Beyond the 100-Year Storm:
Elevating the Flagler Beach Pier for Future Coastal Extremes

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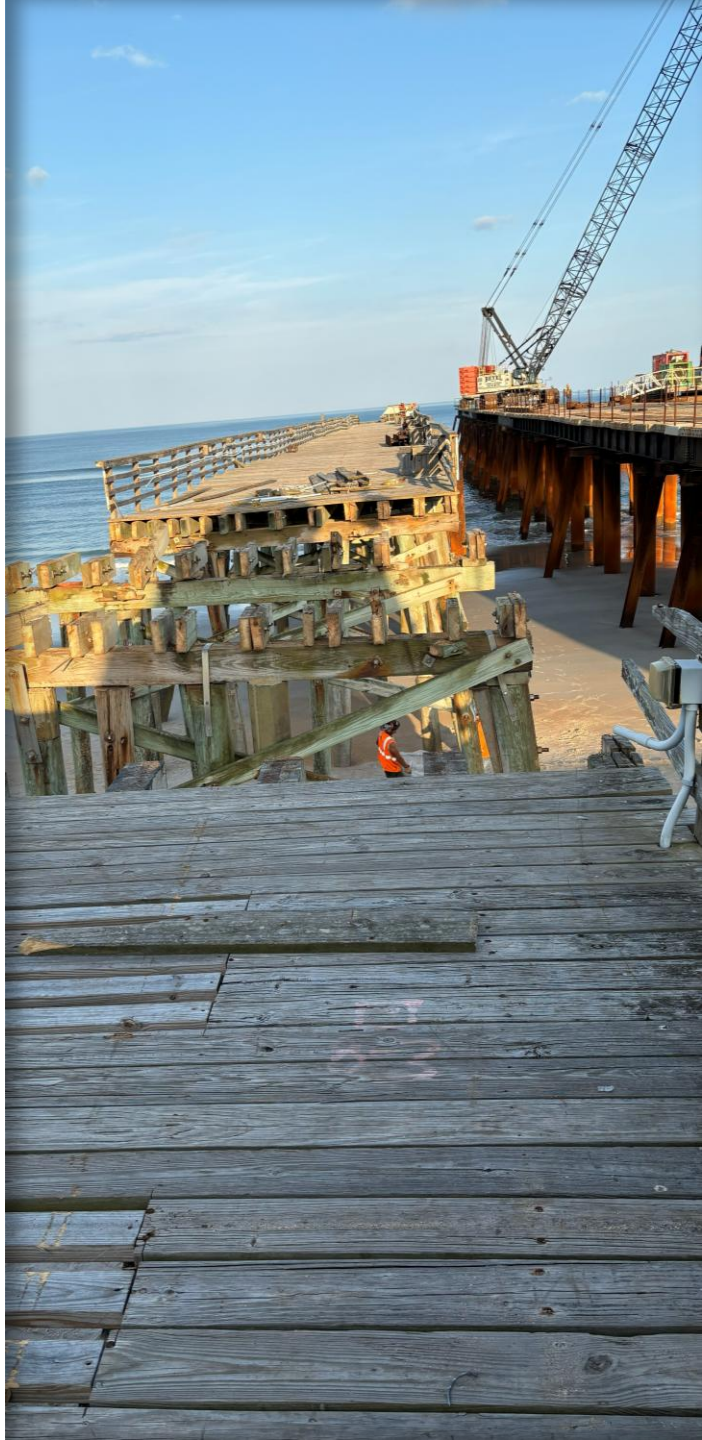
Presentation Outline

1. Flagler Beach Pier History
2. Project Information
3. Design Approach
4. Results
5. Future Guidance



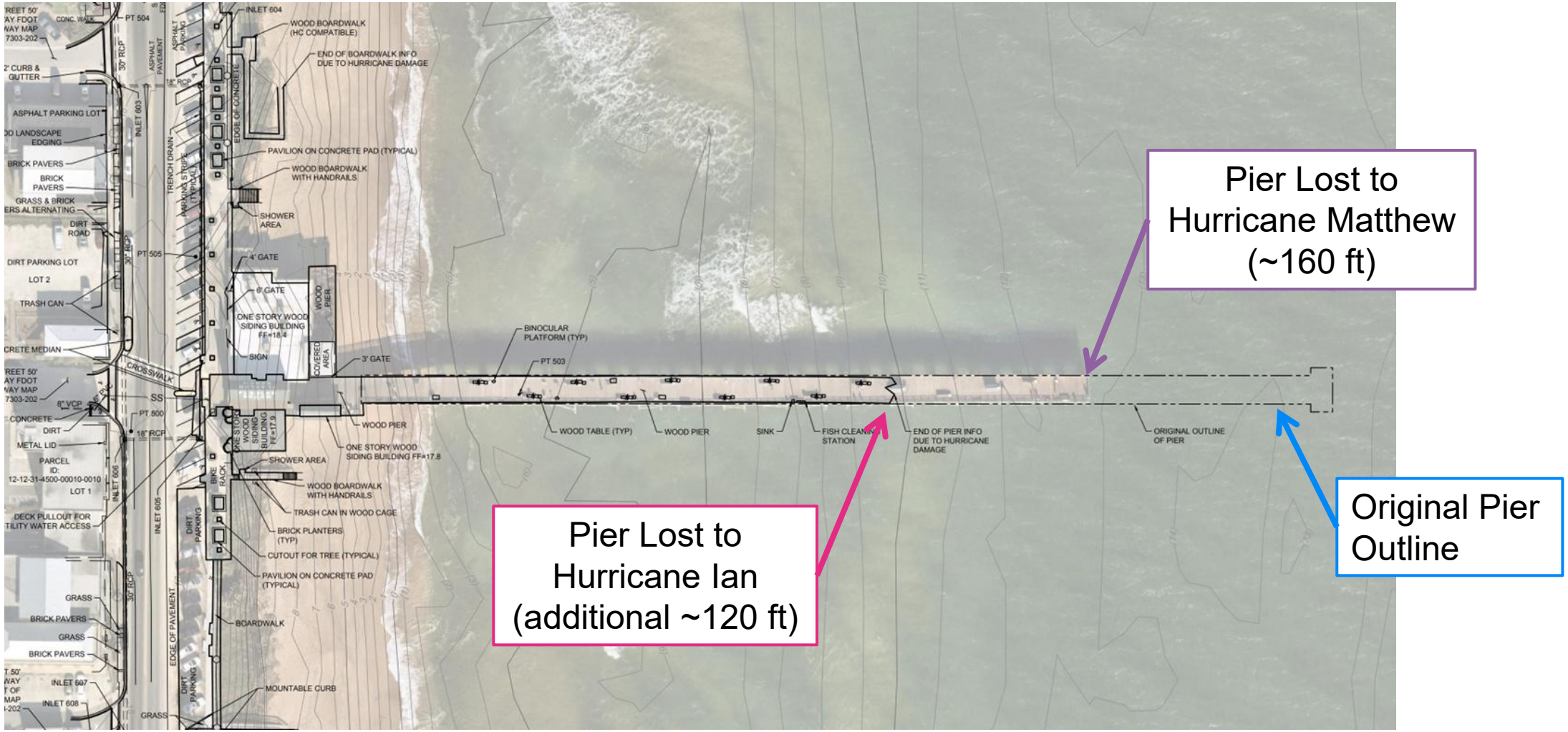
History of Flagler Beach Pier

- Completed in 1928

History of Damages

Year	Storm Event	Length of Pier Lost
1944	Unnamed Storm	330’
1957	Unnamed Tropical Storm	(Unknown)
1984	Tropical Storm Isidore & Thanksgiving Nor’easter	430’
1996	Nor’easter	154’
1999	Hurricane Floyd	75’
2004	TS Bonnie, Hurricane Charlie, Hurricane Frances	144’
2016	Hurricane Matthew	160’
2022	Hurricane Ian & Hurricane Nicole	120’

Recent Damage



FEMA Project

- Replace the outer 700 feet
- Preserve and repair the first 100 feet
- Consider modern codes, standards, and engineering practices.
- Consider resiliency improvements

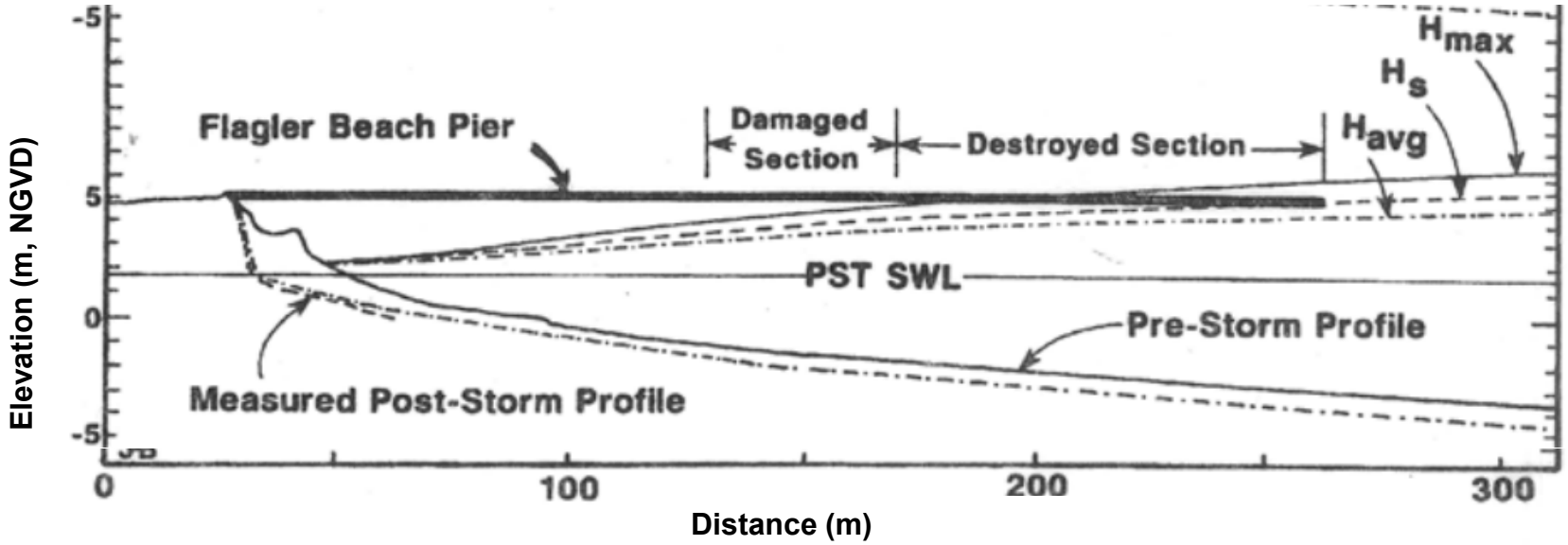
Source: Ask Flagler, Joey Santos-Jones

Design Objectives

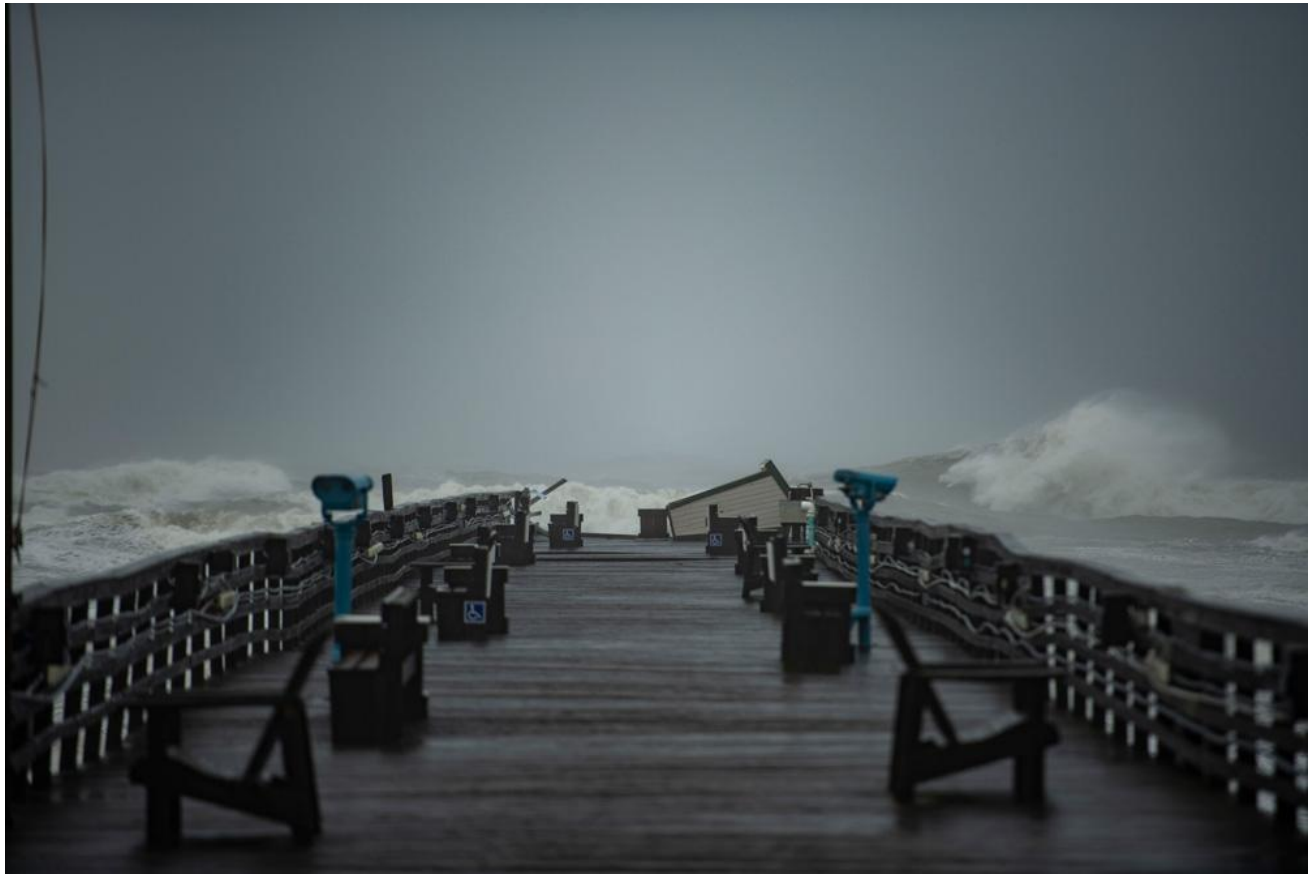
- Improve resilience by:
  - Replacing timber with concrete
  - Including timber breakaway deck panels
  - **Increasing the deck elevation**
- Balance resiliency with function
- Consider Sea Level Rise
- Evaluate 20-, 50-, 100-, and 500-year events

Approach

- Historical and anecdotal reports
- Tides, storm surge, extreme waves, sea level rise
- FDEP Fishing Pier Design Guidance (2011)



Hurricane Ian, September 2022



Source: Flagler Live, Scott Spradley

Hurricane Nicole, November 2022

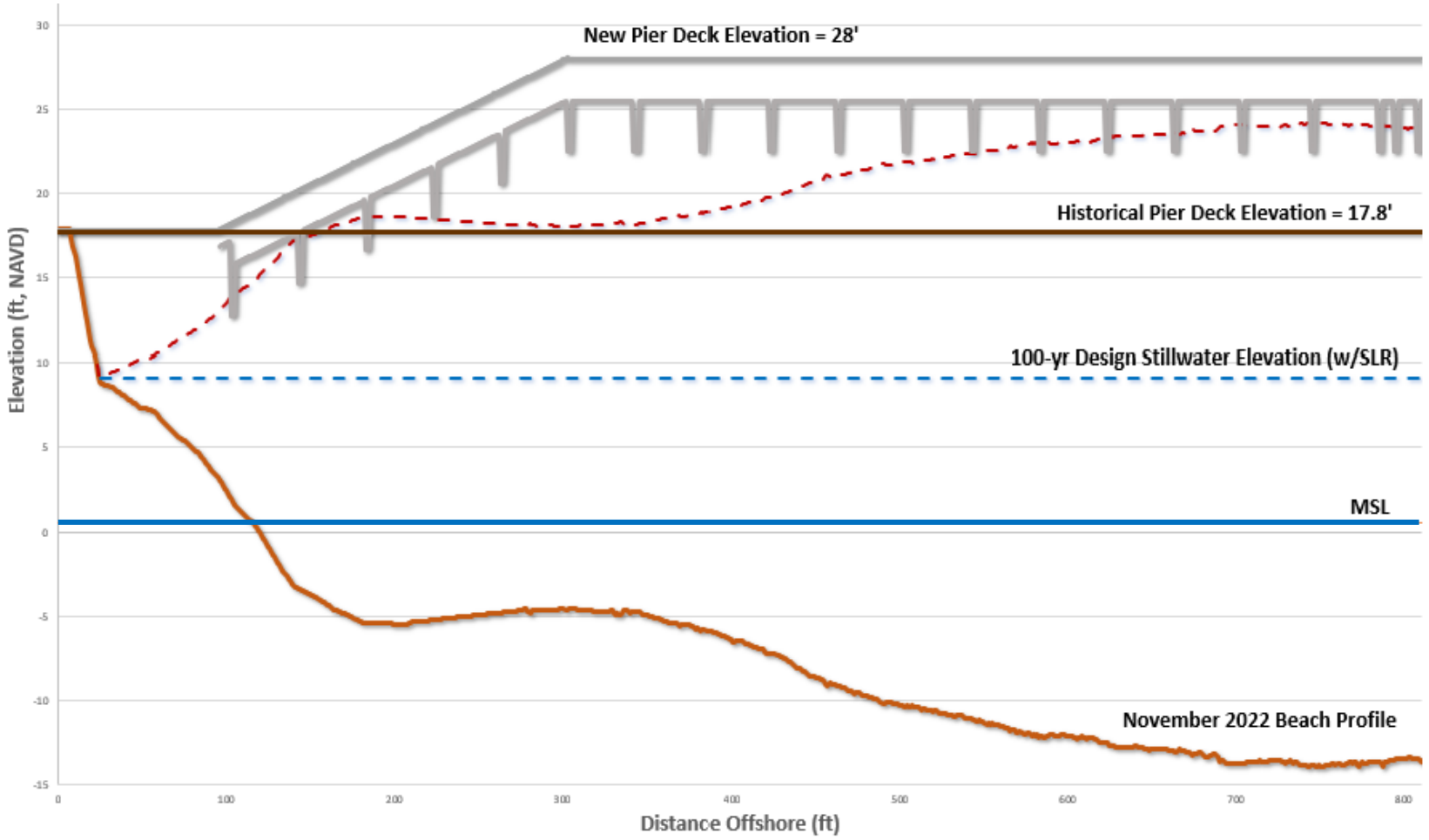
Source: Flagler Live

M&N Coastal Analysis

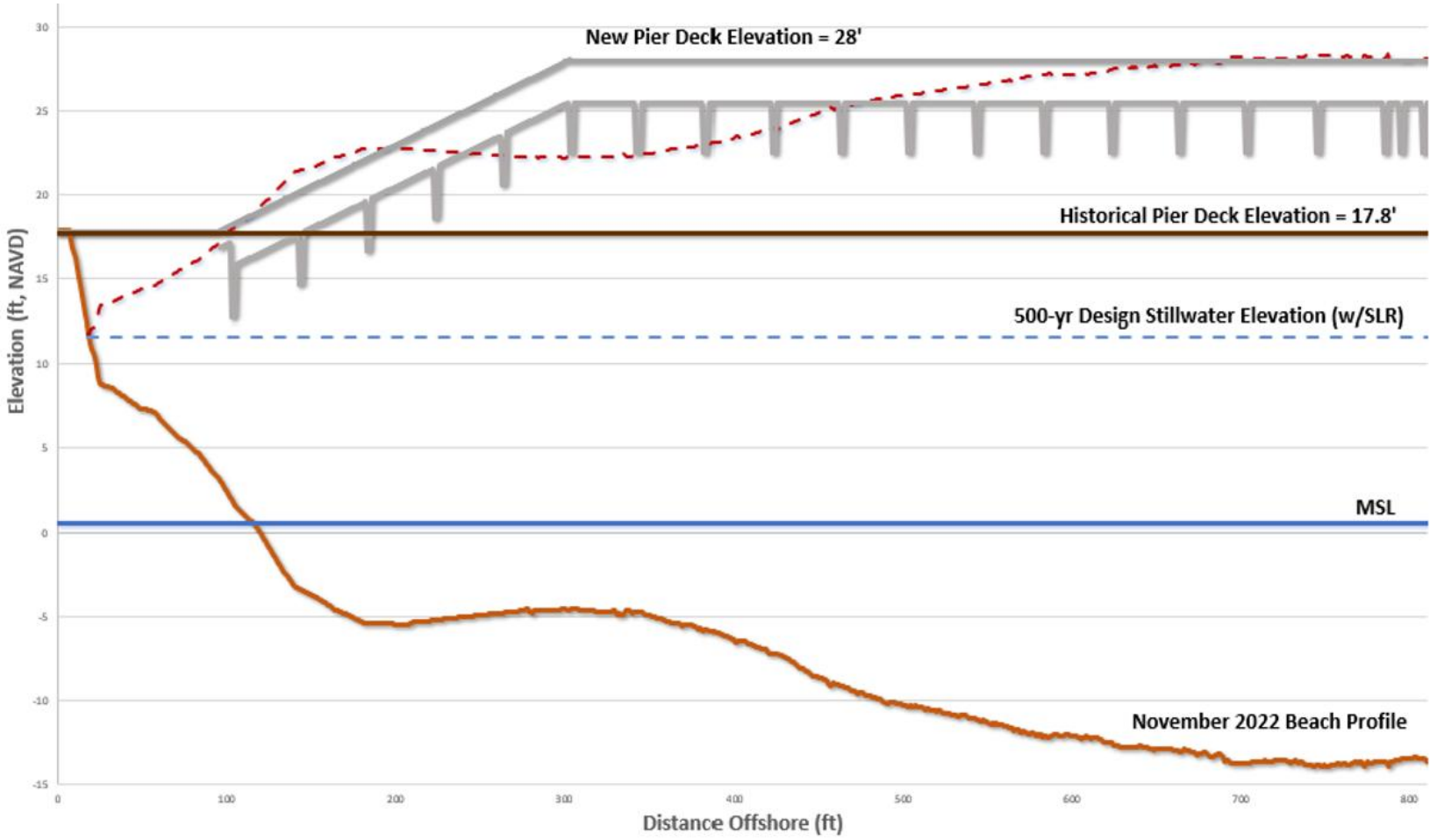
- Post-storm bathymetry survey
- FEMA stillwater elevations
- Sea Level Rise
  - NOAA Intermediate Projection
- Mike SW Wave modelling
  - 20-, 50-, 100-year
- Maximum breaking wave envelope
  - 100- and 500-year

Source: Ed Siarkowicz Photographic Images

100-year H_{max} Breaking Wave Envelope

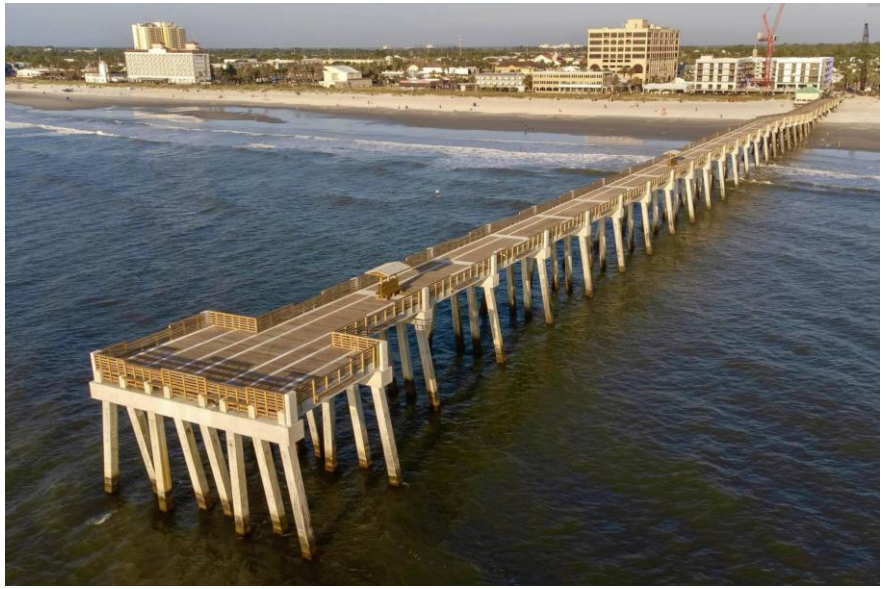


500-year H_{max} Breaking Wave Envelope



Comparable Florida Piers

Fishing Pier	Elevation (ft NAVD88)
Pensacola Beach	26
Jacksonville Beach	**27.5**
Navarre Beach	30
Panama City Beach	26
Pompano Beach	26
Flagler Beach	**28**



Future Guidance

- Evaluating recurrence interval storm conditions
- Understanding:
  - Grant requirements
  - Environmental permitting and SSL lease
  - Project costs and schedule
- Applying resiliency measures and code requirements
- Harmonizing resiliency with functionality

Questions?

Thank you!

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