
GENERAL RE-EVALUATION REPORT

APPENDIX A: ECONOMICS

SAVANNAH HARBOR EXPANSION PROJECT
Chatham County, Georgia and Jasper County, South Carolina

January 2012

ATTACHMENT 4

GEC Multiport Analysis for the
Savannah Harbor Expansion Project



**US Army Corps
of Engineers**
*Savannah District
South Atlantic Division*

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Final Report

SAVANNAH HARBOR EXPANSION PROJECT

MULTIPOINT ANALYSIS FOR THE SAVANNAH HARBOR EXPANSION PROJECT



**US Army Corps of Engineers
Savannah District
Savannah, Georgia**



Final Report

SAVANNAH HARBOR EXPANSION PROJECT

MULTIPOINT ANALYSIS FOR THE SAVANNAH HARBOR EXPANSION PROJECT

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TABLE OF CONTENTS

TABLE OF CONTENTS

Section	Page
I EXECUTIVE SUMMARY	1
II INTRODUCTION	3
III METHODOLOGY	4
IV DETERMINE ECONOMIC STUDY AREA (Task 1)	7
V HISTORIC VOLUMES AND COMMODITY FLOWS OF SOUTH ATLANTIC PORTS: 1995-2003 (Task 2).....	10
Savannah	10
Charleston	12
Jacksonville	15
Wilmington	17
Norfolk	20
World Region Totals.....	22
Commodity Flows.....	26
VI SOUTH ATLANTIC WATERBORNE COMMERCE TO 2050 (Task 3).....	29
Savannah	29
Charleston	39
Jacksonville	48
Wilmington	48
Norfolk	48
VII VESSEL FLEET COMPOSITION OF SOUTH ATLANTIC PORTS (Task 4).....	57
Norfolk	57
Charleston	61
Wilmington	63
Jacksonville	64
VIII CURRENT COST OF COMMODITY MOVEMENTS – SAVANNAH HARBOR WITHOUT-PROJECT CONDITIONS (Task 5)	66
Sea Cost	66
Calculating Sea Cost.....	68
Port Cost	69

TABLE OF CONTENTS (cont'd)

Section	Page
Land Transportation Cost	70
Calculating Truck Cost	73
Direct Rail Services	76
Calculating Rail Cost	77
Total Delivered Transportation Cost	82
IX DETERMINE CURRENT COST OF ALTERNATIVE IMPROVEMENT (Task 6)...	83
Mid-Atlantic and South Atlantic Ports Sea Cost	84
Mid-Atlantic and South Atlantic Port Costs	84
Mid-Atlantic and South Atlantic Port Comparison for Truck Cost.....	84
Mid-Atlantic and South Atlantic Port Comparison for Total Cost.....	86
Least Total Transportation Cost.....	86
Hinterland Cities Less than \$50 Difference in Total Cost (Without Project)....	86
X DETERMINE FUTURE COST OF COMMODITY MOVEMENTS – SAVANNAH HARBOR WITH-PROJECT CONDITIONS (Task 7).....	93
Calculating With-Project Port and Land Cost	94
Calculating With-Project Total Cost.....	95
Calculating With-Project Least Cost	95
Hinterland Cities, Less than \$50 Difference in Total Cost (45 Foot Project)....	96
XI DETERMINE USE OF HARBOR AND CHANNEL WITH-PROJECT AND WITHOUT-PROJECT.....	98
XII COMPUTE NED BENEFITS (Task 9)	102
XIII SUMMARY	103
Appendix A: MATERIALS FOR SECTION VIII.....	A-1
Appendix B: MATERIALS FOR SECTION IX.....	B-1
Appendix C: MATERIALS FOR SECTION X.....	C-1
Appendix D: GROWTH TRENDS IN SELECTED FOREIGN PORTS	D-1
Appendix E: COMMENTS AND RESPONSES.....	E-1

LIST OF TABLES

Number		Page
1	Highway Mileages for Major South East U.S. Ports and Hinterlands.....	8
2	Incremental Highway Mileages for Major South East U.S. Ports and Hinterlands.....	8
3	CTs of Imports to South Atlantic Ports, by Selected World Regions, 1995-2003	24
4	TEUs of Imports to South Atlantic Ports, by Selected World Regions, 1995-2003.....	24
5	CTs of Exports from South Atlantic Ports, by Selected World Regions, 1995-2003.....	25
6	TEUs of Exports from South Atlantic Ports, by Selected World Regions, 1995-2003 ..	25
7	CTs of Imports to South Atlantic Ports from Selected World Regions, by Commodity, 1995-2003	27
8	TEUs of Imports to South Atlantic Ports from Selected World Regions, by Commodity, 1995-2003	27
9	CTs of Exports to South Atlantic Ports from Selected World Regions, by Commodity, 1995-2003	27
10	TEUs of Exports to South Atlantic Ports from Selected World Regions, by Commodity, 1995-2003	27
11	Savannah Harbor Major Container Liner (2003).....	58
12	Ports of Virginia Major Container Lines (June and July 2005	59
13	Norfolk International Terminal's Leading Lines and Their Vessels.....	60
14	Port of Charleston Major Container Lines (January and February 2005)	61
15	Port of Wilmington Major Container Lines (July 2005)	64
16	Port of Jacksonville Major Container Lines (June 2005)	64
17	Port Leg Nautical Distances Eastbound.....	67
18	Port Leg Nautical distances Westbound	68
19	Current Sea Cost for Benefiting Trade Routes, Calling Savannah Harbor (\$/TEC)	69

LIST OF TABLES (cont'd)

Number		Page
20	Port Cost for Five South Atlantic Ports	69
21	Highway Distances in Miles from Port Cities to Hinterland Cities.....	73
22	Incremental Highway Mileages for Major Southeast U.S. Ports and Hinterlands	74
23	Average Distances in Miles Traveled from Each Southeastern Port.....	75
24	Truck Costs for Savannah Associated with Hinterland Cities.....	75
25	Estimated Rail Terminal-to-Terminal Hinterland Rates (\$/FEU)	80
26	Estimated Rail/Truck Intermodal Port to Hinterland Terminal Rates (\$/FEU	80
27	Estimated Rail/Truck Intermodal Port to Hinterland Terminal Rates (R/TEU).....	81
28	Savannah Harbor Total Cost, Existing Conditions, Inbound FE ECUS MED PEN	82
29	Wilmington Sea Cost for Benefiting Services	83
30	Port Costs for Five Mid-Atlantic and South Atlantic Ports, FE ECUS MED PEN.....	84
31	Truck Costs for Norfolk Associated with Hinterland Cities.....	85
32	Land Cost per TEU Based on Truck Cost for Five Mid-Atlantic and South Atlantic Ports	85
33	Incremental Differences in Least Cost for Competing Ports at 42 Feet, Inbound FE ECUS MED PEN	87
34	Savannah Sea Costs Based on 45-Foot Depth	94
35	Average Total Sea Cost for Savannah Harbor for Three World Trade Routes, With-Project Conditions (\$/TEU).....	94
36	Savannah Total Cost for Hinterland, 45 Feet, Inbound, FE ECUS MED PEN	95
37	Incremental Differences in Least Cost for Competing Ports, 45 Feet, Inbound, FE ECUS MED PEN	96
38	Savannah Harbor Least Total Incremental Cost, Import Containers, 42-Foot Project (\$/TEU).....	98

LIST OF TABLES (cont'd)

Number		Page
39	Vessel Cost Savings by Project Depth for Benefiting Services (\$/TEU)	100
40	Vessel Costs by Project Depth for Benefiting Services (\$/TEU)	101

LIST OF FIGURES

Number		Page
1	Flowchart of Deep-Draft Navigation Benefit Evaluation Procedures (Multiport Analysis).....	6
2	Domestic Hinterland for South Atlantic Coast Port Imports	9
3	CTs of Imports to Savannah, 1995-2003	10
4	TEUs of Imports to Savannah, 1995-2003	11
5	CTs of Exports from Savannah, 1995-2003	11
6	TEUs of Exports from Savannah, 1995-2003	12
7	CTs of Imports to Charleston, 1995-2003	13
8	TEUs of Imports to Charleston, 1995-2003	13
9	CTs of Exports from Charleston, 1995-2003.....	14
10	TEUs of Exports from Charleston, 1995-2003	14
11	CTs of Imports to Jacksonville, 1995-2003	15
12	TEUs of Imports to Jacksonville, 1995-2003	16
13	CTs of Exports from Jacksonville, 1995-2003	16
14	TEUs of Exports from Jacksonville, 1995-2003.....	17
15	CTs of Imports to Wilmington, 1995-2003	18
16	TEUs of imports to Wilmington, 1995-2003	18
17	CTs of Exports from Wilmington, 1995-2003.....	19
18	TEUs of Exports from Wilmington, 1995-2003	19
19	CTs of Imports to Norfolk, 1995-2003	20
20	TEUs of Imports to Norfolk, 1995-2003	20
21	CTs of Exports from Norfolk, 1995-2003	21

LIST OF FIGURES (cont'd)

Number		Page
22	TEUs of Exports from Norfolk, 1995-2003	
23	Historic Trends of Imports and Exports during 1995-2003 in CTs for the South Atlantic Ports: Major World Hinterlands	22
24	Historic Trends of Imports and Exports during 1995-2003 in TEUs for the South Atlantic Ports: Major World Hinterlands	23
25	CTs of Imports to South Atlantic Ports from North East Asia, 1995-2050	30
26	CTs of Imports to South Atlantic Ports from Oceania, 1995-2050	31
27	CTs of Imports for selected/Combined Trade Routes, by South Atlantic Ports, 1995-2003	32
28	TEUs of Imports to South Atlantic Ports from North East Asia, 1995-2003	33
29	TEUs of Imports to South Atlantic Ports from Oceania, 1995-2003	34
30	TEUs of Imports for Selected/Combined Trade Routes, by South Atlantic Ports, 1995-2050	35
31	TEUs of Imports for Selected/Combined Trade Routes, by Commodity, 1995-2050	36
32	CTs of Imports for Selected/Combined Trade Routes, by Commodity, 1995-2050	37
33	CTs of Exports for Selected/Combined Trade Routes, by Commodity, 1995-2050	38
34	TEUs of Exports for Selected/Combined Trade Routes, by Commodity, 1995-2050	38
35	CTs of Imports to South Atlantic Ports from Middle East/Mediterranean, 1995-2050	40
36	TEUs of Imports to Selected South Atlantic Ports, by South Atlantic Ports, 1995-2050	41
37	TEUs of Imports to South Atlantic Ports from Europe, 1995-2050	42

LIST OF FIGURES (cont'd)

Number		Page
38	TEUs of Imports to South Atlantic Ports from Middle East/Mediterranean, 1995-2050	43
39	CTs of Exports from South Atlantic Ports to Europe, 1995-2050	44
40	CTs of Exports from South Atlantic Ports to India/South East Asia, 1995-2050	45
41	CTs of Exports from South Atlantic Ports to Middle East/Mediterranean, 1995-2050	46
42	CTs of Exports for Selected/Combined Trade Routes, by South Atlantic Ports, 1995-2050	47
43	CTs of Imports to South Atlantic Ports from Europe, 1995-2050	49
44	CTs of Imports for Selected Commodities, Chemicals, by South Atlantic Ports, 1995-2050	50
45	CTs of Imports for Selected Commodities, Extractives, by South Atlantic Ports, 1995-2050	51
46	CTs of Exports for Selected Commodities, High Technology, by South Atlantic Ports, 1995-2050.....	52
47	TEUs of Exports for Selected Commodities, High Technology, by South Atlantic Ports, 1995-2050.....	53
48	CTs of Imports to South Atlantic Ports from India/South East Asia, 1995-2050.....	54
49	TEUs of Imports to South Atlantic Ports from India/South East Asia, 1995-2050.....	55
50	CTs of Imports for Selected Commodities, Agriculture, by South Atlantic Ports, 1995-2050	56
51	Domestic Hinterland for Five Mid and South Atlantic Coast Ports	71
52	Interstate Highway System, Five Mid and South Atlantic Ports and the Domestic Hinterland	72
53	Railroad Designation, Intermodal Cities Served from the Five Mid and South Atlantic Ports for Norfolk Southern	78

LIST OF FIGURES (cont'd)

Number		Page
54	Railroad Designation, Intermodal Cities Served from the Five Mid and South Atlantic Ports for CSX.....	79
55	Incremental Difference in Least Total Transportation Cost for Savannah Compared to the other Mid and South Atlantic Ports (\$/TEU) (Without Project)	88
56	Incremental Difference in Least Total Transportation Cost for Charleston Compared to the other Mid and South Atlantic Ports (\$/TEU) (Without Project)	89
57	Incremental Difference in Least Total Transportation Cost for Jacksonville Compared to the other Mid and South Atlantic Ports (\$/TEC) (Without Project)	90
58	Incremental Difference in Least Total Transportation Cost for Wilmington Compared to the other Mid and South Atlantic Ports (\$/TEC) (Without Project)	91
59	Incremental Difference in Least Total Transportation Cost for Norfolk Compared to the other Mid and South Atlantic Ports (\$/TEU) (Without Project)	92
60	Incremental Difference in Least Total Transportation Cost for Savannah Compared to the other Mid and South Atlantic Port (\$/TEU) (45 Foot Project)	97

MULTIPOINT ANALYSIS

I. EXECUTIVE SUMMARY

Multiport analysis is a systematic assessment of the effects of the efforts of the with-project condition on other ports. It includes the effects of authorized projects at other ports on the with-project and without-project conditions. The objective of multiport analysis is to allow the planner to adjust the traffic for shifts of cargoes among alternative ports in response to the with-project condition at the port of study, as well as other authorized ports with local cooperation agreements at alternative ports.

Multiport analysis is performed as a series of nine steps to arrive at adjustments to NED benefits directly from the project (Figure 1). For Savannah Harbor, the multiport analysis determined the economic study area (Step one in Section IV) to be related to container traffic, principally imports, serving a hinterland east of the Mississippi River consisting of the following major South and Midwest cities serving as a perimeter: Atlanta, New Orleans, Memphis, St. Louis, Chicago, and Detroit (Table 1 and Figure 2). Eleven other cities were ultimately used for the mapping of the competitive hinterland for the least total delivered transportation cost analysis, including Mobile, Jackson, Birmingham, Charlotte, Nashville, Knoxville, Louisville, Cincinnati, Columbus, Indianapolis, and Cleveland. A broad geographic hinterland was preferred to allow maximum latitude for possible with-project shifts of containers from other ports.

The historical volumes of container imports through Savannah Harbor and the alternative ports of Norfolk, Wilmington, Charleston, and Jacksonville were compiled (Step 2 in Section V). The major South Atlantic container port competing with Savannah is Charleston. Norfolk is traditionally regarded as a North Atlantic port competing primarily with New York. However, Maersk-SeaLand is building a major privately owned marine container terminal at Hampton Roads that might compete to some extent with its own services currently calling Savannah. Jacksonville is a niche container port, serving primarily the offshore domestic trade (Puerto Rico), as well as the Caribbean and Latin America. Wilmington has not been a major player in the South Atlantic container markets.

The container volumes were used as previously projected for the ports for the period 2004 through 2050, including major world trading areas for imports and exports (Step 3 in Section VI). These projections were not constrained by any port capacity limitations.

The container vessel fleet composition for the ports was described relative to the services and major world areas (Step 4 in Section VII).

The current cost of commodity (container) movements was compiled for Savannah Harbor (Step 5 in Section VIII), consisting of the vessel voyage, vessel, and cargo-related port costs and hinterland transportation costs. A vector of sea costs was developed for the voyage legs that precede and follow Savannah Harbor in conjunction with calls at other U.S. East Coast (ECUS) ports, notably Norfolk and New York. Port cost, including vessel time in port, was compiled based on vessel and cargo services, including pilotage, tuggage, dockage, wharfage, stevedoring, and container handling. Land transportation costs for truck and rail movements between the ports and hinterland cities were also compiled. Total delivered transportation cost (voyage, port, and hinterland) for imported containers through the ports and 17 major hinterland cities (New

Orleans, Mobile, Memphis, St. Louis, Jackson, Birmingham, Atlanta, Charlotte, Nashville, Knoxville, Louisville, Cincinnati, Columbus, Indianapolis, Chicago, Detroit, and Cleveland) were compiled (Table 28).

The current total delivered transportation cost of container movements was determined for competing harbors (Norfolk, Wilmington, Charleston, and Jacksonville) for benefiting services (Step 6 in Section IX). The spreadsheet computes the least total cost port and the incremental costs for other ports. A range of hinterlands based on incremental least total delivered transportation costs of \$50 per TEU was developed for sensitivity purposes (figures 55, 56, 57, 58, and 59 for Savannah, Charleston, Jacksonville, Wilmington, and Norfolk, respectively).

The future cost of container movements under with-project conditions (43 to 48 feet) was determined for Savannah Harbor for benefiting services and alternative ports (Step 7 in Section X). In no instance would the vessel voyage cost savings at Savannah Harbor under with-project conditions result in the diversion of containers from other ports on the basis of least total transportation cost (voyage, port, and hinterland). A range of hinterlands based on incremental least total delivered transportation costs of \$50 TEU was developed for sensitivity purposes (Figure 60).

The use of Savannah Harbor under without- and with-project conditions with respect to imported containers was determined (Step 8 in Section XI). For the three benefiting services, Savannah Harbor has the least total delivered transportation cost (voyage, port, and hinterland) under without-project conditions for the major nodes of Memphis, St. Louis, Jackson, Birmingham, Atlanta, and Knoxville (Table 38). These least total cost nodes do not change under the with-project conditions at Savannah Harbor. Alternatively, Charleston Harbor has the least total delivered transportation cost for the major nodes of Knoxville, Louisville, Cincinnati, and Indianapolis. Norfolk has the least total delivered transportation cost for the major nodes of Columbus, Chicago, Detroit, and Cleveland.

The multiport analysis indicates that there are no NED benefits for Savannah Harbor for the three benefiting services because no traffic (containers) is diverted from other ports under the with-project conditions and a least total delivered transportation cost analysis (Step 9 in Section XII). Currently, there are no authorized projects at other competing ports (Norfolk, Wilmington, Charleston, and Jacksonville) that might affect possible diversion of cargo away from Savannah Harbor.

II. INTRODUCTION

Multiport analysis is a systematic assessment of the effects of the with-project condition on other ports. It includes the effects of authorized projects at other ports on the with-project and without-project conditions. Conceptually, multiport analysis is an adjustment to NED benefits that includes systems analysis of port competition. In actual practice, multiport analysis is a systematic comparison of alternative transportation costs for cargoes that could use the project port or be handled through alternative ports.

The objective of multiport analysis is to allow the planner to adjust the traffic forecast for shifts of cargoes among alternative ports in response to the with-project condition at the port of study, as well as other authorized projects with local cooperation agreements at alternative ports. Since the purpose of multiport analysis is to account for changes in the with-project condition traffic forecast, only commodities affecting NED benefits and handled by alternative ports for competitive hinterlands must be analyzed. The entire universe of cargoes handled by the project port is seldom subject to a multiport analysis. Only commodities that could be affected by projects at the port or at alternative ports that would affect the traffic forecasts and benefits should be considered. Therefore, the purpose and scope of a multiport analysis is usually much more limited and well defined than is suggested by the words “multiport analysis.”

For purposes of the Savannah Harbor Expansion Project (SHEP), multiport analysis was defined to include major competing South Atlantic container ports, excluding South Florida and including Norfolk. The competing ports are Norfolk, Wilmington, Charleston, and Jacksonville.

The South Florida container ports, primarily Miami and Port Everglades, were excluded primarily because they handle local cargo or transship between other world areas and the Caribbean and Latin America regions. Norfolk is traditionally regarded as a North Atlantic port. It was included because of the development of a major large privately owned marine container terminal by Maersk-SeaLand that could have competitive impacts on both North and South Atlantic ports for certain Midwest markets, particularly rail intermodal based.

None of the alternative ports have deeper channels authorized but not completed other than New York. Norfolk is 50-foot depth for the largest marine container terminal, Norfolk International Terminal (NIT). The under development Maersk-SeaLand terminal will be on a 50-foot channel as well. Wilmington has a recently completed 42-foot channel. Charleston has a 45-foot channel. Jacksonville has a 40-foot and 38-foot authorized channel, although the port indicates a 41-foot channel. There are no increased authorizations for deeper depths at any of these ports at this time. It is possible that Charleston will pursue a deeper channel at some time in the future, particularly if New York Harbor, regarded as the standard for depth of East Coast ports for container imports, is eventually fully developed to its 50-foot authorized depth. Currently, New York is still not fully developed to the authorized 45-foot depth (along with some air draft issues).

III. METHODOLOGY

Multiport analysis consists of a series of sequential steps. Figure 1, Flowchart of Deep-Draft Navigation Benefit Evaluation Procedure (Multiport Analysis), is an application of the P&G's nine steps for multiport analysis. Conceptually, multiport analysis entails an extension of the study scope to include other ports. Multiport analysis consists of commodity flows in competitive (overlapping) port hinterlands.¹

The P&G study steps are followed as the tasks to be performed for a multiport analysis of Savannah Harbor. These tasks constitute the steps to be executed for a multiport analysis that each represents a set of deliverables. In this final report the first nine tasks will be presented as deliverables: (1) Determine the Economic Study Area; (2) Identify Types and Volumes of Commodity Flow; (3) Project Waterborne Commerce; and (4) Determine Vessel Fleet Composition and Cost; (5) Determine Current Commodity Movement Cost; (6) Determine Alternative Movement Cost; (7) Determine Future Commodity Movement Cost; (8) Determine Harbor Use With and Without Project; and (9) Compute NED Benefits.

The fully executed multiport analysis in this final report pertains to the comparison of changes in total delivered transportation costs of container cargoes through Savannah Harbor for trades that would benefit from deeper channels compared to similar movements for other ports at Norfolk, Wilmington, Charleston, and Jacksonville. The total cost components are compiled for that portion of the benefiting ocean voyage that precedes and follows Savannah Harbor as derived from the NED benefits methodology.² The total costs in addition to changes in sea voyage costs (NED benefits that are affected by harbor deepening) include port costs related to vessel and cargo handling and land transportation costs for the competitive hinterland.

The total delivered transportation costs framework embodied in the multiport analysis represents a compilation of different cost elements for sea, port, and land transportation. Some of these cost elements contain parameter estimates to allow for the inclusion of a full data set of all related transportation cost components for the multiport analysis. Estimated values have been included in the total delivered cost analysis to serve as a proxy to reflect the nominal (estimated) inclusion of all transportation costs related to ocean, port, and land cost elements that constitute the total transportation delivered cost framework of multiport analysis. Beginning in Section VIII, these sections describe the components of a spreadsheet model that (1) calculates "total transportation delivered cost" for containerized cargoes using Savannah Harbor in without-project conditions (Section VIII, Part 5 of multiport analysis); (2) calculates "total transportation delivered cost" for containerized cargoes using alternative ports (Section IX, Part 6 of multiport analysis) and; (3) calculates "total transportation delivered cost" for containerized cargoes using Savannah Harbor in with-project conditions (Section X, Part 7 of multiport analysis). Based on spreadsheet least total transportation costs (sea, port, and land), future use of Savannah Harbor is estimated from a multiport analyses perspective for marine containerized cargoes. Resulting NED benefits are computed.

¹ *National Economic Development Procedures Manual, Deep Draft Navigation*, pp. 155 - 156.

² Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: NED Benefits Model Final Report (May 2006).

Overall, the multiport perspective presented is for a “total delivered cost” analysis of the three transportation components of sea, port, and land. The spreadsheet determines the total cost for each element and then each sea route/port/hinterland city as a summation of all of the transportation cost elements (sea, port, and land). The spreadsheet compiles the least total cost for the sea, port, and land cost components for each port for particular trades and hinterlands and summarizes all these cost elements into a “total cost.” The incremental costs between the least cost ports are also computed for each transportation cost element (sea, port, and land), as well as total delivered cost.

The spreadsheet does not perform any optimization. It relies entirely on user inputs related to the individual transportation cost components (sea, port, and land).³ Each is calculated and then compared across the ports for the trades and hinterland cities and then summed to a “total cost.” The total costs of sea, port, and land and their summations are then ranked by the spreadsheet by “least total cost” for the five ports of Savannah, Norfolk, Wilmington, Charleston, and Jacksonville.⁴

³ All of the user inputs can be changed for the three benefiting services. Ultimately, other benefiting services and attendant sea costs could also be utilized.

⁴ Norfolk is shown for the major existing marine terminals that have different access channel depths ranging from 42 to 50 feet.

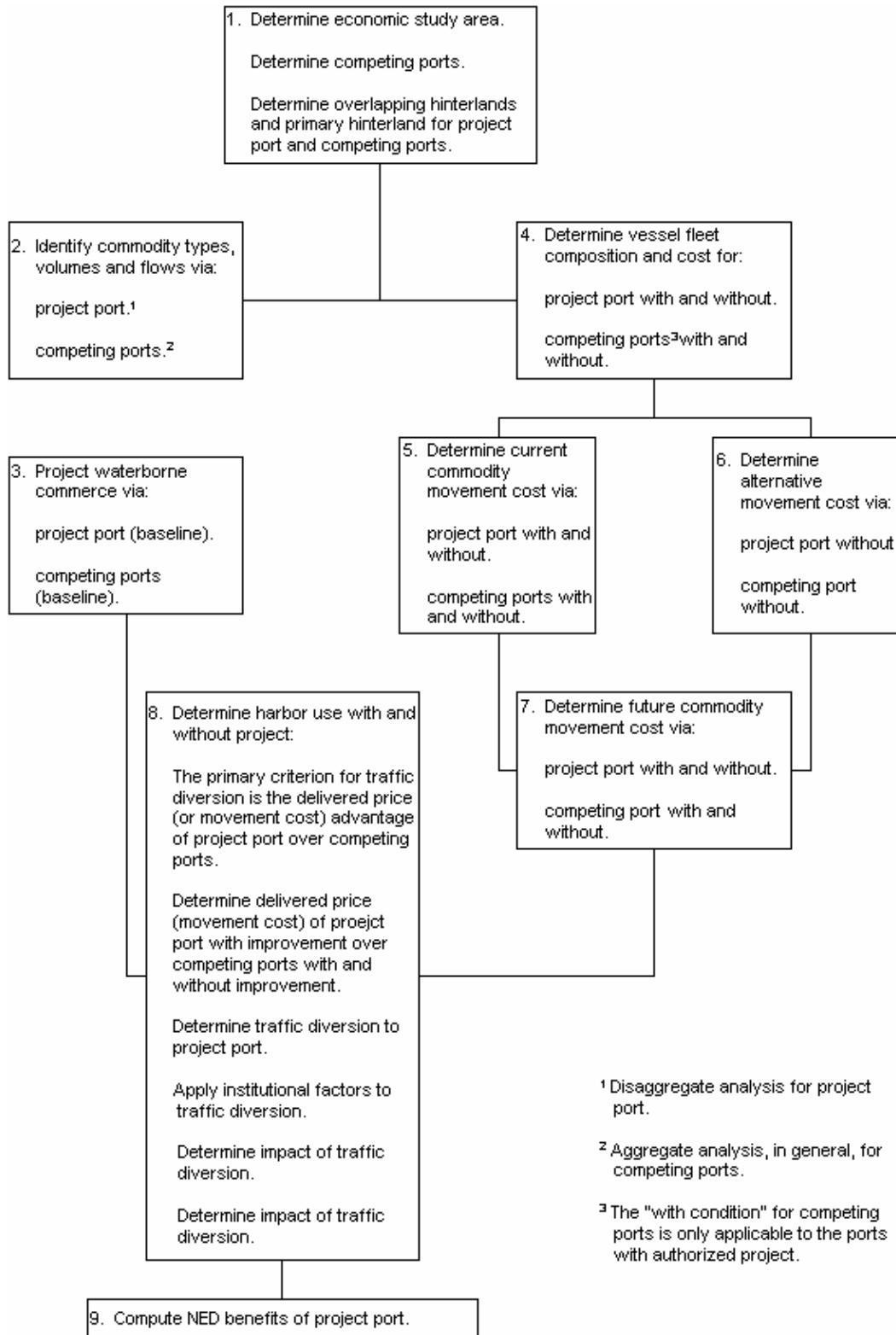


Figure 1. Flowchart of Deep-Draft Navigation Benefit Evaluation Procedure (Multiport Analysis)

IV. DETERMINE ECONOMIC STUDY AREA (Task 1)

The economic study area for a multiport analysis of Savannah Harbor should reflect competing ports and the overlapping hinterlands and the primary hinterland for the project port and competing ports. Savannah Harbor shares a large common hinterland with adjacent container ports at Jacksonville, Charleston, Wilmington, and Norfolk.

The vessel fleet forecast has indicated that container vessels are the primary, if not the exclusive, beneficiary of deepening Savannah Harbor. The major container services with respect to present and projected numbers and sizes of benefiting container vessels calling Savannah Harbor were identified as major east-west services not otherwise constrained by the Panama Canal.⁵ Specifically, two major types of services were identified as beneficiaries from a deeper Savannah Harbor: FE SUEZ ECUS PEN and FE ECUS EU/MED PEN.

The FE SUEZ ECUS PEN links the East Coast of the U.S. (ECUS), including Savannah Harbor, with the Far East (FE) Indian Subcontinent portion of Southeast Asia via the Suez Canal. The FE ECUS EU/MED PEN services reflect components of FE ECUS via the Panama Canal to Europe (EU) or the Mediterranean (MED). The Trans-Pacific and Trans-Atlantic pendulum services are connected by the Panama Canal for these deployments. Only the latter portion of the deployment (Trans-Atlantic) would benefit from deepening Savannah Harbor with respect to vessel calls having deeper drafts to and from Savannah Harbor for Europe or Mediterranean services to and from the ECUS.

Savannah Harbor is served by a network of Panamax container vessels that rely on Panama Canal transits, primarily for FE ECUS pendulum services. These “all-water” services have grown rapidly in response to West Coast port congestion and related problems. These vessels and services will not benefit from a deeper Savannah Harbor with respect to their Far East deployments.⁶ Savannah Harbor is also served by smaller container vessels in the Sub-Panamax and Handysize size categories that will not benefit from deepening. Container vessels smaller than Panamax are primarily used for ECUS north-south routes involving South America and Africa. Although growth is projected for these services, the vessel sizes will not sufficiently increase and therefore cannot be considered a potential beneficiary of Savannah Harbor deepening.

The major world trade routes served by the benefiting services were determined to be the relevant overseas hinterlands for the purpose of imports and growth projections for containerized cargoes. These world areas include: North East Asia (NEA); (2) South East Asia (SEA); (3) Middle East (ME); (4) Oceania (OC); and (5) Europe (EU). Savannah Harbor services calling these world regions for containerized imports are regarded as competing with the other major South Atlantic coast ports of Jacksonville, Charleston, and Wilmington, as well as Norfolk for interior U.S. markets.

⁵ Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Vessel Fleet Forecasts, Part 7, Savannah Fleet With Project.

⁶ Maximum draft for the Panama Canal is 39.5 feet Tropical Fresh Water (TFW).

The South Atlantic ports of interest exclude the South Florida container ports, Miami and Port Everglades, because of the specificity of their hinterland relative to South Florida and associated transshipment services for the Caribbean and Latin America niche markets. Jacksonville and, to a lesser extent, Wilmington also serve niche markets relative to Charleston and Savannah. Although normally regarded as a North Atlantic coast port, Norfolk is viewed as a competitor to Savannah for Midwest hinterland traffic by virtue of rail connections and emerging private sector marine terminal development by Maersk-Sealand.

Determining a distinct domestic hinterland for containerized imports through the different South Atlantic ports is difficult because of the close proximity of several of the ports in relation to the geography of the South and Midwest. The assumed domestic hinterland for South Atlantic Coast port import is shown in Figure 2.

Table 1 shows the highway distances between the major South Atlantic ports, including Norfolk, and a perimeter of major U.S. South and Midwest cities, including Atlanta. The perimeter extends from Detroit to Chicago, St. Louis, Memphis, and New Orleans. The incremental highway distances based on the shortest lane are shown in Table 2. Charleston is 59 miles farther from Atlanta than Savannah, and Jacksonville is 89 miles farther from Atlanta than Savannah. For the perimeter cities except Detroit, the incremental highway distances are generally a minimum for Savannah (Memphis and St. Louis) or comparatively small, such as 57 miles more to Chicago from Savannah than Norfolk. Other than Jacksonville, Savannah is 138 miles farther from New Orleans.

Table 1. Highway Mileages for Major South East U.S. Ports and Hinterlands

Port Cities	Atlanta	New Orleans	Memphis	St. Louis	Chicago	Detroit
Savannah	255	690	642	815	957	931
Charleston	314	788	702	854	903	877
Norfolk	563	1,042	919	925	900	726
Jacksonville	344	552	731	904	1,063	1,062

Source: G.E.C., Inc., based on Rand McNally Tripmaker.

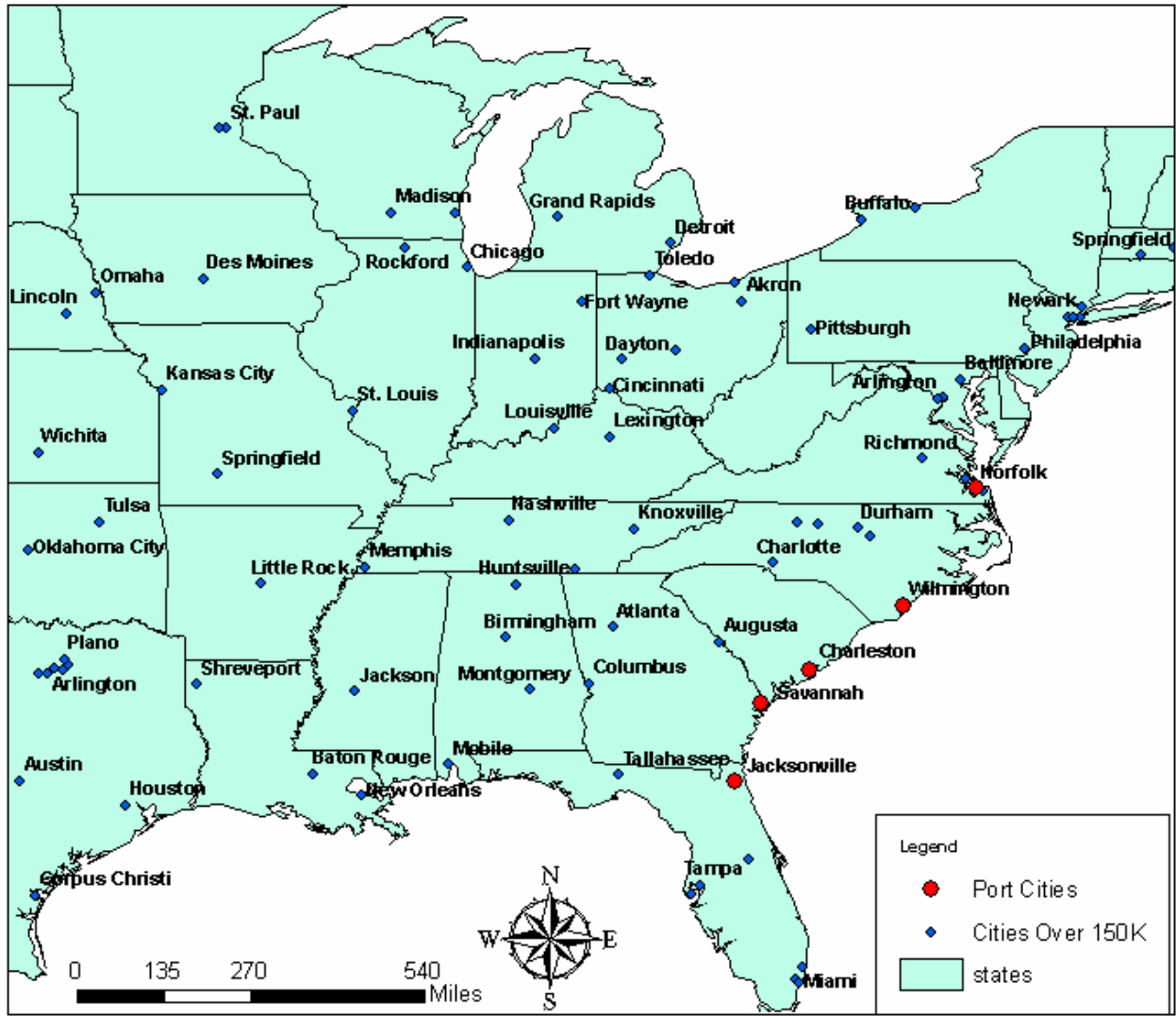
Table 2. Incremental Highway Mileages for Major South East U.S. Ports and Hinterlands

Port Cities	Atlanta	New Orleans	Memphis	St. Louis	Chicago	Detroit
Savannah	0	138	0	0	57	205
Charleston	59	236	60	39	3	151
Norfolk	308	490	277	110	0	0
Jacksonville	89	0	89	89	163	336

Source: G.E.C., Inc., based on Rand McNally Tripmaker.

The examples of highway distances and incremental distances suggest that the competitive landside trucking costs for marine containers will cover a wide range of geography, because some of the ports have very similar highway distances. Moreover, although Atlanta would commonly be regarded as a competitive hinterland for Savannah because of proximity, the

incremental distance for Charleston (59 miles) is not substantially greater from a highway distance perspective.



Note: This figure represents major cities in eastern United States; however, Figure 51 shows the 17 hinterland cities chosen for multiport analysis purposes.

Source: G.E.C. Inc.

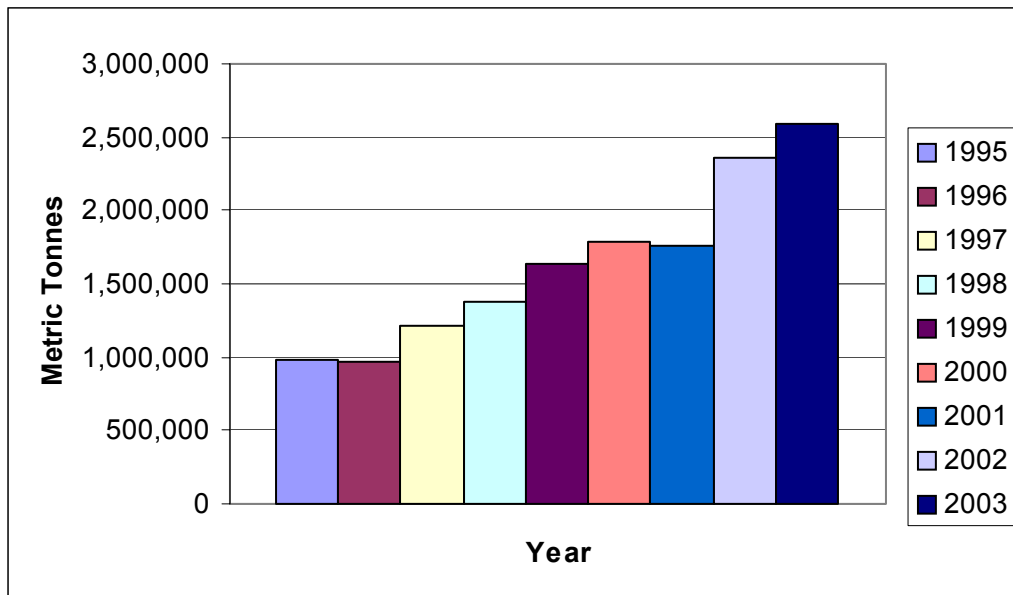
Figure 2. Domestic Hinterland for South Atlantic Coast Port Imports

V. HISTORIC VOLUMES AND COMMODITY FLOWS OF SOUTH ATLANTIC PORTS: 1995-2003 (Task 2)

The following information is a condensed summary of the historic trends in containerized tonnes (CT) and TEUs at each of the five South Atlantic ports for the five world regions of competitive interest.⁷ This section of the report identifies the containerized activity at the ports with respect to tonnes and estimated equivalent loaded TEUs for the major competitive foreign hinterlands⁸. Consequently, the statistics presented do not reflect the total volumes of containerized cargoes at the ports. On the other hand, the regions of competitive overlap do account for a large proportion of the increased import volumes of their respective commodities. However, except for Savannah, the ports have experienced decreases in exports for their respective commodities.

SAVANNAH

Over the nine-year period, Savannah increased CT imports each year from one million to slightly above 2.5 million (Figure 3). The same results appear for TEU imports, which increased from under 200,000 to nearly 600,000 (Figure 4).

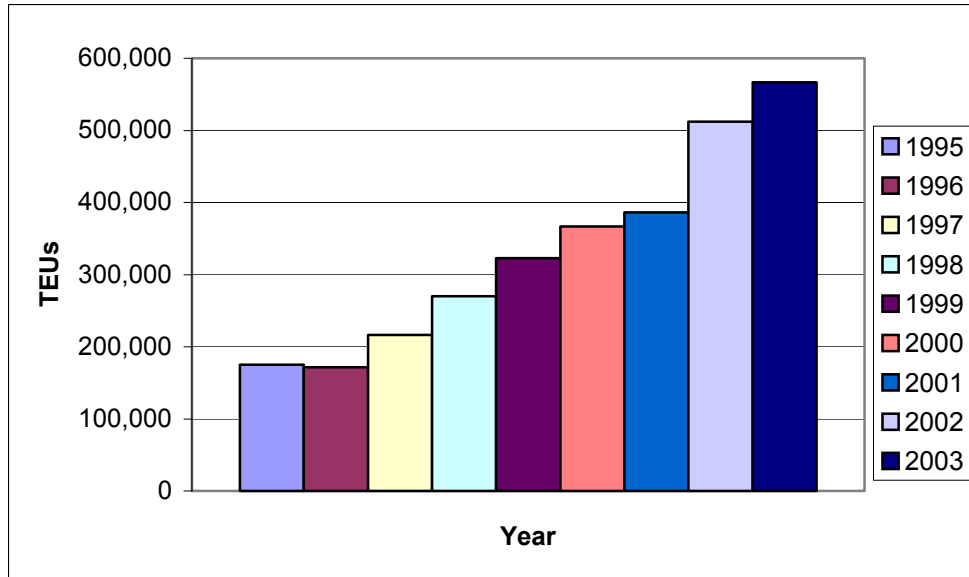


Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 3. CTs of Imports to Savannah, 1995-2003

⁷ The competitive foreign hinterlands for containerized cargoes have been identified as North East Asia, South East Asia, Oceania, Middle East, and Europe.

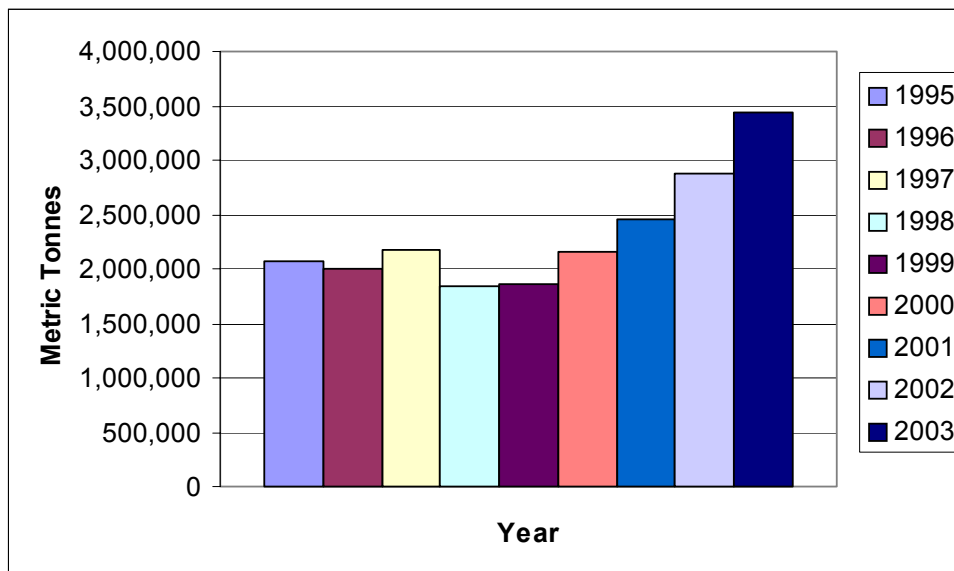
⁸ Empty TEUs are excluded.



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

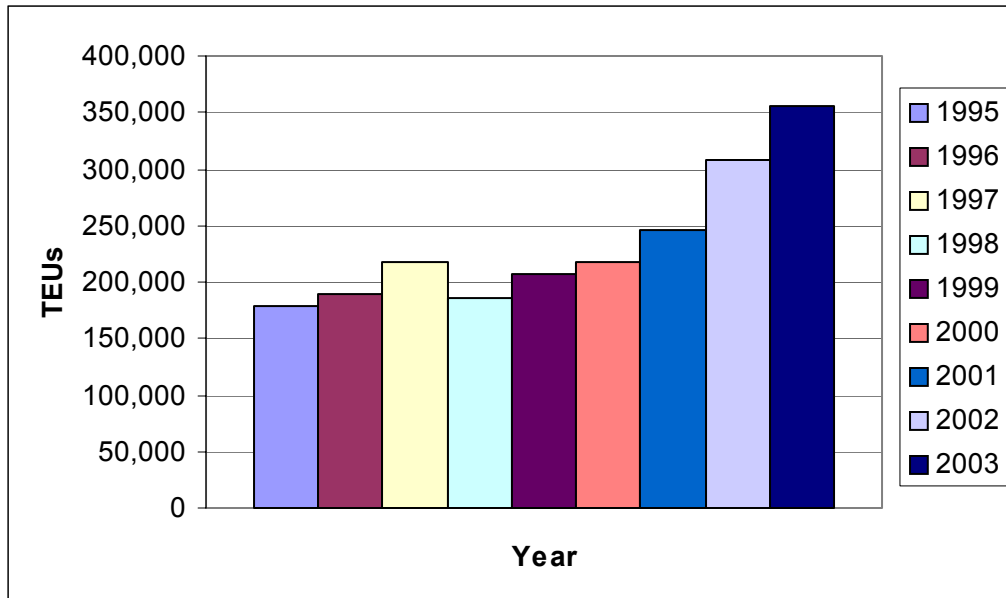
Figure 4. TEUs of Imports to Savannah, 1995-2003

Over the nine-year period, Savannah’s containerized export tonnes fluctuated slightly, but increased by over one million CTs from 2000 to 2003 (Figure 5). TEU exports followed a relatively similar pattern during the nine-year period (Figure 6).



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 5. CTs of Exports from Savannah, 1995-2003



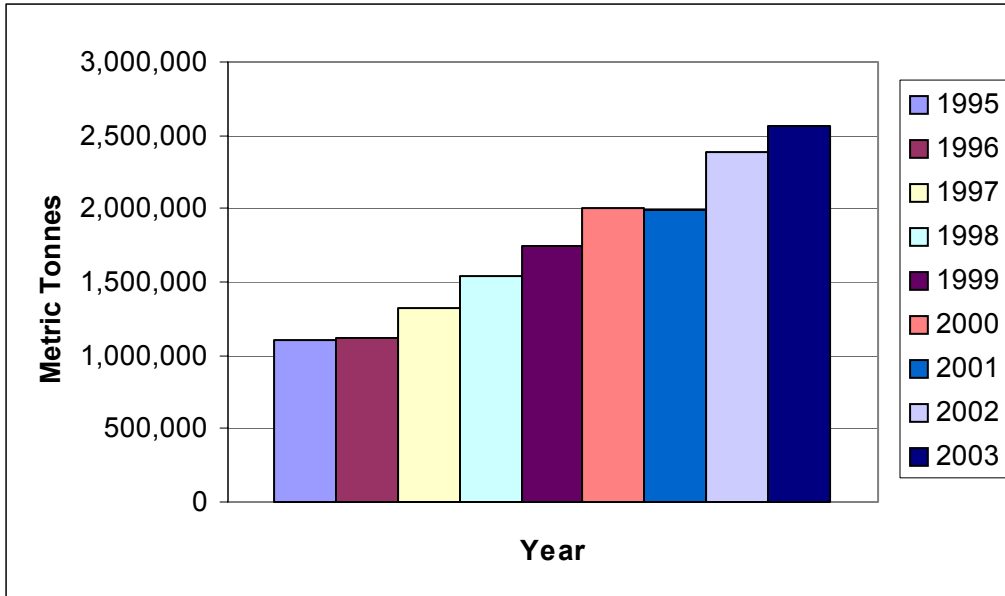
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 6. TEUs of Exports from Savannah, 1995-2003

CHARLESTON

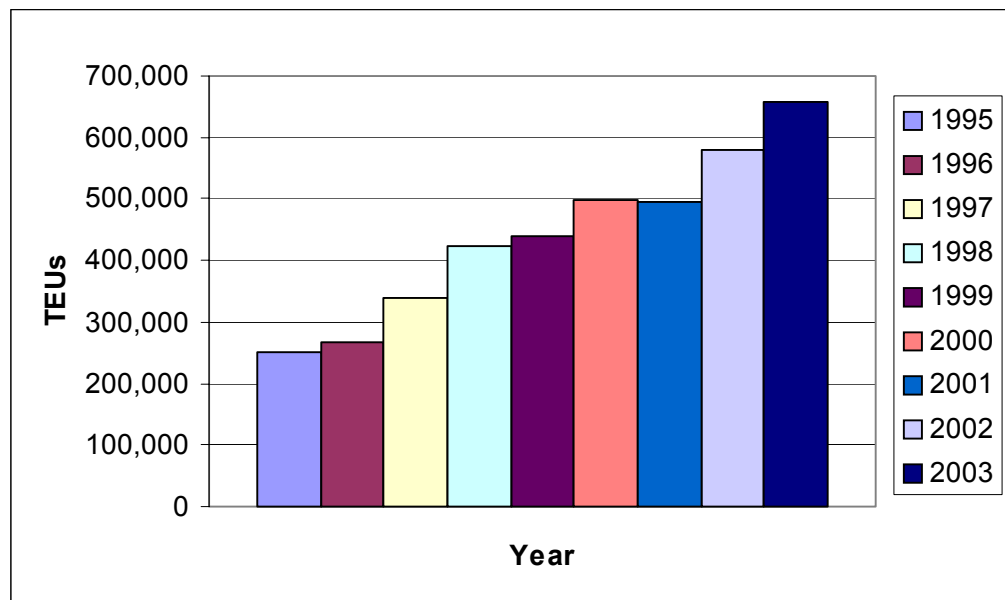
Charleston experienced a similar nine-year trend as Savannah with respect to CT imports. Although 2001 did not show an increase, the following years showed an increase to over 2.5 million CTs (Figure 7). TEU imports followed a very similar pattern, except that 1996 was slightly higher than 1995 (Figure 8).

Slight increases and decreases characterize Charleston's CT exports during the nine-year period. Savannah's CT exports increased greatly from 2000 through 2003, whereas Charleston's volume only slightly increased (Figure 9). In 1999, TEU exports for Charleston reached a peak at nearly 400,000. Savannah increased through 2003, whereas Charleston's average varied slightly over the nine-year period. By 2003, Charleston was similar to Savannah in reaching nearly 350,000 TEUs (Figure 10).



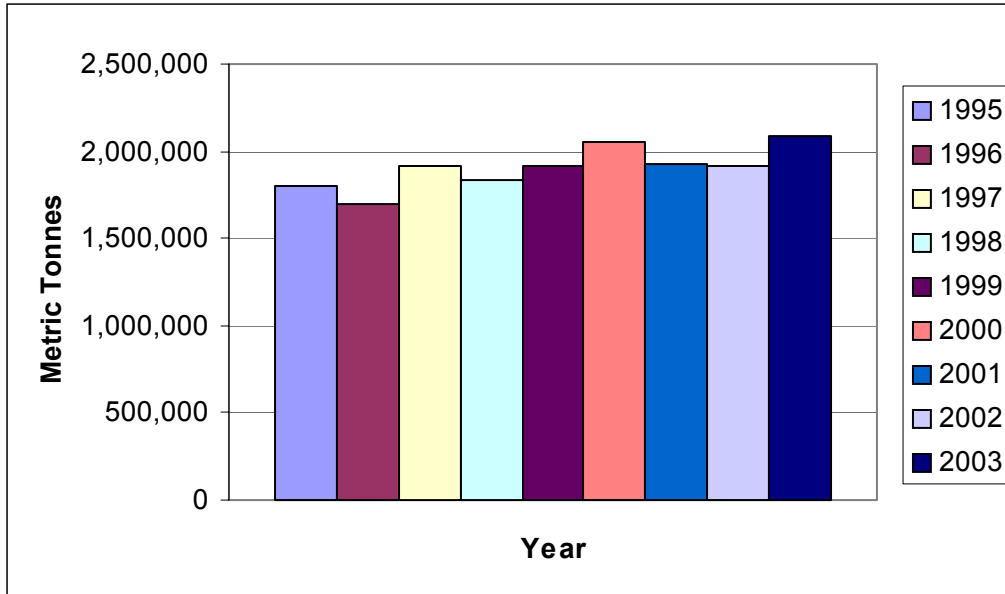
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 7. CTs of Imports to Charleston, 1995-2003



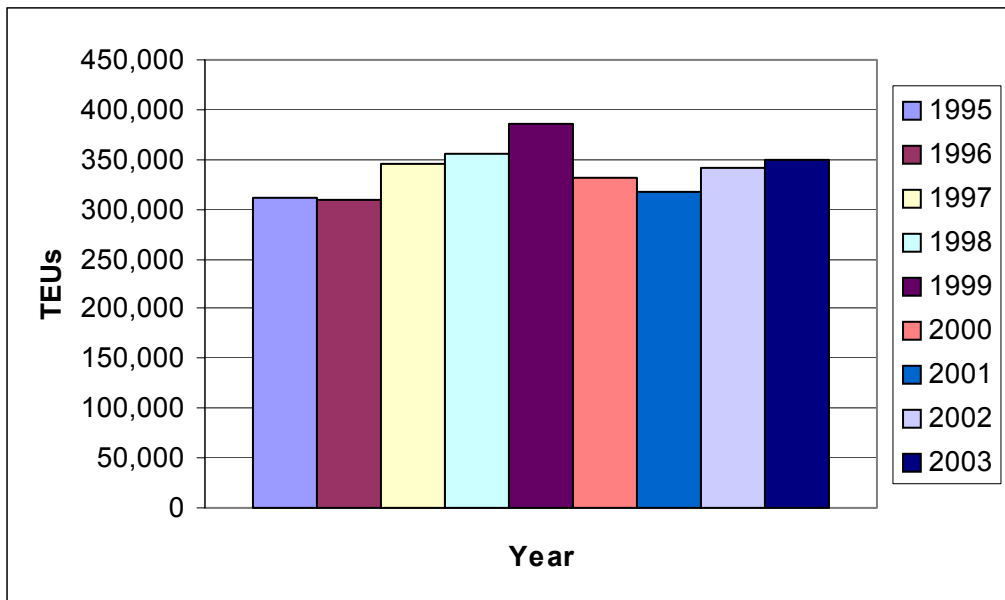
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 8. TEUs of Imports to Charleston, 1995-2003



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 9. CTs of Exports from Charleston, 1995-2003



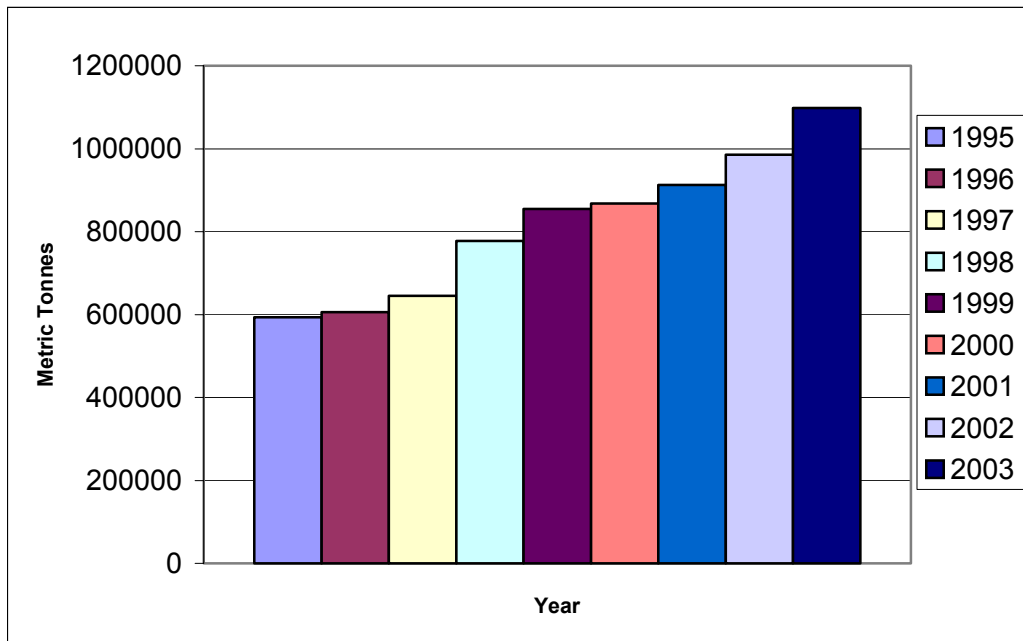
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 10. TEUs of Exports from Charleston, 1995-2003

JACKSONVILLE

Jacksonville's CT imports increased each year from 1995 to 2003. Jacksonville moved from 600,000 CTs in 1995 to nearly 1.1 million in 2003, nearly doubling import commodities during the nine years (Figure 11). TEU imports showed a very similar trend, increasing from about 54,000 in 1995 to nearly 100,000 in 2003 (Figure 12).⁹

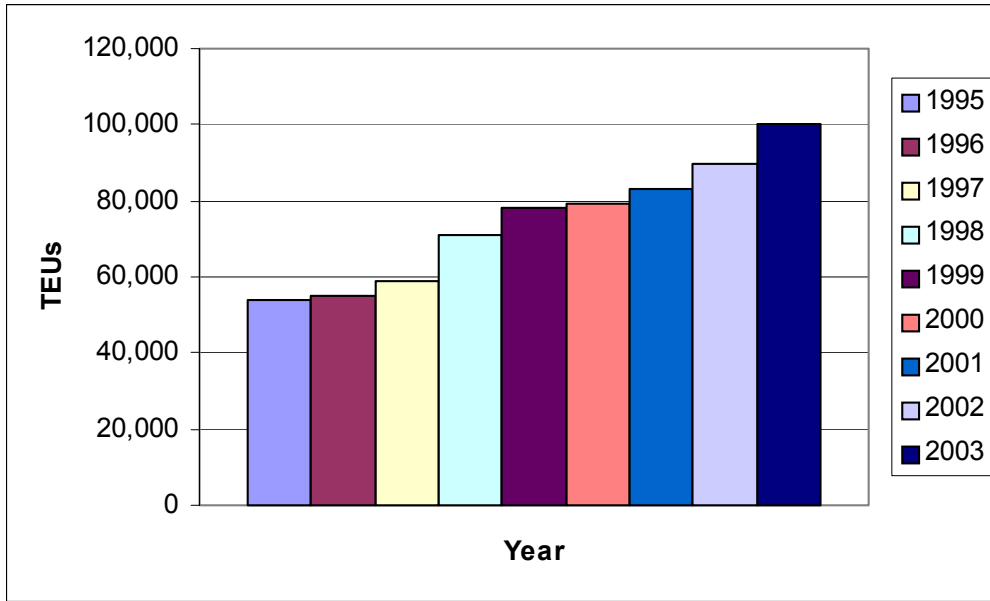
CT export volumes increased until 1997, reaching a peak of nearly 750,000, but fluctuated thereafter and registered only 500,000 CTs in 2003 (Figure 13). TEU exports reached a low in 2000 and rebounded thereafter, but not to the levels experienced in the 1995-1997 period (Figure 14).



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

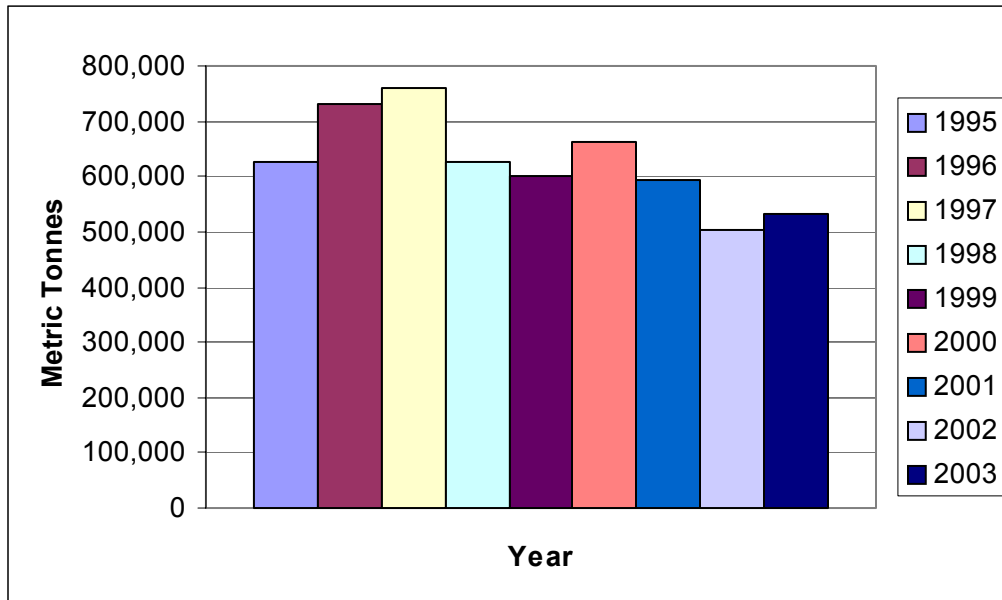
Figure 11. CTs of Imports to Jacksonville, 1995-2003

⁹ Jacksonville's TEU import data for the years 1995-2003 were estimated.



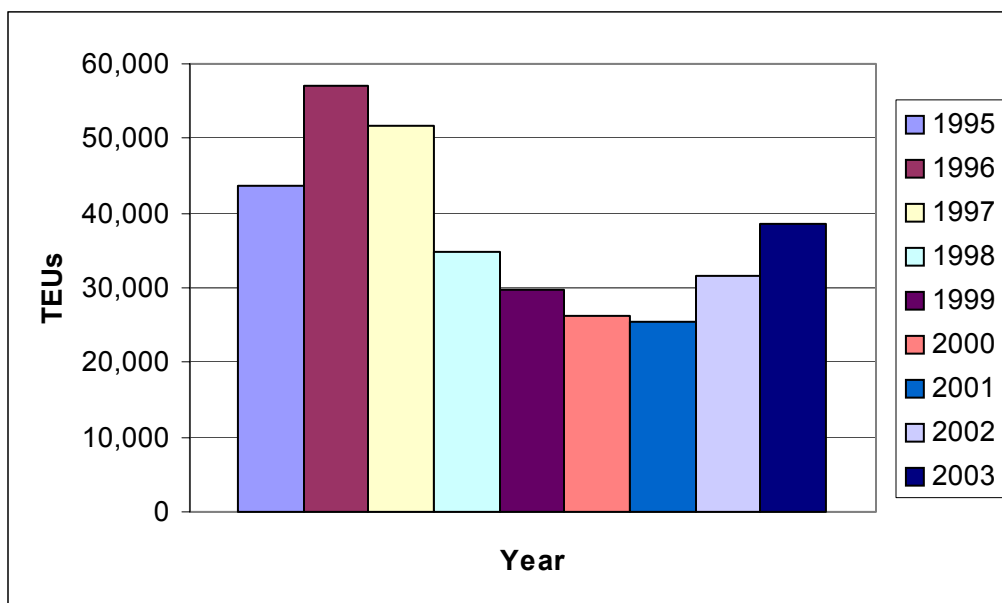
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 12. TEUs of Imports to Jacksonville, 1995-2003



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 13. CTs of Exports from Jacksonville, 1995-2003



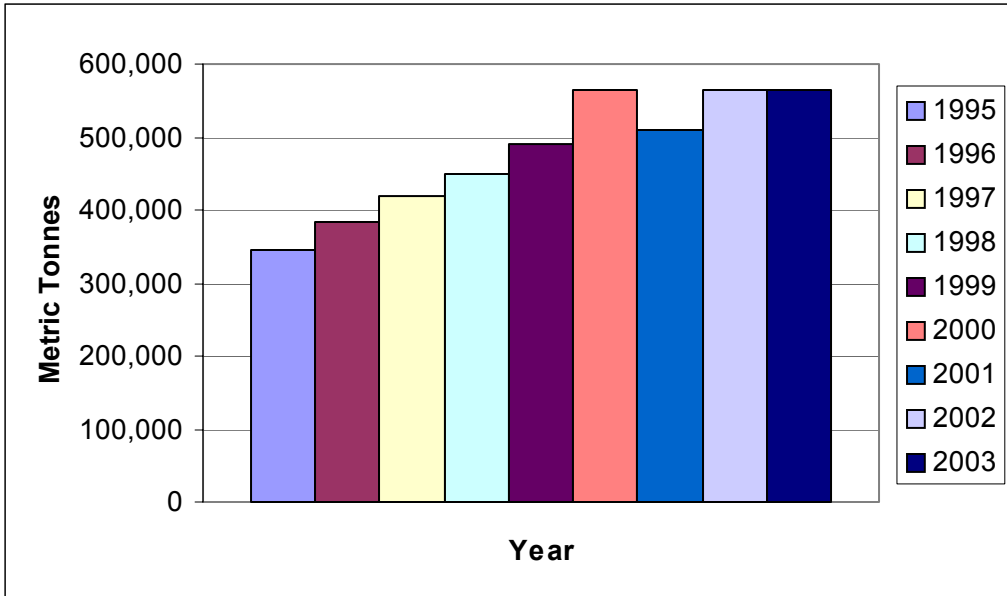
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 14. TEUs of Exports from Jacksonville, 1995-2003

WILMINGTON

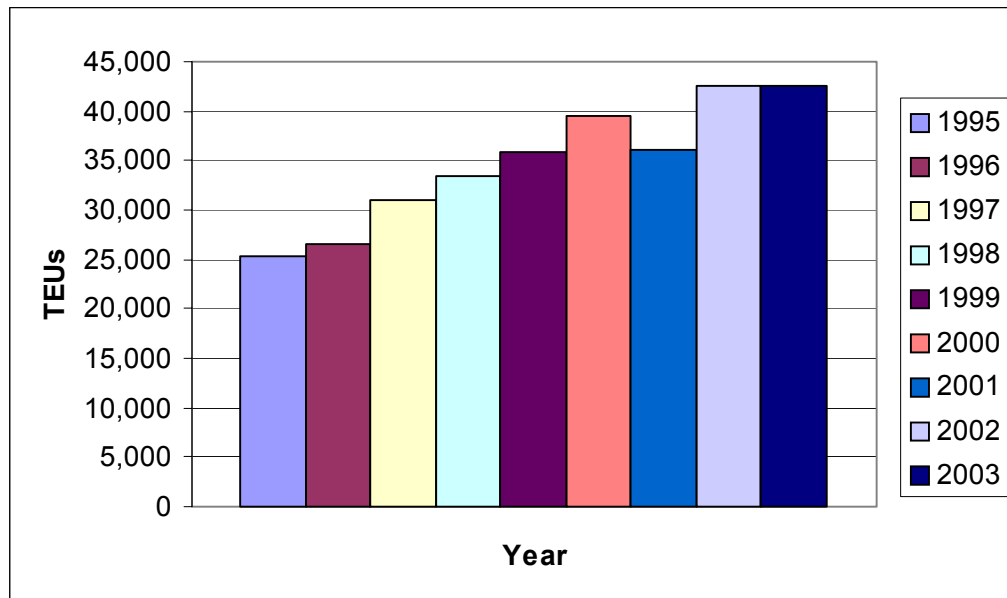
Wilmington experienced an increase in CT imports similar to that of Jacksonville during the nine-year period, rising from over 300,000 in 1995 to over 500,000 in 2003 (Figure 15). TEU imports followed a similar trend, rising from slightly over 25,000 in 1995 to nearly 42,000 in 2003 (Figure 16).

CT export volumes fluctuated during the nine-year period, reaching a low of 300,000 in 1999 and rebounding thereafter to about 400,000, but never reclaiming the highs of the 1995-1997 period (Figure 17). TEU imports declined from a high of over 50,000 in 1996 to less than 20,000 in 2000 and then to about 17,000 in 2003 (Figure 18).



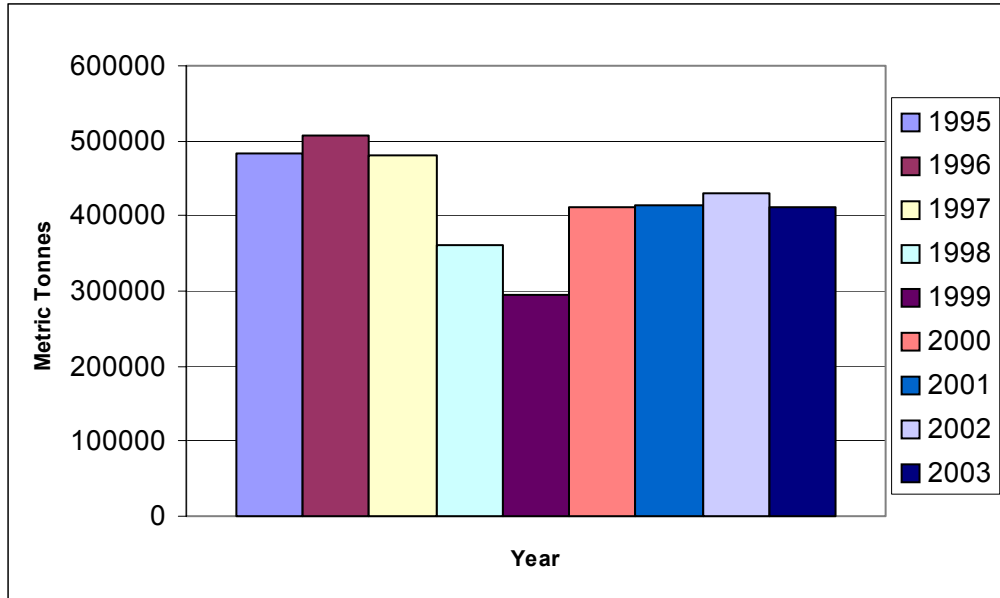
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 15. CTs of Imports to Wilmington, 1995-2003



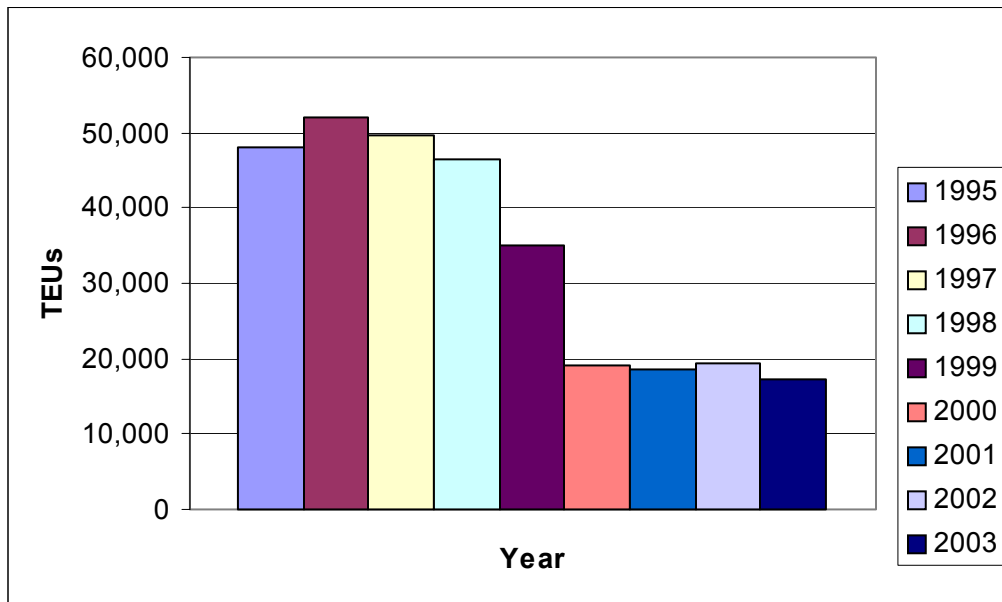
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 16. TEUs of Imports to Wilmington, 1995-2003



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 17. CTs of Exports from Wilmington, 1995-2003

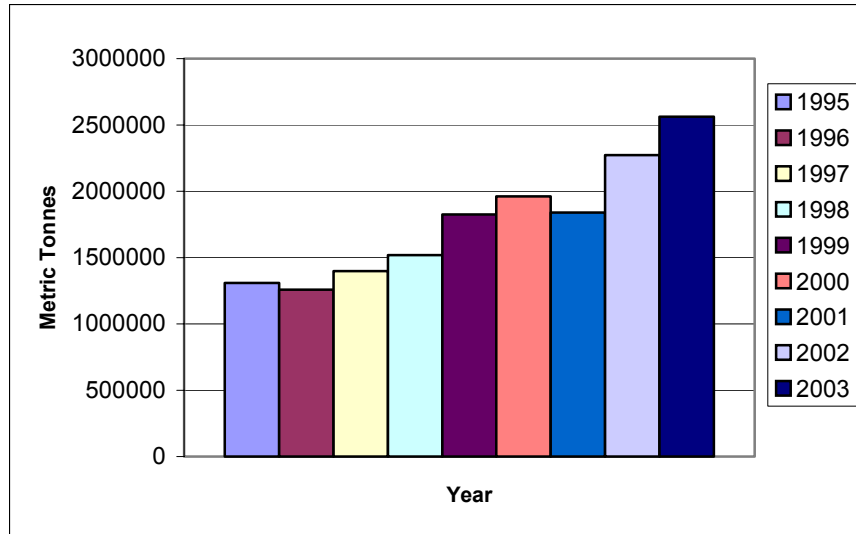


Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 18. TEUs of Exports from Wilmington, 1995-2003

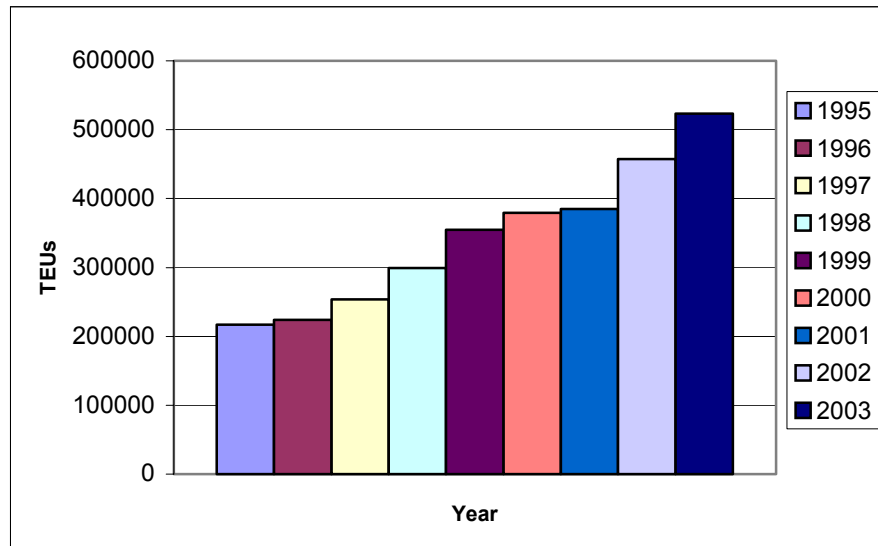
NORFOLK

Norfolk's volume of import CTs doubled during the nine-year period, rising from about 1.3 million in 1995 to 2.6 million in 2000 (Figure 19). TEU import volumes increased each year during the nine-year period, reaching over 500,000 in 2003, which was slightly lower than Charleston and Savannah (Figure 20).



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

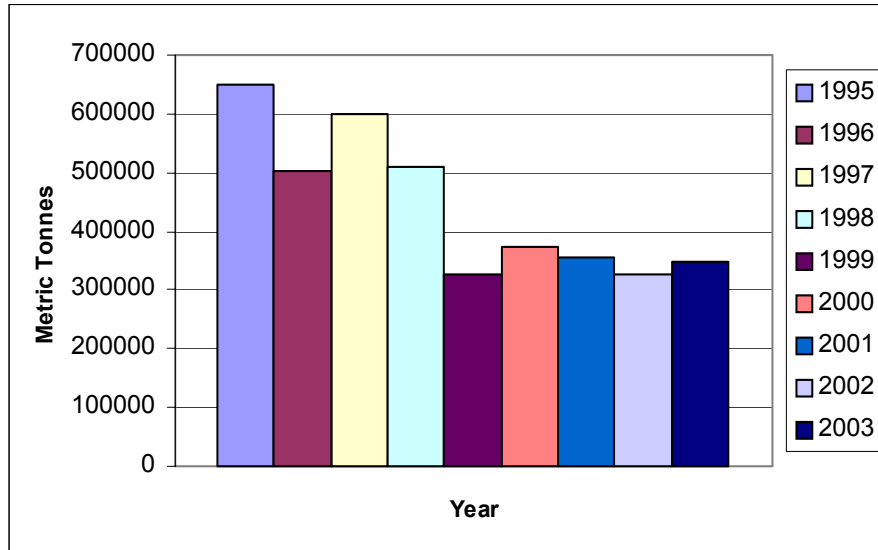
Figure 19. CTs of Imports to Norfolk, 1995-2003



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

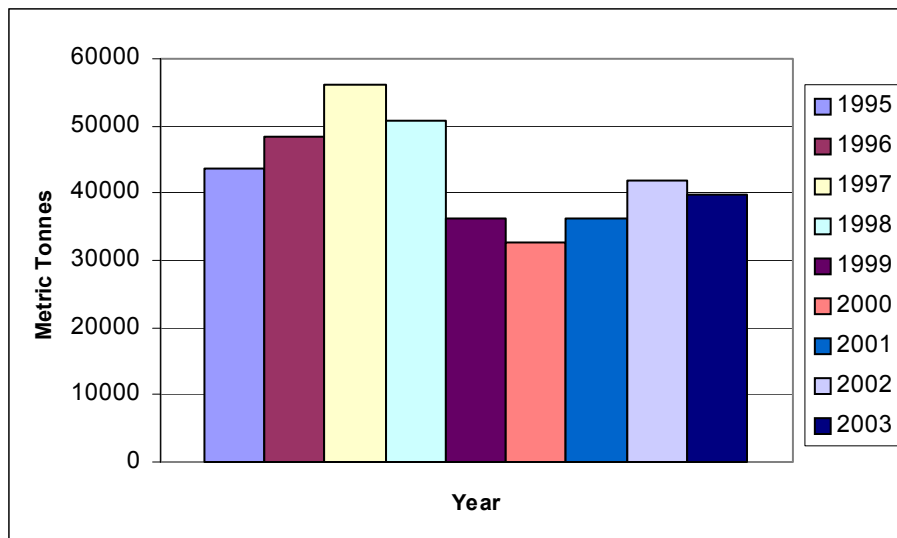
Figure 20. TEUs of Imports to Norfolk, 1995-2003

Norfolk’s volume of CT exports decreased dramatically over the nine-year period, falling from nearly 650,000 in 1995 to above 300,000 in 2003 (Figure 21). TEU exports reached a peak in 1997 at about 56,000 and a low of slightly above 30,000 in 2000, then rose to 40,000 in 2003 (Figure 22).



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 21. CTs of Exports from Norfolk, 1995-2003



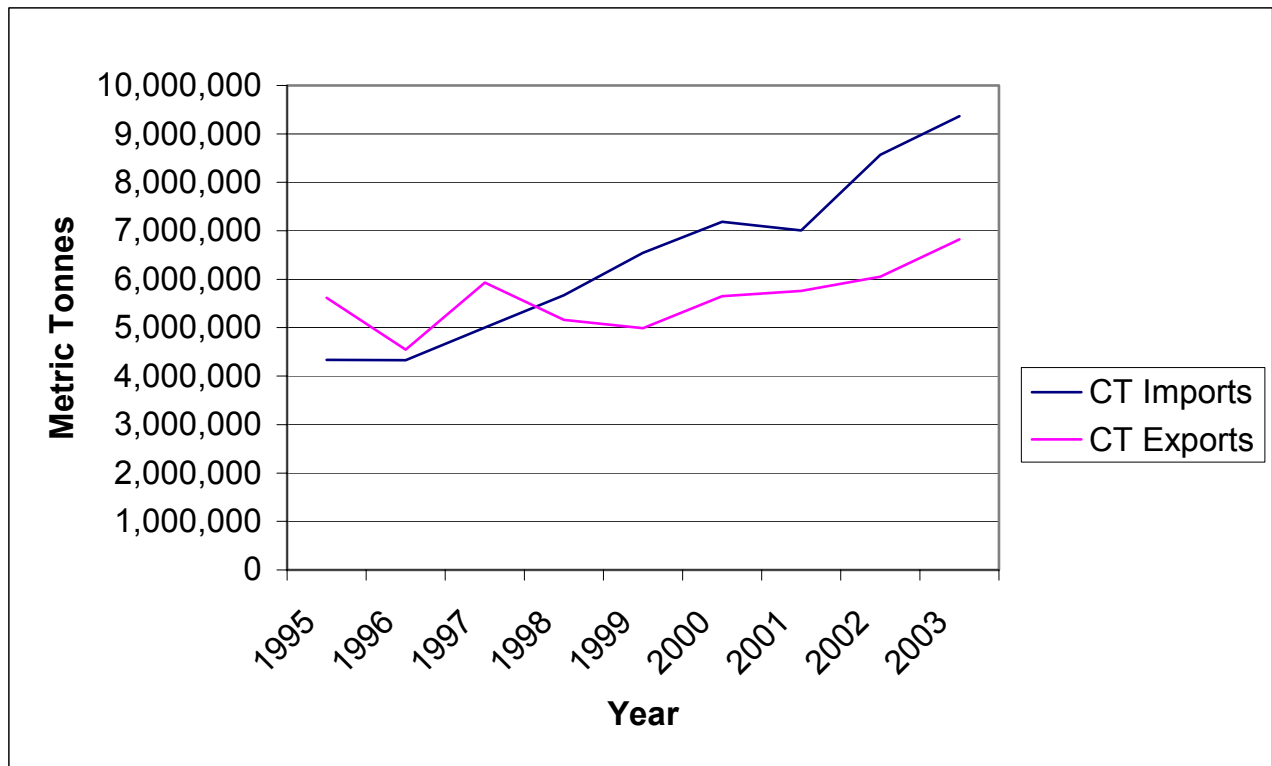
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 22. TEUs of Exports from Norfolk, 1995-2003

WORLD REGION TOTALS

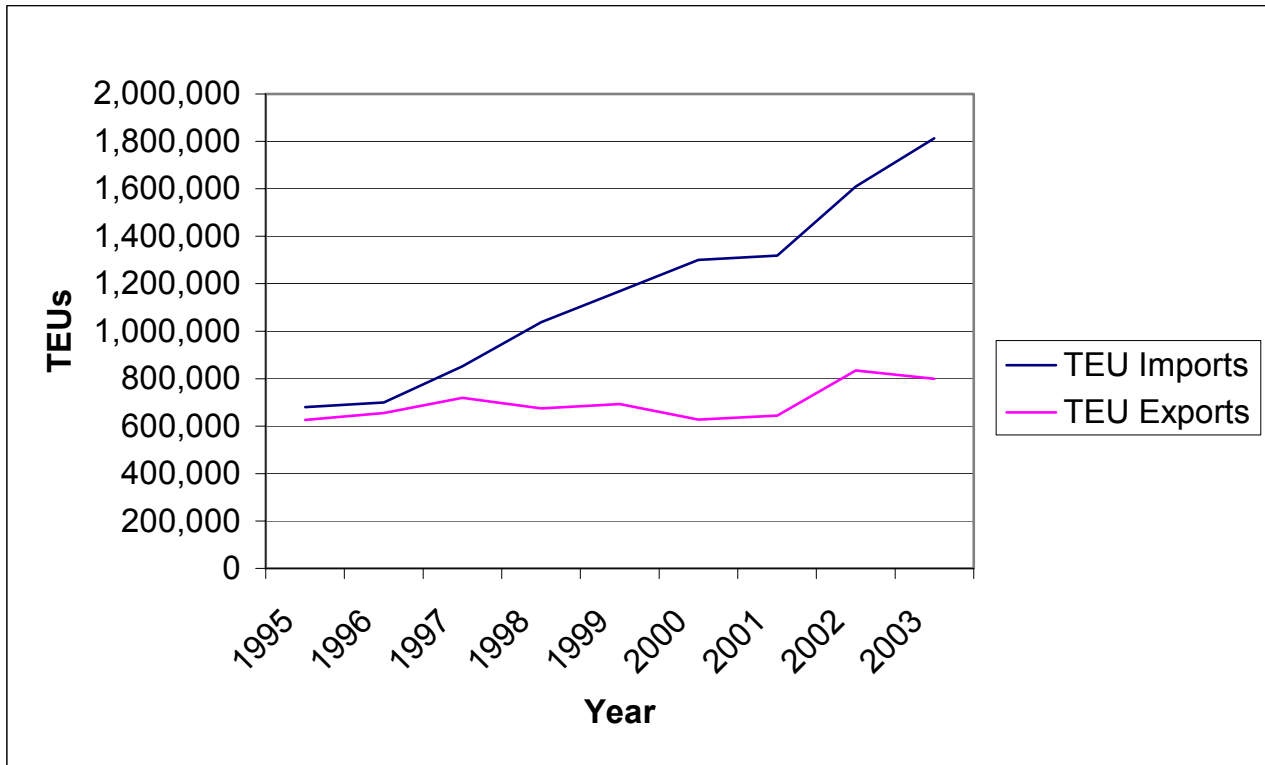
This section summarizes the study area totals for imported and exported CT and TEU volumes for the five world regions calling on the South Atlantic ports. The five world regions are Europe, South East Asia, Middle East/Mediterranean, North East Asia, and Oceania. Excluded are cargoes from other regions such as South America, the Caribbean and Central America, and Africa.

It is important to recognize that CT and TEU imports for the U.S. have been increasing at a much faster rate than CT and TEU exports. Import CTs increased by over 116 percent from 1995 to 2003, compared to a 21 percent increase in export CTs (Figure 23). Import TEUs increased by nearly 167 percent from 1995 to 2003, compared to a 28 percent increase in export TEUs (Figure 24). The tables and figures in this section reinforce the idea that there is a weak tonnage growth for exports compared to a very robust import growth in CTs and TEUs.



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 23. Historic Trends of Imports and Exports during 1995-2003 in CTs for the South Atlantic Ports: Major World Hinterlands



Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 24. Historic Trends of Imports and Exports during 1995-2003 in TEUs for the South Atlantic Ports: Major World Hinterlands

All five of the world regions increased during the nine-year period in CT imports to the U.S. (Table 3). From 1995-2001, Europe accounted for the greatest volume of CT imports to the U.S. to the five South Atlantic ports. However, North East Asia accounted for the greatest amount of imports, had the greatest growth rate from 1995-2003, and accounted for the greatest amount of imports in 2002 and 2003.

Similarly, all five of the world regions increased during the same time period in TEU imports (Table 4). North East Asia experienced the greatest increase, rising from 236,595 TEUs in 1995 to 760,100 TEUs in 2003, and accounted for the greatest amount of imports in 2003.

All five of the world regions increased during the nine-year period in CT exports (Table 5). North East Asia experienced the greatest increase, rising from 2,151,849 CTs in 1995 to 2,863,648 CTs in 2003, and accounted for the greatest amount of exports in 2003.

With the exception of Oceania, all regions increased TEU export volumes over the nine-year period. Oceania experienced a decline from 31,626 TEUs in 1995 to 28,036 TEUs in 2003, but the 2003 volume exceeded the nine-year low of 22,858 TEUs in 2001 (Table 6). North East Asia

Table 3. CTs of Imports to South Atlantic Ports, by Selected World Regions, 1995-2003

Region	Year								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Europe	1,874,613	1,805,195	2,067,921	2,197,286	2,485,034	2,847,441	2,776,691	3,076,751	3,382,322
India/S.E. Asia	678,454	718,622	845,101	890,820	1,090,885	1,370,616	1,300,764	1,553,844	1,542,132
Middle East/ Med	371,553	365,313	457,577	502,386	568,955	511,151	554,011	609,400	602,169
North East Asia	1,303,722	1,315,396	1,522,817	1,983,537	2,293,794	2,359,037	2,200,555	3,131,108	3,640,005
Oceania	104,476	123,877	110,770	98,828	105,423	98,232	177,151	195,253	198,084
Total	4,332,818	4,328,403	5,004,186	5,672,857	6,544,091	7,186,477	7,009,172	8,566,356	9,364,712

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

24

Table 4. TEUs of Imports to South Atlantic Ports, by Selected World Regions, 1995-2003

Region	Year								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Europe	273,073	273,299	341,851	403,434	441,910	504,645	475,168	539,283	575,010
India/S.E. Asia	109,214	126,406	144,198	169,672	192,780	212,864	245,123	289,661	337,243
Middle East/ Med	56,682	58,312	65,785	80,579	97,984	92,271	100,577	110,621	125,220
North East Asia	236,595	236,384	295,656	379,107	430,626	483,953	489,820	661,224	760,100
Oceania	4,097	4,530	5,031	5,637	5,895	6,294	7,771	9,103	14,543
Total	679,661	698,931	852,521	1,038,429	1,169,195	1,300,027	1,318,459	1,609,892	1,812,116

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Table 5. CTs of Exports from South Atlantic Ports, by Selected World Regions, 1995-2003

Region	Year								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Europe	2,290,013	2,189,990	2,455,700	2,235,820	1,968,656	2,184,749	2,288,899	2,269,290	2,520,508
India/S.E. Asia	518,782	557,855	554,143	354,770	400,509	473,380	531,012	578,269	649,130
Middle East/ Med	481,569	462,423	538,781	484,993	478,169	584,785	502,666	586,602	600,874
North East Asia	2,151,849	1,156,217	2,202,590	1,944,152	2,010,626	2,250,091	2,277,300	2,462,073	2,863,648
Oceania	178,071	180,853	176,660	140,903	135,192	159,022	157,067	155,582	188,248
Total	5,620,284	4,547,338	5,927,874	5,160,638	4,993,152	5,652,027	5,756,944	6,051,816	6,822,408

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

25

Table 6. TEUs of Exports from South Atlantic Ports, by Selected World Regions, 1995-2003

Region	Year								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Europe	250,383	255,720	299,723	308,220	296,737	267,452	269,106	278,426	294,234
India/S.E. Asia	61,360	74,394	75,603	47,794	54,903	51,381	63,970	75,298	82,684
Middle East/ Med	57,637	62,434	75,593	71,696	68,864	65,415	52,794	65,162	74,410
North East Asia	224,455	231,516	237,791	220,538	247,792	216,986	234,832	387,987	320,435
Oceania	31,626	31,681	30,661	25,986	24,307	25,923	22,858	27,107	28,036
Total	625,461	655,745	719,371	674,234	692,603	627,157	643,560	833,980	799,799

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

experienced the greatest increase, rising from 224,455 TEUs in 1995 to 320,435 TEUs in 2003, and accounted for the greatest volume of exports in 2002 and 2003.

COMMODITY FLOWS

Commodity flows are discussed in this section for the period 1995-2003 through accumulated data for the five ports. The 10 commodity groups are agriculture, extractive, food, materials, consumer goods, chemicals, high technology, intermediate manufacturing, capital equipment, and motor vehicles. The tables below show the subtotals for the nine-year period.

Every commodity in the CT imports category increased over the nine-year period (Table 7). Relative to the other nine commodities, extractives increased the least (from 19,037 CTs in 1995 to 20,567 CTs in 2003), and consumer goods increased the most (from 318,373 CTs in 1995 to 1,469,443 CTs in 2003). Intermediate manufacturing had the highest import volume in 2003 (1,733,951 CTs).

All TEU import commodities increased except extractives, which declined from 4,624 TEUs in 1995 to 3,360 TEUs in 2003 (Table 8). Relative to the other nine commodities, consumer goods increased the most (from 111,389 TEUs in 1995 to 498,692 TEUs in 2003) and registered the highest volume in 2003.

All CT export commodities increased over the nine-year period, but at a lower rate than imports (Table 9). Relative to the other nine commodities, intermediate manufacturing increased the most from (316,759 CTs in 1995 to 416,683 CTs in 2003). Materials had the highest export volume in 2003 (2,649,881 CTs), which was significantly higher than CT imports during the same year.

TEU exports (Table 10) increased for eight of the 10 commodities. Declines were registered by high technology (from 64,439 TEUs in 1995 to 61,668 TEUs in 2003) and capital equipment (from 62,876 in 1995 to 60,037 TEUs in 2003). Relative to the other nine commodities, motor vehicles increased the most (from 34,024 TEUs in 1995 to 91,489 TEUs in 2003), and materials had the highest export volume in 2003 (305,633 TEUs).

Table 7. CTs of Imports to South Atlantic Ports from Selected World Regions, by Commodity, 1995-2003

Commodity	Year								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Agriculture	163,081	182,029	187,648	198,687	291,157	320,250	348,106	402,827	370,320
Extractive	19,037	36,155	34,100	30,695	24,532	31,370	18,047	15,204	20,567
Food	483,364	559,183	610,288	572,136	325,923	725,995	674,411	708,310	801,142
Materials	456,085	411,010	517,591	557,645	689,367	828,989	781,306	1,069,043	1,274,571
Consumer Goods	318,373	326,363	389,874	494,211	623,804	825,427	877,132	1,218,914	1,469,443
Chemicals	629,168	677,532	715,161	744,022	774,552	894,974	1,054,001	1,205,351	1,287,289
High Technology	684,262	679,078	768,537	847,867	983,760	1,092,996	917,185	1,150,869	1,181,110
Intermediate Manufacturing	908,957	819,675	1,037,310	1,320,431	1,561,092	1,504,800	1,432,811	1,692,080	1,733,951
Capital Equipment	560,202	605,950	693,223	811,933	881,110	886,132	831,405	984,819	1,058,269
Motor Vehicles	291,678	210,583	217,799	230,538	264,286	283,765	275,797	316,453	346,281
Total	4,514,207	4,507,558	5,171,531	5,808,165	6,419,583	7,394,698	7,210,201	8,763,870	9,542,943

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Table 8. TEUs of Imports to South Atlantic Ports from Selected World Regions, by Commodity, 1995-2003

Commodity	Year								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Agriculture	12,918	22,907	16,435	27,667	34,952	36,277	37,996	35,310	30,489
Extractive	4,624	3,652	3,103	4,878	5,205	5,241	2,136	2,383	3,360
Food	62,045	68,337	83,618	85,524	95,475	96,757	104,300	103,313	114,105
Materials	88,249	79,347	107,225	116,712	126,788	160,924	163,013	206,265	234,909
Consumer Goods	111,389	115,029	145,463	191,191	223,848	285,092	319,553	417,738	498,692
Chemicals	74,360	67,613	81,369	89,744	109,599	123,859	119,790	146,518	161,241
High Technology	131,788	132,163	158,929	177,619	198,718	212,530	189,645	225,716	232,019
Intermediate Manufacturing	94,895	97,529	116,960	150,769	184,420	195,057	192,935	226,396	262,010
Capital Equipment	82,472	91,516	111,979	148,737	149,017	146,231	144,455	166,209	181,954
Motor Vehicles	42,309	51,286	58,659	70,462	76,653	80,244	94,328	123,041	132,131
Total	705,049	729,379	883,740	1,063,303	1,204,675	1,342,212	1,368,151	1,652,889	1,850,910

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Table 9. CTs of Exports from South Atlantic Ports from Selected World Regions, by Commodity, 1995-2003

Commodity	Year								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Agriculture	338,750	300,235	344,319	361,767	328,089	349,424	349,743	502,102	628,879
Extractive	1,091,822	1,021,277	1,109,115	1,024,538	998,599	1,146,129	1,223,182	1,196,691	1,417,357
Food	794,458	915,110	1,022,731	911,534	936,045	1,116,725	1,047,159	997,846	1,013,609
Materials	2,250,812	2,210,272	2,269,527	1,951,429	1,999,872	2,226,936	2,276,353	2,500,670	2,649,881
Consumer Goods	92,149	113,533	156,906	96,177	93,419	102,464	99,876	106,845	139,058
Chemicals	663,880	588,311	650,255	570,912	538,908	557,346	593,715	669,242	775,573
High Technology	316,513	301,345	332,120	254,164	257,717	300,945	348,398	347,405	324,822
Intermediate Manufacturing	316,759	284,376	298,837	282,544	244,266	262,690	260,172	255,580	416,683
Capital Equipment	263,436	274,768	290,870	243,206	240,430	262,524	248,995	257,093	268,365
Motor Vehicles	153,257	139,991	196,761	152,041	122,430	158,949	189,385	189,703	180,365
Total	6,281,836	6,149,218	6,671,441	5,848,312	5,759,775	6,484,132	6,636,978	7,023,177	7,814,592

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Table 10. TEUs of Exports from South Atlantic Ports from Selected World Regions, by Commodity, 1995-2003

Commodity	Year								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Agriculture	61,739	67,661	75,055	69,125	57,681	61,503	60,017	100,030	104,695
Extractive	37,881	41,518	52,599	55,269	50,338	53,935	45,099	41,843	39,733
Food	82,888	80,936	88,448	83,166	94,306	89,445	87,034	101,736	96,039
Materials	272,367	305,420	304,515	271,549	282,605	241,980	251,195	269,790	305,633
Consumer Goods	38,959	46,400	65,936	36,267	34,220	32,137	32,583	33,471	39,905
Chemicals	94,345	79,835	92,060	85,666	86,474	88,505	67,026	103,348	107,073
High Technology	64,469	69,830	79,177	59,820	63,964	56,604	62,018	64,893	61,668
Inter. Manufact.	73,232	84,366	81,048	73,661	68,738	61,725	65,266	67,958	73,814
Capital Equipment	62,876	64,549	67,779	64,787	76,816	55,173	53,040	59,476	60,037
Motor Vehicles	34,024	38,471	51,988	57,533	64,118	64,652	77,022	84,637	91,489
Total	822,780	878,986	958,605	856,843	879,260	805,659	800,300	927,182	980,086

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

VI. SOUTH ATLANTIC WATERBORNE COMMERCE TO 2050 (Task 3)

The South Atlantic ports of Savannah, Charleston, Jacksonville, Wilmington, and Norfolk are described below in terms of commodity flows from five different world regions and the 10 commodity groups that are imported into and exported from these five ports. Each port has niches that will increase its market share by 2050 using this unconstrained forecast¹⁰. The five world regions are: Europe, India/SE Asia, Middle East/Mediterranean, NE Asia, and Oceania. The 10 commodity groups that will be discussed are agriculture, extractive, food, materials, consumer goods, chemicals, high technology, intermediate manufacturing, capital equipment, and motor vehicles. The output will be presented in containerized tonnes (CTs) and 20-foot equivalent units (TEUs).

A detailed review of projected imports, by commodity group and region of origin, to selected South Atlantic ports revealed discrepancies in selected commodity movements to the Port of Wilmington. These discrepancies resulted from anomalies in the projection model and manifested themselves as excessive growth in commodity movements over the projection period. Specifically, agriculture imports from Eastern Europe, India, NE Asia, North Europe, Europe (Other), and SE Asia, and intermediate manufactured goods from NE Asia to Port of Wilmington exhibited unrealistic growth patterns. For instance, agriculture imports into the Port of Wilmington from 2005 to 2050 were projected to increase from 717 CTs to 40,059 CTs from NE Asia (a 5,487 percent increase), from 2,330 CTs to 62,996 CTs from Europe (Other) (a 2,604 percent increase), and from 40,367 CTs to 407,952 CTs from SE Asia (a 911 percent increase). By comparison, agriculture commodity imports into Norfolk over the same time period are projected to increase from NE Asia by 23 percent, decrease from Europe (Other) by 44 percent, and decrease from SE Asia by 46 percent. Intermediate manufacturing movements from NE Asia show a similar disparity, increasing from 65,937 CTs in 2005 to 528,650 CTs by 2050, a 702 percent increase, compared to a projected increase of only 60 percent for corresponding movements into Norfolk.

The selected Wilmington projections were adjusted to bring the movements into alignment with the projections for the other South Atlantic ports. The adjustments were accomplished by applying the growth rate, by export region and commodity, as projected for Norfolk from 2005 to 2050 to the 2005 (base) commodity projections for Wilmington for the seven region/commodity movements cited above. The resulting adjusted projections are presented in the data that follows.¹¹

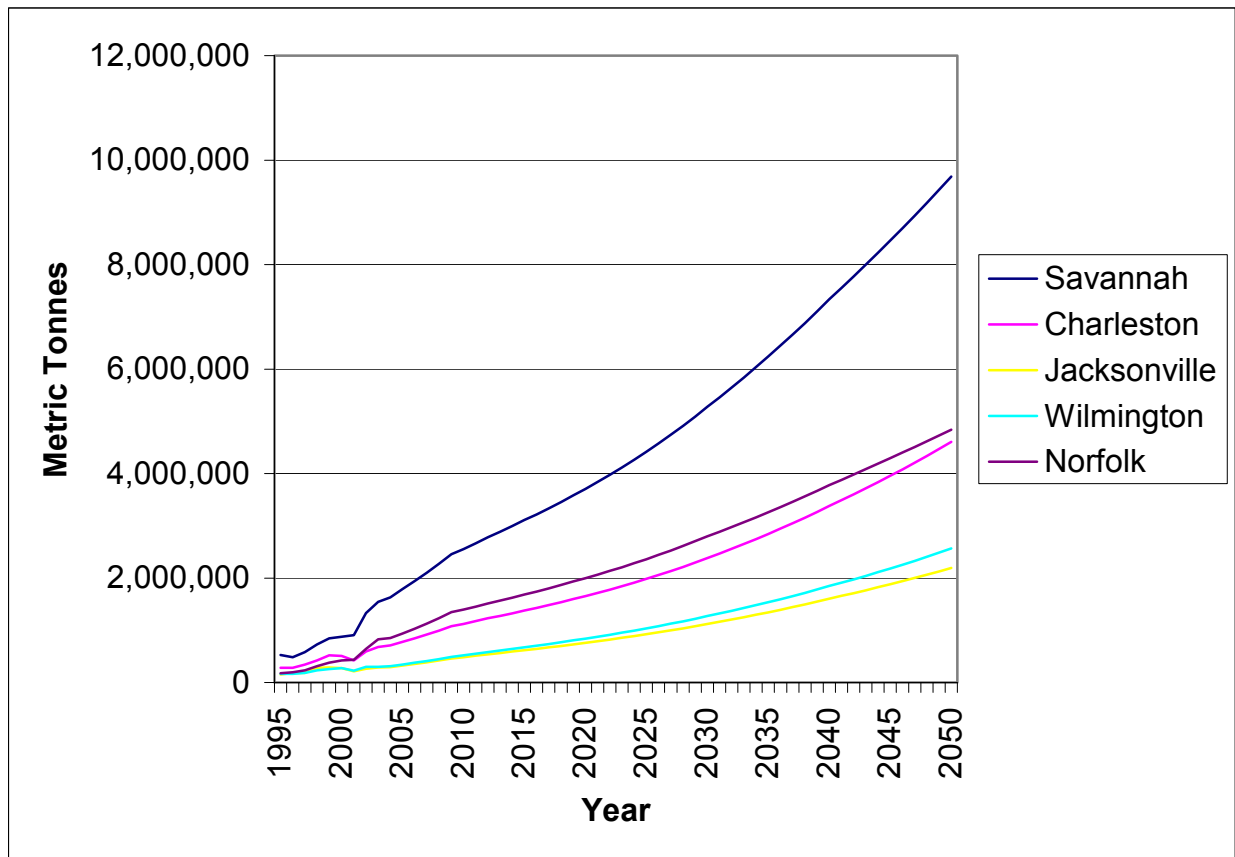
SAVANNAH

Savannah has one large container terminal. Based on the unconstrained forecast, Savannah is likely to capture a large percentage of CT imports from NE Asia relative to the other four ports

¹⁰ The commodity forecast assumes sufficient port capacity during the entire period through 2050 and is referred to as “unconstrained” forecast.

¹¹ The adjustments to Wilmington were not regarded as negating the overall commodity projections or other South Atlantic ports and Norfolk. Wilmington is a niche port of very small size with respect to containerized cargo volume compared to the other South Atlantic container ports of Savannah, Charleston, and Norfolk.

(Figure 25). Trade with China and Korea is projected to increase. Savannah is projected to be the major recipient of this commerce relative to the other South Atlantic ports.

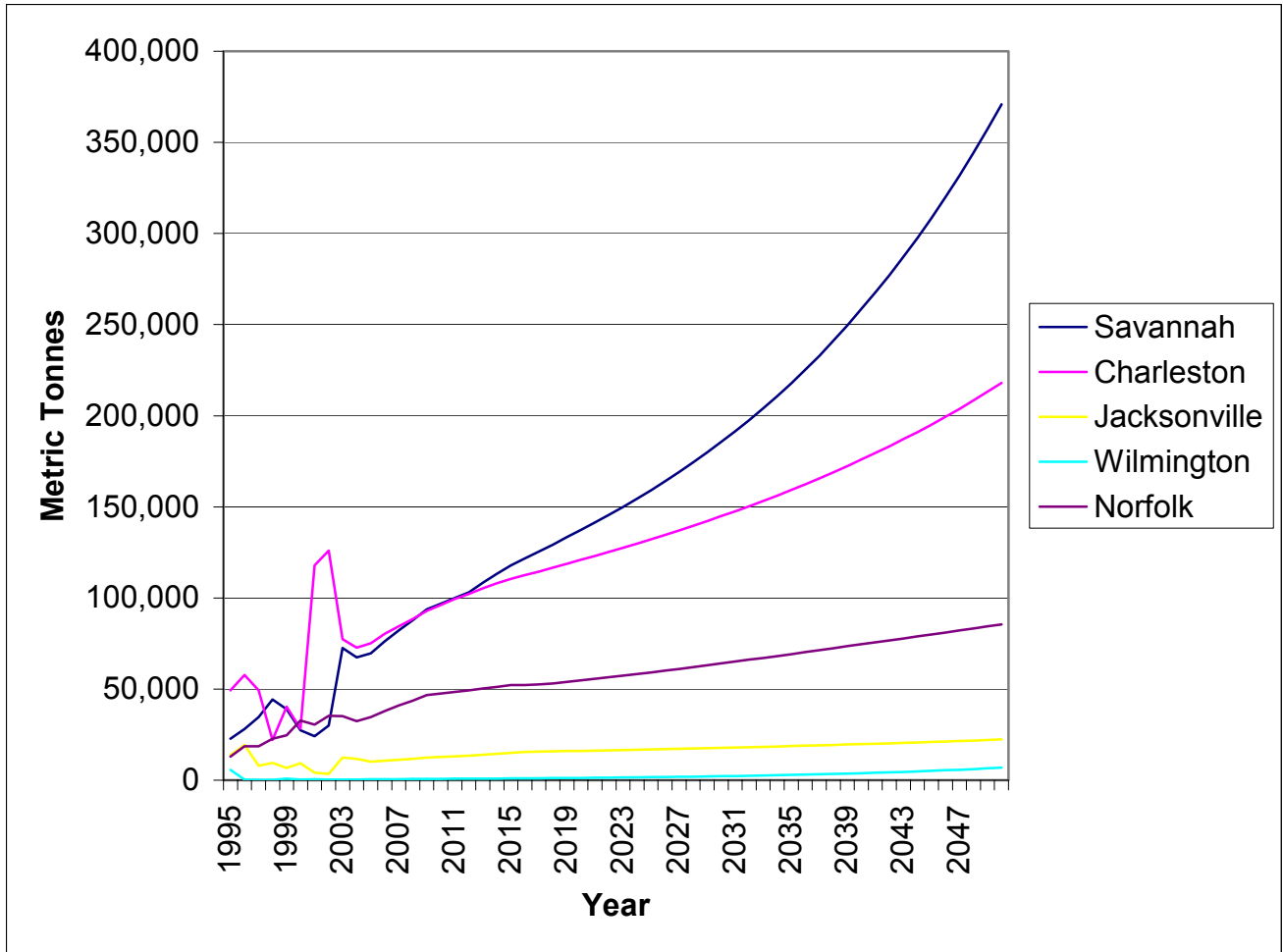


Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 25. CTs of Imports to South Atlantic Ports from North East Asia, 1995-2050

Another niche that Savannah will attain is CT imports from the world region of Oceania (Figure 26). However, the Oceania volume is much smaller than that of NE Asia. The unconstrained forecast indicates that this volume will increase throughout the next 45 years.

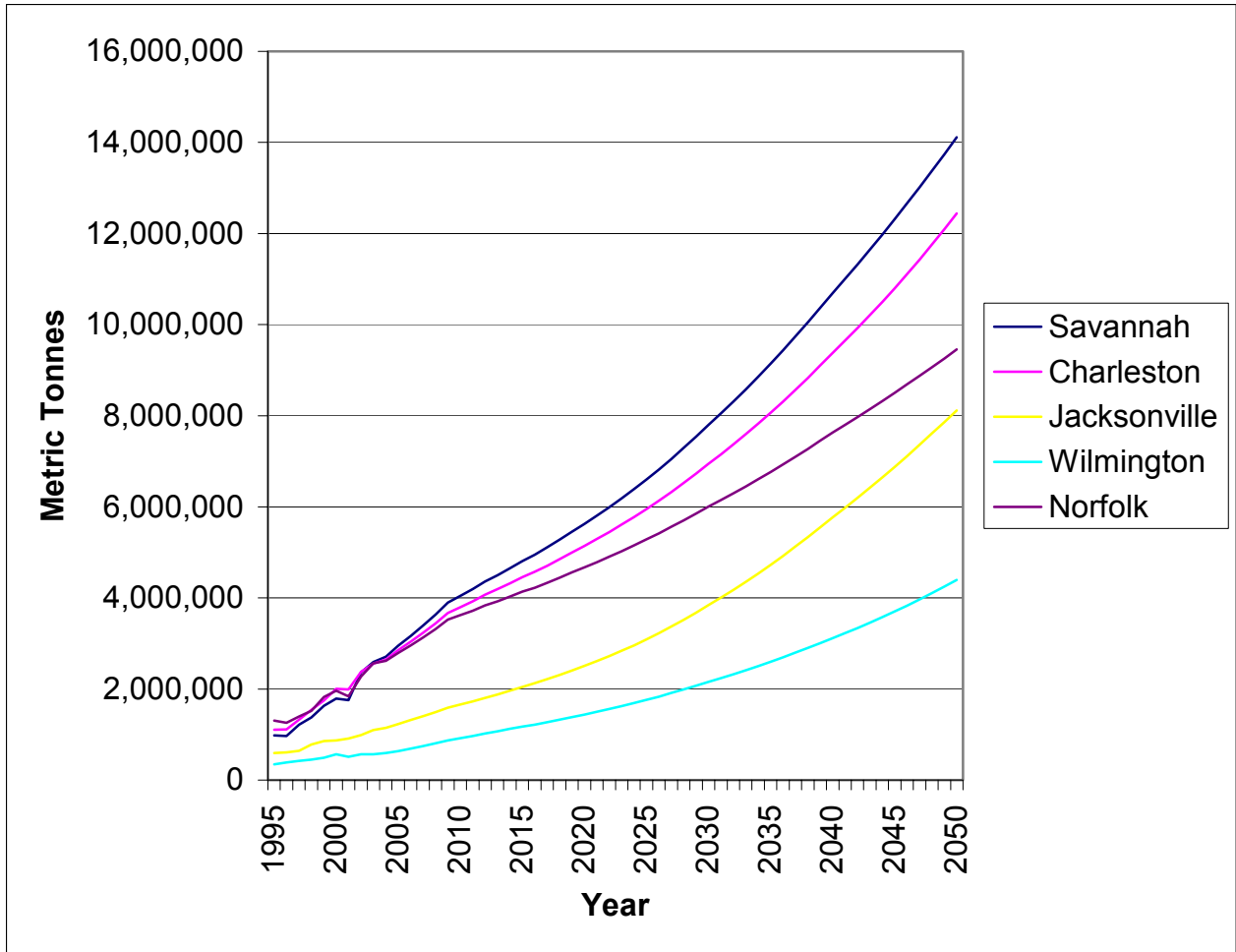


Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 26. CTs of Imports to South Atlantic Ports from Oceania, 1995-2050

Based on the unconstrained forecast, when the subtotals of all five world regions are combined, Savannah would have the largest CT import volume in 2050, followed closely by Charleston and Norfolk and to a lesser degree by Jacksonville and Wilmington (Figure 27). In 2000, Savannah had less CT imports than Charleston and Norfolk. However, the projections indicate that there will be more growth relative to the other South Atlantic ports in this unconstrained forecast for the five world regions.

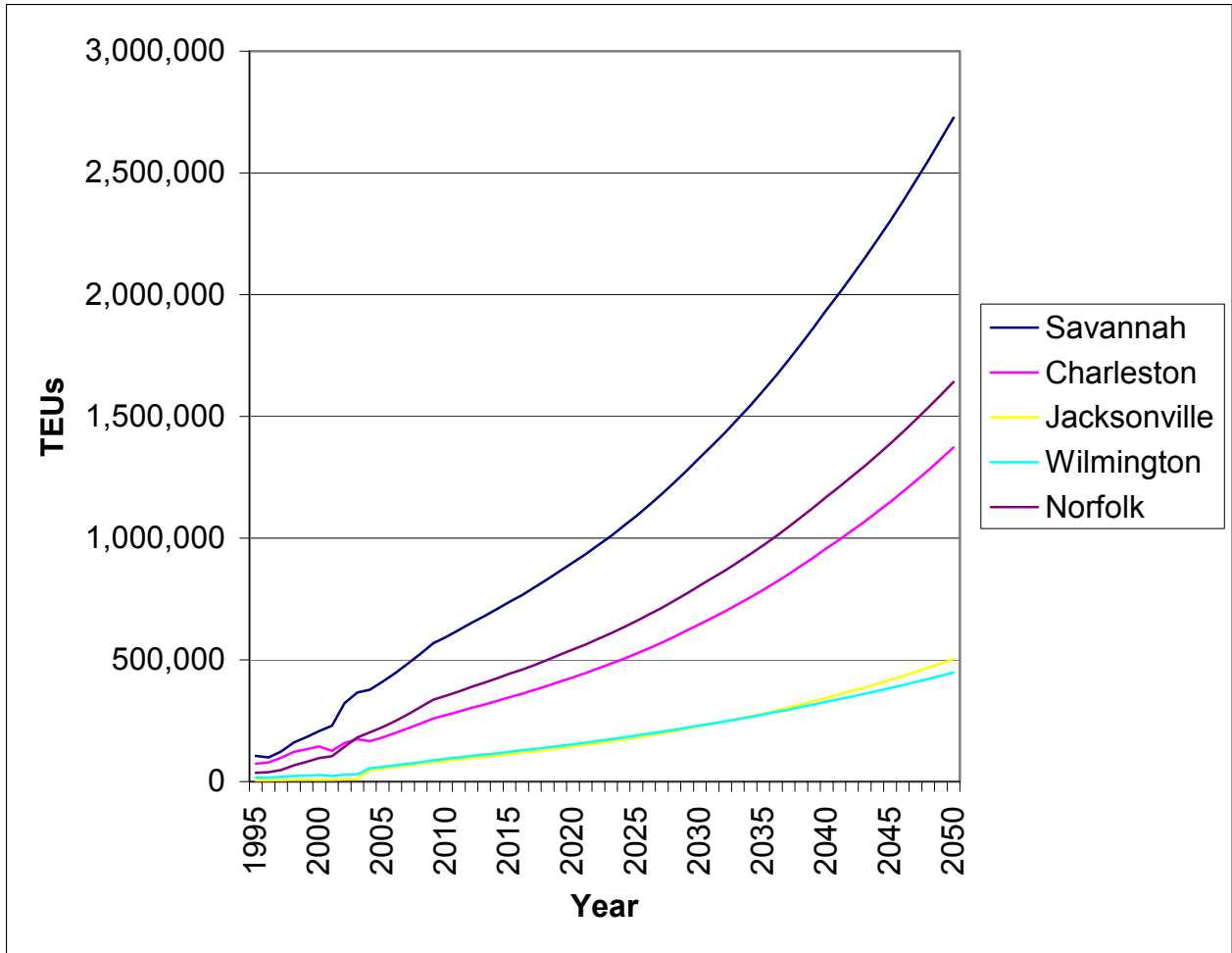


Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 27. CTs of Imports for Selected/Combined Trade Routes, by South Atlantic Ports, 1995-2050

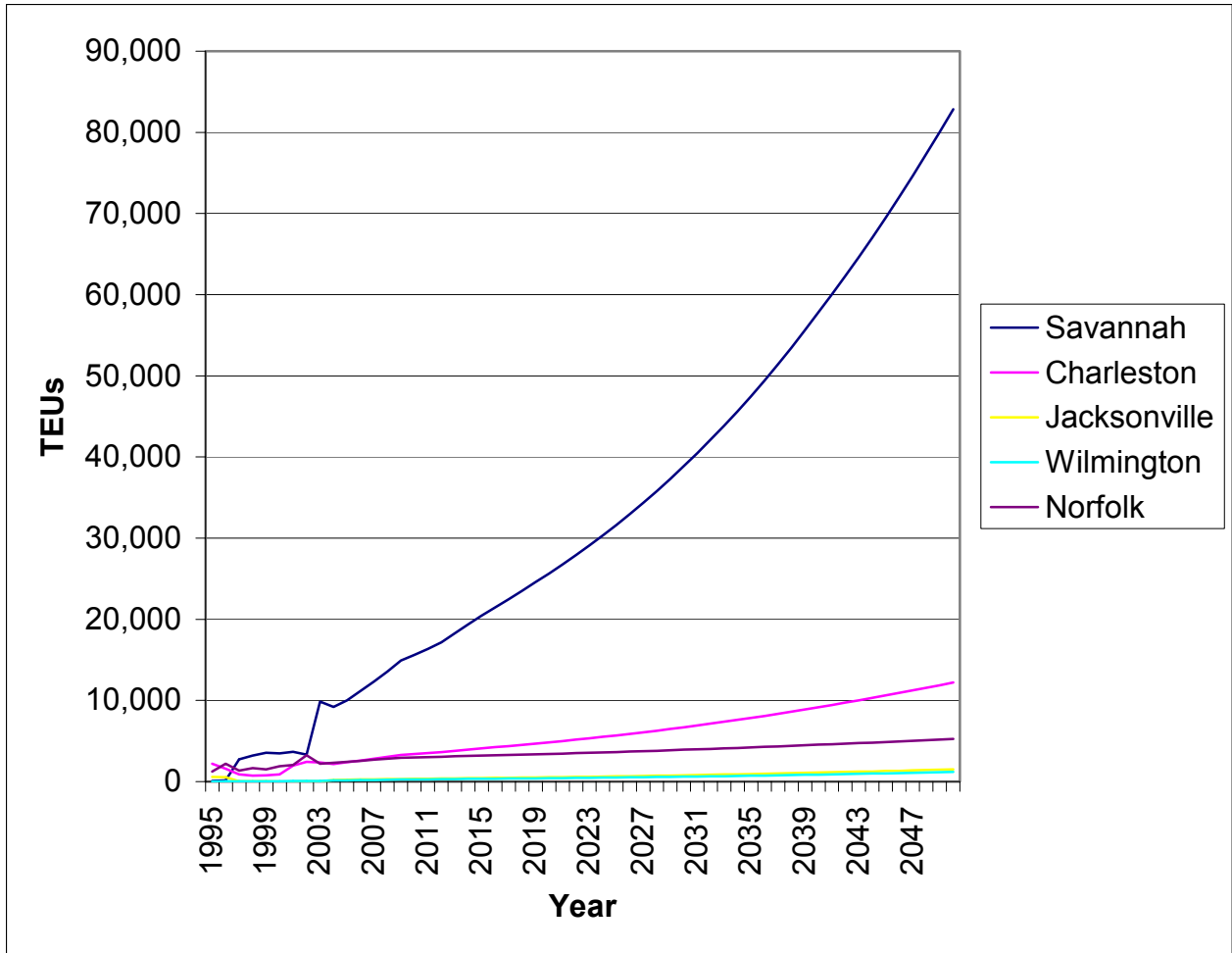
In terms of TEU import volumes, Savannah will have a large market share of the commerce from the world regions of NE Asia and Oceania (figures 28 and 29).



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 28. TEUs of Imports to South Atlantic Ports from North East Asia, 1995-2050

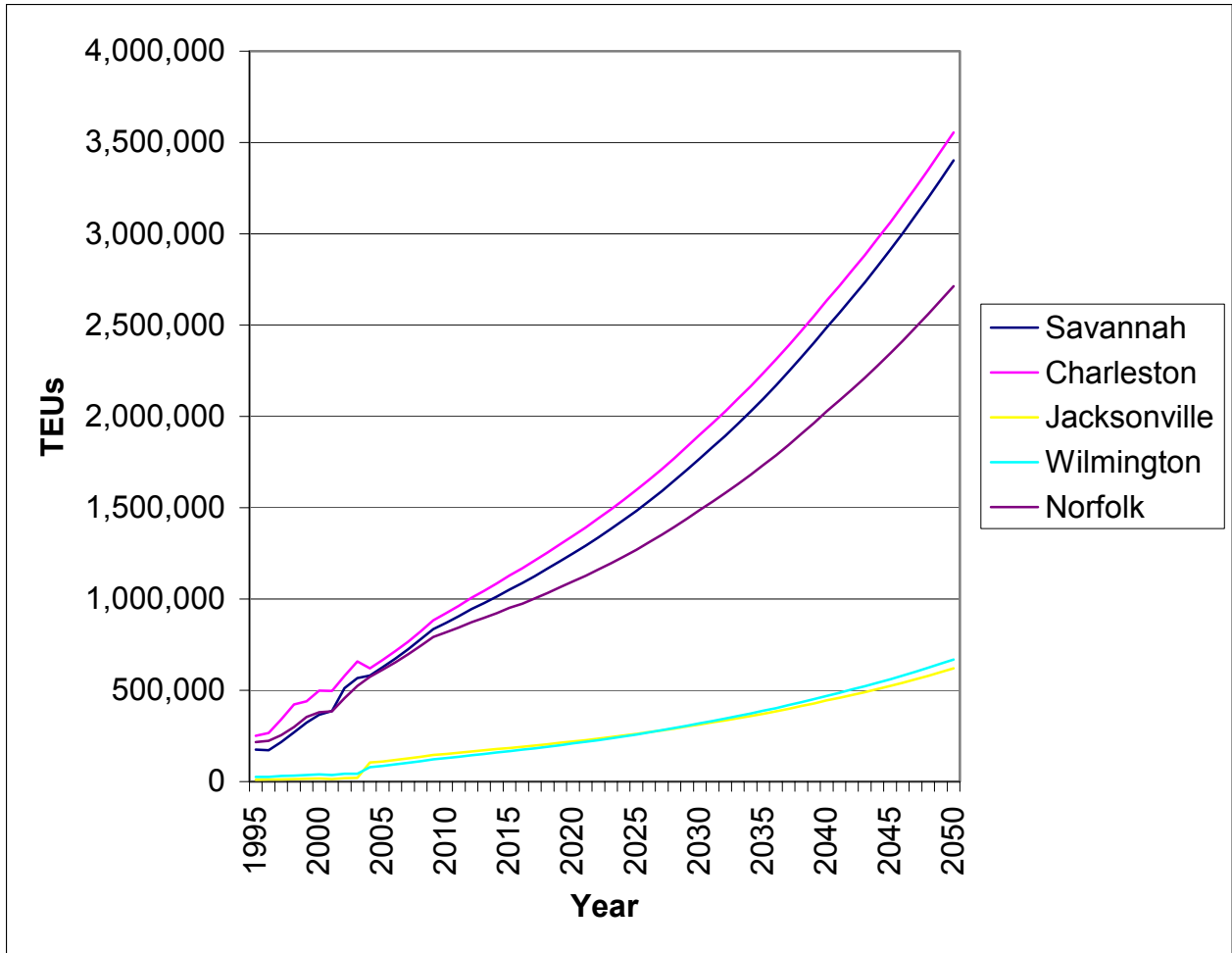


Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 29. TEUs of Imports to South Atlantic Ports from Oceania, 1995-2050

NE Asia and Oceania will also be Savannah’s leading world regions for CT exports. However, the unconstrained forecast indicates that Charleston will have the highest market share of CT export subtotals (Figure 30). TEU export volumes will be provided to the same world regions as TEU import volumes.



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

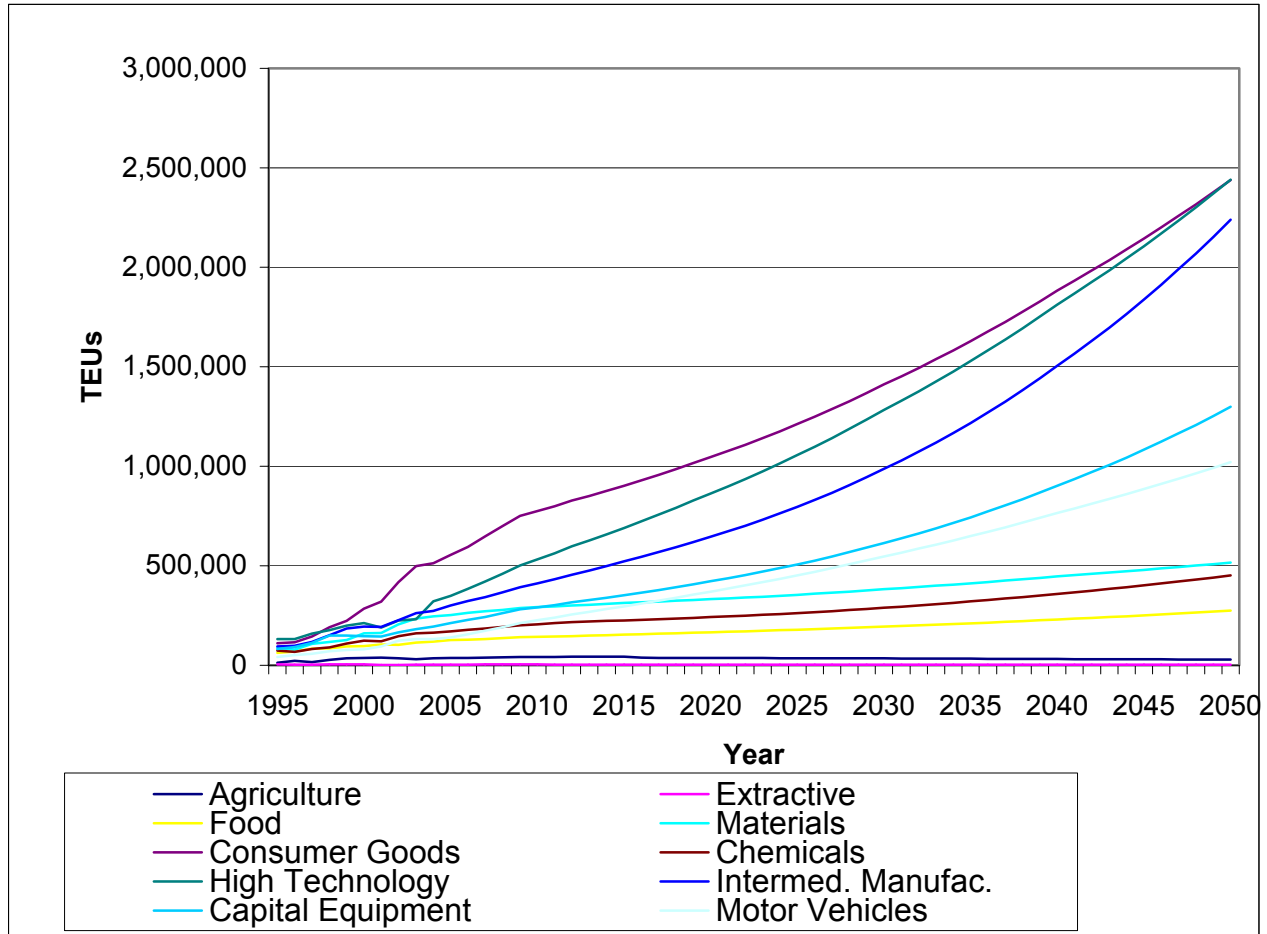
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 30. TEUs of Imports for Selected/Combined Trade Routes, by South Atlantic Ports, 1995-2050

The unconstrained forecast indicates that Savannah will be the leading South Atlantic port for some commodity sectors by 2050. The leading CT import commodities will include consumer goods and capital equipment. The leading TEU import commodity groups will include consumer goods, chemicals, high technology, intermediate manufacturing, and capital equipment (Figure 31). By 2050, the unconstrained forecast indicates that high technology will be the largest import commodity group for the South Atlantic ports, followed by intermediate

manufacturing, chemicals, capital equipment, and consumer goods (Figure 32). All are leading commodity groups imported to Savannah as CTs or TEUs.

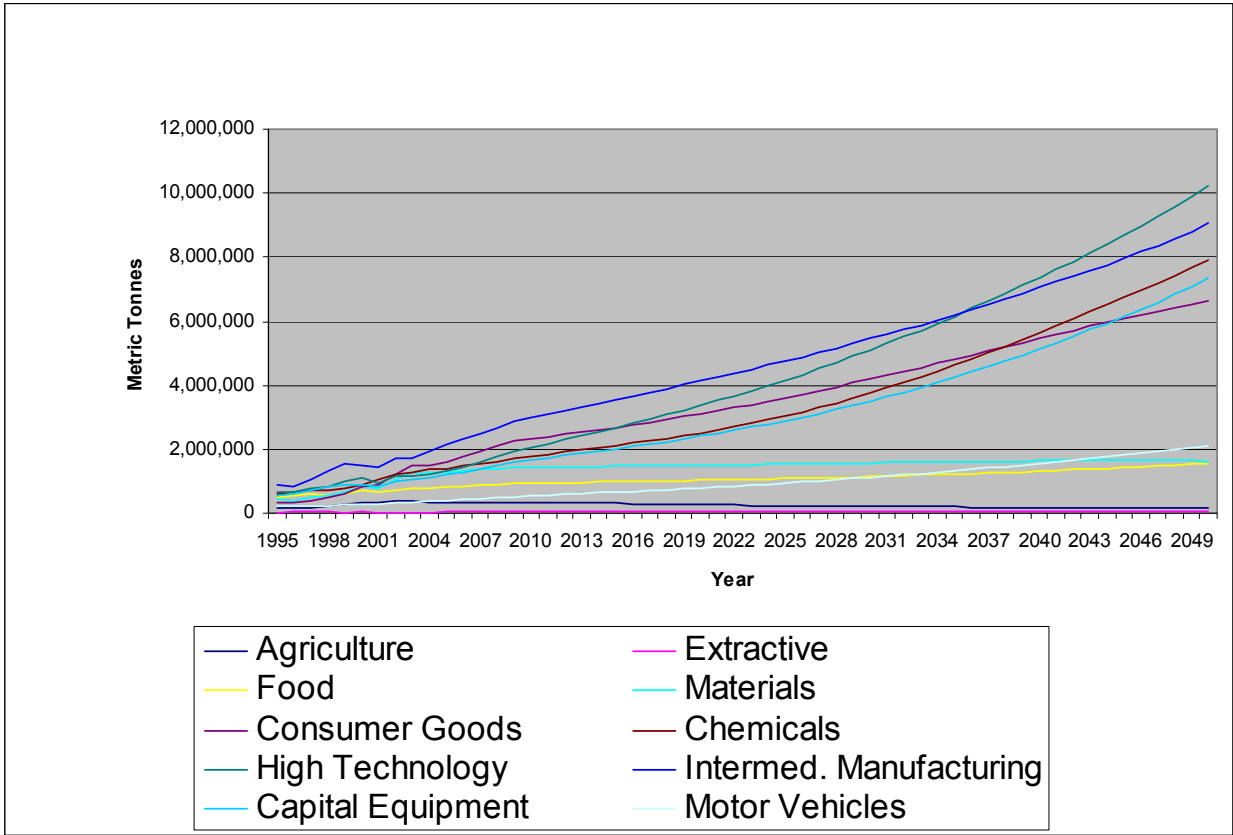
Subtotals for CT and TEU exports are similar to those of imports (figures 33 and 34).



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

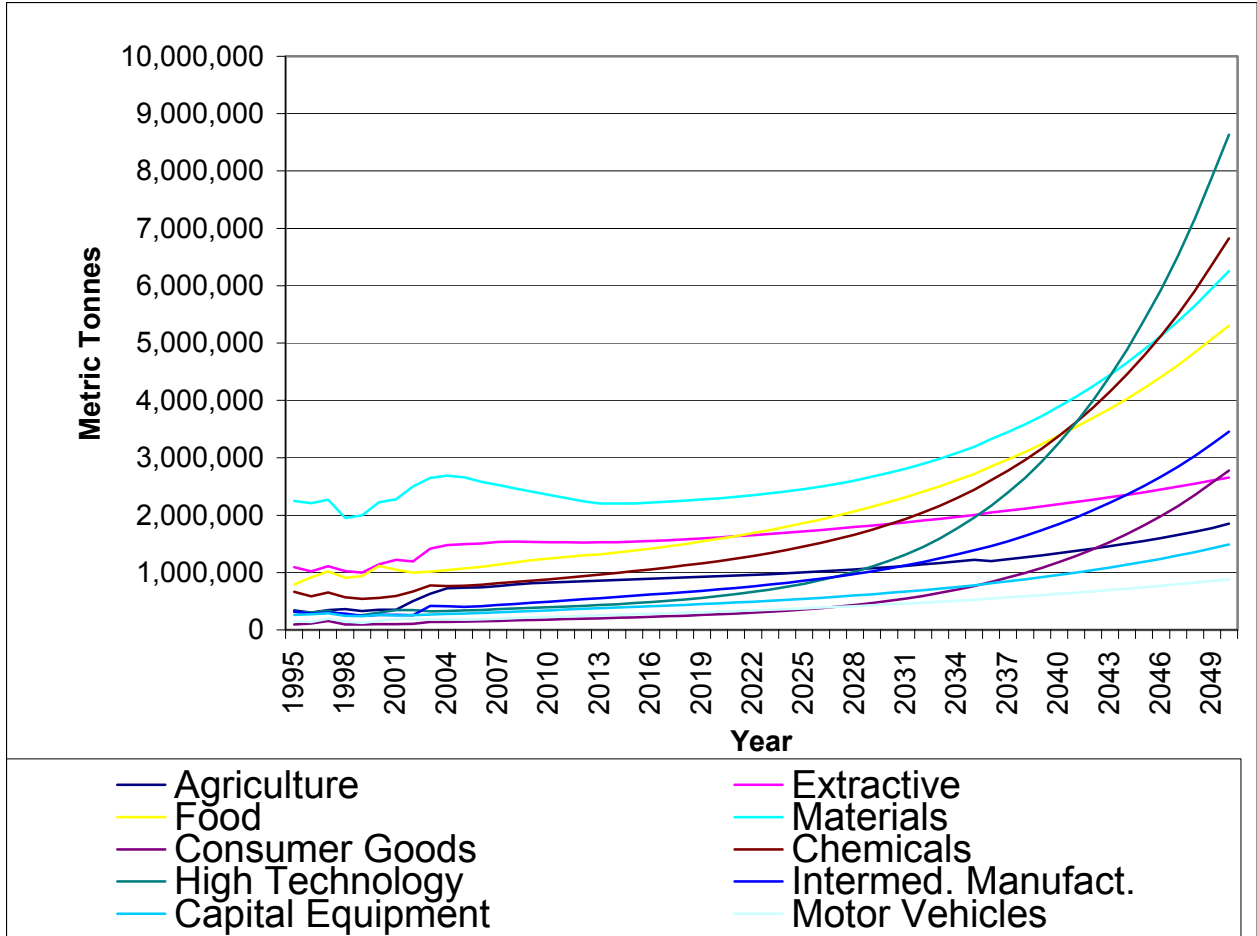
Figure 31. TEUs of Imports for Selected/Combined Trade Routes, by Commodity, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

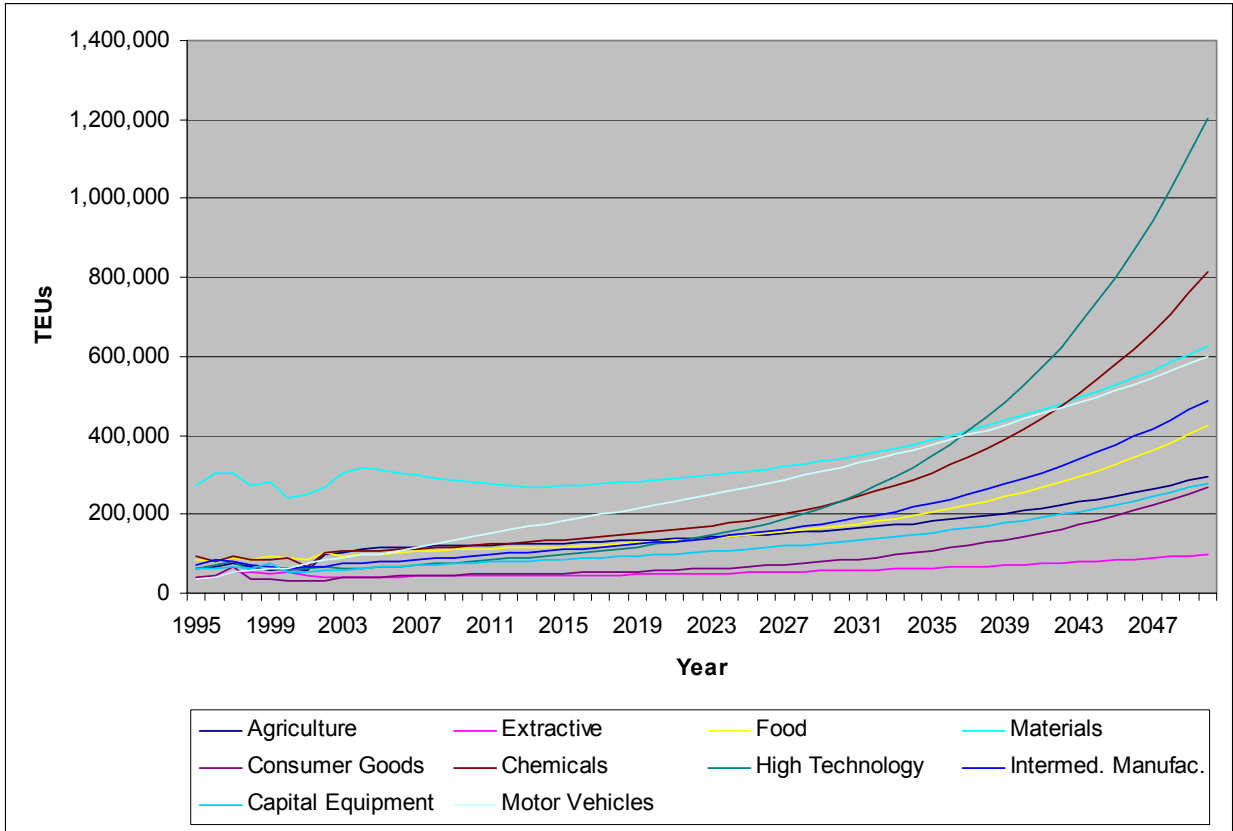
Figure 32. CTs of Imports for Selected/Combined Trade Routes, by Commodity, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 33. CTs of Exports for Selected/Combined Trade Routes, by Commodity, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

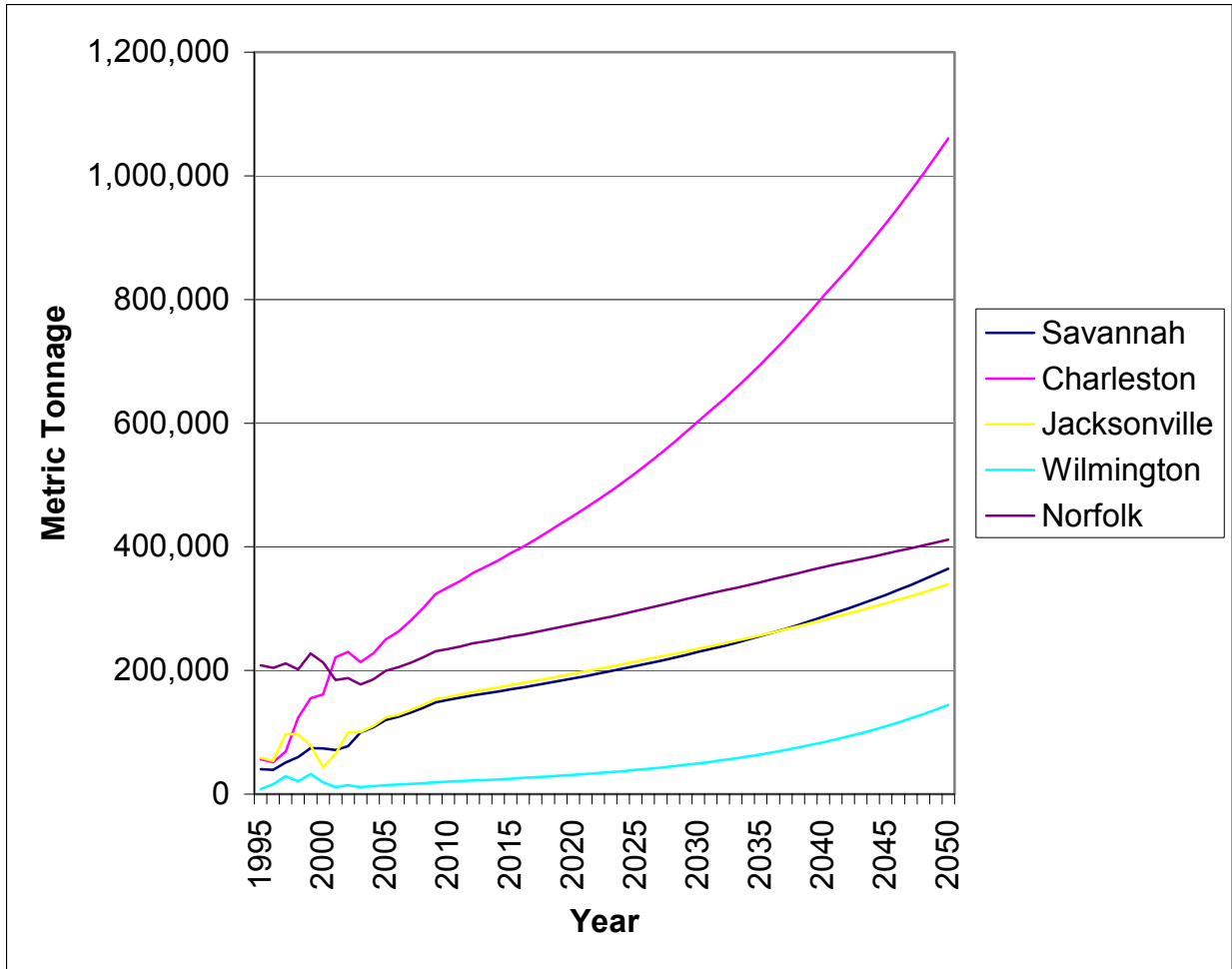
Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 34. TEUs of Exports for Selected/Combined Trade Routes, by Commodity, 1995-2050

CHARLESTON

Charleston has three main container terminals. In the unconstrained forecast that follows, Charleston has more of an importing focus in 2050 than in 2005.

Based on the unconstrained forecast, Charleston is projected to be the leader in 2050 CT imports from the Middle East/Mediterranean (Figure 35).

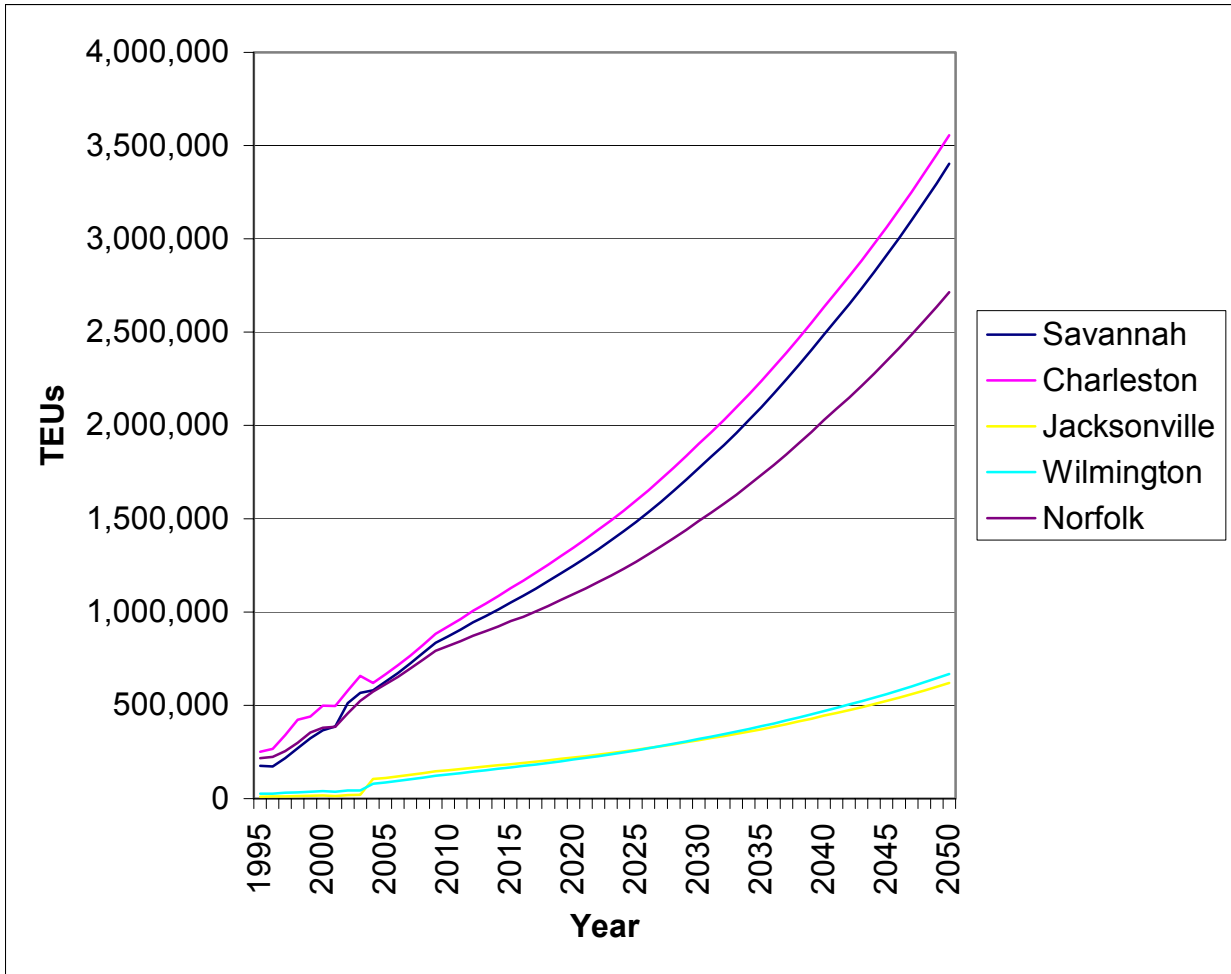


Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 35. CTs of Imports to South Atlantic Ports from Middle East/Mediterranean, 1995-2050

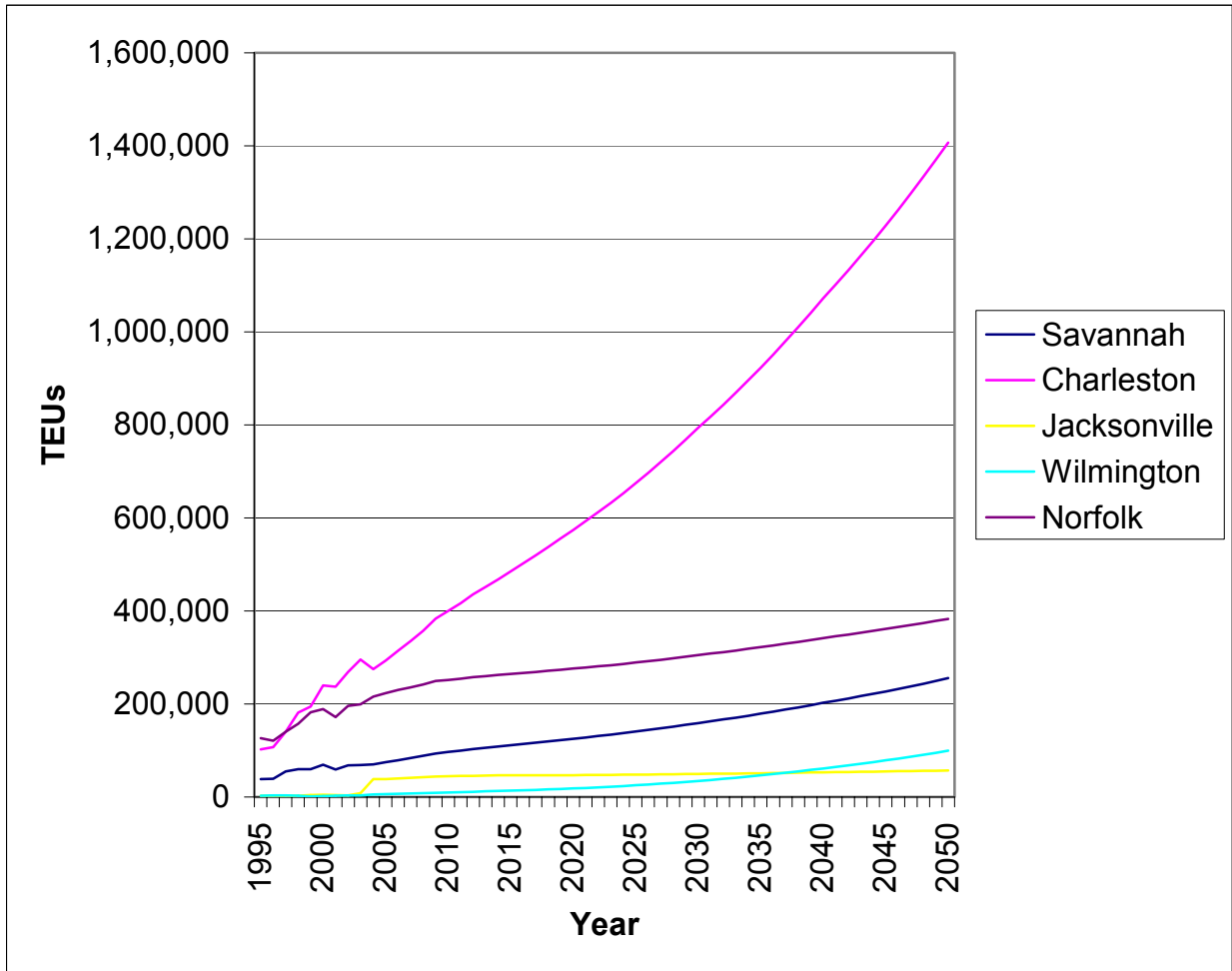
Charleston will control the largest share of imported TEUs (Figure 36). As trade with Europe and the Middle East/Mediterranean increases, the largest percentage of subtotals among the five South Atlantic ports will be registered by Charleston (figures 36, 37, and 38). TEU imports from Europe will be dominated by Charleston. The subtotals for imported TEU volumes will be competitive with Savannah and, to a lesser degree, Norfolk.



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

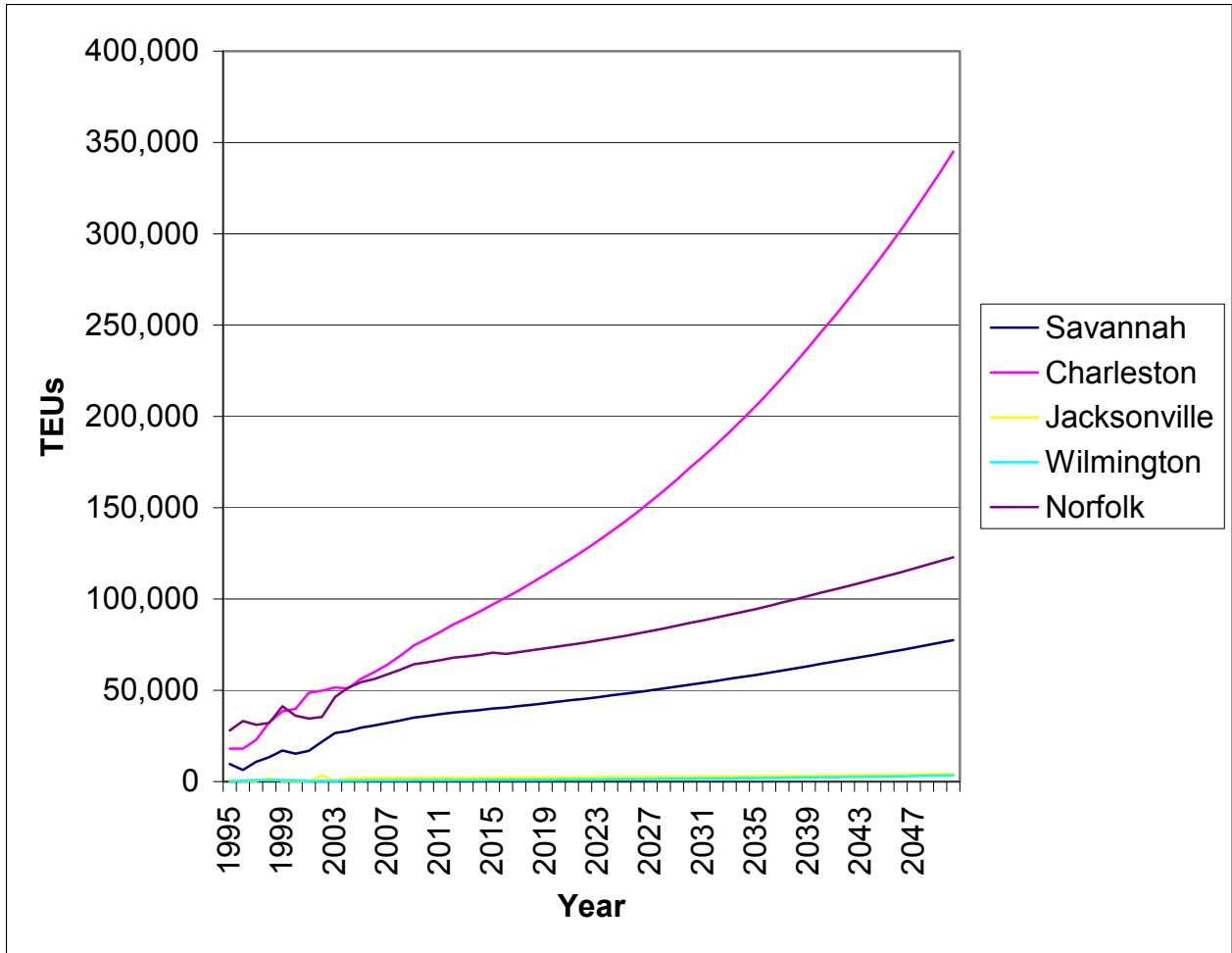
Figure 36. TEUs of Imports to Selected South Atlantic Ports, by South Atlantic Ports, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 37. TEUs of Imports to South Atlantic Ports from Europe, 1995-2050

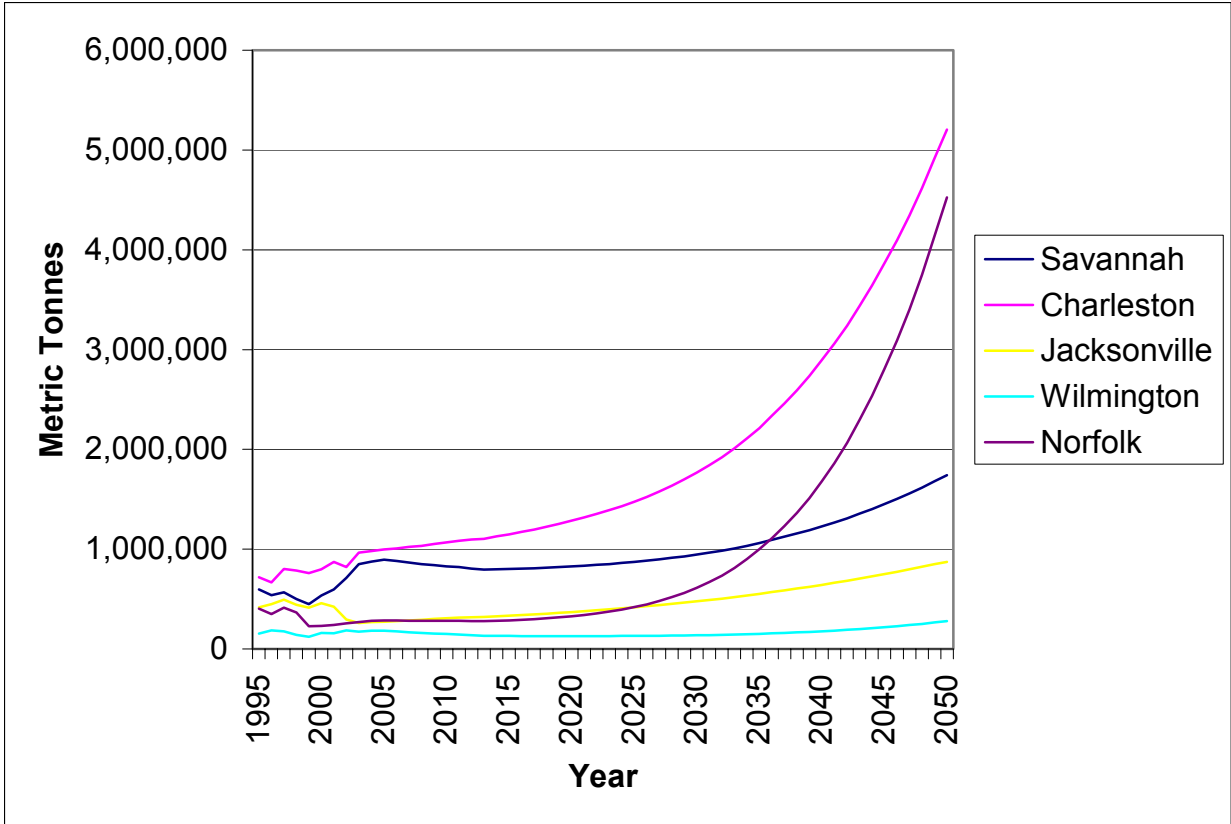


Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 38. TEUs of Imports to South Atlantic Ports from Middle East/Mediterranean, 1995-2050

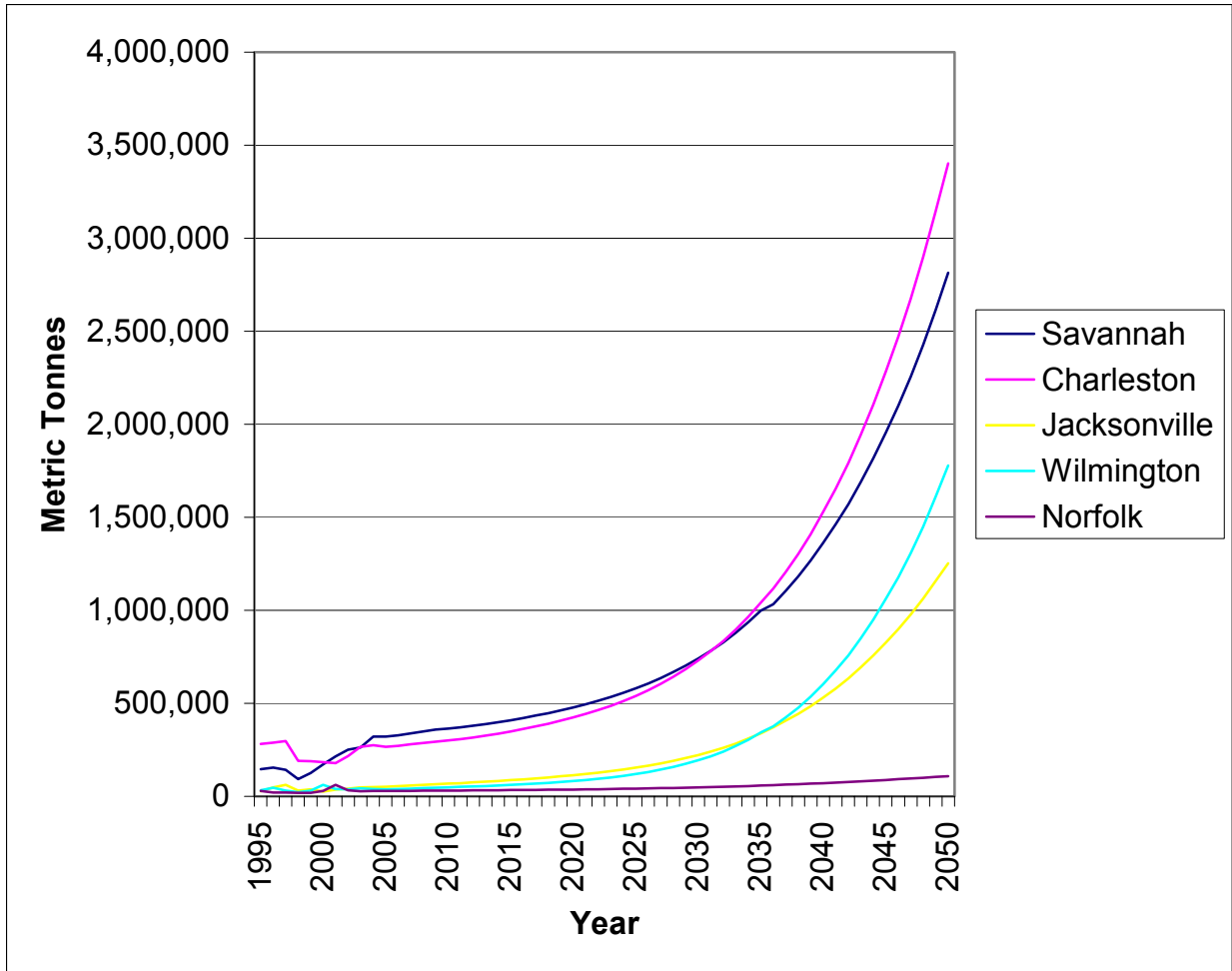
Charleston is projected to capture the largest share of CT export volumes to Europe, India/SE Asia, and Middle East/Mediterranean and the largest percentage of the subtotals (figures 39, 40, 41, and 42). The unconstrained forecast also indicates that Charleston will have the same market share for exported TEU world regions as exported CT world regions.



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

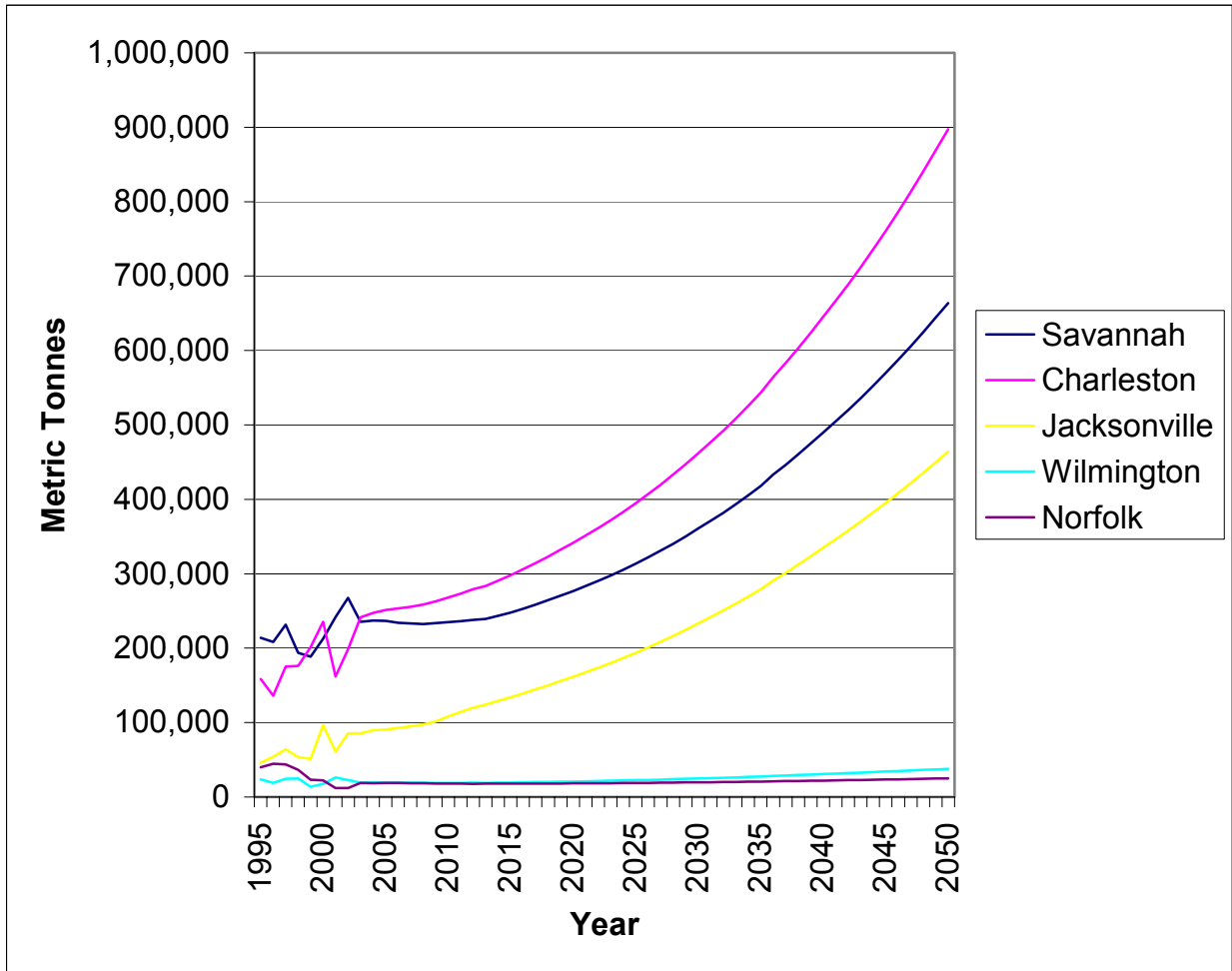
Figure 39. CTs of Exports from South Atlantic Ports to Europe, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

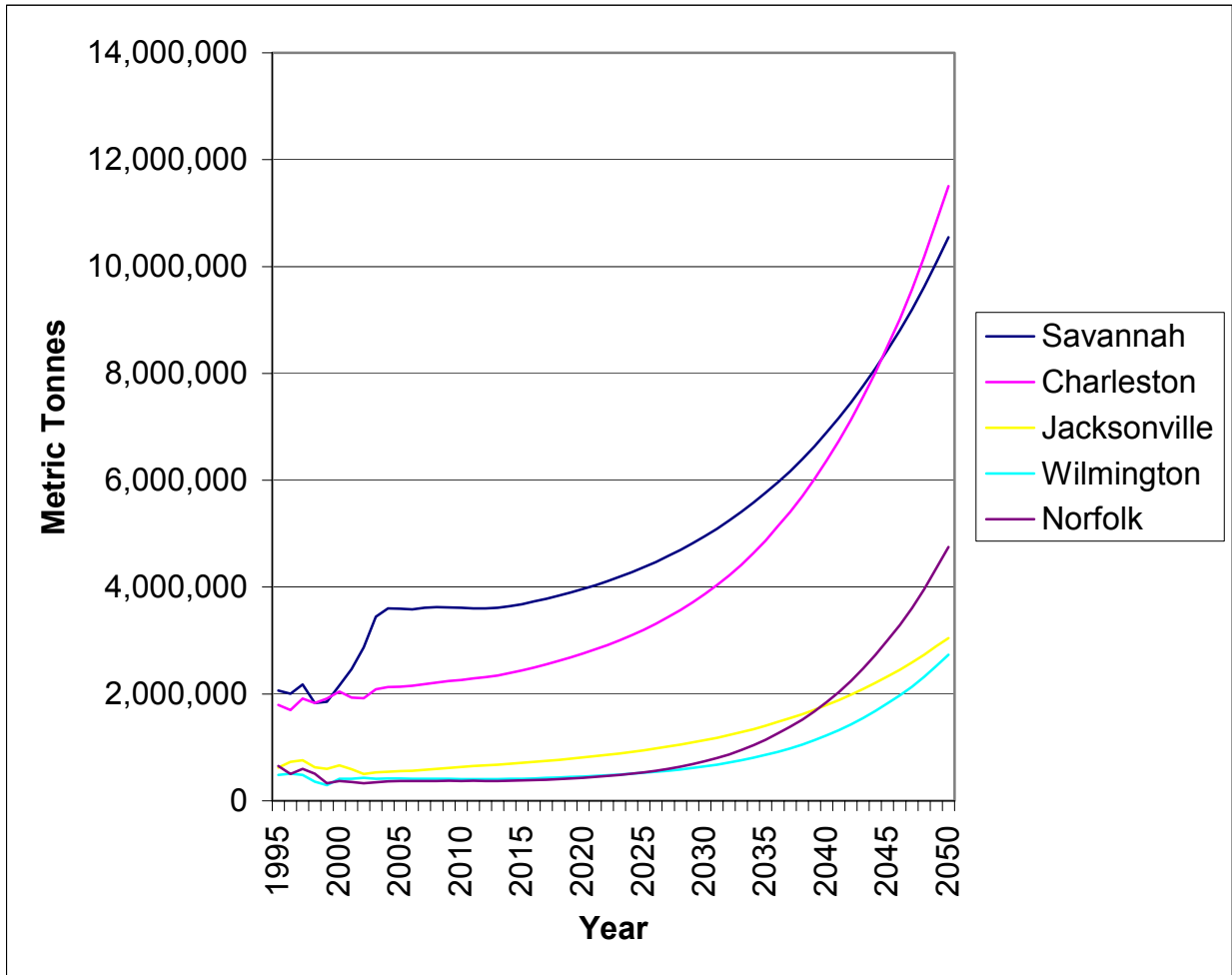
Figure 40. CTs of Exports from South Atlantic Ports to India/South East Asia, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 41. CTs of Exports from South Atlantic Ports to Middle East/Mediterranean, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 42. CTs of Exports for Selected/Combined Trade Routes, by South Atlantic Ports, 1995-2050

Based on the unconstrained forecast, Charleston is projected to be the leading South Atlantic port in terms of some commodity groups. The leading commodities in CT import volume will include materials, intermediate manufacturing, and motor vehicles. The leading commodity groups in TEU import volume will include materials and motor vehicles. In the year 2050, high technology should be the greatest CT import commodity group to the South Atlantic ports, followed by intermediate manufacturing, chemicals, capital equipment, and consumer goods (see

Figure 32). Imported TEU volumes will be similar, except that consumer goods will be replaced by motor vehicles in the top five commodity groups (see Figure 31).

Based on the unconstrained forecast, Charleston is projected to be the leading CT exporter in chemicals, intermediate manufacturing, and motor vehicles and the leading TEU exporter in the same commodities with the addition of capital equipment. In terms of the subtotals, the top five CT export commodity groups in 2050 are projected to be high technology, chemicals, materials, food, and intermediate manufacturing. The top five TEU export commodity groups are projected to be high technology, chemicals, materials, motor vehicles, and intermediate manufacturing.

JACKSONVILLE

Jacksonville has two major container and general cargo terminals, Blount Island and Talleyrand, with both receiving various shipments of container, RoRo, bulk, and multi-cargo types. The unconstrained forecast indicates that Jacksonville is projected to become a major South Atlantic port in imported CT volumes from Europe (Figure 43) other than Charleston.

Jacksonville is expected to develop niches in extractives and chemicals. Chemicals will have a large impact on the exports and imports of commodities by the five South Atlantic ports. Jacksonville is predicted to occupy a chemicals niche on the basis of imported CT volumes (Figure 44) and extractives (Figure 45). However, extractives will not be one of the top five commodity groups in the future.

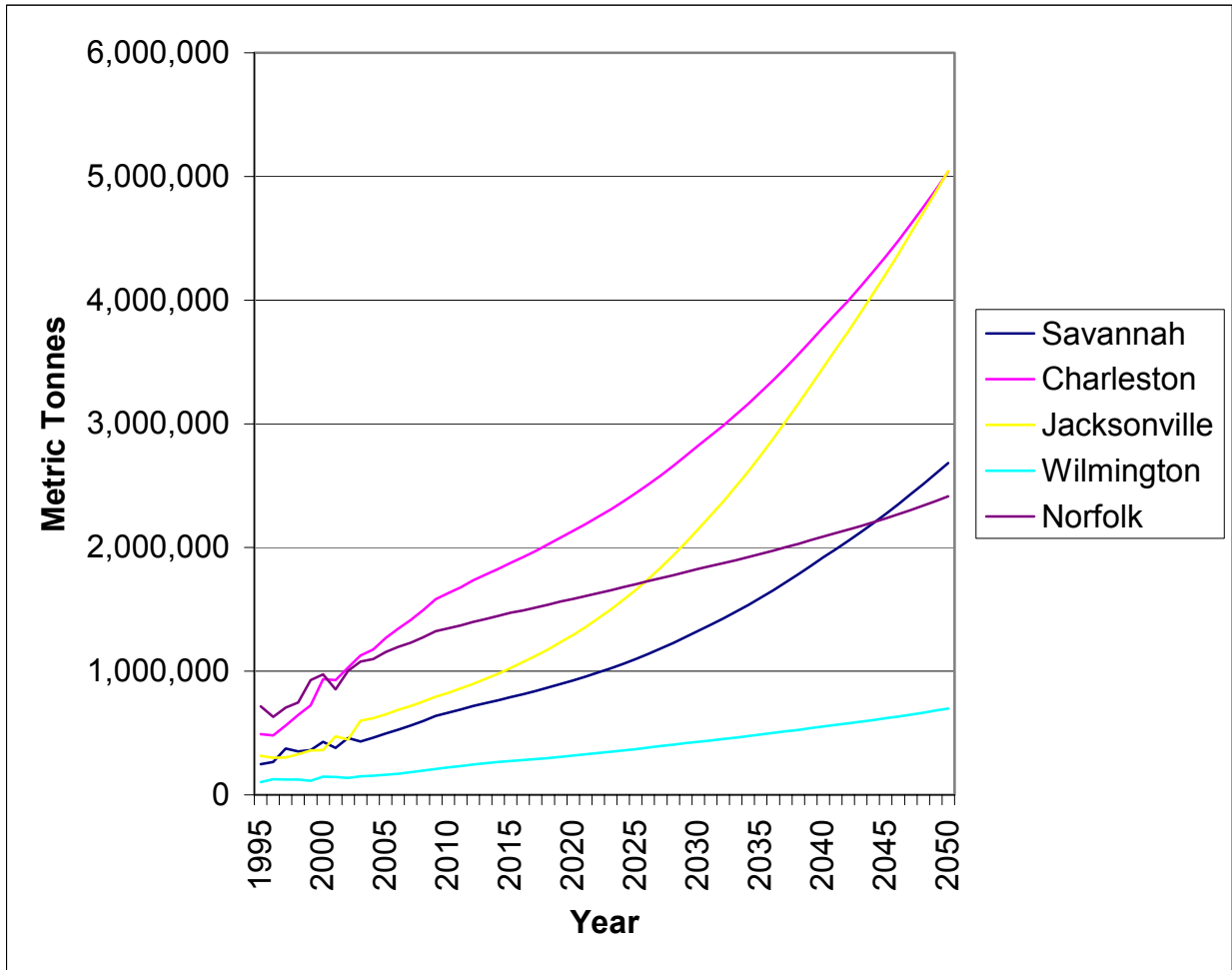
WILMINGTON

The Port of Wilmington has one main terminal and provides facilities for containerized, bulk, and breakbulk cargoes. Wilmington has the lowest container volume of the five South Atlantic ports. The unconstrained forecast indicates that Wilmington is projected to establish a niche in export CT and TEU volumes for high technology (figures 46 and 47). As indicated in figures 33 and 34 above, high technology should have the highest volume of any exported and imported commodity group for the South Atlantic ports.

NORFOLK

Norfolk is part of Hampton Roads, which includes Portsmouth and Newport News. These three terminals are responsible for a large percentage of the trade volume of the South Atlantic ports. Hampton Roads, like the other four ports, is centrally located for commercial traffic to numerous metropolitan regions of the United States.

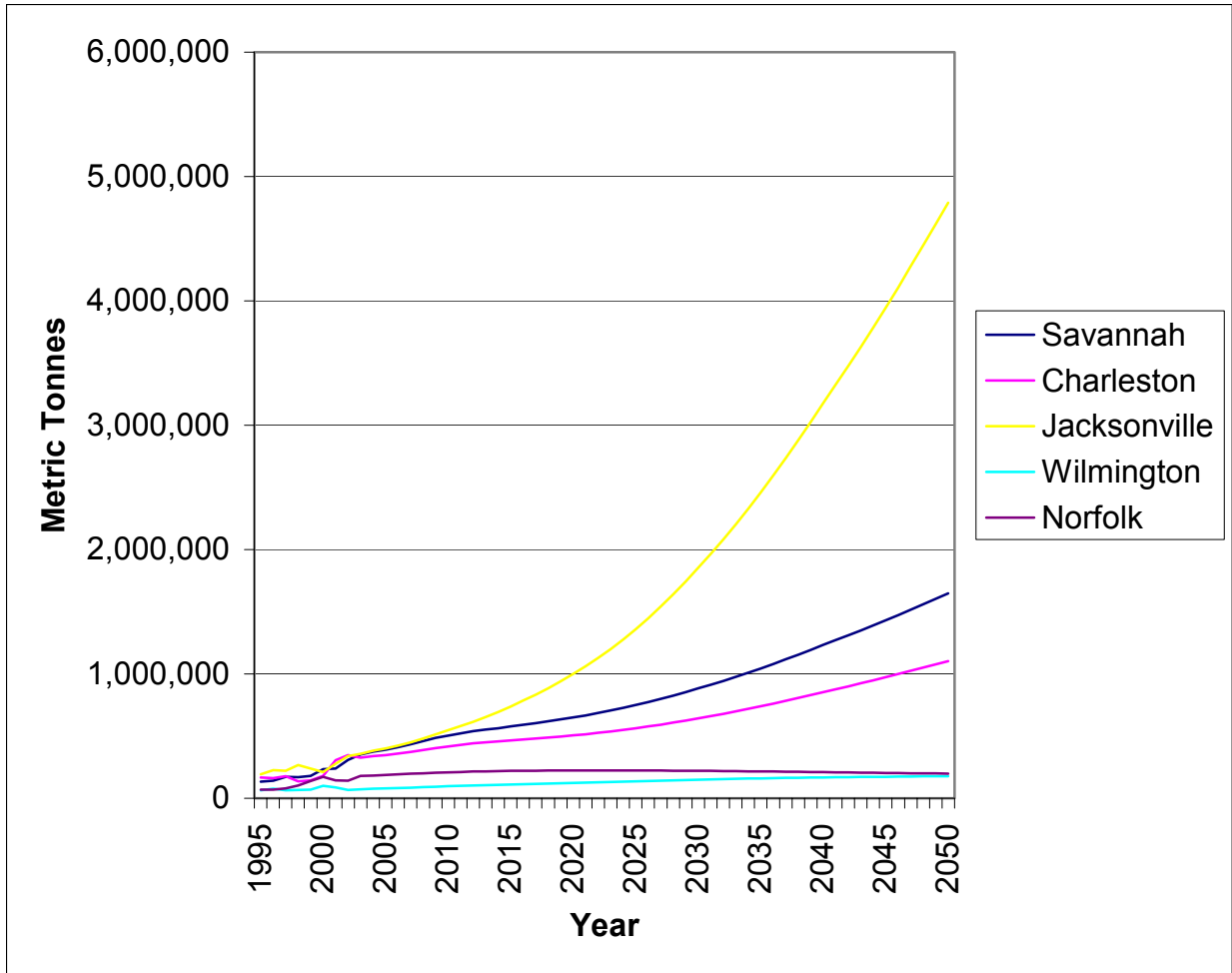
The unconstrained forecast indicates that Norfolk will have the highest percentage market share of CT and TEU volumes for the India/SE Asia region. Nearly 1,700,000 CTs are projected to be imported to Norfolk from this world region, with Charleston close behind. This is not the region with the highest volume of trade to Norfolk, but rather the region where Norfolk has the largest trade volume relative to the other four South Atlantic ports (Figure 48). Norfolk will also have the highest percentage of imported TEU volumes from this same world region (Figure 49).



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

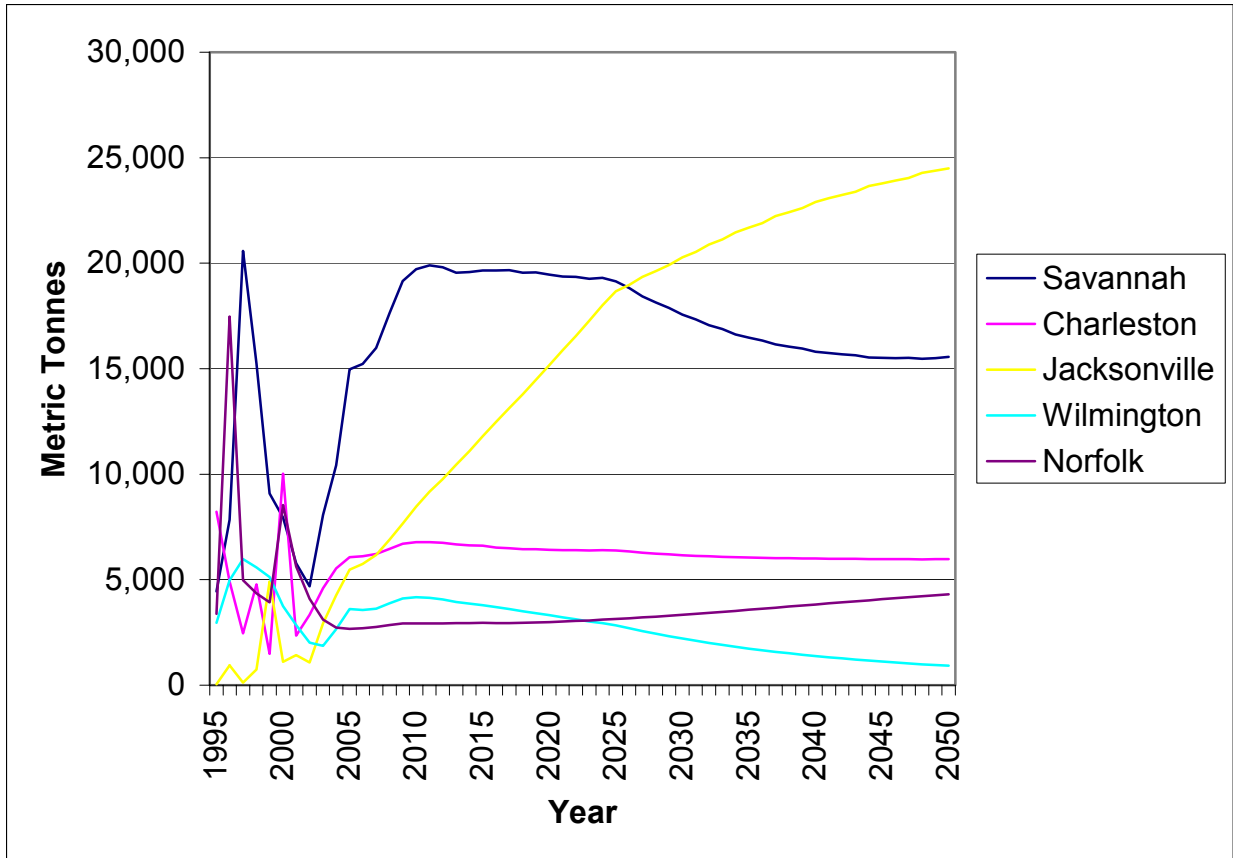
Figure 43. CTs of Imports to South Atlantic Ports from Europe, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

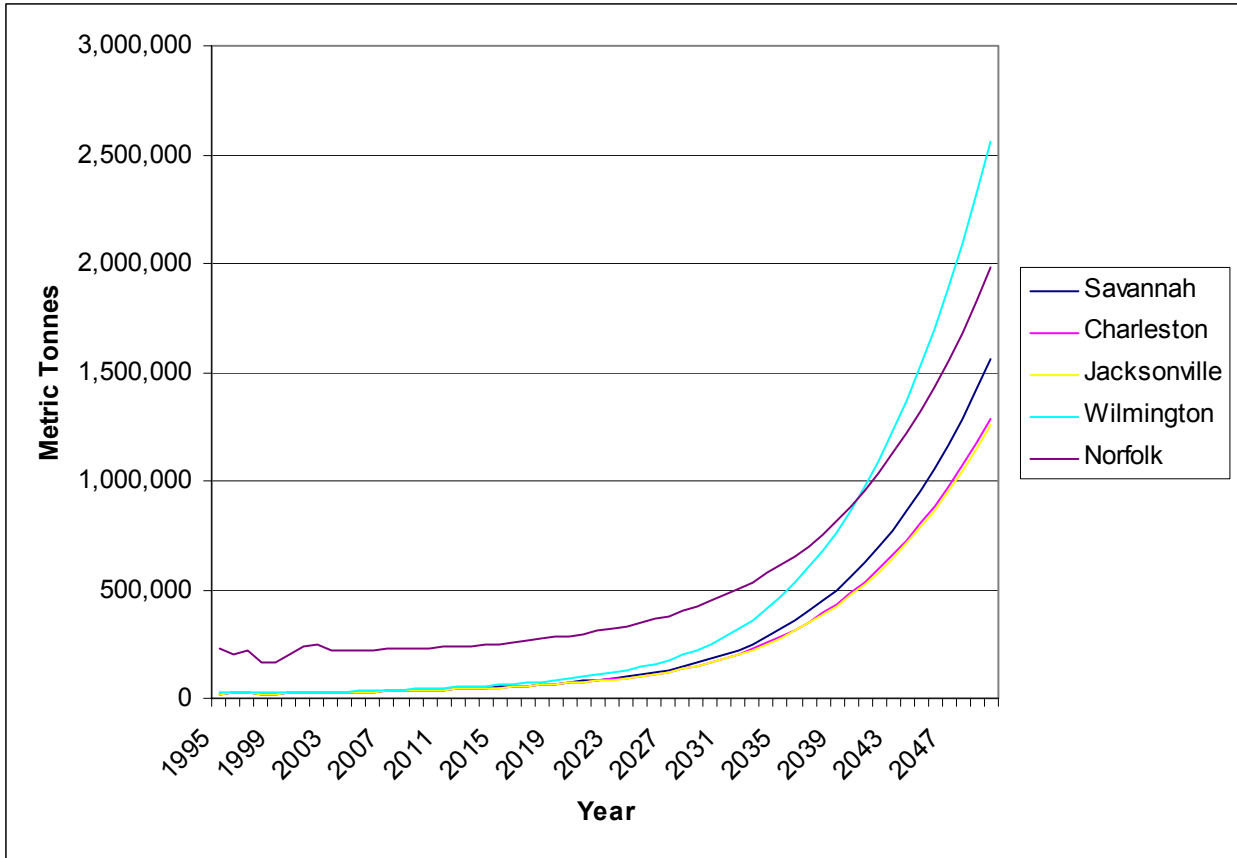
Figure 44. CTs of Imports for Selected Commodities, Chemicals, by South Atlantic Ports, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

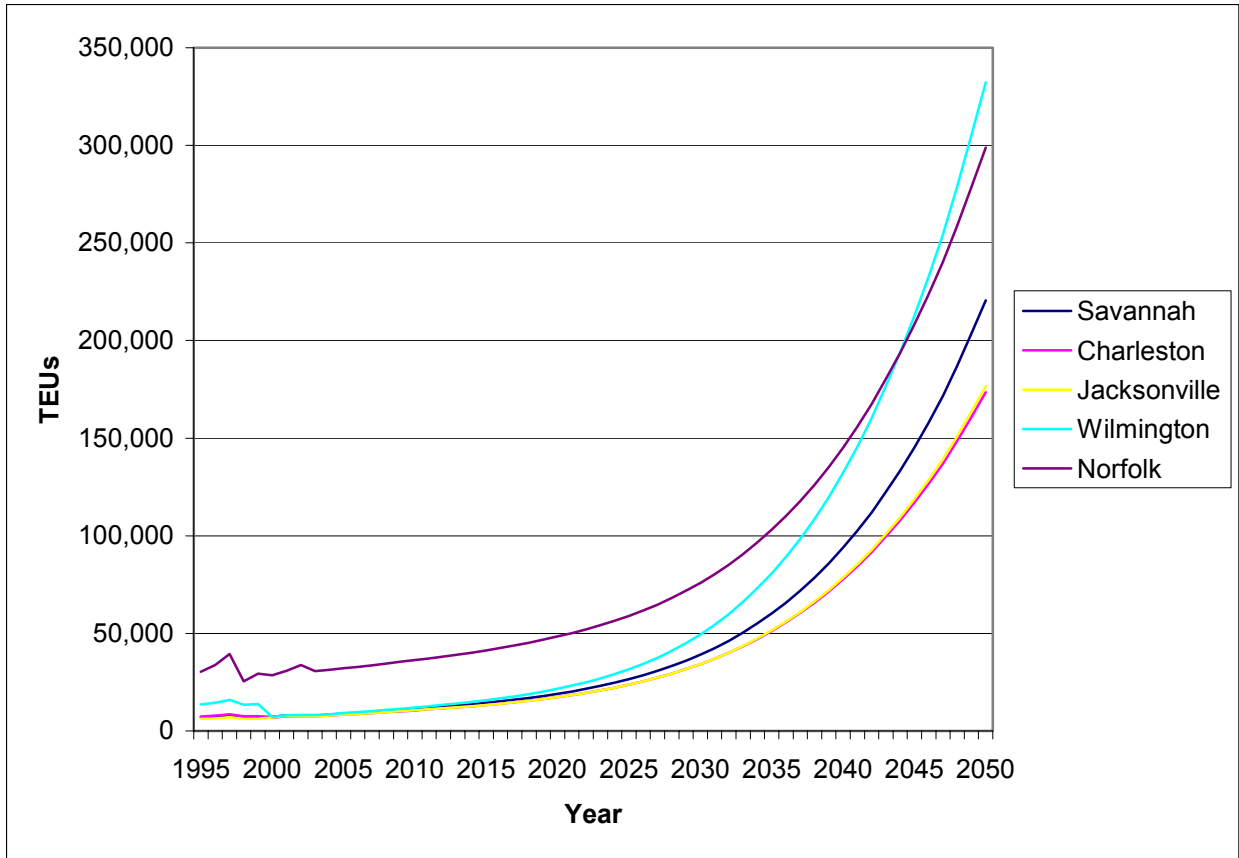
Figure 45. CTs of Imports for Selected Commodities, Extractives, by South Atlantic Ports, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

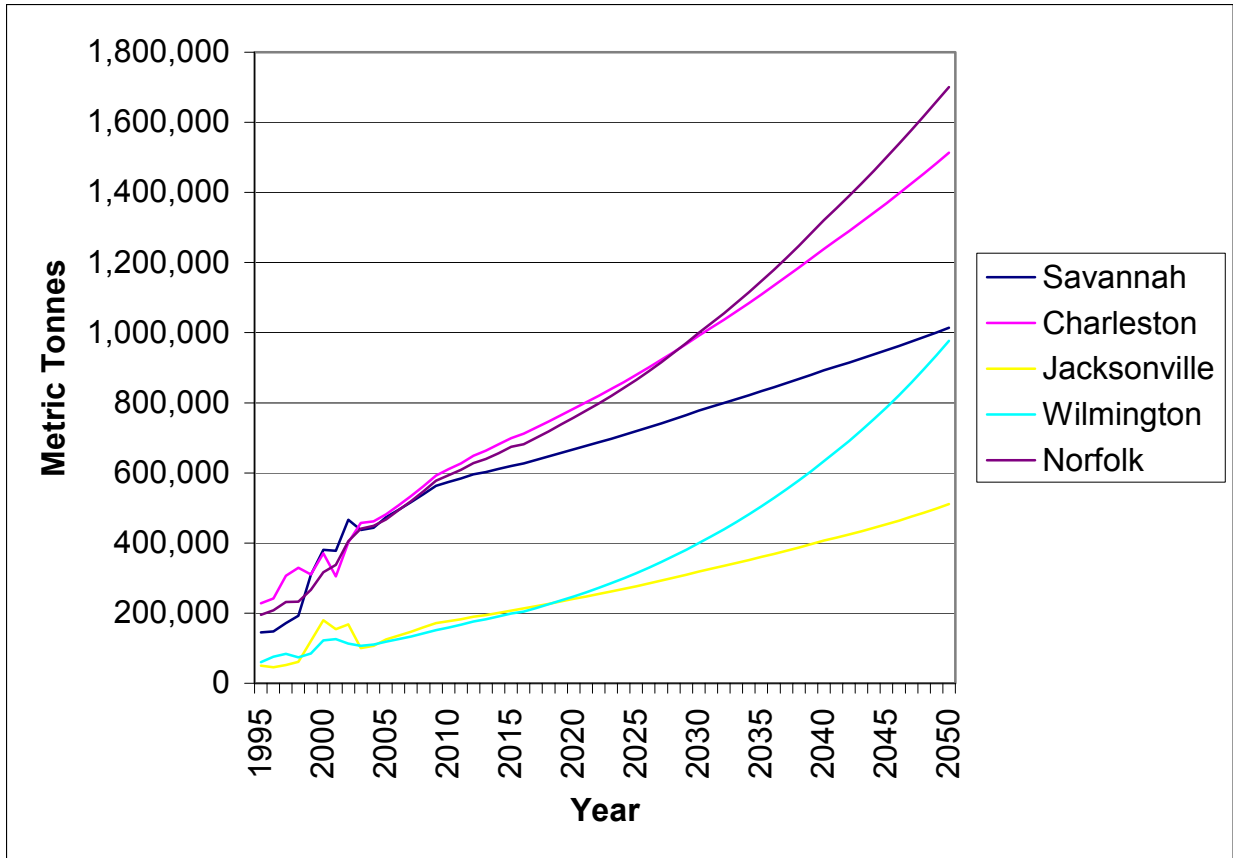
Figure 46. CTs of Exports for Selected Commodities, High Technology, by South Atlantic Ports, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

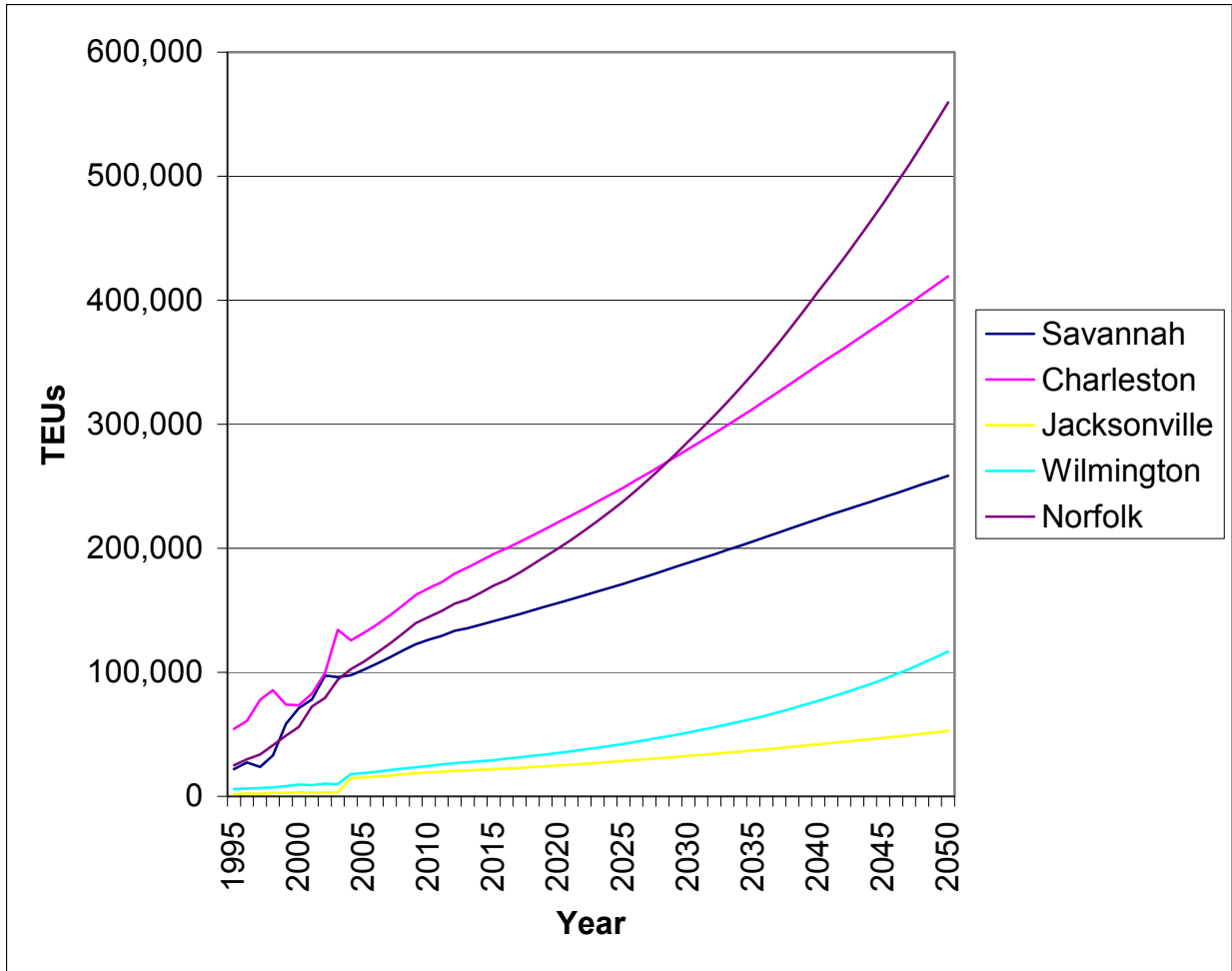
Figure 47. TEUs of Exports for Selected Commodities, High Technology, by South Atlantic Ports, 1995-2050



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 48. CTs of Imports to South Atlantic Ports from India/South East Asia, 1995-2050

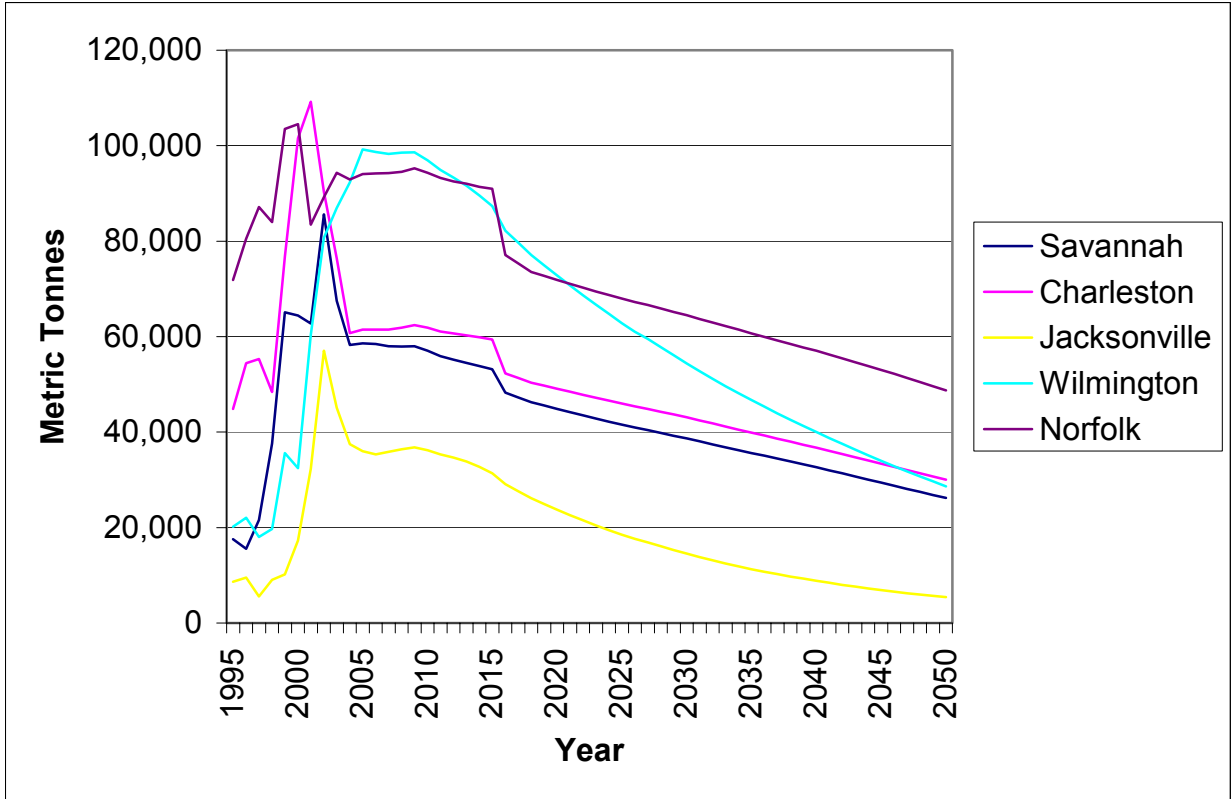


Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 49. TEUs of Imports to South Atlantic Ports from India/South East Asia, 1995-2050

Norfolk is expected to be dominant in the agriculture trade, but agricultural volumes are expected to decline over the 50-year period (Figure 50).



Notes: The commodity forecasts are “unconstrained” by any consideration of port capacity, investment, etc.

Sources: Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Commodity Projections (2004); and G.E.C., Inc.

Figure 50. CTs of Imports for Selected Commodities, Agriculture, by South Atlantic Ports, 1995-2050

Based on the unconstrained forecast, Norfolk is expected to be the leader in CT imports for agriculture, food, consumer goods, and high technology. In addition, they should be strong TEU importers of agriculture, extractive, and food.

Norfolk should have control over the materials CT export market among the South Atlantic ports, along with agriculture, food, and consumer goods. Norfolk should also be dominant in TEU exports for agriculture, extractive, food, and materials.

VII. VESSEL FLEET COMPOSITION OF SOUTH ATLANTIC PORTS (Task 4)

This section describes the major lines/services that apply to the economic study area and the general sizes (TEU) of the container vessels calling at the ports of Norfolk, Charleston, Wilmington, and Jacksonville. This information will be used to compile vessel fleet costs, which will be developed using the applicable types and sizes from Savannah Harbor (Table 11) for the four competing ports. In addition, the port costs (all related expenses such as pilotage, tug assistance, wharfage and dockage) will be developed to include with voyage distances and cost for major trade routes.

The general sizes of the container vessels for the major lines/services applicable to the economic study area are based on the liner services and sailing schedules for each port and information taken from line websites. Most, but not all, line websites provide descriptions of their vessels by service and schedule.

NORFOLK

The Virginia Port Authority owns Norfolk International Terminal, Newport News Marine Terminal, and Portsmouth Marine Terminal. The discussion is based on terminal schedules from the end of June through July 2005.

Europe and the Far East, along with India, make up the largest percentage of world regions calling on these terminals. In these two large world regions P&O Nedlloyd is the most frequently calling shipline (Table 12). Based on a sample of 13 P&O Nedlloyd vessels calling Norfolk (Table 13), the average TEU capacity is 3,489. With respect to Europe, the lines P&O Nedlloyd, Hapag-Lloyd, and NYK occupy the services PAX (Pacific Atlantic Express, FE ECUS EU PEN) and GAX (Gulf Atlantic Express, EU ECUS/GULF). With respect to the Far East, the same lines plus OOCL occupy the service AEX (Asia East Coast Express, FE SUEZ ECUS PEN). A sample of three OOCL vessels calling Norfolk averaged 3,180 TEUs. A sample of 11 Hapag-Lloyd vessels calling Norfolk averaged 4,771 TEUs. These are the largest vessels relative to the other three major lines. A sample of three NYK vessels calling Norfolk, averaged 3,793 TEUs.

In the other world regions, P&O Nedlloyd calls the ports of Virginia from the Middle East, and HANJIN, Norasia, and United Arab sail from the Mediterranean regions in the MIX (Mediterranean India Express, ECUS MED) service.

Norfolk International Terminal (NIT) has a wide assortment of lines calling from the four world regions of Europe, the Far East, India, and the Mediterranean. P&O Nedlloyd and Hapag-Lloyd call on NIT the most each month, with Europe and Asia (Far East and India) as their main world region.

Table 12. Ports of Virginia Major Container Lines (June and July 2005)

Line	World Area	Service	CALLS
P&O Nedlloyd	EUROPE	ACX	Weekly
P&O Nedlloyd	EUROPE	NAX	Weekly
P&O Nedlloyd, Hapag-Lloyd, and NYK	EUROPE	PAX	Weekly
P&O Nedlloyd, Hapag-Lloyd, and NYK	EUROPE	GAX	Weekly
P&O Nedlloyd	EUROPE	FAMEX	Weekly
Hapag-Lloyd	EUROPE	ATA (Portsmouth)	Weekly
Hapag-Lloyd NYK, and OOCL	EUROPE	ATX	Weekly
Hapag-Lloyd	EUROPE	AMX	Weekly
Hapag-Lloyd	EUROPE	EMX	Weekly
Hapag-Lloyd	EUROPE	ESX	Weekly
Hapag-Lloyd	EUROPE	AEX	Weekly
EVERGREEN	EUROPE	NUE	Weekly
K LINE	EUROPE	TASCO 1	Weekly
HANJIN	EUROPE	NTA	Weekly
Wallenius Wilhelmsen	EUROPE	NORTH AMERICA - EUROPE	10 DAYS
Maersk and Yang Ming	EUROPE	TA1	Weekly
Maersk	EUROPE	TA2	Weekly
Atlantic Container	EUROPE	B	Weekly
Atlantic Container	EUROPE	J	Weekly
American President and Hyundai America	EUROPE	ATS	Weekly
American President	EUROPE	MGS	Weekly
Mitsui OSK	EUROPE	APX	Weekly
Mitsui OSK	EUROPE	NYX	Weekly
Yang Ming	EUROPE	GAS	Weekly
COSCO	EUROPE	TAS3	Weekly
P&O Nedlloyd, Hapag-Lloyd, NYK, and OOCL	FAR EAST	AEX	Weekly
P&O Nedlloyd, Hapag-Lloyd, and OOCL	FAR EAST	PAX	Weekly
P&O Nedlloyd	FAR EAST	CRX	Weekly
P&O Nedlloyd	FAR EAST	ECX	Weekly
P&O Nedlloyd	FAR EAST	ECN	Weekly
CMA-CGM, Hapag-Lloyd, and CP Ships (Lykes)	INDIA	INDAMEX	Weekly
Hapag-Lloyd	FAR EAST	ECN	Weekly
EVERGREEN and Hyundai America	ASIA	NUE	Weekly
EVERGREEN	FAR EAST	NYK	Weekly
K LINE	FAR EAST	NATCO 4	Weekly
HANJIN and United Arab	FAR EAST	AWH	Weekly
HANJIN	FAR EAST	AWK	Weekly
HANJIN	FAR EAST	ICA*	Weekly
Wallenius Wilhelmsen	FAR EAST	ASIA - NORTH AMERICA	10 DAYS
NYK and OOCL	FAR EAST	ECS	Weekly
ZIM	FAR EAST	COS	Weekly
ZIM	FAR EAST	ECA	Weekly
Maersk	FAR EAST	TP3	Weekly
Maersk	FAR EAST	SZX (SUEZ ROUTE)	Weekly
Safmarine	FAR EAST	TP3	Weekly
American President	ASIA	IAX (INDIA)	Weekly
American President	FAR EAST	NYX	Weekly
American President	FAR EAST	APX (outbound from Norfolk)	Weekly

Table 12. Ports of Virginia Major Container Lines (June and July 2005)

Line	World Area	Service	CALLS
Hyundai America	FAR EAST	NYX	Weekly
Yang Ming	FAR EAST	AW1	Weekly
Yang Ming	FAR EAST	AW4	Weekly
COSCO	FAR EAST	AWE4	Weekly
P&O Nedlloyd	MIDDLE EAST	LOOP 5 JEBEL ALI and JEDDAH	Weekly
P&O Nedlloyd	MIDDLE EAST	AGX	Weekly
P&O Nedlloyd	MIDDLE EAST	APEX EAST	Weekly
EVERGREEN	MIDDE EAST	MECL	Weekly
Natl Ship Co of Saudi Arabia	MIDDLE EAST	WESTBOUND	Bi Monthly
CMA-CGM	MED	Amerigo	Weekly
Hapag-Lloyd	MED	AEX	Weekly
EVERGREEN	MED	MUS	Weekly
K LINE	MED	TASCO 3	Weekly
K LINE	MED	TASCO 4	Weekly
HANJIN, Norasia, and United Arab	MED	MIX	Weekly
TURKON	MED	USA LINE	8 DAYS
Mediterranean Shipping	MED	North Atlantic	Weekly
Maersk	MED	MED/GULF	Weekly
Maersk	MED	MECL	Weekly
Yang Ming	MED	TA3	Weekly
CMA-CGM and Norasia	RTW	RTW	Weekly
Hyundai America	RTW	APX	Weekly
Hamburg SUD NA	AUSTRALIA/NEW ZEALAND	AANZ (Eastbound)	Weekly
Australian National		Assume bi weekly b/c bi weekly in Savannah	Bi weekly
Gorthon			

Source: G.E.C., Inc., based on shipline websites.

Table 13. Norfolk International Terminal's Leading Lines and Their Vessels

P&O Nedlloyd	Hapag-Lloyd
P&O Nedlloyd Genoa	Tokyo Express
P&O Nedlloyd Caribbean	London Express
P&O Nedlloyd Jakarta	Bremen Express
P&O Nedlloyd Delft	New York Express
P&O Nedlloyd Detroit	Paris Express
P&O Nedlloyd Cartagena	Kobe Express
Enterprise	Singapore Express
P&O Nedlloyd Sydney	Rotterdam Express
P&O Nedlloyd Barossa Valley	Essen Express
P&O Nedlloyd Seattle	Antwerpen Express
Newport Bay	Hannover Express
Jervis Bay	
Endurance	

Source: G.E.C., Inc., based on shipline websites.

Maersk-Sealand calls at the Portsmouth Marine Terminal (PMT). Two vessels (Sealand Pride and Maersk Missouri) calling from Maersk-Sealand averaged 4,109 TEUs. At this terminal, Maersk-Sealand serves the world regions of Europe, Far East, and Mediterranean, with Hyundai American calling PMT to a lesser degree, followed by the other lines.

The third terminal, Newport News Marine Terminal (NNMT), is called most frequent by the Norasia shipline, with the services MIX and RTW (Round The World) all provided on a weekly basis. Mediterranean is the most often called world region at this terminal.

CHARLESTON

This port has three container terminals. Wando Welsh is the most frequently called terminal in Charleston, with most of its calls coming from Europe and, to a slightly less extent, the Caribbean, followed by the Far East and Mediterranean (Table 14).

Table 14. Port of Charleston Major Container Lines (January and February 2005)

Line	Service	World Area	Calls
APL	IAX	Asia - Indian Ocean	Weekly
China Shipping Container Lines, Gold Star Line, Norasia, and Zim	RTW	Asia - Indian Ocean	Weekly
CMA-CGM, Contship, Hapag-Lloyd, Lykes, MacAndrews, and Shpg Corp. of India	INDAMEX	Asia - Indian Ocean	Weekly
Evergreen and Maersk-Sealand	MECL	Asia - Indian Ocean	Weekly
MSC	Unknown	Asia - Indian Ocean	Weekly
P&O Nedlloyd	NSX	Asia - Indian Ocean	Weekly
Safmarine	USEC EXP	Asia - Indian Ocean	Weekly
APL and Hyundai	APX	Asia - Pacific	Weekly
China Shipping Container Lines, Evergreen, Gold Star Line, Norasia, and Zim	RTW	Asia - Pacific	Weekly
COSCO and Yang Ming	AWE 2	Asia - Pacific	Weekly
Hanjin	AWC	Asia - Pacific	Weekly
Hapag-Lloyd, NYK, OOCL, and P&O Nedlloyd	ECS	Asia - Pacific	Weekly
Hatsu Marine	NUE	Asia - Pacific	Weekly
K Line	NATCO-1	Asia - Pacific	Weekly
Lloyd Triestino	NUE	Asia - Pacific	Weekly
Maersk-Sealand	TP3	Asia - Pacific	Weekly
Maersk-Sealand	TP7	Asia - Pacific	Weekly
MOL	CNY/APX	Asia - Pacific	Weekly
MSC and Safmarine	Unknown	Asia - Pacific	Weekly
MSC	Unknown	Australia - New Zealand	Weekly
Alianca, APL, Hamburg Sud, and P&O Nedlloyd	Samba	Caribbean	Weekly
APL and Hyundai	APX	Caribbean	Weekly
CCNI, CMA-CGM, and CSAV	Americas	Caribbean	Weekly
China Shipping Container Lines, Gold Star Line, Norasia, and Zim	RTW	Caribbean	Weekly
CMA-CGM	TAS	Caribbean	Weekly
CMA-CGM	AMBRE	Caribbean	Weekly
Evergreen and Lloyd Triestino	NUE	Caribbean	Weekly
Hapag-Lloyd, NYK, OOCL, P&O Nedlloyd	ECS	Caribbean	Weekly
Libra, Montemar, and Safmarine	Unknown	Caribbean	Weekly
Lykes	USEC-ECSA2	Caribbean	Weekly
Maersk-Sealand, MSC, and Safmarine	AMEX	Caribbean	Weekly
Maersk-Sealand	Rumba	Caribbean	Weekly
Maersk-Sealand	TP3	Caribbean	Weekly

Table 14. Port of Charleston Major Container Lines (January and February 2005)

Line	Service	World Area	Calls
Maersk-Sealand and MOL	CNY/APX	Caribbean	Weekly
MSC	S Atlantic	Caribbean	Weekly
MSC	Arg Exp	Caribbean	Weekly
TMM	Atl-Ams2	Caribbean	Weekly
ACL	F	Europe - Atlantic	Weekly
ACL	N	Europe - Atlantic	Weekly
APL, Hapag-Lloyd, and Hyundai	APX	Europe - Atlantic	Weekly
APL, Hyundai, and MOL	ATS	Europe - Atlantic	Weekly
Atlanticargo and Star Shipping	Unknown	Europe - Atlantic	10 days
China Shipping Container Lines, Gold Star Line, Norasia, and Zim	RTW	Europe - Atlantic	Weekly
CMA-CGM	TAS	Europe - Atlantic	Weekly
CMA-CGM	TA4	Europe - Atlantic	Weekly
COSCO, Hanjin, K Line, and Yang Ming	TAS 1	Europe - Atlantic	Weekly
Evergreen and Lloyd Triestino	NUE	Europe - Atlantic	Weekly
Hapag-Lloyd, NYK, OOCL, and P&O Nedlloyd	GAX	Europe - Atlantic	Weekly
Hapag-Lloyd and OOCL	GMX	Europe - Atlantic	Weekly
Lykes and TMM	GASS 1	Europe - Atlantic	Weekly
Lykes and TMM	GASS 2	Europe - Atlantic	Weekly
Lykes and TMM	GASS 3	Europe - Atlantic	Weekly
Maersk-Sealand	TA1	Europe - Atlantic	Weekly
Maersk-Sealand	TA2	Europe - Atlantic	Weekly
MOL	CNY/APX	Europe - Atlantic	Weekly
MSC	S Atlantic	Europe - Atlantic	Weekly
NYK and OOCL	ATX/SGX	Europe - Atlantic	Weekly
P&O Nedlloyd	MAX	Europe - Atlantic	Weekly
P&O Nedlloyd	SGX	Europe - Atlantic	Weekly
Zim	AUE	Europe - Atlantic	Weekly
APL	IAX	Mediterranean	Weekly
APL	MDX	Mediterranean	Weekly
APL	MGS	Mediterranean	Weekly
China Shipping Container Lines, Gold Star Line, Norasia, and Zim	RTW	Mediterranean	Weekly
CMA-CGM, Contship, Hapag-Lloyd, Lykes, MacAndrews, and Shpg Corp. of India	INDAMEX	Mediterranean	Weekly
CMA-CGM	TA4	Mediterranean	Weekly
COSCO, Hanjin, K Line, and Yang Ming	TAS 3	Mediterranean	Weekly
Hapag-Lloyd	AMX	Mediterranean	6 days
Hapag-Lloyd	ES 1	Mediterranean	Weekly
Hapag-Lloyd	ES 2	Mediterranean	Weekly
Hapag-Lloyd and Maersk-Sealand	MEDEX	Mediterranean	Weekly
Maersk-Sealand	MECL	Mediterranean	Weekly
Maersk-Sealand	Med/Gulf	Mediterranean	Weekly
P&O Nedlloyd	FAMEX	Mediterranean	6 days
P&O Nedlloyd	NSX	Mediterranean	Weekly
Safmarine	USEC EXP	Mediterranean	Weekly
Turkon	USA LINE	Mediterranean	8 days
Zim	Med Atl	Mediterranean	Weekly

Source: G.E.C., Inc., based on shipline websites.

The North Charleston Terminal (NC) received an equal amount of calls from the world regions of Asia-Indian Ocean, Caribbean, and Mediterranean, with the service INDAMEX calling most frequently from Asia-Indian Ocean and Mediterranean. The Columbus Street Terminal received the most calls from Europe with the TAS1 (Transatlantic Service Loop 1, FE ECUS PEN) service.

As a whole, Charleston receives an equal amount of calls from the four world regions of Asia, Caribbean, Europe, and Mediterranean. The lines and services from each of these major world regions are as follows:

- Asia was represented the most by the service INDAMEX, and the lines using this service were CMA-CGM, Contship, Hapag-Lloyd, Lykes, and Shipping Corporation of India.
- Caribbean was represented the most by the services RTW and ECS. The lines using RTW service were China Shipping Container Lines, Gold Star Line, Norasia, and Zim; and the lines using ECS service were Hapag-Lloyd, NYK, OOCL, and P&O Nedlloyd.
- Europe was represented the most by the services RTW and GAX. The same lines as the Caribbean region used the RTW service. GAX was represented by Hapag-Lloyd, NYK, OOCL, and P&O Nedlloyd. The P&O Nedlloyd vessels P&O Nedlloyd Clarence, P&O Nedlloyd Seattle, P&O Nedlloyd Maxima, and P&O Nedlloyd Genoa averaged 2,853 TEUs.
- Mediterranean was represented the most by the service INDAMEX. A sample of three unnamed CMA-CGM vessels calling Charleston averaged 1,917 TEUs.

WILMINGTON

Wilmington is the smallest of the ports in this analysis. Although large international shiplines call on this port, each line has only one service on a weekly, monthly, or bi-monthly schedule.

The service AUX (Asia USA Express) calls on Wilmington with the lines ZIM, Lloyd Triestino, Evergreen, and Hatsu Marine (Table 15). All lines call from the Far East world region. Another service, AWE3 (Asia-US East Coast Loop-3), calls on Wilmington with the lines COSCO, K Line, and Yang Ming from the Far East world region. The average TEU is 3,837 based on the six Yang Ming vessels Yang Ming South, Yang Ming West, Yang Ming Hamburg, Yang Ming Zenith, Yang Ming Kaohsiung, and Yang Ming Shanghai. TEU information on the other ship lines was not available.

Table 15. Port of Wilmington Major Container Lines (July 2005)

Line	Service	World Area	Calls
Yang Ming	AW3	FAR EAST	Weekly
Zim	AUX	FAR EAST	Weekly
Lloyd Triestino, Evergreen, and Hatsu	AUX	FAR EAST	Weekly
COSCO	AWE3	FAR EAST	Weekly
Hanjin	AWY	FAR EAST	Weekly
K Line	NATCO 2 (AWE3)	FAR EAST	Weekly
NSCSA	Westbound	MIDDLE EAST	Bi-Monthly
UASC	Unknown	MIDDLE EAST	Monthly

Source: G.E.C., Inc., based on shipline websites.

JACKSONVILLE

Jacksonville has two main terminals, Blount Island and Talleyrand. From a container shipping point of view, the Caribbean world region dominates Jacksonville. These vessels are much smaller relative to the other services calling South Atlantic ports.

The ship lines calling Jacksonville have a smaller world percentage market share compared to the other three ports discussed in this section of the report. As a result, the services are primarily from country to country in the same region (Caribbean). Only Mediterranean Shipping Company has an interregional service to Jacksonville from the Far East and Europe/Mediterranean (South Atlantic/Gulf to Northern England and United Kingdom service) to Talleyrand Terminal. Seafreight Line calls on Blount Island for its Caribbean services (Table 16). Their container vessels average 1,100 TEUs based on the vessels Stadt Rendsburg, Stadt Berlin, and Stadt Luneburg. Hamburg Sud calls on Jacksonville with a service to South America. Although this report does not focus on services to South America, the average of the three vessels calling this port (Cap San Lorenzo, Alexandra, and Cap San Marco) is 2,711 TEUs. The one vessel (Sea Cloud) documented for Crowley liner service calling Jacksonville is 600 TEUs. Sea Star's two vessels (El Morro and El Yunque) average 1,129 TEUs.

Table 16. Port of Jacksonville Major Container Lines (June 2005)

Line	World Area	Specific Area	Calls	Terminal	Cargo Type
Horizon Lines	Puerto Rico	Caribbean	Weekly	Blount Island	Container
Sea Star Line	Puerto Rico		Weekly	Blount Island	Container
Trailer Bridge	Puerto Rico		Weekly	Blount Island	Container
Crowley Liner Service	Puerto Rico		Weekly	Talleyrand	Container
Frontier Liner	Dominican Republic		Weekly	Blount Island	Container
Crowley Liner Service	Barbados		Weekly	Talleyrand	Container
Frontier Liner	St. Thomas		Weekly	Blount Island	Container
Mediterranean Shipping	St. Croix		Weekly	Talleyrand	Container
Seafreight Line	St. Vincent		Weekly	Blount Island	Container
Seafreight Line	Trinidad		Weekly	Blount Island	Container
Seafreight Line	Aruba		Weekly	Blount Island	Container
Seafreight Line	Bonaire		Weekly	Blount Island	Container

Table 16. Port of Jacksonville Major Container Lines (June 2005)

Line	World Area	Specific Area	Calls	Terminal	Cargo Type
Seafreight Line	Curacao		Weekly	Blount Island	Container
Seafreight Line	Guyana		Weekly	Blount Island	Container
Seafreight Line	Jamaica		Weekly	Blount Island	Container
Seafreight Line	Surinam		Weekly	Blount Island	Container
Crowley Liner Service	Bahamas		Weekly	Talleyrand	Container
Mediterranean Shipping	Bahamas		Weekly	Talleyrand	Container
Pioneer Shipping	Bahamas		Weekly	Talleyrand	Container
Crowley Liner Service	Mexico		Weekly	Talleyrand	Container
Mediterranean Shipping		Asia/Far East	Weekly	Talleyrand	Container
Mediterranean Shipping		Europe/Mediterranean	Weekly	Talleyrand	Container

Source: G.E.C., Inc., based on shipline websites.

VIII. CURRENT COST OF COMMODITY MOVEMENTS - SAVANNAH HARBOR WITHOUT-PROJECT CONDITIONS (Task 5)

Multiport analysis is divided into three cost components: sea (vessel), port, and land transportation (truck and rail intermodal). Vessel and related port costs will be linked to domestic transport costs to develop a “total delivered transportation cost” for cargoes and hinterlands served by rail intermodal and truck. The delivered total transportation cost will be developed for without- and with-project conditions to reflect the incremental changes in the competitive position of Savannah Harbor under the with-project conditions.

SEA COST

The NED benefits model calculates the sea (vessel) cost for the port legs before and after the three benefiting services call Savannah Harbor. The three benefiting services consist of a Far East (FE) East Coast United States (ECUS) deployment through the Suez Canal (SUEZ), a FE ECUS deployment that calls Europe (EU) before returning to the ECUS and FE, and a similar FE ECUS deployment that calls the Mediterranean (MED) before returning to the ECUS and FE. The three benefiting services operate vessels in a pendulum deployment between the FE, ECUS, and/or EU/MED as appropriate.¹

Table 17 shows the port leg nautical distances for Savannah and the other four South Atlantic and Mid-Atlantic ports covered by the multiport analysis (Norfolk, Wilmington, Charleston, and Jacksonville deployments) for the FE services through Suez (AEX), Transatlantic portion of FE Panama Canal Services, EU (PAX), and MED (ZCS). These are particular services calling Savannah Harbor that would be enabled to call at deeper sailing drafts not otherwise constrained by the Panama Canal. It should be noted that all of these services calling Savannah are doing so in conjunction with other ECUS or contiguous foreign ports that precede and follow calls at Savannah Harbor.² These calls reflect comparatively short distances over which vessels are draft constrained by Savannah Harbor compared to authorized drafts at other ECUS or adjacent foreign ports called in conjunction with Savannah Harbor.³

The port leg distances of the three benefiting services as seen in tables 17 and 18 are shown as if these services were effectively calling at the alternative ports (Norfolk, Wilmington, Charleston, and Jacksonville) in direct competition with Savannah.⁴ These distances were used to calculate the sea cost component associated with the use of these ports in place of Savannah Harbor as part of the multiport spreadsheet analysis. Appendix C tables 3.1 and 3.2 show the sea cost inputs

¹ The benefiting services are abbreviated as FE SUEZ ECUS PEN, FE ECUS EU PEN, and FE ECUS MED PEN. Pendulum (PEN) services are characterized by vessel deployments that swing back and forth between major world areas rather than a circular itinerary.

² Savannah Harbor has the same authorized depth as Wilmington, is greater than Jacksonville, and is less than Charleston and Norfolk. Channel depths at foreign ports called by benefiting services serving Savannah in conjunction with other ECUS ports are typically greater than Savannah (refer to Table 4.1).

³ Further descriptive information on the benefiting services can be found in the vessel fleet forecast, Part 6, and the NED benefits model.

⁴ To some degree, this is already in effect, with Savannah Harbor benefiting service rotations including calls at Norfolk and New York.

used to calculate the benefiting services in Appendix C Table 3.3. Appendix D presents growth trends for major foreign ports associated with the benefiting services to indicate the large volumes of trade and growth therein represented by these ports.

Table 17. Port Leg Nautical Distances Eastbound

Port (depth)		Inbound		Outbound	
Savannah (42)					
AEX	New York	594	Savannah	394	Norfolk
PAX	Manzanillo	1,562	Savannah	394	Norfolk
ZCS	Kingston	1,063	Savannah	594	New York
Norfolk (42 - 50)					
AEX	New York	200	Norfolk	200	New York
PAX	Manzanillo	1,778	Norfolk	200	New York
ZCS	Kingston	1,279	Norfolk	200	New York
Wilmington (42)					
AEX	New York	462	Wilmington	262	Norfolk
PAX	Manzanillo	1,612	Wilmington	262	Norfolk
ZCS	Kingston	1,115	Wilmington	462	New York
Charleston (45)					
AEX	New York	533	Charleston	353	Norfolk
PAX	Manzanillo	1,563	Charleston	353	Norfolk
ZCS	Kingston	1,064	Charleston	533	New York
Jacksonville (41)					
AEX	New York	674	Jacksonville	474	Norfolk
PAX	Manzanillo	1,515	Jacksonville	474	Norfolk
ZCS	Kingston	1,016	Jacksonville	674	New York

Notes: Manzanillo is in Panama, and Kingston is in Jamaica.
 AEX is an Asian Suez Canal ECUS Service, PAX is an Asian ECUS EU Service, and ZCS is an Asian ECUS Med Service.
 Norfolk marine container terminals have authorized channel depths ranging from 42 to 50 feet.
 Although authorized as a 40-foot project, Jacksonville indicates 41 feet.

Source: G.E.C., Inc., developed from *Distances Between Ports*.

Table 18. Port Leg Nautical Distances Westbound

Port (depth)		Inbound		Outbound	
Savannah (42)					
PAX	Norfolk	394	Savannah	1,562	Manzanillo
ZCS	New York	594	Savannah	1,063	Kingston
Norfolk (42 - 50)					
PAX	New York	200	Norfolk	1,778	Manzanillo
ZCS	New York	200	Norfolk	1,279	Kingston
Wilmington (42)					
PAX	Norfolk	262	Wilmington	1,612	Manzanillo
ZCS	New York	462	Wilmington	1,115	Kingston
Charleston (45)					
PAX	Norfolk	353	Charleston	1,563	Manzanillo
ZCS	New York	533	Charleston	1,064	Kingston
Jacksonville (41)					
PAX	Norfolk	474	Jacksonville	1,515	Manzanillo
ZCS	New York	674	Jacksonville	1,016	Kingston

Notes: Manzanillo is in Panama, and Kingston is in Jamaica.
 Norfolk marine container terminals have authorized channel depths ranging from 42 to 50 feet.
 Although authorized as a 40-foot project, Jacksonville indicates 41 feet.

Source: G.E.C., Inc., developed from *Distances Between Ports*.

Calculating Sea Cost

Savannah Harbor’s current sea cost (\$/TEU) at a depth of 42 feet (without-project conditions) for the three benefiting trade routes is presented in Table 19. The sea (vessel) cost is developed in the same way as the NED benefits model without-project conditions. It reflects the average total voyage cost for the legs that precede and follow Savannah Harbor calls for the three benefiting services. For multiport total cost input purposes, it is expressed per TEU rather than as the average total voyage cost per tonne of cargo. The multiport cost spreadsheet contains user-defined variables (tonnes per TEU) for each of the services and directions. A default value of 10 tonnes is used for the sea cost calculations in Table 19 and ensuing expressions of sea cost.

Table 19. Current Sea Cost for Benefiting Trade Routes Calling Savannah Harbor (\$/TEU)

FE ECUS MED PEN		
Feet	Inbound (\$)	Outbound (\$)
42	33.09	16.08
FE ECUS EU PEN		
42	47.43	10.69
FE SUEZ ECUS PEN		
42	10.81	10.76

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

PORT COST

The second component in determining current total transportation cost is port cost, which includes wharfage, dockage, pilotage, tuggage, and container loading, unloading, and handling. The average cargo weight (tonnes) per TEU for each trade route and direction was used to obtain the port cost for tonnage-related items such as wharfage. The information in Table 20 was obtained through a desktop review of each port's terminal tariff and through communications with individual associations. The terminal tariff contains governing rates, rules, and regulations of marine services provided by these ports' authorities and terminal operators.

Table 20. Port Cost for Five South Atlantic Ports

Port	Wharfage \$/ton	Dockage \$/foot	Container Charges \$/TEU	Pilotage \$/TEU	Tuggage \$/TEU
Norfolk	\$3.23	\$8.69	\$150	\$2.44	\$1.33
Wilmington	\$2.81	\$9.47	\$150	\$2.33	\$1.33
Charleston	\$3.65	\$7.75	\$150	\$2.33	\$1.33
Savannah	\$3.50	\$10.55	\$150	\$2.30	\$1.33
Jacksonville	\$3.00	\$7.79	\$150	\$2.19	\$1.33

Notes: Dockage charges stated per linear foot of vessel.
Some cost inputs have been estimated.

Source: Port tariffs from Norfolk, Wilmington, Charleston, Savannah, and Jacksonville websites and communications with individual associations.

Dockage is defined as the charges made or assessed against a vessel for berthing or making fast to any dock, wharf, pier mooring device, or other facility of the terminals and applies to vessels so berthed. Dockage charges are usually computed on the LOA (Length Overall) of vessels as

published in Lloyd's Register of Shipping. Dockage is usually based on a minimum 24-hour period, including fractions thereof rounded to the nearest full day.⁵

Wharfage is defined as the use of wharves in the receiving and delivering of cargo to ships, barges, or other watercraft while lying alongside the wharf properties of the terminal, including cargo received or delivered to barges, lighters, or other watercraft lying alongside of such vessels, or taken from or delivered to the water. Wharfage rates are usually stated in dollars per 2,000 pound ton for containerized cargoes.⁶

Pilotage is the activity in which a pilot guides a vessel within the harbor limits to ensure navigational safety. Tugage is the activity in which a tugboat pulls or pushes larger vessels. All port charges to the vessel such as dockage, pilotage, and tugage are assigned to average TEUs assumed to be handled by each service inbound and outbound. The average TEUs per service call inbound and outbound is a user-supplied variable in the multiport spreadsheet. The default value for purposes of this analysis is set at 1,500 TEUs per call.

A composite of other port-related costs under the heading "container charges" is also used on a TEU basis to capture port loading, unloading, and container handling charges on throughputs, exclusive of other tariff items previously noted such as wharfage and dockage. The container handling costs would include other related charges, where applicable, for such things as equipment rental, fresh water, storage, demurrage, terminal security, stevedoring, crane rentals, and special services. Container handling costs were assumed to be similar among the ports because of standardized inputs (labor and equipment). In practice, container throughput port costs may vary on individual components, but for overall total charges per TEU the costs are relatively similar for major lines and cargo volumes.⁷

LAND TRANSPORTATION COST

There are two sets of land transportation costs for truck and rail intermodal services. Table 5 contains the highway mileages for major southeast U.S. ports and hinterlands. Figure 51 is a map showing the five Mid-Atlantic and South Atlantic ports and the 17 selected hinterland cities. In addition, Figure 52 shows the Interstate Highway System from the five Mid-Atlantic and South Atlantic ports.

The major competitive cargoes for overlapping hinterlands related to a total delivered cost basis would customarily exclude local imports and exports in close proximity to the port and most likely focus on containerized imports that move by rail or truck to interior hinterland destinations greater than or equal to 250 miles from Savannah (Table 21). This assumption is based on containerized import cargoes that dominate the shared hinterlands of these ports, compared to containerized exports, which tend to be less substantial in volume and/or value and more

⁵ Container vessels calling ECUS ports normally are at berth less than 24 hours unless there are extenuating circumstances related to the vessel or availability of port services.

⁶ All costs per short ton were converted for metric purposes.

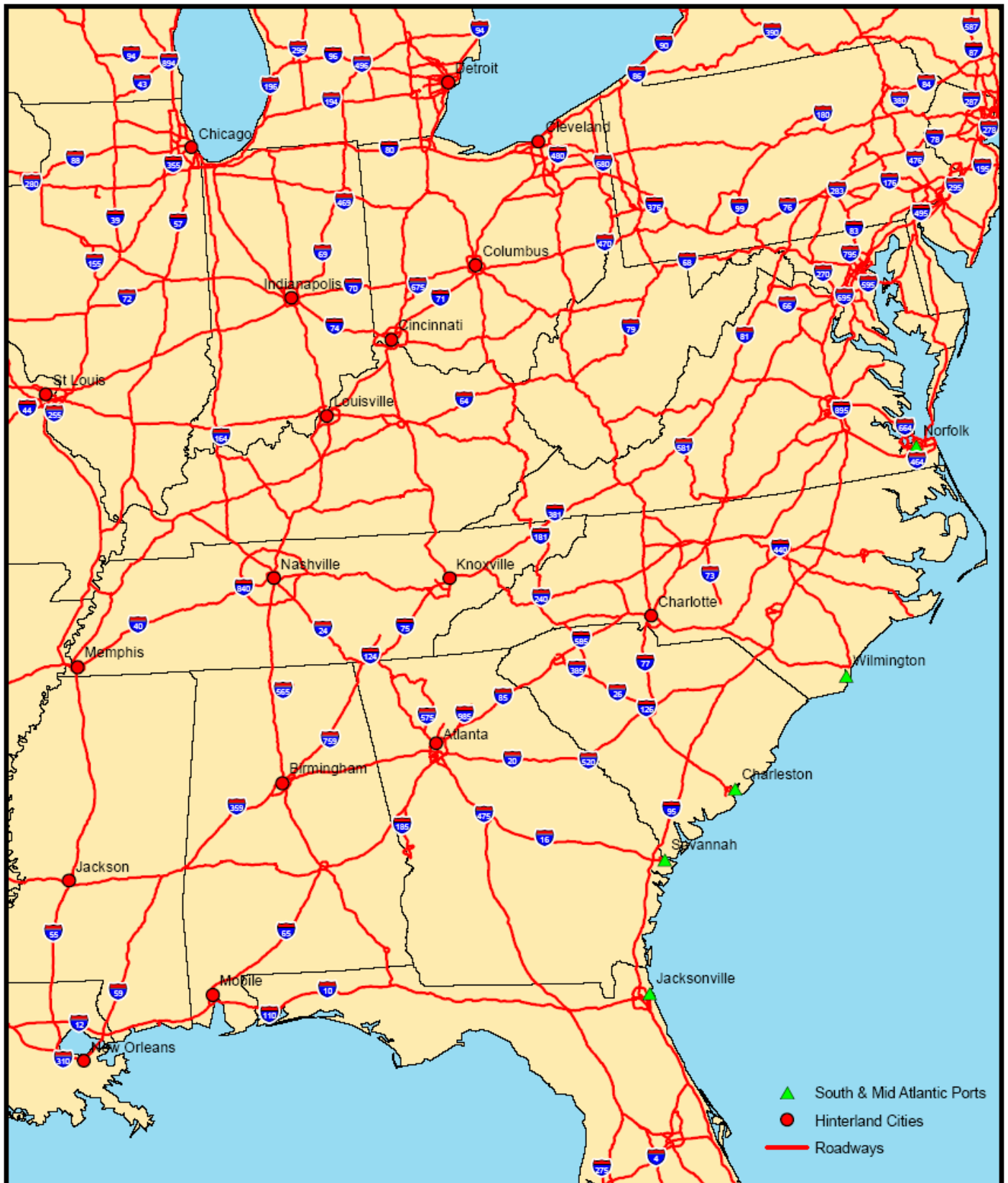
⁷ Steamship lines will negotiate container handling charges with the ports, often with various volume incentives and discounts.



Domestic Hinterland for Five Mid and South Atlantic Coast Ports



Figure: 51
 Date: September 2005
 Scale: 1 inch equals 120 miles
 Source: GEC
 Map Author: G. Sigrest



INTERSTATE HIGHWAY SYSTEM

Five Mid and South Atlantic Ports
and the Domestic Hinterland



Figure: 52
 Date: September 2005
 Scale: 1 inch equals 120 miles
 Source: GEC
 Map Author: G. Sigrest

localized in nature.⁸ Of particular interest to this analysis are the Norfolk Southern and CSX intermodal rail terminals served by Savannah compared to other ports in determining the competitive rail hinterland for intermodal movements, since the Midwest hinterland (particularly Chicago) is heavily oriented toward rail.⁹

Table 21. Highway Distances in Miles from Port Cities to Hinterland Cities

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Savannah	683	504	637	803	629	394	249	252
Charleston	778	638	778	847	695	461	315	200
Norfolk	1,034	894	916	913	947	713	566	327
Jacksonville	546	404	733	900	727	493	345	384
Wilmington	868	728	843	952	785	551	405	196

Table 21 (cont'd). Highway Distances in Miles from Port Cities to Hinterland Cities

Port Cities	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Savannah	497	415	659	664	725	770	953	925	764
Charleston	541	364	607	613	673	718	901	875	713
Norfolk	705	519	654	699	594	765	885	709	558
Jacksonville	594	548	768	796	857	879	1,100	1,057	897
Wilmington	668	491	693	658	658	804	987	862	700

Notes: Savannah mileage is for Garden City, Georgia, and Charleston mileage is for North Charleston, South Carolina.

Source: Rand McNally Tripmaker.

Calculating Truck Cost

Table 21 indicates that the shortest truck travel distance (about 200 miles) is from Wilmington, North Carolina, to Charlotte, North Carolina. The greatest distance (1,100 miles) is Jacksonville to Chicago. Table 22 shows the incremental highway mileages for major southeast U.S. ports and hinterlands. The incremental highway mileages are good indications of the larger distances trucks travel compared to competing ports. For example, in the first column of Table 22, Jacksonville has a zero, representing it as the closest port to New Orleans. Savannah is 137 miles farther than Jacksonville to New Orleans, Charleston is 232 miles farther than Jacksonville

⁸ For example, forest products such as wood pulp and clay are major containerized exports from Savannah.

⁹ Although there are instances in which containerized cargo imports are handled to and from the cities of competing ports (for example, Jacksonville imports handled through Savannah imports), most ports regard local cargo to be dominated primarily (but not exclusively) by them. The Port of New York/New Jersey, for example, regards local cargoes as including an approximate tri-state area within a 250-mile radius of the port.

to New Orleans, Wilmington is 322 miles farther than Jacksonville to New Orleans, and Norfolk is 488 miles farther than Jacksonville to New Orleans.

Table 22. Incremental Highway Mileages for Major Southeast U.S. Ports and Hinterlands

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Savannah	137	100	0	0	0	0	0	56
Charleston	232	234	141	44	66	67	66	4
Norfolk	488	490	279	110	318	319	317	131
Jacksonville	0	0	96	97	98	99	96	188
Wilmington	322	324	206	149	156	157	156	0

Table 22 (cont'd). Incremental Highway Mileages for Major Southeast U.S. Ports and Hinterlands

Port Cities	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Savannah	0	51	52	51	131	52	68	216	206
Charleston	44	0	0	0	79	0	16	166	155
Norfolk	208	155	47	86	0	47	0	0	0
Jacksonville	97	184	161	183	263	161	215	348	339
Wilmington	171	127	86	45	64	86	102	153	142

Note: Savannah mileage is for Garden City, Georgia, and Charleston mileage is for North Charleston, South Carolina.

Source: Rand McNally Tripmaker.

For purposes of this analysis, truck costs will determine the calculation of land costs unless otherwise stated. The spreadsheet model allows the use of a mixture of rail intermodal and truck costs to be specified by the user. However, rail intermodal does not serve all the hinterland cities directly with all the competing ports; and, as subsequently noted, rail intermodal may not be a close substitute for truck service unless there are special circumstances.

Table 23 shows the average distances in miles that a particular truck would travel from each of the five southeastern U.S. ports. Based on these distances, Savannah appears to be more centrally located, because its average distance to these 17 hinterland cities is 619 miles. Savannah is followed in average distance to hinterland cities by Charleston, Wilmington, Jacksonville, and Norfolk. Norfolk has an average distance of 729 miles to the 17 hinterland cities. The relatively similar standard deviation statistic for each port average indicates a similar dispersion of hinterland city distances for each port's average distance.

Truck costs are based on one hour of pickup time at origin and one hour of delivery time at destination. Driving time is based on the highway distances between ports and hinterland cities shown in Table 21, which are divided by an average underway speed of 55 miles per hour. The

total truck idle hours (one hour for pickup and one hour for delivery) and driving hours (distance in miles divided by 55 miles per hour) were multiplied by default values of \$40 per hour for pickup and delivery idling time and \$60 per hour for driving time. The difference between idle time and drive time reflects fuel consumption and related costs.

Table 23. Average Distances in Miles Traveled from Each Southeastern Port

Port Cities	Miles (Standard Deviation)
Savannah	619 (208)
Charleston	630 (200)
Wilmington	697 (202)
Jacksonville	708 (231)
Norfolk	729 (185)

Notes: Savannah mileage is for Garden City, Georgia, and Charleston mileage is for North Charleston, South Carolina. The standard deviation in Table 23 is a measure of how widely dispersed the 17 hinterland cities are from the average distance in miles traveled from each southeastern port.

Source: G.E.C., Inc.

Table 24 shows the truck costs for Savannah Harbor associated with traveling to the 17 hinterland cities. Based on the travel distances and the truck cost per hour, the truck land cost/TEU was calculated.¹⁰ The hinterland city with the most expensive truck land cost/TEU from Savannah is Chicago (\$559.82). The hinterland city with the least expensive truck land cost/TEU from Savannah is Atlanta (\$175.82). Section IV provides more detail regarding the cost analysis of competing Mid-Atlantic and South Atlantic ports.

Table 24. Truck Costs for Savannah Associated with Hinterland Cities

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	12.42	9.16	11.58	14.60	11.44	7.16	4.53	4.58
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$745.09	\$549.82	\$694.91	\$876.00	\$686.18	\$429.82	\$271.64	\$274.91
Total Truck Land Cost	\$825.09	\$629.82	\$774.91	\$956.00	\$766.18	\$509.82	\$351.64	\$354.91
Truck Land Cost/TEU	\$412.55	\$314.91	\$387.45	\$478.00	\$383.09	\$254.91	\$175.82	\$177.45

¹⁰ Land costs were developed per TEU so that they could be added to port and sea costs per TEU. For trucks, a common trip would be a 40-foot container (two TEUs) or two 20-foot containers (two TEUs).

Table 24 (cont'd). Truck Costs for Savannah Associated with Hinterland Cities

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	9.04	7.55	11.98	12.07	13.18	14.00	17.33	16.82	13.89
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$542.18	\$452.73	\$718.91	\$724.36	\$790.91	\$840.00	\$1,039.64	\$1,009.09	\$833.45
Total Truck Land Cost	\$622.18	\$532.73	\$798.91	\$804.36	\$870.91	\$920.00	\$1,119.64	\$1,089.09	\$913.45
Truck Land Cost/TEU	\$311.09	\$266.36	\$399.45	\$402.18	\$435.45	\$460.00	\$559.82	\$544.55	\$456.73

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Direct Rail Services

Rail intermodal rates for the movement of marine containers between ports and hinterland cities are not available in the public domain. Rail intermodal movements of trailers and containers are exempt from any public regulation pertaining to pricing or services provided. In lieu of formal tariffs, there are rail rate circulars that can serve as indicators of the maximum charges for container movements. The rail rate circulars are not binding, and the rates are privately negotiated between the shipper and the railroad and specified in contracts.¹¹ Steamship lines acting as rail intermodal shippers on behalf of their clients typically receive substantial volume discounts from the railroads.¹² The rail intermodal marine container sector is regarded as very price competitive.

The rail charges paid by the steamship line on behalf of its customer do not include all the costs to move the container between the port and the shipper. The rail rate includes only payment for rail service, which is between rail terminals, including railcar loading and unloading of marine containers. It is the responsibility of the steamship line (shipper) to get the marine container to the railroad and then to the final destination from the delivering rail terminal (for exports, the opposite would apply). The rail service and related charge does not include expenses associated with the delivery of the container to and from the terminals and the ports and customers. Marine containers are typically drayed to and from the rail terminals by local trucking companies using chassis supplied by the steamship companies. The truck drayage fees are negotiated based on volume and driving time as reflected by typical traffic flow patterns. Drayage charges for congested urban areas and/or low-volume movements that may lack backhauls of other container movements in opposite directions tend to be higher than less congested areas where truck delays

¹¹ The contracts typically have non-disclosure provisions prohibiting release of the data without mutual consent of the parties.

¹² The volume discounts vary widely and can fluctuate based on volume, but typically range from 25 to 50 percent of the tariff circular.

are infrequent and/or there is a higher volume of containers moving by truck both to and from the rail terminals.

As mentioned above, of particular interest to this analysis are the Norfolk Southern and CSX intermodal rail terminals because of their major presence at the Mideastern and Southeastern ports and hinterland cities. Appendix A tables 1.1 and 1.2 show the direct rail destinations for each of four Mid-Atlantic and South Atlantic port cities and other terminals (Savannah, Norfolk, Charleston, and Jacksonville) by both rail companies. Wilmington does not have a dedicated rail intermodal service.

Appendix A tables 1.1 and 1.2 indicate the ports (excluding Wilmington) for which Norfolk Southern (NS) and CSX have direct rail intermodal services between port cities and 17 hinterland cities. Both NS and CSX both have direct rail intermodal services to Chicago from the four ports. In addition, Norfolk Southern has niche cities by supplying direct services to Atlanta, Cincinnati, Memphis, and Louisville from the ports or terminals adjacent to port cities at Savannah, Norfolk, Charleston, and Jacksonville. Figure 53 shows railroad destinations for NS.¹³

Appendix A Table 1.2 indicates that most CSX direct rail services are to Memphis, particularly from the port cities of Savannah, Charleston, and Jacksonville. In addition, CSX in New Orleans is used in Savannah, Charleston, and Jacksonville for direct rail services. Figure 54 shows railroad destinations for CSX.

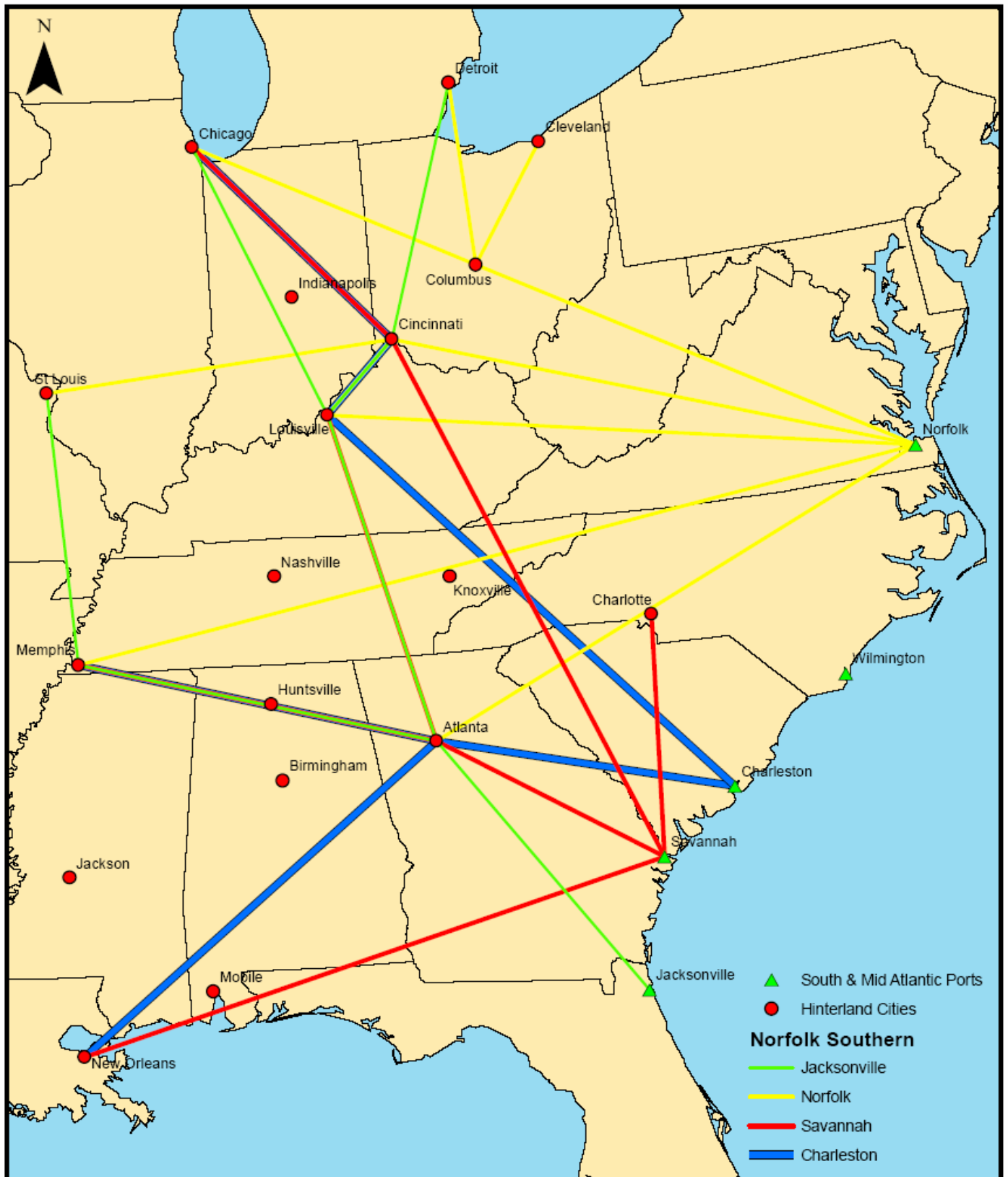
Calculating Rail Cost

Railroad intermodal (trailer and container on flatcar) services compete with trucks on a cost and service basis. Rail service is commonly regarded as less expensive, but often less reliable and slower. Trucks characteristically handle most of the East Coast port containers moving less than approximately 500 miles.¹⁴ The rail share is commonly less than 25 percent of the total container volume at individual ports, although this varies widely from Norfolk, which is more heavily rail compared to less rail intensive ports for marine containers such as Charleston, Savannah, and Jacksonville. Typically, rail marine container movements reflect longer distances, unbalanced movements (load/empty cycles), and multiple lot volumes (for example, retailers). The marine containers handled by rail often exceed maximum highway weight limits (about 48,000 pounds or 24 short tons) or involve repositioning empty containers.

Rail intermodal-related rates and total charges are shown in tables 24, 25, and 26. Rail intermodal service competes with truck rates, which are usually reflective of highway distances in relation to vehicle operating costs.

¹³ Not all railroads, NS and CSX, have direct intermodal services between all port cities and hinterland cities, depending on routes and system configurations.

¹⁴ Five hundred miles is regarded as a proxy for the typical distance that a single driver can legally attain under maximum driving hours before a mandatory rest period.



RAILROAD DESIGNATION

Intermodal Cities Served from the Five Mid and South Atlantic Ports for Norfolk Southern



Figure: 53

Date: September 2005

Scale: 1 inch equals 120 miles

Source: GEC

Map Author: G. Sigrest



RAILROAD DESIGNATION

Intermodal Cities Served from the Five Mid and South Atlantic Ports for CSX



Figure: 54
 Date: September 2005
 Scale: 1 inch equals 120 miles
 Source: GEC
 Map Author: G. Sigrest

Table 25. Estimated Rail Terminal-to-Terminal Hinterland Rates (\$/FEU)

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Savannah	0.00	0.00	573.30	722.70	0.00	0.00	298.80	0.00
Charleston	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Norfolk	930.60	0.00	824.40	0.00	0.00	0.00	509.40	0.00
Jacksonville	491.40	0.00	659.70	0.00	0.00	443.70	414.00	460.80
Wilmington	781.20	0.00	758.70	856.80	0.00	495.90	364.50	0.00

Table 25 (cont'd). Estimated Rail Terminal-to-Terminal Hinterland Rates (\$/FEU)

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Savannah	0.00	0.00	593.10	597.60	652.50	0.00	857.70	832.50	687.60
Charleston	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Norfolk	0.00	0.00	588.60	629.10	0.00	0.00	796.50	0.00	0.00
Jacksonville	0.00	0.00	691.20	716.40	0.00	0.00	990.00	0.00	0.00
Wilmington	0.00	0.00	623.70	592.20	0.00	0.00	888.30	775.80	0.00

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 26. Estimated Rail/Truck Intermodal Port to Hinterland Terminal Rates (\$/FEU)

Port Cities		New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
	Drayage	100.00	100.00	150.00	150.00	100.00	100.00	150.00	150.00
Savannah	30.00	0.00	0.00	753.30	902.70	0.00	0.00	478.80	0.00
Charleston	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Norfolk	30.00	1060.60	0.00	1004.40	0.00	0.00	0.00	689.40	0.00
Jacksonville	100.00	691.40	0.00	909.70	0.00	0.00	643.70	664.00	710.80
Wilmington	100.00	981.20	0.00	1,008.70	1,106.80	0.00	695.90	614.50	426.40

Table 26 (cont'd). Estimated Rail/Truck Intermodal Port to Hinterland Terminal Rates (\$/FEU)

<i>Port Cities</i>		Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
	Drayage	100.00	100.00	100.00	150.00	150.00	150.00	150.00	150.00	150.00
Savannah	30.00	0.00	0.00	723.10	777.60	832.50	0.00	1037.70	1012.50	867.60
Charleston	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Norfolk	30.00	0.00	0.00	718.60	809.10	0.00	0.00	976.50	0.00	0.00
Jacksonville	100.00	0.00	0.00	891.20	966.40	0.00	0.00	1240.00	0.00	0.00
Wilmington	100.00	0.00	0.00	823.70	842.20	0.00	0.00	1138.30	1025.80	0.00

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Rail marine container rates for terminal-to-terminal movements are estimated in Table 25 based on the highway mileages in Table 21. A review of Norfolk Southern rates from the circular indicate that for a 40-foot container, the typical rate per mile is about \$1.20 for distances more than 400 miles and about \$1.60 per mile for shorter distances. Steamship lines were assumed to have a 25 percent volume discount, effectively paying \$0.90 per mile for distances more than 400 miles and \$1.20 per mile for shorter distances. The rail terminal-to-terminal rates in Table 25 are based on \$0.90 per mile for all distances other than fewer than 400 miles.

The total costs of a rail intermodal movement include drayage of the marine container between the port and the rail terminal (imports) and the destination rail terminal and the importer. Table 26 includes estimated local drayage costs between ports and rail terminals and at destination terminals. The destination terminals assume local delivery within a 25-mile radius of the rail terminal. The port drayage costs in Table 26 reflect \$30 and \$100 charges. The \$30 drayage reflects near-dock rail access from the port that does not require the use of licensed vehicles for public streets and roads. The \$100 drayage reflects the use of licensed commercial vehicles and drivers to access rail terminals that are not in or otherwise adjacent to the port.

Drayage at destination cities varies based on time, congestion, and distance. Less congested urban areas are assumed to have \$100 drayage. Larger, more congested urban areas are assumed to have higher drayage costs of \$150.¹⁵ Truck drayage charges do not vary based on the size of the container. A 20-foot container is drayed for the same price as a 40-foot container because there is no difference in driving time.

Table 27 expresses the total rail intermodal costs associated with marine containers on a TEU basis by dividing the 40-foot equivalent unit (FEU) cost in Table 26 by a factor of two. Although there are separate rail rates for 20-foot marine containers (one TEU), these rates are normally more than one-half of a 40-foot container, reflecting the fact that some of the costs are the same regardless of box size (for example, rail car loading and unloading). The truck rates in Table 24 are for a 40-foot marine container and are divided by a factor of two to establish a TEU basis consistent with other multipoint cost inputs (sea and port). Likewise, rail rates are presented in a TEU context.¹⁶

Table 27. Estimated Rail/Truck Intermodal Port to Hinterland Terminal Rates (\$/TEU)

Port Cities		New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
	Drayage	100.00	100.00	150.00	150.00	100.00	100.00	150.00	150.00
Savannah	30.00	0.00	0.00	376.65	451.35	0.00	0.00	239.40	0.00
Charleston	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Norfolk	30.00	530.30	0.00	502.20	0.00	0.00	0.00	344.70	0.00
Jacksonville	100.00	345.70	0.00	454.85	0.00	0.00	321.85	332.00	355.40
Wilmington	100.00	490.60	0.00	504.35	553.40	0.00	347.95	307.25	213.20

¹⁵ Drayage costs are a user input that can be specified separately for each port (marine terminal) and hinterland city.

¹⁶ The intermodal total costs for a 20-foot container are higher than one-half of a 40-foot container because of proportionally higher rail rates on a mile basis (to reflect similar loading and unloading costs), and truck drayage would be the nearly the same as a 40-foot box container.

Table 27. (cont'd). Estimated Rail/Truck Intermodal Port to Hinterland Terminal Rates (\$/TEU)

<i>Port Cities</i>		Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
	Drayage	100.00	100.00	100.00	150.00	150.00	150.00	150.00	150.00	150.00
Savannah	30.00	0.00	0.00	361.55	388.80	416.25	0.00	518.85	506.25	433.80
Charleston	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Norfolk	30.00	0.00	0.00	359.30	404.55	0.00	0.00	488.25	0.00	0.00
Jacksonville	100.00	0.00	0.00	445.60	483.20	0.00	0.00	620.00	0.00	0.00
Wilmington	100.00	0.00	0.00	411.85	421.10	0.00	0.00	569.15	512.90	0.00

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

TOTAL DELIVERED TRANSPORTATION COST

Table 28 shows Savannah Harbor total cost without the project (existing 42-foot channel) using as an example the service FE ECUS MED PEN Inbound. Total cost is calculated by adding the sea, port, and land cost. Currently, Savannah Harbor’s most expensive hinterland city is Chicago (total cost of \$791.81, of which about 72 percent is land cost). The least expensive hinterland city for Savannah Harbor is Atlanta (\$407.81).

Table 28. Savannah Harbor Total Cost, Existing Conditions, Inbound FE ECUS MED PEN

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$33.09	\$33.09	\$33.09	\$33.09	\$33.09	\$33.09	\$33.09	\$33.09
Port Cost Total	\$198.90	\$198.90	\$198.90	\$198.90	\$198.90	\$198.90	\$198.90	\$198.90
Land Cost Total	\$412.55	\$314.91	\$387.45	\$478.00	\$383.09	\$254.91	\$175.82	\$177.45
Total Cost	\$644.54	\$546.90	\$619.45	\$710.00	\$615.09	\$486.90	\$407.81	\$409.45

Table 28 (cont'd). Savannah Harbor Total Cost, Existing Conditions, Inbound FE ECUS MED PEN

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$33.09	\$33.09	\$33.09	\$33.09	\$33.09	\$33.09	\$33.09	\$33.09	\$33.09
Port Cost Total	\$198.90	\$198.90	\$198.90	\$198.90	\$198.90	\$198.90	\$198.90	\$198.90	\$198.90
Land Cost Total	\$311.09	\$266.36	\$399.45	\$402.18	\$435.45	\$460.00	\$559.82	\$544.55	\$456.73
Total Cost	\$543.09	\$498.36	\$631.45	\$634.18	\$667.45	\$692.00	\$791.81	\$776.54	\$688.72

Notes: All land costs are based on truck costs.
Some cost inputs have been estimated.

Source: G.E.C., Inc.

IX. DETERMINE CURRENT COST OF ALTERNATIVE MOVEMENT (Task 6)

The steps cited in Section VIII for Savannah Harbor were repeated for the alternative Mid-Atlantic and South Atlantic ports (Norfolk, Charleston, Wilmington, and Jacksonville) to link vessel and port costs to hinterland rail intermodal and truck costs. This analysis shows the inputs needed to make a cost comparison between the ports.

Table 29 shows sea costs for benefiting services using as an example the Port of Wilmington. The highest sea cost (\$/TEU) inbound is the service FE ECUS EU PEN (\$40.22). The highest sea cost (\$/TEU) outbound is the service FE ECUS MED PEN (\$10.47). The input values to calculate the sea cost for the competing ports Charleston, Norfolk, and Jacksonville can be found in Appendix B tables 2.1 to 2.7. The sea cost for benefiting services for the additional competing ports can be found in Appendix B tables 2.8 to 2.12.

Table 29. Wilmington Sea Cost for Benefiting Services

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	48.47826	70.08696	18.78049
Voyage Days	2.019928	2.92029	0.78252
Total Voyage Cost (\$)	\$69,425	\$100,370	\$37,835
Sea Cost (\$/TEU)	\$28.38	\$40.20	\$7.32
Outbound			
Voyage Hours	20.08696	11.3913	10.65041
Voyage Days	0.836957	0.474638	0.443767
Total Voyage Cost (\$)	\$28,766	\$16,313	\$21,456
Sea Cost (\$/TEU)	\$10.47	\$5.95	\$5.85

Notes: Some cost inputs have been estimated.

It is assumed that a vessel's volume per port call loaded and unloaded is 1,500 TEUs.

Source: G.E.C., Inc.

The basic NED benefits framework for developing Savannah Harbor sea (voyage) costs was applied to the other ports, adjusting for the vessel voyage distances for particular services (refer to Table 17). The input for total voyage tonnes for which average total sea cost is computed was adjusted to reflect the different authorized depths at the other harbors and prevailing underkeel clearances. For all ports except Jacksonville, the average total at sea cost per TEU is less than Savannah Harbor because of greater authorized channel depths. The Norfolk terminals have different depths, of which two are greater than Savannah Harbor (Norfolk International and Newport News), and one is equal to Savannah Harbor (Portsmouth).

MID-ATLANTIC AND SOUTH ATLANTIC PORTS SEA COST

Mid-Atlantic and South Atlantic Port Costs

Table 30 shows the estimated port costs for the five Mid-Atlantic and South Atlantic ports using as an example the service FE ECUS MED PEN. Total port costs consist of wharfage, dockage, tuggage, pilotage and container charges. Table 30 shows that Savannah has the highest estimated port costs per TEU (\$198.90), and Wilmington has the lowest port costs per TEU (\$190.64).¹⁷ Port costs for the services FE ECUS EU PEN and FE SUEZ ECUS PEN are presented in Appendix B tables 2.13 and 2.14.

Table 30. Port Costs for Five Mid-Atlantic and South Atlantic Ports, FE ECUS MED PEN

Port	Wharfage \$/TEU	Dockage \$/TEU	Container Charges \$/TEU	Pilotage \$/TEU	Tuggage \$/TEU	Total Port Costs \$/TEU
Norfolk – Portsmouth	35.60	5.51	150	2.33	1.33	194.77
Norfolk – Newport News	35.60	5.51	150	2.37	1.33	194.82
Norfolk International	35.60	5.51	150	2.44	1.33	194.89
Wilmington	30.97	6.00	150	2.33	1.33	190.64
Charleston	40.23	4.91	150	2.33	1.33	198.81
Savannah 42 feet	38.58	6.69	150	2.30	1.33	198.90
Jacksonville	33.07	4.94	150	2.19	1.33	191.53

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Mid-Atlantic and South Atlantic Port Comparison for Truck Cost

Table 31 shows the truck costs for the 17 hinterland cities using Norfolk as an example. The Norfolk truck land cost/TEU is the most expensive for New Orleans and the least expensive for Charlotte. Truck cost is primarily related to the distance from the port city to the hinterland (refer to Table 21). The truck costs for alternative ports in relation to hinterland cities are presented in Appendix B tables 2.15 to 2.17.

Table 32 compares the land transportation costs per TEU for the five Mid-Atlantic and South Atlantic ports based on truck cost. Chicago is the most expensive land destination city for Savannah (\$559.82), Charleston (\$531.45), Jacksonville (\$640.00), and Wilmington (\$578.36). Norfolk's most expensive land destination city is New Orleans (\$604.00).

¹⁷ Port costs are estimated.

Table 31. Truck Costs for Norfolk Associated with Hinterland Cities

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	18.80	16.25	16.65	16.60	17.22	12.96	10.29	5.95
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$1,128.00	\$975.27	\$999.27	\$996.00	\$1,033.09	\$777.82	\$617.45	\$356.73
Total Truck Land Cost	\$1,208.00	\$1,055.27	\$1,079.27	\$1,076.00	\$1,113.09	\$857.82	\$697.45	\$436.73
Truck Land Cost/TEU	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36

Table 31(cont'd). Truck Costs for Norfolk Associated with Hinterland Cities

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	12.82	9.44	11.89	12.71	10.80	13.91	16.09	12.89	10.15
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$769.09	\$566.18	\$713.45	\$762.55	\$648.00	\$834.55	\$965.45	\$773.45	\$608.73
Total Truck Land Cost	\$849.09	\$646.18	\$793.45	\$842.55	\$728.00	\$914.55	\$1,045.45	\$853.45	\$688.73
Truck Land Cost/TEU	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 32. Land Cost per TEU Based on Truck Cost for Five Mid-Atlantic and South Atlantic Ports

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Savannah	\$412.55	\$314.91	\$387.45	\$478.00	\$383.09	\$254.91	\$175.82	\$177.45
Charleston	\$464.36	\$388.00	\$464.36	\$502.00	\$419.09	\$291.45	\$211.82	\$149.09
Norfolk	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Jacksonville	\$337.82	\$260.36	\$439.82	\$530.91	\$436.55	\$308.91	\$228.18	\$249.45
Wilmington	\$513.45	\$437.09	\$499.82	\$559.27	\$468.18	\$340.55	\$260.91	\$146.91

Table 32 (cont'd). Land Cost per TEU Based on Truck Cost for Five Mid-Atlantic and South Atlantic Ports

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Savannah	\$311.09	\$266.36	\$399.45	\$402.18	\$435.45	\$460.00	\$559.82	\$544.55	\$456.73
Charleston	\$335.09	\$238.55	\$371.09	\$374.36	\$407.09	\$431.64	\$531.45	\$517.27	\$428.91
Norfolk	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Jacksonville	\$364.00	\$338.91	\$458.91	\$474.18	\$507.45	\$519.45	\$640.00	\$616.55	\$529.27
Wilmington	\$404.36	\$307.82	\$418.00	\$398.91	\$398.91	\$478.55	\$578.36	\$510.18	\$421.82

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Mid-Atlantic and South Atlantic Port Comparison for Total Cost

The total delivered transportation cost is calculated by adding the at sea, port, and land cost components. Total land transportation cost is calculated by the truck cost or rail cost, assuming that specific ports have a direct rail service to one of the 17 hinterland cities. However, for this report, total land cost will be assumed on a truck cost basis. Total cost comparisons for the five Mid-Atlantic and South Atlantic ports at Savannah's 42-foot depth without-project conditions are presented in Appendix C tables 3.10 to 3.50.

Least Total Transportation Cost

The total sea, port, and land transportation cost was calculated for the five Mid-Atlantic and South Atlantic ports with destinations for cargo to the 17 hinterland cities. Table 33 provides a synopsis of the incremental differences in least cost for the competing Mid-Atlantic and South Atlantic ports at a depth of 42 feet (without project) with travel destination inbound using the service FE ECUS MED PEN as an example. The numbers in Table 33 are incremental differences in total transportation cost on a TEU basis. For example, the port with the least cost associated with the hinterland city New Orleans is Jacksonville, represented by zero in Table 33; and Portsmouth (Norfolk) is \$264.93 dollars more expensive to transport cargo to New Orleans on the inbound service route FE ECUS MED PEN. Since land cost is the highest cost of transportation per TEU, the port with the most central location to the hinterland cities would generally have the least incremental cost, other things being equal.

Table 23 above showed that Savannah had the lowest average highway distance between hinterland cities (619 miles) compared to the other ports (Jacksonville, Charleston, Wilmington and Norfolk). Table 33 shows that Savannah is the least total cost port to six hinterland cities, consisting of Memphis, St. Louis, Jackson, Birmingham, Atlanta, and Nashville. Figures 55 - 59 show the domestic hinterland and the incremental difference in least total transportation cost for Savannah Harbor compared to the other Mid-Atlantic and South Atlantic ports based on dollars per TEU. The other incremental cost services at 42 feet outbound and inbound can be seen on the excel CD tab Least Cost SH 42 ft.

Hinterland Cities Less than \$50 Difference in Total Cost (Without Project)

Hinterland cities with less than \$50 difference in total cost that overlap each other are: St. Louis, Jackson, Memphis, Birmingham, Atlanta, Nashville, Charlotte, Louisville, Cincinnati, Indianapolis, and Columbia. The hinterland cities of St. Louis, Jackson, Birmingham, Atlanta, and Nashville are overlapped by the port cities of Jacksonville and Charleston. The hinterland city of Charlotte is overlapped by the port cities of Savannah and Charleston. The hinterland cities of Louisville, Cincinnati, and Indianapolis are overlapped by the port cities of Savannah, Wilmington, and Norfolk International Terminal. The hinterland city of Columbus, Ohio, is overlapped by the port cities of Charleston and Wilmington. The two hinterland cities of Knoxville and Chicago all are less than \$50 difference in total cost but do not overlap with other Mid-Atlantic and South Atlantic ports.

Table 33. Incremental Differences in Least Cost for Competing Ports at 42 Feet, Inbound FE ECUS MED PEN

<i>Hinterland</i>	Mid-Atlantic and South Atlantic Ports				
	Difference in Total Cost				
	<i>Jacksonville</i> \$	Savannah \$	Charleston \$	Wilmington \$	Norfolk \$
New Orleans	0.00	86.74	126.63	174.67	264.93
Mobile	0.00	66.55	127.72	175.76	266.02
Memphis	40.36	0.00	64.98	99.39	138.92
St. Louis	40.90	0.00	12.08	68.29	46.74
Jackson	41.45	0.00	24.08	72.11	160.19
Birmingham	41.99	0.00	24.62	72.66	160.74
Atlanta	40.36	0.00	24.08	72.11	159.65
Charlotte	103.52	43.52	3.23	0.00	71.17
Nashville	40.90	0.00	12.08	80.29	100.19
Knoxville	100.28	39.74	0.00	68.22	83.21
Louisville	87.74	40.29	0.00	45.86	24.30
Cincinnati	99.74	39.74	0.00	23.49	45.57
Columbus	35.19	44.43	84.71	144.71	0.00
Indianapolis	87.74	40.29	0.00	45.86	24.30
Chicago	118.52	50.35	10.06	55.92	0.00
Detroit	191.07	131.08	91.88	83.74	0.00
Cleveland	186.16	125.62	85.88	77.74	0.00

Notes: Highlighted cells denote least total transportation delivered costs for particular hinterland cities and ports. Some cost inputs have been estimated.

Source: G.E.C., Inc.



Incremental Difference in Least Total Transportation Cost for Savannah Compared to the other Mid and South Atlantic Ports (\$/TEU) (Without Project)

Note: Some cost inputs have been estimated and need further development



Figure: 55
 Date: March 2006
 Scale: 1 inch equals 120 miles
 Source: GEC
 Map Author: C. Perez



Incremental Difference in Least Total Transportation Cost for Charleston Compared to the other Mid and South Atlantic Ports (\$/TEU) (Without Project)

Note: Some cost inputs have been estimated and need further development



Figure: 56
 Date: March 2006
 Scale: 1 inch equals 120 miles
 Source: GEC
 Map Author: C. Perez



Incremental Difference in Least Total Transportation Cost for Jacksonville Compared to the other Mid and South Atlantic Ports (\$/TEU) (Without Project)

Note: Some cost inputs have been estimated and need further development



Figure: 57
 Date: March 2006
 Scale: 1 inch equals 120 miles
 Source: GEC
 Map Author: C. Perez



Incremental Difference in Least Total Transportation Cost for Wilmington Compared to the other Mid and South Atlantic Ports (\$/TEU) (Without Project)

Note: Some cost inputs have been estimated and need further development



Figure: 58
 Date: March 2006
 Scale: 1 inch equals 120 miles
 Source: GEC
 Map Author: C. Perez



Incremental Difference in Least Total Transportation Cost for Norfolk Compared to the other Mid and South Atlantic Ports (\$/TEU) (Without Project)

Note: Some cost inputs have been estimated and need further development



Figure: 59
 Date: March 2006
 Scale: 1 inch equals 120 miles
 Source: GEC
 Map Author: C. Perez

X. DETERMINE FUTURE COST OF COMMODITY MOVEMENTS - SAVANNAH HARBOR WITH-PROJECT CONDITIONS (Task 7)

The incremental costs between ports and overlapping hinterlands were developed based on the differences between the total transportation costs for Savannah Harbor and competing ports under with-project conditions. The Savannah Harbor without-project analysis calculates average total sea cost for total voyage tonnes based on the current depth (42 feet), reflecting the methodology developed for the derivation of NED benefits. The Savannah Harbor with-project analysis calculates average total sea cost for total voyage tonnes at depths of 43 feet through 48 feet to derive NED benefits as the reduction in average total cost per voyage tonne. Consistent with the NED benefits methodology, Savannah Harbor with-project sea costs are developed for the estimated total voyage tonnage for the port legs that precede and follow Savannah Harbor.¹⁸ As a result of greater depths at Savannah Harbor, the voyage tonnage will increase and average total cost per tonne will decrease.¹⁹

For multiport comparison, the change in average total cost per voyage tonne is expressed on a TEU basis, which differs from the expressed NED benefits based on the change in voyage tonnage. The conversion from voyage tonnes to TEUs is a user-specified variable in the multiport analysis for each trade route and direction. The default value is assumed to be ten tonnes per TEU.

Table 34 shows the Savannah Harbor average total sea costs based on a deep-draft channel improvement depth of 45 feet. FE ECUS EU PEN will have the highest sea cost (\$/TEU) inbound (\$35.76), and this service will also have the least expensive sea cost (\$/TEU) outbound (\$8.28) because of port distances that precede and follow Savannah Harbor (refer to Table 17). The most expensive sea cost (\$/TEU) outbound will be the FE ECUS MED PEN service (\$12.45). Voyage hours, days, and total voyage cost for the additional deep-draft channel improvement depths of 43 feet to 48 feet (45 feet is presented below) are presented in Appendix C tables 3.5 to 3.9. Consistent with the NED benefits methodology, total voyage cost at sea stays the same for different Savannah Harbor depths. Average total cost per voyage ton declines as a function of greater sailing depths because of increased tons of cargo.

Table 35 summarizes Savannah Harbor average total sea costs (in dollars per TEU) for inbound and outbound for each foot increase in depth associated with the three trade routes. The average total sea costs (\$/TEU) are specified for all depths and do not distinguish among the vessel maximum sailing drafts for the different services. The user must determine the maximum vessel sailing drafts from with-project draft distributions as the appropriate comparison for other ports.²⁰

¹⁸ These benefits are exclusive of other benefits such as reductions in tidal delays.

¹⁹ Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: NED Benefits Model Final Report (May 2006).

²⁰ For the sailing draft distributions inbound and outbound for the benefiting services for Savannah Harbor, refer to tables 7-1 through 7-6 in Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Vessel Fleet Forecasts, Part 7, Final Report (August 2005). -

Table 34. Savannah Sea Costs Based on 45-Foot Depth

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	46.21739	67.91304	24.14634
Voyage Days	1.925725	2.82971	1.006098
Total Voyage Cost (\$)	\$66,187	\$97,257	\$48,645
Sea Cost (\$/TEU)	\$24.79	\$35.76	\$8.84
Outbound			
Voyage Hours	25.82609	17.13043	16.01626
Voyage Days	1.076087	0.713768	0.667344
Total Voyage Cost (\$)	\$36,985	\$24,532	\$32,266
Sea Cost (\$/TEU)	\$12.45	\$8.28	\$8.06

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 35. Average Total Sea Cost for Savannah Harbor for Three World Trade Routes, With-Project Conditions (\$/TEU)

Feet	FE ECUS MED PEN		FE ECUS EU PEN		FE SUEZ ECUS PEN	
	Inbound (\$)	Outbound (\$)	Inbound (\$)	Outbound (\$)	Inbound (\$)	Outbound (\$)
43	29.77	14.66	42.78	9.75	10.06	9.68
44	27.05	13.47	38.95	8.95	9.41	8.79
45	24.79	12.45	35.76	8.28	8.84	8.06
46	22.88	11.58	33.04	7.70	8.33	7.44
47	21.24	10.83	30.72	7.19	7.88	6.90
48	19.82	10.16	28.69	6.75	7.47	6.44

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Calculating With-Project Port and Land Cost

The without-project conditions analysis identified the sea, port, and land transportation costs. The only unit cost change under the with-project conditions is the average total sea costs per unit of cargo carried (total voyage tonnes or total TEUs). Cargo handling costs at the ports and land transportation costs per TEU will not change.²¹ As a result, total cost expressed in dollars per TEU under the with-project conditions will change in proportion to the increased voyage cargoes from deeper sailing drafts.

²¹ The multipoint analysis assumes that increased cargo carried under with project conditions will have the same unit costs for port and land elements. It assumes that there is sufficient excess capacity such that there is no change in unit costs for port and land components of total cost.

Calculating With-Project Total Cost

Table 36 shows the total cost for Savannah Harbor for hinterland cities using as an example the world trade service FE ECUS MED PEN inbound at a depth of 45 feet by factoring in all the inputs for sea, port, and land cost. At this depth, the most expensive city to transport goods would be Chicago (\$788.50/TEU), and the least expensive city would be Atlanta (\$404.50/TEU).²² The total cost analysis for competitive ports at 45 feet for Savannah Harbor is presented in Appendix C tables 3.10 to 3.50. Total cost calculations for depths of 43 feet to 48 feet (45 feet is presented below) for the three world trade routes can be found in the Excel CD.

Table 36. Savannah Total Cost for Hinterland, 45 Feet, Inbound FE ECUS MED PEN

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$24.79	\$24.79	\$24.79	\$24.79	\$24.79	\$24.79	\$24.79	\$24.79
Port Cost Total	\$198.92	\$198.92	\$198.92	\$198.92	\$198.92	\$198.92	\$198.92	\$198.92
Land Cost Total	\$412.55	\$314.91	\$387.45	\$478.00	\$383.09	\$254.91	\$175.82	\$177.45
Total Cost	\$636.28	\$538.65	\$611.19	\$701.74	\$606.83	\$478.65	\$399.55	\$401.19

Table 36 (cont'd). Savannah Total Cost for Hinterland, 45 Feet, Inbound FE ECUS MED PEN

Port Cities	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$24.79	\$24.79	\$24.79	\$24.79	\$24.79	\$24.79	\$24.79	\$24.79	\$24.79
Port Cost Total	\$198.92	\$198.92	\$198.92	\$198.92	\$198.92	\$198.92	\$198.92	\$198.92	\$198.92
Land Cost Total	\$311.09	\$266.36	\$399.45	\$402.18	\$435.45	\$460.00	\$559.82	\$544.55	\$456.73
Total Cost	\$534.83	\$490.10	\$623.19	\$625.92	\$659.19	\$683.74	\$783.55	\$768.28	\$680.46

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Calculating With-Project Least Cost

Table 37 shows the incremental differences in least total transportation cost for competing ports at 45 feet depth using as an example the world trade route FE ECUS MED PEN inbound for the 17 hinterland cities. Table 37 has the same pattern as Table 17, which shows the Savannah Harbor least total cost for particular hinterland cities. Savannah will have the least cost among the Mid-Atlantic and South Atlantic ports, primarily because it has the most central location among the 17 cities. This is the final comparison between Savannah Harbor and the four competing Mid-Atlantic and South Atlantic ports. The excel CD presents the least total cost among competing ports for depths up to 48 feet for the three world trade routes. Least total cost

²² The vessel cost component of the total transportation cost is for the sea distance between the preceding port inbound to Savannah for imports.

for the depths from 43 feet to 48 feet (45 feet is shown below) shows the changes to total cost among the five Mid-Atlantic and South Atlantic ports.

Table 37. Incremental Differences in Least Cost for Competing Ports, 45 Feet, Inbound FE ECUS MED PEN

<i>Hinterland</i>	Mid-Atlantic and South Atlantic Ports				
	Difference in Total Cost				
	<i>Jacksonville</i> \$	<i>Savannah</i> \$	<i>Charleston</i> \$	<i>Wilmington</i> \$	<i>Norfolk</i> \$
New Orleans	0.00	78.43	126.63	174.67	264.93
Mobile	0.00	58.29	127.72	175.76	266.02
Memphis	48.61	0.00	73.24	107.24	147.18
St. Louis	49.16	0.00	20.33	76.55	55.00
Jackson	49.71	0.00	32.33	80.37	168.45
Birmingham	50.25	0.00	32.88	80.92	169.00
Atlanta	48.61	0.00	32.33	80.37	167.91
Charlotte	103.52	35.26	3.23	0.00	71.17
Nashville	49.16	0.00	20.33	88.55	108.45
Knoxville	100.28	31.48	0.00	68.22	83.21
Louisville	87.74	32.03	0.00	45.86	24.30
Cincinnati	99.74	31.48	0.00	23.49	45.57
Columbus	144.71	76.46	44.43	35.19	0.00
Indianapolis	87.74	32.03	0.00	45.86	24.30
Chicago	118.52	42.09	10.06	55.92	0.00
Detroit	191.07	122.82	91.88	83.74	0.00
Cleveland	186.76	117.37	85.88	77.74	0.00

Notes: Highlighted cells denote least total transportation delivered cost for particular hinterland cities and ports.
Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Hinterland Cities
Less than \$50 Difference in Total Cost (45 Foot Project)**

Figure 60 shows the difference in least total cost and less than \$50 difference in total cost for competing ports and hinterlands at 45 feet for Savannah.

Hinterland cities with less than \$50 Difference in total cost that overlap each other are essentially the same as hinterland cities less than \$50 difference in total cost without project.



Incremental Difference in Least Total Transportation Cost for Savannah Compared to the other Mid and South Atlantic Ports (\$/TEU) (45 Foot Project)

Note: Some cost inputs have been estimated and need further development



Figure: 60
 Date: March 2006
 Scale: 1 inch equals 120 miles
 Source: GEC
 Map Author: C. Perez

XI. DETERMINE USE OF HARBOR AND CHANNEL WITH AND WITHOUT PROJECT (Task 8)

A multiport least total cost analysis spreadsheet was developed to capture the effects of with-project conditions on the least total transportation cost for containerized cargo through Savannah Harbor and adjacent ports for a domestic hinterland defined by 17 major urban areas east of the Mississippi River. The multiport cost spreadsheet computes the least total transportation cost port for each hinterland city and the greater incremental costs for the other ports that are not “least total cost” in worksheet “Least Cost SH 42ft” for without project conditions. Ensuing worksheets (“Least Cost SH 43ft” through “Least Cost SH 48ft”) pertain to with-project conditions.

Table 38 identifies the incremental total transportation costs for Savannah Harbor for each of the hinterland cities for the three benefiting services (FE ECUS MED, FE ECUS EU, and FE SUEZ ECUS) for without-project conditions as outputs of the worksheet “Least Cost SH 42 ft.” Savannah Harbor is the least total transportation cost for Memphis, St. Louis, Jackson, Birmingham, Atlanta, and Nashville compared to the ports of Norfolk, Wilmington, Charleston, and Jacksonville. For other hinterland areas, Savannah Harbor has higher total transportation costs than the other ports, ranging from \$31.84 (FE SUEZ ECUS – Knoxville) to \$136.61 (FE ECUS EU – Detroit) per TEU.

Table 38. Savannah Harbor Least Total Incremental Cost, Import Containers, 42-Foot Project (\$/TEU)

	FE ECUS MED	FE ECUS EU	FE SUEZ ECUS
New Orleans	\$86.74	\$88.04	\$81.72
Mobile	\$66.55	\$67.86	\$61.54
Memphis	\$0.00	\$0.00	\$0.00
St. Louis	\$0.00	\$0.00	\$0.00
Jackson	\$0.00	\$0.00	\$0.00
Birmingham	\$0.00	\$0.00	\$0.00
Atlanta	\$0.00	\$0.00	\$0.00
Charlotte	\$43.52	\$46.04	\$42.37
Nashville	\$0.00	\$0.00	\$0.00
Knoxville	\$39.74	\$44.61	\$31.84
Louisville	\$40.29	\$45.15	\$32.39
Cincinnati	\$39.74	\$44.61	\$31.84
Columbus	\$84.71	\$90.24	\$84.31
Indianapolis	\$40.29	\$45.15	\$32.39
Chicago	\$50.35	\$55.88	\$49.94
Detroit	\$131.08	\$136.61	\$130.67
Cleveland	\$125.62	\$131.15	\$125.22

Source: G.E.C., Inc.

With-project conditions at Savannah Harbor will reduce vessel average total cargo costs for cargo (TEUs) for each of the benefiting services by virtue of more cargo carried on the vessel voyage legs that precede and follow Savannah Harbor. However, most other transportation costs will remain unchanged on a TEU basis.²³ Therefore, reductions in average total vessel voyage costs per TEU for with-project conditions need to be sufficiently large to overcome higher total transportation costs for the port hinterlands for which Savannah does not have a “least total cost” in without-project conditions. As can be seen from Table 38, Savannah Harbor has higher costs in the range of \$30 to \$50 per TEU for several hinterland cities, including Charlotte, Knoxville, Louisville, Cincinnati, Indianapolis, and Chicago.²⁴

The multiport spreadsheet computes the decreased average total vessel voyage cargo costs per TEU in the same manner as the NED Model spreadsheet. The worksheets “Savannah 42ft” through “Savannah 48ft” compute the average total voyage at sea costs per TEU for inbound and outbound vessel calls at Savannah Harbor for each of the benefiting services for without project conditions (42 feet) and with-project conditions (43 feet through 48 feet). The worksheet outputs are contained in Table 39. For without-project conditions (42-foot project), the average total inbound at sea (voyage leg) costs are \$33.09 per TEU for FE ECUS MED service, \$47.43 per TEU for FE ECUS EU service, and \$10.81 per TEU for FE SUEZ ECUS service.²⁵

The average total voyage leg costs decrease for successive increases in project depth by virtue of more cargo carried on the vessel from deeper sailing drafts consistent with the paradigm for NED deepening benefits. Table 39 indicates that for the FE ECUS MED service, inbound average total voyage costs per TEU decline from \$33.09 to \$29.77 (43 feet), \$27.05 (44 feet), \$24.79 (45 feet), \$22.88 (46 feet), \$21.24 (47 feet) and \$19.82 (48 feet). The other benefiting services (FE ECUS EU and FE SUEZ ECUS) exhibit similar decreases in average total voyage costs per TEU in response to successive increases in project depth (43 feet to 48 feet).

Table 39 shows the change in average total voyage costs unconstrained by vessel maximum sailing draft and project depth.²⁶ For example, the maximum size Panamax container vessels assigned to the two FE Panama Canal ECUS EU or ECUS MED pendulum services have a maximum sailing draft of 44.9 feet. These vessels cannot take advantage of deeper sailings drafts exceeding 38 feet at Savannah Harbor in without-project conditions other than by tide riding.²⁷ The sailing draft distributions for these services indicate that the maximum benefiting project depth is 44 feet for the MED pendulum service and 44 feet outbound and 46 feet inbound

²³ The NED benefits from deepening assumes that more cargo is carried on voyage legs preceding and following Savannah Harbor as part of overall more efficient use of the vessel. This cargo is not necessarily related to Savannah Harbor from an origin/destination and least total transportation cost perspective.

²⁴ The hinterland cities were purposely chosen to include some that would lie outside of an expected least total cost hinterland for Savannah Harbor to more clearly identify the existing and prospective least total cost hinterlands for without and with-project conditions.

²⁵ A description of the Savannah Harbor sea (voyage) related costs for benefiting services is contained in the multiport cost spreadsheet worksheet “Savannah Sea.”

²⁶ Refer to Section III., Methodology, in *Savannah Harbor Expansion Project Deep-Draft Channel Improvements Economic Analysis: Vessel Fleet Forecasts*, Part 7: Savannah Fleet With Project (Final Report August 2005), pages 7-3 through 7-7.

²⁷ The observed sailing draft distributions for these vessels and services indicate that tide riding does occur.

for the EU pendulum service. For the FE SUEZ ECUS service with Post-Panamax vessels, the maximum benefiting project depth is 46 feet inbound and 47 feet outbound.²⁸

Table 39. Vessel Cost Savings by Project Depth for Benefiting Services (\$/TEU)

	FE ECUS MED	FE ECUS EU	FE SUEZ ECUS
42 in	\$0.00	\$0.00	\$0.00
42 out	\$0.00	\$0.00	\$0.00
43 in	\$3.32	\$4.65	\$0.75
43 out	\$1.42	\$0.94	\$1.08
44 in	\$6.04	\$8.48	\$1.40
44 out	\$2.61	\$1.74	\$1.97
45 in	\$8.30	\$11.67	\$1.97
45 out	\$3.63	\$2.41	\$2.70
46 in	\$10.21	\$14.39	\$2.48
46 out	\$4.50	\$2.99	\$3.35
47 in	\$11.85	\$16.71	\$2.93
47 out	\$5.25	\$3.50	\$3.86
48 in	\$13.27	\$18.74	\$3.34
48 out	\$5.92	\$3.94	\$4.32

Notes: Bold values indicate maximum benefiting project depths for particular services and vessels.

Source: G.E.C., Inc.

The average total vessel costs (\$/TEU) for the benefiting services and maximum benefiting project depths have been highlighted in bold in Table 23. Lower average total vessel costs per TEU for successively greater project depths should not be used for the multiport cost analysis (because of vessel maximum sailing draft/project depth constraints).

Table 40 shows the vessel cost savings (\$/TEU) for the with-project conditions (43 feet through 48 feet) compared to the without-project condition. For example, for the FE ECUS MED service inbound, the 43-foot project would save \$3.32 per TEU. Successive depths and corresponding savings would be \$6.04 per TEU for 44 feet, \$8.30 per TEU for 45 feet, \$10.21 per TEU for 46 feet, \$11.85 per TEU for 47 feet and \$13.27 per TEU for 48 feet. Similar to Table 23, Table 24 uses bold to highlight the values for the maximum vessel sailing draft/project depth for each service and direction.

The multiport analysis will focus on imports because this is the predominant trade for Savannah and other competing U.S. ports. For imports, the maximum reduction in average total vessel voyage costs (refer to Table 39) is \$6.04 per TEU for the MED pendulum service, \$14.39 for the EU pendulum service, and \$2.48 for the SUEZ pendulum service. When these savings in voyage costs are compared to the incremental hinterland least total transportation costs in Table 38 for

²⁸ Refer to tables 7-1 through 7-6 for the sailing draft distributions of the benefiting services as contained in Part 7 of the Vessel Fleet Forecasts (Savannah Fleet With Project).

Savannah Harbor (ranging upwards of \$30 per TEU), it is evident that hinterland cargo will not specifically shift to Savannah Harbor under with-project conditions based on “least total transportation cost” analyses. The largest vessel cost savings in Table 39 (\$14.39 per TEU) is about one-third of the higher incremental total transportation costs of this service for Savannah to hinterland cities for which it does not have least total transportation cost such as Charlotte, Knoxville, Louisville, Cincinnati, Indianapolis, and Chicago.

Table 40. Vessel Costs by Project Depth for Benefiting Services (\$/TEU)

	FE ECUS MED	FE ECUS EU	FE SUEZ ECUS
42 in	\$33.09	\$47.43	\$10.81
42 out	\$16.08	\$10.69	\$10.76
43 in	\$29.77	\$42.78	\$10.06
43 out	\$14.66	\$9.75	\$9.68
44 in	\$27.05	\$38.95	\$9.41
44 out	\$13.47	\$8.95	\$8.79
45 in	\$24.79	\$35.76	\$8.84
45 out	\$12.45	\$8.28	\$8.06
46 in	\$22.88	\$33.04	\$8.33
46 out	\$11.58	\$7.70	\$7.41
47 in	\$21.24	\$30.72	\$7.88
47 out	\$10.83	\$7.19	\$6.90
48 in	\$19.82	\$28.69	\$7.47
48 out	\$10.16	\$6.75	\$6.44

Notes: Bold values indicate maximum benefiting project depths for particular services and vessels.

Source: G.E.C., Inc.

XII. COMPUTE NED BENEFITS (Task 9)

For the three benefiting services and current pattern of port calls before and after Savannah Harbor, there are no NED benefits associated with changes in least total transportation costs for containers for a 17-city hinterland and container ports at Hampton Roads, Wilmington, Charleston, and Jacksonville in response to with-project conditions at Savannah Harbor. With-project conditions at Savannah Harbor will not attract containerized cargo from these other ports based on estimated changes in least total transportation costs, other things being equal.

XIII. SUMMARY

The information contained in this final report is part of the overall study of the calculation of NED benefits for Savannah Harbor from a multiport perspective. To determine the lowest total transportation delivered cost for particular ports and hinterland cities, each step involved in the transportation of containerized cargo has been expressed as a total cost for sea (voyage), port, and land components. The voyage costs are developed for Panamax and Post-Panamax vessels for the three major services identified as the beneficiaries from deepening of Savannah Harbor (FE SUEZ ECUS PEN, FE ECUS MED PEN, and FE ECUS EU PEN).

The multiport cost analysis combines the total cost from sea, port, and land components to develop total transportation delivered cost for containers at five ports and 17 hinterland cities.

The multiport spreadsheet developed for this analysis relies on user inputs for different costs (sea, port, and land). The spreadsheet does not perform any optimization analysis. Some of the cost inputs for the sea, port, and land components were estimated to develop the multiport total transportation delivered cost methodology and analytical framework. The methodology and analytical framework used in this final report indicate the “least total cost” for the different components (sea, port, and land), with the sum of these components expressed as total transportation cost. The multiport spreadsheet sorts the ports by “least total cost” for each trade and hinterland city for the transportation cost components (sea, port, and land) and the total costs and computes the incremental costs for each component to identify the least total cost port.

The multiport analysis uses the same analytical framework for the at sea costs as the NED benefits (deepening) applied to competing ports (and channel depths) for a least total cost comparison. The same benefiting vessel services and characteristics are used in the multiport analysis as the NED (deepening) analysis. For these services, there is no indication that deepening Savannah Harbor would sufficiently reduce at sea costs for Savannah Harbor so as to result in lower total transportation costs for more cities in the competitive hinterland. Currently, Savannah Harbor is “least total transportation cost” for six cities in the hinterland. These would not change under with-project conditions. Consequently, under a “least total cost analysis” with-project conditions at Savannah Harbor should not be expected to shift any containerized cargo away from competing ports for the major benefiting services and their current deployments.²⁹

²⁹ It is possible that new services or vessel deployments might have multiport cargo shifts, but these have not been identified as part of the NED benefiting services to be included in this multiport analysis.

Appendix A

MATERIALS FOR SECTION VIII

Appendix A

MATERIALS FOR SECTION VIII

Table 1.1. Direct Rail Services for Norfolk Southern from Savannah, Norfolk, Charleston, and Jacksonville

Rail Company	Port	Terminal City	State
Norfolk Southern	Savannah	Atlanta	GA
		Charlotte	NC
		Memphis	TN
		Chicago	IL
		Huntsville	AL
		New Orleans	LA
		Cincinnati	OH
		Louisville	KY
Norfolk Southern	Norfolk	Atlanta	GA
		Chicago	IL
		Cincinnati	OH
		Cleveland	OH
		Columbus	OH
		Detroit	MI
		Louisville	KY
		Memphis	TN
		St. Louis	MO
Norfolk Southern	Charleston	Cincinnati	OH
		Chicago	IL
		Louisville	KY
		Huntsville	AL
		Memphis	TN
		Atlanta	GA
		New Orleans	LA
Norfolk Southern	Jacksonville	Atlanta	GA
		Chicago	IL
		Cincinnati	OH
		Detroit	MI
		Louisville	KY
		Memphis	TN
	St. Louis	MO	

Source: Norfolk Southern Intermodal Schedules.

Table 1.2. Direct Rail Services for CSX from Savannah, Portsmouth, Charleston, and Jacksonville

Rail Company	Port	Terminal City	State
CSX	Savannah	Chicago	IL
		Birmingham	AL
		Memphis	TN
		New Orleans	LA
	Portsmouth	Chicago	IL
	Charleston	Chicago	IL
		Memphis	TN
		New Orleans	LA
	Jacksonville	Chicago	IL
		Birmingham	AL
		Memphis	TN
		New Orleans	LA

Source: CSX Intermodal Schedules.

Table 1.3 Distances in Miles from Port Cities to Hinterland Cities

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Savannah	683	0	637	0	0	394	249	252
Charleston	778	0	778	0	0	0	315	0
Norfolk	0	0	916	913	0	0	566	0
Jacksonville	546	0	733	900	0	493	345	0
Wilmington	0	0	0	0	0	0	0	0

Table 1.3 (cont'd). Distances in Miles from Port Cities to Hinterland Cities

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland	Huntsville
Savannah	0	0	659	664	0	0	953	0	0	442
Charleston	0	0	607	613	0	0	901	0	0	509
Norfolk	0	0	654	699	594	0	885	709	558	0
Jacksonville	0	0	768	796	0	0	1,100	1,057	0	0
Wilmington	0	0	0	0	0	0	0	0	0	0

Note: Zero represents no direct rail service to that hinterland.

Source: G.E.C., Inc.

**Table 1.4. Direct Rail Services for Norfolk Southern from Savannah
Norfolk, Charleston, and Jacksonville**

Rail Company	Port	Terminal City	State	(\$) Cost per Container
Norfolk Southern	Savannah	Atlanta	GA	186.75
		Charlotte	NC	189
		Memphis	TN	443.5
		Chicago	IL	601.5
		Huntsville	AL	331.5
		New Orleans	LA	466.5
		Cincinnati	OH	457
		Louisville	KY	454.5
Norfolk Southern		Norfolk	Atlanta	GA
	Chicago		IL	567.5
	Cincinnati		OH	474.5
	Cleveland		OH	404
	Columbus		OH	422
	Detroit		MI	479.5
	Louisville		KY	452
	Memphis		TN	583
	St. Louis		MO	581.5
Norfolk Southern	Charleston	Cincinnati	OH	431.5
		Chicago	IL	575.5
		Louisville	KY	428.5
		Huntsville	AL	509
		Memphis	TN	514
		Atlanta	GA	236.25
		New Orleans	LA	514
Norfolk Southern	Jacksonville	Atlanta	GA	258.75
		Chicago	IL	800
		Cincinnati	OH	523
		Detroit	MI	779
		Louisville	KY	509
		Memphis	TN	491.5
		St. Louis	MO	575

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 1.5. Direct Rail Services for CSX from Savannah, Portsmouth, Charleston, and Jacksonville

Rail Company	Port	Terminal City	State	(\$) Cost per Container
CSX	Savannah	Chicago	IL	601.5
		Birmingham	AL	295.5
		Memphis	TN	443.5
		New Orleans	LA	466.5
	Portsmouth	Chicago	IL	893
	Charleston	Chicago	IL	575.5
		Memphis	TN	514
		New Orleans	LA	514
	Jacksonville	Chicago	IL	800
		Birmingham	AL	246.5
		Memphis	TN	491.5
		New Orleans	LA	398

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Appendix B

MATERIALS FOR SECTION IX

Appendix B

MATERIALS FOR SECTION IX

Table 2.1. Tons per TEU Input

Service	Tons per TEU
FE ECUS MED PEN service Inbound	10
FE ECUS MED PEN service Outbound	10
FE ECUS EU PEN service Inbound	10
FE ECUS EU PEN service Outbound	10
FE SUEZ ECUS PEN service Inbound	10
FE SUEZ ECUS PEN service Outbound	10

Source: G.E.C., Inc.

Table 2.2. Wilmington Input Values for Benefiting Services

Service	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Distance for Service Inbound	1,115	1,612	462
Voyage Distance for Service Outbound	462	262	262
Cargo Density Factor (CDF) Inbound	100	100	100
Cargo Density Factor (CDF) Outbound	100	100	100
Vessel Cargo in Metric Tonnes Inbound	24,464	24,968	51,696
Vessel Cargo in Metric Tonnes Outbound	27,464	27,404	36,696
Vessel Type	Panamax	Panamax	Post Panamax

Notes: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.3. Charleston Input Values for Benefiting Services

Service	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Distance for Service Inbound	1,064	1,563	533
Voyage Distance for Service Outbound	533	353	353
Cargo Density Factor (CDF) Inbound	100	100	100
Cargo Density Factor (CDF) Outbound	100	100	100
Vessel Cargo in Metric Tonnes Inbound	31,160	31,664	61,740
Vessel Cargo in Metric Tonnes Outbound	34,160	34,100	46,740
Vessel Type	Panamax	Panamax	Post Panamax

Notes: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.4. Jacksonville Input Values for Benefiting Services

Service	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Distance for Service Inbound	1,016	1,515	674
Voyage Distance for Service Outbound	674	474	474
Cargo Density Factor (CDF) Inbound	100	100	100
Cargo Density Factor (CDF) Outbound	100	100	100
Vessel Cargo in Metric Tonnes Inbound	22,232	22,736	48,348
Vessel Cargo in Metric Tonnes Outbound	25,232	25,172	33,348
Vessel Type	Panamax	Panamax	PostPanamax

Notes: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.5. Portsmouth Input Values for Benefiting Services

Service	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Distance for Service Inbound	1,279	1,778	200
Voyage Distance for Service Outbound	200	200	200
Cargo Density Factor (CDF) Inbound	100	100	100
Cargo Density Factor (CDF) Outbound	100	100	100
Vessel Cargo in Metric Tonnes Inbound	24,464	24,968	51,696
Vessel Cargo in Metric Tonnes Outbound	27,464	27,404	36,696
Vessel Type	Panamax	Panamax	PostPanamax

Notes: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.6. Newport News Input Values for Benefiting Services

Service	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Distance for Service Inbound	1,279	1,778	200
Voyage Distance for Service Outbound	200	200	200
Cargo Density Factor (CDF) Inbound	100	100	100
Cargo Density Factor (CDF) Outbound	100	100	100
Vessel Cargo in Metric Tonnes Inbound	31,160	31,664	61,740
Vessel Cargo in Metric Tonnes Outbound	34,160	34,100	46,740
Vessel Type	Panamax	Panamax	PostPanamax

Notes: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.7. Norfolk International Input Values for Benefiting Services

Service	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Distance for Service Inbound	1,279	1,778	200
Voyage Distance for Service Outbound	200	200	200
Cargo Density Factor (CDF) Inbound	100	100	100
Cargo Density Factor (CDF) Outbound	100	100	100
Vessel Cargo in Metric Tonnes Inbound	33,392	33,896	78,480
Vessel Cargo in Metric Tonnes Outbound	33,392	36,332	63,480
Vessel Type	Panamax	Panamax	PostPanamax

Notes: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.8. Charleston Sea Cost for Benefiting Services

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	46.26087	67.95652	21.66667
Voyage Days	1.927536	2.831522	0.902778
Total Voyage Cost (\$)	\$66,249	\$97,319	\$43,649
Sea Cost (\$/TEU)	\$21.26	\$30.74	\$7.07
Outbound			
Voyage Hours	23.17391	15.34783	14.34959
Voyage Days	0.96558	0.639493	0.5979
Total Voyage Cost (\$)	\$33,187	\$21,979	\$28,908
Sea Cost (\$/TEU)	\$9.72	\$6.45	\$6.18

Notes: It is assumed that the vessel's TEU port volume is 1,500 TEUs.
Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.9. Jacksonville Sea Cost for Benefiting Services

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	44.17391	65.86957	27.39837
Voyage Days	1.84058	2.744565	1.141599
Total Voyage Cost (\$)	\$63,261	\$94,331	\$55,196
Sea Cost (\$/TEU)	\$28.45	\$41.49	\$11.42
Outbound			
Voyage Hours	29.30435	20.6087	19.26829
Voyage Days	1.221014	0.858696	0.802846
Total Voyage Cost (\$)	\$41,966	\$29,513	\$38,818
Sea Cost (\$/TEU)	\$16.63	\$11.72	\$11.64

Notes: It is assumed that the vessel's TEU port volume is 1,500 TEUs.
Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.10. Portsmouth Sea Cost for Benefiting Services

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	55.6087	77.30435	8.130081
Voyage Days	2.317029	3.221014	0.338753
Total Voyage Cost (\$)	\$79,636	\$110,706	\$16,379
Sea Cost (\$/TEU)	\$32.55	\$44.34	\$3.17
Outbound			
Voyage Hours	8.695652	8.695652	8.130081
Voyage Days	0.362319	0.362319	0.338753
Total Voyage Cost (\$)	\$12,453	\$12,453	\$16,379
Sea Cost (\$/TEU)	\$4.53	\$4.54	\$4.46

Notes: It is assumed that the vessel's TEU port volume is 1,500 TEUs.
Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.11. Newport News Sea Cost for Benefiting Services, FE ECUS MED PEN

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	55.6087	77.30435	8.130081
Voyage Days	2.317029	3.221014	0.338753
Total Voyage Cost (\$)	\$79,636	\$110,706	\$16,379
Sea Cost (\$/TEU)	\$25.56	\$34.96	\$2.65
Outbound			
Voyage Hours	8.695652	8.695652	8.130081
Voyage Days	0.362319	0.362319	0.338753
Total Voyage Cost (\$)	\$12,453	\$12,453	\$16,379
Sea Cost (\$/TEU)	\$3.65	\$3.65	\$3.50

Notes: It is assumed that the vessel's TEU port volume is 1,500 TEUs.
Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.12. Norfolk International Sea Cost for Benefiting Services, FE ECUS MED PEN

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	55.6087	77.30435	8.130081
Voyage Days	2.317029	3.221014	0.338753
Total Voyage Cost (\$)	\$79,636	\$110,706	\$16,379
Sea Cost (\$/TEU)	\$23.85	\$32.66	\$2.09
Outbound			
Voyage Hours	8.695652	8.695652	8.130081
Voyage Days	0.362319	0.362319	0.338753
Total Voyage Cost (\$)	\$12,453	\$12,453	\$16,379
Sea Cost (\$/TEU)	\$3.73	\$3.43	\$2.58

Notes: It is assumed that the vessel's TEU capacity is 1,500 TEUs.
Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.13. Port Costs for Five Mid-Atlantic and South Atlantic Ports, FE ECUS EU PEN

Port	Wharfage \$/TEU	Dockage \$/TEU	Container Charges \$/TEU	Pilotage \$/TEU	Tuggage \$/TEU	Total Port Costs \$/TEU
Norfolk – Portsmouth	35.60	5.51	150.00	2.33	1.33	194.77
Norfolk – Newport News	35.60	5.51	150.00	2.37	1.33	194.82
Norfolk – International	35.60	5.51	150.00	2.44	1.33	194.89
Wilmington	30.97	6.00	150.00	2.33	1.33	190.64
Charleston	40.23	4.91	150.00	2.33	1.33	198.81
Savannah 42 feet	38.58	6.69	150.00	2.30	1.33	198.90
Jacksonville	33.07	4.94	150.00	2.19	1.33	191.53

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.14. Port Costs for Five Mid-Atlantic and South Atlantic Ports, FE SUEZ ECUS PEN

	Wharfage \$/TEU	Dockage \$/TEU	Container Charges \$/TEU	Pilotage \$/TEU	Tuggage \$/TEU	Total Port Costs \$/TEU
Norfolk –Portsmouth	35.60	6.05	150.00	3.13	1.33	196.11
Norfolk – Newport News	35.60	6.05	150.00	3.17	1.33	196.15
Norfolk - International	35.60	6.05	150.00	3.24	1.33	196.22
Wilmington	30.97	6.59	150.00	3.13	1.33	196.22
Charleston	40.23	5.39	150.00	3.11	1.33	200.07
Savannah 42 feet	38.58	7.34	150.00	3.10	1.33	200.36
Jacksonville	33.07	5.42	150.00	2.93	1.33	192.76

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.15. Truck Costs for Wilmington Associated with Hinterland Cities

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	15.78	13.24	15.33	17.31	14.27	10.02	7.36	3.56
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$946.91	\$794.18	\$919.64	\$1,038.55	\$856.36	\$601.09	\$441.82	\$213.82
Total Truck Land Cost	\$1,026.91	\$874.18	\$999.64	\$1,118.55	\$936.36	\$681.09	\$521.82	\$293.82
Truck Land Cost/TEU	\$513.45	\$437.09	\$499.82	\$559.27	\$468.18	\$340.55	\$260.91	\$146.91

Table 2.15 (cont'd). Truck Costs for Wilmington Associated with Hinterland Cities

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	12.15	8.93	12.60	11.96	11.96	14.62	17.95	15.67	12.73
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$728.73	\$535.64	\$756.00	\$717.82	\$717.82	\$877.09	\$1,076.73	\$940.36	\$763.64
Total Truck Land Cost	\$808.73	\$615.64	\$836.00	\$797.82	\$797.82	\$957.09	\$1,156.73	\$1,020.36	\$843.64
Truck Land Cost/TEU	\$404.36	\$307.82	\$418.00	\$398.91	\$398.91	\$478.55	\$578.36	\$510.18	\$421.82

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.16. Truck Costs for Charleston Associated with Hinterland Cities

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	14.15	11.60	14.15	15.40	12.64	8.38	5.73	3.64
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$848.73	\$696.00	\$848.73	\$924.00	\$758.18	\$502.91	\$343.64	\$218.18
Total Truck Land Cost	\$928.73	\$776.00	\$928.73	\$1,004.00	\$838.18	\$582.91	\$423.64	\$298.18
Truck Land Cost/TEU	\$464.36	\$388.00	\$464.36	\$502.00	\$419.09	\$291.45	\$211.82	\$149.09

Table 2.16 (cont'd). Truck Costs for Charleston Associated with Hinterland Cities

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	9.84	6.62	11.04	11.15	12.24	13.05	16.38	15.91	12.96
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$590.18	\$397.09	\$662.18	\$668.73	\$734.18	\$783.27	\$982.91	\$954.55	\$777.82
Total Truck Land Cost	\$670.18	\$477.09	\$742.18	\$748.73	\$814.18	\$863.27	\$1,062.91	\$1,034.55	\$857.82
Truck Land Cost/TEU	\$335.09	\$238.55	\$371.09	\$374.36	\$407.09	\$431.64	\$531.45	\$517.27	\$428.91

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 2.17. Truck Costs for Jacksonville Associated with Hinterland Cities

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	9.93	7.35	13.33	16.36	13.22	8.96	6.27	6.98
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$595.64	\$440.73	\$799.64	\$981.82	\$793.09	\$537.82	\$376.36	\$418.91
Total Truck Land Cost	\$675.64	\$520.73	\$879.64	\$1,061.82	\$873.09	\$617.82	\$456.36	\$498.91
Truck Land Cost/TEU	\$337.82	\$260.36	\$439.82	\$530.91	\$436.55	\$308.91	\$228.18	\$249.45

Table 2.17 (cont'd). Truck Costs for Jacksonville Associated with Hinterland Cities

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Pickup Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Delivery Time in Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Driving Time in Hours	10.80	9.96	13.96	14.47	15.58	15.98	20.00	19.22	16.31
Pickup/Delivery Cost	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00	\$80.00
Driving Cost	\$648.00	\$597.82	\$837.82	\$868.36	\$934.91	\$958.91	\$1,200.00	\$1,153.09	\$978.55
Total Truck Land Cost	\$728.00	\$677.82	\$917.82	\$948.36	\$1,014.91	\$1,038.91	\$1,280.00	\$1,233.09	\$1,058.55
Truck Land Cost/TEU	\$364.00	\$338.91	\$458.91	\$474.18	\$507.45	\$519.45	\$640.00	\$616.55	\$529.27

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Appendix C

MATERIALS FOR SECTION X

Appendix C

MATERIALS FOR SECTION X

Table 3.1. Vessel Table Inputs

	PP2	Post Panamax	Panamax	SubPanamax	Handysize	Feedermax	Feeder
Service Speed in Knots	0	246	23	209	194	184	164
Daily Vessel Cost	0	48,350	34,370	24,710	18,260	14,740	10,460
Immersion Rate in metric tonnes per inch (TPI)	0	279	186	135.7	101.2	82	52.7
TEC	0	6,000	4,000	2,500	1,600	1,200	600

Source: G.E.C., Inc.

Table 3.2 Tonnes Per TEU Input

Service	Tonnes per TEU
FE ECUS MED PEN – Inbound	10
FE ECUS MED PEN – Outbound	10
FE ECUS EU PEN – Inbound	10
FE ECUS EU PEN – Outbound	10
FE SUEZ ECUS PEN – Inbound	10
FE SUEZ ECUS PEN - Outbound	10

Source: G.E.C., Inc.

Table 3.3. Savannah Sea Cost and Benefiting Services

	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Distance for Service Inbound	1,063	1,562	594
Voyage Distance for Service Outbound	594	394	394
Cargo Density Factor (CDF) Inbound	100	100	100
Cargo Density Factor (CDF) Outbound	100	100	100
Vessel Without-Project Cargo in Metric Tonnes Inbound	20,000	20,504	45,000
Vessel Without-Project Cargo in Metric Tonnes Outbound	23,000	22,940	30,000
43 Feet Vessel Cargo in Metric Tonnes Inbound	22,232	22,736	48,348
43 Feet Vessel Cargo in Metric Tonnes Outbound	25,232	25,172	33,348
44 Feet Vessel Cargo in Metric Tonnes Inbound	24,464	24,968	51,696
44 Feet Vessel Cargo in Metric Tonnes Outbound	27,464	27,404	36,696
45 Feet Vessel Cargo in Metric Tonnes Inbound	26,696	27,200	55,044
45 Feet Vessel Cargo in Metric Tonnes Outbound	29,696	29,636	40,044
46 Feet Vessel Cargo in Metric Tonnes Inbound	28,928	29,432	58,392
46 Feet Vessel Cargo in Metric Tonnes Outbound	31,928	31,868	43,392
47 Feet Vessel Cargo in Metric Tonnes Inbound	31,160	31,664	61,740
47 Feet Vessel Cargo in Metric Tonnes Outbound	34,160	34,100	46,740
48 Feet Vessel Cargo in Metric Tonnes Inbound	33,392	33,896	65,088
48 Feet Vessel Cargo in Metric Tonnes Outbound	36,392	36,332	50,088
Vessel Type	Panamax	Panamax	PostPanamax

Source: G.E.C., Inc.

Table 3.4. Savannah Sea Cost Based on Current Depth of 42 Feet, Inbound/Outbound

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	46.21739	67.91304	24.14634
Voyage Days	1.925725	2.82971	1.006098
Total Voyage Cost (\$)	\$66,187	\$97,257	\$48,645
Sea Cost (\$/TEU)	\$33.09	\$47.43	\$10.81
Outbound			
Voyage Hours	25.82609	17.13043	16.01626
Voyage Days	1.076087	0.713768	0.667344
Total Voyage Cost (\$)	\$36,985	\$24,532	\$32,266
Sea Cost (\$/TEU)	\$16.08	\$10.69	\$10.76

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.5. Savannah Sea Cost Based on Future Depth of 43 Feet, Inbound/Outbound
FE ECUS MED PEN**

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	46.21739	67.91304	24.14634
Voyage Days	1.925725	2.82971	1.006098
Total Voyage Cost (\$)	\$66,187	\$97,257	\$48,645
Sea Cost (\$/TEU)	\$29.77	\$42.78	\$10.06
Outbound			
Voyage Hours	25.82609	17.13043	16.01626
Voyage Days	1.076087	0.713768	0.667344
Total Voyage Cost (\$)	\$36,985	\$24,532	\$32,266
Sea Cost (\$/TEU)	\$14.66	\$9.75	\$9.68

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.6. Savannah Sea Cost Based on Future Depth of 44 Feet, Inbound/Outbound
FE ECUS MED PEN**

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	46.21739	67.91304	24.14634
Voyage Days	1.925725	2.82971	1.006098
Total Voyage Cost (\$)	\$66,187	\$97,257	\$48,645
Sea Cost (\$/TEU)	\$27.05	\$38.95	\$9.41
Outbound			
Voyage Hours	25.82609	17.13043	16.01626
Voyage Days	1.076087	0.713768	0.667344
Total Voyage Cost (\$)	\$36,985	\$24,532	\$32,266
Sea Cost (\$/TEU)	\$13.47	\$8.95	\$8.79

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.7. Savannah Sea Cost Based on Future Depth of 46 Feet, Inbound/Outbound
FE ECUS MED PEN**

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	46.21739	67.91304	24.14634
Voyage Days	1.925725	2.82971	1.006098
Total Voyage Cost (\$)	\$66,187	\$97,257	\$48,645
Sea Cost (\$/TEU)	\$22.88	\$33.04	\$8.33
Outbound			
Voyage Hours	25.82609	17.13043	16.01626
Voyage Days	1.076087	0.713768	0.667344
Total Voyage Cost (\$)	\$36,985	\$24,532	\$32,266
Sea Cost (\$/TEU)	\$11.58	\$7.70	\$7.44

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.8. Savannah Sea Cost Based on Future Depth of 47 Feet, Inbound/Outbound
FE ECUS MED PEN**

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	46.21739	67.91304	24.14634
Voyage Days	1.925725	2.82971	1.006098
Total Voyage Cost (\$)	\$66,187	\$97,257	\$48,645
Sea Cost (\$/TEU)	\$21.24	\$30.72	\$7.88
Outbound			
Voyage Hours	25.82609	17.13043	16.01626
Voyage Days	1.076087	0.713768	0.667344
Total Voyage Cost (\$)	\$36,985	\$24,532	\$32,266
Sea Cost (\$/TEU)	\$10.83	\$7.19	\$6.90

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.9. Savannah Sea Cost Based on Future Depth of 48 Feet, Inbound/Outbound
FE ECUS MED PEN**

Inbound	FE ECUS MED PEN	FE ECUS EU PEN	FE SUEZ ECUS PEN
Voyage Hours	46.21739	67.91304	24.14634
Voyage Days	1.925725	2.82971	1.006098
Total Voyage Cost (\$)	\$66,187	\$97,257	\$48,645
Sea Cost (\$/TEU)	\$19.82	\$28.69	\$7.47
Outbound			
Voyage Hours	25.82609	17.13043	16.01626
Voyage Days	1.076087	0.713768	0.667344
Total Voyage Cost (\$)	\$36,985	\$24,532	\$32,266
Sea Cost (\$/TEU)	\$10.16	\$6.75	\$6.44

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 3.10. Portsmouth Total Cost for Hinterland, 45 Feet, Inbound FE ECUS MED PEN

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$32.55	\$32.55	\$32.55	\$32.55	\$32.55	\$32.55	\$32.55	\$32.55
Port Cost Total	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$831.33	\$754.96	\$766.96	\$765.33	\$783.87	\$656.24	\$576.05	\$445.69

Table 3.10 (cont'd). Portsmouth Total Cost for Hinterland, 45 Feet, Inbound FE ECUS MED PEN

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$32.55	\$32.55	\$32.55	\$32.55	\$32.55	\$32.55	\$32.55	\$32.55	\$32.55
Port Cost Total	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$651.87	\$550.42	\$624.05	\$648.60	\$591.33	\$684.60	\$750.05	\$654.05	\$571.69

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 3.11. Newport News Total Cost for Hinterland, 45 Feet, Inbound FE ECUS MED PEN

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$25.56	\$25.56	\$25.56	\$25.56	\$25.56	\$25.56	\$25.56	\$25.56
Port Cost Total	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$824.37	\$748.01	\$760.01	\$758.37	\$776.92	\$649.28	\$569.10	\$438.74

Table 3.11 (cont'd). Newport News Total Cost for Hinterland, 45 Feet, Inbound FE ECUS MED PEN

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$25.56	\$25.56	\$25.56	\$25.56	\$25.56	\$25.56	\$25.56	\$25.56	\$25.56
Port Cost Total	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$644.92	\$543.46	\$617.10	\$641.65	\$584.37	\$677.65	\$743.10	\$647.10	\$564.74

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.12. Norfolk International Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$23.85	\$23.85	\$23.85	\$23.85	\$23.85	\$23.85	\$23.85	\$23.85
Port Cost Total	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$822.74	\$746.37	\$758.37	\$756.74	\$775.28	\$647.64	\$567.46	\$437.10

**Table 3.12 (cont'd). Norfolk International Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$23.85	\$23.85	\$23.85	\$23.85	\$23.85	\$23.85	\$23.85	\$23.85	\$23.85
Port Cost Total	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$643.28	\$541.83	\$615.46	\$640.01	\$582.74	\$676.01	\$741.46	\$645.46	\$563.10

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Table 3.13. Wilmington Total Cost for Hinterland, 45 Feet, Inbound FE ECUS MED PEN

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$28.38	\$28.38	\$28.38	\$28.38	\$28.38	\$28.38	\$28.38	\$28.38
Port Cost Total	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64
Land Cost Total	\$513.45	\$437.09	\$499.82	\$559.27	\$468.18	\$340.55	\$260.91	\$146.91
Total Cost	\$732.47	\$656.11	\$718.84	\$778.29	\$687.20	\$559.56	\$479.93	\$365.93

**Table 3.13 (cont'd). Wilmington Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$28.38	\$28.38	\$28.38	\$28.38	\$28.38	\$28.38	\$28.38	\$28.38	\$28.38
Port Cost Total	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64
Land Cost Total	\$404.36	\$307.82	\$418.00	\$398.91	\$398.91	\$478.55	\$578.36	\$510.18	\$421.82
Total Cost	\$623.38	\$526.84	\$637.02	\$617.93	\$617.93	\$697.56	\$797.38	\$729.20	\$640.84

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.14. Charleston Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$21.26	\$21.26	\$21.26	\$21.26	\$21.26	\$21.26	\$21.26	\$21.26
Port Cost Total	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81
Land Cost Total	\$464.36	\$388.00	\$464.36	\$502.00	\$419.09	\$291.45	\$211.82	\$149.09
Total Cost	\$684.43	\$608.07	\$684.43	\$722.07	\$639.16	\$511.52	\$431.89	\$369.16

**Table 3.14 (cont'd). Charleston Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$21.26	\$21.26	\$21.26	\$21.26	\$21.26	\$21.26	\$21.26	\$21.26	\$21.26
Port Cost Total	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81
Land Cost Total	\$335.09	\$238.55	\$371.09	\$374.36	\$407.09	\$431.64	\$531.45	\$517.27	\$428.91
Total Cost	\$555.16	\$458.62	\$591.16	\$594.43	\$627.16	\$651.71	\$751.52	\$737.34	\$648.98

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.15. Jacksonville Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$28.45	\$28.45	\$28.45	\$28.45	\$28.45	\$28.45	\$28.45	\$28.45
Port Cost Total	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53
Land Cost Total	\$337.82	\$260.36	\$439.82	\$530.91	\$436.55	\$308.91	\$228.18	\$249.45
Total Cost	\$557.81	\$480.35	\$659.81	\$750.90	\$656.53	\$528.90	\$448.17	\$469.44

**Table 3.15 (cont'd). Jacksonville Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$28.45	\$28.45	\$28.45	\$28.45	\$28.45	\$28.45	\$28.45	\$28.45	\$28.45
Port Cost Total	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53
Land Cost Total	\$364.00	\$338.91	\$458.91	\$474.18	\$507.45	\$519.45	\$640.00	\$616.55	\$529.27
Total Cost	\$583.99	\$558.90	\$678.90	\$694.17	\$727.44	\$739.44	\$859.99	\$836.53	\$749.26

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.16. Portsmouth Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$4.53	\$4.53	\$4.53	\$4.53	\$4.53	\$4.53	\$4.53	\$4.53
Port Cost Total	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$803.31	\$726.94	\$738.94	\$737.31	\$755.85	\$628.22	\$548.04	\$417.67

**Table 3.16 (cont'd). Portsmouth Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$4.53	\$4.53	\$4.53	\$4.53	\$4.53	\$4.53	\$4.53	\$4.53	\$4.53
Port Cost Total	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$623.85	\$522.40	\$596.04	\$620.58	\$563.31	\$656.58	\$722.04	\$626.04	\$543.67

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.17. Newport News Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65
Port Cost Total	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$802.46	\$726.10	\$738.10	\$736.46	\$755.01	\$627.37	\$547.19	\$416.83

**Table 3.17 (cont'd). Newport News Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65
Port Cost Total	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$623.01	\$521.55	\$595.19	\$619.73	\$562.46	\$655.73	\$721.19	\$625.19	\$542.83

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.18. Norfolk International Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$3.73	\$3.73	\$3.73	\$3.73	\$3.73	\$3.73	\$3.73	\$3.73
Port Cost Total	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$802.62	\$726.25	\$738.25	\$736.62	\$755.16	\$627.52	\$547.34	\$416.98

**Table 3.18 (cont'd). Norfolk International Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$3.73	\$3.73	\$3.73	\$3.73	\$3.73	\$3.73	\$3.73	\$3.73	\$3.73
Port Cost Total	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$623.16	\$521.71	\$595.34	\$619.89	\$562.62	\$655.89	\$721.34	\$625.34	\$542.98

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.19. Wilmington Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$10.47	\$10.47	\$10.47	\$10.47	\$10.47	\$10.47	\$10.47	\$10.47
Port Cost Total	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64
Land Cost Total	\$513.45	\$437.09	\$499.82	\$559.27	\$468.18	\$340.55	\$260.91	\$146.91
Total Cost	\$714.57	\$638.20	\$700.93	\$760.39	\$669.29	\$541.66	\$462.02	\$348.02

**Table 3.19 (cont'd). Wilmington Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$10.47	\$10.47	\$10.47	\$10.47	\$10.47	\$10.47	\$10.47	\$10.47	\$10.47
Port Cost Total	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64
Land Cost Total	\$404.36	\$307.82	\$418.00	\$398.91	\$398.91	\$478.55	\$578.36	\$510.18	\$421.82
Total Cost	\$605.48	\$508.93	\$619.11	\$600.02	\$600.02	\$679.66	\$779.48	\$711.29	\$622.93

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.20. Charleston Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72
Port Cost Total	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81
Land Cost Total	\$464.36	\$388.00	\$464.36	\$502.00	\$419.09	\$291.45	\$211.82	\$149.09
Total Cost	\$672.89	\$596.52	\$672.89	\$710.52	\$627.62	\$499.98	\$420.34	\$357.62

**Table 3.20 (cont'd). Charleston Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72	\$9.72
Port Cost Total	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81
Land Cost Total	\$335.09	\$238.55	\$371.09	\$374.36	\$407.09	\$431.64	\$531.45	\$517.27	\$428.91
Total Cost	\$543.62	\$447.07	\$579.62	\$582.89	\$615.62	\$640.16	\$739.98	\$725.80	\$637.43

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.21. Savannah Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$12.45	\$12.45	\$12.45	\$12.45	\$12.45	\$12.45	\$12.45	\$12.45
Port Cost Total	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94
Land Cost Total	\$412.55	\$314.91	\$387.45	\$478.00	\$383.09	\$254.91	\$175.82	\$177.45
Total Cost	\$623.94	\$526.31	\$598.85	\$689.40	\$594.49	\$466.31	\$387.22	\$388.85

**Table 3.21 (cont'd). Savannah Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$12.45	\$12.45	\$12.45	\$12.45	\$12.45	\$12.45	\$12.45	\$12.45	\$12.45
Port Cost Total	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94
Land Cost Total	\$311.09	\$266.36	\$399.45	\$402.18	\$435.45	\$460.00	\$559.82	\$544.55	\$456.73
Total Cost	\$522.49	\$477.76	\$610.85	\$613.58	\$646.85	\$671.40	\$771.22	\$755.94	\$668.13

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.22. Jacksonville Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$16.63	\$16.63	\$16.63	\$16.63	\$16.63	\$16.63	\$16.63	\$16.63
Port Cost Total	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53
Land Cost Total	\$337.82	\$260.36	\$439.82	\$530.91	\$436.55	\$308.91	\$228.18	\$249.45
Total Cost	\$545.98	\$468.53	\$647.98	\$739.07	\$644.71	\$517.07	\$436.35	\$457.62

**Table 3.22 (cont'd). Jacksonville Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS MED PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$16.63	\$16.63	\$16.63	\$16.63	\$16.63	\$16.63	\$16.63	\$16.63	\$16.63
Port Cost Total	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53
Land Cost Total	\$364.00	\$338.91	\$458.91	\$474.18	\$507.45	\$519.45	\$640.00	\$616.55	\$529.27
Total Cost	\$572.16	\$547.07	\$667.07	\$682.35	\$715.62	\$727.62	\$848.16	\$824.71	\$737.44

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.23. Portsmouth Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$44.34	\$44.34	\$44.34	\$44.34	\$44.34	\$44.34	\$44.34	\$44.34
Port Cost Total	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$843.11	\$766.75	\$778.75	\$777.11	\$795.66	\$668.02	\$587.84	\$457.48

**Table 3.23 (cont'd). Portsmouth Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$44.34	\$44.34	\$44.34	\$44.34	\$44.34	\$44.34	\$44.34	\$44.34	\$44.34
Port Cost Total	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$663.66	\$562.20	\$635.84	\$660.39	\$603.11	\$696.39	\$761.84	\$665.84	\$583.48

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.24. Newport News Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$34.96	\$34.96	\$34.96	\$34.96	\$34.96	\$34.96	\$34.96	\$34.96
Port Cost Total	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$833.78	\$757.42	\$769.42	\$767.78	\$786.32	\$658.69	\$578.51	\$448.14

**Table 3.24 (cont'd). Newport News Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$34.96	\$34.96	\$34.96	\$34.96	\$34.96	\$34.96	\$34.96	\$34.96	\$34.96
Port Cost Total	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$654.32	\$552.87	\$626.51	\$651.05	\$593.78	\$687.05	\$752.51	\$656.51	\$574.14

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.25. Norfolk International Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$32.66	\$32.66	\$32.66	\$32.66	\$32.66	\$32.66	\$32.66	\$32.66
Port Cost Total	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$831.55	\$755.18	\$767.18	\$765.55	\$784.09	\$656.46	\$576.27	\$445.91

**Table 3.25 (cont'd). Norfolk International Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$32.66	\$32.66	\$32.66	\$32.66	\$32.66	\$32.66	\$32.66	\$32.66	\$32.66
Port Cost Total	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$652.09	\$550.64	\$624.27	\$648.82	\$591.55	\$684.82	\$750.27	\$654.27	\$571.91

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.26. Wilmington Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$40.20	\$40.20	\$40.20	\$40.20	\$40.20	\$40.20	\$40.20	\$40.20
Port Cost Total	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64
Land Cost Total	\$513.45	\$437.09	\$499.82	\$559.27	\$468.18	\$340.55	\$260.91	\$146.91
Total Cost	\$744.29	\$667.93	\$730.66	\$790.11	\$699.02	\$571.38	\$491.75	\$377.75

**Table 3.26 (cont'd). Wilmington Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$40.20	\$40.20	\$40.20	\$40.20	\$40.20	\$40.20	\$40.20	\$40.20	\$40.20
Port Cost Total	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64
Land Cost Total	\$404.36	\$307.82	\$418.00	\$398.91	\$398.91	\$478.55	\$578.36	\$510.18	\$421.82
Total Cost	\$635.20	\$538.66	\$648.84	\$629.75	\$629.75	\$709.38	\$809.20	\$741.02	\$652.66

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.27. Charleston Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$30.74	\$30.74	\$30.74	\$30.74	\$30.74	\$30.74	\$30.74	\$30.74
Port Cost Total	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81
Land Cost Total	\$464.36	\$388.00	\$464.36	\$502.00	\$419.09	\$291.45	\$211.82	\$149.09
Total Cost	\$693.91	\$617.54	\$693.91	\$731.54	\$648.64	\$521.00	\$441.36	\$378.64

**Table 3.27 (cont'd). Charleston Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$30.74	\$30.74	\$30.74	\$30.74	\$30.74	\$30.74	\$30.74	\$30.74	\$30.74
Port Cost Total	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81
Land Cost Total	\$335.09	\$238.55	\$371.09	\$374.36	\$407.09	\$431.64	\$531.45	\$517.27	\$428.91
Total Cost	\$564.64	\$468.09	\$600.64	\$603.91	\$636.64	\$661.18	\$761.00	\$746.82	\$658.45

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.28. Savannah Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$35.76	\$35.76	\$35.76	\$35.76	\$35.76	\$35.76	\$35.76	\$35.76
Port Cost Total	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94
Land Cost Total	\$412.55	\$314.91	\$387.45	\$478.00	\$383.09	\$254.91	\$175.82	\$177.45
Total Cost	\$647.25	\$549.61	\$622.15	\$712.70	\$617.79	\$489.61	\$410.52	\$412.15

**Table 3.28 (cont'd). Savannah Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$35.76	\$35.76	\$35.76	\$35.76	\$35.76	\$35.76	\$35.76	\$35.76	\$35.76
Port Cost Total	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94
Land Cost Total	\$311.09	\$266.36	\$399.45	\$402.18	\$435.45	\$460.00	\$559.82	\$544.55	\$456.73
Total Cost	\$545.79	\$501.06	\$634.15	\$636.88	\$670.15	\$694.70	\$794.52	\$779.25	\$691.43

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.29. Jacksonville Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$41.49	\$41.49	\$41.49	\$41.49	\$41.49	\$41.49	\$41.49	\$41.49
Port Cost Total	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53
Land Cost Total	\$337.82	\$260.36	\$439.82	\$530.91	\$436.55	\$308.91	\$228.18	\$249.45
Total Cost	\$570.84	\$493.39	\$672.84	\$763.93	\$669.57	\$541.93	\$461.20	\$482.48

**Table 3.29 (cont'd). Jacksonville Total Cost for Hinterland, 45 Feet, Inbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$41.49	\$41.49	\$41.49	\$41.49	\$41.49	\$41.49	\$41.49	\$41.49	\$41.49
Port Cost Total	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53
Land Cost Total	\$364.00	\$338.91	\$458.91	\$474.18	\$507.45	\$519.45	\$640.00	\$616.55	\$529.27
Total Cost	\$597.02	\$571.93	\$691.93	\$707.20	\$740.48	\$752.48	\$873.02	\$849.57	\$762.29

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.30. Portsmouth Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$4.54	\$4.54	\$4.54	\$4.54	\$4.54	\$4.54	\$4.54	\$4.54
Port Cost Total	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$803.32	\$726.95	\$738.95	\$737.32	\$755.86	\$628.23	\$548.05	\$417.68

**Table 3.30 (cont'd). Portsmouth Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$4.54	\$4.54	\$4.54	\$4.54	\$4.54	\$4.54	\$4.54	\$4.54	\$4.54
Port Cost Total	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77	\$194.77
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$623.86	\$522.41	\$596.05	\$620.59	\$563.32	\$656.59	\$722.05	\$626.05	\$543.68

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.31. Newport News Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65
Port Cost Total	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$802.47	\$726.10	\$738.10	\$736.47	\$755.01	\$627.38	\$547.20	\$416.83

**Table 3.31 (cont'd). Newport News Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65	\$3.65
Port Cost Total	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82	\$194.82
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$623.01	\$521.56	\$595.20	\$619.74	\$562.47	\$655.74	\$721.20	\$625.20	\$542.83

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.32. Norfolk International Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43
Port Cost Total	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$802.31	\$725.95	\$737.95	\$736.31	\$754.86	\$627.22	\$547.04	\$416.68

**Table 3.32 (cont'd). Norfolk International Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43	\$3.43
Port Cost Total	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89	\$194.89
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$622.86	\$521.40	\$595.04	\$619.59	\$562.31	\$655.59	\$721.04	\$625.04	\$542.68

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.33. Wilmington Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$5.95	\$5.95	\$5.95	\$5.95	\$5.95	\$5.95	\$5.95	\$5.95
Port Cost Total	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64
Land Cost Total	\$513.45	\$437.09	\$499.82	\$559.27	\$468.18	\$340.55	\$260.91	\$146.91
Total Cost	\$710.05	\$633.68	\$696.41	\$755.86	\$664.77	\$537.14	\$457.50	\$343.50

**Table 3.33 (cont'd). Wilmington Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$5.95	\$5.95	\$5.95	\$5.95	\$5.95	\$5.95	\$5.95	\$5.95	\$5.95
Port Cost Total	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64	\$190.64
Land Cost Total	\$404.36	\$307.82	\$418.00	\$398.91	\$398.91	\$478.55	\$578.36	\$510.18	\$421.82
Total Cost	\$600.96	\$504.41	\$614.59	\$595.50	\$595.50	\$675.14	\$774.96	\$706.77	\$618.41

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.34. Charleston Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$6.45	\$6.45	\$6.45	\$6.45	\$6.45	\$6.45	\$6.45	\$6.45
Port Cost Total	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81
Land Cost Total	\$464.36	\$388.00	\$464.36	\$502.00	\$419.09	\$291.45	\$211.82	\$149.09
Total Cost	\$669.62	\$593.25	\$669.62	\$707.25	\$624.35	\$496.71	\$417.07	\$354.35

**Table 3.34 (cont'd). Charleston Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$6.45	\$6.45	\$6.45	\$6.45	\$6.45	\$6.45	\$6.45	\$6.45	\$6.45
Port Cost Total	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81	\$198.81
Land Cost Total	\$335.09	\$238.55	\$371.09	\$374.36	\$407.09	\$431.64	\$531.45	\$517.27	\$428.91
Total Cost	\$540.35	\$443.80	\$576.35	\$579.62	\$612.35	\$636.89	\$736.71	\$722.53	\$634.16

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.35. Savannah Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$8.28	\$8.28	\$8.28	\$8.28	\$8.28	\$8.28	\$8.28	\$8.28
Port Cost Total	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94
Land Cost Total	\$412.55	\$314.91	\$387.45	\$478.00	\$383.09	\$254.91	\$175.82	\$177.45
Total Cost	\$619.77	\$522.13	\$594.68	\$685.22	\$590.31	\$462.13	\$383.04	\$384.68

**Table 3.35 (cont'd). Savannah Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$8.28	\$8.28	\$8.28	\$8.28	\$8.28	\$8.28	\$8.28	\$8.28	\$8.28
Port Cost Total	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94	\$198.94
Land Cost Total	\$311.09	\$266.36	\$399.45	\$402.18	\$435.45	\$460.00	\$559.82	\$544.55	\$456.73
Total Cost	\$518.31	\$473.59	\$606.68	\$609.40	\$642.68	\$667.22	\$767.04	\$751.77	\$663.95

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.36. Jacksonville Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$11.72	\$11.72	\$11.72	\$11.72	\$11.72	\$11.72	\$11.72	\$11.72
Port Cost Total	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53
Land Cost Total	\$337.82	\$260.36	\$439.82	\$530.91	\$436.55	\$308.91	\$228.18	\$249.45
Total Cost	\$541.08	\$463.62	\$643.08	\$734.17	\$639.80	\$512.17	\$431.44	\$452.71

**Table 3.36 (cont'd). Jacksonville Total Cost for Hinterland, 45 Feet, Outbound
FE ECUS EU PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$11.72	\$11.72	\$11.72	\$11.72	\$11.72	\$11.72	\$11.72	\$11.72	\$11.72
Port Cost Total	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53	\$191.53
Land Cost Total	\$364.00	\$338.91	\$458.91	\$474.18	\$507.45	\$519.45	\$640.00	\$616.55	\$529.27
Total Cost	\$567.26	\$542.17	\$662.17	\$677.44	\$710.71	\$722.71	\$843.26	\$819.80	\$732.53

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.37. Portsmouth Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$3.17	\$3.17	\$3.17	\$3.17	\$3.17	\$3.17	\$3.17	\$3.17
Port Cost Total	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$803.28	\$726.92	\$738.92	\$737.28	\$755.83	\$628.19	\$548.01	\$417.64

**Table 3.37 (cont'd). Portsmouth Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$3.17	\$3.17	\$3.17	\$3.17	\$3.17	\$3.17	\$3.17	\$3.17	\$3.17
Port Cost Total	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$623.83	\$522.37	\$596.01	\$620.55	\$563.28	\$656.55	\$722.01	\$626.01	\$543.64

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.38. Newport News Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$2.65	\$2.65	\$2.65	\$2.65	\$2.65	\$2.65	\$2.65	\$2.65
Port Cost Total	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$802.81	\$726.44	\$738.44	\$736.81	\$755.35	\$627.72	\$547.54	\$417.17

**Table 3.38 (cont'd). Newport News Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$2.65	\$2.65	\$2.65	\$2.65	\$2.65	\$2.65	\$2.65	\$2.65	\$2.65
Port Cost Total	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$623.35	\$521.90	\$595.54	\$620.08	\$562.81	\$656.08	\$721.54	\$625.54	\$543.17

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.39. Norfolk International Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$2.09	\$2.09	\$2.09	\$2.09	\$2.09	\$2.09	\$2.09	\$2.09
Port Cost Total	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$802.31	\$725.95	\$737.95	\$736.31	\$754.86	\$627.22	\$547.04	\$416.68

**Table 3.39 (cont'd). Norfolk International Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$2.09	\$2.09	\$2.09	\$2.09	\$2.09	\$2.09	\$2.09	\$2.09	\$2.09
Port Cost Total	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$622.86	\$521.40	\$595.04	\$619.58	\$562.31	\$655.58	\$721.04	\$625.04	\$542.68

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.40. Wilmington Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$7.32	\$7.32	\$7.32	\$7.32	\$7.32	\$7.32	\$7.32	\$7.32
Port Cost Total	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03
Land Cost Total	\$513.45	\$437.09	\$499.82	\$559.27	\$468.18	\$340.55	\$260.91	\$146.91
Total Cost	\$712.80	\$636.44	\$699.16	\$758.62	\$667.53	\$539.89	\$460.25	\$346.25

**Table 3.40 (cont'd). Wilmington Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$7.32	\$7.32	\$7.32	\$7.32	\$7.32	\$7.32	\$7.32	\$7.32	\$7.32
Port Cost Total	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03
Land Cost Total	\$404.36	\$307.82	\$418.00	\$398.91	\$398.91	\$478.55	\$578.36	\$510.18	\$421.82
Total Cost	\$603.71	\$507.16	\$617.34	\$598.25	\$598.25	\$677.89	\$777.71	\$709.53	\$621.16

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.41. Charleston Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$7.07	\$7.07	\$7.07	\$7.07	\$7.07	\$7.07	\$7.07	\$7.07
Port Cost Total	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07
Land Cost Total	\$464.36	\$388.00	\$464.36	\$502.00	\$419.09	\$291.45	\$211.82	\$149.09
Total Cost	\$671.51	\$595.14	\$671.51	\$709.14	\$626.24	\$498.60	\$418.96	\$356.24

**Table 3.41 (cont'd). Charleston Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$7.07	\$7.07	\$7.07	\$7.07	\$7.07	\$7.07	\$7.07	\$7.07	\$7.07
Port Cost Total	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07
Land Cost Total	\$335.09	\$238.55	\$371.09	\$374.36	\$407.09	\$431.64	\$531.45	\$517.27	\$428.91
Total Cost	\$542.24	\$445.69	\$578.24	\$581.51	\$614.24	\$638.78	\$738.60	\$724.42	\$636.05

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.42. Savannah Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$8.84	\$8.84	\$8.84	\$8.84	\$8.84	\$8.84	\$8.84	\$8.84
Port Cost Total	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40
Land Cost Total	\$412.55	\$314.91	\$387.45	\$478.00	\$383.09	\$254.91	\$175.82	\$177.45
Total Cost	\$621.78	\$524.14	\$596.69	\$687.24	\$592.33	\$464.14	\$385.05	\$386.69

**Table 3.42 (cont'd). Savannah Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$8.84	\$8.84	\$8.84	\$8.84	\$8.84	\$8.84	\$8.84	\$8.84	\$8.84
Port Cost Total	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40
Land Cost Total	\$311.09	\$266.36	\$399.45	\$402.18	\$435.45	\$460.00	\$559.82	\$544.55	\$456.73
Total Cost	\$520.33	\$475.60	\$608.69	\$611.42	\$644.69	\$669.24	\$769.05	\$753.78	\$665.96

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.43. Jacksonville Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$11.42	\$11.42	\$11.42	\$11.42	\$11.42	\$11.42	\$11.42	\$11.42
Port Cost Total	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76
Land Cost Total	\$337.82	\$260.36	\$439.82	\$530.91	\$436.55	\$308.91	\$228.18	\$249.45
Total Cost	\$541.99	\$464.54	\$643.99	\$735.08	\$640.72	\$513.08	\$432.36	\$453.63

**Table 3.43 (cont'd). Jacksonville Total Cost for Hinterland, 45 Feet, Inbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$11.42	\$11.42	\$11.42	\$11.42	\$11.42	\$11.42	\$11.42	\$11.42	\$11.42
Port Cost Total	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76
Land Cost Total	\$364.00	\$338.91	\$458.91	\$474.18	\$507.45	\$519.45	\$640.00	\$616.55	\$529.27
Total Cost	\$568.17	\$543.08	\$663.08	\$678.36	\$711.63	\$723.63	\$844.17	\$820.72	\$733.45

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.44. Portsmouth Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$4.46	\$4.46	\$4.46	\$4.46	\$4.46	\$4.46	\$4.46	\$4.46
Port Cost Total	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$804.58	\$728.21	\$740.21	\$738.58	\$757.12	\$629.49	\$549.30	\$418.94

**Table 3.44 (cont'd). Portsmouth Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$4.46	\$4.46	\$4.46	\$4.46	\$4.46	\$4.46	\$4.46	\$4.46	\$4.46
Port Cost Total	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11	\$196.11
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$625.12	\$523.67	\$597.30	\$621.85	\$564.58	\$657.85	\$723.30	\$627.30	\$544.94

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.45. Newport News Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50
Port Cost Total	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$803.66	\$727.30	\$739.30	\$737.66	\$756.20	\$628.57	\$548.39	\$418.02

**Table 3.45 (cont'd). Newport News Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50
Port Cost Total	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15	\$196.15
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$624.20	\$522.75	\$596.39	\$620.93	\$563.66	\$656.93	\$722.39	\$626.39	\$544.02

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.46. Norfolk International Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$2.58	\$2.58	\$2.58	\$2.58	\$2.58	\$2.58	\$2.58	\$2.58
Port Cost Total	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22
Land Cost Total	\$604.00	\$527.64	\$539.64	\$538.00	\$556.55	\$428.91	\$348.73	\$218.36
Total Cost	\$802.81	\$726.44	\$738.44	\$736.81	\$755.35	\$627.71	\$547.53	\$417.17

**Table 3.46 (cont'd). Norfolk International Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$2.58	\$2.58	\$2.58	\$2.58	\$2.58	\$2.58	\$2.58	\$2.58	\$2.58
Port Cost Total	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22	\$196.22
Land Cost Total	\$424.55	\$323.09	\$396.73	\$421.27	\$364.00	\$457.27	\$522.73	\$426.73	\$344.36
Total Cost	\$623.35	\$521.90	\$595.53	\$620.08	\$562.81	\$656.08	\$721.53	\$625.53	\$543.17

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.47. Wilmington Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$5.85	\$5.85	\$5.85	\$5.85	\$5.85	\$5.85	\$5.85	\$5.85
Port Cost Total	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03
Land Cost Total	\$513.45	\$437.09	\$499.82	\$559.27	\$468.18	\$340.55	\$260.91	\$146.91
Total Cost	\$711.33	\$634.96	\$697.69	\$757.15	\$666.05	\$538.42	\$458.78	\$344.78

**Table 3.47 (cont'd). Wilmington Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$5.85	\$5.85	\$5.85	\$5.85	\$5.85	\$5.85	\$5.85	\$5.85	\$5.85
Port Cost Total	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03	\$192.03
Land Cost Total	\$404.36	\$307.82	\$418.00	\$398.91	\$398.91	\$478.55	\$578.36	\$510.18	\$421.82
Total Cost	\$602.24	\$505.69	\$615.87	\$596.78	\$596.78	\$676.42	\$776.24	\$708.05	\$619.69

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.48. Charleston Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$6.18	\$6.18	\$6.18	\$6.18	\$6.18	\$6.18	\$6.18	\$6.18
Port Cost Total	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07
Land Cost Total	\$464.36	\$388.00	\$464.36	\$502.00	\$419.09	\$291.45	\$211.82	\$149.09
Total Cost	\$670.62	\$594.26	\$670.62	\$708.26	\$625.35	\$497.71	\$418.08	\$355.35

**Table 3.48 (cont'd). Charleston Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$6.18	\$6.18	\$6.18	\$6.18	\$6.18	\$6.18	\$6.18	\$6.18	\$6.18
Port Cost Total	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07	\$200.07
Land Cost Total	\$335.09	\$238.55	\$371.09	\$374.36	\$407.09	\$431.64	\$531.45	\$517.27	\$428.91
Total Cost	\$541.35	\$444.80	\$577.35	\$580.62	\$613.35	\$637.90	\$737.71	\$723.53	\$635.17

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.49. Savannah Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$8.06	\$8.06	\$8.06	\$8.06	\$8.06	\$8.06	\$8.06	\$8.06
Port Cost Total	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40
Land Cost Total	\$412.55	\$314.91	\$387.45	\$478.00	\$383.09	\$254.91	\$175.82	\$177.45
Total Cost	\$621.00	\$523.36	\$595.91	\$686.46	\$591.55	\$463.36	\$384.27	\$385.91

**Table 3.49 (cont'd). Savannah Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$8.06	\$8.06	\$8.06	\$8.06	\$8.06	\$8.06	\$8.06	\$8.06	\$8.06
Port Cost Total	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40	\$200.40
Land Cost Total	\$311.09	\$266.36	\$399.45	\$402.18	\$435.45	\$460.00	\$559.82	\$544.55	\$456.73
Total Cost	\$519.55	\$474.82	\$607.91	\$610.64	\$643.91	\$668.46	\$768.27	\$753.00	\$665.18

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

**Table 3.50. Jacksonville Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

Port Cities	New Orleans	Mobile	Memphis	St. Louis	Jackson	Birmingham	Atlanta	Charlotte
Sea Cost Total	\$11.64	\$11.64	\$11.64	\$11.64	\$11.64	\$11.64	\$11.64	\$11.64
Port Cost Total	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76
Land Cost Total	\$337.82	\$260.36	\$439.82	\$530.91	\$436.55	\$308.91	\$228.18	\$249.45
Total Cost	\$542.22	\$464.76	\$644.22	\$735.31	\$640.94	\$513.31	\$432.58	\$453.85

**Table 3.50 (cont'd). Jacksonville Total Cost for Hinterland, 45 Feet, Outbound
FE SUEZ ECUS PEN**

<i>Port Cities</i>	Nashville	Knoxville	Louisville	Cincinnati	Columbus	Indianapolis	Chicago	Detroit	Cleveland
Sea Cost Total	\$11.64	\$11.64	\$11.64	\$11.64	\$11.64	\$11.64	\$11.64	\$11.64	\$11.64
Port Cost Total	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76	\$192.76
Land Cost Total	\$364.00	\$338.91	\$458.91	\$474.18	\$507.45	\$519.45	\$640.00	\$616.55	\$529.27
Total Cost	\$568.40	\$543.31	\$663.31	\$678.58	\$711.85	\$723.85	\$844.40	\$820.94	\$733.67

Note: Some cost inputs have been estimated.

Source: G.E.C., Inc.

Appendix D

GROWTH TRENDS IN SELECTED FOREIGN PORTS

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GROWTH TRENDS IN SELECTED FOREIGN PORTS

Table 4.1 shows the growth in TEUs for selected foreign ports along the benefiting services. The unlighted cells represent actual numbers acquired through internet searches of individual port websites. Yellow highlighted cells represent estimated growth based on the percentage change of unlighted rows over the previous two years, in order for the final years of the analysis to be complete. Blue highlighted cells represent years not given in the data source, but nonetheless estimated based on later years' percentage growth on a year-by-year basis. Once the yearly percentage change was calculated, the average variation was found and multiplied by each incremental yearly TEU figure. For example, in the year 2002-2003 the port of Jeddah increased by 23 percent and 27 percent in the following year 2004. As a result, the average increase was taken and found to be 25 percent indicating a two percent variation from the average for years 2003 and 2004. In order to complete the backwards trend to year 1997, each subsequent year was multiplied by the percentage decrease of two percent (2001 was calculated $1,366,902 \times 0.79 = 1,079,853$ and 2000 was calculated $1,079,853 \times 0.81 = 874,681$). See Excel spreadsheet Trends in Foreign Ports 3 27 06 for formula validations. Red highlighted cells represent data given in metric tonnes multiplied by 1.1023 to convert into short tons then divided by 10 to convert into TEUs. As one can see this information is estimated but consistent in the trends of foreign port expansion and growth.

Table 4.1 Growth in Total TEUs for Selected Foreign Ports: Benefiting Services

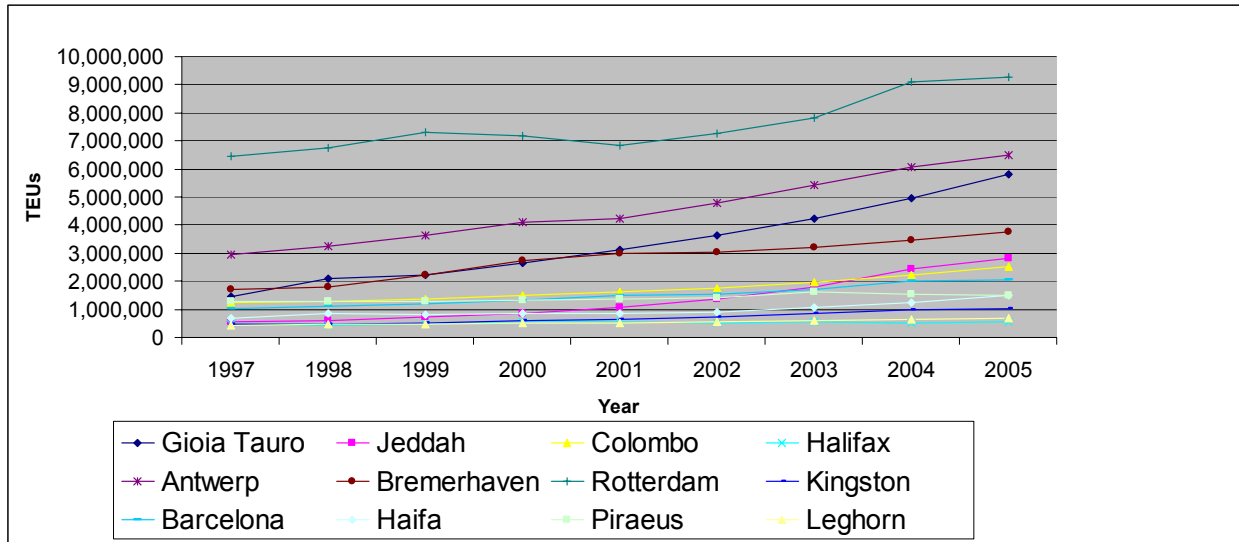
		TEUs									
Service	Port	Year									AACGR
		1997	1998	1999	2000	2001	2002	2003	2004	2005	
AEX	Gioia Tauro	1,448,531	2,093,650	2,202,951	2,652,701	3,103,660	3,631,282	4,248,600	4,970,862	5,815,909	18.98%
	Jeddah	536,866	617,087	725,985	874,681	1,079,853	1,366,902	1,777,165	2,425,930	2,835,461	23.12%
	Colombo	1,226,069	1,290,599	1,372,978	1,476,320	1,604,696	1,763,402	1,959,336	2,214,050	2,501,877	9.32%
PAX	Halifax	459,176	425,435	462,766	548,404	541,640	524,336	541,650	525,553	551,402	2.31%
	Antwerp	2,969,189	3,265,750	3,614,246	4,082,334	4,218,176	4,777,151	5,445,437	6,063,746	6,488,029	10.26%
	Bremerhaven	1,705,089	1,811,014	2,201,210	2,751,793	2,972,882	3,031,587	3,189,853	3,469,253	3,743,969	10.33%
	Rotterdam	6,456,392	6,772,421	7,303,289	7,186,114	6,857,629	7,256,000	7,814,425	9,085,267	9,286,756	4.65%
ZCS	Kingston	449,590	483,431	525,468	577,437	641,597	720,896	837,597	984,093	1,016,751	10.74%
	Barcelona	1,037,353	1,115,433	1,212,427	1,332,337	1,480,375	1,525,822	1,691,347	2,022,103	2,070,726	9.02%
	Haifa	669,000	834,000	800,000	871,000	839,000	906,000	1,069,000	1,260,351	1,485,954	10.49%
	Piraeus	1,262,946	1,269,292	1,282,114	1,308,279	1,348,741	1,404,939	1,605,135	1,541,563	1,479,900	2.00%
	Leghorn	427,428	449,924	478,643	519,169	531,814	546,882	592,778	638,586	683,287	6.04%

Note: AACGR – Average Annual Compound Growth Rate, calculated as $((2005/1997)^{(1/8)} - 1)$
 AEX = FE SUEZ ECUS; PAX = FE ECUS EU; ZCS = FE ECUS MED

Source: Port websites.

Figure 4.1 shows the trends in TEUs for selected foreign ports during the years 1997-2005 along the three world services AEX, PAX, and ZCS. Port of Rotterdam is consistently above the other ports in terms of TEU volume, followed by Antwerp. However, Gioia Tauro is increasing at a

faster rate over the last nine years than Rotterdam or Antwerp⁴¹. Of the ports selected, Halifax has the lowest production numbers in terms of TEU volume.



Source: Port websites.

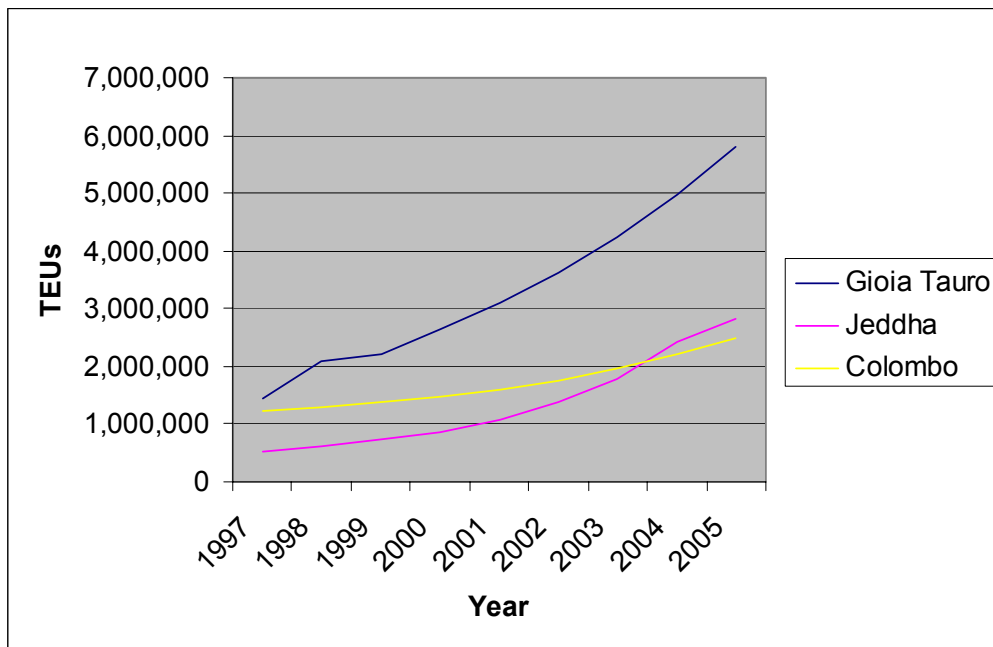
Figure 4.1. Trends in TEUs for Selected Foreign Ports, 1997-2005

Figures 4.2 and 4.3 shows selected ports along the AEX and PAX services, respectively. The AEX service is FE SUEZ ECUS for eastern sections of the international trade pendulum. Since 1997, the port of Gioia Tauro has grown at an average annual compounding growth rate of nearly 19 percent, while Jeddah has grown even faster at a rate of around 23 percent (Appendix Table 4.1).

The PAX service is FE ECUS EU for the European sections of the international trade pendulum. Since 1997, the ports of Antwerp and Bremerhaven have consistently had very similar growth in their average annual compounding growth rates, slightly over 10 percent (Appendix Table 4.1).

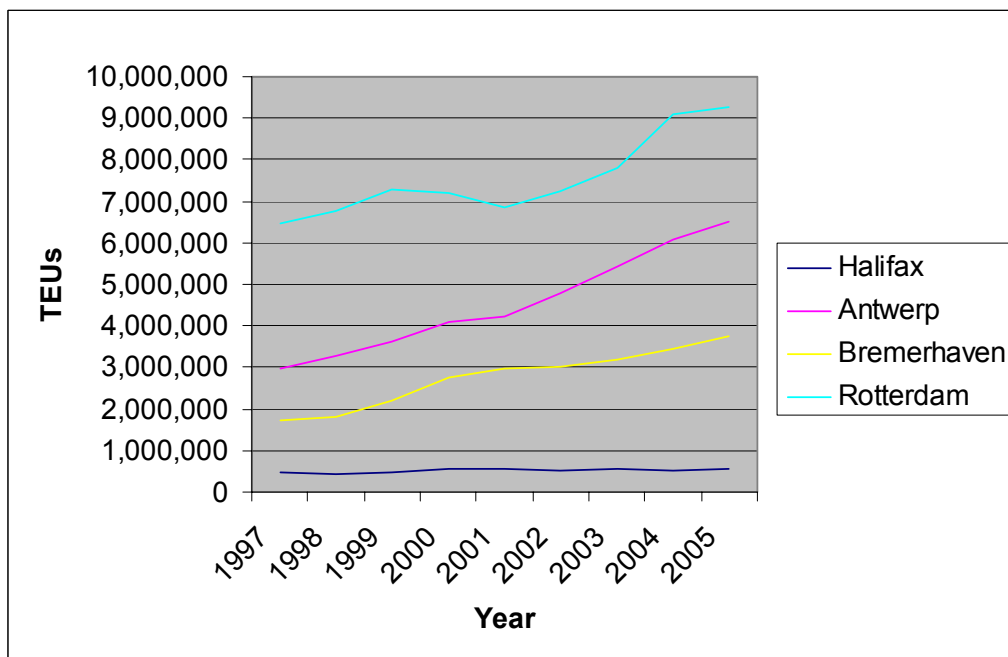
Figure 4.4 shows selected ports along the ZCS service. This service is for the FE ECUS MED for Eastern and Mediterranean sections of the international trade pendulum. Since 1997, the port of Kingston has had a higher AACGR than any of the other ports on this service, nearly 11 percent (Appendix Table 4.1).

⁴¹ After year 2000, Gioia Tauro's TEU volume was estimated.



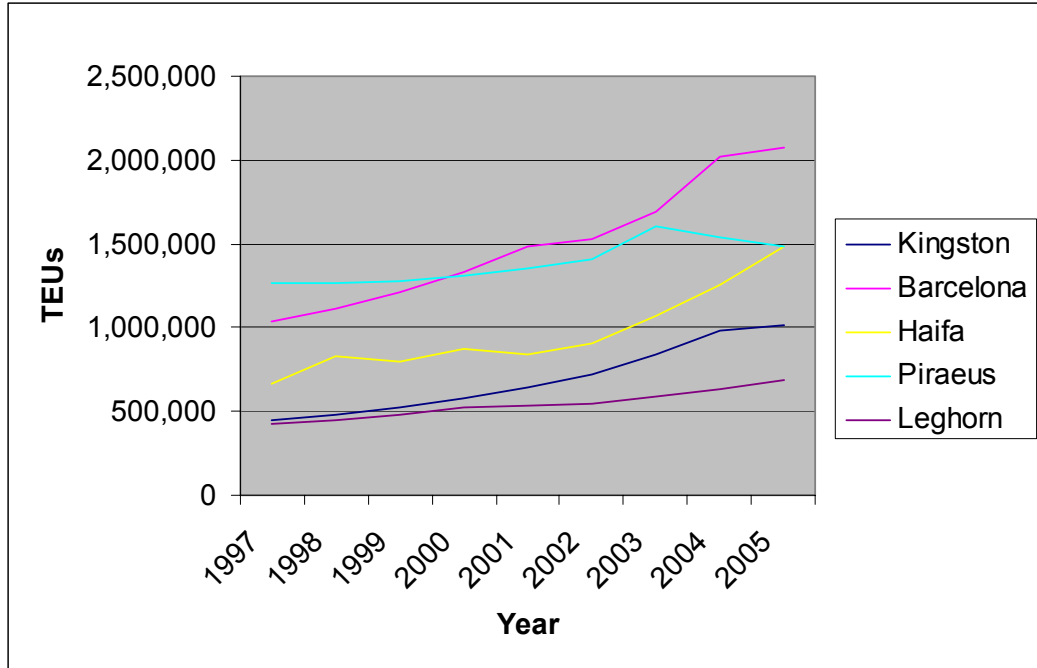
Source: Port websites.

Figure 4.2. Trends in TEUs for Selected Foreign Ports on AEX Service, 1997-2005



Source: Port websites.

Figure 4.3. Trends in TEUs for Selected Foreign Ports on PAX Service, 1997-2005



Source: Port websites.

Figure 4.4. Trends in TEUs for Selected Foreign Ports on ZCS Service, 1997-2005

Table 4.2 shows the channel depth, terminal depth, or both of selected foreign ports on AEX, PAX, and ZCS services. Port of Rotterdam has the deepest terminal depths of all the ports. Port of Piraeus has a depth up to 52.48 feet as well.

Table 4.2. Examples of Port Depths for Benefiting Services

Port	Channel Depth		Terminal Depth	
	Meters	Feet	Meters	Feet
AEX				
Gioia Tauro	12.5 - 18	41 - 59		
Jeddah	16	52.48		
Colombo	16	52.48		
PAX				
Halifax			up to 15.2	50
Antwerp		42	Max draft is 15.5 m or 50.84 ft	
Bremerhaven			15	49
Rotterdam			16	52.48
ZCS				
Kingston	14	46		
Barcelona			up to 16.5	54
Haifa			up to 14	46
Piraeus			12 to 16	39 - 52.48
Leghorn				up to 38

Source: Port websites.



Source: G.E.C., Inc.

Figure 4.5. Shows the Major Benefiting Services (AEX, PAX, and ZCS)

Appendix E

COMMENTS AND RESPONSES

Appendix E

COMMENTS AND RESPONSES

There were no official comments towards the first Multiport Interim report task 1-4 submitted July 2005 and third Multiport Interim report task 8-9 submitted March 30, 2006. The comments below are focused on the second Multiport Interim report tasks 1-7, which were indicated by emails in mid June 2006 to be the only comments for Multiport Analysis.

MEMORANDUM

TO: Ken Claseman, U.S. Army Corps of Engineers, Mobile District
Kevin Knight, U.S. Army Corps of Engineers, San Francisco District

FROM: Kevin Horn, G.E.C., Inc.

DATE: March 22, 2006

SUBJECT: Responses to Peer Review of the Savannah Harbor Expansion Project – Economic Analysis: Benefits Calculation Methodology and Model, Multiport Analysis and Regional Analysis, Phase III, comments (February 22, 2006) on October 24, 2005 Interim Report.

Introduction:

Comment 1. It might be useful to provide additional information on deepening projects at competing harbors. What depths will they ultimately be along with estimated completion dates? What were the results of the Charleston Deepening Study/Norfolk Deepening, etc. Is there any information in those studies that may contradict the assumptions used for Savannah Harbor?

I recall seeing memos accusing the Corps of working in a vacuum, i.e., each District examining their projects on their own merits, without incorporating projects of competing districts.

Response 1. This is a good suggestion. We sometimes take the port competitive environment for granted, i.e., “Everyone knows that Charleston has 45 foot channel depth, etc.”, when this should not be assumed. We will write a small addendum that indicates a brief description of the competing ports that are contained in the multiport analysis, consisting of Norfolk (Hampton Roads), Wilmington, Charleston, and Jacksonville.

Comment 2. Table 1

For the Norfolk (42-50) PAX route, Norfolk is cited twice (should be New York?)

Response 2. Table 1 should be corrected to reflect “New York” for the PAX service shifted to Norfolk instead of Savannah. The distance, 200 nautical miles, is correct but the entry of “Norfolk” will be replaced with “New York”.

Comment 3. Port Costs

Container charges and tuggage are the same across the five South Atlantic ports. Are these costs universal?

Response 3. At the time that the multiport analysis was undertaken it was envisioned that a separate Regional Port Analysis (RPA) task would be conducted during the course of the Multiport task. The RPA was envisioned as dealing with the other ports from a capacity perspective. It was intended that port cargo handling related costs (other than tariff items) and tuggage would be likely identified in contact with the other ports. This has not proved to be possible.

The average total port costs per TEU for cargo throughput at Savannah have been used as a proxy for all the ports. In practice the major East Coast port throughput costs are normally quite similar, such as Charleston and Savannah (other than New York/New Jersey), notwithstanding some differences in particular port cost elements and related cargo handling productivity issues. Port tariffs, although insightful, are often not of particular value with regard to what the actual negotiated port costs are for the lines. Moreover, there are usually substantial cargo volume incentives that provide for layers of “port cost” related to cargo throughput by different lines. In practice steamship lines play port costs off against each other, particularly when there are multiple calls and overlapping hinterlands as in the case of marine containers.

Consequently, the average total port cargo handling costs have been used for cargo handling across the multiport range (Norfolk to Jacksonville). Sensitivity analysis should be conducted to allow “port costs” to be lower or higher at Savannah to determine the competitive impact.

Tuggage costs are another negotiated non-tariff item that steamship lines handle with local firms at each port. It is not unusual to see one major tug operator providing services. While tuggage costs will differ among the ports, particularly depending on the time involved (distance from between berth and where tugs are applied for transit) not enough information exists in the public domain to determine the tug practices at the different ports. Moreover, changes in tug costs will have relatively little impact on cargo throughput costs which are primarily driven by land side transportation costs.

Comment 4. Truck Costs

Table 7—Average Distance in Miles Traveled from Each Southeastern Port shows Savannah Harbor as being the most centrally located, because its average distance to these 17 hinterland cities is 619 miles. Charleston’s average is 630 miles, yet its standard deviation is smaller, so it’s practically identical.

How representative are the trucking costs, especially given the recent spike in fuel prices? Also, can the truck costs be refined for hinterland cities having congestion problems? (We’ve experienced this on the West Coast, particularly Los Angeles, where 1 hour at port is probably too low.)

Response 4. Truck movements of marine containers dominate the East Coast ports, unlike the West Coast ports, because of the shorter distances typically involved. The east coast ports are typically served by a network of east-west Interstates that cross similar north-south Interstates. Consequently, port hinterland distances are often quite similar except at the outside of the range, for example between Jacksonville and New Orleans or New York and Detroit, etc.

The truck cost user defined inputs (refer to the worksheet “Land Costs”) are specified for \$40 per hour idle and \$60 per hour underway. The underway costs, primarily fuel, would be \$20 per hour which at 55 miles per hour would be \$0.36 per mile. With average underway fuel consumption of about 5.5 miles per gallon the fuel factor price would be about \$2.00 per gallon ($\$0.36 * 5.5 = \2.00) which is close to the market price. Truck costs could be specified higher, perhaps \$65.00 per hour underway, but the comparative changes among the ports would not be pronounced given less than ten percent change in truck costs.

More important than the truck costs are determinants of truck productivity with respect to loading and unloading time as well as opportunities for backhauls. The “Truck Costs” worksheet nominally assigns the same user input for pickup and delivery time, one hour. But this is a variable that the user can change to reflect particular situations. Unless particular ports are congested (for example New York/New Jersey marine container terminals) the port times for pick up or delivery would be the major variables rather than hinterland cities for particular ports. Truck turn times for Savannah are reportedly less than one hour and should be similar for the port range included in the multiport analysis.

Comment 5. Railroad/Truck Destinations

For the extreme hinterland cities like Memphis, St. Louis, and New Orleans, how much traffic would be barged via the Mississippi River (and avoid the South Atlantic ports altogether)?

Response 5. Container On Barge (COB) using the Lower Mississippi River and the Port of New Orleans has not been successful for a variety of reasons, particularly transit times and the relatively weak market position of the Gulf ports for non-local marine container traffic in general and New Orleans in particular. There has been a resurrection of COB service primarily from Baton Rouge to New Orleans that reflects overweight export containers (paper products, etc.). This COB service has purportedly been extended to Memphis for similar cargoes. For the most part this service via New Orleans would be designed to handle special circumstances such as over weight boxes (for highway movements), empty containers, and very low value non-time sensitive merchandise, particularly exports of raw materials like scrap and waste products.

Unlike West Coast ports which rely heavily on rail intermodal for very long distance (Midwest) marine container movements, most east coast ports utilize truck for marine container movements. The multiport model has been set to a default for “truck”. There is some rail (about 15 percent of the TEU volume at Savannah may be moved by rail) at the various ports, Jacksonville, Charleston, and Norfolk (Wilmington has no dedicated rail intermodal train service other than rail intermodal with conventional mixed general freight train service) but truck predominates. Rail movements as previously indicated for the east coast reflect containers that are not

particularly susceptible to truck movement such as overweight containers (for highway movement), 20 foot boxes, empty boxes and non-time sensitive merchandise.

Comment 6. Tables 9 and 10, suggest labeling them Norfolk Southern and CSX, respectively. Also, might want to distinguish between no rail linkage (hence the zero) and the lowest cost.

Response 6. We will do this.

Comment 7. Summary, 2nd Paragraph states “The spreadsheet does perform any optimization analysis...(should be “not perform”).

Response 7. This will be corrected as noted above.