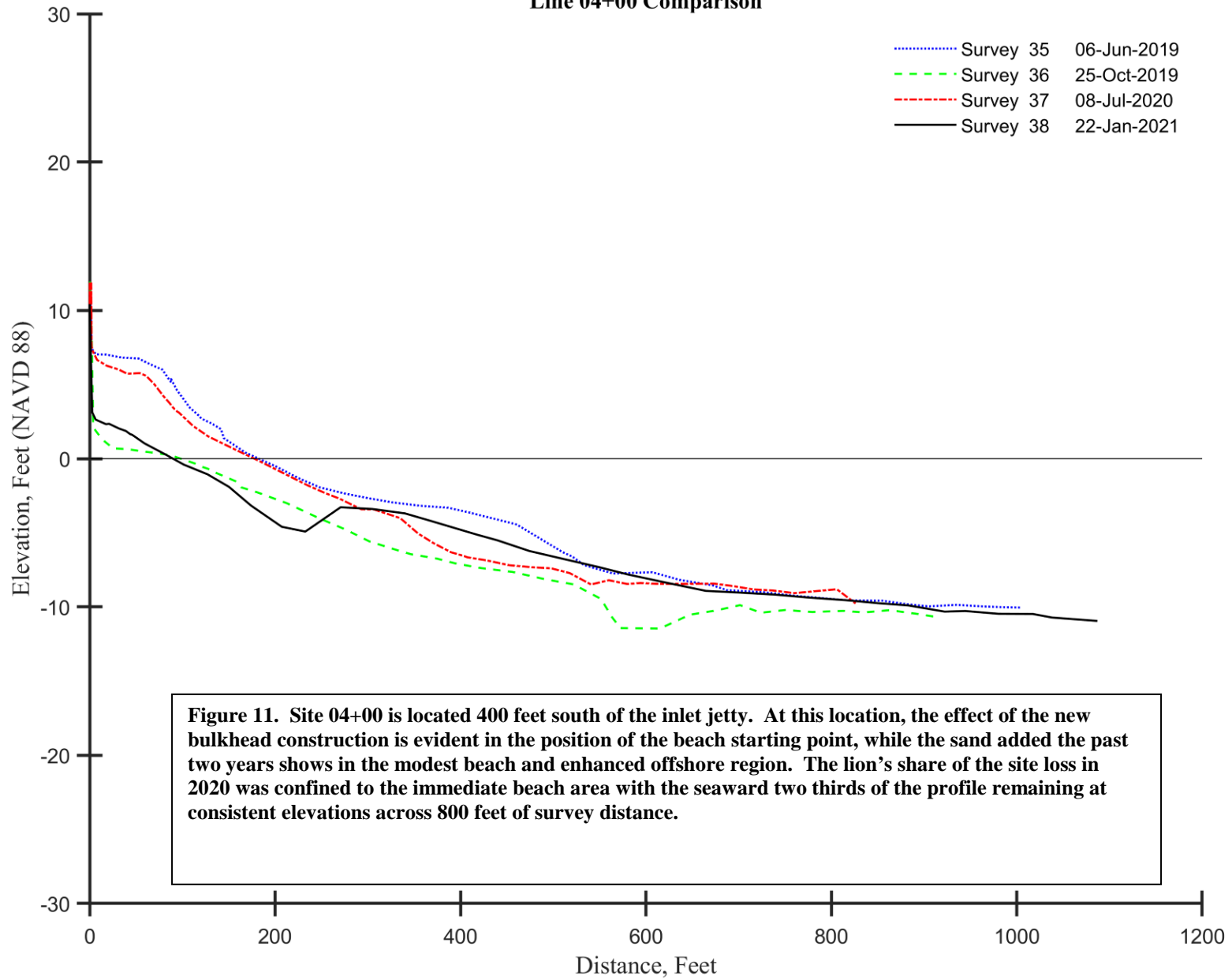


Figure 11. Site 04+00 is located 400 feet south of the inlet jetty. At this location, the effect of the new bulkhead construction is evident in the position of the beach starting point, while the sand added the past two years shows in the modest beach and enhanced offshore region. The lion's share of the site loss in 2020 was confined to the immediate beach area with the seaward two thirds of the profile remaining at consistent elevations across 800 feet of survey distance.

Site 06+00 (approximately at 4th Avenue)

This location is at the end of 4th Avenue where the new bulkhead was completed in early 2018. Erosion acted to expose the new structure to wave run-up during the winter of 2019. By July 2020, the beach restoration had provided a bathing opportunity once again. This view below looks south across survey line 06+00.



Figure 12. Site 06+00 is on the beach slightly north of where the new steel bulkhead extends seaward into the surf zone. The beach is a bit wider than at the 04+00 site, but high tide still reaches the bulkhead each time. The wave conditions on Jan 22, 2021 were extremely mild and the water was still at the bulkhead during the previous high water.

North Wildwood - Semi-Annual Comparison Line 06+00 Comparison

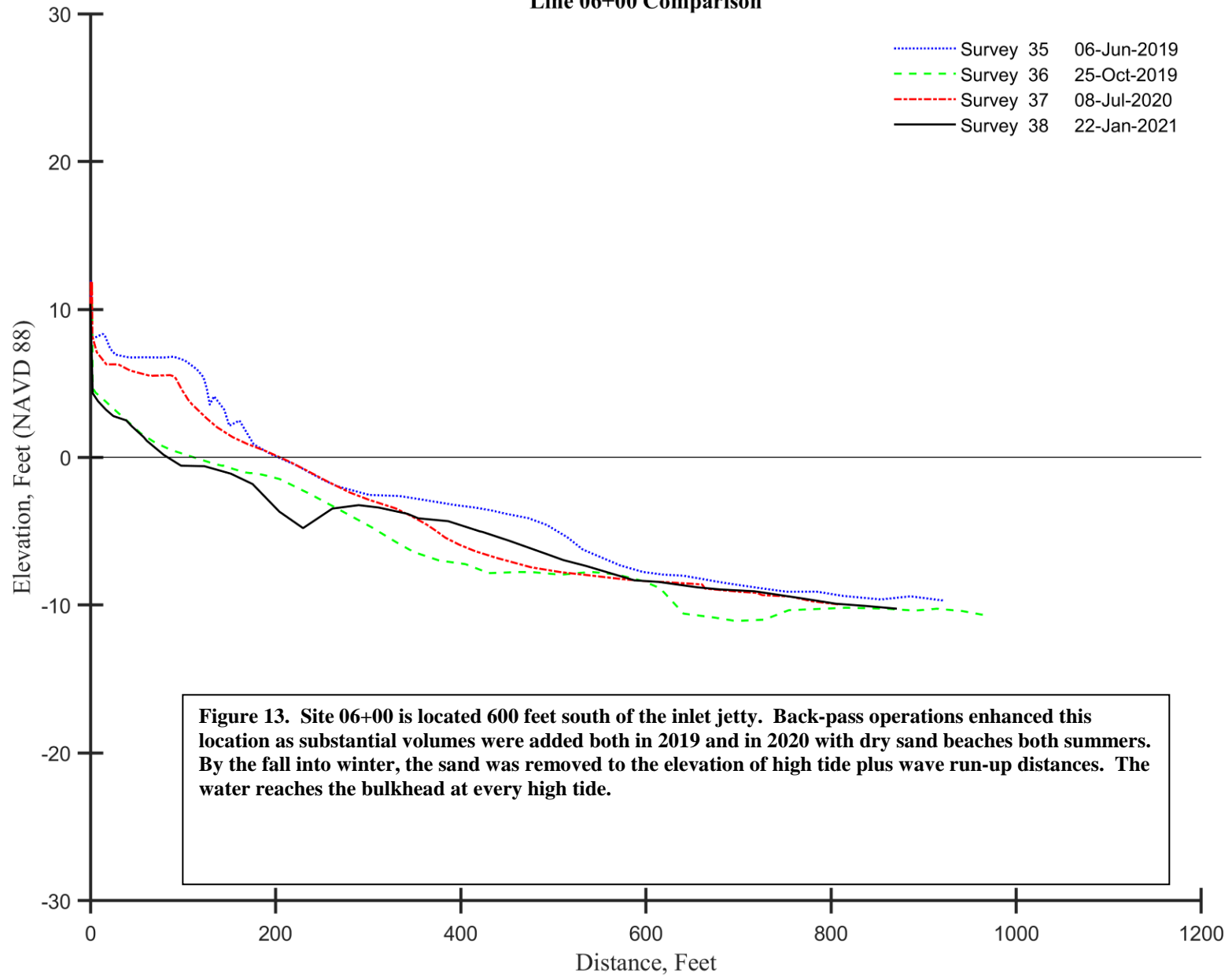


Figure 13. Site 06+00 is located 600 feet south of the inlet jetty. Back-pass operations enhanced this location as substantial volumes were added both in 2019 and in 2020 with dry sand beaches both summers. By the fall into winter, the sand was removed to the elevation of high tide plus wave run-up distances. The water reaches the bulkhead at every high tide.

Site 20+00 (between 9th and 10th Avenues)

This site is located 2,000 feet south of the inlet jetty and was reasonably stable up until this past year. Dune erosion took the entire feature during installation of the steel sheet pile bulkhead. The material seaward of the bulkhead was transported from the 2020 Wildwood source stockpile. While normal high tide does not reach the sand ridge, any northeast event could easily overtop the bulkhead and pour inland.



Figure 14. View to the north taken from the beach at 10th Ave. on January 21, 2021 following loss of the dune constructed in 2009. The new steel bulkhead is partially buried in sand, but there is little added protection from the beach/dune system remaining.

**North Wildwood - Semi-Annual Comparison
Line 20+00 Comparison**

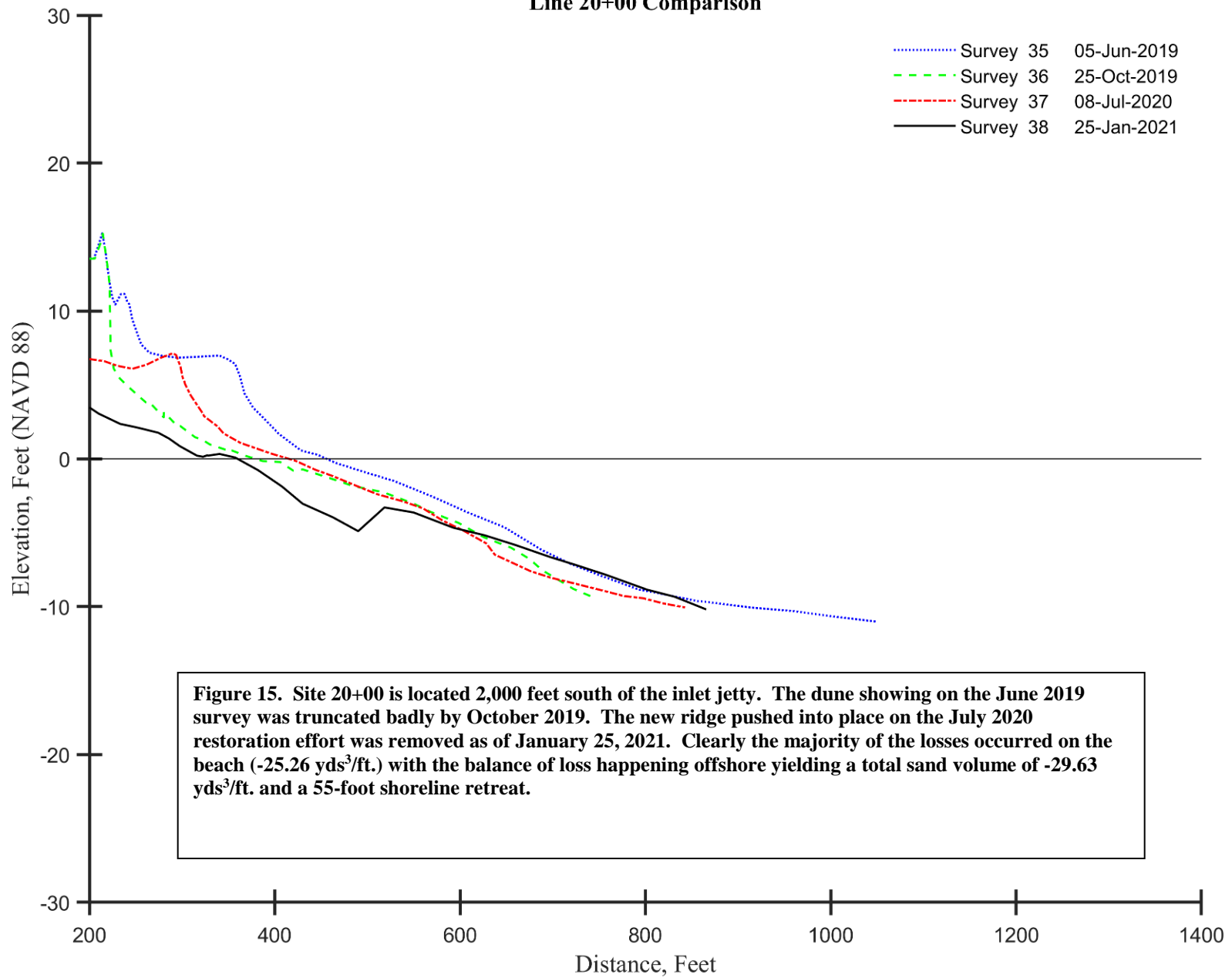


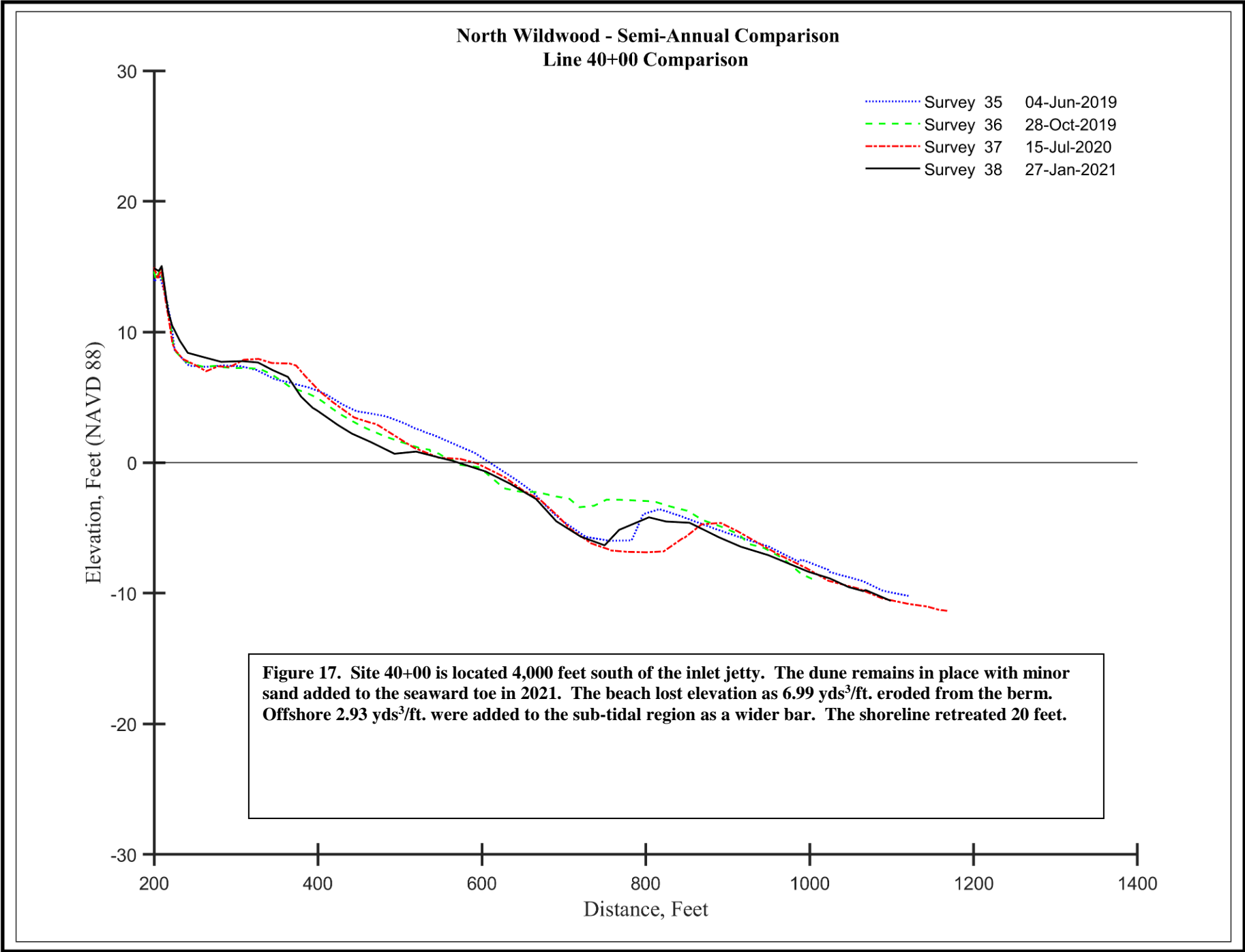
Figure 15. Site 20+00 is located 2,000 feet south of the inlet jetty. The dune showing on the June 2019 survey was truncated badly by October 2019. The new ridge pushed into place on the July 2020 restoration effort was removed as of January 25, 2021. Clearly the majority of the losses occurred on the beach (-25.26 yds³/ft.) with the balance of loss happening offshore yielding a total sand volume of -29.63 yds³/ft. and a 55-foot shoreline retreat.

Site 40+00 (17th Avenue)

Positioned 4,000 feet south of the 2nd Avenue jetty, this site is located two blocks south of the lifeguard station in the mid-section of the City's oceanfront beaches. Following initial construction in 2009 this region has remained relatively stable. The dry sand expanse has diminished over the past decade, leaving the visitor area dependent on wave run-up conditions. The bar offshore was in the process of adding material to the beachface in modest amounts. Backpassed sand was not directly placed here, but a quantity did migrate onto the beach during the summer.



Figure 16. View to the south along the seaward dune slope and upper beach on January 27, 2021. The 2020 sand stockpile shows in the middle ground with the tracks on it. The dunes and beach lost 6.99 yds³/ft. with sand deposited offshore as a bar.



Site 52+00 (21st Avenue)

This view was taken at 56th Avenue looking north toward the survey site 400 feet to the north. The 2009 dune was still present at the site, but a large volume of stored sand extended south from what had been the end of the original 2009 dune system where it curved seaward to pass in front of the timber pier to the left in the photograph. Hurricane Sandy removed the dune from in front of the piers and the barrier was shifted landward between them. This material was truck-hauled north from Wildwood City in the spring of 2020 for redistribution.



Figure 18. View to the north taken from line 56+00 looking toward the dunes present at line 52+00 across the piles of Wildwood City sand stored for redistribution along the beaches.

North Wildwood - Semi-Annual Comparison
Line 52+00 Comparison

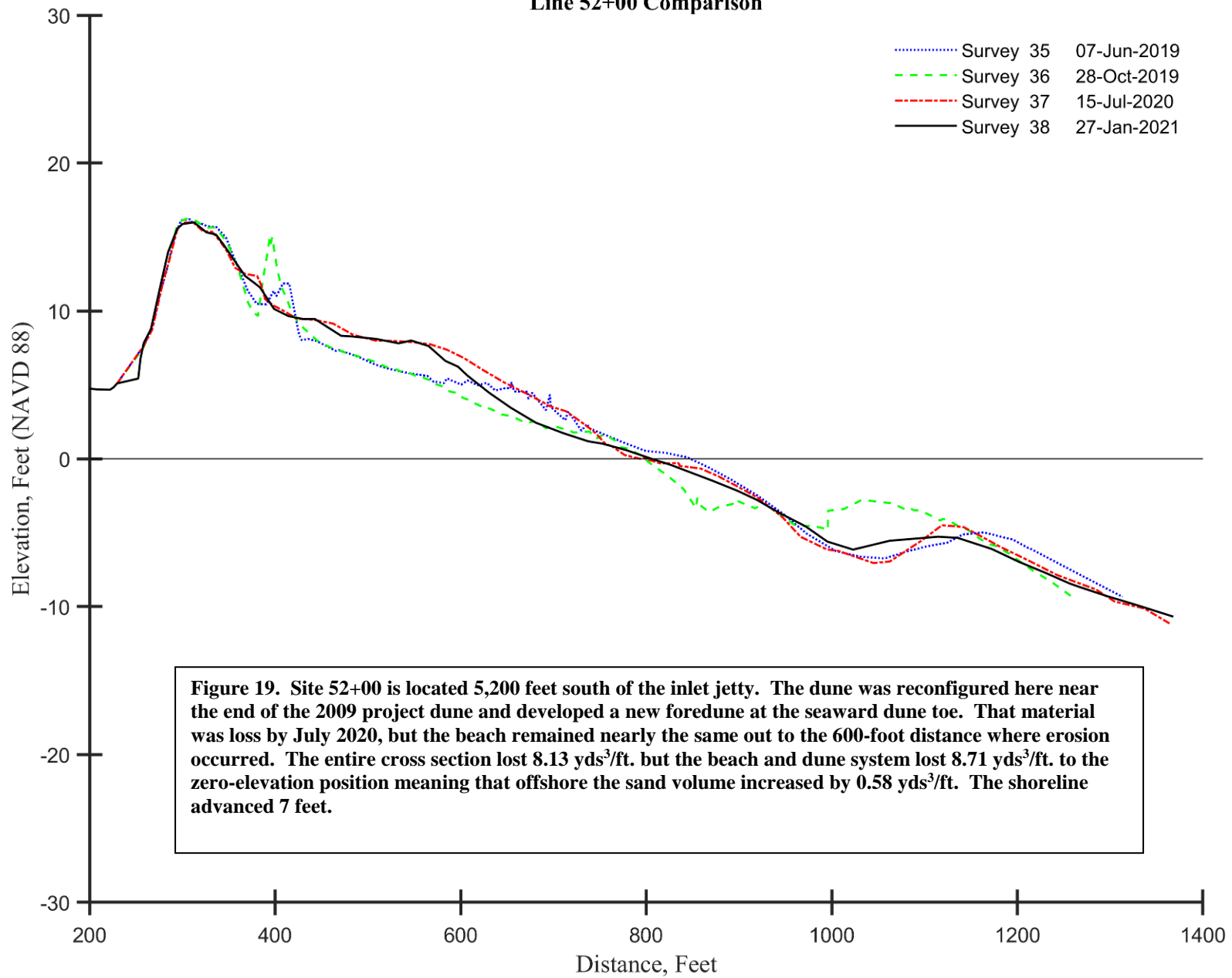


Figure 19. Site 52+00 is located 5,200 feet south of the inlet jetty. The dune was reconfigured here near the end of the 2009 project dune and developed a new foredune at the seaward dune toe. That material was loss by July 2020, but the beach remained nearly the same out to the 600-foot distance where erosion occurred. The entire cross section lost 8.13 yds³/ft. but the beach and dune system lost 8.71 yds³/ft. to the zero-elevation position meaning that offshore the sand volume increased by 0.58 yds³/ft. The shoreline advanced 7 feet.

Site 58+00 (Between 23rd & 24th Avenues)

This site is located in the southern section of the City's oceanfront where the engineered dune system was originally constructed seaward of the piers. An effort was made in 2013 to restore the dune, but events in 2014 forced re-positioning the dune system landward between the piers and including a large vegetated island dune that had existed between Morey's Surfside Pier and the adjacent timber pier.

As of January 27, 2021, a temporary haul road had been built seaward of the piers so trucks could move sand north from Wildwood at high tide. This feature was broken up by the February 2021 storm, but work had ceased on hauling sand.



Figure 20. The January 27, 2021 view to the south looks across the front of the timber pier with the sand haul road in place to ease the trip past the pier at high tide. Morey's Surfside Pier can be seen in the distance further south with a wide, flat beach exposed at low tide.

**North Wildwood - Semi-Annual Comparison
Line 58+00 Comparison**

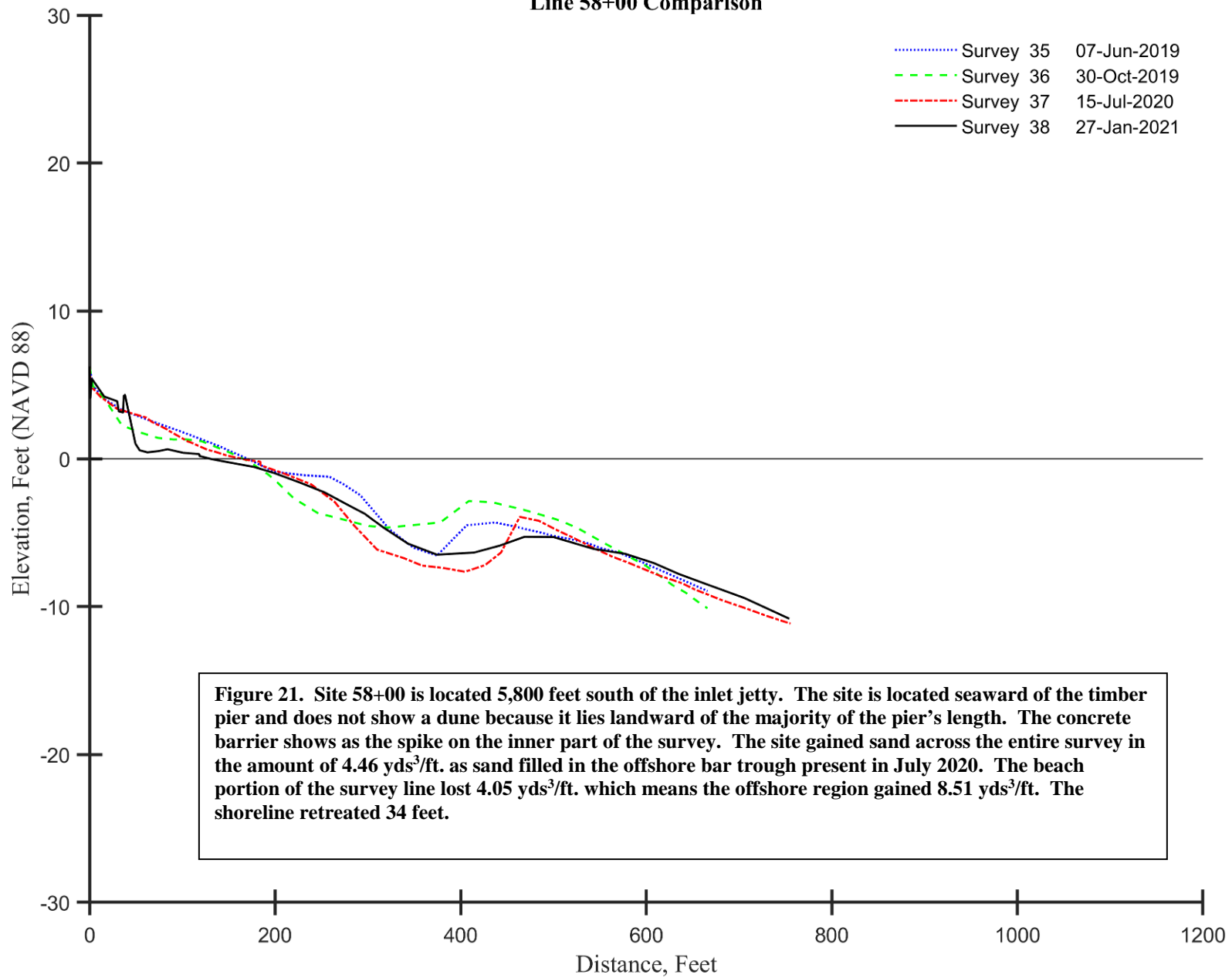


Figure 21. Site 58+00 is located 5,800 feet south of the inlet jetty. The site is located seaward of the timber pier and does not show a dune because it lies landward of the majority of the pier's length. The concrete barrier shows as the spike on the inner part of the survey. The site gained sand across the entire survey in the amount of 4.46 yds³/ft. as sand filled in the offshore bar trough present in July 2020. The beach portion of the survey line lost 4.05 yds³/ft. which means the offshore region gained 8.51 yds³/ft. The shoreline retreated 34 feet.

Site 60+00 (24th Avenue)

In an effort to better define the beach zone where piers dominate in North Wildwood, this site was included to show the changes to enhance dune protection since Hurricane Sandy. The main feature is an old dune island likely developed around beach raking debris left in a variety of places when the North Wildwood beach was much wider. The piers originally had the 2009 dune built seaward of the pier ends on the outer beach, but storm erosion starting November 2009 and climaxing with Hurricane Sandy in October 2012 saw complete loss of the dune seaward of the three piers. The existing situation was completed in 2014 and has established quite well. However shoreline retreat has forced the high tide line under the two timber piers producing the need for the haul road. This beach in Jan. 2021 was extremely flat following two storms in December 2020.



Figure 22. Site 60+00 lies between Morey’s Surfside Pier and the next timber pier to the north. The bulldozer is maintaining the haul road entrance past the two timber piers.

**North Wildwood - Semi-Annual Comparison
Line 60+00 Comparison**

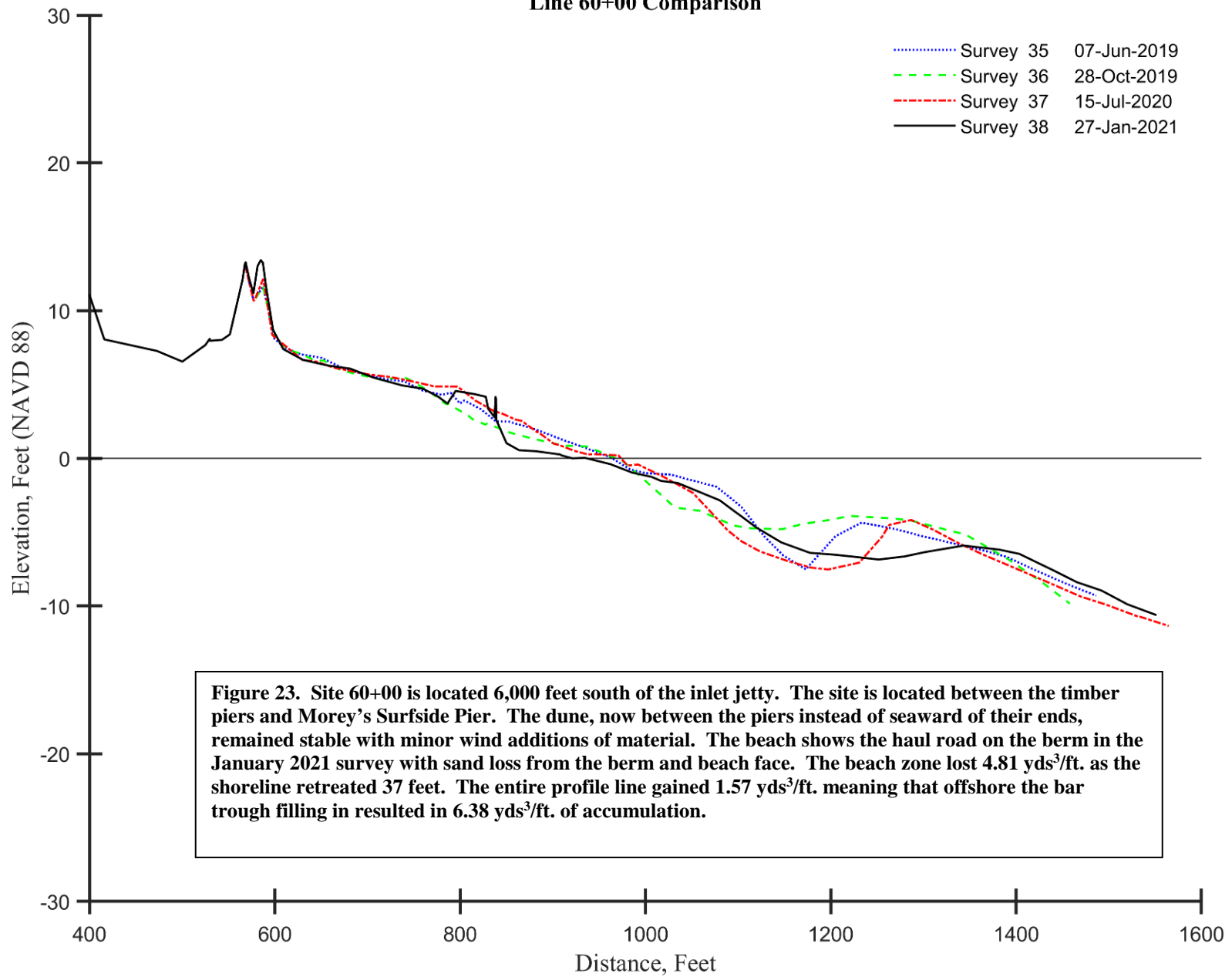


Figure 23. Site 60+00 is located 6,000 feet south of the inlet jetty. The site is located between the timber piers and Morey's Surfside Pier. The dune, now between the piers instead of seaward of their ends, remained stable with minor wind additions of material. The beach shows the haul road on the berm in the January 2021 survey with sand loss from the berm and beach face. The beach zone lost 4.81 yds³/ft. as the shoreline retreated 37 feet. The entire profile line gained 1.57 yds³/ft. meaning that offshore the bar trough filling in resulted in 6.38 yds³/ft. of accumulation.

Site 64+00 (between 25th and 26th Avenues)

This is the southern-most cross section of the selected profiles within the larger database and just 400 feet from the southern limit of surveys. Located seaward of the Surfside Pier and Ocean Oasis Water Park and Beach Club this site represents conditions at the south end engineered beach and its taper near the Wildwood and North Wildwood border. Initially the engineered beach design template placed the dune feature 30 feet seaward of the pier's steel bulkhead. A series of storm events that followed construction in 2009 resulted in multiple episodes of erosion followed by restoration efforts to maintain this section of dune. By the spring 2014 survey (April 25th), the beach and dune had eroded to a point where the City was forced to reposition this feature landward of the easternmost point of the piers. No dune was replaced south of Surfside Pier because the City of Wildwood declined to allow the original design to be re-established. Morey's Pier company erected the steel sheet pile bulkhead following the initial series of northeast storms prior to Hurricane Irene in 2011 and it has been the starting point since. The sand haul road extends past this pier as well so at high tide the haul trucks could pass through.



Figure 24. View to the north taken on January 27, 2021 looking along the concrete “Jersey barriers” employed to retain the sand for the road. Seaward the beach is extremely flat, but quite wide. Waves easily reach the bulkhead making a dry berm unlikely until the shoreline advances seaward about 100 feet further seaward.

**North Wildwood - Semi-Annual Comparison
Line 64+00 Comparison**

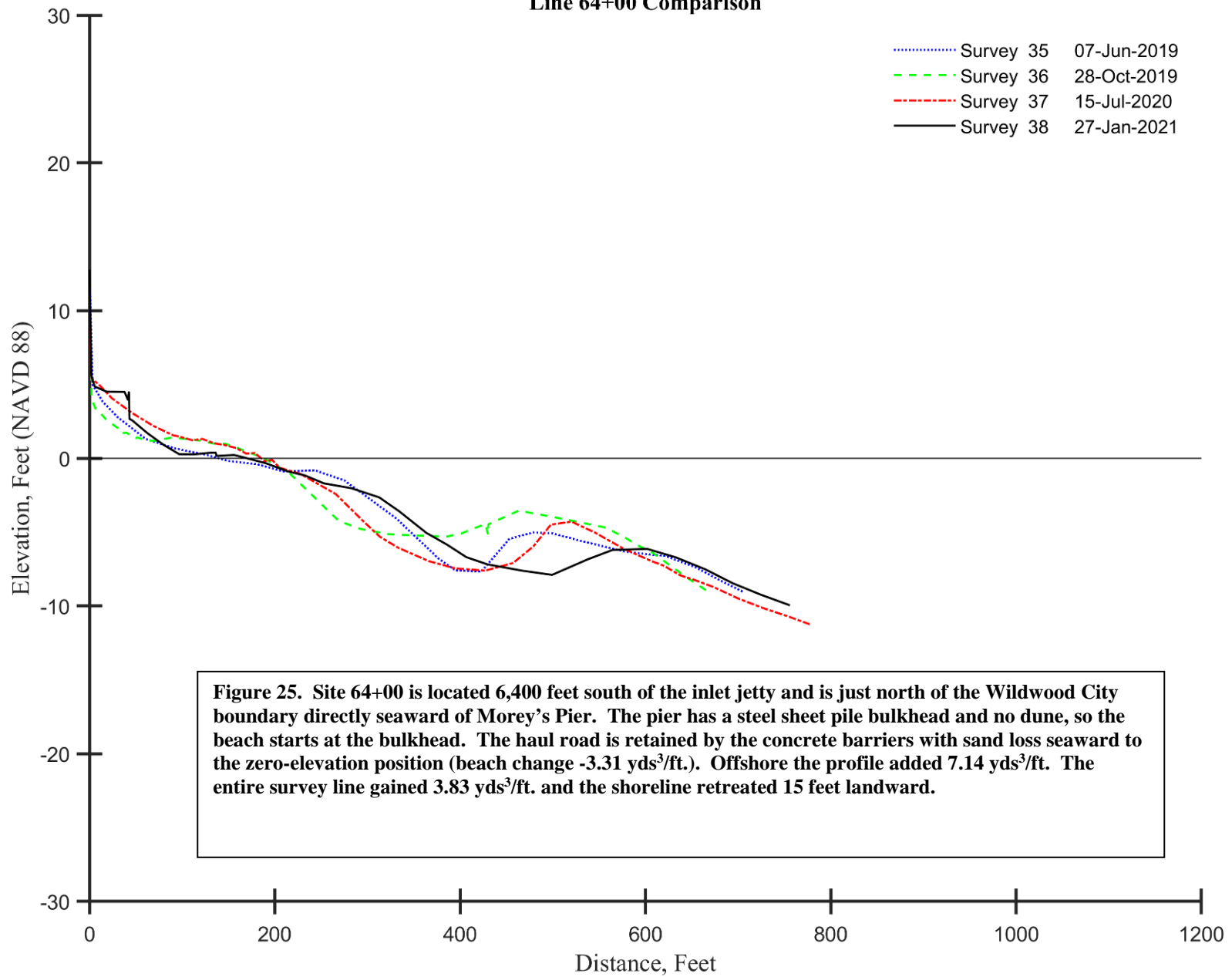


Figure 25. Site 64+00 is located 6,400 feet south of the inlet jetty and is just north of the Wildwood City boundary directly seaward of Morey’s Pier. The pier has a steel sheet pile bulkhead and no dune, so the beach starts at the bulkhead. The haul road is retained by the concrete barriers with sand loss seaward to the zero-elevation position (beach change -3.31 yds³/ft.). Offshore the profile added 7.14 yds³/ft. The entire survey line gained 3.83 yds³/ft. and the shoreline retreated 15 feet landward.

Site -00+00 (at the toe of the jetty, but into Hereford Inlet 90° to the oceanfront shoreline)

Site -02+00 (200 feet to the northwest along the Hereford Inlet shoreline)

Site -04+00 (400 feet to the northwest along the Hereford Inlet shoreline)

Site -06+00 (near the end of Surf Avenue on the Hereford Inlet shoreline)

This is the northwestern most cross section on beaches open to public bathing. Further up the inlet the beach is closed for endangered species bird nesting every summer starting March 15th until August 30th. Sand was deposited here in quantity starting in about 2000 creating a large spit growing along the inlet revetment toward the end of New Jersey Avenue in North Wildwood. Surveys were initiated here during the 2009 NJ State/North Wildwood beach restoration project. In the past several years the southeastern portion of this beach has been erosional as inlet currents alter sand deposition and the oceanfront beach retreated to the point where material was unable to move past the jetty into the inlet shore.



Figure 26. This view on January 22, 2021 shows a view to the southeast along the toe of the dunes. The bathing beach is substantial in width with a taper to zero width at the 2nd Ave. and Kennedy Blvd. gazebo. The site stability is tied to loss from the oceanfront sand deposited each year derived from Wildwood City beaches. Flood tides act in concert with wave activity to move sand past the jetty into Hereford Inlet and it deposits along the inlet shoreline as an extended sand spit oriented into the inlet, along the City shoreline. Material initially deposits in the nearby offshore allowing ocean waves to move it landward adding to the beach eventually.

North Wildwood - Semi-Annual Comparison
Line -00+06 Comparison

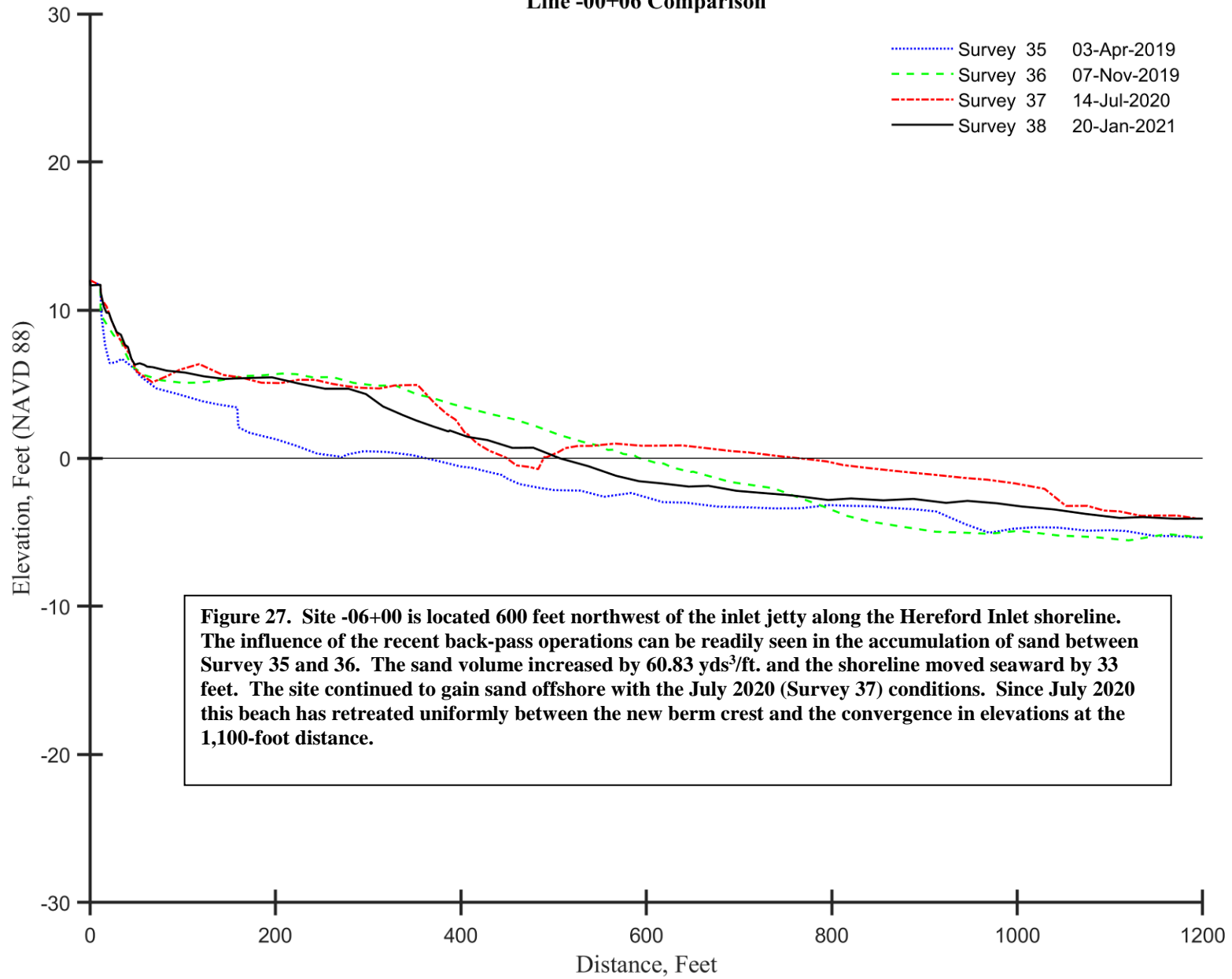


Figure 27. Site -06+00 is located 600 feet northwest of the inlet jetty along the Hereford Inlet shoreline. The influence of the recent back-pass operations can be readily seen in the accumulation of sand between Survey 35 and 36. The sand volume increased by 60.83 yds³/ft. and the shoreline moved seaward by 33 feet. The site continued to gain sand offshore with the July 2020 (Survey 37) conditions. Since July 2020 this beach has retreated uniformly between the new berm crest and the convergence in elevations at the 1,100-foot distance.

Hereford Inlet Borrow Zone Survey Fall 2020:

The City requested a survey of the State and Federally authorized Hereford Inlet sand borrow zone located in the ebb-tidal shoals of the inlet approximately 1,500 feet northeast of the inlet jetty at 2nd and Kennedy Boulevard. This was completed November 24, 2020 under ideal surf and wind wave conditions. The digital elevation model of the bathymetry shows extensive sand deposition in the southern section of the borrow zone where any potential supply for North Wildwood would be extracted. A significant shift in the inlet's medial ebb channel produced a deeper trough through the entire zone area since 2018 data was obtained, reducing some parts of the site for sand supplies. Most of the sediment has accumulated between this new ebb channel and the North Wildwood shoreline on the inlet. In fact, at the high tide during the day of the survey, the 24-foot vessel was unable to continue out to sea along what had previously been an 8-foot channel along the inlet beach and past the jetty tip. The water was less than 2 feet deep at high tide over 800 feet from the water's edge.

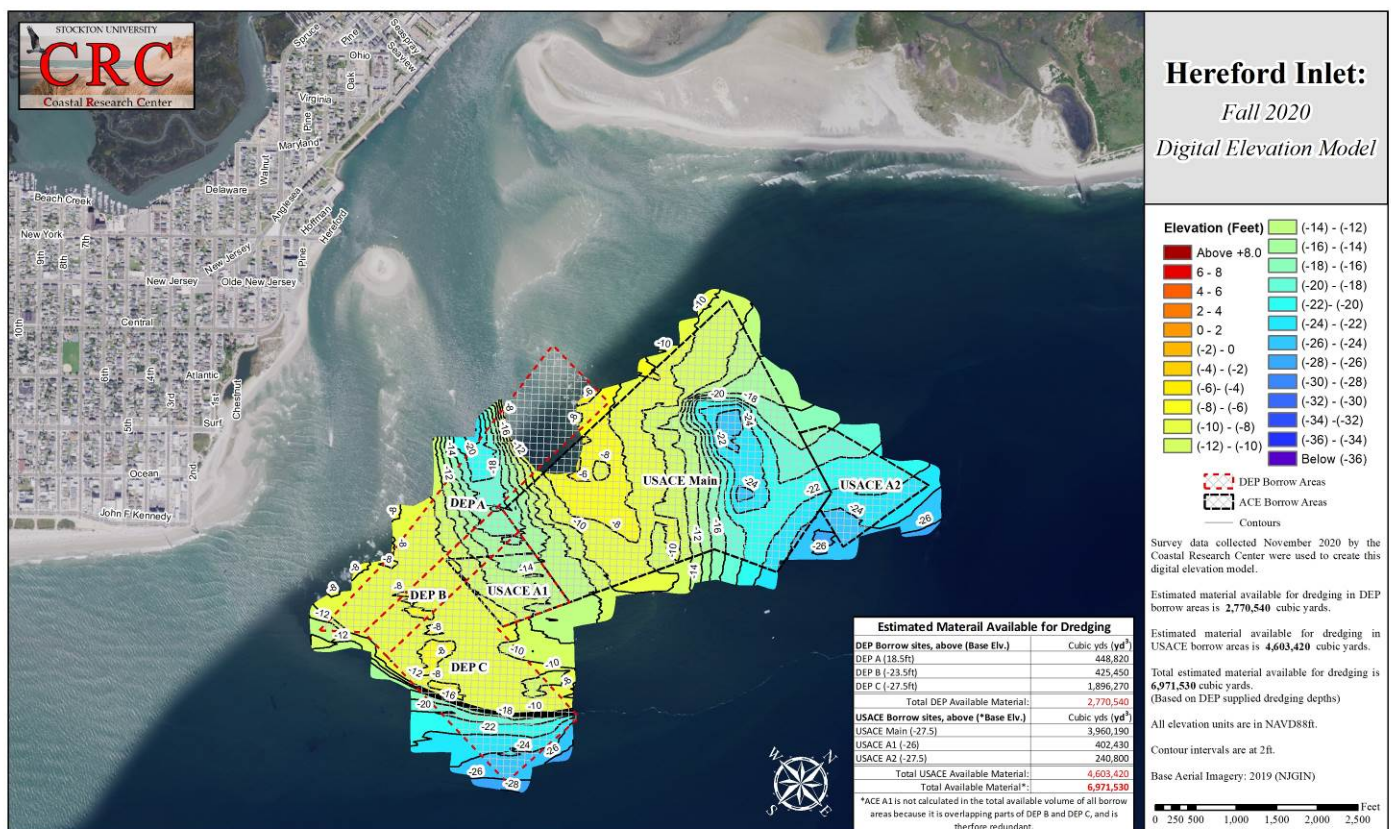


Figure 28. Digital Elevation Model for the survey extent authorized by North Wildwood to learn the sand volume potentially available for beach nourishment if a hydraulic placement were approved and permitted. The depth data in the NJDEP zones on the southeast end of the area approved for sand harvesting are all between -10- and -8-foot elevation (NAVD 1988). The authorized excavation depths are listed in the material availability box above between -18.5 up to -27.5-foot elevations. All together 2,770,540 cubic yards of sand are currently available in the DEP areas. The background air photograph is from 2019 and shows a vessel in progress outbound in a channel no longer present. The shallow area at DEP A and B extend to the inlet beach at decreasing depth to the low tide line at the beach. The hatched area in DEP A zone without any color all lies at elevations less than -6.0 NAVD 1988 with top crest values in the -1.0-foot range since the area was too shallow to survey even with almost no waves present on the survey date.

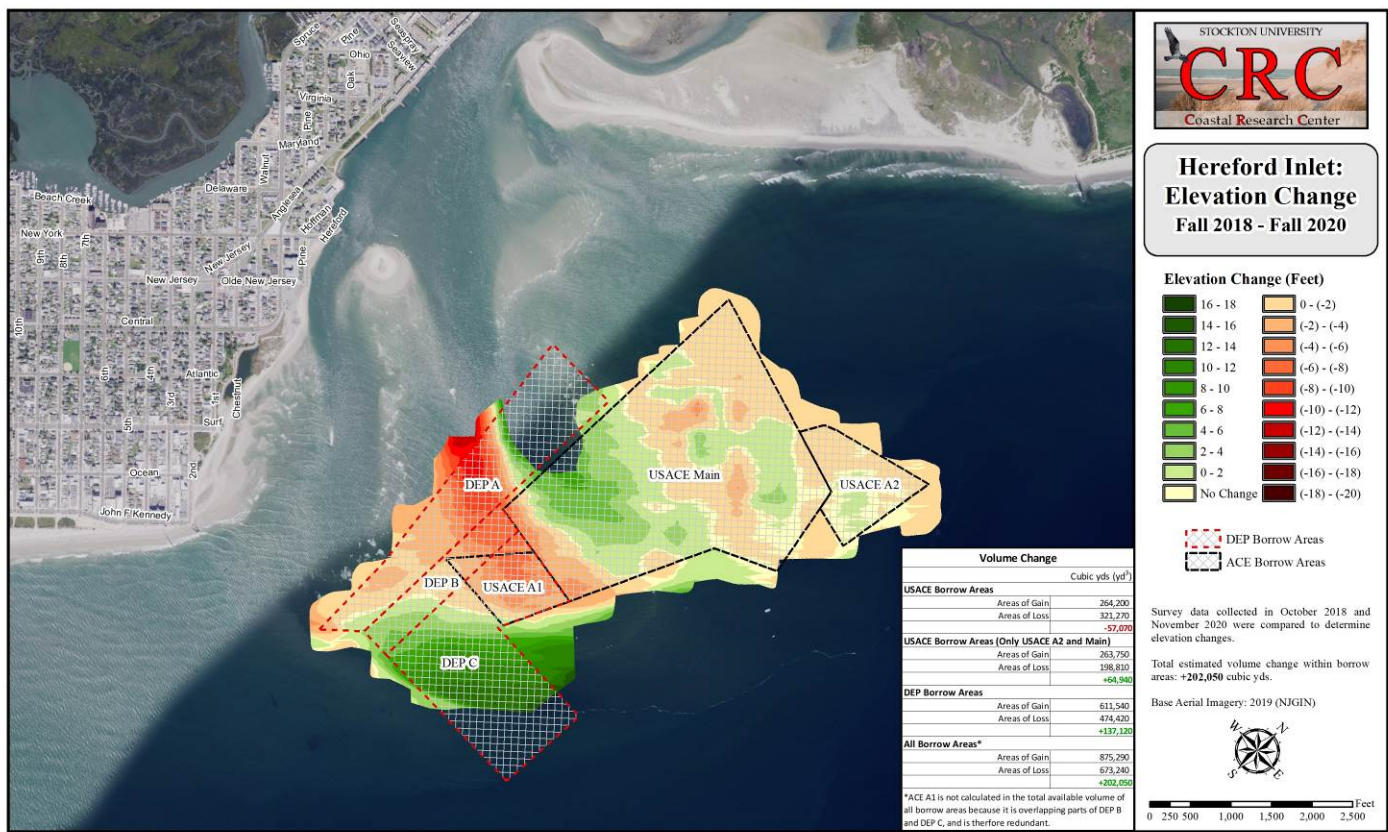


Figure 29. The fall 2020 borrow zone survey data was compared to the last NJDEP funded Hereford Inlet survey covering a wider area to determine change in sand supplies and locations since fall 2018. The multi-assigned authorized borrow zones are outlined for both federal and NJDEP source areas with the NJDEP sites A, B and C on the south end of the entire site. The best accumulation has occurred in DEP sites B and C where the net gain was 137,120 yards of sand since 2018. NJDEP zone A has done better than the data indicates because the color-blanked hatched area could not be surveyed in 2020 because of extremely shallow water within the hatched area. The deep red zone cutting through the DEP A and USACE A1 zones is the new ebb-tidal channel generated by the closure of the one shown in the 2019 air photograph as background that existed close to the North Wildwood inlet shoreline. The NJDEP C zone blank hatched area was not surveyed in 2018 as it was too far from shore and in deep water beyond the allowed dredging depths. That segment remains deep as of 2020 (Figure 28).

Summary/Conclusions:

Hereford Inlet;

The area surveyed extended across the entire conglomerate of approved sand borrow areas allocated to either the US Army Corps of Engineers or the NJ DEP Division of Engineering and Construction. The NJDEP zones all collected sand in large amounts especially NJDEP zone C closest to North Wildwood. A shift in ebb-tidal channels exiting Hereford Inlet produced a deeper area north of DEP zone C and added a large sand volume to the north end of DEP A zone and the Main USACE borrow area. The northern third of the entire area was essentially in the same status as it was in 2018. The ebb channel closest to North Wildwood’s inlet beachfront is essentially closed to channelized flow with depths at high tide in the 1 to 3-foot range all the way to the borrow areas.

Bottom line is that there is over 2.77 million cubic yards of sand available to North Wildwood from just the NJDEP borrow sites (Figure 27). If the current conditions persist for continued periods of time without any satellite ebb channel developing between the borrow zone and the inlet beach, sand will migrate under flood

tidal flow and incident northeast waves toward the inlet jetty. In any event the pumping distance involved is among the shortest of the NJ inlet sources for project beaches and could mean cost savings.

North Wildwood Oceanfront Beaches;

Storm frequencies were low until the middle of December 2020 with only one tropical system producing beach erosion with Tropical Storm Isaias on August 4, 2020. There were tropical force winds for a short period of time accompanied by erosion. The fall season saw multiple minor events with sufficient frequency to continue sand loss on the oceanfront. Storms Dec. 16th and 24th of 2020 were more impactful and were followed by a more intense event Feb. 1-2, 2021. The final survey for 2020 took place on January 21, 2021 again due to weather related issues. These data were shared with the municipal engineer who conducted a post-storm survey for comparison reasons related to potential disaster declaration reimbursement for the engineered beach sand loss of previously back-passed material.

During 2020 at least 220,000 cubic yards of material was transferred in from Wildwood beaches and placed in large stockpiles at the toe of the remaining dunes on the beach. Some was distributed into a ridge of sand north of 11th Avenue to 7th Avenue to provide a small measure of protection at this vulnerable area. The first six city blocks south of the inlet jetty are solely dependent on the rock revetment and bulkhead for storm protection.

Hydraulic beach restoration from Hereford Inlet is still possible if just the State of NJ and North Wildwood participate in the project at the 75% State vs. 25% Local cost split. The federal project in a long post design, pre-construction phase does not utilize Hereford Inlet sand for North Wildwood. Should the City seek to conduct another hydraulic project, both NJDEP and US Army Corps permits need to be re-applied for. The current permits were modified to capture the Wildwood City sand instead of the inlet material. Should the Division of Coastal Engineering offer to renew the 2009 project at some level, they would do the permit work, design and bid the project, then monitor its implementation, leaving the City to monitor the change following construction as was done previously.

Continued intercession with the US Army Corps of Engineers must persevere to encourage them to decide on the sand sources, placement mechanisms and timing so that this much-needed final New Jersey municipal regional shore protection project goes to construction. The Wildwoods are the only NJ coastal oceanfront communities NOT under either the jurisdiction of the New York or Philadelphia District Army Corps Divisions with completed beach nourishment projects.