CHARLOTTE COUNTY 10-YEAR BEACH AND INLET MANAGEMENT PLAN

ALTERNATIVES ANALYSIS

COASTAL ENGINEERING CONSULTANTS INC

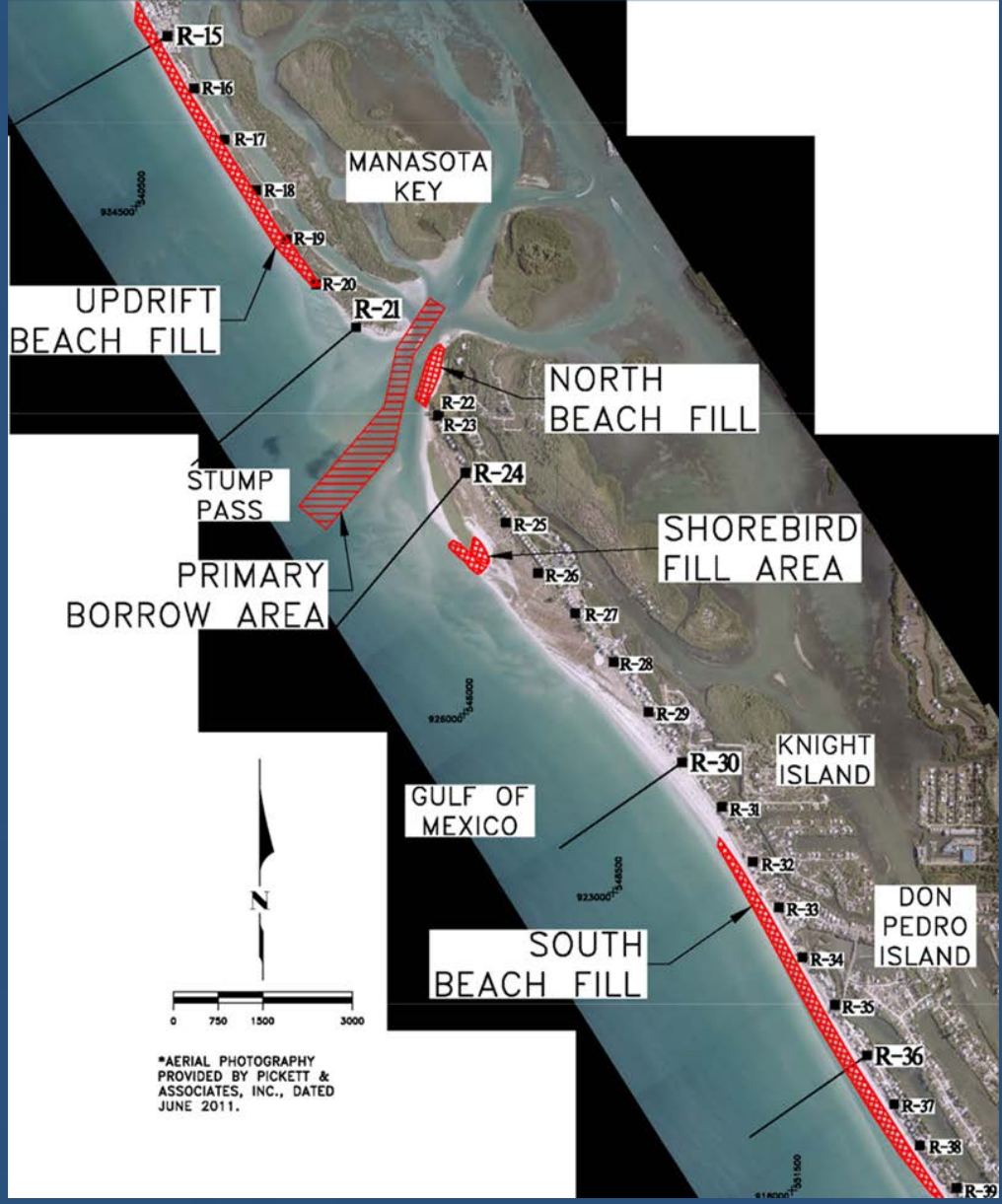
COASTAL TECH
COASTAL TECHNOLOGY CORPORATION

BEACHES AND SHORES COMMITEE

May 2, 2013

OUTLINE

- Goals & Objectives
- Structural Desktop Summary
- Alternatives Development
- Evaluation Parameters
- Program Recommendations



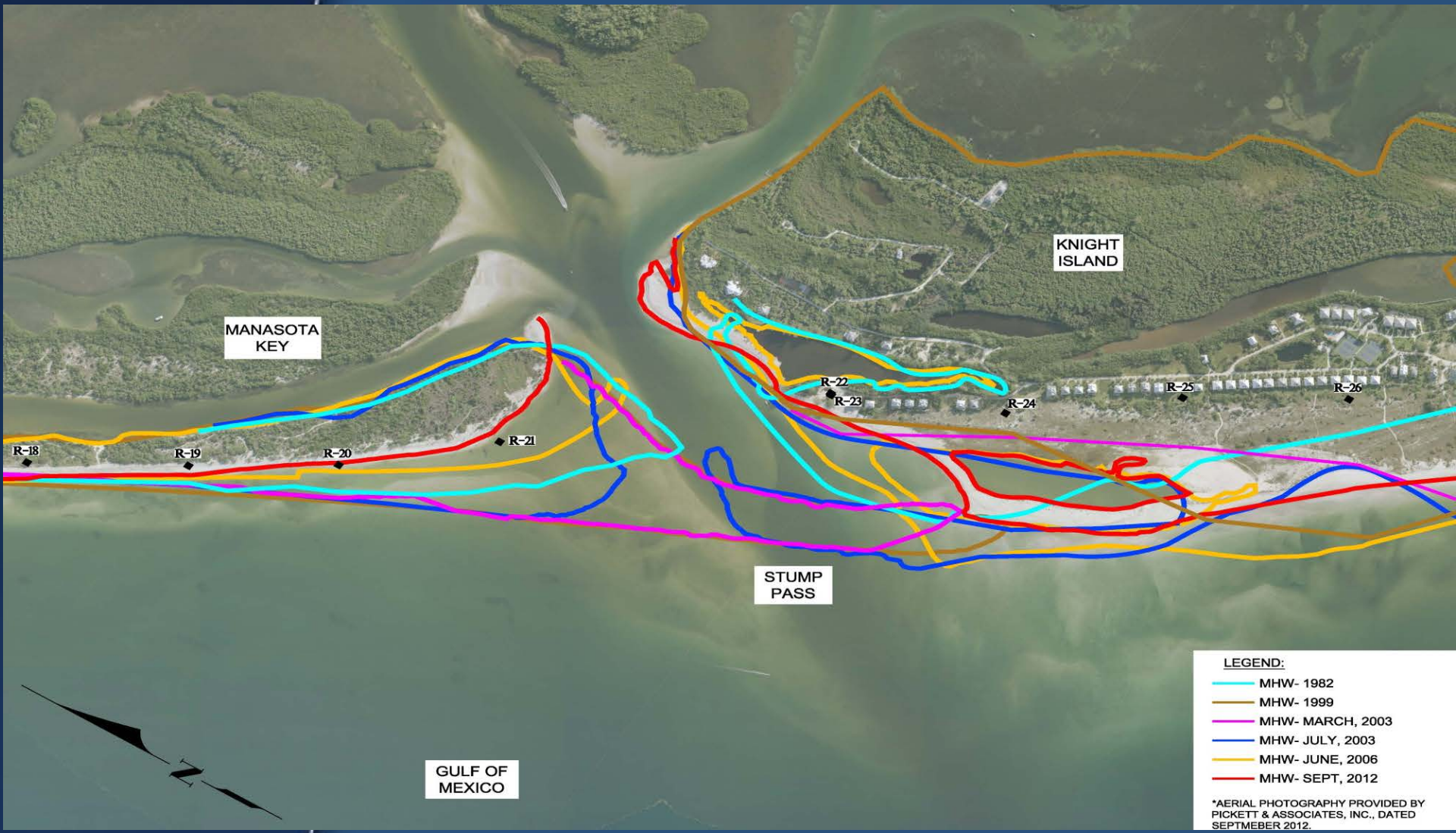
PROGRAM GOALS

- Restore & maintain critically eroding beaches using high quality sand
- Provide storm damage reduction benefits along developed shoreline through “engineered beach design”
- Provide for improved navigation through Stump Pass
- Enhance recreational opportunities
- Provide environmental protection and enhancement for T&E species

PROGRAM OBJECTIVES

- Stabilize Inlet Shorelines
  - Improve Project performance
  - Address eroding updrift shoreline adjacent to inlet
  - Minimize “advanced mitigation”
  - Address dynamic downdrift shoreline adjacent to inlet
- Address Sand Needs via Offshore Sand Resources
  - Reduce reliance upon inlet for long-term sand needs
  - Reduce erosion rate immediately updrift of inlet
  - Minimize or eliminate “advanced mitigation”

Stabilize Inlet Shorelines

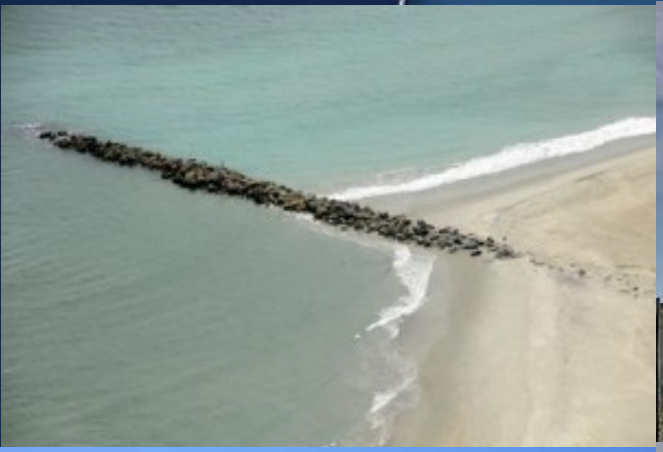


STRUCTURAL DESKTOP SUMMARY

- Continue / Modify Beach Renourishment & Maintenance Dredging
- Terminal Groin (North of Inlet)
- Terminal Groins (North and South of Inlet)
- Groin Field (North and / or South of Inlet)
- Ebb Shoal Restoration
- Throat Armoring ~ Screened Out
- Seawalls / Revetment ~ Screened Out
- Breakwaters ~ Screened Out
- Innovative Technologies ~ Screened Out
- Interior Channel Dredging ~ Screened Out

Materials / Designs for Terminal Groin(s)

ROCK



TIMBER PILES

VINYL SHEET PILING

Example: T-Groins Along Inlet Shoreline

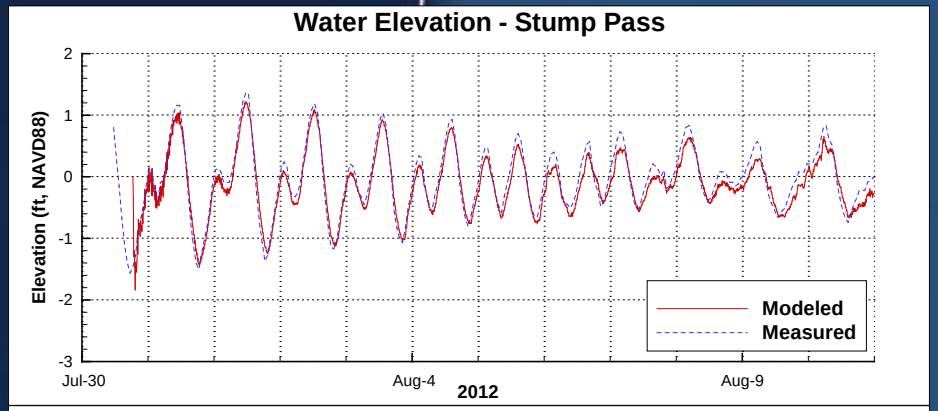
ALTERNATIVES DEVELOPMENT

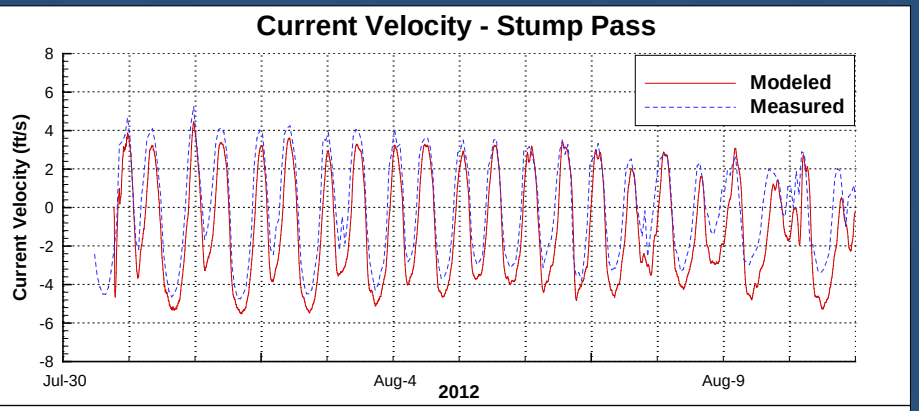
- Delft3D Model Calibration
- Conceptual Plans
  - Beach Fills
    - Updrift (180,000 CY)
    - North (45,000 CY)
    - South (195,000 CY)
  - Structural Compliments
    - Terminal Groin (MK)
    - Permeable Groin Field (MK)
    - T-groin Field (PI)
- Modeling Alternatives

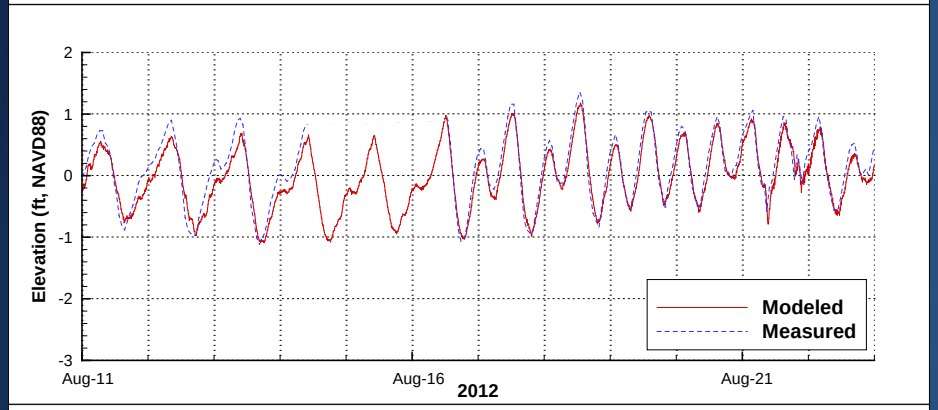
Delft3D Model Calibration

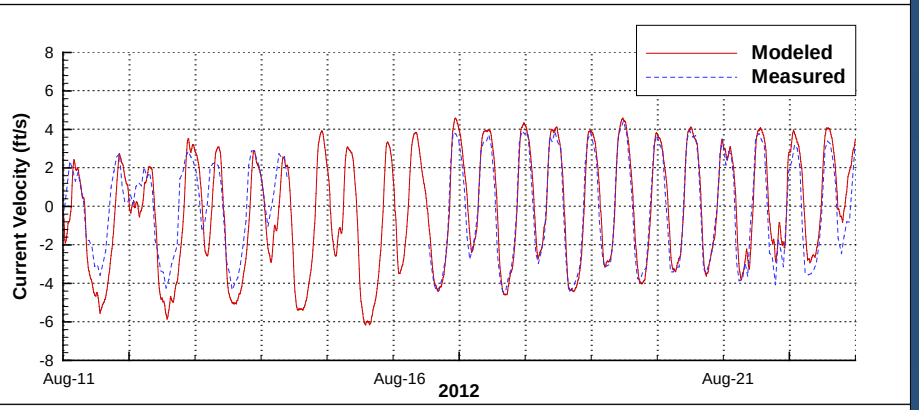
Parameter	Range
Number of Vertical Layers	1, 4, 8, 10
Sediment Size (mm)	0.1 – 0.43
Chezy Bottom Roughness	25 – 145
Stress Formulation due to Waves	Fredsoe, Grant, Van Rijn
Minimum Depth for Sediment Calculation (m)	0.1 – 0.5
Wave Related Transport Factor	0.05 – 1.0
Current Related Transport Factor	0.05 – 1.0

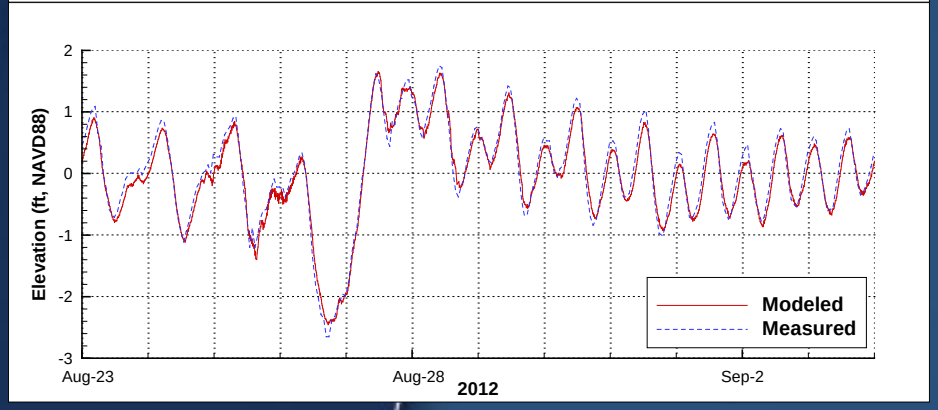
Calibration Results: Water Elevations/Flow

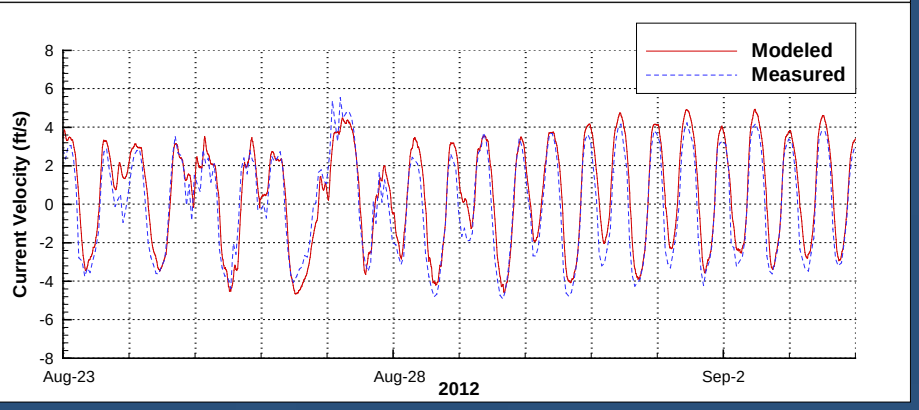




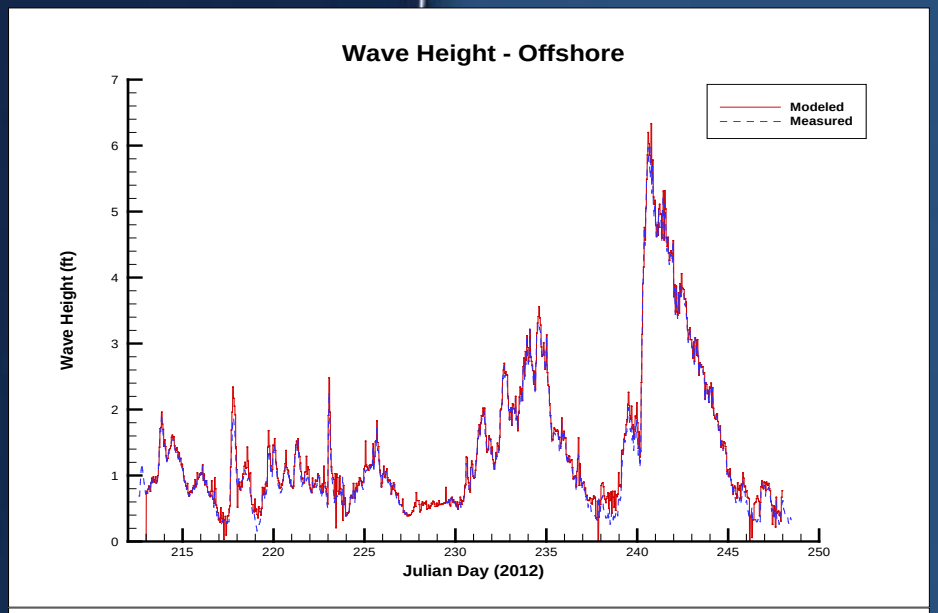


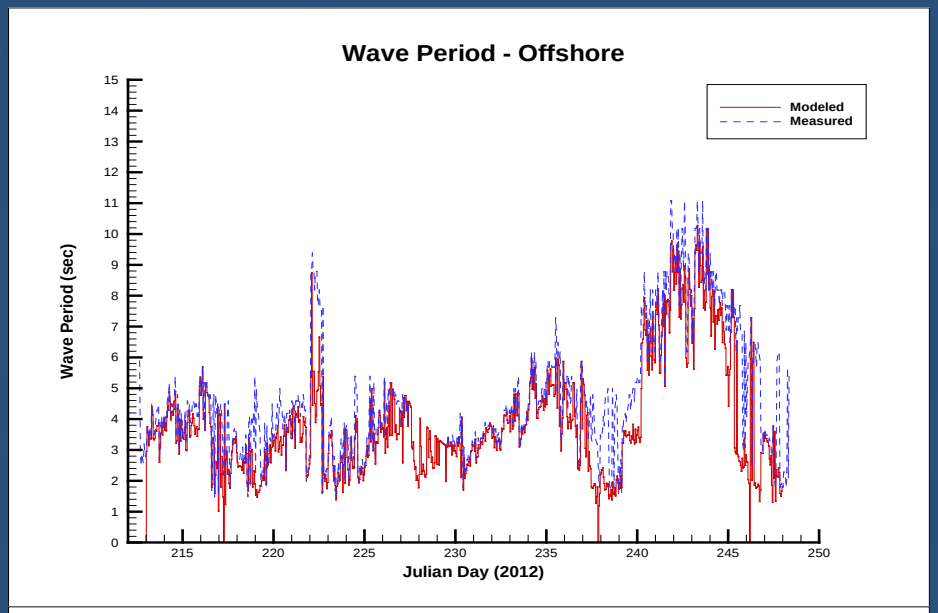


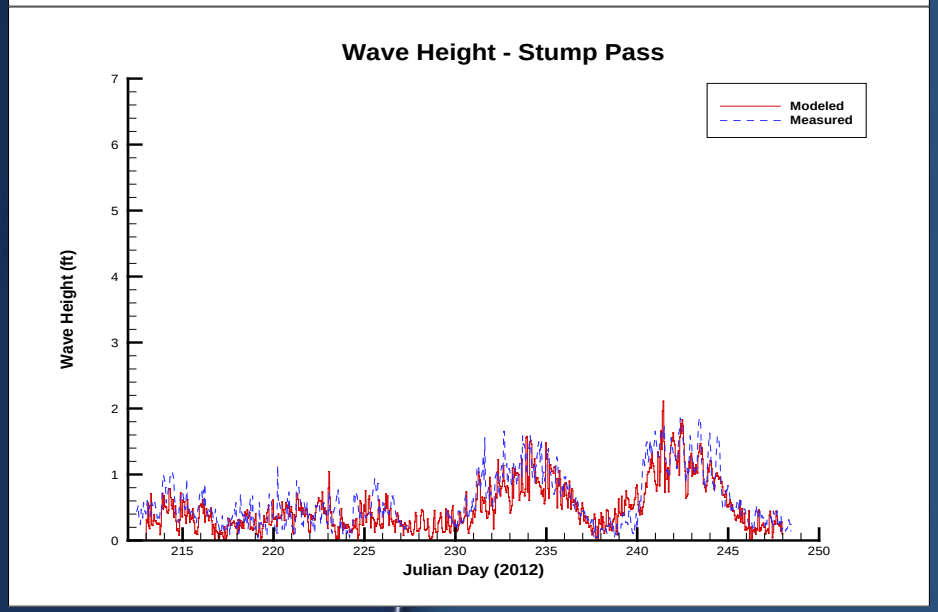


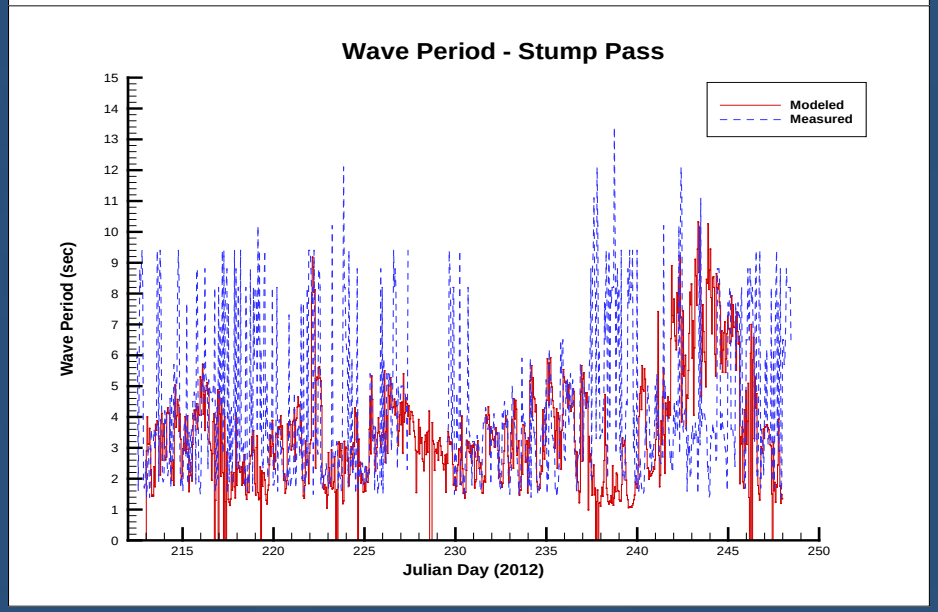


Calibration Results: Waves

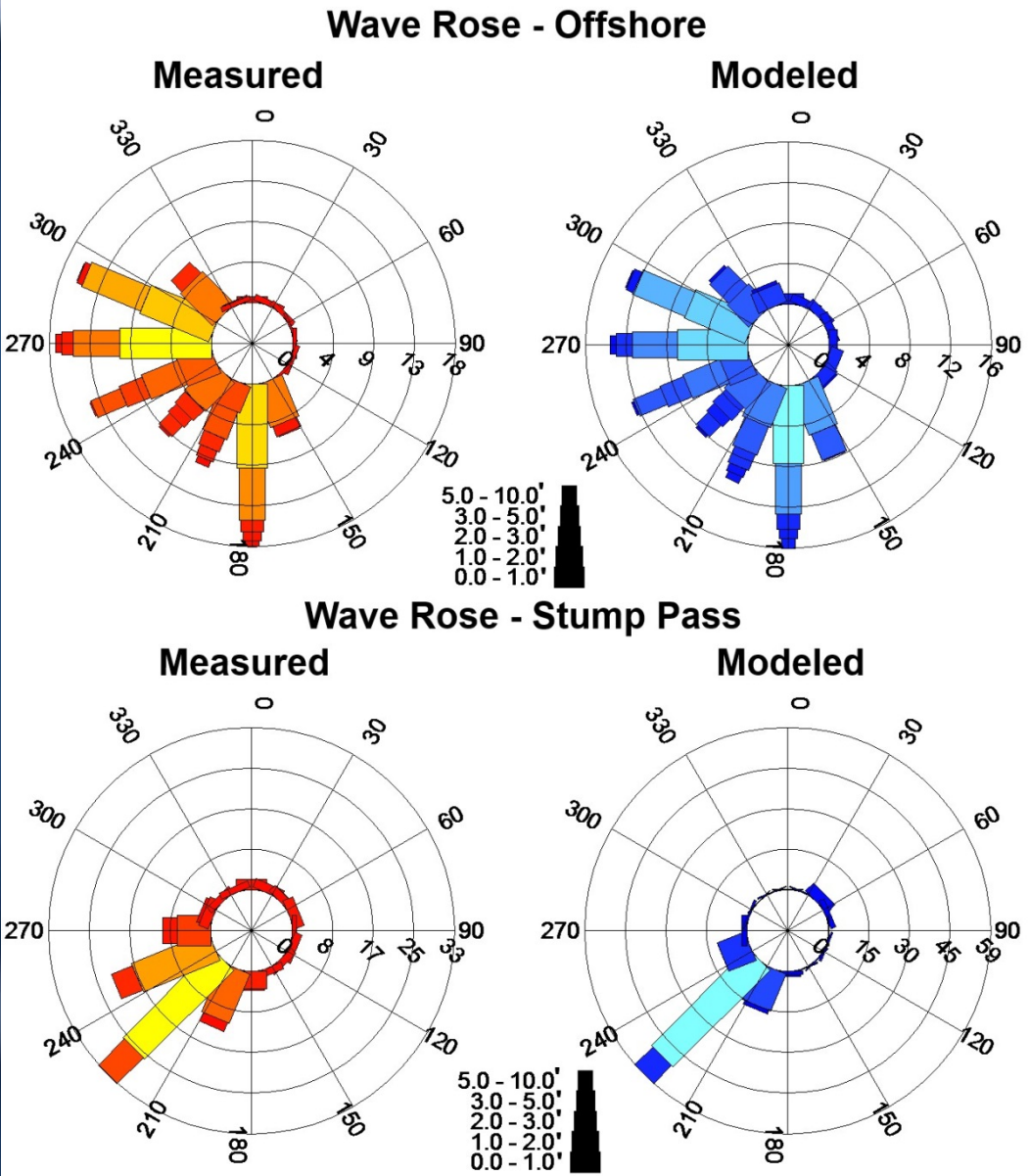








Calibration Results: Waves

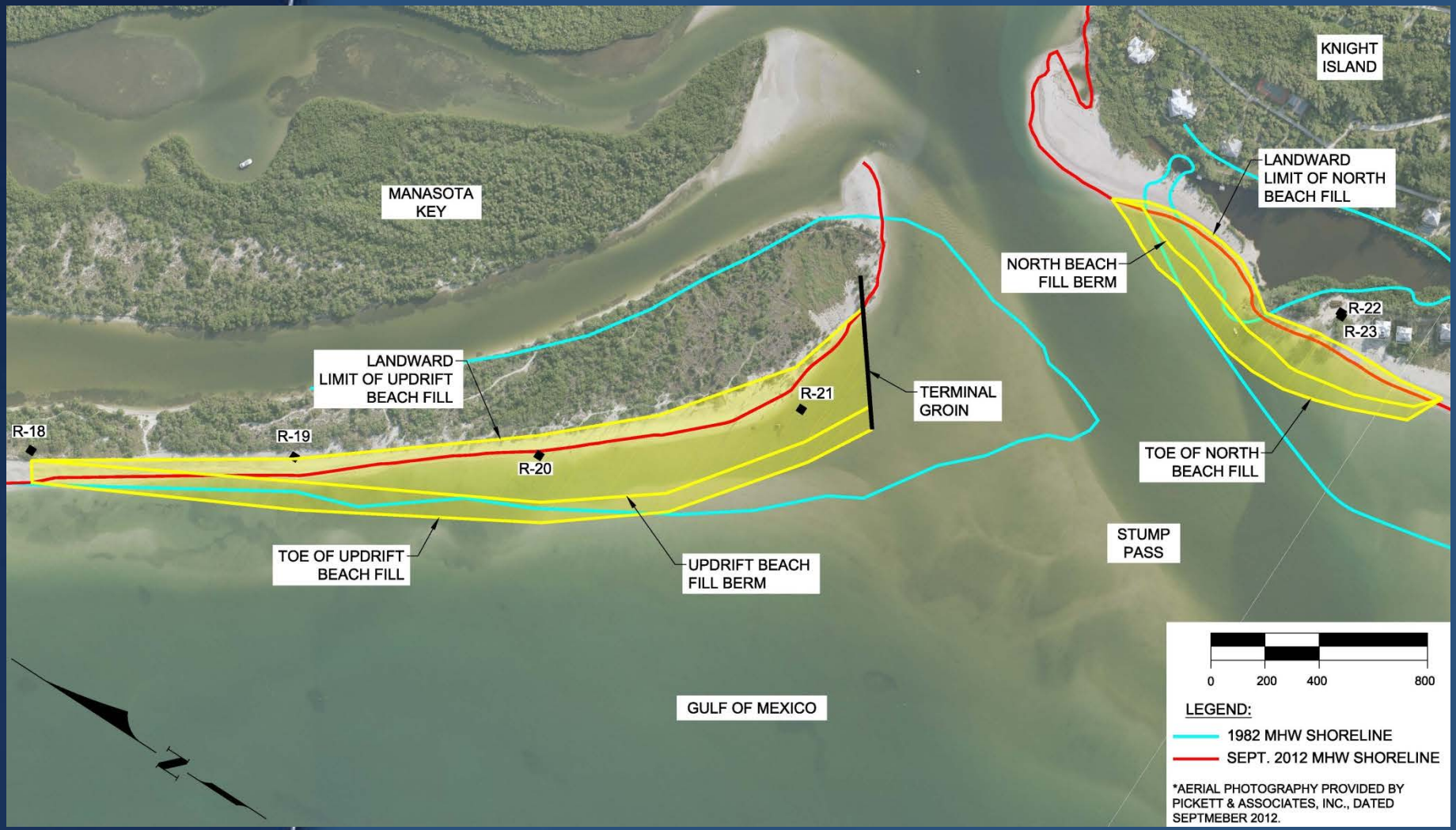


Calibration Results: Morphology

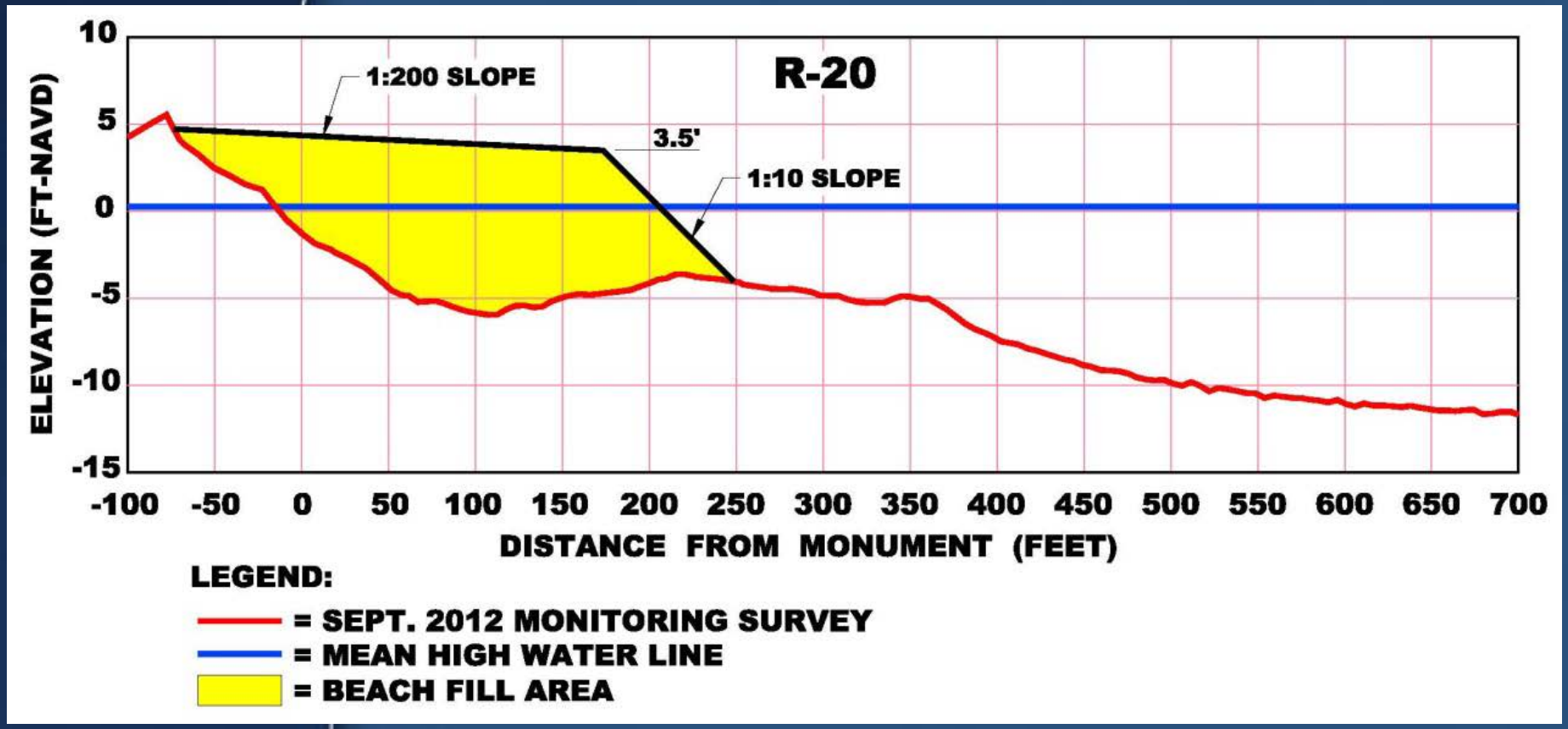
Cell #	Measured Volume Change to DOC (CY)	Modeled Volume Change to DOC (CY)
1: R-8 – R-14	2,120	2,777
2: R-14 – R-20	-3,360	-2,275
3: R-20 – PBA (north)	-2,837	-2,140
4: PBA	9,861	2,097
5: PBA (south) – R26	-346	-468
6: R-26 – R-29	14,769	9,503
7: R-29 – R-39	-15,040	-3,902
8: R-39 – R-47	-7,534	-5,108

Positive values denote accretion and negative values denote erosion

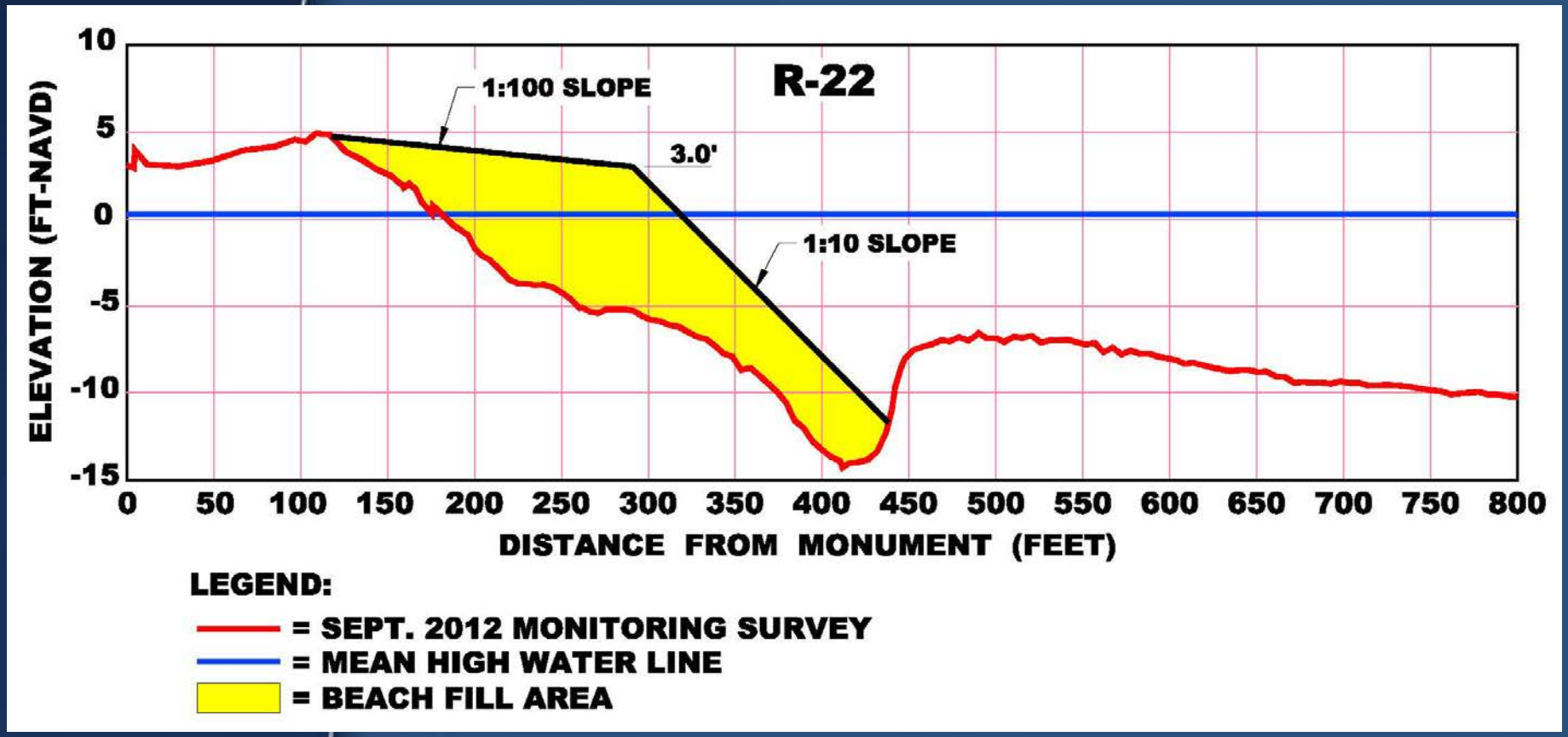
Conceptual Plan for Beach Fills (Updrift/ North) and Terminal Structure (Updrift)



Beach Fill Conceptual Template for Updrift Beach Fill (Manasota Key)

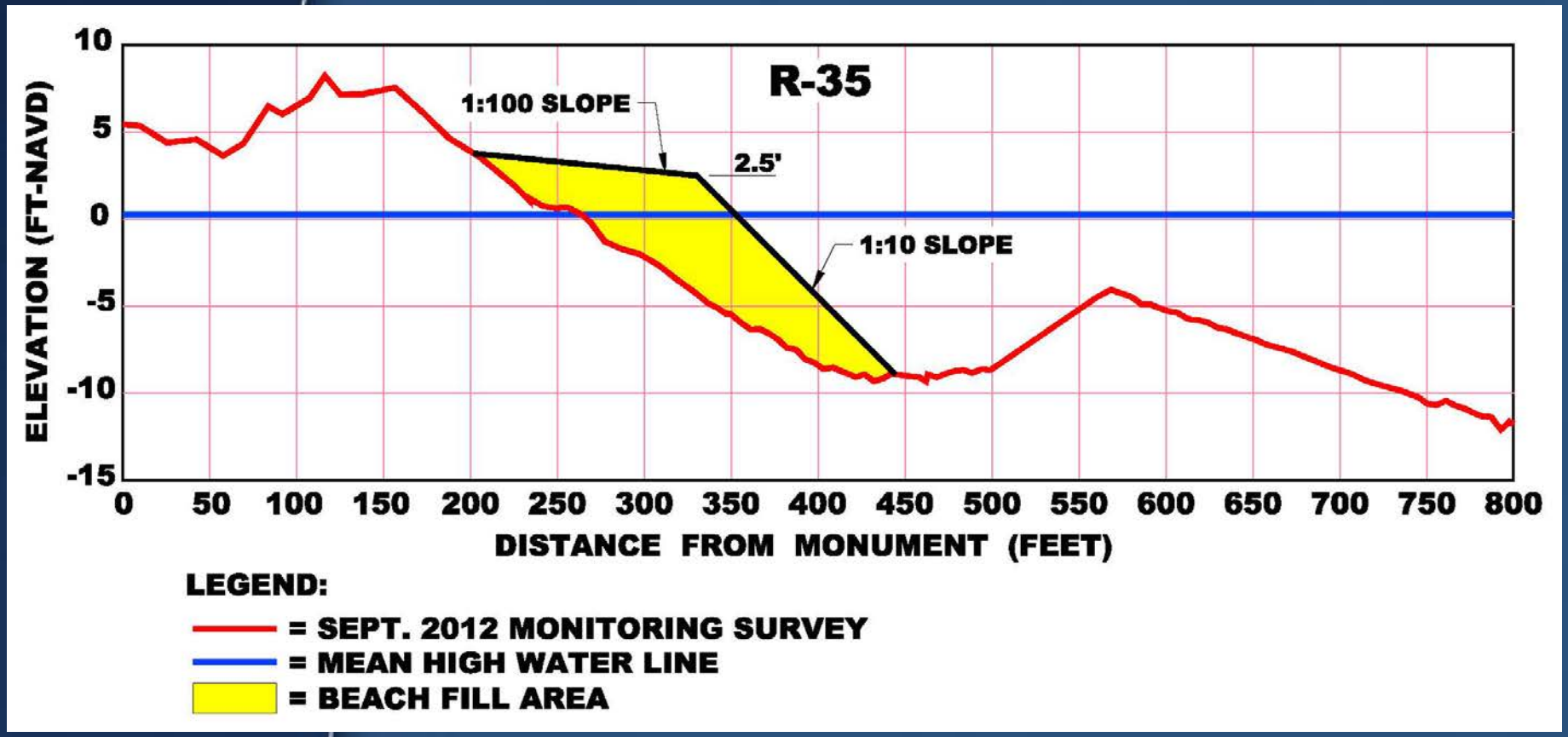


Beach Fill Conceptual Template for North Beach Fill (Palm Island)

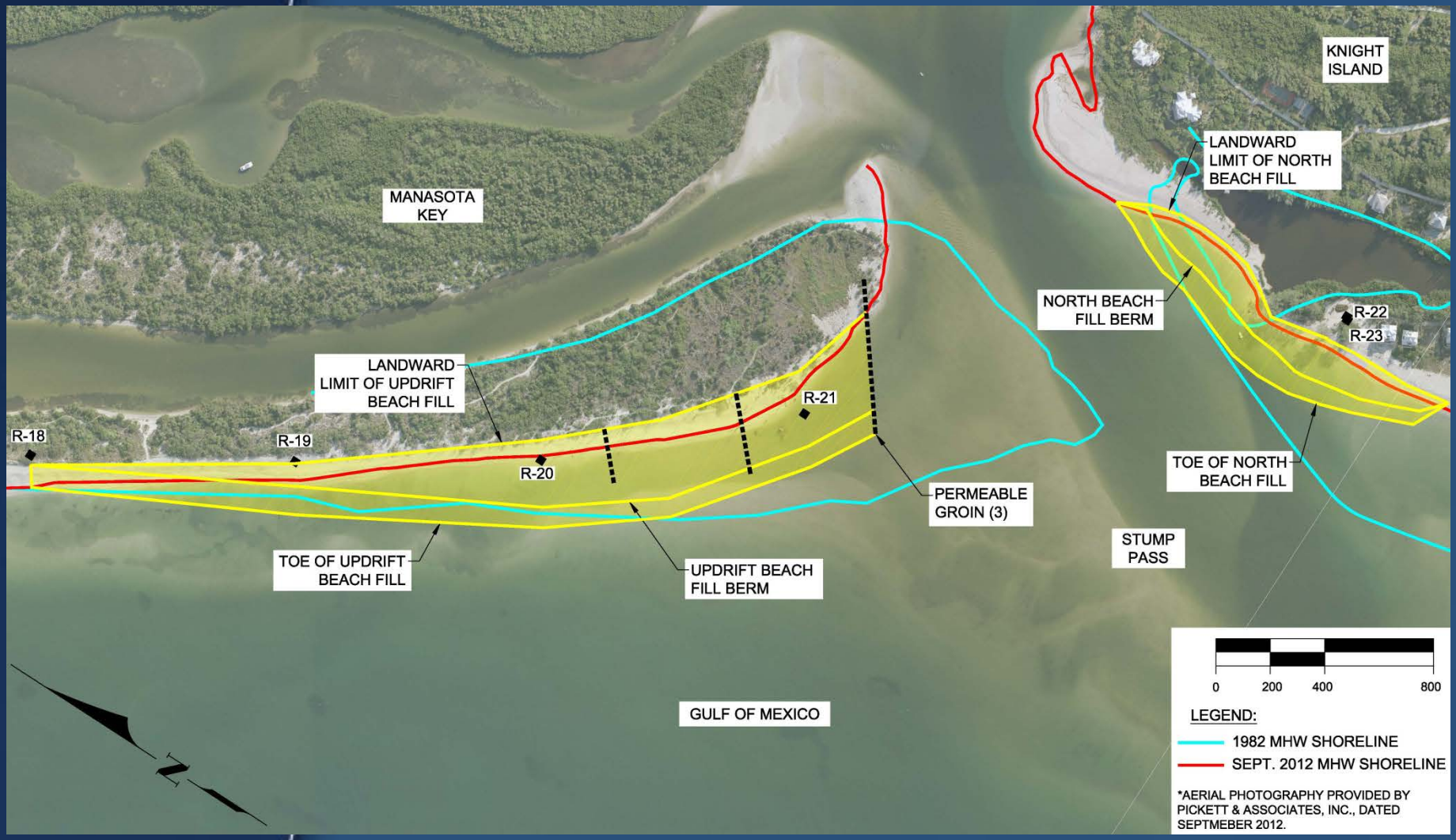


Conceptual Plan for South Beach Fill (Knight Island – Don Pedro Island)

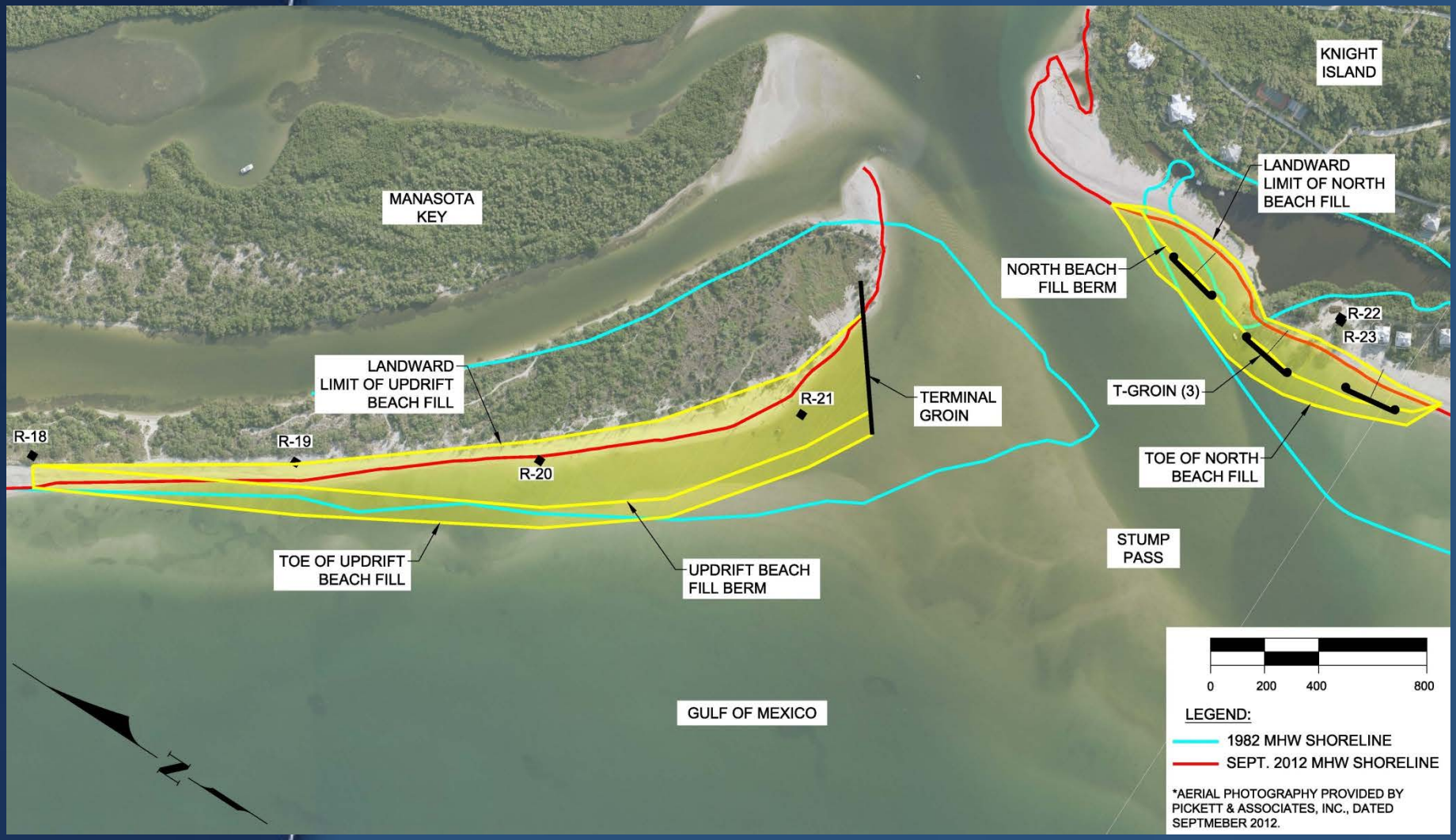
Beach Fill Conceptual Template for South Beach Fill (Knight / Don Pedro Islands)



Conceptual Plan for Beach Fill (Updrift /North) and Permeable Groin Field (Updrift)



Conceptual Plan for Beach Fills, Terminal Structure (Updrift) & T-Groin Field (North)



EVALUATION PARAMETERS

- Acres Remaining / Acres Created
- Volumes Remaining / Volumes Placed
- Downdrift Impacts / Benefits
- Reduction in Shoaling Rate
- Preservation of Tidal Prism
- Preservation of Navigation Controlling Depth
- Construction Budgets

Preliminary Construction Budgets
25-Year Time Frame

Alternative in Combination with Beach Fill Placement	Present Value *	Avg. Annual Cost *
0: Beach Fill Placement Only	$31.5 Million	$1.26 Million
1: Terminal Groin-Manasota Key	$22.2 Million	$887,000
2: Pile Cluster Groin Field-Manasota Key	$22.1 Million	$885,000
3: Terminal Groin-Manasota Key & T-Groin Field-Palm Island	$23.5 Million	$940,000

* Prime Interest Rate = 3.25% Inflation Rate = 2.20% 20% Contingency

Evaluation Matrix (Preliminary Results)

ALT	ACRES	VOLUME	DOWN-DRIFT	SHOAL RATE	TIDAL PRISM	CONTROL DEPTH	CONST BUDGET*
1	0.56	0.95	0.67	0.90	1.00	1.00	1.00
2	0.57	0.96	0.67	1.00	1.00	1.00	1.00
3	0.61	0.98	0.33	0.91	0.98	1.00	0.94

* Prime Interest Rate = 3.25% Inflation Rate = 2.20% 20% Contingency

PROGRAM RECOMMENDATIONS

- Conduct routine beach restoration utilizing offshore sand sources (storm damage reduction)
- Maintain program for engineered beaches (FEMA eligibility)
- Conduct routine inlet channel maintenance dredging & marking plan with bypassing to adjacent downdrift beach (improved navigation / storm damage reduction)
- Improve Project performance through installation of stabilizing structure(s) on south end of Manasota Key
- Implement Adaptive Management Plan
  - Permit additional stabilizing structures for inlet shoreline
- Continue robust environmental monitoring & protection
- Continue current base funding program but… aggressively pursue post-storm recovery projects (FEMA) & State funding

ACKNOWLEDGEMENTS

- Charlotte County BCC & Staff
- Advisory Committees
- Residents & Boating Community
- Bureau of Beaches and Coastal Systems
- FL State Park Staff
- FFWCC & Aquatic Preserves
- Federal Agencies
- Shorebird and Sea Turtle Monitors
- Coastal Tech & Coastal Engineering