NORTH CAROLINA
MARITIME Strategy

NC Maritime Strategy
Capital Costs by Market Scenario

Prepared for the
North Carolina Department of Transportation

by

AECOM

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DISCLAIMER

The capital cost estimates described in this memorandum are order of magnitude estimates. Many are developed by pro-rating estimates for similar facilities or are compilations of estimates provided in long-range planning documents.

ACKNOWLEDGEMENTS

Initiated by the Governor's Logistics Task Force (GLTF), the *North Carolina Maritime Strategy* takes a fresh look at North Carolina's maritime assets and the needs for improvement to ensure that our State remains competitive in the future. A *Maritime Strategy* Executive Team has been formed to oversee this process, evaluate the results, and provide an objective technical and economic analysis. The *Maritime Strategy* Executive Team includes: Lieutenant Governor Walter Dalton; the Governor's Senior Policy Advisor, Al Delia; Secretary of Transportation, Gene Conti; Secretary of Commerce, J. Keith Crisco; and Secretary of Environment and Natural Resources, Dee Freeman. The following North Carolina Department of Transportation (NCDOT) and North Carolina Department of Commerce (NCDOC) staff have provided day-to-day direction, guidance and support for study execution: NCDOT Director of Strategic Initiatives, Roberto Canales PE; NCDOT Project Manager, Virginia Mabry; NCDOT Liaison to the Lieutenant Governor, W. Seth Palmer; NCDOT/Commerce Liaison Joseph (Jed) McMillan; and Transportation Consultant to NCDOT and Global TransPark, Charles Diehl.

A Maritime Advisory Council, comprised of State officials and staff, along with industry representatives from ocean shipping, trucking, rail, and manufacturing interests, as well as community-at-large representatives, has provided further guidance and support to the study team.

Finally, broad-based stakeholder outreach is key to successful development of the statewide *Maritime Strategy*. A comprehensive and ongoing public involvement program has provided additional input to the study by engaging the public, agencies, and others through a series of informational meetings, public workshops and focused discussions with industry, as well as environmental and community groups.

EXECUTIVE SUMMARY

The *North Carolina Maritime Strategy* is being developed to connect maritime goods and economic development in North Carolina. This is accomplished through the following primary tasks:

- Facilitated collaboration of freight transportation, economic development and community interests as input to the statewide strategy,
- Definition of North Carolina's economic context and maritime market positioning strategies that would offer the greatest economic benefit to the State, and
- Identification of infrastructure investments and policies that would most significantly enhance North Carolina's economy through improved performance of the State's maritime gateways and related trade corridors.

The *North Carolina Maritime Strategy* has defined maritime market scenarios in which the State could realize economic and public benefit. The market scenarios that are being considered as a part of the *North Carolina Maritime Strategy* include grain, wood products, wood pellets, containers, cold storage, and Roll-on / Roll-off (Ro/Ro) and oversize cargo (with wind as a subset). Military cargo is also discussed, though it is not identified as a specific market scenario. The *North Carolina Maritime Strategy* will present the benefits and infrastructure costs of each scenario. For analysis purposes, each scenario is being defined and evaluated independently. In reality, a combination of scenarios may be pursued.

This technical memorandum summarizes the capital costs of infrastructure identified for each market scenario. Infrastructure costs discussed or summarized include dredging costs, terminal costs, highway infrastructure costs, railroad improvement costs, and inland facility costs. In the case of highway capital costs, the information is provided in summary format. More detailed information on how highway projects were selected is presented in the *North Carolina Maritime Strategy Highway Infrastructure Assessment*.

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1 INTRODUCTION

The *North Carolina Maritime Strategy* has defined maritime market scenarios in which the State could realize economic and public benefit. The market scenarios that are being considered as a part of the *North Carolina Maritime Strategy* include grain, wood pellets, other wood products, containers, cold storage, as well as Ro/Ro and oversize cargo (including wind as a subset). Chemicals and phosphates are an important existing industry that should be protected; however, no focused maritime investments are proposed to support this sector. Military cargo is also discussed because of North Carolina's tight association with the US military. The *North Carolina Maritime Strategy* will present the benefits and infrastructure costs of each scenario. For analysis purposes, each scenario is being defined and evaluated independently. In reality, a combination of scenarios may be pursued.

This technical memorandum summarizes conceptual capital costs of infrastructure investments needed at each port or potential port locations for each market scenario. Potential port locations being considered include the Port of Wilmington and associated north property; the Port of Morehead City and Radio Island; a potential new site near Southport, also known as the North Carolina International Terminal site; and a potential site on River Road, southwest of Wilmington. However, not all sites are being considered for all scenarios.

Conceptual infrastructure costs discussed or summarized include dredging costs, terminal costs, highway infrastructure costs, railroad improvement costs, and inland facility costs. Costs were developed to a level to allow for fair comparison among the alternatives being evaluated. In the case of highway capital costs, the information is provided in summary format. More detailed information on how highway projects were selected is included in the *North Carolina Maritime Strategy Highway Infrastructure Assessment*. This memorandum presents conceptual infrastructure costs using the following headings:

- Port and Terminal Costs
- Dredging Costs
- Highway Infrastructure Costs
- Railroad Improvement Costs
- Inland Facility Costs

Under each type of capital improvement category, assumptions used and cost calculations for each market scenario are presented. At the end of the memorandum, a summary of all conceptual infrastructure costs for each market scenario is presented. All costs have been estimated in 2011 dollars. A summary of costs and supporting information is also included in Appendices. These appendices are large, so hyperlinks have been added to the Appendices' cover page to ease navigation.

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2 PORT AND TERMINAL COSTS

Construction cost estimates for port terminal development were developed to capture costs for on-terminal and immediately adjacent off-terminal improvements. Rough-order-of-magnitude (ROM) construction costs for wharves, terminals, on-dock rail yards, gate facilities, and utilities were generated based on recent bids and final design estimates for port and harbor projects from throughout the US adjusted to the North Carolina construction market. Terminal development costs considered demolition, civil site work, wharves, electrical, security and communications, utilities, truck processing gates, buildings, design and contingencies. For port development alternatives affecting known wetlands, additional costs for wetland mitigation were also incorporated. Conceptual capital costs for port and terminal developments for each market scenario are described below. Supporting information is included in the Appendix.

2.1 Grain

In 2040, projections for grain handling capacity needs in North Carolina approach 730,000 tons per year. A cost estimate for a grain terminal in North Carolina was based on a facility recently constructed in Longview, Washington. The Longview Terminal cost $200 million to build. A brochure describing the Longview Terminal is included in Appendix II. An equivalent cost to construct the Longview Terminal in North Carolina was determined by using ratios of typical construction costs in each location published in the 2009 Saylor Current Construction Cost Publication. Building the same facility that was constructed in Longview, Washington at a North Carolina location would cost $140 million. The Longview Terminal included the construction of one berth. In North Carolina, one berth is anticipated to cost $20 million. Therefore, the non-berth costs to build the same facility in North Carolina would be $120 million.

The facility in Longview is at least twice as large as needed to accommodate the projected 730,000 tons per year of grain in North Carolina. Therefore, $60 million is estimated to construct an appropriately sized grain terminal in North Carolina without a berth. With a berth, the grain terminal is estimated at $80 million. A cost of $80 million was included in the capital infrastructure costs associated the grain market scenario for Morehead City / Radio Island and the Port of Wilmington.

AECOM also received cost input from Mark Blake of NCSPA, which was also based on Longview and was consistent with the team's initial estimate for North Carolina.

2.2 Wood Pellets and Other Wood Products

In 2040, projected volumes for non-pellet wood products are anticipated to reach 1.3 million tons per year. The *North Carolina Maritime Strategy Existing and Planned Port Infrastructure* presents a total calculated capacity of 2.1 million tons per year, broken down as follows:

- Port of Wilmington lumber — 0.4 million tons per year
- Port of Wilmington woodpulp — 0.9 million tons per year
- Port of Wilmington woodchips — 0.6 million tons per year
- Port of Morehead City forest products — 0.2 million tons per year

Provided demand fits reasonably well within these subcategories, the ports of North Carolina do not need additional capital investments to accommodate non-pellet wood products in 2040.

Additional investment, however, is needed to capture 450,000 tons of wood pellets per year that are projected for 2040. AECOM has an estimate for a wood pellet facility that can handle 1.0 million tons of wood pellets per year. That facility is projected to cost $60 million. Assuming a diseconomy of scale for a smaller facility, AECOM proposes to use a cost of $35 million for a new pellet terminal to handle 450,000 tons of wood pellets. This facility would include dump pits for trucks and rail cars, conveyor systems, storage buildings or silos, reclaimers, and ship loading equipment. In order to include a 1000-foot berth, an additional $20 million is needed. In sum for a wood pellet facility with one berth, $55 million dollars has been included in the capital cost estimate.

2.3 Containers

Port terminal development costs for container terminals were developed for the following options:

- Port of Wilmington, 2 Berths, 42-foot depth, Reach Stacker Layout (Site 5B)
- Port of Wilmington, 2 Berths, 42-foot depth, Rubber Tired Gantry Crane Layout (Site 5C)
- Port of Wilmington, 2 Berths, 45-foot depth, Rubber Tired Gantry Crane Layout (80 percent Dwell Time)(Site 5C1)
- Port of Wilmington, 2 Berths, 47-foot depth, Rubber Tired Gantry Crane Layout (65 percent Dwell Time)(Site 5C2)
- Port of Wilmington, 2 Berths, 51-foot depth, Rubber Tired Gantry Crane Layout (65 percent Dwell Time)(Site 5C3)
- Port of Morehead City / Radio Island, 2 Berths, 45-foot depth, Rubber Tired Gantry Crane Layout(Site 3A)
- Port of Morehead City / Radio Island, 2 Berths, 51-foot depth, Rubber Tired Gantry Crane Layout(Site 3B)
- River Road Site, 2 Berths, 51-foot depth, Rubber Tired Gantry Crane Layout (Site 4A)
- River Road Site, 2 Berths, 51-foot depth, Automated Stacking Crane Layout (Site 4B)
- Southport Site, 3 Berths, 51-foot depth, Rubber Tired Gantry Crane Layout (Site 6A)
- Southport Site, 3 Berths, 51-foot depth, Automated Stacking Crane Layout (Site 6B)

Descriptions of these container terminal layouts are included in *North Carolina Maritime Strategy Future Port Infrastructure.* Figures of representative port layouts are shown below.

Figure 1: 2-Berth Reachstacker Facility at the Port of Wilmington (Site 5)

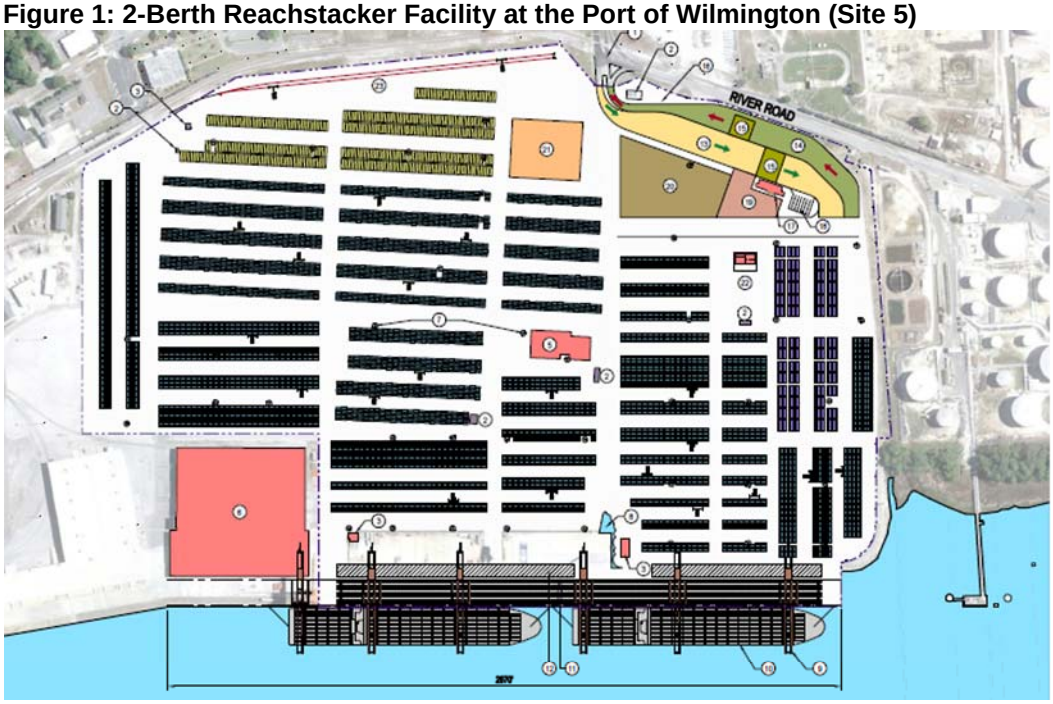


Figure 2: 2-Berth RTG Facility at the Port of Wilmington (Site 5)

Figure 3: 2-Berth RTG Terminal at Port of Morehead City / Radio Island (Site 3)

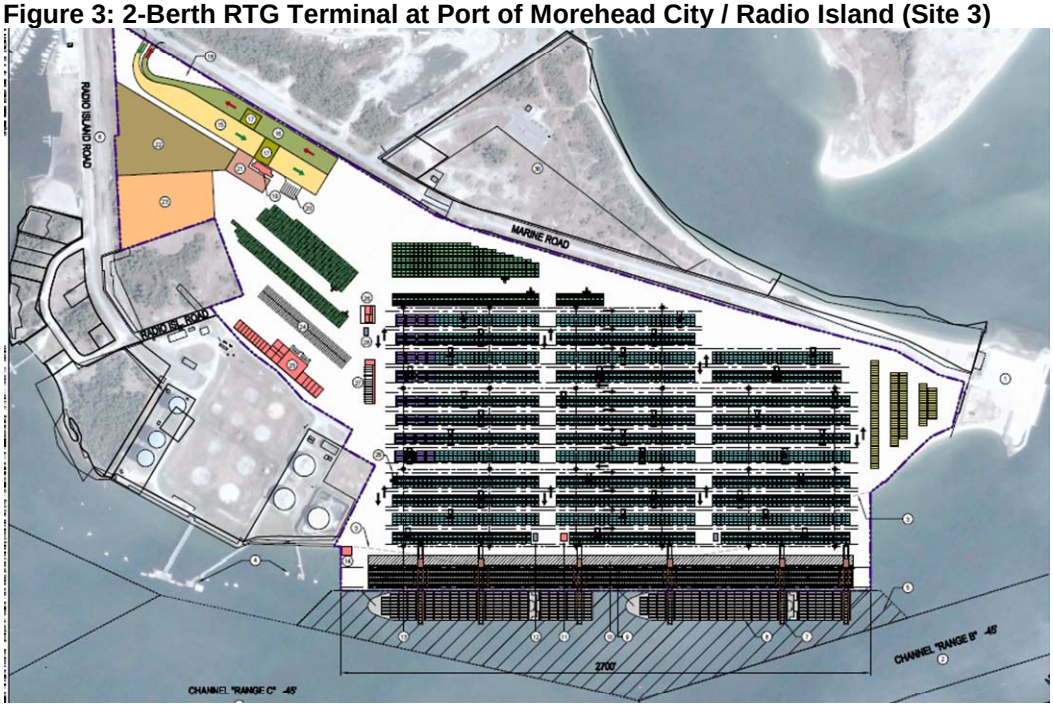


Figure 4: 2-Berth RTG Container Terminal at the Potential River Road Site (Site 4)

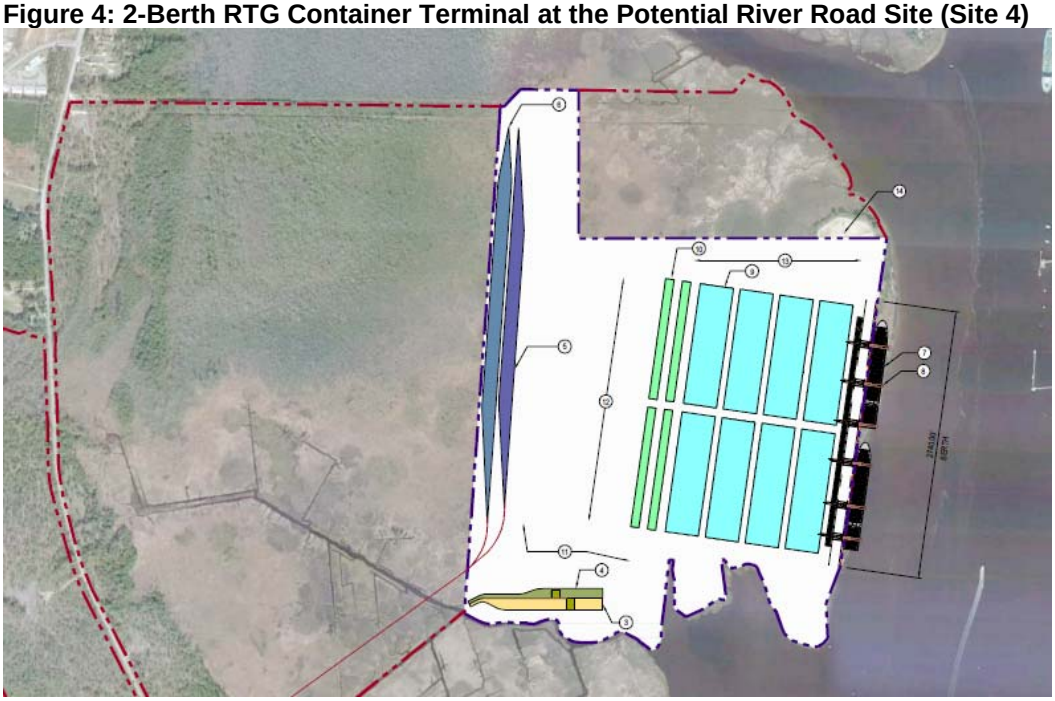


Figure 5: 3-Berth RTG Container Terminal at the Potential Southport Site (Site 6)

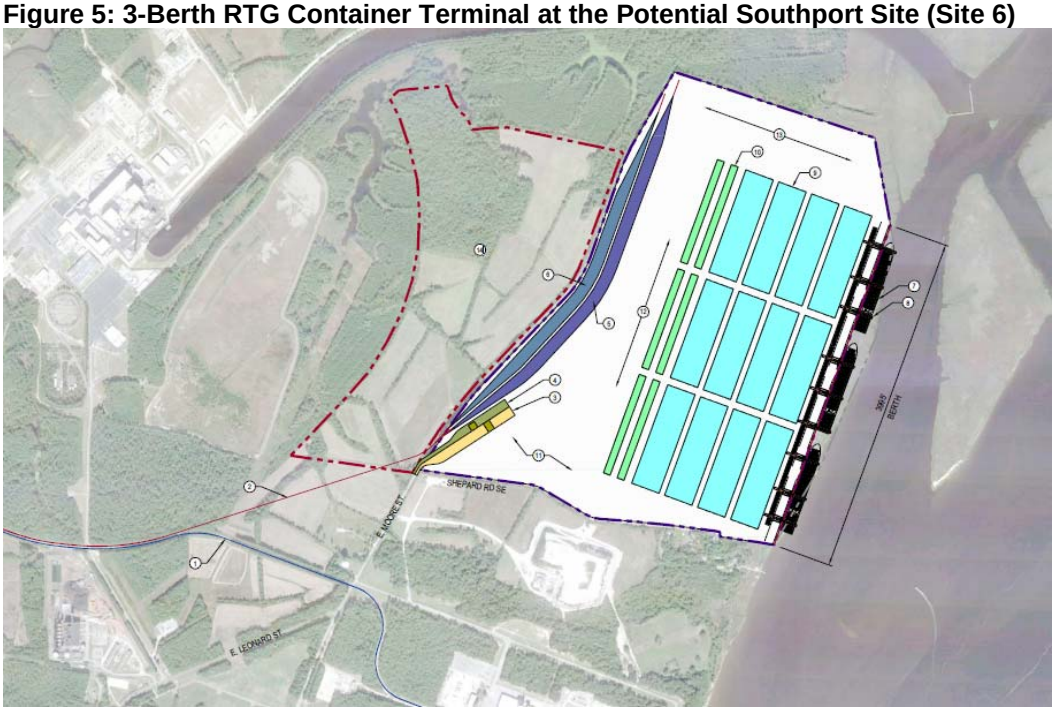
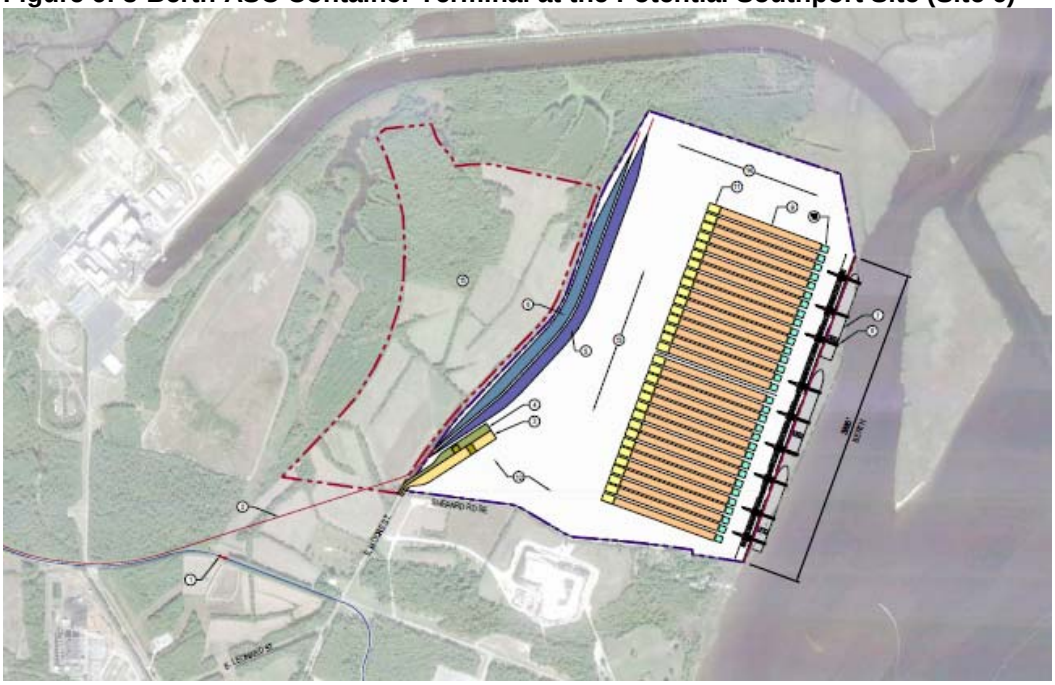


Figure 6: 3-Berth ASC Container Terminal at the Potential Southport Site (Site 6)



Initial development costs (not including equipment) were prepared for the redevelopment of the Port of Wilmington for a 2-berth reach stacker layout and a 2-berth rubber tired gantry crane layout (Figures 1 and 2). In addition, an estimate was prepared for the development of a 2-berth rubber tired gantry crane layout on Radio Island. These estimates are summarized in Table 1. Reference information and additional estimate detail is included in Appendix II.

Table 1: Capital Upgrades at Port of Wilmington and Port of Morehead City / Radio Island

	WILMINGTON: REDEVELOPMENT		WILMINGTON: REDEVELOPMENT		MOREHEAD CITY: RADIO ISLAND TERMINAL RTG LAYOUT	
	REACH STACKER LAYOUT		RTG LAYOUT			
	200-Foot-Wide Wharf Costs		200-Foot-Wide Wharf Costs			
	Total Package Minimum Cost	Total Package Maximum Cost	Total Package Minimum Cost	Total Package Maximum Cost	Total Package Minimum Cost	Total Package Maximum Cost
Demolition	$232,250	$278,700	$1,159,723	$1,391,667	$383,856	$460,627
Civil Site Work	$8,236,602	$9,883,922	$21,297,032	$25,556,439	$52,433,936	$62,920,723
Wharves	$43,512,500	$52,215,000	$43,512,500	$52,215,000	$83,830,000	$100,596,000
Electrical	$4,382,893	$5,259,472	$32,880,150	$39,456,180	$31,819,000	$38,182,800
Utilities	$2,703,359	$3,244,030	$5,730,378	$6,876,453	$17,389,748	$20,867,698
Gates	$2,915,000	$3,498,000	$2,915,000	$3,498,000	$2,915,000	$3,498,000
Buildings	$2,785,000	$3,342,000	$14,104,000	$16,924,800	$18,199,000	$21,838,800
MOBILIZATION / DEMOBILIZATION	$3,240,000	$3,890,000	$4,870,000	$6,210,000	$6,210,000	$7,460,000
ESTIMATED TOTAL CONSTRUCTION COST	**$68,007,603**	**$81,611,124**	**$126,468,782**	**$152,128,539**	**$213,180,540**	**$255,824,648**
ESTIMATED SOFT COSTS (15 percent)	$10,201,141	$12,241,669	$18,970,317	$22,819,281	$31,977,081	$38,373,697
ESTIMATED TOTAL COST	**$78,208,744**	**$93,852,793**	**$145,439,100**	**$174,947,819**	**$245,157,621**	**$294,198,346**

Source: Estimate provided by URS, dated August 24, 2011, as included in AECOM file NC_Cost_Grid_km15.xlsx

The maximum costs were rounded and used in capital cost calculations for the Port of Wilmington and Port of Morehead City / Radio Island layouts (94 million for Port of Wilmington Reach Stacker, $175 million for Port of Wilmington RTG, and $294 million for Radio Island RTG).

Next, the development costs of the RTG layout for Radio Island were used to calculate a cost per acre for new container terminal development (sans equipment). The cost per acre was determined to be approximately $2.16 million / acre. In addition to these capital development costs, additional wetland mitigation costs were added at both the River Road and Southport sites, and additional cost to bring in structurally sound soil was added at River Road.

At River Road (Site 4) approximately 287 acres of coastal wetlands are located onsite (*NC Maritime Strategy Site Assessment and Environmental Screening*). This area of wetland impact was estimated based on preliminary GIS data, not a formal delineation with the US Army Corps of Engineers (USACE). Assuming a unit cost of mitigation of $157,627 per acre, the mitigation would cost $45,238,949. It is estimated that approximately 77 acres of coastal wetlands would be impacted at the Southport site (Site 6). The mitigation cost for 77 acres of impacts is approximately $12,137,279.

Developing a container terminal at River Road (Site 4) would require filling the existing marsh

area with good structural soil that would be brought in from an inland location. Potential use of the dredged material is not an option due to poor quality of the material. It was estimated that it would cost approximately $1.5 million per acre for filling and site preparation at Site 4 in addition to the $2.1 million per acre for container terminal development cost and the wetlands mitigation costs discussed earlier.

Total costs for the River Road site (Site 4) were calculated as follows:

Site 4 Costs = 375 acres X $2,161,765 / acre + 338 acres X $1,500,000 / acre + $45,238,949
Site 4 Costs = $1,362,900,824
Site 4 Costs = $1,363 million

Total costs for the Southport site (Site 6) were calculated as follows:

Site 6 Costs = 402 acres X $2,161,765 / acre + $12,137,279
Site 6 Costs = $881,166,809
Site 6 Costs = $881 million

Equipment costs were added to the initial development costs calculated above to calculate total terminal and berth costs reported in the *North Carolina Maritime Strategy*. Table 2: Total Terminal and Berth Costs presents the development costs and equipment costs that were used in capital cost estimates for each port layout and equipment combination. These costs are indexed to the number of annual moves anticipated for each scenario.

Table 2: Total Terminal and Berth Costs with Initial Equipment Purchase

Port Site	**MHC Radio Island**	**POW**					**River Road**		**Southport**	
Site No.	3	5B	5C	5C1	5C2	5C3	4	4	6	6
Design / Operation	RTG	RS	RTG	RTG 80 percent Dwell	RTG 65 percent Dwell	RTG 65 percent Dwell	RTG	ASC	RTG	ASC
Depth(s)(ft)	45,51	42	42	45	47	51	51	51	51	51
Initial Dev. Cost ($millions)	294	94	175	175	175	175	1,363	1,363	881	881
Equipment Cost ($millions)										
Dock Crane(s)	63	27	45	54	63	72	72	72	108	108
Side-pick(s)	3	2	3	3	4	5	3		5	
Reachstacker(s)	5	9	5	6	6	7				
RTG(s)	23		23	26	30	33	40		59	
ASC(s)								100		150
Yard Tractor(s)	5	4	5	6	7	7	6		9	
Bombcart(s)	2	1	2	2	2	2	2		3	
Shuttle(s)								21		31
IY RMG(s)										
Subtotal Equipment	101	43	83	97	112	126	123	193	184	289
Total ($millions)	395	137	258	272	287	301	1486	1556	1065	1170

Source: AECOM file NC_Cost_Grid_km15.xlsx

2.4 Cold Storage

The cold storage market scenario requires the construction of a refrigerated warehouse where items can be stored as break-bulk and potentially be stuffed into refrigerated containers, which would then be stored within the container yard. A refrigerated warehouse was conceptually sized to accommodate 200 TEU of meats and other products. In order to size the facility, the following simplistic data and assumptions were used:

- One FEU equals 2050 cubic feet
- At any one time, 200 TEUs of storage is needed
- It is assumed that the products can be palletized in 4'X4'X4' cubes (64 cubic feet)
- Assume a pallet is 0.5 feet high and 0.5 feet of clearance is needed between the top of the product and the bottom of the next highest rack / shelf
- Cost to construct a refrigerated warehouse is $300 per square foot

The volume of product (205,000 cubic feet) was divided by 64 cubic feet to determine the number of 64 cubic-foot bundles of palletized product that need to be stored. This calculation results in 3,203 bundles of palletized product.

If pallets are stored on four levels of racks / shelves, with an assumed 0.5 feet for the thickness of a pallet, 1-foot of height for the thickness of each shelf, and allowance of 0.5 feet of clearance, 23 feet of height is required. The number of palletized bundles (3,203) was divided by the number of shelves / stacks (4) resulting in the number of units that would be on the floor (801 palletized units as a footprint). It was assumed that eight rows of racks / shelves would be constructed, each providing floor space for approximately 100 units. A total of 5 feet of width per pallet is assumed to accommodate the width of the pallet, shelf structure, and clearance between pallets, requiring a 270-foot long, two-sided rack could provide floor space for 108 units. Therefore, it was assumed that eight racks 270 feet long and 15 feet wide would be provided. The 15-foot width provides a conservative depth for storing a pallet on each side of the shelf, while allowing for the structure and distance from the edge of the shelf. Assuming 15 feet of clearance is provided between and on the outside of each rack, and 20 feet of clearance is provided beyond the end of each row of racks, a building 310 feet by 255 feet wide is required. At $300 per square foot, a 79,050 square-foot building would cost approximately $24 million.

2.5 Ro/Ro and Oversize Cargo

In order to accommodate 2040 Ro/Ro demand, a 21.23 acre terminal with a 900-foot long wharf is required. The terminal would include two mobile harbor cranes to enable the facility to handle oversize cargo including, but not limited to, wind turbines. It was assumed that the terminal development costs of a Ro/Ro facility would be less than those of a container terminal. For the *NC Maritime Strategy*, a unit cost of 87.5 percent of the $2,165,765 per acre container terminal development cost was used for the development of a Ro/Ro terminal ($1,895,044 per acre). Using a unit cost of $1,895,044 per acre and $4.2 million per mobile harbor crane, the construction of a Ro/Ro and Oversize Cargo terminal is estimated as $49 million.

3 DREDGING COSTS

Dredging costs include a range of factors that can impact costs. These include the costs of phases such as planning, engineering, design, permitting, construction, and monitoring for an alternative. Each of these factors can be influenced by a range of sub-factors. For example, engineering costs can be influenced by geotechnical factors (i.e., type of material such as rock, sands, muds, and silts). Construction costs can fluctuate based on mobilization/demobilization costs, which can be impacted by fluctuating fuel costs. Permitting costs can vary with the degree of environmental impacts that have to be assessed and/or mitigated for an alternative.

For the *Maritime Strategy*, it is assumed that these factors and sub-factors are implicitly accounted for in the dredge cost estimates, but recognize some specific variation will occur during actual phases implemented for an alternative. Many large projects recognize and adjust to changing unit cost factors during construction. For example, the total cost of a project (a-priori versus post-priori) can be significantly impacted by the cost of materials. Material costs can change significantly during construction due to supply chain volatility thus altering the constructed costs for the project from what was originally estimated. A comparative cost analysis applied for the *Maritime Strategy* assumes an implicit “apples to apples” comparison of aggregated factors/ sub-factors, which assumes when one factor is high for one alternative, it is perhaps lower in another and vice-versa for all other factors/ sub-factors comprising the estimated unit costs. In this sense, the actual total unit cost variations are “balanced out” a-priori and recognize in reality actual post-priori costs/ sub-costs per factor/ sub-factor will vary from one alternative to another (i.e., an explicit “apples to apples” comparison).

Dredging costs were based primarily on the unit cost of the volume of material required to dredge a new channel or modify an existing one depending on the site under consideration. A common engineering approach for estimating channel volumes would be to create a Digital Terrain Model (i.e, DTM) of both the existing channel and the proposed channel for a prospective alternative and subtract the cut/fill volumes following the horizontal and vertical alignment of the channel. This requires a comprehensive collection, assimilation, and post processing of hydrographic surveys in addition to detailed and variable channel design widths that is beyond the scope of this effort.

A simpler method suitable for dredge volume estimating purposes is to assume a representative shape of the channel dimensions from previous designs, modify it for deeper depths, and then calculate the geometric difference in area (and sum for volume along navigation channel reaches). Figure 7 depicts a conceptual representative channel cross section for existing USACE channels in the Port of Wilmington and at the Port of Morehead City. Dredge volume is estimated as the sum of additional cut volume that would be made going to deeper depths. Volume calculations assume that the authorized channel width and depth is currently maintained. Figure 8 depicts a concept representative cross section for estimating dredge volumes in regions where a natural channel existed. These approaches do not take into account irregularities in the natural channel or the navigation channels caused by hydrodynamics, sediment characteristics, equilibrium adjustments following construction, nor the geologic framework.

Figure 7: Additional Cut Volume Required for Going to Deeper Channel Depths in a Situation with an Existing Navigation Channel

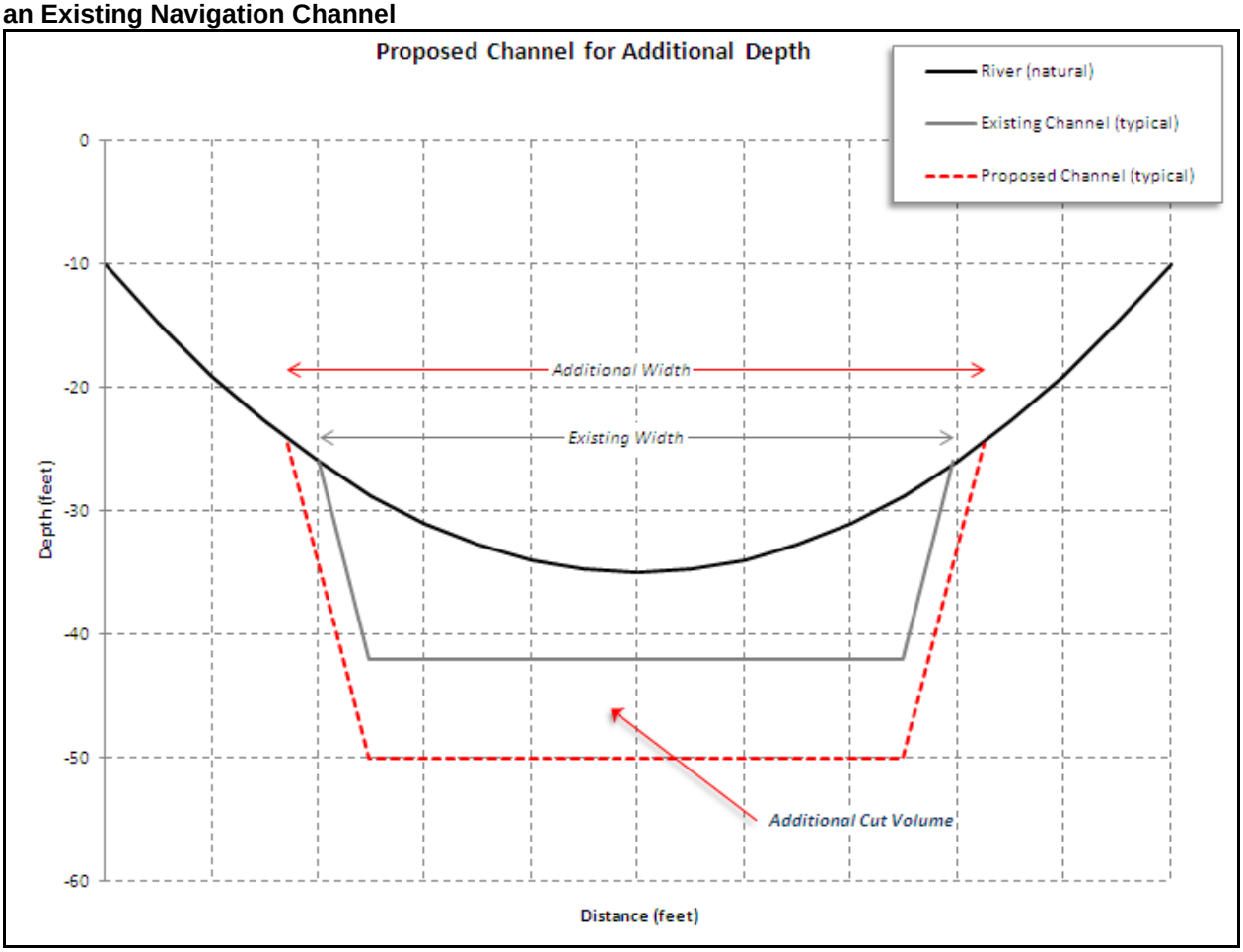
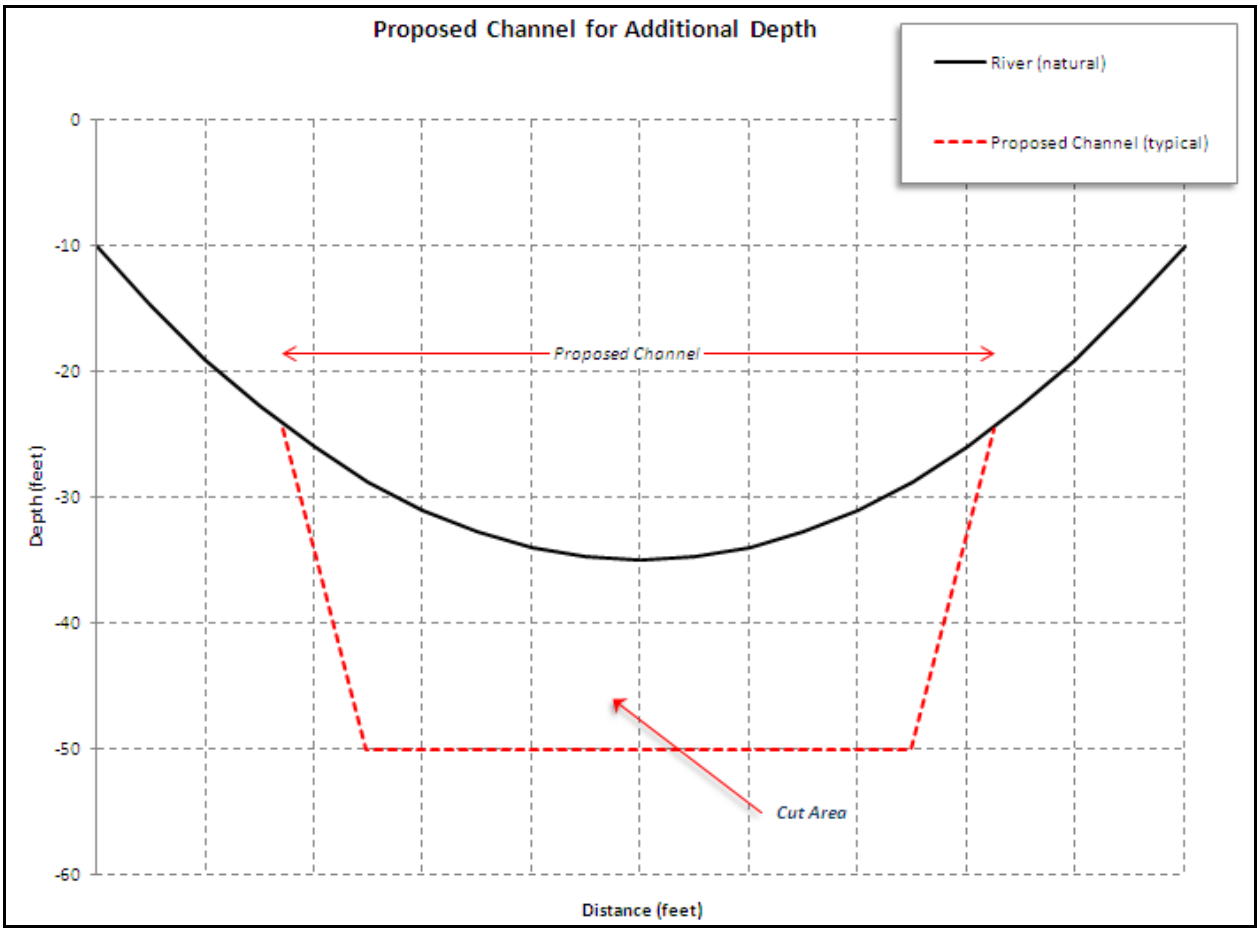


Figure 8: Estimated Cut Volume Required for Going to Deeper Channel Depths in a Situation with a Natural Channel



Estimates for dredging volumes and costs also included the additional distance offshore that would be required to reach natural depth for a proposed navigation depth.

Unit costs were derived from recent dredging contracts by the USACE Wilmington District for maintenance dredging in the Port of Wilmington and the Port of Morehead City. These cost estimates used to derive unit costs are included in Appendix III. Dredge costs were estimated reach-by-reach to account for the unit cost of removal of varying materials – whether soft or hard bottom. Because rock is so prevalent in the southern province, dredge volumes were divided to differentiate estimates for typical dredge sediments and also rock material expected to be encountered. Estimates for rock are based on past project and geologic investigations of the regions. Supporting information on dredge volumes and costs is included in Appendix III. Additional information associated with dredging costs is included in *North Carolina Maritime Strategy Site Assessment and Environmental Screening.*

3.1 Grain

No dredging costs were incorporated into estimates for facilities supporting the Grain market scenario. Dredging incidental to construction of a new berth is included in the port and terminal costs.

3.2 Wood Pellets and Other Wood Products

No dredging costs were incorporated into estimates for facilities supporting the Wood Pellets or Other Wood Products market scenarios. For the Wood Pellets scenario, dredging incidental to construction of a new berth is included in the port and terminal costs.

3.3 Containers

3.3.1 Initial Deepening

Each of the container scenarios that proposes channels deeper than current authorized depths will require initial deepening. Table 3 summarizes the estimated total volume of dredge material, including sediments and rock material. This table focuses primarily on dredge volumes associated with modifications or creation of a navigation channel; it does not include estimates for other features that would be associated with a proposed project such as turning basins, berth areas, and anchorage basins. Additional features typical for constructing new terminals would include an access channel, turning basin, and berthing area. Table 4 summarizes additional dredging volumes and costs associated with these additional features. Table 5 summarizes initial dredging costs incorporated into capital cost estimates for each market scenario. Appendix III includes more detail on dredging volumes and costs. It also includes information on maintenance dredging.

Table 3: Summary of Dredge Volumes and Costs per Dredging Depth per Site

Site	Proposed Design Depth (feet)	Estimated Volume of Dredge Material (cy)	Estimated Cost ($)
Morehead City / Radio Island	45	1,329,390	$10,648,390
	47	2,464,000	$21,042,560
	51	6,138,880	$54,022,140
River Road	45	22,324,850	$178,627,050
	47	33,612,130	$290,691,700
	51	44,267,280	$396,790,760
Port of Wilmington	42	15,435,530	$109,644,359
	45	24,619,250	$197,093,010
	47	36,855,690	$314,795,080
	51	48,477,950	$426,654,310
Southport	45	12,205,650	$103,446,980
	47	19,303,580	$176,776,440
	51	25,688,340	$243,340,320

Table 4: Estimated Volume and Costs for Additional Features

Site	Feature	Estimated Volume of Dredge Material (cy)	Unit Cost ($/cy)	Estimated Cost ($)
River Road	Access Channel and Turning Basin	1,100,000	$8.96	$9,856,000
	Berthing Area	2,800,000	$8.96	$25,088,000
	Total	**3,900,000**		**$34,944,000**
Radio Island	Turning Basin	350,000	$8.96	$3,136,000
	Berthing Area	1,200,000	$8.96	$10,752,000
	Total	**1,550,000**		**$13,888,000**
Southport	Access Channel	6,400,000	$9.47	$60,608,000
	Turning Basin	2,200,000	$9.47	$20,834,000
	Berthing Area	3,900,000	$9.47	$36,933,000
	Total	**12,500,000**		**$118,375,000**

Table 5: Total Dredging Costs Presented in Capital Cost Estimate by Port and Depth

Site	Proposed Design Depth (feet)	Estimated Cost ($ millions)
Morehead City / Radio Island	45	$11
	51	$68
River Road	51	$432
Port of Wilmington	45	$197
	47	$315
	51	$427
Southport	51	$362

3.3.2 Maintenance Dredging

While not an initial capital cost, evaluation of the relative cost effectiveness container port alternatives considered the recurring costs of maintenance dredging that would be required to maintain the channel depth. Regular maintenance dredging of navigation channels is required to maintain the navigation channel to its design depth. Shoaling occurs from multiple sources including suspended sediments, bed load, and migration of sediments from river banks and shoals within a waterway.

In the USACE Phase II DMMP Study - Upper Portion of Wilmington Harbor Eagle Island Management Plan Report, the USACE developed a correlation between pre-deepened volumes to later annual maintenance volumes. This approach accounted for the variability in shoaling

that occurs post-dredging of a harbor or river channel. Typically, the shoaling rates will increase immediately following the initial deepening, and then taper off until some point of "equilibrium" is reached in the channel. The USACE said, "This projection includes a 50% increase in maintenance dredge volume in the dredging event immediately after the initial deepening. The dredge volume for the second dredge event after deepening includes a 25% increase in maintenance volume. After that, maintenance dredging is anticipated to stabilize at an annual volume approximately 10% greater than the predeepening dredge volume".

Projections were made for annual dredging volumes (and costs) for various container port sites and deepening alternatives evaluated to support the container market. Total volumes of maintenance dredge material were estimated over a 20-year cycle and these volumes were used to calculate average annual volumes also shown in Table 6. Appendix III includes more detail on maintenance dredging volumes and costs.

Table 6: Maintenance Dredging Costs Presented by Port and Depth

Site	Proposed Design Depth (feet)	Total 20-Year Volume (cubic yards)	Estimated Annual Cost
Morehead City / Radio Island	45	1,272,830	$509,770
	51	3,132,710	$4,537,430
River Road	51	74,361,910	$32,719,240
Port of Wilmington	42	10,920,333	$4,373,590
	45	23,571,730	$9,440,480
	47	46,857,980	$20,008,360
	51	81,435,150	$35,831,470
Southport	51	43,152,270	$18,987,000

3.4 Cold Storage

No dredging costs were incorporated into estimates for facilities supporting the Cold Storage market scenario.

3.5 Ro/Ro and Oversize Cargo

No dredging costs were incorporated into estimates for facilities supporting the Ro/Ro and Oversize Cargo market scenario. Dredging incidental to construction of a new berth is included in the port and terminal costs.

4 HIGHWAY INFRASTRUCTURE COSTS

A highway infrastructure assessment was conducted to identify potential projects beyond those identified in the North Carolina Transportation Improvement Program that would enhance goods movements between ports and North Carolina markets. The procedure used to identify potential projects and associated travel time savings is detailed in the *Highway Infrastructure Assessment Technical Memorandum*, however, recommended projects and their associated costs are included in this memorandum.

In most cases, State Transportation Improvement Program and long range transportation plan data collected from the various states provided project cost information. For additional improvement projects proposed to be implemented by 2040 and long range transportation plans without cost estimates reported, the NCDOT Construction Estimation Worksheet was utilized to develop high-level construction cost estimates. These estimates, included in Appendix VI and Appendix VII, are calculated using a cost per mile dependent upon the type of improvement that includes various contingency factors (generally, in the supporting information included in the Appendix, if a project has a TIP number assigned, i.e. U-, I-, R-, X-, the cost shown is a total cost. SHC and CU project costs shown in the Appendix are construction costs). For projects without right of way costs reported in STIP or long range transportation plan data, a factor was applied to the construction cost estimates to estimate right of way costs. While right of way costs are typically higher for urban projects, for the purposes of this report is was assumed the right of way costs would be around 29 percent of the construction costs. Appendix VI includes supporting information for highway network improvements. Appendix VII includes supporting information for local access projects.

4.1 Grain

Conceptual capital costs for port and terminal developments for each market scenario are described below.

The majority of soy-producing counties are located in either eastern or southeastern North Carolina, including areas surrounding Lumberton and Kinston. Grain improvements will also include local truck access to the terminal. Based on 2040 grain volume projections, approximately 130 trucks per day would deliver soybeans to on-dock silos.

Radio Island

Local truck access to Radio Island will be achieved through construction of a new access road and tight, modified diamond interchange on US 70 (see Figure 9). This access is based on information included in a letter of interest document prepared by Moffatt and Nichol for the North Carolina State Ports Authority (See Appendix VII). That document included a cost estimate of $2.1 million for the access road. The estimate included in that document was for the basic access road and did not include an interchange. An additional $15.5 million was added to account for a tight diamond interchange based on coordination with the North Carolina Department of Transportation's Preliminary Estimates Squad. Total construction cost for local access to Radio Island is estimated to be $17.6 million. With the addition of 29 percent to account for potential right of way costs, local highway access is anticipated to cost $23 million.

Figure 9: Enhanced Roadway Access to Radio Island

Source: Long-term recommended roadway improvements as prepared for NCSPA by Moffatt & Nichol (2007) and included in the request for letters of interest for development of Radio Island.

For the Radio Island site, key highway corridors for grain include US 70, NC 24 to US 17, and US 74 / 76. Proposed highway network improvements include the construction of the US 70 North Carteret Bypass, the funded Havelock Bypass, improvements in James City, and improvements to NC 24 in Onslow County. These projects are listed in Table 7 and are illustrated in Figure 10.

Construction and right of way costs of the highway corridor projects identified below are estimated as $1,092,000,000 and $317,000,000, respectively (for a total of $1,408,000,000). Combined with local access costs, total highway infrastructure costs for the grain market scenario at Radio Island are approximately $1,431 million.

Table 7: Detail of Highway Projects to Support Grain Access to Radio Island

ID Number	Route	Description	County
SHC 344	NC 11	new location from US 70 to SR 1732	Lenoir
SHC 345	NC 11	upgrade expressway to freeway from SR 1744 to SR 1835	Lenoir
SHC 346	NC 11	upgrade expressway to freeway from SR 1835 to SR 1110	Lenoir, Pitt
SHC 347	NC 11	upgrade expressway to freeway from SR 1110 to R-2250	Pitt
CU1 24	NC 24	widening from Atlantic Beach Causeway to NC 24	Carteret
CU2 24	NC 24	widening from NC 58 to White Oak River	Carteret
CU3 24	NC 24	widening lanes from NC 172 to FS-1103A	Onslow
FS-1103A	NC 24	access management and drainage improvements from NC 24 to SR 1459	Onslow
R-4431	New Route	new location (Havelock Bypass) to Beaufort	Carteret
CU1 17	US 17	upgrade to freeway from US 17 Bypass in Jacksonville to Maysville	Onslow
FS-1002A	US 70	widening from Morehead City to Beaufort Causeway	Carteret
FS-0802B	US 70	access improvements from James City to proposed Havelock Bypass	Craven
SHC 336	US 70	upgrade to interstate standards from SR 1200 to Kinston Bypass	Craven, Jones
SHC 341	US 70	upgrade to interstate standards from east of La Grange to Goldsboro Bypass	Lenoir
FS-1106B	US 74	upgrade to interstate standards from NC 41 in Lumberton to SR 1585 (Union Valley Road) in Columbus County	Robeson, Columbus
R-4462	US 74/US 76	upgrade to interstate standards from Whiteville to the proposed US 17 Wilmington Bypass	Columbus, Brunswick

Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Project ID numbers explained: Please note that although some projects may have STIP numbers (i.e. numbers that start with I, U, R, or X) they are not currently included in the funded STIP. Instead they are projects that have been identified previously or are scheduled for potential reprioritization. Projects whose identification numbers begin with an FS are projects for which feasibility studies have been conducted or are currently being conducted. Projects with identification numbers that start with SHC are projects that have been identified as potential future projects in the North Carolina Department of Transportation's *Strategic Highway Corridor Plan*. Identification numbers that begin with CU are conceptual upgrade projects that the Maritime Strategy team has identified as potential needs that have not been identified to date in any NCDOT programs or plans. These projects help fill gaps or address anticipated future capacity deficiencies (based on a review of Freight Analysis Framework data) in the landside highway network.

Port of Wilmington

Local truck access to the Port of Wilmington will be enhanced by the completion of the Wilmington Bypass and anticipated construction of the Cape Fear Skyway toll facility. Although the Cape Fear Skyway is not programmed in the current STIP, it is anticipated to be paid for by toll revenues and was thus not included in capital cost estimates associated with the *North Carolina Maritime Strategy*.

US 74 / 76 and NC 24 and US 258 provide access to Port of Wilmington from major soy-producing counties. Key highway improvements include completion of I-140, improvements to US 74 / 76 between the port and I 95, completion of I-795, south of Goldsboro, and improvements to US 17 and US 258 between Jacksonville and Kinston. Capacity additions to these corridors will be required to maintain competitive travel times. Improvements to US 74 / 76 to upgrade it to interstate standards, bypassing segments of existing US 17 between Wilmington and Jacksonville, and widening the two-lane portions of US 258 between Jacksonville and Kinston are needed. These proposed projects are detailed in Table 8 and shown in Figure 10.

Table 8: Detail of Highway Projects to Support Grain Access to Port of Wilmington

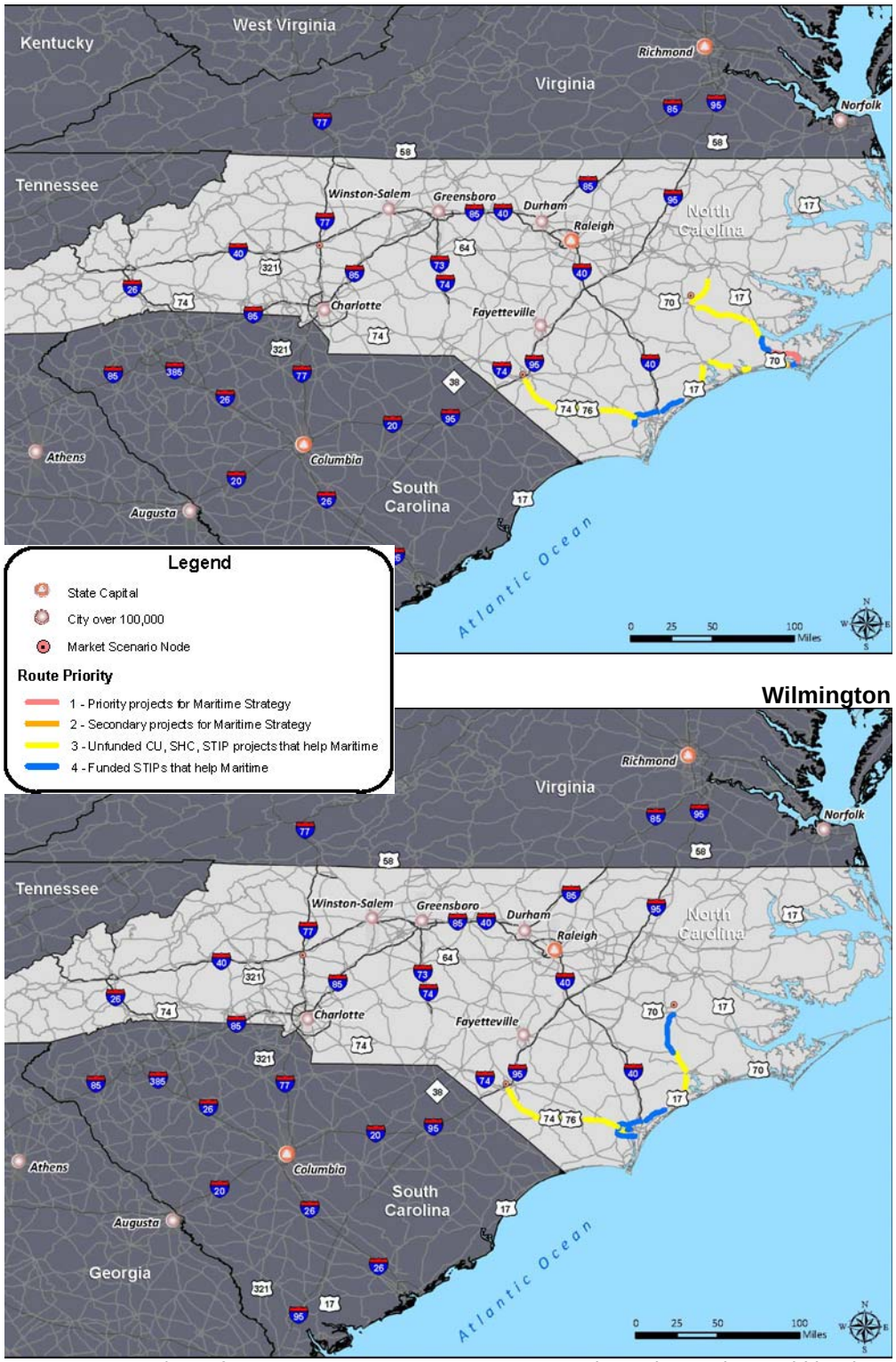
ID Number	Route	Description	County
CU4 24	NC 24	widening from NC 24 Business to NC 111	Onslow
FS-0803A	US 17	widening from proposed I-140 to NC 133 (Village Road)	Brunswick
CU1 17	US 17	upgrade to freeway from US 17 Bypass in Jacksonville to Maysville	Onslow
CU2 258	US 17/US 258	widening from NC 24 Business to NC 111	Onslow
FS-1106B	US 74	upgrade to interstate standards from NC 41 in Lumberton to SR 1585 (Union Valley Road) in Columbus County	Robeson, Columbus
R-4462	US 74/US 76	upgrade to interstate standards from Whiteville to the proposed US 17 Wilmington Bypass	Columbus, Brunswick

Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Note: CU = Conceptual Upgrade; SHC = Strategic Highway Corridor; FS = Feasibility Study. For more information, please refer to the "Project ID numbers explained" text below Table 7.

Construction and right of way costs of the highway corridor projects identified above are estimated as $448,000,000 and $130,000,000, respectively. Total highway infrastructure costs associated with the grain market scenario at the Port of Wilmington are estimated at $578 million.

Figure 10: Highway Network Improvements to Support Grain Market

Radio Island



Source: AECOM/URS from ESRI, NCDOT, FAF v3.1, USGS ThematicMapping world borders dataset

4.2 Wood Pellets and Other Wood Products

In 2040, wood pellet export volumes are anticipated to reach 450,000 tons. Volumes of other wood products are anticipated to increase to 990,000 tons for bulk items and 320,000 tons for break bulk. Trucks are expected to be the primary mode of delivery for wood products to port from Lumberton, Riegelwood, and other timber production areas east of I-95.

Radio Island

Local truck access to Radio Island will be achieved through construction of a new access road and tight, modified diamond interchange on US 70. These improvements are illustrated in Figure 9. Local access to Radio Island is estimated to cost $23,000,000 ($18,000,000 for construction and $5,000,000 for right of way).

NC 24, US 17, I-140, and US 74 / 76 are the primary corridors that provide access from southeastern North Carolina to Radio Island. Highway network improvements to support wood transport include upgrades to NC 24, US 17, and US 74 / 76. These projects are listed in Table 9.

Table 9: Detail of Highway Projects to Support Wood Access to Radio Island

ID Number	Route	Description	County
I-3806	I-95	widening from US 74 to US 301	Robeson
CU1 24	NC 24	widening from Atlantic Beach Causeway to NC 24	Carteret
CU2 24	NC 24	widening from NC 58 to White Oak River	Carteret
CU3 24	NC 24	widening lanes from NC 172 to FS-1103A	Onslow
FS-1103A	NC 24	access management and drainage improvements from NC 24 to SR 1459	Onslow
CU1 17	US 17	upgrade to freeway from US 17 Bypass in Jacksonville to Maysville	Onslow
R-4462	US 74/US 76	upgrade to interstate standards from Whiteville to the proposed US 17 Wilmington Bypass	Columbus, Brunswick
FS-1002A	US 70	widening from Morehead City to Beaufort Causeway	Carteret
SHC 341	US 70	upgrade to interstate standards from east of La Grange to Goldsboro Bypass	Lenoir
FS-1106B	US 74	upgrade to interstate standards from NC 41 in Lumberton to SR 1585 (Union Valley Road) in Columbus County	Robeson, Columbus

Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Note: CU = Conceptual Upgrade; SHC = Strategic Highway Corridor; FS = Feasibility Study. For more information, please refer to the "Project ID numbers explained" text below Table 7.

Construction and right of way costs of the highway corridor projects identified above are estimated as $585,000,000 and $169,000,000, respectively. The total cost for highway network improvements for the wood pellets and other wood products scenario is $754 million.

Combined with local access costs, total highway infrastructure costs for the wood pellet market scenario at Radio Island are estimated to be $777 million.

Port of Wilmington

Local truck access to the Port of Wilmington will be enhanced by the completion of the Wilmington Bypass and anticipated construction of the Cape Fear Skyway toll facility. Although the Cape Fear Skyway is not programmed in the current STIP, it is anticipated to be paid for by toll revenues and was thus not included in capital cost estimates associated with the *North Carolina Maritime Strategy*.

For the Port of Wilmington site, I-140 and US 74 / 76 are the primary corridors that provide access from timber production areas in southeastern North Carolina. Highway improvements to US 74 / 76 are proposed to provide efficient highway connections to the port. These projects are listed below.

Table 10: Detail of Highway Projects to Support Wood Access to Port of Wilmington

ID Number	Route	Description	County
FS-0803A	US 17	US 17; widening from proposed I-140 to NC 133 (Village Road)	Brunswick
FS-1106B	US 74	US 74; upgrade to interstate standards from NC 41 in Lumberton to SR 1585 (Union Valley Road) in Columbus County	Robeson, Columbus
R-4462	US 74/US 76	US 74/US 76; upgrade to interstate standards from Whiteville to the proposed US 17 Wilmington Bypass	Columbus, Brunswick

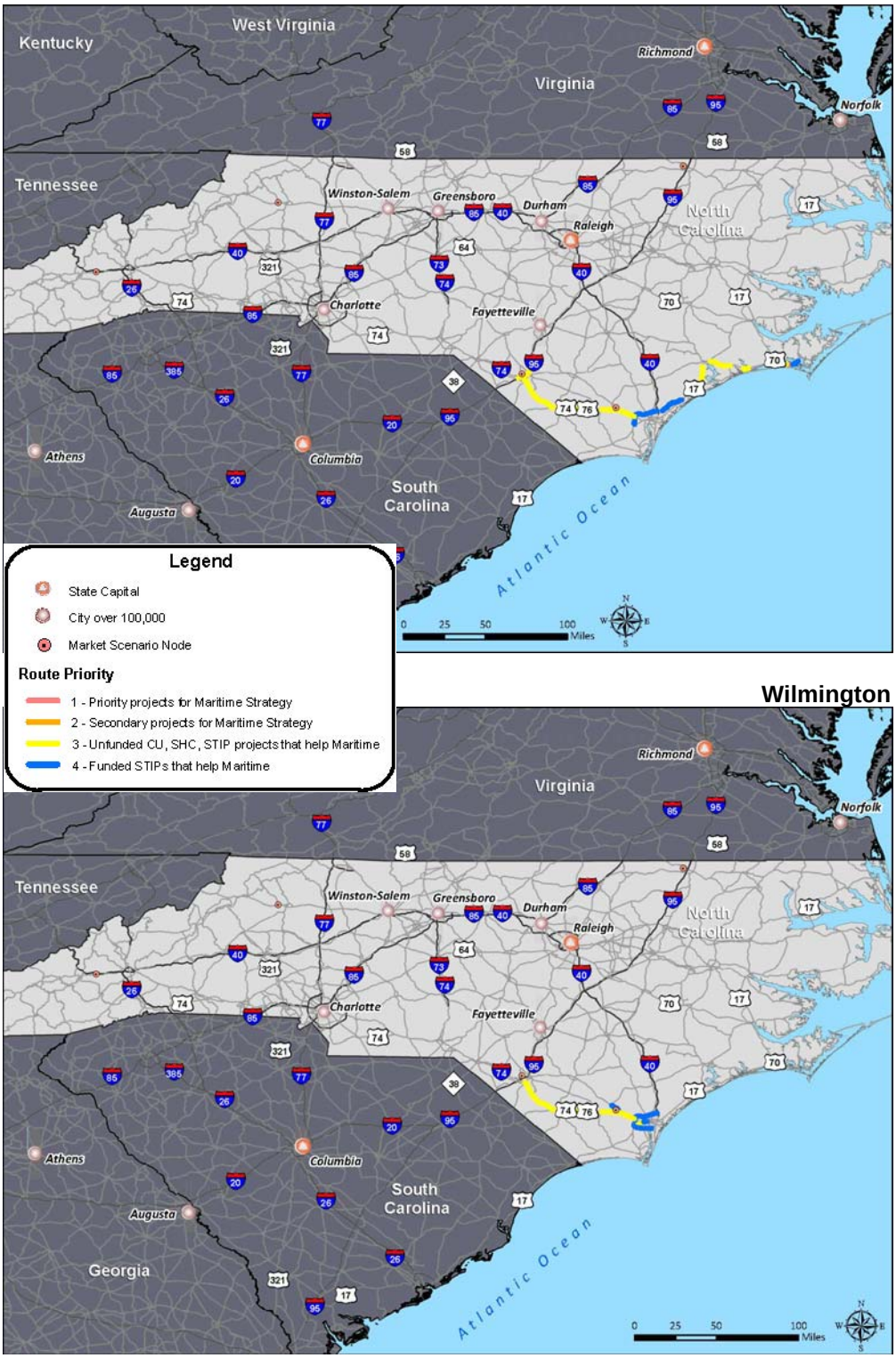
Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Note: CU = Conceptual Upgrade; SHC = Strategic Highway Corridor; FS = Feasibility Study. For more information, please refer to the "Project ID numbers explained" text below

Table 7.

Construction and right of way costs of the highway corridor projects identified above are estimated as $271,000,000 and $79,000,000, respectively.

Total highway infrastructure costs associated with the wood pellets and wood products market scenario at the Port of Wilmington total $350 million.

Figure 11: Highway Network Improvements to Support Wood Products Market
Radio Island



Source: AECOM/URS from ESRI, NCDOT, FAF v3.1, USGS ThematicMapping world borders dataset

4.3 Containers

To support the transport of containers to and from major North Carolina markets in Charlotte, the Triad, and Triangle regions, upgrades to major corridors are proposed to connect those markets to each potential container terminal site. Potential highway improvements supporting potential terminals at Radio Island, River Road, Port of Wilmington, and Southport are described below.

Site 3 - Radio Island

Highway travel times from Radio Island to the container nodes are higher than those of competing ports (Charleston and Savannah) for all container nodes, except for the Triangle Region. Both Charlotte and the Triad would require transport by rail. To enhance access to Radio Island from the Triangle, and to enhance access to the interstate network, upgrades to US 70 would be required. In order to have a minimum of a four-lane expressway from Radio Island to the interstate system and on to the Triangle, unfunded projects such as the North Carteret Bypass and Kinston Bypass are needed. Other critical projects include the funded Havelock Bypass. These and other projects that would facilitate travel to and from a container terminal at Radio Island are listed below.

Table 11: Detail of Highway Projects to Support Container Access to Site 3 - Radio Island

ID Number	Route	Description	County
R-2829	Future NC 540	(Eastern Wake Freeway/ Triangle Expressway Southeast Extenstion/ Raleigh Outer Loop); new location from I-40 to US 64/US 264 Bypass	Wake, Johnston
SHC 139	I-40	widening from Wade Avenue to NC 147	Durham, Wake
SHC 158	I-40	widening from I-95 to NC 42	Johnston
SHC 153	I-40	widening from Lake Wheeler Road to I-440/US 1/ US 64	Wake
SHC 154	I-40	widening from I-440/US 64 to Lake Wheeler Road	Wake
I-5111BB	I-40	widening from I-95 to NC 42	Wake, Johnston
FS-1005A	I-40/US 64	widening, pavement, interchange mod, operation improvements from West of SR 1728 (Wade Avenue) to east of SR 1375 (Lake Wheeler Road)	Wake
CU1 24	NC 24	widening from Atlantic Beach Causeway to NC 24	Carteret
R-4431	New Route	new location (Havelock Bypass) to Beaufort	Carteret
FS-1002A	US 70	widening from Morehead City to Beaufort Causeway	Carteret
FS-0802B	US 70	access improvements from James City to proposed Havelock Bypass	Craven
SHC 336	US 70	upgrade to interstate standards from SR 1200 to Kinston Bypass	Craven, Jones
CU1 70	US 70	upgrade to interstate standards from Goldsboro Bypass to Selma Bypass	Johnston, Wayne
R-2553	US 70	new location (US 70 Kinston Bypass) from Craven County line to west of Kinston	Lenoir
SHC 341	US 70	upgrade to interstate standards from east of La Grange to Goldsboro Bypass	Lenoir
SHC 357	US 70	upgrade to interstate standards from Kinston Bypass to LaGrange Bypass	Lenoir
CU1 95	I-95	widening from I-40 to Virginia state line	New Hanover, Pender
CU2 70	US 70	Selma Bypass at US 70/I-95	Wake, Johnston

Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Note: CU = Conceptual Upgrade; SHC = Strategic Highway Corridor; FS = Feasibility Study. For more information, please refer to the "Project ID numbers explained" text below

Table 7.

In addition to improvements to these highway corridors, the local highway connection to provide access from US 70 to Radio Island (as described in the Grain and Wood Market Scenarios) is needed. Local access to Radio Island is estimated to cost $23,000,000 ($18,000,000 for construction and $5,000,000 for right of way).

Construction and right of way costs of the highway corridor projects identified above are estimated as $2,487,000,000 and $721,000,000, respectively (for a total of $3,208 million).

Including local access costs, total highway infrastructure costs associated with the container market scenario at Radio Island are estimated at $3,231 million.

Site 4 – River Road

In 2040, with highway infrastructure improvements, the River Road container terminal site provides shorter travel times than competing ports (Savannah, Charleston, and Norfolk) to the markets of the Triangle, Triad, and Charlotte; however, travel times to portions of the Triangle suggest that Norfolk may be able to reach eastern portions of the Triangle with a similar travel time. To further enhance access to each of these regions, improvements to I-40 at various locations between Wilmington and Durham, completion of the I-73 / 74 interstate corridor, and improvements to US 74 between Rockingham and Monroe are included. Currently unfunded projects that would enhance access to this potential port location are listed below.

Table 12: Detail of Highway Projects to Support Container Access to Site 4 – River Road

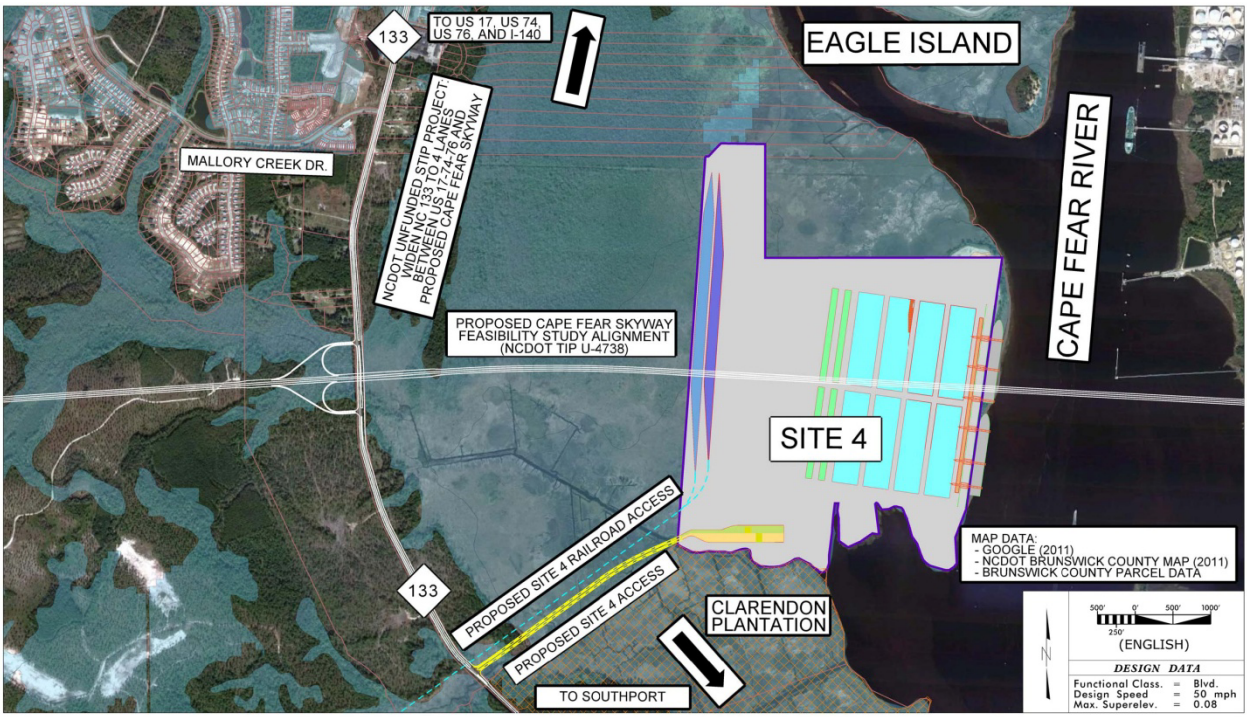
ID Number	Route	Description	County
I-3801	Future I-74/US 74	upgrade to interstate standards from Rockingham-Hamlet Bypass to Laurinburg Bypass	Richmond, Scotland
R-2829	Future NC 540	(Eastern Wake Freeway/ Triangle Expressway Southeast Extenstion/ Raleigh Outer Loop); new location from I-40 to US 64/US 264 Bypass	Wake, Johnston
CU2 I-40	I-40	widening NC 24 segment Exit 364 to 373	Duplin
SHC 139	I-40	widening from Wade Avenue to NC 147	Durham, Wake
FS-1104B	I-40	widening from NC 42 to NC 210	Johnston
SHC 158	I-40	widening from I-95 to NC 42	Johnston
CU1 I-40	I-40	widening Exit 398 (NC 53) to Exit 416 (US 17)	New Hanover, Pender
SHC 153	I-40	widening from Lake Wheeler Road to I-440/US 1/ US 64	Wake
SHC 154	I-40	widening from I-440/US 64 to Lake Wheeler Road	Wake
I-5111BB	I-40	widening from I-95 to NC 42	Wake, Johnston
FS-1005A	I-40/US 64	widening, pavement, interchange mod, operation improvements from West of SR 1728 (Wade Avenue) to east of SR 1375 (Lake Wheeler Road)	Wake
CU1 73	I-73	widening from US 220 Bus in Asheboro to SR 2269	Randolph
SHC 264	I-73	widening from US 220 Bus in Asheboro to SR 2269	Randolph
UFSTIP 133	NC 133	widening from Cape Fear Skyway to US 17/US 74/US 76	Brunswick
FS-1106B	US 74	upgrade to interstate standards from NC 41 in Lumberton to SR 1585 (Union Valley Road) in Columbus County	Robeson, Columbus
R-4441	US 74	upgrade to freeway standards with bypass of Wadesboro from Monroe Bypass (F-2559) to Rockingham Bypass (R-512)	Union, Anson
R-4462	US 74/US 76	upgrade to interstate standards from Whiteville to the proposed US 17 Wilmington Bypass	Columbus, Brunswick

Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Note: CU = Conceptual Upgrade; SHC = Strategic Highway Corridor; FS = Feasibility Study. For more information, please refer to the "Project ID numbers explained" text below Table 7.

If a container terminal were constructed at the River Road site, an access road to NC 133 would be needed as shown in the figure below. In addition, a connector between NC 133 and US 17 would need to be provided. Capital cost estimates for the River Road site include the construction of both the access road to NC 133 (included in Appendix VII) and construction of a four-lane median-divided roadway between NC 133 and US 17. This connector would include an interchange at NC 133 and a grade separation over the U.S. Government Railroad that lies between the routes. Construction of the access road is estimated at $8,200,000. Construction of the connector is estimated at $68,000,000. Including an additional 29 percent for right of way costs, local access costs to the River Road site total $98 million.

Construction and right of way costs for the highway network improvements identified in Table 12 are estimated as $2,264,000,000 and $656,560,000, respectively (for a total of $2,921 million). Including local access costs, total highway infrastructure costs associated with the container market scenario at River Road are estimated as $3,019,000,000.

Figure 12: Highway Access to Site 4 – River Road



Source: AECOM/URS with ESRI, I-Cubed Imagery

Site 5 - Port of Wilmington

To enhance access to container destinations from Port of Wilmington, improvements to I-40 at various locations between Wilmington and the Triangle, completion of the I-73 / 74 interstate corridor to enhance access to the Triad, and improvements to US 74 between Rockingham and Monroe to enhance access to Charlotte are proposed. The Cape Fear Skyway would also

provide better local access. Currently unfunded projects that would enhance access to the Port of Wilmington are listed in Table 13.

Table 13: Detail of Highway Projects to Support Container Access to Site 4 – Port of Wilmington

ID Number	Route	Description	County
I-3801	Future I-74/US 74	upgrade to interstate standards from Rockingham-Hamlet Bypass to Laurinburg Bypass	Richmond, Scotland
R-2829	Future NC 540	(Eastern Wake Freeway/ Triangle Expressway Southeast Extenstion/ Raleigh Outer Loop); new location from I-40 to US 64/US 264 Bypass	Wake, Johnston
CU2 I-40	I-40	widening NC 24 segment Exit 364 to 373	Duplin
SHC 139	I-40	widening from Wade Avenue to NC 147	Durham, Wake
SHC 158	I-40	widening from I-95 to NC 42	Johnston
CU1 I-40	I-40	widening Exit 398 (NC 53) to Exit 416 (US 17)	New Hanover, Pender
SHC 153	I-40	widening from Lake Wheeler Road to I-440/US 1/ US 64	Wake
SHC 154	I-40	widening from I-440/US 64 to Lake Wheeler Road	Wake
I-5111BB	I-40	widening from I-95 to NC 42	Wake, Johnston
FS-1005A	I-40/US 64	widening, pavement, interchange mod, operation improvements from West of SR 1728 (Wade Avenue) to east of SR 1375 (Lake Wheeler Road)	Wake
CU1 73	I-73	widening from US 220 Bus in Asheboro to SR 2269	Randolph
SHC 264	I-73	widening from US 220 Bus in Asheboro to SR 2269	Randolph
FS-0803A	US 17	widening from proposed I-140 to NC 133 (Village Road)	Brunswick
FS-1106B	US 74	upgrade to interstate standards from NC 41 in Lumberton to SR 1585 (Union Valley Road) in Columbus County	Robeson, Columbus
R-4441	US 74	upgrade to freeway standards with bypass of Wadesboro from Monroe Bypass (F-2559) to Rockingham Bypass (R-512)	Union, Anson
R-4462	US 74/US 76	upgrade to interstate standards from Whiteville to the proposed US 17 Wilmington Bypass	Columbus, Brunswick

Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Note: CU = Conceptual Upgrade; SHC = Strategic Highway Corridor; FS = Feasibility Study. For more information, please refer to the "Project ID numbers explained" text below

Table 7.

Construction and right of way costs of the highway corridor projects identified above are estimated as $2,242,000,000 and $650,000,000, respectively. Total highway infrastructure costs associated with the container market scenario at the Port of Wilmington total $2,892,000,000.

Site 6 - Southport

Access to the proposed site from I-40 and I-95 would be accomplished using I-140 to US 421 to US 17 and to an improved NC 87, with a bypass of Boiling Springs Lakes. The improvements to NC 87 and bypass of Boiling Springs Lakes are identified Strategic Highway Corridor projects, but they are currently unfunded. Currently unfunded projects that should be considered to enhance access to this potential port location are listed below:

Table 14: Detail of Highway Projects to Support Container Access to Site 6 - Southport

ID Number	Route	Description	County
I-3801	Future I-74/US 74	Future I-74/US 74; upgrade to interstate standards from Rockingham-Hamlet Bypass to Laurinburg Bypass	Richmond, Scotland
R-2829	Future NC 540	(Eastern Wake Freeway/ Triangle Expressway Southeast Extenstion/ Raleigh Outer Loop); new location from I-40 to US 64/US 264 Bypass	Wake, Johnston
CU2 I-40	I-40	widening NC 24 segment Exit 364 to 373	Duplin
SHC 139	I-40	widening from Wade Avenue to NC 147	Durham, Wake
SHC 158	I-40	widening from I-95 to NC 42	Johnston
CU1 I-40	I-40	widening Exit 398 (NC 53) to Exit 416 (US 17)	New Hanover, Pender
SHC 153	I-40	widening from Lake Wheeler Road to I-440/US 1/ US 64	Wake
SHC 154	I-40	widening from I-440/US 64 to Lake Wheeler Road	Wake
I-5111BB	I-40	widening from I-95 to NC 42	Wake, Johnston
FS-1005A	I-40/US 64	widening, pavement, interchange mod, operation improvements from West of SR 1728 (Wade Avenue) to east of SR 1375 (Lake Wheeler Road)	Wake
CU1 73	I-73	widening from US 220 Bus in Asheboro to SR 2269	Randolph
SHC 264	I-73	widening from US 220 Bus in Asheboro to SR 2269	Randolph
SHC353-354	NC 87	widening from US 17 to NC 133	Brunswick, New Hanover
CU1 S87U17	NC 87/US 17	widening from NC 87 to I-140	Brunswick
SHC 352	NC 87/US 17	widening from NC 211 to N of Orton Creek	Brunswick
FS-0803A	US 17	widening from proposed I-140 to NC 133 (Village Road)	Brunswick
FS-1106B	US 74	upgrade to interstate standards from NC 41 in Lumberton to SR 1585 (Union Valley Road) in Columbus County	Robeson, Columbus
R-4441	US 74	upgrade to freeway standards with bypass of Wadesboro from Monroe Bypass (F-2559) to Rockingham Bypass (R-512)	Union, Anson
R-4462	US 74/US 76	upgrade to interstate standards from Whiteville to the proposed US 17 Wilmington Bypass	Columbus, Brunswick

Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Note: CU = Conceptual Upgrade; SHC = Strategic Highway Corridor; FS = Feasibility Study. For more information, please refer to the "Project ID numbers explained" text below

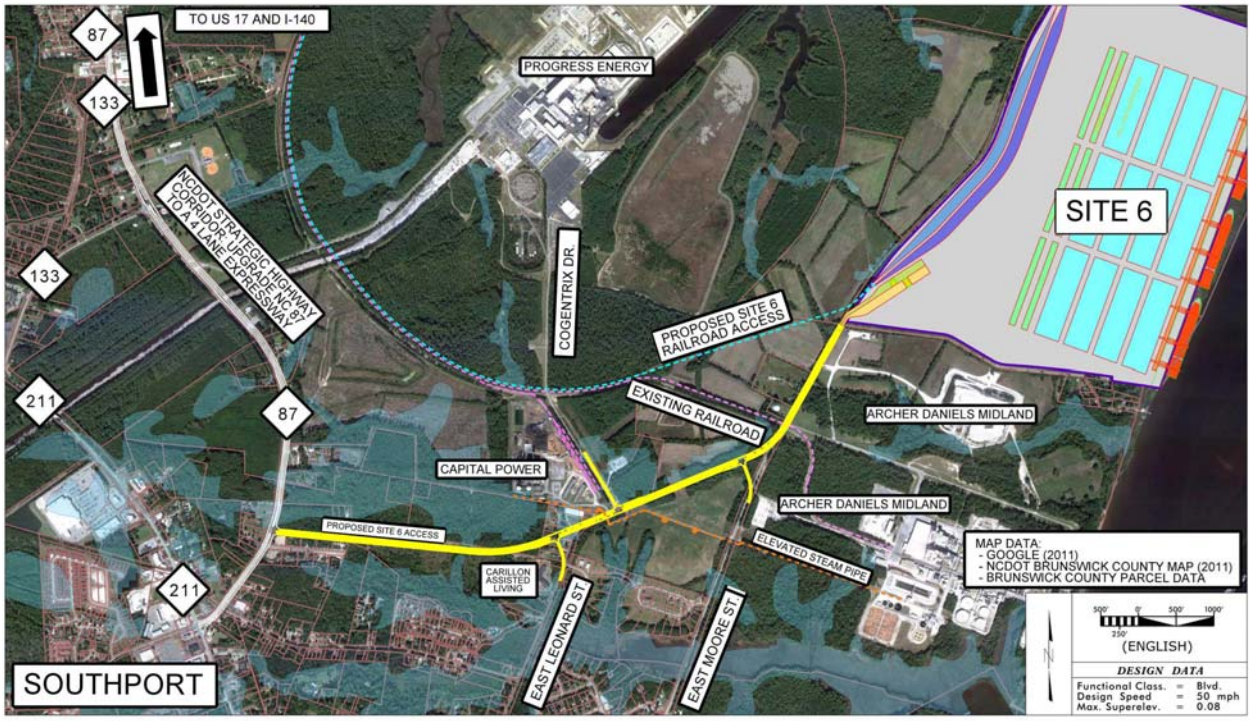
Table 7.

In addition, a connection similar to that shown in Figure 13 would provide access to the container terminal from NC 87. Construction and right of way costs for the connection shown in Figure 13 are estimated as $13,000,000 and $3,770,000, respectively (for a total of $16.7 million). This estimate is included in Appendix VII.

Construction and right of way costs for the highway network improvements identified in Table 14 are estimated as $2,483,000,000 and $720,070,000, respectively (for a total of $3,203 million).

Including costs to provide local road access, highway infrastructure costs associated with the container market scenario at the potential Southport site total $3,220 million.

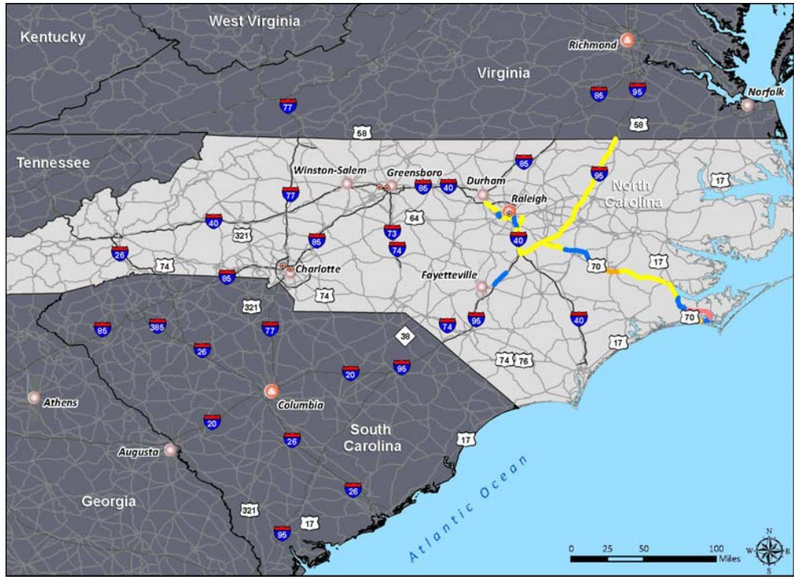
Figure 13: Highway Access to Site 6 – Southport



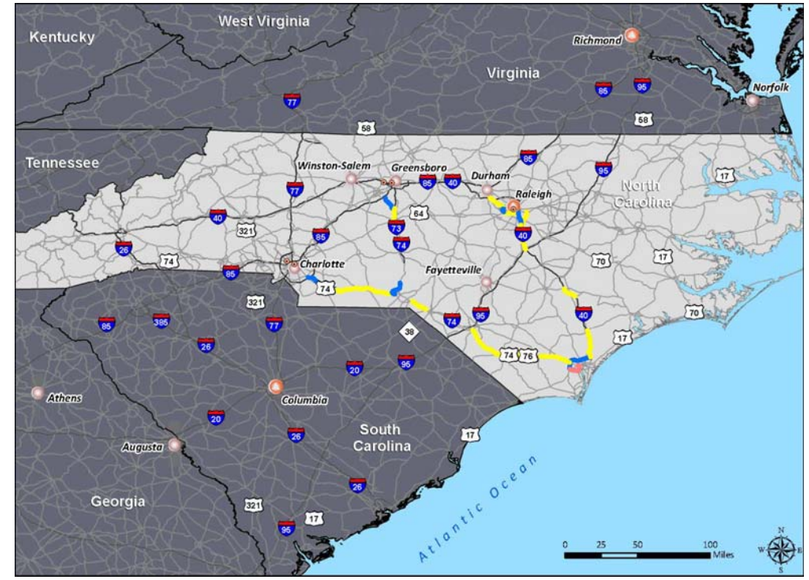
Source: AECOM/URS with ESRI, I-Cubed Imagery

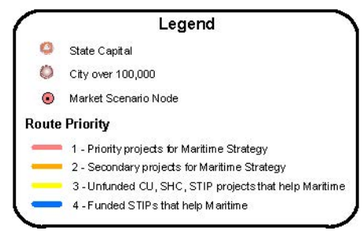
Figure 14: Highway Network Improvements to Support Container Market

Site 3 – Radio Island

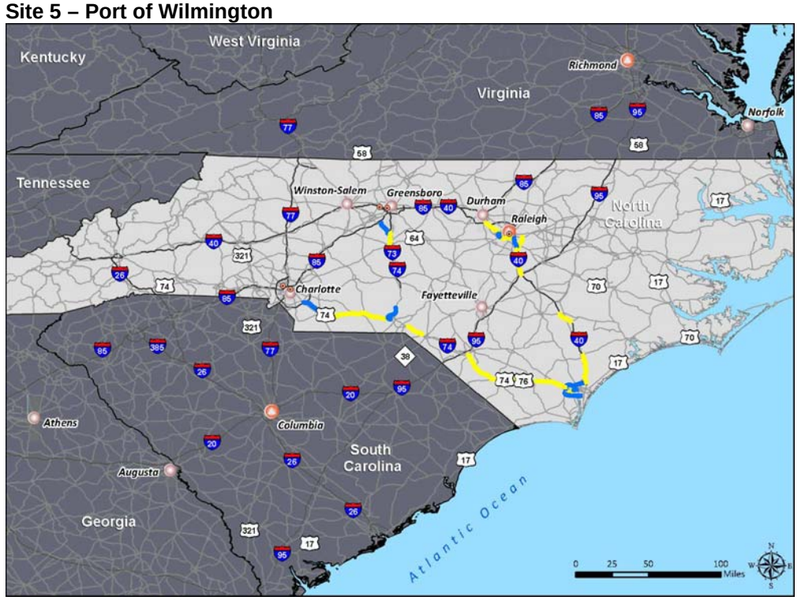


Site 4 – River Road

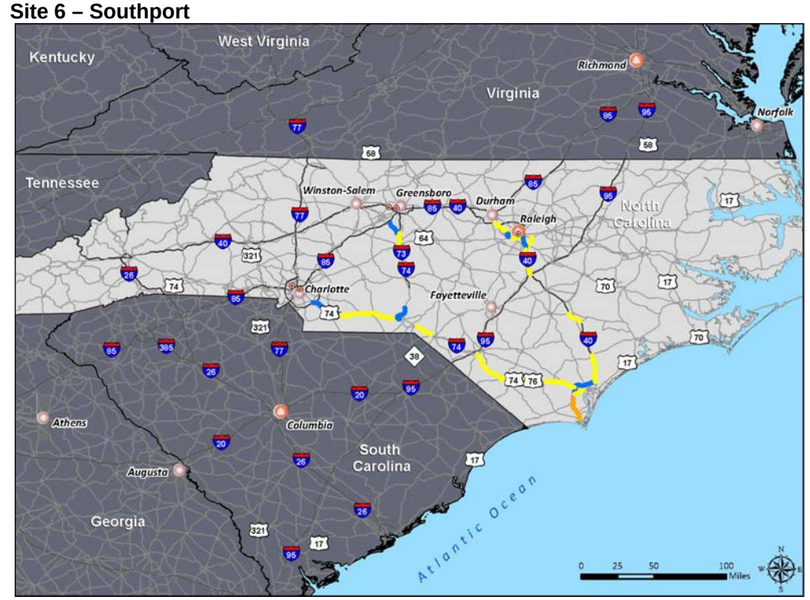




Site 5 – Port of Wilmington



Site 6 – Southport



Source: AECOM/URS from ESRI, NCDOT, FAF v3.1, USGS ThematicMapping world borders dataset

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4.4 Cold Storage

No inland highway infrastructure costs were incorporated into estimates for facilities supporting the Cold Storage market scenario.

4.5 Ro/Ro and Oversize Cargo

Highway investments were targeted to improve access from manufacturing centers in the Triangle region, Kinston, and other sites in the eastern Piedmont to potential port locations. Due to the size and weight of this cargo, it is assumed that transport to and from points further west would be supported by rail.

Radio Island

Key improvements to enhance access to the Port of Morehead City – Radio Island include the North Carteret Bypass and Kinston Bypass. Additional improvements to US 70, I-40, NC 42, US 401, and US 421 have been identified. Currently unfunded projects included in cost estimates for this scenario are listed below. Proposed highway network improvements to support the transport of Ro/Ro and oversize goods are illustrated in Figure 15.

Table 15: Detail of Highway Projects to Support Ro/Ro and Oversize Access to Radio Island

ID Number	Route	Description	County
SHC 139	I-40	widening from Wade Avenue to NC 147	Durham, Wake
SHC 153	I-40	widening from Lake Wheeler Road to I-440/US 1/ US 64	Wake
SHC 154	I-40	widening from I-440/US 64 to Lake Wheeler Road	Wake
I-5111BB	I-40	widening from I-95 to NC 42	Wake, Johnston
FS-1005A	I-40/US 64	widening, pavement, interchange mod, operation improvements from West of SR 1728 (Wade Avenue) to east of SR 1375 (Lake Wheeler Road)	Wake
CU2 24	NC 24	widening from NC 58 to White Oak River	Carteret
CU3 24	NC 24	widening lanes from NC 172 to FS-1103A	Onslow
FS-1103A	NC 24	access management and drainage improvements from NC 24 to SR 1459	Onslow
R-3410	NC 42	widening from NC 50 to US 70	Johnston
CU1 42	NC 42	widening from Fuquay Varina to NC 50	Wake, Johnston
R-4431	New Route	new location (Havelock Bypass) to Beaufort	Carteret
R-2609	US 401	widening from North of Fayetteville to Fuquay Varina	Wake, Harnett, Cumberland
UF STIP	US 421	widening from Sanford to US 401	Harnett, Lee
FS-0802B	US 70	access improvements from James City to proposed Havelock Bypass	Craven
SHC 336	US 70	upgrade to interstate standards from SR 1200 to Kinston Bypass	Craven, Jones
CU3 70	US 70	upgrade to interstate standards from Buffalo Road to Clayton Bypass	Johnston
CU1 70	US 70	upgrade to interstate standards from Goldsboro Bypass to Selma Bypass	Johnston, Wayne
R-2553	US 70	new location (US 70 Kinston Bypass) from Craven County line to west of Kinston	Lenoir
SHC 341	US 70	upgrade to interstate standards from east of La Grange to Goldsboro Bypass	Lenoir
CU2 70	US 70	Selma Bypass at US 70/I-95	Wake, Johnston

Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Note: CU = Conceptual Upgrade; SHC = Strategic Highway Corridor; FS = Feasibility Study. For more information, please refer to the "Project ID numbers explained" text below

Table 7.

In addition to improvements to these highway corridors, the local highway connection to provide access from US 70 to Radio Island (as described in the Grain and Wood Market Scenarios) is needed. Local access to Radio Island is estimated to cost $23,000,000 ($18,000,000 for construction and $5,000,000 for right of way).

Construction and right of way costs of the highway corridor projects identified in Table 15 above are estimated as $1,672,000,000 and $485,000,000, respectively (for a total of $2,157 million). Including local access costs, total highway infrastructure costs associated with the Ro/Ro and Oversize market scenario at Radio Island are estimated as $2,180 million.

Wilmington

Key improvements to enhance access to the Port of Wilmington to market scenario nodes include US 74 / 76, I-40, and US 17 to US 258. Currently unfunded projects included in cost estimates for this scenario are listed below.

Table 16: Detail of Highway Projects to Support Ro/Ro and Oversize Access to Wilmington

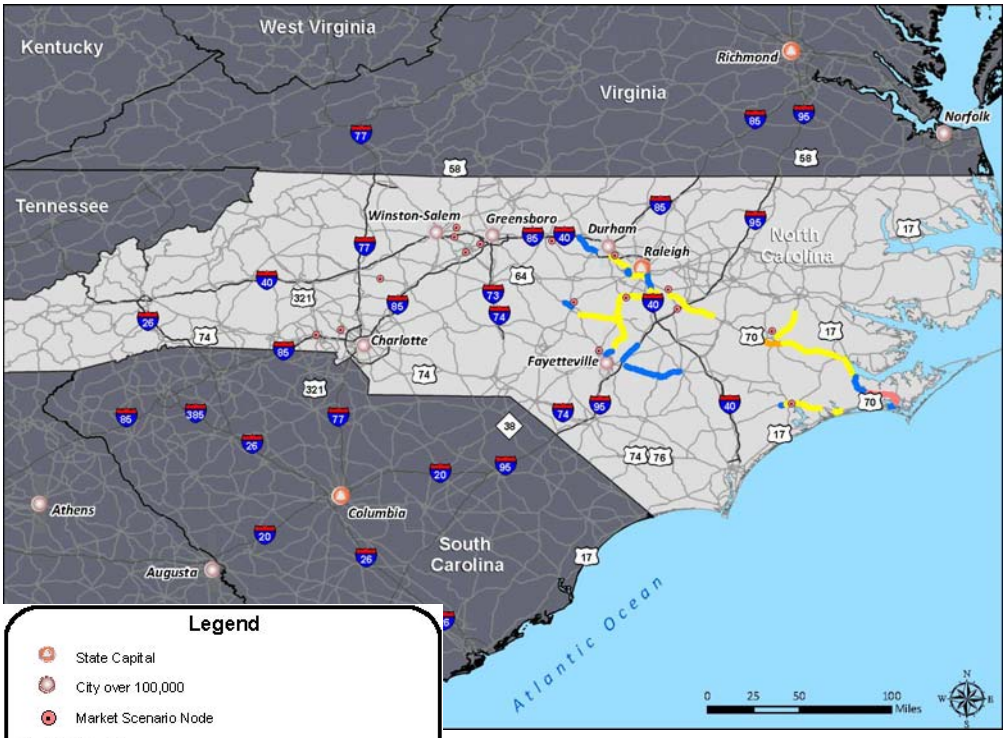
ID Number	Route	Description	County
CU2 I-40	I-40	widening NC 24 segment Exit 364 to 373	Duplin
SHC 139	I-40	widening from Wade Avenue to NC 147	Durham, Wake
SHC 158	I-40	widening from I-95 to NC 42	Johnston
CU1 I-40	I-40	widening Exit 398 (NC 53) to Exit 416 (US 17)	New Hanover, Pender
SHC 153	I-40	widening from Lake Wheeler Road to I-440/US 1/ US 64	Wake
SHC 154	I-40	widening from I-440/US 64 to Lake Wheeler Road	Wake
I-5111BB	I-40	widening from I-95 to NC 42	Wake, Johnston
FS-1005A	I-40/US 64	widening, pavement, interchange mod, operation improvements from West of SR 1728 (Wade Avenue) to east of SR 1375 (Lake Wheeler Road)	Wake
CU4 24	NC 24	widening from NC 24 Business to NC 111	Onslow
R-3410	NC 42	widening from NC 50 to US 70	Johnston
CU1 42	NC 42	widening from Fuquay Varina to NC 50	Wake, Johnston
FS-0803A	US 17	widening from proposed I-140 to NC 133 (Village Road)	Brunswick
CU1 17	US 17	upgrade to freeway from US 17 Bypass in Jacksonville to Maysville	Onslow
CU2 258	US 17/US 258	widening from NC 24 Business to NC 111	Onslow
R-2609	US 401	widening from North of Fayetteville to Fuquay Varina	Wake, Harnett, Cumberland
UF STIP	US 421	widening from Sanford to US 401	Harnett, Lee
CU3 70	US 70	upgrade to interstate standards from Buffalo Road to Clayton Bypass	Johnston
CU2 70	US 70	Selma Bypass at US 70/I-95	Wake, Johnston
FS-1106B	US 74	upgrade to interstate standards from NC 41 in Lumberton to SR 1585 (Union Valley Road) in Columbus County	Robeson, Columbus
R-4462	US 74/US 76	upgrade to interstate standards from Whiteville to the proposed US 17 Wilmington Bypass	Columbus, Brunswick

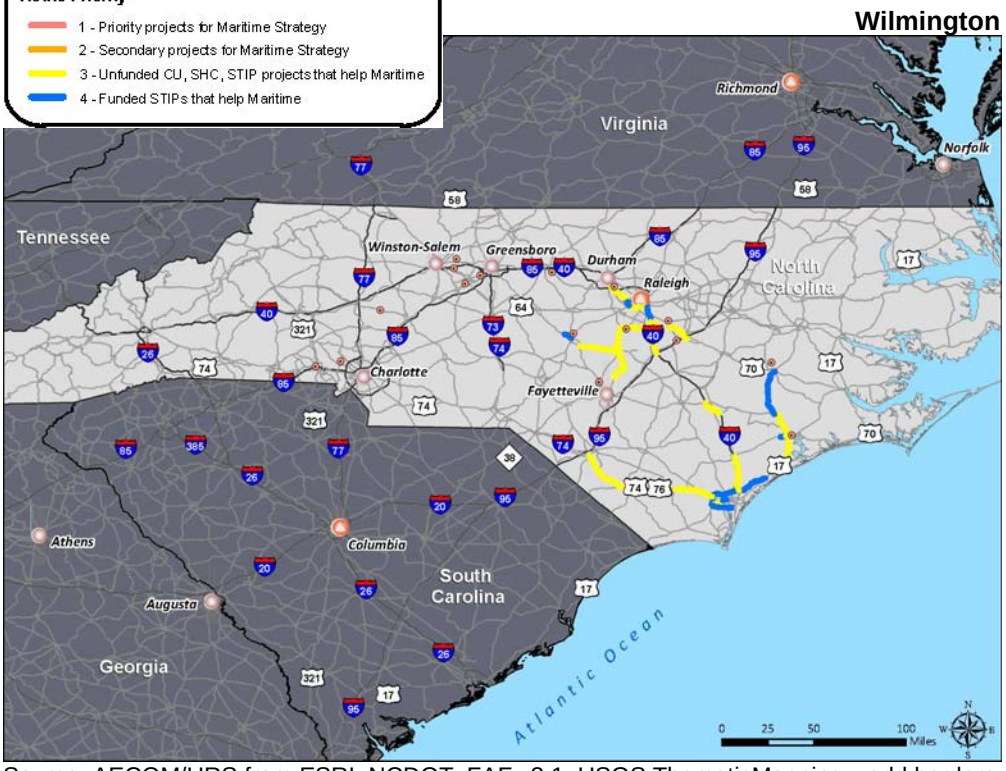
Source: AECOM/URS from FAF 3.1 and AECOM Delivered Cost Model
Note: CU = Conceptual Upgrade; SHC = Strategic Highway Corridor; FS = Feasibility Study. For more information, please refer to the "Project ID numbers explained" text below

Table 7.

Construction and right of way costs of the highway corridor projects identified above are estimated as $1,833,000,000 and $532,000,000, respectively. Total highway infrastructure costs associated with the Ro/Ro and Oversize market scenario at the Port of Wilmington total $2,365,000,000.

Figure 15: Highway Network Improvements to Support Ro/Ro and Oversize Market Radio Island





Source: AECOM/URS from ESRI, NCDOT, FAF v3.1, USGS ThematicMapping world borders dataset

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5 RAILROAD IMPROVEMENT COSTS

Order of magnitude cost estimates for the identified railroad related improvements were developed from conceptual alignment or scope of the improvements. Major cost items were identified and assigned unit prices based on recent contract bids and self-performed track construction railroad projects in the southeastern US. Existing available cost estimates were used where available from prior studies or reports. Consistent with the highway cost methodology, 29 percent of construction cost was added to projects requiring new right-of-way. Supporting information on railroad estimates is included in the Appendix IV.

5.1 Grain

Because centers for soybean production in North Carolina are located in the eastern part of the state (generally east of I-95), only a small percentage of grain is anticipated to be delivered by rail. The additional estimated rail traffic of one train per week would not require additional investment in off-port rail infrastructure. However a rail connection would be required to the new grain terminal.

Radio Island

For the Radio Island site, rail access would be accomplished through upgrade of the existing track onto the parcel proposed for grain use and connection to an on-terminal loop. Although the proposed Havelock to Morehead City Rail Relocation project would enhance access to the Port of Morehead City, the majority of the grain market is within trucking distances so that project is not included in capital cost estimates for the scenario. The loop track is estimated to cost $6,800,000 and upgrade of the tracks connecting Radio Island to the existing rail line was estimated at $2,600,000 (see Appendix IV). With estimated right of way costs, total rail access costs for a grain terminal at Radio Island are approximately $12 million.

Port of Wilmington

For the Port of Wilmington site, a loop track and rail connection are needed to the CSX mainline, which runs immediately west of the proposed terminal. A loop track on the north property is estimated to cost $8,228,000 to construct (included in Appendix IV). With the addition of a new rail signal at approximately $1,000,000 and an additional 29 percent of construction costs to estimate potential right of way, it was estimated that $12 million would be required to provide rail access to a new grain terminal at Port of Wilmington.

5.2 Wood Pellets and Other Wood Products

Wood sources in the western part of the state, including areas around Canton and Wilkesboro, are expected to use rail to deliver products to the port. The additional estimated rail traffic of two trains per week is not anticipated to have a significant impact on surrounding rail capacity; however, focused rail improvements are proposed.

Radio Island

For the Radio Island site, in addition to the access and loop track described as part of the Grain market scenario, the improvement of rail access to the port via the Morehead City to Havelock Rail Relocation Project was included in capital cost estimates. This project is shown in Figure

16. In addition to the $2,600,000 and $6,800,000 estimated for the loop and connection, capital cost estimates for the wood pellet scenario includes $158,131,000 for construction of the Morehead City to Havelock Railroad relocation. The construction cost for this relocation was obtained from the feasibility study and adjusted for current (2011) dollars (see Appendix IV). With two rail signals at $1,000,000 each and an additional 29 percent of construction costs to estimate right of way acquisition, rail infrastructure costs total $218,000,000.

Figure 16: Rail Access to Site 3 - Radio Island

Source: AECOM/URS with ESRI, I-Cubed Imagery

Port of Wilmington

The rail costs associated with the Wood Pellet and the Other Wood Products market scenarios at the Port of Wilmington are the same as those for the Port of Wilmington Grain market scenario ($12 million).

5.3 Containers

Capital costs of rail improvements for each potential container terminal site are described below.

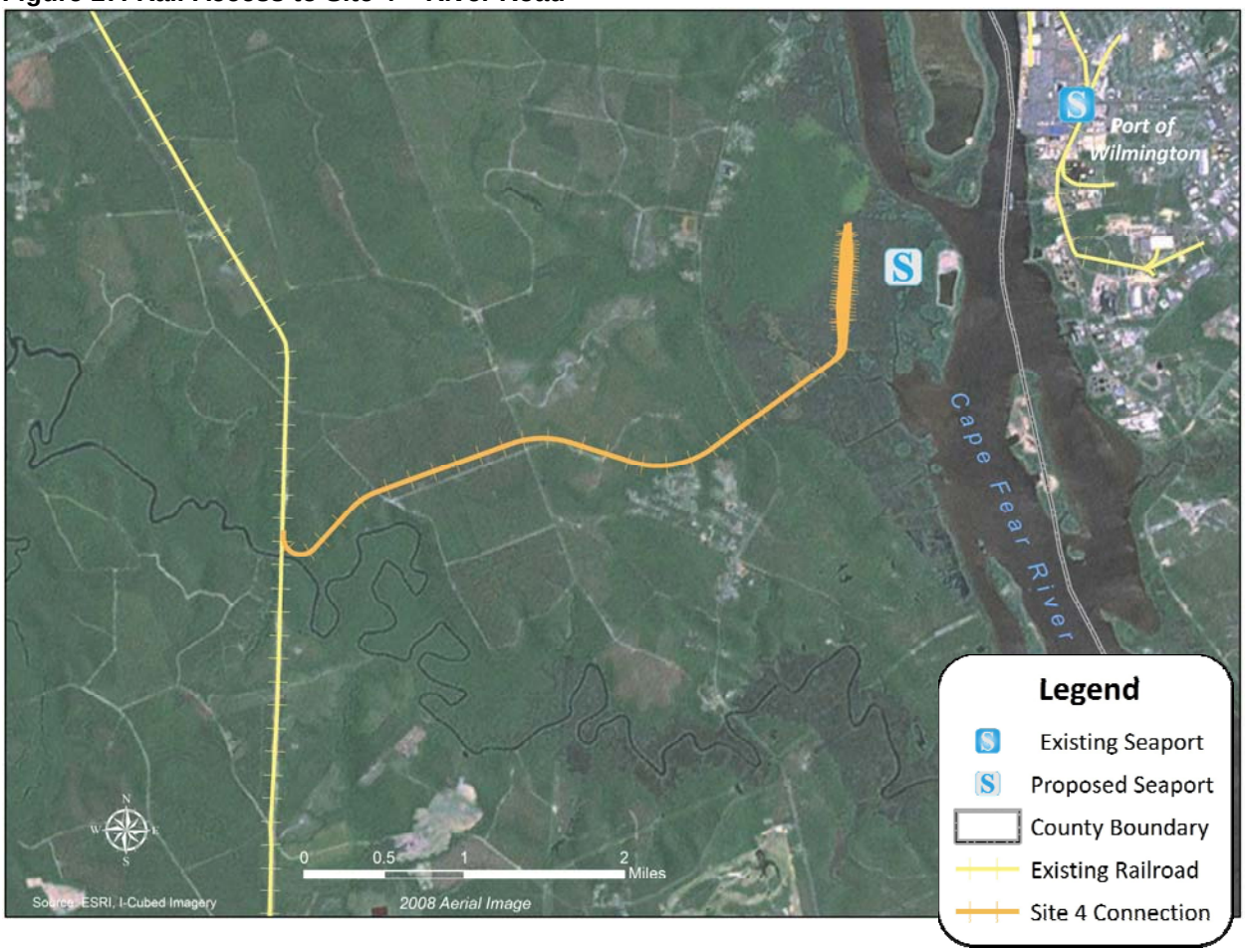
Site 3 – Radio Island

Because a new container facility and intermodal container service would increase train traffic through Morehead City, rail improvements to Radio Island would include completion of the Havelock to Morehead City Rail Relocation Project. This project would improve speed and reliability of intermodal rail service and minimize impacts of increased train frequency on local traffic. Construction costs for the Container market scenario at Radio Island include $2,600,000 to connect the terminal to the main track and $158,131,000 for construction of the Morehead City to Havelock Railroad relocation. With the addition of two railroad signals ($1,000,000 each) and 29 percent of construction costs to estimate right of way acquisition, rail capital costs are approximately $209 million.

Site 4 – River Road

This site is proposed to be accessed by a 22,000-foot lead track off of the existing north/south US Military track that runs from Sunny Point Junction to Military Ocean Terminal Sunny Point (MOTSU) (see Figure 17). The long lead allows for reasonable track geometry and allows unit trains to be built outside the facility. Rail cost estimates for the lead track are $12,600,000 for construction (see Appendix IV) and $3,654,000 for right of way acquisition. In addition to the lead track, 7.6 miles of the US Military Railroad must be rehabilitated from the River Road site to the existing CSX line. Using an estimate for major railroad track rehabilitation of $100 per track foot, an additional $4,012,800 is estimated to support this scenario. With the addition of a railroad signal ($1,000,000) railroad costs associated with the Container market scenario at River Road are approximately $21 million.

Figure 17: Rail Access to Site 4 – River Road



Source: AECOM/URS with ESRI, I-Cubed Imagery

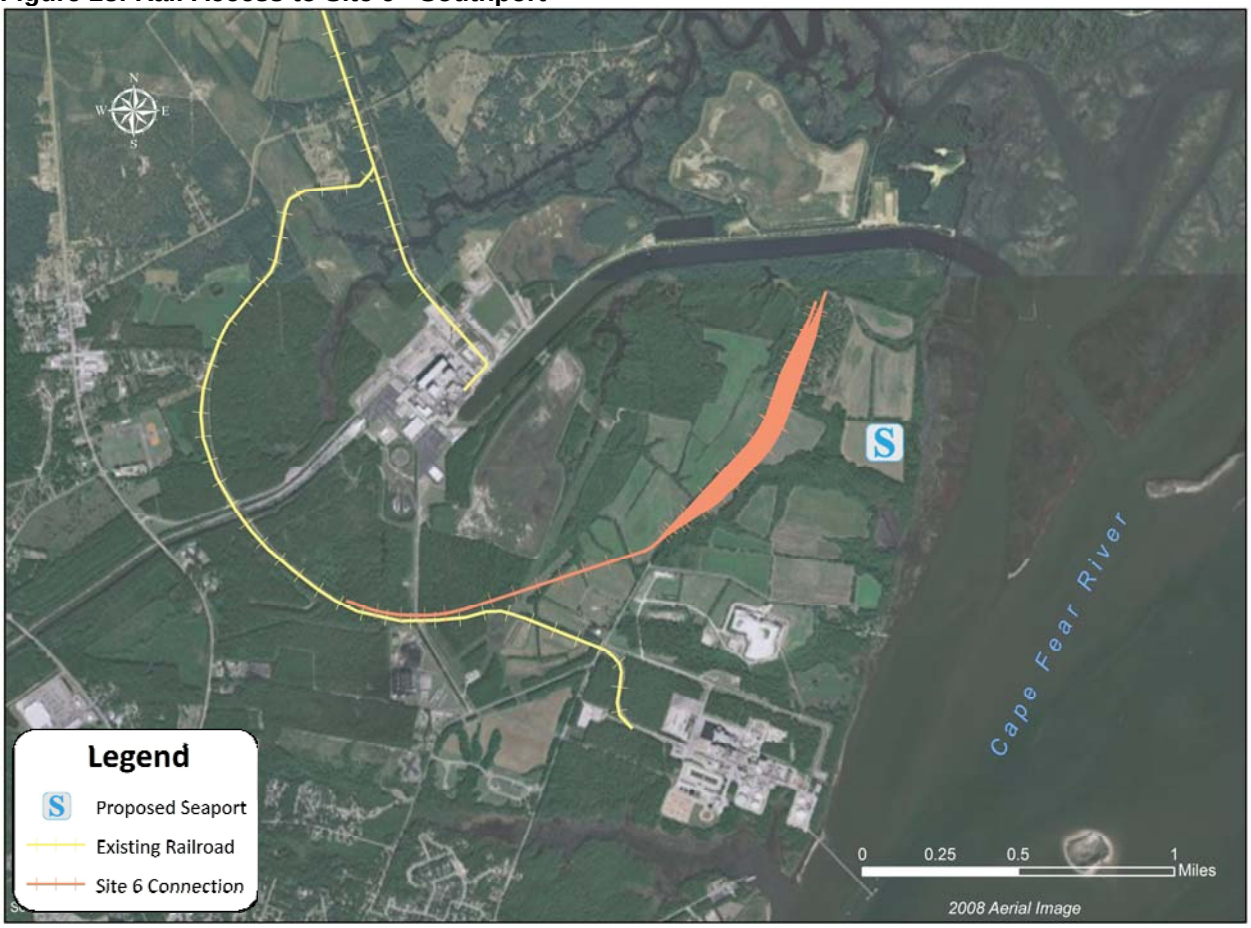
Site 5 – Port of Wilmington

The proposed container yard at the Port of Wilmington lies immediately adjacent to the existing CSX mainline. Only a new rail signal at $1,000,000 was included in capital cost estimates for the Container market scenario at Port of Wilmington.

Site 6 – Southport

To provide rail access to Site 4, a 5,400-foot lead track is proposed off the existing track that is currently serving nearby industries (see Figure 18). The US Military track from MOTSU to Sunny Point Junction would be utilized to gain access to/from the CSX mainline. While the potential lead track to the facility is identified, review of the entire rail operation will be required to locate siding and receiving and departure tracks. The lead track is estimated to cost $3,500,000 (see Appendix IV) to construct and $1,015,000 for right of way acquisition. In addition to the lead track, 22.6 miles of the US Military and Industrial Railroad is assumed to be rehabilitated from the Southport site to the existing CSX line. Using an estimate for major railroad track rehabilitation of $100 per linear foot, an additional $11,932,800 is needed to support this scenario. With the addition of a railroad signal ($1,000,000) railroad costs associated with the Container market scenario at Southport are approximately $17 million.

Figure 18: Rail Access to Site 6 - Southport



Source: AECOM/URS from ESRI data

5.4 Cold Storage

No railroad infrastructure costs were incorporated into estimates for facilities supporting the Cold Storage market scenario.

5.5 Ro/Ro and Oversize Cargo

Radio Island

The railroad infrastructure needed to support Ro/Ro and Oversize Cargo is the same as that supporting the Wood Pellet market scenario. A loop track, connection to the mainline, and the relocation of the railroad between Morehead City and Havelock were included. As described under the Wood Pellet market scenario, this rail infrastructure would cost approximately $218,000,000 (approximately $168,000,000 for construction, $2,000,000 for railroad signals, and $49,000,000 for right of way acquisition).

Port of Wilmington

The railroad infrastructure needed to support Ro/Ro and Oversize Cargo is the same as that supporting the Wood Pellet market scenario. A loop track and railroad signal at the mainline was included. As described under the Wood Pellet market scenario, this rail infrastructure would cost approximately $12 million (approximately $8,228,000 for construction, $1,000,000 for railroad signals, and $2,386,120 for right of way acquisition).

6 INLAND FACILITY COSTS

The market opportunities evaluated each have unique transport requirements and origin or destination of goods. The need for inland loading, transfer, or distribution for each scenario is therefore different and there is no set of inland developments that would support all market opportunities. Rather, the availability and effectiveness of inland facilities was evaluated individually for each set of investment alternatives. Capital cost estimates of any inland facilities identified are described below. Supporting information is included in the Appendix.

6.1 Grain

Construction of an inland public grain elevator was not included in capital cost estimates for this scenario. Numerous private grain elevators are located within the soy-producing counties of North Carolina and it is anticipated that one or more of those facilities would support export through the port.

6.2 Wood Pellets and Other Wood Products

Capital cost estimates for the Wood Pellets and Other Wood Products scenarios did not include the construction of any inland facilities.

6.3 Containers

It was determined that the construction of a new inland intermodal facility east of Charlotte would enhance container / intermodal operations. A generic drawing of a potential intermodal facility is included in Appendix V.

Years ago, the railroads fit intermodal terminals into old classification yards, while a rail served intermodal terminal today requires a minimum of 60 acres to operate efficiently. Costs for new terminals range from $1.5 to $2.0 million per acre (excluding property acquisition costs). Costs can be affected by type of lift equipment, environmental issues, or even specialty issues like inclusion of an electric substation or roadway improvements needed at the entrance to the terminal.

For purposes of the *North Carolina Maritime Strategy*, the capital cost of an inland terminal was estimated using the minimum 60 acre size and $1.69 million per acre for construction / development. An additional 29 percent of the construction cost was added to estimate property acquisition. A capital cost of $131 million was used for an inland intermodal terminal in the Container market scenarios.

6.4 Cold Storage

Capital costs developed for a refrigerated warehouse were described in Section 2.4.

6.5 Ro/Ro and Oversize Cargo

The movement of heavy or oversize goods by rail requires the ability to roll or lift goods onto railcars at manufacturing sites. Capital cost estimates for the Ro/Ro and Oversize market scenario includes the provision of two inland Ro/Ro ramps. The cost of a single Ro/Ro ramp was assumed to cost $30 million to construct. Based on an assumption of right of way acquisition as 29 percent of construction, the total cost of a single ramp was estimated as $39 million. Two Ro/Ro ramps at a total cost of $78 million were included in capital cost estimates.

7 SUMMARY OF CAPITAL COSTS

Capital costs for each market scenario and potential port site are summarized in the tables that follow.

7.1 Grain

Table 17: Infrastructure Investment to Support Grain Market ($ Millions, 2011)

Required Infrastructure Investment	Radio Island	Wilmington
Port and terminal	$80	$80
Highway network	$1,408	$578
Local highway access	$23	$0
Rail network	$0	$0
Local rail access	$12	$12
Total	$1,523	$670

Source: AECOM/URS

7.2 Wood Pellets and Other Wood Products

Table 18: Infrastructure Investment to Support Wood Products Market ($ Millions, 2011)

Required Infrastructure Investment	Radio Island	Wilmington
Port and terminal (for pellets only)	$55	$55
Highway network	$754	$350
Local highway access	$23	$0
Rail network	$204	$0
Local rail access	$14	$12
Total	$1,050	$417

Source: AECOM/URS
Note: Port and terminal improvements quantified above are required for Wood Pellets only and are not needed to support Other Wood Products market scenario.

7.3 Containers

Table 19: Infrastructure Investment to Support Container Market ($ Millions, 2011)

Investment	Site 3 – Radio Island		Site 4 – River Road		Site 5 –Wilmington	
	RTG + 45 ft	RTG + 51 ft	RTG + 51 ft	ASC + 51 ft	RS + 42 ft	RTG + 42 ft
Berth / dredging	$ 11	$68	$432	$432	$0	$0
Port and terminal	$ 395	$395	$1,486	$1,556	$137	$258
Highway network	$ 3,208	$3,208	$2,921	$2,921	$2,892	$2,892
Highway access	$ 23	$23	$98	$98	$0	$0
Rail access	$ 5	$ 5	$21	$21	$1	$1
Rail network	$ 204	$204	$0	$0	$0	$0
Inland facilities	$ 131	$131	$131	$131	$131	$131
Total	$3,977	$4,034	$5,089	$5,159	$3,161	$3,282

Investment	Site 5 – Wilmington			Site 6 – Southport	
	RTG + 45 ft	RTG + 47 ft	RTG + 51 ft	RTG + 51 ft	ASC + 51 ft
Berth / dredging	$197	$315	$427	$362	$362
Port and terminal	$272	$287	$301	$1,065	$1,170
Highway network	$2,892	$2,892	$2,892	$3,203	$3,203
Highway access	$0	$0	$0	$17	$17
Rail access	$1	$1	$1	$17	$17
Rail network	$0	$0	$0	$0	$0
Inland facilities	$131	$131	$131	$131	$131
Total	$3,493	$3,626	$3,752	$4,795	$4900

Source: AECOM/URS

7.4 Cold Storage

Table 20: Infrastructure Investment to Support Refrigerated Cargo ($ Millions, 2011)

Required Infrastructure Investment	Estimated Capital Cost
Cold storage warehouse	$ 24
Total	**$ 24**

Source: AECOM/URS

7.5 Ro/Ro and Oversize Cargo

Table 21: Infrastructure Investment to Support Ro/Ro and Oversize Cargo Market ($ Millions, 2011)

Required Infrastructure Investment	Radio Island	Wilmington
Port and terminal	$49	$49
Highway network	$2,157	$2,365
Local highway access	$23	$0
Rail network	$204	$0
Local rail access	$14	$12
Inland facilities	$78	$78
Total	$2,525	$2,503

Source: AECOM/URS

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APPENDICES

I. Capital Cost Summary Table
II. Supporting Information for Terminal Costs
III. Supporting Information for Dredging Costs
IV. Supporting Information for Railroad Costs
V. Supporting Information for Inland Facility Costs
VI. Supporting Information for Highway Network Infrastructure Costs
VII. Supporting Information for Local Highway Access Costs

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