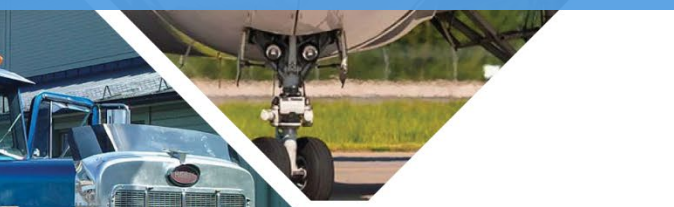
NORTH CAROLINA
STATEWIDE MULTIMODAL FREIGHT PLAN

Planning for the Future of Freight Movement

MARITIME PROFILE - DRAFT



North Carolina Statewide Multimodal Freight Plan

Maritime Modal Profile

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LIST OF ACRONYMS

BEA	Bureau of Economic Analysis	NCDOT	North Carolina Department of Transportation
BCO	Beneficial Cargo Owners	NCDA	North Carolina Department of Agriculture
BIL	Bipartisan Infrastructure Law	NCRR	North Carolina Railroad
BTS	Bureau of Transportation Statistics	NCSPA	North Carolina State Ports Authority
CAGR	Compound Annual Growth Rate	NIT	Norfolk International Terminal
CBP	United States Customs and Borders Patrol	NS	Norfolk Southern
CCM	Consolidated Chassis Management	OSHA	Occupational Safety and Health Administration
CCX	Carolina Connector	OWS	Offshore Wind Site
CIC	Cordele Intermodal Center	PIERS	Port Import/Export Reporting Services
CIP	Charlotte Inland Port	PMT	Portsmouth Inland Terminal
C-TPAT	Customs Trader Partnership Against Terrorism	PTIT	Piedmont Triad Inland Terminal
CSX	CSX Transportation	QCE	Queen City Express
FAF	Freight Analysis Framework	RAISE	Rebuilding American Infrastructure with Sustainability and Equity
FEMA	Federal Emergency Management Agency	Ro/Ro	Roll-On/Roll-Off
FHWA	Federal Highway Administration	RMG	Rail Mount Gantry Crane
FTZ	Foreign Trade Zone	RTG	Rubber-Tired Gantry Crane
FY	Fiscal Year	SHEP	Savannah Harbor Deepening Project
GAO	United States Government Accounting Office	SC	South Carolina
GDP	Gross Domestic Product	SF	Square Feet
GPA	Georgia Port Authority	SCSPA	South Carolina State Ports Authority
GTP	Global TransPark	SMT	Savannah Marine Terminal
ICTF	Intermodal Container Transfer Facility	STI	Strategic Transportation Investment Program
IMF	International Monetary Fund	STS	Ship-to-Shore (as for Gantry Cranes)
INFRA	Infrastructure for Rebuilding America	STIP	North Carolina's State Transportation Improvement Program
I-###	Interstate-#	TEU	Twenty-foot Equivalent Unit
IWR	Institute for Water Resources	TWIC	Transportation Worker Identification Card
JOC	Journal of Commerce	UK	United Kingdom
M-#	Marine Highway-#	ULCV	Ultra Large Container Vessels
MARAD	United States Maritime Administration	USACE	United States Army Corps of Engineers
MLLW	Mean lower low water	USDA	United States Department of Agriculture
M	Million	USDOT	United States Department of Transportation
M-F	Monday-Friday	USGS	United States Geological Survey
MPO	Metropolitan Planning Organization	VA	Virginia
lb	Pounds	VIG	Virginia International Gateway
NC	North Carolina	VPA	Virginia Port Authority
NCDA	North Carolina Department of Agriculture	WCSC	Waterborne Commerce Statistic Center
NCDOC	North Carolina Department of Commerce	WTRY	Wilmington Terminal Railroad

1. OVERVIEW

Moving the future of freight to, from and through North Carolina demands an examination of the state's public maritime assets including seaports and inland port terminals. As critical nodes of domestic and international freight movement, port facilities must implement strategic investments in critical infrastructure to remain competitive in a global marketplace. In this profile, a general facility overview, latest modal trends and future projections of North Carolina's maritime freight movements are provided. Additionally, an overview of the data analysis, stakeholder perspectives and key references that produce an up-to-date and accurate analysis of North Carolina's maritime and related freight programs are included.

1.1 Purpose

This profile reviews port related freight activities in North Carolina recognizing the ports as essential economic engines and gateways for trade. Both inland and waterside ports are multimodal hubs that facilitate the transfer of freight and goods to and from both domestic and international markets. This profile provides an overview of the port industry's on-going needs and opportunities, current and future developments, a description of financial investments, and plans to modernize and expand the maritime system in North Carolina.

1.2 Data Uses and Methodology

The 2022 update of the Maritime Profile supports the overall 2022 North Carolina Statewide Multimodal Freight Plan by providing updates of key data metrics within this Maritime Profile from resources including the North Carolina State Ports Authority (NCSPA or NC Ports) website, outreach to port staff, maritime freight data found in version 5 of the Freight Analysis Framework (FAF5), maritime industry resources and other relevant resources to update the 2017 North Carolina Statewide Multimodal Freight Plan and Maritime Modal Profile. The profile tables from the 2017 Plan have been updated with more recent data to reflect current conditions and future forecasts. Where possible, data sets were collected and processed in a similar manner to the 2017 report to ensure date presented in this report is comparable to the previous report. Table 1.1 on the following page provides a comprehensive list of datasets used in this modal profile.

1.2.1 Freight Analysis Framework

The Freight Analysis Framework (FAF) is one of the primary data resources currently available to update the North Carolina Statewide Multimodal Freight Plan and many of the modal profiles. This dataset is produced through a partnership between Bureau of Transportation Statistics (BTS) and the Federal Highway Administration (FHWA), providing integrated data from various sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. The 2017 Commodity Flow Survey and international trade data from the Census Bureau serve as the backbone of FAF and are integrated with ancillary data sources that capture goods movement in agriculture, resource extraction, utility, construction, retail, services and other sectors.

The current version, FAF5, provides estimates for tonnage and value by origin-destination pairs of FAF regions, commodity type and mode for the base year (2017), the forecast year estimates (2020-2050) and the state level historical trend estimates (1997-2012). Note that data reported as ton-miles, as well as the data for recent years (2018-2019), will be available in a later release. The information may be accessed through the Data Tabulation Tool available on faf.ornl.gov and downloaded as either a complete database or in summary files.[1]

TABLE 1.1 DATASET COMPARISON

North Carolina Maritime Strategy (NCMS)	Maritime Modal Profile
Bureau of Economic Analysis	BEA
Bureau of Transportation Statistics	BTS
Freight Analysis Framework (FAF)	FAF 4.1 2010 - 2016
Freight Analysis Framework (FAF)	FAF 5.2 2017- 2050
North Carolina State Ports Authority	NCSPA
Port Import Export Reporting Service data (PIERS)	PIERS data
Strategic Transportation Improvement Program (STIP)	STIP 2020-2029
United States Census Bureau	CENSUS 2010
United States Census Bureau	CENSUS 2020
U.S. Army Corps of Engineers	USACE

Other key references include the following:

- Meetings with the Freight Advisory Committee to interview stakeholders,
- 2021 Strategic Plan of the North Carolina State Ports Authority,
- North Carolina Rail Division staff,
- North Carolina State Ports Authority Data,
- FY 17-21 North Carolina Ports Trade Statistics (Containers, Bulk, Breakbulk and Trading Partners, 2022),
- Eastern Infrastructure Improvement Study: A Report to the North Carolina General Assembly (2015) and
- Economic Contribution of the North Carolina Ports study by the Institute for Transportation Research and Education (2018).

[1] Freight Analysis Framework (FAF) https://faf.ornl.gov/faf5/Default.aspx

1.3 Report Organization

This first section includes an overview of the report, purpose, methodology and organization.

The second section of this report focuses on the existing supply-side of maritime freight in North Carolina. The facilities at the state's ports as well as those of the three neighboring states are discussed in terms of infrastructure and capacity. In addition, how these facilities connect to the broader transport system is shown. The second section also discusses which services are offered at the ports and the companies that provide those services.

The third section contains descriptions of the existing demand-side of maritime freight in North Carolina with a focus on network usage for maritime freight activities as well as the performance with respect to the state's three neighboring ports: Norfolk, Virginia; Charleston, South Carolina, and Savannah, Georgia. The industries served and markets supported by maritime transport are outlined and the safety and security of ports and maritime transport is briefly covered.

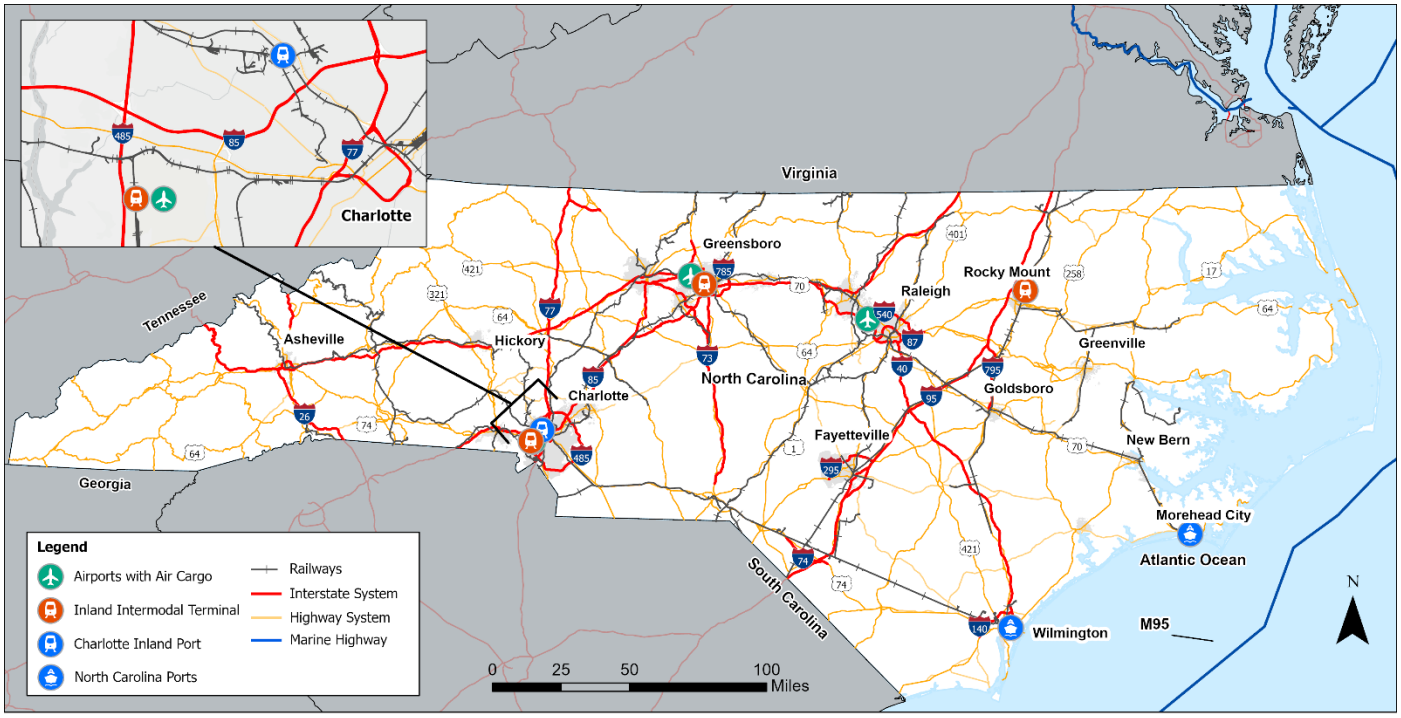
The fourth section identifies various trends and forecasts in maritime activity and demands to establish future freight maritime markets. Secondly, it looks at the implication of growth in maritime trade and industries that directly use or connect with the state port terminals, both in NC and regionally.

The fifth and final section provides a needs assessment. This assessment identifies infrastructure needs and opportunities to support the growth and sustainability of North Carolina's maritime industries based on cargo forecasts and emerging trends and markets. Lastly, the needs assessment examines safety and security at the ports.

2. STATE MARITIME SYSTEM

The economic value of establishing two deep water ports was recognized by the state legislature in 1945 with the creation of the NCSPA. The NCSPA was charged with operating and promoting North Carolina's ports and terminals. Today, the NCSPA owns and maintains the Port of Wilmington, the Port of Morehead City, as well as the Charlotte Inland Port. State infrastructure supporting maritime trade includes its highways, rail network, pipelines, ports, as well as inland production, logistics and distribution centers that serve maritime and other freight modes. The Figure 2.1 map below provides an illustration of the location of major multimodal freight modes throughout North Carolina, demonstrating proximity with major freight corridors and interconnectivity into and out of the state. While the state has a vast freight network in place today, it is not without challenges to growth. This profile and ultimate freight plan will identify challenges and opportunities to reduce deficiencies and provide a better understanding of the policies, capital and infrastructure necessary to address the challenges of freight providers across the state.

FIGURE 2.1 NORTH CAROLINA FREIGHT MODES AND FACILITIES



Sources: North Carolina Department of Transportation (NCDOT), North Carolina Department of Agriculture (NCDA) and the U.S. Geological Survey (USGS) Thematic Mapping world borders dataset.

2.1 Statewide Maritime System

North Carolina has a system of interconnected freight networks and transportation providers working collectively to provide the movement of goods and services through the supply chain to manufacturers, production companies, retailers, businesses, residents and visitors of the state. Freight services move cargo via various modes of

transportation including highways, railroads, air cargo, pipelines and ports. North Carolina has two public, state-governed port terminals playing critical roles in goods movement in both domestic and international trade. The two terminals are the Port of Wilmington and the Port of Morehead City, briefly outlined in Table 2.1.

Table 2.1 lists each port's facilities' access, overall terminal size in acres, on-port facilities, equipment, general cargo types and military use. In addition to the waterside terminals, NCSPA provides inland connectivity at the Charlotte Inland Port, which connects customers to regional manufacturing and distribution centers serving the I-85 and I-77 corridors. Additional details and terminal descriptions are provided for the Port of Wilmington in section 2.1.2, for the Port of Morehead City in section 2.1.3, and for the Charlotte Inland Port in section 2.1.4.

TABLE 2.1 EXISTING NORTH CAROLINA PORT INFRASTRUCTURE AND SERVICES

	Wilmington	Morehead City
Access		
Channel Depth	42 ft (12.8 m) MLLW	• 45 ft (13.7 m) MLLW
Max Air Draft	212 ft (64.6 m) clearance	• NA
Distance to Interstate	7.8 miles to I-40	• 111 miles to I-95
Class I Rail Access	CSX	• Norfolk Southern (on dock rail)
Port Terminal Rail	Wilmington Terminal Railroad (WTRY of G&W)	• Carolina Coastal Railway
Rail Service Provided	Heavy-lift cargo: on-dock; ICTF: on-dock	• Heavy-lift cargo: on-dock
Entrances	Two secured gates	• One secured gate
Highway Access	U.S.17, U.S. 117, U.S. 74, U.S. 421, I-40 and I-140	• U.S. 70 (Future I-42)
Size		
Total Acres	• 284 Acres	• 128 Acres + 150 Acres in development
Wharfs Linear Feet	• 6,740 LF with 9 berths	• 5,366 LF with 9 berths
On-Port Facilities		
	• Container terminal 600,000 TEU capacity	• Covered dry bulk facilities
	• USDA-authorized fumigation	• 1,000 tons per hour conveyor system
	• Covered dry bulk	• 43 Acres of open storage dry bulk
	• 125 Acres Open storage dry bulk	• Warehousing 1 million sq/ft
	• Warehousing 1 million sq/ft	• Rail access to berths and warehouses
	• Certified Truck Scale Onsite	• Certified Truck Scale Onsite
	• 775 Reefer Plugs	• Warehouse & Inventory Management
	• Foreign Trade Zone 214	• Foreign Trade Zone 214
Cranes and Equipment		
	• 3 Neo-Panamax ship-to-shore (STS) cranes 203 ft reach over vessel beam (22 containers wide)	• Liebherr 420 Portal Gantry Crane,
	• 4 Post-Panamax ship-to-shore (STS) cranes 165 ft reach (18 containers wide)	• Liebherr 110 Portal Gantry Crane
	• Multi-purpose bulk/intermodal crane, 150-ton, 100-ton	• Direct bulk rail dump to ship loader
Cargo Types		
	• Intermodal (containers)	• Breakbulk
	• Breakbulk	• Bulk (Dry and Liquid)
	• Bulk (Dry and Liquid)	• Ro/Ro
	• Roll-on/roll-off (Ro/Ro)	• Project & heavy lift
	• Reefer - Cold Chain Logistics	
	• Project & heavy lift	
Military Use	• Strategic Seaport	• Strategic Seaport

Sources: NC Ports Website, accessed 2022; Factsheets for Wilmington, Morehead City, 2021; 2017 NCDOT Freight Plan Maritime Profile

Notes: RMG = Rail Mount Gantry Cranes are rail-mounted overhead gantry cranes located at berths that load/offload vessels. RTG = Rubber-Tired-Gantry cranes typically used to stack and move containers throughout the intermodal terminal.

2.1.1 Governance Structure

A port authority is a public or a private entity that is empowered to carry out the management, development, and operation of the port land and infrastructure. It may also coordinate and control port activities. In North Carolina, the NCSPA has the authority to operate both the Wilmington and Morehead City ports. Port authorities are involved in port management and the promotion of the port they manage. With the increasing presence of private operators, the role of port authorities has evolved. The North Carolina State Ports Authority (NCSPA) operates under the governance structure of an eleven-member board of directors, six gubernatorial appointees, two State Senate appointees, two State House appointees and the final board member is the NCDOT Secretary or their appointed representative. The Board of Directors is responsible for staying informed on world trade and economic trends and developments and making informed decisions about the state's investments in port infrastructure and operations. NCSPA owns and operates all terminals and facilities. The primary source of revenue for NCSPA is from these operating activities; however, NCSPA has received grants and aid from state government to support its capital expansion program.

NCSPA has been the recipient of federal grants to support capital investments, primarily security related. Historic new funding from the U.S. Department of Transportation (USDOT) was announced in 2021 and 2022 to help strengthen freight and maritime infrastructure. These federal grant programs are directed at capital improvements and increasingly require project sponsors to assemble additional funding from multiple sources to meet the overall maintenance needs and expansion plans. Ports are a strategic focus of many of these federal multi-modal funding programs that seek to invest in goods movement infrastructure and its many beneficiaries.

Numerous funding mechanisms at the federal, state and local levels need to be explored by NCSPA that could provide opportunities for infrastructure and operational investments. Several federal grant and loan programs that will be evaluated in more detail later in this profile to support maritime infrastructure investment include the following:

- Port Infrastructure Development Program, United States Maritime Administration (MARAD)
- America's Marine Highway M-95, MARAD
- Bipartisan Infrastructure Law (BIL) Grants
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Discretionary Grants, USDOT
- Infrastructure for Rebuilding America (INFRA), USDOT
- Port Security Grant Program (FEMA)
- Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Formula Grants, FHWA
- U.S. Army Civil Works and Federal cost-sharing for navigational improvements, USACE
- U.S. Departments of Homeland Security, Agriculture and Transportation
- U.S. Department of Defense investments in U.S. military institutions and strategic seaports

In addition, other funding programs are considered from sources such as local public, private investment and other modal funding programs available for roadway, railroads, inland port facilities and distribution centers. Public-private partnerships also provide additional resources to support maritime investment throughout the state, demonstrating the confidence of the private sector in the potential of NCSPA sites.

2.1.2 Port of Wilmington

FIGURE 2.2 AERIAL PHOTO OF PORT OF WILMINGTON

Source: Image courtesy of North Carolina State Port Authority 2022

The Port of Wilmington located on the Cape Fear River pictured in Figure 2.2 is within Wilmington City limits. The Port of Wilmington provides diverse operations and service capabilities including container, bulk (dry and liquid), breakbulk, Ro/Ro[2] and Reefer (climate-controlled) storage. The port is also part of Foreign Trade Zone 214 (FTZ).

As shown in Table 2.1, the port's current authorized channel depth is 42 feet mean lower low water (MLLW). Wilmington boasts over a mile of berths with 6,768 linear feet of wharf frontage. The port has seven container cranes in total: three Neo-Panamax ship-to-shore (STS) cranes that reach 203 feet or 22 containers across, four Post-Panamax STS cranes that reach 165 feet or 18 containers across and a multi-purpose bulk/intermodal crane with 150-ton lift capacity. The terminal includes modern transit and warehouse facilities and the latest in cargo management technology.

The NCSPA has recently completed or is currently working on several key investments to increase access, efficiency, safety, and resiliency at the port. The Wilmington Harbor Navigation Improvement Project will modernize and deepen the ports navigation channel, supporting increased demand for deeper waterborne access and solidifying the Port's position as a major East Coast intermodal freight gateway. According to the ports Integrated Section 203 Study submitted to the USACE,[3] the preferred plan would deepen the Wilmington Navigational Harbor to 47 feet MLLW to accommodate larger, deep-draft container vessels. This investment will support existing customers, tenants, as well as potential opportunities for additional carrier services from the U.S. East Coast to Asia and Europe. The port recently increased its air draft (water surface to the lowest restricted point) by raising power lines that crossed the channel from 164 ft to 212 ft. The turning basin was widened to 1,524 feet accommodating Post-Panamax vessels that can transport 14,000 twenty-foot equivalent units (TEUs). Highway access and efficient and safe entry to the port is critical and the port is investigating plans to improve its North Gate to optimize operations with a new access road and entrance. This would eliminate inbound truck queuing on neighborhood streets and reduce truck delays and congestion at an existing railroad grade crossing. Rail improvements are underway and are a major focus as the port plans to construct a new intermodal rail facility to increase its capacity from 14,000 to 50,000 intermodal rail movements annually. This offers alternatives to truck transportation, providing support for customers seeking access to hinterlands and supports sustainable intermodal growth at the port. The port property can be seen on the following pages (Figure 2.3 and Figure 2.4), which provides land use with acres and square feet descriptions.

[2] Ro/Ro stands for Roll-on Roll-off cargo like vehicles, trucks, trailers and equipment.

[3] Wilmington Harbor NC Ports NIP Integrated Section 203 Study February 2020, Accessed online 4/7/2022, from: https://www.saw.usace.army.mil/Portals/59/siteimages/Public%20Affairs/WHNIP%20Sec%20203%20%20-%20%20Integrated%20Main%20Report%20FEB%202020.pdf

FIGURE 2.3 PORT OF WILMINGTON TERMINAL AERIAL MAP

Port of Wilmington Aerial

Source: NC OneMap (2020 Imagery)

FIGURE 2.4 PORT OF WILMINGTON FACILITIES USE MAP

PORT OF WILMINGTON

FOR DEVELOPMENT

AREA	ACRES	SM
North Property	86	344,051
DEV - A	2.1	8,495
DEV - B	9.45	38,239
DEV - C	4.24	17,160
DEV - D	7.10	28,752
DEV - E	3.07	12,426
DEV - F	4.93	19,940
DEV - G	3.03	12,275
DEV - H	2.11	8,524
DEV - I	1.01	4,094
DEV - J	2.38	9,630

LEASED AREAS

AREA	NAME	SF
LA-1	Liquid Bulk Facilities	662,995
LA-2	Bulk Transload Facility	35,431
LA-3	Bulk Storage	178,835
LA-4	Outside Storage	572,579
LA-5	Wood Pellet Facility	240,365
LA-6	Produce Chiller	10,600
LA-7	Port Security	3,556
LA-8	Trucking Area	153,640
LA-9	Container Maintenance	1,105

TRANSIT SHED / WAREHOUSE

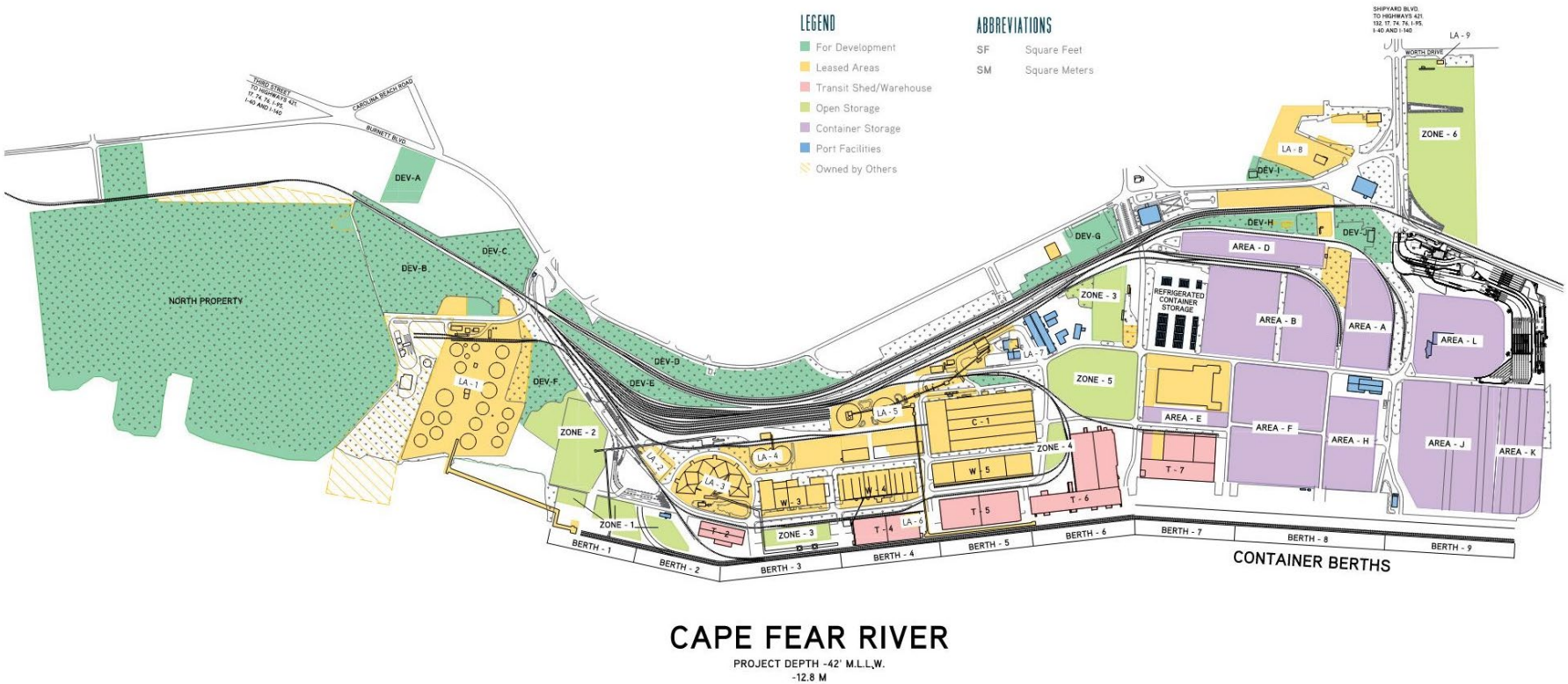
AREA	SF	SM
C-1	279,200	25,939
T-2	31,200	2,899
T-4	74,331	6,906
T-5	100,000	9,290
T-6	183,031	17,004
T-7	152,289	14,148
W-3	65,119	6,050
W-4	90,750	8,431
W-5	96,716	8,985

OPEN STORAGE

AREA	ACRES	SM
ZONE - 1	2.68	10,846
ZONE - 2	5.64	22,824
ZONE - 3	1.22	4,935
ZONE - 4	.73	2,957
ZONE - 5	5.97	24,169
ZONE - 6	11.54	46,697

CONTAINER STORAGE

AREA	ACRES	SM
AREA - A	5	20,261
AREA - B	11.44	46,298
AREA - D	3.58	14,495
AREA - E	1.42	5,748
AREA - F	11.64	47,097
AREA - H	5.08	20,565
AREA - J	13.07	52,892
AREA - K	6	24,240
AREA - L	7.4	29,944



Source: North Carolina Ports Facilities Guide October 2021 – Accessed online 2022 https://ncports.com/wp-content/uploads/2021/10/Facilities_Guide_5.0_Oct.2021.pdf

2.1.3 Port of Morehead City

The Port of Morehead City is located on a multimodal 128-acre terminal accessed via water, rail, and truck. The port is well equipped to provide bulk, breakbulk, and Ro/Ro services. The terminal is located approximately four miles from the Atlantic Ocean with a 45-foot MLLW deep access channel with no air draft restrictions. This waterway is part of the USDOT Maritime Administration, or MARAD, Marine Highway M-95. The port has 5,366 linear feet of bulkheads including nine berths. In addition to the main terminal, the port owns approximately 150 acres across Newport River on Radio Island and is ready for freight and maritime business development opportunities. Both facilities can be seen in the aerial photo shown in Figure 2.5.

FIGURE 2.5 AERIAL PHOTO OF PORT OF MOREHEAD CITY

Source: Image courtesy of North Carolina State Port Authority 2022

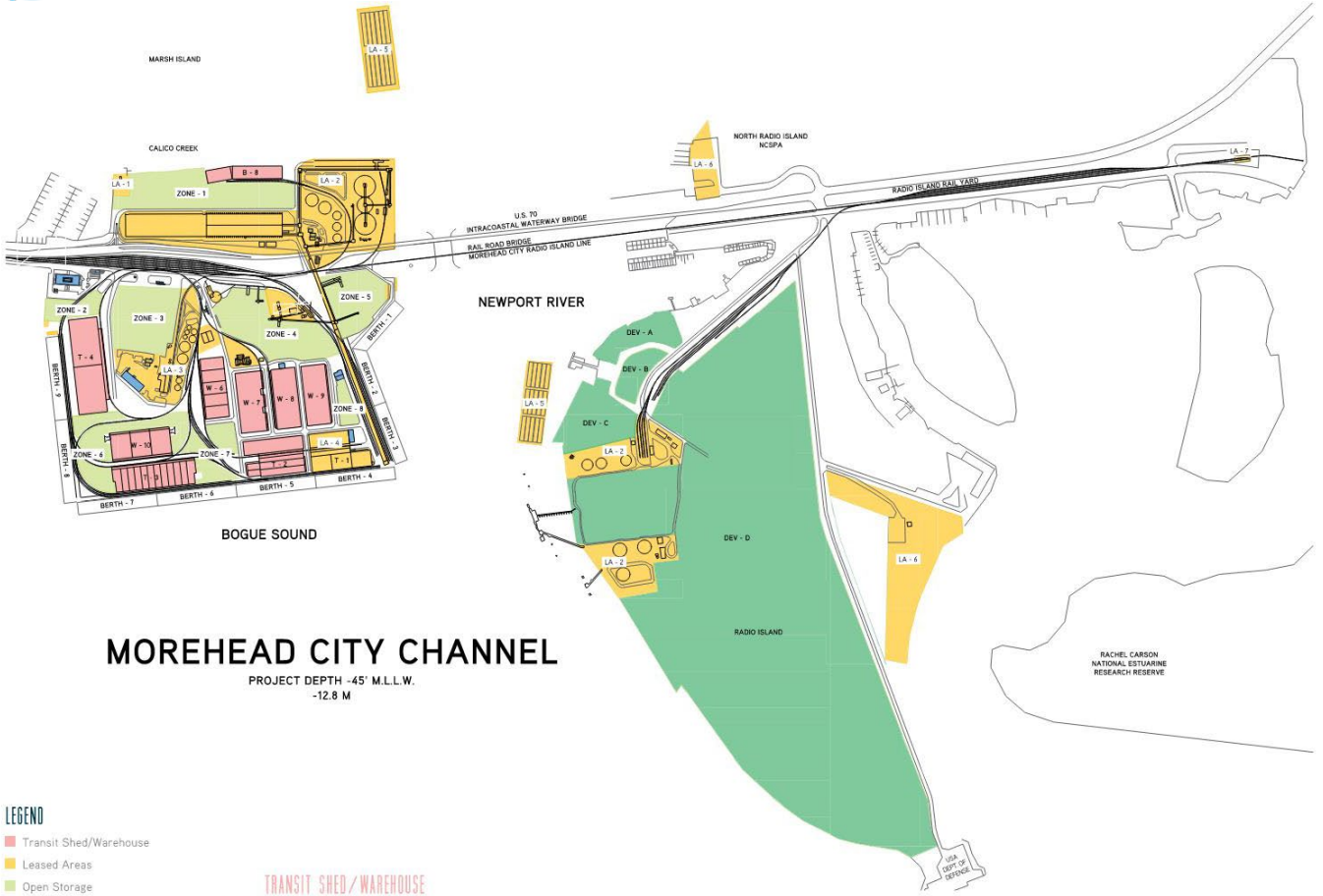
The Port of Morehead City is strategically located within 700 miles of more than 70% of the U.S. industrial base. Connectivity is provided by road and rail with the primary highway access via U.S. 70 (future Interstate 42) directly connecting to I-95. The port also connects to U.S. 17 via N.C. 24 east and south bound, which provides connection to the I-40 corridor between Wilmington and Raleigh. Both port terminals have Class I rail service provided by Norfolk Southern (NS) and have extensive operations on each terminal including on-dock rail, certified railroad scale, bulk loading facility, warehouse sidings, and substantial storage spur tracks available to support rail activity. Terminals switching for this port is provided by Carolina Coastal Railway to position cars for loading and off-loading and prepare trains. Both facilities are illustrated with aerial photo map in Figure 2.6 and the facilities use map in Figure 2.7 on the following pages.

FIGURE 2.6 PORT OF MOREHEAD CITY TERMINAL AERIAL MAP

Port of Morehead City Aerial

Source: NC OneMap (2020 Imagery)

FIGURE 2.7 PORT OF MOREHEAD CITY FACILITIES USE MAP



PORT OF MOREHEAD CITY

RADIO ISLAND AT MOREHEAD CITY

PRIME DEEPWATER TERMINAL

- Approximately 150 acres suitable for port industrial development
- Only 4 miles from sea buoy
- Situated on 45 ft. channel across Newport River from Port of Morehead City, NC
- Municipal water and sewer
- Truck and rail access
- Ocean/River barge fleeting area
- T-head pier with liquid bulk transfer and storage infrastructure

LEGEND

- Transit Shed/Warehouse
- Leased Areas
- Open Storage
- For Development
- Port Facilities

ABBREVIATIONS

SF Square Feet
SM Square Meters

TRANSIT SHED/WAREHOUSE

AREA	SF	SM
T-1	118,631	11,021
T-2	129,019	11,986
T-3	120,320	11,178
T-4	177,100	16,453
W-6	90,024	8,364
W-7	107,000	9,940
W-8	99,400	9,234
W-9	99,400	9,234
W-10	109,998	10,220
B-8	62,568	5,813

LEASED AREAS

AREA	NAME	SF	ACRES
LA-1	Army Docking Corp	23,516	54
LA-2	Liquid/Dry Bulk Facilities	1,096,338	25.10
LA-3	Asphalt Facility	274,424	4.65
LA-4	Cement Facility	122,386	2.81
LA-5	Barge Fleeting Areas	309,598	7.11
LA-6	Public Access	99,178	2.28
LA-7	C.C. Railway	6,837	N/A

OPEN STORAGE

AREA	ACRES	SM
ZONE - 1	8.24	33,334
ZONE - 2	1.45	5,885
ZONE - 3	6.06	24,538
ZONE - 4	7.62	30,872
ZONE - 5	4.58	18,524
ZONE - 6	4.87	19,728
ZONE - 7	2.46	9,948
ZONE - 8	1.01	4,017

FOR DEVELOPMENT

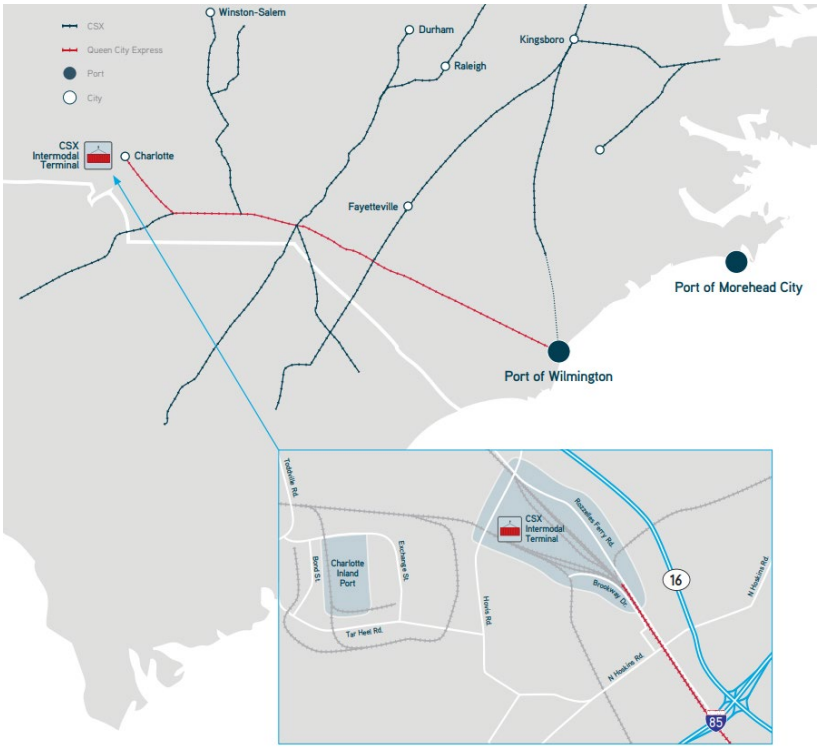
AREA	ACRES	SM
DEV - A	3.25	13,161
DEV - B	2.15	8,711
DEV - C	5.69	23,041
DEV - D	139.29	563,687

Source: North Carolina Ports Facilities Guide October 2021 – Accessed online 2022 https://ncports.com/wp-content/uploads/2021/10/Facilities_Guide_5.0_Oct.2021.pdf

2.1.4 Charlotte Inland Port (CIP)

NCSPA Charlotte Inland Port (CIP) is located at 1301 Exchange Street in the northwest industrial area of Charlotte. The inland terminal is strategically located in the heart of the region's manufacturing and distribution centers. It provides customers broad access to the Southeastern United States and connects globally through the Port of Wilmington. The inland terminal connects customers to distribution corridors and intermodal services. The port connects to major interstates on the I-85 and I-77 corridors.

FIGURE 2.8 CHARLOTTE INLAND PORT MAP AND CALLOUT



Source: Map is courtesy of North Carolina State Port Authority 2022.
Note: Map not to scale and with north orientation.

CIP currently provides 10 paved acres dedicated to intermodal services for both grounded and wheel containers with capability to accommodate 2,000 stacked or wheeled (on-chassis) containers. The terminal has an additional 10-acres ready for development when expansion of capacity is required. The facility serves as a staging area for loaded and empty containers serving ocean carriers with yard operations and provides on-site maintenance and repair services. The terminal is bonded by U.S. Customs and Border Protection (CBP).

Although the terminal is adjacent to a spur track, it is not directly accessible by rail; however, CSX's Charlotte Intermodal Terminal is one mile away and the NS intermodal facility is eight miles away. Figure 2.8 contains a general facility map and a map showing regional connection with Port of Wilmington. Additional descriptions of inland ports and logistics centers are provided in later sections.

2.2 Neighboring State Maritime Systems

The NCSPA provides important multimodal services relying mostly on truck and rail service between the port and other freight generator facilities such as manufacturing, distribution, foreign trade zones, inland ports and mega sites that may require maritime or other multi-modal freight movement services. Analysis of these facilities' effectiveness to enhance North Carolina's economic development requires the examination and understanding of neighboring states' maritime metrics and port facilities that directly or indirectly compete for customers and opportunities with North Carolina ports. The following section will provide an overview of the state metrics for neighboring states of Virginia, South Carolina, Georgia and Florida.

The 2017 North Carolina Statewide Multimodal Freight Plan stated that imports and exports were handled primarily through adjacent state ports in Virginia, South Carolina, Georgia and Florida. This freight plan update considers the investments made by NC State Ports to allow North Carolina to compete for more freight movement through its terminals. The Port of Wilmington competes with neighboring container ports on the United States East Coast, including Norfolk, Virginia; Charleston, South Carolina; Savannah, Georgia; and Jacksonville, Florida. For the non-container market, the extent of competition varies based on the type of cargo handled and port location relative to markets foreign and domestic.

The Waterborne Commerce Statistic Center (WCSC) provides annual accounting of port container movements across all U.S. states and territories. North Carolina's Port of Wilmington consistently ranks among the top 25 ports in the country in total container movements annually and the state is the 16th largest in waterborne container movements as of 2020. Table 2.2 shows a five-year total waterborne volume comparison of the five selected southeastern states. Over the last 4 years, there has been a 13% increase in the total container volume handled by these ports, except for a slight drop in 2019 most likely due to the COVID-19 pandemic.

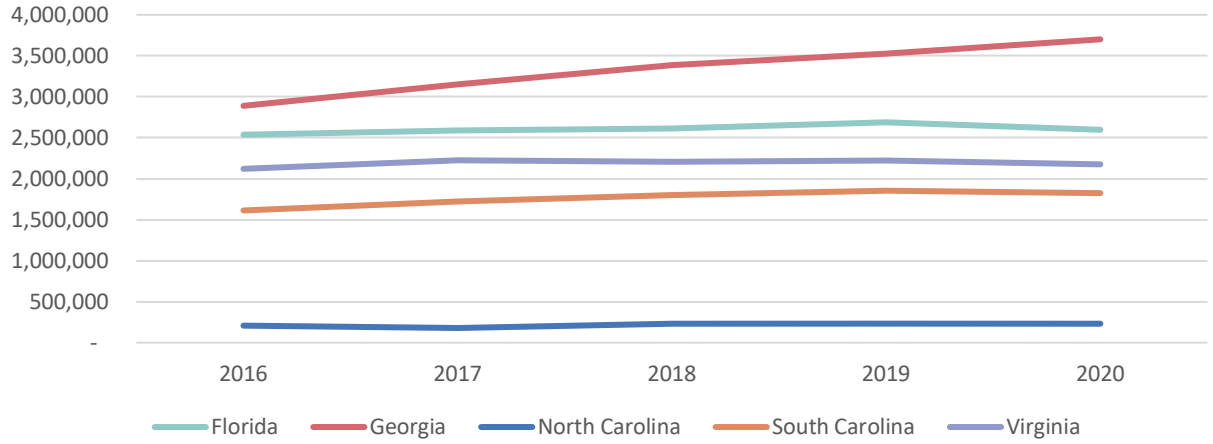
TABLE 2.2 WATERBORNE COMMERCE STATISTICS CENTER, CONTAINER VOLUMES IN TEUS, SELECTED STATES AND UNITED STATES TOTAL CALENDAR YEAR (CY) 2016-2020

State	2016	2017	2018	2019	2020	Percent Change
Georgia	2,889,993	3,154,732	3,386,858	3,523,006	3,701,297	28%
Florida	2,537,062	2,589,719	2,616,443	2,688,777	2,597,641	2%
Virginia	2,121,191	2,225,297	2,209,633	2,219,323	2,175,882	3%
South Carolina	1,612,987	1,719,052	1,803,069	1,854,364	1,821,148	13%
North Carolina	207,240	178,865	229,741	231,943	231,452	12%
Regional Total	9,368,473	9,867,665	10,245,744	10,517,413	10,527,420	12%
U.S. Total*	36,504,338	38,222,328	40,189,425	40,058,783	41,193,715	13%

*Notes: *Excludes duplication from domestic moves.*

Source: Waterborne Container Traffic for selected U.S. States, U.S. Army Corps of Engineers 2016-2020, accessed online from: https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/7439

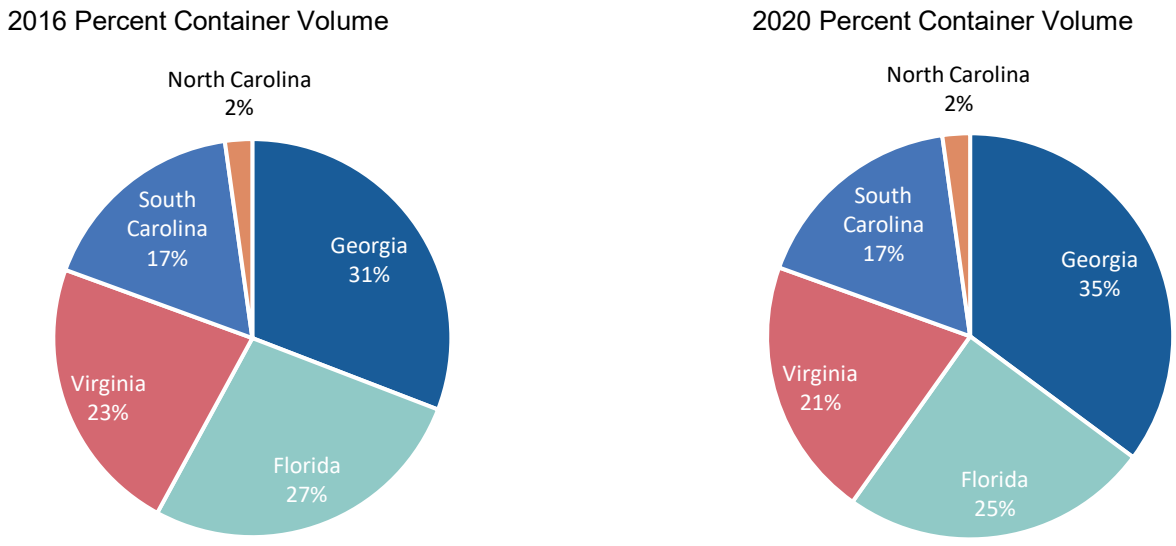
FIGURE 2.9 WATERBORNE COMMERCE STATISTICS CENTER CONTAINER VOLUMES IN TEUS FOR SELECTED STATES (CY 2016-2020)



Source: Waterborne Tonnage for All U.S. States and U.S. territories, U.S. Army Corps of Engineers 2016-2020, Accessed online from: https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/1491

Figure 2.9 provides another perspective of the data by depicting a line chart with trend lines from 2016 to 2020 to represent growth in Florida, Georgia, South Carolina, Virginia and North Carolina during the given period. These trendlines illustrate how North Carolina and Georgia had continuous growth in 2020, while Florida and Virginia had decreased volumes. Table 2.2 indicates NC volume of cargo handled increased by 13%; however, NC's relative percentage of the total volume of cargo handled in the region remains unchanged at 2% since 2016.

FIGURE 2.10 WATERBORNE COMMERCE STATISTICS CENTER PECENTAGE COMPARISON OF CONTAINER VOLUMES IN TEUS FOR SELECTED STATES (CY 2016 AND-2020)



*Notes: *Excludes duplication from domestic moves.*
Source: Waterborne Container Traffic for selected U.S. States, U.S. Army Corps of Engineers 2016-2020, accessed online from: https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/7439

Another important metric to compare waterborne freight movement activity is total tons of cargo moved by states annually. The WCSC provides resources for cross state comparisons. In Table 2.3, statewide waterborne tonnage for the five states is displayed for the calendar years 2016 through 2020. In 2018, tonnage volumes were the highest with Florida and Virginia leading, mainly because both are heavy fuel import states. North Carolina reports mild but stable growth from 9.4 million tons in 2016 to a peak of 9.9 in 2018 and a drop in 2019 and 2020, likely related to the COVID-19 pandemic. Virginia saw a spike in 2018 with 77.7 million tons, followed by a decline into 2019 and 2020.

TABLE 2.3 WATERBORNE COMMERCE STATISTICS CENTER TONNAGE IN 1000'S TONS FOR SELECTED STATES (CY 2016-2020)

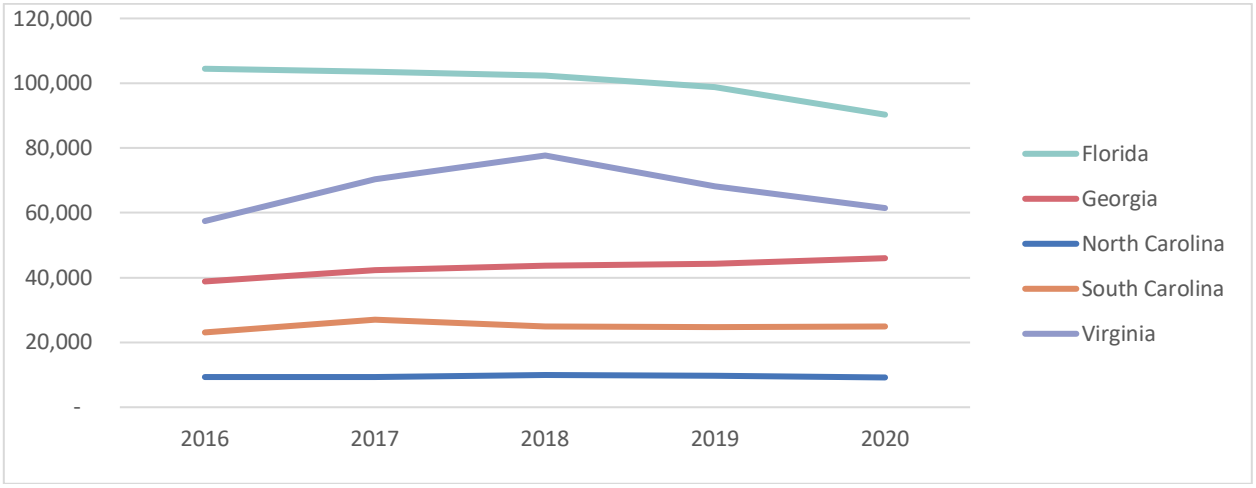
State	2016	2017	2018	2019	2020	Percent Change
Florida	104,470	103,590	102,357	98,803	90,297	-14%
Georgia	38,819	42,354	43,778	44,270	46,003	19%
North Carolina	9,359	9,333	9,949	9,740	9,187	-2%
South Carolina	23,092	27,024	24,854	24,633	24,972	8%
Virginia	57,456	70,449	77,699	68,280	61,564	7%
Totals*	2,292,044	2,385,121	2,416,852	2,363,190	2,226,442	-3%

Source: Waterborne Tonnage for All U.S. States and U.S. territories, U.S. Army Corps of Engineers 2016-2020, Accessed online from: https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/1491

*Notes: * Excludes duplication from domestic moves.*

Another way to view the data analysis from 2016-2020 is with the line graph shown in Figure 2.11, which visually represents five-year trends with a noticeable bump in 2018 for Virginia and the gradual decline in Florida over the five-year period.

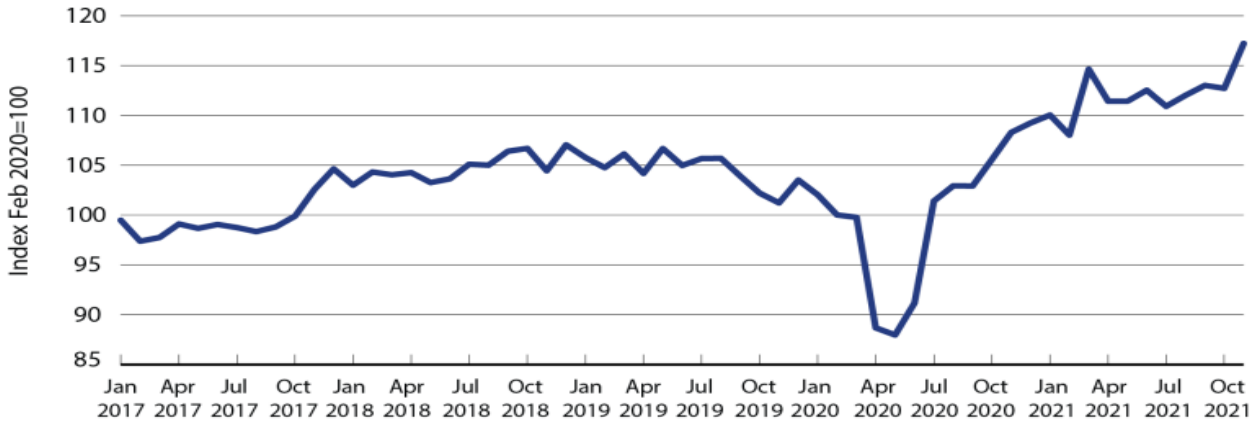
FIGURE 2.11 WATERBORNE COMMERCE STATISTICS CENTER TONNAGE IN 1000'S TONS FOR SELECTED STATES (CY 2016-2020)



Source: Waterborne Tonnage for All U.S. States and U.S. territories, U.S. Army Corps of Engineers 2016-2020, Accessed online from: https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/1491

Providing a broader recent perspective of trend data, Figure 2.12 shows a graph from USDOT BTS capturing trends from January 2017 to October of 2021. The index shows United States imports on a steep climb for more than a year since May 2020.

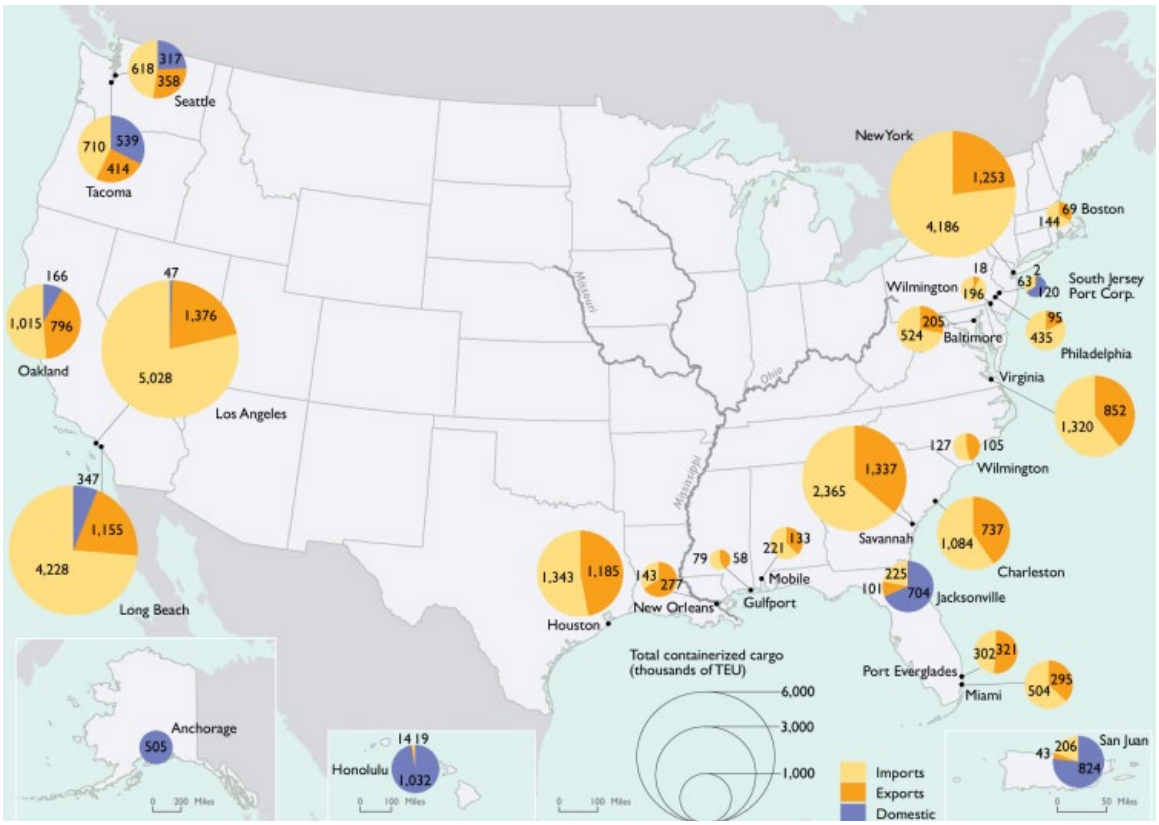
FIGURE 2.12 INDEX OF U.S. GOODS IMPORTS (REAL): JAN. 2017 THROUGH NOV. 2021



Source: USDOT, BTS index, USDOC, Census Bureau, U.S. International Trade in Goods and Services, available at https://www.census.gov as of January 2021.

It is important to see current throughput totals from a national and geographic perspective as shown in Figure 2.13, which provides the Top 25 container ports by volume in TEUs by port within each state. One important observation is the large opportunity for continued expansion at the Port of Wilmington to serve the Piedmont Atlantic mega region.

FIGURE 2.13 TOP 25 U.S. CONTAINER PORTS BY TEUS IN CY 2020



Source: U.S. Department of Transportation, Bureau of Transportation Statistics, based upon 2020 data provided by U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center. Special tabulation as of December 2021.

States and ports were chosen due to location in the Southeast with proximity to regional demand for containerized goods, which are projected to grow at a compound annual growth rate of 3.7% to 4.1% through 2045. Container capacity at southeastern United States ports is expected to continue growing over the next decade as many ports complete major investment programs.

With the expected growth in the container market, NCSPA has recently expanded container terminals, providing shippers efficient access and proximity to the Piedmont Atlantic megaregion, which is comprised of core metropolitan areas including Birmingham, Atlanta, Charlotte and Raleigh-Durham. The expansion of these container terminals supports increasing shipments through NC ports. This megaregion is among the fastest growing regions in the country. With critical rail and highway freight connections, North Carolina is well positioned to support freight movements into and out of these regions. Additional comparisons by neighboring state ports include:

- Interstate access to major North Carolina markets,
- If the port is designated as a strategic military facility,
- Top North Carolina waterborne exporting facilities; and
- Handling the same freight types as the North Carolina ports.

For comparison purposes, a table detailing attributes of neighboring state ports is described in Table 2.4 and the North Carolina ports are detailed previously in Table 1.1.

TABLE 2.4 SUMMARY OF NEIGHBORING PORT CHARACTERISTICS (2 PAGES)

Characteristic	Norfolk (NIT)	Charleston	Savannah
Landside Characteristics			
Employment (300 miles)	24,385,081	12,485,153	14,540,810
Employment (500 miles)	46,705,178	31,630,102	26,769,378
Jobs supported throughout the state	374,600	225,000	496,719
Annual economic contribution to state	$60.3 B economic activity	$63.4 B economic activity	$29 B income $122 B sales $3.4 B state/local taxes
Distance to interstate from gate	5.8 miles to I-264	2.5 miles to U.S.17 and I-26	5.6 miles to I-95 from Garden City Terminal 1.2 miles to I-16; 10 miles to I-95; 1.5 miles to I-516 from Ocean Terminal
Rail access	CSX and NS service to Hampton Roads. NS and CSX service to NS via Direct NS and CSX via Portsmouth Beltline 18,000 Linear Feet of working track arranged in (12) 1,500-foot sections	CSX and NS service to Union Pier, Columbus Street, North Charleston and Veterans. On-terminal rail yards at Columbus St. and North Charleston	CSX and NS service to Garden City and Ocean Terminal. On-terminal ICTF at Garden City
Port Characteristics			
Depth (maximum feet at MLLW)	Norfolk International Terminal (NIT) 50 Virginia Internal Gateway (VIG) 50	45 (harbor channel and dockside)	Garden City Terminal: 47
Air draft (feet)	No Restriction	186 (Arthur Ravenel Bridge) 155 (Don Holt Bridge)	185 (Talmadge Memorial Bridge)
Type of facilities	Bulk Grain Container Ro/Ro Breakbulk Refrigerated cargo	Container Ro/Ro Breakbulk Bulk Refrigerated cargo Cruise	Container Ro/Ro Breakbulk Bulk Refrigerated cargo Cruise
On-site cranes	8 STS container cranes 231’ reach (25-containers) * 14 STS container cranes 201’ reach (22-containers) * 3 STS container cranes 146’ (17-containers) * 104 Straddle carriers 5 rubber-tired gantry cranes^ 60 rail-mounted gantry cranes	5 STS container cranes 228’ (26-container reach) * 2 STS container cranes 212’ (24-container reach) * 9 STS container cranes 197’ (22-container reach) * 4 STS container cranes 197’ (22-container reach) * 2 STS container cranes 190’ (21-container reach) * 3 STS container cranes 146’ (17-container reach) ^	36 STS container cranes (22-container reach) * 1 barge crane, 500-ton 172 rubber-tired gantry (RTG) cranes 6 Rail Mounted Gantry Cranes

Continues on next page

TABLE 2.4 SUMMARY OF NEIGHBORING PORT CHARACTERISTICS (2 PAGES)

Characteristic	Norfolk (NIT)	Charleston	Savannah
Operational Characteristics			
Military Use			
	Yes - Strategic Seaport	Yes - Strategic Seaport	Yes - Strategic Seaport
Gate hours of operation	**NIT:** M-F 5am-6pm; Sat 7am-12pm **VIG:** M-F 5am-6pm; Sat 7am-12pm **NNMT:** M-F 7am-11am; 12pm-4pm **Portsmouth Marine Terminal (PMT):** M-F 8am-5pm	**Container Gates:** 7am-6pm **Breakbulk Gates:** 8am-12pm; 1pm-5pm	**GCT Gate 1, 3, 4, 5 and 8:** M-F 6 am-6 pm. S 8am–5pm **GCT Gate 4:** Only has lunch break from noon to 1 pm

Sources: HNTB team analysis, individual port web sites. Longitudinal Employer-Household Dynamics (http://onthemap.ces.census.gov/ interactive tool used for 2019 employment numbers)

Notes: 1. STS = Ship-to-Shore cranes are overhead cranes located at berths to load/ unload ships; they are usually rail-mounted so they can be moved along the wharf. RTG, or rubber-tired gantry cranes, are typically for stacking and moving containers around the yard.
*2. ^ = can serve ships as large as Post Panamax, * = can serve ships as large as Super Post Panamax*

Historically, handling facilities at North Carolina's ports have been more limited than those of surrounding states or neighboring ports in terms of the volume of freight and commodities handled, but since the 2017 North Carolina Statewide Multimodal Freight Plan was adopted, this is changing. Although refrigerated and roll-on/roll-off (Ro/Ro) cargo has been shipped in North Carolina in the past, the port facilities were limited compared to neighboring state ports. NC Ports, with support from the state, have made major public and private investments. In the past five years, the Port of Wilmington has handled the highest volume of refrigerated cargo in its history.[4] These warehouse facilities have modern sustainable cold chain logistics and are specifically designed as import-export hubs for refrigerated cargo delivered through the Port of Wilmington, expanding the ports capacity.

In 2020, the port completed a $14 million dollar reefer yard expansion from 235 to 775 plugs, more than doubling its cold container storage capability. NC Ports also has an approved Phase II Reefer Yard Expansion shown in Figure 2.14 on the following page, which is a $22.6 million dollar project to bring the total reefer storage for the port to 1,479 plugs.

[4] Wilmington handles record refrigerated container volume, Port Technology, May 14, 2020, accessed online from, https://www.porttechnology.org/news/wilmington-handles-record-refrigerated-container-volume/

North Carolina's port terminals have 24 hours per day operations. The ports' terminal gate hours are Monday through Friday (M-F) 7 a.m. to 6 p.m. at the Port of Wilmington, and M-F 8 a.m. to 5 p.m. at the Port of Morehead City. The gate hours do not limit access to the port, as the terminal has operations sufficient for the volumes. The fluid terminal operations and best in-class turn times permit multiple truck loads to be delivered per day. Truckers and Beneficial Cargo Owners (BCO) prefer NC Ports for this reason. The terminal congestion at other ports limits the ability for multiple truck turns at those locations.

FIGURE 2.14 REFRIDGERATED (REEFER) PLUG EXPANSION

Source: NC Ports 2022, Rendering of Reefer Yard Expansion Project

North Carolina's ports are constantly competing for market share among neighboring state ports. Wilmington, Morehead City and Charlotte Inland Port link the state's consumers, business and industry to world markets, serving as magnets to attract new opportunities to the state. Port activities contribute to more than 87,700 jobs statewide and $15.4 billion (present day value) annually in economic output to the state.[5] They are enormous job creators and economic engines providing some of the highest paying jobs by industry sectors. Port activities create opportunities for truck transport, warehousing, third party logistics services, postal services, rail, water, air cargo and pipeline industries.

2.2.1 East Coast Harbor Deepening

North Carolina Ports have made major facility investments to maintain competitivity with neighboring states. The Port of Wilmington can currently accommodate Post-Panamax sized vessels at its container terminal. The Wilmington Harbor Navigation Improvement Project is currently underway to expand the port's capabilities. Additionally, Wilmington completed improvements to widen the turning basin in the Cape Fear River from 1,400 feet to 1,524 feet. This additional 124 feet allows vessels up to 14,000 TEU to safely and efficiently turn around in the Wilmington Navigational Harbor. The Port of Morehead has a channel depth of 45 feet and is one of the deepest in the industry for vessel types that move traditional bulk, breakbulk and general cargo commodities.

For more than a decade, top container shipping lines have been transitioning from older, smaller vessels to larger vessels that require wider channels, extended turning basins and deeper water. The largest current container ships are the Ultra Large Container Vessels (ULCV), which typically draft around 45 feet and

[5] 2018 Economic Contribution Study completed by NC State ITRE provided by NCSPA.

measuring over 1,200 linear feet in length. The preferred plan would be to deepen the port to 47 feet to accommodate these vessels as illustrated in Figure 2.15, enabling carriers to continue to utilize the Port of Wilmington with Post-Panamax and ULCV vessels deployed on global trade routes.

FIGURE 2.15 WILMINGTON HARBOR NAVIGATION IMPROVEMENT PROJECT

Source: NC Ports Wilmington Harbor Navigation Improvement Project, accessed from, https://ncports.com/port-improvements/wilmington-harbor-improvements-project/

Table 2.5 provides an overview of the United States Army Corp of Engineers (USACE) current port depths in feet and planned future port deepening project depths for major East Coast ports.

TABLE 2.5 U.S. ARMY CORPS OF ENGINEERS (USACE) CURRENT AND PLANNED FUTURE U.S. EAST COAST PORT DEPTHS

Port	Current Depth Feet	Planned Depth Feet	Status/Completion Date
Baltimore	50	50	Complete
Miami	50	50	Complete
New York*	50	50	Complete
Norfolk	50	55	Design/2025
Charleston*	52	52	Complete
Morehead City	45	45	Complete
Philadelphia	45	45	Complete
Port Everglades	42	48	Design/2024
Savannah*	47	47	Complete
Wilmington	42	47	In Design
Boston*	40	48	In Construction/2024
Jacksonville*	47	47	Construction/2022

Source: United States Army Corps of Engineers, 2019 Sec 203 Wilmington Harbor Deepening https://eft.usace.army.mil/saw-nav/Dredging/Wilmington_Harbor/WHNIP/20190926_WHNIP203_Final_Scoping_Presentation.pdf

*Notes: * Asian Service Route Partners.*

Wilmington is currently working with the USACE to deepen to a design depth of 47 feet. Competition with other East Coast ports for deep water access is an important reason for the port deepening project to remain a top priority to remain a viable and competitive port option on the East Coast.

KEY OBJECTIVES OF THE WILMINGTON HARBOR NAVIGATION IMPROVEMENT PROJECT

- Allow for the Port of Wilmington to remain a competitive as a port-of-call for major East Coast containership services
- Accommodate recent and anticipated growth in cargo vessel traffic
- Improve the efficiency of operations for cargo vessels at the Port of Wilmington
- Allow ultra large cargo vessels (ULCV) to use the Wilmington Navigational Harbor like the one shown in Figure 2.16.

FIGURE 2.16 PORT OF WILMINGTON WELCOMES LARGEST CONTAINER SHIP

Source: NC Ports April of 2020, accessed from https://ncports.com/about-the-ports/news/largest-container-ship-visits-wilmington/

The Port of Wilmington competes for the container market with neighboring ports on the United States (U.S.) East Coast including Norfolk, Virginia, Charleston, South Carolina, Savannah, Georgia and Jacksonville, Florida. For the non-container market, the extent of competition varies based on the type of cargo handled and proximity of importer/exporter to the port location. Therefore, the regional ports identified as neighbors to North Carolina ports include Norfolk, Virginia, Charleston, South Carolina and Savannah, Georgia, and were selected for evaluation and comparison based on the following factors:

- Similar location in the southeastern United States: all the ports selected are likely to directly serve North Carolina shippers and the emerging Piedmont Atlantic Mega-region, composed of core metropolitan areas, including Nashville, Birmingham, Atlanta, Charlotte and Raleigh-Durham;
- All have interstate landside access to major North Carolina market areas without passing one of the other neighboring ports;
- All are designated as strategic military ports;
- They are the leading ports for current North Carolina waterborne exports; and

- They handle the same freight types as the North Carolina facilities.

These regional ports are compared in Table 2.4 and the North Carolina port details are in Table 2.1.

Port of Virginia, Virginia

The Port of Virginia is located in the Hampton Roads area near the entrance of the Chesapeake Bay and operated by the Virginia Port Authority (VPA). VPA owns six terminals on 1,864 acres and nearly 20,000 linear feet of berths and 30 miles of on-dock rail. The four main marine terminals include: Norfolk International Terminal (NIT), Virginia International Gateway (VIG), Newport News Marine Terminal and Portsmouth Marine Terminal (PMT). VIG is the former APM Terminal facility, a semi-automated container terminal; it is privately owned by Alinda Capital and operated by the VPA under a 49-year long-term lease signed in 2016. In 2019, the port completed a $312 million container and rail capacity improvement project expanding its capacity to 1.2 million TEUs or 480,000 lifts, respectively. Also in this area are the Kinder Morgan bulk terminals that handle coal, other dry bulk cargo and liquid bulk (petroleum, chemicals and ethanol). This is one of the deepest ports on the U.S. East Coast because of the naval facilities in the region; it is 50 feet deep and can be dredged to 55 feet. The terminal provides 4,000-feet of berth capacity, currently able to accommodate three ULCV served by 12 super Post-Panamax cranes. The Virginia Ports are served by two Class I railroads Norfolk Southern (NS) and CSX.

Port of Charleston, South Carolina

The South Carolina terminal is 16 miles from the open ocean and is maintained at a depth of 45 feet; deepening is planned in the future. There are air draft restrictions of 185 feet from bridges to reach some of the terminals. Landside cargo can reach interstate highways in 2.5 miles to U.S. 17 and I-26. Charleston's facilities are spread across seven terminals and provide service for all types of cargo and cruise line operations. In FY 2021, the port moved a record number of 1.42 million TEUs and the climate-controlled storage expansion at the New Orleans Cold Storage & Warehouse Co. Ltd. facility in North Charleston has been fruitful. The port has also seen growth in reefer containers from 67,000 TEUs in FY 2017 to 73,000 in FY 2021. CSX and NS both operate large, rail yards in Charleston served by double-stack intermodal trains.

Port of Savannah, Georgia

Since 2017, Georgia Ports Authority (GPA) has seen a 39% growth in containers movements from 4.05 million TEUS to 5.61 million in CY 2021.[6] The Savannah Harbor Deepening Project (SHEP) was completed in the first quarter of 2022 after six years of dredging the Savannah River. The SHEP supports the expansion plans implemented by the GPA. The $973 million project deepens the 32-mile channel from 42 feet to 47 feet. The port has a 1,500-foot turning basin. The Garden City Terminal, GPA's primary container port, consists of 1,345 acres with 9,693 linear feet of berth area for containerized cargo, 600 linear feet of berth for liquid bulk, 1,124,016 square feet of warehousing (with 68 K sq. ft. cold storage) and 3,378 feet of rail sidings.[7] The Ocean Terminal is 200.4 acres dedicated to breakbulk and Ro/Ro cargo with 5,768 feet of

[6] Georgia Ports by the Numbers, accessed from, https://gaports.com/wp-content/uploads/2022/05/CY21-Annual-Container-Trade.pdf?1655922710

[7] https://gaports.com/facilities/port-of-savannah/garden-city-terminal/ Accessed 6/6/2022.

waterfront consisting of five berths and four slips. This terminal also has more than 1,330,345 square feet of sheds and warehouse space along with 9,046 feet of rail sidings.[8]

2.2.2 On-port Providers

General Labor

To physically load/unload cargo from docked ships and move it around the port, stevedores and crane operators are essential. The former are union laborers that tether and secure cargo on vessels as well as unload it. In the southeastern part of the U.S., most states are right-to-work states and other port workers are non-union laborers. In the case of North Carolina, all the crane operators are port employees giving the port more freedom to be agile as markets change. Other key personnel include port security and gate operators.

Value-Added Services

Depending on the cargo moving through a particular port terminal, differing value-added services may be offered on-port. These enable a port to distinguish itself from others because of a specialty service that caters to a particular industry, while also providing the port with another revenue stream. Example services offered at Morehead City, Wilmington and neighboring ports are as follows:

- Cleaning reefers (pre-tripping),
- Stripping and stuffing containers,
- Cargo fumigation,
- Intense cleaning of warehouses for a commodity (such as for fluff pulp),
- Wood chipping on-site,
- Storage such as warehouses, transit sheds, tanks and
- Reefer or Climate Controlled services (cold storage, blast freezing, USDA inspection services).

Chassis Leasing

A chassis is a steel frame with wheels that connects to a semi-truck for the transporting of a cargo container. Leasing of chassis is an on-port, land-side service. Shipping containers are typically unloaded from a container vessel by a ship-to-shore crane to a chassis pulled by a drayage truck. The drayage truck moves the container stack to a storage yard, intermodal container transfer facility, or other near port destination. Chassis were originally supplied by steamship companies, but in the U.S. they are primarily handled by leasing companies. The leasing company supplies the chassis to the transporter to conduct a container move. Leasing companies typically operate chassis in a pooled system as a way to efficiently share and distribute chassis among users of various ports in a region.

Neighboring States Inland Support Facilities

Many functions previously performed dockside may be transferred to inland sites, thereby relieving demand for the limited area on or near a marine terminal. Inland ports, intermodal rail facilities and logistics sites support the distribution of waterborne goods in the port locality. These facilities may be used to perform tasks

[8] https://gaports.com/facilities/port-of-savannah/ocean-terminal/ Accessed 6/6/2022.

that package or repackage goods, load containers and transfer containers between truck and rail. Tasks such as receiving, processing, customs requirements, inspection and handling for cross-dock shipment may also be performed at an inland port or intermodal facilities. These facilities in North Carolina and the neighboring states are outlined in Table 2.6, with some further discussed in-depth in sections 2.3.3 through 2.3.7.

TABLE 2.6 INLAND PORTS AND MEGASITES BY STATE CHECK ACRONYMS ARE IN LIST

State	City/ County	Name	Status	Size (acres)	Facility Type*	Cargo Type	Rail Access	Associated Sea Port
Virginia	Front Royal	Virginia Inland Port (VIP)	Existing since 1989 with 39 major companies near VIP	161 (8.5M SF of buildings)	Sea Marine Terminal (SMT)	Containers	NS dedicated, 5x/day	Norfolk
	Dublin	Virginia Trade Port	Existing	Data not available	MLP	Data not available	12 miles to NS yard in Radford, VA	Norfolk
	Greensville County	Mid-Atlantic Manufacturing Center (MAMaC)	Proposed	1,545	EDI, certified megasite	n/a	CSX mainline with spur, NS nearby	n/a
	Richmond	Meadowville Technology Park	Existing	1,300	megasite	n/a	None	Port of Virginia
North Carolina	Charlotte	Charlotte Inland Terminal	Existing	10 acres developed, 10 undeveloped	SMT	Containers	8 miles to NS terminal, 1 mile to CSX terminal	Wilmington
	Chatham County	Chatham-Siler City Advanced Manufacturing Site	Existing	approx. 1800	megasite, NC Certified		NS	Wilmington
	Greensboro	Piedmont Triad Inland Terminal	Existing, dormant	Data not available	SMT	n/a	CSX, NS terminals 6 miles away	Wilmington
	Greensboro	Greensboro-Randolph Megasite	Under development	1,480	megasite, KPKG certified		NS	Wilmington
	Kinston	Global TransPark	Existing	2,500	MLP	Air Cargo	Short-line RR spur into NCRR	Morehead City
	Edgecombe County	Kingsboro-Rose Megasite	Existing	1,961	EDI, megasite	n/a	CSX line borders property	Norfolk or Morehead City
	Leland	International Logistics Park (ILP)	Existing, NC Certified Site	1,040	EDI, megasite	n/a	CSX at Mid-Atlantic LC is closest	Wilmington

	Leland	Mid-Atlantic Industrial Rail Park	Potential site: new, across from ILP	1,100	EDI	n/a	CSX connection	Wilmington
	Lenoir	Caldwell-Lenoir Transload Facility	Existing trans-load & consolidation center	Approx. 5	RIP	Data not available	Short-line RR interchanges with NS	n/a
	Moncure	Triangle Innovation Point, Moncure, , NC	Proposed	2,150	megasite	n/a	CSX and NS	Morehead City
	Navassa	1690 Royster Road	Potential site: new, undeveloped	53	EDI	n/a	CSX	Wilmington
	Navassa	Lincoln Industrial Site	Potential site: new, undeveloped	280	EDI	n/a	CSX	Wilmington
	Navassa	Old Mill Road Site	Potential site: new, undeveloped	256	EDI	n/a	CSX line borders property	Wilmington
	Northwest	Northwest Rail Site	Potential site: new, undeveloped	135	EDI	n/a	CSX line borders property	Wilmington
	Person County	Person County Megasite	new, undeveloped	1,300	megasite	n/a	Offsite	Multiple
	Rocky Mount	Carolina Connector (CCX)	In Operation	500+	Intermodal Terminal	Containers	CSX	Wilmington
	Union County	Project Legacy	Proposed	5,000	EDI	n/a	CSX	Wilmington
South Carolina	Greer	Inland Port Greer	Existing, Opened Oct 2013	38 acres currently, 100 acres when complete	Inland Port	Containers/ BMW cars	NS	Charleston
	Santee	South Carolina Gateway Industrial Park	Being developed	1,322	EDI	Data not available	CSX branch line	Charleston, Savannah
	Clarendon County	I-95 Megasite	Existing, land for sale	1440	certified megasite	Data not available	None	Charleston, Georgetown
	Chester County	Carolinas I-77 Megasite	Private	1,152	certified megasite	Data not available	On-site short line, 12 mi. to Class I	n/a
	Dillon County	I-95 Industrial Megasite	Existing	1,920	megasite	Data not available	CSX	Charleston
	Kershaw County	Central South Carolina Megasite	Existing	1,426	certified megasite	Data not available	On-site	Charleston

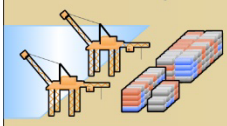
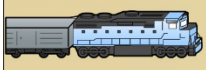
	Orangeburg County	See text for site names and details	Multiple sites proposed	Approx. 1,100	megasite	Data not available	Varies by site	n/a
	Graniteville	Sage Mill East Site	Potential site	1,380	certified megasite	n/a	NS	Charleston, Savannah
Georgia	Bainbridge	Port Bainbridge	Existing	107	SMT	Dry & Liquid Bulk	CSX	Savannah
	Columbus	Port Columbus	Existing	14	SMT	Liquid Bulk	NS	Savannah
	Cordele	Cordele Intermodal Center	Existing. Opened on 7/1/2011.	40, expandable to 1,200	SMT	Container	Heart of Georgia RR to GA Central to CSX	Savannah
	Augusta	Augusta Corporate Park	Potential site	1,734	GRAD site	n/a	NS rail access	Savannah
	Cook County	South Cook Industrial District	Potential site	2,000	GRAD site	n/a	NS rail spur	Brunswick
	Newton County	Stanton Springs	Potential site	1,618	GRAD site	n/a	None	Savannah
	Baldwin County	Sibley Smith Industrial Park	Potential site	1,643	GRAD site	n/a	None	Savannah
	Baldwin County	Milledgeville-Baldwin County Industrial Park	Potential site	414	GRAD site	n/a	none	Savannah
	Barrow County	One University Parkway-Statham	Potential site	360	GRAD site	n/a	none	Savannah
	Barrow County	Park 53 Industrial/Technology Complex	Potential site	288	GRAD site	n/a	none	Savannah
	Barrow County	University Parkway/ Stan Coley Property	Potential site	78	GRAD site	n/a	none	Savannah
	Bartow County	Highland 75-White	Potential site	707	GRAD site	n/a	none	Savannah
	Bibb	Airport East Industrial Park-Macon	Potential site	264	GRAD site	n/a	none	Savannah
	Murray County	Appalachian Regional Port	Existing	42	Inland Port		CSX	Savannah

Note: RR = railroad, NS = Norfolk Southern Railway or Norfolk Southern Corporation, NCRR = North Carolina Railroad Company, CSX = CSX Corporation, GRAD = Georgia Ready for Accelerated Development, EDI = Economic Development Initiative, SMT = Sea Marine Terminal, MLP = Master Limited Partnership, RIP = Rail Inland Port.

2.3 Services & Service Providers

Conducting international trade by moving goods through a port requires a variety of service offerings that add costs to the commodity throughout the supply chain. Therefore, a host of services and service providers are considered with waterborne cargo as shown in Figure 2.17, which describes various entities and depicts their designated roles. This figure was developed for a report by the United States Government Accounting Office (GAO). This illustration reviews entities on the marine-side, on-port terminals and landside connections. It is important to note that each service can potentially alter both the time and cost efficiency of cargo, ultimately influencing shippers' logistical choices of port of entry, modal choice and landside connections.

FIGURE 2.17 ENTITIES INVOLVED IN SHIPPING CARGO VIA PORTS

Entity	Description	Role in the supply chain
Shippers 	The consumer or business providing goods for shipment, or as defined by the Federal Maritime Commission (FMC), an ocean transportation intermediary (non-vessel-operating common carriers).	Shippers make transportation choices—such as where and how to ship goods—based on firm and commodity attributes such as market value, costs, geography, perishability, time-sensitivity, and inspection requirements. Shippers consider total logistics costs, transit time, and reliability in their supply chain and operational decision-making.
Ocean carriers 	For profit entities that own and operate the ships that move cargo from one port to another. These entities may also own or lease the containers that cargo is shipped in. They frequently operate in alliances with other carriers. Ocean common carriers frequently establish collective agreements, filed with and monitored by the FMC, to discuss and agree on common pricing policies or to jointly provide shipping services.	Ocean carriers select which ports and terminals to call on and formulate their routes based on a number of factors, including overall port capacity, profitability, shipper demand, and other business objectives. Ocean carriers may charge shippers fees to rent out containers and late fees if containers are not returned after a certain period of time.
Port authority 	Public entities created by a state, county, or city that own and manage port property, including land and physical assets, which may extend beyond maritime. Typically governed by a board or commission elected regionally or appointed by an elected official.	Port authorities develop and strategize maritime assets, for example, choosing to specialize in handling certain commodities or types of cargo. They compete with one another domestically and internationally to secure and maintain leases with marine terminal operators and to attract vessel calls from ocean carriers.[a]
Marine terminal operators 	Entities that may operate terminals at multiple ports or have affiliations with ocean carriers. The FMC defines marine terminal operators as providers of wharfage, dock, warehouse, or other marine terminal facilities to ocean common carriers moving cargo in the ocean-borne, foreign commerce of the United States. They often participate in marine terminal operator agreements, filed with and overseen by the FMC, whose members collectively engage in cooperative working arrangements or discuss and regulate rates or conditions of service.	Marine terminal operators lease facilities (e.g., a terminal) from port authorities and coordinate all cargo operations and other maritime related functions (such as operating the equipment that loads and unloads ships). They depend on ocean carriers' ships calling on their facilities for revenue. Terminal operators are also responsible for "calling" and contracting labor. Marine terminal operators may charge storage fees (demurrage) when a container is not picked up by a shipper after a certain period of "free" time.[b]
Labor 	Workers (labor) engaged in longshore division work, such as crane and equipment operators, marine clerks, and mechanics. Their employment conditions, including rates of pay, hours, worker safety provisions and protections, are statutorily mandated or negotiated in labor contracts.	Labor is responsible for the clerical functions associated with the receiving, delivering, checking, tallying, inventorying, etc. of cargo and the physical loading and unloading cargo on and off of ships for transport into and out of the terminal. Labor is also responsible for the maintenance and repair of cargo handling equipment (including, but not limited to, the maintenance and repair of most chassis used to transport cargo to and from the terminal).
Truckers 	Truckers are truck operators, often owner-operators, who are paid by the number of pick ups and drop offs they make (commonly referred to as "turns"), or employees of licensed motor carriers.	Truckers transport containers between port terminals and other intermodal facilities, such as railyards and warehouses. Many are dispatched by larger trucking companies, while others work independently.
Chassis leasing company 	Third-party leasing companies now own the majority of container chassis—truck trailer beds hooked up to truck cabs designed to accommodate specific shipping container sizes (typically 20, 40, or 45 feet long). Ocean carriers once owned chassis, but recently got out of this line of business.	These companies rent chassis to truckers or long-term lease chassis to shippers, truckers, and others for the movement of ocean carrier's shipping containers to and from a terminal.
Rail operators 	For profit entities that own, maintain, and manage the railroad infrastructure and equipment they are dependent upon for carrying cargo. Freight railroads are divided into three groups, called classes, based upon their annual revenues.	Rail operators transport cargo to and from shippers and the terminals, using railroads located on-dock, near-dock (<5 miles from port), and off-dock. Class I railroads, which are the largest railroads generally focus on providing long-haul freight services, whereas smaller or regional Class II and III railroads often provide the first and last mile of rail freight movement.

Source: GAO. | GAO-17-23

Source: West Coast Ports: Better Supply Chain Information Could Improve DOT's Freight Efforts (GAO 17-23 published Oct 2016) (http://www.gao.gov/assets/690/680719.pdf Accessed 11/1/2016)

2.3.1 Marine-side Providers

In the international arena, there are several companies that own and operate ships to transport cargo. Shipping lines can operate independently or group themselves in alliances to transit shipping lanes and meet market demand for sailing frequencies.

In the local arena, specialty operators (such as river pilots and tug operators) are commonly needed to carefully maneuver the large vessels up and down narrow rivers with ever-changing contours caused by currents, shoaling and dredging.

2.3.2 Land-side Providers

Once off-port, transport of cargo is typically handled by the Class I railroads and/or truck drivers that are either performing short drays or long-haul moves. Each of these modes is covered in greater detail in the Rail and Highway Modal Profile documents as part of this project, respectively.

Transport, storage and distribution are often done landside beyond port property where land is cheaper and less constrained.

2.3.3 North Carolina's Inland Terminals

North Carolina has several inland intermodal freight terminals in strategic locations throughout the state that serve container movements to, through and out of the state. There are three Class I intermodal terminals: CSX Charlotte Intermodal Terminal, NS Charlotte Intermodal Terminal and NS Greensboro Intermodal Terminal. A fourth terminal, the Carolina Connector, also known as CCX, opened in Rocky Mount in 2021. North Carolina Ports operates the Charlotte Inland Port, which does not have direct rail access, but can receive containers through drayage trucks. The Queen City Express (QCE) intermodal service connects the Port of Wilmington to the CSX Charlotte Intermodal Terminal by rail and then to the North Carolina Ports Charlotte Inland Terminal by truck. QCE is an intermodal rail service providing direct access to major distribution corridors in the Southeastern portion of the U.S. QCE reduces transit costs and eliminates dwell time from coast to city, proving to be an advantageous intermodal rail service.[9] Inland freight terminals serve as transshipment hubs for loading and off-loading cargo from container to full size truck trailers or moving containers from one mode of shipment to another. For example, one inland freight service is the transitioning from train flat or well car to truck flat bed or chassis. These facilities can also serve staging or storage needs of some customers.

Charlotte Inland Port (CIP)

NC Ports owns and operates the Charlotte Inland Port (CIP). The terminal currently sits on a 20-acre site with 10 developed acres dedicated for intermodal container operations and services. CIP connects customers to distribution corridor opportunities. Strategically located in the heart of the region's manufacturing and distribution centers, the port serves the I-85 and I-77 corridors. The port can accommodate 2,000 grounded/wheeled containers and provides container yard operations to ocean carriers.

[9] NC Ports, From Sea to Queen City. In One Day. Accessed on September 06, 2022, https://ncports.com/rail-connectivity/queen-city-express/

The port serves as a staging area for empty and loaded containers with maintenance and repair service from an onsite vendor that is bonded by Customs and Border Protection (CBP). The container service via truck goes to and from the Port of Wilmington, Charlotte and beyond. While CIP is not directly accessible by rail, the CSX Charlotte Intermodal Terminal is approximately one mile from CIP, and the NS intermodal facility is approximately eight miles away. Containers are drayed to and from the CSX terminal to CIP for delivery and pickup between Wilmington and Charlotte using the Queen City Express (QCE).

QCE Advantages

- Shortens first and last mile truck transit
- Lowers transportation costs for businesses
- No dwell times at Port of Wilmington or CIP
- Flexible staging at CIP with 24 hours a day, seven days a week access potential
- Provides customers unprecedented access to Southeastern U.S.
- Reduces the number of trucks on roadways, therefore reducing emissions

2.3.4 Regional Intermodal Facilities, Logistics Centers and Megasites

FIGURE 2.18 CSX NATIONAL GATEWAY CORRIDOR

Source: CSX Transportation, Intermodal Core Network, November 2021

CSX Charlotte Intermodal Terminal

CSX operates approximately 1,104 miles of track in North Carolina along three primary corridors. An east-west freight rail corridor runs from the Port of Wilmington to Charlotte passing through the rural communities of Pembroke and Hamlet (SE-Line). CSX also has a major north-south corridor in the western part of the State that connects Tennessee to the South Carolina state line. The north-south A-Line is CSX's busiest track in North Carolina and traverses the eastern part of the state, paralleling I-95. The A-Line provides a major connection for the state to the rest of the East Coast, including destinations such as Florida and Massachusetts. The A-Line, the CSX Charlotte Intermodal and the Port of Wilmington are all components of the CSX National Gateway Corridor, presented in Figure 2.18.

The National Gateway Project invested $850 million to improve efficiency, reliability and competitivity of intermodal rail traffic. The funds were raised by a mixture of CSX, federal government and state contributions. The project increased the use of double-stack intermodal trains and created more efficient rail routes to link mid-Atlantic ports with Midwestern consumer markets. The CSX Charlotte Intermodal Terminal lies west of downtown Charlotte. It has an estimated annual operating capacity of 140,000 lifts. As part of the National Gateway Project and in cooperation with NCDOT, CSX is creating capacity and increased efficiency at this terminal.

NS Charlotte Intermodal Terminal

NS operates a 200-acre intermodal yard in Charlotte with an annual lift capacity of approximately 200,000 containers. This terminal opened in December 2013 and is located at the Charlotte-Douglas International Airport.

NS Greensboro Intermodal Terminal

NS maintains an intermodal terminal in Greensboro that offers double-stack intermodal rail services to container ports at Hampton Roads, Virginia. This facility provides access 7 days a week with a 24-hour gate

Monday through Friday, 12 a.m. to 2 p.m. Saturdays and 6 a.m. to 4 p.m. Sundays. The facility has Top and Bottom lift capabilities on the terminal and has two RMG cranes at the facility. The terminal is adjacent to the NS Pomona Yard where major switching operations are located.

North Carolina Global TransPark

North Carolina Global TransPark (NCGTP) is an industrial site located in Kinston, North Carolina with 5,775 acres of industrial-permitted land nearby. It is owned by the State of North Carolina and has a focus on aerospace, logistics and industrial activities. NCGTP is within FTZ 214 (Foreign Trade Zone)[10] with access to three modes of transportation: air, road and rail. Road connections include U.S. 70 and U.S. 258. A 5.8-mile spur connects GTP to the North Carolina Railroad (NCRR) mainline, thereby enabling a connection to the Port of Morehead City operated by Jaguar Holdings.[11]

NCGTP receives funding through a combination of public (federal and state) and private sources. Most recently, NCGTP received $863,000 annually per year in state funding to support annual operations. In return for this state investment, the North Carolina State of Aviation Report[12] estimates the following economic benefits to the state due to tenant operations:

- $10.99 million in tax revenues,
- $115 million in personal income, and
- $487.17 million projected statewide economic impact in 2020.

With rail connections and a functioning intermodal facility, the NCGTP has a similar model as the Virginia Inland Port. Targeted industries include aerospace and aviation manufacturing, high-tech manufacturing, logistics services, emergency response, and defense and security. NCGTP seeks greater strategic coordination and alignment with NCRR and NCSPA. Infrastructure and development proposed for the medium and long term future would include additional land acquisition, new Spine Road, transload facility, rail expansion, improved Interstate and rail connection to the Port of Wilmington.

2.3.5 Neighboring States Inland Terminals

Virginia Inland Port

Virginia Inland Port (VIP) is an Intermodal Container Transfer Facility (ICTF) in Front Royal, Virginia (Warren County) owned by the Virginia Port Authority. The inland port is situated on 161 acres located approximately 60 miles from Washington, D.C. The terminal is strategically located to serve the Port of Virginia by providing intermodal access to more than 220 miles of inland markets to metro centers such as Washington, D.C and Baltimore Metro Region with rail service to Hampton Roads terminals. VIP also consolidates and containerizes local cargo for export. The terminal is served by 17,820 feet of rail track that runs adjacent to the NS Crescent Corridor. NS provides rail access to Harrisburg, PA and the New York/New Jersey region with intermodal rail service to and from VIP. The facility is a CBP-designated port of entry and offers

[10] FTZ or Foreign-Trade zones are designated sites licensed by the Foreign-Trade Zones Board (Commerce Secretary is Chairperson) at which special customs procedures may be used, accessed from https://www.trade.gov/about-ftzs

[11] Global TransPark Accessed Online from North Carolina Global TransPark: Infrastructure (ncgtp.com)

[12] North Carolina: The State of Aviation 2021 Report

customers a full range of onsite services including log-stuffing, chassis and container repair, secure container storage, and shore power for refrigerated units. The terminal has a 78,000-container capacity for Virginia ports and offers intermodal services to vendors five days a week. Vendors such as Home Depot, Red Bull, Newell Rubbermaid, Family Dollar, Lenox and Mercury Paper and many others utilize the intermodal services provided by VIP.[13]

Georgia Inland Ports

Georgia has three major inland ports linked to the Port of Savannah for deep sea service. Port Bainbridge and Port Columbus are owned and operated by the Georgia Port Authority (GPA). Port Bainbridge handles both dry and liquid bulk commodities on 107 acres and offers both short and long term storage in on-site transit sheds and warehouses. Port Bainbridge is served by I-10 and I-85, CSX rail and maritime barge. Port Columbus handles liquid bulk across 14 acres on the Tri-Rivers System. It is served by highway, NS railroad and barge.

Cordele Intermodal Center (CIC) opened in July 2011 as a public-private partnership. The 40-acre facility includes rail service by three carriers and direct interstate access. The CIC has the ability to expand to 1,200 acres. At full build out, ultimate rail lift capacity extends up to 100,000 lifts. With onsite chassis operations, CIC is able to save shippers in dray costs. CIC connects to the GPA Garden City Terminal via a 200-mile rail line and provides 100% rail car loading capacity moving nearly 200 truck trips per train off major highways and reducing carbon emissions.[14]

2.3.6 Additional Planned Logistics Centers and Inland Ports

Carolina Connector Intermodal Terminal (CCX)

The Carolina Connector, often referred to as CCX, is an intermodal terminal in Rocky Mount, North Carolina. The facility is situated on approximately 500 acres adjacent to CSX's A-line east of I-95 and U.S. 301. The full-service intermodal logistics center provides environmentally sound resources including wide-span, zero emission electric cranes and value-added services to reduces truck idle time. CCX is positioned within 120 miles of five million consumers. This facility opened in October of 2021.

Greensboro-Randolph Megasite (under development)

The Greensboro-Randolph Megasite is an 1,825-acre site located in Randolph County, NC with Greensboro as a close neighbor. The site is 10 miles from I-85 via U.S. 421 and is also served by a NS Rail corridor. NCRR plans to buy 100 acres of land that borders the megasite and extend services to Wilmington, Norfolk and Charleston.[15]

Chatham-Siler City Advanced Manufacturing Site

Chatham-Siler City Advanced Manufacturing Site is a North Carolina certified site at approximately 1,802 acres. The site is served by the Port of Morehead City, Port of Wilmington and Port of Charleston. An NS rail line is available on the east side of the property. The property is directly access via U.S. 64 and is 50 miles

[13] Virginia Ports Authority (VIP) Virginia Inland Port (VIP) | Port of Virginia

[14] Cordele Intermodal Service – Container Drayage: https://cordeleintermodal.com/3pl-intermodal-container-drayage-services/

[15] Greensboro-Randolph Megasite accessed from https://www.greensboro-randolphmegasite.com/site-specifics

from two international airports and has existing onsite utilities including water, wastewater, natural gas, electric and fiber optic internet.[16]

Kingsboro-Rose Megasite

The Carolinas Gateway Partnership of Rocky Mount, North Carolina is promoting a 1,449-acre industrial area in Edgecombe County, North Carolina, called the Kingsboro-Rose Megasite. The site is within 50 miles of more than 1.1 million workers and in the heart of the skilled manufacturing workforce of eastern North Carolina. The Kingsboro CSX Select Megasite is a certified site and one of six national sites to receive CSX select site designation. This site is directly served by CSX rail and has direct highway access to U.S. 64 and 10 miles from I-95.[17]

International Logistics Park

The International Commerce Center is located in the International Logistics Park of North Carolina. Its first phase of 150,660 SF is fully leased and expected to be completed in the second quarter of 2022. The commerce center is engaging potential leases for the second phase of the facility, an additional 150,660 SF. This second portion of the facility should begin construction late 2022 or early 2023. Three additional sites are shovel-ready with preliminary site plan approvals. 1,000+ acres are still available in this mega-industrial park located in southeastern North Carolina/Greater Wilmington, North Carolina/Brunswick County/Columbus County. It is within 16 miles of the Port of Wilmington via U.S. 74 and I-140. It is an undeveloped megasite that has highway access, but no direct rail access. The site is a North Carolina certified megasite.[18]

Brunswick Industrial River Park

Brunswick Industrial River Park is located alongside I-140, the Cape Fear River and the Brunswick County side of the border with New Hanover County in Navassa, North Carolina. It is less than 10 highway miles from the Port of Wilmington. It is zoned heavy industrial and is within 0.5 miles of a CSX key branch line; a spur extends to the southeast part of the property.

Triangle Innovation Point formerly known as Moncure Megasite (In Development)

The Triangle Innovation Point site is situated on a 2,150 acre site and located about 30 minutes from Raleigh, North Carolina. The site is currently under development and provides access for two class I railroads CSX and NS and is locate in proximity of U.S. 1 or Highway 64. The Interstate beltway I-540 is only approximately a 10-minute drive. This site has opportunities to serve the Port of Morehead City, North Carolina and Newport News, Virginia.

Legacy Park Megasite (Planned)

Project Legacy is a development proposed by the Union County Partnership for Progress, a public-private economic development organization. The site is located near U.S. 74 and would comprise 5,000 acres of

[16] Chatham-Siler City Advanced Manufacturing Site accessed from https://www.chathamadvancedmanufacturing.com/infrastructure

[17] Kingsboro-Rose Megasite, accessed from, https://edpnc.com/megasites/kingsboro-csx-select/

[18] International Logistics Park of North Carolina, accessed from, https://internationallogisticspark.com/

industrial and commercial development, including several rail-served tracts. The site in Union County is adjacent to an existing CSX rail line.

2.3.7 Neighboring States Inland Ports

Inland Port Greer, South Carolina

Inland Port Greer is an inland port facility in upstate South Carolina served by Norfolk Southern Railway. Owned and operated by South Carolina State Ports Authority (SCSPA), Inland Port Greer extends the Port of Charleston's reach 212 miles inland via rail. Inland Port Greer has 24 hour, 7 days a week gate operations and next-day available container service from Charleston. Import load services operate 6 days per week with five RTGs, a top lift straddle carrier and three empty handlers.[19]

Inland Port Dillon, South Carolina

Located within a prime 3,400-acre industrial site and near I-95, Inland Port Dillon gives importers and exporters in the eastern Carolinas access to CSX rail networks. The inland terminal is owned and operated by SCSPA and is equipped with two RTGs and two empty container handlers.

Appalachian Regional Port, Georgia Ports Authority

Appalachian Regional Port is a joint effort between Georgia Department of Transportation, Murray County, the Georgia Ports Authority and CSX Transportation. The inland facility is an Intermodal Container Transfer Facility (ICTF) that provides a linkage between the Piedmont Atlantic Megaregion (PAM) and global markets via the Port of Savannah as seen in Figure 2.19. The terminal is a 42-acre site in Chatsworth (Murray County) with rail service by CSX and rubber-tired gantry cranes for on-site cargo transfers.[20] The terminal has more than 6,000 linear feet of storage spurs and switching tracks. The yard accommodates stacks 6 wide and 5 high with a total container capacity of 2,365 TEUs.

FIGURE 2.19 APPALACHIAN REGIONAL PORT, GPA

Source: Georgia Ports Authority

2.3.8 Rail Yards

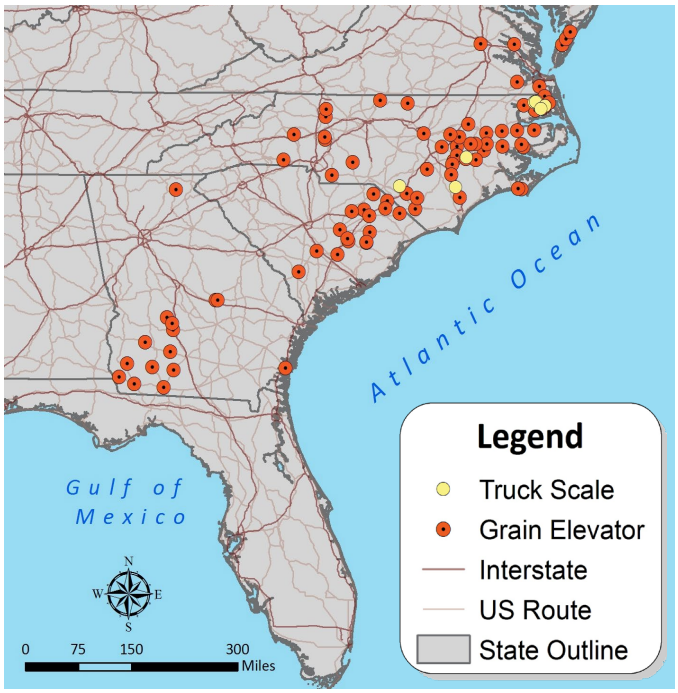
In addition to the intermodal terminals identified above, CSX and NS maintain several rail yards in North Carolina. CSX maintains transfer terminals and service bulk terminals in Winston-Salem, Raleigh, Charlotte and Wilmington, as well as a major rail yard located in Rocky Mount. NS maintains rail terminals in Raleigh, Winston-Salem (bulk transfer), Asheville and has a rail hub in Linwood.

[19] Inland Port Greer, South Carolina accessed, accessed from, https://scspa.com/sc-ports-locations/inland-port-greer/

[20] Appalachian Regional Port, Georgia Ports accessed from https://gaports.com/facilities/inland-ports/appalachian-regional-port/

2.3.9 Grain Elevators and Truck Scales

FIGURE 2.20 TRUCK SCALES AND GRAIN ELEVATORS IN NORTH CAROLINA AND NEIGHBORING STATES



Source: North Carolina Statewide Multimodal Freight Plan Maritime Profile (2016)

Inland grain elevators and truck scales are important assets to support transport of food grade agricultural cargo for export. They provide large capacity storage to load ships, barges, train hopper cars and trucks. The locations of both privately-owned and public grain elevators as well as highway truck scales are shown in Figure 2.20. The figure is a map of the southeast states illustrating the large cluster of agricultural grain elevators load facilities throughout North Carolina which help facilitate multimodal access connecting North Carolina farmers to major interstates, highways, rail corridors, waterways and to the state's port terminals.

2.4 Freight Significant Corridors

Corridors are critical landside connections to maritime terminals where domestic and international cargo movements occur while in transit to various supply chain destinations. Goods movement patterns in the U.S. have emerged for supply chain optimization based on sources of goods in proximity to consumer market locations. A fully functioning system of ports of entry, transportation links and distribution nodes is needed to more efficiently deliver goods to market. This has led to a transportation strategy focused on "gateways" that facilitate the entry of goods and "corridors" that provide reliable capacity to transport goods and "support facilities" that sort, handle and distribute goods.

For example, reliability of transit time is critical for delivery of containerized goods. By affording "time-certain" delivery, the container supply chain – including ship, train and truck – may serve as a virtual warehouse, thereby reducing warehouse inventory costs. To avoid congestion-related transportation costs and delays, shippers and shipping lines are drawn to ports of call that provide access to transportation networks (highway and rail facilities) and distribution centers with adequate capacity and a record of time-certain delivery.

Increasingly, transportation providers – including air and seaports, departments of transportation, railroads and facility operators – are collaborating to implement multi-state or multi-party strategies for gateway and corridor development.

2.4.1 Marine Network Providers

When U.S. supply chains include international waterborne trade, the greatest transit duration will be vessels crossing major bodies of water like the Atlantic Ocean, Pacific Ocean and Gulf of Mexico. This section will review marine providers, network routes specific to the United States, and review major waterway linkages like the Panama and Suez Canals.

Domestic Marine Corridors

A network of marine highway corridors has been designated that align with nearby United States interstate highways, for example, Marine Highway 95 (M-95) parallels I-95. These marine corridors can be seen in Figure 2.21. Within the network are both deep sea corridors serving ocean-going foreign and domestic ships (short sea shipping) as well as river corridors serving primarily barge traffic within this network.

FIGURE 2.21 MAP OF SHORT SEA SHIPPING ROUTES IN THE UNITED STATES

Source: America's Marine Highway Routes Nation Map Last updated: Thursday, September 16, 2021, from https://www.maritime.dot.gov/grants/marine-highways/marine-highway

The Panama Canal

The Panama Canal's new set of locks have been in operation for six years providing expanded vessel capacity and transit capabilities for larger vessels and total number of ships transiting the canal since June

26, 2016.. The Port of Wilmington is now capable of serving the large container vessels currently traversing the Panama Canal following the completion of the phase II expansion of the turning basin to 1,524 feet, air draft increased from 164 ft to 212 ft, and the addition of 2,600 linear feet of berth space, along with the Panama Canal locks expansion project pictured in Figure 2.22.[21] The Yang Ming Warranty, a Super Post Panamax vessel with a 14,220 TEU capacity, sailed across the Panama Canal and into Wilmington October 26, 2020.

FIGURE 2.22 NEO PANAMAX VESSEL TRANSITING NEW PANAMA CANAL LOCK

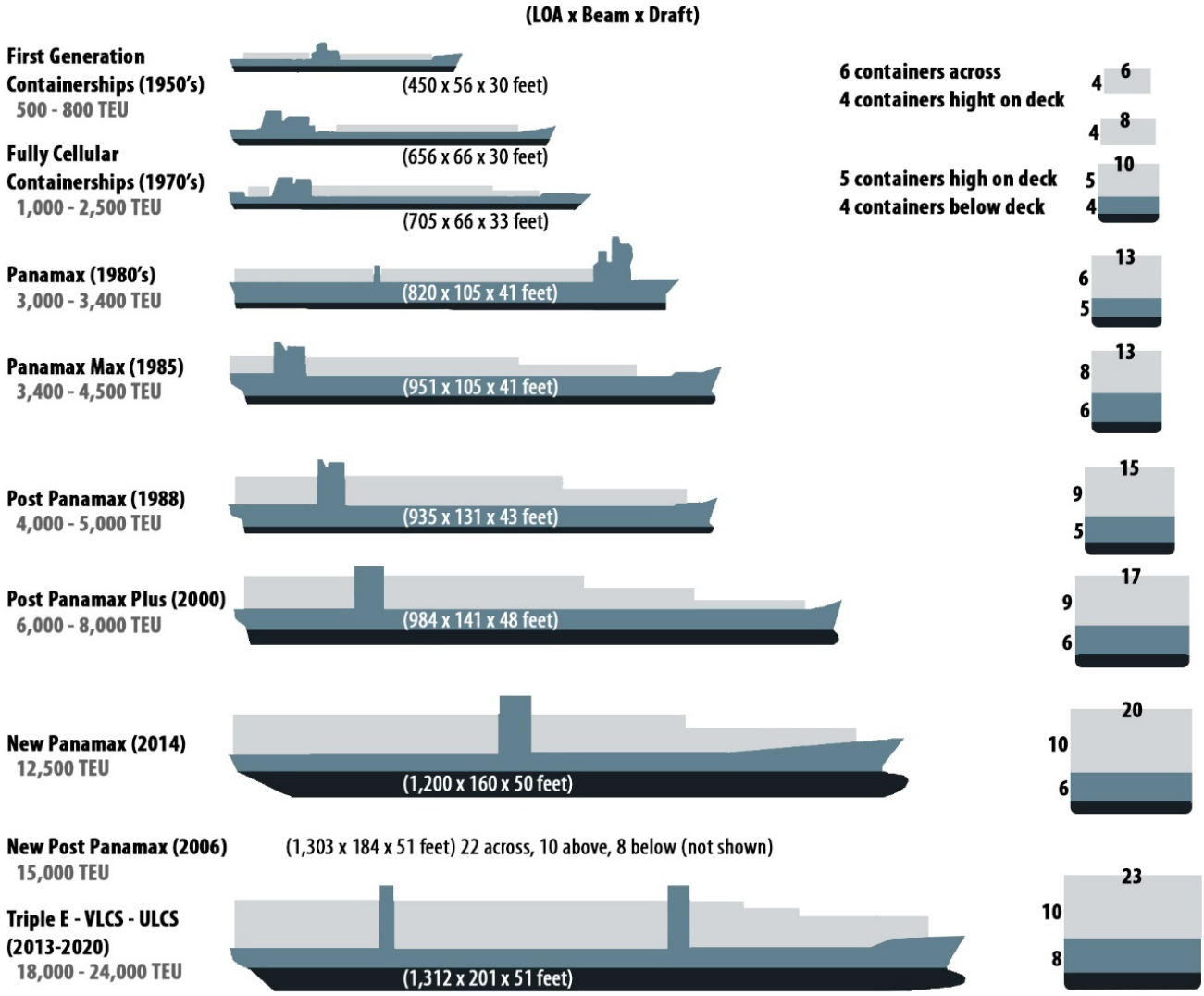
Source: Panama Canal Authority, 2016

The Panama Canal has provided expanded access for East Coast ports to Asia-Pacific trade routes. The expansion included the addition of a second, larger set of locks allowing transit of New Post Panamax sized vessels providing nearly three times the container capacity per ship. Older Panamax and Post Panamax vessels could load approximately 4,000 to 5,000 TEUS while these newer larger Post Panamax and New Post Panamax are 6,000 to 15,000 TEUS as shown in Figure 2.23. Increased capacity of the canal freight tons and annual vessel transits is another essential addition of the Panama Canal expansion. With high vessel demand, transit through the Panama Canal had required an average four days of canal water time (including actual canal transit and wait time) and caused vessels to queue for up to ten days during peak

[21] North Carolina Ports Continues to Make History, accessed online from: https://ncports.com/about-the-ports/news/north-carolina-ports-continues-to-make-history-welcomes-largest-container-ship/#:~:text=October%2027%2C%202020&text=The%20Yang%20Ming%20Warranty%20sailed,the%20United%20States%20East%20Coast.

shipping seasons. Vessels carrying passengers or high-value goods often pay extra to jump the queue. The evolution of container vessel sizes seen over the past five decades has provided additional capacity to truly bring the canal into the 21st century.

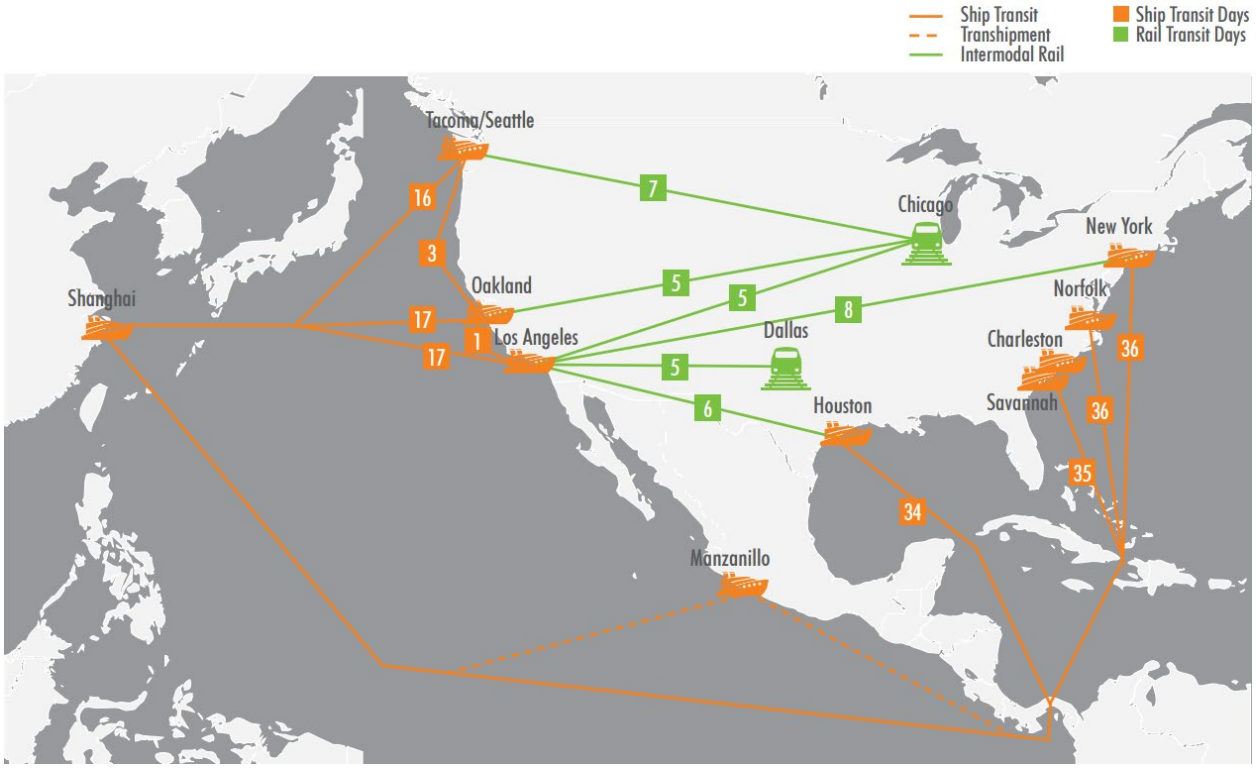
FIGURE 2.23 EVOLUTION OF CONTAINER VESSELS



Source: HNTB 2022

Marine transit times between Shanghai and the U.S. East Coast can range in length from approximately 25 to 36 days, as shown in Figure 2.24. Sailing east from Shanghai, vessels can either dock on the U.S. west coast and use a land bridge of rail and trucking services to reach the East Coast or follow the all-water route through the Panama Canal.

FIGURE 2.24 SHANGHAI TO THE UNITED STATES EAST COAST – OVERLAND VS. ALL-WATER ROUTES



Source: Image from 2016 North America Seaports and Logistics Annual Report, CBRE Research; data from IMS Worldwide, Inc.

Suez Canal

In addition, the Suez Canal made news when the Ever Givens vessel became stuck on March 23, 2021 in the Suez Canal preventing other vessels from transiting for 6 days. Estimates stated that $54 billion in trade losses occurred from the six-day blockage. About 12% of daily global trade consisting of about 1M barrels of oil and roughly 8% of LNG pass through the canal in a 24-hour period. This incident and the expansion of the Panama Canal have impacted the Suez Canal's dominance in the U.S.-Asia container trade. Following recent real-world examples, container and bulk lines are considering more resilient supply chains; however, growth in Indian markets and other parts of Asia gives the Suez Canal an advantage when liner services and shipping alliances determine their routes for larger vessels that serve the U.S. East Coast.

The Suez Canal has no locks and therefore, no vessel length restrictions. Ships with a maximum draft of 68.9 feet and beam of nearly 200 feet can navigate the Suez Canal and are designated Triple E, ULCS (Ultra Large Container Ship) and Aframax Class. To increase its competitiveness and offer improved two-way travel, the Suez Canal completed an extension in August 2015; a parallel waterway 45 miles in length was created and dredged to depth of 79 feet to accommodate vessels with a 66-foot draft.[22] Regional ports are

[22] http://www.cnbc.com/2015/08/07/egypt-unveils-suez-canal-extension-with-pomp-filled-ceremony.html Accessed 9/13/2016

currently called on by vessels coming through the Suez Canal. The canal is currently expanding and plans to complete another project by July 2023.[23]

2.4.2 Domestic Land Networks

In the Southeastern U.S., highways and railways provide the most popular land transport access to markets. The goods movement characteristics of these two modes are described below.

2.4.3 Highway

Goods originating from or destined to North Carolina are transported primarily by truck. The state and regional network of interstate, state and local highways substantially support the movement of goods throughout and between the state and its international trading partners.

Truck routes within North Carolina comprise Interstate Highways, U.S. Highways and State Highways, as well as four-lane divided roadways. North Carolina's Strategic Transportation Corridors, Statewide Logistics Plan and Seven Portals Study each recognize important corridors within the state's highway network. Review of the state highway network serving in-state port facilities and providing access to ports in the neighboring states of Virginia, South Carolina and Georgia identifies the following primary highway routes for waterborne truck freight within North Carolina:

- I-40 serving Port of Wilmington, the Triangle Region and Greensboro from east and west,
- I-85 serving Charlotte, Greensboro and the Triangle Region from north and south,
- I-95 serving Lumberton, Fayetteville and Benson from north and south,
- I-26 providing access from western North Carolina to Port of Savannah and to Port of Charleston,
- I-73/1-74 providing access from Greensboro to Port of Charleston,
- I-77 providing access from Charlotte and western North Carolina to Port of Savannah and to Port of Charleston,
- U.S. 17 providing access along eastern North Carolina to Port of Wilmington, Camp Lejeune, Morehead City, as well as Port of Charleston to the south and Port of Norfolk to the north,
- U.S. 117 provides a parallel route to I-40 out of Port of Wilmington heading North, Northeast,
- U.S. 70 serving Morehead City, Kinston and the southern Triangle Region,
- U.S. 74/U.S. 76 serving Lumberton and Port of Wilmington, and
- NC 24 serving Fayetteville and Morehead City.

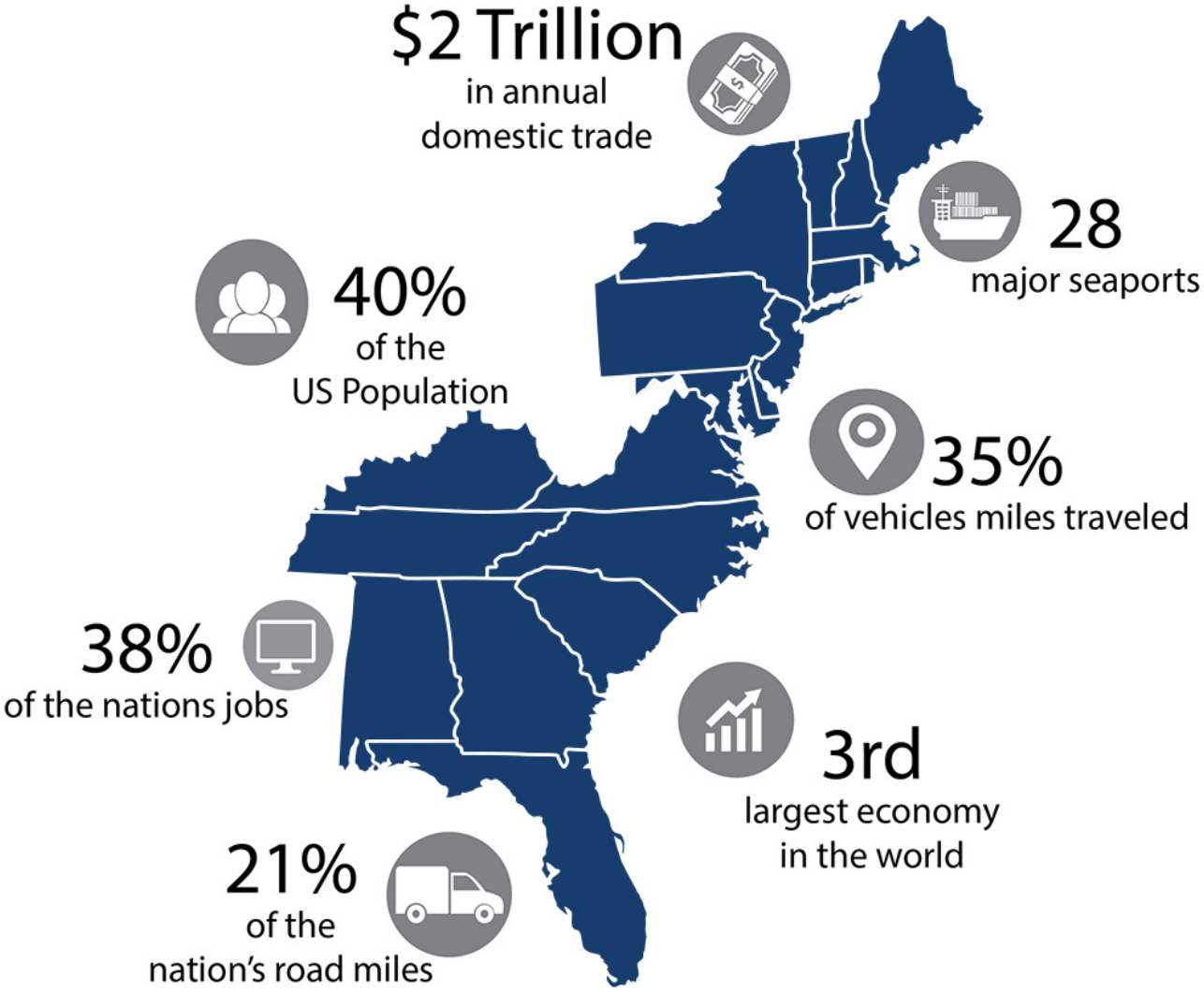
The Eastern Transportation Coalition (formerly The I-95 Corridor Coalition)

One of the most traveled and historic transportation arteries on the East Coast of the U.S. is the I-95 corridor. The former I-95 Corridor Coalition, which is now called "The Eastern Transportation Coalition," brings together key entities and agencies such as state and local transportation departments, transportation authorities, transit and rail agencies, port authorities and railroads, who have established a collaborative

[23] New Suez Canal, accessed from, https://www.suezcanal.gov.eg/English/About/SuezCanal/Pages/NewSuezCanal.aspx

vision plan. The Eastern Transportation Coalition represents this corridor collectively across nearly 2,000 miles of interstate highway spanning from Maine to Florida. Its impact across the U.S. from north to south brings nearly $2 trillion dollars in domestic trade in addition to so many economic activities – some that are shown in Figure 2.25. NCDOT is an active member of the Eastern Transportation Coalition, and is planning and advocating for projects that strive to advance multi-state passenger and freight mobility needs of this primary highway backbone along the Atlantic seaboard. [24]

FIGURE 2.25 EASTERN TRANSPORTATION COALITION



Source: The Eastern Transportation Coalition formerly (I-95 Corridor Coalition) accessed September 2022, from, https://tetcoalition.org/

The Eastern Transportation Coalition combined represents the third largest world economy encompassing 40% of the U.S. population, 38% of the nation's jobs, 21% of the national highway miles and 28 seaports.

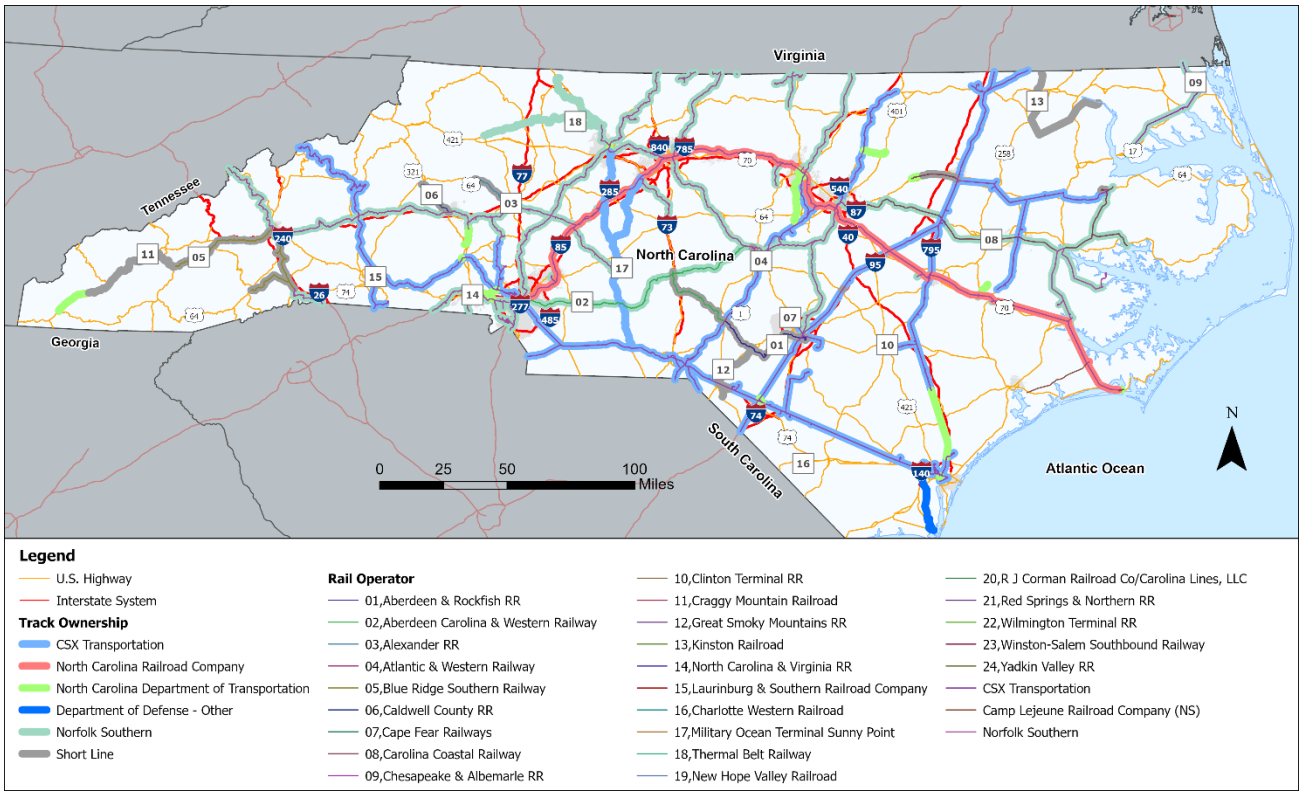
[24] The Eastern Transportation Coalition https://tetcoalition.org/

2.4.4 Rail Providers

Efficient freight rail service is an important component of inland distribution for market opportunities including bulk, breakbulk, Ro/Ro large or heavy loads, intermodal or containerized goods, or transport of goods beyond a cost-efficient trucking distance. Overall, North Carolina's rail network offers sufficient capacity to accommodate additional rail trips across most of the state.

There are currently 3,200-miles of railroad in the state. The network includes two Class I railroads, NS and CSX, and 24 freight short line railroads that connect businesses and industries to domestic and global markets. Around 70% of the rail system is operated and managed by NS and CSX, while the remainder is managed by short line owners such as Genesee and Wyoming (Atlantic and Western Railway, Wilmington Terminal Railroad (WTRY), North Carolina and Virginia Railroad, Chesapeake and Albemarle Railroad), Watco (Blue Ridge Southern Railroad) and RJ Corman (Carolina Southern Railroad). Included in this network is a 317-mile corridor, owned and managed by the NCRR, stretching from Charlotte to the Port of Morehead City. Through a long-standing agreement, NS leases and operates these tracks while CSX uses a portion of the corridor. The state's rail network connects two deep water ports, the Port of Wilmington and the Port of Morehead City, four existing inland intermodal terminals, 21 rail yards and over 70 transload facilities across the system. Figure 2.26 identifies railroad owners and operators in North Carolina.

FIGURE 2.26 TRACK OWNERSHIP AND RAILROAD OPERATORS IN NORTH CAROLINA



Source: NCDOT GIS Maps

National Gateway Corridor

The National Gateway Corridor spans six states (Ohio, Pennsylvania, West Virginia, Maryland, Virginia and North Carolina) and the District of Columbia as shown in Figure 2.27. The corridor is a public-private partnership between CSX, USDOT and various state departments. The project was initiated to alleviate highway congestion along three major corridors: I-95/I-81 in North Carolina, Virginia and Maryland; I-70/I-76/I-80 between Washington D.C. and Northwest Ohio; and I-40 North Carolina corridor between Charlotte and Wilmington. Additional improvements related to North Carolina in this initiative is the proposed expansion of the existing CSX Charlotte Intermodal Terminal. The overall project will allow the corridor to transport double-stacked intermodal rail cars between the mid-Atlantic states and their ports to the Midwest markets.[25]

[25] USDOT FRA National Gateway Initiative, April 21, 2022, accessed from https://railroads.dot.gov/environment/environmental-reviews/national-gateway-initiative

FIGURE 2.27 THE NATIONAL GATEWAY CORRIDOR

Source: CSX Transportation, Intermodal Core Network Terminals and Ports, November 2021.

Crescent Corridor

The Crescent Corridor[26] is a 2,500-mile NS rail corridor supporting the supply chain from Memphis and New Orleans to New Jersey. Shown in Figure 2.28, the corridor includes NS' two primary rail lines paralleling I-85 through North Carolina and other Atlantic states and paralleling I-40/I-81 in eastern Tennessee. NS is planning and implementing a series of focused improvements to move a higher quantity of freight at a faster rate.

FIGURE 2.28 CRESCENT CORRIDOR

Source: Norfolk Southern (MARAD Panama Canal Expansion, Phase 1 Report)
http://www.thefutureneedsus.com/crescent-corridor/

Heartland Corridor

The NS Heartland Corridor[27] provides access for intermodal trains carrying double-stacked containers along the high-speed, high-capacity NS line from VPA terminals in Norfolk, Virginia, to population centers and inland intermodal facilities in the Midwest, as seen in Figure 2.29. The program, which was completed in

[26] Norfolk Southern Crescent Corridor, accessed from, http://www.nscorp.com/content/nscorp/en/shipping-options/corridors/crescent-corridor.html

[27] Norfolk Southern Heartland Corridor, accessed from http://www.nscorp.com/content/nscorp/en/shipping-options/corridors/crescent-corridor.html

September 2010, included a total investment of $191 million shared between NS and federal and state governments; it included a new intermodal terminal at Columbus, Ohio and clearance improvements to allow for movement of double-stack containers along its full length. The improvements are estimated to have cut 250 miles and one day of transit time between VPA terminals and the Midwest destinations in Ohio and Chicago.

FIGURE 2.29 HEARTLAND CORRIDOR

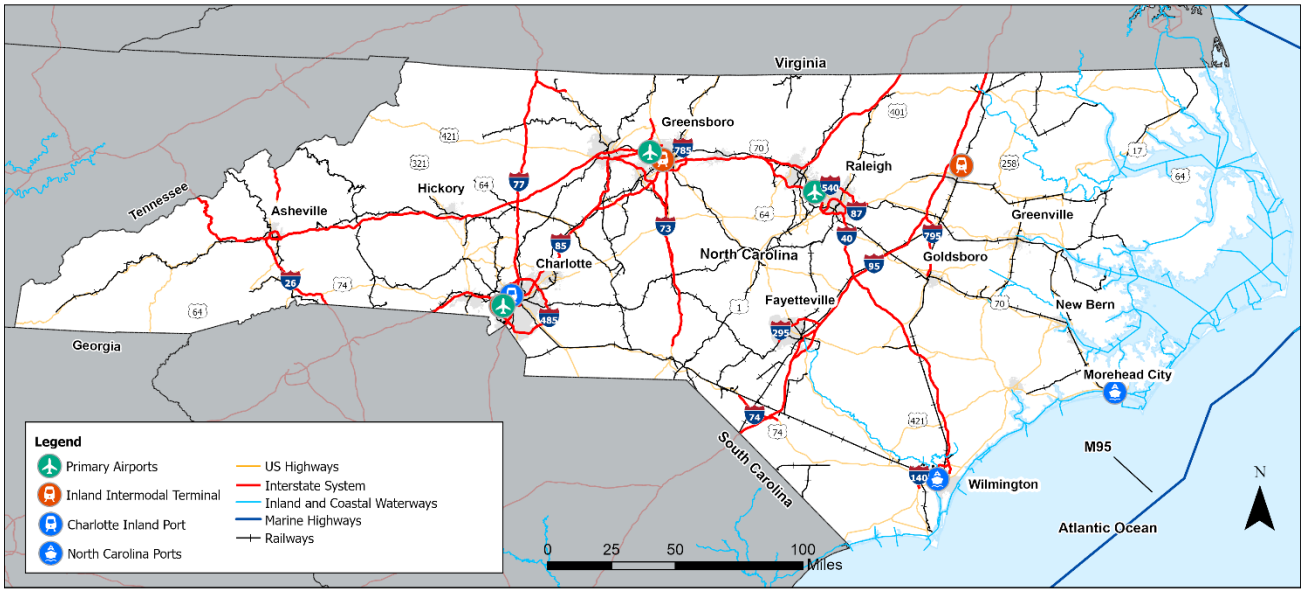
Source: http://www.thefutureneedsus.com/project-updates/heartland-corridor/

2.4.5 Multimodal Freight Network Serving Maritime

The domestic marine, road and rail networks described above combine, as shown in Figure 2.30, to create the interim National Multimodal Freight Network, which serves North Carolina's freight transport needs. This is the network, as designated by the federal government, which is essential to efficiently move freight from producers and suppliers to consumers. In addition to the primary facilities, there are key "last mile" facilities.

According to the BTS, there were freight intermodal connectors within the National Highway System and North Carolina's borders to two port terminals, four truck/rail facilities, nine airports and five truck/pipeline terminals as of the 2022 freight planning process. The BIL provides critical funding and policy resources to establish an Office of Multimodal Freight Infrastructure and Policy within the Department of Transportation (DOT). Headed by an Assistant Secretary of Multimodal Freight, the Freight Office would be responsible for developing and managing freight policy and AASHTO analysis of the BIL funding programs and projects.

FIGURE 2.30 INTERIM NATIONAL MULTIMODAL FREIGHT NETWORK



2.5 Capacity

Ports are based on size, location, surrounding development, transportation access and capacity limits as shown in Table 2.7. In addition, depending on the equipment and personnel, each port can process cargo at a certain rate as described in Table 2.8.

TABLE 2.7 REGIONAL PORTS CAPACITY

Cargo Capacity	Wilmington	Morehead City	Norfolk	Charleston	Savannah
Intermodal containers (TEUs)	600,000	0	3,522,834	2,309,995	4,682,249
Breakbulk (Tons)	1,470,000	1,080,000	147,686	4,030,000	2,400,502
Bulk (Tons)	2,220,000	2,730,000	0	100,000	1,937,257
Ro/Ro (Units)	Unknown	Unknown	320,000	200,000	900,000

Source: Port and Statewide Authority Websites, Waterborne Container Traffic for selected U.S. States, U.S. Army Corps of Engineers 2016-2020, Accessed online from: https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/7439

In terms of physical capacity, the Port of Savannah has the largest container capacity at 4.6 million TEUs. Other neighboring ports can accommodate more than 3 million TEUs each, whereas the Port of Wilmington currently has space for 600 thousand TEUs. A similar story exists for breakbulk cargo, with the Port of Charleston outpacing other regional ports with a capacity of more than 4 million short tons. Combining the two North Carolina ports provides a much stronger breakbulk capacity compared with neighboring ports. North Carolina ports surpass regional ports in bulk cargo capacities with each port at well over 2 million short tons. Although North Carolina ports have the capability to move Ro/Ro cargo (both NC facilities are strategic seaports and actively engage military Ro/Ro cargo), neighboring ports presently serve automobile

manufacturers as well as other heavy vehicle manufacturers on terminal, providing larger tonnage figures. GA Ports move a large capacity of Ro/Ro through the Port of Brunswick.

TABLE 2.8 NORTH CAROLINA PORT CAPACITIES

Infrastructure/ Equipment	Wilmington	Morehead City
Equipment		
	• (3) STS 203 ft reach (22 containers) • (4) STS 165 ft reach (18 containers) • Mobile reach stackers • (2) gantry cranes (100 & 150-ton capacity) • Lift trucks, 52,000 lb. max capacity	• (1) bridge crane 115 ft outreach • (2) gantry cranes (115-ton capacity) • One mobile crane, 125-ton capacity • Lift trucks, 70,000 lb. max capacity
Facilities		
• Modern ship loader (dry bulk) • Open storage dry bulk • Covered dry bulk • Rail car storage*	• 800 tons/hour transfer rate • 1,000 tons/hour transfer rate • 256 rail cars	• Two berths, 3,000 tons/hour max loadout rate • 800 tons/hour transfer rate • 1,000 tons/hour transfer rate • 350 rail cars
Overall Cargo Capacity		
• Intermodal containers • Breakbulk • Bulk • Ro/Ro	• 600,000 TEU • 1,470,000 Tons • 2,220,000 Tons • Unknown	• n/a • 1,080,000 Tons • 2,730,000 Tons • Unknown

Sources: North Carolina Maritime Strategy (NCMS 2021), 2016 NCSPA Strategic Plan, NCSPA Facilities Guide, G&W interview, CNLA call.

*Note: *Rail car storage for Morehead City is the maximum number of cars that can be on-site for operations; 200 cars on Radio Island and 100-150 at the main port.*

3. NETWORK USAGE AND PERFORMANCE

North Carolina's main maritime assets are the Port of Wilmington, the Port of Morehead City and the Charlotte Inland Port. Both maritime ports are designated as strategic seaports capable of simultaneously handling commercial and military requirements. With 300 seaports nationally, only 15 have been identified as strategic commercial ports and tasked with Port Planning Orders to fulfill defense requirements. North Carolina is uniquely positioned to help solve the challenge of readiness in an environment of significant projected commercial trade growth.

Separate from the NC Port terminals are additional privately owned marine terminals along the Cape Fear River. For more information on these terminals, please refer to Section 4.3, Private Marine Terminals, found on page 21 of *the North Carolina Maritime Strategy*.[28]

3.1 Activity/Demand

The Port of Wilmington and the Port of Morehead City offer services for a variety of commodity types. The NCSPA provides records of historic activity at each of the ports for numbers of vessel calls, tonnages handled, types of cargo, as well as a list of major commodities.[29] The sections below summarize the ports' import and export activity for FY 2016-2021 as reported by the NCSPA.

3.1.1 Port of Morehead City

The Port of Morehead City serves as a breakbulk and bulk facility and is one of the deepest on the U.S. East Coast, lying just four miles from the Atlantic Ocean. It is also within 700 miles of more than 70% of the U.S. industrial base. Interstates 95 and 40 are easily accessed via U.S. 70 and U.S. 17 and train service is provided by Norfolk Southern. Located across the Newport River from the Port of Morehead City is Radio Island, a 150-acre site perfectly suited for a port industrial development, conveniently supplied with municipal water and sewer.

The commodities imported at the Port of Morehead City over the past six years (FY 2017-2022) include sulfur, rubber, metal products, scrap metal and ores and minerals. On the exports side, phosphate, wood chips, metal products and military materiel are the top commodities.

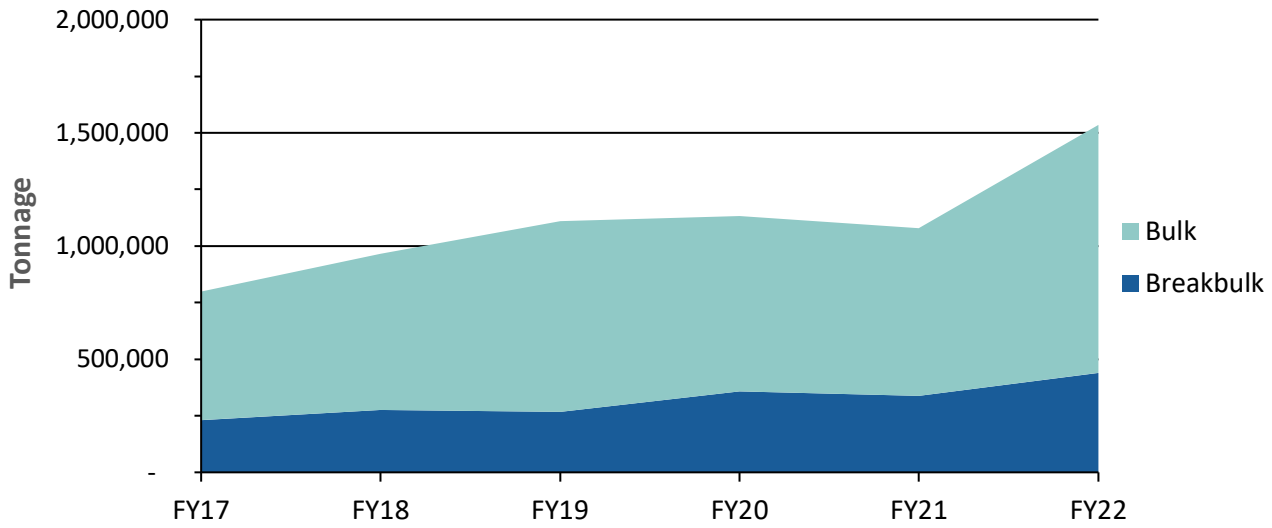
Total tonnage through the Port of Morehead City has remained relatively steady during the past six years but saw a strong increase in FY 2022. The total tonnage has ranged from 799,999 in FY 2017 to its highest point during the study period in FY 2022 of 1,534,904. During the past six years, the average total tonnage has is

[28] North Carolina Maritime Strategy, June 26, 2021 accessed from https://www.ncdot.gov/initiatives-policies/Transportation/freight/Documents/NC_Maritime_final_report_2012-06-26.pdf

[29] Port of Morehead City Port Statistics, http://www.ncports.com/port-of-morehead-city/port-statistics/; Port of Wilmington Port Statistics http://www.ncports.com/port-of-wilmington/port-statistics/

around 1,003,306 tons, not reaching two million since 2012 but trending in that direction. The tonnage consists of bulk and breakbulk, as containers are not handled at Morehead City. The tonnage trends for bulk and breakbulk cargoes are shown in Figure 3.1 and both cargo types are trending upward.

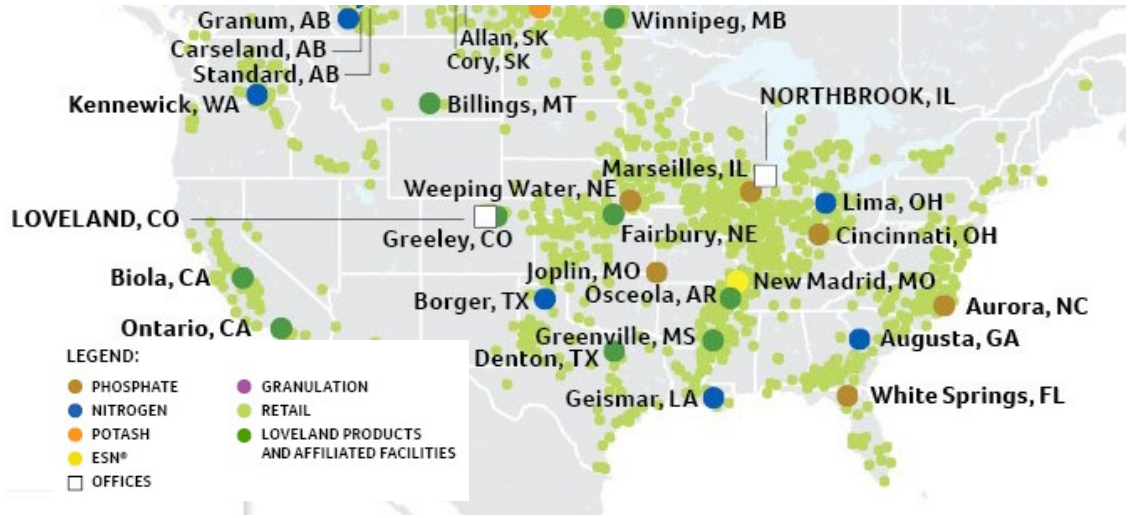
FIGURE 3.1 TONNAGE THROUGH THE PORT OF MOREHEAD CITY, FY 2017-2022



Source: NCSPA, 2022

The trend shows that the majority of goods handled at the Port of Morehead City are bulk, 71% by weight in FY 2022, with about 29% breakbulk. The breakbulk consists of forest products, rubber, metal products, military material and vehicles. The major bulk commodities include ores, feed and agriculture products, scrap metal, woodchips and fertilizer.

FIGURE 3.2 NUTRIEN CORPORATION MAJOR NORTH AMERICAN TERMINALS AND FACILITIES



Source: Nutrien Corporation website, July 2022

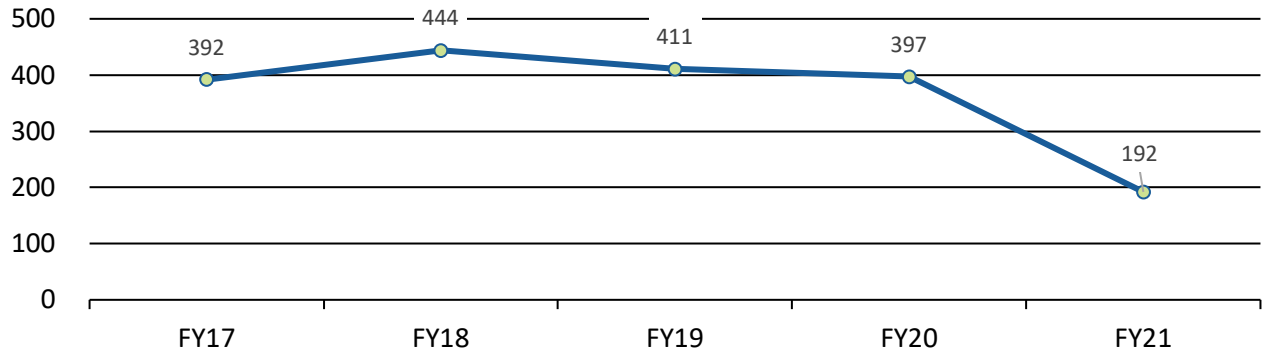
Barges are heavily used at the Port of Morehead City to transport phosphate for export as fertilizers. Nutrien is an anchor tenant at the Port of Morehead City, and while Nutrien also uses rail and truck to transport products, barge access and service is important to their operations. The phosphate is derived from Nutrien phosphate mines in Aurora, North Carolina and is barged to the Port of Morehead City. Nutrien has a long-

term contract with the Port of Morehead City for the storage and export of phosphate rock, phosphoric acid, purified acid and phosphate feed. These commodities are used as liquid and solid fertilizers, animal feed supplements and a variety of food and beverage products and metal treatment compounds.[30]

Scrap metal is loaded via barge to the Nucor Steel facility in Cofield, North Carolina. Nutrien has long term leases on shipping terminals in Morehead City and Beaufort, North Carolina through which the company receives and stores raw materials and finished products.

While the port is currently operating at full capacity, annual vessel calls (including LNG barges and ships) averaged around 410 calls between FY 2017 and FY 2020 but dropped dramatically to 192 in FY 2021 as shown in Figure 3.3. This may be due to the COVID-19 pandemic.

FIGURE 3.3 VESSEL CALLS AT THE PORT OF MOREHEAD CITY, FY 2017-2021



Source: NCSPA, 2022

Unlike container ships, bulk vessels generally have not increased in size during the past decade. The 2017 North Carolina Statewide Multimodal Freight Plan Maritime Profile stated that approximately 75% of vessel calls at the Port of Morehead City were barges. Barges and tugboats are used to transport solid products, phosphoric acid and sulfur between the Aurora facility and shipping terminals.[31] Raw materials and products, including sulfur, are also transported to and from the Aurora facility by rail.[32]

The long-term port operations are dependent on the Nutrien phosphate mines. Existing reserves for the Aurora facility would permit mining for about 33 years. If deposits covered by permits are classified as resources, the mine life could extend to over 50 years, confirming this as a long-term opportunity for North Carolina.

Adding negative pressure to the port's bulk and breakbulk business is the growing trend of containerization of traditional bulk commodities. Driven by customers' preference for better protection during transit and lower shipping rates made possible by larger container ships, some grains such as soybeans and dimensional lumber are increasingly utilizing containers in addition to traditional bulk methods of transit.

[30] Nutrien formerly (PotashCorp), *Aurora,NC Facilities & Investments,* accessed July 2022, from, https://www.nutrien.com/

[31] Nitren's facility in Aurora, NC is a large open pit mine and chemical plant for phosphate products.

[32] Summary of NUTRIEN operations drawn from 2010 10K report and supplemental filings with the U.S. SEC. Report accessed at http://www.potashcorp.com/annual_reports/2010/media/PotashCorp_10-K_110225.pdf.

Project cargo, dimensionally challenging, high-value, heavy or complex pieces may prove to be a growth opportunity for the Port of Morehead City. An example of heavy lift or project cargo includes wind turbine components including bases, hubs, engines and other components for regional wind farm development and maintenance. Shipments for the Elizabeth City energy farm started in May 2016 as the facility was coming online back in 2017. The main Amazon Wind Farm is designed to produce power for 25 years and initial installations can power the equivalent of 61,000 homes power per year. The large project that will take up 22,000 acres and aims to have 104 turbines has been in operation since 2017. In 2016, approximately 100 base pieces were imported through Wilmington for an onshore wind farm being developed in Pasquotank County before the operations moved to the Port of Morehead City where the remaining 316 base pieces were imported. This move was partially due to the availability of barges at Morehead City. The components are manufactured by Gamesa, a Spanish company, that is coordinating the shipments, assembly and commissioning of the towers.

NCSPA is investing in the prior successful shipments and transfers such as those to Edenton that could pave the way for future imports of wind turbine equipment. Such a specialization would support not only jobs at the port, but also employment opportunities in construction industries and long term operations and maintenance that could be based at the port's Radio Island terminal to provide ongoing support for wind farms. Future plans call for paving a majority of the 154 acres of the Port's undeveloped land on Radio Island.[33] With the potential for offshore and inshore wind farms, there is also the potential for growth in this emerging industry, particularly if the parts can be manufactured domestically.[34,35]

3.1.2 Port of Wilmington

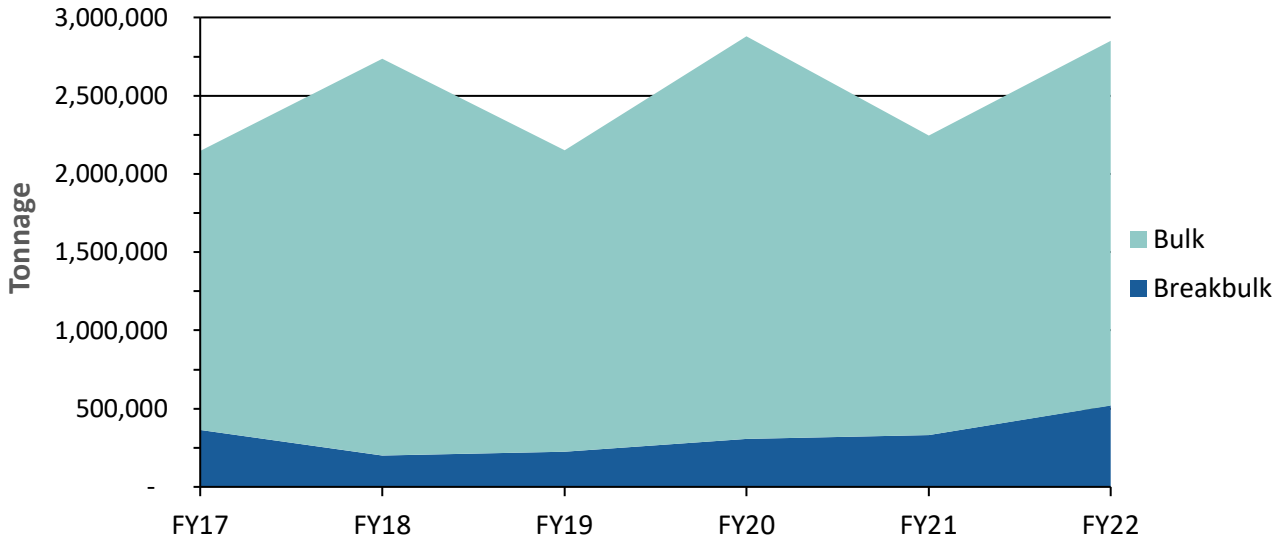
Aside from container cargo, bulk and breakbulk trade at the Port of Wilmington include forest produces, wood pulp, cement bags, metal products, chemicals, grains, fertilizers and cement. Top exports include forest products and other including military shipments. Total tonnage through the Port of Wilmington increased from 2.14 million tons in FY 2017 to 2.85 million tons in FY 2022. During the study period the tonnage seems to have an overall growth trend, but has risen and fallen several times as shown in Figure 3.4. Most of the tonnage is accounted for in containers to be describe in a following section. Bulk peaked in FY 2018, 2020 and again in FY 2022 and dipped in FY 2019 and FY 2021. The dip in FY 2019 may be attributed to the COVID-19 pandemic and it is possible that FY 2021 could be related to supply chain issues or global economic slowing. The overall trend for breakbulk products has been increasing since FY 2018 and is at a current peak in FY 2022 at 330,684 tons.

[33] Wind Energy at Radio Island, 2021 accessed from https://www.starnewsonline.com/story/news/2022/04/28/morehead-city-proposed-offshore-wind-manufacturing-hub/7439460001/

[34] Harvey, Anna, "Ports authority officials fans of wind turbine section shipments," *The Carteret County News-Times*, May 20, 2016, http://www.carolinacoastonline.com/news_times/article_4258c872-1e9c-11e6-aca3-bb68fdb73809.html, Accessed 9/13/16.

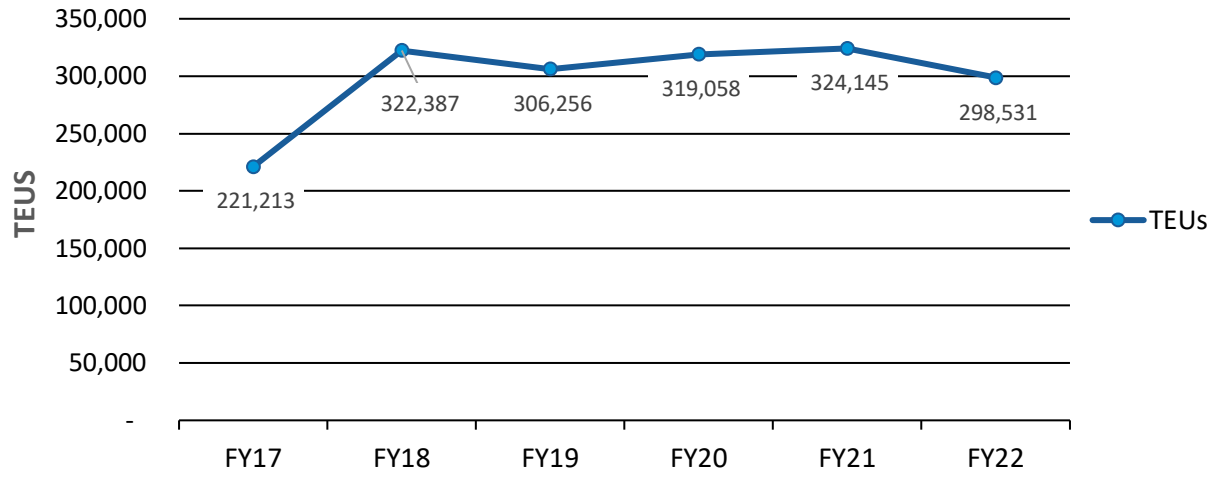
[35] Hawley, Jon, "Wind energy blows into area – piece by mammoth pieces," *Daily Advance*, May 26, 2-16, http://www.dailyadvance.com/News/2016/05/26/Wind-energy-blows-into-area-piece-by-mammoth-piece.html, Accessed 9/13/16.

FIGURE 3.4 TONNAGE THROUGH THE PORT OF WILMINGTON, FY 2017-2022



Source: NCSPA, 2022

FIGURE 3.5 CONTAINER TRAFFIC AT THE PORT OF WILMINGTON, FY 2017-2022



Source: NCSPA, 2022

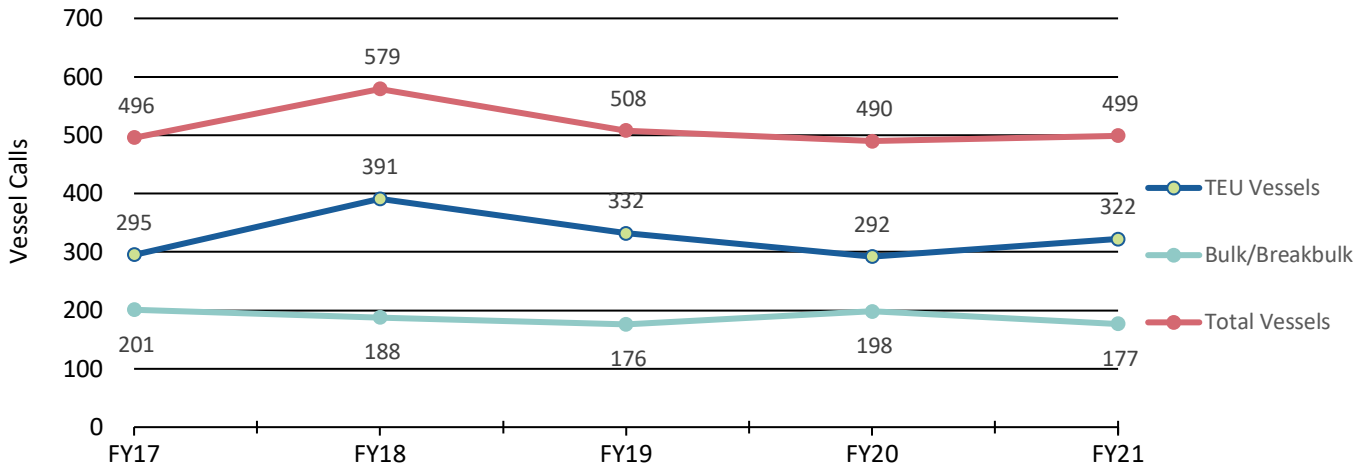
Figure 3.5 above shows that even during COVID-19, container volumes continued to increase at the Port of Wilmington. Over the past five years, NC Ports has invested over $256 million in infrastructure improvement projects. These enhancements allow NC Ports to maintain top tier landside and waterside efficiencies and address the needs of an increasing customer base. Wilmington was ranked #4 in North America and #49 in the World Bank's Container Port Performance Index report.[36] Container yard improvements at the port included the turning basin widening, new ship-to-shore Neo Panamax cranes, new terminal gates and operating systems. According to the North Carolina Ports (NCSPA 2022), the container terminal has a

[36] Transport Global Practice, The Container Port Performance Index 2021, accessed online from, https://ncports.com/wp-content/uploads/2022/06/Container-Port-Performance-Index-2021.pdf

maximum capacity of 600,000 TEUs per year, with goals to expand capacity to 1.2 million TEUs annually. The NCSPA has indicated that there is ample capacity for expanded container operations at the port.[37]

TEUs serviced by the Port of Wilmington have historically been lower than its neighboring ports like Savannah and Charleston, but this is susceptible to change with the forthcoming intermodal service. Currently, intermodal service is provided by the Queen City Express. With the opening of CCX Rocky Mount Intermodal Terminal, intermodal rail service is expected to improve. As shown in Figure 3.6, 322 of the 499 vessel calls at the Port of Wilmington in 2021 were container ships, while 177 were bulk or breakbulk vessels. For comparison, in 2021, the Port of Savannah experienced a 9.8% reduction in vessel calls from the previous year. Charleston averaged around 846 vessel calls in 2021 and Norfolk handled 1,908 vessels.[38] There are ample container vessels and routes serving the East Coast for Wilmington's continued growth.

FIGURE 3.6 VESSEL CALLS AT THE PORT OF WILMINGTON, FY 2017-2021



Source: NCSPA, 2022

3.2 Industries that Rely on Waterborne Imports and Exports

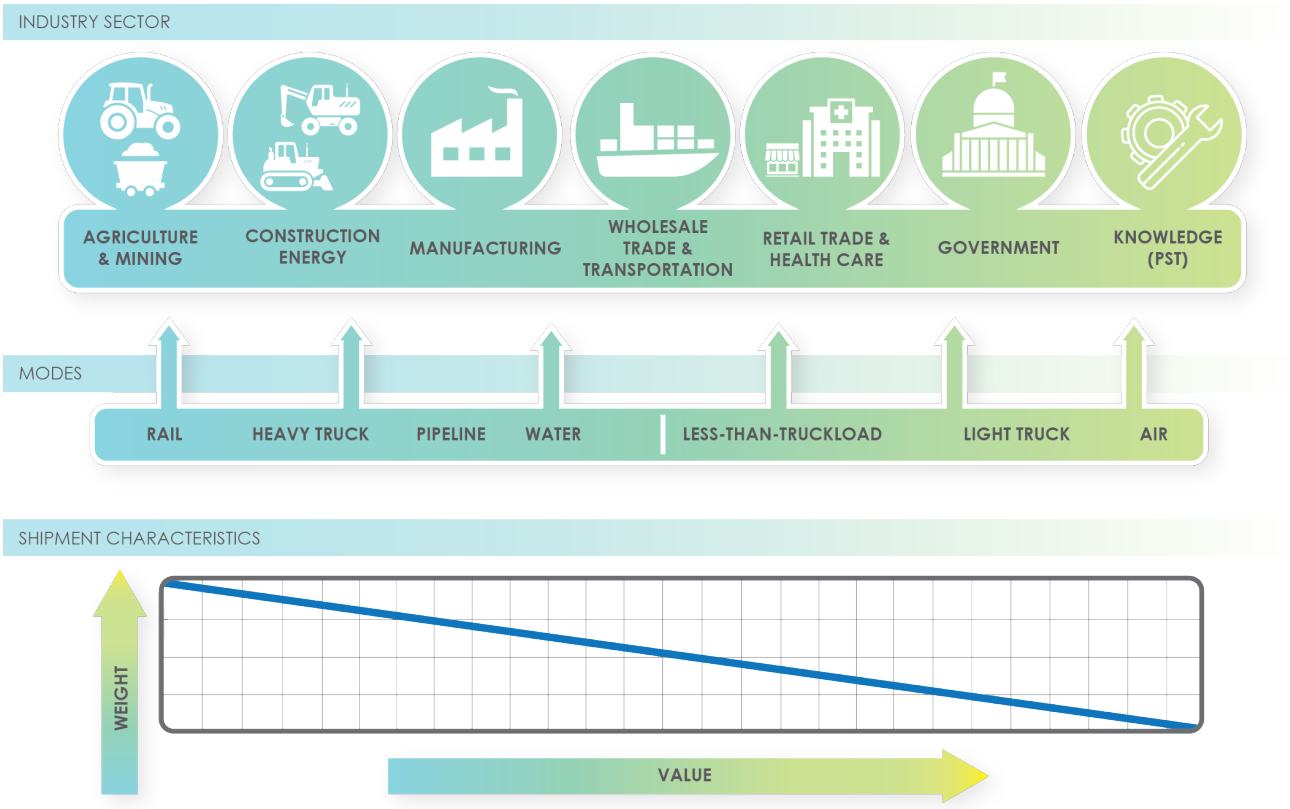
Although U.S. and North Carolina economies are much less dependent on manufacturing than in the past, waterborne trade remains vital for certain production industries. Maritime freight to and from North Carolina is dominated by agricultural, commodities, manufacturing, mining/aggregates and forest products. Dominant shipper locations include sites where a commodity is grown, logged, or mined; where a commodity is processed or manufactured; and distribution sites where products and commodities are aggregated for more efficient shipment.

[37] North Carolina State Ports Authority, *Container Terminal*, 2022 accessed from http://www.ncports.com/port-of-wilmington/container-terminal/

[39] North Carolina Agricultural Statistics, 2020, access from https://www.nass.usda.gov/Statistics_by_State/North_Carolina/Publications/Annual_Statistical_Bulletin/AgStat/NCHighlights.pdf .

Figure 3.7 provides a basic overview of the relationship between some of the major industry sectors and their primary mode of freight transportation and the correlation between tonnage and value. As shown, products of mid-value and tonnage such as manufacturing and wholesale trade are ideal for travel by water. North Carolina's agriculture and mining industries are typically rail-dependent, and products are often exported by ship.

FIGURE 3.7 TYPICAL INDUSTRY SECTORS AND MODES OF TRAVEL



Source: NCDOT Freight Plan Update (2022)-

3.2.1 Agriculture and Forestry

North Carolina is a particularly diverse agricultural state with nearly every county active in some type of production. In 2020, North Carolina produced $10 billion in agriculture and forestry products including 66% in livestock, dairy and poultry, and the remaining 34% in crops for the state's agriculture.[39] North Carolina's highest value agricultural exports primarily consist of tobacco, live animals and fish, and meat and seafood. The highest volume of agricultural exports based on percentage of U.S. market is wood products, other agricultural products and meat/seafood. North Carolina is ranked as a national leader in tobacco and all

[39] North Carolina Agricultural Statistics, 2020, access from https://www.nass.usda.gov/Statistics_by_State/North_Carolina/Publications/Annual_Statistical_Bulletin/AgStat/NCHighlights.pdf .

tobacco products, sweet potatoes, poultry and eggs, and ranks third in turkeys, hogs, cucumbers and bell peppers as shown in Figure 3.8.

FIGURE 3.8 NORTH CAROLINA'S RANK IN U.S. AGRICULTURE 2020

NORTH CAROLINA'S RANK IN U.S. AGRICULTURE, 2020

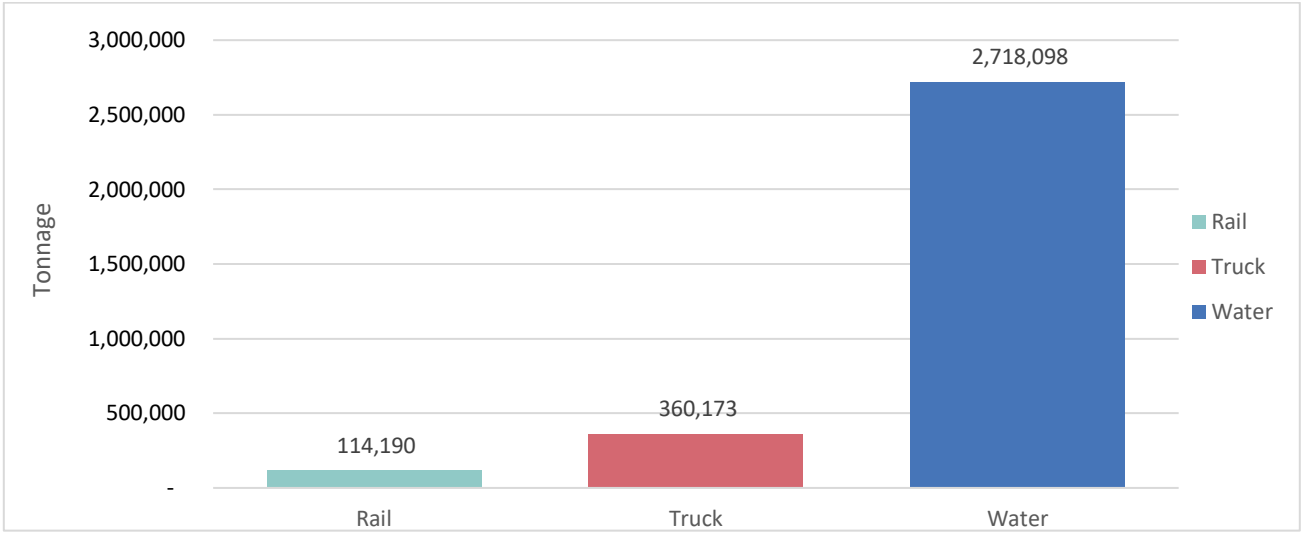
Rank	Item	Production		NC % of US	Top 3 States		
					1	2	3
1	Flue-cured Tobacco	183.6	(Mil Lbs)	77.2	NC	VA	GA
	Sweet Potatoes	16,848	(000 Cwt)	54.9	NC	CA	MS
	All Tobacco	184	(Mil Lbs)	47.3	NC	KY	TN
	All Poultry & Egg Cash Receipts	4,189	(Mil $)	11.8	NC	AR	GA
2	Annual Pig Crop Dec 19 - Nov 20	19	(Mil Hd)	13.8	IA	NC	MN
3	Turkeys	30	(Mil Hd)	13.4	MN	AR	NC
	Hogs & Pigs (12-1-20)	9	(Mil Hd)	11.5	IA	MN	NC
	Cucumbers	1,326	(000 Cwt)	10.4	MI	FL	NC
	Bell Peppers	541	(000 Cwt)	4.6	CA	NJ	NC
4	Broilers	961	(Mil Hd)	10.4	GA	AL	AR
5	Squash	500	(000 Cwt)	7.2	MI	CA	NY
	Peanuts	424	(Mil Lbs)	6.9	GA	AL	FL
	Burley Tobacco	1	(Mil Lbs)	0.6	KY	PA	TN

[1] *480-lb. net weight bales.*

Source: 2021 North Carolina Agricultural Statistics, accessed from https://www.nass.usda.gov/Statistics_by_State/North_Carolina/Publications/Annual_Statistical_Bulletin/AgStat/NCHighlights.pdf

North Carolina farmers and agricultural industries have built strong bonds with the state's ports exporting 2,718,098 million tons of industry leading commodities by water. North Carolina is leading the nation in agricultural commodities in either first, second, or third place as shown in Figure 3.9.

FIGURE 3.9 2021 NORTH CAROLINA AGRICULTURAL TONNAGE MODAL BREAKOUT



Source: FAF5

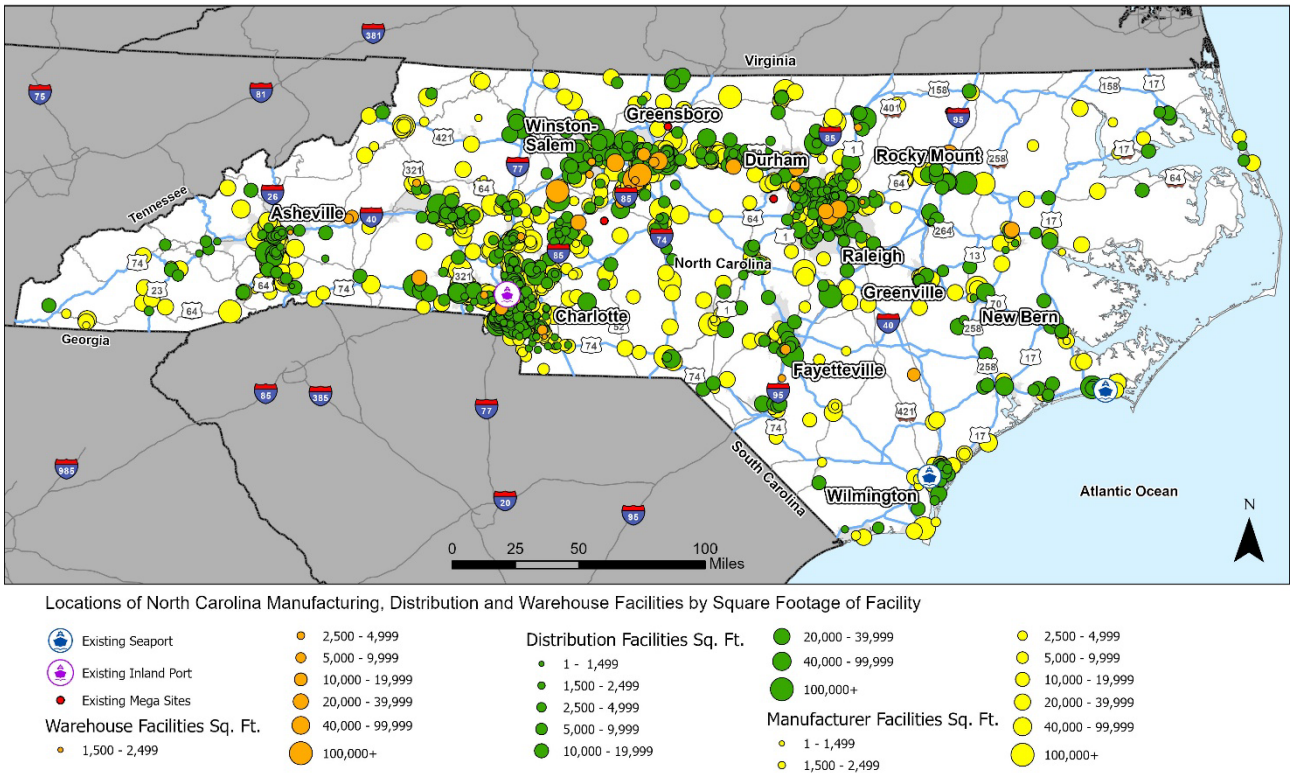
According to national freight statistics, 84% of North Carolinian agricultural and forestry products are exported by water as shown in Figure 3.9. North Carolina's agricultural producers use both ports in other

states as well as their own in-state facilities. The total value of North Carolina's agricultural waterborne exports is $2.7 billion in 2021 dollars.

3.2.2 Manufacturing and Distribution

Manufacturing, distribution centers and warehouse locations are shown on the cluster map shown in Figure 3.10. The map of the state reflects a tradeoff between proximity to urban labor markets with higher land costs and proximity to the source of inputs, or final markets with lower transportation costs for inputs or the final delivered product. Figure 3.10 illustrates the density of large manufacturing, distribution and warehouse facilities across the state. The figure illustrates the areas of the state with concentrations of manufacturing, and some potential locations of firms that that may have a propensity to export or import by ocean trade. While the major manufacturing areas are not located near the state's ports, most are within four hours along interstate and highway corridors or by Class I rail networks.

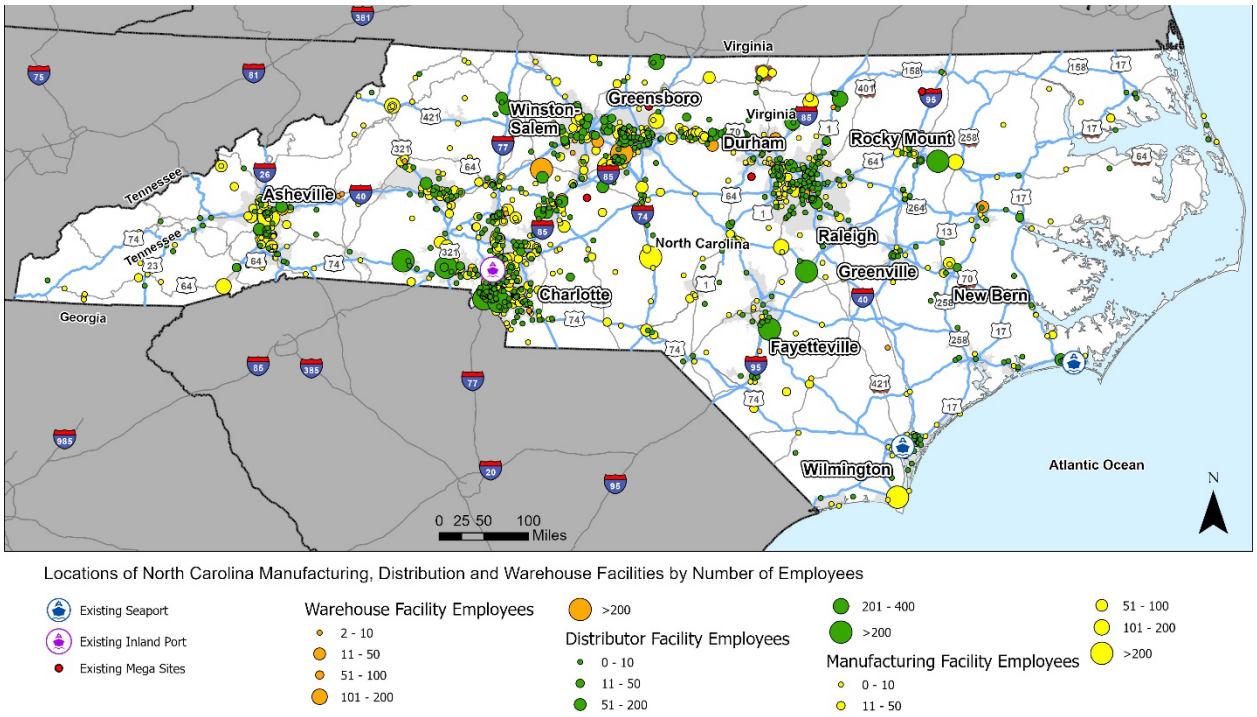
FIGURE 3.10 LOCATIONS OF NORTH CAROLINA MANUFACTURING, DISTRIBUTION AND WAREHOUSE FACILITIES BY SQUARE FOOTAGE OF FACILITY



Source: NCDOT provided Data Axle 2019

Manufacturing, distribution centers and warehouse locations by number of employees are shown in the cluster map shown in Figure 3.11. The pattern illustrates the employment size by diameter of the circle and facility type by color with manufacturing in yellow, distribution in green and warehousing in orange. Raleigh Durham, Charlotte and Winton-Salem have large warehouse facilities with larger workforces, but Fayetteville, Greenville, Wilmington and Rocky Mount are locations with some of the largest employers closer to the coast and port terminals.

FIGURE 3.11 LOCATIONS OF NORTH CAROLINA MANUFACTURING, DISTRIBUTION AND WAREHOUSE FACILITIES BY NUMBER OF EMPLOYEES



Locations of North Carolina Manufacturing, Distribution and Warehouse Facilities by Number of Employees

Existing Seaport
Existing Inland Port
Existing Mega Sites

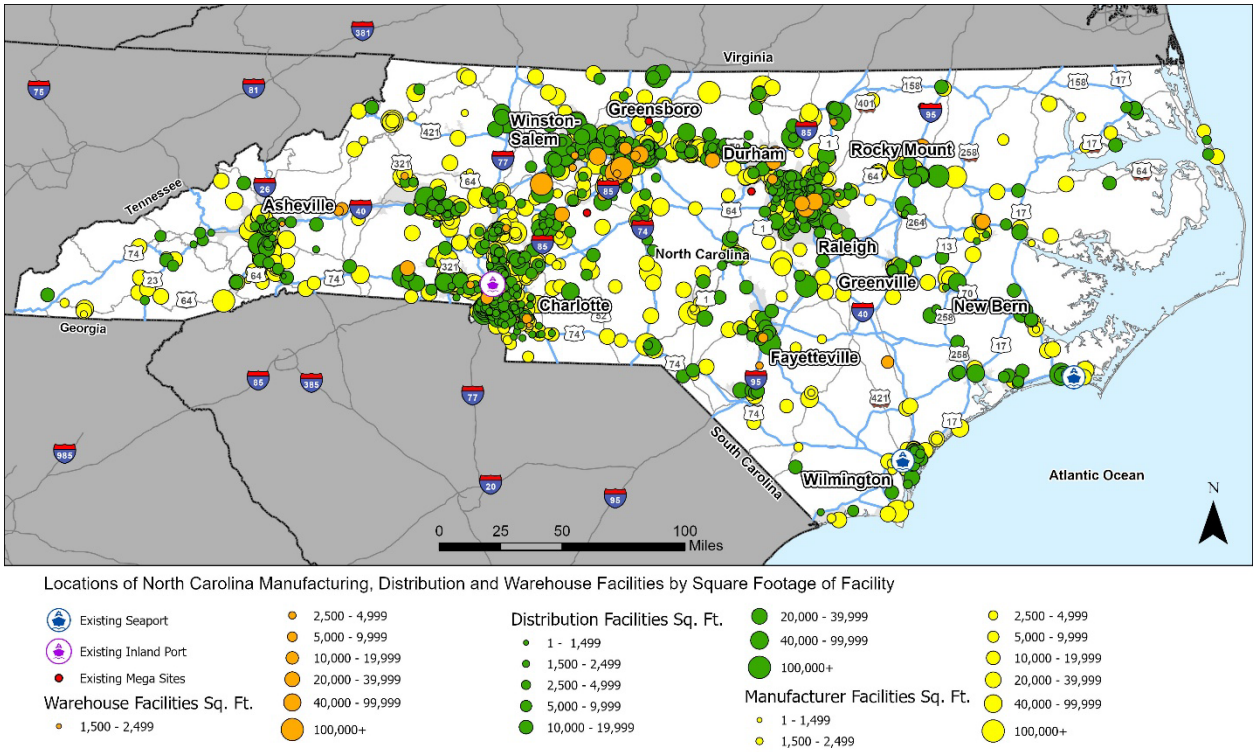
Warehouse Facility Employees
2 - 10
11 - 50
51 - 100
101 - 200
>200

Distributor Facility Employees
0 - 10
11 - 50
51 - 200
201 - 400
>200

Manufacturing Facility Employees
0 - 10
11 - 50
51 - 100
101 - 200
>200

Source: NCDOT provided Data Axle 2019

FIGURE 3.12 LOCATIONS OF NORTH CAROLINA MANUFACTURING, DISTRIBUTION AND WAREHOUSE FACILITIES BY SQUARE FOOTAGE OF FACILITY



Source: NCDOT provided Data Axle 2019

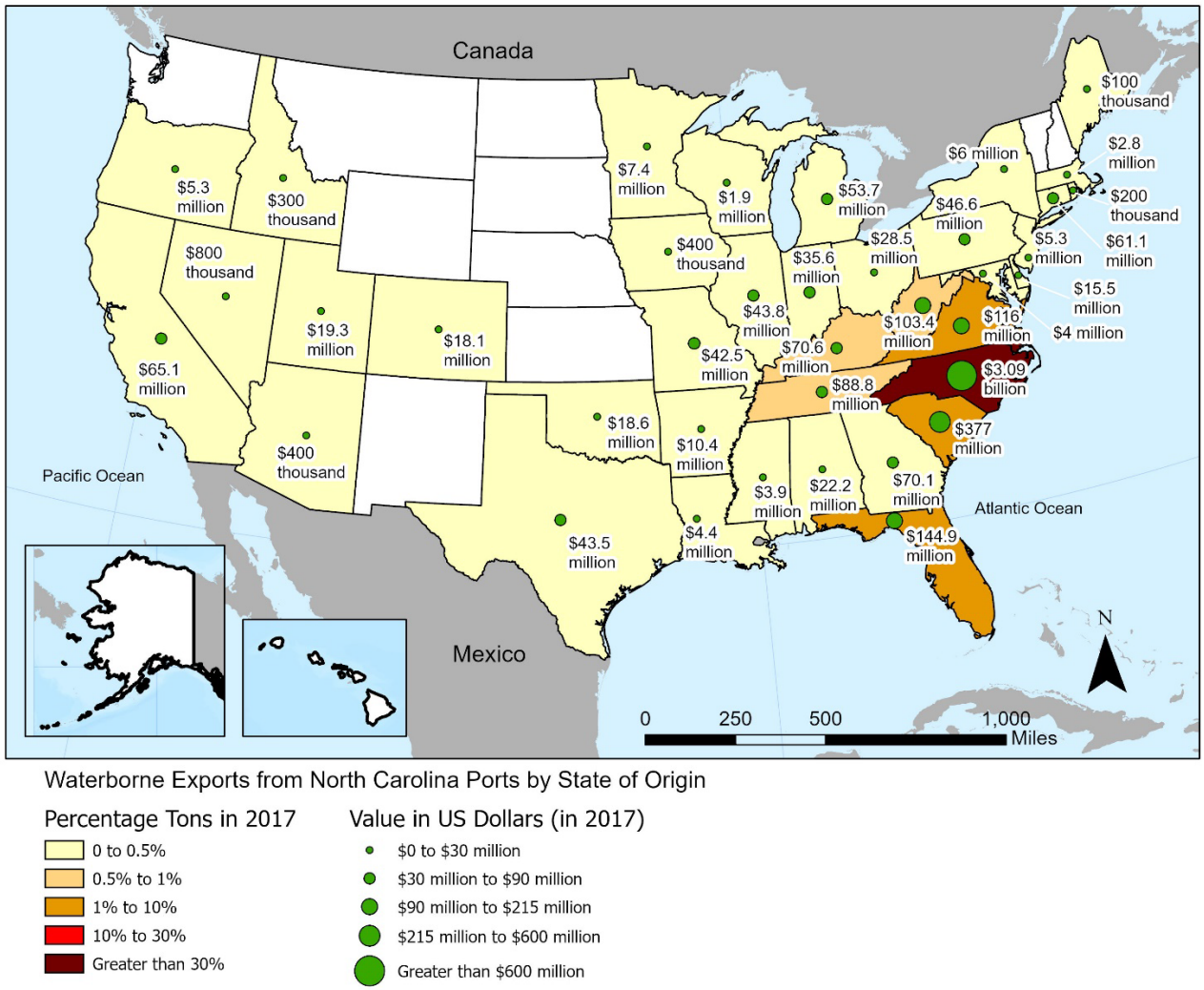
3.3 Markets Served

Import and export movement through the ports plays a major role in the state's economy. This section will provide a breakdown of the origins and destinations of imports and exports that pass through North Carolina's ports, as well as an analysis of regional port volumes and utilization levels. By understanding the economic trends of North Carolina's ports, a clear understanding of the state's maritime needs can be established.

3.3.1 North Carolina's Role in National Imports/Exports

Shippers beyond North Carolina's border also use the state's port facilities. When exports are measured by volume, North Carolina shippers use their ports the most, followed by shippers from South Carolina, Virginia, West Virginia, Tennessee, Kentucky and Florida. (FAF5, 2017). By export value, North Carolina shippers utilize the state's ports the most (Figure 3.13). Due to the proximity and condition of their own state's facilities, shippers in South Carolina, Virginia and Florida still rank among top state customer for North Carolina's ports. Freight from other states must be transported via other modes to North Carolina ports, highlighting the need for efficient multimodal freight transport options. While FAF5 data inconsistencies could impact rankings, the overall trend indicates that North Carolina shippers are the primary users of export services from the state's own ports.

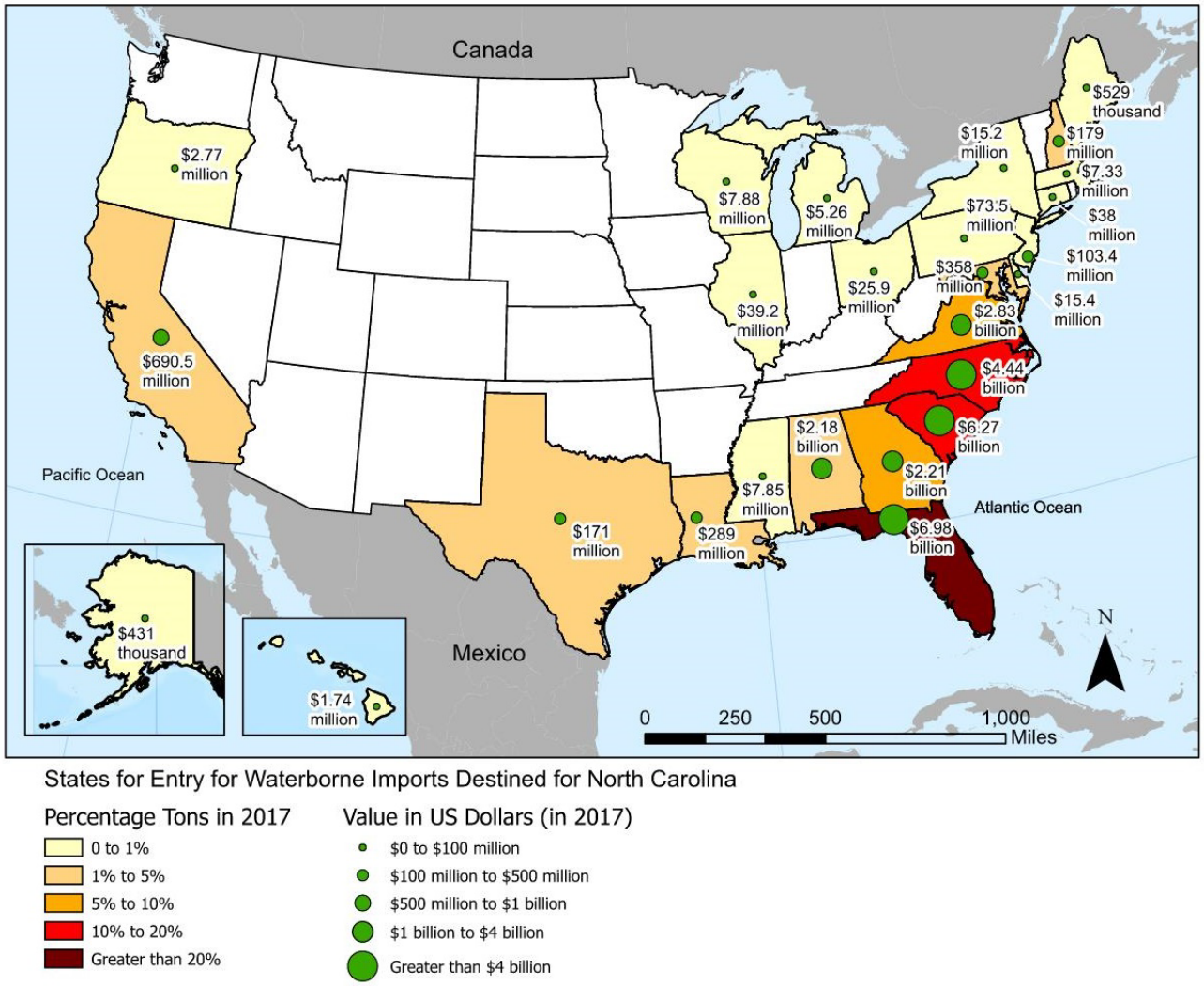
FIGURE 3.13 WATERBORNE EXPORTS THROUGH NORTH CAROLINA PORTS BY STATE OF ORIGIN



Source: HNTB Analysis, assembled from FAF5 and USGS ThematicMapping

Regarding imports, more than 65% of all foreign imports destined for North Carolina travel by water through other state ports, as illustrated in Figure 3.14. Seven states account for nearly 90% of North Carolina's waterborne imports including Virginia, South Carolina, California, Georgia, Maryland, Florida and North Carolina. As shown in Figure 3.14, South Carolina was the second highest destination for imports handled by North Carolina in 2017 with a total import value of $6.27 billion. Florida became the top state of entry of imports handled valuing $6.98 billion. North Carolina has increased its import values from 2012 to 2017 from $3.58 billion to $4.44 billion.

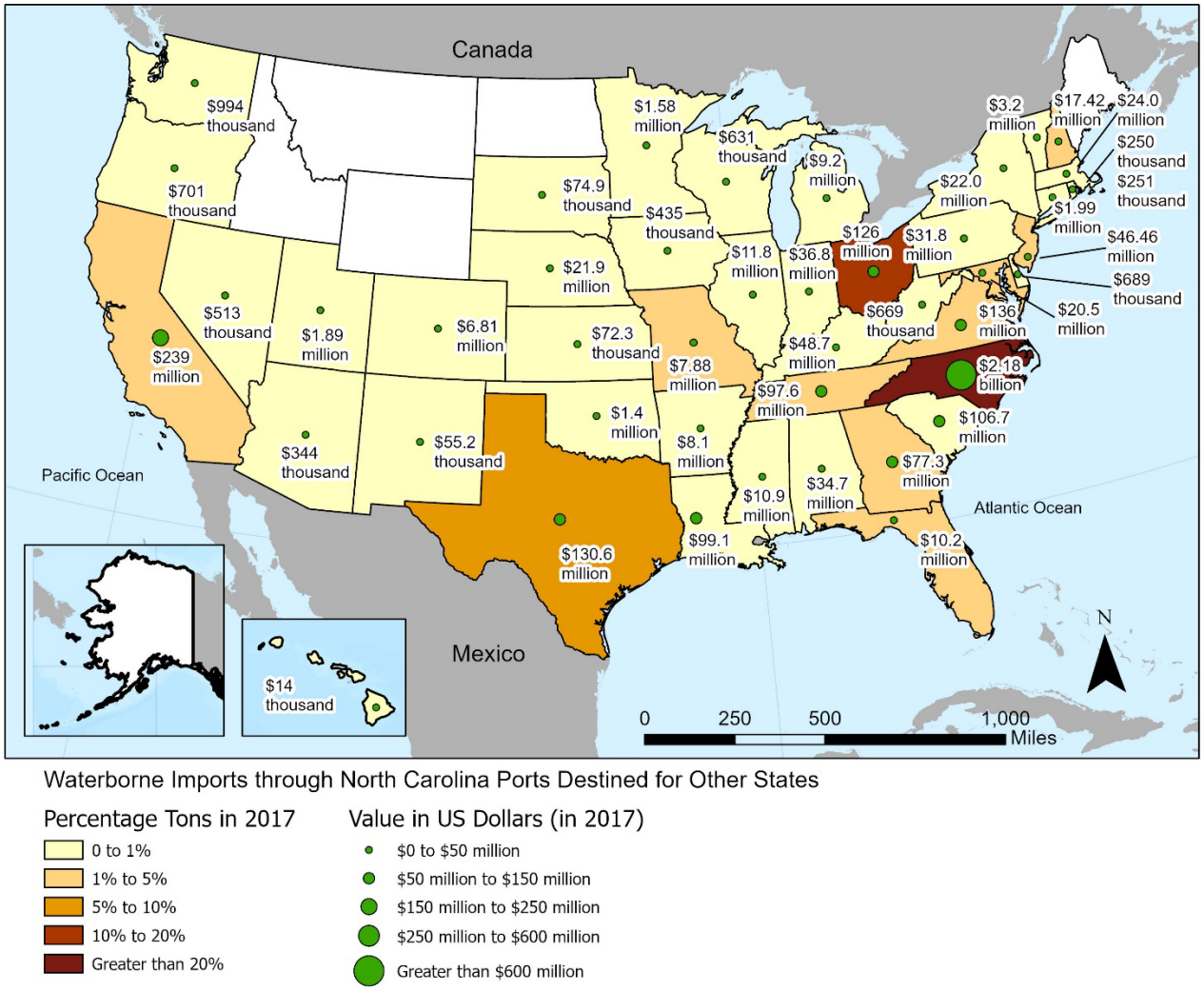
FIGURE 3.14 STATES OF ENTRY FOR WATERBORNE IMPORTS DESTINED FOR NORTH CAROLINA



Source: HNTB Analysis, assembled from FAF5 and USGS ThematicMapping

Among those shipments that enter the U.S. through North Carolina's ports, the majority are destined for consumption in North Carolina, Ohio and Texas (Figure 3.15).

FIGURE 3.15 WATERBORNE IMPORTS THROUGH NORTH CAROLINA PORTS DESTINED FOR OTHER STATES



Source: HNTB Analysis, assembled from FAF5 and USGS ThematicMapping

3.3.2 Global Partners

North Carolina's trading partners are geographically diverse. Major export regions ranked in order of total tonnage include Europe, Eastern Asia, SW & Central Asia, Rest of Americas, SE Asia & Oceania, Canada, Africa and Mexico. The mix is similarly diverse on the import side, led by Europe, Rest of Americas, SW & Central Asia, Eastern Asia, SE Asia & Oceania, Africa, Canada and Mexico.

This diversity is favorable as it shields the state from an economic downturn in a particular region of the world economy.

The listings in Table 3.1 and Table 3.2 provide ranked comparisons of the state's import and export partners using any U.S. port of entry with an ultimate origin or destination in North Carolina. The second column shows the leading origin and destination for trade through the state's own ports.

In Table 3.1, the top global trading partners exporting through a North Carolina port include Europe, Eastern Asia, SW and Central Asia, Rest of Americas, SE Asia and Oceania, Canada, Africa and Mexico. The second column on the export side shown in Table 3.1 includes top export regions from North Carolina through out-of-state ports. Under this scenario, the data source provides top export partners starting with Eastern Asia, Europe, and SW and Central Asia to fill the top three spots.

TABLE 3.1 INTERNATIONAL DESTINATION REGIONS OF WATERBORNE EXPORTS FROM NORTH CAROLINA (2017, BY TONNAGE)

Exported through North Carolina Ports	Exported from North Carolina through All Ports
1. Europe	1. Eastern Asia
2. Eastern Asia	2. Europe
3. SW & Central Asia	3. SW & Central Asia
4. Rest of Americas	4. Rest of Americas
5. SE Asia & Oceania	5. SE Asia & Oceania
6. Canada	6. Africa
7. Africa	7. Mexico
8. Mexico	8. Canada

Source: HNTB Analysis, assembled from FAF5 and USGS ThematicMapping

In Table 3.2, the top global trading partners importing to North Carolina through all ports except NCSPA, includes Rest of America, Canada, Eastern Asia, Europe, SW and Central Asia, and SE Asia and Oceania, Mexico and Africa. The second column on the import side shown in Table 3.2 includes top import regions through a North Carolina seaport throughout the state and nation. Under this scenario, the data source provides top import partners starting with Europe, Rest of Americas, SW & Central Asia and Eastern Asia to fill the top four spots.

TABLE 3.2 INTERNATIONAL ORIGIN REGIONS OF WATERBORNE IMPORTS TO NORTH CAROLINA (2017, BY TONNAGE)

Imported to North Carolina through All Ports	Imported through North Carolina Ports
1. Rest of Americas	1. Europe
2. Canada	2. Rest of Americas
3. Eastern Asia	3. SW & Central Asia
4. Europe	4. Eastern Asia
5. SW & Central Asia	5. SE Asia & Oceania
6. SE Asia & Oceania	6. Africa
7. Mexico	7. Canada
8. Africa	8. Mexico

Source: HNTB Analysis, assembled from FAF5 and USGS ThematicMapping

Europe is leading in exports and imports through North Carolina ports. Europe ranks second in exports from North Carolina through all ports and fourth in imports of the same manner. The close proximity in rank

suggests that North Carolina shippers choose to use an out of state port to reach leading trade partners due to the availability of ship calls, storage/equipment availability or other factors.

3.4 Level-of-Service

The operation and level of service or efficiency possible within each port depends on several factors. The activities at each port depend on the physical constraints of facilities, policy decisions on commodities served and operating hours, worker and equipment productivity, weather and numerous other factors that may or may not be controllable. Two key measures of port efficiency commonly used are (1) how long it takes for a truck to enter the terminal and deliver or pick up a container and leave the terminal, and (2) how many containers can be moved between a ship and the shore in an hour.

Bottlenecks in the adjacent landside transportation networks also affect port operations. Bottlenecks are defined here as temporary situations that cause a loss of time and/or money in the supply chain. Conversely, constraints are fixed issues that require a change or upgrade in infrastructure, policy, or other change that affects freight move. An example of a bottleneck would be a stalled train on a single-track line, a broken traffic signal, or no available container cranes to service an incoming ship.

Alternatively, a constraint would be narrow tunnels impacting the ability for ports to accept oversize or overweight project cargo, low utility lines and bridges restricting air drafts into a port, or track sections that cannot handle the 286,000 lb. railcar weights. The constraints can be best illustrated by comparing North Carolina ports to regional neighboring ports. As a result of bottlenecks and constraints, the ports' levels of service are directly affected by issues both within and beyond the ports' control.

In this section, we have summarized two measures of port efficiency across regional ports and bottlenecks and constraints experienced by the North Carolina ports.

3.4.1 Port Efficiencies

Both port efficiencies elaborated upon are tied to container moves. Since bulk and breakbulk cargo are less common across the ports and vary widely in the required equipment, it is difficult to compare unless a specific commodity is tracked.

3.4.2 Truck Turn Times

A truck turn is the amount of time (in minutes) it takes for a truck to enter, conduct business and leave a port facility. For example, picking up a container requires a truck to enter a port gate and be processed, potentially pick up a chassis on-site if not previously done offsite, have a container loaded onto the chassis, be weighed, and finally, be processed and inspected at the gate upon exit. This is a single truck turn as only one container is touched. A dual or import/export truck turn is when a truck is both delivering and picking up a container, in either order, resulting in two containers being touched. Three parts of this process, gate entry, loading and gate exit times can vary based on level of automation at a port. Note that turn times are partially contingent upon the size of the terminal facility and how far the truck must be driven; therefore, a smaller port such as the Port of Wilmington is likely to have shorter turn times than a larger port, unless the larger port sets up gates for each terminal to reduce on-port distances.

The truck turns at North Carolina's Port of Wilmington and its neighboring ports are compared in Table 3.3. Overall, Wilmington has the fastest average truck turn times at 18 and 30 minutes for single and dual turns, respectively. Charleston touts a 23-minute average truck turn-time and more than 40 container crane moves per hour. Wilmington remains very competitive and is among the highest crane productivity rates in the nation with more than 40 container moves per hour.

TABLE 3.3 AVERAGE TRUCK TURNS BY PORT

Port	Single Truck Turn	Import/Export Truck Turn
Wilmington	22 minutes	33 minutes
Charleston	23 minutes	< 60 minutes
Savannah (Garden City Terminal)	30 minutes	< 60 minutes
Norfolk	<40 minutes (single and dual combined)	

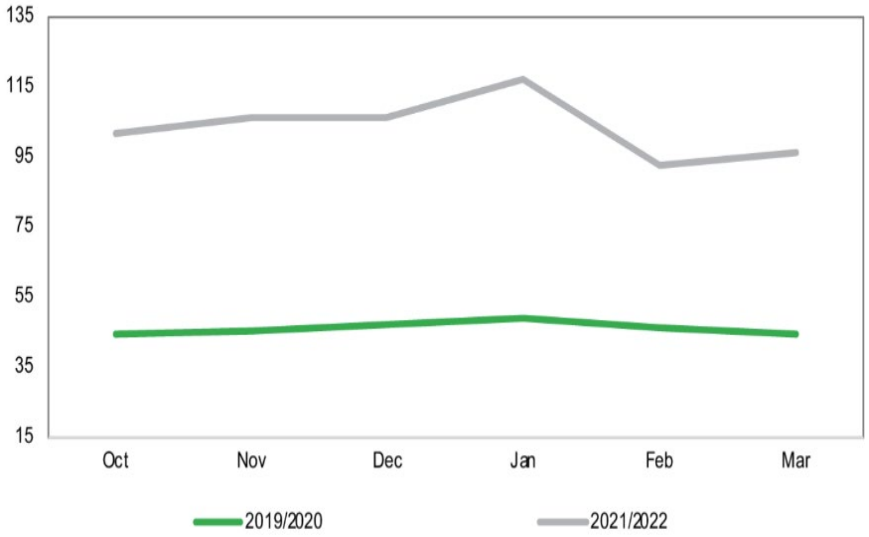
Sources: https://peachcountydevelopment.com/images/uploads/Georgia_Ports_Authority_-_Savannah_Fact_Sheet_Dec_2019.pdf, https://scspa.com/solutions-center/motor-carrier-guide/, http://www.portofvirginia.com/pdfs/Weekly%20Metrics.pdf, NCSPA2022 Interviews and email.

The Port of Savannah has average truck turn times of 30 minutes for a single move and under an hour for a dual move at the Garden City Terminal. Lastly, truck turns at the Port of Virginia vary by terminal and are posted weekly, with the average turn time being approximately 36 minutes at Norfolk International Terminal and 40 minutes at Virginia International Gateway for the 3rd quarter 2022 for traditional turn times.[40] The shortest average turn times were at PMT (40-50 minutes) and longest at VIG (50-60 minutes) for that same month. To further decrease turn times and increase efficiency, the South Carolina Port Authority began use of GO! Port in June 2016. The advanced gate system is for motor carriers at the Wando Welch and North Charleston Terminals and acts much like an airline kiosk system for booking cargo and being advised on where to pick it up or drop it off on-terminal.

[40] Port of Virginia Weekly Metrics, NIT and VIG Gate Transactions, from 8/21/22 to 10/9/22, https://wp.portofvirginia.com/wp-content/uploads/2022/10/POV-Weekly-Metrics-10-09-2022-2.pdf

3.4.3 Vessel Turn Times

FIGURE 3.16 TWO-YEAR COMPARISON OF U.S. WEST COAST PORTS AVERAGE VESSEL DWELL TIME IN HOURS FROM 10/2021 - 3/2022 COMPARED TO 10/2019 - 3/2020

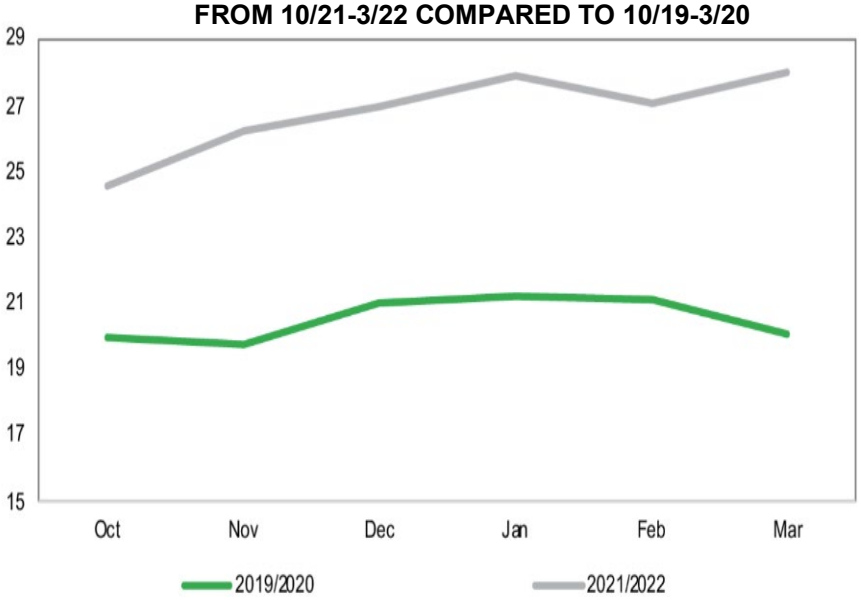


Source: IHS Markit Port Performance Data, 2022 Journal of Commerce, "U.S. port congestion will worsen through 2022 peak: industry leaders"

Average vessel dwell time is a measure of how long a ship is moored at a port. The efficient turn of trucks, improved intermodal rail connectivity, and the container terminal expansion project at Port of Wilmington are the infrastructure investments necessary to provide great service, competitive rates and multimodal solutions for port customers. This translates into additional capacity from a berth utilization standpoint because of better storage and throughput solutions. Efficient movement of containers into storage or off-port creates berth capacity to serve additional vessels. However, some states are experiencing extreme delays turning vessels and even having vessels backed up waiting at an anchorage location.

In the end of 2021 and beginning of 2022 many West and East Coast ports were experiencing vessel delays. In contrast, the Port of Wilmington has no on-going container terminal congestion. U.S. West Coast ports have experienced double pre-pandemic average vessel dwell times at their berths as shown in Figure 3.16, which considers the six peak months of 2019 - 2020 and 2021 - 2022. U.S. East Coast ports are experiencing similar challenges shown in Figure 3.17 with higher-than-average dwell times, but even the peak of 28 days is a third of the time taken at U.S. West Coast Ports.

FIGURE 3.17 TWO-YEAR COMPARISON OF U.S. EAST COAST PORTS AVERAGE VESSEL DWELL TIME IN HOURS FROM 10/21-3/22 COMPARED TO 10/19-3/20



Source: IHS Markit Port Performance Data, 2022 Journal of Commerce, "U.S. port congestion will worsen through 2022 peak: industry leaders"

3.4.4 Bottlenecks

At-grade crossings are inconvenient leading to the Port of Wilmington where switching activities cause backups frequently near the port's south entrance. It is not uncommon for several trucks bound to/from the port to queue on access roads as they wait for trains to move over the crossings. Truck parking inside the terminal and outside the terminal, repairing or replacing the Cape Fear Memorial Bridge, and a need for a dedicated north gate access were identified as bottlenecks and challenges for Port of Wilmington during stakeholder interviews. The Port of Wilmington is operating at or near capacity and in need of additional or improved warehouse space.

3.4.5 Constraints

The Ports of Charleston, Jacksonville, Miami, New York, Virginia, Savannah and Wilmington have either deepened or are planning to deepen access channels and harbors as shown in Table 3.4. As of April 2022, all neighboring ports of interest can now, at minimum, accommodate Post-Panamax vessels at high tide. With Post-Panamax ships now reaching the U.S. East Coast regularly via the Panama Canal and larger vessel fleets in major container alliances, differences in water depth are more critical in determining current competitive advantages and in positioning the ports for continued New Panamax vessel service opportunities.

TABLE 3.4 U.S. ARMY CORPS OF ENGINEERS (USACE) CURRENT AND PLANNED FUTURE U.S. EAST COAST PORT DEPTHS

Port	Current Depth Feet	Planned Depth Feet	Status/Completion Date
Baltimore	50	50	Complete
Miami	50	50	Complete
New York*	50	50	Complete
Norfolk	50	55	Design/2025
Charleston*	52	52	Construction/2021
Morehead City	45	45	Complete
Philadelphia	45	45	Complete
Port Everglades	42	48	Design/2024
Savannah*	47	47	Complete
Wilmington	42	47	In Design**
Boston*	40	48	In Construction/2024
Jacksonville*	47	47	Construction/2022

Source: United States Army Corps of Engineers2019 Sec 203 Wilmington Harbor Deepening *https://eft.usace.army.mil/saw-nav/Dredging/Wilmington_Harbor/WHNIP/20190926_WHNIP203_Final_Scoping_Presentation.pdf*

*Notes: * Asian Service Route Partners;*

Securing and regulating federal funding for ports is key, especially for depth maintenance (dredging funding and frequency). In 2020, the USACE received a civil works appropriation for national navigation related

projects of $1.6 billion.[41] In 2021, the commercial navigation amount was $593 million,[42] which included maintenance and funding for navigation projects has been increasing over the past five years as shown in Table 3.5. The FY 2020 total annual funding of $1.5 billion for coastal projects represents nearly a $500 million dollar budget increase for that period. Harbor Maintenance Trust Fund Reform Act is currently funding the projects and is moving through congressional committees; however, it is unknown whether it will pass in the US Congress. Distribution of funds for area ports from the last major federal outlay are listed in Table 3.5.

TABLE 3.5 USACE FY 2016-2020 COASTAL NAVIGATION BUDGET IN (MILLIONS)

Year	Investigations	Construction	O&M	MR&T	Total Coastal
FY20	$8	$487	$956	$5	$1,455
FY19	$7	$139	$934	$0	$1,080
FY18	$11	$133	$933	$2	$1,079
FY17	$14	$105	$896	$2	$1,017
FY16	$18	$81	$872	$2	$973

Source: USACE, 2020 Inland Coastal Navigation Budget Presentation, access from, https://www.iwr.usace.army.mil/Portals/70/UB93%2001%20FY20%20Nav%20Summary%2019FEB20%20v2.pdf

Air Draft Clearance

Another form of waterway hinderance comes from overhead. In 2020, the Port of Wilmington raised power lines on the Cape Fear River increasing the allowable air draft to 212 feet. The improved air draft clearance will allow ships with a carrying capacity of 14,000 TEUs or greater to navigate to Wilmington safely and efficiently. The four-month, a multi-million-dollar project led by Duke Energy consisted of upgrades to the transmission towers in the Cape Fear River and the replacement of existing lines. Altogether, the improvements raised the transmission lines a total of 41 feet.[43]

3.4.6 Port Competitiveness

The surrounding industrial base compared with neighboring ports (measured by employment within 300 miles of the port) is the smallest for the North Carolina ports. Each regional neighboring port has a greater density of economic activity to generate trade. The ranking changes, however, at a broader 500-mile radius. Both Morehead City and Wilmington have larger markets compared to Savannah and Charleston. Only Norfolk's market density exceeds that of North Carolina at a 500-mile radius.

Through the seaports in Wilmington and Morehead City as well as the Charlotte Inland Port, North Carolina is able to link state consumers to world markets and foster economic growth by attracting new business and industry. Port activities contribute more than 87,700 jobs and $678 million statewide each year in state and

[41] U.S. Army Corps of Engineers Releases Work Plan for Fiscal 2020 Civil Works Appropriations, accessed from, https://www.usace.army.mil/Media/News-Releases/News-Release-Article-View/Article/2080242/us-army-corps-of-engineers-releases-work-plan-for-fiscal-2020-civil-works-appro/

[42] U.S. Army Corps of Engineers Releases Work Plan for Fiscal 2021 Civil Works Appropriations, accessed from, https://www.usace.army.mil/Media/News/NewsSearch/Article/3042747/us-army-corps-of-engineers-releases-work-plan-for-fiscal-2022-civil-works-appro/

[43] Increased Air Draft Allows Larger Ships to Reach the Port of Wilmington, accessed from, https://ncports.com/about-the-ports/news/increased-air-draft-at-port-of-wilmington/

local tax revenues. North Carolina Ports have taken strides to maintain competitiveness with the initiation of a $200 million capital improvements plan. Infrastructure improvements include a wider turning basin, berth enhancements, improved container terminal, three new ship-to-shore gantry cranes and new intermodal rail yard. The terminal renovations will double the port's annual throughput capacity to 1.2 million TEU and triple its refrigerated container capacity to more than 1,400 plugs.

Furthermore, North Carolina Ports has established operations on Radio Island, which has been used for liquid bulk activities in the past and retains this legacy infrastructure. Radio Island offers an expansion opportunity for port operations as market conditions warrant.

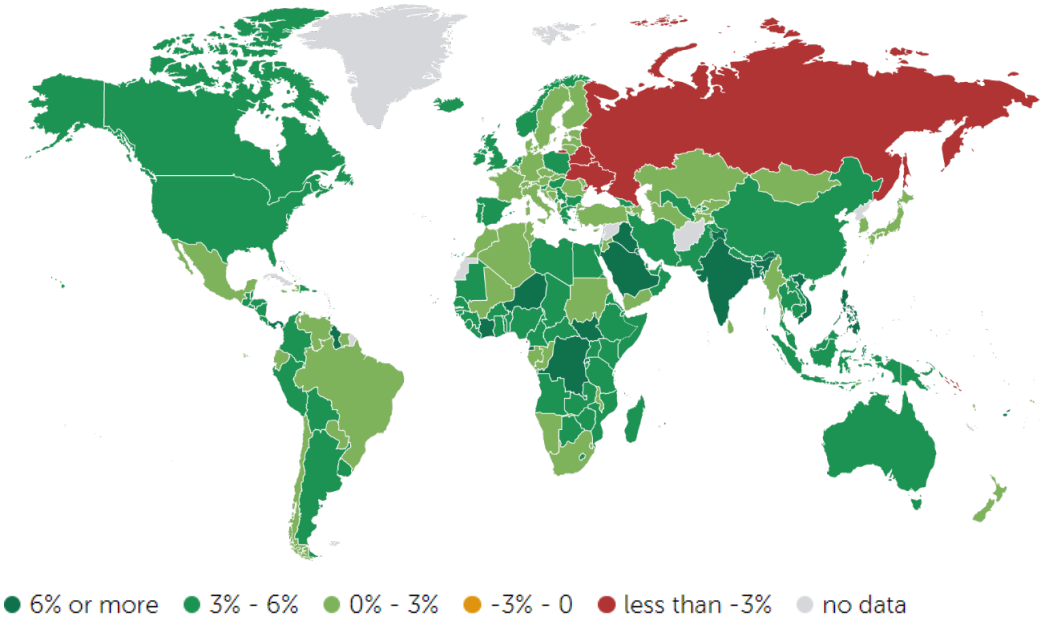
4. FUTURE PERFORMANCE AND TRENDS

4.1 Future Activity/Demand in North Carolina

There are many factors that impact economic and trade activity at North Carolina ports. Some examples include economic growth or recession of foreign trading partners, changes in cargo type handled, and population or employment within North Carolina. Since the release of the previous 2017 North Carolina Statewide Multimodal Freight Plan, economic activity has been a rollercoaster, ranging from booming economic growth to global economic shutdowns due to the COVID-19 pandemic, and then to recovery. Figure 4.1 illustrates this recovery by presenting the estimated annual percent change in real global GDP for each country for 2021-2022.

Infrastructure development for ports requires long-term planning and securing of both public and private financial resources. These plans must be developed and executed regardless of economic fluctuations in order for ports to maintain and grow their customer base. To create growth opportunities, the ports must also plan for both the diversification of commodity movements and the shift to developing markets with favorable growth potential.

FIGURE 4.1 MAP OF PERCENT CHANGE IN REAL GLOBAL GDP FOR 2021-2022



Source: IMF or International Monetary Fund, Real Global GDP Map 2022, accessed from, https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD

4.1.1 Global Market Recovery and Growth

Economic projections indicate that the pace of economic expansion and associated demand for goods among North Carolina's key trading partners should remain strong with GDP of 3% to 6% or higher. The

International Monetary Fund (IMF) forecast indicates a slowing of growth but remains strong on pace or exceeding the U.S. economy as shown in Figure 4.2. The ability to connect with these foreign economies and capitalize on this market potential through exchange of resources, goods and products represents an important economic opportunity.

FIGURE 4.2 U.S. GDP GROWTH RATE OUTPACES OR IS ON PAR WITH LEADING ECONOMIES FROM 2020-2022

(real GDP, annual percent change)	2020	PROJECTIONS 2021	2022
World Output	**-3.2**	**6.0**	**4.9**
Advanced Economies	**-4.6**	**5.6**	**4.4**
United States	-3.5	7.0	4.9
Euro Area	-6.5	4.6	4.3
Germany	-4.8	3.6	4.1
France	-8.0	5.8	4.2
Italy	-8.9	4.9	4.2
Spain	-10.8	6.2	5.8
Japan	-4.7	2.8	3.0
United Kingdom	-9.8	7.0	4.8
Canada	-5.3	6.3	4.5
Other Advanced Economies	-2.0	4.9	3.6
Emerging Market and Developing Economies	**-2.1**	**6.3**	**5.2**
Emerging and Developing Asia	-0.9	7.5	6.4
China	2.3	8.1	5.7
India	-7.3	9.5	8.5
ASEAN-5	-3.4	4.3	6.3
Emerging and Developing Europe	-2.0	4.9	3.6
Russia	-3.0	4.4	3.1
Latin America and the Caribbean	-7.0	5.8	3.2
Brazil	-4.1	5.3	1.9
Mexico	-8.3	6.3	4.2
Middle East and Central Asia	-2.6	4.0	3.7
Saudi Arabia	-4.1	2.4	4.8
Sub-Saharan Africa	-1.8	3.4	4.1
Nigeria	-1.8	2.5	2.6
South Africa	-7.0	4.0	2.2
Memorandum			
Emerging Market and Middle-Income Economies	-2.3	6.5	5.2
Low-Income Developing Countries	0.2	3.9	5.5

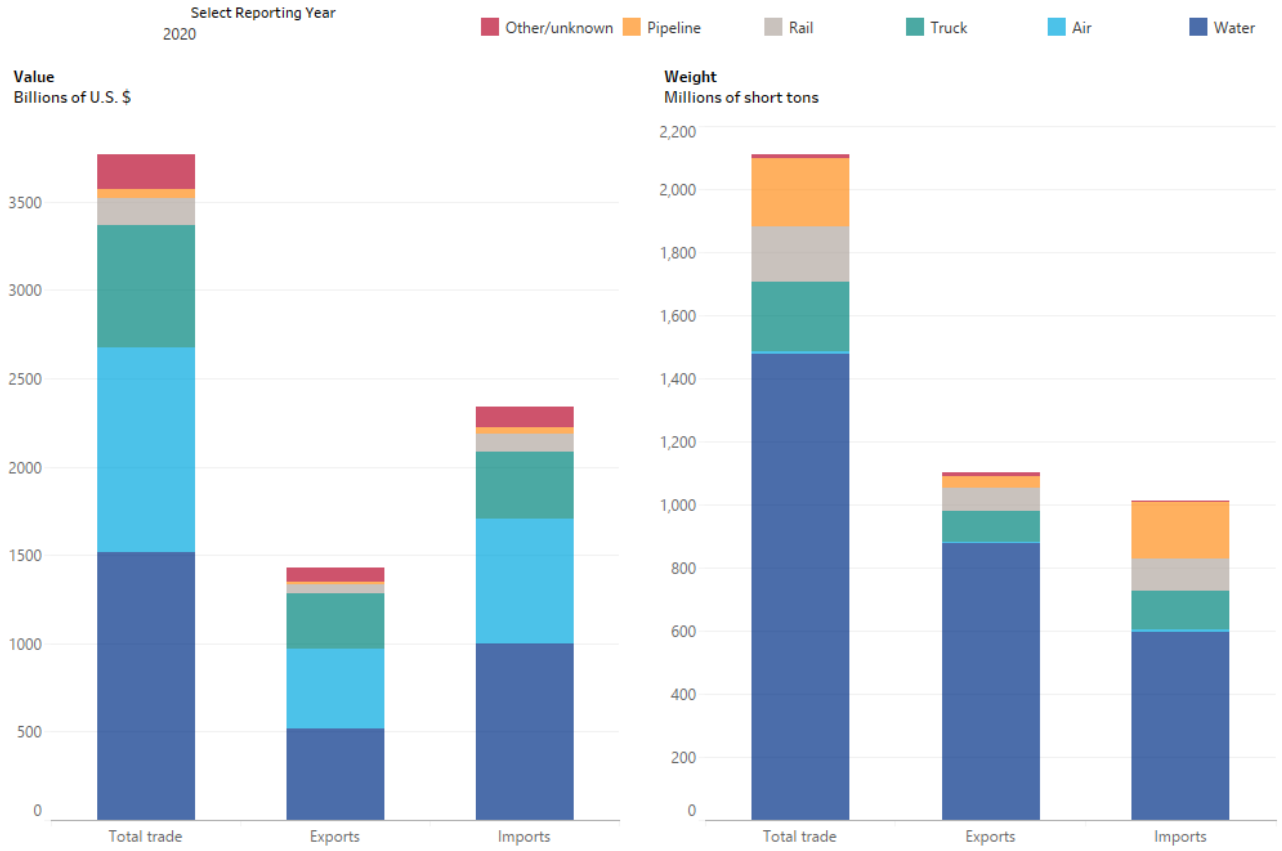
Source: IMF or International Monetary Fund, World Economic Outlook Update July 2021 accessed from, https://www.imf.org/en/Publications/WEO/Issues/2021/07/27/world-economic-outlook-update-july-2021

The U.S. economy has outpaced or, at minimum, grown with the strongest nations' economies in recent years. The IMF publishes an annual world economic outlook and a recent version is shown above in Figure 4.2. The table considers annual real GDP percent change for 2020-2022 and growth with the United States levels off at 4.9% in 2022. With increased inflation, this growth may taper off, but the economy overall

appears to be stable and strong. Notable regions and major trading partners with the U.S. East Coast that are also predicted to grow above 4% GDP include China, Canada, UK, India and Mexico.

Waterborne trade is by far the leading mode for U.S. international trade, both in value and tonnage as illustrated in Figure 4.3, followed by air cargo, with truck and rail sharing the remaining tonnage but very little value trading with Canada and Mexico across the borders.

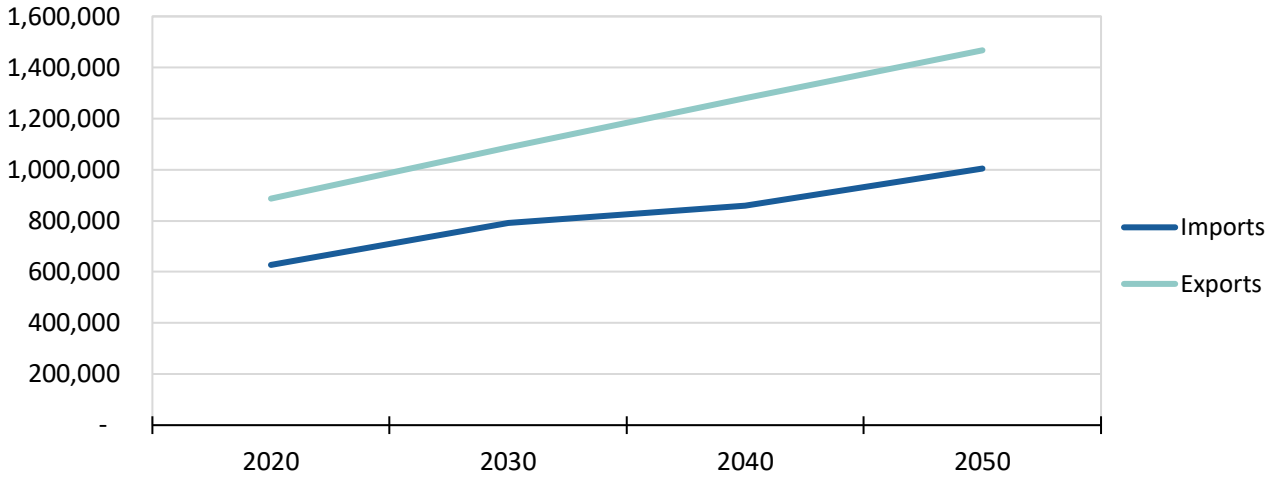
FIGURE 4.3 U.S. INTERNATIONAL FREIGHT TRADE VALUE (BILLIONS $) AND WEIGHT (TONS) BY MODE



NOTES: 1 short ton = 2,000 pounds. The U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS) estimated export weight data for truck, rail, pipeline, and other and unknown modes using value-to-weight ratios derived from imported commodities. Totals for the most recent year differ slightly from the USDOT, BTS and Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework (FAF) due to variations in coverage and FAF conversion of values to constant dollars. "Other/Unknown" mode includes movements not elsewhere classified such as flyaway aircraft and shipments for which the mode cannot be determined. Numbers may not add to totals due to rounding.
SOURCES: *Total, water and air data*: U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, USA Trade Online, https://usatrade.census.gov/. *Truck, rail, pipeline, and other and unknown data*: U.S. Department of Transportation, Bureau of Transportation Statistics, North American Transborder Freight Data, available at www.bts.gov/transborder as of April 2021.

Updated projections of U.S. imports and exports via waterborne trade were obtained using FHWA's FAF5 tool shown in Figure 4.4. In review of the 2017 North Carolina Statewide Multimodal Freight Plan, waterborne exports surpassed imports in 2012 as the leading trade direction. The trade gap has continued to grow further apart in the past decade. The projections do not project a business cycle, but rather project long-term trends based on expectations for U.S. and Southeast regional industrial and population growth. The projections are only for waterborne trade and are based on a 2050 unconstrained forecast.

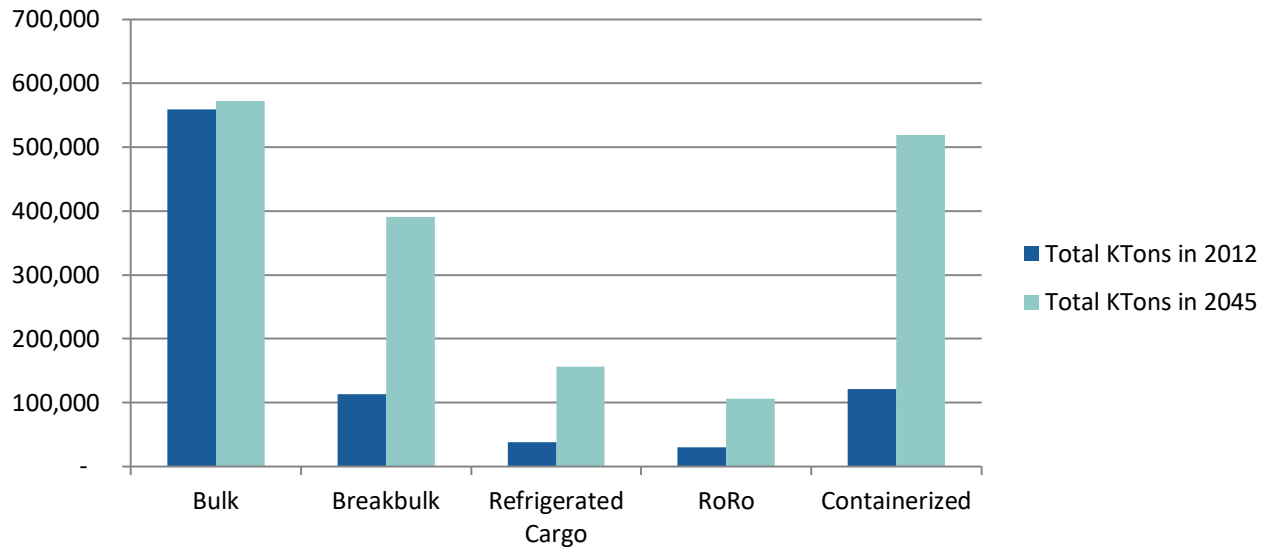
FIGURE 4.4 FORECASTED GROWTH FOR WATERBORNE IMPORTS AND EXPORTS IN THE U.S.



Source: HNTB Analysis of FAF5 Data

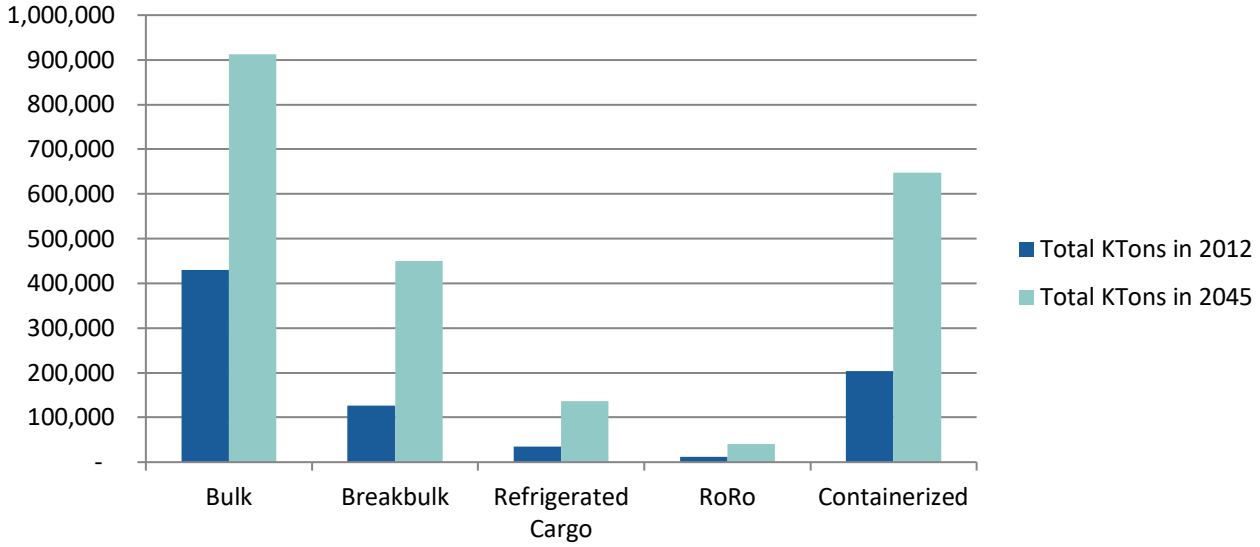
When evaluated by cargo types, containerized, bulk, breakbulk and Ro/Ro, the forecasted demand for waterborne imports and exports in the U.S. identifies stronger growth for some cargo types than others as shown in Figure 4.5 and Figure 4.6. Figure 4.5 and Figure 4.6 include data evaluations broken out by cargo type not available in FAF5.2 data and for forecasting purposes, the prior FAF4.1 data will be used until an updated version of FAF5.2 can provide modal break outs. Containerized cargo has the greatest growth projections, with breakbulk cargos as a close second. Reefer or refrigerated cargos are projected to triple, aligning with major investments in reefer plugs and climate-controlled warehousing at the two North Carolina Port terminals.

FIGURE 4.5 FORECASTED GROWTH FOR WATERBORNE IMPORTS TO THE U.S. BY COMMODITY TYPE



Source: FAF 4.1, Update unavailable in FAF5 for cargo type breakout.
Note: Commodities may overlap in shipment type, so there is some double counting.

FIGURE 4.6 FORECASTED GROWTH FOR WATERBORNE EXPORTS FROM THE U.S. BY COMMODITY TYPE



Source: FAF4.1, Update unavailable in FAF5 for cargo type breakout.
Note: Commodities may overlap in shipment type, so there is some double counting.

4.1.2 North Carolina Market Growth

In June 2021, the NCSPA completed a strategic plan update which provides the base year 2021 and forecasted cargo growth by activity type including container, industrial bulk, chemicals and fertilizers and agriculture and forest products. The container forecast is provided in TEU, with the remaining types in tons. The forecast covers the years of 2022 through 2026. Table 4.1 provides details for each metric with subtotals for both the Port of Wilmington and Port of Morehead City and an overall total tonnage by year.

TABLE 4.1 NORTH CAROLINA STATE PORTS AUTHORITY GROWTH OF CARGO VOLUMES FIVE-YEAR FORECAST

Port of Wilmington	Metric	FY2022	FY2023	FY2024	FY2025	FY2026
Containers	TEUS	330,300	343,113	448,807	467,109	484,640
Industrial	Tons	162,000	272,000	332,000	392,000	452,000
Chemicals/Fertilizers	Tons	641,500	697,500	722,500	722,500	722,500
Agriculture/Forest Products	Tons	1,530,000	1,465,000	1,570,000	1,680,000	1,785,000
Subtotal		***2,333,500***	***2,434,500***	***2,624,500***	***2,794,500***	***2,959,500***
Port of Morehead City	**Metric**	**FY2022**	**FY2023**	**FY2024**	**FY2025**	**FY2026**
Industrial	Tons	605,500	686,200	714,900	728,600	742,500
Chemicals/Fertilizers	Tons	240,000	250,000	250,000	250,000	250,000
Agriculture/Forest Products	Tons	320,000	385,000	470,000	495,000	495,000
Subtotal		***1,165,500***	***1,321,200***	***1,434,900***	***1,473,600***	***1,487,500***
Total Tons		**3,499,000**	**3,755,700**	**4,059,400**	**4,268,100**	**4,447,000**

Source: Growth of cargo volumes includes whole harbor tonnage, NCSPA, Strategic Plan, page 5, June 24,2021

Container movements through the Port of Wilmington are forecasted to grow 47% by FY 2026, approaching half a million TEU. Industrial bulk and breakbulk volumes are expected to grow 179% at Wilmington moving 452,000 tons. Agriculture and Forest Products through Morehead City is forecasted to grow 55% moving 495,000 tons by FY 2026. Industrial cargo movements are also expected to grow 23% to reach 742,500 tons by 2026.

The 2021 North Carolina Ports Strategic Plan identified the following areas as the top opportunities for growth in shipments as bulk, breakbulk, Ro/Ro, oversized project cargo and containers and for growth in commodities as wood products, chemicals, phosphates, military materiel and grain.

North Carolina is actively considering offshore wind power, a sector with strong demand for project or oversize cargo, as a new industry. There is active investment in Offshore Wind development in North Carolina, with potential for the state's ports to serve as the base of construction and operations. During the construction phase, North Carolina's ports could be the focus for import and export of equipment and materials for the offshore site. Once an Offshore Wind Site (OWS) site is fully constructed, freight volumes may diminish, but the port could serve as a service base to maintain and operate the offshore facility. Finally, the presence of the large-scale facility and the state's low business costs could recruit existing and new wind power manufacturers to the state, creating increased potential for equipment exports from the state.

A January 2022 analysis by the Southeastern Wind Coalition in January 2022 projected that the construction of 2.8 gigawatts of offshore wind energy by 2030 would result in a net economic benefit for the state of $3.7 billion in a base scenario and up to $4.6 billion on the higher end. This could create between 28,500 and 32,000 jobs.

Additionally, many of the scenarios outlined employ resources and opportunities for underserved communities. As much of the state's growth takes place in its metropolitan areas, maritime investment supports continued economic growth in both metropolitan areas near ports and the state's rural areas where freight generators like agriculture, timber, manufacturing and distribution are often located.

Statewide Maritime Projections

The projected cargo activity at North Carolina's ports is based on 2017 data and 2050 projections from the FHWA FAF5.1, which estimates national and international freight activity. Since 2017, the NCSPA has had an increase in activity and port development not fully captured in the FAF projections. By 2050, North Carolina's maritime cargo tonnage is expected to nearly double, from 7.0 million tons in 2017 to more than 12.4 million tons as shown in Table 4.2. This is an overall growth of 76%, with an annual growth rate of 1.7% over the 33-year period. Import and export tonnage is expected to grow at similar rates, with imports increasing to more than 7.6 million tons and exports increasing to more than 4.7 million tons.

TABLE 4.2 PROJECTED MARITIME CARGO ACTIVITY IN NORTH CAROLINA, BY DIRECTION, 2017-2050

Direction	2017 (thousand tons)	2045 (thousand tons)	2050 (thousand tons)	Total Growth (2017-2050)
Imports	3,946	6,889	7,664	94%
Exports	3,095	4,217	4,710	52%
Total	7,041	11,106	12,374	76%

Source: FAF5.2, Note: tonnage includes whole harbor

All top imported maritime freight commodities from 2017 to 2050 are expected to increase in tonnage and value from 2016 levels, except for coal which is declining. Basic chemicals fell to second spot and are expected to grow 13% by 2050. Fertilizers jumped to the first spot for imported commodities, representing 26% of total imports. Plastics/rubber and machinery will make up 6% of the projected total value of imports in 2050, totaling more than $7.6 billion in imported trade as shown in Table 4.4.

TABLE 4.3 NORTH CAROLINA PORTS IMPORT COMMODITY PROJECTED GROWTH 2017, 2045 AND 2050

Commodities	Tons in Thousands				Value in Millions of Dollars			
	2017	2045	2050	% of Total 2050	2017 Value	2045 Value	2050 Value	% of Total 2050
Fertilizers	606	1,724	2,027	26%	$ 105	$ 292	$ 343	5%
Basic chemicals	701	935	977	13%	$ 534	$ 774	$ 821	11%
Base metals	533	775	851	11%	$ 270	$ 408	$ 448	6%
Cereal grains	271	550	597	8%	$ 46	$ 90	$ 97	1%
Plastics/rubber	220	427	478	6%	$ 445	$ 835	$ 933	12%
Nonmetallic minerals	152	354	412	5%	$ 7	$ 21	$ 25	<1%
Machinery	102	233	268	3%	$ 627	$ 1,352	$ 1,550	20%
Gravel	109	220	260	3%	$ 1	$ 1	$ 2	0%
Metallic ores	95	204	231	3%	$ 22	$ 48	$ 54	1%
Total	3,946	6,889	7,664	100%	$ 3,577	$ 6,783	$ 7,596	100%

Source: FAF5

The top maritime exported freight commodities show slower growth from 2017 to 2050, but all are expected to increase in tonnage and value as describe in Table 4.5. Wood products and newsprint/paper are projected to be the top two exported commodities by tonnage, fertilizers remain in the fourth spot with 10% of the total export volume. The top ten exported commodities make up 29% of the projected exported value in 2050 for a total of $12.4 billion a 3% increase since the previous NCSFP was released.

TABLE 4.4 NORTH CAROLINA PORTS EXPORT COMMODITY PROJECTED GROWTH 2017, 2045 AND 2050

Commodities	Tons in Thousands				Value in Millions of Dollars			
	2017	2045	2050	% of Total 2050	2017 Value	2045 Value	2050 Value	% of Total 2050
Wood prods.	1,037	1,601	1,780	38%	$ 105	$ 171	$ 192	2%
Newsprint/paper	446	757	846	18%	$ 266	$ 446	$ 498	4%
Logs	352	424	487	10%	$ 36	$ 44	$ 50	< 1%
Fertilizers	529	439	475	10%	$ 143	$ 132	$ 142	1%
Plastics/rubber	57	194	222	5%	$ 340	$ 1,046	$ 1,198	10%
Textiles/leather	112	163	188	4%	$ 294	$ 491	$ 566	5%
Other Ag Products	87	89	93	2%	$ 91	$ 94	$ 97	1%
Basic chemicals	33	68	75	2%	$ 175	$ 388	$ 426	3%
Fuel oils	60	66	73	2%	$ 17	$ 19	$ 21	< 1%
Waste/scrap	91	59	68	1%	$ 39	$ 28	$ 32	< 1%
Total	3,095	4,217	4,710	100%	$ 5,966	$10,997	$12,401	100%

Source: NCSPA 2021 and 2022, FAF5

Note: Commodities do not necessarily match between FAF5.1 and NCSPA but were reviewed for forecasting.

The following sections provide FAF projections for freight handled at North Carolina ports by freight type, followed by projections for commodities that are important to the state.

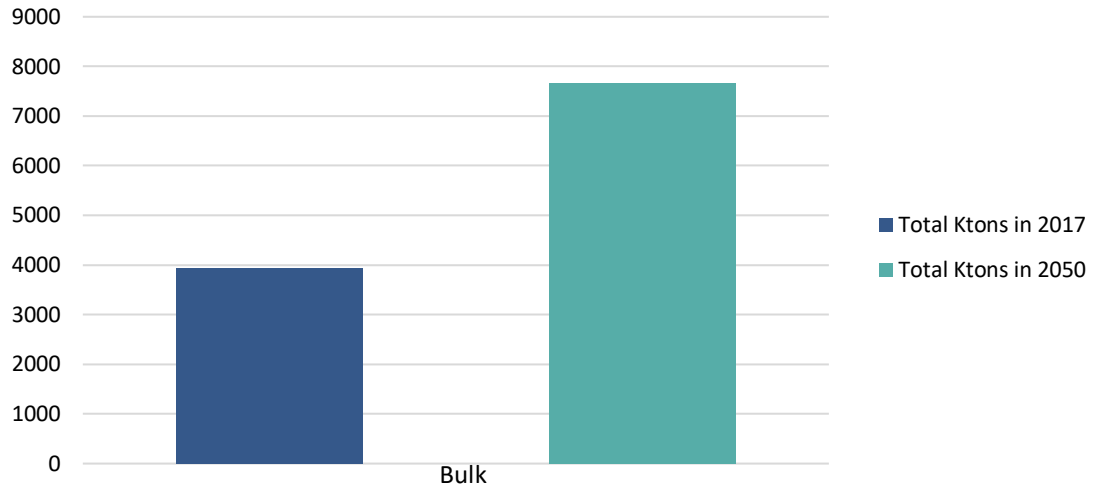
Bulk Cargo

FAF5 shows NCSPA growth forecasts for bulk commodities both in imports and exports steadily improving from FAF base year of 2017 to the forecasted horizon of 2050 and are between 95% for imports and 48% for exports as shown in Figure 4.7 and Figure 4.8. This has been a strong shift since the prior freight plan forecast and demonstrates the strong growth in bulk and breakbulk cargos that is forecasted through the

FAF data from FHWA. While these numbers do not perfectly align with 2021 NCSPA Strategic Plan, under a low growth scenario, existing bulk facilities within the regional neighboring ports could theoretically handle forecasted bulk volumes through 2050, while a more optimistic overall market demand for bulk products would require additional capacity to handle regional demand as soon as 2040. From data provided by NC Ports and FAF5 data, those projections are expected to remain on a growth trajectory and have potential to exceed previous freight plan projections.

Bulk facilities are often dedicated to a single or mixed commodity type and the imbalance between demand and capacity may be more significant for specific commodities. Bulk products are also expensive to transport on land over large distances, so ports farther from production or extraction sites may not be economically feasible alternatives unless rail or barge capabilities are readily available. Such a mismatch in location or capability and specific shipper needs would be consistent with the perception of North Carolina's agricultural shippers, that there is a shortage of regional bulk export terminals to handle their products.[44] Particularly for North Carolina, key commodities such as forestry, logs, pulp, pellets, wood chips and agricultural products are among the state's strongest bulk commodity movements. Some of these commodities are highly sensitive to differences in shipping costs. Investments to improve the landside travel times and reliability can change the relative costs between shipping locations in North Carolina's favor.

FIGURE 4.7 BULK IMPORTS THROUGH NORTH CAROLINA PORTS (KTONS)



Source: FAF5.1

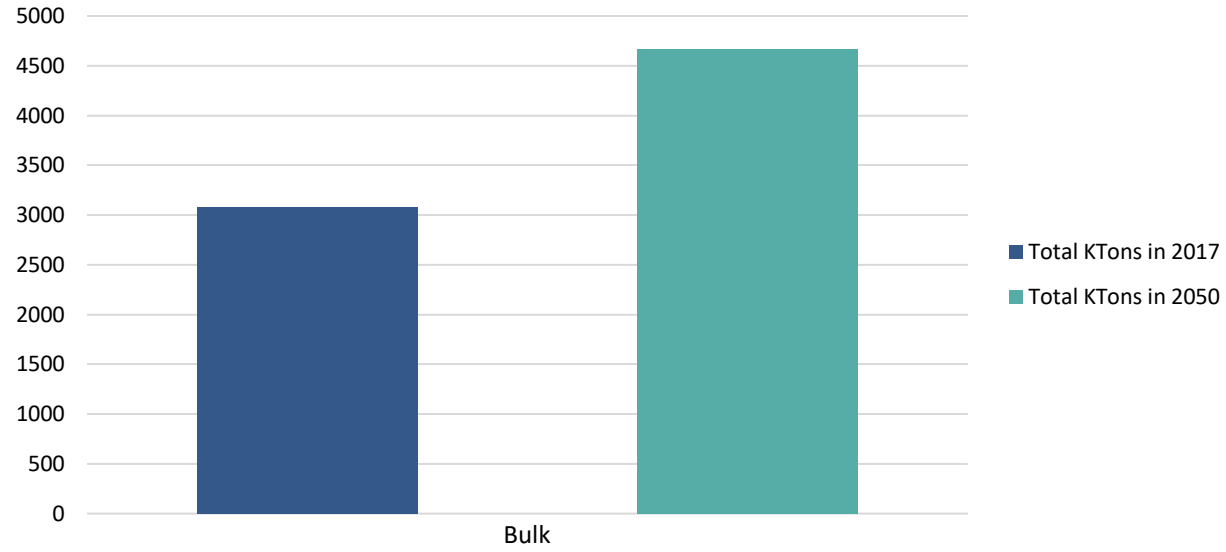
The bulk import market growth is showing a strong growth projection from 2017 through the 2050 horizon nearly doubling bulk imports into the ports. This is a very positive shift for the state as the NCSPA continue to invest in infrastructure to attract new and serve existing port customers.

Refrigerated and intermodal rail cargo are two major container markets that deserve special attention. Resources and effort must focus on continuing to grow these markets. The refrigerated market supports the strong agriculture and pork and poultry exports from North Carolina, while the rail brings inland points closer to the port.45

[44] *NCMS* agricultural shippers' workshop held August 16, 2011.

[45] *2021 Strategic Plan North Carolina Ports, NC Ports Economic Alignment, page 6.*

FIGURE 4.8 BULK EXPORTS THROUGH NORTH CAROLINA PORTS (KTONS)



Source: FAF5.1

Assuming continued growth over 2017 to 2050, bulk imports and exports may exceed identified capacity (2,220,000 tons at Wilmington and 2,730,000 tons at Morehead City) by 2050 or at minimum reach above 90% of capacity between the two terminals combined. For these reasons, the NCSPA strategic plan investments for bulk facilities and infrastructure are needed to accommodate the projected tonnages that are expected to be handled at North Carolina ports through 2050. Continued support of legacy business sectors within the state, such as wood pulp manufacturing, as well as emerging sectors, like aerospace, combined with breakbulk and project cargo aids in the expansion of North Carolina's industrial sectors and creates strong revenue on higher value commodity movements.

Breakbulk Cargo

As a generalized commodity type, breakbulk products can be handled across numerous facilities, and estimated overall capacity within the region is high, at nearly 25 million annual tons[46] across regional ports. Terminals, equipment and storage facilities can be readily adapted to handle a variety of goods that do not require special handling or storage. Where specialized equipment or storage facilities are required, the demand-to-capacity ratio may be quite different. North Carolina producers of heavy and oversize cargo have identified a need for terminals that can move this cargo.[47] Heavy or oversize goods are expensive to transport on land over long distances; therefore, ports farther from manufacturing sites may not be economically feasible alternatives.

The state has made investments in key agricultural commodities that include the state's exports of poultry, pork and seafood. Sweet potatoes also have benefitted from recent investments in cold-chain logistics which is another term for temperature-controlled warehouses or refrigerated container plugs. North Carolina is the nation's leading producer of sweet potatoes. Refrigerated products are shipped both as break-bulk on pallets or in containers with refrigerated chilling units also called "reefer containers" in the industry. Reefer

[46] 2012 North Carolina Maritime Strategy

[47] Bulk and breakbulk shippers' workshop, held October 21, 2011, 2012 North Carolina Maritime Strategy

containers manage proper shipping temperatures for commodities like produce, fruits, vegetables, meats, or processed food products. The region's growing population creates a healthy market for these products among other perishables such as flowers. These imports and continued infrastructure investments pair well with the state's existing strengths for exporting chilled agricultural products such as sweet potatoes, frozen poultry and frozen meats.

Provided that there is the requisite equipment and capacity to handle freight, relative costs are the next important driver of diversion potential. Ensuring that shippers can maintain their profit margins by removing impedances on landside access between ports and population centers may encourage higher use of North Carolina ports for refrigerated cargo.

Ro/Ro and Oversize Cargo

The state's low costs of conducting business makes North Carolina an attractive location for producers of capital goods. Moreover, the state's competitiveness in metals and machinery supports the outlook for a growing capital goods industry. Ensuring the state has the capability to handle large project cargo supports essential existing industries including local military facilities, Spirit AeroSystems, and Caterpillar. Additionally, the capacity to handle large project cargo makes North Carolina a more attractive candidate for the relocation and expansion of other capital goods producers. These are attractive industries because they purchase significant inputs from their host economies, generating larger than average multiplier effects.

Ro/Ro commodities include machinery, motorized vehicles and transportation equipment. For the purpose of evaluating available Ro/Ro capacity, the analysis focuses on these three commodities to be representative of the total Ro/Ro market. Specific requirements of heavy or oversized Ro/Ro cargo are not reflected in this analysis. This specialized segment of the Ro/Ro market would have limited available capacity across North Carolina and its neighboring ports.

North Carolina is actively pursuing a new industry, offshore wind power, due to strong demand for project or oversize cargo. North Carolina is actively investing in offshore wind development and the state ports have the potential to serve as the base of construction and operations. During the construction phase, North Carolina ports could be the focus for import and export of equipment and materials for the offshore site. Once an OWS site is fully constructed, freight volumes may diminish, but the port could serve as a service base to maintain and operate the offshore facility. It is possible the port could find a niche market serving the offshore wind energy markets on the U.S. East Coast and other potential locations. Finally, the presence of the large-scale facility and the state's low business costs could recruit existing and new wind power manufacturers to the state, creating increased potential for equipment exports from the state.

Containerized Cargo

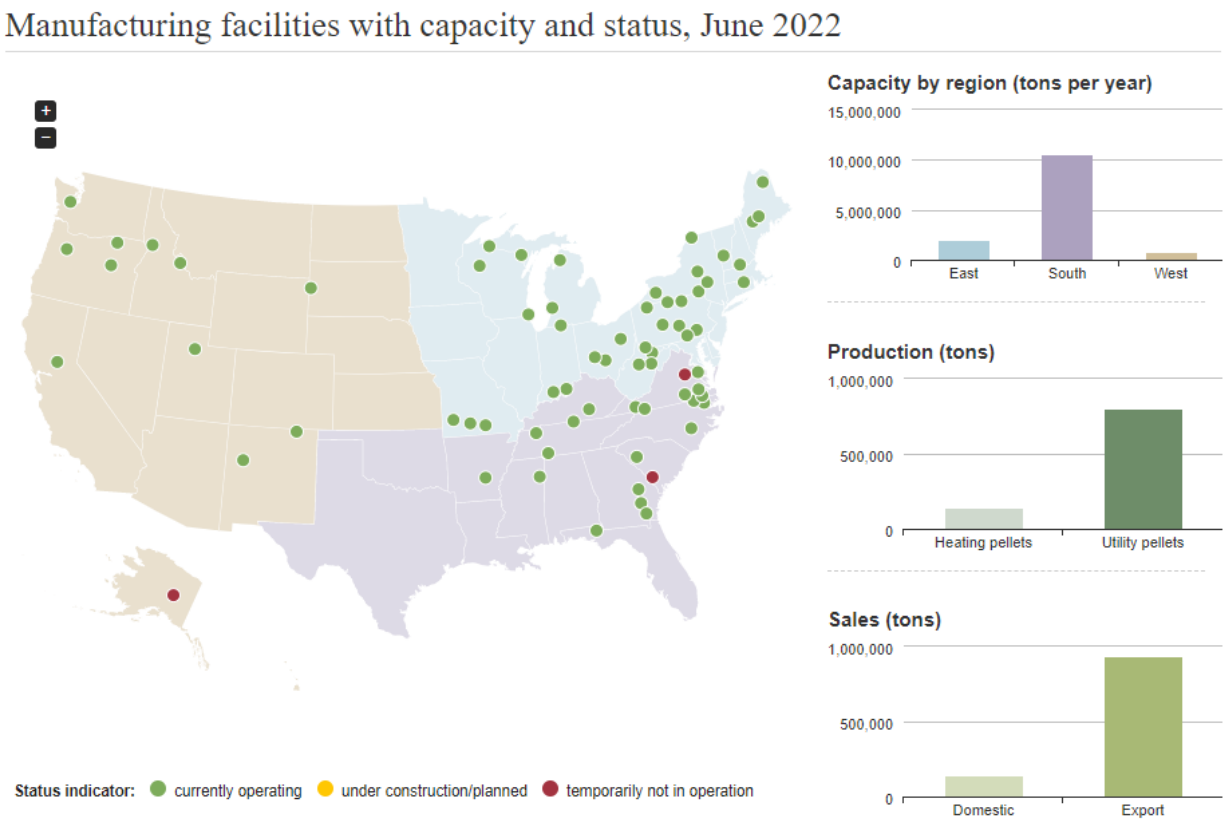
North Carolina is becoming one of the nation's most populous states and is home to several growing urban economies. Growth in container activity at the port would make North Carolina facilities more attractive ports of call for shipping lines, expanding the market reach for North Carolina producers, making it easier to secure containers and creating economies of scale. North Carolina producers that export goods by container must transport primarily by truck to the nearest port, where empty containers are available and regular overseas service by container shipping lines is provided. Cost effective delivery of containerized goods to North Carolina users and consumers of foreign products is not the sole reason that the waterborne container

market is important to the state; development of infrastructure and services to support a strong import container market will simultaneously support the competitiveness of containerized exports originating from North Carolina.

Wood Pellets

Heavy commodities such as wood and wood products are particularly sensitive to transportation costs. The wood pellets industry is driven by the United Kingdom (UK) and European initiatives to convert fossil-fuel energy sources to renewable ones. For example, in the UK, by the year 2020, 15% of energy consumption had to be from forms of renewable energy (versus approximately 1% in 2007). Electricity supply had to be 35% from renewable sources by 2020, in comparison to about 5% in 2007. This created a large market for wood biomass that cannot be met domestically. The map in Figure 4.9 produced by the U.S. Energy Information Administration (EIA) shows the existing and proposed wood pellet plants in the region as of June 2022.

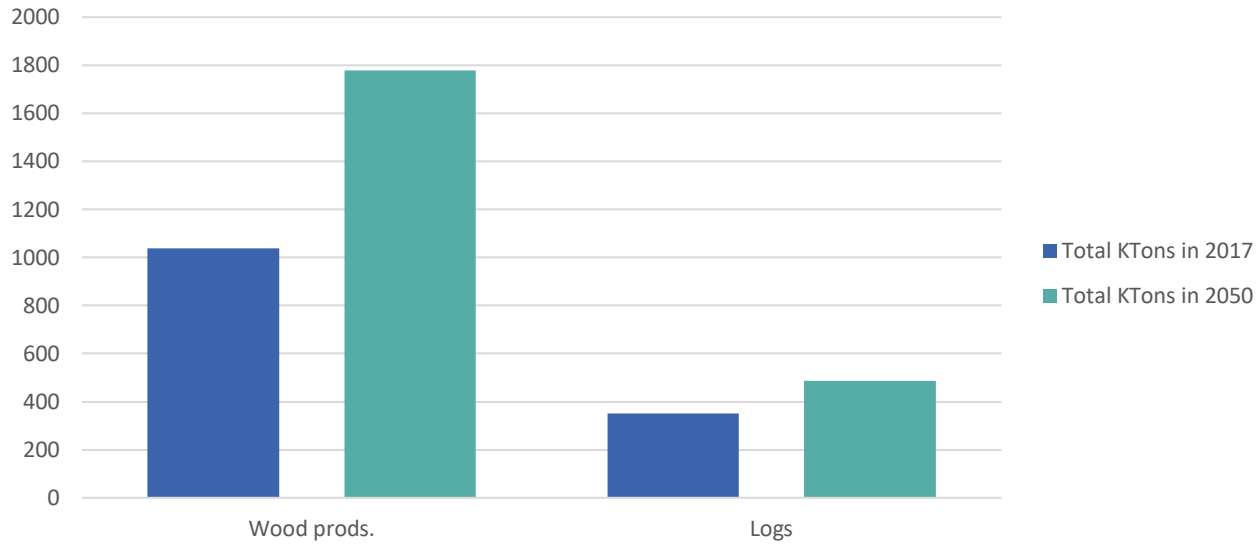
FIGURE 4.9 CURRENTLY OPERATING, UNDER CONSTRUCTION/PLANNED AND NOT IN OPERATION U.S. WOOD PELLET MANUFACTORING FACILITIES 2022



Source: US Energy Information Office U.S. Southeast, New EIA survey collects data on production and sales of wood pellets, June, 2022. Accessed from, https://www.eia.gov/biofuels/biomass/

At the Port of Wilmington, Enviva Wilmington Holdings, LLC has built two domes to store up to 45,000 metric tons each of pellets and a marine terminal for pellet export. The domes receive and store pellets from several plants that produce pellet commodities.

FIGURE 4.10 WOOD PRODUCTS EXPORTED FROM NORTH CAROLINA PORTS (KTONS)



Source: FAF5
Note: excludes NCSPA projections for 2015-2020

Chemicals and Phosphates

Chemicals are a major existing export for North Carolina's port facilities and have strong future export potential. The anchor for the state's industry, Nutrien, has a long-term contract with the Port of Morehead City for the storage and export of phosphate rock, phosphoric acid, purified acid and phosphate feed, which is used as liquid and solid fertilizers and animal feed supplements and other food and beverage products and metal treatment compounds.[48] Nutrien has potash mines in Aurora, North Carolina. The Aurora facility has a capacity of 1.2 million tons of phosphoric acid per year; the company reports that it is the largest integrated phosphate mine and phosphate processing complex at one site in the world.

The company has long-term leases on shipping terminals in Morehead City, Radio Island, and Beaufort, North Carolina, through which the company stores the Aurora facility's raw materials and finished products. Barges and tugboats are used to transport solid products and phosphoric acid between the Aurora facility and shipping terminals. According to company reports, raw materials and products, including sulfur, are also transported to and from the Aurora facility by rail.

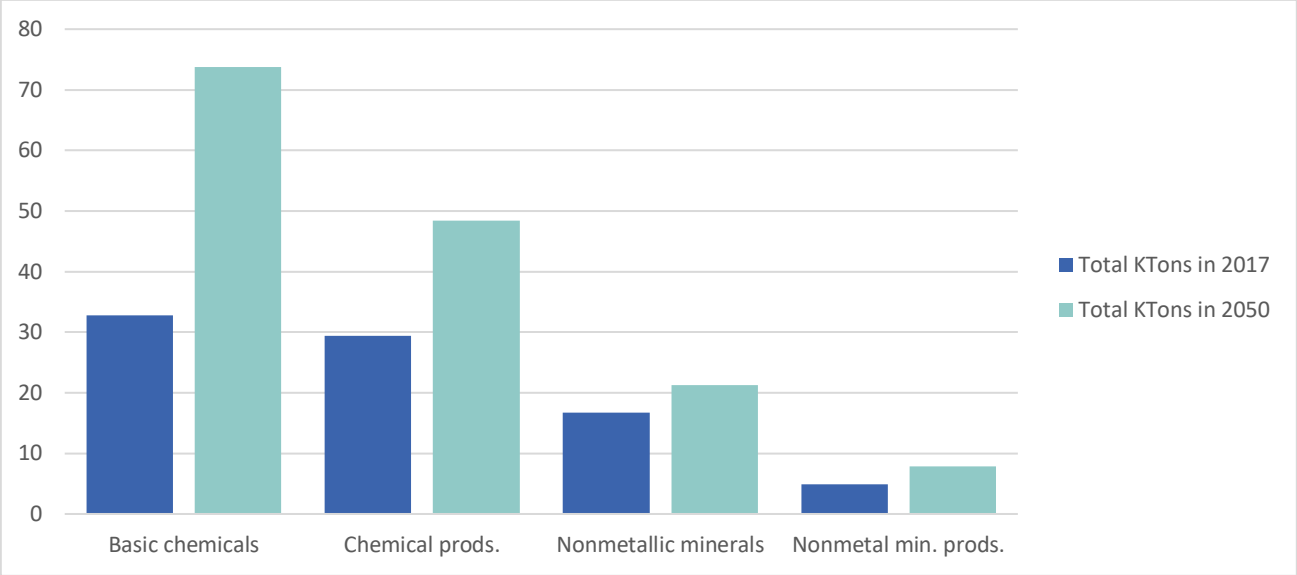
Existing reserves for the Aurora facility would permit mining for about 30 years. If deposits covered by permits are classified as resources, the mine life extends to nearly 50 years, confirming that this is a long-

[48] Nutrien, *Aurora Facilities & Investments*, http://www.potashcorp.com/about/facilities/phosphate/aurora/, accessed August 4, 2016.

term opportunity for North Carolina. State investments in pursuit of new maritime opportunities should be supportive of this existing market for export fluid.

As seen in Figure 4.11, the outlook for exported chemical and phosphate products is good through North Carolina's ports. Basic chemicals and chemical products have particularly strong growth nearly doubling exports by 2050 and a compound annual growth rate (CAGR) of 5.5%. Together, the products show a CAGR of 3.7%, indicating strong markets through 2045.

FIGURE 4.11 EXPORTS OF CHEMICALS AND PHOSPHATE PRODUCTS FROM NC PORTS (KTONS)



Source: FAF5

Military Cargo

North Carolina has the third-largest active-duty military population in the U.S. and tenth largest reserve force,[49] distributed among seven military installations and multiple U.S. Coast Guard facilities. Figure 4.12 displays some of the major military installations.

[49] Governing Data, Military Active-Duty Personnel, Civilians by State, http://www.governing.com/gov-data/military-civilian-active-duty-employee-workforce-numbers-by-state.html, Accessed 8/25/16

FIGURE 4.12 MILITARY DEPOTS AND MILITARY BASES IN THE SOUTHEASTERN U.S.

Source: North Carolina Logistics Initiative, Military Growth Task Force, Major Bases

The U.S. Military is investigating changes to its traditional equipment maintenance and reset functions to include an end-to-end Defense Logistics Organization. Challenges presented by shrinking budgets and mandated consolidation are forcing the examination of the equipment reset process, which includes redeployment of equipment from overseas; assessment for heavy or light repair; transport to inland depots in Alabama and Georgia for rehabilitation or major overhaul; and return to base, primarily in North Carolina. Through its North Carolina Defense Logistics Initiative, the North Carolina East Region Military Growth Task Force has proposed changes in the marine reset logistics to redirect North Carolina-bound equipment through North Carolina ports to eliminate several hundreds of miles of equipment transport. The ports, therefore, should be sure to have the capacity and handling capabilities of oversize cargoes.

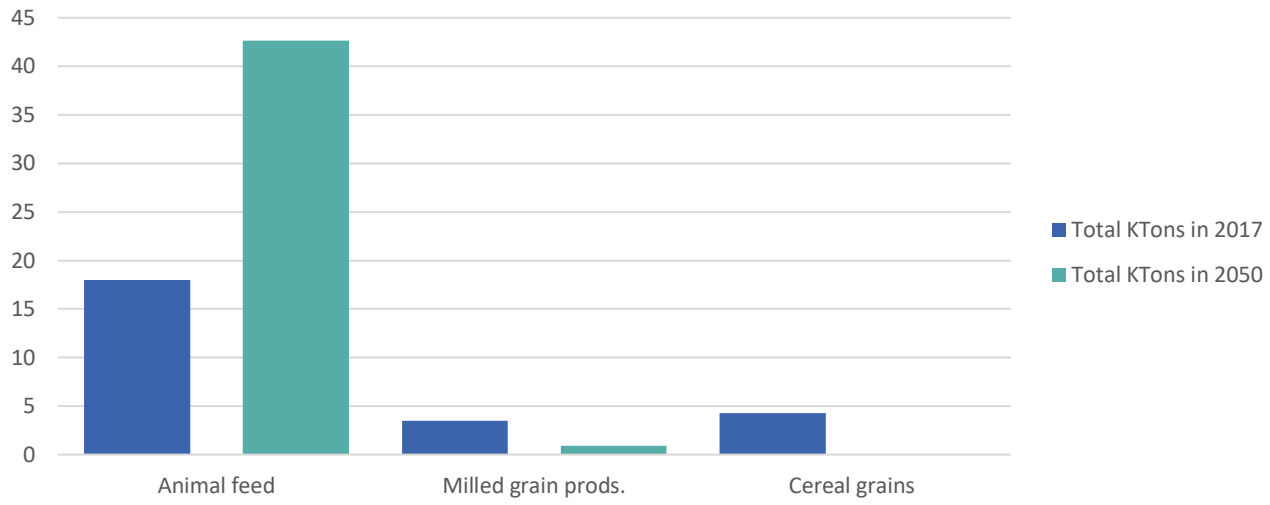
Nine Federal agencies and organizations including the Maritime Administration, U.S. Army Corps of Engineers (USACE), Surface Deployment and Distribution Command (SDDC), U.S. Coast Guard (USCG), Military Sealift Command (MSC), U.S. Army Forces Command (USFORSCOM), Transportation Security Administration (TSA), U.S. Northern Command (USNORTHCOM) and U.S. Transportation Command (USTRANSCOM) have responsibilities for support of the secure movement of military forces through U.S. ports. Together, these organizations developed a National Port Readiness Network Steering Group (NPRNSG) and a National Port Readiness Network Working Group (NPRNWG) to provide coordination and cooperation to ensure readiness of commercial ports to support force deployment during contingencies and other defense emergencies. Out of the nation's more than 300 seaports, North Carolina's Port of Wilmington and Port of Morehead City have been identified as two of the nation's fifteen Strategic Seaports capable of simultaneously handling commercial and military requirements.

Grain

Soybean exports account for 11.8% of North Carolina's agricultural exports; adding wheat and feed grains and products, the combined grain total rises to 17.4% of the state's exports and nearly $728 million for the state's economy in 2017 (Figure 4.13). As a result, market options are important for the state. A new facility recently opened at the Port of Wilmington introducing North Carolina soybean farmers to new buyers by facilitating a transloading facility that allows containerization of soybeans and other agricultural products to be loaded onto ships and exported to Asian and other markets globally. North Carolina's farmers can now load soybeans and other agricultural products directly into containers on site at the port property, opening new major trade lanes for NC Agriculture and new customers for the ports. The port negotiated a 10.5-year land lease with Scoular at the Port of Wilmington for the transload of soy and grain products

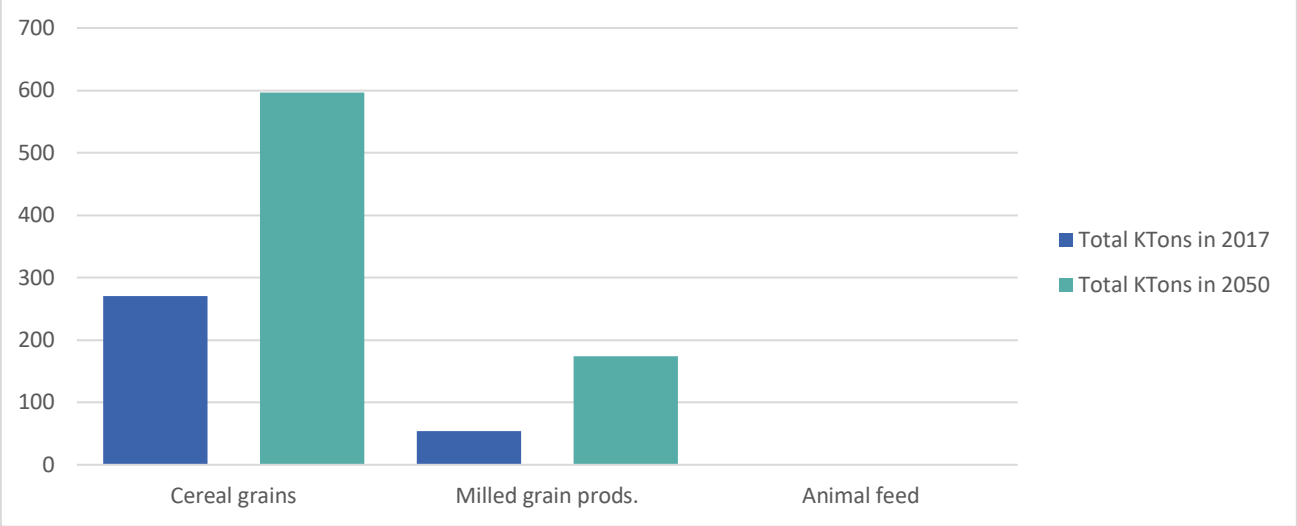
The majority of North Carolina's grain is exported out of neighboring state ports, adding to producers' costs and reducing profit margins. Some exports travel by container through Wilmington. Even a small savings in transportation cost could yield significant savings for this industry with multiplier effects for the North Carolina economy.

FIGURE 4.13 2017 AND 2050 GRAIN EXPORTS FROM NORTH CAROLINA PORTS (KTONS)



Source: FAF5
Note: excludes NCSPA projections for 2015-2020

FIGURE 4.14 2017 AND 2050 GRAIN IMPORTS TO NORTH CAROLINA PORTS (KTONS)



Source: FAF5
Note: excludes NCSPA projections for 2015-2020

4.1.3 Population Growth in North Carolina

The future activity and demand for goods through North Carolina's ports will depend on end users. Because much of the product imported through the ports is destined to stay in-state, the end users are the people who live and work in North Carolina. The populations of the coastal regions are most directly affected by the ports' activity because populations living and working there are in closest proximity to the ports and therefore most likely to use the ports. The goods produced in these regions are most likely to be reliant on imports from the ports and to use the ports to export goods across the globe. Residents and businesses in the central and western portions of the state are less reliant on the ports in North Carolina due to the accessibility to other ports (especially inland ports) in the region.

FIGURE 4.15 NORTH CAROLINA POPULATION CHANGE

2010	2021	Change
9,535,483	10,551,162	11%

Source: US Census Bureau, https://www.census.gov/quickfacts/NC

Population change is a key contributor to economic growth and transportation demand as increases in population creates demand for goods and services. In conjunction with the expanding demand for goods and services, population impacts the number of passenger and freight trips through the North Carolina transportation system. North Carolina grew its total population by 11% from 2010 to 2021 (Figure 4.15). Of the prosperity zones in North Carolina, the North Central and Southwest zones are the most populous and make up 45.9% of the population of North Carolina (23.6% and 22.3%, respectively).

4.2 Trends and Implications of Growth

4.2.1 Trends Impacting Maritime Trade

Several trends are occurring nationally and across the globe that could impact the amount and type of freight handled at the world's ports. The sections below summarize trends that could impact ports in North Carolina.

Global Move towards Containerization

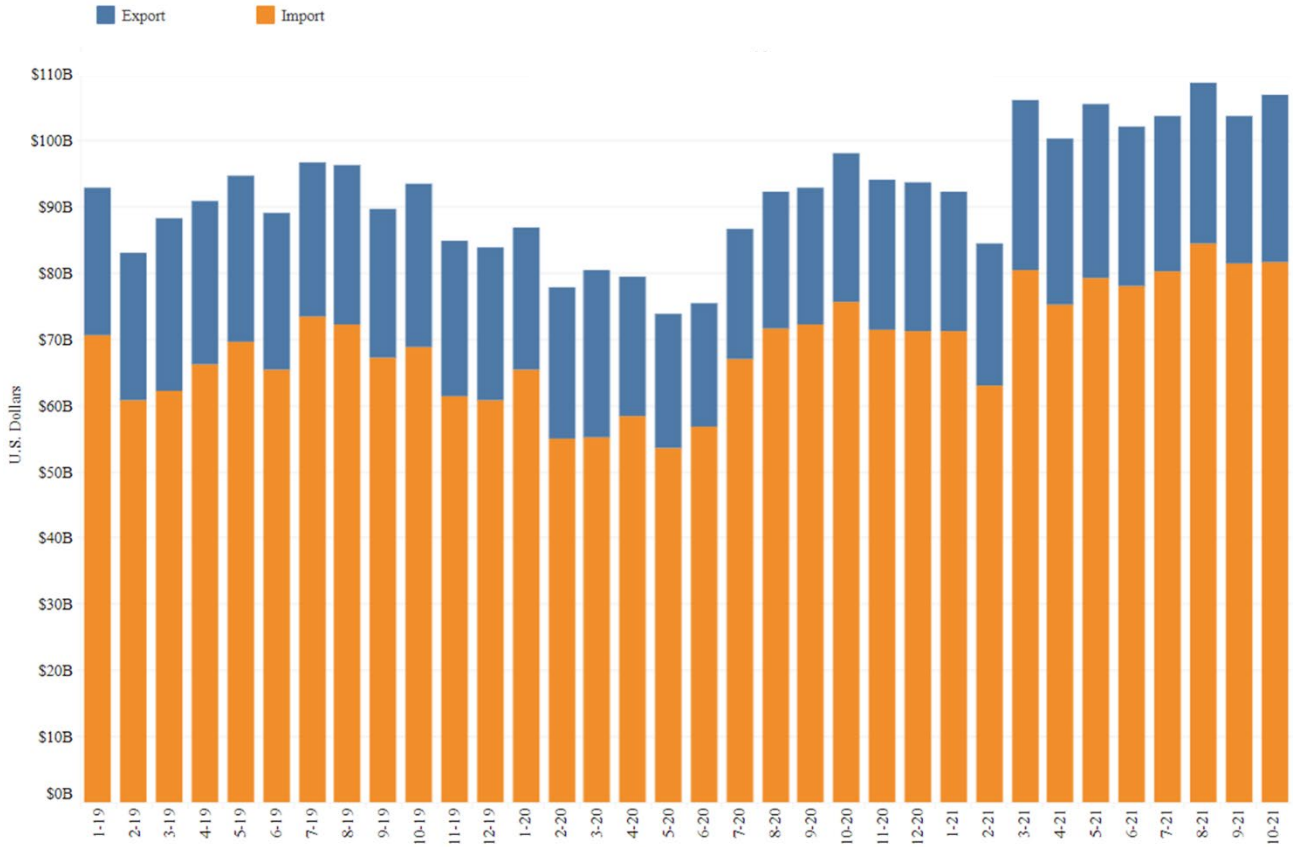
The use of shipping containers began in the late 1950s. With modest but growing container use in the 1960s and 1970s, it was not until the 1980s that fully functional container terminals began to take precedence. From 1980 onward, the use of containers to import and export goods was a true revolution in freight handling. Containers offered security of transport and logistical efficiencies that had not previously existed. The efficiency of intermodal ship to rail container cargo is even more dramatic, cutting dwell times in the port by 50% or more. With average dwell times around 15 hours per container vessel in 2019 and 2020,[50] the Port of Wilmington outshines its East Coast neighboring ports and most other leading container ports across the country providing an attractive advantage to container lines and shipper when considering market access.

Due to efficiency of handling, the use of containers has expanded beyond use for consumer goods. Containers can also reduce cargo damage and loss associated with multiple handlings of traditional bulk and breakbulk goods. Today's containerized goods include such items as furniture, auto parts, toys, computers, electronics, cotton, paper, animal feed, scrap or recycling, refrigerated food products, rices, grains, beans and bulk food products.

Figure 4.16 provided by the USDOT Bureau of Transportation Statistics describes the U.S. Overall Monthly Container Trade by Value subdivided into Imports and Exports for a nearly three-year period from January 2019 to October 2021. Growth in containerized shipments has outpaced overall freight growth in the U.S. since 2007 and continued through October 2021. International exports remain constant while imports trends toward overall growth during the 34-month period. The largest dip was seen in imports and exports during the height of the COVID-19 pandemic between March and May of 2020 but saw strong recovery for the remainder of that same year.

[50] Bureau of Transportation Statistics, Port Profiles 2022, Average Vessel Dwell Time in Hours, accessed from, https://explore.dot.gov/views/PortProfiles2022/ProfileDashboard?%3Aembed=y&%3AisGuestRedirectFromVizportal=y

FIGURE 4.16 MONTHLY U.S. INTERNATIONAL WATERBORNE CONTAINER VALUE: JAN. 2019 TO OCT. 2021



Source: USDOT Bureau of Transportation Statistics, based upon USDOC, Census Bureau, USA Trade Online, accessed from, https://data.bts.gov/stories/s/Measuring-Port-Performance/xqz2-92fw

Note: As of December 2021, Containers including trade value transported on vessel

Global Ocean Carrier Shipping Alliances

There are currently three major global shipping alliances between maritime carriers, which are constantly evolving. They include 2M Alliance, THE Alliance and Ocean Alliance. Their membership makes up nine of the top ten container shipping lines operating globally as shown in Figure 4.17. These alliances are similar to airline alliances, allowing customers to ship on a set schedule while requiring carriers to have fewer larger ships with limited sailings. With assistance from alliances, carriers can carry more cargo without having to buy additional ships to sail more routes. Figure 4.17 illustrates the annual breakdown of owned vs. chartered carriers (place on other alliance vessel) and in many cases, carriers exceed their own capacity.

FIGURE 4.17 CURRENT OCEAN CARRIER ALLIANCES

Ocean Carrier	Ships	Total TEU	Owned Ships	Owned TEU	Chartered Ships	Chartered TEU	Orderbook Ships	Orderbook TEU
2M Alliance								
1 Maersk	710	4,122,702	298	2,280,090	412	1,842,612	17	44,036
2 Mediterranean Shipping Co.	591	3,902,661	157	1,047,070	434	2,855,591	22	451,544
Total	*1,301*	*8,025,363*	*455*	*3,327,160*	*846*	*4,698,203*	*39*	*495,580*
THE Alliance								
5 Hapag-Lloyd	255	1,774,132	112	1,052,321	143	721,811	6	141,600
6 ONE (Ocean Network Express)	223	1,612,250	69	500,971	154	1,111,279	15	266,152
8 Hyundai Merchant Marine	74	750,872	28	449,074	46	301,798	6	96,060
9 Yang Ming Marine Transport Corp.	89	628,467	46	193,813	43	434,654	12	125,598
Total	*641*	*4,765,721*	*255*	*2,196,179*	*386*	*2,569,542*	*39*	*629,410*
Ocean Alliance								
3 COSCO Group (includes OOCL)	501	3,022,125	177	1,567,423	324	1,454,702	12	276,000
4 CMA CGM Group	558	3,019,469	118	1,030,328	440	1,989,141	23	354,024
7 Evergreen Line	199	1,327,918	111	639,764	88	688,154	74	703,573
Total	*1,258*	*7,369,512*	*406*	*3,237,515*	*852*	*4,131,997*	*109*	*1,333,597*
Alliances Total	*3,200*	*20,160,596*	*1,116*	*8,760,854*	*2,084*	*11,399,742*	*187*	*2,458,587*

Source: Alphaline February 4, 2021, accessed from https://ajot.com/premium/ajot-ocean-carrier-alliances-the-tripartite

Reductions in service and scheduling are a major concern for users, as paralleled by the airline industry. The restructured alliances lead to larger entities and the perception of reduced service and choices for shippers. However, regulations may be able to maintain reliability, shipper satisfaction and container flow.[51]

Following the global COVID-19 pandemic, the U.S. has turned its attention to the record profits that these shipping alliances have made in 2021. The US President and Congress are considering an Ocean Shipping Reform Act of 2022 which seeks to hold shipping alliances accountable for inflating the cost of shipping.[52]

The alliances offer an opportunity to North Carolina's ports because customers have access to all alliance-member ships, additional global routes and a broader listing of ports of call. This potentially opens the globe for import and export markets, but pricing and scheduling should be monitored as alliances change and the needs of North Carolina shippers mature.

Growth in TEU Volume and Capacity in Asia – U.S. East Coast Trade Lane

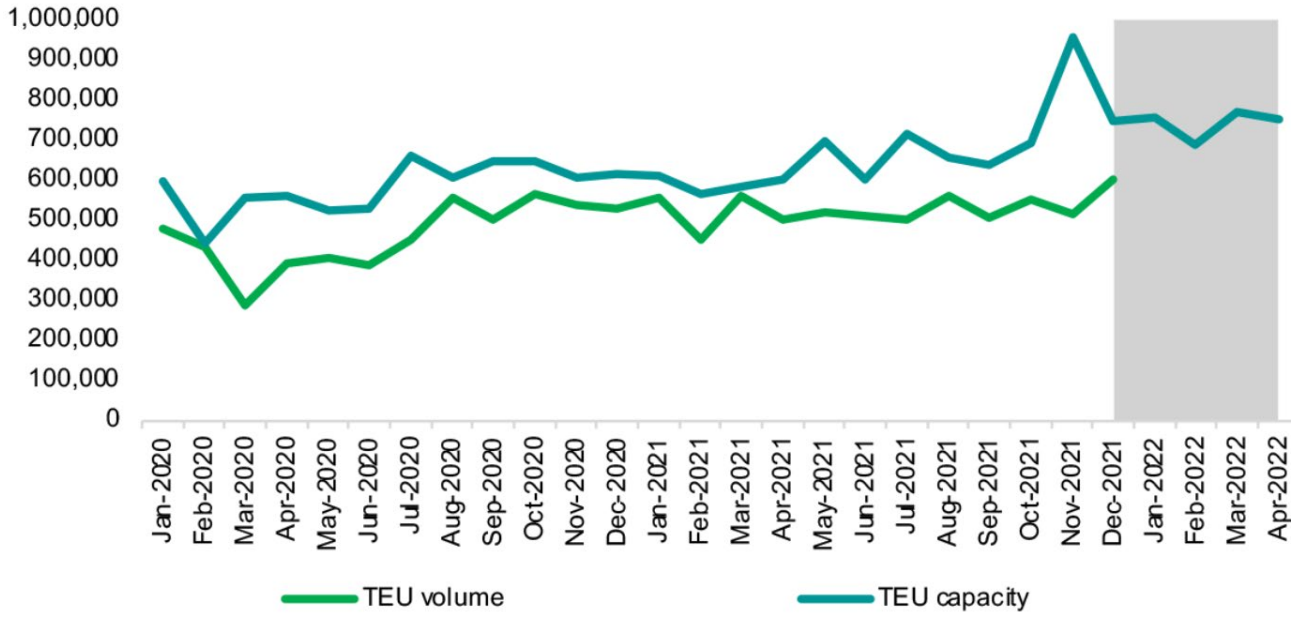
As of January of 2022, sailings to U.S. East Coast ports for the past two years have been on the rise, but capacity at these ports has risen faster than service as shown in Figure 4.18. This is occurring at the same time as record long vessel dwell time at U.S. West Coast ports, labor shortages, long haul truck driver shortages, empty container shortages and rail well car shortages. This makes for a perfect opportunity to drive continued Asia to U.S. East Coast growth. Additional vessel deployments and new routes through the

[51] GlobalTrade, "Ocean Shipping Alliances Impact U.S. Exporters", July 8, 2016, http://www.globaltrademag.com/global-trade-daily/commentary/ocean-shipping-alliances-impact-u-s-exporters, Accessed 8/24/16

[52] Biden to ocean carriers: 'The rip-off is over', American Shipper, June 10, 2022 accessed from, https://www.freightwaves.com/news/biden-to-ocean-carriers-the-rip-off-is-over

Panama Canal and Suez Canal have been placed into service are under consideration by the major alliances.

FIGURE 4.18 GROWTH IN TEU VOLUME AND CAPACITY IN ASIA – U.S. EAST COAST TRADE LANE

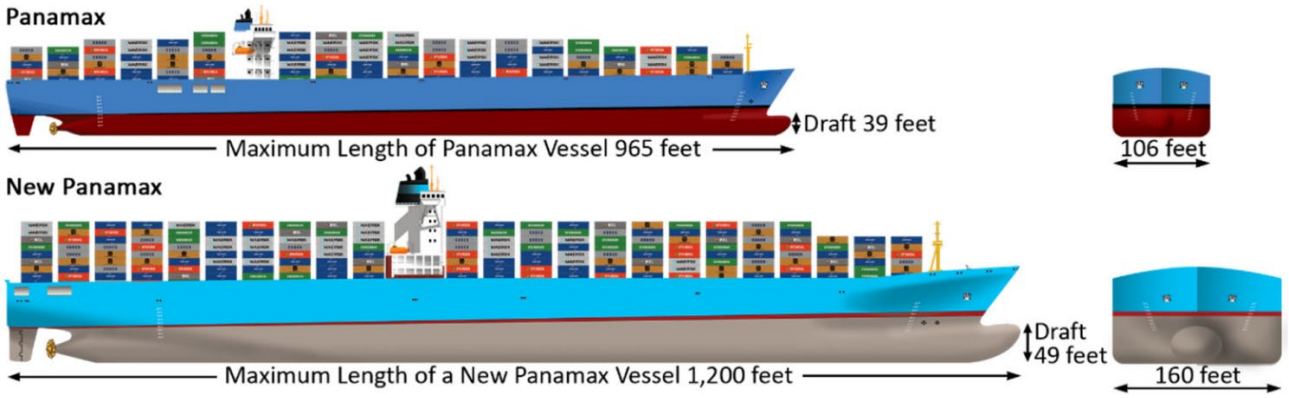


Source: IHS Markit January 2022, JOC, Container lines beefing up Asia–U.S. East Coast capacity, accessed from https://www.joc.com/maritime-news/international-freight-shipping/container-lines-beefing-asia%E2%80%93us-east-coast-capacity-eesea_20220127.htm

Implications of the Panama Canal

The expansion of the Panama Canal in 2006 created new locks allowing much larger vessels with deeper drafts, wider beams, longer lengths, and increased cargo capacity to transit from Pacific Ocean to the Caribbean Sea, Gulf of Mexico and Atlantic Ocean. These larger vessels are illustrated in Figure 4.19 on the following page. The expanded Panama Canal is enhancing the competitiveness of the all-water route between Pacific rim countries and the U.S. Gulf Coast and East Coast as shown in Figure 4.18 and Figure 4.20. There has been much debate regarding the amount of Asia-Pacific cargo that will be diverted from U.S. and Canadian west coast ports through the canal. Gulf Coast and East Coast marine ports stand to improve their share of the Asia-Pacific trade volumes, if they can prove reliable service and turn times of vessels, provide adequate crane service, container yard handling capacity and efficiency, fast inland rail and highway connections from North American production centers (for exports) to end consumer markets (for imports). Dredging deeper remains a top priority with most East Coast neighboring ports.

FIGURE 4.19 VESSEL CROSS-SECTIONS FOR PANAMAX/OLD LOCKS (TOP) AND NEW PANAMAX/NEW LOCKS (BOTTOM) MAX SPECIFICATIONS FOR PANAMA CANAL LOCKS



Source: HNTB Team design based upon Panama Canal old and new lock specifications

Today's Asia-Pacific trade routes have developed over more than two decades to provide a highly efficient gateway and corridor for containerized imports into the U.S. from China and other north Asian countries. For example, the Ports of Los Angeles and Long Beach are the nation's first and second largest container ports and together form the world's sixth largest port complex. These Southern California ports handle about 40% of all container imports into the U.S.[53] This includes more than 55% of waterborne imports destined for North Carolina.[54] The West Coast Ports have experienced major delays and have vessel dwell times more than double that of East Coast ports.

In consideration of the potential impacts of the Panama Canal on global shipping practices, the USACE Institute for Water Resources (IWR) conducted an analysis[55] to identify the potential impacts of the Panama Canal expansion on the economics of deep draft navigation projects in the U.S. The study identified factors affecting projections of volumes through Canal to the U.S. East Coast including vessel size, water transit cost, overall transit time and potential shifting of manufacturing centers from the Far East to India. IWR concluded the size of vessels that may call on U.S. East Coast ports will depend not only on the capacity of the canal, but also on ocean service alternatives that include regional specialization or a hub-and-spoke network. Either of these options would use smaller vessels (as opposed to New Panamax) to serve local markets in the southeastern U.S. IWR recommended a follow-on study to assess U.S. ports' capacity and ability to handle post-Panamax vessels to examine the key variables driving port choice and the attraction/diversion of containers to different ports. The results of this analysis could be used to prioritize USACE investments in channel deepening and dredging.

U.S. East Coast container service growth along with vessel redeployments makes a case that cargo owners desire, and liner services are considering, route diversification opportunities to U.S. East Coast markets. The

[53] Source: MARAD DS_ContainerPorts_00to15 (released 2016-03-25), loaded containers only

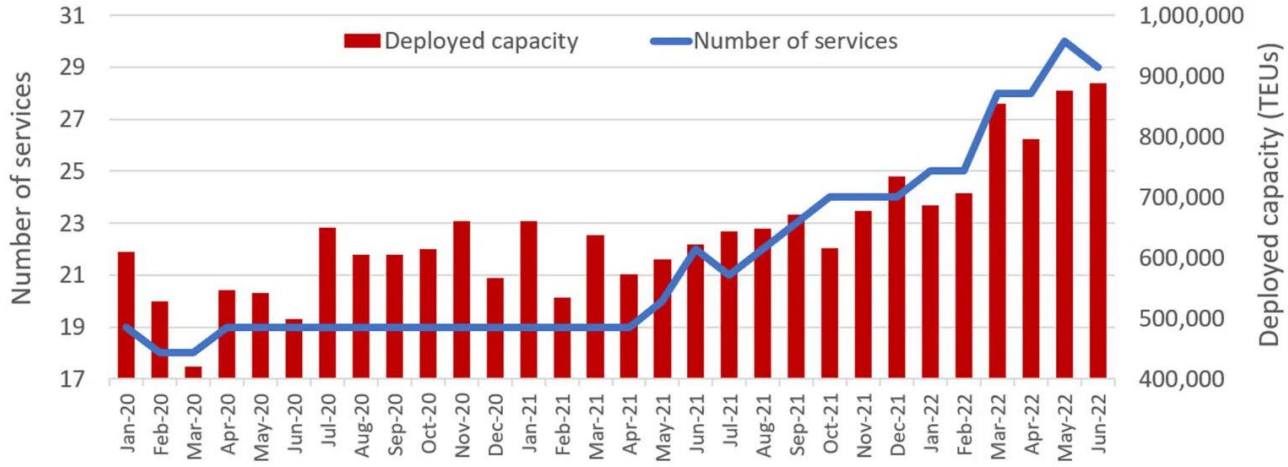
[54] Source: FAF 4.1 (and see Figure 3.14)

[55] IWR White Paper: The Implications of Panama Canal Expansion to U.S. Ports and Coastal Navigation Economic Analysis (December 2008)

number of Asia to U.S. East Coast services per month was steady at around 19 in 2020. Average growth continued through 2021, then jumped to 30 services in May of 2022, according to American Shipper.[56]

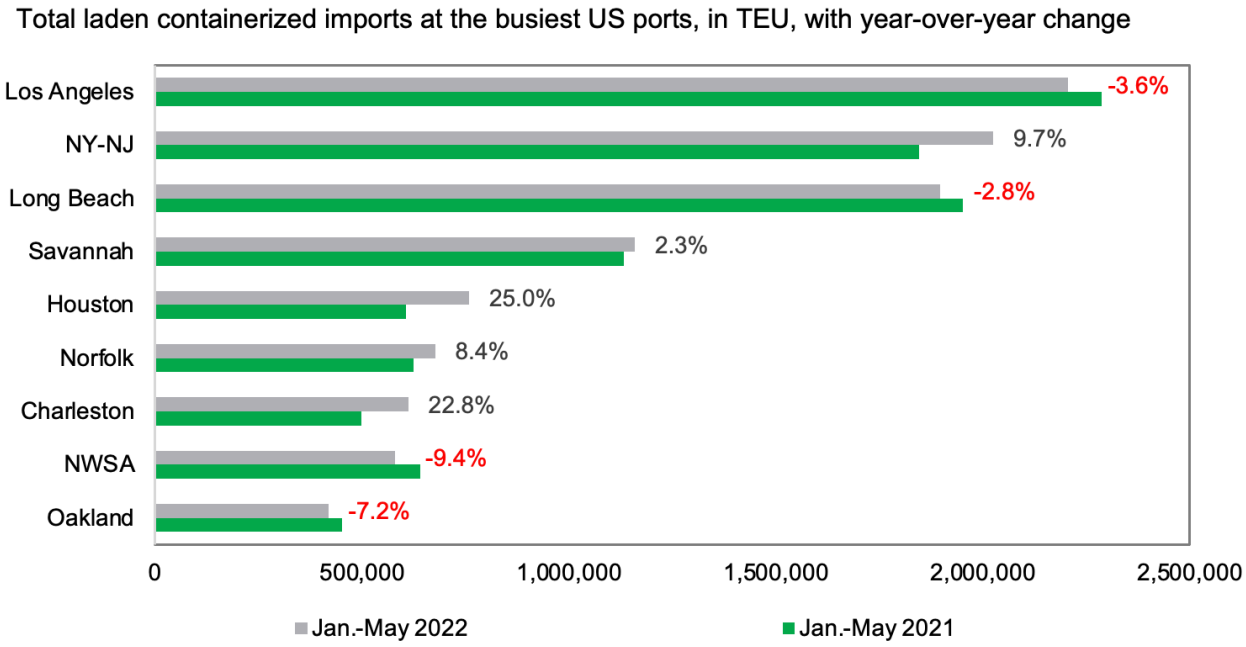
The projection for deployed capacity could reach nearly 900,000 TEUs by June 2022, which is 40% higher than the 2021 annual average and 56% higher than the 2020 annual average as shown in Figure 4.20.

FIGURE 4.20 ASIA EAST COAST MONTHLY DEPLOYMENTS FROM JANUARY 2020 TO JUNE 2022



Source: American Shipper, Chart: American Shipper based on data provided by eeSea, March 18, 2022

FIGURE 4.21 2022 U.S. EAST AND GULF COAST CONTAINER GROWTH AND WEST COAST DECLINE



Source: Journal of Commerce Online, rising volumes slowing port flow on East, Gulf coasts, July 05, 2022

[56] East Coast ports about to get slammed by a lot more ships, Greg Miller, American Shipper, March 18, 2022, accessed from, https://www.freightwaves.com/news/east-coast-ports-about-to-get-slammed-by-a-lot-more-ships

During 2022, Ports located on the U.S. East and Gulf coasts have been engaging strategies to increase efficiency, reduce congestion, and meet the increased demands container services have placed on them. There has been a surge in new business for East Coast and Gulf Coast based on the record volumes that many ports have been reporting. Several ports early in the year were reporting larger than normal numbers of vessel queuing creating a sustained backlog and challenges in finding the available capacity to move and store containers. Despite current warnings about economic constraints and increased consumer costs, spending has remained constant. Total U.S. imports have grown nearly 3% from January through May of 2022 according to container industry trade research performed by the Journal of Commerce.57 This research also described 13.1% total annual container growth in 2021 U.S. international trade. Shown in Figure 4.21 growth has been stronger for trans-Atlantic, or Panama Canal routed lines that have or are considering long-term cargo shifts from West Coast ports like Long Beach, Los Angles, Oakland, or Seattle Tacoma to the East and Gulf Coast ports. Reported volumes at East and Gulf ports are up 6.1% and 21.3% respectively, in comparison to West Coast container imports which have declined 3.5% in the leading five months of 2022. Notably the Port of Houston at 25.0% and the Port of Charleston at 22.8%.

North Carolina's ports should consider ongoing container trade shifts and continue to monitor international trade lanes as liner services continue to adjust trade lanes, routes, schedules, vessels, and alliances to and from East Coast ports that can accommodate them. For the state to remain competitive, NCSPA will need to maintain the current ship calls while seeking opportunities to serve any secondary markets that may not be accommodated at New Panamax ready ports. The projects for infrastructure improvement are critical to keeping the NC Ports competitive on the East Coast.

Reshoring of Manufacturing

There have been numerous discussions over the last few years of reshoring manufacturing back to the U.S. The reshoring has occurred as companies have realized that the benefits of offshoring production have diminished. A number of reasons have been cited as to why companies are moving facilities back to the U.S., including the following:

- New Trade Agreements with Canada and Mexico USMCA
- Cost of foreign labor has increased
- Transportation costs have eroded margins
- Congestion and delays at U.S.-Asia trade lanes
- Time required transporting products to the U.S.
- Concerns with quality at foreign locations
- Difficulty in conducting research and development at a distant facility
- Increased fuel costs in the U.S.
- Transition of vessels to natural gas and alternative fuels

[57] Journal of Commerce Online, Rising volumes slowing port flow on East, Gulf coasts, Ari Ashe, July 5, 2022, accessed from https://www.joc.com/port-news/us-ports/rising-volumes-slowing-port-flow-east-gulf-coasts_20220705.html

It is generally agreed that the manufacturing facilities that do return to the U.S. are using advanced technologies that require less labor. Many of the trends in reshoring have been with the automobile industry and durable goods (e.g., appliances), items which can be expensive to transport long distances.

According to data compiled in the 2022 Reshoring Initiative,[58] between 2010 and 2022 the Southeastern U.S. gained the most from reshoring, with North Carolina ranked second in the number of facilities and jobs gained from reshoring. The 2022 projected job growth for North Carolina is 43,881 jobs and over 105 companies locating to the state.

In addition to companies moving production facilities back to the U.S., foreign companies have also been building domestic facilities in the U.S. These include car companies, such as Volkswagen and Honda, who are taking advantage of closer proximity to customers and tax incentives. The top industries moving back to the U.S. includes electrical equipment and appliance and parts manufacturing, chemical production, transportation equipment, computer and electronic production and medical reequipment and supplies. While these companies may not necessarily be considered reshoring, it is consistent with the trend to manufacture products closer to their consumer base.

Overall, the products that are produced at re-shored facilities tend to be used domestically, as opposed to shipping overseas. Therefore, as one of the prime recipients of companies' reshoring and new foreign investment in the U.S., North Carolina may see a change in how freight is moved within the state, but it may not have a significant impact on ports in the state.

4.2.2 Opportunities for Growth in North Carolina Maritime Trade

In an increasingly global and interlinked economy, ports (air and sea) are gateways to the rest of the world. Although communication technology enabled employees in many industries to work in nearly any location, technology has yet to untether goods from the need for efficient access to seaports, nor the economy's reliance on these commodities.

Firms regularly assess their location as part of paring production costs and remaining competitive. Efficient port access for all types of goods, consumer goods as well as commodities, remains an essential element of an integrated logistics strategy. The Southeast region of the U.S. is expected to remain attractive to migrants in coming decades and to drive population growth rates above the national average.

Investments in North Carolina port facilities and associated landside infrastructure have the potential to support and strengthen the state's maritime trade by reducing import and export costs of North Carolina based shippers. The amount of North Carolina freight currently exported through out-of-state ports that could be retained for export in North Carolina is an important metric to determine the potential for greater capture of the state's trade flows and the associated reduction in shipping costs and ultimate realization of a maritime freight-focused economic development strategy.

For North Carolina, the potential benefits of maritime trade include expanded markets for North Carolina based producers via exports, which support local jobs and a diverse state economy and increased quality

[58] / https://reshorenow.org/content/pdf/2022_1H_data_report-final5.5.pdf

and choices available for consumers and business via imports, which support local competitiveness and quality of life.

In addition to the value of the exports and imports to North Carolina's economy, the presence of the port facilities attracts a variety of value-added services that support employment in industries such as trucking, rail, distribution, marine maintenance and repair services and services to facilitate the trade transaction. The port activity also attracts industries that use heavy imported goods and bulk items such as manufacturing firms that employ the chemicals and forest products imported through the marine terminals in their production process.

Distribution Centers, Foreign Trade Zones and Inland Port Developments

Regional distribution nodes, including logistic centers and inland ports, provide facilities for intermodal transfers, transloading and warehousing for waterborne goods. At present, most maritime-transported goods, both to and from North Carolina, move through seaports in other states, most notably Norfolk, Virginia, Savannah, Georgia and Charleston, South Carolina (Table 4.6).

TABLE 4.5 SHARE OF NORTH CAROLINA PRODUCTS USING ANOTHER STATE'S PORTS, 2017, 2020, 2050

2017 States	2017 Exports from NC via	2017 States	2017 Imports from NC via
North Carolina	85.3%	Florida	30.5%
South Carolina	5.5%	South Carolina	16.9%
Florida	3.3%	North Carolina	16.8%
Virginia	1.4%	Virginia	9.5%
West Virginia	0.9%	Georgia	9.1%
Tennessee	0.7%	Alabama	3.2%
2020 States	**2020 Exports from NC via**	**2020 States**	**2020 Imports from NC via**
North Carolina	79.8%	Florida	30.5%
South Carolina	6.5%	South Carolina	16.9%
Florida	5.3%	North Carolina	16.8%
Virginia	2.3%	Virginia	9.5%
West Virginia	1.3%	Georgia	9.1%
Kentucky	0.9%	Alabama	3.2%
2050 States	**2050 Exports from NC via**	**2050 States**	**2050 Imports from NC via**
North Carolina	80.5%	Florida	31.5%
South Carolina	6.6%	South Carolina	18.7%
Florida	4.6%	North Carolina	14.9%
Virginia	2.4%	Georgia	10.5%
West Virginia	1.2%	Virginia	8.3%
Kentucky	0.9%	Alabama	4.4%

Source: FAF5

One of the driving purposes of an inland port is to accommodate numerous functions of shipping that do not have to take place at or near the water's edge. In addition to consolidation of cargo, inland ports may include warehousing, cross-docking (unloading goods from incoming truck or rail units and loading them directly into outbound units with little or no storage in between), light manufacturing, truck and rail servicing and storage of chassis and containers. Inland ports also free up limited terminal backland capacity and are not limited by

gate hours of operation. With the U.S. chassis provisioning model changing due to ocean carriers get out of this aspect of shipping, involvement of inland ports in furnishing chassis may also be considered.

The aggregation of transportation assets and logistics services at a single location such as an inland port has the potential to reduce cost-to-market for manufacturers and shippers with similar transport needs. Benefits of logistics infrastructure, from road connections and airport access to industrial zoning and FTZ must be brought to the full awareness of potential users. Availability of value-added services (warehousing, distribution, handling, repackaging and consolidation) may also be seen as essential. Some of the most successful inland ports in other states, such as the Virginia Inland Port at Front Royal, serve as U.S. Customs-designated ports of entry and offer a full range of customs functions to customers.

Today, North Carolina's inland logistics centers and the value-added services available are generally underused. Discussions with logistics providers as part of stakeholder outreach in March of 2022 and the 2020 NCMS indicated that the benefits of North Carolina's six existing FTZs are not well-publicized. They suggest that successful strategies for distribution and logistics centers, including foreign trade zones, should include a coordinated marketing effort with the NCDOC. Engagement of metropolitan planning organizations (MPOs), local economic development commissions and logistics providers is important to identify and target the needs of potential users. In some locations, distribution center infrastructure (for example, local road connections and industrial zoning) is already in place, but has not been strongly marketed as part of a larger freight transportation strategy.

Building upon North Carolina's Existing Industrial Strengths

North Carolina's competitive industries are a barometer of the state's resource and technical advantages; these are industries that are sources of strength for the state's economy and future job creation. It is important that port investments support the needs of the state's most competitive port-using industries. Shift share analysis[59] was applied to identify the state's competitive industries.

Wood product manufacturing has a high location quotient and has suffered only a small negative regional shift out of North Carolina. In addition, transportation equipment manufacturing, and motor vehicle parts manufacturing have positive shift effects though small location quotients. This indicates some competitiveness, but they have not yet gained a foothold in the state's economy.

Taking Advantage of North Carolina's Cost Structure

An important element in identifying industries that might flourish or falter in North Carolina is the cost structure of the state relative to competing regions. Investments in maritime infrastructure will improve access between the state's producers and the global economy, but if the state has a high cost of doing business, businesses will still select other locations and the port investment will not foster the desired economic development. The tables below, provides a summary of North Carolina's business costs relative to other states in the region, as developed by the U.S. Tax Foundation, a nationally known economics research association.

[59] A shift-share analysis determines what portions of regional economic growth or decline can be attributed to national, economic, industry, and regional factors.

The Tax Foundation collaborated with the U.S. audit, tax, and advisory firm KPMG LLP to develop and publish a landmark, apples-to-apples comparison of corporate tax costs in the 50 states. Tax Foundation economists designed eight model firms, a corporate headquarters, a research and development facility, a technology center, a data center, a capital-intensive manufacturer, a labor-intensive manufacturer, a shared services center and a distribution center and KPMG modeling experts calculated each firm's tax bill in each state. This study accounts for all business taxes, including corporate income taxes, property taxes, sales taxes, unemployment insurance taxes, capital stock taxes, inventory taxes and gross receipts taxes. Additionally, each firm was modeled twice in each state: once as a new firm eligible for tax incentives and once as a mature firm not eligible for such incentives.[60]

Table 4.7 demonstrates that as of 2021, North Carolina has very favorable business costs. North Carolina ranks first in the nation (50 states plus the District of Columbia) in terms of new business costs and third in the nation for mature firms with approximately 10.4% rate for established businesses. After review of other neighboring states shown in Table 4.7, the next best state in new firm rankings is Kentucky, ranking eighth in the nation and Virginia ranking eighth for mature firms cost to conduct business. All other states reviewed include South Carolina, Georgia, Florida, Tennessee and Maryland, which all ranged between 15 and 18.8% of new firm rates and 14 to 19.3% of mature firm rates. In fact, South Carolina ranked worst of all neighboring states comparisons. North Carolina is advantageous for starting and retaining companies because surrounding competition cost to conduct business is much higher.

TABLE 4.6 NEIGHBORING STATE COMPARISON COST TO DO BUSINESS TAX RATES AS OF MAY 5, 2021

State	Mature Firm Rank	Mature Firm Rate	New Firm Rank	New Firm Rate
North Carolina	3	10.4%	1	7.1%
Kentucky	17	14.5%	8	12.7%
Virginia	8	12.1%	21	15.0%
South Carolina	37	19.3%	25	15.9%
Florida	14	14.0%	28	16.9%
Georgia	25	16.6%	29	17.6%
Tennessee	24	16.2%	30	18.0%
Maryland	21	15.9%	33	18.8%

Source: US Tax Foundation Updated May 5, 2021, Rankings of all 50 states and 51 (50 states plus the District of Columbia). https://taxfoundation.org/state-tax-costs-of-doing-business-2021/

Looking at individual components, including corporate headquarters, technology center, research and development, labor intensive manufacturing, distribution centers, shared services center, data centers and capital-intensive manufacturing in Table 4.8, North Carolina has a low ranking compared with neighboring states. North Carolina is attracting mature, corporate headquarters and new companies and ranks third overall in the nation. Tech centers place in the top five for mature and startup firms. Manufacturing and distribution centers are both in the top four best states in the nation for cost to conduct business in these

[60] Introduction: A Comparative Analysis of State Tax Costs on Business: Full methodological description of the Cost of Doing Business Index, accessed from, https://taxfoundation.org/state-tax-costs-of-doing-business-2021/#_ftn1

sectors. The cost of business in North Carolina is low and is a huge selling point for freight industries in North Carolina including the ports, manufacturers and distribution centers.

TABLE 4.7 TABLE OF EFFECTIVE TAX RATES IN NORTH CAROLINA BY INDUSTRY SECTOR AS OF MAY 5, 2021

Industry Sector	Mature Firm Rank	Mature Firm Rate	New Firm Rank	New Firm Rate
Corporate Headquarters	3	10.4%	1	7.1%
Technology Center	5	8.2%	3	5.4%
R&D Firm	11	8.8%	5	3.5%
Labor-Intensive Manufacturer	4	6.8%	8	6.0%
Distribution Center	4	20.6%	9	22.8%
Shared Services Center	4	15.1%	13	21.2%
Data Center	34	11.1%	21	11.6%
Capital-Intensive Manufacturer	10	7.9%	29	13.1%

Source: U.S. Tax Foundation Updated May 5, 2021, ibid

4.2.3 Industries with Regional Growth Potential

Market opportunities were also identified by considering the projected growth in the overall regional market driven by a fast-growing urban concentration in the Piedmont-Atlanta megaregion, rising demand in China and other developing countries for U.S. goods and changes in shipping patterns.

Although building on North Carolina's existing strengths is important, it is also necessary to assess what industries represent growing export markets for the region that might find North Carolina attractive and represent diversification or entirely new industries for the state. In this analysis, market opportunities are identified by both the projected volume of the trade flows to and from national ports and North Carolina ports and growth rates based on projections by FAF.

Exports

National Exports

On the national scale, coal and fuel oils top the list of commodities projected to be exported by water in 2050, followed by crude and petroleum products and cereal grains (Table 4.9). The national exports are a gauge to compare against North Carolina's exports, products that have high export tonnages nationally and/or are growing quickly, may be good candidate markets for the North Carolina Ports to consider. While many commodities are likely handled at some of the larger ports such as Norfolk and Savannah, North Carolina may be able to acquire a portion of the goods and therefore, provide a strong anchor base to operations.

TABLE 4.8 LEADING EXPORTS FROM THE UNITED STATES

Exports	Total K Tons in 2017	Total K Tons in 2050	Compound Annual Growth Rate (CAGR)
Coal N.E.C.	99,998	185,221	1.9%
Fuel oils	112,816	192,786	1.6%
Crude petroleum	51,479	139,272	3.1%
Cereal grains	84,156	126,675	1.2%
Other ag prods.	65,275	116,527	1.8%
Coal	110,170	65,197	-1.6%
Gasoline	53,617	99,372	1.9%
Basic chemicals	46,403	97,883	2.3%
Waste/scrap	36,212	103,184	3.2%
Animal feed	27,571	56,623	2.2%

Source: FAF5

Exports from North Carolina

Using data from FAF5, the commodities exported through North Carolina by water with the top ten expected CAGRs from 2017-2050 are shown in Table 4.10. Most of the commodities have low tonnages, like motorized vehicles, mixed freight, fuel oils, precision instruments and alcoholic beverages. These are possible niche markets that could be good prospects for the ports, particularly the high value products like precision instruments. The export of chemical products likely includes phosphates, which is a major export through the Port of Morehead City.

As described in the former 2017 North Carolina Statewide Multimodal Freight Plan Maritime Profile and the 2012 North Carolina Maritime Strategy, alcoholic beverages, plastics and rubber, base metals, machinery parts, wood products and food are among the major commodities for the NCSPA. Several of NCSPA's current key markets are projected to post strong growth over the next two decades. These are summarized in Table 4.10 below.

TABLE 4.9 LEADING EXPORT PROSPECTS FROM NORTH CAROLINA (KTONS)

Exports	Total K Tons in 2017	Total K Tons in 2050	CAGR
Alcoholic beverages	0.04	0.26	5.5%
Plastics/rubber	55.6	219.9	4.3%
Articles-base metal	2.4	8.6	3.9%
Motorized vehicles	19.5	61.0	3.5%
Natural sands	3.7	10.1	3.1%
Furniture	1.2	3.07	2.8%
Pharmaceuticals	0.1	0.1	2.7%
Animal feed	18.0	42.6	2.6%
Basic chemicals	32.7	73.8	2.5%
Gasoline	0.20	0.41	2.2%

Source: FAF5

In terms of tonnages exported, the list is quite different, as only two commodities are on both lists: waste/scrap and logs. Table 4.11 shows the products in which the region specializes in, such as wood chips and wood pellets, are some of the highest tonnages exported. The region also handles scrap metals, plastics/rubber and wood pulp, logs and agricultural goods. None of the commodities listed show a decline in tonnage over time, all the products demonstrate positive CAGRs, with most projecting more than 4% growth. These are products that North Carolina Ports should maintain as anchors of port operations.

TABLE 4.10 TOP EXPORT COMMODITIES FROM NORTH CAROLINA

Exports	Total K Tons in 2017	Total K Tons in 2050	CAGR
Wood prods.	1,037	1,780	1.9%
Newsprint/paper	446	846	2.3%
Logs	352	487	1.2%
Fertilizers	529	475	-0.4%
Plastics/rubber	57	222	5.0%
Textiles/leather	112	188	1.9%
Other agricultural products	87	93	0.2%
Basic chemicals	33	75	2.9%
Fuel oils	60	73	0.7%
Waste/scrap	91	68	-1.0%

Source: FAF5

Wood products are projected to post strong growth and wood pellets are expected to continue to be a major product exported from the state. Facilities are under development at both North Carolina ports to serve the UK and other places throughout Europe. Continued research suggests that European companies will continue to have demand and partner with U.S. firms to develop the capability to source additional pellets. Another export commodity with strong growth potential is plastics and rubber with a 5.0% CAGR.

Newsprint and paper products remain at the top of the list for North Carolina exports and have a 2.3% CAGR with strong potential for tonnage growth to nearly double by 2050. Logs, a traditional strength in North Carolina, is projected to grow from 2017-2050 with a CAGR of 1.2% but shows low total volumes. Fertilizer remains a large export market but is showing signs of slowing over the forecast horizon, suggesting that it has the potential to remain an anchor on the import side and new customers could provide additional export trade as well. North Carolina could still benefit if the U.S. fertilizer industry consolidated into North Carolina, but it is not a major freight opportunity for the state.

Agriculture presents another opportunity, with solid export growth projected for the region. North Carolina agricultural shippers reported that they could ship much more than they currently send, citing transportation cost as limiting access to international markets. North Carolina's agricultural exports posted solid growth, even during the recent global recession.

Imports

National Imports

On the national scale, crude petroleum tops the list of commodities projected to be imported by water in 2050, followed by machinery and nonmetal mineral products. The national imports are a gauge to compare against North Carolina's imports, products that have high import tonnages nationally or are growing quickly, may be good candidate markets for the ports to consider. While many commodities are likely handled at larger ports like Norfolk, Charleston, and Savannah, North Carolina has opportunity acquire a small portion of goods movements and continued growth in containerized freight. Goods like crude, basic chemicals, nonmetallic minerals, machinery, base metals, food products furniture and textile products are projected to be some of the leading imported products at North Carolina's ports in 2050 (Table 4.12).

TABLE 4.11 LEADING IMPORTS TO THE U.S.

Imports	Total K Tons in 2017	Total K Tons in 2050	CAGR
Crude petroleum	256,973	109,219	-2.6%
Nonmetallic minerals	29,475	89,008	3.4%
Gravel	21,095	70,772	3.7%
Machinery	21,700	54,956	2.9%
Base metals	34,033	53,635	1.4%
Fuel oils	57,384	44,378	-0.8%
Other food products	19,546	41,429	2.3%
Fertilizers	15,834	41,272	2.9%
Textiles/leather	15,348	40,028	2.9%
Gasoline	39,903	34,848	-0.4%

Source: FAF5

Imports to North Carolina

According to NCSPA data, the following commodities have consistently ranked among the top commodities handled at the facilities in recent years: sulfur, metal products, rubber, scrap metal, chemicals, fertilizers and

ores and minerals. Several of NCSPA's current key markets are projected to post strong growth over the next three decades.

The commodities imported through North Carolina by water with the top ten expected CAGRs from 2017-2050 are shown in Table 4.13. Similar to exports, the majority of the commodities had low tonnages in 2017. Leading commodities on the imports list include fertilizers, which are also on the exports list, indicating the state is importing goods, providing value-added services and sending them out as higher value products. Natural sands, milled grain products, precision instruments, waste materials and scrap, electronics and textiles products are among the leading import prospects to North Carolina from 2017 to 2050.

TABLE 4.12 LEADING IMPORT PROSPECTS TO NORTH CAROLINA

Imports	Total K Tons in 2017	Total K Tons in 2050	CAGR
Fertilizers	606	2,027	3.7%
Natural sands	0.5	1.5	3.7%
Milled grain prods.	54	174	3.6%
Precision instruments	3	10	3.5%
Waste/scrap	4	12	3.4%
Electronics	33	98	3.3%
Textiles/leather	28	80	3.2%
Transport equip.	1.5	4	3.1%
Other foodstuffs	41	111	3.1%
Furniture	39	107	3.1%

Source: FAF5

In terms of tonnages imported to North Carolina, the list is somewhat different, with three commodities making both lists: fertilizers, other food products and textiles/leather. Table 4.14 shows the products that the region depends on, leading with fertilizers and basic chemicals. The region imports high volumes of rubber to serve the automotive industry and the numerous tire manufacturers in the region. Seven out of 10 products show CAGRs of over 2.4%, with the highest at 3.7% growth, indicating that most commodities imported through the ports are expected to remain market strengths in the state for the foreseeable future.

TABLE 4.13 TOP IMPORT COMMODITIES TO NORTH CAROLINA

Imports	Total K Tons in 2017	Total K Tons in 2050	CAGR
Fertilizers	606	2,027	3.7%
Basic chemicals	701	977	1.0%
Base metals	533	851	1.4%
Cereal grains	271	597	2.4%
Plastics/rubber	220	478	2.4%
Nonmetallic minerals	152	412	3.1%
Machinery	102	268	3.0%
Gravel	109	260	2.7%
Metallic ores	95	231	2.7%
Articles-base metal	140	220	1.4%

Source: FAF5

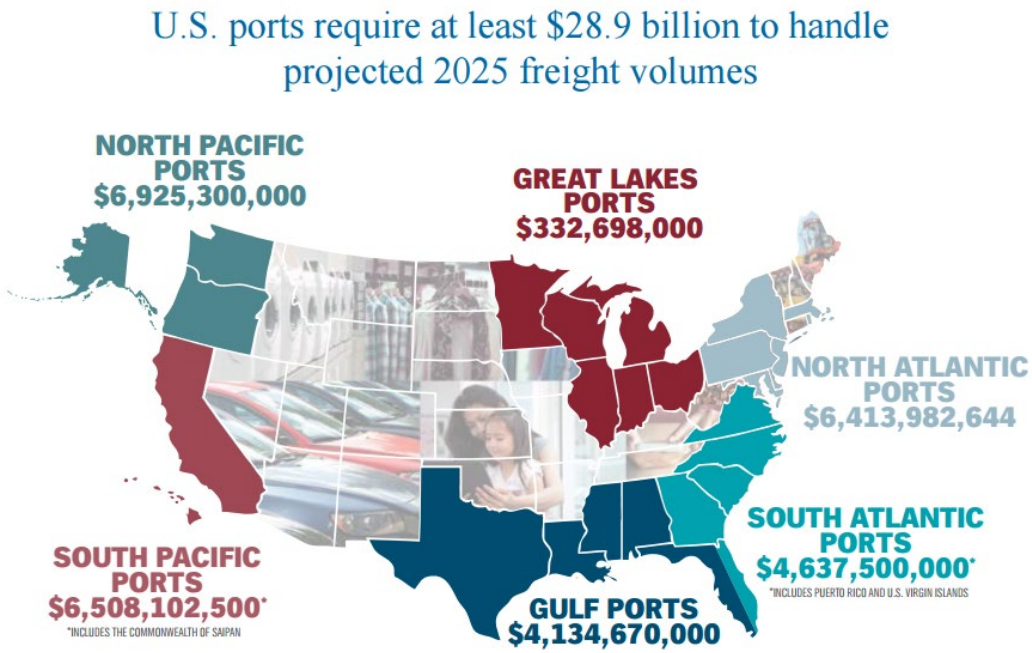
5. NEEDS ASSESSMENT

North Carolina's maritime industry development strategy must address not only current needs, but also projected trends. Improvements at neighboring ports will influence the actions necessary to remain competitive or complementary. The upward trajectory of U.S. freight volumes will put pressure on North Carolina's maritime facilities, while also providing economic opportunity. The varying needs and issues that should be considered in future improvements are analyzed in this section.

5.1 Infrastructure

Across the U.S., ports compete for a market share of waterborne freight and staying competitive requires maintaining and upgrading infrastructure. In 2015, the American Association of Port Authorities published the State of Freight, a report based on a survey of their 83 U.S. public port members focusing on port surface transportation infrastructure. Projections to 2025, estimated that South Atlantic ports would require $4.6 billion worth of infrastructure improvements to meet the projected freight demand (Figure 5.1). In 2019, AAPA urged USDOT and the federal government to support even larger identified national maritime infrastructure needs of $32 billion.

FIGURE 5.1 U.S. PORT INFRASTRUCTURE NEEDS TO SERVE PROJECTED 2025 FREIGHT VOLUMES



Source: http://aapa.files.cms-plus.com/StateofFreight_Report_final.pdf Accessed 8/8/2016.

The USACE has focused on port infrastructure needs because of their role in sustaining minimum channel depths. For instance, in consideration of the potential impacts of the Panama Canal on global shipping practices, the USACE IWR conducted an analysis to identify the potential impacts of the Panama Canal expansion on the economics of deep draft navigation projects in the U.S. The study identified factors affecting projections of volumes

through the canal to the U.S. East Coast including vessel size, water transit cost, overall transit time and potential shifting of manufacturing centers from the Far East to India. IWR concluded the size of vessels that may call on U.S. East Coast ports will depend not only on the capacity of the canal, but also ocean service alternatives that include regional specialization or a hub-and-spoke network. Either of these options would likely employ smaller vessels (as opposed to Neo Panamax) to serve local markets in the southeastern U.S. IWR recommended a follow-on study to assess U.S. ports' capacity and ability to handle Post-Panamax vessels, to examine the key variables driving port choice and the attraction/diversion of containers to different ports. The results of this analysis could be used to prioritize USACE investments in channel deepening and dredging, but this study has not been undertaken.

5.1.1 Future Supply-Side Improvements at Neighbor Ports

With the prior national and U.S. East Coast assessments, neighboring port investment plans for the Port of Virginia, Port of Charleston and Port of Savannah are considered in this section; followed by a discussion of NC ports.

Port of Virginia

Expansion of container operations is planned for in Hampton Roads harbor by reclaiming the eastern part of Craney Island. It has been fully permitted, including the planned deepening to 55 feet. When completed (between 2028 and 2040), it will be a semi-automated container terminal serving nearly 50% of the port's container volumes. Both CSX and NS will have on-dock rail access expanding from 350,000 to 628,000 railed TEUs accomplished by the Port of Virginia Gateway project that extends the Commonwealth Rail Line. The new terminal is expected to open in 2028 with a planned buildout in 2043 to handle approximately 10 million TEUs per year. Further improvements at the Port of Virginia include completion in 2017 of a second Midtown Tunnel that accesses Portsmouth Marine Terminal. Also, the Virginia International Gateway shall be expanded from 231 to 291 acres, funded by the owners as a condition of the renegotiated lease with the port. Cost estimates for the expansion are given below.

• Offshore Wind Hub at PMT	$200 M
• 55 ft Channel Deepening	$350 M
• Central Rail Yard NIT Rail Capacity 350K-610K	$900 M
• North NIT 800,000 TEU Lift Capacity (8 STS)	$650 M
• Hampton Road Bridge and Tunnel	Unknown
• **Total for FY2020 – FY2025**	**$1.3 B**

Port of Charleston

South Carolina's Ports invested more than $2 billion in the past decade to enhance infrastructure, ensuring the Port of Charleston can handle mega container ships and accommodate cargo growth. SC Ports opened the Hugh K. Leatherman Terminal in March 2021, marking the first greenfield container terminal to open in the U.S. since 2009. The terminal is 117 acres and was completed in 2020 with an annual capacity of 628,000 TEUs; if the market demands it, the terminal can ultimately expand to handle 1.4 million TEUs per year. The Charleston Harbor Deepening Project is well underway to achieving a 52-foot depth in 2022, making Charleston the deepest harbor on the East Coast. SC Ports continually invest to add capacity and increase efficiency, including the ongoing modernization of Wando Welch Terminal and the expansion of Inland Port Greer. Costs for the various projects are given below.

• Hugh K. Leatherman Terminal	$727.6 M
• Wando Welch Terminal Improvements	$307.4 M
• Inland Ports	$ 53.3 M
• New Corporate Headquarters	$ 42.9 M
• Ridgeville Industrial Campus	$ 23.5 M
• All Other Terminal Improvements	$ 74.3 M
• **Total for FY2017 – FY2021**	**$1.229 B**

Port of Savannah

The Georgia Ports Authority has installed eight neo-Panamax cranes to help Savannah compete for the growing container market on the East Coast. GPA recently purchased 36 ship-to-shore cranes. Supporting the GPA expansion plans and after more than six years of dredging the Savannah River, the SHEP was completed in the first quarter of 2022. The $973 million project deepens the 32-mile channel from 42 feet to 47 feet. The port has a 1,500-foot turning basin and harbor depth of 47 feet and an outer harbor depth of 49 feet MLLW. GPA plans to expedite $500 million in capacity expansion projects over the next 5-years which includes a $200 million dollar expansion of the Garden City container terminal. The goal is to expand TEU capacity from 6 million planned to 9.5 million by 2025. GPA is expanding Port of Brunswick as well with $167 million dollar expansion of Ro/Ro cargo facilities to expand its market share of autos, cars, trucks and equipment trade. Cost estimates for the expansion are given below.

• Deepening Project 47 feet - Completed in 2022	$973 M
• Garden City Terminal Improvements	$200 M
• TEU capacity expansion - 5.4 million to 6.8 million	$305 M
• Port of Brunswick Ro/Ro	$167 M
• *Additional unidentified investments*	$1.3 B *(not in total)*
• **Total for FY2022 – FY2032**	**$1.645 B**

5.1.2 North Carolina

North Carolina's infrastructure must serve waterborne freight aligned with the state's vision, port area needs and statewide transportation infrastructure needs.

North Carolina's transportation infrastructure plays a critical role in attracting and retaining businesses, while connecting people to jobs, healthcare, education and recreation. Transforming North Carolina ports is one of the key elements of the state's vision. The objectives outlined in the vision are listed below:

NC Ports Objectives:

- Include a recommendation in the Army Corps of Engineers Chief's Report to deepen and widen the channels to support movements of the newest generation of shipping vessels
- Expand intermodal train service at the Port of Wilmington
- Continue to develop intermodal facilities along the I-95 corridor to support freight shipping

- Leverage public-private partnerships to complete the development of Radio Island, off-shore wind energy and support landside improvements in interstate quality connections
- Enhanced rail access to the Port of Morehead City

Additionally, the North Carolina Ports 2021 Strategic Plan identified a number of needed infrastructure investments that were either underway or under consideration. Most recently, North Carolina Ports opened an expanded refrigerated container yard in 2020, resulting quickly in record volumes of shipping, and demonstrating the need for more refrigerated capacity in the near term. A partnership between Duke Energy-Progress, North Carolina Ports and the state raised Duke Power lines over the Cape Fear River to allow for the largest ships on the East Coast to call on North Carolina ports. Most recently, the Wilmington Harbor Navigation Improvement Project received conditional authorization and inclusion in the federal Water Resources Development Act of 2020.

NC Port Needs:

Based on current operations, the existing facilities supporting the maritime industry in North Carolina need improvements to continue and improve service offerings. From the inventory discussed in Section 2 and the demand discussed in Section 3, the following needs and issues have been identified.

TABLE 5.1 NORTH CAROLINA PORTS INFRASTRUCTURE NEEDS ASSESSMENT

Port of Wilmington[61]	Port of Morehead City[62]
On-site: • Wilmington Harbor Channel deepening from 42 feet to 47 feet • Ship-to-Shore Cranes 12-16 modification or replacement • New intermodal rail transfer facility (ICTF) (including implementation of RPMs • North Gate & Inland Road Improvements: New North gate • Container yard paving • Expanded Reefer plugs and refrigerated facility • Warehouse System Automation, • Environmental Management System • U.S. 74 & U.S. 70 to highway standards • East Wheeled yard expansion	**On-site:** • Further develop Radio Island Improvement • New warehouse north of A-Frame building • Purchase a rail loader • Warehouse System Automation • New Warehouse • Replace aging warehouses and transit sheds • New Gate to North terminal • Increase building setbacks near lower-numbered berths (for better rail access, crane movement) • Purchase a rail loader • Environmental Management System
Roads: • U-5734, South Front Street improvements • U-5729, Carolina Beach Road Improvements • U.S. 74, U.S. 70, U.S. 421 • Retrofit on-ramp from northbound U.S. 17/421 onto I-140 for safety • CF Memorial Bridge replacement • CB and South Front Street improvements • Pursue select STIP projects	**Roads:** • Redesign intersection at Port's main gate (Arendelle St / Port Terminal Rd) to reduce and/or eliminate oversized trucks' maneuvering issues upon exit that require blocking of on-coming traffic to complete a turn • U-2876, Newport River Bridge (and Radio Island interchange)
Rail: • ICTF listed above On-site • Expand container yard to service longer intermodal trains, adding trackage • Wood Yard East Rail Storage Track	**Rail:** • Radio Island Rail Improvements • Study at-grade crossings for identifying improvements, reducing their numbers and prioritizing implementation.

North Carolina's State Transportation Improvement Program (STIP) includes funded projects totaling $11.5 billion (highway construction plus right-of-way acquisition) to be implemented over the next seven years. Key projects currently funded in the STIP that will improve overall freight mobility within the freight corridors identified in section 2.4.2 include the following:

- Widening and upgrade of interchanges on I-95 from I-95 Business to I-40 in Cumberland, Harnett and Johnston counties [I-4745A]
- Widening of I-26 from U.S. 25 to I-40 in Henderson and Buncombe counties [I-4400, I-4700]
- Construction of the U.S. 74 Rockingham-Hamlet Bypass in Richmond County [R-3421]
- Additional upgrades to bring portions of I-73 / 74 to interstate standards between Rockingham and Greensboro [R-2606, I-5110]

[61] Interview with NCSPA on 3/21/2022

[62] Interview with NCSPA on 3/21/2022

- Construction of the U.S. 70 Bypass of Havelock, Craven County [R-1015]
- Construction of the U.S. 70 Bypass of Goldsboro, Wayne County [R-2554]
- Additional capacity and safety enhancements on U.S. 74 in Mecklenburg County [U-2509A]
- Upgrade south end of Chowan Bridge to U.S. 17 Business, Bertie, Chowan counties [R-5731]
- U.S. 17 widening from New Bern to just south of Williamston in Beaufort County [R-2510]
- Replace Bridge 060043 over NS Railroad in Beaufort County [B-5302]
- Widen and improve Newport River Bridge Morehead City to Beaufort [U-5740]
- Four lane divided Wilmington Bypass from U.S. 17 to I 140 in Brunswick and New Hanover counties [R-2633]

Implementation or acceleration of these projects would benefit the movement of North Carolina's waterborne goods.

5.2 Institutional and Regulatory

Beyond investments in maritime-supporting infrastructure and operations, realization of maritime growth opportunities also depends upon the implementation of supportive institutional strategies and regulatory policies. This section outlines a number of recommendations for maintaining and growing port traffic through agency and public cooperation and directives.

5.2.1 Port Funding

NCSPA owns and operates its terminals and facilities. The primary source of revenues to NCSPA is from these operating activities; however, NCSPA has received grants and aid from the State of North Carolina to support its capital expansion program. NCSPA has also been the recipient of federal grants to support capital investments, primarily security related. No state or local funds or tax revenues are used to support operations.

Maritime infrastructure is capital-intensive and increasingly requiring project sponsors to assemble funding from multiple sources to meet maintenance and expansion needs. Given the multimodal nature of goods movement infrastructure and its many beneficiaries, numerous funding options need to be explored for federal, state and local participation. Several federal grant and loan programs that should be evaluated to support maritime infrastructure investment include the following: NEED TO ADD ACRONYMS TO LIST - PIDP, INFRA

- Port Infrastructure Development Program (PIDP) is a discretionary grant program administered by the U.S. Maritime Administration
- MARAD's Marine Highway Grant Program
- Port Security Grant Program, FEMA
- Infrastructure for Rebuilding American (INFRA) Grants, USDOT
- Grants from the U.S. Departments of Homeland Security, Agriculture and Transportation.
- Federal cost-sharing for navigational improvements is available through the USACE.
- U.S. Department of Defense funding to support investments that benefit U.S. military institutions and strategic seaports.

- U.S. Economic Development Administration support for public works and developments to help distressed communities attract new industry and diversify local economies.

Private investment opportunities and benefit capture strategies should also be leveraged. Direct investments by railroads, user fees, sale/leaseback of rail assets and public-private partnerships are all potential means for funding maritime investments that have demonstrated private benefit.

5.2.2 Comprehensive Maritime Vision and Marketing Plan

An organization's marketing strategy is first defined by its mission; a statement of what the organization is and does. A clear and unified mission and vision is paramount to advancing North Carolina's maritime industry. Other regional ports are perceived to have realized a closer alignment between overall state vision and the goals of host communities, yielding successful partnerships that benefited both the host communities and the ports. A joint economic development and marketing plan, such as has been developed by the South Carolina Ports Authority in collaboration with the City of Charleston, would demonstrate broad-based support for a single mission.

Through a collaborative marketing and economic effort, the state, the ports and the port community can advance a single mission, leveraging resources and providing a unified message to potential relocating firms that need reliable port access, to ocean carriers whose competitive service must be supported by complementary port and landside infrastructure and to landside transportation providers who seek cargo volumes that can justify their own capital and operating investments. Such collaboration could not only support growth for existing port users and facilities, but may also encourage growth at Radio Island, where there is ample space for port development but contention with the local community. A comprehensive vision for the ports should include Radio Island if the NCSPA hopes to take advantage of the island's proximity to port and developable space.

5.2.3 Greater Collaboration Among the State's Various Marketing and Operating Functions Could Raise the Port's Profile in the Market

Involvement of industry and industry stakeholders was an important element of the 2021/22 Freight Plan and provided valuable input. Stakeholder expressed a willingness and desire to provide input to the strategic direction in support of North Carolina's ports and maritime industries advising on critical transportation improvements to include in this freight plan update and associated Seaport Profile. In addition, DOT staff, port staff, and residents agreed that greater interaction and understanding of port operations helps to strengthen relationship between the NCDOT, NCSPA, supporting freight industries, and the port communities.

5.3 Community and Environmental

5.3.1 Community

The relationship between the ports and their surrounding communities is complex. The ports support vital economic interests with local as well as geographically far-reaching effects. On the local level, a fine balance has been developed over time between the economic benefits of the port and burdens which are borne by the local community including competing land uses, traffic congestion, noise and visual effects. The NCSPA endeavors to

maintain a positive relationship with the local community and often sponsors local events such as the North Carolina Seafood Festival. The NCSPA has a communications department that is responsible for maintaining communications with the community through press releases and social media, as well as providing tours of port facilities. As the Port of Wilmington and the Port of Morehead City continue to grow, it will be increasingly important for the ports to maintain good community relations by expanding partnerships with local businesses, organizations and the general public.

According to the NCSPA, relations between the Port of Morehead City and the community are good and the locals are generally supportive of the port. The port also works very closely with the community to minimize disruption from port-related activity. For example, the port and the city worked out an agreement that oversized cargo, such as wind turbines, being transported by truck through the city must be accompanied by a police escort and that only one piece of oversized truck cargo can be transported at a time through the city limits. This effort helps to minimize traffic impacts. As competing land uses such as residential developments, tourism-related businesses and recreational marine uses, such as marinas, encroach upon port property, the port is concerned that it will become increasingly more difficult to develop port property, particularly Radio Island, without complaints from adjacent landowners about issues such as visual impacts, noise, rail and truck movement and property access

5.3.2 Environmental

NCSPA is dedicated to being a good steward of the environment and the community surrounding its ports. The Executive Director stated in the 2021 North Carolina Ports Strategic Plan, that the publication of the NCSPA Environment Management System (EMS) shows NC Ports are commitment to their communities and the environment. The EMS is an integrated, proactive approach to managing environmental responsibilities and objectives, ensuring a systematic approach to continual improvement of environmental performance at the port terminals. The EMS establishes environmental management as an intrinsic part of NC Ports' overall business philosophy and management of operations. In addition, the ports are focused on environmental industries they can impact by providing excellent transport, storage, maintenance and operations services. Described earlier in section 4.1, North Carolina is examining the offshore wind (OSW) supply chain, including OSW manufacturing (blades, towers and nacelles), assembly, marshalling and the OSW maintenance and support industries. This is a broader commitment to the environment beyond the borders of the ports and into the communities they serve. Continuing to remain a leader amongst ports in the sustainability effort means NCSPA must secure grants and other funding to conserve energy consumption, reduce air emissions and protect water and air quality in and around their terminals, and the broader port communities they serve..

5.4 Safety & Security

5.4.1 Safety

Given the nature of work and the number of moving parts and people at North Carolina ports, NCSPA prioritizes safety and security. The intent is to achieve the desired safety goals and continually review maritime port safety effectiveness. Both ports at Wilmington and at Morehead City have taken necessary safety and security measures to comply with threat management and have a process to address their respective effectiveness.

To provide a safe working environment on-site for all operators on the ports, The NCSPA and the Port Police work closely with anyone who will be using the port and advise all port users to become familiar with and adhere to the following safety policy and rules posted on their website:[63]

- Obey all traffic signs and lane markings.
- Obey posted speed limits.
- Do not travel between containers in the container yard.
- Maintain 50 feet from heavy equipment while operational.
- Travel in approved lanes. Do not take shortcuts.
- Class 2 reflective vests are required when walking in the operational areas.
- NCSPA employees are prohibited from using a cell phone while their vehicle is in motion. Please exercise the same courtesy when you are visiting a port facility.

5.4.2 Security

There is a need to continually review maritime security at the Port of Wilmington and at the Port of Morehead City. Each of the North Carolina ports has policing operations that actively conduct training exercises and both ports continually update their compliance with security protocols based on anticipated security threats. The North Carolina State Port Police work closely with the local, state and federal law-enforcement as well as emergency management agencies. The department includes sworn police officers (with arresting authority) and security officers on duty 24 hours a day, seven days a week. These officers work at both the Port of Morehead City and the Port of Wilmington. The police work closely with port customers and visitors to be sure they are aware of the safety and security measures they should adhere to while using the port. The mission is to provide a safe and secure environment for personnel and cargo.

The U.S. Coast Guard and Transportation Security Administration have required that anyone needing access to restricted areas of NCSPA facilities, be required to present a valid Transportation Worker Identification Credential (TWIC) or be escorted by a TWIC holder.[64] This protocol includes access management to the restricted areas which are composed of all areas within the gates at both ports.

NCSPA takes port safety and security very seriously and in the past ten years has had few incidents according to the U.S. Coast Guard Incident Investigation Reports.[65] In addition, security cameras are in operation throughout the ports of Wilmington and Morehead City as an extra level of surveillance. Available funding for improved security measures as well as infrastructure improvements could help NCSPA continue to be a leader in port safety and security.

[63] North Carolina State Ports Authority — NC Ports. (2022). North Carolina State Ports Authority. Accessed July 2022 from http://www.ncports.com/

[64] North Carolina State Ports Authority — NC Ports. (2022). *North Carolina State Ports Authority* Accessed July, 2022, from https://ncports.com/customer-tools/port-access/#how-do-i-obtain-an-escort-form

[65] USCG Maritime Information Exchange. (2016). *USCG CGMIX Incident Investigation Reports (IIR) home page.* Accessed September 14, 2016, from https://cgmix.uscg.mil/IIR/Default.aspx