

MARITIME COMMERCE IN GREATER PHILADELPHIA



Assessing Industry Trends and Growth Opportunities for Delaware River Ports

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Executive Summary

For more than 300 years, the Delaware River has served as a key commercial highway for the region. While Greater Philadelphia's maritime roots remain, rapid globalization and technological advances are driving an industry-wide transformation that has impacted the role that Delaware River ports play in the larger economy.

Understanding the impact of ever-evolving trends in maritime commerce on Greater Philadelphia is essential to make appropriate policy and investment decisions. To this end, the Philadelphia Industrial Development Corporation (PIDC) sponsored a study of maritime commerce in Greater Philadelphia, commissioning the Economy League of Greater Philadelphia to lead a project team that consisted of a partnership with the Economic Development Research Group (EDR) and assistance from Select Greater Philadelphia and the Delaware Valley Regional Planning Commission.

The study considered port activity on both sides of the Delaware River, from Trenton, NJ and Bucks County, PA to the ocean. Its analysis included a review of dynamic factors impacting maritime commerce in Greater Philadelphia. Its key findings include:

- ⇒ **Economic Impact.** The port industry's regional job base is relatively small but generates higher than average labor income and economic output per job.
- ⇒ **Delaware River Port Descriptions.** The region's inability to overcome natural and market-based limitations have resulted in a loss of global market share in maritime commerce.
- ⇒ **Global Trends.** Projections indicate continued containerization and rationalization of trade, especially from high-growth Asian markets seeking to improve the cost-effectiveness of service

from origin to final destination.

- ⇒ **Implications for Delaware River Ports.** The region has capacity to accommodate growth, but its ports must collaborate to develop a comprehensive plan that addresses existing constraints and rationally allocates cargo based on competitive advantages.
- ⇒ **Recommended Strategies for Port Growth.** The potential for Delaware River port growth will depend on the region's ability to leverage existing competitive strengths, strategically invest in infrastructure enhancements, and collaborate to ensure the efficient deployment of resources.
- ⇒ **Scenarios for Port Growth.** Given dynamic industry trends, Delaware River ports are at a critical juncture. Future growth will depend on the extent to which the ports collaborate to implement recommended strategies.

Economic Impact

Delaware River port activity generates jobs, labor income, economic output, and tax revenues. Delaware River ports employ 4,056 workers who earn \$326 million and generate \$1.3 billion in economic output. Each direct port-related worker supports an additional two jobs from industry demand and worker spending. Based on these impacts, port activity in Greater Philadelphia

supports 12,121 jobs and \$772 million in labor income, generating \$2.4 billion in economic output.

The port industry's regional job base is relatively small, but those jobs generate higher than average income and output per job. Regional direct jobs represent an average annual income (including fringe benefits) of \$80,000, more than double the regional per capita income.

Port activity in the City of Philadelphia is responsible for approximately 45 percent of regional impacts. City ports employ 1,945 workers who earn \$142 million and generate \$569 million in economic output. Direct city port jobs support an additional 3,565 indirect and induced jobs. In sum, port activity in the City of Philadelphia supports 5,510 jobs and \$338 million in labor income, generating \$1.0 billion in economic output.

Regional port activity annually adds \$81 million in tax revenues to Pennsylvania, New Jersey, and Delaware, as well as \$12 million to City of Philadelphia coffers.¹

Delaware River Port Descriptions

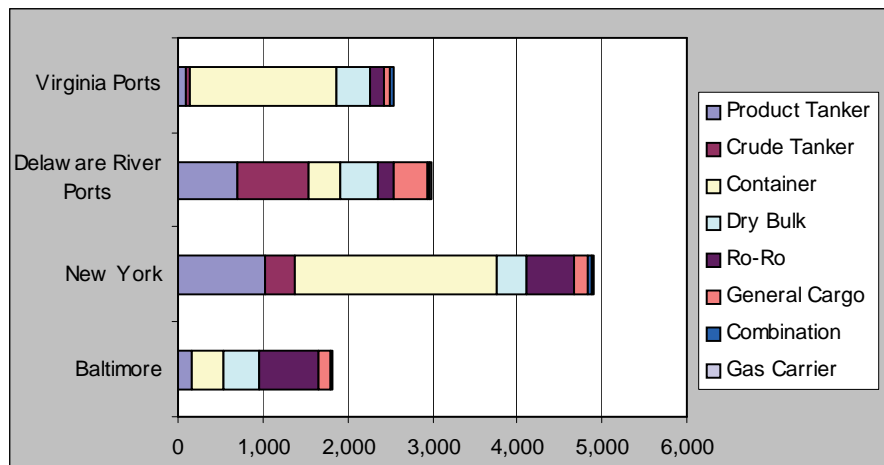
The Delaware River port industry's contribution to the Greater Philadelphia economy is a result of activity at the region's more than 40 port facilities and their associated businesses. The region's public port facilities are owned by three state-run entities: the Philadelphia Regional

Economic Impacts Related to Delaware River Port Activity, 2005

Totals	Greater Philadelphia		City of Philadelphia	
	Direct	Total	Direct	Total
Employment	4,056	12,121	1,945	5,110
Labor Income	\$326M	\$772M	\$142M	\$338M
Economic Output (e.g., sales)	\$1.3B	\$2.4B	\$569M	\$1.0B
Total Tax Revenues		\$81M		\$33M

Note: Economic impact calculations using IMPLAN model.

Vessel Calls by Ship Type, 2005



Source: U.S. Department of Transportation, Maritime Division.

Port Authority (Pennsylvania); the South Jersey Port Corporation (New Jersey); and the Diamond State Port Corporation (Delaware). Dozens more facilities are owned and operated by private entities.

The region has historically struggled to keep pace with the ever-evolving maritime industry. This reality is due in part to inherent physical limitations of its port complex, located 60-100 miles up the naturally shallow Delaware River, increasing shipping costs and constraining market competitiveness. But the region's struggles are also owed in part to the

inability to strategically position itself to leverage a flourishing maritime industry. As a result, while Delaware River ports have managed to capture a share of global growth, their overall market share has declined.

Another reason for the region's decline in market share is the nature of cargo handled by its ports. Approximately 65 percent of the region's cargo tonnage is in petroleum, a stable industry but one that has not experienced market growth. The region also specializes in "niche" cargoes such as steel, wood products, and perishable items such as fresh

fruit, nuts, cocoa beans, and meat products. These cargoes require specialized facilities that are difficult to replicate; Greater Philadelphia's agglomeration of specialized facilities is a significant competitive advantage for capturing a large market share of these commodities.

Where Delaware River ports are most lacking is in container facilities, which has accounted for the vast majority of global growth in maritime commerce over the past quarter-century. Competitor ports, such as the Port of New York/New Jersey, Baltimore, and Virginia, have superior location and market advantages and have made significant investments to expand container capacity, managing to increase share of container shipments. Delaware River ports have failed to match these investments. As a result, no port on the Delaware River is considered a top-tier container destination, and the region has not enjoyed the full impact of global containerization. Emblematic of this shortcoming is the region's paucity of trade partnerships with Asia, the world's largest container growth market.

Another factor in the Delaware River ports status is a drastic import/export trade imbalance. A weak export market compromises cost competitiveness by limiting the ability for shipping lines to "backhaul" cargo, thereby increasing the unit costs of calling upon a port. In 2005, the region's import tonnage outpaced export tonnage 34:1. Philadelphia's import/export trade imbalance was even more severe at 80:1, while Camden (9:1) and Wilmington (18:1) were comparably less severe.

Rankings of U.S. Ports by Tonnage and Value, 2005

Cargo Tonnage					
Imports			Exports		
Rank	Port	Short Tons	Rank	Port	Short Tons
11	Philadelphia	25,914,744	60	Camden-Gloucester	545,293
17	Paulsboro	18,133,852	66	Chester	400,092
33	Wilmington	6,896,449	67	Wilmington	381,567
40	Camden-Gloucester	4,742,854	70	Philadelphia	322,702
66	Chester	1,243,599			

Cargo Value					
Imports			Exports		
Rank	Port	Value (\$)	Rank	Port	Value (\$)
6	Philadelphia	29,462,379,151	22	Philadelphia	2,430,517,679
35	Chester	5,684,957,894	24	Wilmington	2,175,543,116
37	Wilmington	5,499,289,565	32	Chester	1,594,532,247
79	Paulsboro	255,203,257	74	Camden	149,968,973
103	Camden	67,409,025	84	Paulsboro	88,580,455

Note: Tonnage is for foreign trade only.

Global Trends

Shifts in technology, consumption, and trade patterns are changing the nature of global maritime commerce. Specifically, the containerization of cargo and rise of Asian manufacturing have driven increases in

global cargo demand, led by double-digit annual growth of demand from South and East Asian markets. Containerization is expected to continue, with container-based shipping projected to double from its 2000 total by 2020.

Rapid containerization is driving innovation in the shipping industry. To increase efficiency, shipping lines are adding larger ships to their fleet that are able to carry more containers, thereby lowering unit shipping costs. Ports, in turn, have been forced to continually upgrade terminal and intermodal infrastructure to keep pace with the demands of increasing cargo volumes. For many ports, investments have included expensive channel-deepening projects to accommodate deeper draft requirements of new container ships beyond 45 feet.

Shipping lines have also sought to achieve efficiencies through “trade rationalization.” With congestion and gas prices increasing the cost of moving cargo by land, shippers are seeking to maximize the proportion of total cargo movement that occurs by water, thereby minimizing total unit shipping costs. And, in the United States, trade rationalization has occurred in response to the cost of “land-bridging” cargo from West Coast ports to central and eastern parts of the country by rail or long-haul trucking.

Trade rationalization has increased the demand for container capacity at East Coast ports. Intensifying this trend is congestion in the Panama Canal, which has capacity constraints that will not be alleviated until its expansion project is completed (scheduled for 2014). In the meantime, shipping lines are increasingly relying on the Suez Canal to ship cargo from Asian markets to the United States. This shift has made East Coast destinations even more attractive as a primary port of call.

Annual Growth in Container Demand by World Region, 1990-2005

World Region	1990-1995	1995-2000	2000-2005
North Europe	6.45%	8.07%	8.52%
S. Europe/Mediterranean	11.41%	12.86%	9.96%
Middle East & South Asia	12.90%	10.48%	15.39%
Sub-Saharan Africa	9.55%	8.35%	11.78%
East Asia	14.22%	11.13%	12.22%
Australia/Oceania	5.00%	8.22%	7.84%
North America	6.13%	7.48%	7.24%
Other Americas	14.58%	10.72%	9.64%
Total	10.83%	10.14%	10.82%

Notes: CAGR=Compound Annual Growth Rate; major bulk cargo limited to iron ore, grain, coal, bauxite/alumina & phosphate.

Implications for Delaware River Ports

Global trends in maritime commerce will profoundly impact the ongoing viability and vitality of Delaware River ports. Containerization is driving rapid growth of waterborne cargo shipments, while trade rationalization and shifting trade routes have increased the attractiveness of East Coast ports. These factors, coupled with strategic action, present an opportunity for the region’s port industry to grow its business.

The ability of Delaware River ports to capture additional market share of maritime cargo is related to its competitive strengths and weaknesses as a port of call. Delaware River ports are, in some respects, well-positioned to benefit from increased cargo shipments. For example, the region’s proximity to the most dense population base in the

country (27 million people live within 100 miles and 90 million within 500 miles), give its ports a large natural consumer market.

Also, despite a history of turbulence in Philadelphia, since the 1990s the port labor force has embodied stability and flexibility that has become a strategic advantage. The port has not experienced a labor strike in over a decade, and Philadelphia’s 19 labor “start times” accommodate the demands of time-conscious shipping lines, increasing the port’s competitiveness.

In addition, while other ports face severe congestion issues, Delaware River ports are relatively unconstrained by either terminal or intermodal congestion. This is due in part to an expansive network of road and rail infrastructure that is directly connected to many of the region’s port facilities.

Average Annual Growth Rates in Container Traffic by North American Port Region, 1990-2005

North American Port Region	1990-1995	1995-2000	2000-2005
Pacific CN	6.33%	18.75%	11.71%
Atlantic CN	1.71%	7.12%	3.30%
North Atlantic	4.36%	4.58%	8.14%
South Atlantic	12.08%	7.17%	2.79%
North Pacific	6.17%	2.06%	6.09%
South Pacific	7.01%	10.08%	7.94%
Island Pacific	8.29%	-8.42%	16.18%
Gulf	7.61%	7.30%	5.20%
Total United States	7.48%	6.35%	6.66%
Total North America	7.11%	6.73%	6.71%

Finally, the region possesses the infrastructure to support shipment of “niche” cargos that require specialized terminal and storage infrastructure. Refrigerated warehouse facilities and other supporting infrastructure is expensive and difficult to replicate; as a result, Delaware River ports have become the country’s preeminent port of call for perishable products such as fresh fruit (especially ba-

nanas), juices, and cocoa beans.

On the other hand, Delaware River ports do struggle with factors that limit growth potential. For example, the region’s inland location requires a 60 to 100 mile trek from the Atlantic Ocean, a distance that increases travel time and shipping cost. Also, the Delaware River’s 40-foot channel is shallow relative to competitor ports, limiting the ports’

ability to compete with top-tier ports for shipments on the new generation of container mega-ships that require 45 and 50-plus foot drafts. The imminent execution of a project partnership agreement between the Army Corps of Engineers and the Commonwealth to dredge the Delaware River channel to 45 feet was a critical first step for the region to simply maintain its existing port business.

Delaware River ports’ paucity of Asian shipping service is noteworthy given the dramatic growth of Asian markets. This shortcoming has limited the region’s ability to benefit from increased global containerization. Greater Philadelphia’s weak export market is also a liability, limiting shippers’ ability to minimize unit shipping costs by backhauling cargo out of port.

Additionally, while expansive, the region’s landside infrastructure has limited connectivity to inland distribution markets. Of note is the region’s inadequate “double stack” rail clearance. Double-stacking containers on railcars has become the dominant mode for moving cargo from the port to inland destinations because it doubles rail container capacity at no additional cost. Greater Philadelphia’s freight rail lines are constrained by low bridge clearances that preclude efficient use of double stacked trains, putting Delaware River ports at a significant competitive disadvantage for servicing Midwestern U.S. growth markets.

Finally, Delaware River ports’ growth potential is constrained by disjointed planning, marketing, and development. Lack of collaboration among Delaware River ports has led to intra-port complex competition for business and has limited the region’s ability to strategically plan for the future. Both factors have thwarted attempts to rationalize the use of port facilities and created inefficiencies that limit growth potential.

100-mile and 500-mile Radii from Philadelphia



Recommended Strategies for Port Growth

The potential for Delaware River ports to grow will depend on their ability to leverage strengths and manage weaknesses. Doing so will require objective analysis to guide strategic planning efforts. This planning should consider:

- ⇒ Cargo segments handled by Delaware River ports;
- ⇒ Cargo demand on the U.S. East Coast;
- ⇒ Existing cargo capacity; and
- ⇒ Existing geographic and infrastructure limitations.

From this plan, Delaware River ports will be able to identify strategic opportunities to grow business. In general, the strategy for growth should be built around three core principles:

- ⇒ **Leverage existing competitive strengths**, especially geographic proximity to the large consumer market of the U.S. northeast and a difficult-to-replicate expertise in niche cargo handling;

- ⇒ **Investment in infrastructure enhancements**, especially terminal container capacity and road and rail condition and connections.
- ⇒ **Collaboration for the efficient deployment of resources**, especially to rationalize the use of facilities and coordinate marketing efforts in a region-wide manner.

Scenarios for Port Growth

Based on global trends and the Delaware River's competitive position (which assumes the anticipated Delaware River channel-deepening project), the study team developed three potential scenarios for port growth:

- ⇒ **Scenario 1: Growing market share by one percent.** This scenario depends on successful implementation of the framework for a strategic plan outlined in this report and careful management of such risks as acceleration of competitor port invest-

ments.

- ⇒ **Scenario 2: Moderate growth.** This scenario requires that the region collaborate to keep pace with competitor port investments and leverage existing cargo-handling strengths. Short of significant infrastructure investment, the scenario also requires that future economic trends swing in the region's favor.
- ⇒ **Scenario 3: Declining market share by one percent.** This scenario may be realized if the ports maintain the status quo of disjointed development and fail to collaborate around a strategic plan for the future.

Summary of Growth Scenarios

Factors	Scenario 1: Growing Market Share	Scenario 2: Moderate Growth	Scenario 3: Declining Market Share
Assumptions	<ul style="list-style-type: none"> ◆ Delaware River ports increase the share of U.S. waterborne commerce from 5.5 percent to 6.5 percent of the national market 	<ul style="list-style-type: none"> ◆ All cargo growth at 0.9 percent ◆ Container growth at 4.4 percent, equal to the national rate 	<ul style="list-style-type: none"> ◆ Delaware River ports share of U.S. waterborne commerce decreases from 5.5 percent to 4.5 percent of the U.S. market
Requirements	<ul style="list-style-type: none"> ◆ Transit times and cost to serve inland markets are improved ◆ Growth in niche cargo ◆ Regional coordination in marketing and capacity management 	<ul style="list-style-type: none"> ◆ Petroleum import levels must be maintained ◆ Bulk and breakbulk cargoes remain dominant, particularly steel and perishables 	<ul style="list-style-type: none"> ◆ None
Risks	<ul style="list-style-type: none"> ◆ Absence of economies of scale ◆ Improved capacity and transportation networks at competitor ports ◆ Distance from Asian manufacturing centers 	<ul style="list-style-type: none"> ◆ Acceleration of global shift to alternative fuels ◆ Weak regional economic and demographic growth 	<ul style="list-style-type: none"> ◆ Continued containerization trends ◆ Decline in niche cargoes ◆ Lack of goods to export
Strategies	<ul style="list-style-type: none"> ◆ Leverage existing competitive strengths ◆ Strategic infrastructure investment ◆ Regional collaboration 	<ul style="list-style-type: none"> ◆ Leverage existing competitive strengths ◆ Regional collaboration 	<ul style="list-style-type: none"> ◆ The absence of coordination to leverage existing assets and improve transportation networks

Introduction

For more than 300 years, the Delaware River has served as a key commercial highway for the region, facilitating the import and export of raw and manufactured products from the region and beyond. Over time, Delaware River port activity has been a key component in perpetuating Greater Philadelphia's role as a commercial hub, supporting industrial development and thousands of port-related local jobs.

While Greater Philadelphia's maritime roots remain, rapid globalization and technological advances are driving an industry-wide transformation that has had an impact on the role that Delaware River ports play in the larger economy. Understanding the impact of ever-evolving industry

trends on the nature of maritime commerce in Greater Philadelphia is essential for making smart and appropriate policy and investment decisions.

To this end, the Philadelphia Industrial Development Corporation (PIDC) sponsored a study of maritime commerce in Greater Philadelphia and commissioned the Economy League of Greater Philadelphia to conduct the analysis. The Economy League assembled a study team that consisted of a partnership with the Economic Development Research Group (EDR) and assistance from Select Greater Philadelphia and the Delaware Valley Regional Planning Commission.

The study considered port activity on both sides of the Delaware River,

from Trenton, NJ and Bucks County, PA to the ocean. Its analysis included a review of dynamic factors impacting maritime commerce in Greater Philadelphia and a discussion of trends and policies that may alter anticipated future activity.

The resulting report presents findings from this research. It does not seek to evaluate the costs and benefits of any particular port development proposal; rather, the report is intended to instruct decisions regarding investment and land use along the Delaware Riverfront, and offer context and insights to guide the critical future choices to be made by government and business stakeholders.

Project Partners

Economy League of Greater Philadelphia

The Economy League of Greater Philadelphia (ELGP) is an independent, nonpartisan, nonprofit organization dedicated to research and analysis of the region's resources and challenges with the goal of promoting sound public policy and increasing the region's prosperity.

Philadelphia Industrial Development Corporation

Philadelphia Industrial Development Corporation (PIDC) is a private, not-for-profit Pennsylvania corporation, founded in 1958 by the City of Philadelphia and the Greater Philadelphia Chamber of Commerce, to promote economic development throughout the city.

Economic Development Research Group

Economic Development Research Group, Inc. (EDR Group) is a consulting firm focusing specifically on applying state-of-the-art tools and techniques for evaluating economic development performance, impacts and opportunities. The firm was started in 1996 by a core group of economists and planners who are specialists in evaluating impacts of transportation infrastructure, services, and technology on economic development opportunities.

Select Greater Philadelphia

A business marketing organization, Select Greater Philadelphia focuses on building the economy of our region by attracting and retaining businesses. The Greater Philadelphia region encompasses Southeastern Pennsylvania, Southern New Jersey, and Northern Delaware.

Delaware Valley Regional Planning Commission

Serving the Greater Philadelphia region for more than 40 years, the Delaware Valley Regional Planning Commission works to foster regional cooperation in a nine-county, two state area. City, county and state representatives work together to address key issues, including transportation, land use, environmental protection and economic development.

Section 1: Economic Impact Analysis

Key Findings

- ⇒ The port industry's regional job base is relatively small, but those jobs generate higher than average income and output per job.
- ⇒ Delaware River ports employ 4,056 workers who earn \$326 million and generate \$1.3 billion in economic output.
- ⇒ The vast majority of regional direct port employment is in cargo handling and warehousing.
- ⇒ Each direct port job supports an additional two jobs from industry demand and worker re-spending, resulting in a region-wide port-related employment total of 12,121.
- ⇒ Petroleum-based port activity, while generating a majority of the Delaware River's cargo traffic, constitutes less than 10 percent of the region's port-related employment.
- ⇒ City of Philadelphia ports represent approximately 45 percent of region-wide employment, labor income, and economic output.
- ⇒ Regional port activity generates \$69 million in tax revenues for state governments in Greater Philadelphia, however its net fiscal impact is somewhat less pronounced due to subsidiza-

tion.

- ⇒ The 6,094 regional port workers subject to the City of Philadelphia Wage Tax produce \$11.6 million in Wage Tax revenues.

Overview

Delaware River ports add value to Greater Philadelphia's economy. This section explores the magnitude and nature of this value by considering both region-wide and city-specific economic impacts. Using an industry-standard input-output model, the analysis quantifies economic impacts in terms of jobs, labor income, economic output (e.g., sales), and tax revenues. On-site employment data for Delaware River ports were assembled through discussions with private terminal operators, cooperation from public port agencies, port directory references, and employment estimates obtained through proprietary databases. (See Appendix C for a full methodological description. See Appendix D for a summary of an additional set of "port-reliant"² employment.)

Greater Philadelphia

Delaware River port activity adds value to the regional economy by creating and supporting jobs across the 11-county, tri-state Greater Philadelphia area. (See Appendix C for a list of counties included in the region.)

Employment

Employment impacts associated with Delaware River port activity include: 1) **direct** maritime industry jobs; 2) **indirect** jobs supported by maritime industry demand; and 3) **induced** jobs supported by direct maritime worker re-spending.

As Figure 1 illustrates, Delaware River ports employ 4,056 workers across Greater Philadelphia. Sector-based direct employment analysis⁴ indicates that slightly fewer than half (1,911) of direct port jobs are in cargo handling, and another fourth of the jobs are in warehousing (987). With a multiplier of 3.0, direct port employment supports 4,655 indirect and 3,410 induced jobs for a total employment impact of 12,121 jobs.

Petroleum-based regional employment. While petroleum constitutes a majority (both in tons and value) of Delaware River cargo traffic, petroleum-based direct port employment represent approximately 10 percent, or 455, of the region's 4,056 direct port jobs. This disparity is due in large part to the non-labor-intensive nature of importing petroleum, a distinction that is akin to the labor intensity of pumping gas into a car as opposed to hauling numerous grocery bags out of the trunk.³

Labor Income

Delaware River port employment generates income that is distributed throughout the regional economy.

As Figure 2 illustrates, the region's 4,056 direct port workers earn

Figure 1: Greater Philadelphia Employment Impacts, 2005

Employment Impact Type	Jobs by Sector
Direct (Maritime/Port Activity)	4,056
Construction	318
Wholesale	36
Cargo Handling	1,911
Warehousing	987
Security	99
Other Government	152
Federal Government	553
Indirect (Industry Demand)	4,655
Induced (Worker Spending)	3,410
Total	12,121

Note: Economic impact calculations using IMPLAN model.

Figure 2: Greater Philadelphia Economic Impacts, 2005

	Employment Impact Type		
	Direct	Indirect/Induced	Total
Employment	4,056	8,065	12,121
Labor Income	\$326 million	\$446 million	\$772 million
Economic Output	\$1.3 billion	\$1.1 billion	\$2.4 billion

Notes: Economic impact calculations using IMPLAN model; labor income and economic output are presented in 2006 dollars.

\$326 million, a total that includes both wages and fringe benefits. With a multiplier of 2.4, direct labor income supports an additional \$446 million in indirect and induced income for a region-wide labor income impact of \$772 million. The variation in multipliers (3.0 for employment; 2.4 for labor income) indicates that employment directly related to port activity boasts higher wages than the indirect and induced jobs supported by industry demand and worker re-spending.

The region's direct port jobs represent an average income (including fringe benefits) of \$80,000, more than double the regional per capita income. When indirect and induced jobs are also considered, the average income drops to \$64,000, illustrating the relatively high-paying nature of the region's maritime-industry jobs.

Economic Output

Delaware River port activity creates a ripple effect of sales throughout the region. The aggregate impact of this activity is quantified as the ports' economic output.

Greater Philadelphia's 4,056 direct port jobs generate \$1.3 billion in economic output. With a multiplier of 1.8, port activity supports another \$1.1 billion in economic output related to indirect and induced jobs for

a total regional economic output impact of \$2.4 billion.

City of Philadelphia

Port activity in the City of Philadelphia constitutes approximately 45 percent of region-wide employment, labor income, and economic output.

Employment

As Figure 3 illustrates, City of Philadelphia ports employ 1,945 workers, slightly fewer than half of regional direct port employment. Mirroring the region's sector-based employment, slightly fewer than half (870) of direct port jobs are in cargo handling, and another fourth of the jobs are in warehousing (478). With a multiplier of 2.8, direct port employment supports 2,336 indirect and 1,229 induced jobs for a city employment impact of 5,510 jobs.

The somewhat lower city employment multiplier (2.8 for the city; 3.0 for the region) is indicative of additional "leakages" that occur for city employment impacts. This reflects the notion that city-related indirect and induced jobs are more likely to occur outside of the city than their regional equivalents are to occur outside the region.

Petroleum-based city employment. The city's 1,945 direct port jobs include 162 in petroleum, amounting to less than 10 percent of total direct jobs and mirroring the region-wide proportion of petroleum-based employment.

Labor Income

As Figure 4 illustrates, Philadelphia's 1,945 direct port workers earn \$142 million, a total that includes both wages and fringe benefits. With a multiplier of 2.4, direct labor income supports an additional \$196 million in indirect and induced income for a city-wide labor income impact of \$338 million.

Economic Output

Philadelphia's 1,945 direct port jobs generate \$569 million in economic output. With a multiplier of 2.1, port activity supports another \$472 million in economic output related to indirect and induced jobs for a total city economic output impact of \$1.0 billion.

Tax Revenues

The wages paid to direct, indirect, and induced port employees, as well as the sales generated by maritime commerce along the Delaware River, are subject to taxation, providing revenues to state and local governments in the region.

State Tax Revenues

As Figure 5 illustrates, state governments across Greater Philadelphia collect a total of \$69 million in tax revenues from Delaware River port activity, including \$44 million for Pennsylvania, \$18 million for New Jersey, and \$7 million for Delaware. For Delaware and New Jersey, the largest source of port-related tax revenue is Individual Income Taxes, while in Pennsylvania the General Sales and Use Taxes slightly outpace Commonwealth Personal Income Tax receipts. Over one-third (\$25

Figure 3: City of Philadelphia Employment Impacts, 2005

Employment Impact Type	Jobs by Sector
Direct (Maritime/Port Activity)	1,945
Construction	183
Wholesale	20
Cargo Handling	870
Warehousing	478
Security	41
Other Government	35
Federal Government	318
Indirect (Industry Demand)	2,336
Induced (Worker Spending)	1,229
Total	5,510

Note: Economic impact calculations using IMPLAN model.

Figure 4: City of Philadelphia Economic Impacts, 2005

Employment Impact Type	Employment Impact Type		
	Direct	Indirect/Induced	Total
Employment	1,945	3,565	5,510
Labor Income	\$142 million	\$196 million	\$338 million
Economic Output	\$569 million	\$472 million	\$1.0 billion

Note: Economic impact calculations using IMPLAN model; labor income and economic output are presented in 2006 dollars.

million) of state tax revenues are associated with port activity in the City of Philadelphia.

It should be noted that states in turn use taxpayer dollars to support public port agencies, reducing the *net* financial benefit to balance sheets. For example, while the Commonwealth of Pennsylvania received approximately \$44 million in taxes as a result of port activity in 2005, it also spent roughly \$10 million to subsidize Philadelphia Regional Port Authority operations and \$19 million for debt service obligations.

City of Philadelphia Tax Revenues

The City of Philadelphia collects tax revenue from port activity that occurs inside *and* outside the taxing jurisdiction.

Wage Tax Revenues. The primary source of the city's port-related tax revenue is the Wage Tax, which the city receives from both residents of Philadelphia and non-residents that work in Philadelphia. For the Wage Tax, taxable wages reflect an amount equivalent to labor income less fringe benefits and are assessed at two different rates based on place of residence: in 2006, the Philadelphia resident rate was 4.301 percent, and the non-resident rate was 3.7716 percent.

Of the 12,121 direct, indirect, and induced port-related regional jobs, 4,216 (35 percent) hold residence in Philadelphia and generate \$183 million in taxable wages. At the 2006 resident tax rate, this produced \$7.9 million in Wage Tax revenues. Another 1,878 (15 percent) of port-related employees work - but do not live - in Philadelphia and pay the non-resident Wage Tax rate. The \$99.7 million in non-resident taxable wages produced \$3.8 million in Wage Tax revenues.

In total, Philadelphia Wage Tax rates were assessed on 6,094 workers and \$283 million of taxable wages, producing \$11.6 million in tax revenues for the city and reflecting an

Figure 5: Tax Revenue Impacts of Delaware River Ports and City of Philadelphia Ports, 2005

Type of Tax	All Regional Jobs	All City Jobs
Individual Income Taxes		
Delaware	\$ 2,538,803	\$ 932,829
New Jersey	\$ 6,679,380	\$ 2,454,197
Pennsylvania	\$ 13,102,579	\$ 4,814,266
General Sales and Use Tax		
Delaware	-	-
New Jersey	\$ 5,326,255	\$ 1,944,851
Pennsylvania	\$ 13,851,735	\$ 5,056,706
Corporate Income Tax		
Delaware	\$ 888,055	\$ 323,581
New Jersey	\$ 1,988,447	\$ 724,530
Pennsylvania	\$ 3,632,195	\$ 1,323,463
Selective Sales Taxes		
Delaware	\$ 1,075,499	\$ 395,169
New Jersey	\$ 2,674,104	\$ 982,543
Pennsylvania	\$ 7,807,469	\$ 2,868,689
Other State Taxes, Licenses and Fees		
Delaware	\$ 2,536,226	\$ 924,124
New Jersey	\$ 1,597,420	\$ 582,052
Pennsylvania	\$ 5,199,444	\$ 1,894,521
City of Philadelphia		
Wage Taxes (See Below)	\$ 11,649,603	\$ 7,886,308
Sales Taxes	\$ 731,330	\$ 266,843
Total State and Local Taxes		
Delaware	\$ 7,038,582	\$ 2,575,704
New Jersey	\$ 18,265,605	\$ 6,688,173
Pennsylvania	\$ 43,593,424	\$ 15,957,645
City of Philadelphia	\$ 12,380,933	\$ 8,153,151
Total	\$ 81,278,544	\$ 33,374,673

City of Philadelphia Wage Tax	Calculation
Wage Tax Rate	
Residents	4.301%
Non-Residents	3.7716%
Philadelphia Residents	
Employment	4,216
Wages	\$183 million
Wage Taxes Paid	\$7.9 million
Non-Residents That Work in Philadelphia	
Employment	1,878
Wages	\$100 million
Wage Taxes Paid	\$3.8 million
Total Wages	\$283 million
Total Wage Taxes Paid	\$11.6 million
Effective Wage Tax Rate	4.11%

Notes: Economic impact calculations using IMPLAN model; while employment figures are for 2005, wage tax rates used are for 2006. Wages are labor income less benefits and reflect Bureau of Economic Analysis (BEA) Place of Residence adjustment factors; totals may not add due to rounding.

effective Wage Tax rate of 4.11 percent.

Sales Tax Revenues. The city also recoups revenue from its one percent Sales Tax. The city generates over seven-hundred thousand dollars in annual Sales Tax revenues from

region-wide port activity, 36 percent of which is directly related to city-specific port activity.

Section 2: Delaware River Port Descriptions and Key Competitors

Key Findings

Delaware River ports:

- ⇒ Have historically struggled to keep pace with the ever-evolving maritime industry.
- ⇒ Are comprised, in part, of public facilities owned by three state-run entities: the Philadelphia Regional Port Authority (Pennsylvania); the South Jersey Port Corporation (New Jersey); and the Diamond State Port Corporation (Delaware). Dozens more facilities are owned and operated by private entities.
- ⇒ Are constrained by an inland, up-river location and naturally shallow channel.
- ⇒ Have experienced growth in business but a decline in market share.
- ⇒ Are noted for their large share of petroleum imports and for niche commodities such as fresh fruit and cocoa beans.
- ⇒ Have capacity for container shipments but are not primary ports-of-call.
- ⇒ Trade primarily with African markets, owed in large part to the region's preeminence in petroleum imports. The Delaware River has virtually no trade relationship with Asia, the largest global growth market.
- ⇒ Have imports that far outpace exports, resulting in a drastic import-export imbalance.

⇒ Compete for cargo with other East Coast ports, including the Port of New York/New Jersey, Baltimore, and Virginia. These ports have key locational, market, and infrastructure advantages and been more aggressive than the Delaware River in infrastructure investment to attract new business, particularly in the growing global container market.

Delaware River Ports in Historical Context

Greater Philadelphia commercial activity originated along the Delaware River. William Penn selected the location for his settlement based on proximity to the river for commerce and inland location for safe harbor and access to the region's resource-rich hinterlands.

These assets fueled growth in maritime commerce through the 18th century, during which time Philadelphia rose to premier port status as the third largest port in the British Empire behind London and Liverpool. The Industrial Revolution accelerated Philadelphia's rise in the 19th century. Steam locomotives provided access to the Lehigh Valley's vast coalmines, and manufacturing activity in the city stimulated the market for both imports and exports.

But by the turn of the 20th century, Philadelphia's prominence as a commercial hub had waned. Manufacturing activity moved to less costly regions and the demand for anthracite coal slackened. Hastening the decline was Philadelphia's failure to keep pace with demands for infrastructure modernization. This shortcoming put the port at a competitive disadvantage. (A more complete history of Delaware River maritime commerce is available in Appendix B).

Containerization

Philadelphia's industrial decline coincided with the rise of alternative global supplier markets, spurred on in large part by dramatic post-World War II advancements to cargo shipping. In particular, the advent of containerization in 1956 dramatically improved the efficiency of goods movement. Employing a standardized box for moving cargo, containers simplified cargo handling, thereby lowering overall costs of goods movement.² Over the second half of the 20th century, containerization grew to become the predominant means for general cargo movement, driving rapid growth in trade across all modes of goods transport. However, by far the most pervasive impact of container shipping was on maritime commerce. By increasing the cost effectiveness of overseas shipping, containerization stimulated dramatic growth in waterborne trade and became a key driver in economic globalization.

Containerization changed the economics of shipping. Efficiencies resulting from the use of standard container boxes drove demand for the construction of larger ships that could take advantage of economies of scale. In turn, this new breed of ship accelerated the pressure to modernize port facilities by imposing a new set of terminal requirements that rendered older-style finger piers obsolete. Many of Philadelphia's competitor ports aggressively responded by initiating expensive efforts to adapt and expand terminal facilities to meet the demands of container vessels.

Efforts to Keep Pace

Philadelphia reacted slowly to the demands of containerization. Struggling to compete, in 1965 the city partnered with the Commonwealth of Pennsylvania and Greater Phila-

Figure 6: 1978 Forecast for Port of Philadelphia Containerization

Year	Forecasted TEUs	Actual TEUs
1972		43,512
1975		86,148
1978	126,000	n/a
1980	211,000	124,339
1990	353,000 ^a	65,309

Source: Philadelphia Commerce Department, Philadelphia Port Facilities Study, 1978.
Notes: (a) - Based on the Commerce Department study's standard of an average of 11 tons per container.

delphia Chamber of Commerce to replace the Department of Wharves, Docks, and Ferries with the Philadelphia Port Corporation (PPC). The formation of the PPC was considered critical to keep up with the demands of technological advancements of maritime commerce. It created a more accommodating governance structure and enhanced access to capital that provided for swifter and more flexible pursuit of infrastructure improvements to port facilities.

The PPC oversaw the development of Philadelphia's two container terminals, the Packer Avenue Marine Terminal (PAMT), completed eleven years after the first container ship's voyage in 1967, and Tioga Marine Terminal (TMT), completed five years later in 1972. With PAMT and TMT online, Philadelphia had entered the market to compete for a share of the container business.

In 1978, the Philadelphia Department of Commerce released a study that analyzed the city's port facilities and presented a strategy for future development. Citing significant growth in container traffic and a trend towards containerization of previously non-containerized general cargoes, the study concluded that PAMT and TMT in their existing state would reach container capacity by 1984 and require significant upgrades and expansion to satisfy future container demand. Between 1972 (the year of TMT's establishment) and 1975, container traffic at Philadelphia ports doubled, from 43,512 Twenty-Foot Equivalent Units (TEUs), the standard capacity measure for containers, in 1972 to 86,148 in 1975.

At the same time, containerization of the region's existing cargo flows increased the share of containerized cargo in Philadelphia from 16 percent in 1972 to 23 percent in 1975. Citing concurrent shifts at competitor ports, the study projected

that the containerized proportion of Philadelphia's overall cargo would reach 60 percent by 1990, effectively quadrupling the city's container traffic.⁶

By the mid-1980s it was apparent that Philadelphia would not realize the Commerce Department's bullish projections. Globally, the containerization revolution was driving growth of container ships in both size and number. With larger ships requiring deeper channels and shipping lines looking for quicker turnaround times, the port's inland location - nearly 100 miles up the Delaware River, which featured a naturally shallow channel - became an increasingly significant liability. Moreover, while PAMT and TMT established Philadelphia as a player in the container game, several other East Coast ports modernized their infrastructure more quickly and aggressively, increasing their competitiveness vis-à-vis Philadelphia.

Delaware River Port Descriptions

Today, the Delaware River serves as a 100-mile "marine highway" for

more than 40 public and private port facilities. As Figure 9 illustrates, Delaware River port facilities line both sides of the Delaware River from Delaware to Trenton, NJ. For maps of individual Delaware River port facilities, see Appendix H.

Public Port Facilities

Aside from petroleum facilities (which represent nearly 80 percent of waterborne trade by volume on the Delaware River), state-owned facilities have the highest volume of Delaware River port operations. Three public entities own and either operate or lease port facilities covering nearly 1,000 acres, including:

- ⇒ The Port of Philadelphia;
- ⇒ The Port of Camden; and
- ⇒ The Port of Wilmington.

Port of Philadelphia. In 1990, the Commonwealth of Pennsylvania purchased the city's public port facilities and created the Philadelphia Regional Port Authority (PRPA) to replace the PPC. PRPA owns and acts as landlord for Packer Avenue and Tioga Marine Terminals, Piers 38/40, 78/80, 82, 84, 96 and 98 Annex. Since its inception, the PRPA has initiated several upgrades to these

Figure 7: Philadelphia Regional Port Authority Facilities

Name	Location	Acreage	Specialized Cargoes
Packer Avenue Marine Terminal	Columbus Blvd. at Packer Ave.	106	Containers, steel products, frozen meat, fruit, heavy lift, project, paper
Piers 38/ 40	Columbus Blvd. at Christian St.	12	Newsprint, coated paper, wood pulp, other forest products
Piers 78/ 80	Columbus Blvd. at Snyder Ave.	40	Newsprint, coated paper, wood pulp, other forest products
Pier 84	Columbus Blvd. between Oregon Ave. & Jackson St.	23	Cocoa beans and cocoa products
Pier 96 & 98 Annex	Columbus Blvd. at Oregon Ave.	55	Automobiles, project, heavy equipment
Tioga Marine Terminal	Delaware River & Tioga Street	97	Containers, refrigerated fresh fruit, paper, plywood, cocoa beans, autos, palletized, project, breakbulk and steel
Pier 82	Columbus Blvd. between Oregon Ave. & Jackson St.	18	Fruits and vegetables, break bulk, project, paper

Source: Philadelphia Regional Port Authority.

Figure 8: South Jersey Port Corporation Facilities

Name	Acreage	Specialized Cargoes
Beckett Street Terminal	125	Wood product, steel products, cocoa beans, containers, iron ore, furnace slag, scrap metal
Broadway Terminal	180	Petroleum coke, furnace slag, dolomite, other dry bulks, steel products, wood products, minerals, cocoa beans, and fresh fruit
Broadway Produce Terminal	26	Bananas, pineapples, other perishables
Paulsboro (Planned)	—	—
Port Of Salem	—	—

Source: South Jersey Port Corporation.

port facilities, including the addition of on-dock warehouse space at the Tioga Marine Terminal and new warehouse space and refrigeration at the Pier 82 site.

Today, Packer Avenue and Tioga facilities each have six berths and one roll-on-roll-off (“RoRo”) berth. PRPA’s other facilities have one to three berths. Additionally, PRPA boasts more than 2.3 million square feet of refrigerated storage space at Packer Avenue and Tioga as well as significant dry and heated space at its other facilities. The facilities have close access to Interstates 76 and 95 and are served by three railroads: Norfolk Southern, Canadian Pacific, and CSX.

Port of Camden. Established in 1834, the Port of Camden has developed into a niche port that specializes in breakbulk cargo. A national leader in the import of cement, plywood, fresh fruit, and cocoa beans, Camden is also the region’s primary exporter, shipping hundreds of thousands of tons of scrap metal each year.

The South Jersey Port Corporation (SJPC), a state-created entity, has managed the Port of Camden since 1928. SJPC’s primary port facilities include the Beckett Street Terminal, opened in 1931, and Broadway Terminal, opened in 1971. Additionally, SJPC owns the Broadway Produce terminal and another terminal in Salem, New Jersey.

In total, SJPC facilities feature eight berths: four at Beckett Street, two at Broadway, and one each at Salem and Broadway Produce. SJPC also boasts more than 2.2 million square feet of dry warehouse space and three temperature controlled facilities at the Broadway Produce Terminal. All SJPC facilities are within close proximity to I-676, I-76, US Rte. 130, and I-295.

In recent years, private operators have made significant investments to these facilities, including over \$50 million in expansion projects at the Broadway Terminal in the past decade. Additionally, in 1994 the SJPC entered into an agreement to operate the Port of Salem in New Jersey, expanding its scope of operations south.⁷ Further expansions are planned, including a new two-berth facility at the Port of Paulsboro.

Port of Wilmington. Established in 1923, the Port of Wilmington is a national leader in the import of fresh fruit (particularly bananas) and juice concentrate and is currently the mid-Atlantic regional port of discharge for Volkswagen of America. Its container operations have rapidly grown in recent years.

In 1995, the State of Delaware purchased the port from the City of Wilmington and created the Diamond State Port Corporation (DSPC) to manage and operate the port. Since its inception, the DSPC has guided the port through a series of improvements, including the pur-

chase of a \$5.6 million multipurpose crane, creation of a \$27.5 million auto and RoRo berth, and construction of two new storage warehouses.⁸

Unlike the Ports of Philadelphia and Camden, the Port of Wilmington’s operations occur at a single site on 308 acres. The Port of Wilmington features ten berths, including seven deepwater general cargo berths, two RoRo and auto berths, and one tanker berth. Additionally, the Port of Wilmington features six separate warehouses that provide upwards of 800,000 square feet of chilled and freezer storage space, and 16,000 extra square feet of controlled atmosphere capability. The facility also has two multi-purpose gantries, each with 50-ton capacity, and one heavy-lift gantry with 75-ton capability. Wilmington’s key cargoes are autos, fruit, juice, meat, paper, salt, and steel.

Regarding landside transportation, Wilmington is primarily serviced by trucks and is situated in close proximity to I-495 and I-95. From a regional perspective, the port’s principle locational advantage is its 65-mile proximity to the Atlantic Ocean; Philadelphia and Camden are 90-100 miles upriver.

Private Port Facilities

The remainder of the region’s port facilities are owned and operated by private firms and play a significant role in Delaware River maritime commerce. They include operations at:

- ⇒ Port of Chester (Penn Terminals);
- ⇒ Port of Bucks (Kinder Morgan, Riverside, and Waste Management);
- ⇒ Gloucester Marine Terminal (Gloucester Terminals LLC); and
- ⇒ Oil refineries.

Port of Chester. At the Port of Chester, Penn Terminals has retrofitted a former Sun Shipbuilding yard to handle both container and break-

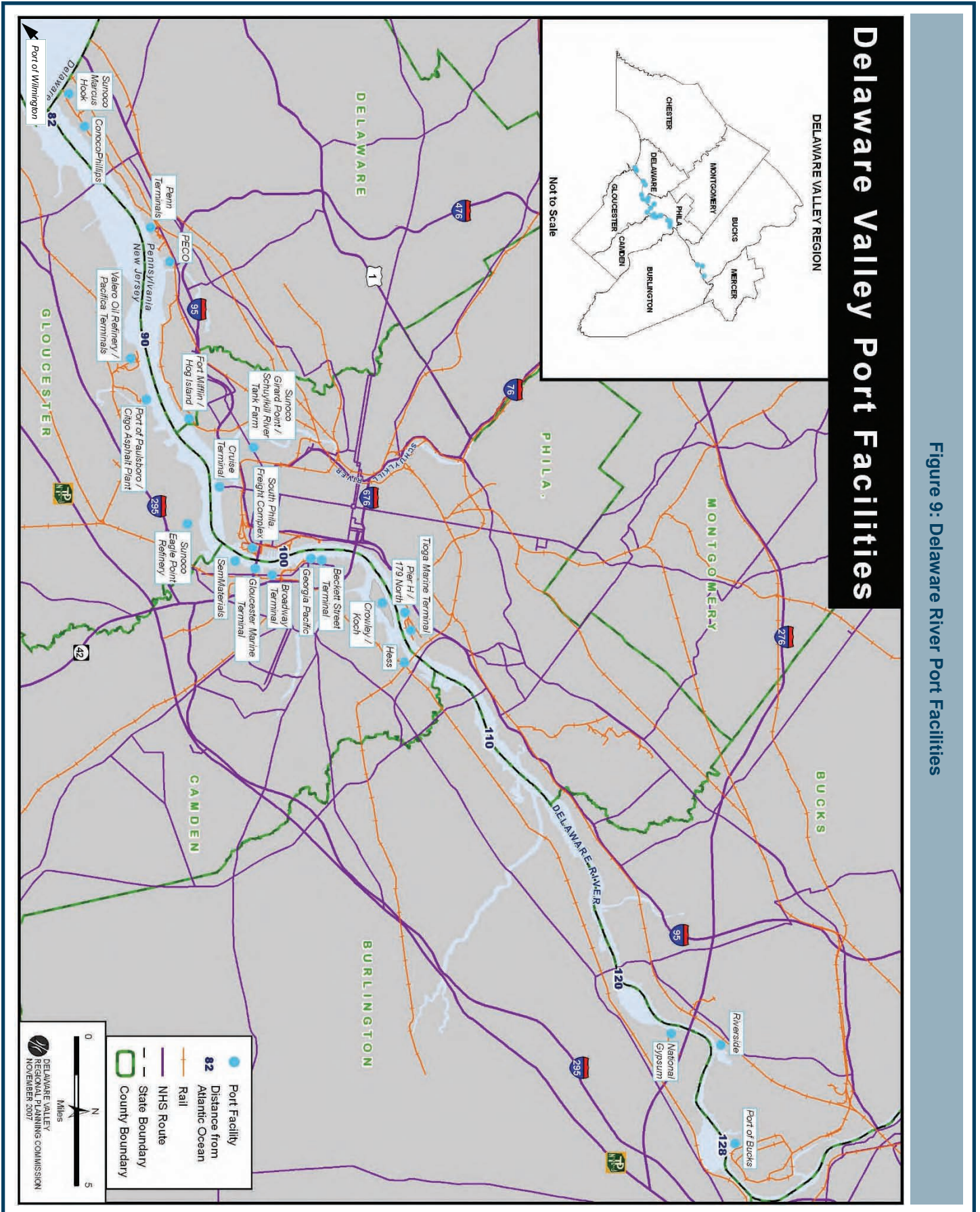


Figure 9: Delaware River Port Facilities

bulk cargo. Since purchasing the property in the 1980s, Penn Terminals refurbished two dry storage warehouses and developed 80,000 square feet of refrigerated storage space, increasing the terminals' total reefer (refrigerated storage) capacity to 100,000 square feet.

These facilities support the handling of Penn Terminals' key cargoes, including bananas, steel, forest products, and project cargo. The 71-acre facility is situated between Philadelphia and Wilmington and approximately 2 miles from I-95.

Port of Bucks. Formerly the U.S. Steel "Fairless Hills" site, the Port of Bucks is situated 29 miles north of Philadelphia and is entirely privately owned. The port is now part of what is called the Keystone Industrial Port Complex (KIPC), with facilities divided between Kinder Morgan, Inc. and Waste Management. Nearby, Riverside Concrete also has port operations but is not part of the KIPC. The port's operations are coordinated by the Bucks County International Trade Council, a body founded by the county's five chambers of commerce, that serves as a *de facto* port authority for the county.

Overall, the port's principle cargoes include steel, and salt, and project cargo (windmill materials, mostly). Facilities are situated in close proximity to the Pennsylvania Turnpike, I-95, and U.S. Route 1.

Gloucester Marine Terminal. Gloucester Marine Terminal is situated below the Walt Whitman Bridge in New Jersey and is operated by Gloucester Terminals LLC, with operations supported by Holt Logistics (Holt also supports the operations of Greenwich Marine Terminals LLC at PRPA's Packer Avenue facility). The facility has 22 warehouses, half of which are refrigerated and frozen storage space.

Gloucester's key cargoes include containers, steel products, frozen meat, fruit, heavy lift, and project cargo. Its 150-acre site is close to the Walt Whitman Bridge, I-95, and I-76.

Oil Refineries. Private petroleum operations in Delaware City, Chester, and Philadelphia account for the vast majority of the region's annual tonnage and cargo value. Large oil companies, including Sunoco and BP, have operations along the Delaware River. As a result, the Delaware River

is a leading American port complex for petroleum imports.

Delaware River Port Activity: Recent Trends

Delaware River port facilities overall activity has increased. Nearly 3,000 ships called upon the Delaware River in 2006, up ten percent over 1995. As Figure 10 illustrates, a 58 percent increase in container shipments drove overall growth. (See Appendix G for 2006 vessel calls at individual Delaware River port facilities.)

Containers

The Port of Philadelphia captured a portion of the growth in regional container shipments. As Figure 11 illustrates, after bottoming out at 65,309 TEUs in 1990, Philadelphia recovered to break 100,000 TEUs in 1995 and 200,000 in 2005.

Nevertheless, Philadelphia's container growth pales in comparison to other ports. Between 1985 and 2005, Philadelphia's share of East Coast and U.S. container traffic dropped by more than half, from 2.60 to 1.09 percent of the East Coast market and

Figure 10: Delaware River Ports Vessel Calls by Cargo Type, 1995-2006

Year	General	Containers	Roll-On/ Roll-Off	Refrig.	Bulk	Tankers	Chemicals/ Gas	Autos	Passenger	Totals
1995	304	368	84	333	405	812	138	110	16	2,570
1996	332	448	58	321	411	770	119	79	23	2,561
1997	317	533	70	318	419	798	140	40	13	2,648
1998	380	632	76	372	462	902	154	95	22	3,095
1999	392	478	41	487	452	872	145	102	20	2,989
2000	400	397	64	458	399	873	155	116	28	2,890
2001	352	376	82	455	381	831	166	126	28	2,797
2002	340	359	75	444	349	852	99	121	12	2,651
2003	330	321	78	465	608	858	86	120	28	2,594
2004	330	340	91	456	329	877	86	92	36	2,637
2005	279	441	77	392	358	897	107	108	41	2,700
2006	248	581	78	373	402	861	144	121	39	2,847
Change, '95-'06	-56	213	-6	40	-3	49	6	11	23	277
% Change, '95-'06	-18.4%	57.9%	-7.1%	12.0%	-0.7%	6.0%	4.3%	10.0%	143.8%	10.8%

Source: OCS, 2006.

Notes: "Other" category includes Port of Albany, NY, Providence, RI, New Haven and Bridgeport, CT, and Camden-Gloucester NJ.

from 1.12 to 0.49 percent of the U.S. market.

While Philadelphia lost ground, Wilmington approximately tripled its TEU share between 1985 and 2005, increasing from 0.47 to 1.33 percent of the East Coast market and from 0.20 to 0.60 percent of the U.S. market. Wilmington’s rapid ascent in the container business represented the largest proportionate growth among the 20 largest U.S. container ports during that time period.⁹

Despite overall growth, containers remain a small proportion of Delaware River port activity. As Figure 12 illustrates, container trade accounts for 5 percent of Philadelphia’s tonnage and 19 percent of its cargo value, well below the national averages of 16 percent and 51 percent. Wilmington and Camden also fall below the national averages.

Tonnage

In contrast to containers, Philadelphia ranks among top U.S. ports in total tonnage, a volume measure largely driven by bulk and breakbulk activity, especially petroleum. In 2005, Philadelphia tonnage ranked 4th among East Coast ports and 19th among U.S. ports. But as Figure 13 illustrates, Philadelphia lost tonnage market share between 1985 and 2005, declining from 7.7 percent to 6.7 percent of the East Coast market and from 2.06 percent to 1.66 percent of the U.S. market.

On a smaller scale, Camden and

Figure 11: Port of Philadelphia and Wilmington Total TEUs as a Share of East Coast and U.S. Markets, 1985-2005

Year	Philadelphia			Wilmington		
	Total TEUs	Share of East Coast	Share of U.S.	Total TEUs	Share of East Coast	Share of U.S.
1985	104,522	2.60%	1.12%	18,790	0.47%	0.20%
1990	65,309	1.13%	0.48%	91,623	1.58%	0.67%
1995	107,094	1.23%	0.53%	156,940	1.81%	0.78%
2000	198,680	1.70%	0.73%	192,091	1.64%	0.70%
2005	204,912	1.09%	0.49%	250,507	1.33%	0.60%

Source: AAPA; Notes: Unavailable for Chester, Camden, and Paulsboro.

Wilmington witnessed growth in tonnage market share over this period. Between 1985 and 2005, Camden’s tonnage share grew from 1.08 to 1.32 percent of the East Coast market and from 0.29 to 0.33 percent of the U.S. market. Wilmington’s East Coast share grew from 0.56 to 1.44 percent and its U.S. share grew from 0.15 to 0.36 percent. Wilmington’s tonnage growth represented the second fastest proportionate increase of any port on the East Coast.

Commodities

While U.S. maritime commerce is increasingly containerized, the Delaware River’s cargo expertise remains in bulk and breakbulk cargo — commodities that are shipped by means other than containers. In particular, Delaware River ports have carved out a niche in perishable cargoes.¹⁰ Shippers are drawn to the region’s agglomeration of refrigerated storage facilities. The region’s streamlined U.S. Customs systems allow for expedited transport, another attractive element for time and cost-conscious

shippers of perishable cargo. As a result, Delaware River ports import nearly half of the nation’s cocoa beans, almost a third of the bananas, and a quarter of all fruit and nuts.

Still, the region’s biggest commodity is petroleum. While the region’s perishable imports boast large share of national imports, their share of total Delaware River activity is dwarfed by that of the oil refineries. As Figure 14 illustrates, petroleum accounts for 65 percent of the region’s import activity by value, while fruits and nuts account for just 4 percent.

A large share of Delaware River exports is highly valued goods such as motor vehicles, petroleum, and military supplies. Philadelphia has been designated as one of 14 United States “ports of strategic military significance.” As a result, the port ships supplies to international posts and sees the return of equipment and vehicles for repair and refurbishment.

Figure 12: Containers as a Percentage of Port Trade, 2005

Port	% Container Trade (Weight)	% Container Trade (Value)
Philadelphia, PA	5%	19%
Wilmington, DE	7%	7%
Chester, PA	10%	47%
Camden, NJ	13%	17%
Paulsboro, NJ	0%	0%
U.S. Total	16%	51%

Source: U.S. Census Foreign Trade Division.

Figure 13: Philadelphia, Wilmington, and Camden Tonnage as a Share of East Coast and U.S. Markets, 1985-2005

Year	Philadelphia			Wilmington			Camden		
	Tonnage (000s)	Share of East Coast	Share of U.S.	Tonnage (000s)	Share of East Coast	Share of U.S.	Tonnage (000s)	Share of East Coast	Share of U.S.
1985	32,690	7.72%	2.06%	2,362	0.56%	0.15%	4,573	1.08%	0.29%
1990	41,830	8.99%	2.03%	4,209	0.90%	0.20%	4,379	0.94%	0.21%
1995	40,634	9.08%	1.92%	4,273	0.96%	0.20%	5,919	1.32%	0.28%
2000	43,855	7.97%	1.85%	5,184	0.94%	0.22%	5,171	0.94%	0.22%
2005	39,365	6.70%	1.66%	8,445	1.44%	0.36%	7,732	1.32%	0.33%

Source: AAPA; Notes: Unavailable for Chester, Camden, and Paulsboro.

Figure 14: Top Five Imports and Exports for Delaware River Ports and U.S. by Value, 2005

Delaware River Exports	Delaware River Export Share	U.S. Exports	U.S. Export Share
Motor Vehicles	31%	Industrial Machinery	14%
Petroleum Products	12%	Motor Vehicles	10%
Precious Stones & Metals	7%	Petroleum Products	7%
Industrial Machinery	6%	Organic Chemicals	7%
Plastics	6%	Plastics	6%
Delaware River Imports	Delaware River Import Share	U.S. Imports	U.S. Import Share
Petroleum Products	65%	Petroleum Products	27%
Iron & Steel	7%	Motor Vehicles	13%
Fruit & Nuts	4%	Industrial Machinery	11%
Meat	3%	Elec. Machinery	7%
Industrial Machinery	2%	Apparel	3%

U.S. Census Foreign Trade Division.

Figure 15: Trading Partners by Percentage of Total Trade, 2005

Trade Partners (by weight)	Delaware River % of Trade	U.S. % of Trade
Asia	3%	22%
Africa	43%	13%
North America	7%	17%
South America	16%	18%
Middle East	13%	11%
Europe	15%	16%
Australia/Oceania	1%	1%
Central America	2%	2%
Total	100%	100%

Source: U.S. Army Corps of Engineers.
Notes: Foreign imports and exports only.

Trading Partners

Although Asia dominates U.S. waterborne trade, few Asian carriers visit the Delaware River, and none call on Philadelphia. In general, East Asian cargo shippers prefer the Trans Pacific route and tend to call on West Coast ports. West Asian cargo shippers that use the Suez Canal are drawn to the Port of New York/New Jersey as a first port of call given its size and local consumer market. These factors limit the Delaware River ports' competitiveness in Asian markets, which is also constrained by the complex's upriver

location and limited connectivity to inland distribution networks.

Instead of Asia, Delaware River ports are tied to Africa, a trade relationship largely driven by the region's strength in petroleum and other niche cargoes. As Figure 15 illustrates, 43 percent of Delaware River trade was with African markets in 2005, compared with 13 percent nationwide. And, as Figure 16 illustrates, trade with African markets account for virtually none of the Delaware River's container shipments.

Import/Export Ratio

While the Delaware River ranks among the top U.S. ports for total tonnage, the region represents a small export market, resulting in a stark import/export imbalance.

As Figure 17 illustrates, in 2005 Philadelphia ranked highest in the region for import tonnage (11th in the nation) and lowest for export tonnage (70th in the nation), amounting to a 80 to 1 ratio of import tons to export tons. Camden (9 to 1) and Wilmington (18 to 1) also have trade imbalances. The region's import/export imbalance is less stark when measured by value, largely due to the high volume and value of petroleum cargo shipments. Current import and export rankings of all U.S. ports by tonnage and value is provided in Appendix G.

The Delaware River's trade imbalance can be explained in part by the economic composition of industry in its market area. For the most part, the region's businesses do not manufacture products that require ocean-going services, resulting in a weak export market. The weak export market compromises shippers' ability to backhaul cargo from Delaware River ports, resulting in inefficiencies associated with moving empty vessels out of port. This amounts to an additional expense to

Figure 16: Delaware River and United States Trade with Asia and Africa, 2005

	Delaware River		United States	
	% Containerized Trade Value	Top Five Goods Traded by Value (% of Total)	% Containerized Trade Value	Top Five Goods Traded by Value (% of Total)
Asia	25%	Iron & Steel (30%) Petroleum Product (12%) Wood Products (11%) Elec. Machinery (9%) Cocoa (8%)	74%	Ind. Machinery (15%) Motor Vehicles (14%) Elec. Machinery (12%) Furniture (4%) Apparel (4%)
Africa	1%	Petroleum Product (12%) Cocoa (2%) Iron & Steel (1%) Fruit & Nuts (0.4%) Ind. Machinery (0.2%)	11%	Petroleum Product (78%) Ind. Machinery (4%) Motor Vehicles (3%) Cereals (2%) Iron & Steel (1%)

Source: U.S. Census Foreign Trade Division.

shippers, reducing Delaware River’s cost competitiveness.

Key Competitors

Delaware River ports compete for business with other East Coast ports. Its closest competitors include the ports of New York/New Jersey, Baltimore, and Virginia.

Port of New York/New Jersey

With the largest volume on the East Coast, the Port of New York/ New Jersey is comprised of multiple publicly-owned facilities on more than 1,400 acres. It is nearly 50 percent larger than the footprint of Camden, Philadelphia, and Wilmington ports combined.

The Port Authority, created in 1921 to manage the shared harbor interests of New York and New Jersey, oversees seven cargo terminals and is viewed as a “must call” port by shippers due to the economies of scale it offers, its affluent and dense local consumer market, and the vast network of road and rail connections to inland markets. Norfolk Southern, Canadian Pacific, and CSX railroads serve the facilities. Efforts to dredge to a channel depth of 50 feet are underway to the new generation of container mega-ships.

New York/New Jersey handles a wide variety of cargo. Its largest markets include petroleum products (especially gasoline), food products (especially alcoholic beverages), and manufactured equipment (especially vehicles and textiles).

Port of Baltimore

At just over 1,000 acres, the Port of Baltimore is slightly larger in area than Camden, Philadelphia, and Wilmington combined. Its facilities are accessible via a 50-foot channel and are located 150 miles from the ocean, over twice as far inland as Wilmington and fifty percent farther than Philadelphia. (Appendix G provides

Figure 17: Rankings of U.S. Ports by Tonnage and Value, 2005

Cargo Tonnage					
Imports			Exports		
Rank	Port	Short Tons	Rank	Port	Short Tons
11	Philadelphia	25,914,744	60	Camden-Gloucester	545,293
17	Paulsboro	18,133,852	66	Chester	400,092
29	Marcus Hook	9,570,380	67	Wilmington	381,567
33	Wilmington	6,896,449	70	Philadelphia	322,702
40	Camden-Gloucester	4,742,854			

Cargo Value					
Imports			Exports		
Rank	Port	Value (\$)	Rank	Port	Value (\$)
6	Philadelphia	29,462,379,151	22	Philadelphia	2,430,517,679
35	Chester	5,684,957,894	24	Wilmington	2,175,543,116
37	Wilmington	5,499,289,565	32	Chester	1,594,532,247
79	Paulsboro	255,203,257	74	Camden	149,968,973
103	Camden	67,409,025	84	Paulsboro	88,580,455

Source: U.S. Census Foreign Trade Division.
Note: Tonnage is for foreign trade only.

a comparison of selected East Coast ports’ distance to inland destinations.) Baltimore markets its inland location as a strategic advantage related to closer proximity to Midwest distribution locations.

Baltimore’s five public terminals are overseen by the Maryland Port Administration. The port is served by the Norfolk Southern and CSX railroads and is close to I-95. Its key

commodities include crude materials (especially iron ore and scrap metal), forest products, and “Ro-Ro” products (especially motor vehicles and parts).

Virginia Ports

The Virginia ports are comprised of three publicly-owned terminals stretching over 1,172 acres. Virginia ports have distinct natural assets,

Figure 18: Port of New York/New Jersey



Source: Port Authority of New York/New Jersey

Figure 19: Competitor Port Facilities

Competitor Port	Number of Facilities	Total Acreage	Channel Depth
Port of Baltimore	5	1,073	50 feet
Virginia Ports	3	1,172	50 feet
Port of New York/New Jersey	7	1,407	45 feet*
Delaware River Ports	11	990	40 feet**
<i>Philadelphia Regional Port Authority</i>	7	351	
<i>South Jersey Port Corporation</i>	3	331	
<i>Diamond State Port Corporation</i>	1	308	

Source: Port websites.

Note: Facilities and acreage represent publicly owned port facilities only.

* Dredging project is underway to deepen the channel to 50 feet.

** Funding for dredging project to deepen the channel to 45 feet has received preliminary approval.

including proximity to the ocean (18 miles) and a natural deepwater (50 foot) and ice-free harbor.

These advantages help the Virginia ports compete in the container market with other top ports like New York/New Jersey. Virginia Port Authority, which owns and oversees the port's public terminals, has adopted a strategy of attracting distribution centers for major retailers, such as Wal-Mart, to reinforce the Virginia ports attractiveness as the gateway to inland markets. With close access to I-64 and rail service from both CSX and Norfolk Southern, fast access to of the country's interior has boosted the Virginia port's volume of business.

Virginia's key commodities include coal and food products (especially tobacco). In another noteworthy department from East Coast competitors, its exports outweigh its imports.

Comparative Cargo Statistics and Trends

Comparative analysis shows that the Delaware River has lost ground to its competitors in recent years, especially relative to New York/New Jersey.

Commodities & Tonnage

As Figure 21 illustrates, Delaware River ports' market share of foreign

trade volume has declined in recent years, while New York/New Jersey's share has spiked.

Trends in market share can be explained in large part by the type of commodities shipped through the port. As Figures 22 and 23 illustrate, while the Delaware River's market share of trade volume remains high compared to competitor ports, it is largely driven by the slower growth bulk and breakbulk markets (including general cargo). By contrast, New York/New Jersey's prominence in the high-growth container market is driving growth in that port's overall market share.

Containers

The Delaware River's small position in global container trade has contributed to its loss of market share in overall foreign trade volume. As Figure 24 illustrates, New York/New Jersey and Virginia have experienced dramatic increases in container traffic in recent years, while Delaware River container traffic has remained flat.

As a result, the Delaware River is currently not a major center of activity for container traffic. As Figure 25 illustrates, none of the ports on the Delaware River are top tier container ports. In 2006, Wilmington ranked 18th (9th on the East Coast) and

Figure 20: Competitor Port Commodities, 2005

Top Five Commodities	Port of Baltimore		Virginia Ports		Port of New York/New Jersey		Delaware River Ports	
	Short Tons (000s)	% of U.S. Total	Short Tons (000s)	% of U.S. Total	Short Tons (000s)	% of U.S. Total	Short Tons (000s)	% of U.S. Total
Crude Materials	9,260	5.4%	2,745	1.6%	9,947	5.8%	3,945	2.3%
Coal	6,224	7.6%	16,725	20.6%	n/a	n/a	n/a	n/a
Primary Manufactured Goods	3,602	3.0%	3,298	2.7%	7,574	6.2%	5,924	4.9%
Petroleum & Petroleum Products	3,438	0.5%	n/a	n/a	44,806	6.0%	66,908	8.9%
Manufactured Equipment/Machinery	2,695	3.0%	4,499	5.0%	10,233	11.4%	5,924	4.9%
Food and Farm Products	n/a	n/a	3,805	2.2%	7,673	4.4%	5,032	2.9%
Total	28,235	1.9%	34,280	2.3%	87,799	5.9%	82,250	5.5%

Source: U.S. Census Foreign Trade Division.

Note: Foreign imports and exports only.

Philadelphia ranked 19th (10th on the East Coast) in TEUs. Even if tonnage handled at Philadelphia and Wilmington were combined, the volumes would fail to match 16th-ranked Baltimore. Together, Wilmington and Philadelphia handle just one-quarter of the containers moving through the Virginia ports and one-tenth moving through the Port of New York/New Jersey.

As a whole, East Coast container movements are highly concentrated, with New York/New Jersey, Savannah (GA), and Virginia ports accounting for over 60 percent of East Coast traffic.¹¹ This concentration is the product of port capacity, strong landside connections critical national distribution markets such as Chicago and Columbus, and large consumer markets. The stabilizing influence of these market factors will likely perpetuate concentration of container traffic in the foreseeable future.

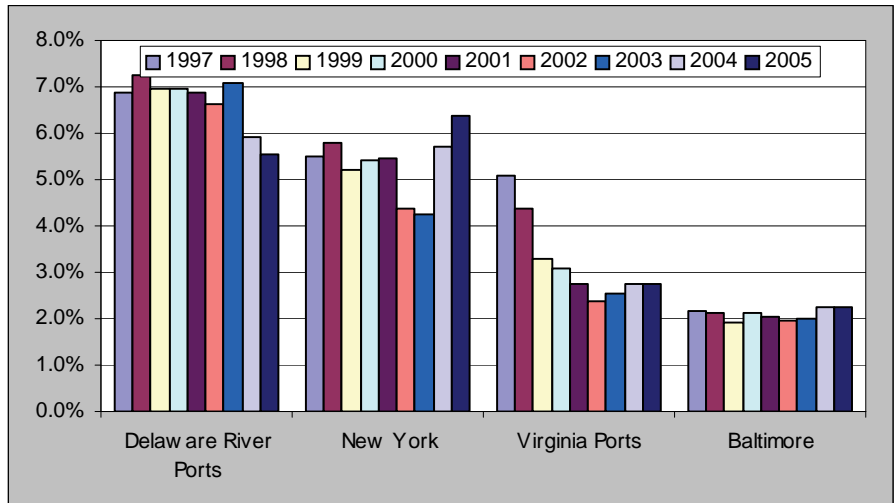
**Plans for the Future:
Philadelphia, the Delaware River, and the Competition**

Ports are in a constant state of re-evaluating global trends and the competitive landscape to strategically position facilities for capturing future maritime business. Planning for the future on the Delaware River will require keeping pace with these efforts. The planned and potential improvements and expansions of individual ports, and those of their competitors, will affect the future volumes of maritime commerce in the region and the economic benefits that that activity generates.

Port of Baltimore

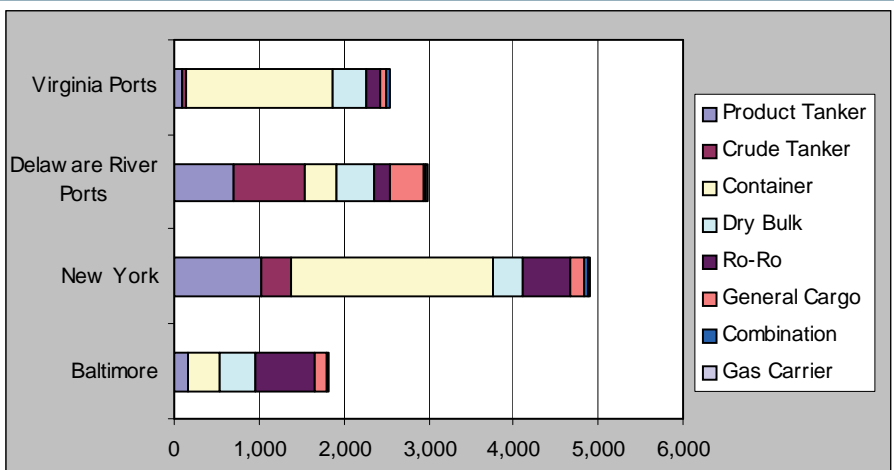
The Maryland Port Administration's 2002 Strategic Plan for the Port of Baltimore evaluated the comparative strengths and weaknesses of the port and the operational and political environment. The plan established an explicit goal of three percent annual container growth and

Figure 21: Share of U.S. Waterborne Foreign Trade Volume by Customs Port, 1997-2005



Source: U.S. Census Bureau.

Figure 22: Vessel Calls by Ship Type, 2005



Source: U.S. Department of Transportation, Maritime Division.

Figure 23: Petroleum and Petroleum Product Vessel Calls, 2005

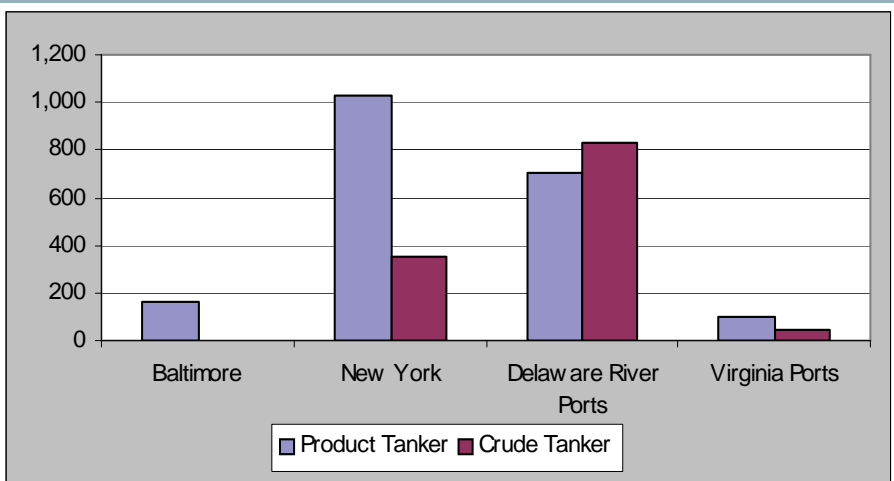
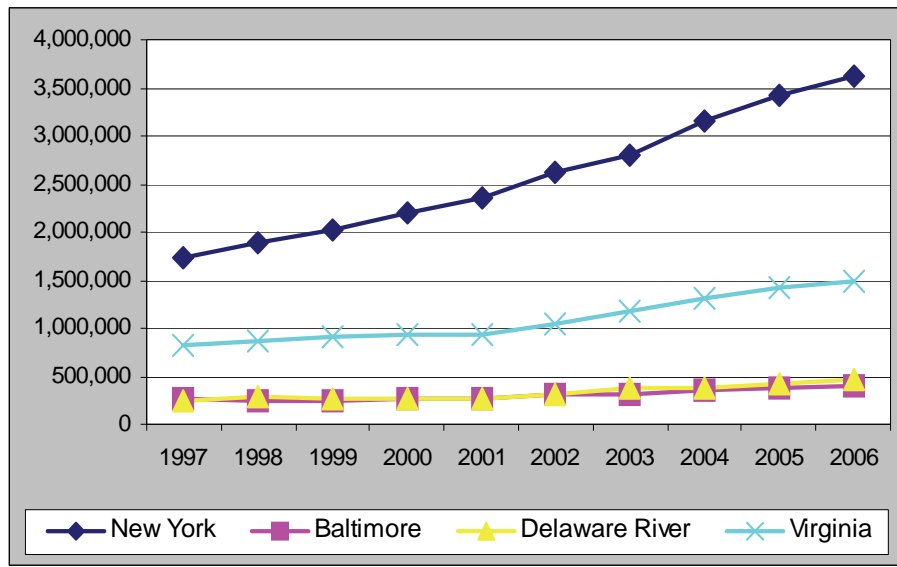


Figure 24: Total TEUs by Customs Port, 1997-2005



Source: U.S. Census Bureau.

Figure 25: Rankings of U.S. Container Ports, 2006

Rank	Port	TEUs
1	Los Angeles	8,469,853
2	Long Beach	7,289,365
3	New York/New Jersey	5,092,806
4	Oakland	2,390,262
5	Savannah	2,160,168
6	Tacoma	2,067,186
7	Hampton Roads	2,029,799
8	Seattle	1,987,360
9	Charleston	1,968,474
10	San Juan (FY)	1,729,294
11	Houston	1,606,360
12	Honolulu (FY)	1,113,789
13	Miami (FY)	976,514
14	Port Everglades (FY)	864,030
15	Jacksonville (FY)	768,239
16	Baltimore	627,947
17	Anchorage	485,760
18	Wilmington (DE)	262,856
19	Philadelphia	247,211
20	Palm Beach (FY)	244,004
21	Portland (OR)	214,484
22	Boston	200,113
23	Gulfport	197,428
24	Wilmington (NC)	177,634
25	New Orleans	175,957

Source: AAPA & PRPA.

Notes: East Coast Ports in bold.

expanded niche cargo business in forest products, steel, and automobiles.

New facilities were designed to help Baltimore reach its goal of being the first-ranked port for automobiles (it is currently ranked second). Between 1997 and 2002, the Port of Baltimore constructed 200,000 square feet of cargo sheds and a new auto terminal and acquired land for future expansion. In 2007, the port opened two automotive-related facilities, including a 72-acre processing center.

The Port of Baltimore also sought to foster new relationships and expand its business. For example, the Port has completed an agreement with the Suez Canal Authority for information sharing that could lead to joint marketing efforts. The Port of Baltimore also intends to expand its facilities. In addition to the construction of an additional berth at the Seagirt Marine Terminal, three other sites have been targeted for future expansion and terminal development:

⇒ *Cox Creek*: 230 to 330 acres, available about 2020

⇒ *Masonville*: 100 to 130 acres, avail-

able about 2035

⇒ *Sparrows Point*: 220 to 420 acres, available about 2040

Baltimore has also taken strides to link facilities improvement and expansion with infrastructure enhancement, including dredging projects and security upgrades. A working group including CSX and Norfolk Southern has managed marketing issues and landside transportation concerns, including chokepoints in the rail system that serves the port. In particular, the region's lack of "double stack" (two containers stacked on top of each other) rail clearance in its aging tunnels limits potential future port growth. Establishing such clearance would cost billions of dollars and likely require a massive public subsidy.

Virginia Ports

Recent private and public infrastructure investments have helped the Virginia ports prepare for future growth. APM Terminals, associated with the Maersk-Sealand shipping line, announced a \$600 million investment in a 300-acre container terminal in April 2004. In 2005, federal funding was granted for the Heartland Corridor, an improvement project that will enhance rail capacity and access to Midwest growth markets such as Columbus, OH (a growing hub for distribution centers) and Chicago, IL. Construction is underway with completion expected in June 2010. In 2006, a \$60 million investment funded the construction of one million square feet of warehouse/distribution space. Another 3.5 million square feet is in planning stages.

The Virginia ports' long-term vision is reflected in its 2040 master plan. Capital investments totaling nearly \$3 billion are planned between 2006 and 2032, all with an eye towards managing the anticipated tripling of cargo demand during this period. Among them, the largest is Craney Island development, container facilities to be built over 600

acres in two stages with a projected final capacity of 5.0 million TEUs. The port also has authorization to dredge its harbor to a depth of 55 feet, enabling it to handle the new generation of container mega-ships.

Port of New York/New Jersey

The Port of New York/New Jersey expects to continue to be a high volume port. To accommodate increasing container demand, New York/New Jersey is dredging its channel to 50 feet. Scheduled for completion in 2014, parts of the deeper channel may be serviceable as soon as 2009.

New York/New Jersey's long-term vision is reflected in its Comprehensive Port Improvement Plan. Created in 2005, the Plan projects cargo volumes through 2060 and evaluates infrastructure needs to handle anticipated traffic flows. The plan's projections also account for competitor port activity.

A capacity analysis revealed that roughly double the number of containers could be handled without major expansion or investment, but also that by 2060, an additional 2,138 acres would be needed. There are 2,780 acres available at existing facilities, so redevelopment rather than acquisition will be employed. Cost analysis revealed that Port Elizabeth is the optimum location for terminal enhancements to increase container-handling operations.

As part of a \$2 billion capital strategy, investments are being made that will double the port's rail capacity, allowing for simultaneous arrivals and departures for CSX and Norfolk Southern. Other terminal area upgrades, such as new buildings and implementation of advanced green and information technologies, also have commenced. To address the region's highway congestion, the plan also suggests revenue supports and other mechanisms that would incen-

Figure 26: Virginia Port Authority Proposal for "Craney Island Marine Terminal"

	Phase I: 2017	Phase II: 2032
Size	220 acres	600 acres
Depth	52 feet	52 feet
Capacity	1.5 million TEUs	5.0 million TEUs
Cost	\$1.2 billion	\$1.0 billion

Source: Virginia Port Authority presentation to the Transportation Accountability Commission, January 31, 2007.

tivize greater use of rail for landside transportation movements at the port.

Delaware River Ports

Although the Delaware River ports as a whole have not undertaken a comprehensive planning process, various infrastructure and facility improvement projects are either planned or underway. The long-awaited I-95/PA Turnpike Interchange connection is designed to reduce congestion and smooth tran-

River Port Authority, identifies the need for additional berths beyond those being developed at Paulsboro, including additional berths at sites in Carney's Point and Gloucester City. In Delaware, the Diamond State Port Corporation has 180 acres adjacent to the Delaware River available for future expansion. While it hopes to develop this land, funding has yet to be secured for the project. In Pennsylvania, Governor Edward G. Rendell announced in May 2007 a \$300 million capital improvement program for port development.

In addition to investments in existing facilities, there may be a proposal for a new facility construction under the aegis of the Philadelphia Regional Port Authority. Of particular note are two sites adjacent to the Packer Avenue Marine Terminal. To the north, an expansion of 1000 acres would add 2,700 linear berthing feet. To the south of Packer Avenue, marginalization of existing finger piers and conversion of 90 to 140 acres is being explored. The PRPA anticipates issuing a request for information in June 2008 to private investors to gauge interest in developing the facility. The size, cargo types handled, equipment and technology employed and net new business attracted to the region will determine the magnitude of tonnage and direct employment growth associated with any new facilities.

The Heartland Corridor promises to shave a half-day and over 200 miles off the current rail route to Chicago from the Port of Virginia.

sitions between the region's major highway connectors. Construction is slated to commence in 2008. Rail improvements initiated by CSX will enhance the region's existing double stack clearance, allowing for higher volumes of container cargo to move through the region. PRPA has been designated the non-federal sponsor for dredging the Delaware River's main channel from 40 to 45 feet to allow the region's ports to accommodate larger vessels with heavier loads.

These proposed investments and projects suggest that Delaware River ports could see additional upgrades or expansion in the near future. In New Jersey, The South Jersey Port Corporation is developing a 190-acre port in Paulsboro, a facility that is anticipated to start with two berths and be operational in three years. A master plan for the South Jersey Waterfront, completed by the Delaware

Section 3: Global Trends and Implications for Delaware River Ports

Key Findings

- ⇒ Containerization has driven increases in global cargo demand, led by double-digit annual growth of demand from South and East Asian markets.
- ⇒ Container-based shipping is expected to double by 2020.
- ⇒ Containerization is driving innovation in the shipping industry, including larger ships and increased scrutiny on unit shipping costs.
- ⇒ Trade rationalization and shifting trade routes have created opportunities for East Coast ports to capture additional market share of global maritime cargo.
- ⇒ Several factors indicate Delaware River ports are well-positioned to capture a share of the global increase in cargo shipments, including existing terminal and landside capacity; noted operating efficiency; proximity to a large consumer market; and positioning for niche cargoes.
- ⇒ Several factors limit Delaware River ports' ability to capture additional cargo, including distance from the ocean and a relatively shallow channel; limited connectivity with distribution networks; limited trade with Asian growth

markets; a weak export market; and limited regional collaboration.

Recent Patterns of Cargo Movement by Type

International trade patterns, technological development, and consumption patterns have impacted Delaware River port development.

Over the past quarter-century, growth in shipment of crude oil and petroleum products, major bulk commodities, and other bulk and containerized cargoes has roughly paralleled global and regional GDP growth. However, other factors such as production and supply chain management could render historical trends less reliable as predictors of future shipments. Figure 27 provides a summary of global growth trends by cargo type from 1980 to 2005, excluding containers. Unprecedented growth in global shipping occurred between 1990 and 2000 despite significant disruptions in Asian trade and economic shocks in South America and Eastern Europe.

Global exports in 2005 were dominated by Asia, including both intra- and inter-continental trade. Exports from the Americas and Europe were at approximately the same levels in 2005, with Oceania

and Africa exporting a distinctly lesser volume of goods. Increased transshipment activity – the movement of goods between ships in port – and slowing of the most rapidly growing economies of Asia, coupled with the maturation of outsourcing trends, might change existing structural relationships between GDP growth and trade volumes.

The composition of maritime global trade changed significantly between 1970 to 2005. In the 1970s, crude oil and petroleum shipments accounted for the majority of waterborne commerce. Between 1980 and 1990, crude oil and petroleum shipments remained relatively constant, but containerized traffic began to emerge. By 2005, dry shipments (bulk and container) comprised almost two-thirds of all waterborne trade despite continued growth in liquid (crude oil and petroleum) bulk shipments, a shift driven by the 5.0 percent average annual growth in dry (container and bulk) shipments between 1990 and 2005.

Container Trades

The second half of the twentieth century was marked by the revolutionary development of container-based shipping. In standardizing the method of cargo handling, containerization improved the efficiency of marine commerce, driving port interests to pursue technological investments that would adequately support container operations.

These investments served to expand port capacity and set the stage for enormous increases in overall trade volume. Continued technological advancements have increased the cost effectiveness of container shipping, expanding the breadth of cargoes moved in this medium. The movement to containerization perpetuated virtually all of late 20th century global shipping and undoubtedly

Figure 27: Trends in Global Maritime Trade, Loaded Goods, 1980-2005

Cargo Type	1980	1990	2000	2005
Tanker/Liquid	1,871	1,755	2,163	2,422
CAGR		-0.6%	2.1%	2.3%
Dry Major Bulk	796	968	1,288	1,701
CAGR		2.0%	2.9%	5.7%
Other Bulk	1,037	1,285	2,533	2,986
CAGR		2.2%	7.0%	3.3%
Total Dry	1,833	2,253	3,821	4,687
CAGR		2.1%	5.4%	4.2%
Total	3,704	4,008	5,984	7,109
CAGR		0.8%	4.1%	3.5%

Source: UNCTAD, 2006.

Notes: CAGR=Compound Annual Growth Rate; Major bulk cargo limited to iron ore, grain, coal, bauxite/alumina & phosphate.

will drive 21st century maritime commerce.

Changes in the global economy have played a leading role in promoting container growth. Among the driving forces in expansion of container and liner (regularly scheduled) operations has been globalization of production, transition of developed countries from manufacturing- to service-oriented economies, and the adaptability of containerized transportation to handle diverse commodities, including many that were formerly shipped via bulk carriers. Additionally, the growth of income and wealth in developing countries among a percent of the population has led to greater global demand for finished goods.

One of the most significant factors in the rapid expansion of containerized trade has been the integration of landside intermodal transportation. Port operators that understood this connection and implemented innovations in integrating transportation modes have seen an increase in container traffic.

Between 1995 and 2005, total container demand more than doubled from 144.1 million TEUs to 391.1 million TEUs. However, the concentration of growth has been less pronounced with traditional trade partners for the East Coast

Figure 28: Annual Growth in Container Demand by World Region, 1990-2005

World Region	1990-1995	1995-2000	2000-2005
North Europe	6.45%	8.07%	8.52%
S. Europe/Mediterranean	11.41%	12.86%	9.96%
Middle East & South Asia	12.90%	10.48%	15.39%
Sub-Saharan Africa	9.55%	8.35%	11.78%
East Asia	14.22%	11.13%	12.22%
Australia/Oceania	5.00%	8.22%	7.84%
North America	6.13%	7.48%	7.24%
Other Americas	14.58%	10.72%	9.64%
Total	10.83%	10.14%	10.82%

Source: UNCTAD, 2006.
Notes: CAGR=Compound Annual Growth Rate; major bulk cargo limited to iron ore, grain, coal, bauxite/alumina & phosphate.

such as Europe and South America, limiting the impact of growth on East Coast port traffic. Overall, average annual growth was over 10 percent for each five-year period from between 1990 and 2005. As Figure 28 illustrates, the Middle East and South Asia grew most rapidly throughout this period, with an average annual growth rate of over 15 percent between 2000 and 2005. North America was among the slowest growing of all global port regions, averaging less than 8 percent. Northern Europe averaged more than 8 percent growth for both time periods between 1995 and 2005, while the Southern Europe/Mediterranean averaged nearly 13 percent growth between 1995 and 2000 and 10 percent between 2000 and 2005.

As Figure 29 illustrates, relative growth rates have caused changes to relative market share. These data show that the relative growth in developing regions has begun to drive global container trade and that growth in container trade for developed economies is more modest yet still significant. Most forecasters expect these trends to continue through the next five to seven years.

Although North America's share of global container demand declined between 1995 and 2005, growth in container cargo rose in each of the North American port areas: North and South Atlantic, North and South Pacific, Pacific and Atlantic Canadian, Gulf and Island Pacific. The South Pacific port region, which includes the ports of Los Angeles

Figure 29: Shares of World Container Demand by Port Region, 1995 and 2005

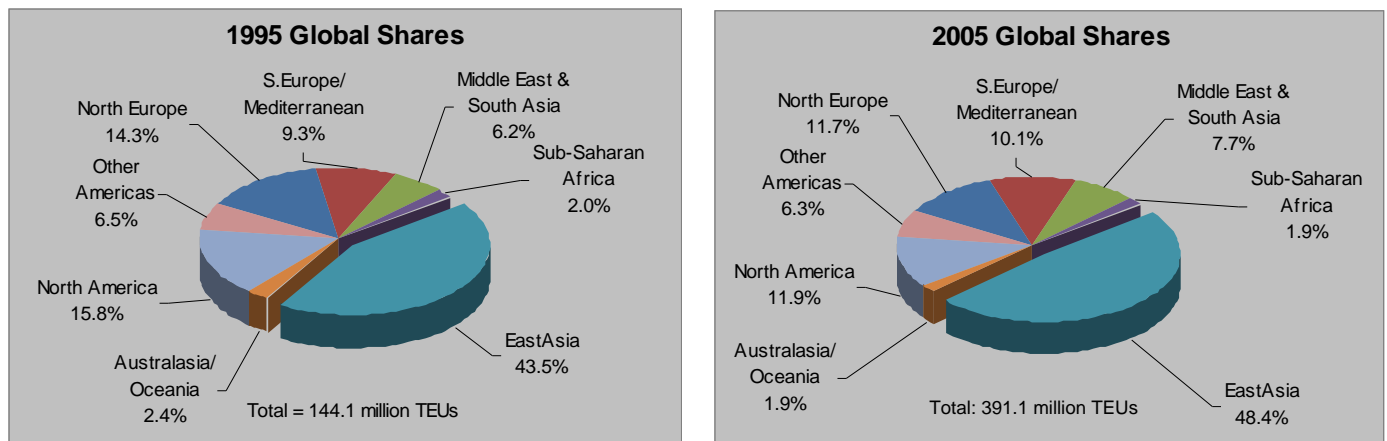
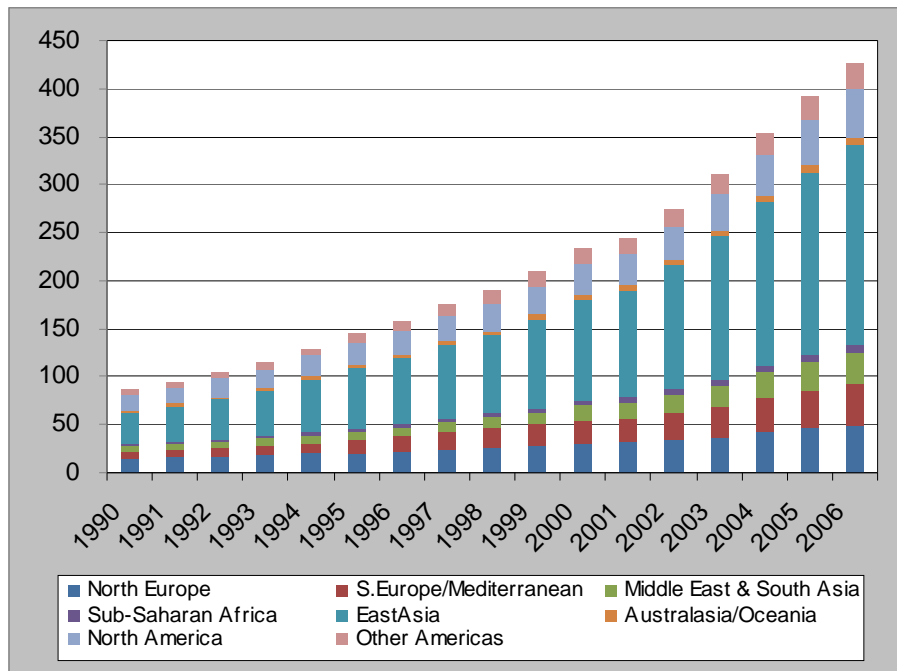


Figure 30: Growth in Container Demand by Global Port Regions, 1990-2006



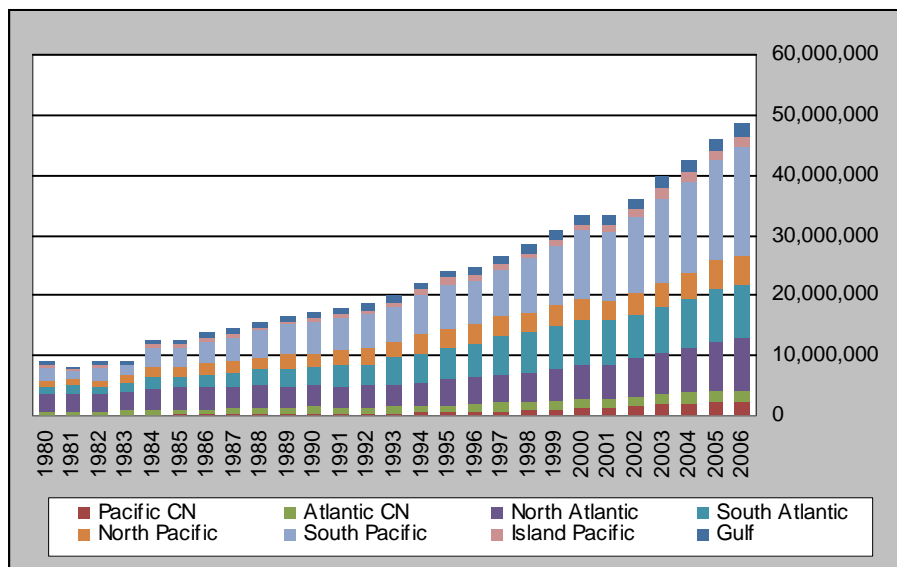
Source: Ocean Shipping Consultants, 2007.

and Long Beach, Oakland and San Diego (among others), moves the largest number of containers annually. North and South Atlantic ports handle roughly the same annual volumes of container traffic, with the South Atlantic ports handling

between 400,000 TEUs (2004) and 2.1 million TEUs (2000) more than the North Atlantic ports since 1993. For a list of individual ports by North American region, please see Appendix G.

As Figure 32 illustrates, the North

Figure 31: Growth in Container Demand by U.S. Port Regions, 1990-2006



Source: American Association of Port Authorities, July 2007.

Atlantic port region (which includes Philadelphia and Delaware River ports) has the third highest average growth rate (over 6 percent) among U.S. and Canadian port regions, behind North and South Pacific regions. Unlike most regions, the North Atlantic and North Pacific port regions both had higher average annual growth rates between 2000 and 2005 than between 1995 and 2000. In particular, the North Pacific region grew as overflow and congestion in the South Pacific ports caused problems. Also, residual effects of the longshoremen's strike and the rail slowdowns on the Union Pacific caused shippers to employ alternative access points. On the North Atlantic, increased direct shipments from Asia, the size of inland markets, and new niche services (such as refrigerated cargo) helped to increase overall cargo flows.

Global Factors Driving Future Maritime Commerce

The study team convened an expert panel of national specialists in port operations, maritime commerce, international trade, freight flow dynamics, and intermodal logistics to weigh in on the factors that will have the greatest impact and how they might affect Philadelphia and the region. Panelists included: Steve Fitzroy of Volpe Transportation Group; Shashi Kumar, Dean of the U.S. Merchant Marine Academy; Elizabeth Ogard of Prime Focus Consulting; and John Rounesville of Horizon Lines. This chapter draws from the findings that emerged from panelist discussions.

Projected Container Growth

Global growth of container movements is expected to continue, fueled in part by the fast growing economies of Asia. In the U.S., container traffic is expected to more than double by 2020. However, the increase in containers also means larger ships

with deeper berth and channel requirements.

The global surge in containers is also expected to exhaust projected United States port capacity by 2015. Dwindling capacity is leading to port congestion, which is increasing shipping costs. Larger container ships also need plentiful warehouse storage, which is running out.

Trade Rationalization

Asian cargo destined for the U.S. East Coast or Midwest has historically been imported through West Coast ports and transported by train across the country, a trade pattern referred to as “land-bridging.” Rising fuel costs, congestion at West Coast ports, concerns regarding the vulnerability to trade disruptions, and changing global trade patterns have made land-bridging less economically viable in recent years. As a result, goods intended for East Coast markets are increasingly being shipped through East Coast ports, a shift referred to as “trade rationalization.”

The expected continuation of trade rationalization could result in increased activity at U.S. East Coast ports. Capturing additional market share will require that ports actively prepare for growth, especially by focusing on improvements to landside infrastructure and services. Shipping lines are increasingly taking into account the efficiency of cargo handling and inland distribution networks in choosing a port-of-call. For this reason, coordinated regional port activity and cost-effective connections to inland U.S. markets will be key factors in attracting future port business. Ports that are able to swiftly move cargo off the terminal and to such inland markets as Chicago, Memphis, and Detroit will be at a competitive advantage.

Shifting Trade Routes

Figure 33 illustrates current major global shipping routes. Trade patterns involving Latin America (via

Figure 32: Average Annual Growth Rates in Container Traffic by North American Port Region, 1990-2005

North American Port Region	1990-1995	1995-2000	2000-2005
Pacific CN	6.33%	18.75%	11.71%
Atlantic CN	1.71%	7.12%	3.30%
North Atlantic	4.36%	4.58%	8.14%
South Atlantic	12.08%	7.17%	2.79%
North Pacific	6.17%	2.06%	6.09%
South Pacific	7.01%	10.08%	7.94%
Island Pacific	8.29%	-8.42%	16.18%
Gulf	7.61%	7.30%	5.20%
Total United States	7.48%	6.35%	6.66%
Total North America	7.11%	6.73%	6.71%

Source: American Association of Port Authorities, July 2007.

the Panama Canal) and Southwest Asia (via the Suez Canal) are becoming more desirable as the economies of these regions improve. The relative viability of these trade routes is impacted by infrastructure limitations. Of note, the Panama Canal is coping with mounting delays and will not be able to accommodate the new generation of container ships until its expansion project is completed (scheduled for 2014). As an alternative, global traffic will increasingly make use of the Suez Canal. As ships travel through the Suez and across the Mediterranean Sea and Atlantic Ocean to the U.S., East Coast ports are the logical destination.

Short Sea Shipping

As container mega-ships enter global fleets, they will call on only the largest container ports. This trend will increase potential for the development of a hub and spoke system to accommodate demand, in which secondary ports with feeder barges would handle local, or “short sea,” trips. Such a system could be seen as analogous to air traffic, which utilizes hub airports as primary destinations and smaller, “reliever” airports to absorb a portion of additional traffic.

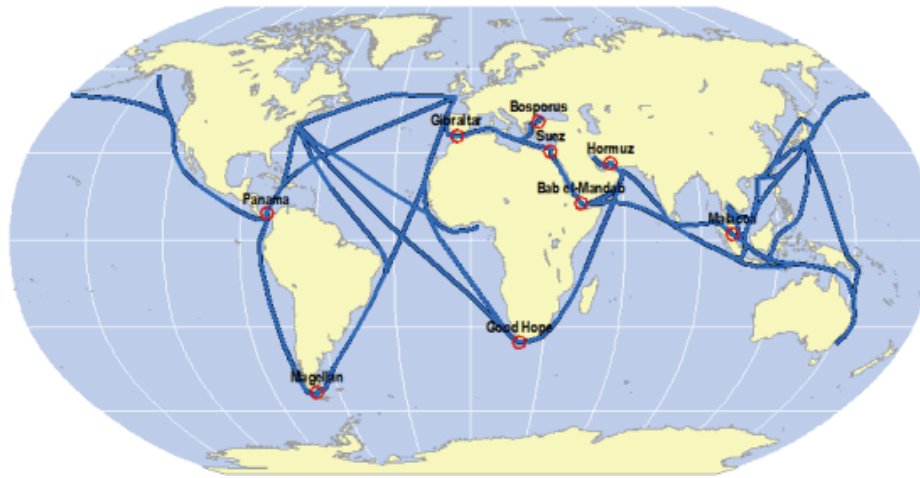
In other parts of the world, short sea shipping is used as a way to bypass poor roads and congestion. In the U.S., despite congestion in major metro areas and particularly around

ports, the cost differential is currently not significant enough to justify the entry of short sea routes by carriers. If the Federal Highway Administration pushes short sea shipping as a real strategy for mitigating landside highway congestion and improving air quality, then it is possible that subsidies like those offered intermodal rail facilities (using grants, bonds, and public/private partnerships) would induce marine carriers to develop these services.

A recent study evaluated possibilities for short sea shipping routes on the U.S. East Coast.¹² The investigators asked shipping companies to assess cost factors that would prompt them to use this type of service. Interviewees indicated that because container cargo is time-sensitive, the dependability of truck transportation is very valuable. The study estimated that a 10 percent cost savings would not be sufficient to utilize short sea shipping, however a 20 percent reduction may cause shippers to consider it.

In addition, legal barriers exist to the implementation of short sea shipping. The Merchant Marine Act of 1920, commonly referred to as the Jones Act, requires that shipping activity between ports in the United States be limited to U.S.-built ships. The Federal government’s recent exploration of short sea shipping as a means to mitigate road and rail con-

Figure 33: Global Shipping Routes



Source: Hofstra University.

gestion has underscored the potential for expansion of U.S. shipbuilding capacity.

Military Cargo Demand

Commercial cargo is not the only business flowing through the U.S. ports. Military cargo is imported and exported through local facilities. In particular, the RESET program returns damaged military equipment to a state of good repair. This effort requires that equipment, such as tanks, jeeps, and helicopters, be shipped back to the United States for maintenance. The 2007 Defense Appropriations bill included \$17.1 billion for this program, a substantial increase made necessary by mounting volumes of equipment worn out by prolonged military engagements in Afghanistan, Iraq, and elsewhere.

Implications for Delaware River's Competitive Position

Anticipated global trends highlight the important factors that will influence Delaware River ports' competitive position in future maritime commerce.

Positive Factors

Container Capacity to Increase Throughput. Proposed capital in-

vestments in port infrastructure would increase container capacity, thereby allowing the ports to capture a share of anticipated demand. In Philadelphia, recent proposals include densification of existing facilities and construction of new facilities, including the Southport and Northport proposals adjacent to the existing Packer Avenue facility. If realized, these capital projects could triple the Port of Philadelphia's container capacity.

Storage Capacity. Existing congestion at large East Coast container ports may present an opportunity for Delaware River ports. In particular, warehouse facilities are becoming scarce around the Port of New York/New Jersey. Efforts to invest in and promote warehousing and distribution centers in Greater Philadelphia could attract shipping business being squeezed out by dwindling supply at its competitor ports.

Access to Trade Routes. Ports on the Delaware River will not likely become the first point of call for container mega-ships coming through the Suez Canal, but they stand to benefit from increased usage of the Suez as a primary trade route.

Proximity to Large Regional Consumer Market. The Delaware

River's primary port function is to accommodate demand generated by its regional population base. As Figure 34 illustrates, the Delaware River is situated at the center of the most heavily populated region in the U.S. Approximately 27 million people are located within 100 miles of Delaware River ports, and 95 million people (31 percent of the U.S. population) are within 500 miles. The 500 mile radius is a rough fulcrum point between cost-effective service for trucks (shorter distance) and trains (longer distances). The Delaware River's geographic proximity to such a large consumer market will help its ports sustain competitiveness in maritime commerce.

Port Operating Efficiency.

Delaware River ports have relatively predictable and versatile work rules that are a distinct advantage over competitors. For example, the Port of Philadelphia offers 19 labor "start times" compared to New York/New Jersey's five. Additional start times improve competitiveness by increasing docking flexibility, thereby reducing the potential for delays and, in turn, the average cost to shippers of calling on the port. Additionally, Philadelphia has been noted for high landside velocity, minimizing a ship's "turnaround time" and further reducing shipping costs.

Landside Infrastructure Capacity. The region's major highways, including Interstate 95, Interstate 476, Interstate 76, Pennsylvania Turnpike, and New Jersey Turnpike create an extensive arterial network serving both North-South and East-West freight corridors. These roadways are close to the region's port facilities and have low levels of congestion relative to competitor ports, thus providing competitive connections to large clusters of distribution facilities in South Central Pennsylvania, the Lehigh Valley, and Central New Jersey.

The region's freight rail network also is extensive and well-connected to the river. Both CSX and Norfolk Southern have modern intermodal facilities adjacent to Packer Avenue Marine Terminal. Combined, the region's road and rail infrastructure represent a critical support mechanism for moving cargo from the Delaware River ports to a final destination.

Positioning for Short Sea Shipping. If short sea shipping materializes, Delaware River ports would likely act as "relievers" for larger container ports such as New York/New Jersey or the Virginia ports. Of specific short sea feeder routes evaluated by the study team, one from Halifax, Nova Scotia to Philadelphia was seen as having the most promise. The study team concluded: "Should a short sea operator from Atlantic Canada wish to target transshipped feeder traffic...a port in Philadelphia would be a suitable choice and help complement the existing demand."¹³

Short sea shipping would also create new demand for American-built ships. In the Aker Shipyard, Philadelphia would be well positioned to capture a significant share of this new market.

Positioning for Military Cargo. Philadelphia is strategically positioned to handle additional demand for military cargo. Letterkenny and Tobyhanna Army Depots in Pennsylvania are already servicing electronics and vehicles that come through the Port of Philadelphia, a designated strategic port deemed to have the appropriate capacity, logistical networks, and security to handle military cargo. Increased Congressional funding for RESET, continued military equipment needs, and Philadelphia's maintenance of its strategic port designation present the opportunity for increased maritime activity.

Limiting Factors

Shallow Channel Depth. The

Delaware River does not have a deep enough channel to accommodate the largest of new container ships. Even now, some ships must be "lightered" (partially offloaded to reduce draft requirements) before navigating up the river. Dredging the Delaware River channel from 40 to 45 feet will help to mitigate this limitation, but it will not be sufficient to accommodate the new generation of

container mega ships. Several competitors are undertaking more aggressive channel deepening measures, putting the Delaware River ports at a competitive disadvantage, even if dredged to a 45-foot depth.

The impact of a relatively shallow channel is compounded by tidal shifts, which can delay ships at the mouth of the Delaware River for up

Figure 34: 100-mile and 500-mile Radii from Philadelphia



to 10 hours.

Distance from the Ocean. The Port of Philadelphia is approximately 100 miles from the mouth of the Delaware River, a trip of as much as a half-day that amounts to a significant additional cost.

Limited Trade with Asian Markets. The Delaware River ports have not been active participants in the rise of trade with Asia, the world's largest container growth market. At present, no Asian ships call on any Delaware River port. Capturing additional container share will require establishing closer ties with Asian container business.

Limited Connectivity with Inland Markets and Critical National Distribution Networks. The ability for Delaware River ports to develop connections with distribution networks is constrained by the Philadelphia region's rail and road infrastructure.

Regarding railroads, low bridge clearances limit the region's capacity for "double stack" container trains to access inland distribution networks. Double stack trains have become the standard for container service, doubling a train's container capacity by without increasing fixed costs. Double stack clearance is critical for railroads to provide ports with competitive distribution service, and is therefore essential for establishing a port's competitiveness in connections with inland markets.

Currently, the only port facility in the Philadelphia region with double stack clearance is the Packer Avenue Marine Terminal. However, Packer Avenue's double stack clearance is constrained in that it requires trains to stop and change tracks, a process that adds 37 miles and 5 hours to travel. This distance and time adds cost that reduces the benefit of double stacking.

Most of the Philadelphia region's double-stacked trains first travel north through New York to access inland distribution markets, a process that can add up to a day of additional travel for Delaware River based trains compared with New York-based trains.

As a result, the Delaware River ports' container market is limited to regional markets and truck-based distribution, which is also constrained in part by infrastructure limitations. The connections between the highway system and port facilities are characterized by troublesome grade crossings and frequent delays. Compounding poor connectivity is poor condition. That 57 road bridges

The ability for Delaware River ports to develop connections with distribution networks is constrained by the Philadelphia region's rail and road infrastructure.

in southeastern Pennsylvania are rated "structurally deficient" illustrates that the region's infrastructure is rapidly aging, a factor that is compromising the highway network's ability to effectively service port activity.

Trade Imbalance. The decline of manufacturing in Philadelphia reduced the region's exports. Rapid globalization weakened U.S. export markets and further undermined the region's status as an exporter. The result has been a drastic import-export trade imbalance. This imbalance has led to inefficiencies by limiting shippers' ability to backhaul, thereby increasing the cost of calling on a Delaware River port. Moreover, niche cargoes, for which the region has developed an expertise, tend to be seasonal, a temporal reality that results in an uneven and therefore inefficient overall usage of existing facilities. These factors have all lim-

ited the Delaware River's maritime competitiveness.

Limited Regional Collaboration. Competition and conflict among Delaware River port facilities have led to fractious and unproductive relationships among port stakeholders. Despite several efforts at institutionalizing regional coordination, historically public and private port entities have operated unilaterally.

As a result, while other regions have banded together to promote unified port interests, Delaware River ports compete with one another for business and develop plans for growth in a piecemeal manner. Philadelphia's lack of regional collaboration has resulted in inefficient use of increasingly scarce waterfront land, compromising overall port competitiveness.

Summary

Delaware River ports' competitive advantages - terminal, storage, and infrastructure capacity, access to trade routes, proximity to a large regional consumer market, operating efficiency, and positioning to accommodate future demand - and their disadvantages - a shallow channel, prohibitive distance from the ocean, trade imbalance and trade partners, poor connectivity with inland markets and distribution networks, and limited regional collaboration - suggest that the region is not now and is unlikely to become a top tier container port, but that global trends offer prospects for growth. Delaware River ports should strategically focus on leveraging competitive advantages and mitigating disadvantages to maximize growth potential.

Section 4: Strategies and Scenarios for Delaware River Port Growth

Key Findings

- ⇒ Planning matters. In particular, planning around cargo segments, existing capacity, and inherent limitations will help Delaware River ports prepare for growth.
- ⇒ Delaware River ports' strategy for growth should include leveraging existing strengths, targeting infrastructure investments around strategic objectives, and collaborating as a region to pursue all future growth opportunities.
- ⇒ The future of maritime commerce on the Delaware River is uncertain, and will depend on the ports' collective ability to strategically develop infrastructure and mitigate risks.
- ⇒ Ports presently have capacity to accommodate another 1.5 million TEUs through 2020.

use, storage, quayside operations and equipment, and landside transport linkages. Many port's capital and strategic plans collapse the cargo emphasis to container, bulk (dry, liquid, and break-bulk) and roll-on/roll-off (vehicles).

Planning Around Demand on the U.S. East Coast

The macro factors influencing global maritime commerce are having a profound affect on the U.S. East Coast ports, resulting in a constantly evolving competitive landscape. These industry factors will continue to impact future cargo de-

tially offloaded ships would not require drafts as deep as needed when sailing at full capacity.

To capture additional share in this market, Delaware River ports have an opportunity to target trade routes that typically feature smaller ships. For example, Eastern Europe, the Baltics, and Central America are smaller volume regions that may serve as an attractive alternative to trade with larger Asian markets. In particular, Eastern European and Baltic involvement in intermediate manufacturing could serve the Delaware River region well.¹⁴

A strategy to promote port growth should explicitly relate to an objective analysis of market opportunities.

Strategies to Leverage Opportunities for Growth

A strategy to promote port growth should explicitly relate to an objective analysis of market opportunities. This report has illustrated some of the market considerations that

Planning Principles for Growth

Strategically positioning port facilities for the future is a complex process of effective marketing and capacity readiness. Market positioning is somewhat predetermined by relative geographic placement, local market size, density of development around port facilities, and access to inland markets.

Strategically improving the competitive position of Delaware River ports will require proactively leveraging the region's competitive advantages and mitigating its disadvantages. The first step in this process is to shape future plans and actions around anticipated global trends.

Planning Around Cargo Segments

The types of cargo Delaware River ports plan to handle matters. Each cargo segment has unique requirements for labor utilization, land

mand at East Coast ports, a reality that will have significant implications for Delaware River ports' future competitive position.

Planning Around Existing Capacity

Capacity investments are expensive, protracted propositions. Ideally, a port's capacity reflects an optimal balance of infrastructure types to service a port's existing cargo mix. To maximize the value of future investment, desired increases to capacity should take into account cargo mixes and industry factors that will have the largest positive impact on a port's competitive position.

Planning Around Limitations

Even with channel-deepening, Delaware River ports must develop other capabilities (inland distribution, for example) that add value for shippers. Wilmington and Philadelphia may be able to capture significant business as a second port of call. Par-

should impact the development of a strategy for Delaware River port growth. Its key findings accentuate the importance of building this strategy around three core actions:

- ⇒ Leveraging existing competitive strengths;
- ⇒ Investing in infrastructure enhancements; and
- ⇒ Collaborating to rationalize use of regional facilities.

Leverage Existing Competitive Strengths

Delaware River ports' competitive strengths include a proximity to a large consumer market and an agglomeration of facilities to support niche cargo shipments. These strengths should be strategically leveraged to capture additional business.

Leverage Geographic Proximity to U.S. Northeast Market. Sitting at the center of the largest population mass in the country,

Figure 35: North Atlantic Port Range Container Demand by Hinterland

Hinterland Market	Projected Demand for TEUs, 2020 (Millions)	CAGR, 2005-2020
U.S. Northeast	10.34	5.5%
Eastern Canada	3.14	5.4%
Great Lakes/Plains	3.55	4.0%
U.S. Southeast	3.70	6.8%

Source: Ocean Shipping Consultants, 2006.

Delaware River ports have an opportunity to leverage geographic proximity to a large population base. While a recent marine trade growth outlook for the North Atlantic port range shows growth fueled by inland markets,¹⁵ an expert panel found that the Delaware River's best opportunity to expand market share is in the northeast United States.

Greater Philadelphia's large local consumer market that the Delaware River helped to create is largely responsible for the river's continued viability as a commercial maritime highway. The regional consumer market provides a stable source of cargo demand and therefore a strategic opportunity for growth. Delaware River ports are located a short distance from two growing distribution hubs: south-central Pennsylvania and the New Jersey Turnpike Corridor. From this perspective, Delaware River ports stand to gain from limited availability of land in northern

New Jersey for warehouse and distribution uses that has resulted in a migration of distribution centers towards Greater Philadelphia. This trend represents an opportunity for Delaware River port interests to leverage proximity to distribution centers and position themselves as a cost-effective way to access this network.

However, the Port Authority of New York and New Jersey is actively addressing this trend by supplementing expanded terminal capacity with a "Portfields" initiative that aims to recapture the migrating distribution centers and strengthen the port's ties to its local distribution networks. Greater Philadelphia port stakeholders should consider developing a similar proactive strategy for addressing migrating distribution centers as a business development opportunity.

Leverage Expertise in Niche Cargoes. Specialization of port operations¹⁶ could be a significant market opportunity for the Delaware

River, which has a well-established reputation for managing high-value perishable breakbulk cargo. With the concentration of container trade at the largest U.S. ports expected to continue, the remaining U.S. ports will be competing for a smaller share of overall U.S. container traffic. Ports with strength in container movements will look to leverage that strength, potentially at the expense of other existing bulk and breakbulk operations.

The region's agglomeration of infrastructure to support refrigerated cargo movement has created economies of scale that maximize the cost effectiveness of facilities. Moreover, such infrastructure clusters are very difficult and costly to duplicate; as a result, refrigerated cargo traffic is relatively stable at Delaware River ports. Leveraging this strength is an opportunity to grow market share in a important commodity for the region's overall port activity.

Invest in Infrastructure Enhancements

To accommodate anticipated additional business, Delaware River ports will require strategic investments in terminal and landside infrastructure capacity.

Investment in Terminal Capacity. Philadelphia's container capacity is documented at 362,000 TEUs for the Packer Avenue Marine Terminal (with limited additional container capacity at Tioga Terminal). Based on 2006 statistics from PRPA, the 247,211 TEUs consumed 68 percent of the current container capacity.

As Figure 37 illustrates, realization of a densification project (one of four proposed projects under PRPA's Capital Enhancement Plan, and the one with the shortest build-out of 1 year) would provide Philadelphia with an additional capacity of 750,000 TEUs, more than tripling its current container capacity.

Figure 36: Container Market Share at North Atlantic Ports, 2005

Port	TEUs (000s)	Market Share
New York/New Jersey	4,793	47%
Hampton Roads	1,982	20%
Montreal	1,255	12%
Baltimore	603	6%
Halifax	551	5%
Wilmington, DE	251	2%
Philadelphia	205	2%
Boston	189	2%
St. Johns NF	111	2%
Other	157	2%
Total - North Atlantic Ports	10,097	100%

Source: OCS, 2006.

Notes: "Other" category includes Port of Albany, NY, Providence, RI, New Haven and Bridgeport, CT, and Camden-Gloucester NJ.

Existing and proposed capacity at Delaware River ports comes at a time of projected exhaustion of existing container capacity at competitor ports. A North Atlantic port outlook projects that 95 percent of the planned container capacity by 2015 in the North Atlantic port range will occur among the ports of New York/New Jersey, Baltimore, Halifax, Montreal, and the Virginia ports. If demand expectations for the North Atlantic port range are near accurate, capacity utilization will be at 93 percent, a rate well above the level associated with efficient port operations.¹⁷

An overall increase in container demand, coupled with potentially displaced cargo due to capacity constraints at competitor ports, suggest that Delaware River ports could capture additional container business. Existing capacity and proposed capacity enhancements would help to prepare port facilities for this potential growth.

Investment in Landside Capacity. Any growth in port activity will increase the strain on Greater Philadelphia's existing landside infrastructure. For this reason, terminal capacity investments *must* be linked with strategic investments in road and rail infrastructure.

The various infrastructure improvement projects planned or underway (described in Section II) will allow for higher volumes of cargo to move more efficiently through the region. Given the magnitude of infrastructure need, the best way to maximize the utility of investments is to focus each investment on targeted objectives. For this reason, future infrastructure investments should be tailored towards achieving explicit goals set forth in strategic plans.

Given the strength of the consumer market in the northeast U.S., landside infrastructure improvements

should be geared towards improving road connections to regional destinations. To this end, the Delaware River ports should consider its geographic proximity to distribution center growth markets as a strategic advantage and look to enhance connections with the Lehigh Valley, Carlisle, and Harrisburg areas. Developing linkages with these markets is an opportunity for the region to establish a stable niche market for its ports.

Currently, PennPORTS (an office of the Pennsylvania Department of Community and Economic Development that facilitates port and infrastructure projects) is working on an initiative with PennDOT to improve

Terminal capacity investments must be linked with strategic investments in road and rail infrastructure.

the east-west transportation corridor spanning from U.S. 422 in Altoona to western Pennsylvania and Ohio. The proposed Ben Franklin Corridor project would improve linkages between the Port of Philadelphia and the Midwest, an integral element for maintaining and growing port activity in Philadelphia.

In the same way that PennDOT's "Ben Franklin" corridor has enhanced access to areas of western Pennsylvania and southeastern Ohio, future infrastructure investments should target strategic destinations to improve overall connectivity between Delaware River ports and inland distribution destinations.

Collaborate for the Efficient Deployment of Resources

Efforts to grow Delaware River port activity will be most effective if port stakeholders work together to plan and develop strategies for the

Figure 37: Packer Avenue Marine Terminal Container Capacity

PAMT	Incremental TEU Capacity
Current	362,000
With Densification	750,000
Total TEUs	1,112,000

Source: Transystems' Port of Philadelphia Forecast.

future.

Rationalize Facility Utilization and Planning. Without effective collaboration and coordination, port investments may yield an inefficient allocation of resources. It is easy to imagine that without coordination, capacity for some types of cargo may be oversupplied, while others are undersupplied. In areas that the region has a dearth of capacity, business will be lost to competitor ports outside the region.

Public and private ports with excess capacity will compete internally for business, driving down prices. Given that port costs are but one part of the overall expenses considered by supply chain managers, it is unlikely that undercutting prices is what draws business to the Delaware River ports. In this scenario, pitting Delaware River ports against one another for cargo that was destined for this region anyway hurts public and private operators by lowering their revenues.

State and local governments are also harmed by this internal competition, as lower revenues translate into lower tax collections overall for the region. Even if state and local governments wanted to encourage internal competition in the hopes of getting a larger piece of the shrinking pie, the economic impact analysis of the Delaware River ports discussed in Section I made clear that states and local governments realize tax revenues from port activity even when it occurs outside their taxing jurisdiction.

Coordinate Marketing. Carriers and national shipping experts identified the region as having neither a positive or negative image, but rather no real image at all. Given that each port entity in the region is small compared to competitors like the Port of New York/New Jersey and the Virginia ports, it is unsurprising that marketing efforts to date have not made the region a well-known shipping destination.

Pooling resources to raise awareness of the Delaware River ports would provide an opportunity to introduce the region to non-traditional trading partners that offer growth potential, such as Asian and Eastern European lines. Rather than individual marketing efforts designed to brand a particular facility, these efforts would present the assets of the region, such as proximity to population centers, transportation networks, and expertise in niche cargoes, as well as to address concerns shippers may have, such as the depth and distance of the river.

Select Greater Philadelphia is a business marketing organization that has successfully employed this model; it proactively markets the area to firms that could choose any region and then later provides the resources for business to find the appropriate location within the region.

A Continuum of Cooperation. Efforts to grow Delaware River port activity will be most effective if port stakeholders work together to plan and develop strategies for the future. Unification of public facilities, while a challenge with the involvement of three state jurisdictions and a complex history, may be ripe for serious reexamination, particularly in light of the success it has brought competitors such as the Port of New York/New Jersey.

Even if unification proves too challenging or otherwise undesirable,

smaller cooperative efforts can build trust for future collaboration. Joint facilities planning and market research ensure an efficient allocation of investment, and coordinated marketing efforts will leverage individual marketing budgets to provide a broader reach and image.

Scenarios for Delaware River Port Growth

With global trade volumes rising and competition among East Coast ports intensifying, the study team engaged a panel of national experts to better understand the range of trade activity the Delaware River ports could expect in the future.

With global trade volumes rising and competition among East Coast ports intensifying, the Delaware River ports are poised for either growth or decline.

They evaluated prospects for three growth scenarios for Delaware River ports:

- ⇒ Increasing market share of total U.S. tonnage;
- ⇒ Moderate growth; and
- ⇒ Declining market share of total U.S. tonnage.

Each scenario anticipates dredging of the Delaware River channel to 45 feet, a baseline prerequisite that experts emphasized was absolutely necessary to simply maintain the region's maritime competitiveness.

Scenario 1 – increasing market share – requires regional coordination, growing niche cargoes, and infrastructure investment that outdoes competitors. Scenario 2 – moderate growth – is dependent on public and private investments to improve distribution networks. Scenario 3 – declining market share – reflects the absence of coordinated regional

planning and investment. Of these scenarios, the expert panel found Scenario 3 to be the most likely outcome as it most closely resembles the status quo. (See Appendix E for excerpts from the panel discussion.)

Scenario 1: Increasing Market Share

Summary of Factors

Assumption

- ⇒ Delaware River ports increase the share of U.S. waterborne commerce from 5.5 percent to 6.5 percent of the national market

Key Requirements

- ⇒ Inland transit times and cost to serve inland markets is improved
- ⇒ Growth in niche cargo
- ⇒ Regional coordination in marketing and capacity management

Risks

- ⇒ Absence of economies of scale
- ⇒ Improved capacity and transportation networks at competitor ports
- ⇒ Distance from Asian manufacturing centers

Strategies

- ⇒ Leverage existing competitive strengths
- ⇒ Strategic infrastructure investment
- ⇒ Regional collaboration

Assumption. This scenario assumes that ports of the Delaware River are able to capture an increased market share of port activity by 2020. Capturing additional market share will require new strategies and actions, particularly in light of aggressive efforts by competitor ports on the East Coast. In 2005, the Delaware River ports carried 5.5 percent of the nation's waterborne commerce. This included 12 percent of the nation's petroleum shipped, ac-

counting for more than three quarters of the total tonnage moved on the Delaware River. As the volume of petroleum is not expected to increase due to refinery capacity constraints, growth would have to be achieved in non-crude cargoes.

Without commodity specific projections, estimates of necessary growth levels by cargo type (container, bulk, and breakbulk) cannot be estimated. Reaching 6.5 percent market share without growth in petroleum will likely necessitate expansion in volume for each cargo type at levels beyond national growth rates. If container volumes needed to be 8.8 percent compound annual growth rate (CAGR), twice the national growth rate of 4.4, total volume for the Delaware River ports would grow from 317,000 in 2000 to roughly 1.5 million TEUs in 2020, more than could be accommodated at just Packer Avenue and Tioga Marine Terminals with densification, but likely feasible if spread across the Philadelphia Regional Port Authority

facilities and other existing ports in the region.

Key Requirements. Increasing market share requires that Delaware River ports cultivate new business flows to inland markets with trip time and cost improvements. Reliability, vessel turnaround time, and seamless intermodal connections are of primary concern to supply chain managers, assuming the port’s cost structure is not grossly out of line. The ports’ future will depend in part on identifying opportunities to improve intermodal connectivity, identifying corridors to and from inland growth markets, and strategically focusing infrastructure investment on developing those connections.

More competitive distribution networks to inland markets would present the opportunity to expand the base for the Delaware River’s niche cargoes, such as steel and perishables. The Delaware River ports will also be well positioned to divert niche bulk and breakbulk cargo away from competitors focused on in-

creasing their container business. Capacity constraints in New York and elsewhere may push out these cargo types. Delaware River ports can build upon existing niche markets more efficiently than developing specialization in new areas.

Most successful regional ports, such as the Virginia ports and the Port of New York/New Jersey, have consolidated to create marketing entities that recognize the increasing scale of shipping companies and competitive ports driving the industry. Currently, the individual ports of the Delaware River do not have the market power individually nor the combined resources to compete with emerging North Atlantic ports. Opportunities for coordination include unified international sales teams and more impactful presence at trade events.

Risks. The Delaware River ports are currently at a disadvantage in terms of economies of scale and inland market connections and efforts to improve may not be suffi-

Figure 38: Summary of Growth Scenarios

Factors	Scenario 1: Growing Market Share	Scenario 2: Moderate Growth	Scenario 3: Declining Market Share
Assumptions	<ul style="list-style-type: none"> Delaware River ports increase the share of U.S. waterborne commerce from 5.5 percent to 6.5 percent of the national market 	<ul style="list-style-type: none"> All cargo growth at 0.9 percent Container growth at 4.4 percent, equal to the national rate 	<ul style="list-style-type: none"> Delaware River ports decrease the share of U.S. waterborne commerce from 5.5 percent to 4.5 percent of the national market
Requirements	<ul style="list-style-type: none"> Inland transit times and cost to serve inland markets is improved Growth in niche cargo Regional coordination in marketing and capacity management 	<ul style="list-style-type: none"> Petroleum import levels must be maintained Bulk and breakbulk cargoes remain dominant, particularly steel and perishables 	<ul style="list-style-type: none"> None
Risks	<ul style="list-style-type: none"> Absence of economies of scale Improved capacity and transportation networks at competitor ports Distance from Asian manufacturing centers 	<ul style="list-style-type: none"> Acceleration of global shift to alternative fuels Weak regional economic and demographic growth 	<ul style="list-style-type: none"> Continued containerization Decline in niche cargoes Lack of goods to export
Strategies	<ul style="list-style-type: none"> Leverage existing competitive strengths Strategic infrastructure investment Regional collaboration 	<ul style="list-style-type: none"> Leverage existing competitive strengths Regional collaboration 	<ul style="list-style-type: none"> The absence of coordination to leverage existing assets and improve transportation networks

cient to overcome the advantage held by other East Coast ports.

The Delaware River ports will not be alone in upgrading transportation infrastructure and adopting policies to improve freight movement. The Heartland Corridor serving the Virginia ports will cut travel times to the Midwest, and the Port of New York/New Jersey has considered subsidizing rail rates to ease congestion on regional roads.

Delaware River ports will have difficulty attracting additional container traffic given their location and lack of historic container business. The distance from Asian manufacturing centers that are the origin of increasing container traffic exacerbates this. As those manufacturing centers in East Asia move westward, Suez shipping routes will become more competitive. While this presents an opportunity for the East Coast to capture business from West Coast ports, southern East Coast ports will have an advantage over the Delaware River ports based on travel times from the Straits of Gibraltar.

Strategies. Successful implementation of three interlocking strategies, leveraging existing strengths, strategic infrastructure investment, and regional collaboration are preconditions for increasing the market share of trade volumes at the Delaware River ports.

As this scenario requires improved transportation networks and may necessitate expansion or reconfiguration of port facilities, region-wide market research for specific commodities and cargo types should be a precursor to investment decisions. To guide resources efficiently and effectively throughout the region, regional cooperation among all public and private entities can ensure that additional capacity is used and that internal competition for business

among the region's ports does not artificially deflate profits.

Scenario 2: Moderate Growth

Summary of Factors

Assumptions

- ⇒ All cargo growth at 0.9 percent
- ⇒ Container growth at 4.4 percent, equal to the national rate

Key Requirements

- ⇒ Petroleum import levels must be maintained
- ⇒ Bulk and breakbulk cargoes remain dominant, particularly steel and perishables

Risks

- ⇒ Acceleration of global shift to

Successful implementation of three interlocking strategies - leveraging existing strengths, strategic infrastructure investment, and regional collaboration - are preconditions for increasing the market share of trade volumes at the Delaware River ports.

alternative fuels

- ⇒ Weak regional economic and demographic growth

Strategies

- ⇒ Leverage existing competitive strengths
- ⇒ Regional collaboration

Assumptions. Consistent with projections by Global Insight and forecasts prepared by the Army Corps of Engineers and others, the projected growth of 0.9 percent CAGR is envisioned for the Delaware River ports, despite national cargo projections for all cargo at double this rate. At this rate, Delaware River port tonnage will expand from 72 million tons to 82 million tons between 2000 and 2020.

Growth in containerized cargo is projected to mirror the national rate in this scenario, at 4.4 percent CAGR. This would increase regional

container volumes from 317,000 in 2000 to 605,000 TEUs in 2020. This volume of activity could be entirely accommodated at Philadelphia Regional Port Authority facilities, provided that densification occurs as envisioned, which would add 750,000 slots to the existing 362,000 available at Packer Avenue and Tioga Marine Terminals. The existence of other container handling facilities in the region suggests that even with the assumption that the region will match national container growth rates, Delaware River ports will have excess container handling capacity through 2020.

Key Requirements. This scenario's plausibility rests upon maintaining existing core strengths in niche cargo markets. For total tonnage to grow, petroleum import levels must be maintained. The location of oil refineries in the region, absence of planned new facilities, and the fact that refineries elsewhere in the country are at capacity limits the threat of losing business to competitor ports.

Maintaining prominence in key niche bulk and breakbulk cargoes will be necessary to achieve growth. Significant quantities of steel are handled through private ports in the area and this may be enhanced by additional investment in United States steel manufacturing by foreign firms. This development may stimulate exports through Delaware River ports and help address the region's trade imbalance.

Refrigerated cargo can be expected to remain strong, particularly in Wilmington which benefits from being closer to the ocean than Philadelphia and South Jersey ports with comparable refrigerated warehousing and other facilities. Barriers to entry in this market segment are high, making the region best positioned to attract additional container growth in

the shipment of perishable items.

Risks. Erosion of the current volume of petroleum is not likely to come from competition, but instead result from changes in oil consumption patterns. Environmental concerns and high oil prices may cause a shift to other fuels that are less likely to be trafficked on the Delaware River.

The Delaware River ports can realize moderate growth, albeit at lower levels than national growth, so long as the region's population and economic conditions continue to rise. Delaware River ports have focused on serving the local consumer market; should conditions deteriorate without the region improving its service to inland markets, port activity could be expected to slow proportionally.

Strategies. This growth scenario is contingent on leveraging existing strengths and regional collaboration. In areas where growth is possible, such as containers, region-wide facility planning can prevent the building of excess capacity. Additionally, joint marketing efforts can support the maintenance and expansion of niche cargoes in the face of competition from more coordinated ports along the East Coast.

Regional cooperation and priority setting for investment in landside transportation can improve connections to inland markets that the Delaware River ports have not traditionally served. This serves as a hedge against economic and demographic decline in the local market, but is not as essential as in Scenario 1.

Scenario 3: Declining Market Share

Summary of Factors

Assumption

⇒ Delaware River ports decrease the share of U.S. waterborne commerce from 5.5 percent to

4.5 percent of the national market

Risks

- ⇒ Continued containerization
- ⇒ Decline in niche cargoes
- ⇒ Lack of goods to exports

Strategies

- ⇒ The absence of coordination to leverage existing assets and improve transportation networks.

Assumption. This scenario assumes that the Delaware River ports' market share will decline from 5.5 percent to 4.5 percent of waterborne commerce. This assumption is based on maintenance of the region's share of crude traffic but declines in other cargo types, although vulnerability of

Uncoordinated efforts to attract containers away from other East Coast ports without the benefit of improved transportation linkages to inland markets will divert resources away from investments that would maintain and expand traditional cargoes.

the region's petroleum trade is a possibility.

Delaware River ports could experience volume growth even while losing market share. In this scenario it is unlikely that container growth would match the national rate of 4.4 percent CAGR.

Risks. Without a great increase in population or efficient inland connections, it is unlikely that consumer demand for products that move through the region's ports will grow. As a relatively small player in the container business, the trend of moving more and more commodities by container rather than shipping them as bulk or breakbulk could hurt regional port activity in two ways:

- ⇒ The distance up the Delaware River and lack of Asian business relationships makes the region's ports unattractive to Asian growth markets and container

shippers in general; and
 ⇒ As breakbulk and bulk cargoes are converted to containerized shipping, the Delaware River may lose business in the niche cargo areas that it once dominated.

Further erosions to the region's niche cargoes may arise from a prolonged slump in the real estate sector. As new housing starts decline, so to does the demand for construction materials in which the Delaware River ports have traditionally excelled.

Uncoordinated efforts to attract containers away from other East Coast ports without the benefit of improved transportation linkages to inland markets will divert resources away from investments that would maintain and expand traditional cargoes, creating opportunities that other ports could exploit to lure that business away. South Atlantic and Gulf Coast ports closer to the South American and Australian origins of many of the perishable items that currently arrive in the United States via the Delaware River are already expanding facilities to handle those cargoes.

Strategies. As a result of rising trade volumes, Delaware River ports can expect to gain some trade volume without making any strategic actions. Maintaining the region's market share, however, is an additional hurdle given that improvements at competitor ports are already underway. Without coordination for improved distribution networks and efforts to retain and expand niche cargoes, market share decline can be expected.

Section 5: Conclusions and Key Recommendations

Conclusion

For more than 300 years, Delaware River ports have been vital to Greater Philadelphia's development. Going forward, the question is whether the ports' diverse entities and interests can come together to leverage strengths, confront weaknesses, and gain from global trends driving the future of maritime commerce.

Summary of Key Findings

This report has described the current composition of Delaware River ports and highlighted the key factors that will impact their future. The report has illustrated that Delaware River ports are characterized by:

- ⇒ A low number of jobs with high wages
- ⇒ Niche – and largely un-containerized – commodities
- ⇒ Largely constrained landside infrastructure
- ⇒ A drastic import/export trade imbalance
- ⇒ A history of disjointed planning, marketing, and development
- ⇒ Existing capacity for expansion

These factors have dictated the impact of Delaware River ports on the Greater Philadelphia economy and now comprise the framework for evaluating potential future growth of port activity.

Within this framework, the report also illustrates that several factors will impact the potential future growth for Delaware River ports and will continue to drive the future of maritime commerce in the region. They include:

- ⇒ Evolving global shipping trends
- ⇒ Investments made by competitor ports
- ⇒ The ability of Delaware River ports to adapt to the fluid competitive landscape.

Key Recommendations

Based on its key findings, the Economy League developed a series of recommendations highlighting opportunities for the region's ports to enhance advantages and improve competitiveness through a renewed focus on coordination and comprehensive approaches to maritime business development. They include:

The region's ports remain viable despite several limiting factors and could gain from global trends driving the future of maritime commerce.

- ⇒ Leverage existing assets that are both inherent (geographic) and commodity-based (niche cargoes)
- ⇒ Strategically investing in infrastructure enhancements (both terminal and landside)
- ⇒ Collaborating to rationally leverage existing assets and strategically invest in the future.

Leverage Existing Assets

With centuries of continuous operations, Delaware River ports have managed to survive adaptations in global trends, technology, and demand. Nevertheless, to improve its competitiveness will require the Delaware River ports to take a proactive approach in reconstituting its business to define a competitive position in the 21st century port industry.

To do so, Delaware River ports should leverage their existing assets, including expertise in niche cargoes, proximity to consumer markets, and opportunities for improved port facilities. Efforts by the Delaware River ports to grow trade volumes

and maintain or expand market share rest upon building on what the region already does well, as opposed to chasing business for which we are ill-suited or at a competitive disadvantage.

Investment in Infrastructure Enhancements

Expanding existing lines of business or pursuing new ones will require investment in facilities, infrastructure and marketing. Piecemeal or uncoordinated approaches should be avoided to ensure that the scarce resources spent have maximum impact. Through densification and other investments in existing facilities, the region has the capacity to accommodate projected container traffic, and also has locations identified as suitable for future port development.

Access to inland markets is critical to port competitiveness. For this reason, adequate rail and road connections from port facilities to distribution networks is critical to port expansion. In particular, competitive rail service will require increasing the region's double stack clearance. Improving double stack rail access would enhance port capacity by making freight movement more efficient. Expanded double stack clearance would also help the port and region develop linkages with the Midwest, a critical growth market for potential expansion of Delaware River port activity.

Collaborate for Efficient Deployment of Resources

Although past port unification efforts have experienced limited success, stakeholders recognized the benefits of coordinating and rationalizing port operations. Business development and national experts are clear that institutionalizing collaborative regional port activity is a prerequisite

for enhancing the competitive position of the Delaware River ports. With three states and a mixture of public and private facilities, a single ownership and management structure for the region's ports is unlikely, but there are key initiatives that could be undertaken to better coordinate port operations and development. Opportunities for doing so include:

- ⇒ Joint market demand and cargo strategy
- ⇒ Multi-state waterfront and port land use planning
- ⇒ A region-wide capacity analysis and demand forecast to prevent over or under supply of facilities, including comparative cost/benefit analyses of densification and expansion opportunities
- ⇒ Joint marketing and branding efforts.

The regional port industry would also benefit from a more holistic approach to port-related investment and development. A comprehensive approach to future port planning should include evaluation of various

models of public and private financing and management of design, construction, and operations of new and redeveloped port facilities. As shipping companies, investment banks, and others seek to invest in ports, public authorities should carefully explore potential costs and benefits. Consideration also should be given to the off-site infrastructure demands

Successful growth of regional port activity will require a diverse group of port interests to rally around mutually beneficial goals.

from port development. Transportation improvements are likely to remain a public responsibility, even with private port development, and may be a prerequisite to future investment.

A Defining Moment

The Delaware River has reached a critical juncture in its commercial history. Potential for port growth is real but will hinge on the region's ability to take a coordinated approach to future development. This situation analysis has highlighted both opportunities and challenges impacting the future of maritime commerce in Greater Philadelphia. As the region continues to reassess and reevaluate its relationship to the Delaware River, port functions have the opportunity to remain an important part of the Greater Philadelphia economy as it has for over 300 years. Successful growth in regional port activity will require a diverse group of port interests to rally around mutually beneficial goals. Only through strategic and collaborative action can stakeholders ensure that the Delaware River ports will thrive in the future.

Appendix A: Glossary

Backhaul

To load a freight vessel for its return to its point of origin.

Berth

Where a vessel “parks” at a port for loading and unloading.

Breakbulk

Goods shipped in small separable units. For example, bags of cocoa beans.

Bulk

Unpacked, unbundled cargo. It may be liquid (e.g., petroleum products) or dry (e.g., gravel or sand).

CAGR

Compound Annual Growth Rate, the year-over-year growth rate. Often applied to changes in tonnage or value of cargo in relation to port activity.

Channel Depth

Distance between the waterline and bed of the dredged body of water.

Containerization

System of freight transport where goods are placed in standardized containers that can be loaded onto ships, rail, or trucks.

Densification

Process by which capital upgrades are made at existing port facilities to increase the efficiency of land use.

Distribution Facilities

Warehouse/logistical centers where goods are organized for delivery.

Double Stack

Rail routes with overhead clearances sufficient for trains carrying two containers stacked atop one another to pass through.

Drayage

Logistical service in the shipping industry.

Dredging

Underwater excavation to remove bottom sediments and move them elsewhere, thus increasing the channel depth and facilitating the movement of larger or more heavily laden vessels.

DSPC

Diamond State Port Corporation. The Delaware State agency that owns and operates the Port of Wilmington.

DWT/Deadweight tonnage

The weight of a loaded ship minus the weight of an empty ship. The DWT includes the weight of cargo, crew, passengers, crew, and fuel.

Gantry

Crane used to move breakbulk cargo and containers on and off ships. May either be on rails or wheels.

ILA

The International Longshoremen’s Association is a union of maritime workers.

Intermodal Transportation

Freight or passenger movements that involve multiple forms of transportation between origin and destination.

Jones Act

Also known as the Merchant Marine Act of 1920, the Jones Act is a federal statute that governs the rights of sailors and restricts the movement of goods between U.S. port. Goods may be moved by ship between U.S. ports only if the ship was made and registered in the United States.

Labor Starts

Appointed times per day when loading or unloading of a vessel may begin.

Land bridging

Moving goods from West Coast ports to the central and eastern U.S. via long-haul trucking or intermodal rail.

Landside Logistical Networks

The management of the flow of goods, incorporating information, transportation, warehousing, and transportation, once cargo has been offloaded from the ship.

Lighter

The act of transferring a commodity from ship-to-ship without anchoring. This is common practice with oil tankers because the large vessels cannot fit into ports.

Liner Operations

Regularly scheduled commercial ship sailings along established trade lanes.

Megaship

Ships that typically have capacity for more than 8,000 TEUs.

Perishables

Products that are temperature sensitive, such as produce, meats, and pharmaceuticals.

Project Cargo

Freight that is unusually large in either weight or size. An example of project cargo in this region is large windmill components destined for Gamesa, a Spanish manufacturer and supplier of energy technologies with facilities in Bucks County.

PRPA

Philadelphia Regional Port Authority. The state-created entity that is responsible for public port management in Philadelphia.

RESET

Military equipment refurbishment program.

RoRo

Cargo, such as cars, machinery, and farm equipment, that can roll on and roll off vessels.

Short Sea Shipping

Hub and spoke system of freight movement to alleviate congestion and accommodate overflow demand.

Short Ton

A measurement of weight equal to 2,000 lbs. A long ton is equal to 2,240 lbs or 1,000 kilograms.

SJPC

South Jersey Port Corporation. State-created agency that owns and operates public port facilities at the Port of Camden.

Strategic Port

Ports designated by the military as having logistical capabilities, security, and capacity sufficient for the handling of military cargo.

Terminal

Maritime terminals are facilities where cargo is moved from ships to other modes of transportation.

TEUs

Twenty-foot Equivalent Units, the standard capacity measure for containers. Most containers today are forty feet, or 2 TEUs.

Tidal Delays

The amount of time a ship spends waiting for high tide because depth is insufficient to sail at low tide.

Tonnage

The cargo capacity of a ship, a measurement of volume.

Trade Rationalization

Shipping patterns where goods get as close as possible to their final destination by water.

Transshipment

Goods that are shipped to one location, transfer to another vessel, then continue on to their final destination.

Appendix B: History of the Delaware River Ports

Summary

- ⇒ Philadelphia and surrounding towns along the Delaware River were settled to take advantage of the safe harbor and access to the resource-rich inland areas.
- ⇒ Coal exports from the Lehigh Valley, development of railroads, and manufacturing activity in the region supported port growth in the 19th century.
- ⇒ As coal exports waned, manufacturing moved, and port facilities failed to modernize quickly to attract containerized cargo; Delaware River ports declined in prominence.
- ⇒ Efforts to consolidate regional management of port operations have been attempted and failed, yet stakeholders still see opportunities for improved efficiencies through coordination and collaboration.

Origins

American cities – especially along the eastern seaboard – have historically developed around ports, which provided commercial access to waterways and allowed for the convenient exchange of both people and goods. Today, maritime commerce remains critical to the national economy, accounting for over 95 percent of the United States’ international trade by volume.¹⁹

In Greater Philadelphia, commercial activity originated with the Delaware River. The land was initially inhabited by the Lenape (Delaware) people, and then settled by Europeans in the early 1600s. After receiving the charter for Pennsylvania in 1681, William Penn founded Philadelphia on the river’s western bank and began dividing parcels of land among backers. Penn’s investors were immediately drawn to the opportunity

for maritime commerce and quickly purchased land within close proximity to the river. From the very beginning, the Delaware River played a critical role in Philadelphia’s emergence as a commercial powerhouse in colonial America.

The Delaware River’s commercial attractiveness was enhanced by its resource-rich hinterlands characterized by fertile farmland and ample forestland, providing the River’s ports with a natural agricultural appeal. The Delaware Valley was also characterized by a temperate climate and an inland location, affording Delaware River ports a safe harbor and immediate access to inland trade

From the very beginning, the Delaware River played a critical role in Philadelphia’s emergence as a commercial powerhouse in colonial America.

routes, increasing Philadelphia’s viability as an international and domestic port of call.

However, Delaware River ports also faced an assortment of natural impediments. First and foremost, Philadelphia’s inland location, while safely removed from the ocean, was less convenient than coastal locations like New York. Moreover, navigating the River was considered hazardous because of its shallow water and scarcity of lighthouses and accurate maps. On arrival in Philadelphia ships were greeted by thirty-foot high riverbanks, further complicating the logistics of cargo movement.²⁰ By 1720, Philadelphia had passed Charleston, SC as the third largest American port in annual trade volume.²¹

Growth in maritime commerce continued through the 18th century,

and by the time of the Revolutionary War, Philadelphia had become a premier port destination for both domestic and international trade and the third most important commercial hub in the British Empire behind only London and Liverpool.²²

The Industrial Revolution

The discovery of anthracite coal in the Lehigh Valley in 1792 accelerated Philadelphia’s rise during the industrial revolution as the manufacturing hub of America. The advent of the steam locomotive enhanced access from the port to coalmining territory and other inland locations.

While the railroad industry marginalized the use of canals, Philadelphia successfully leveraged railroads as a new means to promote port activity. By the close of the 19th century, every wharf in the city had direct rail access, with service offering rates lower than that of New York or Boston.²³ In addition, many of the marine terminals were owned by the rail companies themselves, allowing ships to dock and unload free of wharfage charges.²⁴ These features increased the competitiveness of Philadelphia as a port of call.

In the late 19th century, advances in steamship technology improved the viability of transatlantic shipping routes and accelerated international maritime commerce along the East Coast of the U.S. Demands of bigger and faster ships pressured ports to modernize facilities. Philadelphia responded in 1895 by deepening the Delaware River from its natural depth of 17 feet to 26 feet.

As a result, Philadelphia was able to add new transatlantic lines to support increases in both goods movement and passenger travel.²⁵ How-

ever, as the new century would illustrate, the more immediate impact of steamship technology was on Philadelphia's shipbuilding capacity. Already the premier 18th and 19th century port for North American shipbuilding, Philadelphia was poised to leverage steamship technology to become a dominant force in a new era of 20th century shipbuilding.

At the turn of the 20th century, Philadelphia was still a top tier East Coast port of call, bolstered in large part by the Delaware Valley's industrial development into a manufacturing powerhouse. In 1912, Philadelphia produced five percent of all manufactured goods in the United States, much of which were exported through the city's port facilities. While Philadelphia had made a name for itself in the textile industry, the city also exhibited world-class strength in a variety of building industries, including lumber, concrete, paints, roofings, and fixtures.²⁶ Industrial activity was also strong elsewhere in the region, especially in cities and towns along the Delaware River.

A variety of export markets were thriving, including coal, petroleum, iron, machinery, cotton, leather, grain, livestock, lumber, fertilizer, and tobacco. Bristol (PA) had become a primary point of connection from the Delaware River to the Lehigh Valley coal region. It also boasted mill operations, developing industry strengths in wool, silk, and felt production. Trenton was a primary producer of machinery and agricultural equipment, as well as automobiles, carriages, bridges, and elevators. Camden had developed a number of specialties, including commercial and military shipbuilding, iron and wood products, paper, paints, and coffee. Chester was a national leader in oil refining, while Wilmington boasted the largest powder making plant in the world.

By 1910, approximately 4 million tons of coal were being exported annually from Philadelphia to points along the East Coast and to the West Indies, while annual oil exports ranged from 250 million to 400 million gallons.²⁷ Philadelphia's sugar industry also experienced rapid growth in the early 20th century, due in large part to the opening of the Panama Canal in 1914 that enhanced East Coast access to the port from the Hawaiian Islands. That year, Philadelphia refined approximately 500,000 tons of raw sugar, approximately one-sixth of all sugar refined in the United States.²⁸ Several investments were made to waterfront facilities in this period to support industrial growth, including a state-of-the-art grain elevator at Girard Point

Despite the improvements and a robust export market, by the late 19th century Philadelphia had begun to lag behind port competitors in the effort to modernize port facilities.

and an ore handling plant at Port Richmond.

Despite the improvements and a robust export market, by the late 19th century Philadelphia had begun to lag behind port competitors in the effort to modernize port facilities, negatively impacting the port complex's global competitiveness. Between 1900 and 1907, the city's ranking among worldwide ports in volume of trade fell thirteen spots, from 38th in 1900 to 51st in 1907.²⁹ Principal among modernization efforts was deepening the Delaware River, which had become increasingly important to account for rapid growth in ship size. At the time, the depth of the Delaware Channel was 28 feet, seven feet shallower than that of Boston and Baltimore and 10 feet shallower than New York.³⁰ The failure to keep

pace in this regard diminished Philadelphia's relative attractiveness and utility of its port facilities.

The Post-War Period

Philadelphia's post-World War II industrial decline had a markedly damaging impact on port competitiveness. Compounding the city's industrial decline was a weakening market for Pennsylvania coal and steel production, which had driven a large share of Philadelphia export activity through the first half of the century. The use of oil and natural gas decreased demand for coal, and high sulfur levels characteristic of Pennsylvania anthracite damaged its competitiveness in the remaining coal market.

Philadelphia's export market also suffered from the decline of Pennsylvania's steel industry, which by the 1950s and 1960s had begun to succumb to rising costs, material shortages, environmental regulations, and overseas competition. The resulting economic decline had a harmful effect on Philadelphia port activity, which relied on the city and state's once-strong industrial base for a viable export market to sustain global competitiveness.³¹

In fact, Philadelphia's most significant maritime activity during the mid-20th century was at the Navy Yard. Its 40,000 wartime employees built 53 ships and repaired over 500 more, earning it the moniker "Arsenal of America."³² The Navy Yard was able to satisfy the requirements of building large military vessels due in part to deepening of the Delaware River to 40 feet in 1941.³³ However, after the war the demand for shipbuilding dropped precipitously, and the Yard eventually ceased operations as a U.S. Navy facility in 1995.

Historical Port Governance

Recognition of declining standing in the early 20th century spurred what became a century of port governance change. In 1907, Philadelphia Mayor John Rayburn moved to create a Municipal Department of Wharves, Docks, and Ferries, charged with overseeing maritime activity and coordinating improvements to port facilities.³⁴ Through the 1910s and 1920s, the Department oversaw a quadrupling of the number of publicly owned piers. New “finger piers” employed new technology to improve the efficiency of multimodal cargo movement, emphasizing connections between railroads and loading docks along Delaware Avenue.³⁵

While Philadelphia was commissioning a municipal department to manage its port facilities, competitors had begun to see the benefits of inter-jurisdictional collaboration in port governance. After many years of interstate battles, in 1921 New York and New Jersey formed the Port Authority of New York, later renamed the Port Authority of New York and New Jersey, to oversee both states’ port infrastructure. As the first bi-state port authority in the United States, New York/New Jersey eased political tension and became a model for regional port governance.

In Philadelphia, regional port governance was much slower to take hold. In 1919, New Jersey and Pennsylvania created the Delaware River Joint Bridge Commission, which managed the construction of the Delaware River Bridge, later renamed the Benjamin Franklin Bridge. In 1948, the Commission recommended the creation of a joint port authority, and in 1952 the Delaware River Port Authority (DRPA) was established as the Commission’s successor.³⁶ However, the DRPA failed to take control of the region’s commercial port interests and has played only an indi-

rect role in maritime trade on either side of the River.

For most of the 20th century, Delaware River ports struggled to keep pace with an evolving maritime industry, resulting in a steady deterioration of port business. In the 1980s this decline became more pronounced. Between 1981 and 1987, the region’s non-petroleum imports and exports fell by 23 percent, with exports dropping by 74 percent.³⁷ This decline caught the attention of regional port stakeholders, prompting several investigations that confirmed the ports’ overall state of crisis.³⁸

While some were quick to blame the port complex’s shallow channel and inland location for its weakened

For decades, ports on both sides of the river had resisted developing a regional alliance for port governance, funding, and operations, opting instead to protect individual port interests at the expense of overall port competitiveness.

condition, many came to realize that one of the most significant impediments to growth was in fact self-imposed. For decades, ports on both sides of the river had resisted developing a regional alliance for port governance, funding, and operations, opting instead to protect individual port interests at the expense of overall port competitiveness. While other regions had forged institutionalized partnerships, Philadelphia’s intra-regional battles for shrinking port business was growing increasingly fierce, prompting a 1988 DRPA study to conclude: “The ports of the Delaware are a maritime house divided against itself. The outside observer need only spend a short period’ with the port ‘community to become convinced he has walked onto the battlefield of a river war.”³⁹

Recognizing the role regional infighting had played in accelerating port decline, leaders in Delaware, New Jersey, and Pennsylvania began to call for “port unification,” sparking the most concerted attempt at regional port governance in the history of the Delaware River. Champions of the port unification cause included: New Jersey Governor Thomas Kean; Pennsylvania Governor Robert Casey; business-led groups, such as the Greater Philadelphia Chamber of Commerce and the Penjerdel Council; and the Maritime Exchange, an organization of port stakeholders.⁴⁰ Delaware Governor Michael Castle was involved in initial unification discussions but would not continue to play an active role.

Also endorsing unification was a gubernatorial panel commissioned by Governor Casey and led by SmithKline Beecham CEO Henry Wendt to develop recommendations for resuscitating the Philadelphia ports. The Wendt report resolved that the Commonwealth must take two steps to revive port activity: 1) purchase the ports from the City of Philadelphia; and 2) unify the ports of Pennsylvania and New Jersey under the Delaware River Port Authority (DRPA). According to the committee report, these actions would have three specific benefits:

- ⇒ A state takeover of Philadelphia’s ports would put Pennsylvania and New Jersey, which already controlled the ports of Camden under the South Jersey Port Corporation, on equal political footing;
- ⇒ The combination of state ownership and DRPA management would afford the ports an unprecedented level of capital to pursue much needed improvements to infrastructure; and
- ⇒ DPRA control would represent concerted regional port govern-

ance, institutionalizing bi-state cooperation and mitigating river infighting that had threatened overall port competitiveness.

In July 1989, Pennsylvania purchased Philadelphia's port facilities, replacing the Philadelphia Port Corporation with the Philadelphia Regional Port Authority (PRPA). Unification was the first of PRPA's three strategic initiatives, which also included retention and expansion of Pennsylvania port business and development of the South Philadelphia rail yard. In creating the PRPA, the state pledged \$33 million towards initial port improvements, with the promise of additional future funds from DRPA's expanded coffers.⁴¹

After nearly two years of state leadership change and bi-state political posturing, in 1992 New Jersey and Pennsylvania both passed bills that dramatically expanded DRPA's ability to manage a unified port. The DPRA's revised compact allowed the Authority to: "acquire railroads and related facilities, even using the power of eminent domain; operate terminals, transportation and commerce-related facilities; engage in a wide range of economic development and job-creation initiatives; and consolidate government-owned docks and terminals into a single operation and market the area's public and private port facilities worldwide."⁴²

In December 1993, the bi-state merger was approved by the PRPA and SJPC, creating the Ports of Philadelphia and Camden, a not-for-profit subsidiary of the DPRA to be governed by an 18-member board, with nine appointees from each state. Made official in May 1994, the merger set in motion the naming of a

board chairman, a series of additional board appointments, and a national search for a qualified CEO. It also empowered the DRPA to engage in the final phase of port unification: the official takeover of PRPA and SJPC port facilities.⁴³

Considered at the time to be a two-year process, DRPA assumption of bi-state port ownership was almost immediately snagged by intense politicking and legal challenges. By the end of 1994, port unification was in jeopardy. A lawsuit filed by Thomas Holt, owner of the largest private operating port facility in the region, argued that the DRPA's subsidization of public ports would represent unfair competition with private facilities. Also at issue was intrastate anger among New Jersey legis-

Bi-state port ownership was almost immediately snagged by intense politicking and legal challenges.

lators at Governor Christie Whitman's board appointment choices, with several State Senators threatening to block the appointments altogether.

The mechanics of staff merger had also become contentious, complicated by a provision requiring that no port employees be fired in the process. Finally, renewed port activity drove port stakeholders to protest to unification and explicitly act in ways that would hinder the takeover. On both sides of the river, port leaders began pursuing new leases and maverick port operations that would ultimately limit the DPRA's authority

and flexibility should the takeover occur.⁴⁴

Two years after the DPRA takeover process had begun, legal and political battles had paralyzed unification efforts. By 1996 very few proponents of the original plan remained. To many, it seemed the unification effort had actually soured port relations, between port stakeholders and DPRA officials, between the two states, and within the states themselves. The final death knell to unification was delivered in 1998, when the SJPC withdrew its offer to voluntarily turn over its ports to the DRPA, asking instead for an annual rent payment of \$2 million. SJPC also insisted on the DPRA assuming its liabilities, including debt service obligations, environmental problems, and pending litigation. Such an agreement on the part of DPRA would have required a similar arrangement with PRPA.

By fall of 1998, port unification was all-but abandoned. The CEO of the Ports of Philadelphia and Camden, hired after a national search following the 1994 merger, decided not to pursue renewal of his contract and left the region. Port executives promised employment in the unified port agency moved on to other positions. By that time a judge had dismissed Holt's lawsuit questioning the legality of public subsidies, but unification efforts had been irrevocably damaged.

Recognizing the reality of the situation, the Ports of Philadelphia and Camden board members decided to cut their losses and devised a new plan to develop unified port marketing, resolving that each state would retain rights to own and operate its port facilities separately.⁴⁵

Appendix C: Methodology for Economic Impact Analysis

Calculating Impacts

To estimate the magnitude of economic impact of the port industry, information regarding 2005 activity at Delaware River marine ports in the 11-county Philadelphia-Camden metro area was compiled. This assessment includes maritime trade activity at both public and private terminals along the river and reflects the availability of the terminal-related data needed to build this analysis – namely the employment on-site to conduct port activity. This analysis shows the resulting annual economic impact for the group of Delaware River ports together and for the Philadelphia port complex alone. Impacts and activity of only non-oil facilities are also presented.

The economic multiplier model from IMPLAN⁴⁶ was used to estimate the impact of on-site port and terminal employment. Two versions of the model were assembled by Select Greater Philadelphia using the latest IMPLAN model (2006): an 11-county⁴⁷ Greater Philadelphia Metro area model for analysis of the Delaware River port complex and a single-county model of Philadelphia to address the stand alone evaluation of Philadelphia ports (public and private facilities).

Economic Impact

The IMPLAN analysis system is an input-output model that calculates multipliers. Once IMPLAN has provided a description of the *direct* effects (whether as jobs or dollars of sales), it measures the added economic activity that is subsequently triggered. This additional effect is made up of indirect and induced impact. Indirect impact reflects the subsequent rounds of purchase interactions among businesses across different industries (some are local) to buy inputs in the form of goods and services for their respective production processes. Households are also paid

to supply labor to assemble/improve the inputs into a final product or service. When local households spend their after-tax earnings for household consumption, it creates cycles of wage generation and more household spending. This describes the induced impact. The sum of the direct, indirect, and induced impact is the total economic impact.

The success in using this tool for impact estimation depends on: (a) data quality; (b) knowing how to describe the workings of the policy/facility under study to the IMPLAN model; and (c) ensuring that sectors selected in the IMPLAN model to represent the profile of direct activity do a good job of representing the other direct aspects (wages, sales or jobs) of each sector in use and a plausible set of indirect responses.

Tax Revenue Impact

IMPLAN was further employed to determine the tax revenue impact associated with port activity in the city and region. The level of tax revenues produced by an individual scenario is a function of its total economic impact, specifically the increases in employment, output, value added, and labor income produced by that scenario's direct increase in employment.

The tax analysis estimated changes in the following types of state taxes: individual income tax, corporate income tax, general sales and use tax, selective sales taxes (e.g., cigarettes, alcohol), and other state taxes and fees. Increases in the City of Philadelphia's wage and sales taxes were also determined. Business Privilege Tax and other taxes unique to Philadelphia were not included. Further analysis may be done to determine if these taxes are significant enough to include in further models.

Determining regional tax revenues. Because this study covered

parts of three states, each with its own unique tax system and tax rates, it was necessary to distribute the total economic impact generated by the IMPLAN model across the three states. The total changes in employment, which IMPLAN provides on a place of work basis, were distributed across 11 counties based on the Journey to Work commuting flows for the region from the 2000 Census of Population.

The commuting flow data show, for a single county, all the counties where its employed residents worked in 2000 and also the county of residence for all the persons who worked there in 2000. For example, in 2000 Philadelphia's place-of-work employment was 660,050 persons, comprised of 429,667 residents who also worked in the city and 230,383 residents from other counties who commuted into Philadelphia to work.

Gross output, valued added, and earnings were distributed across the 11 counties based on 2005 personal income data published by the Bureau of Economic Analysis (BEA), which is available at <http://www.bea.gov/regional/reis/>.

Since the amount of individual income taxes paid is determined by where a worker lives as opposed to where he or she is employed, it was necessary to convert the county-level employment and earnings data from a place-of-work to a place-of-residence basis. The Journey to Work flows were used to convert the employment estimates, while 2005 personal income data was also used to convert the wage and proprietor's earnings estimates. Supplemental income (i.e., employer-paid fringe benefits and contributions to retirement) was subtracted from IMPLAN's labor income results to obtain wage and proprietor earnings that are subject to income and wage taxes.

In order to use the results of the IMPLAN model, it was necessary to derive effective tax rates for each of the taxes being considered. An effective tax rate is expressed in percent terms; it is obtained by dividing the annual revenues collected for a specific tax (e.g., individual income, corporate income, sales, etc.) by the primary economic activity that the tax is generated by. For example, if total individual income taxes paid in a year are \$2 million from a total earnings base of \$100 million, then the effective tax rate is 2 percent.

The first step in deriving the effective tax rates was to obtain actual 2006 values for the amount collected in each of the three states for the taxes listed above. This data was obtained from the U.S. Census Bureau's 2006 State Government Tax collections data, available at: <http://www.census.gov/govs/www/statetax06.html>. This source showed that total individual income tax collections during 2006 were \$1,018.6 million in Delaware, \$9,091.7 million in New Jersey, and \$9,021.9 million in Pennsylvania.

The next step was to obtain state-level totals in 2006 for the same variables provided by the IMPLAN model. Estimates for gross output, value added (i.e., Gross Domestic Product by State), employment, and labor income in each of the three states were obtained.

Effective tax rates were then calculated for each of the taxes by dividing revenues collected by the appropriate variable. For example, collections of individual income taxes in New Jersey during 2006 were divided by total labor income in the state for the same year to obtain the effective tax rate for individual income taxes, while corporate income tax receipts in Pennsylvania for 2006 were divided by the state's output in 2006 to obtain the effective tax rate for corporate income taxes. Once the effective tax rates were derived, they were

multiplied by the appropriate measures of economic activity to estimate the increases in tax revenues.

Determining Philadelphia tax revenues. The first step in estimating the increases in Philadelphia's wage tax revenues was to estimate place of residence employment for each scenario since City residents paid a higher wage tax of 4.301 percent in 2006 regardless of where they worked. It was also estimated that the number of employed residents of the other 10 counties that worked in Philadelphia paid a lower wage tax of 3.7716 percent in 2006. The two employment estimates were multiplied by county-specific figures for wage and proprietor earnings per job to obtain the total amounts subject to the wage tax, and these two figures were multiplied by the appropriate wage tax rate from 2006.

The resulting shares of wage tax payments by residents and non-residents were compared against actual data to check the accuracy of our methodology. The City of Philadelphia's Department of Revenue indicated that 61 percent of total wage taxes in 2006 were paid by residents of Philadelphia versus 39 percent paid by non-residents. By comparison, this study estimates that just over 64 percent of the wage tax payments were made by residents; the higher share is likely due to the fact the difference between the average salaries of residents and non-residents is less in the port sector than in other sectors such as Finances, and Professional and Business Services.

The City of Philadelphia levies an additional 1 percent sales tax on top of the 6 percent Pennsylvania sales and use tax, so the state sales tax revenue estimate was divided by 6 to obtain additional revenues received by the City. Finally, the effective sales tax rate for New Jersey was adjusted upward to account for the fact that the sales tax rate was increased

from 6 percent to 7 percent on July 1, 2006.

Calculating "Direct" Employment

When reviewing the best estimate of port facilities and private terminal jobs (termed the direct effect or direct jobs) to base the economic impact measurement on, it is important to understand what is being described. The estimate describes on-site employment functions. Other support activities involved in running a specific facility at a port and terminal represent indirect effects occurring with suppliers or vendors that contribute to water cargo transaction (e.g., off-site warehousing, trucking, export packing, etc.)

Some researchers and consultants augment the concept of what the direct effect includes typically when evaluating transportation facilities such as water ports and airports. They add many of the indirect (off-site) functions into the direct category and the consequence is their analysis presents a larger number of direct jobs and a disproportionately smaller number of indirect jobs. In the process of assembling the 2005 employment data for this exercise, it became clear that two of the three public port facilities in the Delaware River port system are associated with direct effects congruous with on-site jobs. We have attempted to place all facilities' employment on an equal footing. Direct jobs are on-site and include union and non-union positions. Off-site port-related activity is handled as an indirect effect of the port.

Appendix D: Port-Related Employment

Delaware River ports also have an economic impact related to their customer base, which is comprised of firms across different industries that rely on water transportation to ship or receive products. Based upon information from the Port Import Export Reporting Service (PIERS) 2006 database of importers and exporters provided by the Philadelphia Regional Port Authority and employment for port customers in the 11-county area derived from Dun and Bradstreet data, it is estimated that “port-reliant” firms employ 72,825 people across Greater Philadelphia.⁴ Of this total, 58,705 positions are related to imports and 14,120 to exports, a disparity that reflects the region’s import-export trade imbalance.

Much of this activity arises from firms involved in the manufacturing of chemicals, computer and electronic products, and petroleum and coals products. With the region’s expertise in perishable items and steel, it is unsurprising that firms in the region are creating finished products from those materials and exporting them through ports in Philadelphia and South Jersey. While it is not possible to assess the value of Delaware River ports to day-to-day operations, it can be surmised that for a great many port-reliant firms, a disruption in port services would have a some impact on business activity. However, port-reliant employment estimates are for

context only and should not be added to direct, indirect, and induced employment estimates.

Employment of Port-Reliant Business in Greater Philadelphia, Importers 2006

NAICS Code	Description	Jobs
111	Crop Production	550
212	Mining	108
221	Utilities	110
236	Construction	50
237	Heavy and Civil Engineering Construction	40
238	Specialty Trade Contractors	26
311	Food Manufacturing	1,719
312	Beverage & Tobacco Product Manufacturing	140
313	Textile Mills	293
314	Textile Product Mills	50
315	Apparel Manufacturing	20
316	Leather and Allied Product Manufacturing	20
321	Wood Product Manufacturing	6
322	Paper Manufacturing	1,118
323	Printing and Related Support Activities	475
324	Petrol and Coal Product Manufacturing	2,583
325	Chemical Manufacturing	19,309
326	Plastics and Rubber Product Manufacturing	677
327	Nonmetallic Mineral Product Manufacturing	362
331	Primary Metal Manufacturing	528
332	Fabricated Metal Manufacturing	98
333	Machinery Manufacturing	384
334	Computer & Electrical Product Manufacturing	16,989
335	Electric Equipment Manufacturing	1,297
336	Tran. Equipment Manufacturing	701
337	Furniture Manufacturing	242
339	Miscellaneous Manufacturing	162
423	Wholesale – Durable Goods	1,956
424	Wholesale – Non-Durable Goods	2,624
444	Retail – Bldg Material and Garden Supplies	85
445	Retail – Food and Beverage	1,315
447	Gasoline Stations	746
448	Retail – Clothing	487
452	Retail – General Merchandise	204
453	Retail – Miscellaneous	4
454	Non-store Retailers	98
484	Truck Transportation	42
488	Support Activities for Transportation	901
493	Warehousing and Storage	161
511	Publishing	1,330
541	Prof. Scientific, Tech., Services	124
561	Administrative and Support Services	266
611	Educational Services	120
624	Social Assistance	185
Total Jobs With Port-Reliant Importing Firms		58,705

Source: PIERS 2006 for Port of Philadelphia (excludes Port of Wilmington).

Employment of Port-Reliant Business in Greater Philadelphia, Exporters 2006

NAICS Code	Description	Jobs
221	Utilities	21
236	Construction	3
238	Specialty Trade Contractors	1
311	Food Manufacturing	1,993
315	Apparel Manufacturing	60
322	Paper Manufacturing	64
324	Petrol and Coal Product Manufacturing	40
325	Chemical Manufacturing	5,335
326	Plastics and Rubber Product Manufacturing	811
331	Primary Metal Manufacturing	2,625
332	Fabricated Metal Manufacturing	62
333	Machinery Manufacturing	84
336	Tran. Equipment Manufacturing	700
423	Wholesale – Durable Goods	1,222
424	Wholesale – Non-Durable Goods	436
441	Motor Vehicle and Parts Dealers	26
444	Retail – Bldg Material & Garden Supplies	200
445	Retail – Food and Beverage	2
541	Prof. Scientific, Tech, Services	400
561	Administrative and Support Services	3
562	Waste Management and Remediation Services	32
Total Jobs With Port-Reliant Exporting Firms		14,120

Appendix E: Excerpts from Expert Panel Discussions

Conference Call July 26, 2007

Topic: Global Issues & Implications
for Delaware River Ports and the
Port of Philadelphia

Panelists

Steve Fitzroy, Fitzroy Associates;
Shashi Kumar, Dean, U.S. Merchant
Marine Academy; Elizabeth Ogard,
Prime Focus Consulting; John
Rounesville, Horizon Lines.

Moderator

Lisa Petraglia, EDR Group

Excerpts

Hierarchy of U.S. Ports

Kumar: The Port of Philadelphia is not and will not become be a top tier port – even on the East Coast. Its niche is primarily viewed as a bulk port (i.e., fruit, other agricultural commodities, and petroleum). With respect to container growth prospects there are two criteria that limit the Port of Philadelphia: (a) centrality (*population density*), and (b) intermediacy (*ability to attract supplemental cargo typically for transshipment*). In both cases the Ports of NY/NJ eclipse the Port of Philadelphia. The 45 foot draft, while important, is not going to add a sustained competitive advantage in terms of attracting bigger containerships. A 2 or 3 fold increase in global container movements will surely exhaust all U.S. ports by 2015.

Fitzroy: Port of Philadelphia will never be NY/NJ or LA/Long Beach. Not realistic to think the Port of Philadelphia would attain 3-4 million TEU's or 50 million short tons per year. However, the entire system of Delaware River ports (particularly Wilmington) has huge growth potential. Wilmington has already established itself as an important niche for containerized (refrigerated) fruit, which has grown significantly. Separate from any de-

velopments related to a port *inland distribution network* (PIDN), the Port of Philadelphia may carve out a niche related to reaching secondary markets in central and western Pennsylvania as well as Ohio and other mid-western market areas. Port of Philadelphia might consider looking to establishing new markets via the North Sea to reach Baltic and eastern European markets.

Ogard: The Port of Philadelphia is a second tier, niche port in comparison to the deep water East Coast container ports. According to Sean Mahoney, Director of Marketing for the Philadelphia Regional Port Authority, Philadelphia is perceived to have a poor reputation with labor which is undeserved. The Port of Philadelphia actually offers 19 start times daily while Port of NY only has 5. Many feel that Philadelphia's location, up the Delaware river is a disadvantage for European cargo, but there is no disadvantage for South American cargo or carriers using the Panama Canal. There are clearance issues for double-stack rail, and this is a hindrance for shippers who want to move double stack traffic. Rail connections from the port are somewhat circuitous, for example, the CSX railroad must go north or south when leaving the port, to go to western markets. While rail investment is persistently a "big issue" because of the magnitude of the projects and costs. Finding funding to clear double stack routes is not easy. The Port of Philadelphia has survived with the current rail access because of its large surrounding market, accessible by truck and because it is primarily a bulk cargo port. Class 1 railroads prefer long haul railroad markets. Highway access issues may become a priority to achieve future growth at the port.

There are landside issues at NY/NJ. Huge containerships require large warehouse facilities and suitable

parcels of property in the vicinity of the NY/NJ ports are scarce. This could mean an opportunity for Philadelphia's port, if ocean lines currently calling NY/NJ shift southward to be closer to the large distribution centers in Pennsylvania. Today the Port of Philadelphia does not have an Asian service. If the Port could establish an Asian service, this might be an opportunity for Philadelphia. (Kumar agrees.)

Rounesville: Philadelphia has good niche for refrigerated (reefer) cargo which is a very attractive feature for shippers. Reefer containers exhibit the highest revenue – per unit – for most shipping lines. Pharmaceutical companies depend on refrigerated containers that once landside move predominantly by truck.

Global Issues

Fitzroy: Shipping lines determine where routes will be established (e.g., first ports of call on trans-Atlantic routes) and hence where dredging investment must be made to capture that business. Philadelphia is not likely to be the first port if call for large container vessels. However, some cargo may be lightered off at other ports before going to Phil. In this case the 45 foot draft may be sufficient for some time.

Smaller container vessels are coming on the market (fabricated by Philadelphia-based ship building company—AKER) for Hawaiian trade as a result of Jones Act. Vessels of this size can already access Philadelphia and Delaware ports without deepening the current channel.

Kumar: Panama Canal has growing delays and likely will be saturated by 2008. As a result more service will divert through the Suez Canal from Asian and West Asian ports to East Coast ports until Panama expansion is completed in 2014 or 2015. Meanwhile, all major East Coast ports are expected to be at capacity by 2015.

While every East Coast port should not aim to be a mega-port, that doesn't mean there aren't opportunities for those ports which megaships do not call on. There will be a reallocation of trade activity by vessel type when certain ports take on a growing share of megaship carried cargo.

Ogard: There are serious environmental concerns in Southern California as these ports seek to expand. Southern California is already dealing with diesel emission issues related to truck drayage and marine emissions. All port are watching the Port of Los Angeles/Long Beach in their effort to spread peak gate demand to off-peak terminal hours. (e.g., PIER PASS, an incentive program (per container) to induce shipping and trucking lines to call on the port during off-peak congestion periods). Security issues have become paramount and the introduction of TWIC (transportation worker identification cards for on-port worker clearance) may cause administrative related delays if everyone waits until closer to the deadline to get their credentials. Some are concerned that there may be a worker shortage if the current workforce does not comply with the process.

Efficiency is also an issue. Many ports in the U.S. have a mission to create jobs. While efficiency is important to attract customers, funding for productivity improvements is often slow to materialize.⁴⁸ U.S. port productivity is typically constrained by worker rules, which is one reason productivity is not as high in the U.S. as it is in Asian ports. Railroad intermodal service particularly on the West Coast is becoming constrained by key choke points, which are created by sheer train volumes, steep mountain grades and restricted tunnels. As a result of the labor issues in 2004, many containerized shippers have reevaluated their ports of entry and are diversifying their ports of call. Marine shipments which used to arrive on the West Coast are now

arriving at East Coast U.S. ports. Some shippers are looking at a reverse Suez Canal operation. Landside transportation can add as much as 30 percent to the total inland transportation cost of getting the goods to market. In the ideal world, a shipping line, would only call a few ports and would operate full vessels, with quick and efficient terminal handling operations, and all markets would have a back-haul. We aren't there yet.

Rounesville: There has been a green movement across all industries. Dredging and expansion will be hindered by environmental rules. There has been revenue erosion (for shippers) due to increasing rail rates; these are hard to pass on to the customer. Shipping lines would prefer to take on business that requires as little intermodal movements as possible for protecting profits on the transaction.

⇒ *Issue 1: Issues that affect a shipping line's profitability other than port depth or vessel operating costs*

Ogard: Market density and the ability to backhaul cargo helps.

Kumar: Competition among other shipping lines to that port, but equally important is maintaining customer loyalty and market share, particularly in the container business.

Rounesville: While market density is viewed as crucial, a port like Jacksonville (lacking market density) has promoted several of its locational advantages such as good roads, excellent rail connections, and ample and competitive supply of truckers.

Implications for Philadelphia

⇒ *Issue 2: How water shipping services might realistically evolve and how it would affect relative position of ports*

Fitzroy: New services will evolve if justified – based on efficiency and profitability of vessels. There has been a reaction to increases in rail rates. However, ignoring intermodal

connections would be a mistake. Opportunities may exist around new services to handle biofuels coming from South America and the export of US farm products to Europe (building on the reefer capacity in Wilmington). Also exports of distiller's dried grains (DDGs) are expected to increase substantially as corn stocks are converted to domestic ethanol production. There is a significant export capacity for these products to Europe.⁴⁹

Kumar: Philadelphia should focus on CAFTA countries which use smaller vessels. Short-sea shipping could work and I'm a bit surprised it hasn't taken hold yet. There is room for it, but you must use a Jones' Act ship which is a problem since there aren't enough vessels with these American flagships.

Ogard: Short-sea shipping has strong parallel with intermodal rail. If the government subsidizes it, then it may be introduced before the pure market signals would warrant its introduction. What needs to be worked out is the frequency, cost, and profitability of a specific short-sea route, and right now, even with truck congestion being what it is, a short-sea movement can't compete with the truck. In a recent study looking at water service between Burns Harbor, Indiana and Milwaukee, Wisconsin, truck rates are still too low and the transit times are too slow between the two terminal points.

⇒ *Issue 3: Types of factors that can be attributed to a port's loss of market share*

Rounesville: Philadelphia had a big loss of market share when a Puerto Rico shipper folded. Alternate service was located by the interested parties; the service now calls the Port of NY/NJ.

Ogard: Rates on landside transportation are key. Port of Tacoma saw shipping lines migrate down to Port of LA due to a landside transport cost increase for one line.

Kumar: Union vs. non-union labor and other costs associated with using a port's facilities. Capacity issues have somewhat curtailed the shipping line's ability to shop for the best port-of-call.

⇒ *Issue 4: What it would take for Philadelphia to harness an anticipated overflow of growth at NY/NJ*

Fitzroy: PIDN is a possibility. It is in competition with New Jersey inland warehouses, some (in central New Jersey) effectively closing the distance between activity generated at the Port of NY/NJ and Philadelphia. Inter-port agreements would pave the way to securing overflow at NY/NJ; stimulating investment in the Philadelphia region for warehousing/distribution facilities network and learning to compete with the New Jersey warehousing business.

Ogard: Philadelphia needs to first improve its poor intermodal connections (as defined by FHWA) around the port complex. Trains which run along Delaware Avenue can block access to terminals. Access to I-95 moves along city congested streets. Trains blocking at-grade rail crossings can create delays for motorists and trucks. During peak traffic, if a train blocks the grade crossings as much as a 40-minute delay has been reported in getting to the nearest interstate connection. Some vessels calling NY/NJ don't have their own terminals, and currently share facilities at other carrier's terminal. This makes for uncertainty/vulnerability regarding future availability of terminal resources, especially if the primary tenant grows into the full terminal area. As a result these smaller carriers are quite interested in considering the Port of Philadelphia, yet terminal access issues create doubt. Philadelphia must clarify their core competence and market their services to specific users. Philadelphia has an advantage with access to Lehigh Valley, Carlisle and Harrisburg Distribution Centers. It would be

helpful to segment the current customer base, strategically target, and sell the port's *high velocity, high security* traits to new users who would value these attributes. For example, Philadelphia might clarify its market niche as a premier refrigerated load center on the East Coast, and target users in these markets that they believe they provide a competitive advantage. (e.g., refrigerated dairy products or fruit).

⇒ *Issue 5: How the additional five feet of draft would affect the current standing of Philadelphia*

Kumar: Every other port is deepening its channels. The effect will be short-lived.

Fitzroy: It is important to ask for a port such as Philadelphia's (given its current activity profile) how much is depth a differentiator among the class of ports for which it is truly in competition with? What kind of business would you lose if you didn't dredge?

⇒ *Issue 6: What Philadelphia must do to aggressively grow its container business*

Kumar: I have never considered Philadelphia to be a player in the container market. They would need a huge marketing campaign and draw customers by offering a lower price. They need to evolve certain services and make additional terminal investment.

Fitzroy: Quickest to get cargo off the dock and onto its destination will be a key selling point, whether this is by on-dock rail, double-stack dock to the mainline. Partnership of port with rail industry participants would be a big plus and it should be marketed as such.

Ogard: Show how you stack up against port competitors in terms of throughput time, cost, and service. Sell your niche and make the case for why customers should come. Philadelphia would need to do complete study on transit time and compare

strengths and weaknesses with competitive ports; look at primary markets and their competitive advantage for users in markets that are in their niche; and need to make the case about why people should come.

⇒ *Issue 7: Why global private investment aimed at port infrastructure might consider Philadelphia*

Fitzroy: Equity investors will need to know their expected return-on-investment, the value proposition and likely risk sharing with the port authority as well as the State. The Governors and the Secretary's of Transportation in both New Jersey and Pennsylvania have commissioned high-level studies on public-private partnerships in the past year. The timing is right to assess private equity interest in port infrastructure investments.

Kumar: People are looking to invest; there are many examples of privatization outside the U.S.

⇒ *Issue 8: If the Port of Wilmington creates a ceiling on growth for Philadelphia*

Kumar: Wilmington being closer to open water does cause a problem for Philadelphia's competitiveness since ships run on a tight schedule.

Ogard: PRPA needs to ask: Who is the Port of Wilmington selling to and how do you offset their advantage of being closer to open water? Would the Wilmington users find value in Philadelphia?

Fitzroy: Airports offer an analogy to marine ports. Reliever airports were developed recently when big airports reached maximum capacity. The lesson is that all ports may gain if they cooperate.

Conclusions

Ogard: I'm excited about the Port of Philadelphia. There is a lot of opportunity, and the Port is doing a lot of interesting things right now when you consider dredging and Port development opportunities. PennDOT

is focused on freight transportation as well as corridor opportunities. The stars could be lining up properly. The Port needs to explore an increase in refrigerated users who need storage near a large customer base. Highway improvements are needed. Look into securing an Asian container service.

Fitzroy: It could establish relationships with up and coming regions – especially in Latin America, Eastern Europe/Baltics, and Africa.

Rounesville: Refrigerated cargo is very important. It is time sensitive and pays more than other cargo.

Conference Call November 16, 2007

Topic: Future Scenarios for Delaware
River Ports

Panelists

Elizabeth (Libby) Ogard, Prime Focus; Sashi Kumar, Dean of the US Merchant Marine Academy; Steve Fitzroy, Transport Economics & International Trade, EDR Group

Moderator

Lisa Petraglia, EDR Group

Summary of Scenarios

Scenario 1: “Base case.” As defined by DRI/WEFA forecasts to 2020 for the ACE Re-Analysis Report on River Dredging, all cargo (tonnage) would grow at a CAGR of 0.9% (which is half the projected rate for cargo nationwide). The container segment would grow at a CAGR of 4.4% (in line with U.S. projected container growth).

Scenario 2: “Increased Market Share.” Between 2005 and 2020 the Delaware River ports group will capture an additional *percentage point* of the non-petroleum trade (from 5.5% to 6.5% of the U.S. short tons).

Scenario 3: “Diminished Market Share.” Similar definition to scenario 2 except between 2005 and 2020 this group of ports will forfeit a

percentage point in the U.S. short tons handled (from 5.5% down to 4.5%). Petroleum trade is unaffected.

Excerpts

The following perspectives were shared regarding how specific aspects of waterborne trade along the Delaware River (affecting the Ports of Philadelphia, South Jersey, and Wilmington) influence the likelihood of these three possible future growth scenarios. At the close of the discussion, the panelists were asked which (if any) scenario seemed most plausible for Delaware River ports and to suggest any additional macro (global) influences that need to be taken into account when envisioning the growth trajectory for these ports.

⇒ *Issue 1: While the above scenarios are to motivate a discussion about future levels of container and bulk cargo that can be attracted to Delaware River ports, the river historically has played and will continue to play a vital role in receiving crude petroleum shipments at private terminals. Comment on how this traffic may change over the next 15 years.*

Kumar: U.S. consumption patterns will change as oil prices remain high. There will be a growth in consumption of LNG. The Delaware River ports should therefore expect to *maintain* their share of the petroleum trade but not grow it.

Fitzroy: The CAGR of the Delaware River ports’ petroleum trade are near an all-time high. Would only envision a larger market share if more refining capacity were added in the region, and that seems unlikely. What is likely to change, however, is where crude petroleum shipments will originate from. Philadelphia will see more liquid tankers arriving from the African continent and from South America.

Another issue to watch is how successfully ethanol (corn or sugar based) will be in substituting for petroleum. If there isn’t ample domestic imports, then conceivably the river could see liquid bulk ethanol shipments. This

current raises storage concerns.

Ogard: Expect different trade patterns to emerge for the Philadelphia oil terminals.

⇒ *Issue 2: The future for bulk and break-bulk for Delaware River ports*

Kumar: The Port of Philadelphia will retain its competitive position in this cargo segment. The commodities include beef from Australia and South America, forest-products, wood pulp and flowers. It will present a stable business segment but not a growth segment in part since containerization is still on-going and some break-bulk cargo will convert to container shipments.

Fitzroy: Regarding break-bulk, steel manufacturing spurred by foreign direct investment from Russia and India for integrated and mini mills here in the U.S. will create increased shipments for the Port of Philadelphia and other East Coast ports which can serve midwest and southeast U.S. markets. So competition (from Hampton Roads, Savannah, Baltimore) will be present and Philadelphia should prepare by leveraging its existing steel relationships and build capacity. Part of this potential is driven by steel mills looking to reduce the rising transport costs over the road (with land bridging) and looking more at unladenage at East Coast ports. Steel shipments are a likely factor for scenarios 1 or 2.

Possible vulnerability in the break-bulk segment is lumber shipments due to the housing slump. Once housing investment re-starts, the additions will likely be for a different housing unit concept. Sees a shift towards multi-unit which uses many non-wood components.

Ogard: As ports are forced to focus on specific market segment to survive, the projected growth in international container trade will cause some ports to shed their bulk and break-bulk business. There is an opportunity for the Delaware River ports to concentrate further on their existing competitive

position in this cargo segment. It is very difficult to balance growing segments since they make different port utilization demands.

⇒ *Issue 3: The future for refrigerated containers vs. other containers for Delaware River ports*

Kumar: Beef (Australia) and fruit (South America) shipments will remain strong and underpin scenario 1.

Fitzroy: Wilmington serves as an important niche in reefer cargo in terms of markets served and customers. It will play a moderate positive role in underpinning scenario 1. Port of Philadelphia is vulnerable with respect to non-reefer containers as many ocean carriers are closely managing unit costs given vessel size optimization and achieving economies of rotation. The outcome may be that Philadelphia is bypassed in container segments for which Philadelphia doesn't currently exhibit a competitive position. Port of NY/NJ sees the most calls from the largest vessels on the East Coast, and those vessels typically serve Baltimore and Hampton Roads on the same string of calls. The channel depth requirements are onerous for Delaware River port facilities if they continue to pursue the lure of larger vessels.

The plus for Delaware River ports is their strength in the local market served. This must be maintained to serve as a stabilizer for facility performance in the future. Reefer cargo will maintain its share, while other container cargo will be under pressure.

Ogard: The re-building of reefer capacity in the Gulf post-Katrina has been state-of-the art facilities, and these locations have a deep reach into the midwest. The Port of Philadelphia fortunately has a good catchment area in the New England market. Competition is rising as NYC is underway with railroad improvements; Hampton Roads is adding new container capacity. As mentioned back in the first panel discussion (August 2007), lack of a North Asian service is a weakness for

Philadelphia.

One other limitation to container growth for Philadelphia is that gaps exist in the inland rail network depending on how far goods need to move once unladen at Philadelphia. Pilot demonstration projects are being fielded for container-on-barge but no current proposal includes Philadelphia.

⇒ *Issue 4: Markets and products that promise growth for Delaware River ports*

Kumar: Linking the hinterland will be a key driver for the ports. The sustained decline of the U.S. dollar is increasing the demand for U.S. exports. Expects less growth from the local market served.

Fitzroy: The local market will be demanding building materials. Hinterlands have some potential but are contested – Wilmington for reefers, land-side infrastructure, slated improvements at competitor ports, priorities and privatization all play a role in how the hinterland business is awarded. Private steel operations are guaranteed business for Philadelphia but will need to have storage issues addressed (both open & closed warehouses) and some rail connections established.

Ogard: Exchange rates will definitely affect trading partners and flows and so will port improvements that come online. Expects a resurgence of U.S. exports to Europe, some of it manufactured goods that will move in containers. Some of these containers arrived at West Coast ports and would have traveled back empty across the Pacific. Instead they move inland, are filled with manufacturers from the mid-West and will export to Europe off the East Coast. Without an already established container position it is hard to see the windfall for Philadelphia. Foreign Trade Zones have had good success statewide with pharmaceuticals and small manufacturing.

⇒ *Issue 5: Delaware River ports' ability to play a role in port diversification strategies of shippers/consignees or carriers*

Kumar: Hard to say of there is an

opportunity here. Ports must repackage themselves to portray they are key player in the supply chain for specific goods.

Fitzroy: Market efficiency and capacity are the most compelling factors for being selected on the carrier's rotation. Carriers want to see a separate treatment for importers and exporters. Economies of scale are key to the carrier. Baltimore and Savannah have these, and they have been the winners with carriers.

Ogard: The economics of vessel strings, markets served (rail bottlenecks at a port and gateway cities), as well as the economic outlook of the trading partners are all involved in determining whether Delaware River ports would be chosen in a port diversification strategy. Volume and capacity at other locations may determine some opportunity. Pending resolution of labor issues on both West and East Coasts may also influence port diversification.

⇒ *Issue 6: Factors in the relative cost competitiveness of Delaware River ports*

Kumar: While relative cost of the port is important it is not the main influencer in attracting shipments. Reliability is the driver whereby vessel turnaround time and seamless intermodal connections are what matter most. This assumes that the port's cost structure is not grossly out of line.

Fitzroy: If Delaware River ports build on concentrating their current customer cargo (affording them stability), then based on current cost parameters, there is a favorable trajectory. Business growth is more complicated than just the on-port cost. Gross investment in freight infrastructure plays a big role.

Ogard: The channel deepening to 45 feet is a plus, but there are corridor issues. The future will depend on identifying the corridors that can lead to key gateway cities, or link to new warehouse centers (Lehigh, Chambersburg, Harrisburg). Philadelphia is addressing highway infrastructure improvements

and the Liberty Corridor has been funded to remove clearance issues.

A supply chain manager examines the entire ocean-highway and/or rail transit. They look for a carrier that can offer that seamlessly and consider the cost and time involved.

⇒ *Issue 7: How Delaware River ports should position themselves as they look to the future*

Kumar: Each port should focus on a specialty. Coordination through political collaboration or port unification should be looked at (again) seriously.

Fitzroy: The most successful regional ports have evolved into joint marketing entities and are realizing economies of scale as a result. This mirrors the trend among carriers. Large carriers want to negotiate with large port complexes. Smaller individual ports can not leverage the same bargaining assets. Internal competition along the river can be viewed as non-productive.

Ogard: When viewed as a multi-jurisdiction planning issue, three states present a challenge for coordination, but it is not impossible. Freight will flow to the path with least resistance (cost effective and smooth reliable intermodal movements). All this presents challenges for a small facility.

⇒ *Issue 8: The role of carrier commitments*

Kumar: The Panama Canal widening completion in 2014 and the South Asian stimulus will contribute to more traffic to the East Coast. This traffic will typically involve vessels of 12,000 TEUs as the worldwide fleet is shifting into larger vessels. Despite the 45-foot channel deepening, there will remain depth limitations and the geographic limitation of position up river.

Fitzroy: Continued consolidation among carriers will make container growth for Philadelphia difficult to achieve. The Suez route of Hong Kong to Philadelphia could begin to look more attractive, but vessel size and the order of ports of call will dis-

advantage Philadelphia. Channel deepening is necessary but not sufficient. These challenges could be somewhat mitigated with a unified strategy between Philadelphia, South Jersey, and Wilmington.

Ogard: First movers on capacity enhancements will have an advantage over Philadelphia. Possible opportunities exist through offering support/feeder services to large vessels calling elsewhere on the East Coast.

⇒ *Issue 9: Role for regional intermodal initiatives*

Fitzroy: These will become relevant for the long-haul move (1-2 day market). These are typically arranged between the carrier and the consignee. Baltimore, Hampton Roads and Port of New York/New Jersey are also competitive depending on the specific commodity. Increasing fuel costs will tend to favor rail move instead of long-haul truck.

Ogard: Double stack long-haul rail ideally travels 700-1,000 miles before the first stop. Philadelphia (CSX) has some rail issues to remedy in terms of ease of moving westward from port. The port currently does not have the volume to justify investment in high cube stack services in the near future but other competitor ports are already underway.

Intermodal connections – getting from port to highway – issues of spot congestion and grade separations – fixable. Philadelphia has a highway network with good connections to warehousing districts (Lehigh Valley, Chambersburg, Harrisburg) and a straight path (one-day drive) to Columbus, Ohio. Also has possibly the fastest and most cost effective move for high value cargo to the midwest. But not being a first port-of-call will limit upside. Best market opportunity reached through intermodal is likely the North East corridor. Limited market opportunity in the midwest.

⇒ *Issue 10: Implications for port capacity additions*

Kumar: Should promote through public-private investments between Operator-Carriers-Shippers.

Fitzroy: Private money is key. Pick specific commodity carefully to develop the capacity around. Locate the investments appropriately. Large amounts of public money invested are best in large economies of scale context.

Ogard: Focus on a market niche, secure commitments and work with the customer to build the investment.

⇒ *Issue 11: What else may influence the future for Delaware River ports*

Ogard: Recent AASHTO publication shows a long-term railroad infrastructure shortfall despite \$8 billion of planned improvements. The 2008 election may change policy towards transportation and freight but it is an unknown right now. The role of fuel surcharges is shifting the truck-rail mix to move freight to/from the inland. Ocean carrier rationalization will dictate where the winner ports are; it will be those that can assemble point-to-point business for the railroad. Hard to see a strong advantage for Philadelphia with the inland double-stack service. Lastly, the TWIC daily implementation official as of January 2008 may likely pose a process bottleneck.

⇒ *Issue 12: Most probable outlook for the Delaware River ports*

Kumar: Would caution that the base case is overly ambitious when viewed on current market conditions. Port operators are reexamining their recent forecasts again.

Fitzroy: Believes it is unlikely that the Delaware River ports will be able to keep pace with the assumed growth for U.S. ports. The base case is too optimistic for containers and so is scenario 2. Forecasts from 1 year ago are being reworked. Bulk will likely remain the opportunity for these ports. Scenario likelihood: #1 – 45%, #2 – 15%, and #3 – 30% (including liquid bulk component).

Appendix F: Port Profiles

Philadelphia Regional Port Authority							
Facility	Operator	2006 Vessel Calls	Specialized Cargoes	Terminal Area	Berths	Warehouse & Storage	Landside Connection
Packer Avenue Marine Terminal (Columbus Blvd. at Packer Ave.)	Greenwich Terminals, LLC	363	Containers, steel products, frozen meat, fruit, heavy lift, project, paper	112 acres 45 sq. hectares (ha.)	6 berths - 3,800 linear ft.; 1 Ro/Ro	1 dry/heated - 100,000 sq. ft. 1 dry - 90,000 sq. ft. 1 dry - 100,000 sq. ft. 1 reefer - 2,200,000 cu. ft.	Highway: I-95 & I-76 within 0.5 mi.; Rail: CP, CSX, NS
Tioga Marine Terminal (Delaware Ave. at Tioga St.)	Delaware River Stevedores, Inc.	95	Containers, fresh fruit, paper, plywood, cocoa beans, autos, palletized, project, breakbulk, & steel	116 acres 47 sq. ha.	6 berths - 3,822 linear ft.; 1 Ro/Ro	1 compartment, reefer/heated - 300,000 sq. ft. 1 cold storage - 90,000 sq. ft. 1 heated storage - 97,500 sq. ft. 1 dry - 40,000 sq. ft. 1 dry - 107,000 sq. ft.	Highway: Close to I-95; Rail: CP, CSX, NS
Piers 78/80 (Columbus Blvd. at Snyder St.)	Penn Warehousing Distribution	60	Newsprint, coated paper, wood pulp, other forest products	44.4 acres 18 sq. ha.	4 berths - 3,892 linear ft.; 2 Ro/Ro	Pier 74 Annex: 115,000 sq. ft. Pier 78: 1 dry - 364,000 sq. ft. 78 Annex: 1 dry - 208,000 sq. ft. Pier 80: 1 dry - 456,000 sq. ft.; 80 Annex: 1 dry - 125,000 sq. ft.	Highway: Close to I-95 & I-76; Rail: CP, CSX, NS
Pier 82 (Columbus Blvd. at Oregon Ave. & Jackson St.)	Horizon Stevedoring	39	Fruits & vegetables, break bulk, project, paper	13.3 acres 5.4 sq. ha.	2 berths - 1,994 linear ft.	1 heated chilled - 130,000 chilled sq. ft. (with humidification system)	Highway: Close to I-95 & I-76; Rail: CP, CSX, NS
Piers 38/40 (Columbus Blvd. at Christian St.)	Penn Warehousing & Distribution	23	Newsprint, coated paper, wood pulp, other forest products	12 acres 4.9 sq. ha.	3 berths - 1,721 linear ft.	2 dry - each 180,000 sq. ft. Pier 40 - 1st floor heated and humidification system	Highway: Close to I-95 & I-76; Rail: CP, CSX, NS
Pier 84 (Columbus Blvd. at Jackson St.)	Dependable Distribution Services	22	Cocoa beans & other cocoa products	13.9 acres 5.6 sq. ha.	1 berth - 855 linear ft.	1 dry - 500,000 sq. ft. 1 dry - 40,000 sq. ft.	Highway: Close to I-95 & I-76; Rail: CP, CSX, NS
Pier 96 & 98 Annex (Columbus Blvd. at Oregon Ave.)	Pasha Auto Warehousing, Inc.	n/a	Automobiles, project, heavy equipment	<i>Pier 96:</i> 9.7 acres 3.9 sq. ha. <i>98 Annex:</i> 45.2 acres 18.3 sq. ha.	2 berths - 2,640 linear ft.	Auto-washing system - 15,000 sq. ft. Service building - 80,000 sq. ft.	Highway: Immediate access to I-95 & I-76; Rail: CP, CSX, NS

South Jersey Port Corporation							
Facility	Operator	2006 Vessel Calls	Specialized Cargoes	Terminal Area	Berths	Warehouse & Storage	Landside Connection
Beckett Street Terminal (Beckett St. at Second St., Camden)	South Jersey Port Corporation	154	Cocoa beans, wood, scrap metal, steel, wood products, iron ore, pyrite, & salt	125 acres 50.9 sq. ha.	4 berths - 2,655 linear ft.	19 dry - 1,110,000 sq. ft. total	Highway: Access to I-676, I-76, US 130, & I-295; Rail: CP, CSX, NS
Broadway Produce Terminal (2500 Broadway, Camden)	Del Monte Fresh Produce N.A., Inc.	65	Bananas, pineapples, & other perishables	28 acres 11.3 sq. ha.	1 berth - 1,135 linear ft.	3 temperature-controlled - Total 210,600 sq. ft. 1 dry - 25,000 sq. ft.	Highway: Access to I-676, I-76, US 130, & I-295; Rail: CP, CSX, NS
Broadway Terminal (Broadway at Morgan Blvd., Camden)	South Jersey Port Corporation	34	Furnace slag, cement, steel, wood products, dolomite, salt, cocoa beans, & other perishables	180 acres 72.8 sq. ha.	2 berths - 2,000 linear ft.	29 dry - 1,100,000 sq. ft. total	Highway: Access to I-676, I-76, US 130, & I-295; Rail: CP, CSX, NS
Port of Salem (Exit 1, NJ Turnpike, Salem)	South Jersey Port Corporation	n/a	Wearing apparel, finishing apparel, autos, food products, sand, & gravel	22 acres 8.9 sq. ha.	1 berth - 350 linear ft.	Shed & warehouse space - 80,000 sq. ft.	Highway: Direct access to US 45 and US 49, with access to US 130, I-295, & NJ Turnpike

Diamond State Port Corporation							
Facility	Operator	2006 Vessel Calls	Specialized Cargoes	Terminal Area	Berths	Warehouse & Storage	Landside Connection
Port of Wilmington (Hausel Rd., Wilmington)	Diamond State Port Corporation	399	Containers, autos, fruit, juice, meat, paper, salt, & steel	308 acres 124 sq. ha.	7 berths - general cargo; 1 tanker; 1 floating; 1 Ro/Ro	6 warehouses - chilled & freezer storage - 800,000 sq. ft. total Controlled atmosphere capability - 16,000 sq. ft. total	Highway: Access to I-95; Rail: CSX, NS

Major Privately Owned Facilities							
Facility	Operator	2006 Vessel Calls	Specialized Cargoes	Terminal Area	Berths	Warehouse & Storage	Landside Connection
Penn Terminal (Saville Rd., Ed-dystone, PA)	Penn Terminals	253	Containers, fruit, autos, clothes, & project	71.4 acres 28.9 sq. ha.	1 berth - 1,150 linear ft.	Warehousing capacity - 300,000 sq. ft.	Highway: Access to I-95, I-476, & NJ Turnpike
Gloucester Marine Terminal (King St., Gloucester, NJ)	Greenwich Terminals, LLC	187	Containers, steel, frozen meat, fruit, heavy lift, & project	150 acres 60.8 sq. ha.	5 berths - 2,600 linear ft.	11 dry/heated - 1,200,000 sq. ft. 11 reefer/frozen - 5,090,000 cu. ft.	Highway: Access to I-676, I-76, I-295, & NJ Turnpike
Fairless Hills (Sinter Rd., Fairless Hills, PA)	Kinder Morgan	94	Steel	100 acres 40.5 sq. ha.	3 berths - 2,200 linear ft.	Warehousing capacity - 208,000 sq. ft.	Highway: Access to I-95, PA Turnpike, & NJ Turnpike Rail: CSX &

Other Privately Owned Facilities				
Facility	Owner/Operator	2006 Vessel Calls	Specialized Cargoes	
Kinder Morgan Liquid Terminal (Delaware Ave. at Allegheny Ave., Phila.)	Kinder Morgan	58	Chemical	
Bermuda International (Tilbury Rd., Salem, NJ)	Bermuda International Mid-Atlantic	49	Containers	
Grows Terminal (New Ford Mill Rd., Fairless Hills, PA)	Grows Waste Management	30	Salt & Gravel	
Oceanport (Claymont, DE)	Oceanport Industries, Inc.	15	Salt	
National Gypsum (River Rd., Burlington, NJ)	National Gypsum Company	14	Gypsum	
Riverside (Newbold Rd., Fairless Hills, PA)	Riverside Construction Materials, Inc.	13	Cement	
Georgia Pacific (South Front St., Camden, NJ)	Georgia Pacific Gypsum	9	Gypsum	

Oil Refineries		
Facility	Owner/Operator	2006 Vessel Calls
Delaware City (Wrangle Hill Rd., Delaware City, DE)	Valero, Inc.	231
Eagle Point (US 130 & I-295, Westville, NJ)	Sunoco, Inc.	189
Fort Mifflin (Fort Mifflin, Phila.)	Sunoco, Inc.	180
Marcus Hook (Delaware Ave. at Green St., Marcus Hook, PA)	Sunoco, Inc.	166
Paulsboro (Billingsport Rd., Paulsboro, NJ)	Valero Refining Co. of New Jersey	151
Trainers (Post Rd., Trainer, PA)	ConocoPhillips, Inc.	85
Citgo Paulsboro (Paradise Rd., Paulsboro, NJ)	Citgo Asphalt Refining	68
Hess Delair (Derousse Ave., Pennsauken, NJ)	Amerada Hess Corporation	58
Pacific Atlantic Terminal (3rd St. at Billingsport Rd., Paulsboro, NJ)	ST Services	56
H. Port Richmond (E. Allegheny Ave., Phila.)	Westway Terminals, Inc.	42
Girard Point (Girard Point, Phila.)	Sunoco, Inc.	40
Hog Island (Hog Island, Phila.)	Sunoco, Inc.	16
Wilmington Oil Pier (Christiana Ave., Wilmington, DE)	Magellan Midstream Partners	10
PECO Coal Terminal (Essington, PA)	PECO	7
Koch Fuels (Gloucester City, NJ)	Koch Fuels	4

Appendix G: Additional Data

Rankings of U.S. Ports by Tonnage, 2005					
Imports			Exports		
Rank	Port	Short Tons	Rank	Port	Short Tons
1	Houston, TX	103,189,879	1	South Louisiana, LA	51,083,963
2	New York/New Jersey	76,566,928	2	Houston, TX	41,860,694
3	Beaumont, TX	55,505,173	3	Virginia Ports/Hampton Roads, VA	24,417,636
4	Corpus Christi, TX	45,418,170	4	Long Beach, CA	18,808,002
5	Long Beach, CA	44,492,991	5	Duluth-Superior, MN and WI	13,951,792
6	South Louisiana, LA	43,489,700	6	Tacoma, WA	13,014,877
7	Texas City, TX	38,005,188	7	Los Angeles, CA	12,932,048
8	Los Angeles, CA	33,994,001	8	Portland, OR	11,945,116
9	Portland, ME	28,038,852	9	New Orleans, LA	11,826,683
10	Lake Charles, LA	27,083,364	10	New York/New Jersey	11,231,712
11	Philadelphia, PA	25,914,744	11	Seattle, WA	10,507,096
12	Freeport, TX	25,415,676	12	Mobile, AL	10,151,874
13	Baltimore, MD	21,507,392	13	Savannah, GA	10,084,137
14	New Orleans, LA	21,251,947	14	Kalama, WA	8,809,228
15	Mobile, AL	21,224,217	15	Corpus Christi, TX	8,390,095
16	Savannah, GA	18,216,211	16	Tampa, FL	8,270,965
17	Paulsboro, NJ	18,133,852	17	Plaquemines, LA	7,914,170
18	Baton Rouge, LA	17,585,231	18	Oakland, CA	7,113,612
19	Pascagoula, MS	16,542,106	19	Baltimore, MD	6,727,261
20	Charleston, SC	15,560,101	20	Charleston, SC	6,314,453
21	Boston, MA	14,090,568	21	Texas City, TX	5,462,230
22	Port Arthur, TX	12,992,497	22	Port Arthur, TX	5,060,308
23	Tampa, FL	11,838,306	23	Lake Charles, LA	5,022,731
24	Port Everglades, FL	11,566,543	24	Baton Rouge, LA	4,819,554
25	Jacksonville, FL	10,962,641	25	Beaumont, TX	4,597,105
26	Seattle, WA	10,476,388	26	Ashtabula, OH	4,319,057
27	Richmond, CA	9,991,591	27	Presque Isle, MI	3,373,239
28	Virginia Ports, VA	9,862,698	28	Pascagoula, MS	3,352,099
29	Marcus Hook, PA	9,570,380	29	Vancouver, WA	3,227,795
30	Plaquemines, LA	8,039,242	30	Longview, WA	3,204,802
31	Tacoma, WA	7,658,776	31	Conneaut, OH	3,165,069
32	Port Lavaca/Point Comfort, TX	7,358,387	32	Freeport, TX	3,029,744
33	Wilmington, DE	6,896,449	33	Miami, FL	2,834,117
34	Oakland, CA	6,357,517	34	Toledo, OH	2,752,376
35	Honolulu, HI	6,220,219	35	Nikishka, AK	2,703,823
36	Providence, RI	5,795,456	36	Galveston, TX	2,654,586
37	San Juan, PR	5,791,386	37	Port Everglades, FL	2,654,147
38	Miami, FL	5,000,574	38	Port Lavaca/Point Comfort, TX	1,872,184
39	Toledo, OH	4,847,786	39	Richmond, CA	1,744,862
40	Camden-Gloucester, NJ	4,742,854	40	Sandusky, OH	1,714,235
41	Portland, OR	4,410,840	41	Jacksonville, FL	1,546,678
42	Portsmouth, NH	4,285,676	42	Chicago, IL	1,500,501
43	Detroit, MI	4,120,212	43	Coos Bay, OR	1,440,917
44	Wilmington, NC	3,989,349	44	Kivilina, AK	1,381,126
45	Port Canaveral, FL	3,604,931	45	Palm Beach, FL	1,144,665
46	Cleveland, OH	3,137,262	46	Boston, MA	1,068,296
47	New Castle, DE	3,056,252	47	Morehead City, NC	1,021,929
48	Brownsville, FL	2,935,438	48	Anacortes, WA	995,410
49	Port Manatee, FL	2,931,318	49	Port Manatee, FL	930,651
50	New Haven, CT	2,783,030	50	Wilmington, NC	912,924

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Rankings of U.S. Ports by Tonnage, 2005					
Imports			Exports		
Rank	Port	Short Tons	Rank	Port	Short Tons
51	San Diego, CA	2,552,817	51	Calcite, MI	899,856
52	Ponce, PR	2,280,006	52	Grays Harbor, WA	839,018
53	Barbers Point, Oahu, HI	2,192,235	53	Port Dolomite, MI	734,139
54	Penn Manor, PA	2,175,149	54	Gulfport, MS	687,240
55	Anacortes, WA	2,174,164	55	Brunswick, GA	672,140
56	Stockton, CA	1,904,034	56	Stockton, CA	667,849
57	Fall River, MA	1,889,507	57	Port Inland, MI	611,367
58	Bridgeport, CT	1,854,093	58	Burns Waterway Harbor, IN	591,894
59	Searsport, ME	1,705,823	59	Marblehead, OH	568,744
60	San Francisco, CA	1,667,908	60	Camden-Gloucester, NJ	545,293
61	Burns Waterway Harbor, IN	1,597,349	61	San Juan, PR	520,706
62	Brunswick, GA	1,563,859	62	Everett, WA	495,718
63	Port Hueneme, CA	1,375,792	63	Anchorage, AK	467,520
64	Morehead City, NC	1,282,428	64	Honolulu, HI	460,701
65	Chicago, IL	1,245,876	65	Brownsville, TX	420,287
66	Chester, PA	1,243,599	66	Chester, PA	400,092
67	Palm Beach, FL	1,193,852	67	Wilmington, DE	381,567
68	Milwaukee, WI	1,099,300	68	Fairport Harbor, OH	359,250
69	Vancouver, WA	1,064,786	69	Panama City, FL	346,551
70	Salem, MA	1,044,597	70	Philadelphia, PA	322,702

Source: American Association of Port Authorities.
Notes: Tonnage is for foreign trade only.

Rankings of U.S. Ports by Value of Goods, 2005					
Imports			Exports		
Rank	Port	Dollars	Rank	Port	Dollars
1	Los Angeles, CA	199,642,517,489	1	Houston, TX	41,934,379,555
2	Newark, NJ	100,835,454,909	2	Los Angeles, CA	26,264,621,637
3	Houston, TX	61,027,767,704	3	New York, NY	26,218,253,329
4	Long Beach, CA	57,661,560,859	4	Long Beach, CA	21,615,283,322
5	Charleston, SC	39,097,702,980	5	Norfolk, VA	16,595,053,349
6	Philadelphia, PA	29,462,379,151	6	Charleston, SC	16,101,460,266
7	Seattle, WA	27,906,668,169	7	New Orleans, LA	15,232,446,605
8	Norfolk, VA	27,226,542,494	8	Savannah, GA	13,703,056,423
9	Baltimore, MD	27,105,718,036	9	Oakland, CA	9,785,999,732
10	Tacoma, WA	26,911,757,293	10	Baltimore, MD	9,599,931,056
11	Savannah, GA	25,967,964,985	11	Miami, FL	9,413,624,905
12	Morgan City, LA	25,399,358,026	12	Seattle, WA	8,610,941,883
13	Oakland, CA	24,607,011,089	13	Jacksonville, FL	8,151,596,185
14	New Orleans, LA	18,467,400,418	14	Pt. Everglades, FL	7,570,159,382
15	Port Arthur, TX	15,713,257,491	15	Newark, NJ	6,945,122,058
16	Corpus Christi, TX	15,490,616,223	16	Tacoma, WA	4,973,481,293
17	Jacksonville, FL	12,471,747,504	17	Gramercy, LA	3,607,888,988
18	New York, NY	11,521,083,027	18	Corpus Christi, TX	3,282,648,360
19	Portland, OR	11,486,029,187	19	Detroit, MI	3,259,974,703
20	Miami, FL	11,469,886,241	20	Anchorage, AK	2,816,065,593
21	Pt. Everglades, FL	10,410,717,153	21	Portland, OR	2,555,628,178
22	Texas City, TX	10,129,026,843	22	Philadelphia, PA	2,430,517,679
23	Christiansted, Virgin Islands	10,100,103,974	23	Texas City, TX	2,297,503,047
24	Lake Charles, LA	9,374,219,400	24	Wilmington, DE	2,175,543,116
25	Beaumont, TX	9,013,516,806	25	Norfolk/Mobile/Charleston	1,988,681,398
26	Freeport, TX	8,742,964,843	26	Tampa, FL	1,954,990,969
27	Boston, MA	7,921,249,597	27	Baton Rouge, LA	1,894,212,777
28	Port Hueneme, CA	7,273,092,554	28	Beaumont, TX	1,841,535,908
29	Gramercy, LA	7,146,872,453	29	Mobile, AL	1,720,115,827
30	San Diego, CA	6,964,608,381	30	Pascagoula, MS	1,627,875,033
31	Pascagoula, MS	6,949,396,144	31	San Juan, PR	1,614,841,751
32	Baton Rouge, LA	6,870,916,666	32	Chester, PA	1,594,532,247
33	Mobile, AL	6,440,936,114	33	Freeport, TX	1,552,170,482
34	Richmond, CA	5,931,786,701	34	Wilmington, NC	1,357,231,895
35	Chester, PA	5,684,957,894	35	Boston, MA	1,292,834,383
36	Brunswick, GA	5,531,070,484	36	Kalama, WA	1,260,132,956
37	Wilmington, DE	5,499,289,565	37	Port Huron, MI	1,216,838,133
38	Providence, RI	5,269,111,207	38	West Palm Beach, FL	1,176,090,644
39	El Segundo, CA	4,961,753,258	39	Lake Charles, LA	1,144,648,129
40	San Juan, PR	4,837,450,824	40	Port Arthur, TX	1,129,938,104
41	Honolulu, HI	4,292,762,495	41	Galveston, TX	1,096,490,279
42	Panama City, FL	3,962,293,344	42	Vancouver, WA	1,081,813,469
43	Galveston, TX	3,501,867,193	43	Brunswick, GA	1,026,293,932
44	Perth Amboy, NJ	3,441,226,238	44	Gulfport, MS	922,507,705
45	San Francisco, CA	2,935,301,630	45	San Francisco, CA	866,723,964
46	Newport News, VA	2,486,968,631	46	Buffalo-Niagara Falls, NY	833,134,819
47	Wilmington, NC	2,455,994,599	47	Newport News, VA	802,252,054
48	Portland, ME	2,189,686,349	48	Panama City, FL	667,799,946
49	Tampa, FL	2,156,839,891	49	Longview, WA	630,784,599
50	Bellingham, WA	2,070,271,556	50	Richmond-Petersburg, VA	630,100,362
51	New Haven, CT	1,859,660,073	51	Chicago, IL	591,617,977
52	Gulfport, MS	1,518,840,565	52	Toledo-Sandusky, OH	525,819,320

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Rankings of U.S. Ports by Value of Goods, 2005					
Imports			Exports		
Rank	Port	Dollars	Rank	Port	Dollars
53	Humacao, PR	1,501,767,992	53	Champlain-Rouses Pt., NY	525,238,823
54	Guayanilla, PR	1,406,400,483	54	Christiansted, Virgin Islands	443,056,944
55	Chicago, IL	1,316,173,599	55	Everett, WA	404,875,614
56	Vancouver, WA	1,237,656,495	56	Duluth-Superior, MN-WI	368,021,760
57	Martinez, CA	1,046,283,847	57	Mayagues, PR	310,291,993
58	Richmond-Petersburg, VA	1,011,247,855	58	Humacao, PR	304,237,111
59	Detroit, MI	897,985,522	59	Honolulu, HI	292,724,785
60	Everett, WA	851,056,822	60	Brownsville-Cameron, TX	291,104,448
61	Anacortes, WA	834,682,942	61	Anacortes, WA	275,003,255
62	Port Manatee	817,316,420	62	Morehead-Beaufort, NC	256,073,294
63	West Palm Beach, FL	747,176,243	63	Fernandina, FL	246,625,301
64	Portsmouth, NH	693,721,722	64	Perth Amboy, NJ	220,703,434
65	Port Lavaca, TX	648,162,542	65	Eastport, ME	219,744,509
66	Carquinez Strait, CA	641,877,538	66	Port Hueneme, CA	219,619,353
67	Anchorage, AK	628,464,774	67	Port Lavaca, TX	214,629,905
68	Searsport, ME	568,770,515	68	Blaine, WA	208,686,751
69	San Joaquin River, CA	565,937,065	69	Guayanilla, PR	186,171,703
70	Port Canaveral, FL	554,688,410	70	Marquette, MI	170,973,341
71	Toledo-Sandusky, OH	507,168,379	71	Juneau, AK	162,165,865
72	Cleveland, OH	506,408,171	72	Portsmouth, NH	155,509,546
73	Morehead-Beaufort, NC	447,638,757	73	Bellingham, WA	154,378,774
74	Mayagues, PR	408,757,782	74	Camden, NJ	149,968,973
75	Brownsville-Cameron, TX	369,165,533	75	Albany, NY	142,437,075
76	Stockton, CA	347,358,071	76	Morgan City, LA	132,807,662
77	Good Hope, LA	270,017,958	77	Port Townsend, WA	129,516,603
78	Kalama, WA	269,499,677	78	Aberdeen-Hoquiam, WA	115,533,791
79	Paulsboro, NJ	255,203,257	79	Richmond, CA	114,233,947
80	Crockett, CA	248,054,863	80	Port Manatee, FL	110,559,407
81	Albany, NY	245,460,248	81	Port Canaveral, FL	109,175,706
82	Milwaukee, WI	243,292,793	82	Fort Pierce, FL	92,589,652
83	Oswego, NY	230,012,534	83	Providence, RI	92,154,050
84	Ponce, PR	225,120,810	84	Paulsboro, NJ	88,580,455
85	Bridgeport, CT	211,443,577	85	Stockton, CA	85,554,551
86	Longview, WA	202,345,085	86	Sacramento, CA	85,534,998
87	Port Huron, MI	152,273,688	87	Portland, ME	83,504,871
88	Fernandina, FL	151,484,840	88	Ketchikan, AK	82,862,637
89	Selby, CA	138,930,200	89	Coos Bay, OR	77,407,916
90	Fall River, MA	138,819,889	90	Ponce, PR	73,505,901
91	Jobos, PR	128,883,420	91	Milwaukee, WI	72,236,565
92	Duluth-Superior, MN-WI	128,544,575	92	New Haven, CT	70,939,879
93	Georgetown, SC	127,358,342	93	St. Rose, LA	70,747,918
94	New London, CT	125,262,747	94	San Diego, CA	63,126,526
95	Belfast, ME	119,742,120	95	Jobos, PR	52,863,916
96	Olympia, WA	107,009,652	96	Gary, IN	51,225,502
97	Marinette, WI	104,176,480	97	Sault Ste. Marie, MI	47,524,993
98	Newport, RI	89,111,987	98	International Falls-Ranier, MN	41,437,596
99	Memphis, TN	86,092,331	99	San Pablo Bay, CA	41,118,088
100	Sacramento, CA	80,324,139	100	Georgetown, SC	32,563,377
101	Green Bay, WI	78,359,561	101	Alexandria Bay, NY	28,447,201
102	Ashtabula/Conneaut, OH	77,118,161	102	Memphis, TN	27,076,360
103	Camden, NJ	67,409,025	103	Annapolis, MD	25,980,909
Total-All Ports		971,141,080,593	Total-All Ports		307,553,120,715

Source: U.S. Census Foreign Trade Division.

Ports by North American Region							
Pacific				Atlantic			
Canadian Pacific	U.S. Island Pacific	U.S. North Pacific	U.S. South Pacific	Canadian Atlantic	U.S. North Atlantic	U.S. South Atlantic	U.S. Gulf Coast
Fraser	Apra	Anchorage	Long Beach	Halifax	Albany	Brunswick (GA)	Beaumont
Vancouver (BC)	Barbers Point	Everett	Los Angeles	Montreal	Baltimore	Canaveral	Corpus Christi
	Hilo	Grays Harbor	Oakland	Saint John	Boston	Charleston	Freeport
	Honolulu	Longview	Richmond (CA)	St. John's	Camden	Fernandina	Galveston
	Hueneme	Olympia	San Diego	Toronto	Chester	Jacksonville	Greater Baton Rouge
	Kahului	Portland (OR)	San Francisco		Hampton Roads	Miami	Gulfport
	Haunakakai	Seattle			New York/ New Jersey	Palm Beach	Houston
	Kawaihae	Tacoma			Philadelphia	Ponce	Lake Charles
	Nawiliwili	Vancouver (WA)			Portland (ME)	Port Everglades	Manatee
					Portsmouth (NH)	San Juan	Mobile
					Richmond (VA)	Savannah	New Orleans
					Wilmington (DE)	Wilmington (NC)	Panama City
							Saint Bernard
							Tampa

Mileage to Selected Inland Destinations				
	Philadelphia	Norfolk	Baltimore	New York
Buffalo, NY	357	542	357	370
Chicago, IL	744	853	684	798
Cleveland, OH	421	532	363	475
Cincinnati, OH	568	585	499	661
Columbus, OH	461	555	392	554
Detroit, MI	578	687	518	632
Indianapolis, IN	635	697	566	728
Kansas City, MO	1126	1159	1057	1219
Louisville, KY	668	647	599	761
Memphis, TN	988	867	894	1092
Twin Cities, MN	1146	1255	1086	1200
Pittsburgh, PA	297	406	237	388
St. Louis, MO	681	908	357	735

Source: Maryland Port Administration, Mileage Chart. Available at: <<http://www.mpa.state.md.us/location/index.htm>>.

Due to the large file size, Appendix H (Maps, pages 62 - 74) has been extracted to a separate file.

Appendix I: End Notes

- ¹ Output, labor income, and tax revenue impacts are for 2005, expressed in 2006 dollars. This is a result of the particular economic model employed.
- ² Given the constraints of the data available, this analysis was restricted to port activity in Philadelphia and South Jersey.
- ³ The more labor-intensive facets of petroleum-related activity in the region are in the refining of crude, which is beyond the scope of this analysis.
- ⁴ There is a citation in the original text.
- ⁵ Arthur Donovan & Joseph Bonney, *The Box that Changed the World*, Commonwealth Business Media, 2006.
- ⁶ Philadelphia Commerce Department, Philadelphia Port Facilities Study, 1978.
- ⁷ South Jersey Port Corporation.
- ⁸ Port of Wilmington.
- ⁹ American Association of Port Authorities (AAPA).
- ¹⁰ John Rounesville & Steve Fitzroy, Expert Panel Conference Call, July 26, 2007.
- ¹¹ AAPA, US/Canada Container Traffic in TEUs, 2006.
- ¹² Brooks, Mary R. et al, "Short-Sea Shipping on the East Coast of North America: An Analysis of Opportunities and Issues," Dalhousie University, Transportation Planning/Modal Integration Initiative, March 31, 2006.
- ¹³ *Ibid*, p. 76.
- ¹⁴ Steve Fitzroy, Expert Panel Conference Call, July 26, 2007.
- ¹⁵ Ocean Shipping Consultants, 2006.
- ¹⁶ In the New York/New Jersey region, Port Elizabeth, Port Newark, Howland Hook, Red Hook, and Global Marine terminals are all dedicated to container cargo.
- ¹⁷ Estimated to be approximately 18.8 million TEU for the North Atlantic port range.
- ¹⁸ Container Port Strategy, OCS 2007.
- ¹⁹ National Oceanic and Atmospheric Association. Available at: <<http://tidesandcurrents.noaa.gov/ports.html>>.
- ²⁰ Weigley, Russell et al. (1982) *Philadelphia: A 300-Year History*.
- ²¹ *Ibid*.
- ²² *Ibid*.
- ²³ William Stanley Ray (1914) *The Port of Philadelphia: Its Facilities and Advantages*, State Printer, Harrisburg, PA.
- ²⁴ *Ibid*.
- ²⁵ Taylor and Schoff, *The Port and City of Philadelphia*.
- ²⁶ *Ibid*.
- ²⁷ William Stanley Ray, *The Port of Philadelphia*.
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- ³² *Ibid*.
- ³³ South Jersey Port Corporation.
- ³⁴ AAPA.
- ³⁵ Christopher Raymond Dougherty, "The Department of Docks, Wharves, and Ferries: Making Philadelphia's Modern Waterfront," The PhillyHistoryBlog, Available at: <<http://www.phillyhistory.org/PhotoArchive/blog/bloxsom.pl>>, September 2007.
- ³⁶ Delaware River Port Authority, History, Available at: <http://www.drpa.org/drpa/drpa_history.html>.
- ³⁷ "Three States Vow to Aid Area Port," *The Philadelphia Inquirer*, 5 April 1988.
- ³⁸ "State control of city port is urged," *The Philadelphia Inquirer*, 15 June 1988.
- ³⁹ "Study says 'river war' hurts ports," *The Philadelphia Inquirer*, 7 September 1988.
- ⁴⁰ "Group Urges Governor to Activate Port Rescue Plan," *The Philadelphia Inquirer*, 23 August 1988.
- ⁴¹ "At the Helm, Investment Banker to Head State Port Agency," *The Philadelphia Inquirer*, 13 October 1989.
- ⁴² "DPRA Set to Exercise Its Development Clout," *The Philadelphia Inquirer*, 27 October 1993.
- ⁴³ "Merging of Port Boards is Uneasy," *The Philadelphia Inquirer*, 16 May 1994.
- ⁴⁴ "Holt Unites Port Officials: They Are Angry At Him," *The Philadelphia Inquirer*, 11 January 1995.
- ⁴⁵ "Political Maneuvers Sinking Port Merger," *The Philadelphia Inquirer*, 23 August 1998.
- ⁴⁶ The IMPLAN model (Stillwater, MN) has been used for many years in Philadelphia by the Economy League of Greater Philadelphia (formerly the Pennsylvania Economy League), by Delaware Valley Regional Planning Commission, and Select Greater Philadelphia.
- ⁴⁷ Counties include: Philadelphia, Bucks, Delaware, Montgomery and Chester, PA; Camden, Salem, Gloucester, Burlington, and Cumberland, NJ; and New Castle, DE.
- ⁴⁸ Fitzroy: Measures of efficiency of ports is a function of investment in equipment, labor productivity, and utilization of live storage areas (see attached table at end of document.)
- ⁴⁹ U.S. exports of brewing waste have grown from about \$70 million in fiscal 1998 to over \$150 million in fiscal 2006. Volume has also almost doubled from just over 600 million metric tons in FY1998 to over 1.2 billion metric tons in FY2006. This growth is expected to continue as U.S. ethanol production continues to expand. The top destination markets are Mexico, Ireland, Taiwan, Canada, and the United Kingdom. Although several member states of the EU-27 are in the top 20 destinations, the EU share has fallen from 96 percent in fiscal 1997 to 30 percent in fiscal 2006. Exports of brewing waste closely track ethanol production. Source: Outlook for U.S. Agricultural Trade, Economic Research Service and Foreign Agricultural Service, May 31, 2007.

Appendix J: Resources

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