SUMMER HAVEN

Potential Erosion Control Alternatives Study

2nd Public Workshop

August 16, 2007

Introductions

St. Johns County

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Agenda

- Background, schedule, and study tasks
- Data collection
- Historical analysis
- Planning level modeling

Agenda (continued)

- Permitting considerations
- Conceptual alternatives
- Evaluation matrix
- Comments and questions

PBS&J Background

- Statewide coastal support for the FDEP for the past 6 years
- Involved with Summer Haven berm projects
- Managed *Marineland* revetment repair

Overall Approach and Schedule

- Initial public workshop:
  June 11

- Perform study:
  (underway)

- Second public workshop:
  August 16

- Report to Commissioners:
  September

Study Tasks

- Data collection
- Analysis of historical data from north of Matanzas Inlet to south of Marineland
- Planning level modeling effort
- Examine erosion control/shoreline stabilization alternatives
- Develop conceptual layouts for creating a protected driving surface in the current ROW
- For each alternative, examine:
  - permitting considerations
  - relative costs
- Prepare an evaluation matrix

Study Boundaries

The coastal region immediately north of Matanzas Inlet to the Flagler County/St. Johns County line

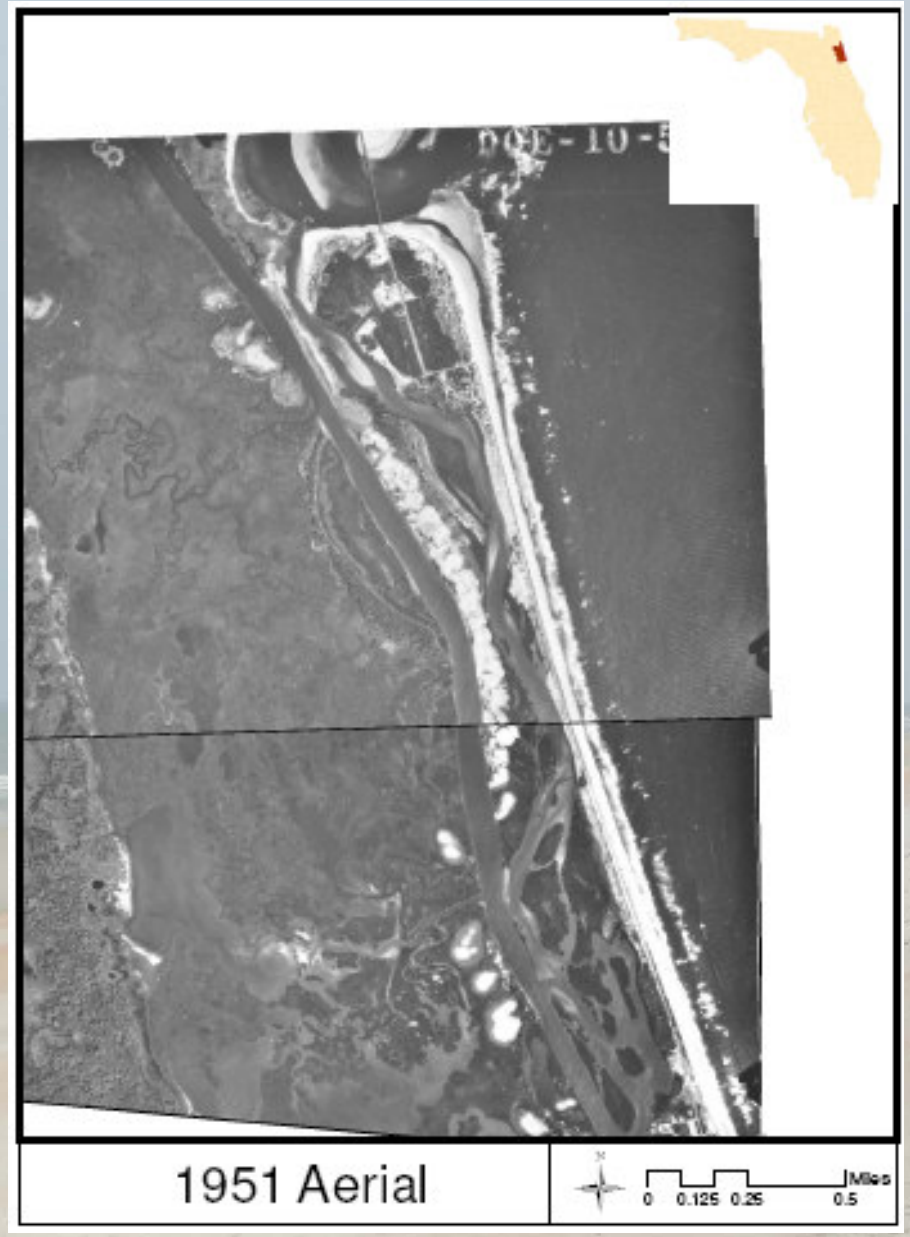
- FDEP Reference Monuments used for Beach Monitoring. (Summer Haven Area R-Monument 196 to R-209)

Data Collection

- Aerial photography: 1943 - 2005
- Historical shorelines: 1858 -2003
- DEP beach profiles: 1972-2003
- USACE WIS data: 1980-1999
- Topography: 1979,1997, 2001 (various resolutions)
- Hurricane information: 1878 – 2004
- St. Johns County parcel map: 2007
- “Post Storm” aerial photo/video: 2006
- Various scientific studies: 1972 - 1999

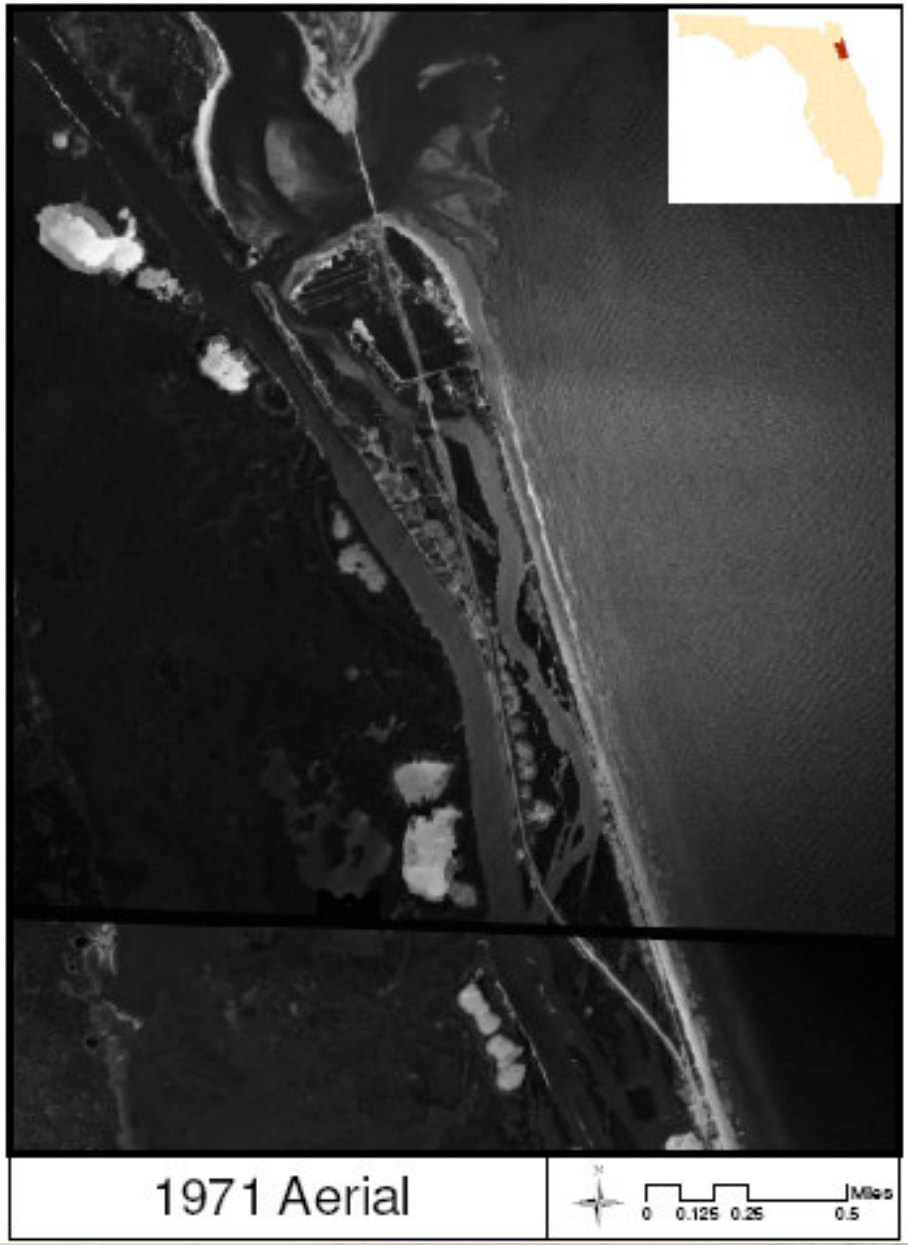
Scientific Studies of Interest

- Burnson, T. Quentin. (1972). Sedimentological Study of Matanzas Inlet, Florida and Adjacent Areas. MS Thesis, University of Florida.
- Gallivan, L.B. (1979, Dec). Sediment Transport in a Mesotidal Inlet; Matanzas Inlet, Florida. University of Florida Coastal Engineering Archives. Gainesville, Florida.
- Mehta, A.J., Jones, C.P. (1977, May). Matanzas Inlet Glossary of Inlets Report #5. Coastal and Oceanographic Engineering Laboratory. University of Florida, Gainesville, Florida.
- SR A1A Over Matanzas Inlet, District 2, St Johns County. (1988, April) Florida Department of Transportation. University of Florida, Coastal Engineering Archives, Gainesville, Florida.
- Taylor, R.B., McFeteridge, W.F. (1991, July). Management Plan Matanzas Inlet Beach Disposal Area Site SJ-MB. Florida Inland Navigation District. Jacksonville, Florida.
- U.S. Army Corps of Engineers. (1976, Feb). Intracoastal Waterway, Jacksonville to Miami Florida, Closure of Dike Break through Vicinity of Matanzas Inlet.



Historical Aerials: 1943, 1951

Source: FDEP/FDOT



Historical Aerials: 1957, 1971

Source: FDEP/FDOT

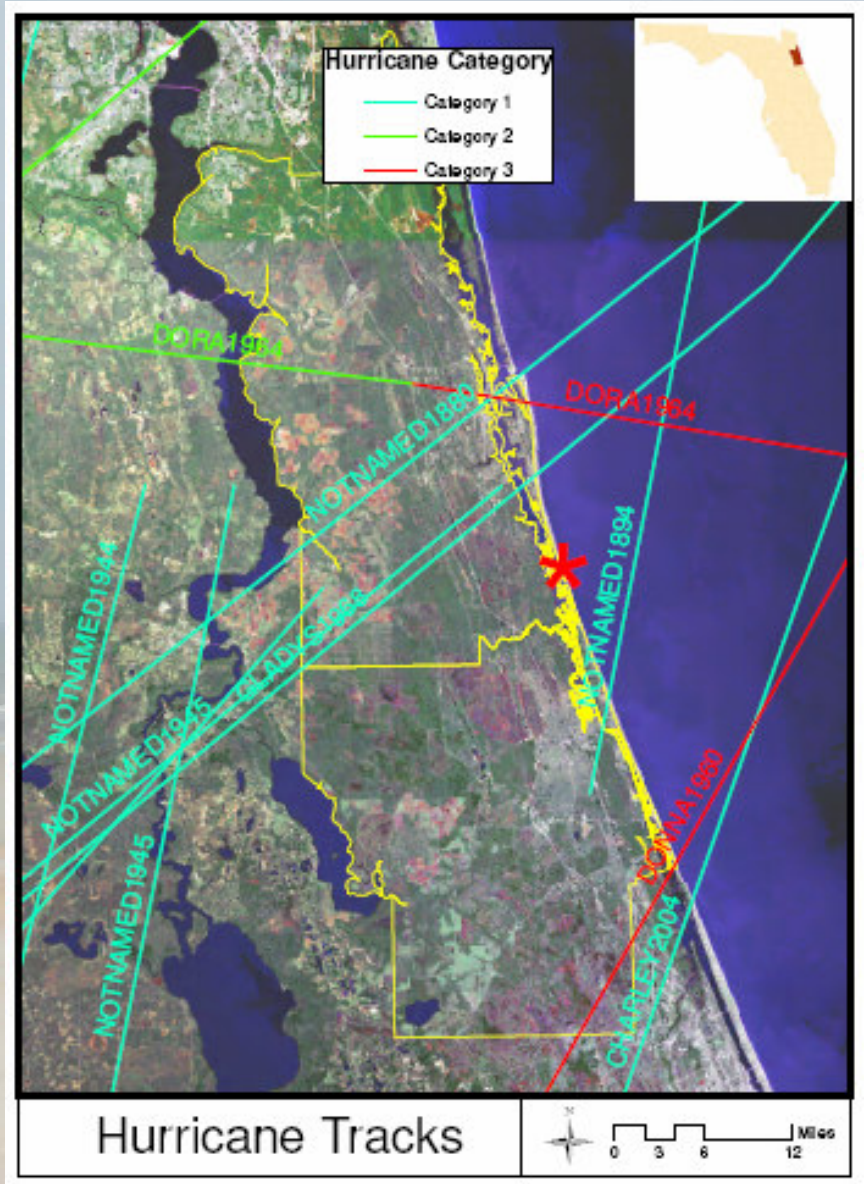
Historical Aerials: 2005

Source: FDEP/FDOT

Historical Hurricanes

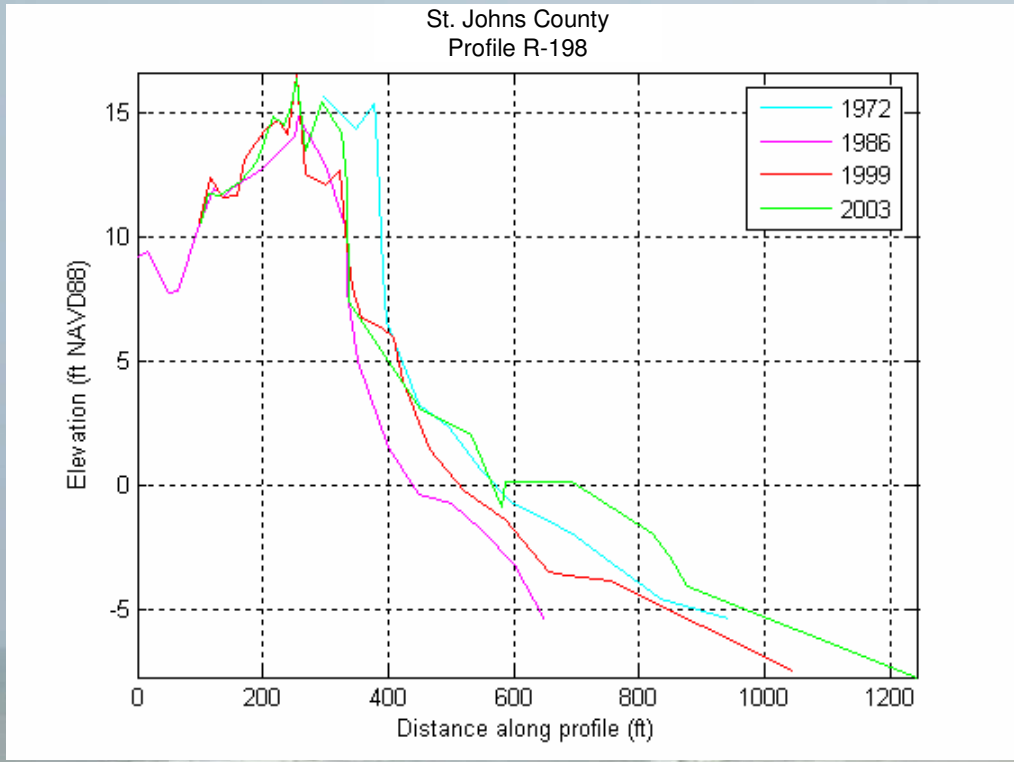
1878 – 2004

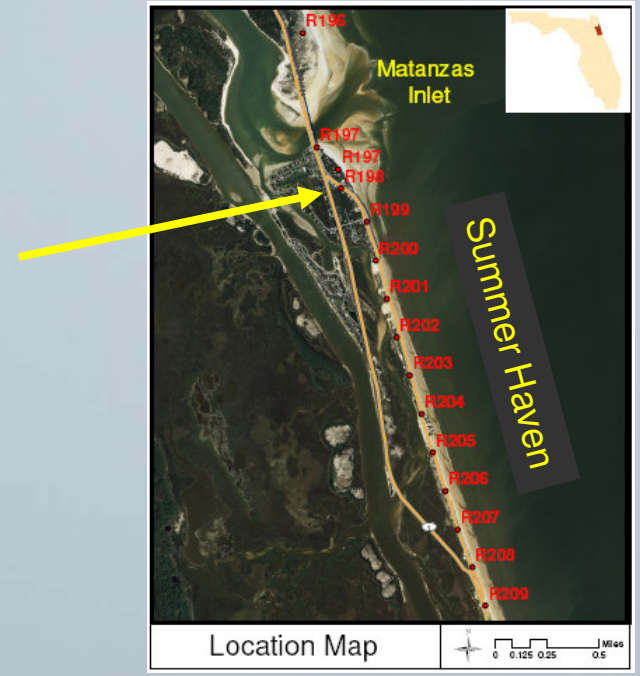
No Name, 1894, Cat 1
Donna, 1960, Cat 3
Dora, 1964, Cat 3
Gladys, 1988, Cat 1
Floyd, 1999, Cat 3
Charlie, 2004, Cat 1



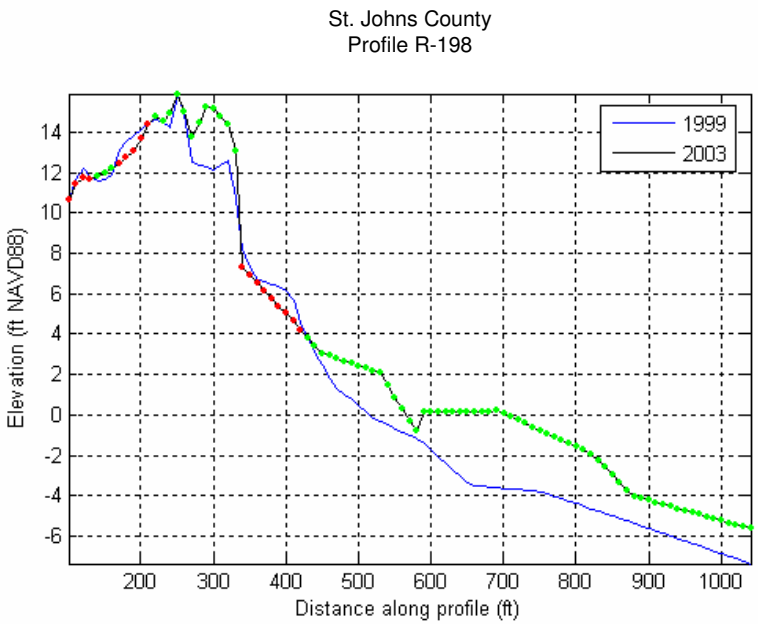
Source: NHC (NOAA)

FDEP Beach Profiles, R-198





Source: FDEP (BBCS)



Goals of Historical Analysis

- Provide a qualitative understanding of the hydrodynamic forces and sediment transport patterns of the project area.
- Provide guidance for developing any potential additional data collection requirements.
- Provide data to be used to assist with the planning-level modeling effort.
- Provide guidance for creating alternatives.

Historical Analysis

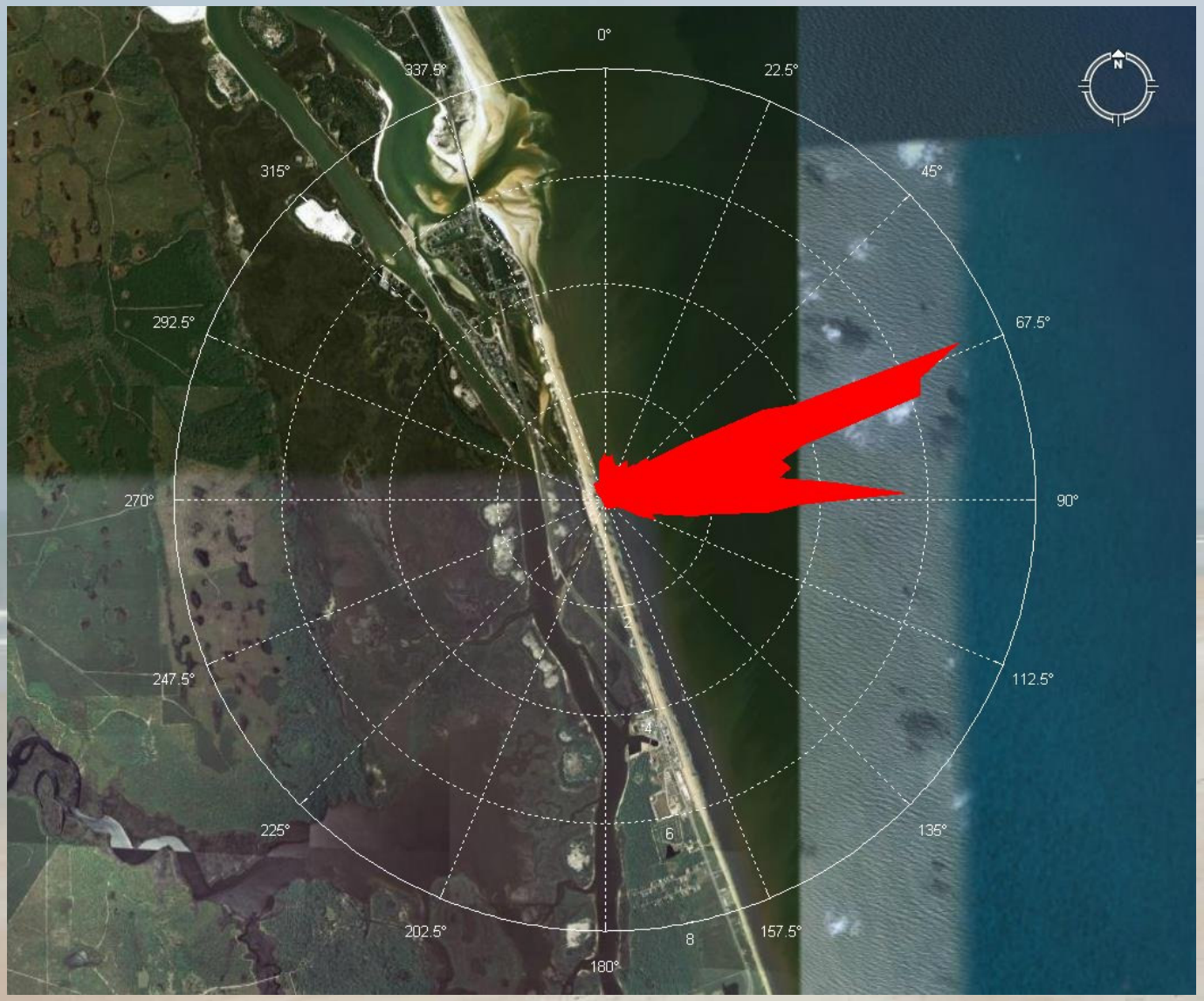
Where data permitted, created a GIS (geographic information system) database to identify and characterize historical trends and current conditions in the Project Area.

- Historical shoreline changes
- Post-storm beach profile changes
- Historical bathymetry changes, including the ebb and flood shoals of the inlet
- Long-shore transport rates, shoreline regression rates, and sediment transport volumes
- Sediment volume currently in the ebb and flood shoals of the inlet
- Location of hard bottom in the project area
- Historical changes and current location of environmental resources in the project area (seagrass, turtle nesting locations, etc.)

Shoreline Change Envelope (1923 – 2003) → includes fill

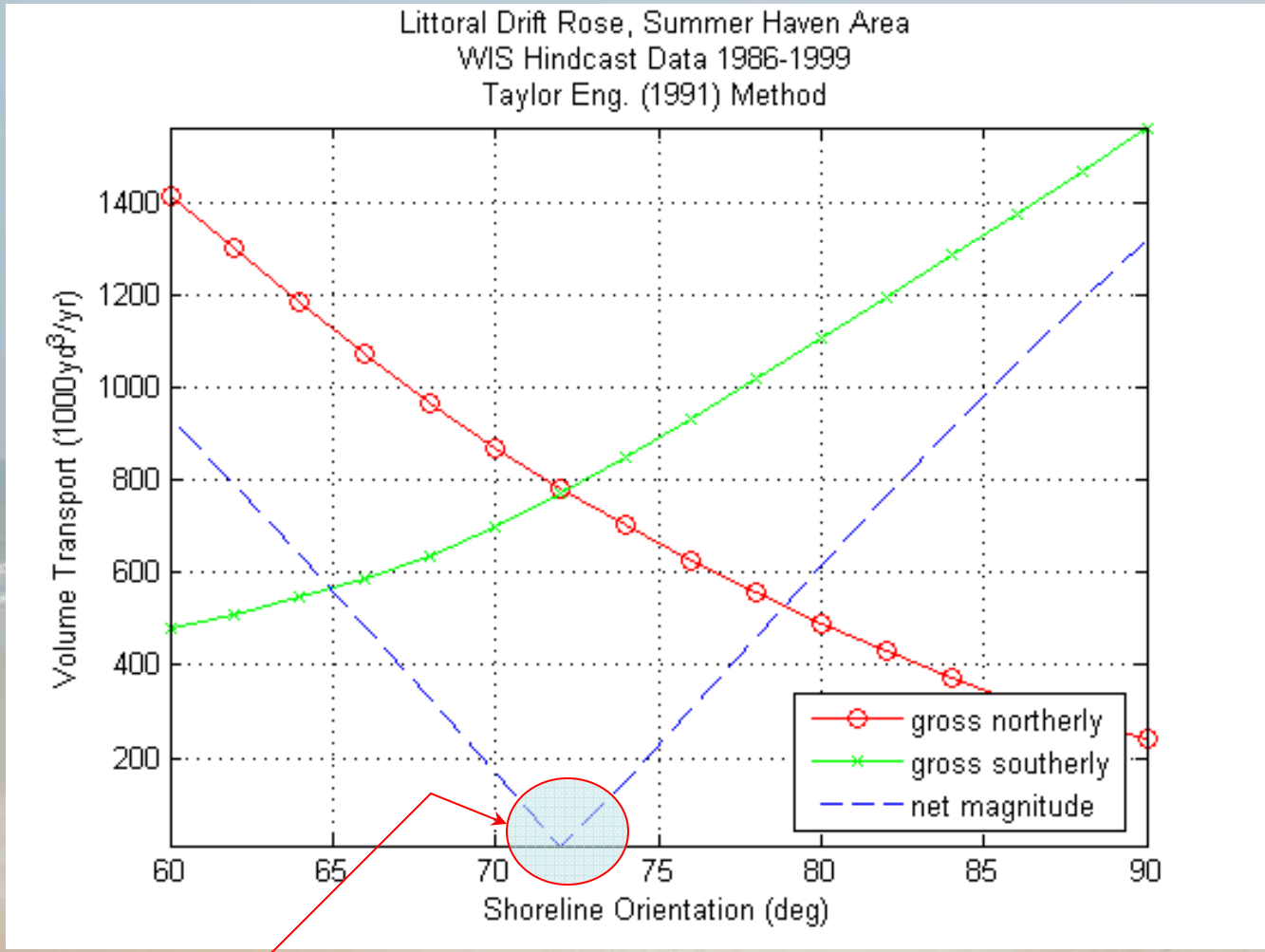
Average Width of Envelope = 130 ft

Wave Energy from WIS Data 1980-1999



Source: USACE

Long-shore Sediment Transport



Summer Haven Shoreline Orientation

Source: USACE

Coastal process summary

- From aerials and beach profiles through 1999, the sediment transport appears to be net to the south in the Summer Haven area.

- From beach profiles and MHW line measurements from 1923 through 2003, the MHW line oscillates within a 130 ft wide envelope.

- Erosion of the beach appears to be driven by episodic storm events.

- From wave data between 1980 and 1999 (USACE), the slant of shoreline with respect to wave direction is such that the longshore transport direction can oscillate between north and south over time. (theoretical calculations).

- The ROW is located in the active foreshore.

- There is some visual evidence in aerials of “groundwater” flow from the Matanzas River into the ocean through the Summer Haven area.

Additional Data Collection and Studies Needed if Permitting and Design Proceeds

- Numerical modeling effort (Possibly use study currently underway for FIND)
  - Wave model
  - Hardbottom Study

- Beach profiles, including areas north of inlet and Marineland area
  - 4 times per year due to seasonal variations
  - Densely spaced (500 ft or less)
  - Offshore data out to depth of closure (30 to 40 ft)
  - Resolve ebb and flood shoals

- Sediment tracer study
  - Release fluorescent particles sized to in situ material in coastal zone
  - Sample over some small time frame

Additional Data Collection and Studies Needed if Permitting and Design Proceeds (continued)

- Groundwater exchange between river/ocean
  - Piezometer study (hydraulic head between river/ocean)
  - Flow velocity through sediments

- Environmental (habitat) assessments

- Locating a compatible sand source for initial construction and longer term maintenance

Permitting considerations

Permitting agencies include:

- Florida DEP
- Florida Fish and Wildlife Conservation Commission
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers

Permit required for any project such as a beach fill, driving surface, geotextile tube (“sandbags”), bulkhead, revetment, or groin field

Permitting considerations

Permits will require:

- Additional data collection and studies
- Assessment of environmental impacts
- Measures to address impacts (e.g. marine turtle nesting)
  - Maintain a beach for turtle nesting

Permitting considerations

Proposed projects will also need to consider:

- Long-term monitoring
- Routine maintenance
- Repair after storms
- Relationship with other St. Johns County coastal permits, habitat conservation plans, and projects

Permitting considerations

Permitting process for structures:

- Extremely difficult (may not be possible) to obtain permits for structures such as driving surface, geotextile tube ("sandbags"), bulkhead, revetment, or groin field
- Agency review of permit application and addressing requests for additional information will require at least 2 years

Planning Level Modeling

A planning-level modeling was used in support of the following:

- Examination of possible shoreline responses to potential alternatives in the Summer Haven area.
- Examination of possible profile responses to potential alternatives.

The modeling effort was limited by the quantity and quality of available data.

Development of Conceptual Alternatives

- Main goal: Develop conceptual plans for providing a protected driving surface in the County ROW
- Basic options include a bulkhead, geotextile structure, and a rock revetment.
  - Groin fields also considered to extend lifetime of beach fill
- Prepared conceptual designs and cost estimates
- Developed a matrix to compare options.
  - Estimated construction costs
  - Maintenance needs
  - Relative permitting timeframe and costs

Design Criteria

Combined Total Storm Tide Values for Various Return Periods (St. Johns County)			
Return Period TR (years)	Combined Total Storm Tide Level* above NGVD (ft.)		
	North Profile	Middle Profile	South Profile
500	18.9	16.9	16.3
200	15.4	14.5	14.5
100	13.1	12.3	12.3
50	10.4	9.6	9.2
20	***5.5***	***5.4***	***5.1***
10	3.2	3.6	3.6

*Includes contributions of: wind stress, barometric pressure, dynamic wave set-up and astronomical tide.

Source: FDEP (BBCS)

Conceptual Alternatives, Geometry:

Typical cross-section geometry:

Driving Surface Width → 20 ft

Vertical Wall:

Crest Elevation (ocean side) → ~10 ft NGVD
Crest Elevation (river side) → ~ 5.1 ft NGVD
Width → approx. 3 feet or less

Rock and Geo-textile Revetment:

Crest Elevation → ~ 8.5 ft NGVD
Toe Elevation → ~ 0 ft NGVD
Width 1:3 slope (ocean side) → ~ 25 ft
Width 1:2 slope (river side) → ~ 15 ft
Armor size → Approx. 4 ft Dia. Rock

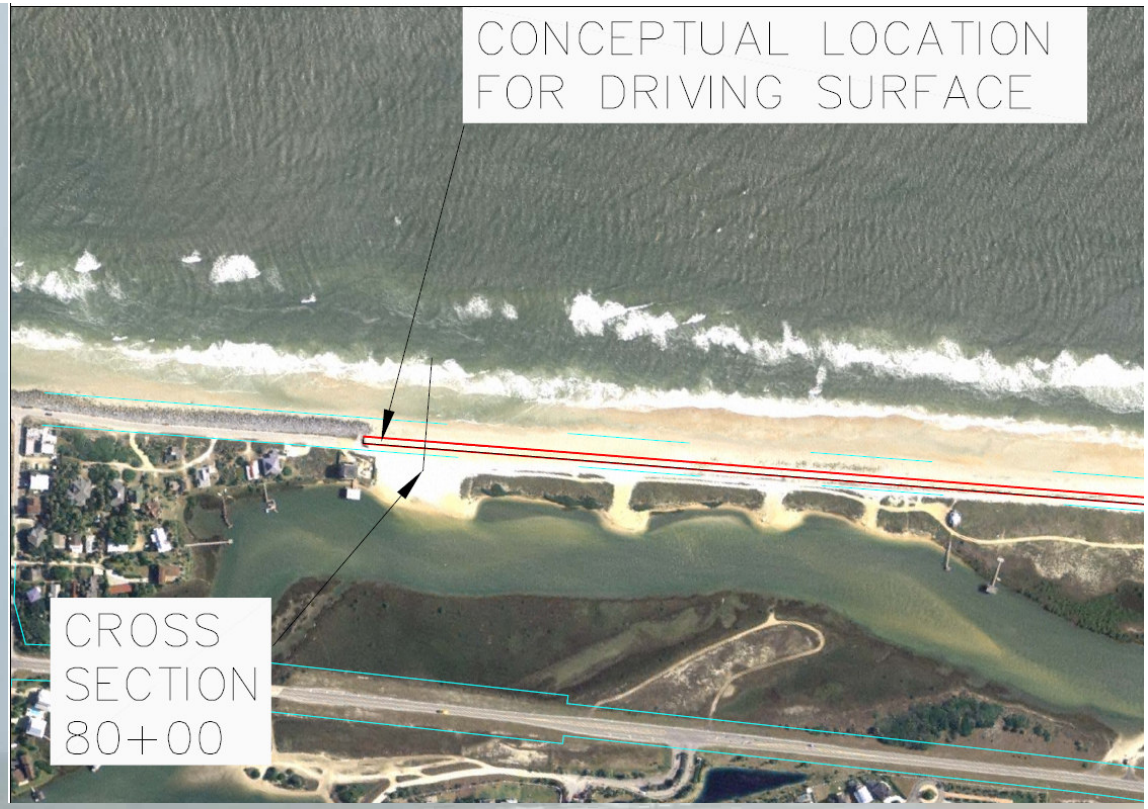
Beach Nourishment:

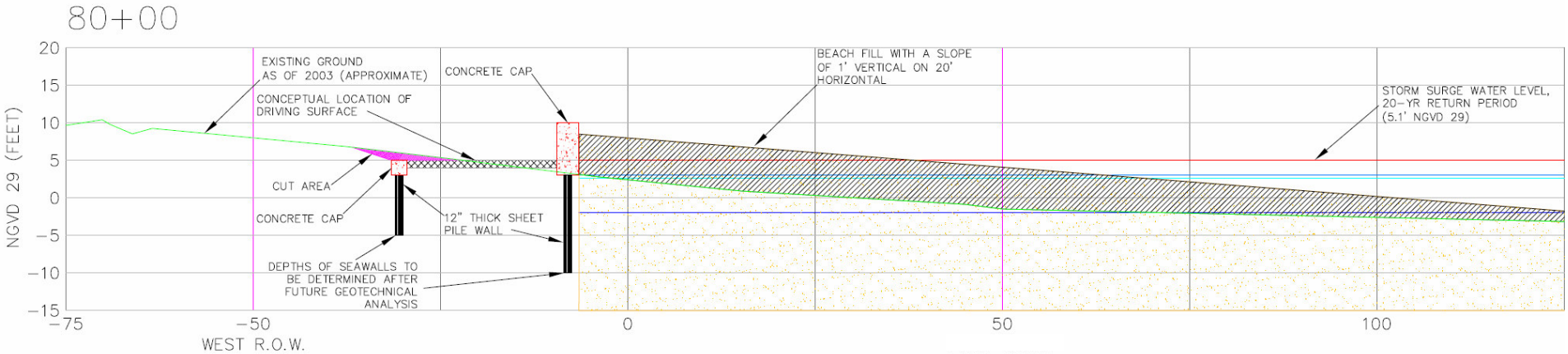
Berm → 125 ft wide
Foreshore → Slope on 1:10 to grade

Conceptual layouts and cross sections

Alternative 1: Seawall

NORTH

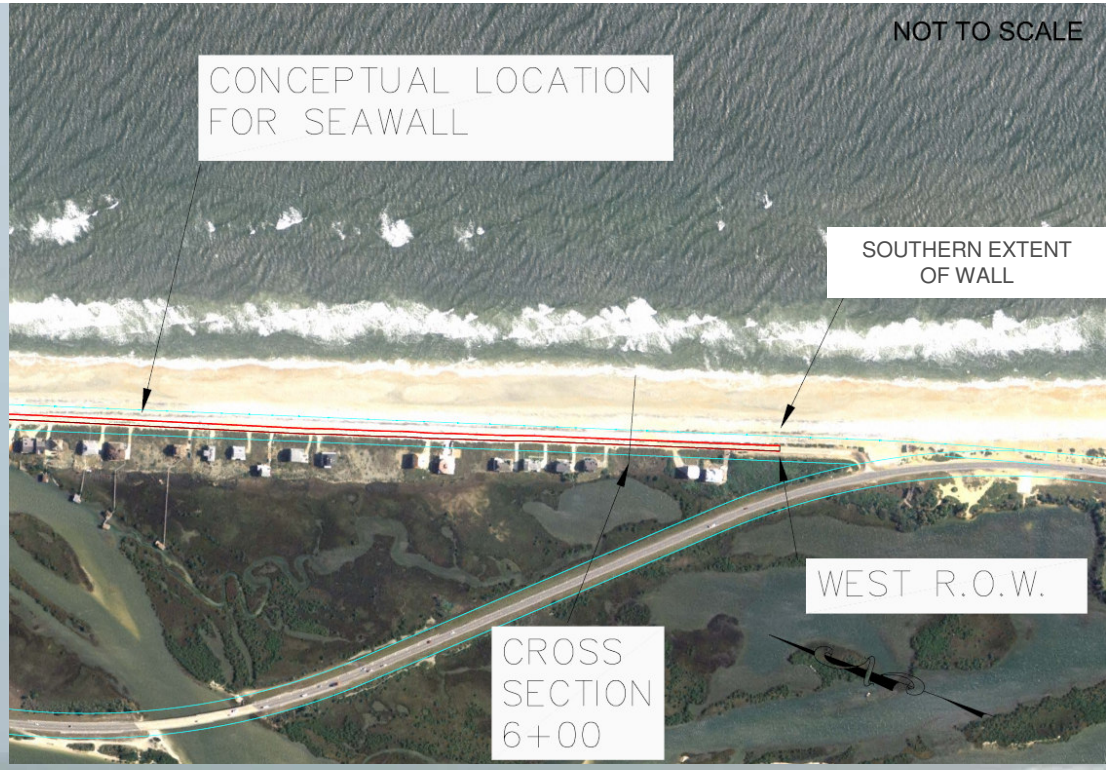


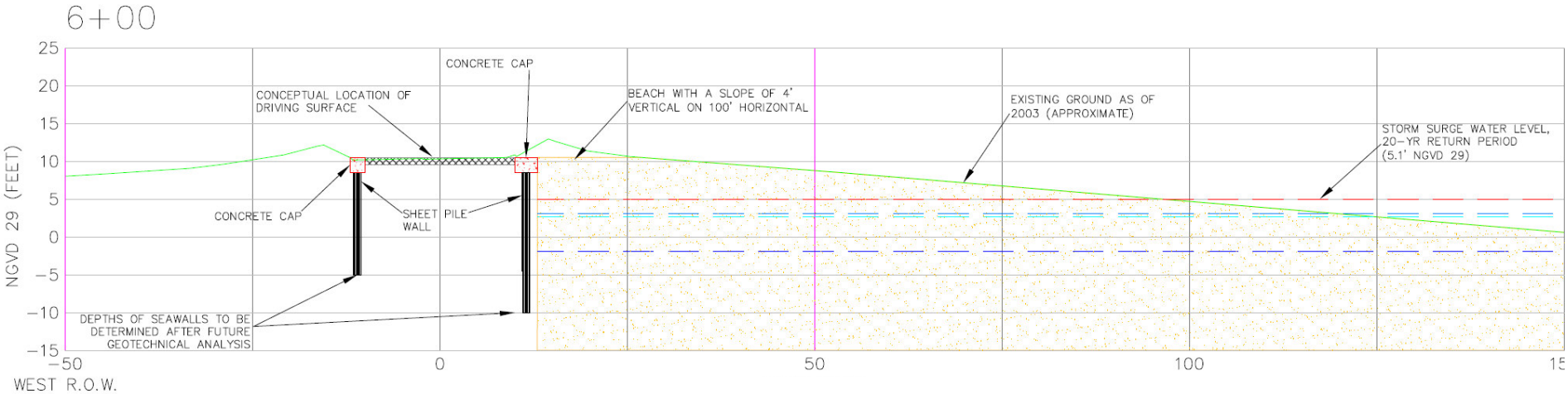


Conceptual layouts and cross sections

Alternative 1: Seawall

SOUTH

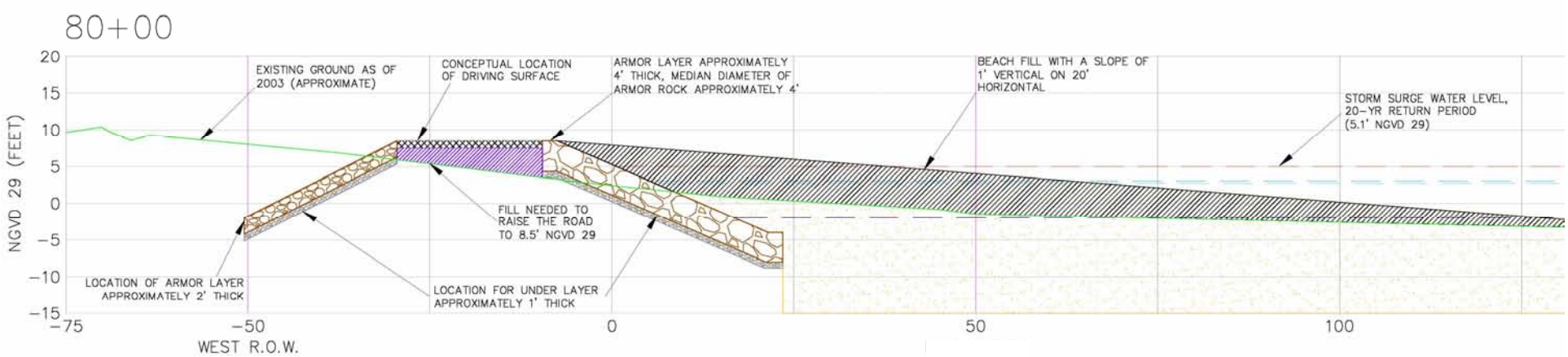




Conceptual layouts and cross sections

Alternative 2: Rock Revetment

NORTH



Conceptual layouts and cross sections

Alternative 2: Rock Revetment

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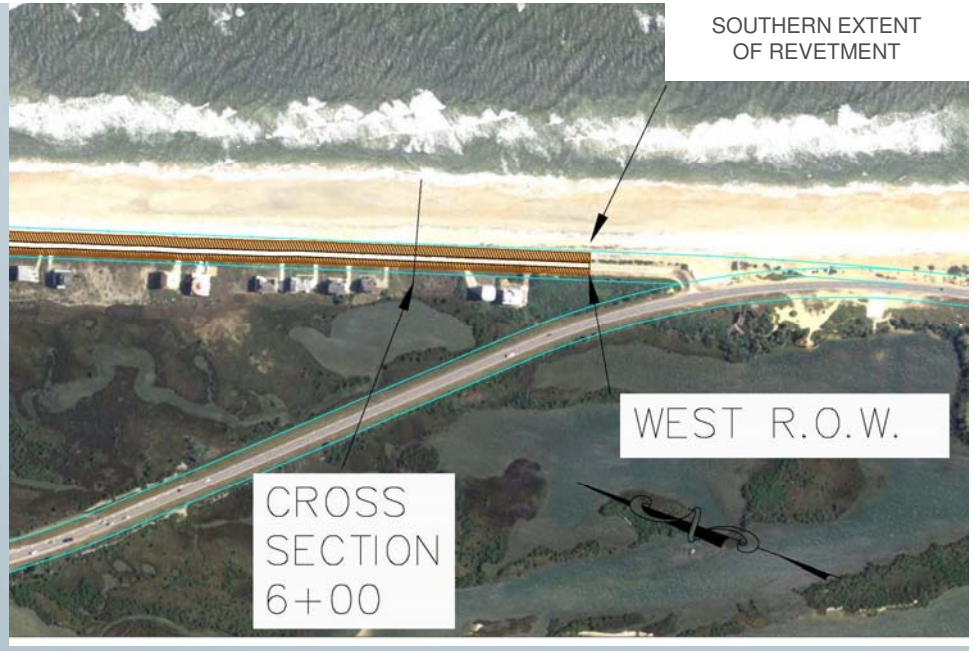
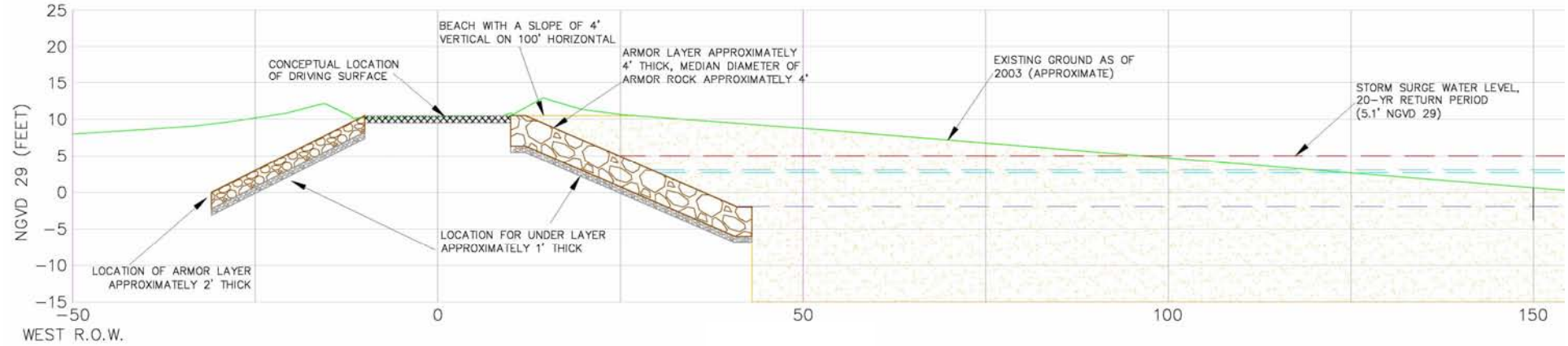
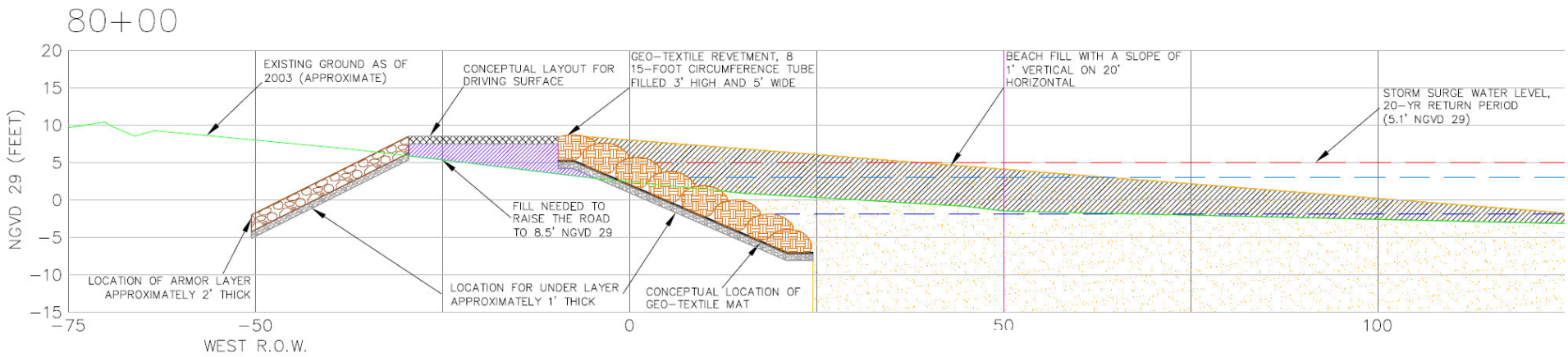




Conceptual layouts and cross sections

Alternative 3: Geo-textile Revetment

NORTH



Conceptual layouts and cross sections

Alternative 3: Geo-textile Revetment

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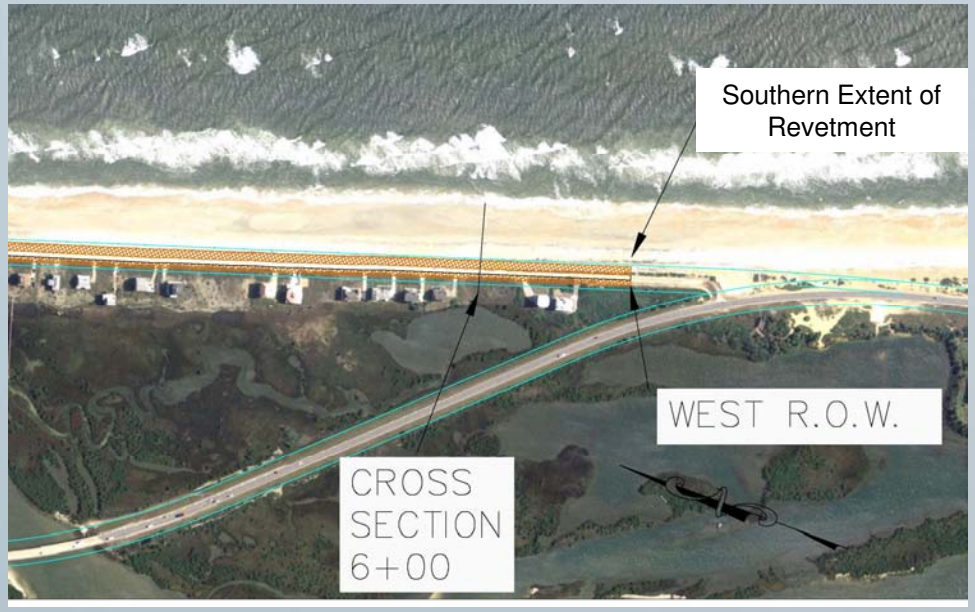
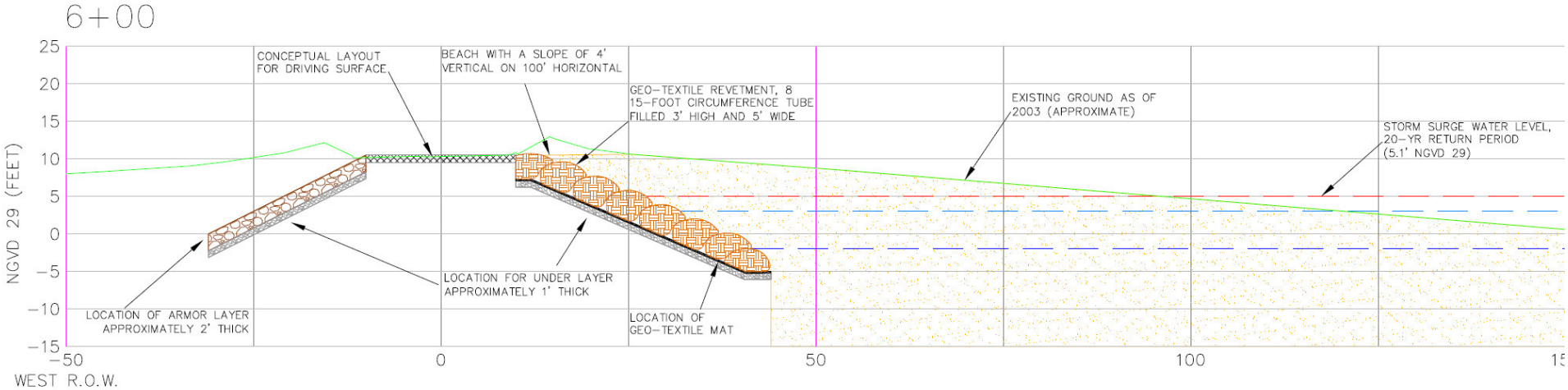
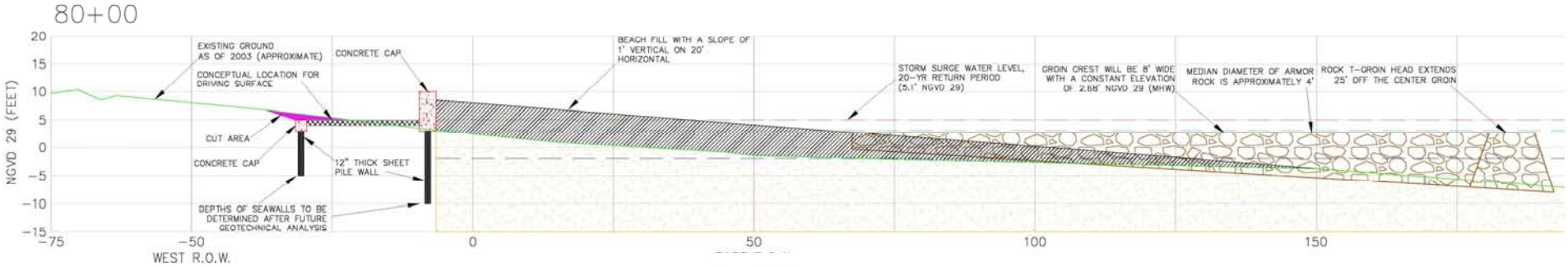




Conceptual layouts and cross sections

Alternative 4: Seawall w/ T-Groins

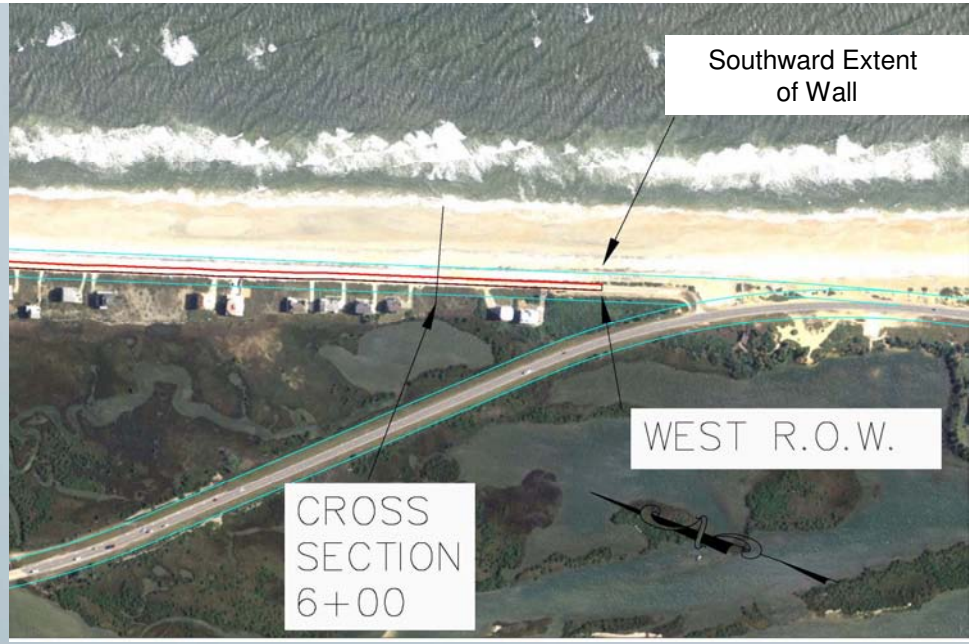
NORTH

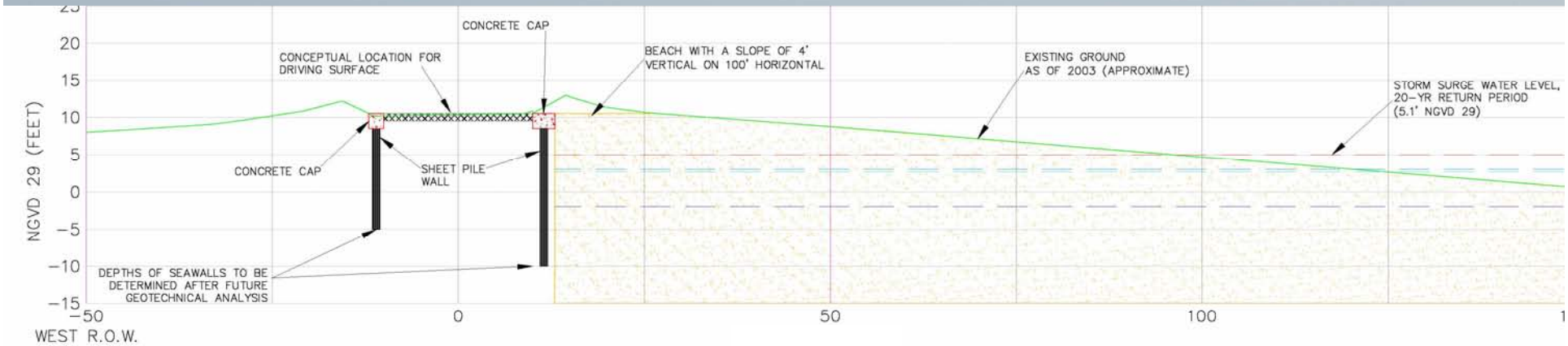


Conceptual layouts and cross sections

Alternative 4: Seawall w/ T-Groins

SOUTH

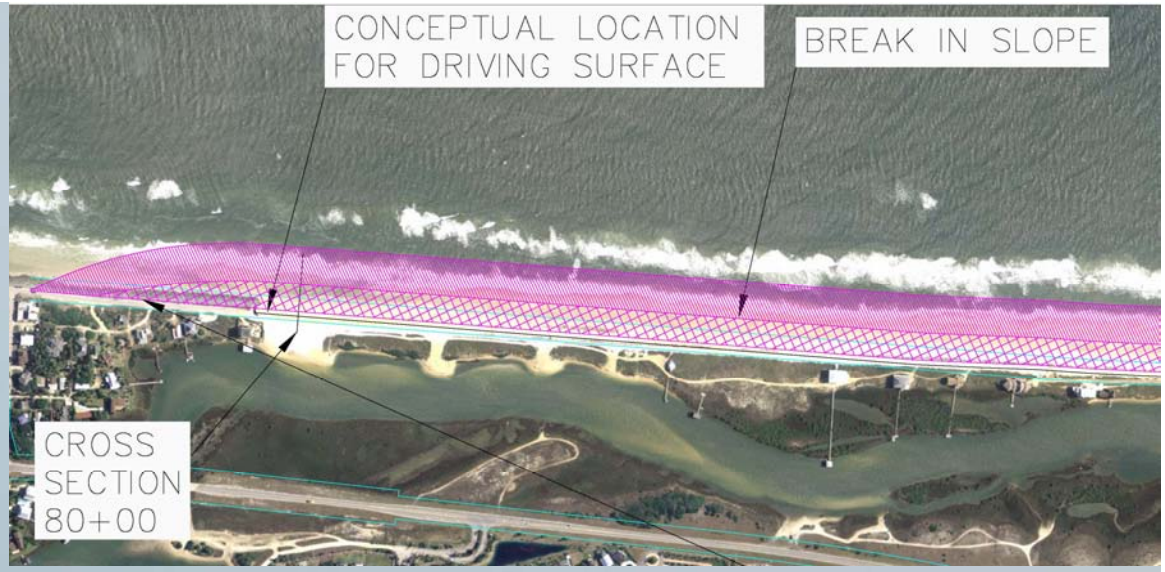


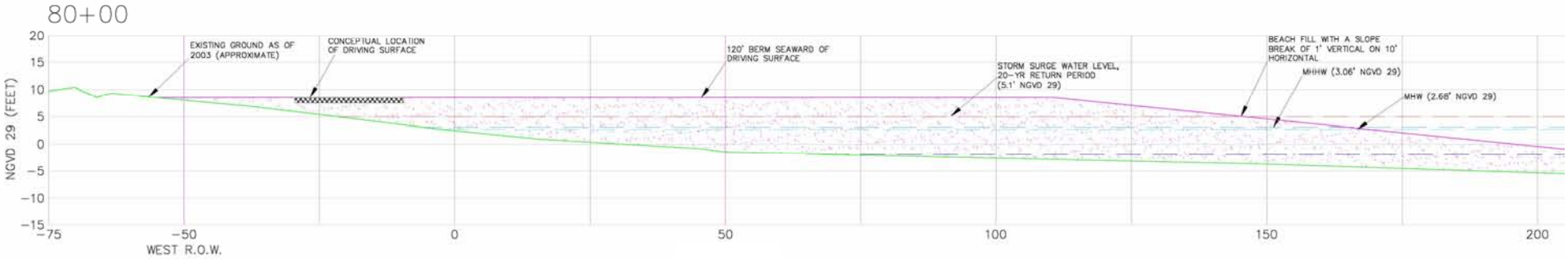


Conceptual layouts and cross sections

Alternative 5: Beach Fill

NORTH





Conceptual layouts and cross sections

Alternative 5: Beach fill

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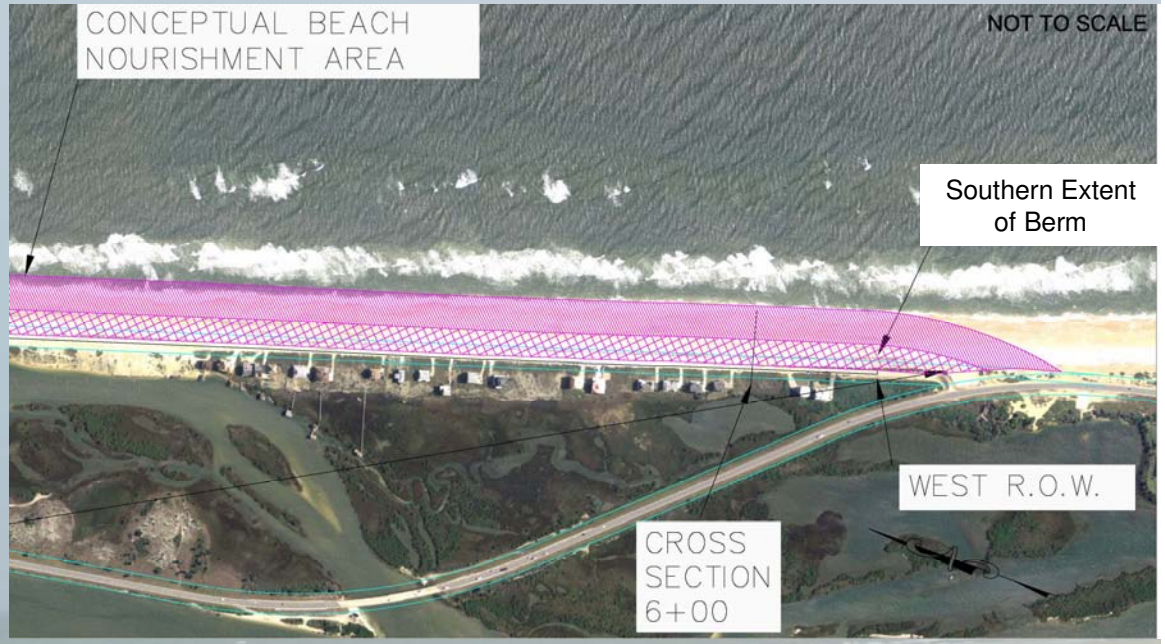

Evaluation Matrix

Alternative	Estimated study, permitting and design costs * *(millions)*	Estimated construction costs * *(millions)*	Beach Fill Maintenance * (every 3-5 years depending on events)
1. Seawall	$2.3	$15.3	$1.3 - $2.0
2. Rock Revetment	$2.0	$13.2	$1.0 - $ 1.4
3. Geo-textile Revetment	$2.5	$16.7	$1.2 - $1.8
4. Seawall and rock T-groins	$2.4	$16.2	$1.3 - $2.0
5. Beach nourishment	$1.7	$11.4	$5.7 - $8.5

* Provided to compare the relative costs of each conceptual alternative.
Not intended for budgeting or construction purposes.

Evaluation Matrix

Alternative	Permitting issues	Comments
1. Seawall	Permits extremely unlikely	
2. Rock Revetment	Permits extremely unlikely	
3. Geotextile Revetment	Permits extremely unlikely	Risk of damage to fabric. There are a variety of geo-textile structures available that have varying lifetimes and associated costs. Lower cost options will offer a lower lever of performance.
4. Seawall and rock T-groins	Permits extremely unlikely	Increased stability for overwash prone areas
5. Beach nourishment	Can likely obtain permits	Viable for single 20-year design storm event

Comments and questions