

TAYLOR ENGINEERING, INC.

**Embassy Suites
St. Augustine Beach, Florida
Shoreline Protection and
Seawall Replacement**



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February 7, 2024

Presentation Outline

- Timeline of Events
- Conditions Prior to Work
- Phase I – Short Term Seawall Repair
- Phase II – Northeast Corner Armor Stone
- Phase III – Additional Armor Stone
- Phase IV – Seawall Construction
- Acknowledgments

Project Mission

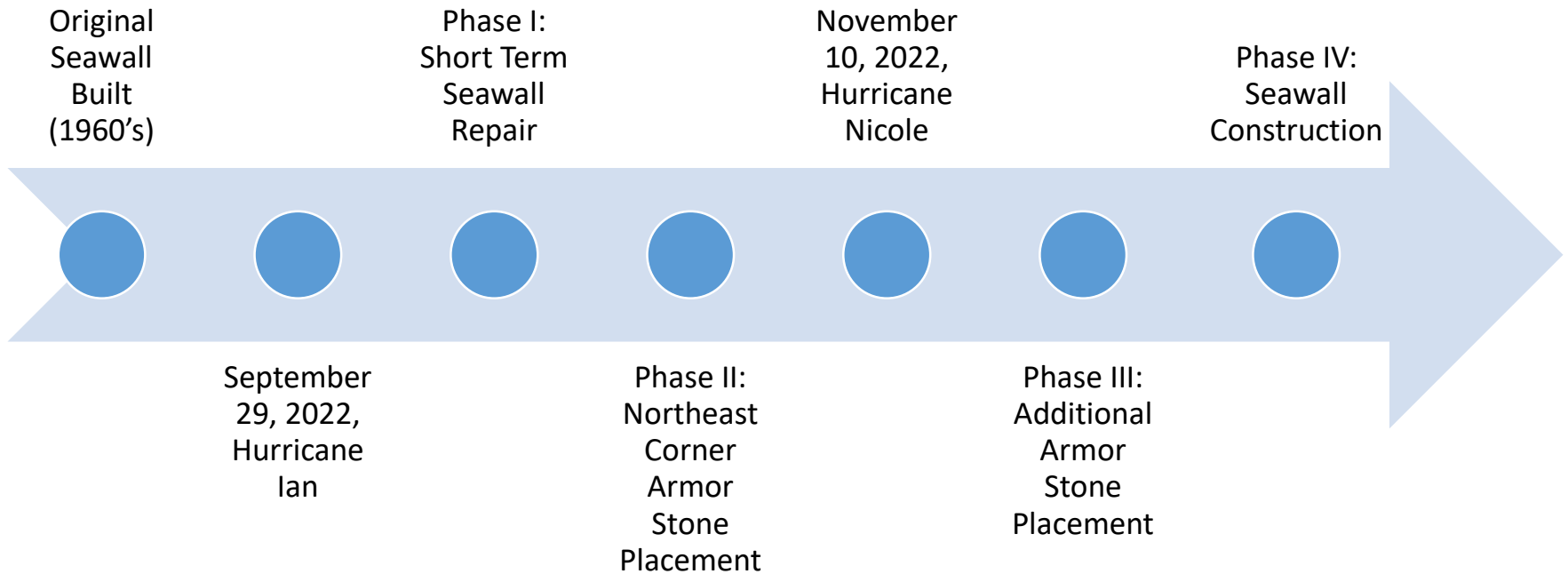
- Enhance the waterfront to be resilient against storm events
- Enhance the architecture and aesthetics of the Resort's waterfront



Provided by Zev Cohen and Associates



Timeline of Events and Damages



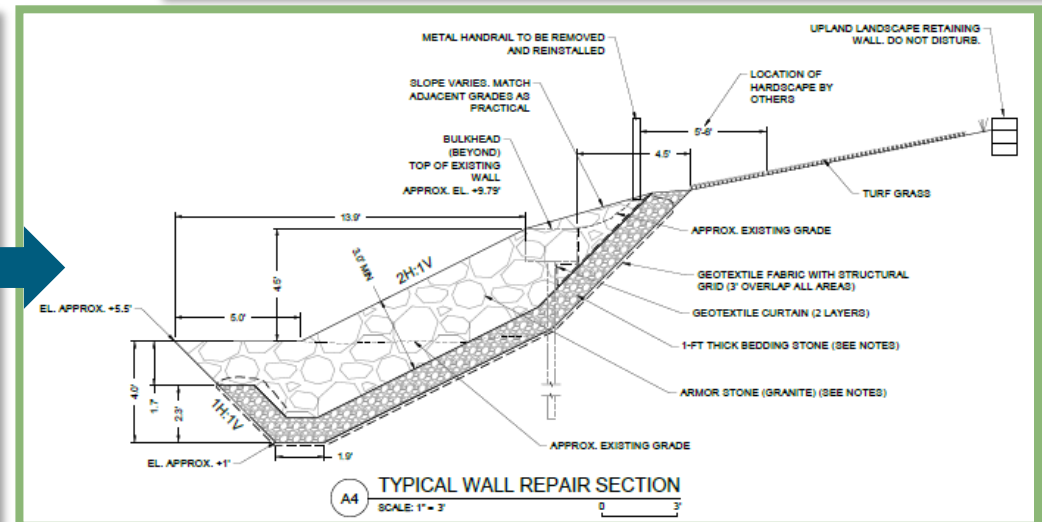
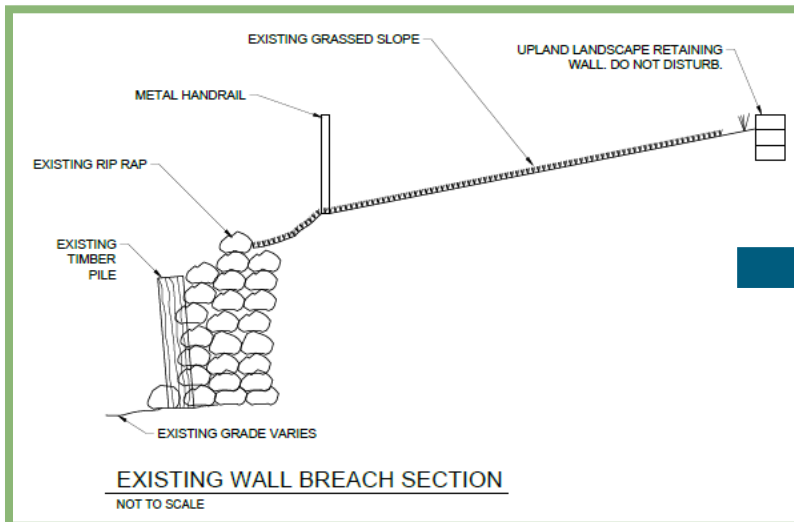
Phases II,III,VI design and permitted in parallel

Embassy Suites Coastal Conditions



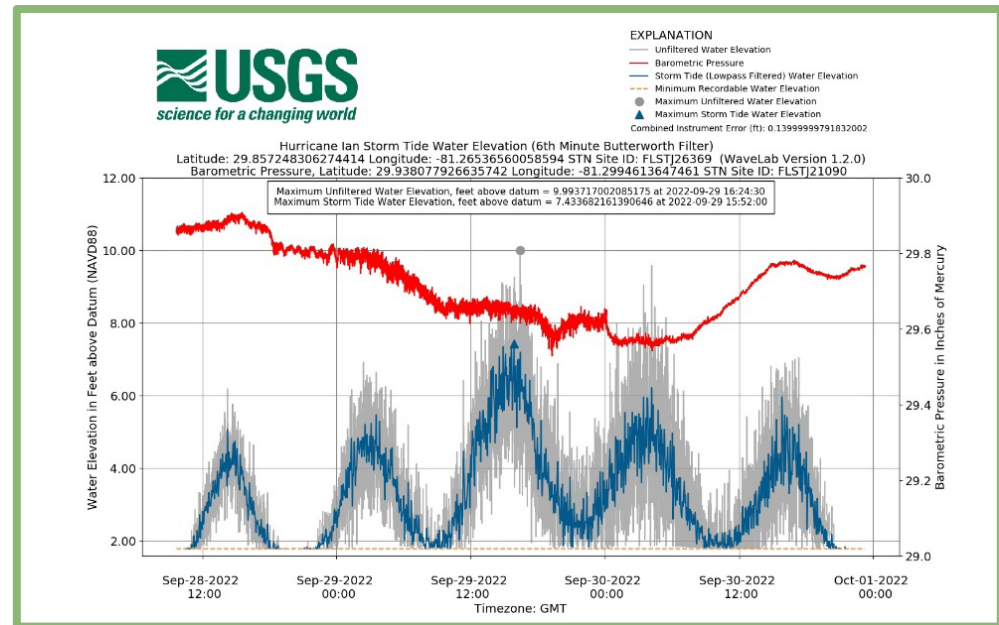
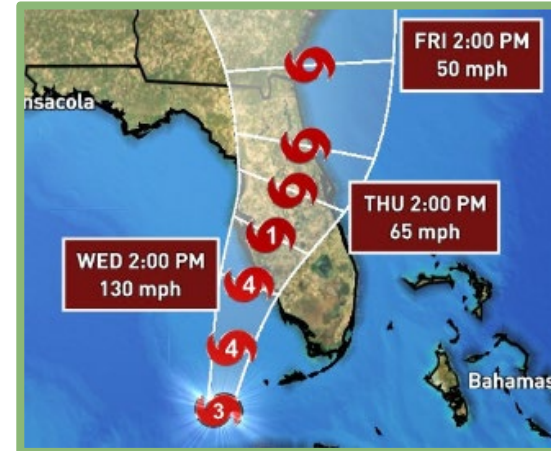
Phase I: Short Term Seawall Repair

- Gap in wall on northern corner
 - Plugged with old rubble and other debris
 - Causing depressions from fill loss
- Significant issue for flooding



Hurricane Ian

- September 2022
- St. Augustine Beach Pier
- WSE = 7.43 ft NAVD, peak at 9.99 ft NAVD
- ~100-yr storm
- EL: +7.8 Ft-NAVD WSE (FEMA)



Post-Hurricane Ian



Advanced Corrosion



Displaced Armor Stone



Severe Erosion



Broken Tiebacks

Phase II: Northeast Corner Armor Stone

- (FAC 62B-33.0051) states,
“Armoring shall not to exceed a 50-year design storm.”
- Coastal conditions analysis:
 - 50-yr $H_{\text{design}} = 5.5 \text{ ft}$
 - $T = 13 \text{ s}$
- Rock sizing:
 - $D_{n50} = 2.11 \text{ ft}$
 - $W_{50} = 1,553 \text{ lb}$



Hurricane Nicole (St. Augustine Beach Area)

- November 2022
- NOAA Station 41117
- Peak offshore wave (H) = 5.7 m (18.7 ft)
@ average T = 8.65 s
- Volume Change: -1.5M CY (FDEP₁)



*1*Hurricane Ian & Hurricane Nicole Post-Storm Beach Conditions and Coastal Impact Report (FDEP)

Hurricane Nicole Cont.



Post-Hurricane Nicole



Waterfront Erosion



Repair Intact



Overtopping Damage



Storm Debris

Phase III: Additional Armor Stone

- March 2023
- 1100 tons of granite armor stone (W_{50} : 5700lbs)
- 282 ft revetment along northern portion of main wall
- Requires 408 Permit (USACE)
 - SAB SPP



Phase IV: Seawall Construction

Design considerations:

- Wave overtopping/flooding
- Sea level rise
- Aesthetics and functionality

New structures include:

- Seawall (raised 4 ft and 600 LF long)
- Pedestrian walkway and upland retaining wall
- Sundeck and wedding venues



Phase IV: Seawall Construction Cont.

- Permitting challenges with Armoring Rule:
 - Structure must be “non-conforming”
 - Embassy Suites is on a pile foundation
 - Cannot obtain a CCCL permit for what is defined as “major reconstruction”
 - Embassy Phase IV is complete replacement
 - The widespread destruction experienced from Hurricane Ian caused the FDEP to review major repairs differently.

Phase IV: Seawall Construction

- Required height of wall analysis:

SWEL 10 ft NAVD 88 (USACE SACS 50-yr)

Wave Crest

H_b 5.5 ft

Crest Height 3.9 ft ($0.7 \times 5.5 = 3.9$ ft)

Crest Elev. 13.9 ft NAVD → **14 ft NAVD 88**

SLR

NOAA 2017 50-yr SLR ~3 ft INT-HIGH

Surge + SLR = 13 ft NAVD → 1 ft freeboard → **14 ft NAVD 88**

Overtopping Depth

Revetment acts as a weir → 2-3 ft depth of overtopping flow

Surge + overtopping depth = 13 ft NAVD → 1 ft freeboard → **14 ft NAVD 88**

Phase IV: Seawall Construction Challenges

Sheet pile driving challenges:

- Silent press-in equipment
 - No vibration
- Buried debris up to 16 ft deep

Adjustments:

- Excavation to remove debris
- Compaction program to mitigate consolidation
- S.S. mesh reinforcement in walkway slab



Phase IV: Seawall Cont.

Concrete design considerations:

- High wave loads & chloride intrusion
 - Silica fume concrete (5500 psi)
- Walkway aesthetics/features
 - Pigmented concrete with tabby finish
 - S.S. #2 mesh rebar & fiber mesh

Challenges:

- 650 LF pump distance
- Workability of concrete mix
- Wind and wave climate



Acknowledgments



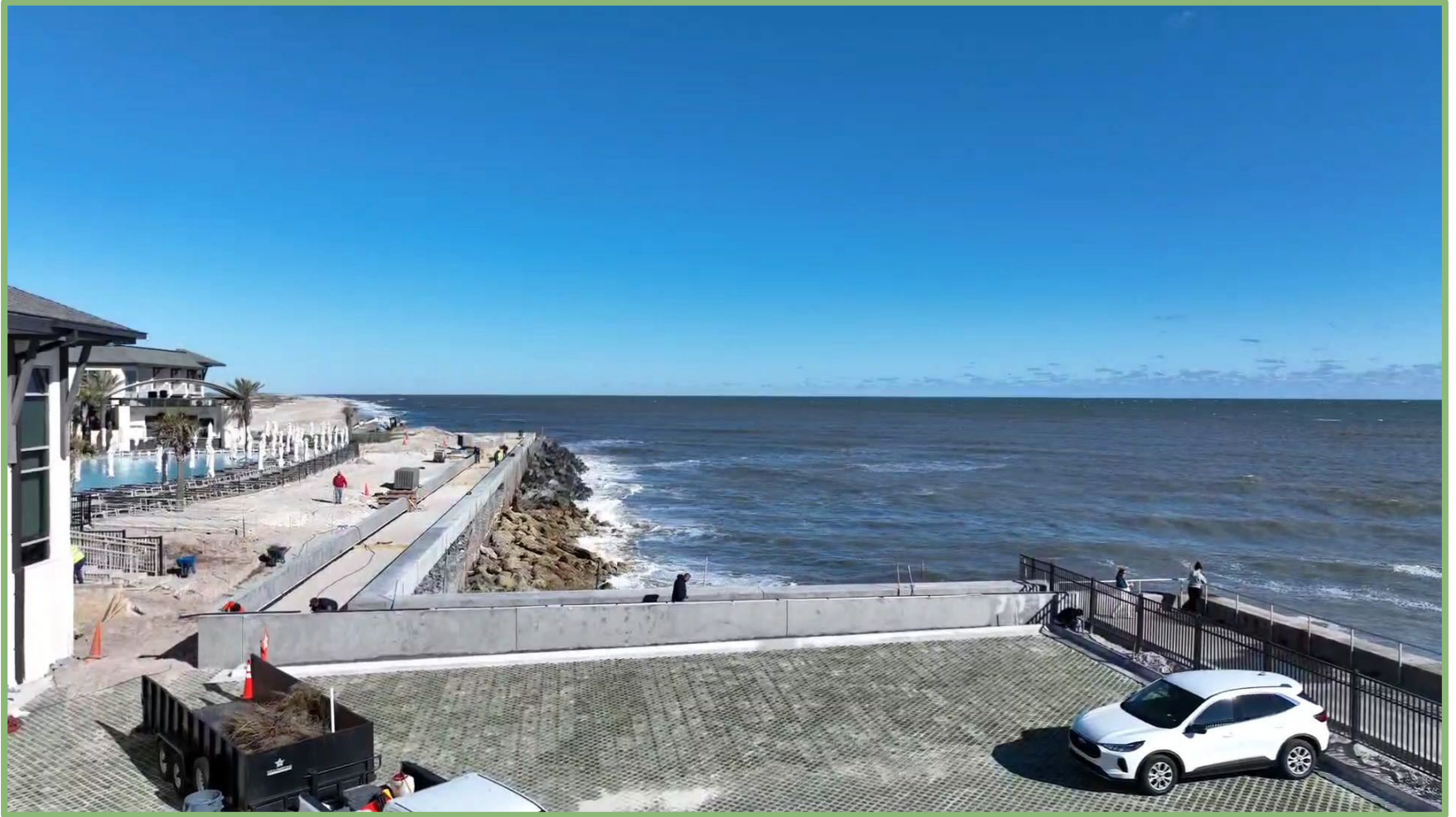
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Recent Drone Footage



THANK YOU
Questions?

