Wetland Restoration Workshop

April 24-25, 2012

Prime Hook NWR

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Director

Circulation Modeling Study

Agenda

- 2010 Bay Beach Management Plan
- Review proposed scope of work
  - Task Assignments

<u>Objectives</u>

- Data based decision making
- Establish an understanding of the hydrodynamics characteristics of the system
  - Physical data collection
  - Hydrodynamic numerical modelling
- Evaluate Alternatives – “what if scenarios”
- Establish restoration and management plan elements

Bay Beach Management Plan 2010

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Seven communities

- Pickering Beach
- Kitts Hummock
- Bowers Beach
- South Bowers
- Slaughter Beach
- Primehook Beach
- Broadkill Beach

Primehook Beach

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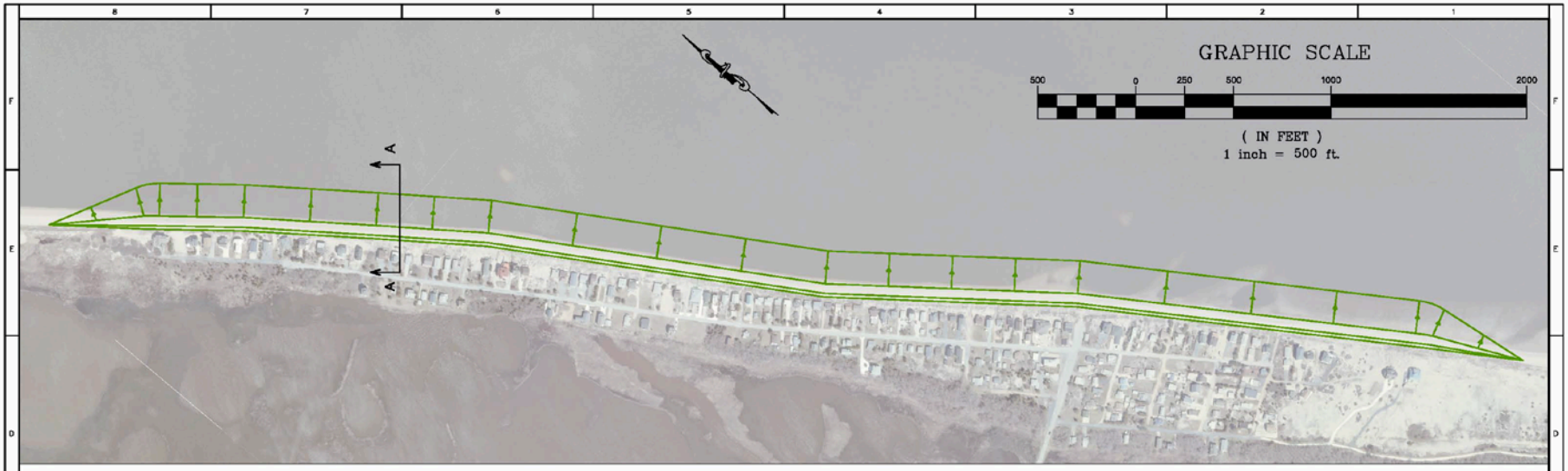

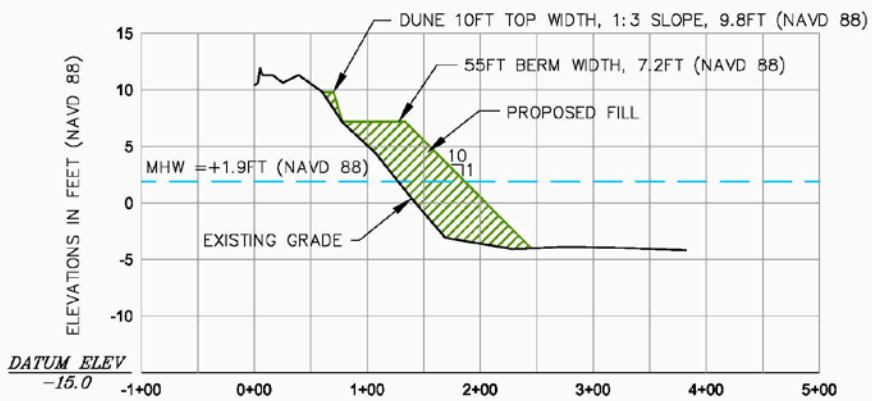

TYPICAL CROSS SECTION A-A

VERTICAL SCALE: 1" = 10'
HORIZONTAL SCALE: 1" = 100'

PBSJ	CLIENT: DELAWARE DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENTAL CONTROL	PROJECT: PRIMEHOOK BEACH	TASK: 10 YEAR SCENARIO	FIGURE 7.47

Historical Beach Fill Placements

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Location	Fill Event Dates	Historical Demand (yd^3/yr)	
		Total	1970s to present
Pickering Beach	1962 to 2001	5,862	8,000
Kitts Hummock	1961 to 2008	7,482	6,056
Bowers Beach	1962 to 2009	6,257	6,326
South Bowers	1961 to 1997	2,483	2,409
Slaughter Beach	1958 to 2005	17,006	17,623
Primehook Beach*	1962	20,626	25,090
Broadkill Beach	1957 to 2005	23,970	28,931

*average of Slaughter Beach and Broadkill Beach

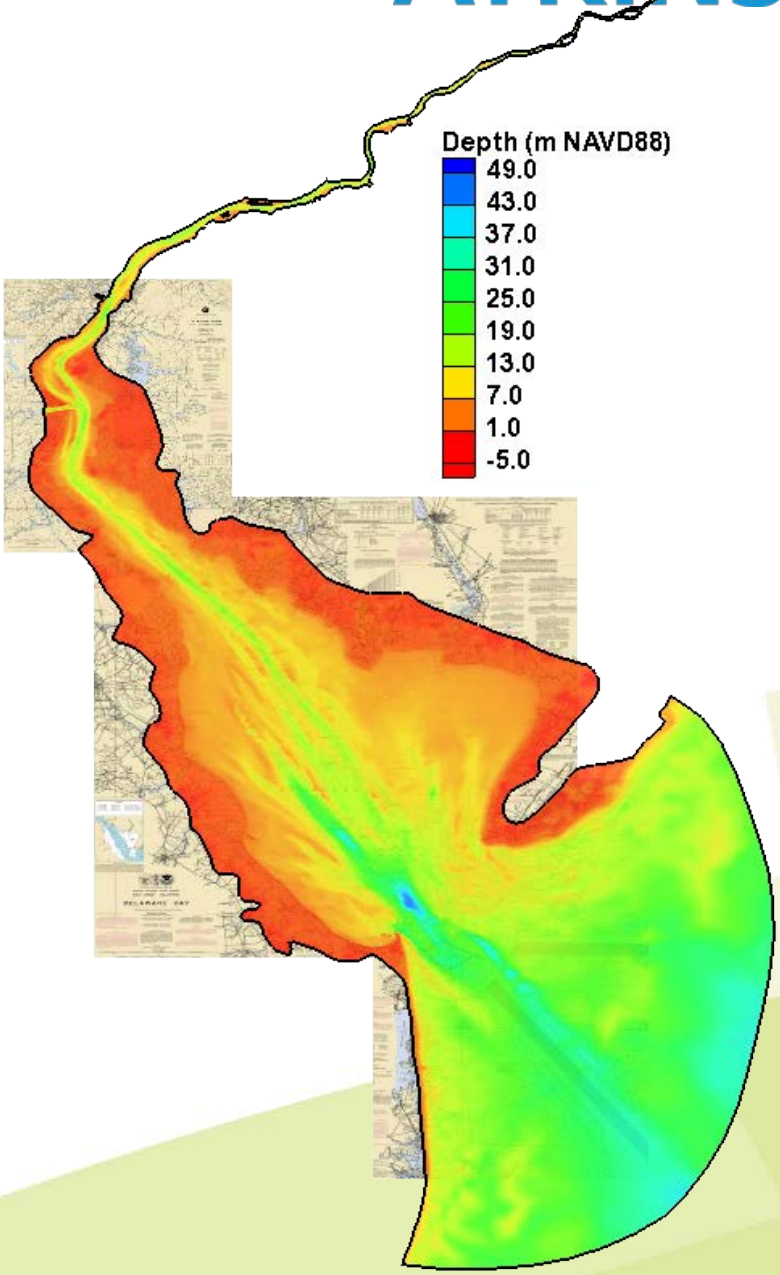
Hydrodynamic Modeling

ADCIRC model

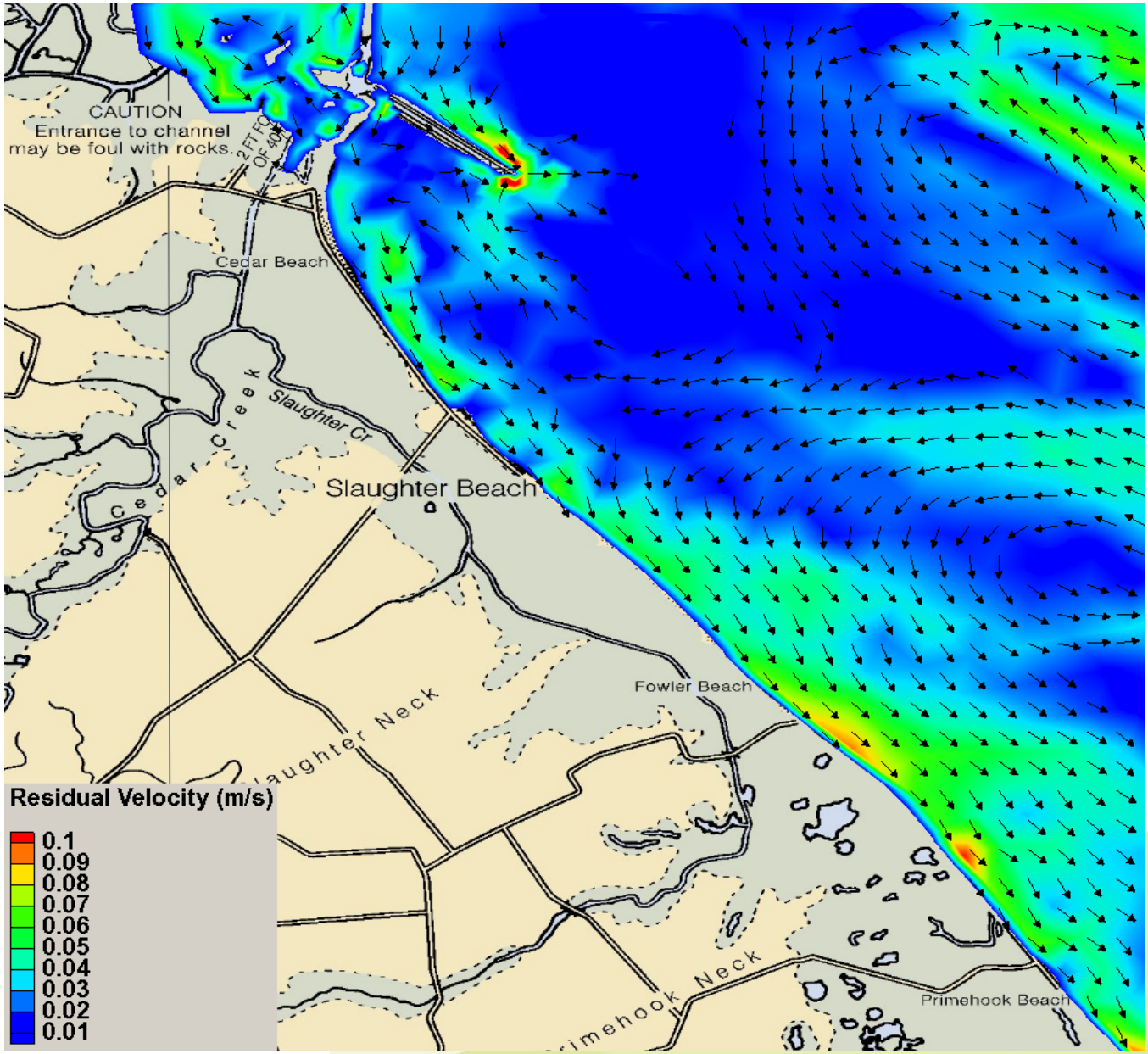
Used existing bathymetric, tidal, wind, and wave data

Bounded by Atlantic Ocean; +13 ft land elevation

Driven by tide, wind, river inflows at Christina, Schuylkill, and Delaware Rivers



‘Average’ Conditions



Mother's Day Storm of 2008

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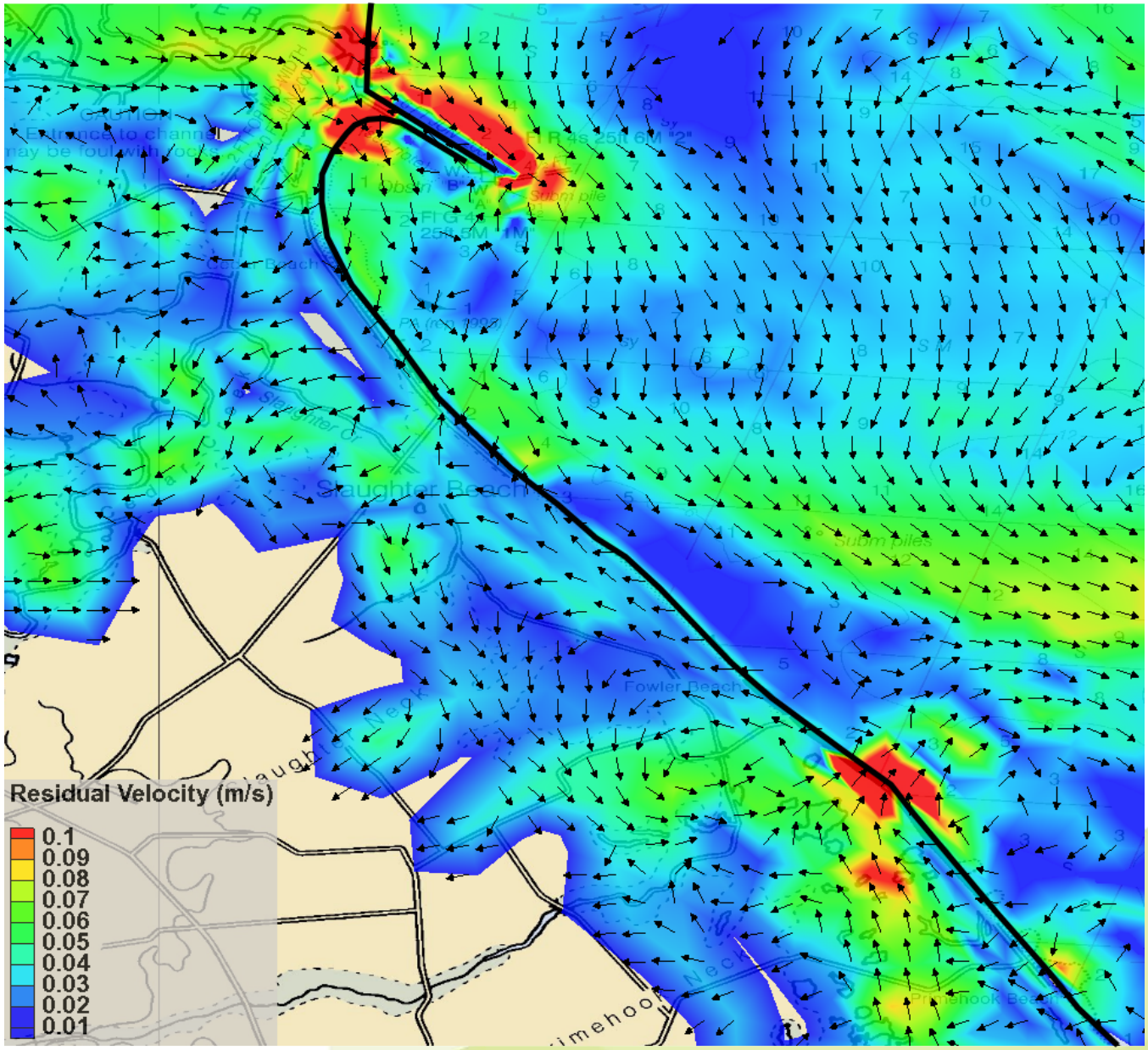

Proposed Scope of Work

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<u>Task Assignments</u>

1. Analysis of Existing Data
2. Data Collection
3. Circulation Model Development
4. Alternatives Analysis
5. Recommendations

Analysis of Existing Data

Maximize Use of Existing Data

We will coordinate with USFWS, Dr. Scarborough/DNREC, DeDOT, etc. to maximize data:

- Topography/Bathymetry
- Water levels
- Salinity
- Temperature
- Nutrients
- Erosion rates
- Sedimentation rate
- Design reports
- Construction plans

Data Collection

Data Collection

Flows – Velocity measurements

1. Obtaining appropriate velocity and water level measurements for model calibration
2. As a general rule ‘continuous’ tidal studies should be conducted for at least 1 lunar cycle (i.e. ~30 days) in order to capture the complete behavior of the system
3. Velocities at specific locations throughout the refuge
4. Volume exchange and direction through the breaches
5. Water level differences and tidal phase lag between breach locations and refuge

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Flow Arrows – Proposed Velocity Measurement Locations

Data Collection

Geotechnical Data

1. Sediment sampling and testing
2. Cores – substrate
3. Grain size analysis
4. Organic content
5. Sediment transport analysis

Development of Circulation Model

Inlet Breach Project

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- Inlet Relocation Project
- Client: Town of Sandwich, Mass.

Increased Flooding

Long-Term Impacts

Hydrodynamic Modeling Results

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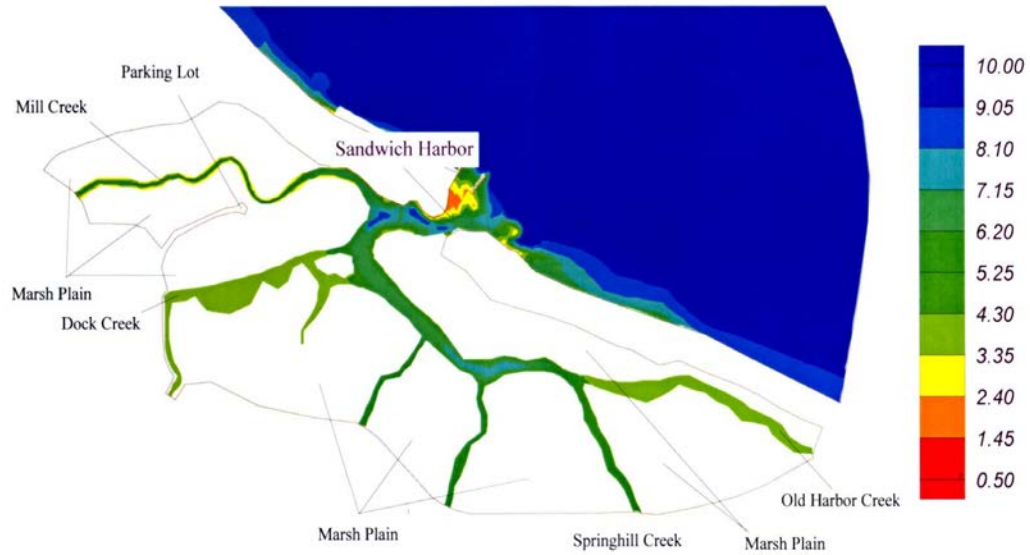
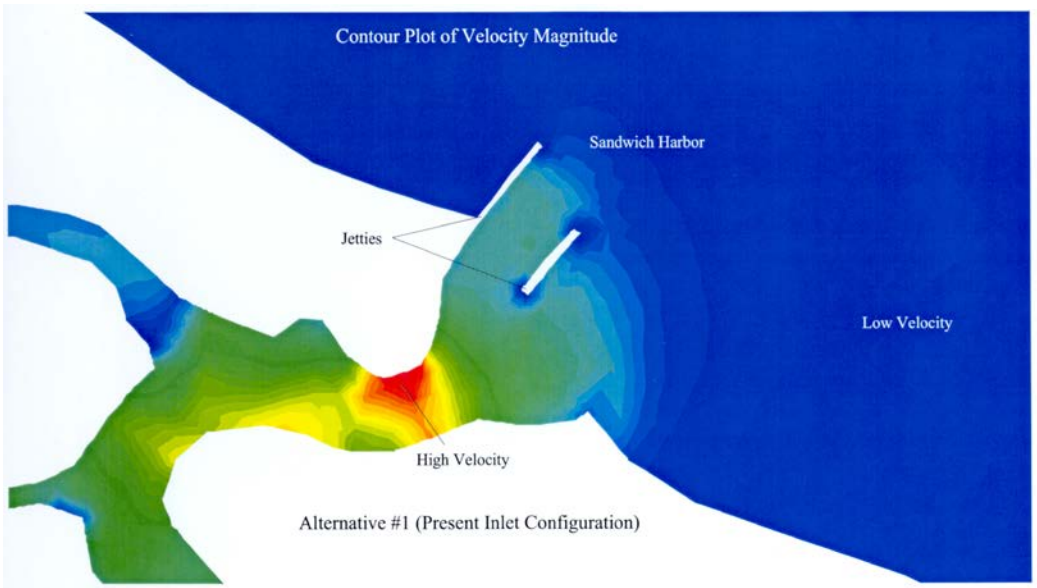
Flooding Analysis





Inlet Stability Analysis

Graphic Representation

Modeling Approach

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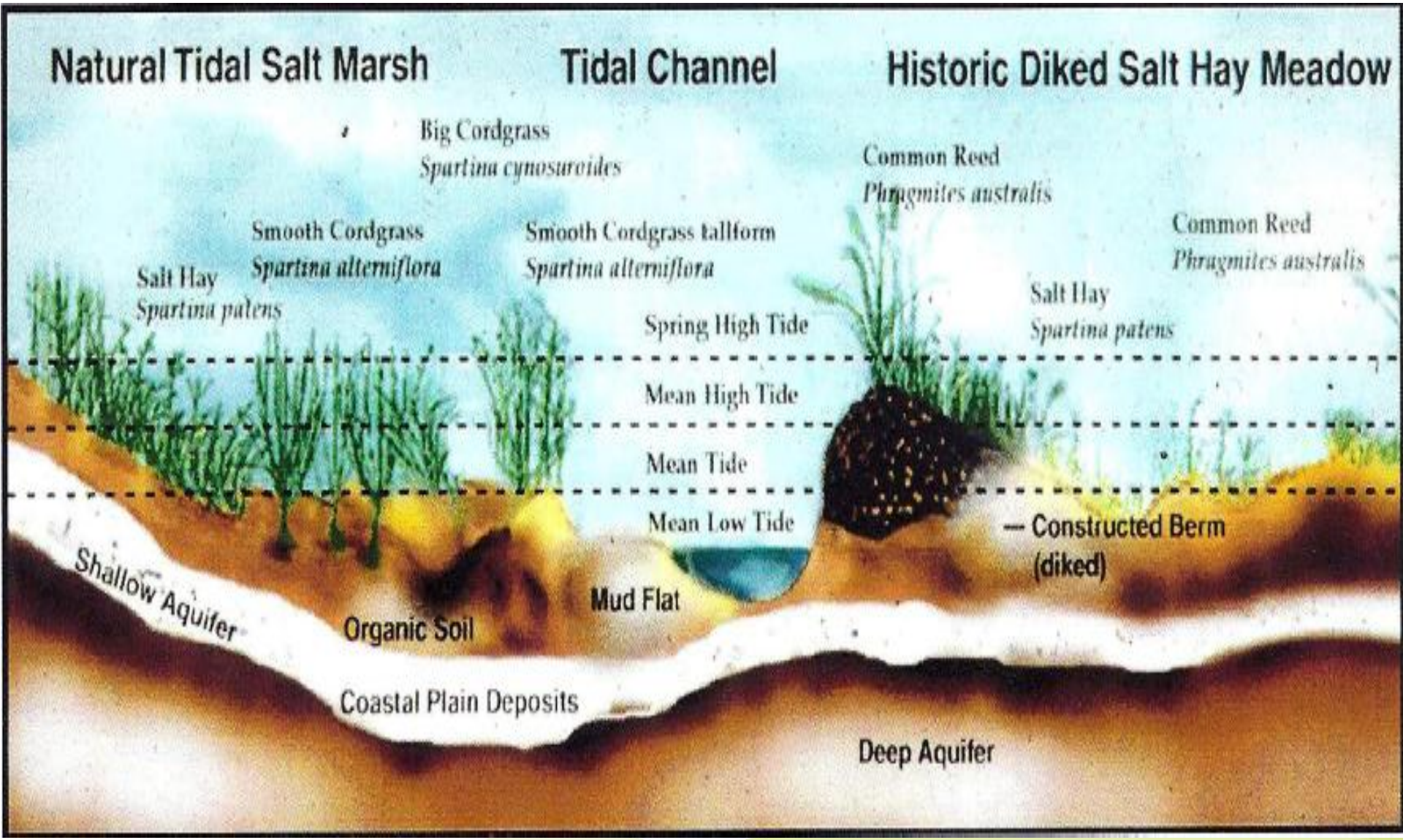
Objectives

1. Determine marsh structure and function
2. Establish the target elevations, sedimentary and hydrodynamics characteristics (required hydro-period)
3. Numerical model development

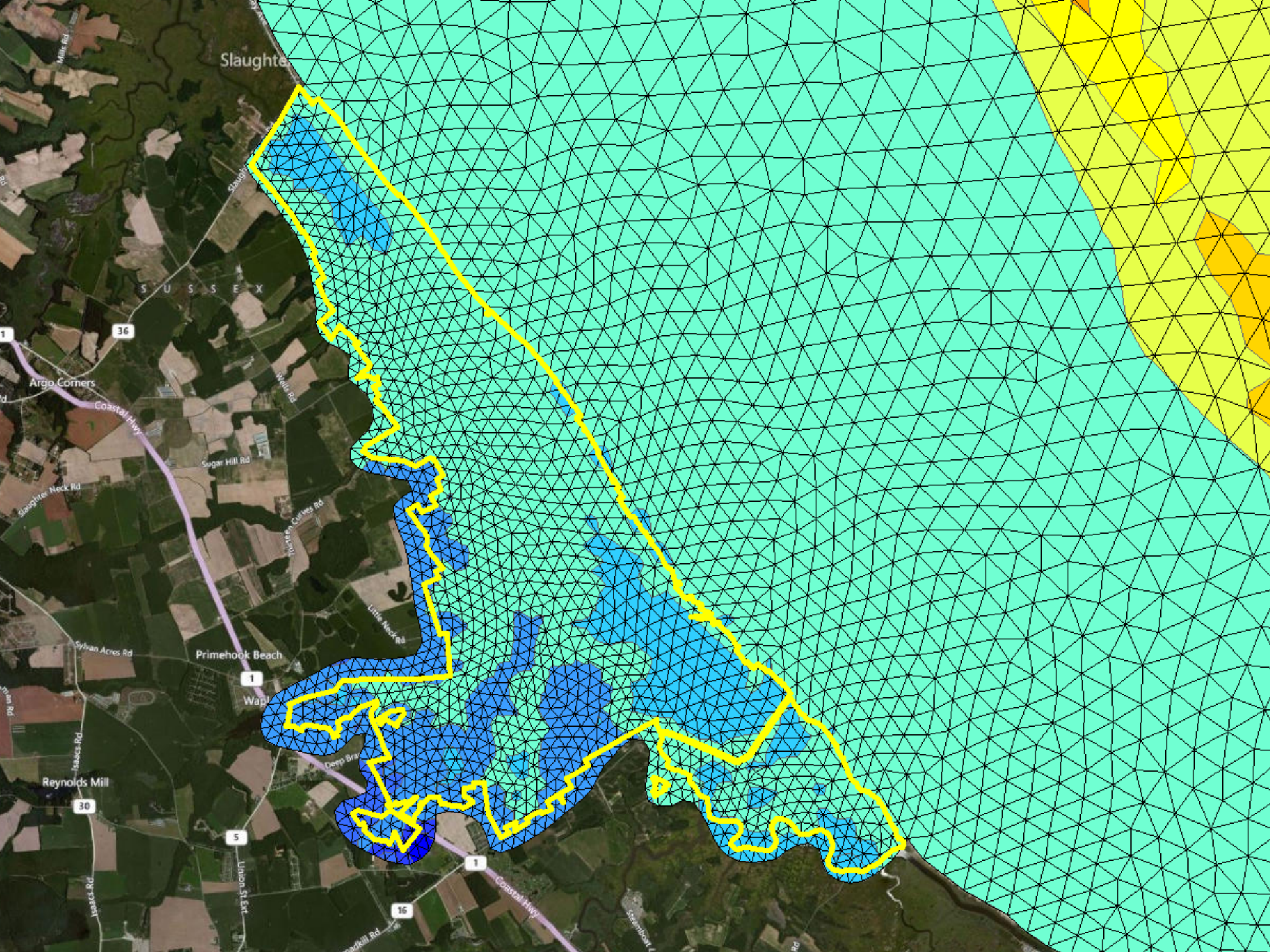
Model

- Set boundary conditions
- Calibration – existing data
- Normal tide conditions
- Storm Event

Natural Marsh vs. Diked Systems



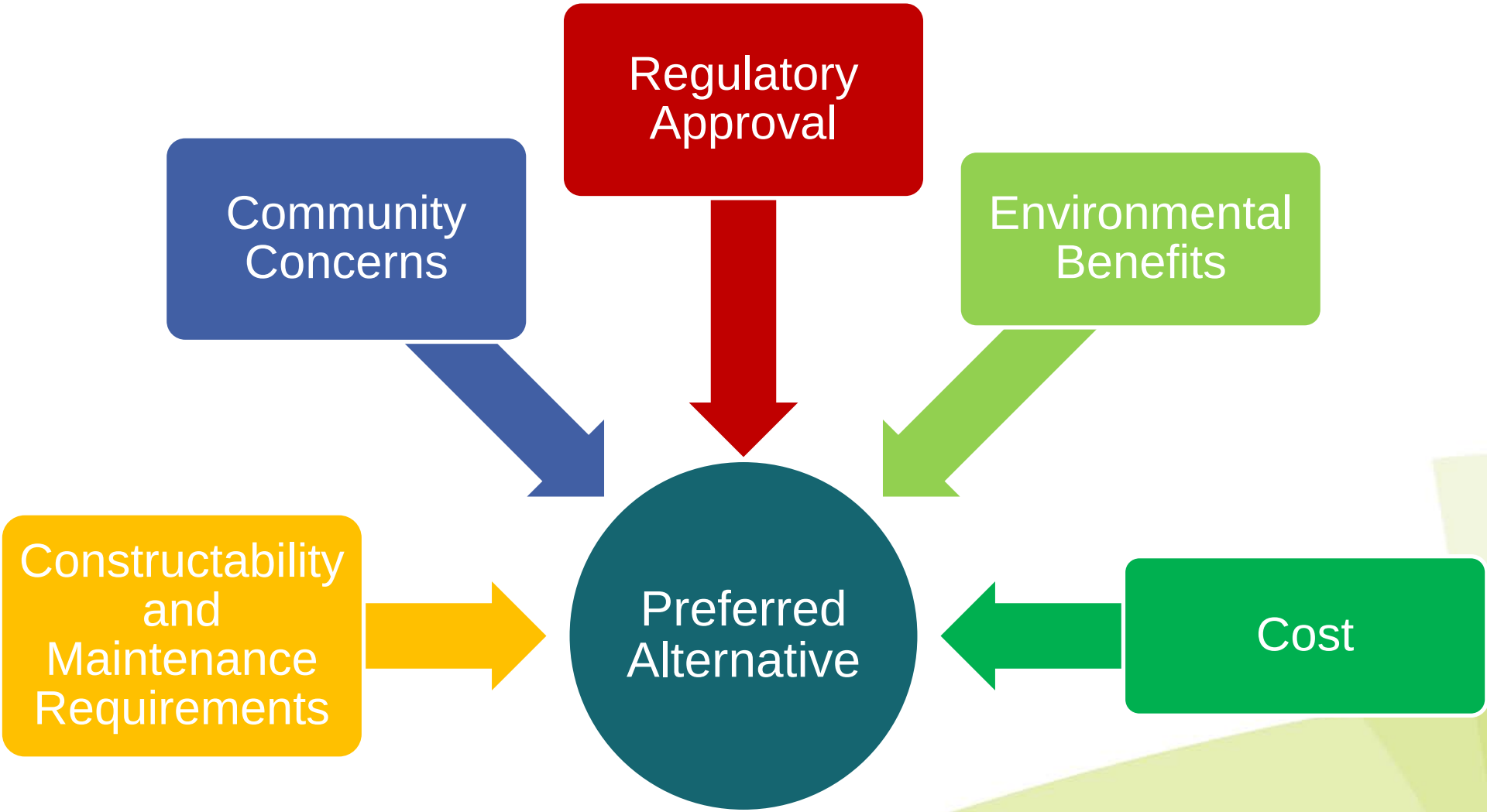
Ref. Teal & Peterson, 2005


Slaughte
S U S S E X
36
Argo Corners
Coastal Hwy
Wells Rd
Sugar Hill Rd
Slaughter Neck Rd
Little Neck Rd
Sylvan Acres Rd
Primehook Beach
1
Reynolds Mill
30
5
Isaacs Rd
Union St Ext
16
Coastal Hwy

Additional Services

1. Sediment transport/morphology
2. Water quality
3. Ecology change response

Alternatives Analysis


Regulatory Approval
Community Concerns
Environmental Benefits
Constructability and Maintenance Requirements
Preferred Alternative
Cost

Schedule

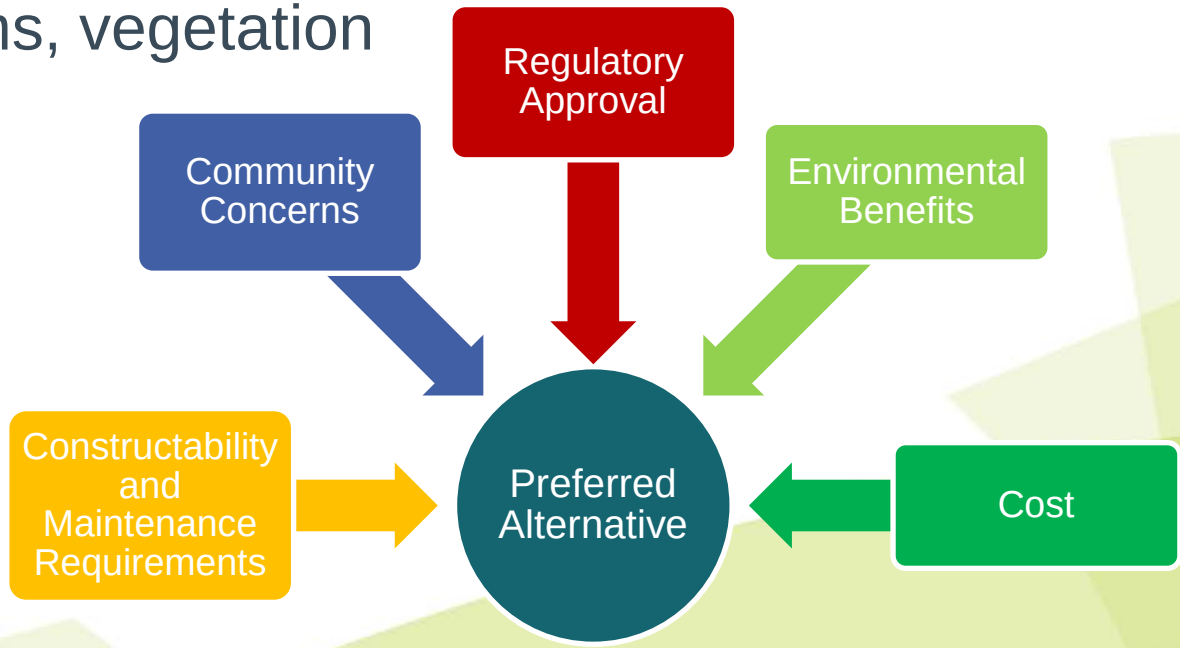
Schedule

Estimated: 8 months

- Data collection
- Post-processing
- QA/QC
- Delivery of data

Thank You!
If you cannot achieve the goal,
redefine the task!

Selection of Potential Restoration Scenarios

Items to Consider

1. Determine marsh structure and function
2. Establish the target elevations, sedimentary and hydrodynamics characteristics
3. System wide solutions
4. Develop manageable solutions
5. Salt vs. Fresh systems, vegetation
6. Sustainability