FREIGHT FLOWS AND FORECASTS

in the PHILADELPHIA CSA

DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

2010

The Delaware Valley Regional Planning Commission is dedicated to uniting the region's elected officials, planning professionals, and the public with the common vision of making a great region even greater. Shaping the way we live, work, and play, DVRPC builds consensus on improving transportation, promoting smart growth, protecting the environment, and enhancing the economy. We serve a diverse region of nine counties: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer in New Jersey. DVRPC is the federally designated Metropolitan Planning Organization for the Greater Philadelphia Region—leading the way to a better future.

The symbol in our logo is adapted from the official DVRPC seal and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole. The diagonal line represents the Delaware River and the two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

DVRPC is funded by a variety of funding sources, including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. (A sentence regarding special sources of funding may be inserted here.) The authors, however, are solely responsible for the findings and conclusions herein, which may not represent the official views or policies of the funding agencies.

DVRPC fully complies with Title VI of the Civil Rights Act of 1964 and related statutes and regulations in all programs and activities. DVRPC's website (www.dvrpc.org) may be translated into multiple languages. Publications and other public documents can be made available in alternative languages and formats, if requested. For more information, please call (215) 238-2871.

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Executive Summary

The Delaware Valley Regional Planning Commission (DVRPC) is the federally designated Metropolitan Planning Organization for the nine-county Philadelphia-Camden-Trenton region. For this report, DVRPC has used data from the Freight Analysis Framework, a tool developed by the Federal Highway Administration (FHWA), to create a regional goods movement commodity flow profile for the Philadelphia Consolidated Statistical Area (CSA). Freight flows are based on year 2002 and forecasted through the year 2035. All forecasts are quantified as weight and measured in tons or by value, measured in 2002 U.S. dollars.

This report contains information concerning shipments moving within the region, into the region, and out of the region. There are separate sections for domestic shipments and international shipments. All data is broken down and categorized by mode, commodity, and origin-destination.

Both the weight and value of goods moving into, out of, and within the region are forecasted to grow through the year 2035. The total shipments by weight are projected to grow from 319.6 million tons in 2002 to 414.2 million tons in 2035. By value, the total shipments are projected to grow from $340.1 billion to $631.4 billion.

A major finding of the report is that the value of shipments is expected to grow at a faster rate than the weight of shipments. The total domestic value of shipments within, into, and out of the Philadelphia CSA is forecasted to grow 82 percent from 2002 to 2035, while the same measurement in terms of weight is only forecasted to grow 29 percent. Another major finding is that inbound shipments are forecasted to grow much faster than intraregional or outbound shipments. Domestic inbound shipments are forecasted to grow 85 percent by weight and 141 percent by value. International flows also exhibit an imbalance of goods coming into the region versus goods leaving the region—the weight of imports was roughly six times that of exports in 2002.

Another finding of the report is that the Philadelphia CSA is an important region in the energy sector. The data shows that shipments of gasoline, natural-gas-related products, coal, and crude petroleum shipments moving into and out of the region are very high in relation to other commodities. Also, the data shows the trucking industry to be the predominant mode of transportation for the region's shipments. In 2002, trucks carried the largest amount of goods within, into, and out of the region, and this is forecasted to remain the case through the year 2035.

The total growth shown in this report underscores the importance of continued freight planning. Also, the amount of shipments that are both originating in and destined for the region proves that this region contains an intertwined fabric of freight facilities. This report can be used by planners and businesses to paint a picture of how commodity flows will adjust through the next 30 years. The data does not take into account possible events, such as a natural disaster or new highway capacity, which could change the forecasts drastically. For example, the database did not anticipate the recent economic downturn that the country has experienced. The data allows a glimpse of how commodities are forecasted to surge through the base year system based on population and economic trends as of the database's release in 2007. While the freight flow data presented in this report may vary from actual freight flows in the present and future, the information effectively highlights relationships and orders of magnitude in the movement of goods.

The support of the Delaware Valley Goods Movement Task Force, DVRPC's freight advisory committee, was essential throughout all stages of this report. The raw data that supports this report can be made available upon request. This report uses the best publicly available data as of the published date.

CHAPTER I

INTRODUCTION

Freight impacts every sector and aspect of the Philadelphia metropolitan area. Freight has positive impacts like putting food on the grocery shelves and clothes on the racks in stores, and negative impacts like contributing to highway congestion and increasing wear and tear on the region's infrastructure. It is important as a region to know the trends in freight in order to be prepared to handle the effects that freight has every day. As the population grows, and as the economy continues to shift from a manufacturing-based economy to a distribution, consumer-based economy, the movement of goods serves a growing regional need. Jobs within the freight industry support families, which helps grow the regional economy.

This first-of-its-kind report estimates and projects freight flows for the Philadelphia Consolidated Statistical Area (CSA) through the year 2035. Using the second generation Freight Analysis Framework (FAF 2) developed by the Federal Highway Administration (FHWA), data regarding the movement of goods will be projected across multiple modes, commodities, origins, and destinations every five years from 2002 to 2035. DVRPC used the FAF 2 data previously to generate worksheets based on 2002 data.

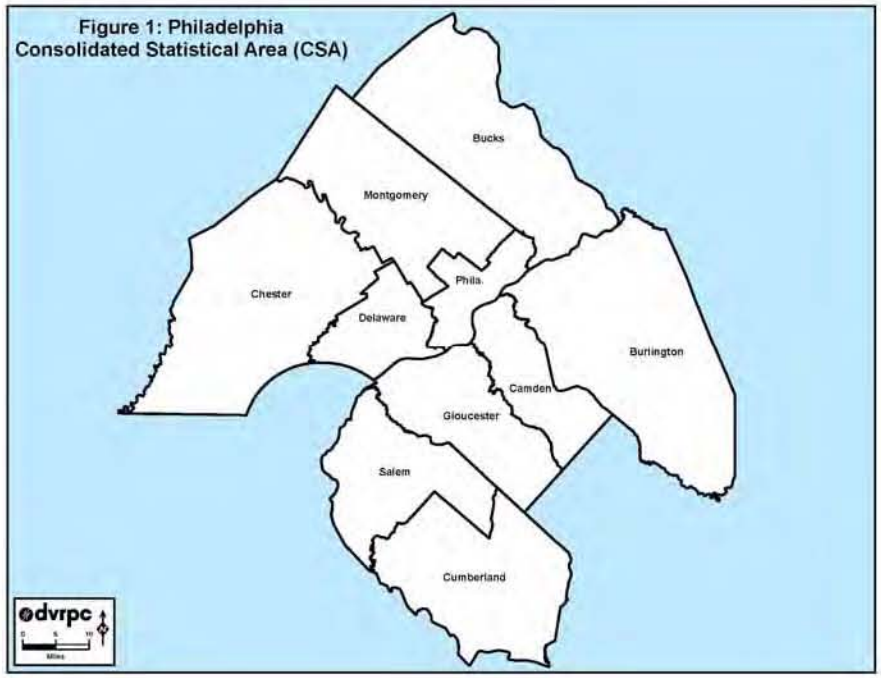


Figure 1: Philadelphia Consolidated Statistical Area (CSA)

The New Jersey side of the Philadelphia CSA varies slightly from the DVRPC region. This report uses the CSA (shown in Figure 1). This

area includes Salem and Cumberland counties, which are not part of the DVRPC region, and does not include Mercer County, which is part of the DVRPC region. CSAs, which are developed by the U.S. Bureau of the Census, represent multiple metropolitan or micropolitan areas that have a moderate degree of employment interchange. In 2005, the Census Bureau added Berks County to the Philadelphia CSA. However, since this analysis is based on the 2002 definition of the Philadelphia CSA, Berks County is not included for the purposes of this report. This report allows DVRPC and its partners to pinpoint how much growth will be seen in the region, and helps with identifying which sectors of industry and transportation will experience growth, extreme growth, little growth, or a decline. The data is also useful in making decisions on which transportation improvements are needed or are desirable.

In recent years, the DVRPC freight office has been working diligently to promote major freight corridors and National Highway System (NHS) connectors. (For more information, please visit the freight page of the DVRPC website at www.dvrpc.org/freight.) This report is an important step in the continuation of both of these initiatives. The corridor approach emphasizes the multimodal network that carries the majority of freight into, out of, and through the Delaware Valley region. Since the FAF 2 is extremely comprehensive, it gives DVRPC an overview of how much freight all the modes and facilities within the corridors will convey in the coming years. The NHS connectors provide the important links between intermodal facilities and highways, and it is likely that the growth projected for the Philadelphia CSA will be similar on the connectors.

Data contained in the report can provide a beneficial guide as to what growth the region can expect. The data has both strengths and weaknesses. A strength of the data is that the forecasts are done in a very detailed, scientific manner and are not just projected flows based on historic growth. A weakness is that because the data is set up and checked on a national level, when it is aggregated at a regional level, totals may not be accurate. The data was incorporated into DVRPC's Long-Range Plan, and the hope is that it will help policy makers make informed decisions as to how future improvements may impact the movement of cargo in the region.

This report is organized into five sections: an introduction, which defines what the Freight Analysis Framework is; a summary of domestic flows; a summary of international flows; a summary of long-haul trucking movements; and important findings and conclusions. Raw data showing values in more detail than shown in this report is available by contacting DVRPC staff.

The report will be a useful tool to the members of the Delaware Valley Goods Movement Task Force to see how goods are projected to grow and change. Also, the Delaware Valley Goods Movement Task Force Data

Subcommittee and its chair, Rick Crawford, Norfolk Southern Corporation, were instrumental in the completion of this report. FHWA and the Bureau of Transportation Statistics were essential for the production and analysis detailed in this report.

WHAT IS THE FREIGHT ANALYSIS FRAMEWORK?

The Freight Analysis Framework (FAF 2) is a massive data integration process undertaken by the Federal Highway Administration (FHWA) to create nationwide freight data. Below is a brief overview of how the FAF 2 was created and its format. For full details on the FAF 2, please visit the FAF 2 website at http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm. All of the information provided below was gained through the technical documents that were published in association with FAF 2. The full documents are all available on the website provided above.

History of the Freight Analysis Framework

The original FAF 1, released in 2000, used a base year of 1997, in accordance with the 1997 Commodity Flow Survey (CFS) produced by the Bureau of Transportation Statistics (BTS), and was forecasted for the years 2010 and 2020. FAF 1 was developed because of the increased pressure that freight was and still is putting on the nation's infrastructure. It was realized that understanding future freight activity was essential for making decisions on additional investment and operational strategies to transportation infrastructure. The mission of the United States Department of Transportation (USDOT) in creating FAF 1 was to have "a comprehensive database and policy analysis tool, to examine geographic relationships between freight movement and infrastructure capacity." In FAF 2, USDOT radically changed the methodology used for collecting data, using a new methodology that provides more reliable information on freight movements. Increasing the amount of modes calculated to include Intermodal and Pipeline Shipments, as well as forecasting further into the future, are two of the more noticeable differences between FAF 1 and FAF 2. It is important to note that because of the differences, FAF 1 and FAF 2 outputs should not be compared.

Data Sources

The 2002 **Commodity Flow Survey** (CFS) is the foundation upon which the FAF 2 is built. The CFS is simply a survey of manufacturing, mining, wholesale, and select retail establishments (namely, electronic shopping)

on the movement of their goods within the United States. It is undertaken in partnership by the United States Census Bureau, the United States Department of Commerce, and the Bureau of Transportation Statistics (BTS). The 2002 CFS covers businesses that have paid employees and are located in the United States, as well as auxiliary establishments (for example, warehouses) of multiestablishment companies. The survey is sent to 50,000 businesses based on geographic location and industry. The selected establishment is asked to provide a report on a sample of individual shipments for a one-week period in each calendar quarter. Businesses are asked to report data that links directly into the CFS and FAF 2 databases, giving commodities, weights, values, and destinations for each reported shipment, as well as total shipments for the four-week period and the monthly value of shipments for the most recent month. The United States Census Bureau is in charge of the survey portion of the data collection; once assimilated, the data is sent to the BTS. The BTS expands these surveys into a nationwide database and calculates the distance of each shipment to come up with a ton-miles category (ton-miles is a category in the CFS, but not in FAF 2).

To create a complete picture of freight movement, other data sources are integrated into the CFS database to arrive at the FAF 2 database. Other major databases used in FAF 2 include:

- The **Carload Waybill Sample** is a sample of carload waybills for terminated shipments by United States railroad carriers. The Association of American Railroads (AAR) collects the waybill information from railroads that move at a minimum 4,500 carloads each year for the past three years, or that move five percent or more of any state's total rail traffic.

- **The Domestic Waterborne Commerce of the United States**, provided by the United States Army Corps of Engineers (USACE), provides data on waterborne commerce. Included in the data are all movements by inland barges and ships over the nation's rivers, lakes, and the United States Intracoastal Waterway. Movements are tracked and created using the Army Corps' Vessel Operating Reports, as well as its Lock Performance Monitoring System.

- The **International Waterborne Commerce of the United States**, also provided by the USACE, is based on information supplied to the Corps by the United States Census Bureau. This data covers both bulk and containerized shipments on all vessels engaged in United States foreign trade and transportation.

- The **Transborder Surface Freight** database features data from the United States Customs Services, via the United States Census Bureau. The database provides the dollar value of imports and exports at the Canadian and Mexican borders, as well as the tonnage of the imports.

- The **US Air Freight Movements** record the weight and origin-destination of domestic and international revenue-generating air freight entering the United States. The data used in FAF 2 reports the annual payload (weight) tons of mail, as well as freight flown between each pair of United States airports over the course of the year.

Even with the incorporation of these five databases to the CFS, there were still some significant data gaps. As part of the FAF 2 effort, Oak Ridge National Laboratory, in collaboration with the BTS and MacroSys Incorporated, worked to estimate 15 additional CFS gaps and undercounts. For example, municipal solid waste, crude petroleum, and natural gas are completely uncounted in the CFS. Also, the CFS does not cover businesses classified as services, transportation, or construction, most retail industries, farms, fisheries, foreign establishments, and most government-owned establishments. The CFS also does not cover foreign imports until they change ownership in the United States (for example, a trip from the port of entry to a warehouse would not be counted). Lastly, shipments that merely pass through the United States, but that originate from and are destined for foreign countries, are not counted in the CFS (for example, a truck traveling from Canada to Mexico).

Classifications

All data within the FAF 2 is classified by origin, destination, and commodity. To achieve this, a standard classification system of commodities, modes, and geographical regions is needed. Not all the data sources mentioned above were in the same classifications as FAF 2, so “crosswalks” were performed to assign them as best as possible. For example, different databases have different commodity classifications, so for every classification, a crosswalk must be made to attribute that commodity to a commodity within the classifications used by FAF 2. In some cases, this can be a one-to-one crosswalk; in other cases, a commodity may be split up, so that 75 percent is assigned to one FAF 2 commodity code, and 25 percent is assigned to another FAF 2 commodity code.

MODES OF TRANSPORTATION

There are seven modes of transportation identified in the FAF 2 Database:

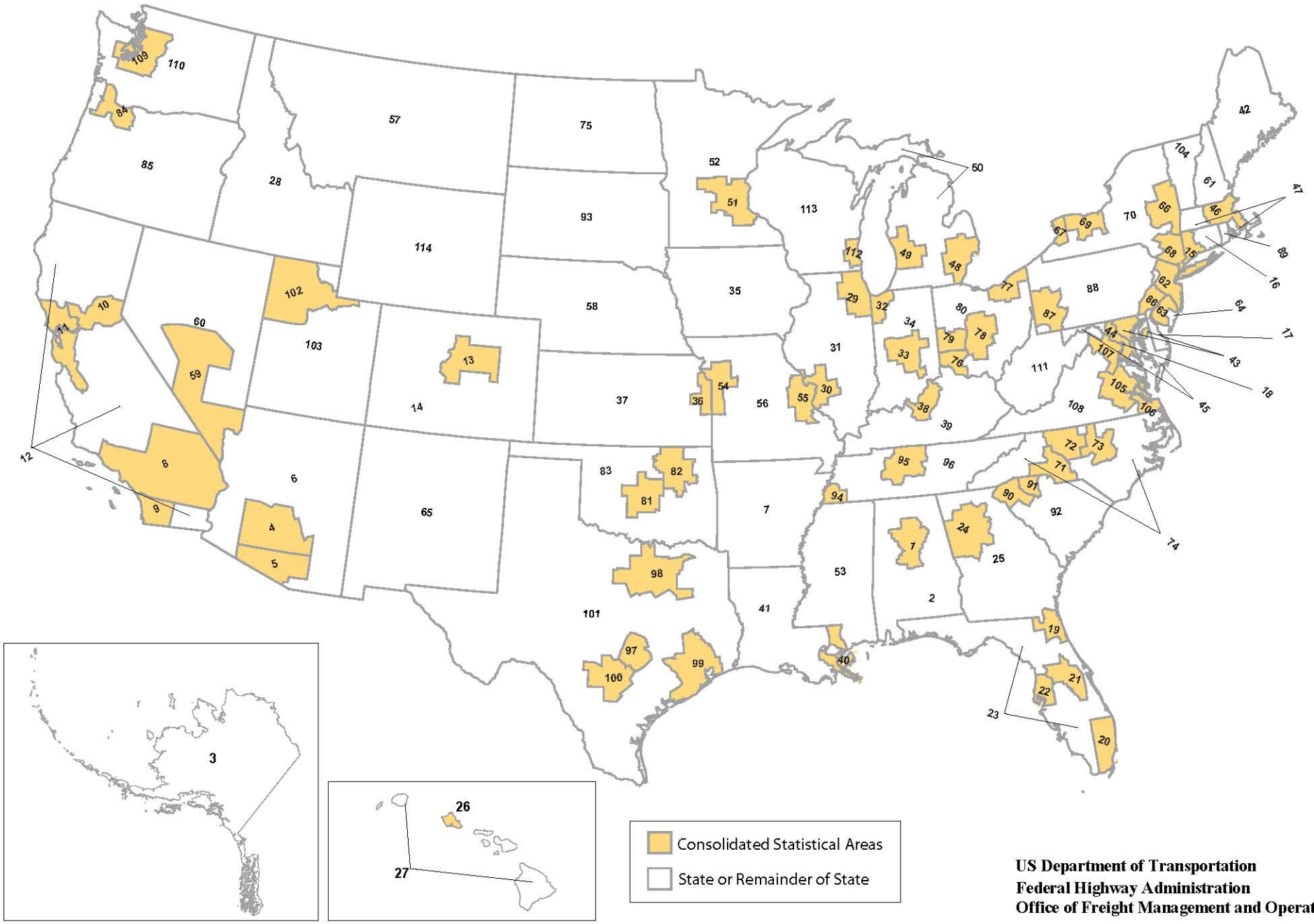
- **Truck**. Includes private and for-hire trucks. Private trucks are operated by a temporary or permanent employee of an establishment or the buyer/receiver of the shipment. For-hire trucks carry freight for a fee collected from the shipper, recipient of the shipment, or an arranger of the transportation.

- **Rail**. Any common carrier or private railroad.
- **Water**. Includes shallow draft, deep draft, and Great Lakes shipments. FAF 2 uses definitions by the USACE. Shallow draft includes barges, ships, or ferries operating primarily on rivers and canals; in harbors; the Saint Lawrence Seaway; the Intracoastal Waterway; the Inside Passage to Alaska; major bays and inlets; or in the ocean close to shoreline. Deep draft shipments include barges, ships, or ferries operating primarily in the open ocean.
- **Air & truck**. Includes shipments by air or a combination of truck and air, commercial or private aircraft, and all air service for shipments that typically weigh more than 100 pounds. Includes air freight and air express.
- **Truck & rail**. Includes shipments by a combination of truck and rail.
- **Other intermodal**. Includes shipments typically weighing less than 100 pounds by parcel, United States Postal Service, or courier, as well as shipments of all sizes by truck-water, water-rail, and other intermodal combinations.
- **Pipeline & unknown**. Pipeline is included with unknown because region-to-region flows by pipeline are subject to large uncertainty.

GEOGRAPHICAL REGIONS

The FAF 2 is broken up into 114 geographical regions within the United States (shown in Figure 2). The regions are based on Metropolitan Statistical Areas, Consolidated Statistical Areas, (shown in yellow), and states or balances of states (shown in white). There are also seven international geographical regions: Canada, Mexico, Latin and South America, Asia, Europe, Rest of World, and Southwest Asia (shown in Figure 31).

Figure 2: Geographic Areas for the Freight Analysis Framework and 2002 Commodity Flow Survey



Commodities

There are 43 commodity codes within the FAF 2 database. They correlate with the Standard Classification of Transported Goods (SCTG) used by BTS and the United States Census Bureau.

Table 1: Commodity Classifications

SCTG	BTS/Census Full Commodity Name	FAF 2 Abbreviation
1	Live animals and live fish	Live animals/fish
2	Cereal grains (including seed)	Cereal grains
3	Other agricultural products, except for animal feed	Other agricultural products
4	Animal feed and products of animal origin, not elsewhere classified	Animal feed
5	Meat, fish, seafood, and their preparations	Meat/seafood
6	Milled grain products and preparations, bakery products	Milled grain products
7	Other prepared foodstuffs and fats and oils	Other foodstuffs
8	Alcoholic beverages	Alcoholic beverages
9	Tobacco products	Tobacco products
10	Monumental or building stone	Building stone
11	Natural sands	Naturals sands
12	Gravel and crushed stone	Gravel
13	Nonmetallic minerals not elsewhere classified	Nonmetallic minerals
14	Metallic ores and concentrates	Metallic ores
15	Coal	Coal
16	Crude petroleum	Crude petroleum
17	Gasoline and aviation turbine fuel	Gasoline
18	Fuel oils	Fuel oils

Table 1: Commodity Classifications (Continued)

SCTG	BTS/Census Full Commodity Name	FAF 2 Abbreviation
19	Coal and petroleum products not elsewhere classified (primarily natural gas, selected coal products, and products of petroleum refining, excluding gasoline, aviation fuel, and fuel oils)	Coal – not elsewhere classified (a.k.a. natural-gas-related products)
20	Basic chemicals	Basic chemicals
21	Pharmaceutical products	Pharmaceuticals
22	Fertilizers	Fertilizers
23	Chemical products and preparations, not elsewhere classified	Chemical products
24	Plastics and rubber	Plastics/rubber
25	Logs and other wood in the rough	Logs
26	Wood products	Wood products
27	Pulp, newsprint, paper, and paperboard	Newsprint/paper
28	Paper or paperboard articles	Paper articles
29	Printed products	Printed products
30	Textiles, leather, and related articles	Textiles/leather
31	Nonmetallic mineral products	Nonmetal mineral products
32	Base metal in primary or semifinished forms and in finished basic shapes	Base metals
33	Articles of base metal	Articles – base metals
34	Machinery	Machinery
35	Electronic and other electrical equipment and components and office equipment	Electronics
36	Motorized and other vehicles (including parts)	Motorized vehicles
37	Transportation equipment	Transport equipment
38	Precision instruments and apparatus	Precision instruments
39	Furniture, mattresses and mattress supports, lamps, and lighting fittings	Furniture
40	Miscellaneous manufactured products	Miscellaneous manufactured products

Table 1: Commodity Classifications (Continued)

SCTG	BTS/Census Full Commodity Name	FAF 2 Abbreviation
41	Waste and scrap	Waste/scrap
42	Mixed freight	Mixed freight
43	Commodity unknown	Unknown

Source: http://ops.fhwa.dot.gov/freight/freight_analysis/faf/faf2_reports/report4/rpt4_commodity_class.pdf

Database Organization

The data for FAF 2 is broken up into multiple databases, with millions of cells of information. The main database is the origin and destination database. This database includes the following six subdatabases:

- **DOM_KT**: this database shows domestic movement by kiloton. It includes origin by FAF 2 region, origin by state, destination by FAF 2 region, destination by state, mode of transportation, commodity being transported, and tonnage values for the years 2002, 2010, 2015, 2020, 2025, 2030, and 2035.
- **DOM_MDOL:** this database shows domestic movement by dollars in the millions. The fields of the database are the same as the DOM_KT database, with the numbers associated with the value of the shipment instead of weight.
- **BRD_KT:** this database shows movement from and to Mexico and Canada by kiloton. Its layout is similar to the DOM databases; however, it includes a port-of-entry field.
- **BRD_MDOL:** the database shows movement from and to Mexico and Canada by millions of dollars. The fields of the database are the same as the BRD_KT database, with the numbers associated with the value of the shipment instead of weight.
- **SEA_KT:** this database shows international movements by kiloton. Like the BRD databases, it includes a port-of-entry field.
- **SEA_MDOL:** this database shows international movements by millions of dollars. The fields are the same as the SEA_KT database, with the numbers associated with the value of shipments instead of weight.

In addition to the main origin and destination databases, there are some other databases that include additional information. A database entitled "international air" and including databases of air_kt and ait_mdol was made to separate international air-based movements from international sea-based movements. For the purposes of this report, these databases have been integrated with the sea_kt and sea_mdol databases, since all cells in the air database have been assigned the mode "air & truck." All other modes listed under international flows in this report moved by sea. Other databases, like those estimating 1997 data by FAF 2 methodology, and estimates of current 2007 data, were not available when the data for this report was being collected.

Shipment Values

All FAF 2 data is described in terms of either weight or value. The total weight of shipments is measured using thousands of short tons (2,000 pounds). For freight shipped to distribution centers for reshipment, the weight is counted two times, both going in and going out of the distribution center. The value of commodities transported is described as the net selling value exclusive of freight charges and taxes. As with weight, the value of shipments can be counted multiple times depending on the number of times the commodity is transported in the production and consumption cycle. It is important to note this because products are often counted multiple times, and the national totals on the value of goods in FAF 2 differ greatly from the national Gross Domestic Product (GDP). The GDP only counts the value added at each step in the production process, while FAF 2 captures the value of shipments of materials used to produce or manufacture a product, as well as the value of shipments of the finished product itself. Thus, the value of the material has been counted multiple times in FAF 2, but only once in GDP.

Forecasts

The most helpful part of FAF 2 to the planning process is the forecasts of freight movement to future years. The forecasts are based on Global Insight's Business Demographics Model (BDM) (for complete information on the BDM, visit http://ops.fhwa.dot.gov/freight/freight_analysis/faf/faf2_reports/reports8/s3_underlying.htm), which includes macroeconomic, regional, industrial, and intrastate forecast modeling capabilities. The forecasts are derived within the path of the economy at a national, regional, and substate level.

The first step in doing forecasts is to calibrate the desired level of geography in the economic models and perform crosswalks for the commodities used in FAF 2 (SCTG classification) and the North American Industry Classification System used in the economic models. The forecast methodology can be broken into a five-step approach:

- Establish national control totals by commodity;
- Apply specific shipment growth by market and commodity;
- Apply specific purchasing and consumption growth by market and commodity;
- Summarize and compare the results from steps 2 and 3 with the national controls; and
- Adjust the resulting freight flows so the volumes correspond with the national control levels as follows:
  - For each market and commodity, adjust so shipments match purchases.
  - For each commodity, adjust so that national control totals are satisfied.

It is important to note that forecasts do not take into account any drastic changes to the transportation system of the United States, either in terms of capacity or conditions. Also, any major world events that have the ability to greatly change the way goods are moved throughout the world and through the United States are unpredictable and thus not taken into account in the forecasts. The forecasts simply use economic and population data to project movements onto the current transportation network. Thus, events such as drastic changes in fuel prices, the deepening of the main channel of the Delaware River, or the Panama Canal expansion are not taken into account in the forecasts contained in this report.

Methodology

The methodology used to aggregate the nationwide data down to the regional level was simple. The tables were downloaded in Microsoft Access format from the FHWA website. Then queries were run in Access for all the different ways that the data could be broken down. The results of those queries were copied into Microsoft Excel and summed. Once all the data had been summed in Excel, the data was further broken down as needed for display purposes.

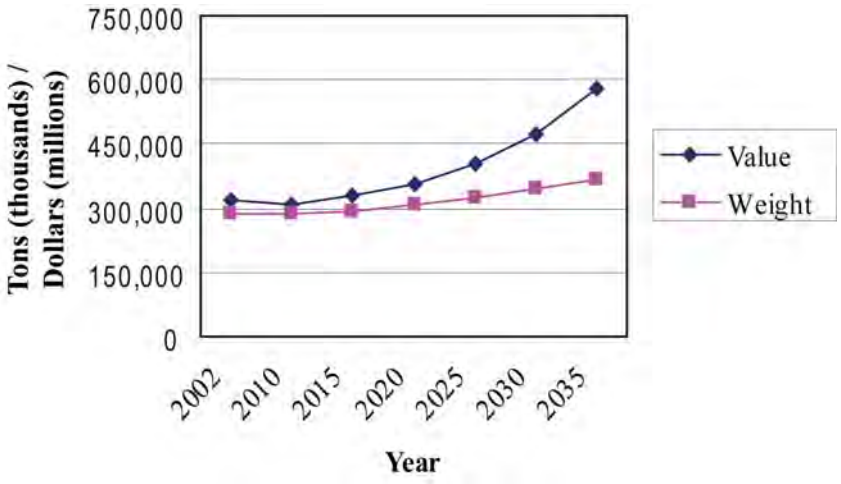
CHAPTER II

DOMESTIC FREIGHT FLOWS

In this section, the report presents a synopsis of the domestic regional FAF 2 data by totals, mode, origin/destination, and commodity, by both value and weight for shipments within, to, and from the Philadelphia CSA. Raw data and further break-outs of specific modes, commodities, or trading partners are available by request.

Total Shipments

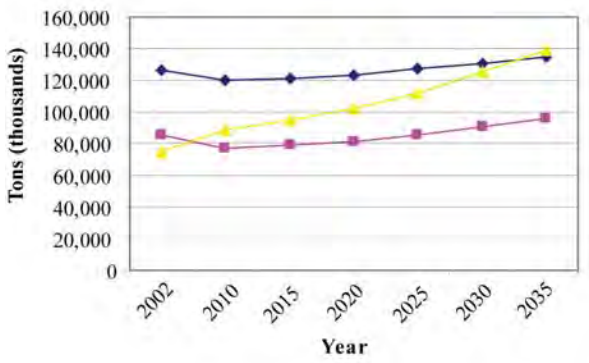
Figure 3: Total Domestic Shipments



Source: FHWA Freight Analysis Framework

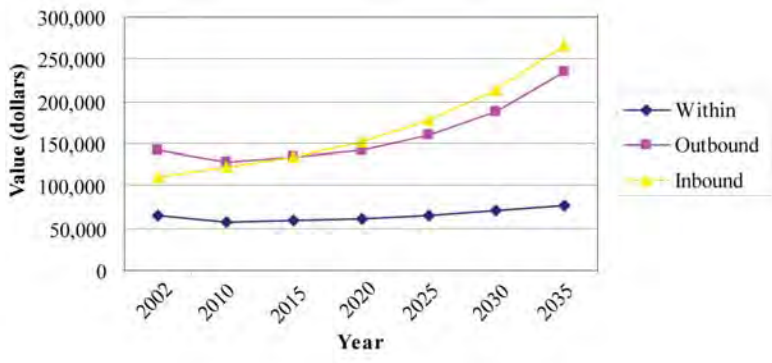
Figure 3 depicts total shipments by weight and value. To achieve the numbers reflected in the chart, intraregional, domestic outbound and inbound shipments were summed for all the years available within the FAF 2 database. Weight represents total tonnage, which grows 29 percent, from 286 million tons to 369 million tons, over the years 2002 to 2035. Minimal growth is seen between 2002 and 2010, but from 2010 to 2035, there is consistently increasing growth from year to year. Value represents the total dollars of goods being shipped, which grows 82 percent, from $317 billion in 2002 to $577 billion in 2035. Between 2002 and 2020, there is only 12 percent growth, so most of the projected growth over that time occurs between the years 2020 to 2035.

Figure 4: Total Weight of Shipments by Type



Source: FHWA Freight Analysis Framework

Figure 5: Total Value of Shipments by Type

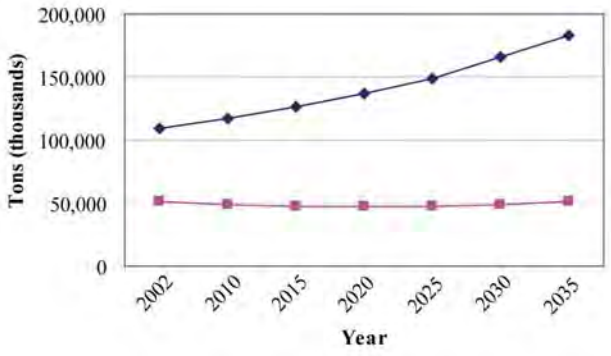


Source: FHWA Freight Analysis Framework

Figures 4 and 5 represent each line in Figure 3 broken out into intraregional, outbound, and inbound shipments. Figure 4 shows that intraregional shipments are projected to grow very little (precisely seven percent between 2002 and 2035). Inbound shipments by weight grow 85 percent, from 74.9 million tons to 138.7 million tons, at a very consistent rate. Outbound shipments by weight over the period grow a total of 11.8 million tons, but decrease from 2002 to 2010.

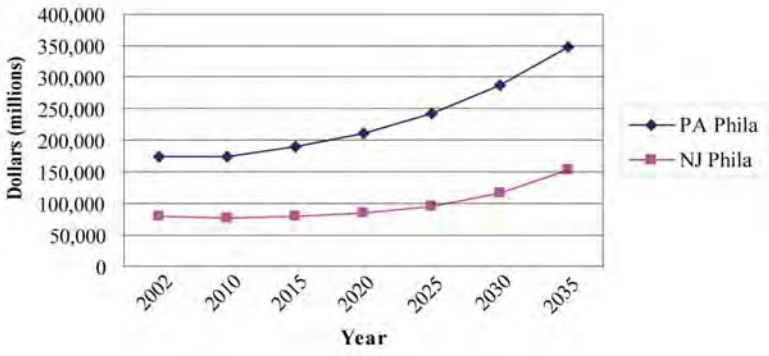
The value of shipments increases at a similar rate to the weight of intraregional shipments, except there is more total growth. Intraregional shipments do not exhibit noticeable growth or decline, but both inbound and outbound shipments show stronger growth by value than by weight. The growth seen in the value of inbound shipments increases for each five-year period, as compared to the value of outbound shipments, which demonstrates consistent growth over the 33-year time period. The total growth is almost double: 141 percent growth for inbound value, as compared to 85 percent growth in inbound tonnage. The value of outbound shipments increases 70 percent, from $44.1 billion to $75.0 billion. As is the case in terms of weight, the value of outbound shipments drops from 2002 to 2010. However, by value, outbound shipments project stronger growth (nearly a doubling from 2010 to 2035), making the total growth of outbound value greater than that of outbound weight.

Figure 6: Weight of Domestic Shipments PA vs NJ



Source: FHWA Freight Analysis Framework

Figure 7: Value of Domestic Shipments PA vs NJ



Source: FHWA Freight Analysis Framework

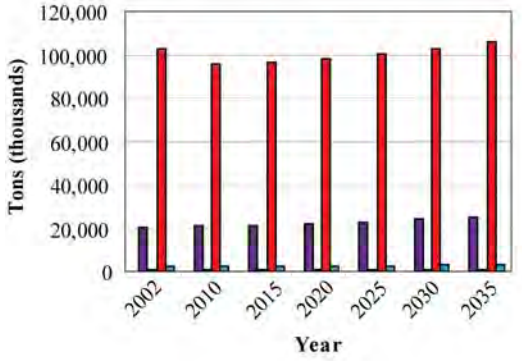
Figures 6 and 7 depict the total domestic shipments, intraregional, outbound, and inbound, for the Pennsylvania and New Jersey sides of the Philadelphia CSA. In 2002, in terms of both weight and value, the Pennsylvania side of the region (hereafter referred to as PA Phila) carried slightly more than twice as much as the New Jersey side of the region (hereafter referred to as NJ Phila). PA Phila accounted for 108.6 million tons of cargo in 2002, while NJ Phila accounted for 51.2 million tons of cargo. In terms of weight, PA Phila projects to have consistently increasing growth for every five-year period, while tonnage growth for NJ Phila is projected to be stagnant. PA Phila projects to have 69 percent growth in the 33-year time period covered in FAF 2, growing to a total of 183 million tons of shipments in 2035. NJ Phila only projects one percent growth over the same time period, so in 2035, PA Phila, is expected to account for 78 percent of the shipments assigned to the Philadelphia CSA.

In terms of value, growth for PA Phila and NJ Phila is projected to be roughly the same. In 2002, PA Phila was responsible for $173.9 billion worth of goods, according to the FAF 2 database, and that number is projected to grow by 100 percent to $347.5 billion. NJ Phila is believed to have accounted for $79.2 billion worth of cargo in 2002 and is projected to account for $153.5 billion in 2035, a growth of 94 percent. Because they both grow at roughly the same rate, the percentage of the value of goods assigned to PA Phila for the Philadelphia CSA remains a constant 69 percent from 2002 to 2035.

How Goods Are Moving

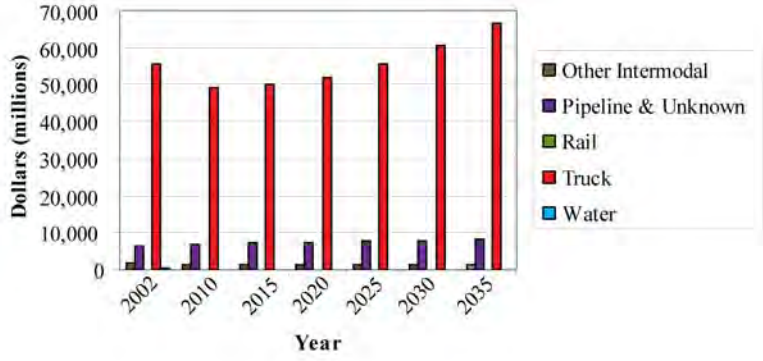
There are seven different modes for shipments to be assigned to within FAF 2. However, for certain shipments, not all modes are represented. Therefore, if a mode is not labeled in the legend for one of the charts below, there were insignificant movements for estimating that mode. For Figures 8 through 13, there are expanded charts for every individual mode that can be found in the Appendix.

Figure 8: Weight of Intraregional Shipments



Source: FHWA Freight Analysis Framework

Figure 9: Value of Intraregional Shipments



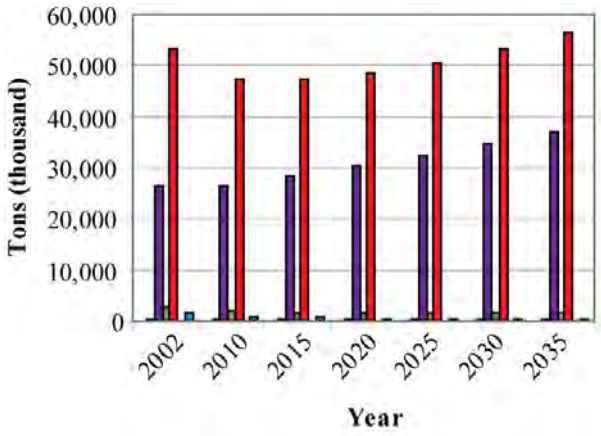
Source: FHWA Freight Analysis Framework

As seen in Figures 8 and 9, there is no significant modal change forecasted in the weight or value of intraregional shipments. These moves are dominated by the truck mode, carrying 81 percent of the tonnage in 2002. However, between 2002 and 2035, truck only projects three percent growth in terms of weight, so in 2035, the intraregional share for truck slips to 79 percent. Most of the growth to displace the share lost by trucking is categorized as pipeline and unknown. Intraregional pipeline shipments are projected to grow 26 percent, from 20.1 million tons to 25.3 million tons, over the 33-year time period. This growth leads to a share increase for pipeline and unknown intraregional weight from 16 to 19 percent.

The value of intraregional shipments has a very similar modal breakdown. Both trucking and pipeline and unknown have forecasted total growth from 2002 to 2035. Trucking was reported at $55.6 billion in 2002 and

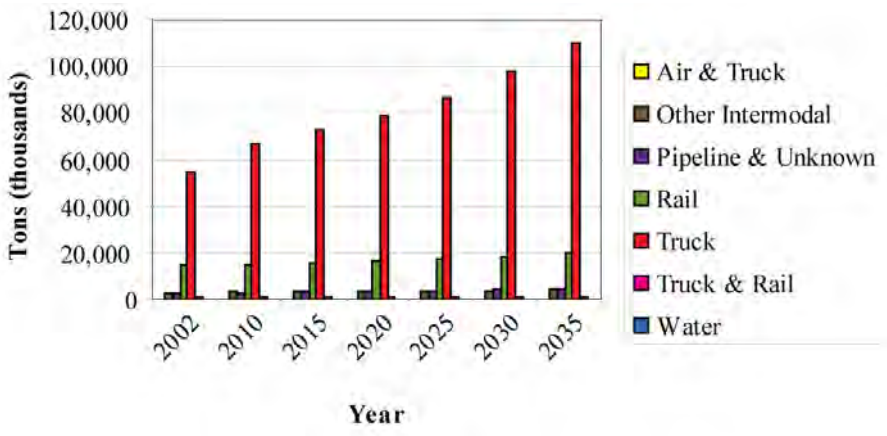
is projected to grow 19 percent to $66.6 billion. Meanwhile, pipeline and unknown is estimated at $6.5 billion in intraregional shipments in 2002, and is projected to have $8.3 billion in intraregional shipments in 2035.

Figure 10: Weight of Outbound Domestic Shipments



Source: FHWA Freight Analysis Framework

Figure 11: Weight of Inbound Domestic Shipments



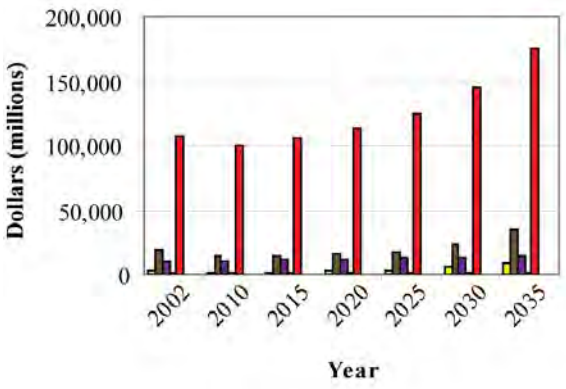
Source: FHWA Freight Analysis Framework

Figures 10 and 11 depict the weight of outbound and inbound shipments by mode. The trucking growth in outbound weight has a sharp drop of 11 percent from 2002 to 2010, and a slow increase from 2010 to 2035, so that by 2035, slight growth is seen—a total of six percent. This trend of a sharp initial drop followed by moderate growth is seen multiple times throughout the data and seems to be especially prevalent in outbound domestic flows by both weight and value. As with intraregional pipeline and unknown activity, outbound pipeline shipments make up a large percentage of the outbound tonnage. In 2002, outbound pipeline and unknown tonnage is 26.6 million tons, accounting for 31 percent of outbound weight, while in 2035, pipeline tonnage is projected to grow to 37 million tons and account for 39 percent of outbound tonnage. Conversely, inbound pipeline and unknown weight carries a very small percentage of total inbound weight.

Truck is by far the predominant mode of choice for cargo coming into the region, but for inbound shipments, rail, not pipeline, is the second highest modal share. Rail is estimated to have carried 14.5 million tons in 2002, making up 19 percent of the total inbound weight, and it is projected to carry 19.7 million tons of cargo into the region in 2035, or 14 percent of total inbound weight. Despite rail's 35 percent growth from 2002 to

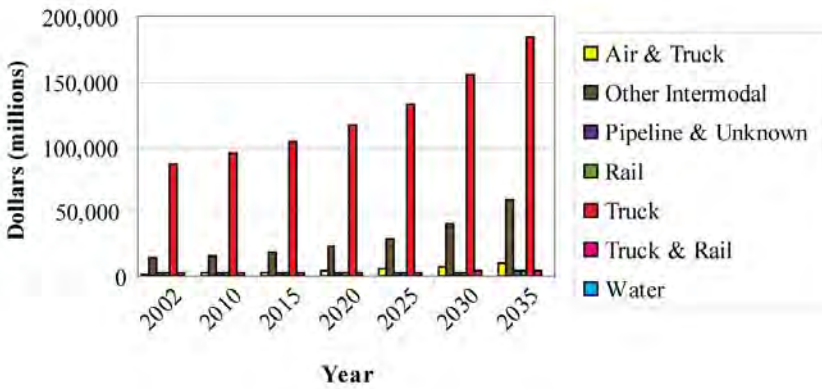
2035, it loses five percentage points of its share of inbound tonnage. This is because trucking doubles over the same time period, which changes its share from 73 percent in 2002 to 79 percent in 2035. The consistent growth that truck exhibits in inbound weight is very different from the large drop and slow recovery displayed by truck in terms of outbound weight.

Figure 12: Value of Outbound Domestic Shipments



Source: FHWA Freight Analysis Framework

Figure 13: Value of Inbound Domestic Shipments



Source: FHWA Freight Analysis Framework

The breakdown of the value of inbound shipments by mode is similar to the weight of inbound shipments by mode, except instead of rail being the second largest carrier of goods, other intermodal comes in second. Other intermodal projects strong growth in both inbound and outbound shipments. Inbound grows 327 percent, from $13.9 billion, a 13 percent share, to $59 billion, a 22 percent share. Outbound other intermodal grows from carrying $19.3 billion in 2002, a 14 percent share, to $34.7 billion in 2035, a 15 percent share, for total growth of 80 percent. Truck has well over 50 percent of the modal share. However, its modal share of the value of goods is not forecasted to grow. For outbound shipments, truck is projected to remain at a steady 75 percent share of shipments, while for inbound shipments, it is expected to lose eight percent of its share, from 78 percent in 2002 to 70 percent in 2035.

The other mode that shows rapid growth is air. For both inbound and outbound shipments, air doubles its share of value, from two to four percent between 2002 and 2035. Outbound air shipments grow from $2.7 billion in 2002 to $9.1 billion in 2035, which is 241 percent growth. The value of inbound air shipments grows

even more—a total of 387 percent, from $2.1 billion in 2002 to $10.0 billion in 2035. Air shipments tend to be high-value, low-weight, and time-sensitive products. Thus, air shipments carry less than one percent of total tonnage, yet a more significant percentage of total value.

Where Goods are Going To and Coming From

For the purpose of looking at where the goods go to and come from, DVRPC staff divided the country into seven regions (Figure 14). Once the regions were set, the states within each region were summed to create a total for each region. The seven regions are as follows:

- Northeast – Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York
- PA – NJ – DE – Pennsylvania, New Jersey, Delaware
- Southeast – Maryland, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida
- Great Lakes – Ohio, Kentucky, Indiana, Michigan, Illinois, Wisconsin, Minnesota, Iowa
- Gulf Coast – Missouri, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas
- Rocky Mountains – North Dakota, South Dakota, Nebraska, Kansas, Montana, Wyoming, Colorado, New Mexico, Idaho, Utah, Nevada, Arizona
- West Coast – Alaska, Oregon, Washington, California, Hawaii

Figure 14: Commodity Flow Origin and Destination Regions: Domestic*

*Domestic Regions as designated by DVRPC staff

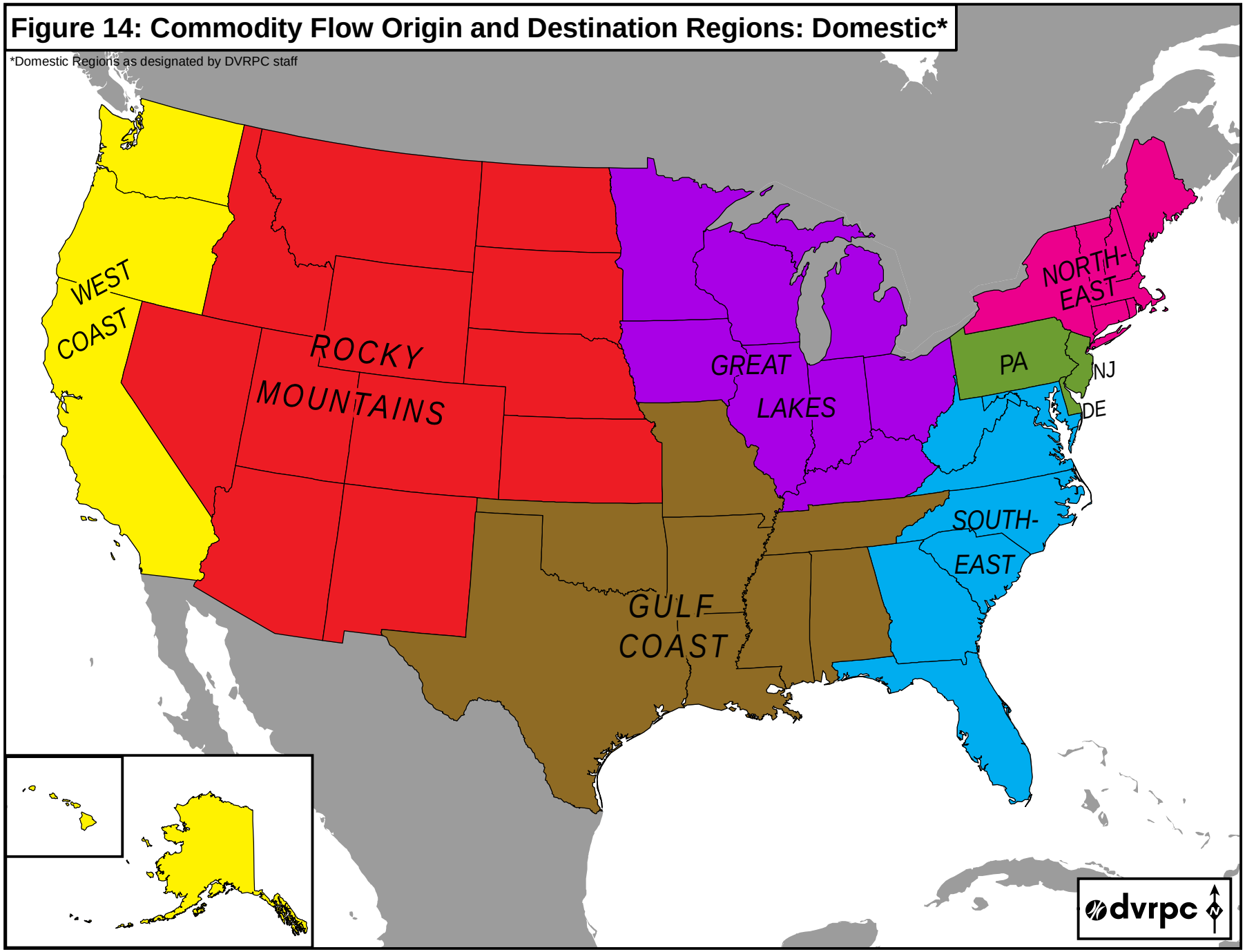
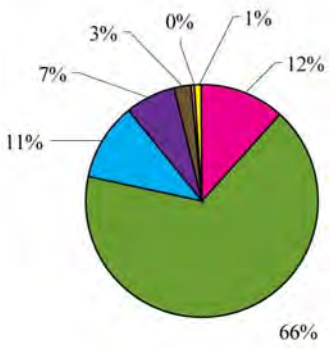
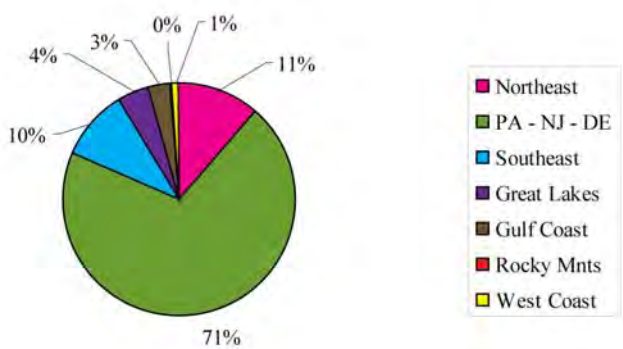


Figure 15: Weight of Domestic Outbound Shipments by Origin: 2002



Source: FHWA Freight Analysis Framework

Figure 16: Weight of Domestic Outbound Shipments by Origin: 2035

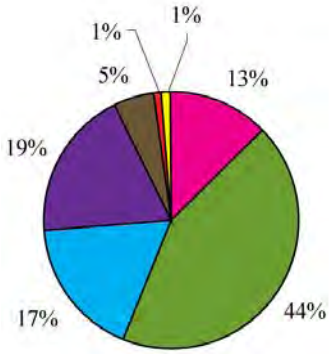


Source: FHWA Freight Analysis Framework

Figures 15 and 16 show where the goods that originate in the Philadelphia CSA are going by weight. The majority of the tonnage is not going far, but staying in Pennsylvania, New Jersey, or Delaware (hereafter referred to as the PA – NJ – DE states). In 2002, 56.5 million tons of goods that originated in the region were destined for one of these three states. In 2035, that number is projected to grow to 67.1 million tons, a 19 percent increase, and the share of tonnage destined for PA – NJ – DE states grows from 66 to 71 percent.

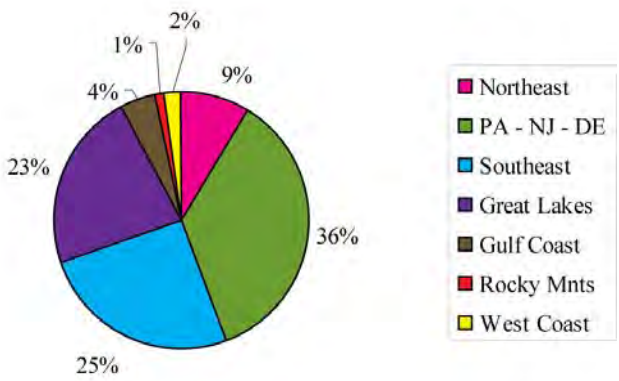
The second largest destination is the Northeast. Most of those goods are headed for New York, with 10.1 million tons estimated to have traveled there in 2002. However, goods traveling to the Northeast are only projected to increase seven percent by the year 2035. The strongest growth is seen in cargo headed to the Gulf Coast. These goods make up only three percent of the total tonnage that originates in our region and do not gain any share, despite 29 percent growth expected between 2002 and 2035. The greatest decrease is seen in goods destined for the Great Lakes region, as the share for this region drops from seven percent in 2002 to four percent in 2035. In 2002, 5.8 million tons moved from the Philadelphia CSA to the Great Lakes. That number is projected to decrease 28 percent to 4.2 million tons by 2035.

Figure 17: Weight of Domestic Inbound Shipments by Origin: 2002



Source: FHWA Freight Analysis Framework

Figure 18: Weight of Domestic Inbound Shipments by Origin: 2035



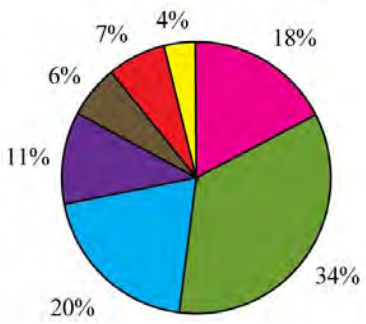
Source: FHWA Freight Analysis Framework

The origin of tonnage is much more diverse than the destination. The PA – NJ – DE states still account for the majority, but less than 50 percent, of goods destined for the Philadelphia CSA. On the other hand, well over 50 percent of the goods originating in the Delaware Valley were destined for one of the PA – NJ – DE states. While goods from the PA – NJ – DE states lose a significant amount of their share from 2002 to 2035, they are still growing at a healthy 50 percent. In 2002, 32.5 million tons came into the region from the PA – NJ – DE states, and in 2035, 48.8 million tons are projected to be coming in from the tristate region.

The two big generators that are displacing the PA – NJ – DE states are the Southeast and Great Lakes regions. The Southeast is believed to have sent 13.1 million tons of goods into the region in 2002, and is projected to send an additional 21.7 million tons by 2035, for a total of 34.8 million tons—a 167 percent growth. Meanwhile, the Great Lakes are also growing as a generator of goods for the region, as the share of goods coming from that region grows from 19 to 23 percent. In 2002, the Great Lakes states sent 14.5 million tons to the Philadelphia CSA, and in 2035, the region is expected to send 31.2 million tons of goods—a 116 percent increase. On a smaller scale, the strongest growth is seen in the weight of goods coming from the West Coast. In 2002, the West Coast region sent slightly less than one million tons of goods to the region. However, in 2035, that number is projected to roughly triple to just less than three million tons of freight. The

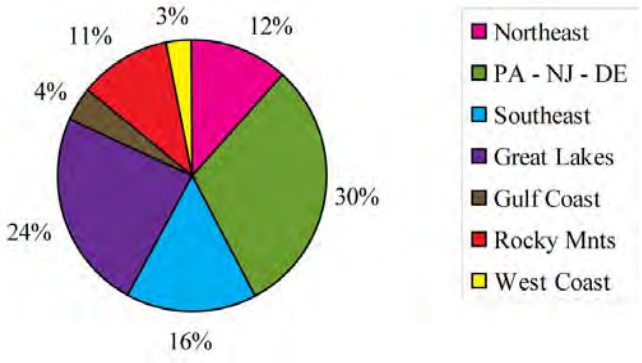
Northeast and the Gulf Coast both are projected to send an increasing amount of goods to the Philadelphia CSA, but will lose share to the other faster-growing regions.

Figure 19: Value of Domestic Outbound Shipments by Destination: 2002



Source: FHWA Freight Analysis Framework

Figure 20: Value of Domestic Outbound Shipments by Destination: 2035

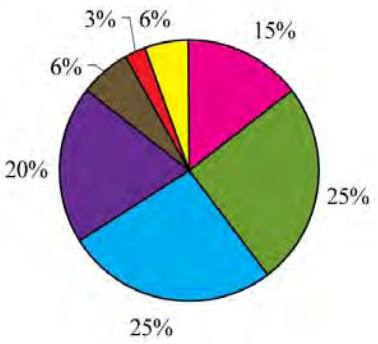


Source: FHWA Freight Analysis Framework

In general, looking at origins and destinations by value produces much more diverse results than by weight. As can be seen in Figures 19 and 20, all destination regions attract at least three percent of the value of goods originating from the Philadelphia CSA. As with weight, the largest region for goods to go is the PA – NJ – DE states, and most of this product is in fact originating and destined for the Philadelphia CSA. In 2002, 34 percent, or $48.7 billion, of goods originating in the region were destined for the PA – NJ – DE states. In 2035, the share slips to 30 percent, although the total value grows 45 percent, to $70.7 billion dollars.

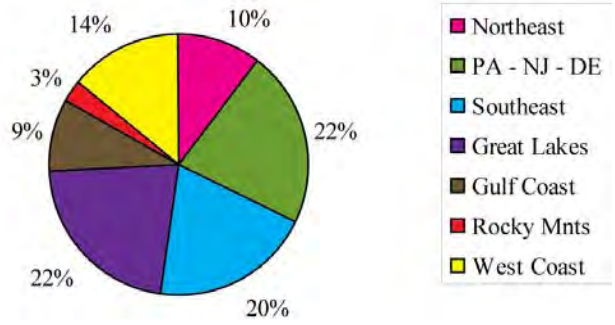
The other region that is projected to have a strong increase is the Midwest. In 2002, $10 billion of goods were shipped from the region to the Midwest, and in 2035, that number is projected to increase 157 percent, to $25.6 billion. This growth drives the share of goods being shipped to the Midwest from seven to 11 percent. The West Coast and the Southeast both project to have growth of slightly over 30 percent, while growth to the Gulf Coast and the Northeast is projected at just over 10 percent.

Figure 21: Value of Domestic Inbound Shipments by Origin: 2002



Source: FHWA Freight Analysis Framework

Figure 22: Value of Domestic Inbound Shipments by Origin: 2035



Source: FHWA Freight Analysis Framework

The breakdown of the value of inbound shipments is the only case where the goods that move between the Delaware Valley and the PA – NJ – DE states do not constitute the largest share. That being said, there is still projected to be over a doubling of the value of goods coming into the region from the PA – NJ – DE states. In 2002, $27.4 billion is estimated to have come in, and in 2035, that number is expected to grow 110 percent, to $57.6 billion. Despite growth across all regions, most regions are projected to lose share between 2002 and 2035 due to the huge jump in cargo imported from the West Coast.

The West Coast states only accounted for $6.1 billion worth of cargo shipped to the region in 2002, but are projected to send $37.5 billion in 2035, a 512 percent increase. This increase causes the share of goods shipped from the West Coast to jump from six percent in 2002 to 14 percent in 2035. The other region to show an increased share in goods shipped to the Philadelphia CSA is the Gulf Coast, increasing its share from six percent in 2002 to nine percent in 2035. This is caused by a 237 percent increase of inbound goods from the region, growing from $6.9 billion in 2002 to $23.3 billion in 2035. The Great Lakes and Southeast regions both show growth, despite losing share. The value of inbound goods from the Southeast grows 85 percent, from $29 billion in 2002 to $53.5 billion in 2035. Over the same period, the value of cargo from the Great Lakes is projected to increase 169 percent, from $21.8 billion to $58.7 billion.

What is Being Carried

Since there are 43 different commodities in the FAF 2 and no easy way to group them, this report will list the top 10 commodities in 2002 and 2035, as well as identify which commodities have the fastest growth during that time range. It is important to understand what commodities in the region are the heaviest and most predominant because these commodities will be putting more wear and tear on the transportation infrastructure that they use. Conversely, it is important to know which commodities in the region have significantly high values, because these commodities will be more time sensitive and will be more affected by issues like congestion.

Table 2: Top 10 Intraregional Commodity Shipments by Weight

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Gasoline	23%	1) Gasoline	27%	1) Alcoholic beverages	130%
2) Gravel	14%	2) Fuel oils	13%	2) Mixed freight	127%
3) Fuel oils	12%	3) Waste/scrap	9%	3) Coal	127%
4) Waste/scrap	7%	4) Gravel	6%	4) Motorized vehicles	102%
5) Natural-gas-related	6%	5) Other foodstuffs	5%	5) Misc. mfg. prods.	97%
6) Other foodstuffs	4%	6) Nonmetallic minerals	4%	6) Chemical prods.	78%
7) Nonmetallic minerals	4%	7) Nonmetal min. prods.	4%	7) Unknown	65%
8) Nonmetal min. prods.	4%	8) Natural-gas-related	4%	8) Machinery	63%
9) Other agricultural	3%	9) Unknown	4%	9) Precision instruments	48%
10) Unknown	3%	10) Mixed freight	3%	10) Waste/scrap	41%

Source: FHWA Freight Analysis Framework

Gasoline is by far the heaviest commodity being transported around the region. In 2002, gasoline made up 23 percent of the intraregional freight tonnage. This is logical given Figure 8, which showed that pipeline shipments made up 16 percent of total intraregional tonnage in 2002. In the time period of 2002 to 2035,

gasoline is projected to increase 20 percent and have an even larger share of intraregional tonnage. The top three commodities in 2002, gasoline, gravel, and fuel oils, make up 50 percent of all tonnage moving within the region, and the top 10 make up 81 percent of the total weight. When analyzing the commodity charts, the same commodities tend to appear across all weight categories. Gravel, coal, gasoline, fuel oils, and waste are all heavy commodities and thus rank high in terms of weight. Gravel is the second highest commodity in 2002, with 17.2 million tons moving intraregionally, but it is projected to decline by 2035 to 8.3 million tons. In terms of growth, alcoholic beverages are the fastest growing intraregional commodity, growing from 398,000 tons in 2002 to 917,000 tons in 2035. It is important to note that ethanol products were included in FAF 2 as alcoholic beverages. Waste/scrap will continue to be an important commodity for the region to handle, as it is projected to grow 41 percent. In 2002, 8.8 million tons are believed to have moved within the region, while in 2035, 12.4 million tons are expected to be handled by the intraregional transportation system.

Table 3: Top 10 Domestic Outbound Commodity Shipments by Weight

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Natural-gas-related	32%	1) Natural-gas-related	33%	1) Alcoholic beverages	470%
2) Gasoline	13%	2) Gasoline	12%	2) Precision instruments	262%
3) Gravel	6%	3) Basic chemicals	5%	3) Coal	250%
4) Fuel oils	5%	4) Fuel oils	4%	4) Mixed freight	122%
5) Base metals	4%	5) Nonmetal min. prods.	4%	5) Misc. manufactured	118%
6) Other foodstuffs	4%	6) Other foodstuffs	4%	6) Motorized vehicles	110%
7) Nonmetal min. prods.	3%	7) Unknown	3%	7) Waste/scrap	108%
8) Basic chemicals	3%	8) Chemical prods.	3%	8) Chemical prods.	103%
9) Natural sands	2%	9) Other agricultural	3%	9) Basic chemicals	90%
10) Other agricultural	2%	10) Mixed freight	3%	10) Machinery	88%

Source: FHWA Freight Analysis Framework

Natural-gas-related products and gasoline make up nearly half of total outbound tonnage from the region, and that is not expected to change as flows are forecasted to the year 2035. The natural-gas-related products that are the greatest commodity going out of the region are mostly coming from the Pennsylvania side of the Philadelphia CSA. A further inspection of the database shows that most of the natural-gas-related products outbound from Philadelphia are moving via pipeline; thus, they are most likely products related to natural gas.

In 2002, 22.8 million tons of natural-gas-related products were transported from the Pennsylvania side of the region, while only 4.8 million tons were moved outbound on the New Jersey side of the region. On the Pennsylvania side, natural-gas-related products are expected to grow 35 percent, to 30.8 million tons, while on the New Jersey side, coal is forecasted to decline 74 percent, to 1.2 million tons. The only commodity to appear in all three lists in Table 3 is basic chemicals. Basic chemicals rise 90 percent, from 2.7 million tons in 2002 to 5.2 million tons in 2035. This increase pushes the commodity share from eighth in 2002 to third in 2035. As with intraregional shipments, alcoholic beverages are the fastest growing outbound commodity. They have an extremely high 470 percent growth rate from 2002 to 2035.

Table 4: Top 10 Domestic Inbound Commodity Shipments by Weight

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Coal	9%	1) Gravel	12%	1) Pharmaceuticals	447%
2) Cereal grains	8%	2) Waste/scrap	7%	2) Misc. manufactured	316%
3) Gravel	8%	3) Cereal grains	7%	3) Gasoline	210%
4) Other foodstuffs	7%	4) Gasoline	6%	4) Transport equip.	208%
5) Nonmetal min. prods.	6%	5) Other foodstuffs	6%	5) Gravel	187%
6) Waste/scrap	6%	6) Coal	6%	6) Mixed freight	179%
7) Base metals	5%	7) Base metals	5%	7) Waste/scrap	141%
8) Gasoline	4%	8) Nonmetal min. prods.	4%	8) Fuel oils	140%
9) Nonmetallic minerals	4%	9) Nonmetallic minerals	4%	9) Electronics	137%
10) Woods prods.	4%	10) Natural-gas-related	4%	10) Machinery	125%

Source: FHWA Freight Analysis Framework

There is no single commodity that carried over a 10 percent share of total inbound weight in 2002, which is much different than intraregional and outbound weight. In fact, the top 10 commodities only make up 61 percent of total inbound tonnage, as opposed to outbound tonnage, where the top 10 commodities accounted for 74 percent of the weight. The growth of inbound gravel stands out, as it jumps from third to first in ranking from 2002 to 2035, and it is the fifth fastest growing commodity in the region over the time span. Interestingly, the tonnage of gravel shipments declines over the same time period for intraregional and outbound shipments. Intraregionally, gravel declines 52 percent; outbound, it declines 60 percent; and inbound, it is projected to rise 187 percent, from 5.9 million tons to 16.9 million tons.

The other commodity to appear in all three columns in Table 4 is waste/scrap. Inbound tonnage of waste/scrap grows 141 percent, from 4.1 million tons in 2002 to 9.9 million tons in 2035. As seen in the table, coal slips from being the highest outbound tonnage in 2002 to the sixth highest tonnage in 2035, but does grow a total of 20 percent over the time period. In terms of growth, pharmaceuticals and miscellaneous manufactured products are both projected to more than quadruple. In 2002, the inbound weight of pharmaceuticals is estimated to have been 376,000 tons, and in 2035, it is projected to be 2.1 million tons. Miscellaneous manufactured products are projected to grow 316 percent, from 675,000 tons in 2002 to 2.8 million tons in 2035.

Table 5: Top 10 Intraregional Commodity Shipments by Value

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Gasoline	10%	1) Mixed freight	13%	1) Precision instruments	348%
2) Machinery	9%	2) Machinery	12%	2) Alcoholic beverages	152%
3) Pharmaceuticals	8%	3) Gasoline	9%	3) Mixed freight	100%
4) Mixed freight	7%	4) Motorized vehicles	7%	4) Chemical prods.	99%
5) Electronics	6%	5) Precision instruments	5%	5) Misc. manufactured	94%
6) Other foodstuffs	5%	6) Unknown	5%	6) Motorized vehicles	81%
7) Motorized vehicles	5%	7) Chemical prods.	5%	7) Waste/scrap	57%
8) Unknown	4%	8) Other foodstuffs	5%	8) Machinery	52%
9) Fuel oils	4%	9) Pharmaceuticals	4%	9) Unknown	43%
10) Textiles/leather	4%	10) Misc. manufactured	4%	10) Plastics/rubber	39%

Source: FHWA Freight Analysis Framework

Gasoline, which was the top estimated intraregional commodity in terms of weight in 2002, was also the top intraregional commodity in value. Intraregional gasoline shipments had a value of $6.4 billion in 2002 and are expected to grow 12 percent, to $7.2 billion, in 2035. Machinery was the second top commodity in 2002 and is expected to remain so in 2035. In 2002, $6 billion worth of machinery was involved in intraregional shipments, a nine percent commodity share, while in 2035, there are projected to be $9.1 billion in intraregional shipments, a 12 percent share. Mixed freight, which is comprised mostly of mail and empty trailers, is projected to double over the time period, which takes it from the fourth highest value commodity in 2002 to the highest value commodity in 2035.

The most growth is seen in precision instruments. In 2002, $935 million worth of precision instruments were involved in intraregional shipments, and in 2035, the number is projected to balloon 348 percent, to $4.2 billion. Pharmaceuticals, which showed strong growth in outbound weight, are a major commodity in terms of intraregional value, but the value of pharmaceutical shipments decreases from 2002 to 2035. $5 billion worth of pharmaceuticals is believed to have moved intraregionally in 2002, and that is projected to decline 34 percent, to $3.3 billion, in 2035.

Table 6: Top 10 Domestic Outbound Commodity Shipments by Value

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Pharmaceuticals	16%	1) Precision instruments	28%	1) Precision instruments	1067%
2) Electronics	10%	2) Pharmaceuticals	16%	2) Alcoholic beverages	377%
3) Natural-gas-related	6%	3) Plastics/rubber	6%	3) Waste/scrap	107%
4) Plastics/rubber	6%	4) Motorized vehicles	6%	4) Mixed freight	106%
5) Textiles/leather	6%	5) Machinery	6%	5) Misc. manufactured	94%
6) Machinery	5%	6) Mixed freight	5%	6) Chemical prods.	93%
7) Motorized vehicles	5%	7) Chemical prods.	5%	7) Motorized vehicles	88%
8) Mixed freight	4%	8) Natural-gas-related	4%	8) Cereal grains	85%
9) Chemical prods.	4%	9) Misc. manufactured	3%	9) Machinery	71%
10) Precision instruments	4%	10) Basic chemicals	3%	10) Pharmaceuticals	70%

Source: FHWA Freight Analysis Framework

In 2002, except for natural-gas-related products, none of the top 10 commodities in terms of value are also top 10 commodities in terms of weight. Sixty-six percent of outbound value is represented by the top 10 commodities in 2002, so the region continues to show that heavy commodities tend to be low in value and high-value commodities tend to be low in weight, without much cross over. Pharmaceuticals are the highest value commodity in 2002 and have the tenth most growth from 2002 to 2035. In 2002, $22.2 billion worth of pharmaceutical products were sent out of the region to domestic destinations, and in 2035, $37.7 billion is projected to move outbound—a 70 percent growth. Precision instruments, which show aggressive growth from 2002 to 2035 in terms of value in all trip types, show extreme growth in outbound value.

There are three commodities that appear as top 10 commodities in 2002 and 2035 and as fastest-growing commodities over the time period. In 2002, machinery was estimated to have $7.6 billion worth of outbound shipments, and it is projected to grow 71 percent, to $13.1 billion, by the year 2035. $7 billion worth of outbound shipments of motorized vehicles was documented in 2002, and that number is projected to be $13.3 billion in 2035—a growth of 88 percent. The projections show mixed freight, which includes mail, parcels, and

empty and unidentified containers, to roughly double between 2002 and 2035, going from $6.2 billion to $12.8 billion worth of outbound shipments. Electronics, which appear as the second top commodity according to 2002 shipments, is expected to decline 58 percent over the 33-year time span and does not appear as a top 10 commodity in 2035.

Table 7: Top 10 Domestic Inbound Commodity Shipments by Value

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Electronics	11%	1) Pharmaceuticals	16%	1) Precision instruments	1621%
2) Pharmaceuticals	9%	2) Precision instruments	16%	2) Pharmaceuticals	318%
3) Textiles/leather	9%	3) Electronics	10%	3) Misc. manufactured	294%
4) Machinery	8%	4) Misc. manufactured	8%	4) Gasoline	239%
5) Mixed freight	6%	5) Machinery	7%	5) Mixed freight	188%
6) Misc. manufactured	5%	6) Mixed freight	7%	6) Transport equip.	177%
7) Motorized vehicles	5%	7) Chemical prods.	4%	7) Chemical prods.	164%
8) Other foodstuffs	5%	8) Motorized vehicles	4%	8) Electronics	132%
9) Plastics/rubber	4%	9) Other foodstuffs	3%	9) Machinery	127%
10) Chemical prods.	4%	10) Plastics/rubber	3%	10) Gravel	125%

Source: FHWA Freight Analysis Framework

There is a lot more consistency in the top 10 lists for inbound value than in any other trip type for commodities. Nine of the 10 commodities that appear as a top 10 commodity in 2002 also appear as a top 10 commodity in 2035. Only textiles/leather, which is projected to decline 55 percent, drops out of the top 10. Pharmaceuticals, as with outbound value, perform well in the 2002, 2035, and fastest-growing lists. In 2002, inbound pharmaceutical shipments were reportedly worth $10.3 billion, and they are projected to increase 318 percent, to $42.9 billion, in 2035. Miscellaneous manufactured products have the third most growth in the time period, projecting to nearly quadruple, from $5.6 billion to $22 billion. As with outbound value, precision instruments are the fastest-growing commodity. Inbound shipments of precision instruments project growth of 1,621 percent, from $2.4 billion in 2002 to $41.4 billion in 2035.

CHAPTER III

International Freight Flows

Since the end of World War II, the United States has been one of the biggest advocates of free trade, having established numerous pacts with other nations to secure trade without tariffs. This, along with world-wide globalization, has led to an influx of cargo through United States seaports and airports. The United States' economy and consumption patterns are directly related to its ability to import and export through its ports. “Foreign trade has had a major impact on all U.S. borders and coasts. Since 1950, the value of merchandise trade has increased sixteen-fold in inflation-adjusted terms.”[1]

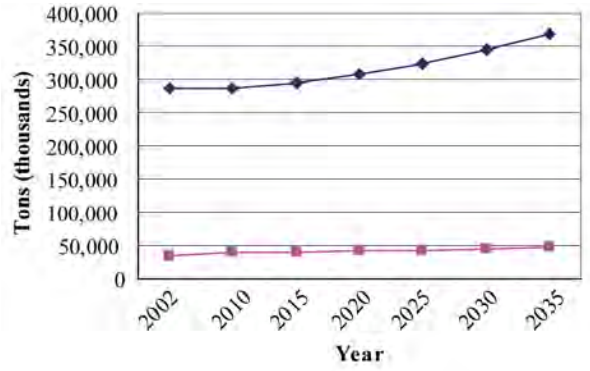
This section of the report presents a synopsis of the international FAF 2 data for both goods originating from or destined for the Philadelphia CSA. It also addresses cargo that uses regional ports but is not destined to or originating in the Philadelphia CSA (this data is not incorporated in international totals). Raw data and further break-outs of specific modes, commodities, or trading partners are available by request.

Total International Shipments

This section represents international shipments that are either destined for, or originating in, the Philadelphia CSA. It does not reflect through shipments (i.e., shipments that use a port in the Philadelphia CSA but are not either destined for or originating in the Philadelphia CSA). Total international shipments make up a small percentage of total movements originating in or destined for the Philadelphia CSA. However, as seen in Figures 23 and 24, the growth of international shipments is expected to be greater than the growth of domestic shipments by both weight and value.

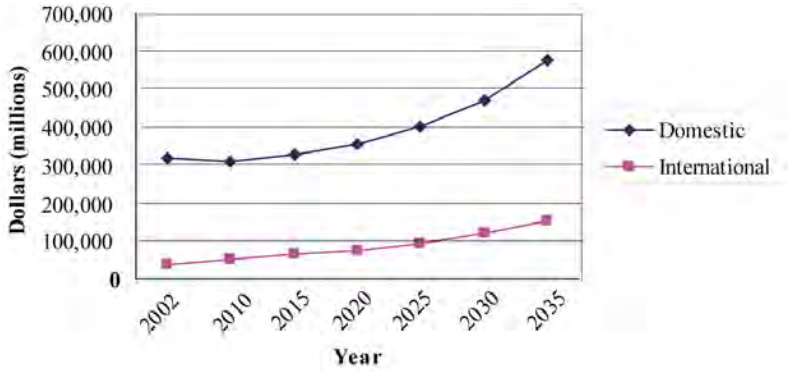
[1] Freight Facts and Figures 2007, Federal Highway Administration, Office of Freight Management and Operations, Page 14

Figure 23: Domestic vs International Shipments by Weight



Source: FHWA Freight Analysis Framework

Figure 24: Domestic vs International Shipments by Value



Source: FHWA Freight Analysis Framework

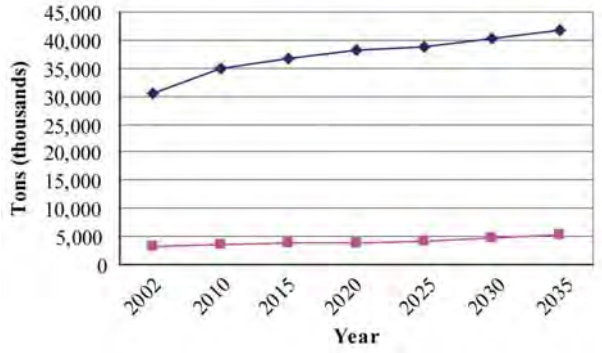
In terms of weight, 2002 estimated international shipments were 11 percent of the total shipments with a Philadelphia CSA origin or destination. Weights of international movements are projected within FAF 2 to grow 40 percent, from 33.6 million tons in 2002 to 47.1 million tons in 2035. This is greater than the growth for the weight of domestic commodities over the same time period, which projects a 29 percent increase. However, the share of domestic and international tonnage projected out to 2035 remains the same, with 89 percent of shipments being domestic and 11 percent of shipments being international.

The value of international shipments grows at a much faster rate than the value of domestic shipments. The value of international shipments either destined for or originating from the Philadelphia CSA is projected to skyrocket over the next 33 years. In 2002, $52.1 billion dollars in international shipments was estimated, and it is estimated that by 2035, the Philadelphia CSA will be responsible for $153.9 billion in international shipments, representing a growth of 320 percent. The growth seen in international shipments from 2002 to 2035 leads to an increased share for international shipments, from 10 to 21 percent of all shipments.

Imports versus Exports

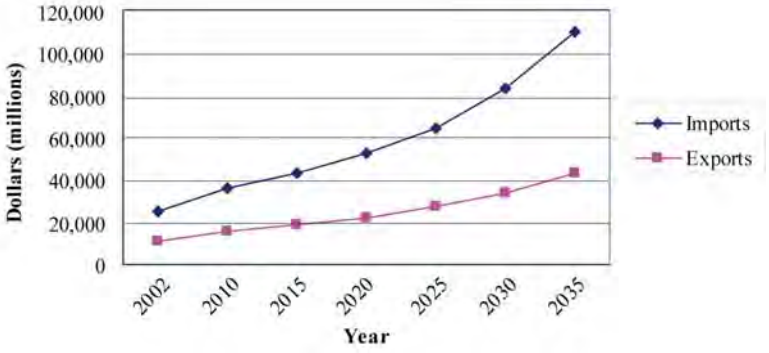
There are two basic types of international shipments: imports, or shipments from countries other than the United States to the Philadelphia CSA, and exports, or shipments to countries other than the United States from the Philadelphia CSA. Figures 25 and 26 show that both imports and exports are expected to increase in the coming years, both in terms of value and weight.

Figure 25: Imports vs Exports by Weight



Source: FHWA Freight Analysis Framework

Figure 26: Imports vs Exports by Value



Source: FHWA Freight Analysis Framework

The tonnage of exported international shipments was slightly under one-sixth of the tonnage of imported shipments in 2002. Exports are projected to grow in weight by 66 percent, from 3.2 million tons in 2002 to 5.2 million tons in 2035. Over the same period, the total imported weight of goods is projected to grow at a slower rate of 37 percent, from 30.5 million tons in 2002 to 41.9 million tons in 2035. Exports project having continuous growth for every five-year period until 2035, but imports project a sharp spike from 2002 to 2010 (almost half of total growth for the 33-year period), and then moderate growth for every five-year period from 2010 through 2035.

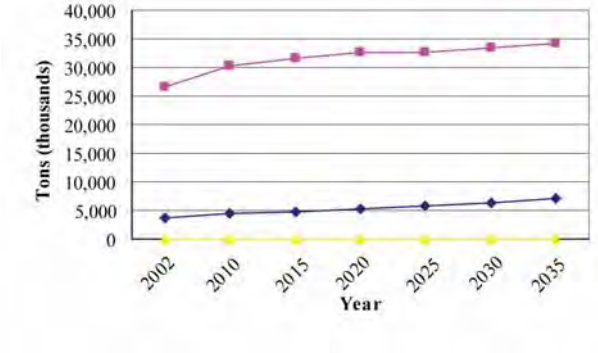
The value of both exports and imports are projected to roughly quadruple between 2002 and 2035. Exports were estimated at $11.3 billion dollars in shipments in 2002 and are projected to increase 280 percent, to $43 billion in shipments, by 2035. Imports show even greater growth and are projected to increase 339 percent,

from $25.3 billion in 2002 to $110.9 billion in 2035. Both imports and exports show mostly moderate growth from 2002 to 2020 and accelerating growth from 2020 to 2035.

How International Goods Move

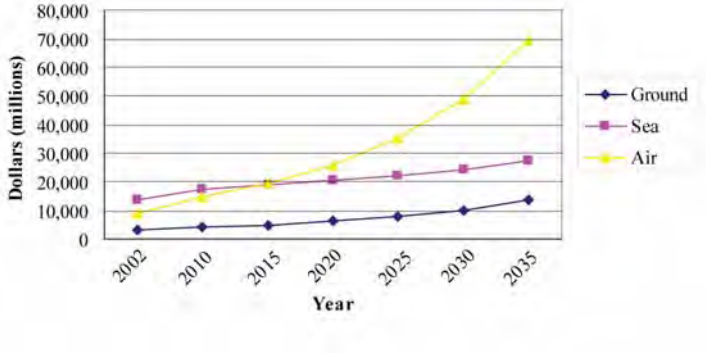
International shipments arrive in the Philadelphia CSA in one of three ways: they are brought by various modes over land crossings from Mexico or Canada, they are brought by ship through one of the nation's many seaports, or they are brought via airplane to one of the nation's international airports. Shipments of large weight often in either break-bulk or containerized form usually arrive through seaport, while light, extremely high-value cargo tends to arrive through the air. Figures 27 and 28 show the mode of inbound shipments to the Philadelphia CSA as they travel from their foreign origins.

Figure 27: Weight of International Outbound Shipments by Mode



Source: FHWA Freight Analysis Framework

Figure 28: Value of International Outbound Shipments by Mode



Source: FHWA Freight Analysis Framework

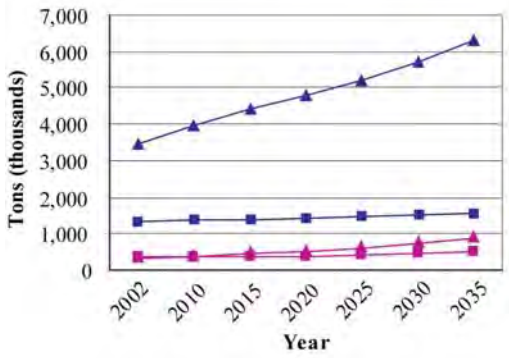
In terms of weight, most of the international tonnage is carried by ship through various United States ports. In 2002, 26.7 million tons of shipments were sent from international origins to PA Phila by sea. The cargo comes into United States ports, including the ports in the Philadelphia CSA. Once the cargo is in the ports, 98 percent of the tonnage is brought to the Philadelphia CSA by truck. In 2035, the tonnage of inbound international shipments by sea is projected to increase 28 percent, to 34.1 million tons, with 98 percent of tonnage still traveling from the port to the Philadelphia CSA by truck. Ground shipments represent shipments from Mexico and Canada that enter the United States and are destined for the Philadelphia CSA. The tonnage of these shipments is projected to grow 90 percent from 2002 to 2035.

Air shipments account for a statistically nonsignificant amount of weight shipped into the region from international origins. However, in terms of value, air shipments are the fastest-growing way of importing cargo to the Philadelphia CSA. In 2002, $8.8 billion in shipments traveled by air from international regions with a final destination of the Philadelphia CSA. All of these shipments used trucks to get from the airport to the final destination. The FAF 2 projects a total of 695 percent growth in the value of inbound international air cargo from 2002 to 2035. In 2002, air accounted for 35 percent of the value of international cargo into the region, but in 2035, it is projected to carry 63 percent. Shipments by sea are projected to grow 104 percent, from $13.4 billion in 2002 to $27.5 billion in 2035. As with weight, inbound shipments that arrive by sea use truck to get from the port to the Philadelphia CSA for well over 90 percent of the total value. The total growth of the value of inbound ground shipments is projected to be 351 percent, from $3 billion in 2002 to $13.8 billion in 2035.

Canada and Mexico

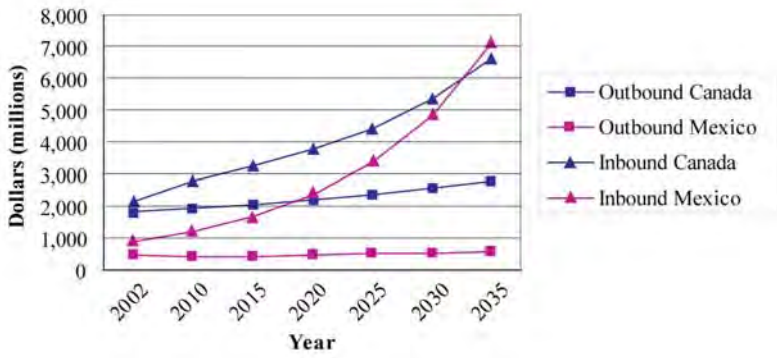
Cargo coming into the United States via ground transportation must come from either Mexico or Canada. The point of entry into the United States for shipments by either truck or rail (or a combination of the two) is assigned to one of the border crossings within the FAF 2 database. Figures 29 and 30 depict shipments to and from Canada and Mexico via ground transportation.

Figure 29: Weight of International Ground Shipments



Source: FHWA Freight Analysis Framework

Figure 30: Value of International Ground Shipments



Source: FHWA Freight Analysis Framework

In terms of outbound tonnage, shipments to Canada and Mexico project a combined 19 percent growth. In 2002, 76 percent of outbound tonnage to Canada and Mexico combined is carried by truck and 22 percent by rail. Projecting these movements out to the year 2035, truck shipments show growth of 22 percent, while the estimated growth in rail is 11 percent. Outbound tonnage to Canada is roughly three times greater than outbound tonnage to Mexico. Outbound tonnage to Canada has continuous growth over the 33-year time span (a total of 16 percent), while outbound tonnage to Mexico exhibits little growth from 2002 to 2020, and 29 percent growth from 2020 to 2035.

Inbound tonnage from Mexico and Canada both show greater growth than outbound tonnage totals. Combined inbound tonnage from Mexico and Canada to the Philadelphia CSA projects a 90 percent increase between 2002 and 2035. Inbound tonnage from both Canada and Mexico is expected to grow at a very steady rate, but the total value of inbound tonnage coming from Canada is much greater than the total value of tonnage from Mexico. The 2002 estimate for inbound tonnage from Canada was estimated at 3.5 million tons, and FAF 2 projects that figure to increase to 6.3 million tons in 2035—a total growth of 82 percent. For inbound tonnage from Mexico, the 2002 data shows 318,000 tons of cargo being shipped to the Philadelphia CSA. These shipments are projected to grow 180 percent, to 889,000 tons of inbound Mexican cargo, in 2035. The 2002 modal shares for inbound tonnage from Mexico and Canada combined were 24 percent for pipeline and unknown, 38 percent for rail, and 89 percent for truck. The 2035 modal shares for inbound tonnage from

Mexico and Canada combined are projected to be 19 percent for pipeline and unknown, 37 percent for rail, and 43 percent for truck.

Growth rates of the value of shipments inbound from Mexico and Canada exceed the growth rates for the value of outbound shipments to the border countries. The value of outbound shipments from the Philadelphia CSA to Canada and Mexico was estimated to total $2.3 billion in 2002 and is projected to grow 46 percent, to $3.4 billion, by 2035. The value of shipments to Canada was about four times that of the value of shipments to Mexico in 2002, and projected shipments to Canada are about five times the value of those shipped to Mexico in 2035. The value of outbound shipments to Canada and Mexico has similar modal breakdowns. The 2002 modal shares for outbound value to Mexico and Canada combined were estimated at 86 percent truck, nine percent rail, and five percent other intermodal. The 2035 modal shares for outbound value to Mexico and Canada combined are projected at 90 percent truck, eight percent rail, and two percent other intermodal.

The value of inbound shipments from both Mexico and Canada is projected to more than triple between 2002 and 2035. In 2002, inbound shipments from Canada were estimated to have a value of $2.2 billion, and that value is projected to increase to $6.6 billion in 2035. Inbound shipments from Mexico are projected to grow at an even faster rate. In 2002, the value of inbound shipments from Mexico was estimated at $879 million, and the value in 2035 is projected to swell to $7.1 billion—a growth rate of 708 percent. The 2002 modal shares for inbound value from Canada were estimated at 67 percent truck, 25 percent rail, and seven percent pipeline and unknown. In 2035, the modal shares for inbound value from Canada are projected to be 80 percent truck, 15 percent rail, and four percent pipeline and unknown. The modal split of cargo by value coming from Mexico is 83 percent truck and 16 percent rail in 2002. However, truck grows 826 percent from 2002 to 2035, and rail grows 99 percent in the same time, so that in 2035, 95 percent of the value of inbound goods from Mexico is estimated to come to the region via truck.

International Trading Partners

International cargo comes to the Philadelphia CSA from all around the world. Also, cargo leaves the Philadelphia CSA destined for many different parts of the world. The FAF 2 breaks down the world into seven regions (for a map of international zones as defined by the Freight Analysis Framework, see Figure 31), all of which receive cargo from and send cargo to the Philadelphia CSA. The data contained in this section includes shipments by both ground and sea, but NOT shipments by air.

Figure 31: Commodity Flow Origin and Destination Regions: International*

*International Regions as Designated by the Freight Analysis Framework 2.2

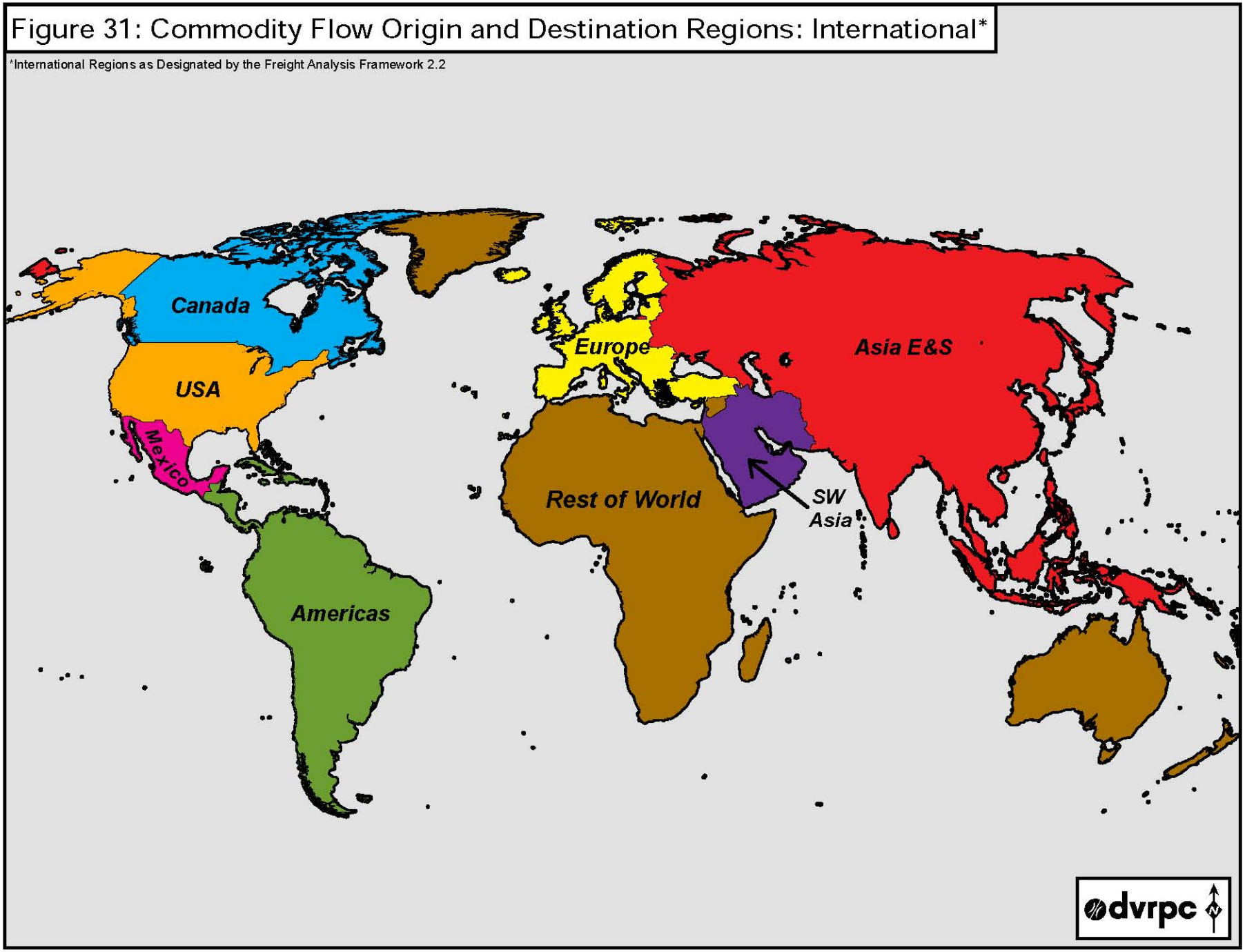
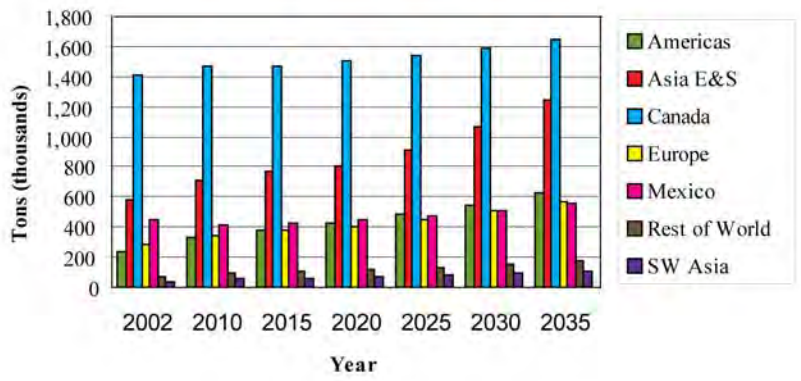


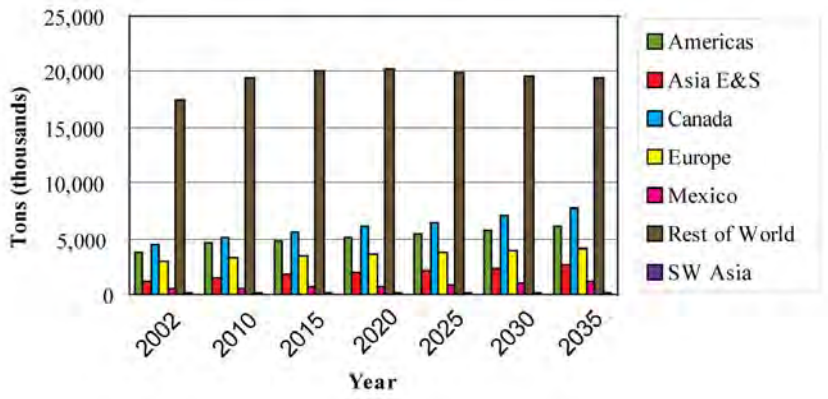
Figure 32: Weight of Outbound International Shipments by Destination



Source: FHWA Freight Analysis Framework

Most of the outbound goods from the Philadelphia CSA to foreign destinations are going to Canada. However, goods going from the Philadelphia CSA to Canada have the slowest growth rate when projected out to the year 2035. In 2002, 1.4 million tons of cargo was shipped between the Philadelphia CSA and Canada, but only 17 percent growth, to 1.7 million tons, is projected to the year 2035. In 2002, shipments to Canada comprised 45 percent of the total tonnage destined for international locations, but in 2035, that number is projected to decrease 32 percent. In 2002, the second largest share of cargo in terms of tonnage is that destined for Asia East and South, with 585,600 tons, or 17 percent. Shipments to Asia East and South are projected to grow 112 percent, to 1.2 million tons of cargo by the year 2035, raising the outbound share of tonnage to 24 percent. The two destination regions with the highest percentage of projected growth (both at 167 percent) are Southwest Asia and the Americas (which basically consist of South America, Central America, and the Gulf of Mexico Islands).

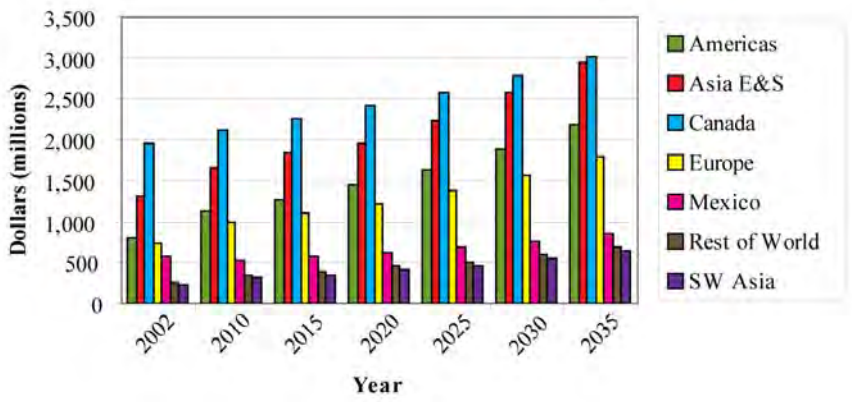
Figure 33: Weight of Inbound International Shipments by Origin



Source: FHWA Freight Analysis Framework

In terms of weight, most inbound goods to the Philadelphia CSA from international origins come from the Rest of World (Rest of World primarily consists of Africa and Oceania). From 2002 to 2020, shipments from the Rest of World, mostly consisting of crude petroleum, grow from 17.5 million tons to 20.2 million tons. However, from 2020 to 2035, shipments from Rest of Word are projected to decline from 20.2 million tons to 19.4 million tons. The share of inbound tonnage that originates from the Rest of World slips from 57 percent in 2002 to 36 percent in 2035. Canada and the Americas both pick up share over the same time period. Shipments from Canada grow in tonnage from 4.4 million tons in 2002 to 7.7 million tons in 2035. The share of cargo tonnage inbound from Canada is forecasted to grow from 14 to 18 percent over the same time period. Shipments from the Americas grow in tonnage from 3.8 million tons in 2002 to 6.1 million tons in 2035. The share of cargo tonnage inbound from Canada will grow from 12 to 15 percent over the same time period. The two origins with the highest percentage of total growth from 2002 to 2035 are Asia East and South and Mexico, which are both projected to more than double.

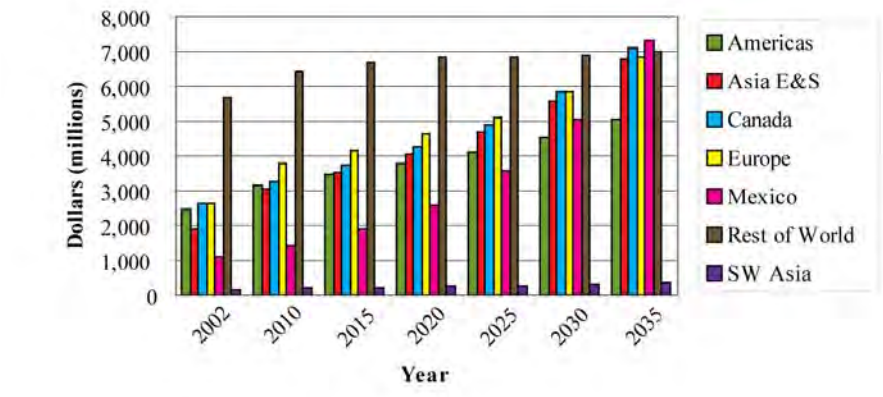
Figure 34: Value of Outbound International Shipments by Destination



Source: FHWA Freight Analysis Framework

The value of outbound international shipments is much more even around the world than are outbound commodities based on weight. And as is the case with outbound weight, Canada is the single largest destination. However, it does not have as large a share, and the share of the value of goods moving to Canada shrinks significantly from 2002 to 2035. In 2002, $2 billion in cargo was shipped from the Philadelphia CSA to Canada, making up 34 percent of total outbound value. In 2035, $3 billion in cargo is projected to be shipped from the Philadelphia CSA to Canada, a 53 percent increase. However, in 2035, this growth only makes up 25 percent of total outbound value. The value of shipments to all regions, except for Mexico, is projected to more than double by the year 2035. Asia East and South was the destination for 22 percent of the value of goods that were sent from the Philadelphia CSA to foreign destinations, and in 2035, it is projected that this number will increase to 24 percent. Over the 33-year time period, shipments to the Americas are projected to grow from $799.6 million to $2.2 billion, and the share of these shipments is projected to increase from 14 to 18 percent. Europe's growth rate is projected to be 147 percent from 2002 to 2035, and its corresponding share is projected to grow from 12 to 15 percent.

Figure 35: Value of Inbound International Shipments by Origin



Source: FHWA Freight Analysis Framework

In 2002, the Rest of World had a majority share of the value of goods that were destined for the Philadelphia CSA, but in 2035, there is no region with a significant majority. From 2002 to 2035, the value of goods coming from Rest of World has the least amount of growth, at 24 percent. The value of goods shipped from all other international regions at least doubles. The strongest growth is inbound cargo from Mexico to the Philadelphia CSA. In 2002, $1.1 billion worth of shipments traveled from Mexico, and that number is projected to swell to $7.3 billion in 2035. In 2002, goods from Mexico only made up 6.7 percent of total inbound international value, but in 2035, it is projected that 18 percent of total inbound international value will come from Mexico. The second fastest growing region in terms of value of cargo being shipped to the Philadelphia CSA is Asia East and South. Asia East and South accounted for 12 percent of the inbound value in 2002, or $1.9 billion in shipments. In 2035, Asia East and South is projected to make up 17 percent of inbound value, or $6.8 billion in shipments. The value of goods shipped from Canada and Europe are both forecasted to increase by over 150 percent, while the value of goods shipped from the Americas is forecasted to more than double.

International Commodities

Due to supply and demand economics, regions worldwide are able to export surplus cargo to other regions that have a demand for that cargo. This section will identify which goods the Philadelphia CSA is importing and which it is exporting. This analysis allows for the identification of some of the region's signature exports and imports. As with the previous section, the tables and data in this section include international shipments by ground and sea, but NOT by air.

Table 8: Top 10 International Exported Commodities by Weight

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Chemical prods.	20%	1) Chemical prods.	34%	1) Machinery	203%
2) Base metals	12%	2) Basic chemicals	11%	2) Furniture	182%
3) Basic chemicals	10%	3) Machinery	11%	3) Chemical prods.	180%
4) Nonmetal min. prods.	9%	4) Other agricultural	7%	4) Other agricultural	117%
5) Natural-gas-related	6%	5) Nonmetal min. prods.	5%	5) Motorized vehicles	110%
6) Machinery	6%	6) Paper articles	4%	6) Precision instruments	106%
7) Nonmetallic minerals	6%	7) Nonmetallic minerals	3%	7) Basic chemicals	95%
8) Other agricultural	5%	8) Base metals	3%	8) Electronics	67%
9) Paper articles	5%	9) Plastics/rubber	3%	9) Mixed freight	55%
10) Plastics/rubber	3%	10) Natural-gas-related	3%	10) Meat/seafood	50%

Source: FHWA Freight Analysis Framework

In terms of outbound weight, chemical products represented the most outbound tonnage in 2002. They are projected to represent the most outbound tonnage in 2035 and are the third fastest-growing commodity from 2002 to 2035. There were 640,300 tons of chemical products estimated to have been shipped from the Philadelphia CSA to international destinations. A 180 percent growth in outbound international shipments of chemical products is estimated by 2035, taking the total outbound tonnage of chemical products to 1.8 million tons. Machinery is the fastest-growing commodity in terms of international outbound weight. It is projected to grow 203 percent, from 196,100 tons to 593,800 tons over the 33-year forecast period. This growth causes its

commodity share to increase from six percent in 2002 to 11 percent in 2035. In 2002, the top four commodities made up just over half of the total outbound tonnage, while in 2035, it is projected that the top four commodities will make up 63 percent of the total outbound tonnage.

Table 9: Top 10 International Imported Commodities by Weight

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Crude petroleum	63%	1) Crude petroleum	49%	1) Pharmaceuticals	996%
2) Other agricultural	6%	2) Other agricultural	9%	2) Electronics	814%
3) Base metals	6%	3) Base metals	6%	3) Precision instruments	620%
4) Natural-gas-related	5%	4) Chemical prods.	5%	4) Furniture	556%
5) Chemical prods.	3%	5) Natural-gas-related	5%	5) Machinery	322%
6) Paper articles	3%	6) Machinery	4%	6) Transport equip.	293%
7) Waste/scrap	2%	7) Paper articles	3%	7) Misc. manufactured	246%
8) Machinery	1%	8) Waste/scrap	3%	8) Coal	201%
9) Wood prods.	1%	9) Plastics/rubber	2%	9) Textiles/leather	201%
10) Natural sands	1%	10) Wood prods.	2%	10) Plastics/rubber	188%

Source: FHWA Freight Analysis Framework

The largest commodity by weight coming into the Philadelphia CSA from international origins is by far crude petroleum. In 2002, 19.2 million tons of crude petroleum was shipped to the Philadelphia CSA, most of which came from the Rest of World. This is estimated to have made up 63 percent of total inbound tonnage from international origins. However, while total inbound tonnage from international origins is projected to increase 120 percent by 2035, inbound tonnage of crude petroleum is only projected to increase six percent, to 20.4 million tons by 2035. This leads to crude petroleum dropping from 63 percent of total imported commodities by weight in 2002 to a projected 49 percent in 2035.

Other agricultural products and base metals both made up six percent of total inbound weight as estimated for the year 2002. A total of 1.9 million tons of other agricultural products was estimated to have been shipped from international destinations. That number is projected to roughly double to 3.9 million tons by 2035, making

the share of other agricultural products increase from six to nine percent. Base metals are projected to maintain the six percent share, as they project 34 percent growth, from 1.8 million tons of inbound cargo to 2.4 million tons. Pharmaceuticals, electronics, precision instruments, and furniture all project to have more than 500 percent growth in their inbound shipments, but none of them rank in the top 10 in terms of weight when projected through the year 2035.

Table 10: Top 10 International Exported Commodities by Value

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Chemical prods.	33%	1) Chemical prods.	43%	1) Furniture	184%
2) Machinery	25%	2) Machinery	32%	2) Chemical prods.	168%
3) Plastics/rubber	5%	3) Plastics/rubber	4%	3) Machinery	162%
4) Paper articles	4%	4) Motorized vehicles	3%	4) Basic chemicals	113%
5) Base metals	4%	5) Paper articles	3%	5) Precision instruments	110%
6) Electronics	4%	6) Basic chemicals	3%	6) Motorized vehicles	102%
7) Motorized vehicles	3%	7) Electronics	2%	7) Other agricultural	63%
8) Mixed freight	2%	8) Mixed freight	2%	8) Plastics/rubber	62%
9) Basic chemicals	2%	9) Precision instruments	1%	9) Meat/seafood	49%
10) Transport equip.	2%	10) Printed prods.	1%	10) Waste/scrap	44%

Source: FHWA Freight Analysis Framework

Chemical products and machinery make up over half of total shipments from the Philadelphia CSA to international regions by ground and sea. Chemical products were the largest single commodity in 2002 and are projected to remain so in 2035, and they are the second fastest-growing commodity from 2002 to 2035. In 2002, $1.9 billion in chemical products was shipped from the Philadelphia CSA to international destinations. The FAF 2 projections show chemical products growing 168 percent, to $5.2 billion, in 2035. This growth is stronger than the 106 percent growth for total outbound international value, leading to a growth in share from 33 percent in 2002 to 43 percent in 2035. Machinery is the second largest commodity in both 2002 and 2035,

growing 162 percent, from $1.5 billion to $3.8 million. Machinery also increases its share in the 33-year time span from 25 to 32 percent.

Table 11: Top 10 International Imported Commodities by Value

2002 Commodities	Share	2035 Commodities	Share	Fastest Growth 2002-2035	% Growth
1) Crude petroleum	36%	1) Machinery	33%	1) Electronics	1280%
2) Machinery	20%	2) Crude petroleum	15%	2) Pharmaceuticals	1233%
3) Chemical prods.	11%	3) Electronics	15%	3) Precision instruments	679%
4) Base metals	7%	4) Chemical prods.	10%	4) Furniture	608%
5) Other agricultural	6%	5) Other agricultural	5%	5) Machinery	311%
6) Paper articles	4%	6) Pharmaceuticals	4%	6) Transport equip.	307%
7) Electronics	3%	7) Base metals	4%	7) Misc. mfg. prods.	271%
8) Mixed freight	2%	8) Paper articles	3%	8) Coal	217%
9) Plastics/rubber	2%	9) Mixed freight	2%	9) Textiles/leather	191%
10) Natural-gas-related	2%	10) Precision instruments	2%	10) Wood prods.	157%

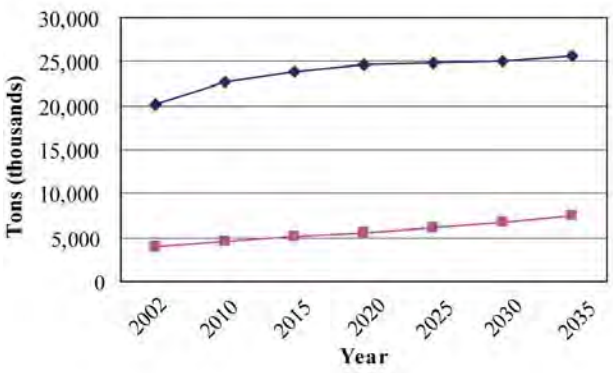
Source: FHWA Freight Analysis Framework

In 2002, machinery was estimated to be responsible for 20 percent of inbound value to the Philadelphia CSA by ground and sea, which was the second highest of any commodity. However, machinery is projected to be the fifth fastest-growing commodity between 2002 and 2035, and this will push it from the second most valuable inbound commodity from international origins to the first. In 2002, crude petroleum was estimated to have had the most value, at $5.9 billion, coming into the region from international origins. Crude petroleum is projected to grow five percent from 2002 to 2035, but the total inbound international value of all commodities is projected to grow 145 percent, so crude petroleum is forecasted to drop in commodity share from 36 percent in 2002 to 15 percent in 2035. The commodity that will grow the fastest is electronics, which increases 1,280 percent, from $438.2 million in 2002 to $6 billion in 2035. This growth causes the value of electronics to leap from a three percent commodity share in 2002 to a 15 percent commodity share in 2035.

Philadelphia CSA Port Activity

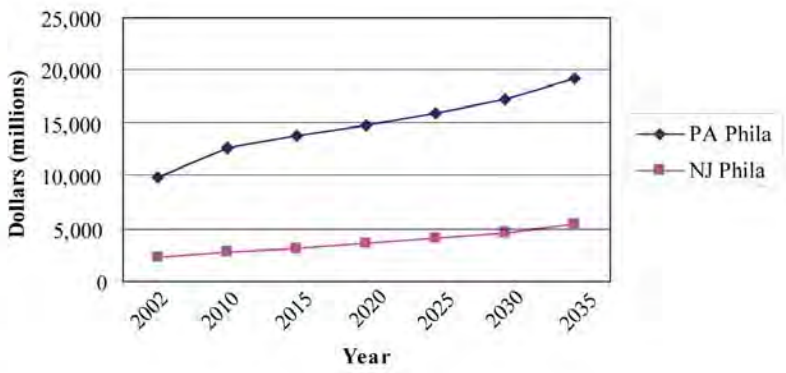
This section displays data on the movement of goods through the Philadelphia CSA's seaports, regardless of origin and destination. The Philadelphia CSA has a long history of port-based commerce dating back to the 17th century. The ports of the Philadelphia CSA create jobs that have "higher than average labor income and economic output per job."[2] Figures 36 and 37 show total seaport activity, both inbound and outbound, for the Pennsylvania and New Jersey sides of the Delaware River in the Philadelphia CSA.

Figure 36: Weight of Shipments: Seaports



Source: FHWA Freight Analysis Framework

Figure 37: Value of Shipments: Seaports



Source: FHWA Freight Analysis Framework

In terms of weight, port activity in PA Phila is projected to grow from 20.2 million tons in 2002 to 24.6 million tons in 2020, but then growth is projected to taper off to 25.7 million tons in 2035. In 2002, for PA Phila ports, 86.3 percent of the tonnage that moves through the ports is destined for PA Phila. In 2035, the tonnage of goods that moves through the PA Phila ports that is destined for PA Phila is projected to be 77.6 percent—a reduction in share from 2002. In terms of origin, the Rest of World projects to be the origin of 69.8 percent of the goods moving through the ports of PA Phila. Crude petroleum is by far the largest commodity moving

[2] Maritime Commerce in Greater Philadelphia, Economy Leagues of Greater Philadelphia, May 2008, Page 3

through the ports of PA Phila, making up 74.8 percent of total tonnage in 2002 and 65.9 percent of total tonnage in 2035.

Growth of tonnage through the NJ Phila ports is projected to be more constant than the PA Phila ports, projecting a total increase of 89 percent, from four million tons to 7.5 millions tons over the 33-year time period. Of the cargo moving through the NJ Phila ports, 40 percent of the tonnage is estimated to have remained in the NJ Phila region in 2002, and 29 percent of projected tonnage is expected to stay in NJ Phila in 2035. In 2002, 12 percent of the tonnage that moved through the NJ Phila ports was destined for PA Phila, and that number is projected to increase to 15 percent by 2035. In 2002, over two-thirds of the tonnage that moved through NJ Phila ports was other agricultural products, coal not elsewhere classified, and base metals.

In terms of value, the growth of shipments through the PA Phila ports is significantly stronger than in terms of weight. The value of shipments through the PA Phila ports is projected to nearly double, increasing from $9.9 billion in 2002 to $19.2 billion by 2035. Sixty-one percent of the value of shipments through the port is represented by inbound goods destined for PA Phila. These inbound shipments accounted for $6 billion in 2002 and are projected to increase to $8 billion 2035, when they are projected to make up only 42 percent of total shipments moving through the PA Phila ports. In 2002, crude petroleum made up nearly half of the value of all commodities that moved through the PA Phila ports. Another 34 percent was made up by the following three commodities: base metals, machinery, and chemical products. Crude petroleum does not project growth as fast as the other commodities, so in 2035, crude petroleum projects to carry a commodity share, in terms of value through the PA Phila ports, of 26 percent. The other three major commodities project to make up 53 percent of the value in the 2035 forecast.

The ports in NJ Phila also project steady growth through the year 2035, with total growth expected to be 142 percent. In 2002, 22 percent of the value of cargo that went through the NJ Phila ports was destined for NJ Phila, 10 percent was destined for PA Phila, and 14 percent was destined for the New York City metropolitan area (a combination of NJ New York and NY New York). In 2035, 16 percent of the value of cargo that goes through the NJ Phila ports will be destined for NJ Phila, and there is no forecasted change in the percentages destined for PA Phila and the New York metropolitan area. With the majority of the value of cargo passing through the NJ Phila ports being imported goods, Europe, the Americas, and Asia East and South make up the largest majority of origin regions. In 2002, in terms of commodities, two-thirds of the value of all goods moving through the ports of NJ Phila was other agricultural products, machinery, or base metals. In 2035, the combined share for those same three commodities is projected to increase to 73 percent of all shipments.

CHAPTER IV

LONG-DISTANCE TRUCK MOVEMENTS

Along with the origin-destination databases, FHWA released geographic information system (GIS) information assigning long-haul truck trips to specific roadways. This section contains maps that show average daily truck volumes and congestion data on the Philadelphia CSA's National Highway System (NHS). For the purpose of this section, Mercer County was included in the maps, despite not being an official part of the Philadelphia CSA. This was done in order to show the full DVRPC region. As a reminder, the FAF 2 website provides the following disclaimer about the data contained in this section: "These models are based on geographic distributions of economic activity rather than a detailed understanding of local conditions. While the FAF 2 provides reasonable estimates for national and multistate corridor analyses, FAF 2 estimates are not a substitute for local data to support local planning and project development." (http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm#faf2trk)

Average Daily Long-Haul Truck Movements

Figures 38 and 39 (pages 58 and 59) show average volumes of daily long-haul truck movements on the regional NHS system. Long-haul truck movements are defined as trucks that travel a minimum of 50 miles from origin to destination. As a means of orientation, a truck leaving the South Philadelphia Freight Complex and traveling west would need to reach the I-176 Morgantown/Reading Interchange on the Pennsylvania Turnpike in order to travel the 50 miles necessary to be considered a long-haul truck movement. Shipments referred to in this report as within region or interregional would almost exclusively not be included in the maps in this section, while the vast majority of inbound and outbound shipments by truck would be included in these maps.

The color and density of the lines indicate the range of the number of long-haul trucks on a segment of roadway. Darker, thicker lines represent a higher volume of long-haul trucks, while lighter, thinner lines represent lower volumes of long-haul trucks. All truck movements are calculated on a per-day basis. Some of the notable observations from Figures 38 and 39 are:

- The highest volumes of long-haul truck movements occur in the north-south corridor along I-95, I-295, and the New Jersey Turnpike.
  - In 2002, the segment of I-95 between Center City and the Delaware state border carried over 5,000 long-haul trucks per day (both directions). This same stretch of road is forecasted to carry over 10,000 long-haul trucks per day by 2035.
  - In 2002, most of I-295 carried less than 2,500 long-haul trucks per day. However, in 2035, it is forecasted that most of I-295 will carry over 2,500 trucks per day, and through Gloucester County, it will carry over 5,000 long-haul trucks per day.
- The noninterstate routes that carried over 5,000 long-haul trucks in 2002 were US 1 in Bucks County and US 130 in Burlington County.
  - The data indicates that long-haul trucks use US 1 in Bucks County and I-195 in Mercer County to connect from I-95 to the New Jersey Turnpike. These roads carried over 2,501 trucks in 2002, and US 1 and I-295 are forecasted to carry over 5,000 long-haul trucks in 2035.
- Forecasted truck volumes in the east-west corridor show more long-haul truck traffic along the Pennsylvania Turnpike than on I-76 in Philadelphia County.
  - In 2002, long-haul truck traffic along I-76 in Philadelphia County is between 2,500 and 5,000 trucks per day. The forecasted growth for this stretch of road does not exceed 5,000 trucks per day.
- Generally speaking, there is an across-the-board increase in long-haul truck traffic projected for virtually every major highway.
  - In 2002, there are no segments shown carrying over 10,000 trucks per day, and the majority of interstate roadway is carrying 2,501 to 5,000 trucks per day. The forecasted growth shows two segments carrying over 10,000 trucks per day, and the majority of the interstate system carrying over 5,000 trucks per day.
  - In 2002, there are two noninterstate highways that have road segments with over 2,501 trucks: Route 1 in Pennsylvania and Route 130 in New Jersey. The forecasted growth predicts that in 2035, two additional noninterstates will have over 2,501 trucks per day: Route 202 in Pennsylvania's Chester County and Route 206 in New Jersey's Mercer County.

Average Peak-Hour Speed

The following are observations about Figures 40 and 41 (pages 60 and 61). These maps show average peak-hour speed as expected in 2002 and 2035 by the FAF 2. DVRPC determined three speed ranges for the purposes of these maps: under 35 mph (which would represent an extreme drop from the speed limit), 35 to 45 mph (which would represent slightly reduced flow), and over 45 mph (which would represent a relatively free flow of traffic). These maps only show roadways that were expected to have carried 500 trucks per day in 2002. Also, these maps reflect both passenger- and freight-related traffic.

The information contained in these maps also exists in the DVRPC Regional Simulation Model. This information is not on a local scale as the DVRPC model is, and thus is meant to merely supplement the data that DVRPC already produces. As with all the data contained in this report, the information in these maps assumes the current highway network, and does not take into account projects contained in the DVRPC 2035 Long-Range Plan. The data contained in these maps displays the need for additional highway infrastructure, which can be garnered through the Long-Range Plan projects.

- In 2002, I-95 had an estimated peak-period speed over 45 mph for a majority of the roadway. However, in 2035, it is forecasted that over 90% of roadway will have average peak-period speeds under 35 mph.
  - This is of particular concern because, according to the forecasts within the region, I-95 will be carrying between 5,000 and 20,000 long-haul trucks per day by 2035.
- The entire extent of I-76 and I-476 in Pennsylvania has a forecasted average peak-period speed under 35 mph in 2035.
  - In 2002, small sections of I-76 have average peak speeds under 35 mph, and the rest of I-76 has average peak travel speeds over 45 mph.
  - In 2002, the southern portion of I-476 has average peak speeds under 35 mph, but the rest of the roadway has peak travel speeds over 45 mph.

- Generally speaking, there is a dramatic shift in the average peak-hour speed from 2002 to 2035.
  - In 2002, the majority of the interstate sections are green, indicating speeds over 45 mph during peak periods; however, in 2035, the projects show the majority of interstate miles as red, indicating speeds under 35 mph during the peak periods.

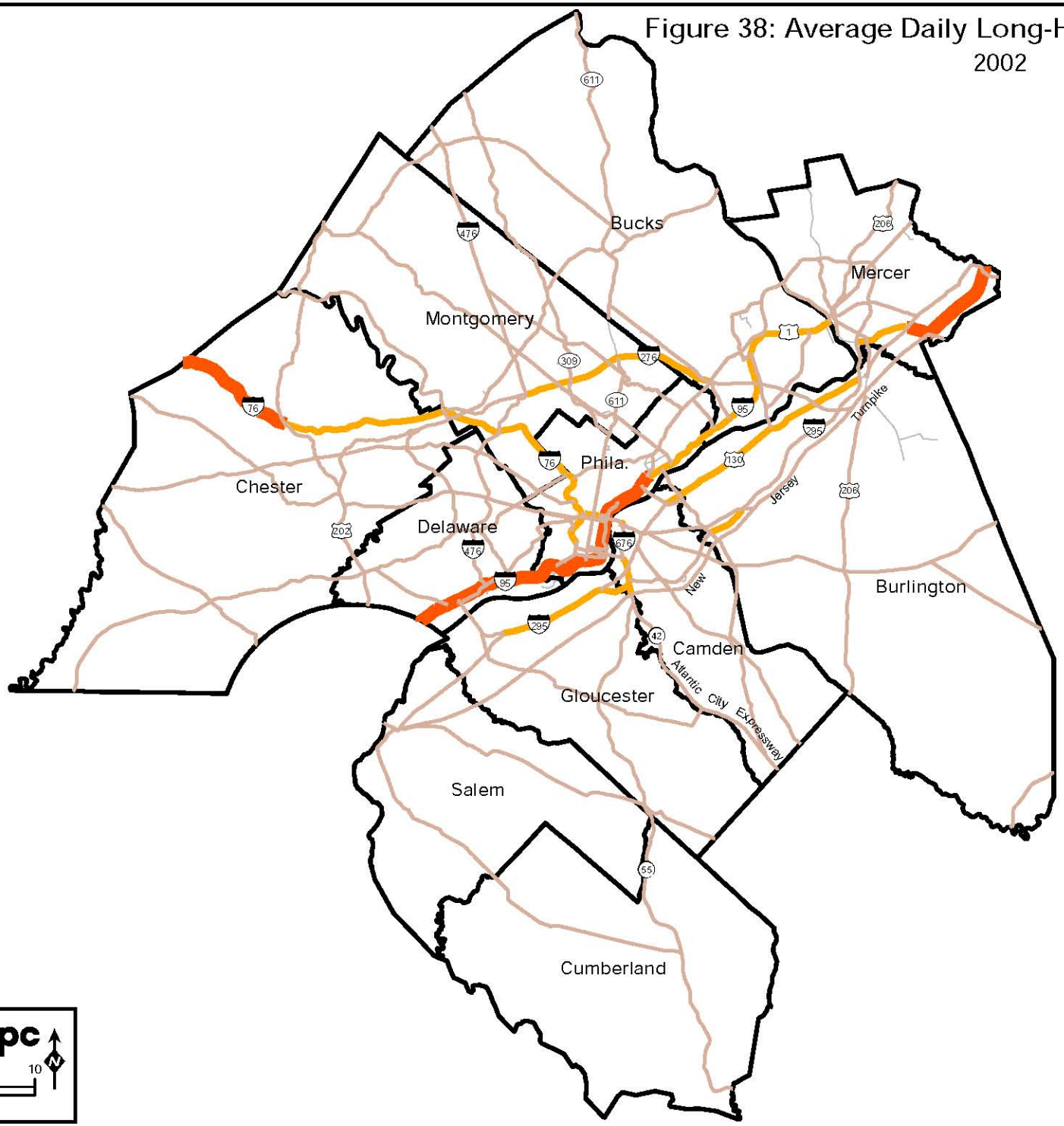
Estimated Peak-Period Congestion

Figures 42 and 43 (pages 62 and 63) show estimated peak-period congestion as measured by volume-to-capacity ratio. Volume-to-capacity ratio is defined as the ratio of demand flow rates to capacity for a given type of transportation facility. These maps show the ratio between the capacity of a roadway and the amount of traffic expected for that roadway. The higher the number of the volume-to-capacity ratio, the more congestion that roadway is expected to experience during peak periods. For this analysis, DVRPC designated three ranges: possessing capacity (a ratio under .75), nearing capacity (a ratio between .75 and 1), and exceeding capacity (a ratio over 1). These maps only show roadways that were expected to have carried 500 trucks per day in 2002. Also, these maps reflect both passenger- and freight-related traffic.

While these maps attempt to show peak-period congestion, they are derived very differently from DVRPC's Congestion Management Process (CMP). The CMP is a complete planning process developed to identify local corridors and subcorridors and take action to relieve congestion. These maps are created on a national level and are meant to demonstrate the increase in peak-period congestion that is forecasted if no changes are made to the highway network. They are created using mathematical formulas of highway capacity and highway volumes, which are assigned based on the commodity flow data contained in the report. They are not a substitute for local planning and local planning processes, such as the CMP. For more information on the DVRPC's CMP, please visit www.dvrpc.org/CongestionManagement.

- In 2035, during peak periods, the majority of the NHS system is forecasted to exceed capacity.
  - In 2002, most of the NHS roads that carry at least 500 trucks either possess capacity or are nearing capacity. Some of the roadways that are already exceeding capacity are: segments of I-76 in Philadelphia County, I-476 in Delaware County, a southern portion of US 202 in Chester County, a western portion of NJ 42 in Camden County, the northern segment of US 206 in Burlington County, much of I-276 in Montgomery County, and a small section of I-95 in Philadelphia County.
  - In 2035, all of I-76, all of I-276, most of I-95 in Pennsylvania, all of I-476, US 202 south of I-76, and large segments of I-295 will exceed capacity and carry between 2,501 and 20,000 trucks per day.

Figure 38: Average Daily Long-Haul Truck Movements
2002



dvrpc
0 5 10
Miles
N

No. of Trucks per day
- 0 - 2,500
- 2,501 - 5,000
- 5,001 - 10,000
- 10,001 - 20,000

Source: Freight Analysis Framework [FAF]

Figure 39: Average Daily Long-Haul Truck Movements
2035

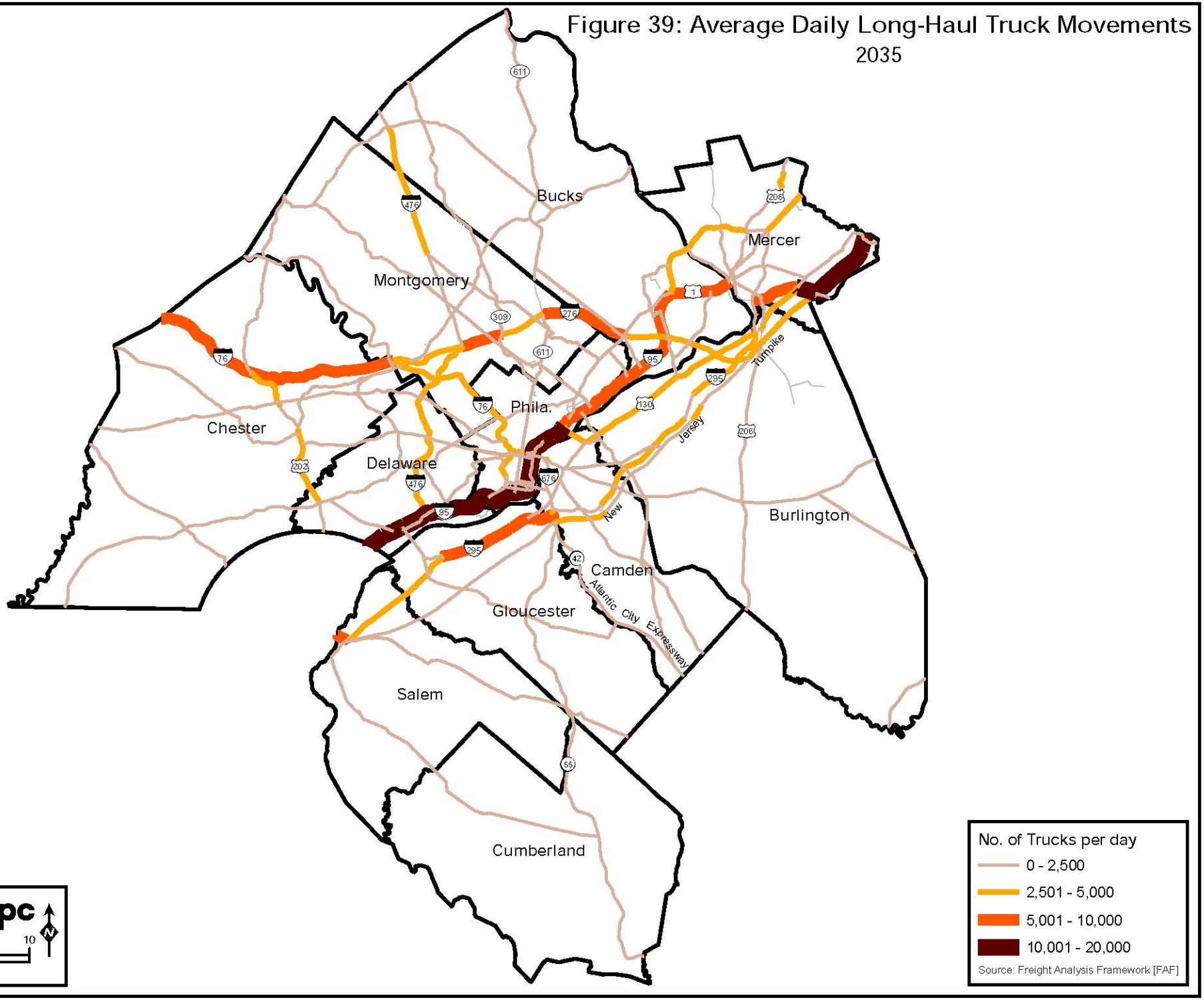
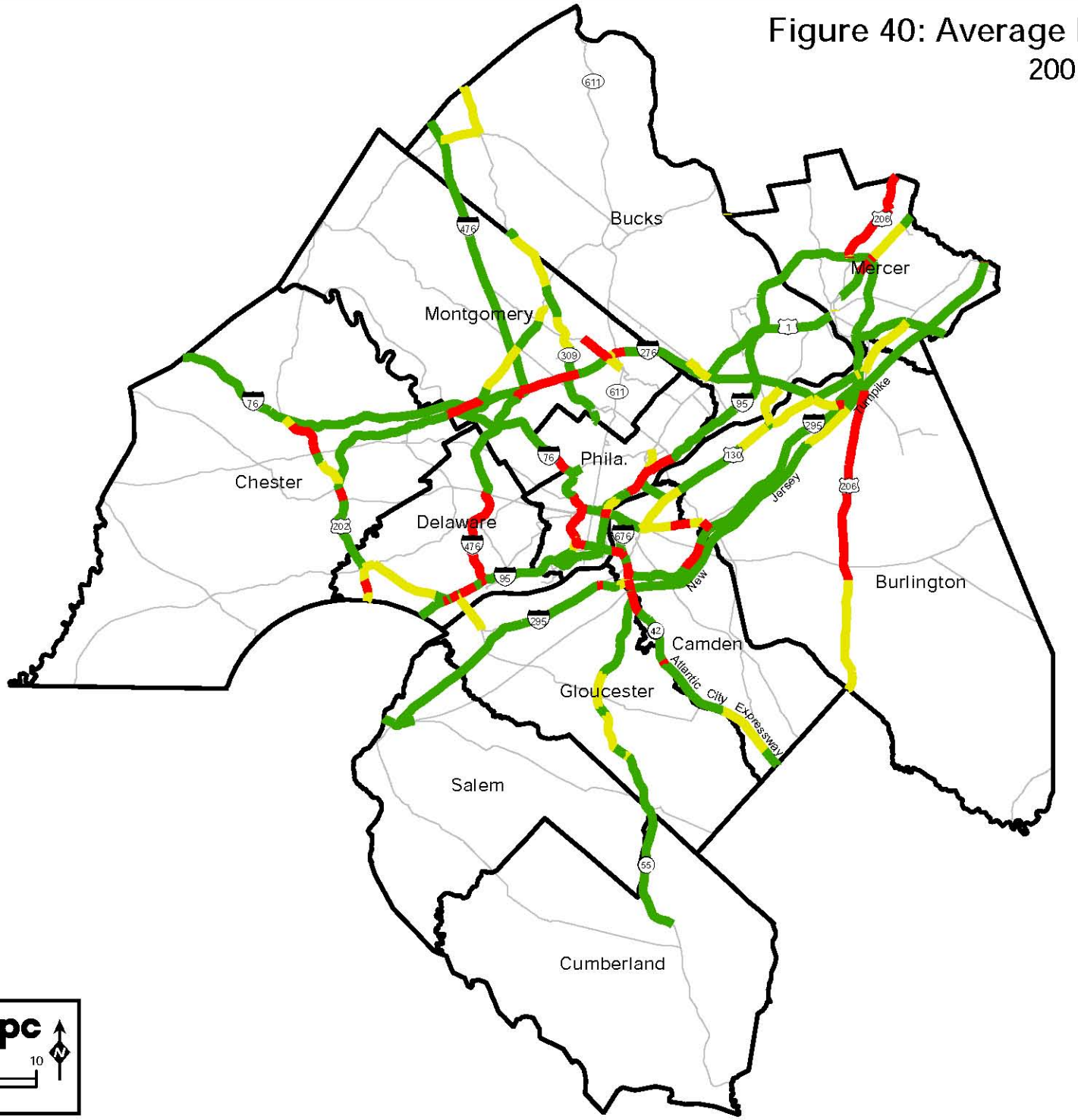


Figure 40: Average Peak-Hour Speed
2002

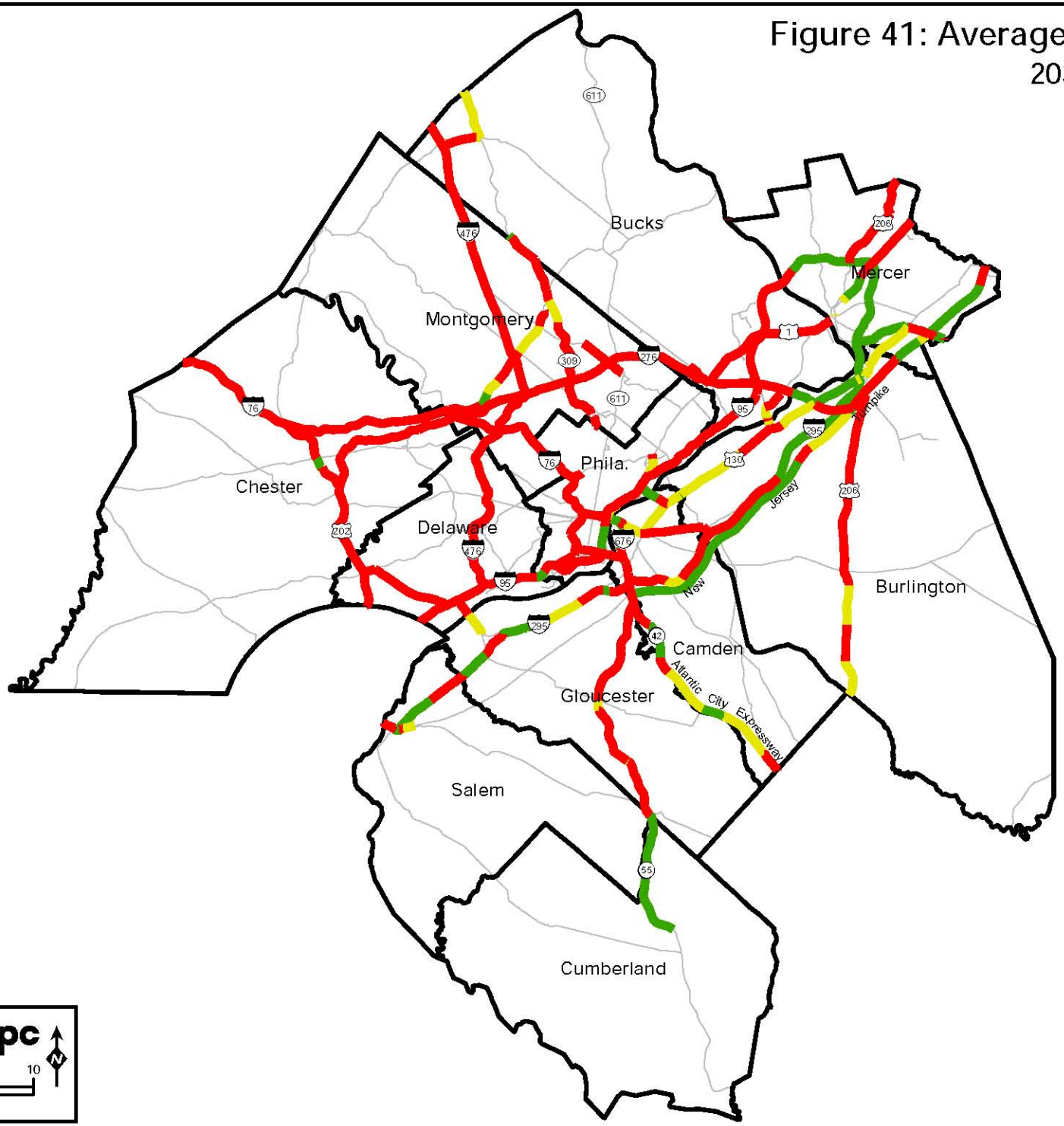


dvrpc
0 5 10
Miles
N

Speed in miles per hr.
- <35
- 35 - 45
- >45

Source: Freight Analysis Framework [FAF]

Figure 41: Average Peak-Hour Speed
2035



dvrpc

0 5 10

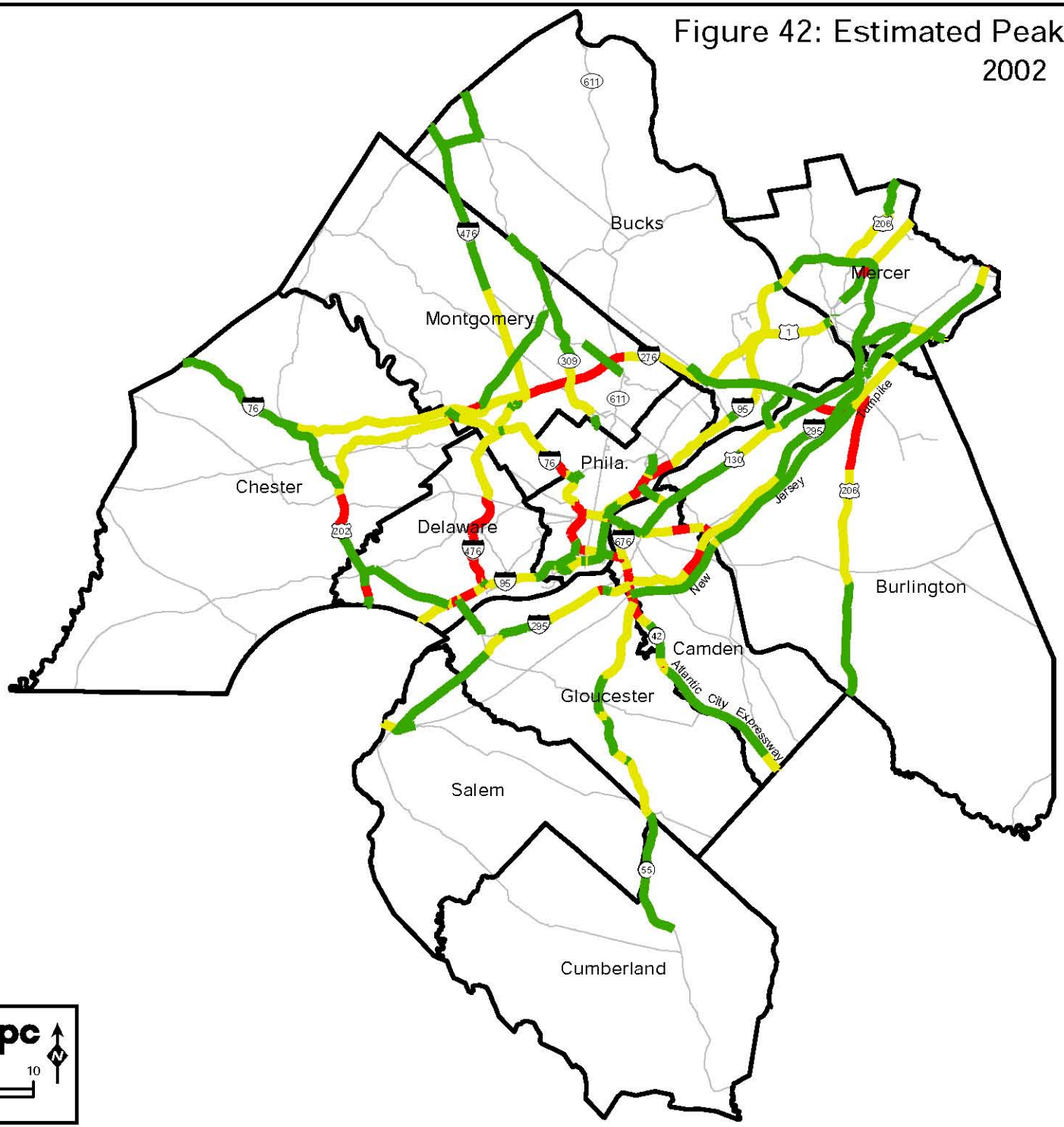
Miles

Speed in miles per hr.

- <35.00
- 35 - 45
- >45

Source: Freight Analysis Framework [FAF]

Figure 42: Estimated Peak-Period Congestion 2002



dvrpc

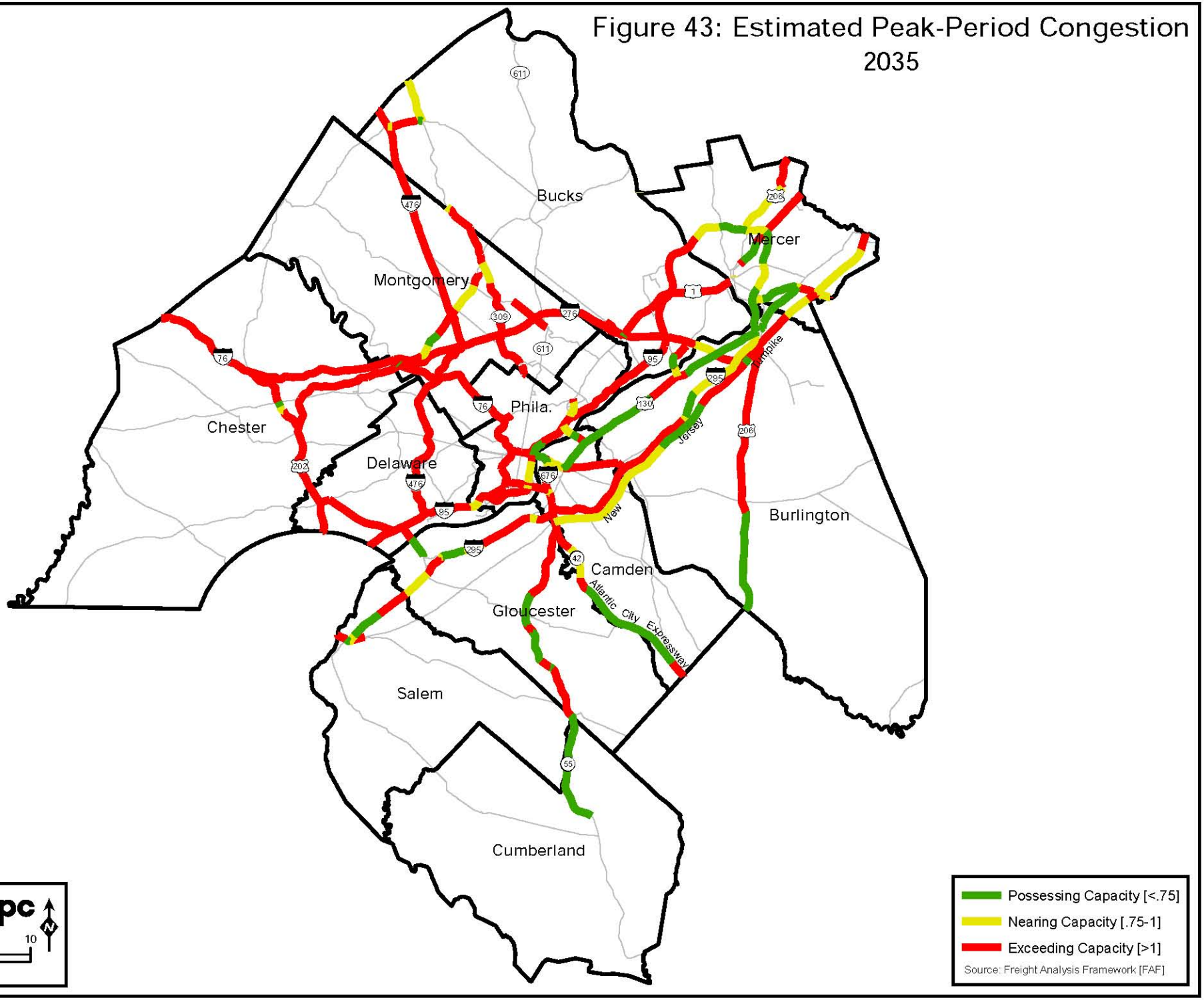
0 5 10

Miles

- Possessing Capacity [<.75]
- Nearing Capacity [.75-1]
- Exceeding Capacity [>1]

Source: Freight Analysis Framework [FAF]

Figure 43: Estimated Peak-Period Congestion
2035



CHAPTER V

SECTION V: KEY FINDINGS

Below are the key findings from the commodity flows and forecasts presented in this report. It is important to remember while reading the findings that they are based on the forecasts for the current transportation system and that they do not take into account any monumental potential changes, such as natural disasters, war, new capacity across a certain mode, or drastically increased energy costs.

Growth in the Value of Shipments

An important trend seen throughout this report is that the value of shipments is growing faster than the weight of shipments for the Philadelphia CSA. This is not a trend that is specific to our region. The "Freight, Facts and Figures: 2007" report, which compiles national FAF 2 data, shows value growing at a significantly faster rate than weight for the nation as a whole. National total value outgrows total weight 217 to 93 percent from 2002 to 2035, while locally, value outgrows weight 106 to 30 percent over the same 33-year time period. This will lead to an increase in total trips across all modes. As seen in the maps in Section IV, long-haul truck trips are projected to increase across the nation and region and, based on the origin and destination data, similar growth in trips for local truck movements, as well as movements across the other modes, should be expected to increase as well.

The region's growth being slower than that of the nation is directly attributable to the modest growth of population and employment in the region. The regional population is expected to grow 11 percent from 2005 to 2035, while the regional employment is forecasted to grow 13 percent over that same time period.[3] The growth in shipments by both value and weight outpace the growth in population and employment through the year 2035 for the Philadelphia CSA.

[3] DVRPC Analytical Data Report No. 14 August 2007. www.dvrpc.org/asp/pubs/publicationabstract.asp?pub_id=ADR14

The relocation of manufacturing jobs to other countries is one contributor to the increase in the value of goods being transported. Instead of raw materials and unfinished products being transported for assembly, the transportation system is being used to carry finished products. According to the Bureau of Labor Statistic's Occupational Outlook Handbook, there has been a major shift in job sectors, with total jobs in the goods-producing industry (manufacturing) declining and jobs in the service-providing industry growing. This shift has been happening since the 1980s and is expected to continue in the 2006 to 2016 period. More specifically, transportation and warehousing (which is not included in good-producing industry) are expected to grow by 11.1 percent from 2006 to 2016. The outlook shows service-providing industries with 15.7 million new jobs in the 10-year time period, while goods-producing industries are projected to decline 3.3 percent over the same time period.

Another cause for the increasing value of shipments is major shifts in supply-chain management. One example of these shifts is Just In-Time deliveries. The concept behind Just In-Time's business practices is that inventory is defined as a waste, so when stock gets low, the system automatically triggers the purchase and delivery of new stock to arrive at the precise moment that the old stock runs out. Originally developed for car assembly plants, Just In-Time has expanded to multiple sectors around the world. It puts increased pressure on carriers to have increased reliability because a late shipment can leave a store with no product in stock, or an assembly plant with nothing to assemble.

Other increasingly common supply-chain practices contribute to the increase in the value of shipments. Both Less Than Truckload (LTL) and parcel carriers have become a larger share of the freight market. These practices transport smaller goods and freight that can be broken down (typically to less than 150 pounds). These types of cargo tend to fall into the range of high-value/low-weight cargoes. One example of this is e-commerce. Instead of a truckload of goods being sent to a store for sale to customers, the customers are able to purchase the goods via the internet for direct shipment to their homes. The FAF 2 results lead to the assumption that these supply-chain practices will grow and lead to value growing at a faster rate than weight.

Air Freight and Other Intermodal

The value of all shipments traveling by both "Other Intermodal" and "Air & Truck" has forecasted growth that is significantly greater than that of value in general. In terms of value, the fastest-growing mode by far is air freight. Domestic air freight is projected to grow almost 300 percent, and international air freight is projected to grow over 600 percent. Air freight can be carried by dedicated freight planes, often courier owned, or as belly

cargo in passenger planes. These trends show that airport congestion is not just an issue in the movement of people, but in the movement of goods as well. As airport congestion is studied, the role of freight planes and belly cargo should be a strong factor in possible expansion and new facilities.

The value of other intermodal shipments moving into and out of the region domestically is expected to grow 183 percent from 2002 to 2035, according to the FAF 2 data. This equates to an almost tripling of the value of goods that are going to be moving into and out of the Philadelphia CSA's intermodal facilities. These facilities need highway and rail connections that allow for safe, secure, and efficient movements. These highway connections come by means of National Highway System (NHS) connectors, which are defined as roadways that link primary NHS routes to major intermodal facilities. The primary criterion to be deemed an NHS connector is the roadway must carry at least 100 trucks per day in each direction. NHS connecters were labeled as the weakest link in the nation's freight infrastructure. DVRPC systematically studied the region's intermodal connectors in 2001, and again in 2007, and determined that there were 11 eligible connectors with 30 miles of roadway. The freight flow data shows that the stress that truck traffic causes to connectors will continue to grow, and in order to have a safe, secure, and efficient regional freight network, the connector roadways need the recommendation put forth in the connector report.

Precision Instruments and Pharmaceuticals

The two commodities whose value the data shows to consistently outgrow total value are precision instruments and pharmaceuticals. The value of precision instruments is projected to grow 1,128 percent from 2002 to 2035. Precision instruments are comprised of optical elements that include eyewear, photographic and photocopying machines, instruments for medical, dental, and veterinarian surgeries, and instruments and apparatus that are involved in measurement and testing. The value of pharmaceuticals has a total growth projection of 128 percent from 2002 to 2035. While pharmaceuticals do not have the enormous growth projected for precision instruments, they are nonetheless one of the top commodities in 2002 and 2035.

Both of these commodities are directly linked to the health care industry, so it is clear from the FAF 2 data that the health care industry is projected to grow in value through 2035. The Philadelphia area houses many hospitals and is known for its strong health care presence. According to the Bureau of Labor Statistics, the health care sector is anticipated to grow 25 percent from 2006 to 2016, so the FAF 2 data for our region shows

a stronger rate of growth among freight shipments than national employment trends do for jobs. Also, according to the DVRPC report *Rating the Region: The State of the Delaware Valley*,[4] our region is one of the oldest in relation to other large metropolitan regions, with a current median age of 37.9 years, and it is forecasted to grow older. The aging of the nation and our region is largely responsible for the forecasted growth in the health care industry and corresponding forecasted growth in precision instruments and pharmaceuticals.

Growth of Inbound Traffic

Another overall trend seen throughout the data is the significance of inbound shipments. Domestic inbound shipments grow at a much faster rate than outbound shipments when measured by either value or weight, while international inbound shipments comprise a significantly larger portion of shipments than outbound international shipments do. The Philadelphia CSA, like the rest of the country, is increasingly reliant on goods that are produced from further and further away. The globalization of production has led to longer travel for goods from where they are manufactured to where they are consumed. Thus, the nation and our region are increasingly reliant on goods whose supply chain starts outside the region. These goods must be brought into the region by the freight network. The FAF 2 data merely projects the future trends, so it is clear that increasing growth of inbound traffic should be expected unless there are drastic changes in the global economy or in regional consumption patterns.

The growth of international inbound shipments will provide benefits and challenges to the Philadelphia CSA and the nation. International inbound weight is projected to grow 30 percent, but international inbound value is projected to grow 145 percent. The overall growth in inbound international shipments leads to increased pressure on the port facilities and land access routes serving the ports and host communities. Since this is a nationwide trend, the expectation that the ships delivering these goods will get bigger and bigger in order to gain more efficiency should become true. The proposed deepening of the Delaware River channel to 45 feet will be beneficial in the effort to capture some of this traffic. Additionally, the FAF 2 data assumes a 2002 infrastructure system; thus, the forecasts do not take into account any deepening project. It is possible that with a 45-foot channel, these forecasts could underestimate the growth that the Philadelphia CSA ports will experience through the year 2035.

[4] www.dvrpc.org/asp/pubs/publicationabstract.asp?pub_id=07043

The growing gap between inbound shipments and outbound shipments creates a logistical problem of having empty trips. These trips are best exemplified by the fields of empty containers seen at many intermodal facilities, especially port complexes, but they are merely a sign of a larger problem. When exports and imports are equal, it is possible to have trips out of intermodal facilities matched by trips into intermodal facilities. However, when imports are much greater than exports, there are many more shipments that need to leave the intermodal facilities than need to return to them. This is largely seen as an operational problem for the carriers only, but just because the trip is empty, it does not mean that it is not still producing the adverse air quality and community impacts that a full shipment would.

Energy

Throughout the FAF 2 data are signs that the Philadelphia CSA is a strong region for energy-related shipments. Modally, pipeline and unknown carry the second most tonnage based on the commodity data. It is clear that energy-related products rank highly in terms of both tonnage and value. Pipeline and unknown made up roughly 19 percent of total domestic shipments in 2002 and will make up 18 percent of total domestic shipments in 2035. These numbers are consistent with the national number from the Freight Facts and Figures report. However, for outbound tonnage, 50 percent of the Philadelphia CSA's shipments were made by pipeline and unknown and only three percent of the inbound tonnage was by pipeline and unknown. It is clear that the refineries and industry related to energy that is within the Philadelphia CSA serve an area much larger than the Philadelphia CSA. It is a reminder that freight has no borders and that state and regional agencies must work together on freight issues. Approximately 28 million people live within 100 miles of Philadelphia, and approximately 100 million live with 500 miles. It is probable that most shipments of energy-related goods that are leaving the region are not traveling across the country and are staying within 500 miles.

When looking at commodity tonnage, gasoline, coal, crude petroleum, and natural-gas-related products are well represented among all shipment types. Sixty-six percent of the tonnage moving through the Philadelphia CSA ports is crude petroleum, and it is all refined locally. The outbound tonnage is comprised of natural-gas-related and gasoline shipments, which comprise a total of 45 percent of the outbound tonnage. From this data alone it is clear that the Philadelphia CSA has a strong industry related to energy and that the industry is not just moving goods through the region, but also undertaking value-added activities. It is also clear that the energy sector of the Philadelphia CSA is serving a large portion of the country's population and should be considered nationally significant.

Trucking Remains Predominant Mode

Across every shipment type by both value and weight, truck is the predominant mode of transportation for the Philadelphia CSA and the nation. Most goods spend some time on truck because it is the most effective mode for short-distance shipments. It is generally not economically feasible to use rail for a shipment under 500 miles, and often, if a shipment uses rail, it still requires a truck to carry it to its final destination.

As seen in Section IV, the region's highways will experience strong growth in the amount of long-haul truck traffic through the year 2035. The greatest amount of long-haul truck traffic will be on I-95 running along the Delaware River. I-276 and the Pennsylvania Turnpike carry the most long-haul trucks for goods traveling east-west. At the same time, the three class-one railroads serving the region run roughly parallel to these main highway routes. This creates two natural freight corridors that have been identified by DVRPC. The corridor approach has been proven a successful way of managing freight flows in a region. By improving the facilities in the corridor and attempting to funnel freight traffic into those corridors, a region can reduce the impacts on other secondary roads and facilities.

All the freight data and forecasts indicate that the amount of trucks on the road should be expected to increase through the year 2035, and the Philadelphia CSA must plan accordingly. Due to their weight, trucks cause a lot of damage to the highway system. Funding needs to be made available for the regular maintenance of the highways, connectors, and bridges, so that trucks can travel in a safe and efficient manner on them. As mentioned before, the value of shipments should be expected to grow, thus the cost of trucks that sit in congestion will rise as well. If trucks are unable to meet shipment schedules, it will directly affect the economic development and well being of the Philadelphia CSA.

It is also important that the region continue to improve the quality of life for the people operating commercial vehicles. There are limited places for truckers to stop and have access to the basic necessities, such as bathrooms, showers, food, and a safe place to park their truck. Space is also needed for long-term truck parking. Due to the new hours-of-service guidelines, drivers must stop driving for 10 straight hours in every 24-hour period. The available truck parking in the Philadelphia CSA is already struggling to meet the demand, and as the number of trucks increases, so must the available parking spots. When no parking spots are available, truck drivers are forced to park in places that have major security and safety risks for both the drivers and the other users of those roadways. Currently, the Philadelphia CSA has three large private truck parking areas, all in New Jersey, and a number of small rest areas with limited truck parking spaces. A recent Pennsylvania statewide study found the state to be in a current deficiency of 4,400 truck parking spaces. The

findings of this study have led DVRPC to start its own study to look at where new spaces may be created in the region.

Interconnected Region

The vast majority of movements by both weight and value begin and end within the Philadelphia CSA. The data shows the region to be both a strong generator of shipments and a large recipient of shipments, and the complex interwoven fabric of the freight infrastructure allows for the majority of the goods to move around the region with minimal negative impacts. An important way that DVRPC has identified to maintain minimal negative impacts for those who use and surround the freight infrastructure is the adoption and use of "freight as a good neighbor" strategies. Some strategies include setting up a website and an '800' number for the community to contact with any questions or concerns. A full list of freight-as-a-good-neighbor strategies can be found at www.dvrpc.org/Freight/pdf/2006-03_FreightGoodNeighbor.pdf.

Uses

The FAF 2 data has uses for DVRPC beyond the production of this report. Conveniently, the FAF 2 forecasts project out through the year 2035, as does the new DVRPC Long-Range Plan. The freight element in the Long-Range Plan contains information from this report, and it is important that both the Long-Range Plan and the Transportation Improvement Program (TIP) continue to use freight data to influence project selection.

The FAF 2 data can also be used for specific studies to look deeper into any specific commodities, modes, or origins and destinations. For example, DVRPC used the data in a regional food plan in fiscal year 2009. Eight food-related commodities were aggregated to develop a profile of how food moves within, out of, and into the region. This profile will be used along with specific case studies to make up the transportation profile for food in the region. This is part of the Greater Philadelphia Food System Study. For more information, please visit www.dvrpc.org/Food.

This report will be distributed to DVRPC member governments to spread a greater knowledge of how freight moves in or through the region and how shipments are forecasted to grow. Finally, the FAF 3, with base year 2007, has been proposed for release in December 2010. The DVRPC 2012 fiscal year will provide an

opportunity to review FAF 3 data and determine if the regional outlook is any different than it was in regards to the FAF 2 data.

Overall Growth

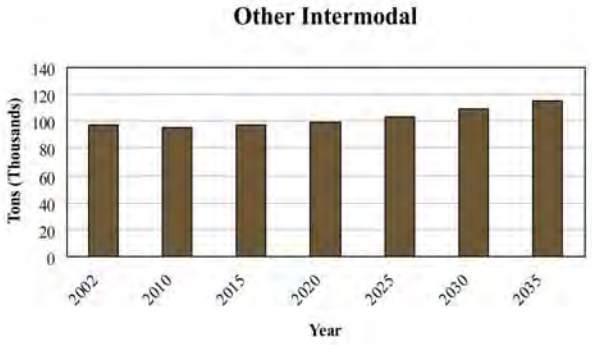
In conclusion, the Philadelphia CSA is forecasted to have roughly a doubling in the value of shipments moving both into and out of the region, and almost a doubling of inbound tonnage, with moderate growth in outbound tonnage. Overall, this data shows the importance that freight will have to the region's transportation infrastructure and makes strong arguments for continued freight planning in the future. The data should also be used in policy and funding decisions because of the importance of freight to the regional economy.

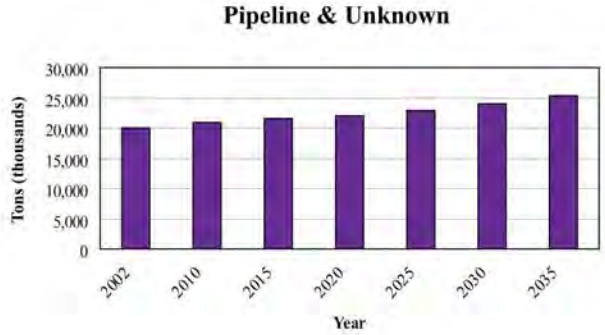
With modal splits that roughly mirror those of the nation, the region has a vast intermodal network on which freight can move, and the challenge going forward is to make the movement across that infrastructure as safe, secure, and efficient as possible. Total shipments should be expected to grow, which means that the amount of trucks, trains, planes, and ships should be expected to grow as well. In order to handle this growth, the region may need to expand existing capacity across all modes. It does not make sense to try to fix or expand one mode at a time. The system needs to work together in a way that maintains and expands all modes.

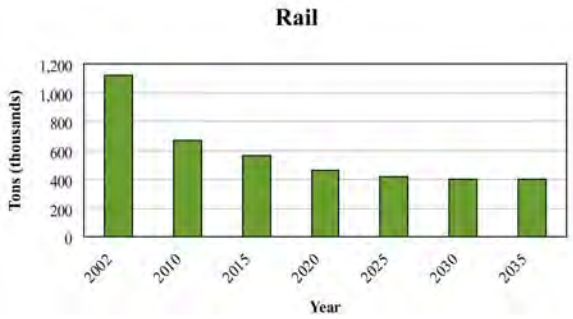
APPENDIX

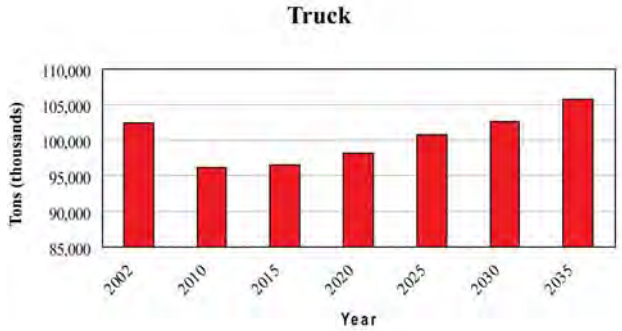
Modal Breakouts for Figures 8 through 13

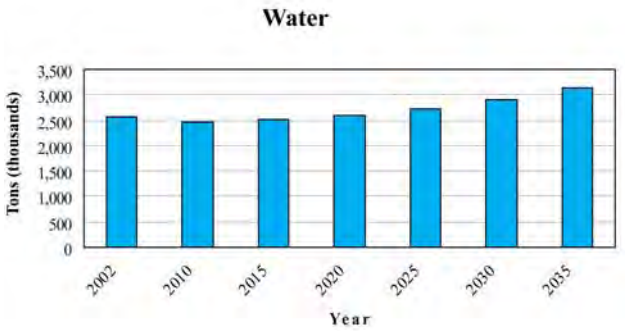
Breakout Tables for Figure 8: Weight of Intraregional Shipments





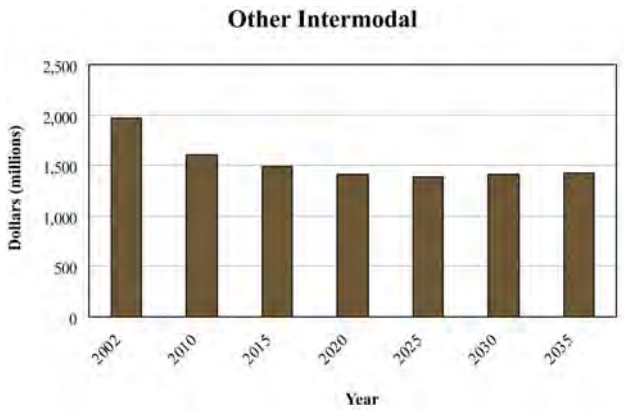


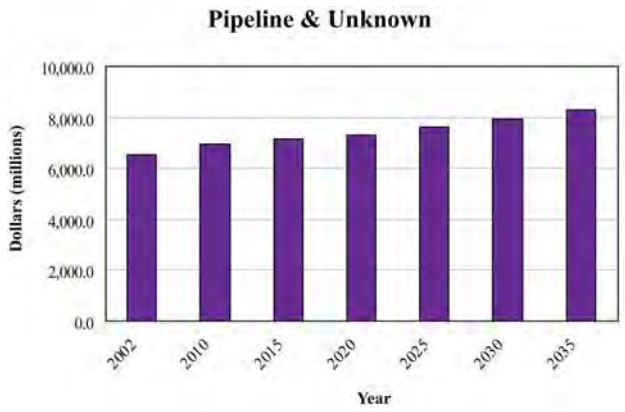


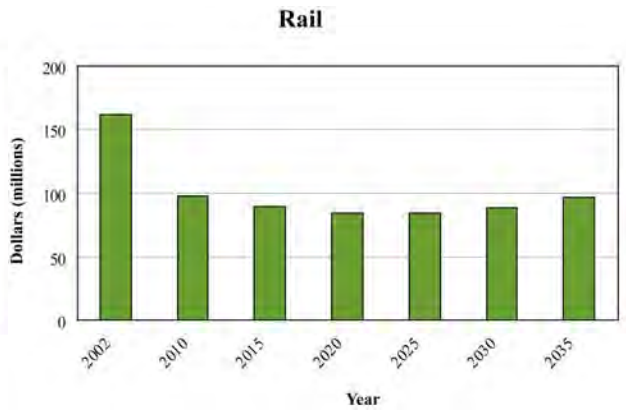


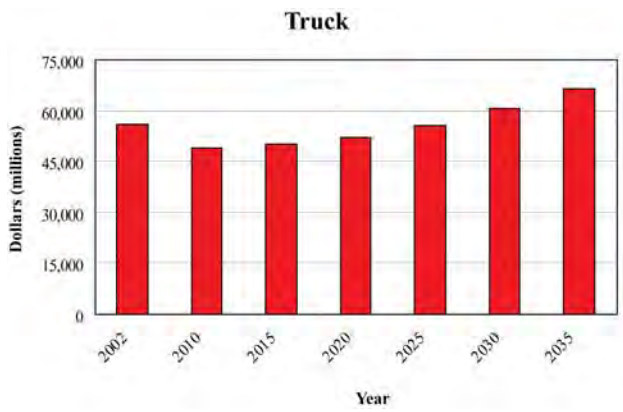
Source: FHWA Freight Analysis Framework

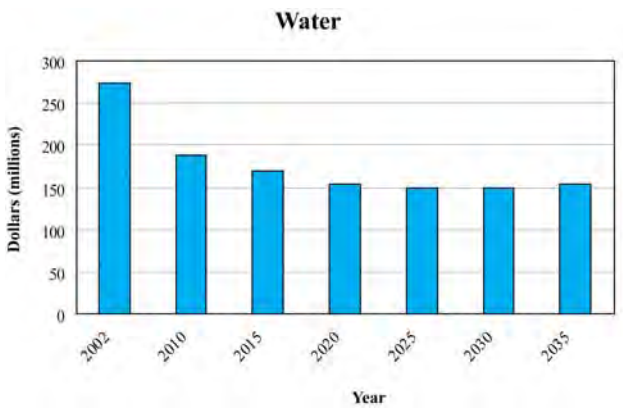
Breakout Tables for Figure 9: Value of Intraregional Shipments





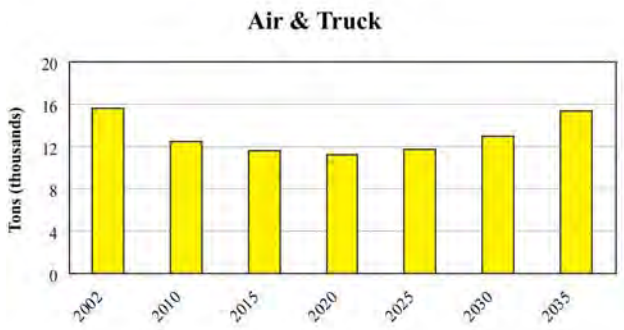


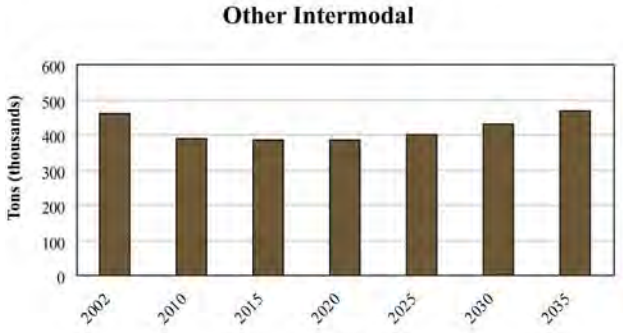


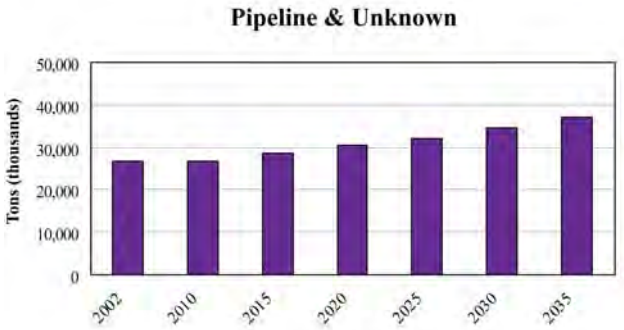


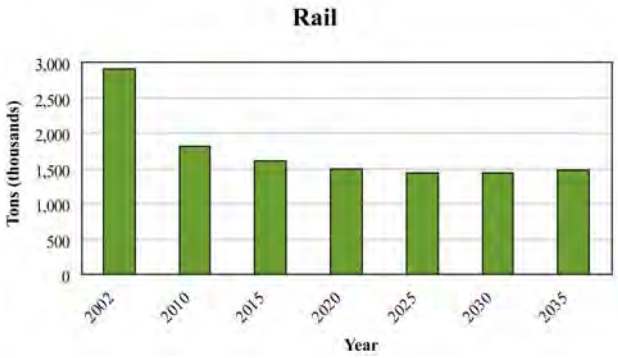
Source: FHWA Freight Analysis Framework

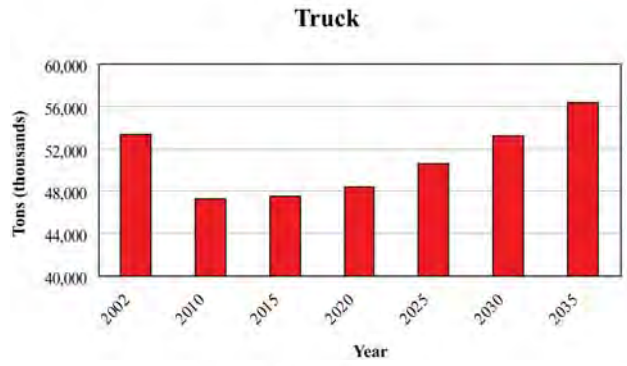
Breakout Tables for Figure 10: Weight of Outbound Domestic Shipments

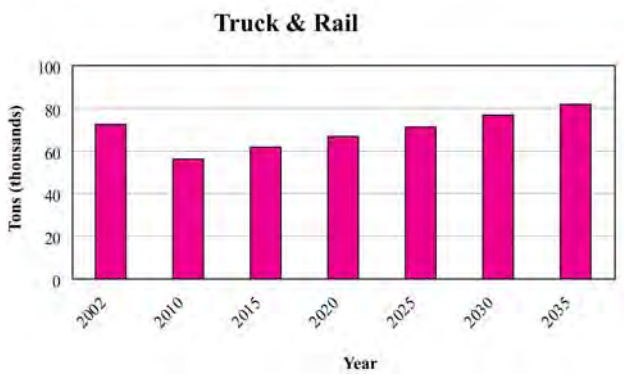


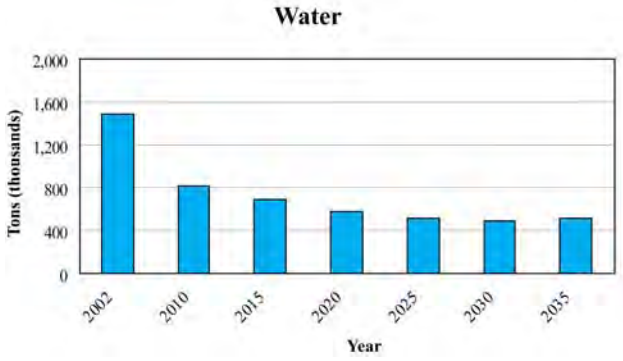






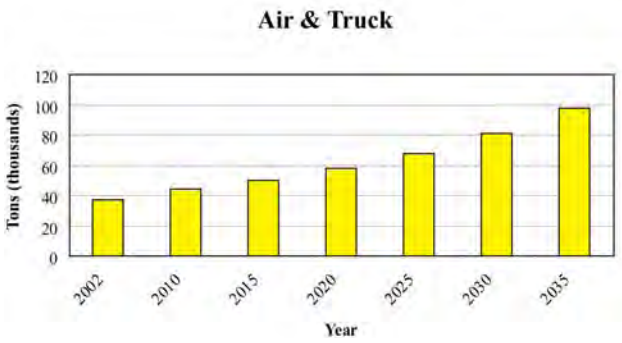


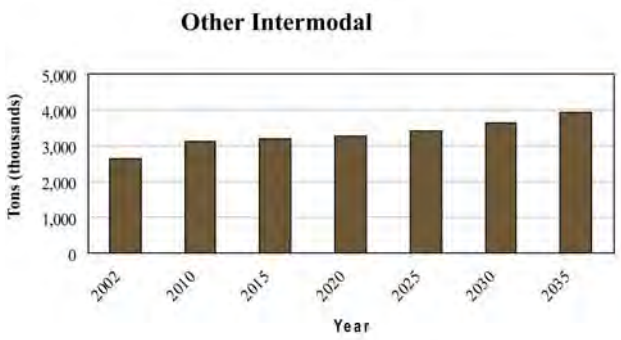


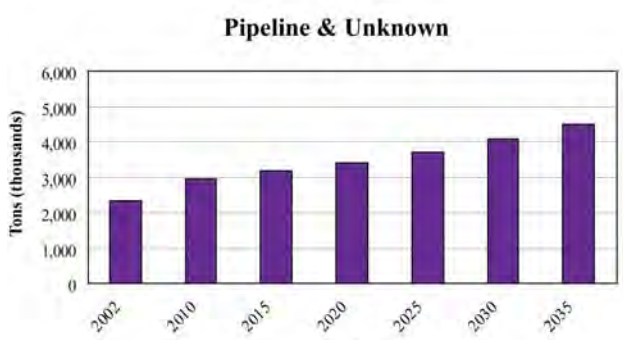


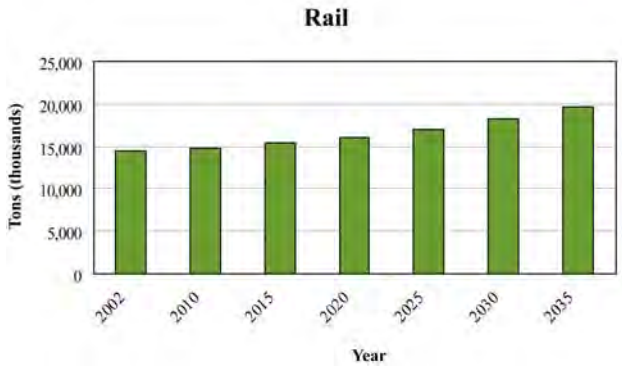
Source: FHWA Freight Analysis Framework

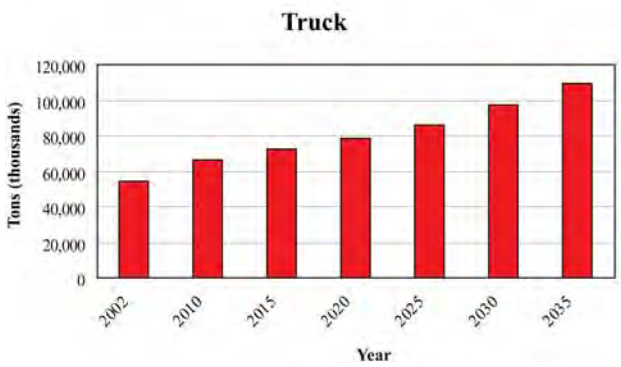
Breakout Tables for Figure 11: Weight of Inbound Domestic Shipments

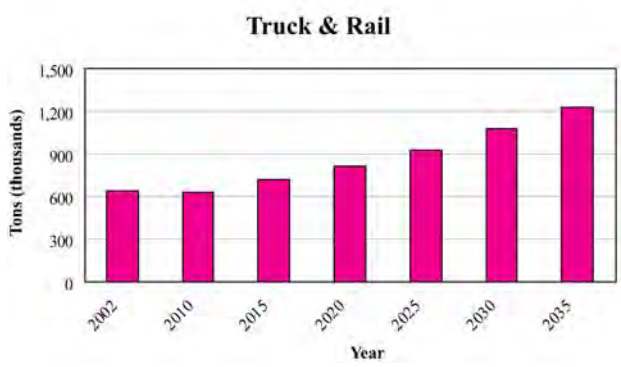


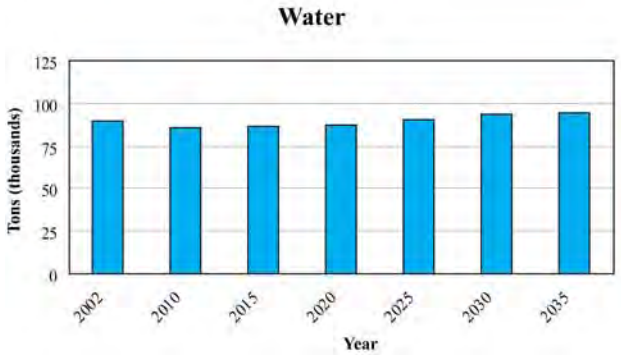






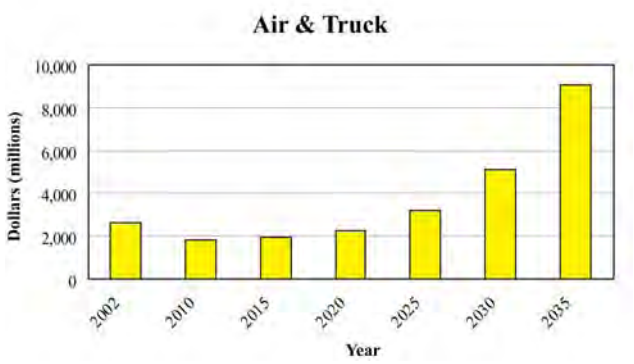


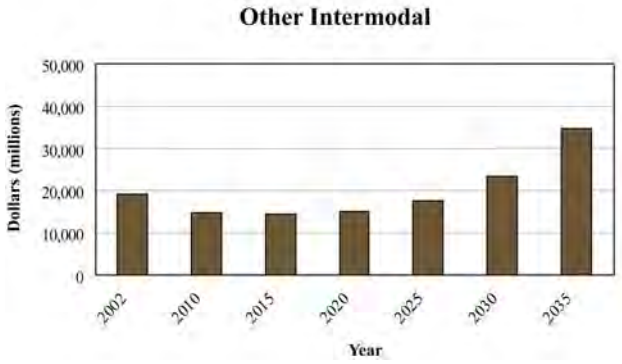


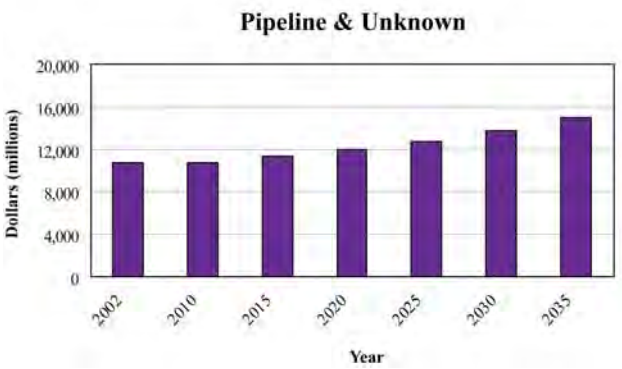


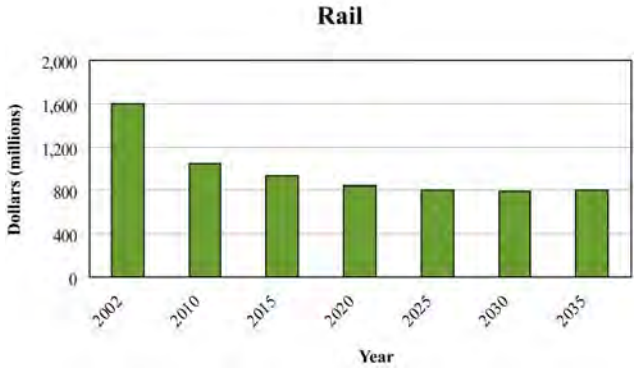
Source: FHWA Freight Analysis Framework

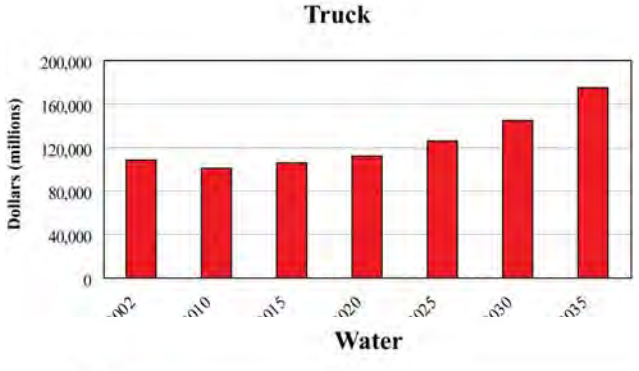
Breakout Tables for Figure 12: Value of Outbound Domestic Shipments

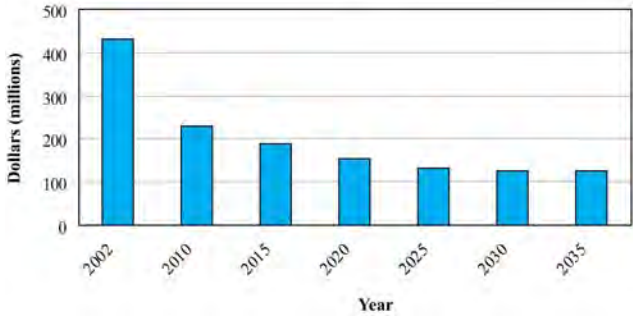






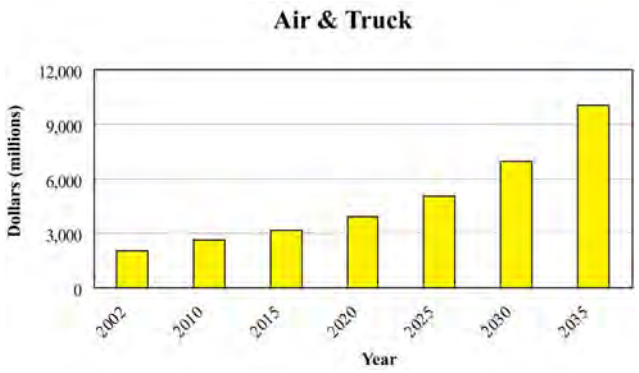


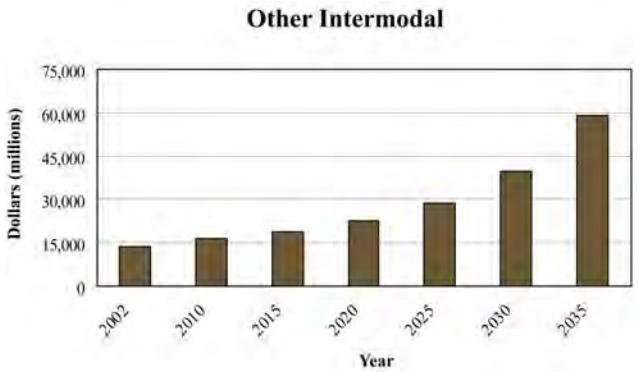


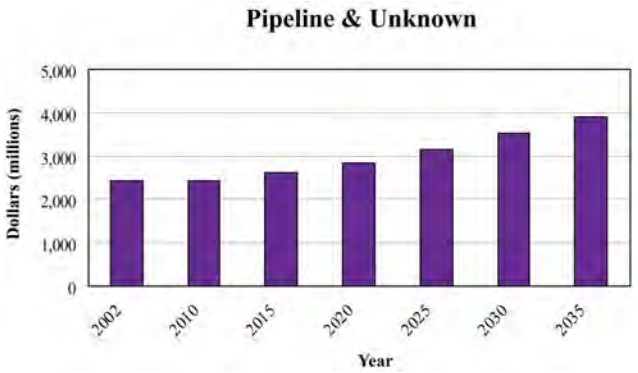


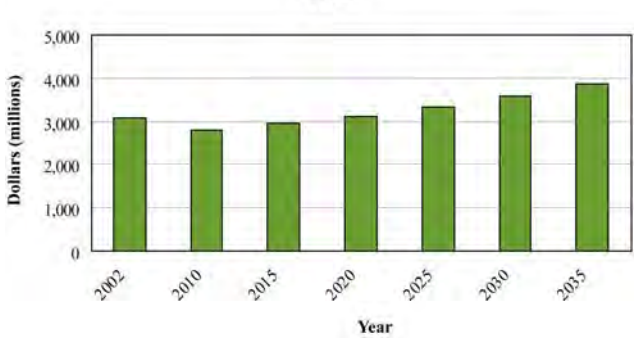
Source: FHWA Freight Analysis Framework

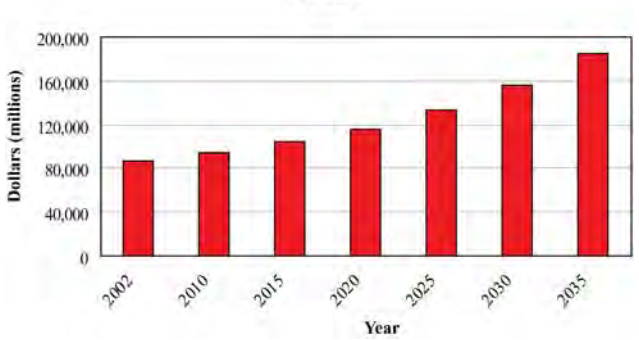
Breakout Tables for Figure 13: Value of Inbound Domestic Shipments

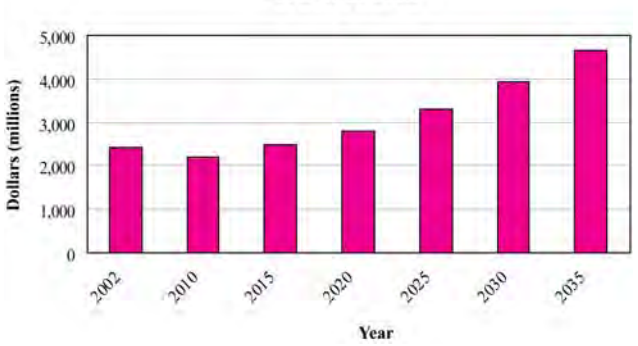


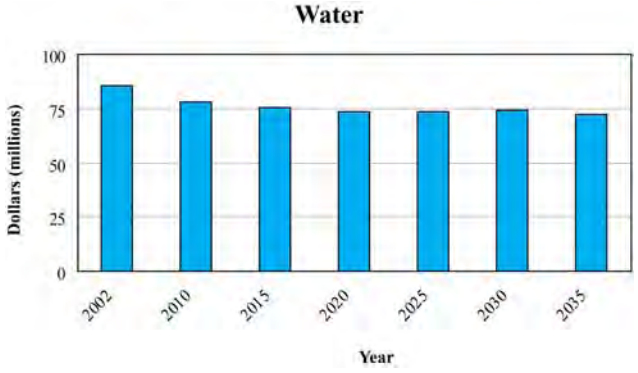












Source: FHWA Freight Analysis Framework

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Key Words: Commodity flows, origin and destination data, goods movement, truck travel.

Abstract: This study disaggregated a national level database of origin- and destination-based commodity flows down to the level of the Philadelphia CSA. Data is available based on origin, destination, mode, and commodity. Commodity flow data is an important tool for DVRPC in its freight planning efforts, as well as a tool for other DVRPC studies. All data is based in year 2002 and forecasted through the year 2035. This project was conceived of and supported by DVRPC's freight advisory committee, The Delaware Valley Goods Movement Task Force. The raw data that supports this report is available upon request.

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