APPENDIX 1. STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS

Customer-focused employees coupled with streamlined operations and ongoing improvements like the deployment of a Terminal Operating System and Warehouse Management that provides valuable tools to the Authority's customers delivers customer satisfaction. The Authority is known among its customers as having one of the high performing, lower-cost operations in the South Atlantic, a position that enables competitive pricing contributing to economic benefit and financial sustainability. A diversified portfolio of business at both port facilities further minimizes risk and provides financial strength and opportunity.

Terminal underutilization, undeveloped properties, opportunities for operational improvements and future technology upgrades provide ample capacity for expansion and growth at the Authority's facilities while neighboring ports are struggling with congestion and long wait times, although they are finding ways to adapt and address these issues. North Carolina's ports have space to expand and a lack of congestion at the terminals.

Internal Organizational Weaknesses

Operations generate revenue streams that are marginally sufficient to cover operating expenses and service debt, however, retained earnings after these obligations have been met are insufficient to fund the considerable major maintenance and asset preservation requirements of the facilities.

A lack of adequate infrastructure is an impediment to growth and development. Improvements to the supply chain outside of the port boundaries are critical, including economic development associated with manufacturing. Additional market intelligence and appropriate resourcing of the sales team would better inform and influence successful marketing efforts. Deficiencies in sailing frequencies and global trade lanes for containers, bulk and breakbulk will continue to restrain growth. Reliable and consistent intermodal service is a critical requirement to grow the container services.

Opportunities in the External Environment

Transhipment provides an opportunity to capture smaller ships suitable to the current channel at the Port of Wilmington (up to 6,600 TEU vessels) and would also address and lack of sailing frequency and trade lane availability. Hand in hand with vessel suitability, the identification of commodities/markets (grain, lumber, pork/poultry, tobacco, cotton) that are indigenous and can support trade volumes to and from the customer base in North Carolina coupled with growth in regions like South America provide market opportunities. Largely driven by private industry, emerging energies could become a large industrial presence in North Carolina that, with investment in infrastructure could benefit ports. While not currently an opportunity, re-shoring, or the concept of the return of manufacturing to the U.S. could boost these energy, transshipment and agriculture efforts.

A modern, scalable rail to ship (with storage) transload complex that could provide inbound and outbound access to a variety of bulk and breakbulk customers would be an ideal approach to providing a number of different commodities/customers customized solutions for complex supply chains. Additionally, a non-dedicated complex allows for multiple users, increasing the investment value.

Increased identification of customer needs that could be provided with expanded products and capabilities as well as logistics services for part, or all or part of a customer's supply chain management is a service that could be leveraged to keep and grow business. Cross-functional skills of staff, coupled with additional sales resources with a focus on beneficial cargo owners and targeted market areas would likely improve and better direct marketing efforts. The current business environment focused on improved infrastructure to support port efforts and a statewide team of dedicated commerce and agriculture partners help to communicate the need for a thriving global gateway.
Threats in the External Environment

The Panama Canal Authority's project to increase capacity in a way that would also allow for much larger vessels to transit is slated for completion in 2016, and with the opening of the additional locks comes the prospect of a game changing ocean carrier migration to Post Panamax container vessels (generally 6,000 TEU and larger). The economic advantage of these larger container vessels is maximized by deploying them in long distance, high volume trade lanes like the Transpacific and limiting the number of ports they call. This issue poses a significant threat to the Authority because while the Cape Fear River cannot accommodate most vessels this large, competing ports in Virginia, South Carolina and Georgia are now or will soon be able to handle them. These circumstances place a large portion of the container volume at risk of being rerouted to other ports with better navigational access and this could have severe negative financial consequences.

In Morehead City, a separate challenges now exists related to recent channel shoaling that has forced vessels to 'light load' in order to safely transit the areas in need of dredging. This condition adds to the operating expenses of customers and creates a negative outlook for the Authority in the marketplace.

The Authority is further threatened by lack of competitive rail rates which limit the size of the addressable markets. While other South Atlantic regional ports have access to multiple Class I rail carriers, CSX is the only rail carrier serving the Port of Wilmington and Norfolk Southern has exclusive rights over the North Carolina Railroad tracks to and from the Port of Morehead City. Rates and services offered to the Authority appear to be less competitive than those provided to ports in Virginia, South Carolina and Georgia. This situation limits the growth prospect of the port itself and ocean carrier customers.

In addition to the lack of rail competition, the inability to leverage the existing rail infrastructure for reliable and cost competitive intermodal service impedes the Authority’s ability to entice new container services to the Port of Wilmington.

The three big ports in the South Atlantic range are investing heavily in infrastructure and facilities and are under extraordinary pressure from their stakeholders to capture market share at any cost. The threat to the Authority is the potential loss of customers to aggressive sales proposals and use of economic development tools not available in North Carolina.
APPENDIX 2. PEER PORT ANALYSIS

Regional ports identified as peers to the Authority include Norfolk, Charleston, and Savannah. These peers were selected for evaluation and comparison based on the following factors:

- Similar location in the southeastern U.S.: all of the ports selected are likely to directly serve North Carolina shippers and the emerging Piedmont Atlantic Megaregion (PAM). PAM is composed of core metropolitan areas, including Birmingham, Atlanta, and two in North Carolina – Charlotte and Raleigh-Durham.
- All have interstate access to major North Carolina market areas without passing one of the other peer ports.
- All are designated as Strategic Seaports.
- They are leading ports for North Carolina waterborne exports.
- They handle the same freight types as the North Carolina facilities, facilitating comparison.

The Port of Morehead City has a highly advantageous location that is closest to the ocean. Wilmington, by contrast, is comparable to the Port of Savannah in distant from the ocean and water depth. None of the regional peers with the possible exception of the Port of Norfolk can fully accommodate the largest new Post Panamax ships.

The peer ports identified for this study include Virginia, South Carolina, Georgia, and container cargo identified with an origin or destination of Caribbean and Central America moving through Port Everglades and Miami, Florida. Jacksonville, Florida has a similar profile and characteristics to the container facility at the Port of Wilmington, however, it was not included in the container addressable market review because currently North Carolina is a truck market.

Table 10. Regional Peer Port Terminal/Port Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Wilmington</th>
<th>Morehead City</th>
<th>Norfolk</th>
<th>Charleston</th>
<th>Savannah</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance to sea buoy (miles)</td>
<td>26</td>
<td>4</td>
<td>18</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>Depth (maximum feet)</td>
<td>42</td>
<td>45</td>
<td>50 (with authorization to 55)</td>
<td>45 (harbor channel and dockside)</td>
<td>Garden City: 42</td>
</tr>
</tbody>
</table>

Source: AECOM/URS team analysis, FAF 3.1 data, individual port web sites
Table 11. Regional Peer Port Landside Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Wilmington</th>
<th>Morehead City</th>
<th>Norfolk</th>
<th>Charleston</th>
<th>Savannah</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment (300 miles)</td>
<td>9,835,746</td>
<td>11,299,091</td>
<td>25,709,948</td>
<td>13,763,843</td>
<td>15,884,074</td>
</tr>
<tr>
<td>Employment (500 miles)</td>
<td>41,704,522</td>
<td>41,900,520</td>
<td>50,527,138</td>
<td>33,299,436</td>
<td>29,043,452</td>
</tr>
<tr>
<td>Distance to interstate from gate</td>
<td>7.8 miles to I-40</td>
<td>111 miles to I-795</td>
<td>5.8 miles to I-264</td>
<td>2.5 miles to I-26</td>
<td>5.6 miles to I-95 from Garden City; 10 miles to I-95; 1.5 miles to I-516 from Ocean Terminal</td>
</tr>
<tr>
<td>Rail access</td>
<td>CSX service; In- port switching by Wilmington Terminal Railroad; Substantial rail car storage</td>
<td>NS service; In- port switching by Carolina Coastal Railway; Railroad scale; Substantial car storage</td>
<td>CSX and NS service to Hampton Roads; NS and CSX service to Norfolk via Suffolk and the Commonwealth Railway</td>
<td>CSX and NS service to Union Pier, Columbus Street, North Charleston and Veterans; On-terminal rail yards at Columbus St. and North Charleston</td>
<td>CSX and NS service to Garden City and Ocean Terminal; On-terminal ICTF at Garden City</td>
</tr>
</tbody>
</table>

Source: AECOM/URS team analysis, FAF 3.1 data, NCDOT rail maps, individual port web sites

Table 12. Regional Peer Port Operational Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Wilmington</th>
<th>Morehead City</th>
<th>Norfolk</th>
<th>Charleston</th>
<th>Savannah</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military use</td>
<td>Strategic Seaport</td>
<td>Strategic Seaport</td>
<td>Strategic Seaport</td>
<td>Strategic Seaport</td>
<td>Strategic Seaport</td>
</tr>
<tr>
<td>Hours of Operation</td>
<td>Container Terminal: M-F 7am - 5:00 pm; General cargo: M-F 7:30am to 3:30pm</td>
<td>General Terminal: M-F 8am - 4pm</td>
<td>Newport News: M-F 8am - 12pm; 1pm - 5pm</td>
<td>7am - 6pm; Saturday 8am - 5 pm (six month trial)</td>
<td>GCT Gate 3: M-Th 7am - 6pm; F 7am - 5pm GCT Gate 4: M-F 7am - 6pm Saturday 8am - 12pm; 1pm - 5pm</td>
</tr>
</tbody>
</table>

Source: AECOM/URS team analysis, FAF 3.1 data, individual port web sites
<table>
<thead>
<tr>
<th>Capital Project Funding Status</th>
<th>North Carolina</th>
<th>Virginia</th>
<th>South Carolina</th>
<th>Georgia</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Appropriations (Project Specific)</td>
<td>Yes in the past, General Appropriations and R&amp;R fund, last contribution was 2010</td>
<td>Yes in the past, last primary government contribution was 2008 for rail relocation/Craney Island</td>
<td>Yes in the past, most recently for land acquisition in 2007.</td>
<td>Yes, through GO Bond issuance, also through other capital contributions (no detail provided)</td>
</tr>
<tr>
<td>State Appropriations (Regular)</td>
<td>No</td>
<td>Yes, from the Commonwealth Transportation Trust Fund (4.2%) to fund debt service and capital expenditures</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Federal</td>
<td>Yes, Port Security Grants</td>
<td>Yes, PSGP, emissions and ARRA</td>
<td>Yes, Port Security Grants, Heavy diesel engine replacement program</td>
<td>Yes (no detail provided)</td>
</tr>
<tr>
<td>Other</td>
<td>Some state grants for special programs, such as FRISCI (Rail grants), Environmental</td>
<td>Yes, from Component Unit (VIT)</td>
<td>Received land from the Charleston Naval Base Redevelopment Authority in 2008</td>
<td>Yes, from local governments (no detail provided)</td>
</tr>
<tr>
<td>GO Bond(s)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes (through the state of GA) - repaid to the state as voluntary payments (does not sit on balance sheet as long term debt)</td>
</tr>
<tr>
<td>Revenue Bond(s)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, but currently has $0 outstanding</td>
</tr>
<tr>
<td>Special Purpose (Conduit) Bonds</td>
<td>Yes (Bulk Grain Facility)</td>
<td>$0 outstanding</td>
<td>$0 outstanding</td>
<td>$0 outstanding</td>
</tr>
<tr>
<td>Capital Leases/Other Debt</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Source: Interviews with peer ports, NCSPA*
<table>
<thead>
<tr>
<th></th>
<th>Containers (TEU)</th>
<th>Breakbulk (Tons)</th>
<th>Bulk (Tons)</th>
<th>Ro/Ro (units)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wilmington</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Capacity</td>
<td>600,000±</td>
<td>1,470,000</td>
<td>3,220,000</td>
<td>Unknown</td>
</tr>
<tr>
<td>2013 Throughput</td>
<td>268,049</td>
<td>324,173</td>
<td>2,947,121</td>
<td>0</td>
</tr>
<tr>
<td>% Utilization</td>
<td>44%</td>
<td>22%</td>
<td>91%^</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Morehead City</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Capacity</td>
<td>0</td>
<td>1,080,000</td>
<td>2,730,000</td>
<td>Unknown</td>
</tr>
<tr>
<td>2013 Throughput</td>
<td>0</td>
<td>221,436</td>
<td>1,588,739</td>
<td>0</td>
</tr>
<tr>
<td>% Utilization</td>
<td>N/A</td>
<td>21%</td>
<td>58%</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Virginia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Capacity</td>
<td>3,630,000</td>
<td>6,820,000</td>
<td>Not available</td>
<td>320,000</td>
</tr>
<tr>
<td>2013 Throughput</td>
<td>2,223,532</td>
<td>3,360,600</td>
<td>N/A *Coal Loadings Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>% Utilization</td>
<td>61%</td>
<td>49%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>South Carolina</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Capacity</td>
<td>3,230,000</td>
<td>4,030,000</td>
<td>100,000</td>
<td>200,000</td>
</tr>
<tr>
<td>2013 Throughput</td>
<td>1,601,000</td>
<td>723,420</td>
<td>494,645</td>
<td>213,407*</td>
</tr>
<tr>
<td>% Utilization</td>
<td>50%</td>
<td>18%</td>
<td>495%</td>
<td>107%</td>
</tr>
<tr>
<td><strong>Georgia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Capacity</td>
<td>4,500,000</td>
<td>7,440,000</td>
<td>2,110,000</td>
<td>1,070,000</td>
</tr>
<tr>
<td>2013 Throughput</td>
<td>3,033,727</td>
<td>2,452,230</td>
<td>2,666,954</td>
<td>636,942</td>
</tr>
<tr>
<td>% Utilization</td>
<td>67%</td>
<td>33%</td>
<td>126%</td>
<td>60%</td>
</tr>
</tbody>
</table>

*Source: AECOM Capacity Analysis, individual port websites, NCSPA
±Could be expanded with capital investment, *Achieves greater capacity through operational methods, *2012 data only available
### Table 15. Regional Peer Port Financial Data

<table>
<thead>
<tr>
<th>Financial Data</th>
<th>North Carolina</th>
<th>Virginia</th>
<th>South Carolina</th>
<th>Georgia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Revenues (in millions, FY13)</td>
<td>44.30</td>
<td>352.30</td>
<td>140.40</td>
<td>292.60</td>
</tr>
<tr>
<td>Operating Expenses (in millions, FY13)</td>
<td>39.50</td>
<td>367.80</td>
<td>124.10</td>
<td>214.30</td>
</tr>
<tr>
<td>Interest Expense (in millions, FY13)</td>
<td>-3.90</td>
<td>-21.70</td>
<td>-1.70</td>
<td>0.30</td>
</tr>
<tr>
<td>Other Nonoperating Income (Expense) (in millions, FY13)</td>
<td>-0.10</td>
<td>41.40</td>
<td>-6.77</td>
<td>-44.90</td>
</tr>
<tr>
<td>Change in Net Position (in millions, FY13)*</td>
<td>0.80</td>
<td>4.20</td>
<td>7.83</td>
<td>-44.60</td>
</tr>
</tbody>
</table>

*Source: Individual port web sites, NCSPA*

*Non operating income/expense may include income from various sources, including receipt of grants or dedicated state funds, as well as unusual or extraordinary expense items.*

### Table 16. Regional Ports Output Contribution Comparison

<table>
<thead>
<tr>
<th>Port</th>
<th>Study Base Year</th>
<th>Output (Millions of Dollars)</th>
<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina (Port of Wilmington)</td>
<td>2013</td>
<td>7,679</td>
<td>2,712</td>
<td>2,513</td>
<td>12,906</td>
<td></td>
</tr>
<tr>
<td>North Carolina (Port of Morehead City)</td>
<td>2013</td>
<td>687</td>
<td>274</td>
<td>149</td>
<td>1,110</td>
<td></td>
</tr>
<tr>
<td>North Carolina (Both Ports)</td>
<td>2013</td>
<td>8,366</td>
<td>2,986</td>
<td>2,662</td>
<td>14,016</td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td>2011</td>
<td>39,254</td>
<td>27,643</td>
<td>55,606</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Carolina</td>
<td>2007</td>
<td>26,643</td>
<td>18,177</td>
<td>44,820</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: North Carolina State University, ITRE, 2014*
<table>
<thead>
<tr>
<th>Port</th>
<th>Study Base Year</th>
<th>Direct</th>
<th>Indirect</th>
<th>Induced</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina (Port of Wilmington)</td>
<td>2013</td>
<td>39,100</td>
<td>16,000</td>
<td>17,900</td>
<td>73,000</td>
</tr>
<tr>
<td>North Carolina (Port of Morehead City)</td>
<td>2013</td>
<td>1,300</td>
<td>1,300</td>
<td>1,100</td>
<td>3,700</td>
</tr>
<tr>
<td>North Carolina (Both Ports)</td>
<td>2013</td>
<td>40,400</td>
<td>17,300</td>
<td>19,000</td>
<td>76,700</td>
</tr>
<tr>
<td>Georgia</td>
<td>2011</td>
<td>153,884</td>
<td>198,263</td>
<td></td>
<td>352,146</td>
</tr>
<tr>
<td>South Carolina</td>
<td>2007</td>
<td>88,700</td>
<td></td>
<td>172,100</td>
<td>260,800</td>
</tr>
</tbody>
</table>

*Source: North Carolina State University, ITRE, 2014*
APPENDIX 3. MEGAREGIONS

With a low cost of living and high quality of life, the southeastern US is projected to realize significant growth in the coming years. In particular, the Piedmont Atlantic Megaregion, anchored by the metropolitan areas of Atlanta, Birmingham, Raleigh-Durham, and Charlotte, is projected to see its 2010 population of 17 million realize 78 percent growth by 2050.

Figure 6. Emerging US Mega-Regions

Source: Regional Plan Association, www.america2050.org/maps/

During the next 40 years, demographers and economists anticipate that the majority of the nation’s population growth and economic expansion is expected to occur in ten or more emerging megaregions. Megaregions are characterized by a group of metropolitan economies that share 1) environmental systems and topography, 2) infrastructure systems, 3) economic linkages, 4) settlement patterns and land use, and 5) shared culture and history.

Two of North Carolina’s largest metropolitan areas anchor the northern end of this sprawling megaregion, expected to become one of the nation’s largest consumer and labor markets. The evolution of an urban network dominated by 360 or more metropolitan areas into a more consolidated one dominated by ten large megaregions is an important change in considering how to move freight in the future. Much of the Piedmont Atlantic megaregion is inside North Carolina’s addressable market.6

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APPENDIX 4. PANAMA CANAL EXPANSION

The ongoing expansion of the Panama Canal will allow more and larger (deeper draft, wider, and of greater capacity) ships to pass through this key trade link between Asia and the U.S. east coast. Scheduled for completion in early 2016, the Panama Canal expansion comprises the addition of a larger set of locks that will allow for transit Neo Panamax ships that have nearly three times the carrying capacity of current Panamax ships. Perhaps more importantly, the new parallel locks will significantly increase the capacity of the Canal.

With larger locks and greater capacity, the expanded Panama Canal has the potential to enhance the competitiveness of the all-water route between Asia and the U.S. Gulf Coast and East Coast; however, there has been much debate regarding the amount of Asia-Pacific cargo that will be diverted from U.S. and Canadian west coast ports through the Canal. Gulf coast and east coast marine ports stand to improve their share of the Asia-Pacific trade volumes if they can provide adequate navigation depth, in-port handling capacity, and fast, reliable rail and highway connections from North American production centers (for exports) to consumer markets (for imports).  

Figure 7. Container Vessels Capable of Transit through the Panama Canal

<table>
<thead>
<tr>
<th>Designation</th>
<th>TEU Capacity</th>
<th>Year</th>
<th>Length</th>
<th>Beam</th>
<th>Draft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panamax</td>
<td>3,000-5,000</td>
<td>1980</td>
<td>965 ft</td>
<td>106 ft</td>
<td>39.5 ft</td>
</tr>
<tr>
<td>Post-Panamax</td>
<td>5,000-6,000</td>
<td>1992</td>
<td>1,043 ft</td>
<td>128-138 ft</td>
<td>49 ft</td>
</tr>
<tr>
<td>5th &amp; 6th generation</td>
<td>5,000-8,700</td>
<td>1997</td>
<td>1,148 ft</td>
<td>128-138 ft</td>
<td>49 ft</td>
</tr>
<tr>
<td>Neo Panamax</td>
<td>10,000-13,000</td>
<td>2009</td>
<td>1,200 ft</td>
<td>160 ft</td>
<td>49.9 ft</td>
</tr>
</tbody>
</table>

Source: adopted from www.globalsecurity.org

7 NC Maritime Strategy Study; AECom, June 26, 2012.
APPENDIX 5. GLOBAL VESSEL FLEET

Containerships

The trend in the container shipping industry in recent decades has been toward the use of increasingly larger vessels. This trend is driven both by economies of scale and the availability of infrastructure to these larger ships, such as Post Panamax and super Post Panamax vessels.

Figure 8: Cross Section of Existing (left) and New (right) Locks of the Panama Canal

![Diagram of Panama Canal locks](image)

*Source: Lloyds Register*

The focus today on the Panama Canal results from the dominance of Asia in the U.S. container trade. With a potential trade shift to India and other parts of Asia, the Suez Canal may become a more significant consideration in the size of vessels that serve the U.S. east coast. The Suez Canal has no locks, and therefore no vessel length restrictions. Ships with a maximum draft of 68.9 feet and beam of nearly 200 feet can navigate the Suez Canal.

Looking beyond size restrictions imposed by the Canal, operational costs will drive the size of vessel serving the southeastern U.S. An evaluation of vessel operational costs, including fuel and crew costs as well as canal tolls, indicates that a 12,000 TEU vessel carrying about 55 percent of its total container capacity would have the same per-TEU operating costs as a Panamax 4,000 TEU Panamax vessel that is 80 percent full. Before putting these larger vessels into service, shipping lines will need to be confident that they can achieve at least this level of utilization.

Figure 9: Cumulative Probability of Actual Containership Draft

![Graph of cumulative probability](image)

*Source: Moffatt & Nichol from Port of Long Beach data on actual vessel draft*
With much focus on design draft of these larger containerships, it is important to remember that vessels typically operate at 80 percent to 90 percent of their design draft, so a vessel with 45-foot design draft may draw significantly less water as loaded. For example, the actual draft of 90 percent of the 8,000 TEU vessels calling on the Port of Long Beach (which has no depth restriction) had an actual draft of 42 feet or less. Those same vessels would require four feet of gross underkeel clearance, or an operating channel depth of 46 feet.

Figure 10: U.S. Army Corps of Engineers Channel Depth Allowances

Channel depths are typically described by Mean Low Low Water Depth (MLLW), which establishes the minimum navigational depth at low tide. Operational depths may be greater due to tide variation, advance maintenance dredging and dredging tolerances below the authorized depth.

Stakeholder discussions with shipping lines serving North Carolina and surrounding states indicate that 8,000 TEU vessels will become the “workhorse” of U.S. container trade. While these vessels have a design draft of 45 feet to 49 feet and would theoretically require an authorized channel depth of up to 53 feet, ocean carriers concur that an operational depth of 45 feet to 47 feet would meet demand for container vessels likely to call on the U.S. East Coast.

Bulk and Breakbulk Vessels

Lloyd’s Register projects a global use of three primary vessel sizes for bulk transport: Panamax (60,000 to 80,000 dead weight tonnage [dwt] capacity), Handymax (50,000 to 60,000 dwt), and Capesize (greater than 80,000 dwt) vessels. The larger (170,000 to 180,000 dwt) Capesize vessels are generally liquid bulk or dry bulk vessels used for Asia, Australia and Europe routes. Use of Handymax bulk vessels offers flexibility to serve a variety of bulk markets. Most berths at North Carolina’s ports can accommodate the popular Panamax and smaller Handymax bulk vessels.

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8 NC Maritime Strategy industry workshop with shipping lines – held August 30, 2011.
Figure 11: Global Bulk Vessel Fleet

Source: Fairplay, as reported in Lloyd's Register Bulk Carrier Focus, January 2005 dwt = dead weight tonnage
APPENDIX 6. DISTRIBUTION CENTERS AND INLAND PORTS

Distribution Centers

Regional distribution nodes, including logistic centers and inland ports, provide facilities for intermodal transfers, transloading, and warehousing for waterborne goods. At present, the vast majority of maritime-transported goods going through North Carolina logistics facilities moves in or out of seaports of other states, most notably the ports of Norfolk, Savannah, and Charleston. Reasons cited for why North Carolina ports are not used to a greater extent include insufficient channel depth for serving larger oceangoing vessels, as well as inland congestion choke points, including in the areas of Charlotte and Greensboro. Thus, in the near term, public and private inland port facilities in North Carolina are likely to largely handle significant cargo volumes that move through seaports of other states; however, growing volumes at North Carolina inland ports could bring about a critical mass that spurs justification of channel enhancement and other infrastructure efficiencies at North Carolina seaports.

Inland Ports

One of the driving purposes of an inland port is to accommodate numerous functions of shipping that do not have to take place at or in close proximity to the water’s edge. In addition to consolidation of cargos, inland ports may include warehousing, cross-docking (unloading goods from incoming truck or rail units and loading them directly into outbound units with little or no storage in between), light manufacturing, truck and rail servicing, and storage of chassis and containers. With the U.S. chassis provisioning model changing, as ocean carriers get out of this aspect, involvement in furnishing chassis may also be considered.

The aggregation of transportation assets and logistics services at a single location has the potential to reduce cost-to-market for manufacturers and shippers with similar transport needs. Availability of value-added services (warehousing, distribution, handling, repackaging and consolidation) may be seen as essential. Some of the most successful inland ports in other states, such as the Virginia Inland Port in Front Royal, Virginia serve as U.S. Customs-designated ports of entry and offer a full range of customs functions to customers.
APPENDIX 7. COMMODITY ANALYSIS

Automobiles

Major manufacturing and assembly plant site-selection criteria require proximity to deepwater port facilities with global service coverage. Automotive plants generate thousands of jobs and lay a foundation for further economic growth. Typically, third party auto processors will operate near an auto processing plant because auto manufacturers depend on auto processing facilities which provide services to the vehicles prior to shipment which results in indirect economic benefits.

Considerations when siting a major auto assembly plant include site development, transportation infrastructure, susceptibility to natural disasters, proximity to competitors and vendors, labor market conditions, and economic impact studies, sites must be examined for their current value and future impact to the company’s operations. Finally, incentives can be an aggressive tool used by a state to attract a project to an area, but there is also an increasing demand for the right kind of labor for the right price. Automotive plants are looking to Southern states for a number of reasons: low wage rates, lower cost utilities, non-unionized labor, less expensive land, freight costs, lower taxes, and market share redistribution from traditional domestic manufacturers to Asian and European companies who manufacture in the south.10

Agriculture

North Carolina’s agricultural industry, including food, fiber and forestry, contributes $78 billion to the state’s economy, accounts for more than 17 percent of the state’s income, and employs 16 percent of the work force. North Carolina is one of the most diversified agriculture states in the nation. The state’s 52,200 farmers grow more than 80 different commodities, utilizing 8.4 million of the state’s 31 million acres to furnish consumers a dependable and affordable supply of food and fiber. North Carolina produces more tobacco and sweet potatoes than any other state and ranks second in Christmas tree cash receipts and the production of hogs and turkeys. The state ranks seventh nationally in farm profits with a net farm income of over $3.3 billion.11

While neighboring ports handle the much of North Carolina’s agriculture exports, recent infrastructure improvements to rail lines and roads, along with infrastructure upgrades at the Port of Wilmington and the Port of Morehead make North Carolina’s ports more attractive for agricultural exports. Recent activity and improvements related to agriculture includes a new development for a cold storage facility at the Port of Wilmington and two new wood pellet projects (one in Wilmington and the other in Morehead City).

According to forest-industry experts at N.C. State University, U.S. production of wood pellets is expected to increase from 3 million tons just four short years ago, to nearly 10 million tons by 2015. With its vast amount of renewable and sustainable wood fiber sources, North Carolina is an attractive location for wood biomass plants. Together, the new wood pellet projects are expected to generate more than 2.4 million tons of volume at the port facilities over the next five years.

Agriculture - Lumber (Dimensional, Chips and Logs)

There are several distinct markets in the import breakbulk lumber segment. These segments are derived from the various geographic origins (Europe, Central and South America, Asia) as well as the specific products (dimensional lumber, fencing lumber, plywood and veneers, etc.). The European import lane is dominated by high grade dimensional lumber from the large sawmills in northern Europe. The South American import market is primarily low grade lumber for fencing or similar applications. The Asian import market is comprised of various veneers and low grade material, such as plywood.

Most of the breakbulk segments are delivered or carried by liner carriers that have specific contracts with the shipper. The liner carriers calling at North Carolina Ports are influenced by the shipper and less by the carrier.

11 http://www.noagr.gov/stats/general/overview.htm
The influence on the carriers by the Authority is primarily the inducement of lower dockage rates based on volume. The Authority normally enters into specific service agreements with the shipper based on handling and wharfage charges dependent on volume. These discounts are either tiered, more volume moves to lower rates, or rates lower than tariff based on total tonnage shipped or guaranteed.

Building slump continues to result in closed mills and consolidation of producers. Imports may continue based on species supply of superior quality and quantity. Pricing pressures limit growth, however. Vida and Klausner USA continue to import small volumes of lumber. SGlobal Prime Wood and other shippers remain keen to induce Gearbulk and other carriers to call the east coast with their fence lumber. However, during the recession shippers shifted imports to smaller quantities with container carriers due to low demand and attractive container rates. Key objectives are to maintain customer contact and develop programs to move products to outside storage and identify warehouse utilization opportunities and if necessary, create an exit strategy for these cargoes. Specific plans include maintaining client relations to understand changing service requirements for shippers and vessel operators and developing client solutions with specific value added service opportunities.

The Port of Wilmington has an ongoing log export program. IVP Forest Products, Inc. has established an operation on a leased area of the port to receive logs, sort and classify, debark, and stuff/load into ocean containers. Anticipated volume this year was approximately 100 FEUs/week. Annual volume targets in following years are 200 FEUs/week, subject to market conditions. In addition to the stuffing of ocean containers, IVP Forest Products exports logs as breakbulk cargo. This option is dependent on U.S. Department of Agriculture fumigation requirements, permits to fumigate large volumes of breakbulk cargo and the economics of the operations.

North Carolina lumber is both an import and an export commodity with a variety of types of lumber commodities. For lumber imports, slow growth is expected over the next three years tied mainly to the housing and construction market. Growth potential will also be affected by strength of U.S. dollar to the Euro and other foreign currencies. The life cycle state of lumber is mature, and the current general import trend is slightly upward with improved construction market in U.S. The confidence in market from lumber importers remains weak despite improved conditions over the past 1.5 years. Trend-line will follow U.S. construction market and domestic production choices from U.S. sawmills. Some uncertainty to traditional North Europe import lumber exists due to sawmill capacity being added in North Carolina and Florida by Klausner (Enfield, N.C.). The capacity may also produce opportunities for export volumes.

Historically, the major lumber importers have segmented the U.S. East Coast into three general geographic areas; Northeast (Baltimore/Philadelphia), Mid-Atlantic (Wilmington), Southeast (Savannah). The Port of Wilmington has dominated the Mid-Atlantic. Increased competition is likely to come from both Norfolk and Charleston in the future.

Agriculture - Grain

As much as one third of all grain produced in the U.S. moves into export. In 2011 approximately $42.3 billion worth of grains and oilseeds were exported from the United States via this system. It is expected that over 100 million metric tons, of primarily U.S. corn, soybeans and wheat, were handled by the U.S. grain export system in the calendar year 2012. Annual volumes and value vary widely based on pricing, currency values, U.S. market access, and global supply and demand for the commodities produced in the United States. Approximately 61 percent of the U.S. export grain shipments departed through the U.S. Gulf region in 2013. Only 3 percent of the grain inspected for export moved via an Atlantic coast port. See Figure 12 for the distribution of grain inspections for export by U.S. port region in 2013.

12 http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDCS107646
Figure 12. Distribution of Grain Inspections for Export by U.S. Port Region (1,000 metric tons) in 2013

Source: Grain Inspection, Packers and Stockyards Administration/USDA

The U.S. grain export system is a large, diverse, and evolving industry including public, private and cooperatively owned and managed facilities and trading entities. The industry must constantly seek added efficiencies, mitigate the enormous risks associated with international trade in a mature and politically charged environment, compete and trade with subsidized and state controlled organizations, upgrade export facilities and streamline logistical capabilities in order to sustain the export of U.S. agricultural products. Exporting grain is both a competitive and a capital-intensive industry. Since the margin of profit to be earned from moving a ton of grain can be quite small, exporters depend upon moving large volumes very quickly. They seek to achieve an economy of scale that lowers their average fixed costs per unit of volume handled, provides operating flexibility, increases bargaining power in chartering for shipping, and improves the services they can provide worldwide.

U.S. export grain marketing is essentially a private sector system; with the exception of humanitarian food aid, the U.S. Government does not directly engage in the day-to-day marketing of grains and oilseeds. Grains and oilseeds are sold by competing private-sector merchants using predominantly private facilities. When the U.S. Government acts to export for international food assistance it contracts for commodity and logistics with the private-sector system.

The following drivers frame global supply and demand for agricultural products and the competition to meet demand among supplier countries early in the 21st century:

- Trade liberalization and opening of markets, in particular the reduction of trade barriers through global progress in World Trade Organization agreement and implementation.
- Political Conflicts, Economic and Social Stability.
- The rise of questionable sanitary and phytosanitary issues and anti-dumping actions, replacing tariffs and quotas as the trade barriers of choice.
- Population growth and heavy urbanization in developing countries,
- Growth in consumer income and of the middle class in emerging markets,
- Rising demand for high-value products, especially new, specialty products,
- Stagnant aggregate demand in high-income, developed countries,
- Global debate over the value, safety, and morality of biotechnology and other technologies,
- Relative cost of production among international competitors, and
• The competitiveness of marketing infrastructure\textsuperscript{13}. The vast majority of grain exports are carried to the Gulf by way of the Mississippi River. The U.S. river system permits a very efficient and economical barge transportation system for the export of grain from the heart of the U.S. grain belt. This is supplemented by seven class one railroads that have and continue to make massive capital investments in their rail systems and feeder shortline railroads that serve all major U.S. ports. United States commercial grain companies have made major expenditures in high speed through-put elevators to load trains and shuttle trains and to unload the timely at export grain elevators\textsuperscript{14}. Low cost barge transportation, favorable rail rates, local grain production, and advantageous geographic location—all of which have contributed to the Gulf ports' current preeminence in grain exporting — add up to a very favorable outlook and dominance of the market\textsuperscript{15}.

Of the U.S. grain exported via the Atlantic coast, the major U.S. South Atlantic port regions are identified as Virginia and Georgia. Currently, there are no planned export elevators in the U.S. South Atlantic, despite a growing number of them in the Pacific Northwest and Gulf regions. However, transloading facilities have emerged along the West, Gulf and Atlantic Coasts, and in the Midwest near the Chicago rail terminals; in the case of grain exports, it involves grain moving among and between trucks or railcars and vessels, including both inland or coastal barges and deep-water ships. The grain can be loaded into shipping containers and placed on the vessel\textsuperscript{16}. While transloading may seem like an ideal Atlantic coast solution, the main reason it has been slow to take hold is the extra cost per container (and a lack of containers) makes the operation uncompetitive for months at a time. In order to profitably ship grain in containers, the shipper must have a reliable supply of containers, a consistent grain source and an inexpensive backhaul opportunity.

**Agriculture - Woodpulp**

The export woodpulp market is comprised of two distinct segments, merchant pulp and fluff pulp. Merchant pulp is used in making paper and other paper related products such as KLB and is derived from both hardwood and softwood fiber. Fluff pulp is used in diapers and hygiene products and derived exclusively from softwood fiber.

Wood pulp is exported through the Port of Wilmington. This commodity has moved through the port for more than 30 years. The primary exporter of pulp is International Paper with substantial volumes also moving with Domtar and Weyerhaeuser. Over the years port operations have provided excellent service to International Paper and the pulp exporters of North Carolina in handling their baled pulp. International Paper remains the largest breakbulk customer to the Authority as well as one of the largest container exporters.

Traditionally, fluff pulp has moved via ocean containers rather than breakbulk. The product is highly sensitive to damage because of its applications in diapers and sanitary products. In early 2011 International Paper and Grieg Star Shipping initiated a breakbulk service for ‘fluff rolls’ of pulp for delivery to Rotterdam. This service added roughly 50000 tons of fluff pulp volumes to the breakbulk portfolio in the Port of Wilmington that continued to export to Europe, the Mediterranean and Asia. The Authority’s Business and Economic Development and Operations departments worked closely in changing operating patterns, cleanliness of the warehouses, communications and data transmission. In addition, the Authority has purchased a warehouse management system that was justified on the increased revenue from the ‘fluff pulp’ and the cross functional platform with other commodities.

Occasionally, other shippers of wood pulp will utilize the services of the vessel operators and move their product through the Port of Wilmington. There also exists an import pulp market into the U.S. East Coast. This

\textsuperscript{13}http://neaga.org

\textsuperscript{14}http://www.globalaginvesting.com/downloads/files/United-States-Grain-Transportation-Outlook.pdf

\textsuperscript{15}https://archive.org/stream/transportinguswh305hutc/transportinguswh305hutc_djvu.txt

market is comprised of low quality merchant and fluff pulp manufactured in South America. Primary fiber input is Eucalyptus.

The export merchant pulp market continues to decline globally as society in developed nations becomes more ‘paperless’. Some growth in certain geographic areas will persist where developing nations continue to use more paper, such as China. It is important to note market growth in the Asia region will not likely translate to growth in the breakbulk sector. This is due to low container rates in this trade-lane which will attract shippers away from breakbulk to the container mode.

The fluff pulp market is experiencing a global growth trend of 4 percent per year as reported by International Paper. The growth is driven by increased penetration of the diaper market in developing countries (China is currently only 20 percent penetrated), as well as aging populations in many developed nations. General consensus among shippers is that fluff pulp capacity will be added to U.S. Southeast in next three years. It is important to note market growth in the Asia region will not likely translate to growth in the breakbulk sector. This is due to low container rates in this trade-lane which will attract shippers away from breakbulk to the container mode. The breakbulk trend lines for fluff pulp into North Europe and the Mediterranean will also be affected by container rates in these trade lanes as shippers look for the most cost effective routing into these slower growth markets. Export merchant pulp is in decline overall. Export fluff pulp is in a growth cycle.

Primary port competition for export breakbulk pulp is currently the Port of Savannah. The volume in play for competition with the Port of Savannah originates in mills that are farther inland and rely on rail. The truck market volumes are well established and entrenched to the geographically optimal port options (i.e. Riegelwood to Wilmington). North Carolina should expect increased competition from Charleston and Norfolk in coming years.

There also exists a high degree of competition between modes of ocean transport, breakbulk versus ocean container. Rates in the container trade will affect shippers' modal decisions and create pressure on the breakbulk carriers. If North Carolina cannot fully serve the container trade, the Authority will lose a portion of the market share to ports north and south with more container trade capacity and offerings. The largest export woodpulp competitors are the Port of Brunswick, Georgia and the Port of Savannah.

The import pulp market has been dominated by two port gateways on the east coast; Jacksonville and Baltimore. Essentially all of the volumes are three primary shippers (Cenibra, Ekman, and Fibria). Philadelphia secured the Fibria business from Baltimore in 2014. Baltimore is still the competitor with the largest portion of the addressable market.

Energy

With the largest offshore wind resource on the U.S. East Coast, North Carolina has a unique and energetic microclimate resulting in an impressive estimated capacity factor for offshore-wind energy off the North Carolina coast17.

Increasing demand from Europe for renewable fuel is changing the landscape of the forestry industry. By-products of timber harvesting - the tops and limbs and other residues that are unsuitable for the sawmilling and lumber industries are milled, dried and processed to create wood pellets. These wood pellets can then be used for supplement or completely replace coal as the fuel source used to fire boilers of electric power generation plants. According to forestry experts at N.C. State University, U.S. exports of pellets are expected to grow from three million tons a year in 2009 to ten million tons by 2015 in support of the European requirement to reduce its carbon footprint. The Port of Wilmington and the Port of Morehead City have new wood pellet export facilities in development that together will export an identified 2.4 million tons of wood pellets annually from North Carolina in 2020.

17 http://www.energync.net/about-us/governors-panel-offshore-energy
There are also a number of other potential emerging energy opportunities that require more long term study and planning. These energy opportunities present challenges or changing market dynamics that may require resolution prior to investment. These energy sectors include off shore oil, natural gas, solar energy and biomass. Currently, natural gas does not have regional or local component to leverage; likewise, both solar and biomass are solely domestic products. Compressed natural gas is a domestic product, but could be a source of income for the Authority given the number of trucks that access the port. Oil and liquid natural gas are highly capital intensive commodities and would require more infrastructure (including pipelines) than is currently available, in addition to the significant community concerns they would raise. Breaking into these new markets would require significant private capital and high profile champions in addition to an exceptionally well-planned and rational statewide strategy. These energy industries operate in regions that have invested heavily and would present heavy competition.

Rubber

Natural rubber is imported to the U.S. for tire manufacturing from southeast Asia, Central America, and West Africa, with more than 90 percent of the total market for imported natural rubber comes from origins in southeast Asia. The smaller volumes of African and Central American rubber are currently all imported via ocean container. 100 percent of the breakbulk market for natural rubber to the U.S. southeast originates in southeast Asia, primarily Indonesia.

Currently the breakbulk import rubber market is dominated by two carriers: Pacific Lloyd Line (PACC) and Wallenius Wilhelmsen Lines (WWL). PACC transports rubber to two ports in the U.S.; Morehead City and New Orleans. WWL transports rubber into Savannah and Newport News.

The Port of Morehead City continues to be a leader in the importing of natural rubber. Goodyear drives the business with Michelin, Bridgestone and Yokohama filling out the vessels. There are occasional shipments by the traders, but infrequent. PACC continues to add on a surcharge for the Morehead City call, driving a competitive edge to the limit. Key objectives for maintaining market share include customer contact and development of programs to grow the tonnage amounts. This includes specific plans for entering into wharfage, handling, and other value add services rates and terms for a multi-year period with Goodyear, Michelin and Bridgestone. North Carolina Ports can leverage the multiyear agreements with the shippers to increase wharfage and value add service rates with PACC.

The current trend for rubber is slightly up. This is primarily due to increased demand as U.S. economy continues to improve. Additionally, in the last two years there have been significant investments new or expanded plants made or planned in U.S. southeast by major tire manufacturers. South Carolina alone has had three. These investments could drive additional breakbulk service with current or alternative carriers. The life cycle state of rubber is mature.

The ports of Norfolk, Charleston, and Savannah are all significant competitors. Charleston in particular will continue to push both the carriers and shippers for breakbulk service. All of the major shippers also utilize container mode for ocean freight which provides significant competition to the Authority and the breakbulk mode in general.

Cold Storage

Cold storage refers to the outsource warehousing of perishable goods kept in a climate-controlled environment. North Carolina is a major hub for global exportation of refrigerated pork and poultry products and a major player in the protein production export business. A new cold storage distribution center service would provide global market benefits to NC’s agricultural industry sectors (export) and food distribution sector (imports).

North Carolina leads the way nationally in total protein production between pork and poultry industries. Although North Carolina is not number one in either industry, North Carolina is number two in pork and turkey, fifth in poultry and added together makes North Carolina the largest in the US for total protein. North
Carolina is also number one in production of sweet potatoes and a lead producer of seafood. These products along with worldwide demand for increasing amounts of food especially protein in the growing middle class of China, India, Russia, the Middle East and Africa will drive the demand for exporting North Carolina products.

For the Authority, a cold storage facility helps generate increased container space each week on the existing container carriers calling at the Port of Wilmington and enhances the ability to market and recruit additional container and break-bulk carrier services, serving existing and/or new global trade-lanes. Additional benefits include the opportunity for job growth, including the creation of a U.S. Department of Agriculture Inspection center, which facilitates and supports efforts to recruit additional cargo carrier services.

**Steel**

The breakbulk steel market includes both imports and exports and is comprised of many different product segments. These segments range in size, shape, and chemistry based on their different applications. Examples of these various product segments include: coils of sheet, coils of wire rod, structural, pipe, tube, sheet pile, billets, ingots, bars, rebar, etc. The storage and handling requirements for each product may vary. Typically, higher value finished products require inside storage while lower value unfinished products can be stored outside.

Steel moves both inbound and outbound to/from U.S. in all major trade-lanes. These markets and relationships within them are complex. It is common to have four parties involved in an import sales transaction for some steel goods; including the producing mill, a foreign and domestic trading firm, as well as the end user of the product. The logistics decisions and associated liabilities for domestic freight, ocean freight, and port services will vary among these different groups depending on the terms of the sale. The Authority has maintained a steady book of steel business in both terminals with the CSX and NS which import 100% of their foreign rail through North Carolina’s ports. Additional accounts include Posco America and AGS.

Overall steel imports have been in a growth cycle in recent years. This is in large part due to over capacity in certain regions, such as China. Lower prices for iron ore and other raw materials has driven the growth in steel production. The other affect of increased production abroad is that export growth has been held in check for domestic steel producers. Both buyers and exporters will weigh the costs of buying or selling abroad vs. buying or selling domestically. As noted, the current trend is driving imports.

**Roll on / Roll off**

The Roll on / Roll off (RoRo) market is primarily driven by the import and export of vehicles. In addition, rolling stock machinery and equipment also contribute significant volumes in these trades. While infrastructure needs to handle RoRo cargoes are minimal from a port perspective, the auto manufacturers depend on auto processing facilities which provide services to the vehicles prior to shipment. Typically, third party auto processors will operate within port facilities. Good rail connectivity and service is typically very important for a thriving vehicle and machinery RoRo business. RoRo facilities also require a large acreage footprint. Primary utilization of RoRo cargoes is handled by private terminal operators at the Port of Wilmington. Morehead City RoRo services are primarily focused on military moves through the port.

Several opportunities to attract additional RoRo services to both ports continue to develop. These opportunities are buoyed by expansion of the Deere/Hitachi facility in Kernersville, Caterpillar’s Cary office, Makino machine tools that currently move through Lambert's Point, Siemens wind turbines and natural rubber going through Norfolk. Expansion of facilities or the construction of new facilities in proximity to the ports can provide opportunities to induce carriers to call. The Authority should execute a targeted marketing outreach effort to commercial RoRo carriers like Wallenius, NYK, ACL/Grimaldi, etc. The Authority also should engage Bahri and cargo principals such as Caterpillar to develop commercial support for this RoRo service, which will provide access into the Red Sea and Persian Gulf regions.
Heavy-Lift / Project Cargo

According to the Journal of Commerce, the market for breakbulk and heavy-lift ocean cargo is emerging from the doldrums it experienced in 2013. Although a backlog of global industrial projects carried the heavy-lift sector through 2012 and construction of new pipelines and wind farms in the U.S. filled inbound multipurpose breakbulk vessels in 2013, demand largely dried up. But the picture is brightening, and the market is positioned for significant recovery in 2014 - 2015.

The excitement in the project cargo business is the sheer number of chemical, petrochemical, refining and other projects being planned for construction along the Gulf Coast from New Orleans to the Mexican border in addition to energy-related projects being built in Montana and the Dakotas to handle the growth in natural gas fields being developed by hydraulic fracturing.

Houston is at the center of all the new developments. Energy and petrochemical companies have announced plans to invest $35 billion in plants lining the banks of the 52-mile Houston Ship Channel and may invest almost twice that as the gas industry develops further. Many of the investments are geared to retrofit those plants, which once processed petroleum imports for the domestic U.S. market, to refine domestic natural gas into products for export. Heavy-lift carriers also are benefiting from investments by foreign steelmakers in the U.S.

Beyond the U.S., the outlook for the global project cargo market also appears to be picking up. Offshore oil fields are being developed in Africa, Southeast Asia and South America. Although the market for breakbulk cargo has dwindled in countries such as Brazil, which imposes high protectionist taxes on imported steel and forest products, this has spurred investment by global steelmakers to build plants in the markets they serve.

The timing for construction of all these projects comes as the breakbulk and heavy-lift carriers come to the end of the multipurpose vessel orders they placed in better economic times, when it looked like global projects would keep these new vessels filled. The multipurpose vessel order book begins to decline precipitously in 2015, so as demand increases, fewer new vessels are being delivered. Supply and demand came into equilibrium in the latter half of 2014, and vessel space may not be enough to meet demand for all these new projects. This will lift freight rates, which have been flat over the last year and plunged many ship operators into the red. Rates may continue to be under pressure at the beginning of 2015, but in the second half when volume accelerates and delivery of new multipurpose vessels tails off, the sector will recover more rapidly than others.18

The heavy lift segment in the Authority's market is comprised of several consistent shippers, primarily exporting Power Generation (Siemens in Pineville, N.C., GE in Greenville, S.C., Toshiba Westinghouse – Nuclear, GE Hitachi – Nuclear, Babcock and Wilcox – Nuclear, Transformers: Siemens, Waukesha, Smit). Project cargoes are handled by the Authority or private terminal operators at the direction of the shipper. It is often directed by size and weight of the cargo, allowing for ships' gear direct to railcar or truck, which removes the Ports from the transaction, or requiring specialized gear that is supplied by the stevedore or terminal operator.

Heavy lift crane capacity exists in numerous competing ports including Norfolk, Baltimore, Philadelphia, Jacksonville, Savannah, and Charleston (with the heaviest lift) which likely would result in a highly competitive environment with a high cost threshold for new entry.

The growth trend for heavy lift and project cargo is limited volumes with heavy competition; project cargo has a relatively flat trend. The largest competitor is Charleston which enjoys good rail connectivity to GE Greenville; the Charleston heavy lift crane is well-positioned to attract business. Currently, there is poor rail clearance in Wilmington and recent potential Morehead City volumes were incepted to Lambert’s Point by Norfolk Southern.

Value-added / Other Services

Operationally, the Authority has unique attributes that may be used to create additional value. Value added services within the structure of the port, specifically with the ability to provide services executed with high customer satisfaction and competitive price could be attractive and compelling for port customers.

Warehousing services could include handling cargo between storage facilities and modes of inland transportation as well as custom inventory management and control services for the beneficial cargo owner. By leveraging the Authority’s role as terminal operators, the Authority can extend its line of services into distribution and warehousing to attract new business and grow organically with existing warehouse clients.

The Authority may further extend its service offerings by developing transloading capabilities. Transloading cargo is not a new service, but one that is growing at an accelerated pace in response to a surging market for bulk material. Typically, transloading involves moving bulk material from one mode of inland transportation to another; however, today transloading often refers to loading bulk material into containers. At the Port of Wilmington, transloading is viewed as a potential substitute for traditional, at port intermodal container services and a strategy for building base-load volume that may motivate CSX to provide intermodal container service to and from the terminal. As with the extension of warehouse services, transloading offers a way to increase volume and revenue for the Authority through organic and new business opportunities.

Development of a permanent value added service like a modern, scalable rail to ship (with storage) transload complex or bulk supercenter could provide inbound and outbound access to a variety of bulk and breakbulk customers. This would be an ideal approach to providing a number of different commodities/customers customized solutions for complex supply chains. By blending the benefits of shipping by rail and local/short haul trucking, transload facilities can serve customers who may not be located on a freight railroad or need expanded warehousing. Transloading works for a variety of commodities (including finished and unfinished goods, food products, lumber, woodpulp and paper, metals, building materials, and a variety of packaged bulk commodities) including special shipments that cannot travel their entire route by road. A non-dedicated complex allows for multiple users, increasing the investment value. A well-partnered bulk concept with multi-modal components and an outstanding business case could potentially be eligible for a federal funding partnership like U.S. Department of Transportation’s Transportation Investment Generating Economic Recovery (TIGER) grants.
APPENDIX 8. PORT OF WILMINGTON

The Port of Wilmington is located approximately 26 miles from the open sea on the Cape Fear River. Currently it has a channel depth of 42 feet Mean Low Low Water (MLLW). The port has nine berths with approximately 6,800 linear feet of wharf and provides cargo storage space for container, bulk, and breakbulk operations. Figure 19 shows an aerial of the Port of Wilmington.

Figure 14. Port of Wilmington Aerial

The Port handles containers, dry bulk and breakbulk. The Port of Wilmington handled 268,049 twenty-foot equivalent units (TEUs) in FY 2013 and 252,369 TEUs in FY 2014. Across all classes of freight, the port handled nearly 1.95 million tons in that same year. Containerized goods accounted for about 52 percent of the total; bulk freight accounted for about 41 percent of the total and breakbulk accounted for the remaining 7 percent. The recent global economic recession and U.S. housing decline has negatively affected the volumes of construction-related commodities, including breakbulk exports and imports handled by the ports. Across all commodities, the Port of Wilmington generated more than $32.6 million in operating revenues in fiscal year 2013 and more than $27.1 million in operating revenues in fiscal year 2014.

Figure 15. Bulk, Breakbulk, and Container Volumes Handled at Port of Wilmington (FY 2001-2014)

Source: Bing Maps

Source: NCSPA, 2014
Among the largest facilities at the Port of Wilmington is its container terminal, which has a gross area of approximately 85 acres, 6,000 twenty-foot ground slots (TGS) for container storage, and provides area for chassis storage. The container yard is primarily served by a single berth of approximately 1,250 feet at the southern-most end of the container terminal and a 400-foot long portion of the berth to the north, which has been recently rebuilt to be able to accommodate 100-foot gauge dock cranes.

The existing four 100-foot gauge cranes have an outreach of 18 containers and can load/unload container vessels up to about 8,000 TEUs as shown in Figure 11. The container terminal is supported by a 12-acre chassis storage yard, which lies outside the gate and across the street the port’s south gate container entrance.

The existing gate that provides truck access to the container yard is located in the southeast end of the terminal, but extends inside the middle of the container storage area. All containers are handled by mobile reach stackers (RS) inside the yard.
APPENDIX 9. PORT OF MOREHEAD CITY

The Port of Morehead City is located approximately four miles from the Atlantic Ocean and has a 45-foot MLLW deep channel from the sea buoy. It has nine berths with approximately 5,500 feet of wharf and handles both breakbulk and bulk cargo at its existing facilities. Radio Island, which is part of the Port of Morehead City, is located across the Newport River from the port and includes approximately 150 acres of land suitable for port industrial development. Figure 22 shows the location of the Port of Morehead City and Radio Island.

Figure 16: Port of Morehead City Aerial

![Port of Morehead City Aerial](image)

*Source: Bing Maps*

The Authority handles only bulk and breakbulk goods at the Port of Morehead City. The Port of Morehead City generated nearly $10.8 million in operating revenues and handled at total volume of 1,810,174 million tons during FY 2013. The Port of Morehead City's operating revenues grew to more than $11.3 million in FY 2014, handling 1,783,375 million tons.

Phosphate and sulfur products represent 68 percent of total tonnage handled by the Port of Morehead City in FY 2014. Breakbulk commodities handled include natural rubber, for which the Authority provides value-added inventory management and warehousing services on the wharf. Like at the Port of Wilmington, the slowdown in the construction industry has affected the volumes of import lumber, aggregate, and other construction materials handled at the facility.
The Port has an authorized channel depth of 45 feet at Radio Island, an adjacent facility, and the ocean channel has a 47-foot depth in the approach to the port. The ocean channel is relatively short compared to competing ports at only four miles. There is no air draft restriction at Morehead City. Three Morehead City berths have depths of 45 feet, but the six remaining berths offer only 35 feet to 41 feet depths\textsuperscript{19}.

Road accessibility to Morehead City is a concern because trucks must pass through the middle of Morehead City to reach the port. This route during the summer months, with the tourism associated with the Crystal Coast region, makes the more than six-miles from the port to beyond the intersection of NC 24, which is the only way out of Morehead City to access U.S. 70, difficult. NCDOT has a number of initiatives underway to mitigate this conflict. The Gallants Channel Bridge project that is now underway will provide an alternative route to US 70. Until the Northern Carteret Bypass and Havelock Bypass are completed, this link would not be a viable alternative route to and from Morehead City. Interstate 95 (I-95) is approximately 120 miles from Morehead City via US 70 and I-795. After construction of the Gallants Channel Bridge, there could be an opportunity to follow NC 101 but this roadway is a rural two-lane road and would not effectively reduce travel time. In the meantime, all traffic would have to continue through Morehead City.

The Port is served by Norfolk Southern (NS), which runs three trains per week into the port. Rail freight passes through the center of Morehead City with numerous at-grade crossings that slow train speeds and create numerous traffic bottlenecks throughout the day. Carolina Coastal Railroad Company provides switching service within the port limits.

The U.S. military makes 10 to 15 calls through the port each year. The Port's roll-on/roll-off (Ro/Ro) ramp is used for loading/unloading of vehicles and equipment and personnel and small barracks on property used by military personnel when they are working with cargo.\textsuperscript{20}

\textsuperscript{19} Figure 1.2 Summary Overview of MHC Facilities in the "Port Business Case Study"