

UPHAM BEACH STABILIZATION PROJECT

BOUSSINESQ WAVE MODELING TO ADDRESS CONCERNS OF LOCAL SURFING COMMUNITY



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Presentation Overview

- **Project Area History**
- **Study Objectives**
- **Model Results**
- **Alternatives Comparison**
- **Policy Considerations**
- **Conclusions & Recommendations**



Location Map

Upham Beach, Pinellas County, FL

Upham
Beach

Melbourne

- North end of Long Key
- Downtdrift of Blind Pass
- History of being highly erosional

1995-2008 Time Series

Jan 8, 2008

- **Persistent Erosion Hotspot**
- **Periodic Nourishment**
- **Structural Stabilization**
- **Geotube Experiment**

Image U.S. Geological Survey

Google

Blind Pass

Inlet Management Plan

- Required and cost-shared by FDEP
- Evaluated erosion related to inlet
- Recommended corrective actions
- Completed 1992 by CPE

Dec. 1978

12/78

Blind Pass Inlet Management Plan (IMP)

- **Goals:**
 - **100% sand bypassing**
 - **Maintain Upham Beach**
 - **Maintain Navigation (recreational)**
- **Option I: Close Inlet**
 - 1. No Action**
 - 2. Remove Jetties / Fill Channels**
 - 3. Nourish Upham Beach with offshore borrow area**
- **Option II: Sand Bypassing Methods**



Blind Pass IMP Sand Bypassing Options

1. Dredge inlet / nourish Upham every 6 years

→ 2. Install groins and dredge inlet / nourish Upham every 6 years

3. Dredge inlet & deposition basin / nourish Upham every 4 years

4. Purchase and operate dedicated dredge

5. Crane mounted jet pump on Treasure Island

6. Jet pump / fluidizer system in inlet

→ 7. Dredge inlet every 6 years / nourish Upham every 3 years

8. Install breakwaters and dredge inlet / nourish Upham every 6 years



Upham Beach Nourishment History

Project	Year	Length (ft)	Volume (cy)	Sand Source
City of St. Pete Nourishment	1975	2,500	75,000	Blind Pass
Initial Upham Beach Construction	1980	2,640	253,760	Blind Pass
1st Beach Renourishment	1986	2,400	96,712	Pass-A-Grille Channel
2nd Beach Renourishment	1991	2,400	229,950	Blind Pass
3rd Beach Renourishment	1996	2,400	225,000	Egmont Shoal
4th Beach Renourishment	2000	2,700	281,000	Blind Pass
5th Beach Renourishment	2004	3,600	385,000	Pass-a-Grille Channel and Ebb Shoal
2006 Corps Storm Repair	2006	1,960	124,000	Egmont Shoal

Geotextile Groins (Geotubes) installed in 2005 to test stabilization of Upham Beach and evaluate reduction of nourishment needs



Long Term Cost Savings

- **Historic nourishment events have required multiple distant sand sources**
- **County 25-yr nourishment cost projections:**
 - **\$53.5 M without structures**
 - **\$22.5 M with structures**
 - **Potential Cost Savings = \$31,000,000 (25 yrs)**
- **Estimated structure cost = \$5 M**
- **Skipping just one nourishment event in 25 years pays for installation cost of structures**



Pre-nourishment, Pre-geotubes



2004



Post-nourishment, Geotube Construction



2005



Post-nourishment, Post-geotubes



2008



How did we do??

Each photo represents two years after nourishment

2002



2008



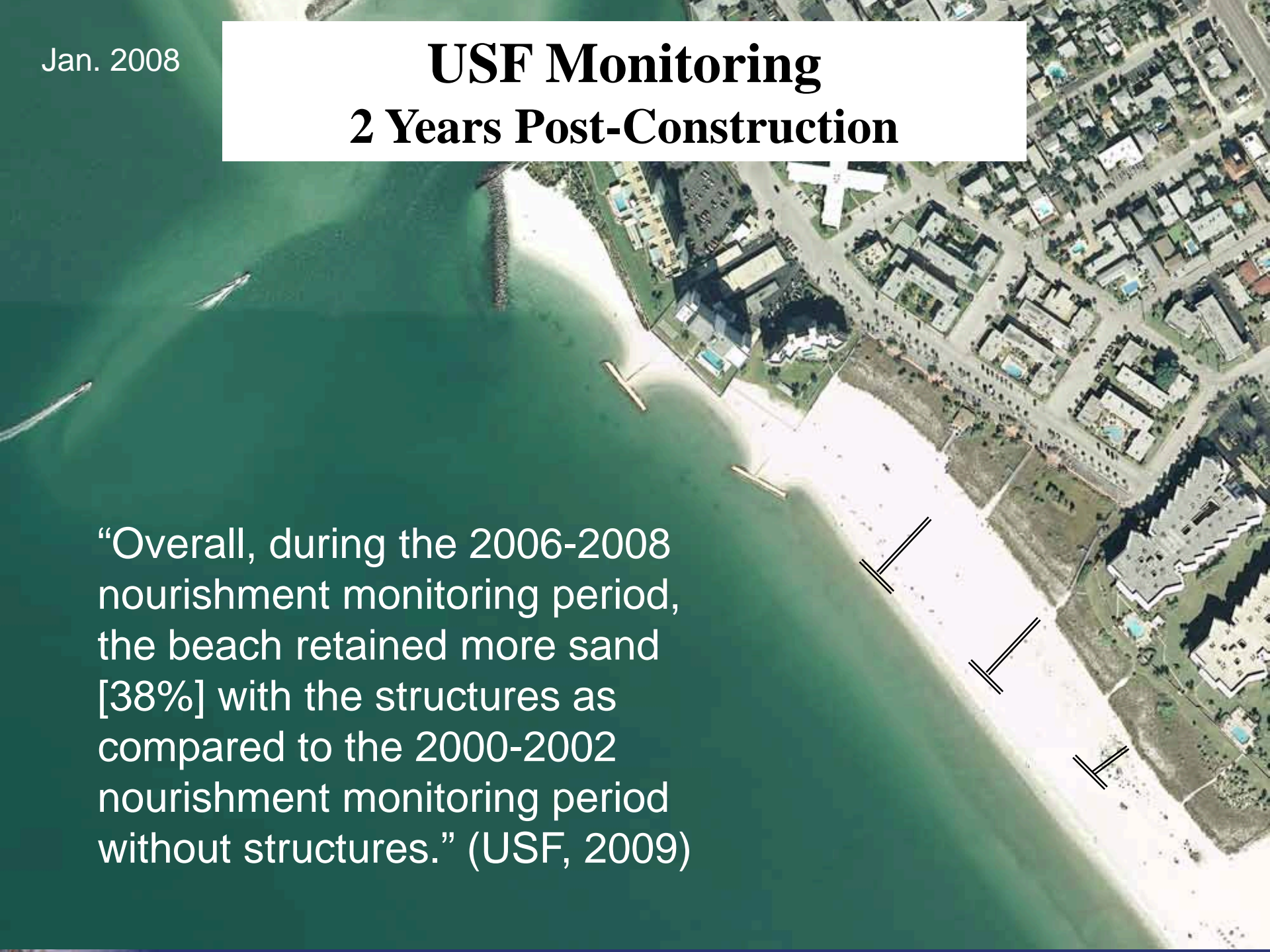
>100 ft wider beach!



Jan. 2008

USF Monitoring 2 Years Post-Construction

“Overall, during the 2006-2008 nourishment monitoring period, the beach retained more sand [38%] with the structures as compared to the 2000-2002 nourishment monitoring period without structures.” (USF, 2009)



No Downdrift Impacts Observed



← Downdrift shoreline is uniform and straight

Re-cap ...

- **Geotubes installed in 2005 to test effectiveness of reducing erosion without downdrift impacts**
- **Performance monitoring:**
 - **Structures retained sand**
 - **No negative downdrift impacts**
 - **Seawall only exposed after damage to geotubes**
 - **Some improvements can be made**
- **County planning to install permanent structures**
- **City of St. Pete Beach support (July 2008)**



Stakeholder Concerns

- Existing geotubes have been damaged
- Safety of beach goers
- Aesthetics and durability
- Effects on surfing:
 - wave quality, break location, reflection

February 2009



October 2009



What to do?

County offered to develop a modeling study to evaluate structural alternatives that would maintain storm protection and minimize impacts to beach users

- **Stakeholder Meetings (Feb-09, June-09)**
- **Design Alternatives Development**
- **BOUSS2D Wave Modeling**



Project Objectives

- **Storm protection**
- **Maintain minimum 40 ft wide beach**
- **Provide structural stabilization to hold sand**
- **Not cause downdrift erosion**
- **Reduce frequency/volume for nourishment**
- **Minimize impacts to surfers and beach goers**
- **Minimize cost & permitting effort**

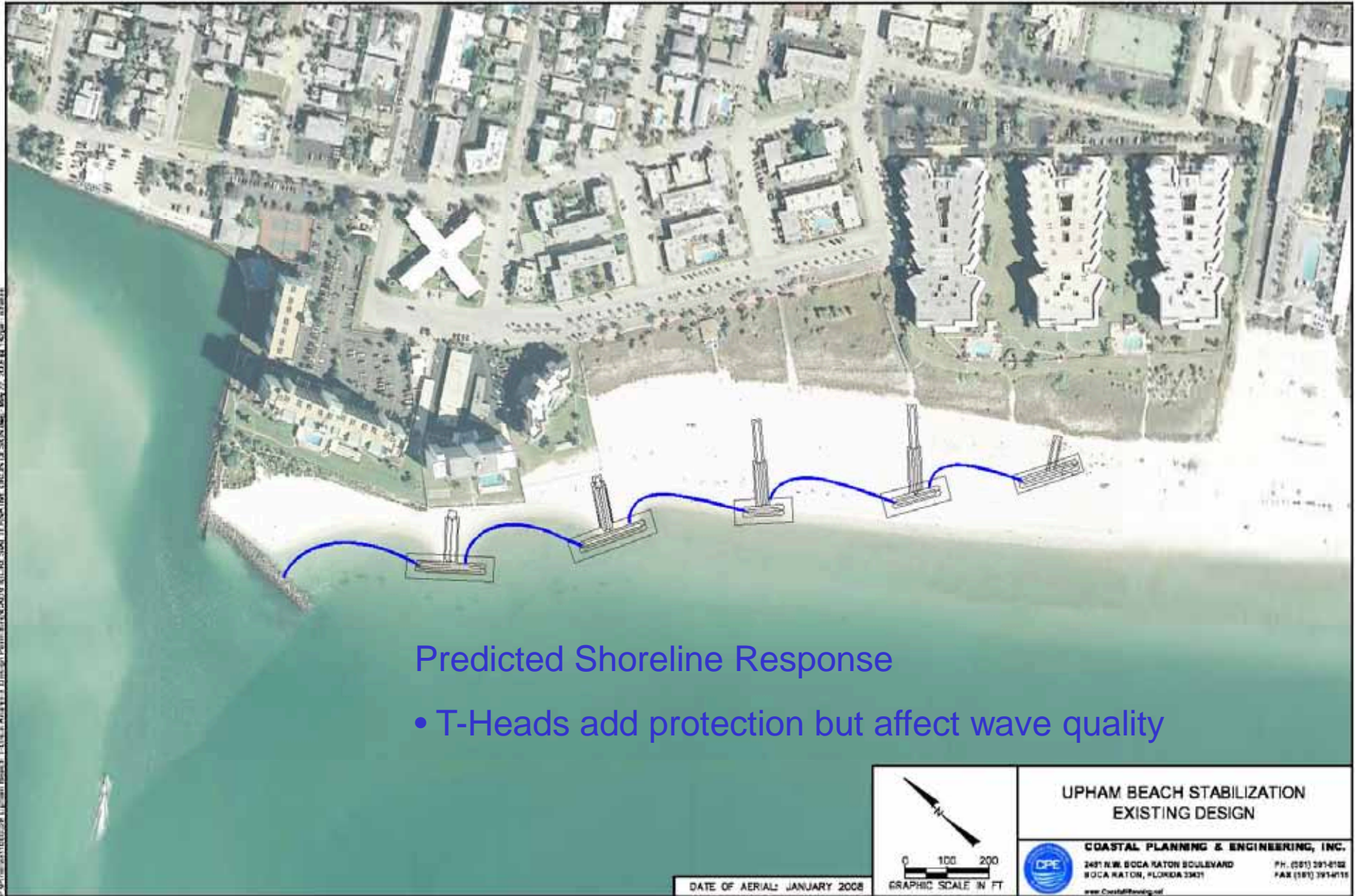


Alternatives Development

- Existing Design
- 4 Alternatives

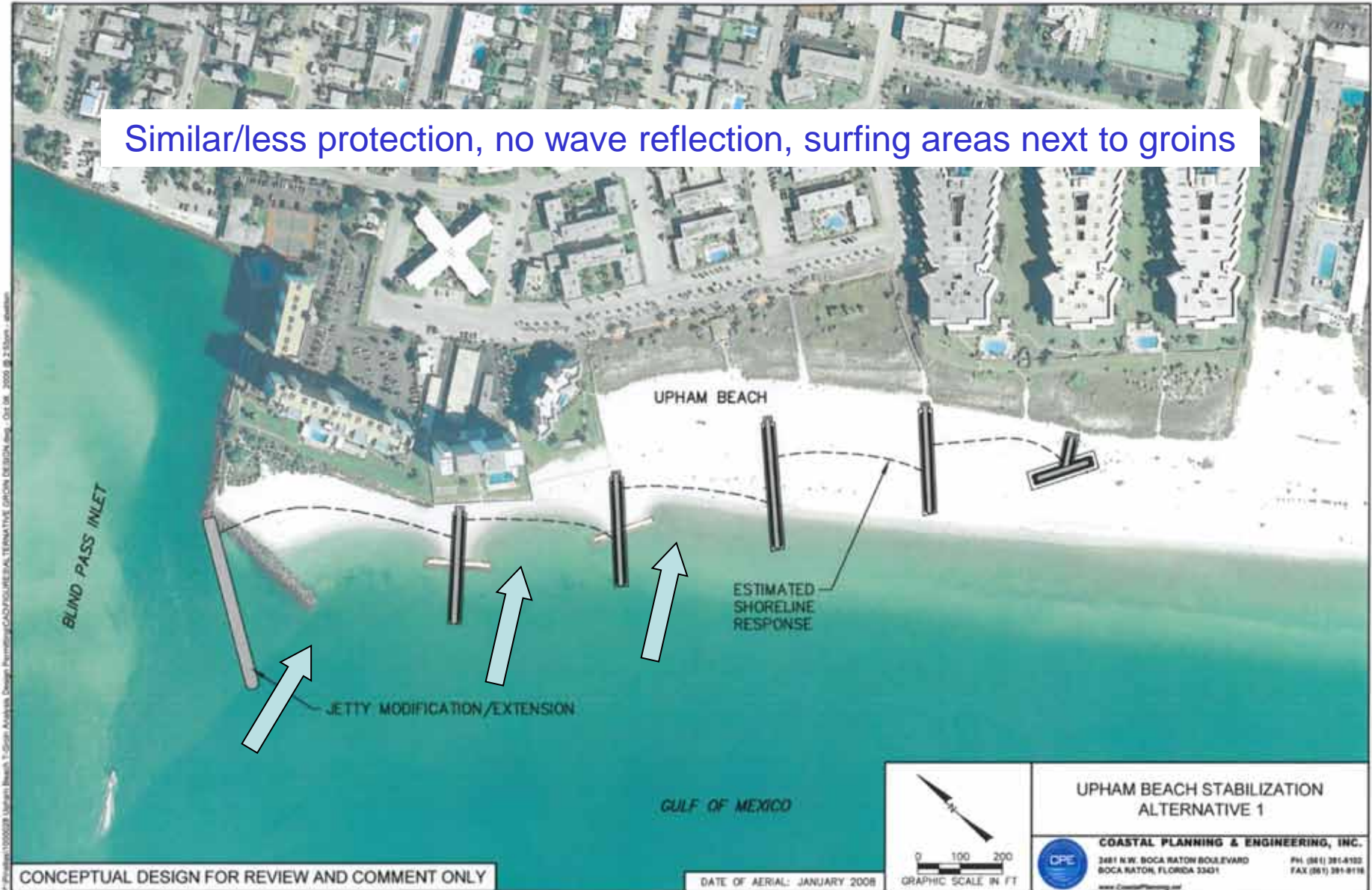


Existing Design



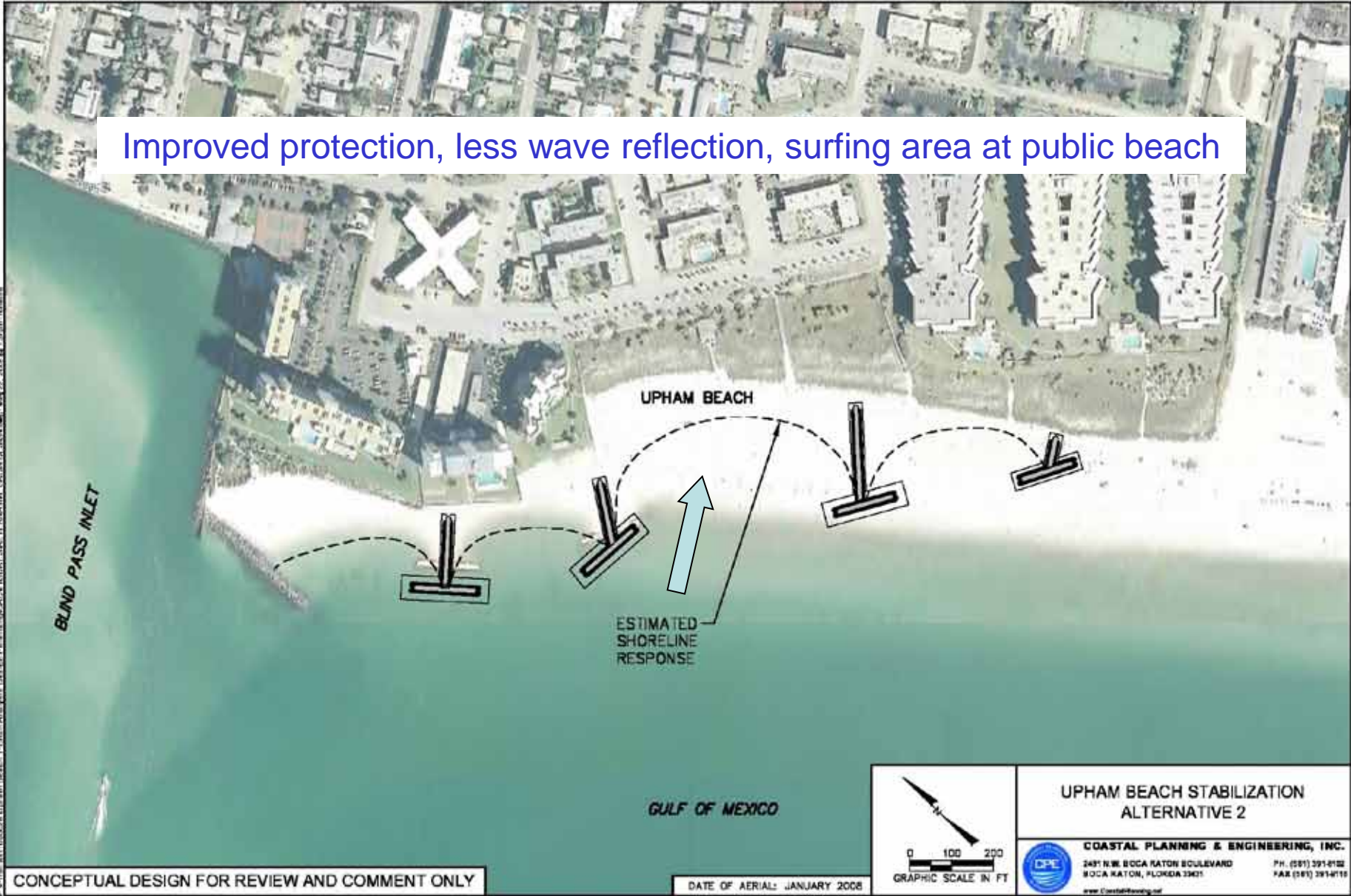
Alternative 1: Straight Groins, Extended Jetty

Similar/less protection, no wave reflection, surfing areas next to groins



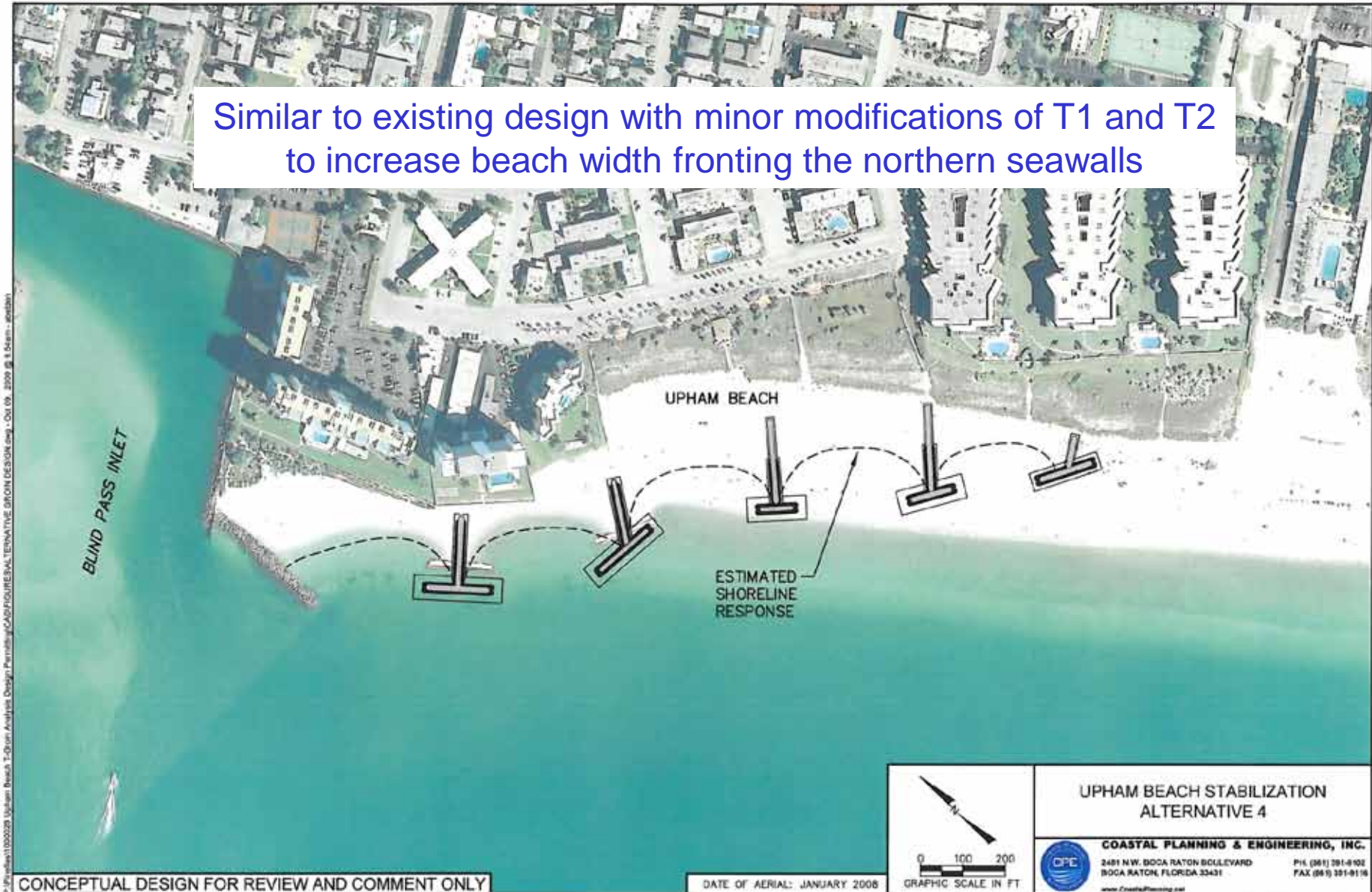
Alternative 2: Modified T-Head Design

Improved protection, less wave reflection, surfing area at public beach



Alternative 4: Modified Existing Design

Similar to existing design with minor modifications of T1 and T2 to increase beach width fronting the northern seawalls



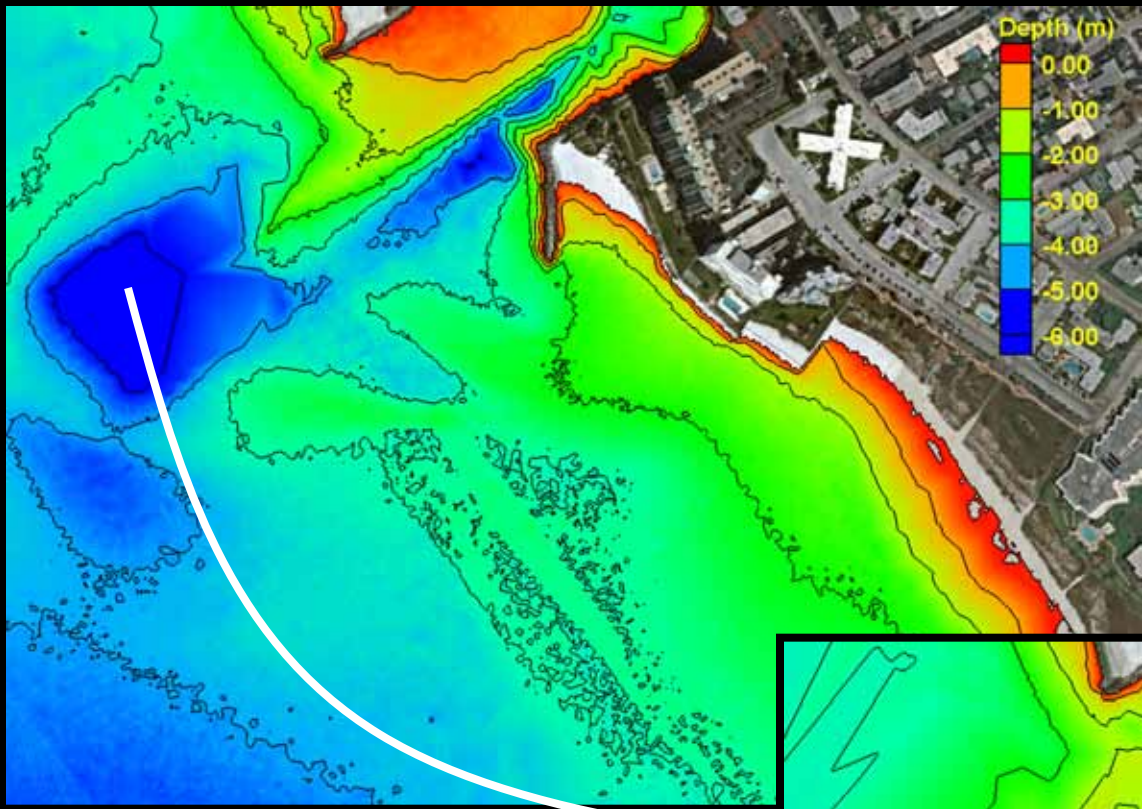
BOUSS-2D Wave Breaking Model

- **Simulates waves and surface currents**
- **Model simulations included cold fronts and hurricane conditions**
- **Verified through comparison with observed conditions**
- **Evaluation of existing conditions and potential alternatives**



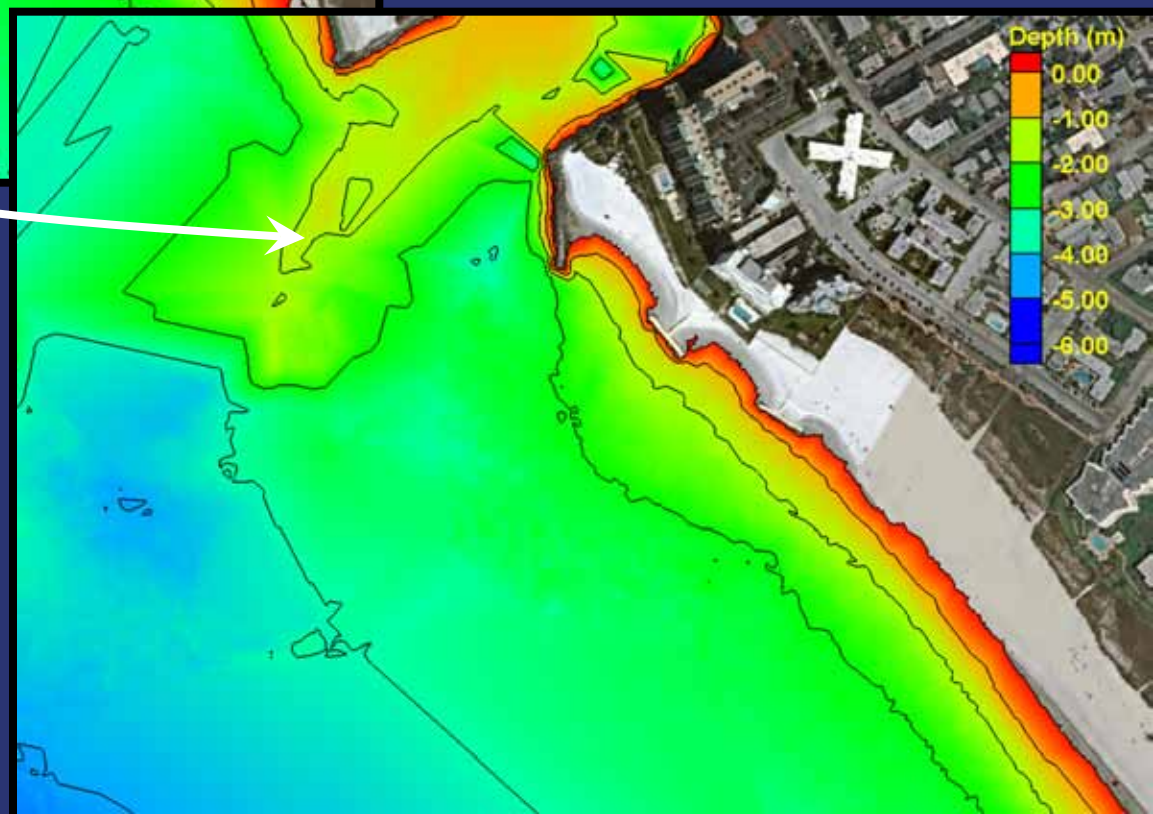
Simulation of Observed Conditions





2004 Bathymetry
“Good Old Days”
(surfing)

Growth of ebb shoal



2006 Bathymetry

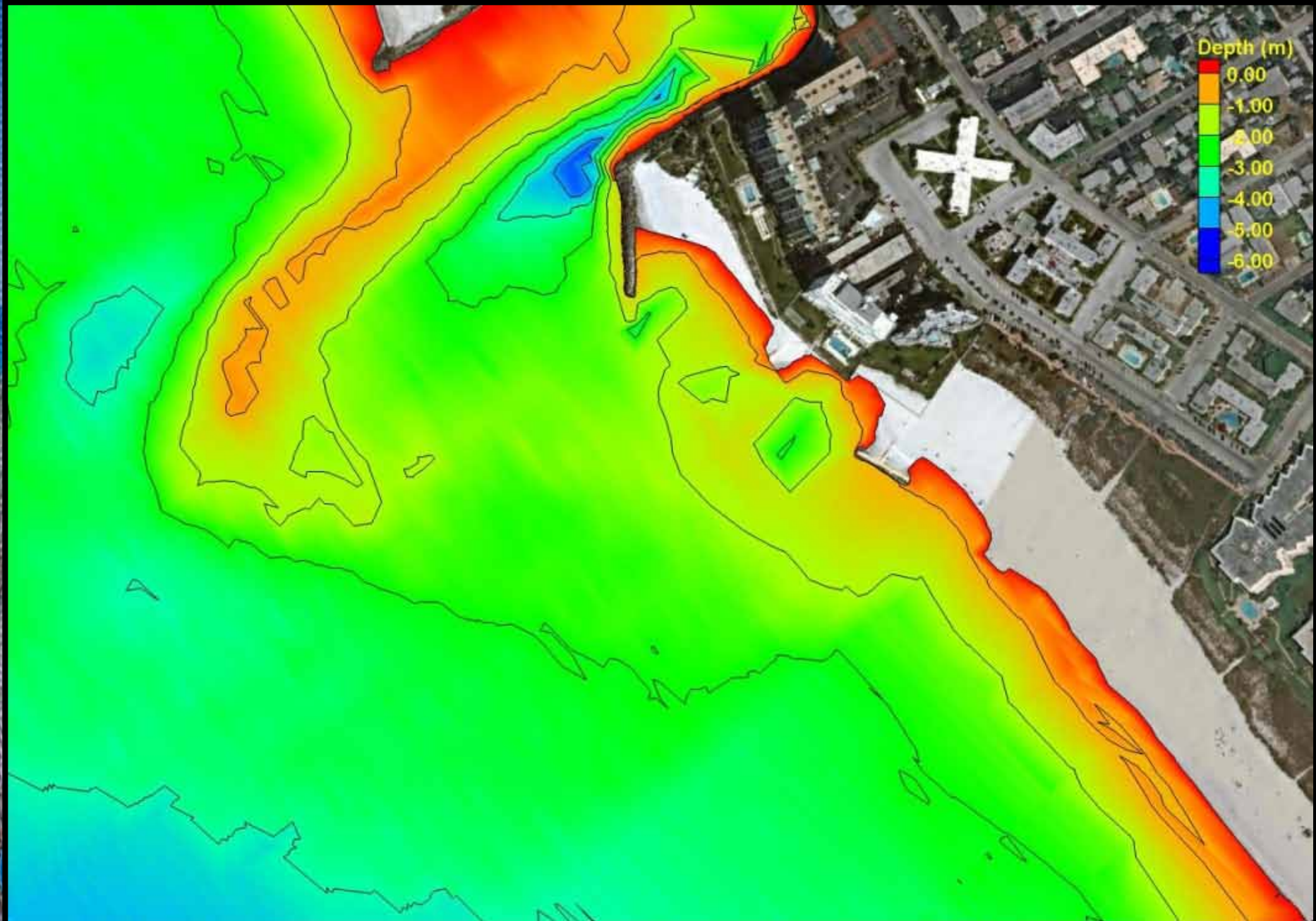


Model Results

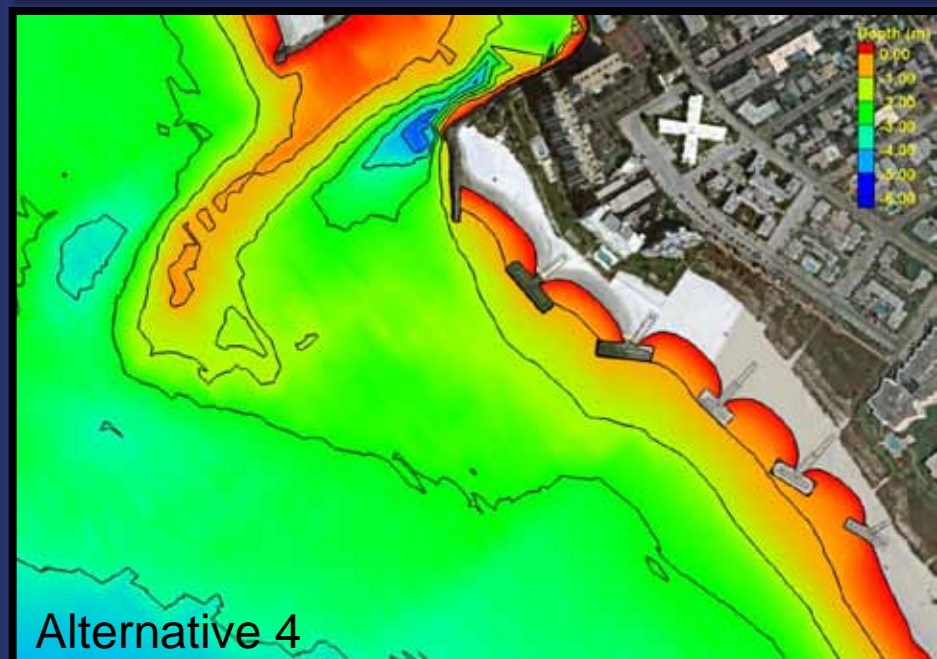
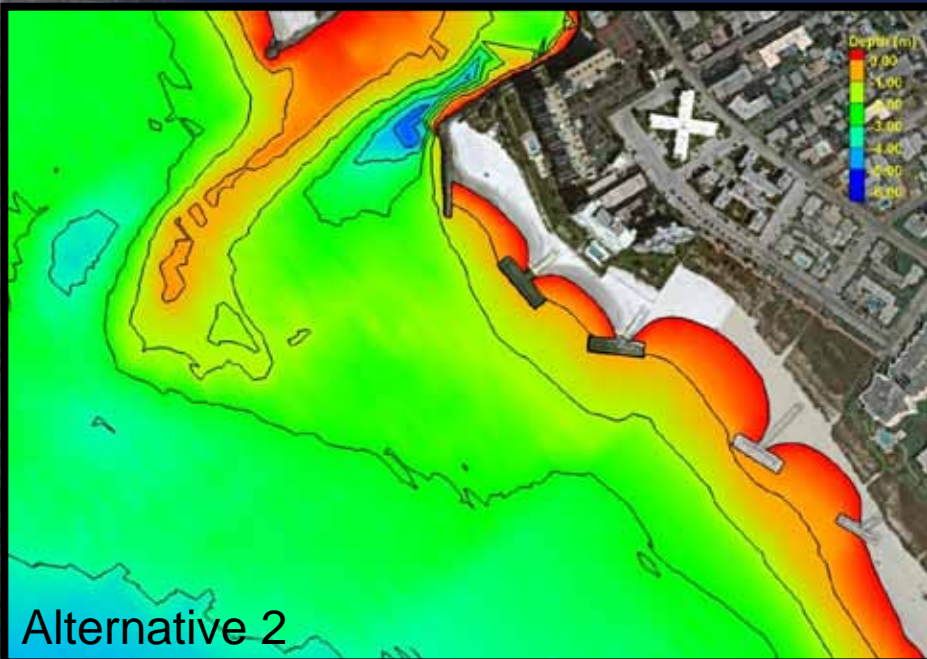
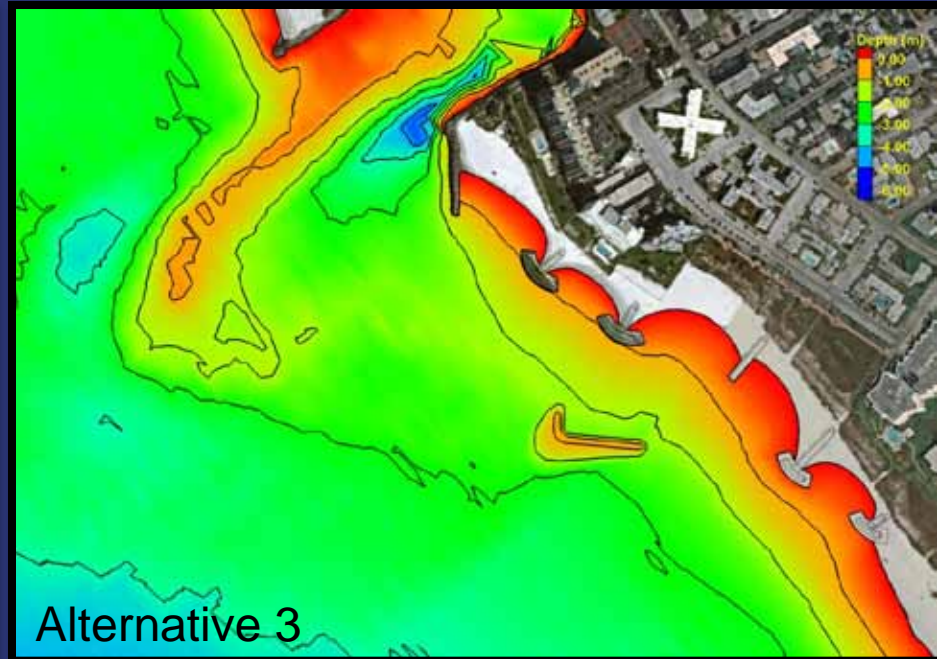
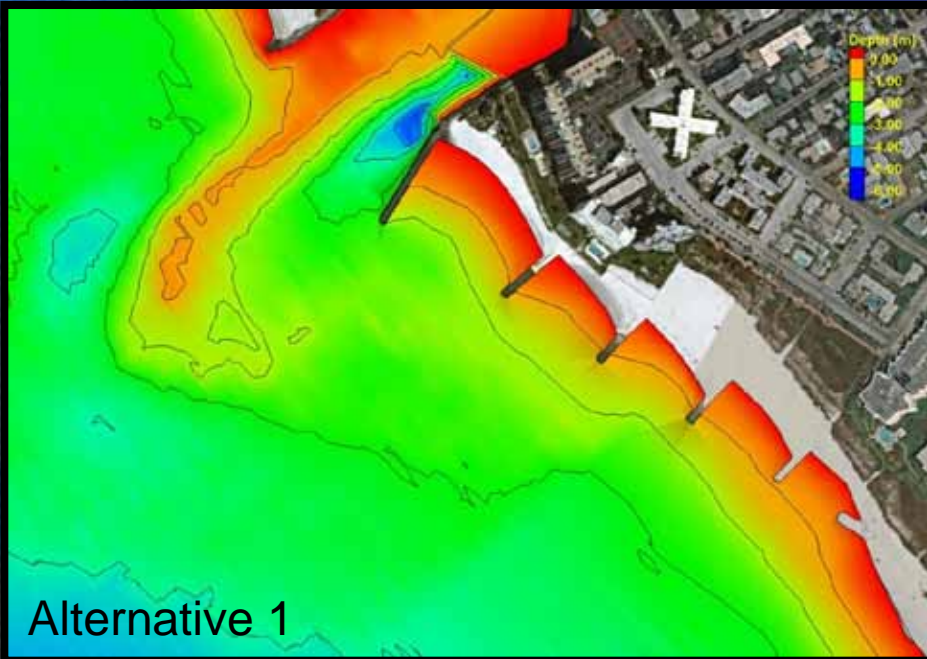
- **2009 Conditions**
- **4 Alternatives**



Existing Conditions for Model Runs (2009 Bathymetry)



Alternatives Analysis with 2009 Bathymetry



Model Wave Cases

EVENT	Hs (ft)	Tp (s)	Nearshore Direction (degrees)
Cold Front A Cold Front A (b)	2.5	9.2	270 (b) - higher angle
Cold Front B	3.0	6.5	282
IVAN	3.3	11.8	250

Note: Wave height at breaking is larger due to wave shoaling.

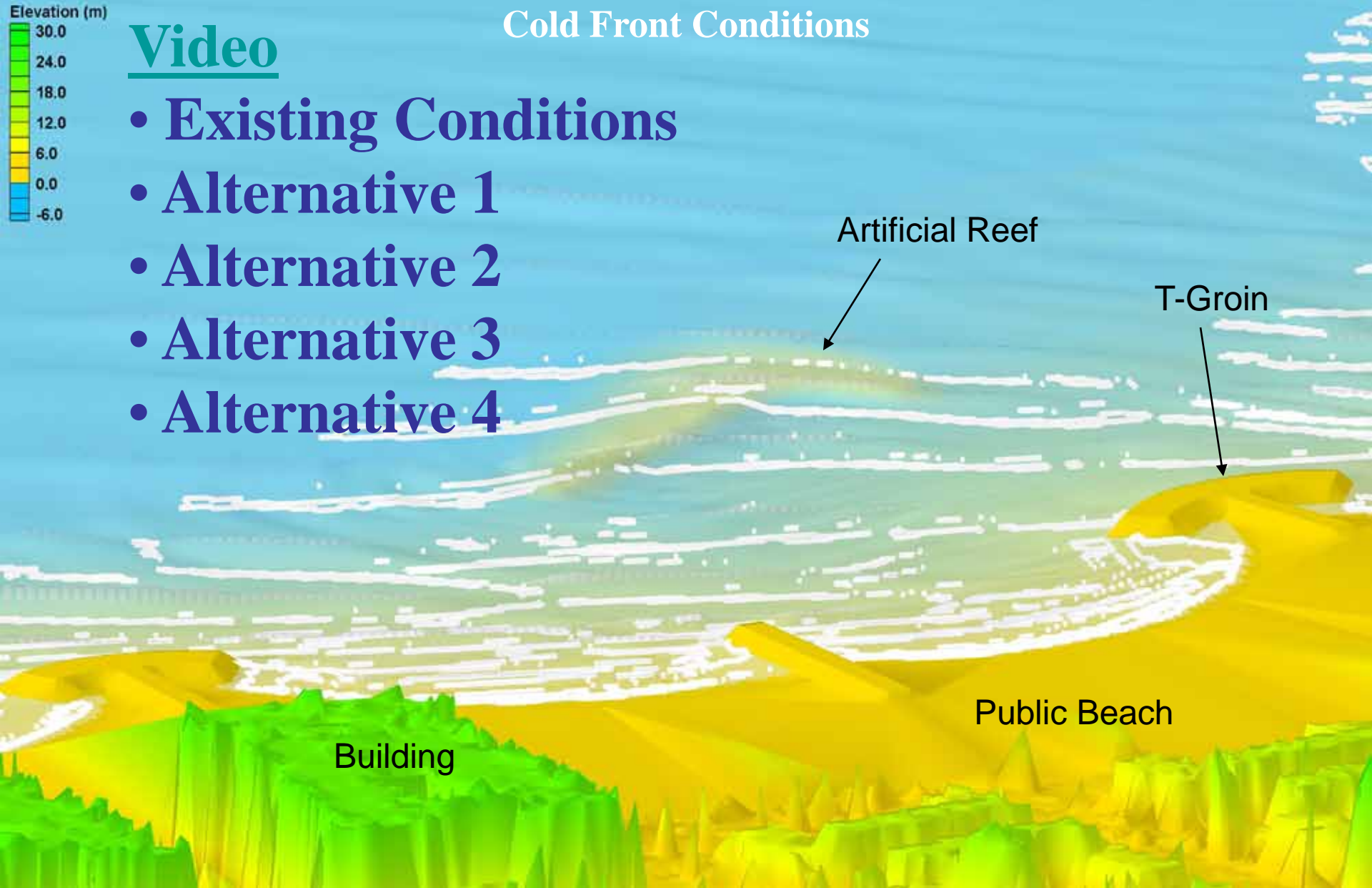


Example Model Simulations

Cold Front Conditions

Video

- Existing Conditions
- Alternative 1
- Alternative 2
- Alternative 3
- Alternative 4



Study Findings

- Shoal affects wave energy and surfing conditions.
- Existing geotube design is effective in maintaining storm protection, but impacts surfing areas.
- T1 and T2 can be modified slightly to improve performance at north end.
- T5 still buried 3+ years after beach construction.
- Modifying groin field can address concerns without compromising storm protection.
- Safety issues remain and can be addressed.



Alternative Comparison Matrix

Objective	Existing Design	Straight Groins ALT 1	Modified T-Heads ALT 2	Curved Heads w/ Reef ALT 3	Modified Existing Design ALT 4
Storm Protection to Upland Properties	**	*	***	**	***
Limit Erosion to Downdrift Beaches	***	**	***	***	***
Reduce Nourishment Needs	***	**	***	***	***
Minimize/Mitigate Impacts to Surfers	*	***	**	***	*
Maximize Public Beach Width	***	**	**	**	***
Minimize Permitting Effort	***	**	**	*	***
Cost Estimate	\$5M	\$6M	\$4M	\$8M	\$5M

Note: Cost estimates provided for comparison purposes only




Recommendations to County

- Repair existing geotubes with upcoming nourishment project to retain sand
- Move forward with permit application for permanent structures:
Alternative 2 – Modified groin field with one less structure fronting public beach



Memorandum



To: Beach Stewardship Committee
From: Steven J. Hallock, Public Services Director [JPH](#)
Date: November 12, 2009
Re: Upham Beach Recommendation
Copy: Mike Bonfield, City Manager
William Davis, Pinellas County
Andrew Squires, Pinellas County

Over the years the City has been closely monitoring the Upham Beach Stabilization project and reviewing all related documentation as it became available. With all of this information and a final decision regarding the permanent structures needed we are now prepared to make a recommendation to the Beach Stewardship Committee based on the latest study's findings and we are proposing "Alternative 2 – Modified T-Head Design". The reasons for this are as follows:

- It will provide the storm protection needed for resident homes. The modifications to T-heads 1 and 2 should protect the northern beach even better than it is now.
- It maintains the minimum 40 foot wide white sandy beach and provides more beach front for visitors. It is important to note that the beach will be much wider than this the vast majority of the time and the minimum may never be reached.
- It provides permanent structural stabilization to hold the sand in place and addresses the problem of what some people think is the fastest eroding beach in the State of Florida.
- It does not cause down drift erosion of sand so the beaches to the south are protected.
- Not only does it save the tax payer \$1.0M to \$1.5M in initial construction costs, it also reduces the frequency and volume of beach nourishment and thus saves the tax payer an estimated \$31.0M over the next 25 years.
- It reduces the number of T-groins from 5 to 4 so that the public beach is not divided by a T-groin, and because T-groins come with inherent safety concerns it reduces the risk for all beach visitors.
- The Blind Pass Inlet is the sole source of sand and the channel is dredged on a routine schedule to ensure navigation which is a primary goal of the Blind Pass Inlet Management Plan (BIMP).
- Since the design is so similar to the existing one it should not slow down the permitting process because the design has been tested and proven.
- **It maintains an area for the surfing stakeholders thus creating a win-win situation for all.**

In order to verify "Alternative 2 – Modified T-Head Design" meets all of the project goals we are also recommending that during the nourishment in the spring of 2010 that this design be installed utilizing the temporary structures. This way the final design can be tested and evaluated over the next 2 to 3 years before the permanent structures are installed. If the design performs as expected then the permanent structures can be installed with a very high level of confidence. If the design does not perform as expected then the final and permanent design can be adjusted based on the additional data collected in the next few years.

"It maintains an area for the surfing stakeholders thus creating a win-win situation for all." Steven J. Hallock, Public Services Director, City of St. Pete Beach.



Guidelines & Policy Considerations

- **Ground Rules: No consideration of aesthetics. Functionality only.**
- **Are structural systems functionally interchangeable?**
- **Are their performances equally sensitive to an understanding (or lack of understanding) of nearshore processes?**
- **Can they be pre-filled to absolutely negate any possibility of downdrift effects?**
- **Are adjustable groins viable?**
- **Can numerical models be used to discriminate between the performances of different types of stabilizing structures?**
- **Selection criteria for your design if appropriate.**



Conclusions

- **Structures can and should be used strategically to cope with hotspots and limited sand resources**
- **Structures can and do effect wave quality and recreation; there are safety issues**
- **Science and monitoring should be the basis for design**
- **Coordination with stakeholders is important**
- **Design guidelines can be developed, but policies may be difficult**
- **“one size doesn’t fit all”**



UPHAM BEACH STABILIZATION PROJECT

The authors would like to acknowledge Pinellas County for funding this study and taking proactive steps toward addressing concerns of the surfing and beach community.

Thank You!

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