Bald Head Island Terminal Groin Project
The Project Plan, Costs & Financing

Peter A. Ravella, Principal
PAR Consulting, LLC

Funding Workshops 1A & 1B
February 14-15, 2014
Preliminary Findings

- Current Beach Fund Account Revenues appear sufficient to support the project without any increase in local taxes or fees
- Construction of the Terminal Groin is less expensive than continuing current beach re-nourishment program over the next 30 years
- Federal & State Permitting is underway and could be completed in September 2014 (earliest)
- Two-phased Groin Project, to be built in 2014 and 2019, with Phase II construction based on performance of Phase I
- Substantial local cost savings possible through modification of the Federal-Local Sand Management Plan (details to come in March)
- Issuance of any Terminal Groin Bonds must go to the Voters
Workshop Agenda

- Development of the Terminal Groin – HB 151 & Beyond
- Project Permitting Status & Schedule
- The Preferred Project Design (Materials by Olsen & Associates)
- Project Costs – Phase I, Phase II
- Current BHI Beach Fund Revenues
- Can you afford this project?
- Conclusion
Development of the Terminal Groin
HB 151 & Beyond

- Under consideration by BHI since 2010
- Engineering analysis & design initiated in 2011
- Project is authorized under the Coastal Policy Reform Act of 2013, NC Session Law 2013-384 (SB 151)
- Designed by Olsen & Associates, the Village’s long-time coastal engineer
- Project is continuation of and improvement on the Village’s current Shoreline Management Strategy
Ideal Project Schedule
Terminal Groin, Phase I

- Sept. 2014: USACE & CAMA Permits Issued
- Sept. 2014: Phase I Bonds Issued but only if permits are in hand
- Nov. 2014: Contractor Selection
- Dec. 2014: Phase I Construction Starts
- Aug. 2015: Phase I Project Completed
- Fall 2019: Phase II Project Bonds Issued & Construction Commences
# Phase I Bond Election Schedule

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond Order Public Hearing, Set Referendum Date</td>
<td>February 20, 2014</td>
</tr>
<tr>
<td>Publish Bond Order and Notice of Referendum</td>
<td>ASAP after February 20, 2014</td>
</tr>
<tr>
<td>Absentee ballots available</td>
<td>March 17, 2014</td>
</tr>
<tr>
<td>Project Workshops 2A and 2B</td>
<td>March 19-20, 2014</td>
</tr>
<tr>
<td>Last Day to Register to Vote</td>
<td>April 11, 2014</td>
</tr>
<tr>
<td>Project Workshops 3A &amp; 3B</td>
<td>April 30 and May 1, 2014</td>
</tr>
<tr>
<td>Bond Referendum (Election Day)</td>
<td>May 6, 2014</td>
</tr>
<tr>
<td>Canvass Returns by Board of Elections</td>
<td>May 13, 2014</td>
</tr>
<tr>
<td>Referendum results certified by resolution</td>
<td>At first available VBHI meeting</td>
</tr>
<tr>
<td>Publish results of referendum</td>
<td>As soon as convenient after election results certified</td>
</tr>
</tbody>
</table>
"Terminal groin" means one or more structures constructed at the terminus of an island or on the side of an inlet, with a main stem generally perpendicular to the beach shoreline, that is primarily intended to protect the terminus of the island from shoreline erosion and inlet migration. A "terminal groin" shall be pre-filled with beach quality sand and allow sand moving in the littoral zone to flow past the structure.
Highlights of Coastal Policy Reform Act

To secure a CAMA permit for a terminal groin, the applicant must demonstrate:

- That structures or infrastructure are imminently threatened by erosion
- That nonstructural approaches to erosion control, including relocation of threatened structures, are impractical
- That the terminal groin will be accompanied by a concurrent beach fill project
- That construction and maintenance of the terminal groin will not result in significant adverse impacts to private property or to the public recreational beach.
Four towns are seeking terminal groin permits:

- Holden Beach
- Ocean Isle Beach
- Bald Head Island and
- Figure Eight Island

Law allows only four terminal groins to be permitted
Local Costs Under the Law

The applicant is responsible for the cost of:

- Construction
- Long-term maintenance and monitoring
- Mitigation of impacts, and
- Modification and removal of the groin, if needed.
- Terminal Groin Bonds must be approved by voters
Village of Bald Head Island, NC Terminal Groin

PUBLIC HEARING DEIS

Erik J. Olsen, P.E.
Overview of Presentation

• Discuss the Applicant’s preferred alternative (Alternative in the Draft EIS)

• Depict terminal groin characteristics

• Outline design and construction precepts

• Discuss intent to phase construction
DEIS Alternative Actions

• Alternative 1: No Action

• Alternative 2: Retreat

• **Alternative 3:** Beach Nourishment with sand tube groin field
  *<Current practice>*

• Alternative 4: Beach Nourishment without sand tube groin field

• **Alternative 5:** Terminal Groin with Beach Nourishment and the sand tube groin field
  *<Proposed action>*

• Alternative 6: Terminal Groin with Beach Nourishment and removal of the sand tube groin field
2006 Inlet Bathymetry

OAK ISLAND

MIDDLE GROUND

JAY BIRD SHOALS

BALD HEAD SHOAL

Project Area
ALT. 5 – Terminal Groin
Terminal Structure Goals

• Reduce sand losses from beach nourishment and beach disposal projects,

• Provide a template for shoreline alignment conducive to reduced littoral transport
Computational Domains (WAVE + FLOW)

- 3 Domains
- 73,800 Cells
Hydrodynamic Grids (FLOW)

- 4 Domains
- 68,650 Cells
- Cell Size Range: 430m offshore (Black) to 17 m nearshore (Red)
- WAVE Model refined using similar grid resolution(s)
Model Analysis of the BHI Terminal Groin

The Delft 3-D model allows for:

- Validation of design(s)
- Performance predictions
- Determination of potential impacts (local, regional, etc.).
Conceptual Terminal Groin

Beach Fill

Permeable

2009/10 Post-Nourishment Shoreline (Approx.)

Sand Tube Groin.

SOUTH BEACH

April 2011 Photo

GROIN WITH FILLET
Sediment Transport Potential (cy/yr)

EXISTING Conditions

PROPOSED Terminal Groin & Fill

May 2011

164,000 cy/year

440,000 cy/year
Terminal Groin Design Precepts

- Structure must be “leaky” (i.e. low and permeable)
- Post-construction “tuning” may be required
- Future up-drift sand placement required in a strategic manner
- Detailed annual monitoring to continue
VBHI – Terminal Groin Construction Approach

• Structure to be rubble mound with a marine mattress foundation
• Landward structure starts on the dry beach
• Seaward section construction methods:
  ➢ from top of structure
  ➢ from temporary trestle on the side
  ➢ from barge
• Material to be stockpiled at the Point.
TYPICAL TRESTLE INSTALLATION - OPTIONAL

NOTE:
1) TRESTLE SHALL BE CONSTRUCTED ALONGSIDE ROCK GROIN.
2) TRESTLE LENGTH TO BE DETERMINED BY BEACH CONDITIONS AT TIME OF CONSTRUCTION.
3) TRESTLE MAY NOT ENTER CULTURAL RESOURCE BUFFER AREA (SEE SHEET 3).
Permit Considerations

- Any future make-up sand would come from 2009 Jay Bird Shoals Borrow Site
- West Beach must continue to be incorporated into the Island’s Sand Management Plan
- Terminal structure may benefit the USACE navigation channel
Permit Considerations

• Structure construction needs to occur immediately following a federal beach disposal operation (usually 1M cubic yards of sand),

• Construction to occur after sand placement in fair weather months of summer

• Construction will overlap with sea turtle nesting season
1. Construct terminal groin to full length (as permitted)
   • Supplement Federal disposal sand from borrow source to assure initial fillet volume requirement

2. Implement Structure in Two (2) Phases
   • Phase I Terminal Groin configuration to be in conformance with Federal disposal volumetric expectations.
Terminal Groin Design
Preferred Engineering Approach

• Construct in two Phases,
• Assume COE disposal plan similar in 2013 (No fill westward of Sta. 45+00),
• Initiate construction mobilization and certain Phase I construction activities prior to and concurrent with beach disposal operations,
• Structure cross-section to be brought to its design elevation incrementally.
PHASE II

PHASE I

PHOTO: MAY 2013

NOTES:
1) PHASE I LENGTH - 1300 FT. M.O.L.
2) PHASE II LENGTH (TOTAL) - 1900 FT
3) PHASE I DESIGN ELEVATIONS REMAIN UNCHANGED.
Phased Structure
Rationale / Benefits

• Shorter period of construction,
• Should not require a trestle,
• Necessitates a smaller initial fillet volume,
• Potentially no additional sand source required (initially),
• Allows for more rapid activation of sand transport to downdrift shorefront,
• May ultimately satisfy stabilization goals of the Village (TBD).
Summary

• Terminal structure with episodic beach fill or beach disposal is the preferred plan,

• The sand tube groin field should remain until various groins are proven unnecessary,

• Adequate sand sources are available for fillet maintenance and mitigation

• The Applicant desires to construct the project in two (2) phase.
Terminal Groin Project
Costs and BHI Revenues

Can we afford this project?
### Beach Fund Revenue Account

<table>
<thead>
<tr>
<th>Year</th>
<th>Accommodations Revenue</th>
<th>Ad Valorem Revenue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-14</td>
<td>$940,500</td>
<td>$2,284,003</td>
<td>$3,224,503</td>
</tr>
<tr>
<td>2014-15*</td>
<td>$978,120</td>
<td>$2,284,003</td>
<td>$3,262,123</td>
</tr>
<tr>
<td>2015-16*</td>
<td>$1,017,245</td>
<td>$2,284,003</td>
<td>$3,301,248</td>
</tr>
<tr>
<td>2016-17*</td>
<td>$1,057,935</td>
<td>$2,284,003</td>
<td>$3,341,938</td>
</tr>
</tbody>
</table>

Note: Ad Valorem Revenues are equalized. If property values increase in 2015, property tax rate could be reduced. If property values fall in 2015, property tax rate could increase or accommodation taxes used to make up the shortfall.
## BHI Dedicated Ad Valorem Beach Fund Revenues

<table>
<thead>
<tr>
<th>Year</th>
<th>Base Rate 15.5 Cents/$100</th>
<th>Zone B Rate 5.06 Cents/$100</th>
<th>Zone A Rate 8.08 Cents/$100</th>
<th>Total AV Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-14</td>
<td>$1,928,405</td>
<td>$187,240</td>
<td>$223,563</td>
<td>$2,284,003</td>
</tr>
<tr>
<td>2014-15</td>
<td>$1,928,405</td>
<td>$187,240</td>
<td>$223,563</td>
<td>$2,284,003</td>
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<td>$1,928,405</td>
<td>$187,240</td>
<td>$223,563</td>
<td>$2,284,003</td>
</tr>
</tbody>
</table>
### BHI Projected Accommodation Tax Revenues

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Collections</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-10</td>
<td>$693,200</td>
<td></td>
</tr>
<tr>
<td>2010-11</td>
<td>$812,500</td>
<td>17%</td>
</tr>
<tr>
<td>2011-12</td>
<td>$893,300</td>
<td>10%</td>
</tr>
<tr>
<td>2012-13</td>
<td>$940,500</td>
<td>5%</td>
</tr>
<tr>
<td>2013-14</td>
<td>$940,500</td>
<td>0%</td>
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<tr>
<td>2014-15</td>
<td>$978,120</td>
<td>4%</td>
</tr>
<tr>
<td>2015-16</td>
<td>$1,017,245</td>
<td>4%</td>
</tr>
<tr>
<td>2016-17</td>
<td>$1,057,935</td>
<td>4%</td>
</tr>
<tr>
<td>2017-18</td>
<td>$1,100,252</td>
<td>4%</td>
</tr>
<tr>
<td>2018-19</td>
<td>$1,144,262</td>
<td>4%</td>
</tr>
<tr>
<td>2019-20</td>
<td>$1,190,033</td>
<td>4%</td>
</tr>
<tr>
<td>2020-21</td>
<td>$1,237,634</td>
<td>4%</td>
</tr>
<tr>
<td>2021-22</td>
<td>$1,287,140</td>
<td>4%</td>
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<tr>
<td>Project Phase</td>
<td>Cost</td>
<td>Date</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Phase I</td>
<td>$8,000,000</td>
<td>Sept. 2014</td>
</tr>
<tr>
<td>Phase II</td>
<td>$8,000,000</td>
<td>Sept. 2019</td>
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<tr>
<td>Phase II Contingency Fund</td>
<td>$2,000,000</td>
<td>Sept. 2019</td>
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Phase II Bond totals $10,000,000
## Terminal Groin Bond Costs

<table>
<thead>
<tr>
<th></th>
<th>Interest Rate</th>
<th>Debt</th>
<th>Quarterly Cost</th>
<th>Annual Cost</th>
<th>Bond Issued</th>
<th>Bond Retired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>2.25%</td>
<td>$8,000,000</td>
<td>$524,241</td>
<td>$2,096,964</td>
<td>Sep-14</td>
<td>Sep-19</td>
</tr>
<tr>
<td>Phase II</td>
<td>3.50%</td>
<td>$10,000,000</td>
<td>$547,204</td>
<td>$2,188,816</td>
<td>Sep-19</td>
<td>24-Sep</td>
</tr>
</tbody>
</table>

Note 1: Existing 2009 Bonds are retired in Sept 2015
Note 2: Phase I Bond payments in 2015 will be interest only at a cost of $135,000
## Existing Revenues Are Enough

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Bond Payment</th>
<th>Ad Valorem Revenue</th>
<th>Supplemental Accommodation Tax Revenue</th>
<th>Funds Pay For:</th>
</tr>
</thead>
<tbody>
<tr>
<td>13/14</td>
<td>$2,893,829</td>
<td>$2,284,003</td>
<td>$609,826</td>
<td>2009 Bond P&amp;I</td>
</tr>
<tr>
<td>14/15</td>
<td>$3,028,829</td>
<td>$2,284,003</td>
<td>$744,826</td>
<td>2009 Bond P&amp;I</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Phase I Bonds Year 1 Interest</td>
</tr>
<tr>
<td>15/16</td>
<td>$2,341,183</td>
<td>$2,284,003</td>
<td>$57,180</td>
<td>2009 Bond P&amp;I</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>and Phase I Bonds P&amp;I</td>
</tr>
<tr>
<td>16/17 to 18/19</td>
<td>$2,227,924</td>
<td>$2,284,003</td>
<td>$ - 0 -</td>
<td>Phase I Bonds P&amp;I</td>
</tr>
<tr>
<td>19/20 to 24/25</td>
<td>$2,188,816</td>
<td>$2,284,003</td>
<td>$ - 0 -</td>
<td>Phase II Bonds P&amp;I</td>
</tr>
</tbody>
</table>
Before the March 19-20 Workshops

- Continue stakeholder interviews
- Verify that all project costs have been accounted for in the financial plan
- Analyze the use of ad valorem vs. accommodations taxes in carrying project bond debt
- Analyze potential impact of 2015 property revaluation
- Ensure adequate beach fund reserves are maintained
- Provide update on CAMA and USACE permitting processes and schedule
Thank you!

For follow up questions or comments, contact

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peter@ravellaconsulting.com