An aerial photograph of a coastal region. The left side shows a dense network of green marshes and wetlands. A river or estuary flows from the top right towards the bottom center, eventually meeting the ocean. The ocean is a deep blue, and the coastline is visible on the right side. The text is overlaid on the left side of the image.

Feasibility And Advisability Of The Use Of A Terminal Groyne As An Erosion Control Device

 MOFFATT & NICHOL

DIAL CORDY
AND ASSOCIATES INC
Environmental Consultants

Introductions & Meeting Objective

- **Introductions**
- **Overall Objective of Meeting is To Present Project Team, Scope of Work, Select Potential Study Sites & Discuss Project Methods for Concurrence**
 - **Contractor Team is Responsible for Technical Study**
 - **CRC Will Be Responsible for Policy Recommendations**
 - **Finalize Site Selection Today**



House Bill 709

Two Sections:

“An Act To Impose A Moratorium On Certain Actions Of The Coastal Resources Commission Related To Temporary Erosion Control Structures And To Direct **The Coastal Resources Commission To Study The Feasibility And Advisability Of The Use Of A Terminal Groin As An Erosion Control Device.**”

26th day of August, 2009

House Bill 709

SECTION 2:

“The Coastal Resources Commission, in consultation with the Division of Coastal Management, the Division of Land Resources, and the Coastal Resources Advisory Commission, shall conduct a **study of the feasibility and advisability of the use of a terminal groin as an erosion control device** at the end of a littoral cell or the side of an inlet to limit or control sediment passage into the inlet channel. For the purpose of this study, a littoral cell is defined as any section of coastline that has its own sediment sources and is isolated from adjacent coastal reaches in terms of sediment movement.”

Items Identified In House Bill 709

Shall consider:

- (1) Scientific data regarding the **effectiveness of terminal groins** constructed in North Carolina and other states in controlling erosion. Such data will include consideration of the effect of terminal groins on adjacent areas of the coastline.
- (2) Scientific data regarding the **impact of terminal groins on the environment** and natural wildlife habitats.
- (3) Information regarding the **engineering techniques used to construct terminal groins**, including technological advances and techniques that minimize the impact on adjacent shorelines.

Items Identified In House Bill 709

Shall consider:

- (4) Information regarding the current and projected **economic impact** to the State, local governments, and the private sector from erosion caused by shifting inlets, including loss of property, public infrastructure, and tax base.
- (5) Information regarding the public and private monetary **costs of the construction and maintenance** of terminal groins.
- (6) Whether the potential use of terminal groins should be **limited to navigable, dredged inlet channels**.

Items Identified In House Bill 709

Public Input

- In conducting the study, the Commission shall hold at least **three public hearings** where interested parties and members of the general public will have the opportunity to present views and written material regarding the feasibility and advisability of the use of a terminal groin as an erosion control device at the end of a littoral cell or the side of an inlet to limit or control sediment passage into the inlet channel.

Report

- No later than **April 1, 2010**, the Commission shall report its findings and recommendations to the Environmental Review Commission and the General Assembly.

Project Team Members

Project Team Members

- Moffatt & Nichol – Coastal Engineering
- Dial Cordy and Associates, Inc. -
Environmental
- Dr. Duncan FitzGerald (Boston University) –
Coastal Geology
- Dr. Chris Dumas (UNCW) – Economics

Overall Project Work Plan

Task 1 – Coastal Engineering Analyses of Effectiveness and Impacts of Terminal Groins

Task 2 – Environmental Resource Analyses of Potential Effects of Terminal Groins

Task 3 – Construction Techniques to Limit Impacts

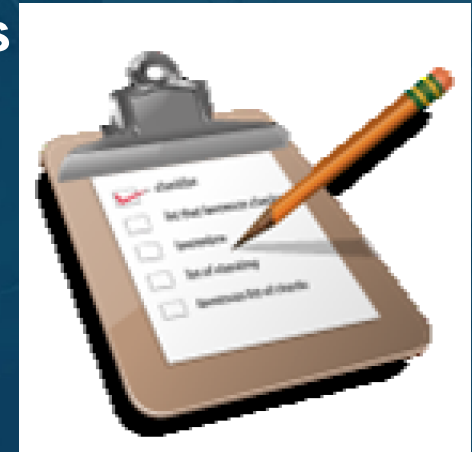
Task 4 – Economic Study of Impacts of Shifting Inlets

Task 5 – Initial Construction and Maintenance Costs

Task 6 – Potential Locations Study

Task 7 – Public Input

Task 8 – Draft and Final Report



Schedule, Public Hearings & Reports

Project Schedule

- Duration is Seven (7) Months – (Sept – March)

Public Hearings

- Sheraton Atlantic Beach – October 29th, 2009 - 5 PM
- Raleigh – January 13th, 2010 - TBD
- Sunset Beach – TBD

Reports to General Assembly

- Findings of the Study and Commission Recommendations Will Be Submitted to the ERC for Consideration and Further Action

Roles of CRC/CRAC, Science Panel

CRC/CRAC

- Will Provide Guidance to M&N During the Study
- Will Be Responsible for Developing the Policy Conclusions and Recommendations to Be Supplied to the ERC and Ultimately the General Assembly

Science Panel

- Science Panel Will Be Involved in the Scoping Meeting and Peer Review of Interim Documents and Draft and Final Report Review
- M&N Will Provide Memos Describing Methodologies and Analyses for Review and Comment – **Schedule Will Necessitate Quick Responses**

Selection of Sites

Initial Site List is Concentrated in Southeast Due To Environmental and Other Similarities

- Will Utilize Northeast Sites Only If Needed
- Will **Select Eight (8) Best Sites** for Coastal Analyses
- Coastal Analyses Will Overlap as Much as Possible with Environmental Analyses (site data diversity)

What is a Terminal Groin?

JETTY - On open seacoasts, a structure extending into a body of water, which is designed to prevent shoaling of a channel by littoral materials and to direct and confine the stream or tidal flow. Jetties are built at the mouths of rivers or tidal inlets to help deepen and stabilize a channel.

GROIN - Narrow, roughly shore-normal structure built to reduce longshore currents, and/or to trap and retain littoral material. Most groins are of timber or rock and extend from a seawall, or the backshore, well onto the foreshore and rarely even further offshore.

TERMINAL GROIN – a groin, often at the end of a littoral cell or at the updrift side of an inlet, intended to prevent sediment passage into the channel beyond

What is a Terminal Groin?



Preliminary Site List

New York - Coney Island
- Rockaway

Maryland - Ocean City Inlet

Virginia - Willoughby Spit
- Chesapeake Beach

North Carolina - Oregon Inlet
- Buxton (Cape Hatteras Lighthouse)
- Fort Macon
- Shell Island (removed)

South Carolina - Folly Beach
- Hunting Island (not built)
- Hilton Head

Georgia - Tybee Island

Florida - Amelia Island
- John's Pass
- Clearwater Pass
- Honeymoon Island
- Baker's Haulover Inlet
- Blind Pass
- Bonita Beach
- Captiva Island
- Boca Grande Lighthouse



Preliminary Site List

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 - Rockaway

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Virginia - Willoughby Spit
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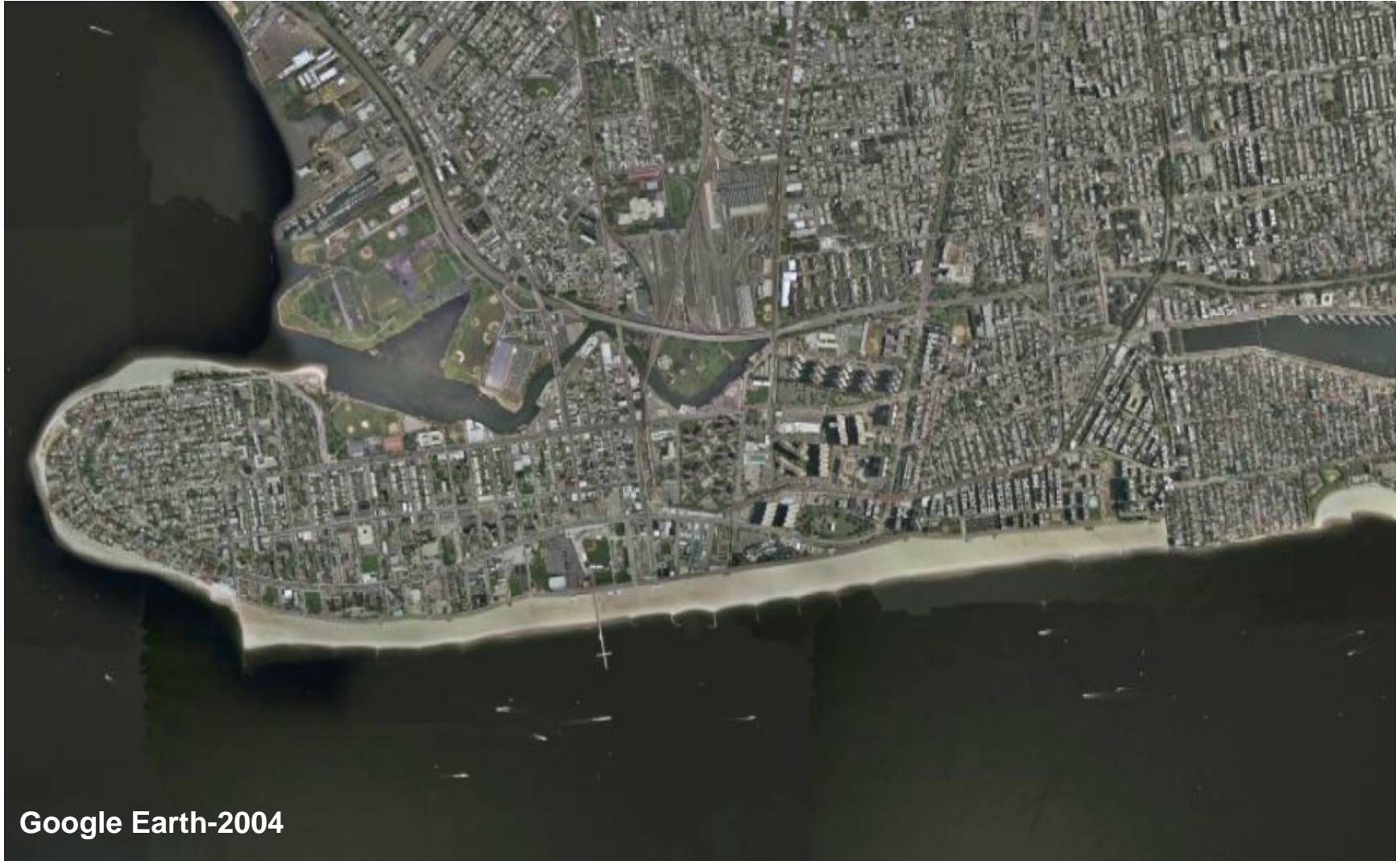
South Carolina - Folly Beach
 - Hunting Island (not built)
 - Hilton Head

Georgia - Tybee Island

Florida - Amelia Island
 - St. Lucie Inlet
 - **Jupiter Inlet**
 - **Baker's Haulover Inlet**
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Coney Island, NY

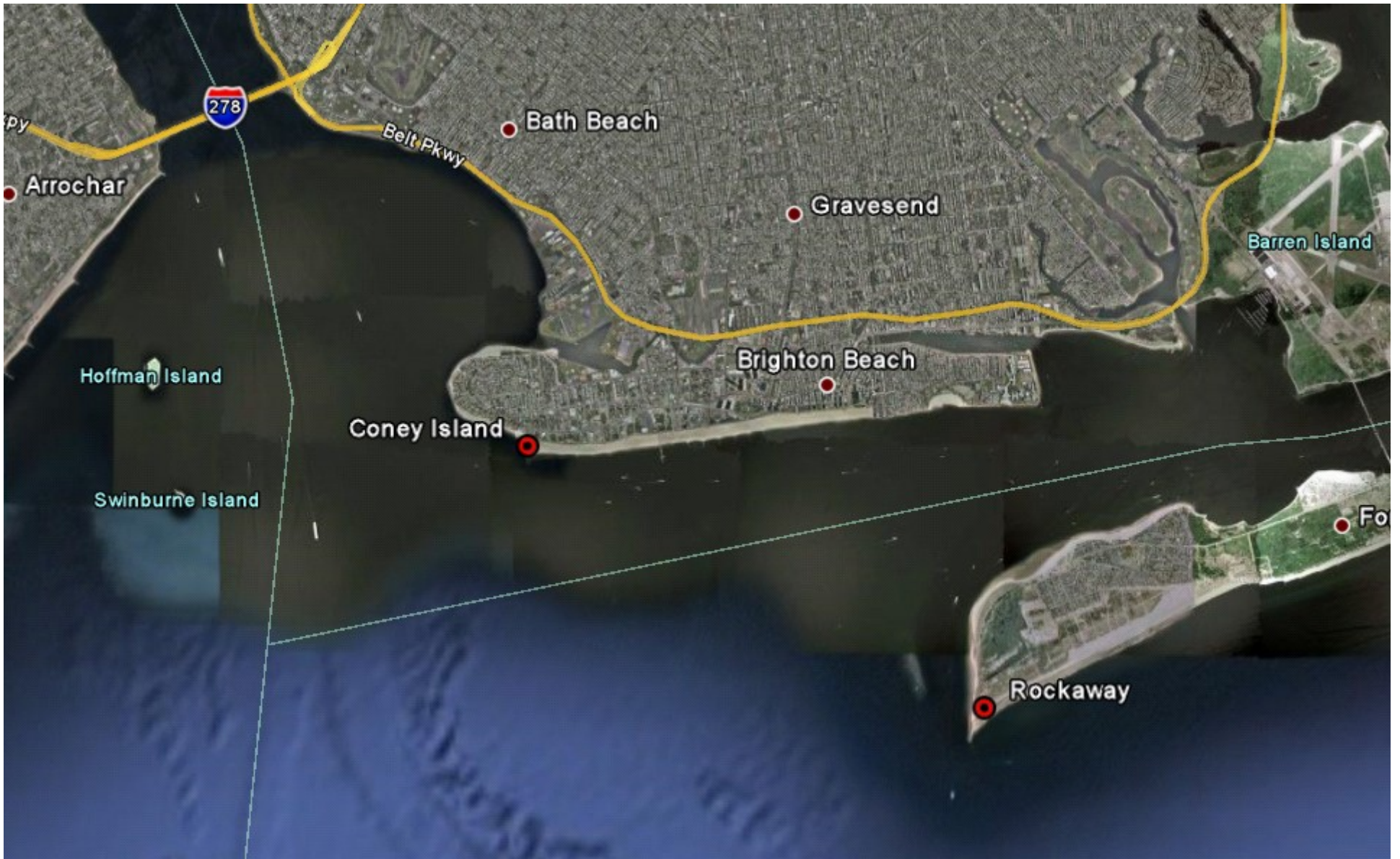


Google Earth-2004

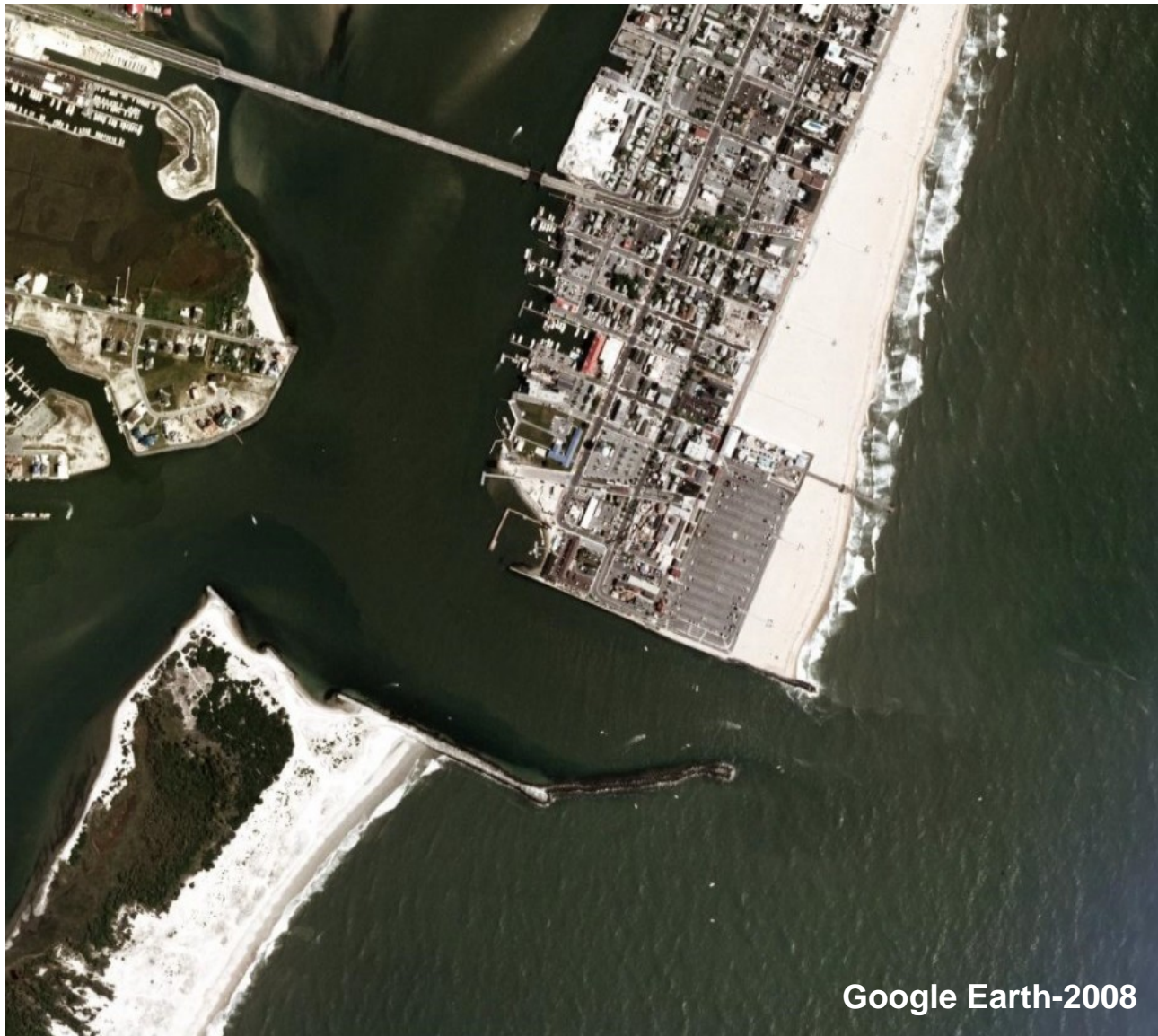
Rockaway, NY



Google Earth-2004

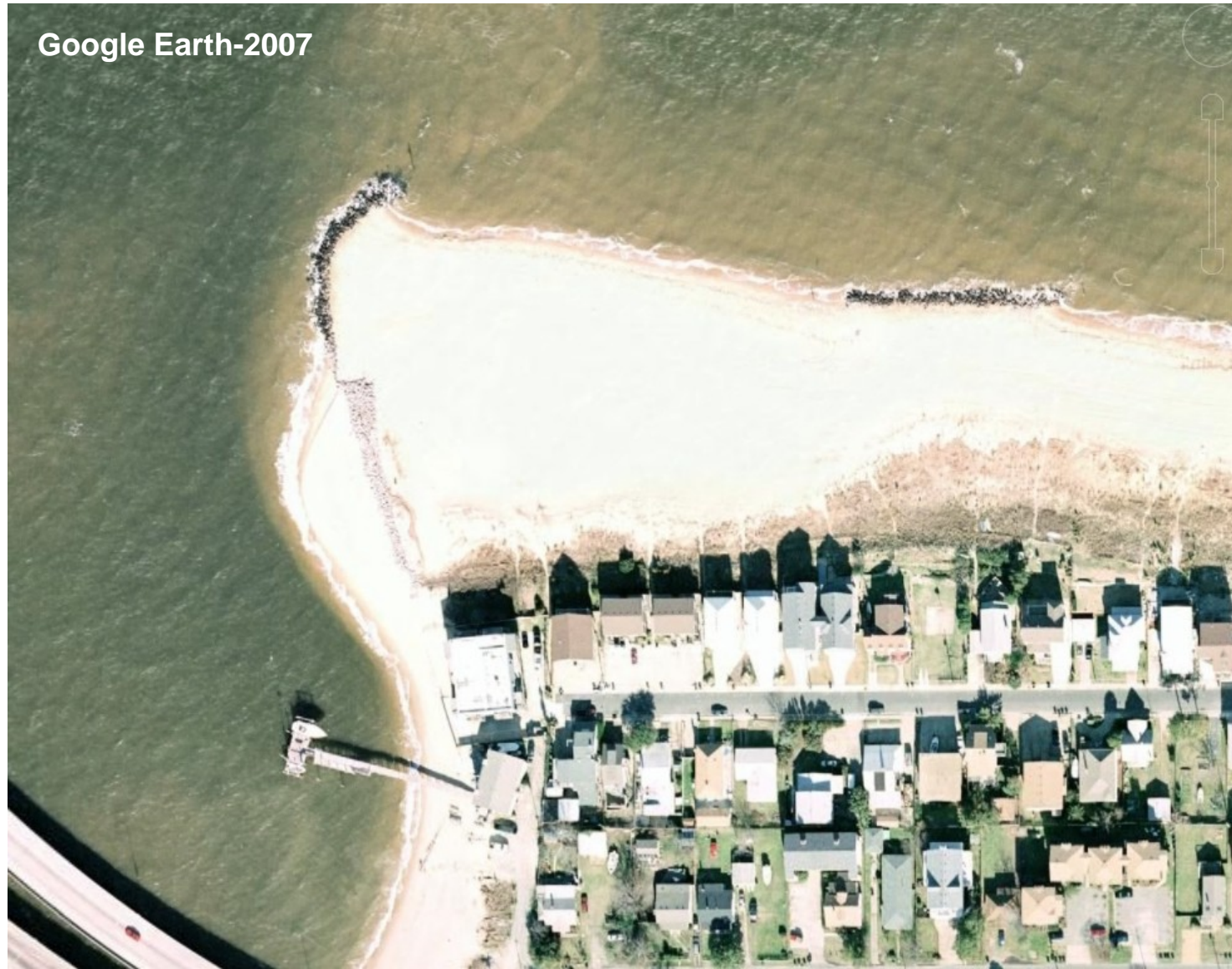


Ocean City Inlet, MD



Google Earth-2008

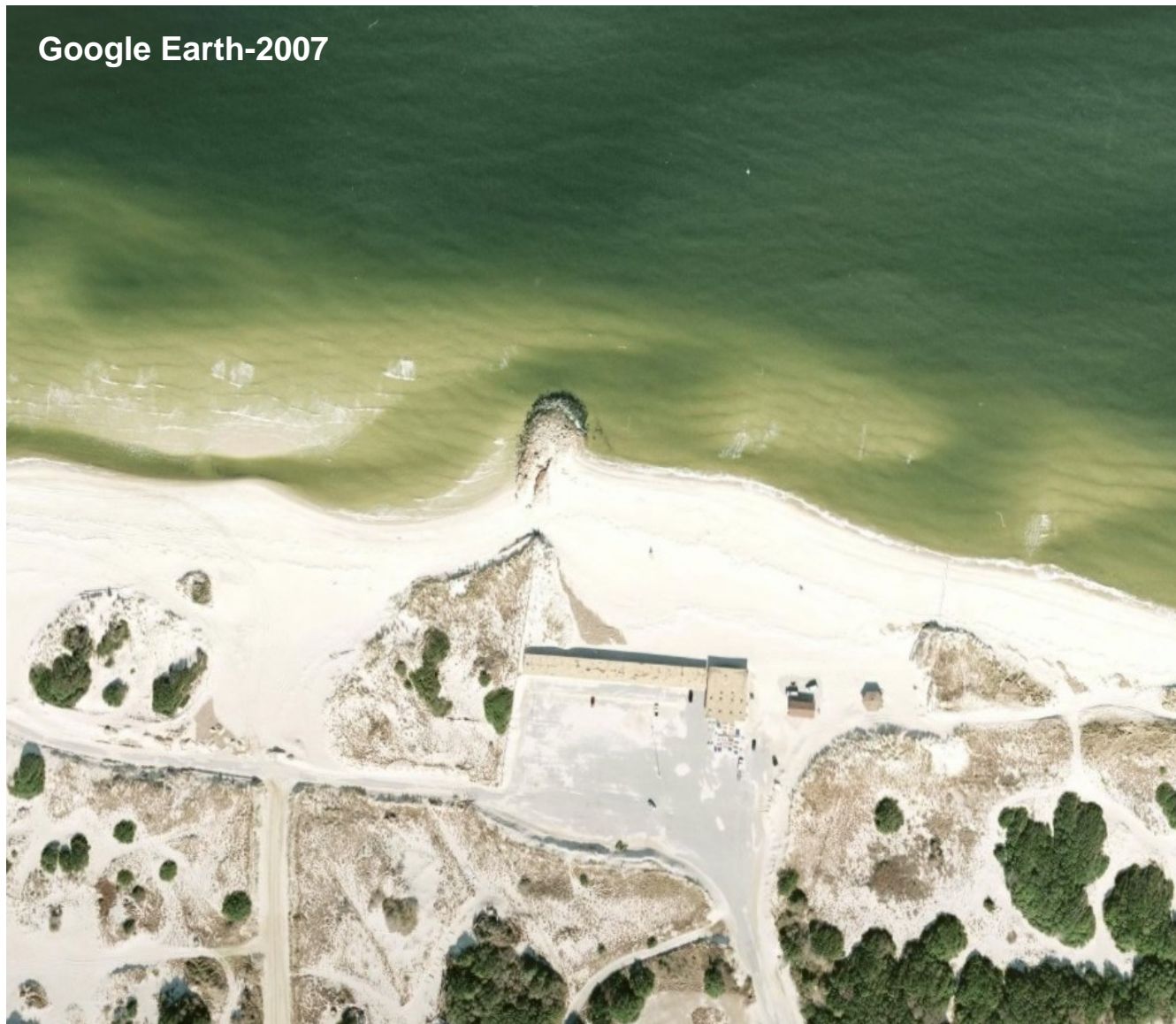
Willoughby Spit, VA



Willoughby Spit, VA



Chesapeake Beach, VA



Chesapeake Beach, VA



Oregon Inlet, NC



Oregon Inlet, NC



Cape Hatteras Lighthouse Groins, Buxton NC



Cape Hatteras Lighthouse Groins, Buxton NC



Fort Macon, NC



1961

Fort Macon, NC



1961

Fort Macon, NC



1993

Fort Macon, NC



1996

Fort Macon, NC



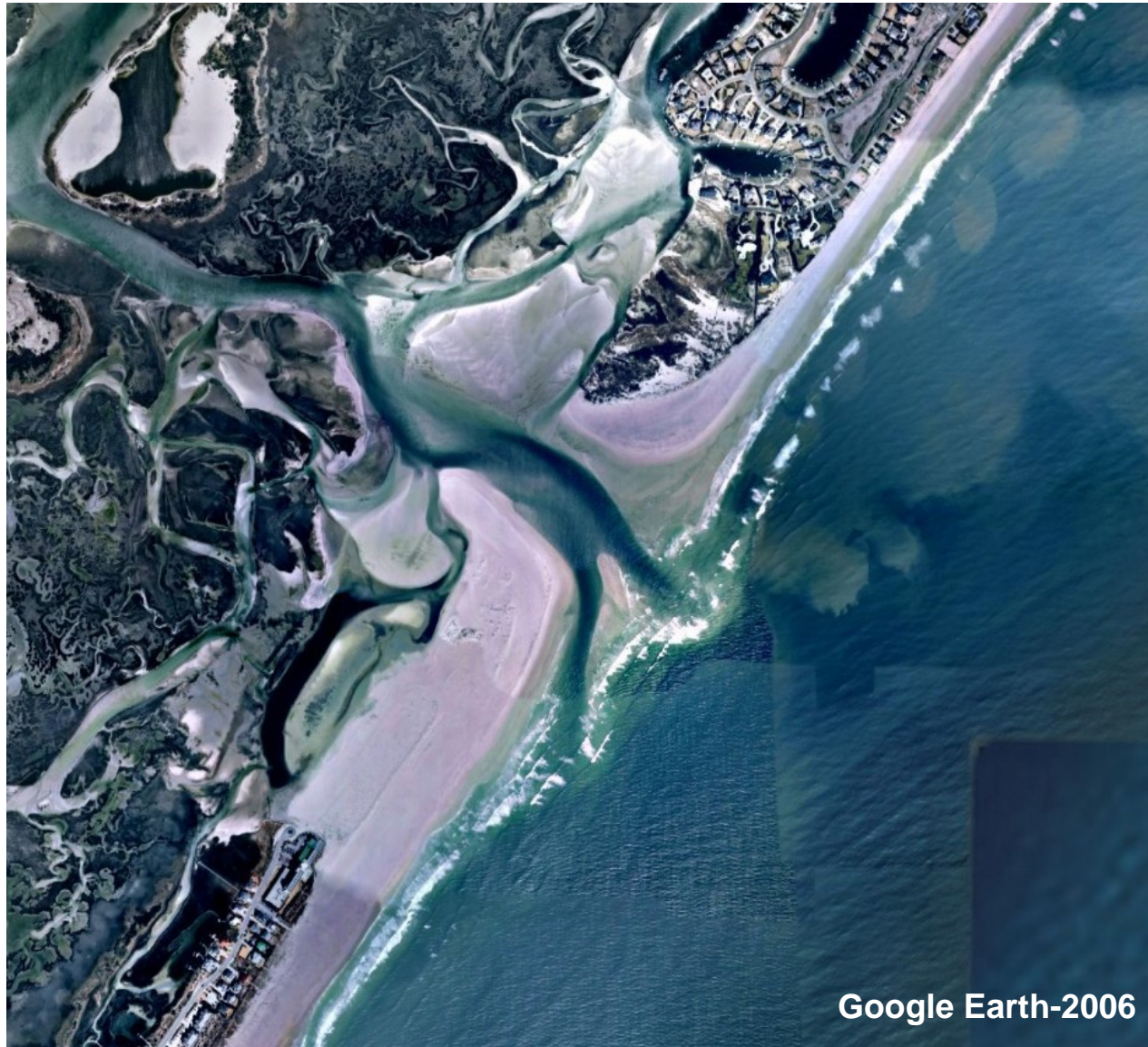
2002

Fort Macon, NC

Google Earth-2006



Shell Island, NC - removed



Folly Beach, SC



Folly Beach



Hunting Island State Park, SC-not built

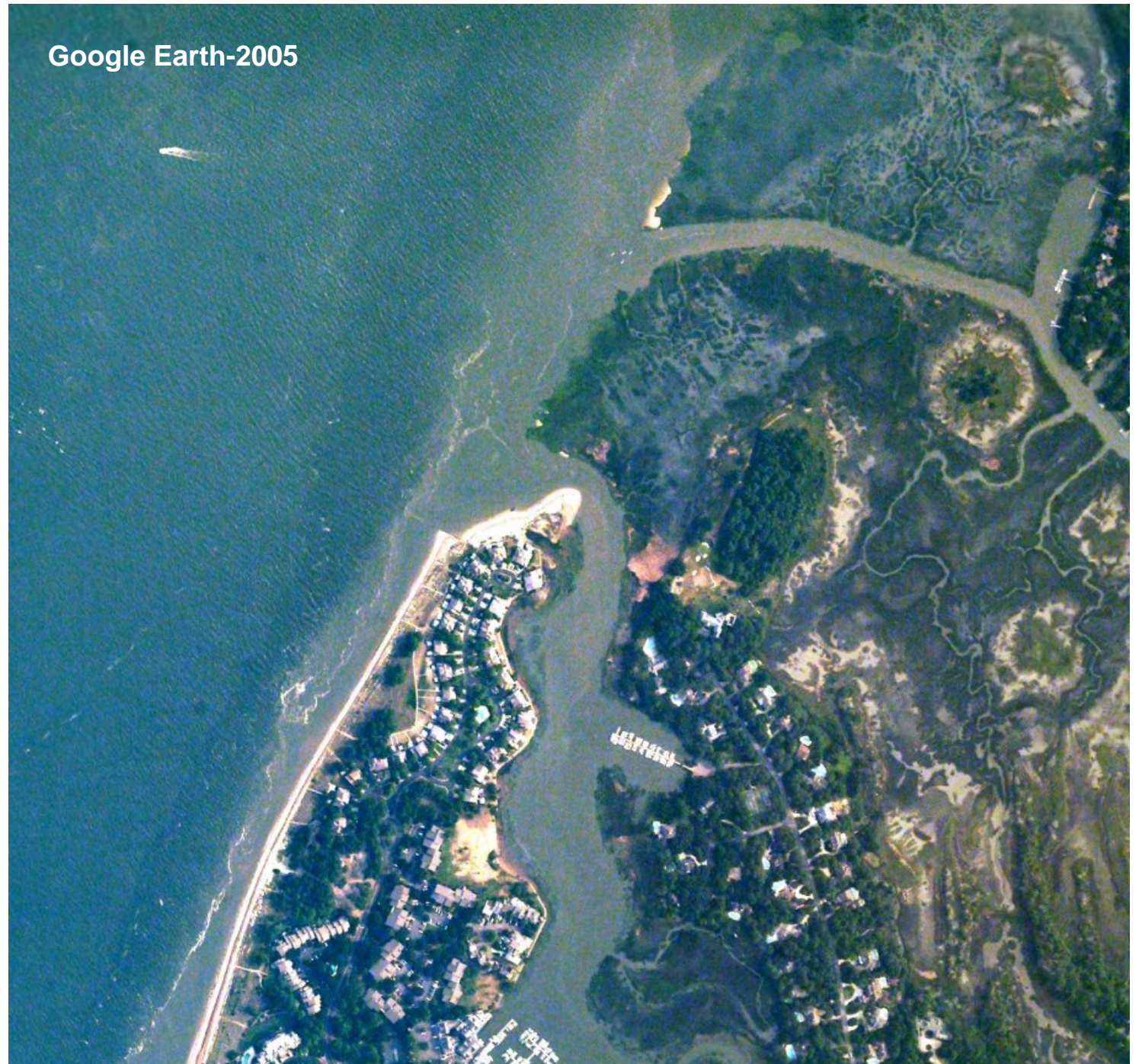


Google Earth-2007

Hilton Head, SC



Hilton Head



Tybee Island, GA-north



Tybee Island, GA-south



Google Earth-2006

Tybee Island, GA North and South



Google Earth-2006



South Amelia Island, FL

2005



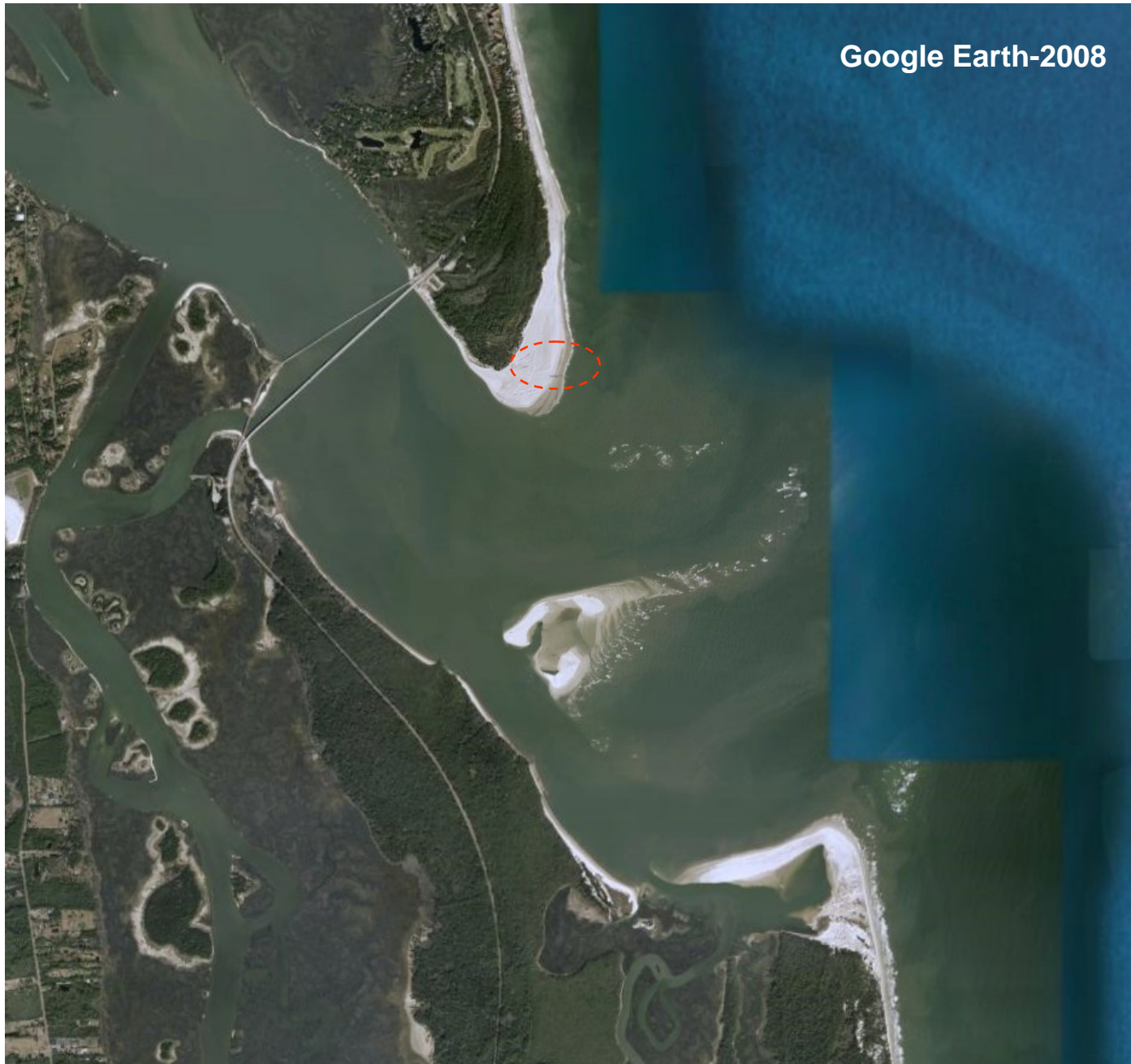
South Amelia Island, FL

2006

South Amelia Island, FL



South Amelia Island, FL



St. Lucie Inlet, FL

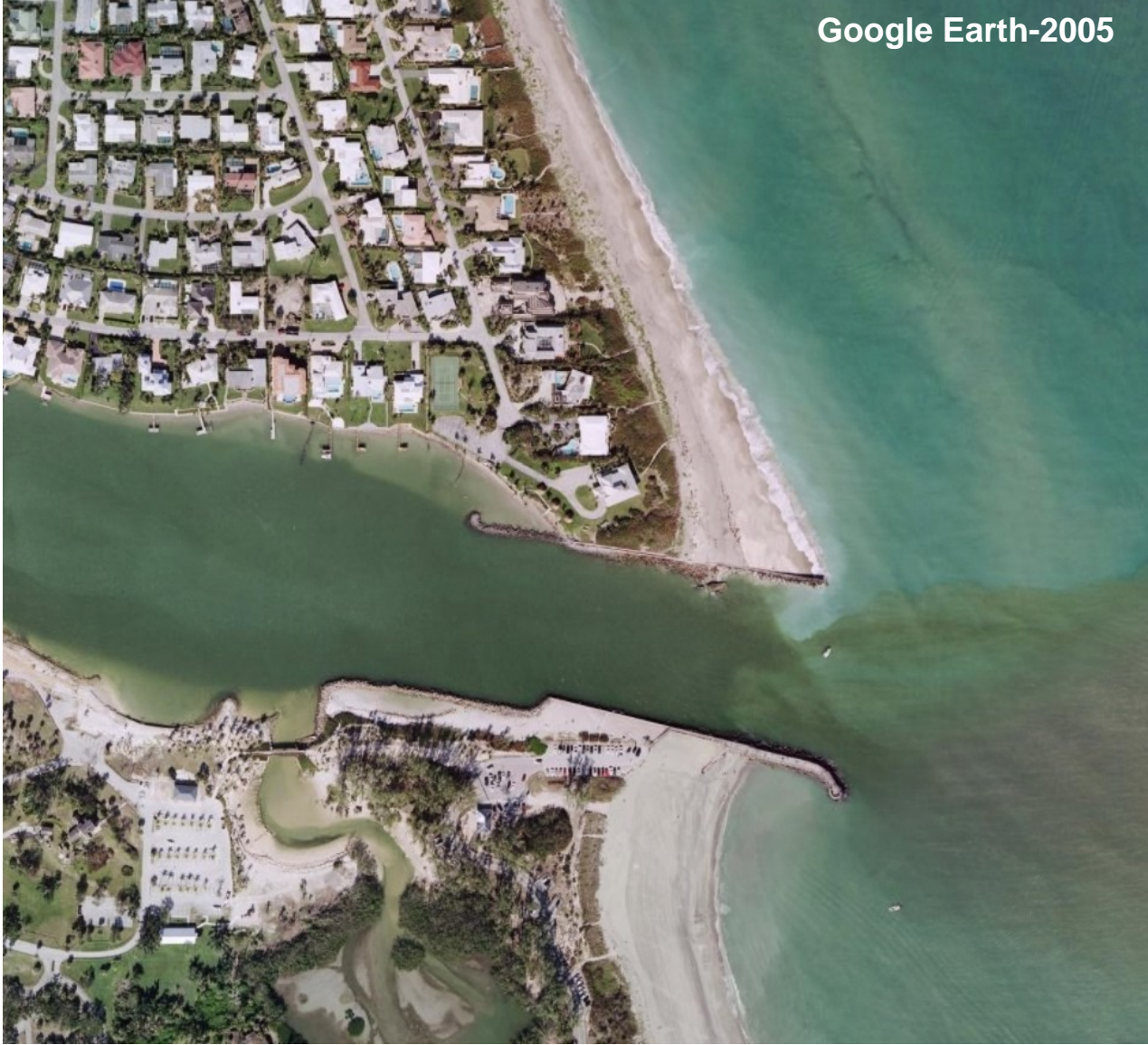


**St. Lucie
Inlet, FL**

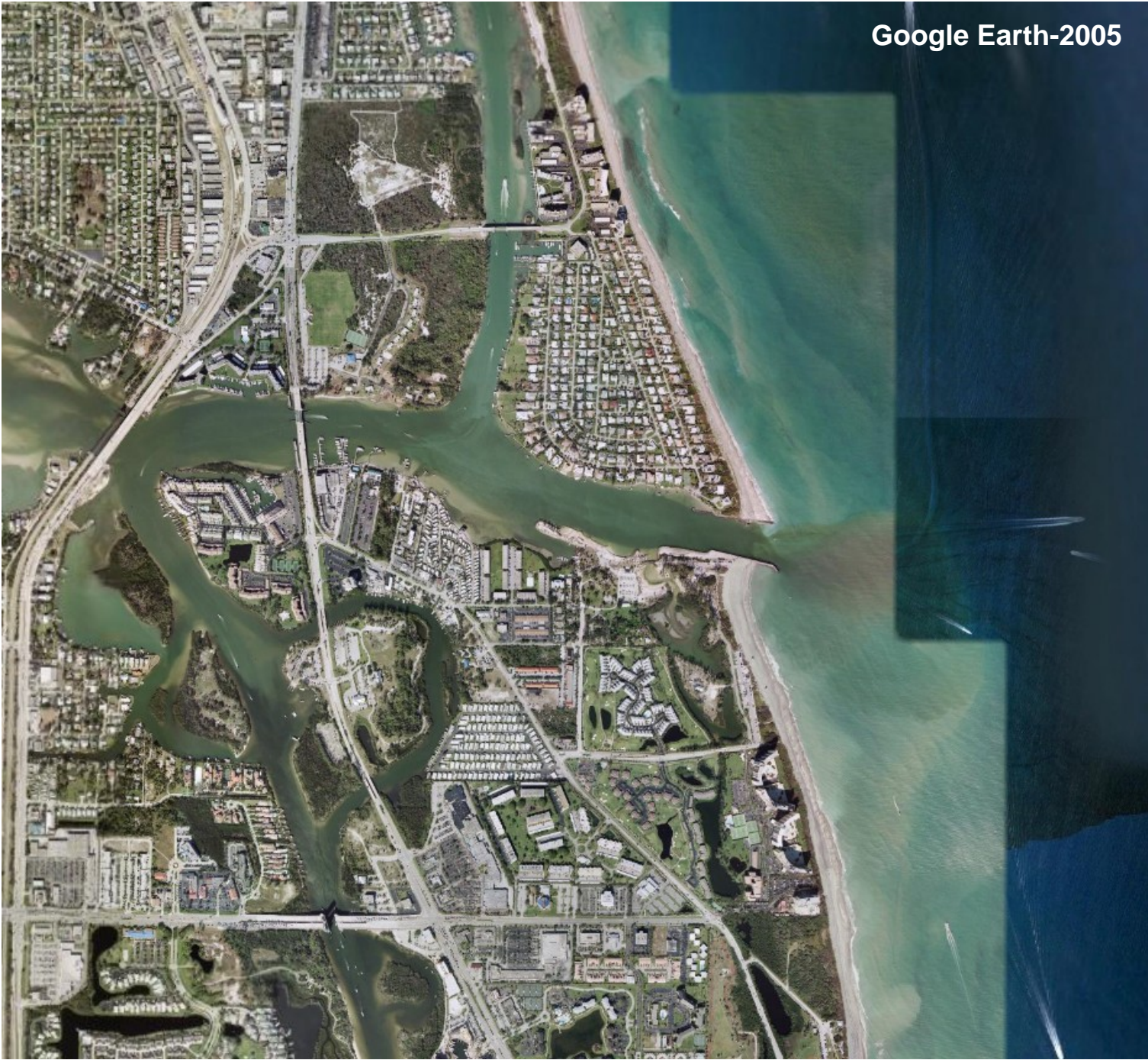


Google Earth-2006

Jupiter Inlet, FL



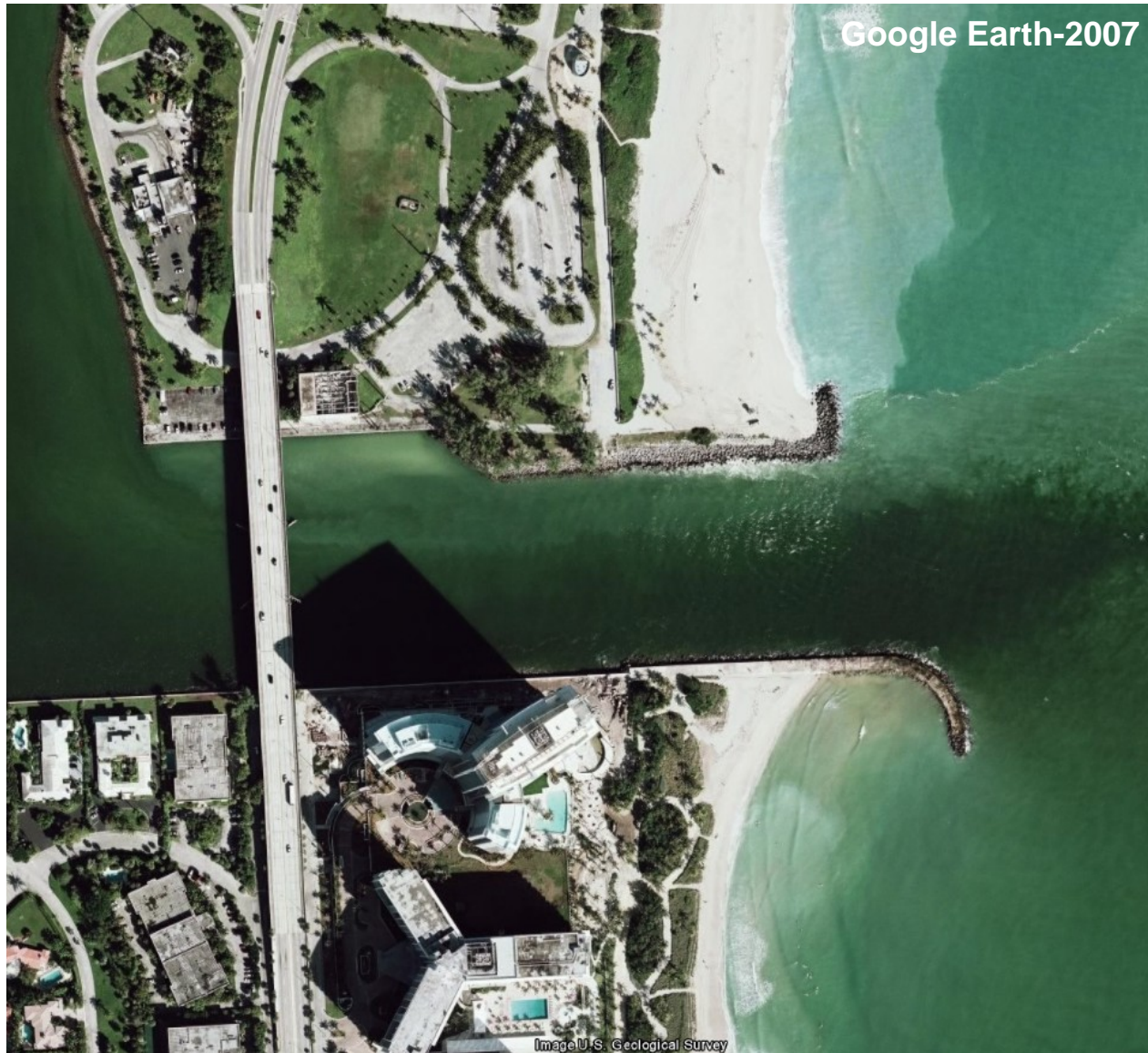
Jupiter
Inlet, FL



Bakers Haulover Inlet, FL



Bakers Haulover Inlet, FL



Bakers Haulover Inlet, FL



Bonita Beach, FL



Google Earth-2005

Bonita Beach, FL



Google Earth-2005

Captiva Island, FL



Google Earth-2005

Captiva Island, FL

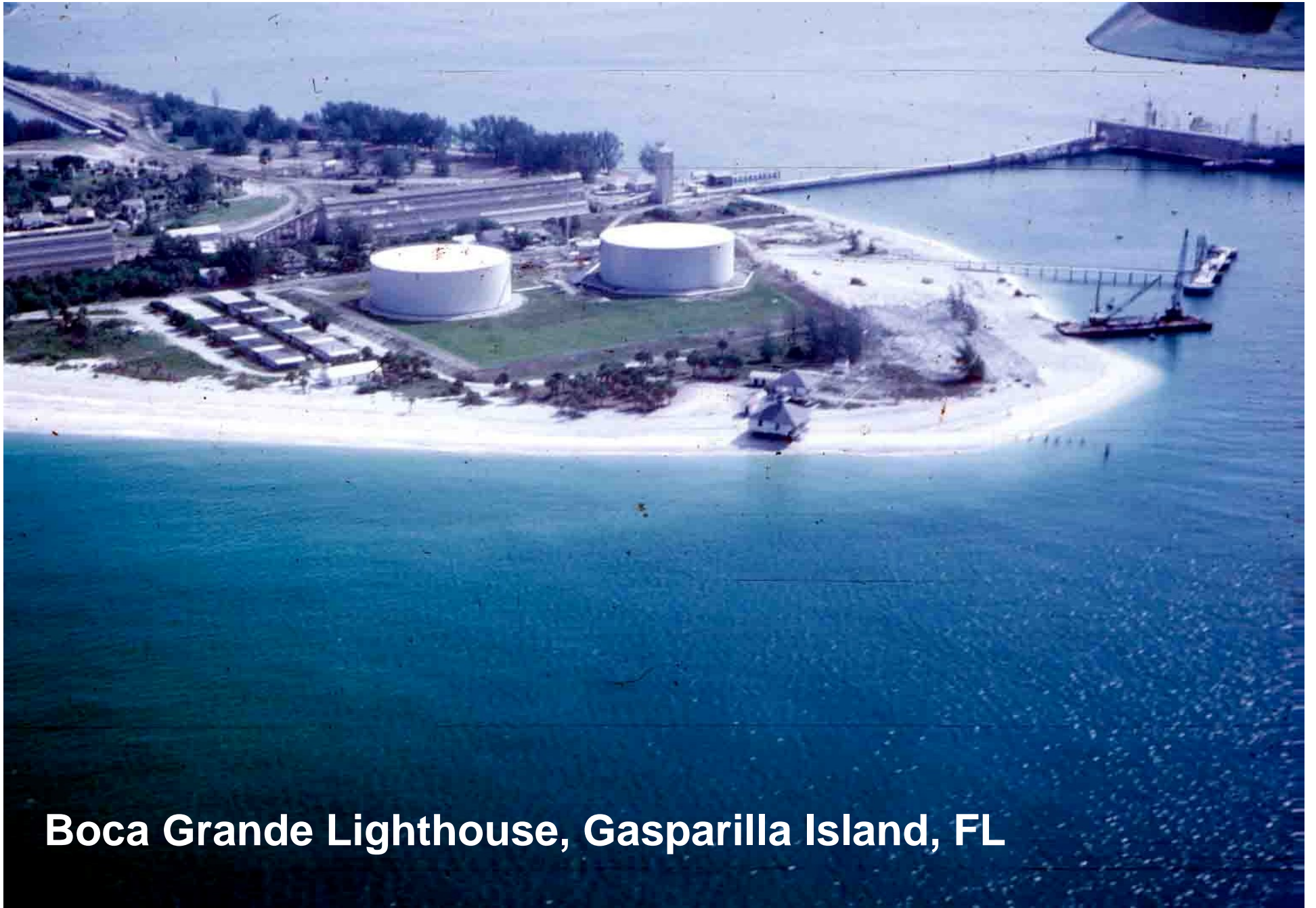


Google Earth-2005

Google Earth

Boca Grande Lighthouse, Gasparilla Island, FL





Boca Grande Lighthouse, Gasparilla Island, FL

Boca Grande Lighthouse, Gasparilla Island, FL



Boca Grande Lighthouse, Gasparilla Island, FL



Google Earth-2005

Blind Pass, FL



Google Earth-2007

Blind Pass, FL



Google Earth-2007

Johns Pass, FL



Google Earth-2007

Johns Pass, FL



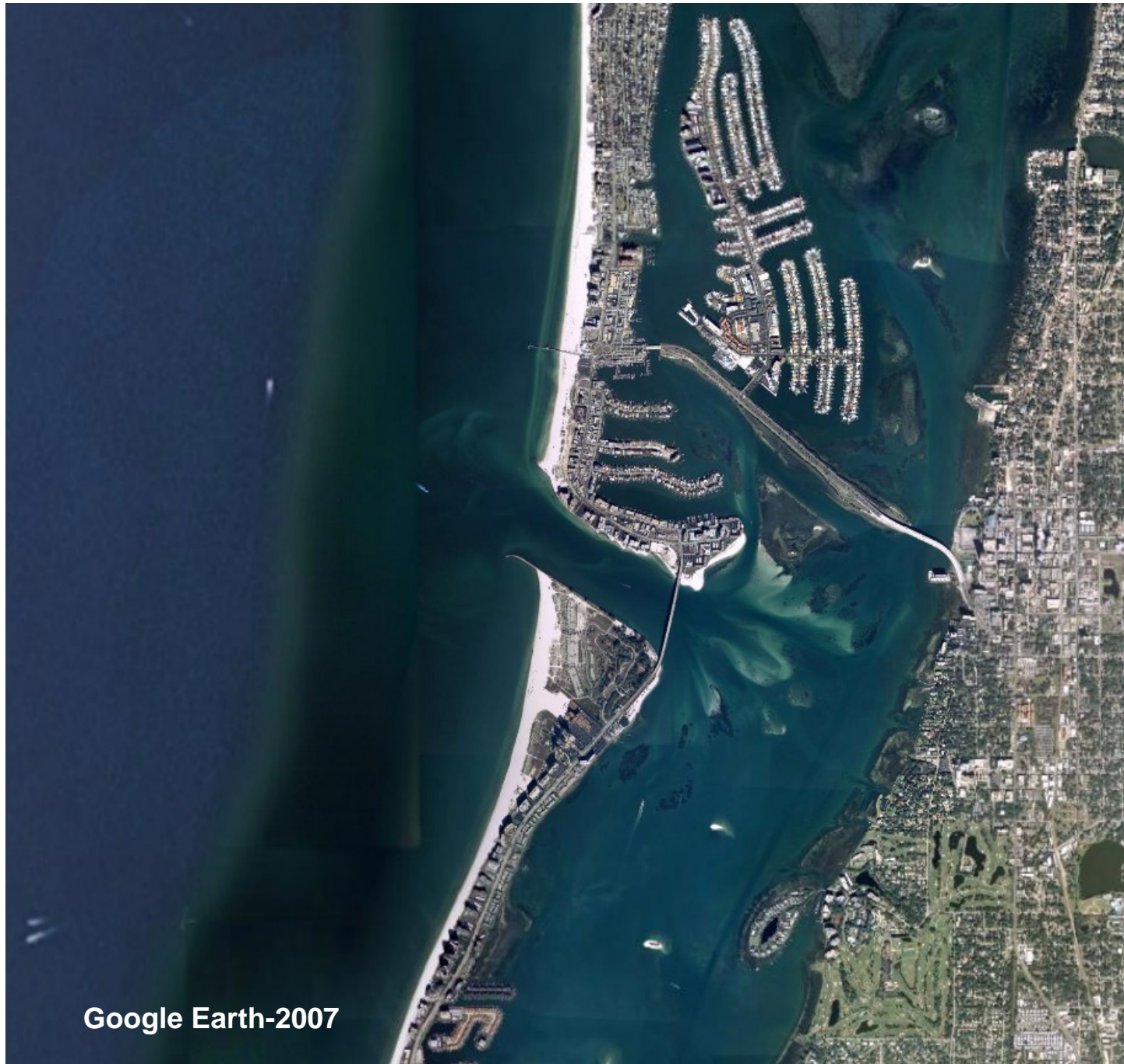
Google Earth

Clearwater Pass, FL



Google Earth-2007

Clearwater Pass, FL



Google Earth-2007

Honeymoon Island, FL



Google Earth

Honeymoon Island, FL



Google Earth-2007

Honeymoon Island, FL



Google Earth-2007

Preliminary Site List

- New York - **Coney Island** ❌
- Rockaway ❌
- Maryland - Ocean City Inlet ❌
- Virginia - Willoughby Spit ❌
- **Chesapeake Beach** ❌
- North Carolina - Oregon Inlet ✔️
- **Buxton (Cape Hatteras Lighthouse)** ❌
- Fort Macon ✔️
- Shell Island (removed) ❌
- South Carolina - Folly Beach ❌
- Hunting Island (not built) ❌
- Hilton Head ❌
- Georgia - Tybee Island ❌
- Florida - Amelia Island ✔️
- St. Lucie Inlet ❌
- **Jupiter Inlet** ❌
- **Baker's Haulover Inlet** ❌
- Captiva Island ✔️
- Boca Grande Lighthouse ❌
- **John's Pass** ✔️
- **Clearwater Pass** ❌
- **Honeymoon Island** ❌
- **Blind Pass** ❌
- **Bonita Beach** ❌



Selected Sites

North Carolina

- Oregon Inlet
- Fort Macon

Florida

- Amelia Island
- Captiva Island
- John's Pass

Project Work Plan

Important Considerations for Analyses

- Data Collection and Assessments for Existing Projects Will Be Site Specific – The Applicability to North Carolina Individual Inlets Will Not Be
- Analyses and Studies Will Focus On What Can Be Learned From Existing Installations and What Those Lessons Mean for Applicability in NC
 - Geology
 - Sediment Transport Patterns
 - Hydrodynamics
 - Natural Resources
 - Etc.
- Modeling to Be Done Will Also be Schematic, Desktop Level Analyses
 - Will Not Be Site Specific
 - Will Look to Determine Relative Trends and Behaviors – Not Absolutes
- Please Recall that the Purpose of the Contractor Study Is a Technical Assessment of Terminal Groins Not a Policy Recommendation

Project Work Plan

Task 1 – Coastal Engineering Analyses

- Data Collection for Terminal Groins on East Coast – Data Sets Will Influence Analysis Approach (Aerials, surveys...)
- Select Eight (8) Best Sites
 - Richness of Datasets Will Be Key Selection Factor
 - Will Try to Select Range of Projects (Length, Height, Porosity, Sediment Transport, Locations)
- Will Collect “Raw” Datasets Where Possible to Limit Bias
- Will Develop Procedures to Net Out Nourishment and Other Project Effects on Impact Calculations (Use Volume vs. Shoreline Change Relationships Similar to BIMP – 1.3 cy/ft)
- Calculation Procedures Will Be Documented for Transparency and Reproduction By Interested Parties
- Geological Factors Will Also Be Considered

Project Work Plan



Task 2 – Environmental Analyses

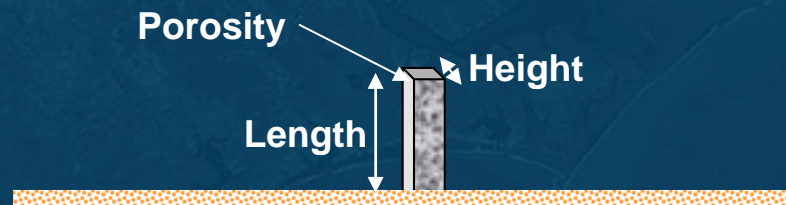
- Existing Data Collection and Literature Review
- Assess From Existing Data Terminal Groin Effects on the Natural Environment
- Report Preparation

Project Work Plan



Task 3 – Construction Techniques

- Conduct Literature Review of Techniques Used to Limit Impacts on Adjacent Shorelines:
 - Limits on Groin Height and Length
 - Porosity of Structures (Sediment Transmission)
 - Etc.
- Schematic Modeling to Assess Techniques Under Average and Storm Wave Conditions (Parametric Study Using GENESIS – Supplement With Available Data On Site Performance)



Project Work Plan

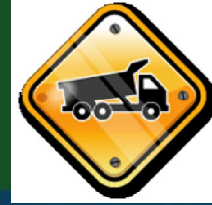


Task 4 – Economic Study

– Impacts of Shifting Inlets to State, Local, and Private Sectors

- Define “Baseline”, “Terminal Groin”, and “Unimpeded Inlet Shifting” Cases
- Assemble Current Property Location and Value Data
- Identify Property Appreciation Scenarios Under Three Cases With 2 to 3 Erosion Potential Scenarios (Sea level Rise and Shoreline Loss)
- Assess Property Value Losses (Current and 50-yr) Under Each Case Including Property Loss, Diminished Market Value, and Tax Base Losses
- Compare Net Economic Impact

Project Work Plan



Task 5 – Initial Construction & Maintenance Costs

- Review Available Data on Initial Construction and Maintenance For Existing Terminal Groins Including Public and Private Costs
- Develop Ranges of Potential Costs Based on Typical Expected Terminal Groin Dimensions and Typical North Carolina Offshore Slopes

Project Work Plan

Task 6 – Potential Terminal Groin Locations

- Literature Review of Existing Locations (Inlets – dredged, natural; end of non-inlet littoral cell)
- Schematic Assessment of Potential Locations (Inlet vs. Non-Inlet Littoral Cell)
- Average and Storm Wave Conditions Considered
- Will Not Recommend Specific Sites
- Assessment of Appropriate and Inappropriate Conditions

Project Work Plan

Task 7 – Public Input

- Three Public Meetings
 - Sheraton Atlantic Beach – October 29th, 2009 - 5 PM
 - Raleigh – January 13th, 2010 - TBD
 - Sunset Beach - TBD
- State Web Site Will Be Developed
 - <http://dcm2.enr.state.nc.us/index.htm>
 - Under What's New Section
- Email – jim.gregson@ncdenr.gov



Project Work Plan

Task 8 – Draft and Final Report

- Draft Report (February 1, 2010)
- Final Report (March 1, 2010)



Project Schedule

Total Project Duration is 7 Months (Sept – March)

TASK	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1 - Coastal Engineering Analyses of Potential Impacts of Terminal Groins	█	█	█				
2 - Environmental Analyses of Potential Impacts of Terminal Groins	█	█	█				
3 - Engineering Construction Techniques to Limit Impacts				█			
4 - Economic Study of Erosion Impacts			█	█	█		
5 - Initial Construction Cost and Maintenance Cost Study				█			
6 - Study to Determine Potential Use at Inlets Only or Other Locations					█		
7 - Public Hearings		█			█		█
8 - Draft and Final Report, Project Management & Admin						█	█

Next Steps

Next Steps

- Finalize Data Collection
- Develop Methodology Statements for Analyses
- **Communication Protocol for the Science Panel for Review Concurrence – Email?**
- First CRC Meeting – October 29th, 2009 – Sheraton Atlantic Beach – 5 PM

Thank You!

