CITY OF CAPE MAY
BEACH DATA COLLECTION & FUTURE NEEDS ASSESSMENT

BEACH SAFETY COMMITTEE MEETING APRIL 28, 2025

PURPOSE

- To better understand and manage the beach's complex balance of the ecosystem, storm hazard protection, and recreation features and benefits.

- Key tasks:
  - Collect, catalog, and analyze historical beach data to understand the evolution of the City's beach
  - Compile findings into a timeline
  - Summarize future studies/actions that the City can take to better understand the beach's behavior and how the beach features and changes effect the quality of the beach experience for residents and visitors

PURPOSE

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WHY START HERE?

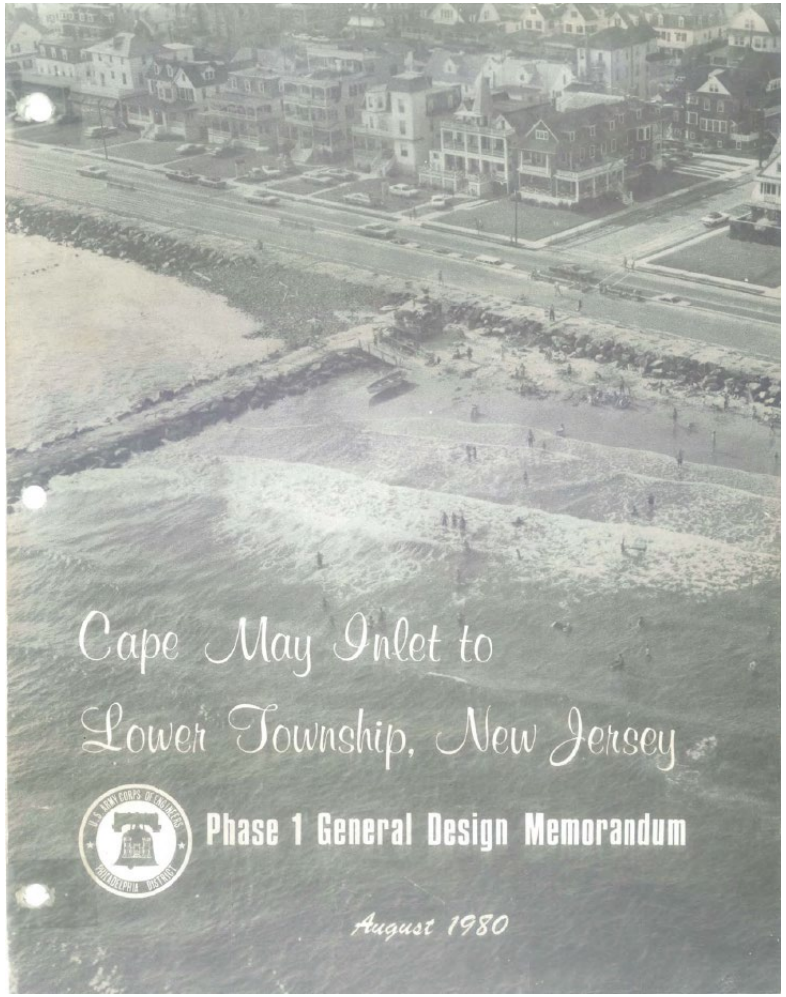
Data collection allows for a deeper understanding of the site including the project history and significant coastal management decisions; it helps determine the beach's current state , predict how it may react in the future, and lay the foundation for future analyses.

DATA COLLECTION

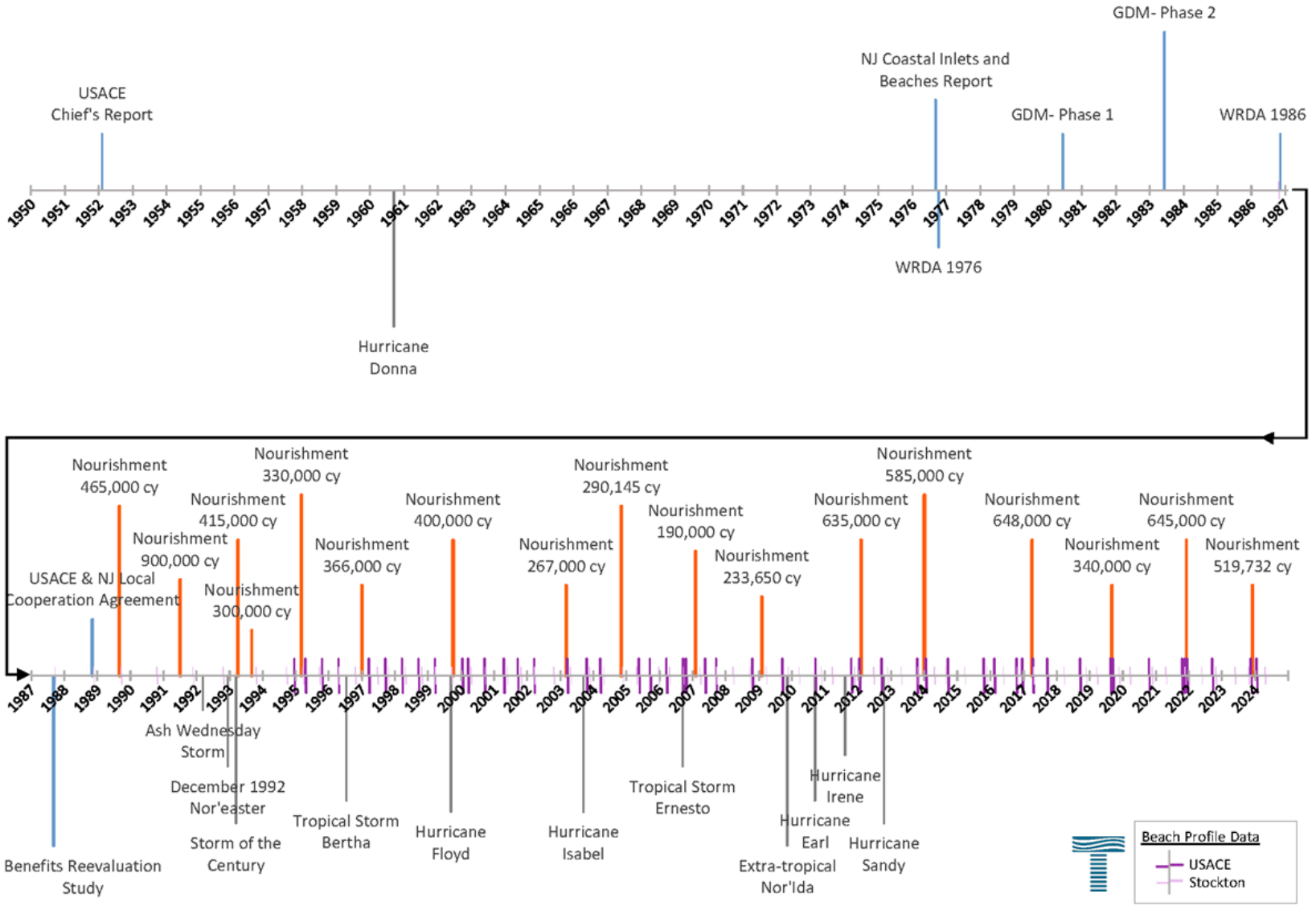
Source: La Mer Resort

Data Collected

- Previous studies- historic project information
- Topographic and bathymetric datasets- allow for assessment of beach changes
- Nourishment history- provides insight on design changes and project magnitude/frequency
- Construction/maintenance of coastal structures- these features interact with the beach
- Historic storm events- impacts beach fill performance; based on NOAA Climate Data Center Storm Events Database
- Water level information- critical sea level information



Timeline



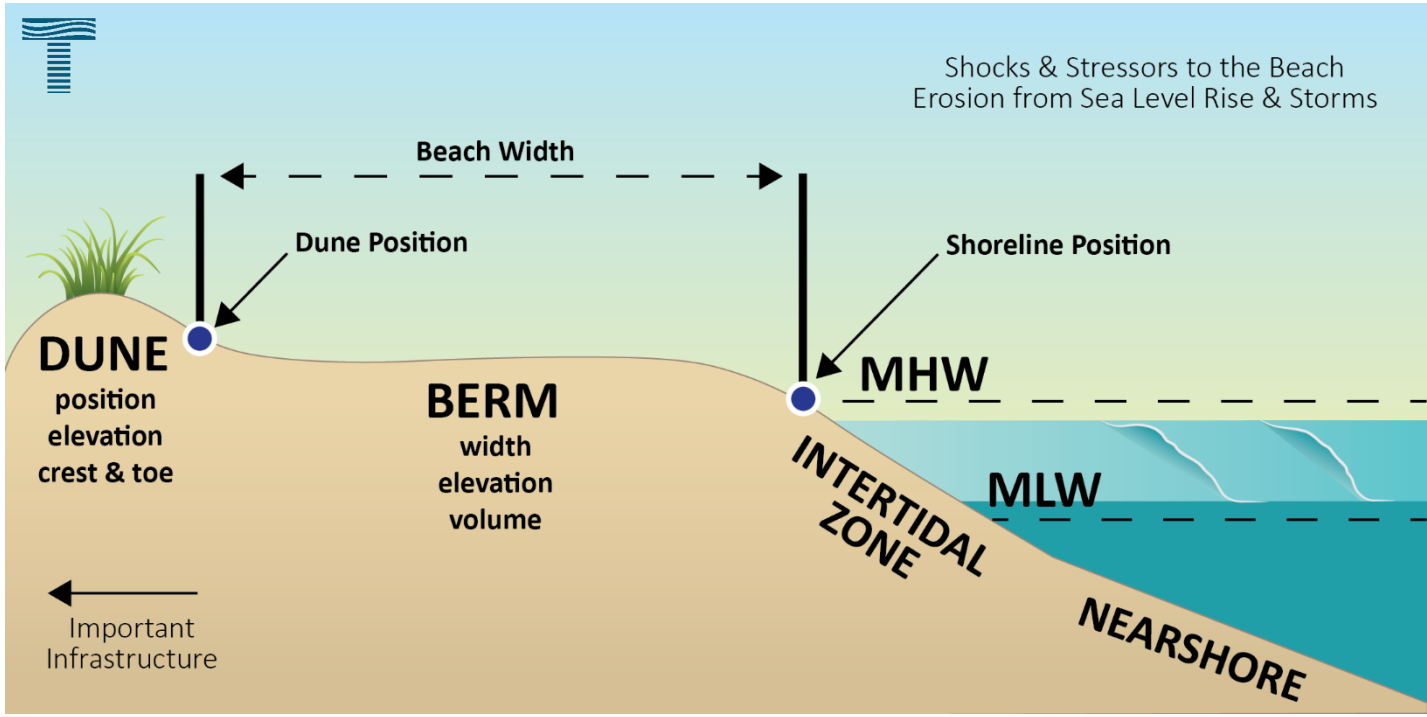
Summary of findings:

- 1950's – 1990's- Authorizing documents
- 1990's – today- periodic, regularly occurring nourishment
- Mid-1990's – today- regular monitoring
- Post-Hurricane Sandy – no significant storms listed within NOAA Storm Events Database

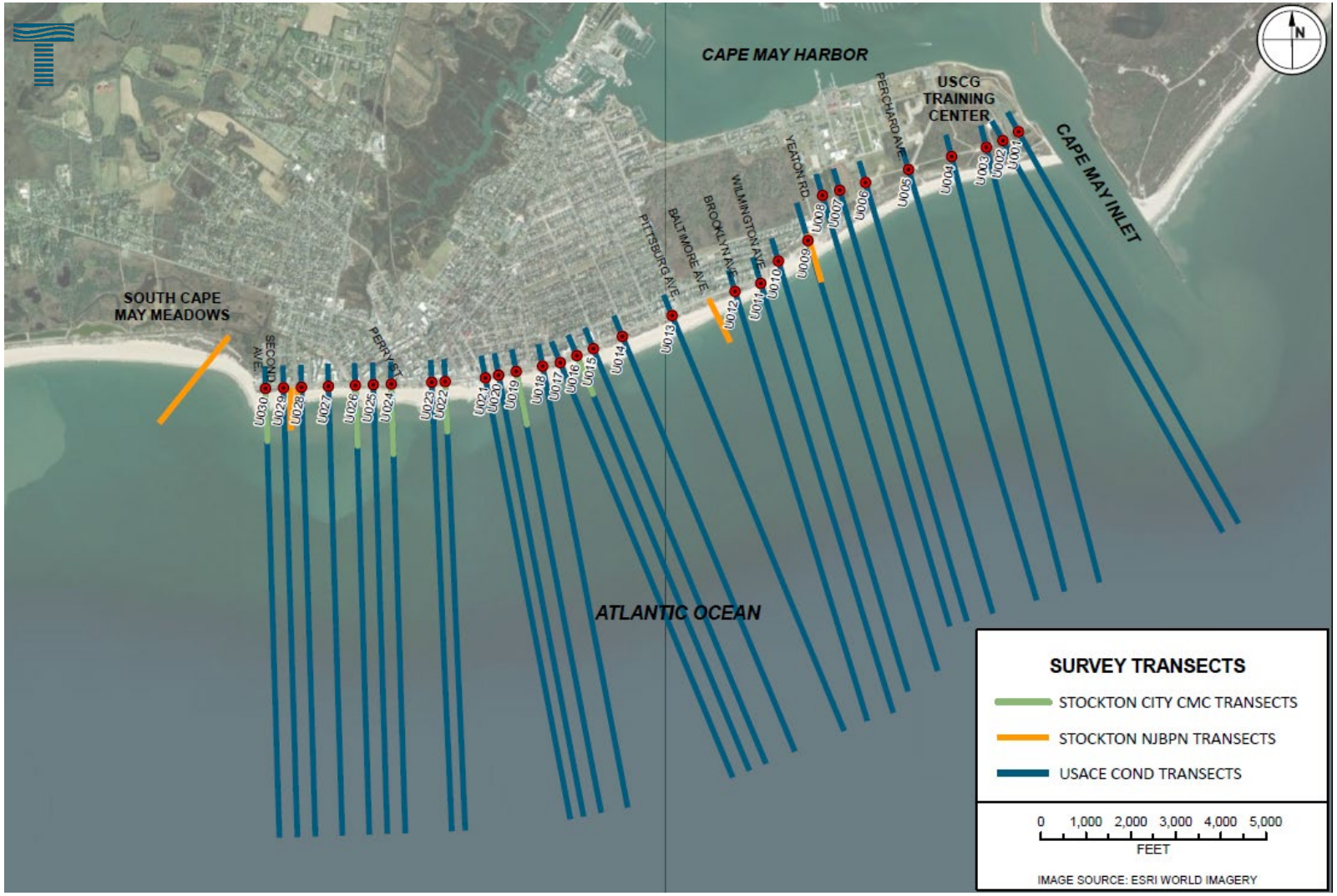
Topographic and Bathymetric Data

- Collect survey data along transects to document physical changes to the beach over time
- Analysis of data helps stakeholders:
  - Determine the current conditions of the shoreline
  - Understand the beach's response to coastal projects
  - Observe how the beach reacts to storm events
  - Understand areas that may have increased vulnerabilities

COMMON BEACH MORPHOLOGY PARAMETERS



Topographic and Bathymetric Data

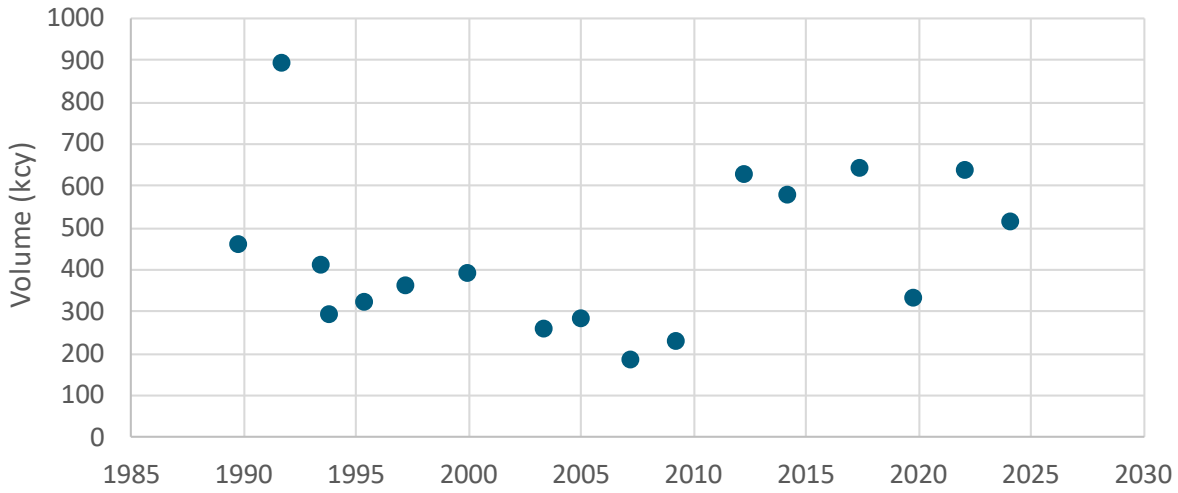


- 77 surveys obtained from USACE and Stockton Univ.
- Multiple datasets
- Varying coverage

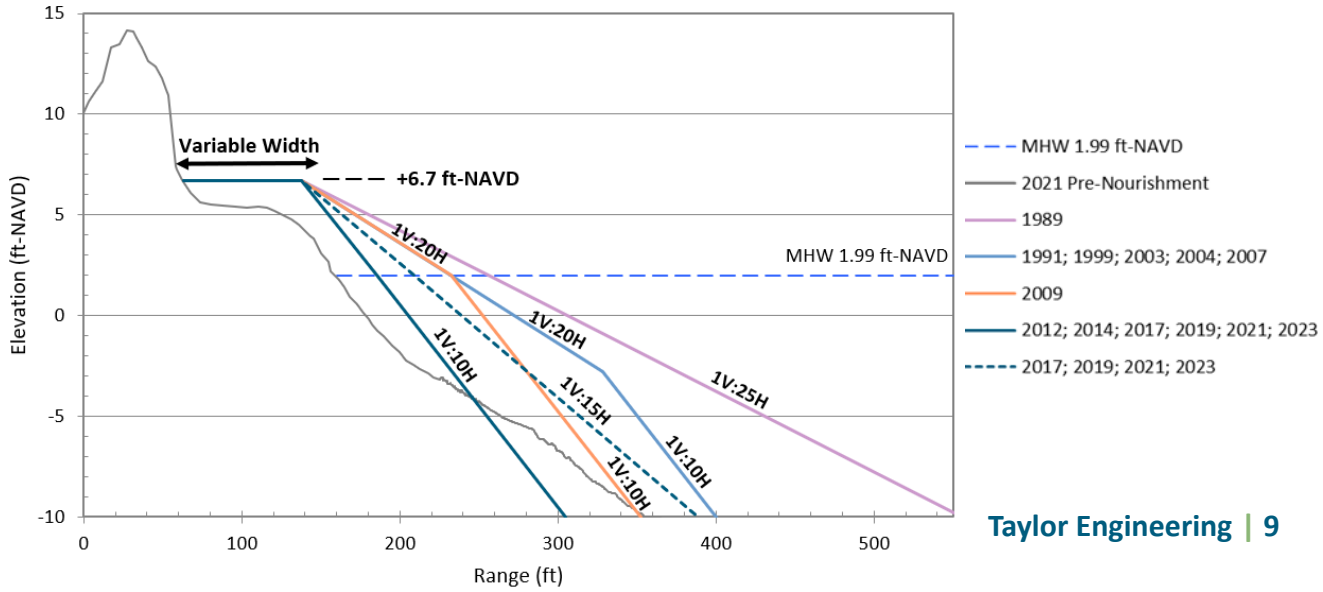
Nourishment History

- Project purpose– mitigate the effects of the federal channel and provide coastal storm damage reduction benefits
- Sand sources– offshore, inlet, sand traps/basins
- 17 federal projects placing 7.5 Mcy
- Variable template and placement areas

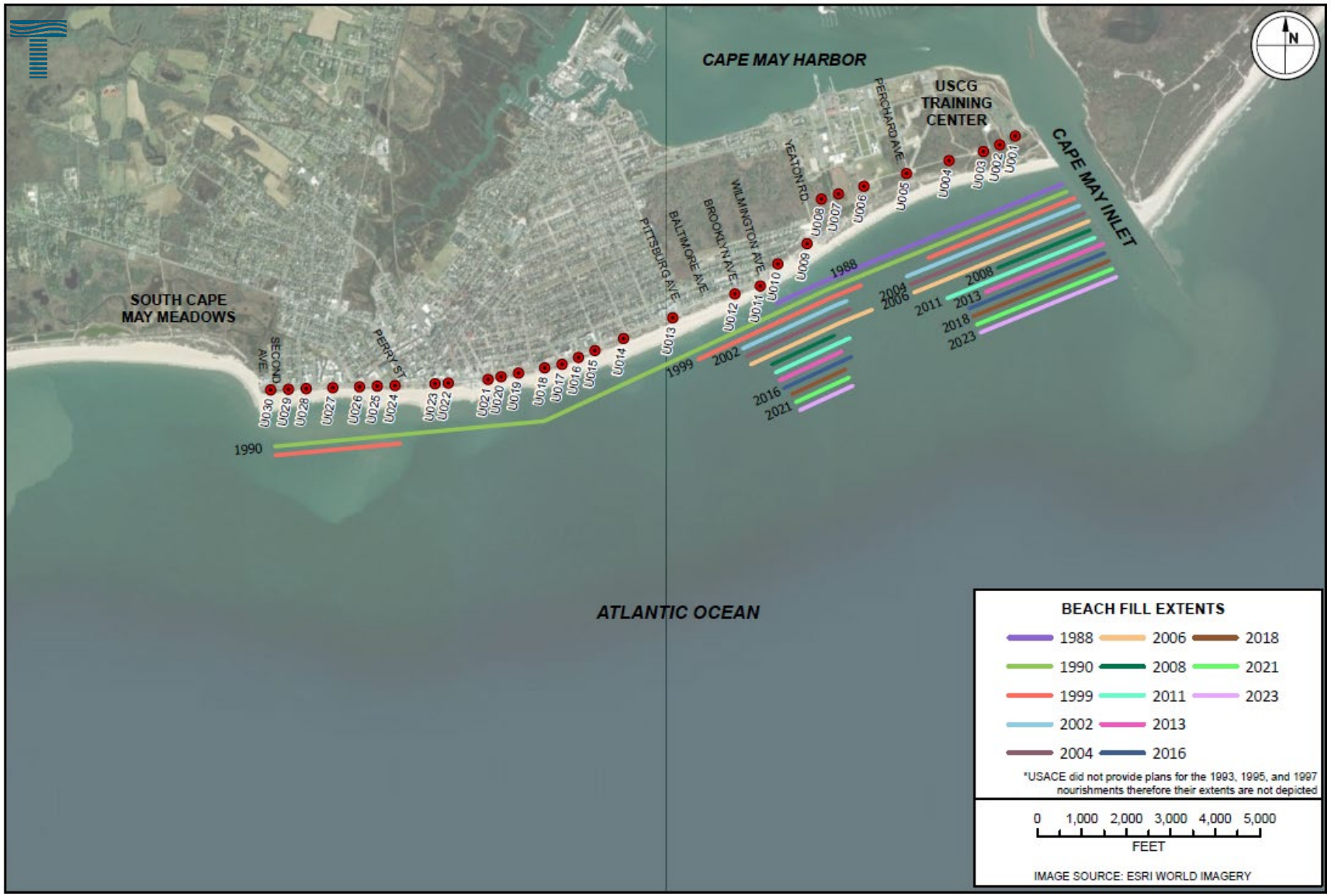
NOURISHMENT VOLUMES



TEMPLATE HISTORY



Nourishment History

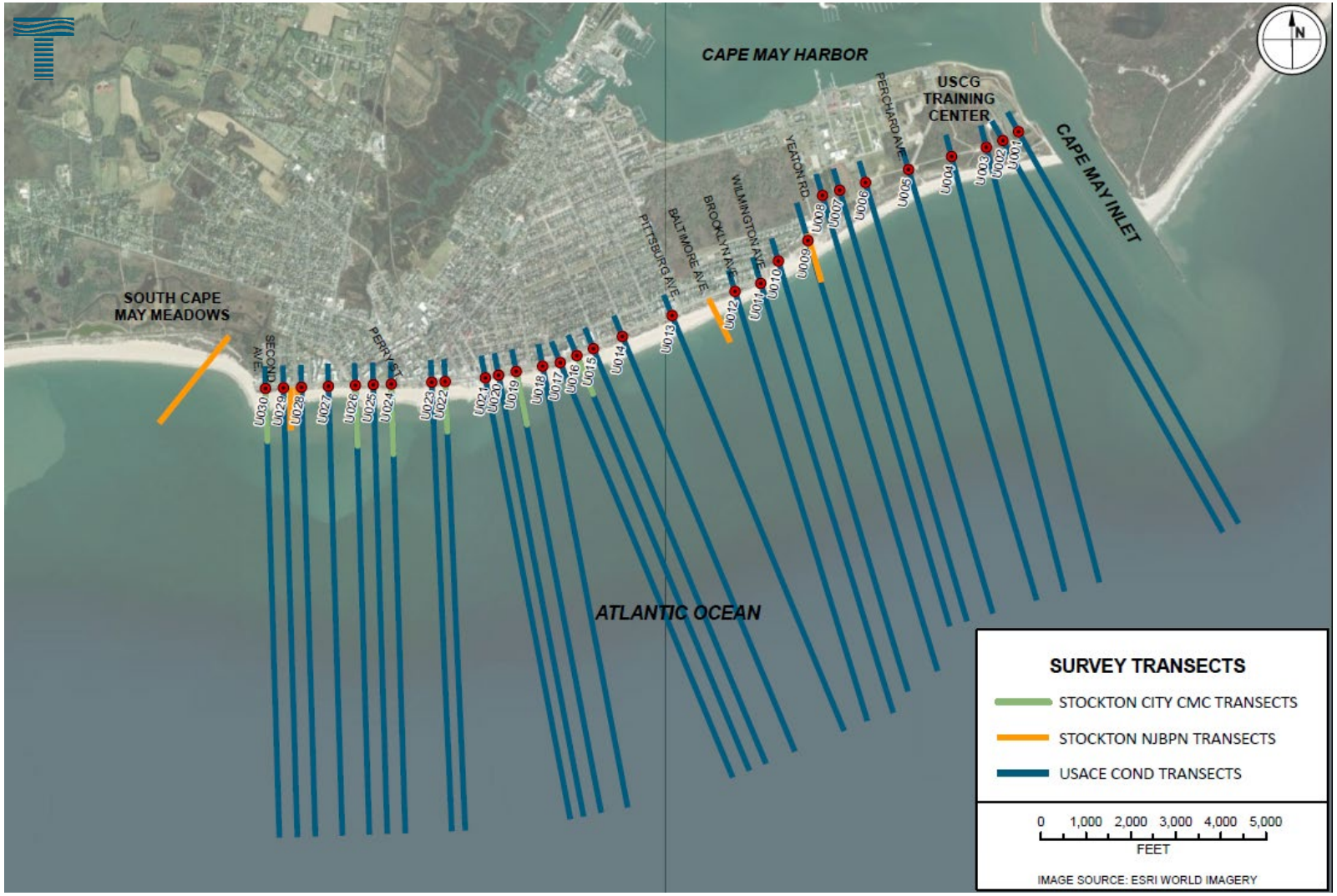


Construction Year	Placed Volume (cy)
1989	465,000
1991	900,000
1993	415,000
1993	300,000
1995	330,000
1997	366,000
1999	400,000
2003	267,000
2004	290,100
2007	190,000
2009	233,700
2012	635,000
2014	585,000
2017	648,000
2019	340,000
2021	645,000
2023	519,700
AVERAGE	442,912
TOTAL	7,529,500

PROJECT PERFORMANCE

Source: Travel Awaits

Topographic and Bathymetric Data



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HOW DID WE CHOOSE?

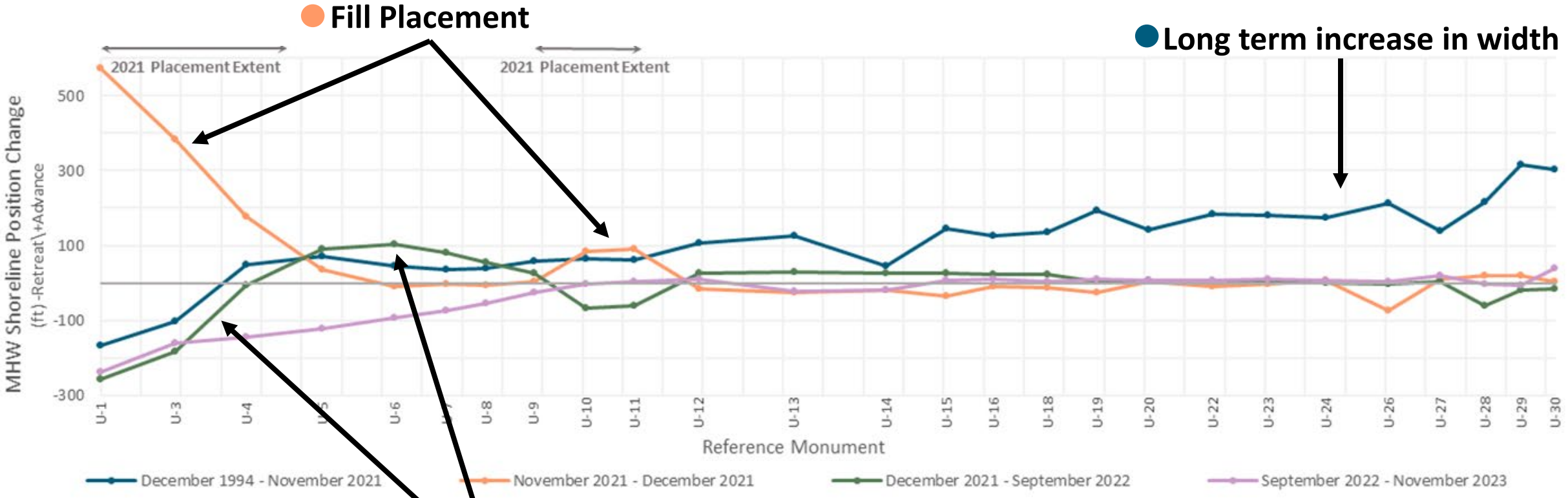
- plotted all the data spatially– better alongshore coverage with USACE
- plotted cross sections to observe trends
- analyzed timeline for major events

Beach Trends– Methodology

- Surveys selected– 1994, 2021 pre-fill, 2021 post-fill, 2022, 2023
- Analysis of topographic and bathymetric data to determine beach evolution through evolution parameters
- Evolution parameters analyzed:
  - ⊕ Shoreline position– tracks the beach's seaward limits
  - ←→ Beach width and berm elevation– provides insight on the beach's protective buffer and available recreation space
- Analyze alongshore and across shore

Beach Trends– Change in Shoreline Position

Beach Trends– Change in Beach Width



Fill Placement

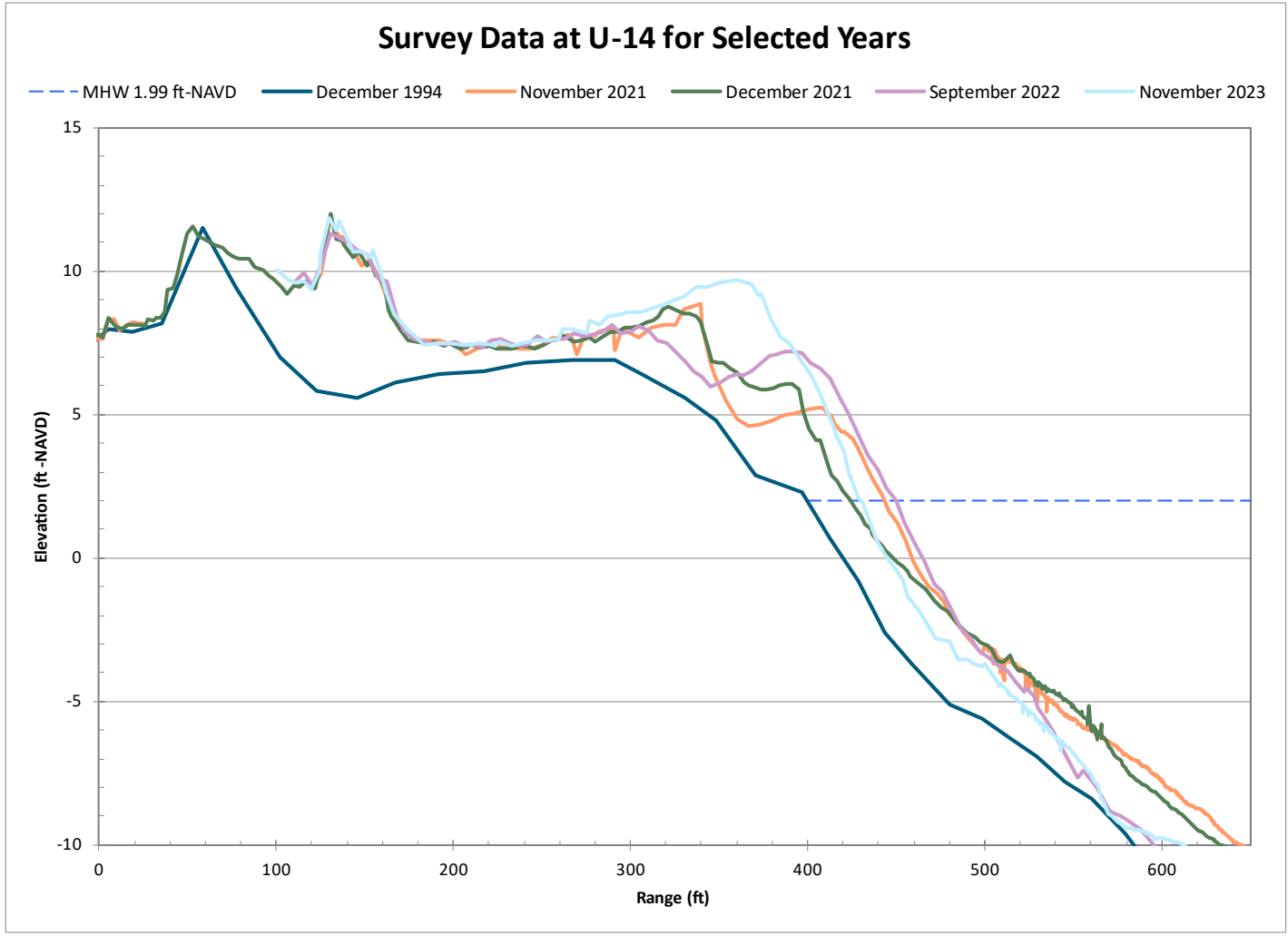
Long term increase in width

Adjacent retreat and advance → alongshore diffusion

Beach Trends– Average Berm Elevation

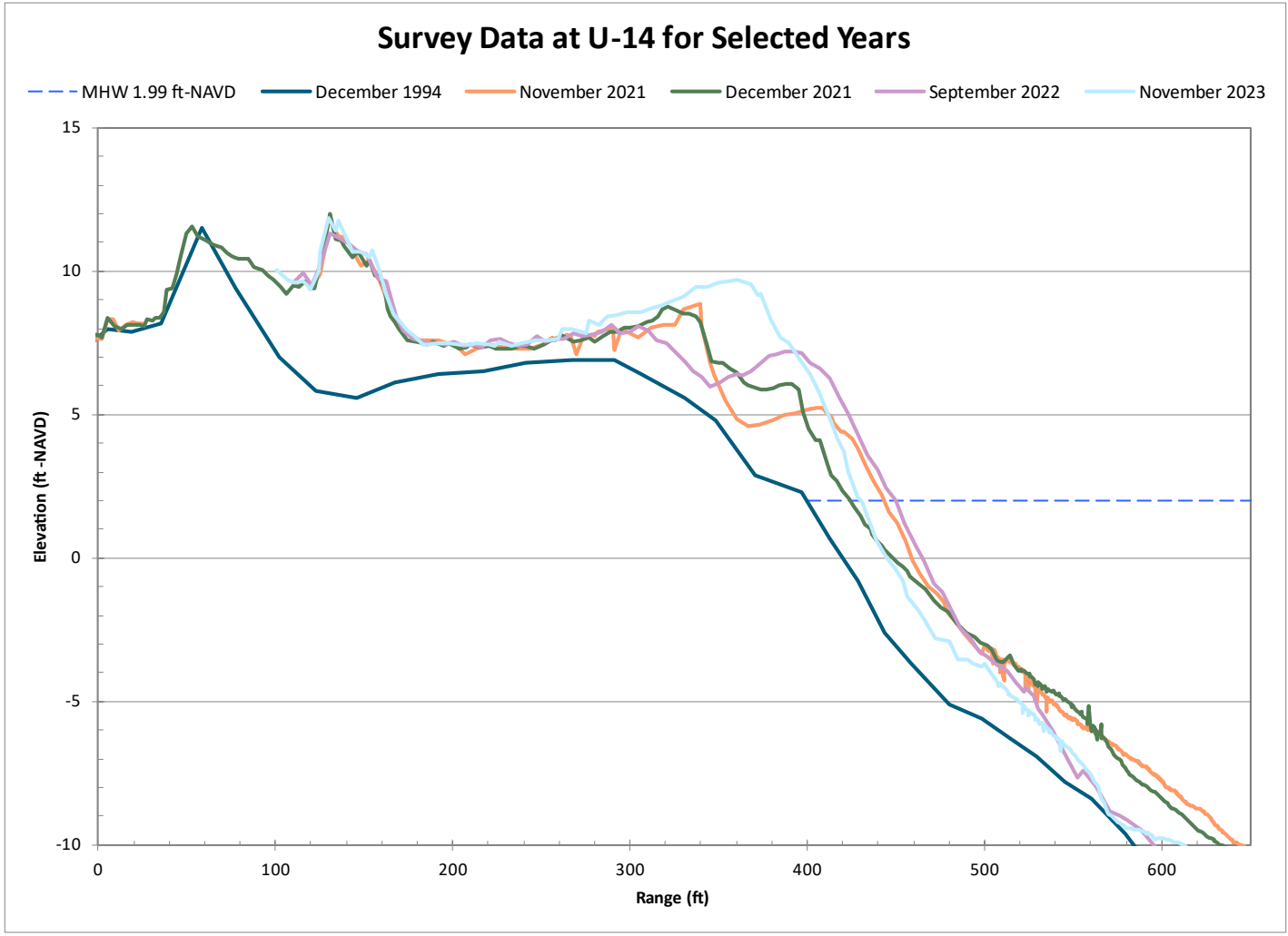
- Increase in berm elevation over time

Transect	Average Berm Elevation (ft-NAVD88)				
	1994	2021	2021	2022	2023
Project Area	5.7	6.2	6.9	7.3	8.0
USCG Training Center (U-1 through U-8)	6.5	5.0	6.0	6.9	7.8
City of Cape May (U-9 through U-30)	5.3	6.7	7.3	7.5	8.1



Beach Trends– Average Berm Elevation

- Increase in berm elevation over time
- Sand “stacking” along the edge of berm
- Profile steepening? *Needs more investigation*
- … multiple reasons this behavior may be occurring– sediment grain size, sea level rise, surging wave breaking regimes



SUMMARY & LOOKING FORWARD

Source: USACE

Summary

- This data compilation acts as a starting point for future assessments to better understand, manage, and balance the complex nature of the beach's ecosystem, storm hazard protection, and recreational functions
- Notable beach trends following the 2021 nourishment
  - Within the first two years following nourishment, sand moves significantly in both the alongshore and across shore directions
  - Although not specifically analyzed, the profile plots do suggest that the nearshore slope is steep and has changed over time
  - The increase in berm elevation following construction suggests that coastal processes, specifically the wave action, may influence the shape of the beach as increased uprush of waves along the foreshore slope steepen and move sediment onto the edge of the berm

Potential Actions Moving Forward

- Investigate the sediment history
- Collect and compile permitting documents, plans, and specifications
  - Provides background information and outlines the management history
- Analyze the foreshore beach slope
- Assemble and catalog beach incident reports
- Conduct post-project monitoring of the beach to understand the evolution of fill
- Conduct a modeling analysis– better understand the interactions between the local hydrodynamics, beach nourishment projects, and coastal structures
  - Determine sediment transport pathways; optimize fill placement
- Engage with project partners to discuss project concerns and successes

Source: USACE

Wendy Laurent, PE, WEDG

wlaurent@taylorengineering.com