

Regional Freight Commodity Profiles Study Final Report



prepared by
Cambridge Systematics, Inc.

with
Parsons Brinckerhoff, Inc.

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Disclaimer

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About the NJTPA

The North Jersey Transportation Planning Authority (NJTPA) is the federally authorized Metropolitan Planning Organization for 6.6 million people in the 13-county northern New Jersey region. Each year, the NJTPA oversees the investment of more than \$1 billion in federal funding for transportation projects and provides a forum for interagency cooperation and public input into funding decisions. It also sponsors and conducts studies, assists county planning agencies and monitors compliance with national air quality goals.

The NJTPA Board of Trustees includes 15 local elected officials, including one representative from each of the 13 northern New Jersey counties – Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, and Warren – as well as from the cities of Newark and Jersey City. The Board also includes the Commissioner of the New Jersey Department of Transportation (NJDOT), the Executive Director of NJ TRANSIT, the Chairman of the Port Authority of New York and New Jersey, a Governor's Representative and a Citizens' Representative appointed by the Governor.

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Acronym Glossary

CAGR	Compound Annual Growth Rate
CPI	Consumer Price Index
CS	Cambridge Systematics
DC	Distribution Center
FAF	Freight Analysis Framework developed by FHWA; There have been three releases of FAF: FAF1 with base year 1998 data; FAF2 with base year 2002 data; and FAF3 with base year 2007 data.
FFT	NJTPA's Freight Forecasting Tool
FHWA	Federal Highway Administration
FIC	NJTPA's Freight Initiatives Committee
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GSP	Gross State Product (also used for Garden State Parkway)
MAP-21	Moving Ahead for Progress in the 21 st Century; This is the current federal transportation funding and policy law.
MSW	Municipal Solid Waste
NAICS	North American Industry Classification System
NEC	Not Elsewhere Classified
NJDOT	New Jersey Department of Transportation
NJRTE-E	North Jersey Regional Transportation Model-Enhanced
O/D	Origin/Destination
PANYNJ	Port Authority of New York and New Jersey
R/ECON	Rutgers Econometric Model
RRF	Resource Recovery Facility
RTAC	NJTPA's Regional Transportation Advisory Committee
STCC	Standard Transportation Commodity Code
TAZ	Traffic Analysis Zone
WDC	Warehouse/Distribution Center

Executive Summary

The objective of the Regional Freight Commodity Profiles Study is to better understand commodity-specific logistics patterns in northern and central New Jersey, thereby allowing the North Jersey Transportation Planning Authority (NJTPA) to plan in a way that supports legacy and emerging industries.

This project advances the NJTPA's 2040 Freight Industry Level Forecasts Study, published in 2012.¹ That study broke new ground in freight data analysis and development of freight analysis tools. The products of the 2040 Freight Industry Level Forecasts Study are effective planning and stakeholder and public engagement tools. Over time, however, NJTPA and its members desired to have a fuller understanding of how specific commodity groups, especially those most critical to the region's economy, move throughout the region.

The ability to collect, manage, and analyze data within or between groups of commodities enhances the intelligence of transportation planning in the NJTPA region, and supports three important dimensions of NJTPA's planning activities by:

1. Supporting planning for the needs of legacy and emerging industries.
2. Supporting freight fluidity and performance-based planning.
3. Preparing NJTPA to comply with the recommendations and requirements specified in Moving Ahead for Progress in the 21st Century (MAP-21), which the next transportation reauthorization law will likely maintain or expand.

Further, understanding the effects and importance of commodity logistics is critical, not only to ensure the accuracy of the regional transportation planning process, but also to effectively communicate the importance of freight and of key industry sectors' transportation needs to the region's freight stakeholders, businesses, communities, residents, and funding decision-makers.

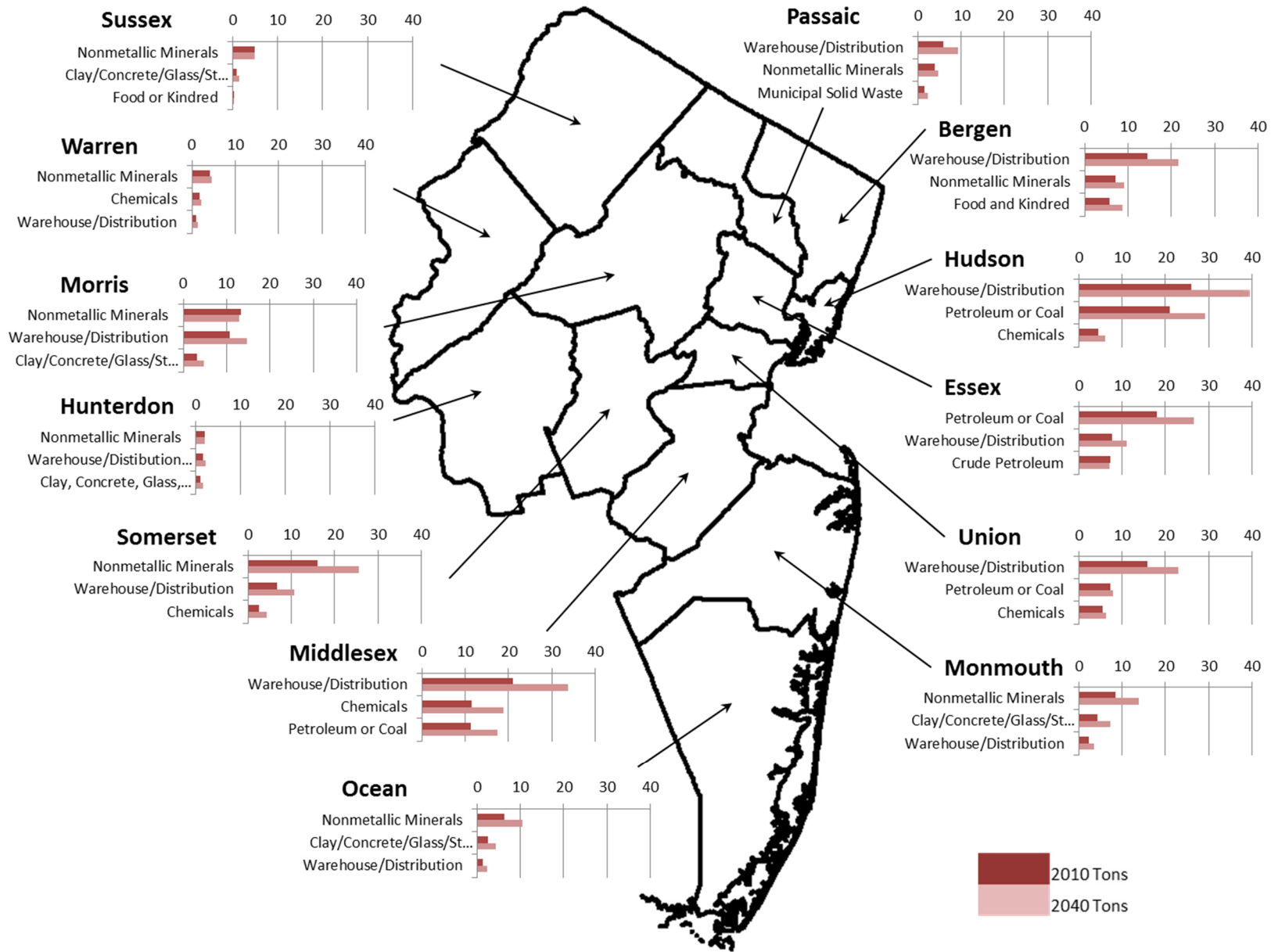
The end product is a set of analysis tools and summary documents that identify "key commodity groups and their subgroups, their points of origin/destination, key distribution facilities, the modes that move them into, out of and through the NJTPA region and the routes they use."

To meet the study's objectives, the Study Team, consisting of NJTPA, Cambridge Systematics, and Parsons Brinckerhoff, completed the following tasks:

¹ More information about the 2040 Freight Industry Level Forecasts Study, including the Final Report, is available on the NJTPA website, at: <http://www.njtpa.org/Planning/Regional-Studies/Recently-Completed-Studies/2040-Freight-Industry-Level-Forecasts/2040-Freight-Forecasts.aspx>.

1. Enhance NJTPA's Freight Forecasting Tool to accommodate user-selection of individual or multiple commodity groups, to generate truck trip tables based on the commodity group(s) selected, and develop scripts that allow commodity truck trip tables generated by the FFT to be assigned to the NJRTM-E regional travel demand model network. This task produced a new version of NJTPA's FFT and NJRTM-E assignment scripts;
2. Use a variety of selection criteria and input from the project's Technical Advisory Committee (TAC) to identify and select a group of "Top 11 Regional Commodity Bundles" that were analyzed and reported upon throughout the remainder of the project. Queries of top commodity groups by weight, value of goods transported, projected change in weight and value between 2010 and 2040, and projected shift in modes used informed the selection process. Figure ES.1 illustrates the results of one such query as an example, showing the top three commodity groups in each county by weight in 2010 and 2040. The Top 11 Regional Commodity Bundles are listed in Table ES.1.

Figure ES.1 Top Three Commodity Groups by County (Millions of Tons), 2010 and 2040



Source: NJTPA Freight Forecasting Tool, 2012.

Table ES.1 Commodity Bundle Components

Bundle Number	Bundle Name	STCC Codes Included
1	Warehouse and Terminal Moves	50-Secondary Freight/Warehouse and Distribution; 46-Freight All Kinds; 39-Miscellaneous Products of Manufacturing; 42-Carriers or Devices, Shipping Containers, Empty Containers; 43-Mail; 41-Miscellaneous Freight Shipments; 44-Freight Forwarder Traffic; 45-Shipper Association or Similar Traffic; 47-Small Packages, Less-than-Carload, or Less-than-Truckload
2	Food and Beverages	20-Food or Kindred Products; 01-Farm Products; 09-Fresh Fish or Other Marine Products; 21-Tobacco Products, Excluding Insecticides
3	Textiles and Apparel	23-Apparel or Other Finished Textile Products; 22-Textile Mill Products; 31-Leather or Leather Products
4	Paper and Printed Materials	26-Pulp, Paper, or Allied Products; 27-Printed Matter
5	Waste	99-Municipal Solid Waste by Truck (estimated in FFT); 40-Waste or Scrap Materials; 48-Waste Hazardous Materials or Waste Hazardous Substances
6	Construction Materials	14-Non-metallic Minerals; 32-Clay, Concrete, Glass, or Stone Products; 24-Lumber or Wood Products, excluding Furniture; 10-Metallic Ores
7	Machinery, Electronics, and Transportation Equipment	37-Transportation Equipment; 35-Machinery, excluding Electrical; 36-Electrical Machinery, Equipment, or Supplies; 38-Instruments, Photographic Goods
8	Durable Goods	25-Furniture or Fixtures; 08-Forest Products; 19-Ordinance or Accessories
9	Energy	29-Petroleum or Coal Products; 11-Coal; 13-Crude Petroleum, Natural Gas, or Gasoline
10	Pharmaceuticals	283 -Drugs
11	Chemicals	28-Chemicals or Allied Products (other than those listed in Bundle 10)

3. Collect and analyze all available data on the composition, direction of movement, key handling facilities, modes used, and routes used to move each of the Top 11 Regional Commodity Bundles. The domestic commodity flow database contained within the FFT and several business location databases were available for this analysis. Telephone interviews were conducted with businesses that send, receive, and/or transport goods in each of the commodity bundles in order to collect information to fill in data gaps and to help the project team more fully understand the logistics chains of goods in each bundle. Table ES.2 presents summary statistics on each of the Top 11 Regional Commodity Bundles developed under this task.
4. Develop a set of Regional Freight Commodity Profile documents that summarize the data and outreach findings, and explain the story of freight demand and logistics patterns for each of the Top 11 Regional Commodity Bundles. The profiles are 12 pages in length and include charts, graphs, maps, tables, and narrative that clearly and concisely describe the component commodities in each bundle, the steps in the logistics chain, the transportation networks that connect those steps, and how the movement of goods in each bundle are likely to change in response to industry trends over time. Profiles for all 11 commodity bundles are available on [NJTPA's website](#).
- 5 and 6. Prepare documentation explaining research methods and findings, and conduct regular project management meetings and meetings with the TAC.

Table ES.2 Domestic Commodity Flows and Business Location Data Summary

Commodity Bundle	Millions of Tons, 2010	Value (billions of 2010 dollars)	Share of Regional Tons	Share of Regional Value	Mode Splits					Number of Business Establishments*	Square Feet of Space Occupied (millions)*
					Truck	Rail	Water	Air	Pipeline / Other		
Warehouse and Terminal Moves	132	937	19%	51%	92%	8%	<1%	<1%	0%	7,174	101
Food and Beverages	68	74	10%	4%	93%	7%	<1%	0%	0%	3,511	29
Textiles and Apparel	4	49	<1%	3%	96%	4%	<1%	0%	0%	7,175	101
Paper and Printed Materials	24	69	4%	4%	87%	12%	0%	0%	1%	732	11
Waste	37	14	6%	1%	66%	15%	19%	0%	<1%	84	<1
Construction Materials	169	49	25%	3%	98%	2%	<1%	0%	0%	1,515	11
Machinery, Electronics, and Transportation Equipment	22	306	3%	17%	92%	8%	<1%	0%	0%	1,649	30
Durable Goods	3	11	<1%	<1%	99%	1%	<1%	0%	0%	1,294	26
Energy	112	46	17%	3%	38%	4%	56%	0%	2%	125	3
Pharmaceuticals	2	14	<1%	1%	99%	<1%	<1%	1%	0%	1,015	9
Chemicals	57	158	9%	9%	73%	16%	11%	<1%	<1%	1,657	21

*Note: Some business establishments, and associated square footage, are assigned to more than one commodity bundle.

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

1.0 Introduction

This project advances the 2040 Freight Industry Level Forecasts Study, which was undertaken by the North Jersey Transportation Planning Authority (NJTPA) and published in 2012. That study broke new ground in freight data analysis and development of freight analysis tools. The key products of the study included:

- NJTPA's first Freight Forecasting Tool (FFT), which is an interactive spreadsheet model that forecasts freight travel demand given assumptions about economic and logistics factors that the user of the tool selects or enters into the tool; and
- A set of [16 freight profiles](#) (one for each of NJTPA's 15 subregions and one for the region overall), which provide summary-level overview of economic and freight trends and forecasts.

The products of the 2040 Freight Industry Level Forecasts Study are effective planning and stakeholder and public engagement tools. Over time, however, NJTPA and its members desired to have a fuller understanding of how specific commodity groups, especially those most critical to the region's economy, move throughout the region. The single commodity truck trip table that the FFT produced did not show the travel patterns of trucks carrying specific commodity groups, and how the travel patterns for one commodity may be changed with different user input scenarios tested using the FFT.

The ability to collect, manage, and analyze data within or between groups of commodities enhances the intelligence of transportation planning in the NJTPA region, and supports three important dimensions of NJTPA's planning activities:

1. It supports planning for the needs of legacy and emerging industries. Understanding the freight logistics patterns within the region is valuable, as it ensures that the regional transportation planning process is supportive, and not contrary, to the needs of key industries. This study supports effective communication of the linkages between commodity moves and key indicators of sustainability – including the health of critical legacy or emerging industries, and quality of life in the region.
2. It supports freight fluidity and performance-based planning. Information on supply chain performance is needed to support regional freight and economic development planning and investment. The public sector is accustomed to looking at the freight transportation systems and thinking about performance in terms of network and corridor capacity, infrastructure condition and safety. Public planners and engineers rarely have an opportunity to see the freight transportation system from the perspectives of freight shippers, carriers and receivers. Information on how supply chains perform from the perspectives of shippers, carriers and receivers is critical to knowing if supply chains are working or failing, and

to determining if and where public investment might improve performance.

3. Understanding freight fluidity and supply chain performance also prepares NJTPA to comply with the recommendations and requirements for freight transportation planning processes and performance-based planning specified in *Moving Ahead for Progress in the 21st Century* (MAP-21), which the next transportation reauthorization law will likely maintain or expand.

Further, understanding the effects and importance of commodity logistics is critical, not only to ensure the accuracy of the regional transportation planning process, but also to effectively communicate the importance of freight and of key industry sectors' transportation needs to the region's freight stakeholders, businesses, communities, residents, and funding decision-makers. In other words, planning information and public information are both important.

To develop these analytical and communications capabilities within NJTPA's Freight Planning program, the Regional Freight Commodity Profiles Study was prepared under contract to NJTPA and its participating subregions, gathering input and direction from the project Technical Advisory Committee (TAC) and other public involvement forums, including NJTPA's Regional Transportation Advisory Committee (RTAC) and NJTPA's Freight Initiatives Committee (FIC). Cambridge Systematics, Inc. was the lead consultant, in association with Parsons Brinckerhoff.

1.1 GOAL AND ORGANIZATION OF THIS PROJECT

The objective of the Regional Freight Commodity Profiles Study is to better understand commodity-specific logistics patterns, thereby allowing NJTPA to plan in a way that supports legacy and emerging industries. The end product is a set of analysis tools and summary documents that identify "key commodity groups and their subgroups, their points of origin/destination, key distribution facilities, the modes that move them into, out of and through the NJTPA region and the routes they use."

To accomplish this objective, the Study Team, consisting of NJTPA, Cambridge Systematics, and Parsons Brinckerhoff, completed the following tasks:

1. Enhance NJTPA's Freight Forecasting Tool to accommodate user-selection of individual or multiple commodity groups, to generate truck trip tables based on the commodity group(s) selected, and develop scripts that allow commodity truck trip tables generated by the FFT to be assigned to the NJRTM-E regional travel demand model network;
2. Use a variety of selection criteria and input from the project's TAC to identify and select a group of "Top 11 Regional Commodity Bundles" that w analyzed and reported upon throughout the remainder of the project;

3. Collect and analyze all available data on the composition, direction of movement, key handling facilities, modes used, and routes used to move each of the Top 11 Regional Commodity Bundles, and fill any data gaps using industry outreach and interviews;
4. Develop a set of Regional Freight Commodity Profile documents that summarize the data and outreach findings, and explain the story of freight demand and logistics patterns for each of the Top 11 Regional Commodity Bundles;
- 5 and 6. Prepare documentation explaining research methods and findings, and conduct regular project management meetings and meetings with the TAC.

1.2 ORGANIZATION OF THIS REPORT

The most significant findings from each of the major steps in the work process have been documented and compiled into this report, which is organized as follows:

- Section 1 - Introduction
- Section 2 - Freight Forecasting Tool Enhancements
- Section 3 - Top 11 Regional Freight Commodity Bundles
- Section 4 - Data Collection and Analysis
- Section 5 - Regional Freight Commodity Profiles
- Appendix A - List of Standard Transportation Commodity Codes (STCC)
- Appendix B - Updated NJTPA Freight Forecasting Tool Users Guide

In addition to this report, other deliverables have been provided to NJTPA under this contract, including:

- 11 Regional Freight Commodity Profiles (one for each commodity bundle)
- Enhanced Freight Forecasting Tool
- NJRTM-E Assignment script files
- GIS data, including:
 - Industry location data by bundle
 - Commodity flows by bundle by county
 - NJRTM-E model network shapefile with commodity trucks assigned to network links

2.0 Freight Forecasting Tool Enhancements

The NJTPA Freight Forecasting Tool (FFT) was originally developed by Cambridge Systematics and Parsons Brinckerhoff in 2012, under the contract to complete the 2040 Freight Industry Level Forecasts Study. The FFT is a user-interactive freight database that generates forecasted freight tons by origin and destination, based upon economic and logistics scenario assumptions and “what if” adjustments selected by the user.

The FFT also produces a commodity truck trip table corresponding to the selected scenario and applicable “what-if” adjustments. The table consists of numbers of annual truck moves between origins and destinations, at either the county or multi-county level based on the level of detail provided for in the Transearch database underlying the FFT. With post-processing to disaggregate the county-level truck trip estimates to traffic analysis zones, the resulting trip table can be run within the NJTPA’s NJRTM-E.

When the FFT was originally developed, the software platform for NJRTM-E was limited with respect to the number of separate trip tables (each corresponding to a particular type of vehicle or trip type) that could be run in the model. With subsequent improvements, that software now allows a much larger number of trip tables.

In addition, as part of the Regional Freight Commodity Profiles Study, the project team defined and evaluated eleven separate commodity “bundles” representing groups of closely-related commodities, as described in Section 3 of this report. In order to evaluate and display commodity truck flows directly related to these bundles, NJTPA requested the development of individual trip tables for each bundle. Two activities were completed to allow the FFT to produce commodity-specific truck trip tables and assign them to the NJRTM-E network—first enhancements to the FFT to make it produce the commodity-specific truck trip tables, and second, development of scripts that assign the truck trip tables to the NJRTM-E model network.

2.1 FFT COMMODITY TRUCK TRIP TABLES

As part of this project, the FFT has been significantly enhanced, so that it now produces customized data, on-demand, for twelve separate commodity truck trip tables – eleven corresponding to the defined commodity bundles, and one representing the remaining commodity types not assigned to any bundle. In parallel, processing routines to expand the FFT origin-destination tables to NJRTM-E zones have been developed. With these combined improvements,

NJRTM-E can now produce assignments and other model results for twelve separate commodity truck types, concurrently within the same model run. This is a capability that, as far as we know, is unique to NJTPA.

While developing and testing different methods to implement the enhancements, a key goal was to minimize the number of changes to the FFT. While the FFT has proven stable and robust in use, it relies on large data files and complex processes. Two upset risks were identified:

1. The possibility that additional functionality would significantly or even fatally impair processing speed; and
2. The possibility that added functionality might have unintended consequences for established functionality.

To address the first risk – processing speed – the team developed a method for integrating MSAccess files with MSEXcel files. The FFT is actually a single spreadsheet, written in MSEXcel, but with the ability to swap files in and out of MSAccess, its processing speed can be improved. We were happy to find this risk did not materialize; in the end, the FFT enhancements actually work well within the MSEXcel-only platform. However, the combined MSEXcel/MSAccess version represents a useful “QuickRun” alternative for “power users.”

To address the second risk – upset of existing functionality – the team focused on implementing the required enhancements at the very end of the processing chain, after all other steps had been performed. In the original FFT, production of the single truck trip table was the last calculation step performed. In the enhanced FFT, the successful approach was to:

- Expand the level of detail provided for in the production of that single truck trip table, so that the underlying contributions of individual commodity groups were visible and accessible;
- Add post-processing to sum the contributions of certain commodity groups into their respective bundles, for each origin-destination pair; and
- Where necessary, disaggregate commodity groups (which are reported in the FFT at the Standard Transportation Commodity Code (STCC), at STCC-2 level of detail) into finer levels of commodity detail, so that 2-digit groups could be split across different bundles.

These functions were implemented within the same worksheet as the previous single truck trip table, and are triggered by the same macro command used to generate the previous single truck trip table.

The “User Inputs” screen – basically, the primary user interface area for the FFT – was updated so that it displays the truck trip results associated with each of the twelve commodity groupings, rather than a single line for all truck types. There is also a cell that validates and reports that the calculations have been successfully implemented. Both annual tons and loaded truck trips per day are reported; as in the previous version, the user can enter and change the conversion factors for tons per truck and days per year, and the calculations will automatically update.

With this approach, all other functions and mechanisms of the original FFT were preserved without modification. Details on how to use this enhanced FFT functionality are documented in Appendix B, the 2015 update to the FFT User Guide.

2.2 NJRTM-E ASSIGNMENT PROCESS

Prior to the implementation of the enhancements described in Section 2.1, the NJTPA Freight Forecasting Tool (FFT) heavy truck trip table was assigned to the North Jersey Regional Transportation Model-Enhanced (NJRTM-E) using assignment scripts that process the heavy truck trip table and assign heavy truck volumes to network links using CUBE software. Because the enhanced version of the FFT generates commodity-specific truck trip tables, new scripts were written to process and assign these additional truck trip tables. Since the completion of the 2040 Freight Industry Level Forecasts Study in 2012, a new version of the CUBE software, CUBE version 6, was released and acquired by NJTPA. CUBE version 6 increased the limit of trip tables that can be input during assignment from a limit of 20 tables to the ability to assign up to 99 tables. This means that all of NJTPA's vehicle classes, plus truck trip tables for each of the 11 commodity bundles identified in Section 3.3 can be accommodated.

Like the scripts written for the original FFT, these new scripts match the TRANSEARCH geographic zones in the truck trip table output with traffic analysis zones (TAZs) in the NJRTM-E network, and, for flows to or from locations outside the NJRTM-E model region, to appropriate external station. The scripts generate a CUBE truck trip table in origin-destination format, where origins are NJRTM-E TAZs or external stations, where destinations are NJRTM-E TAZs or external stations, and where the flow unit is truck trips by different commodity groups.

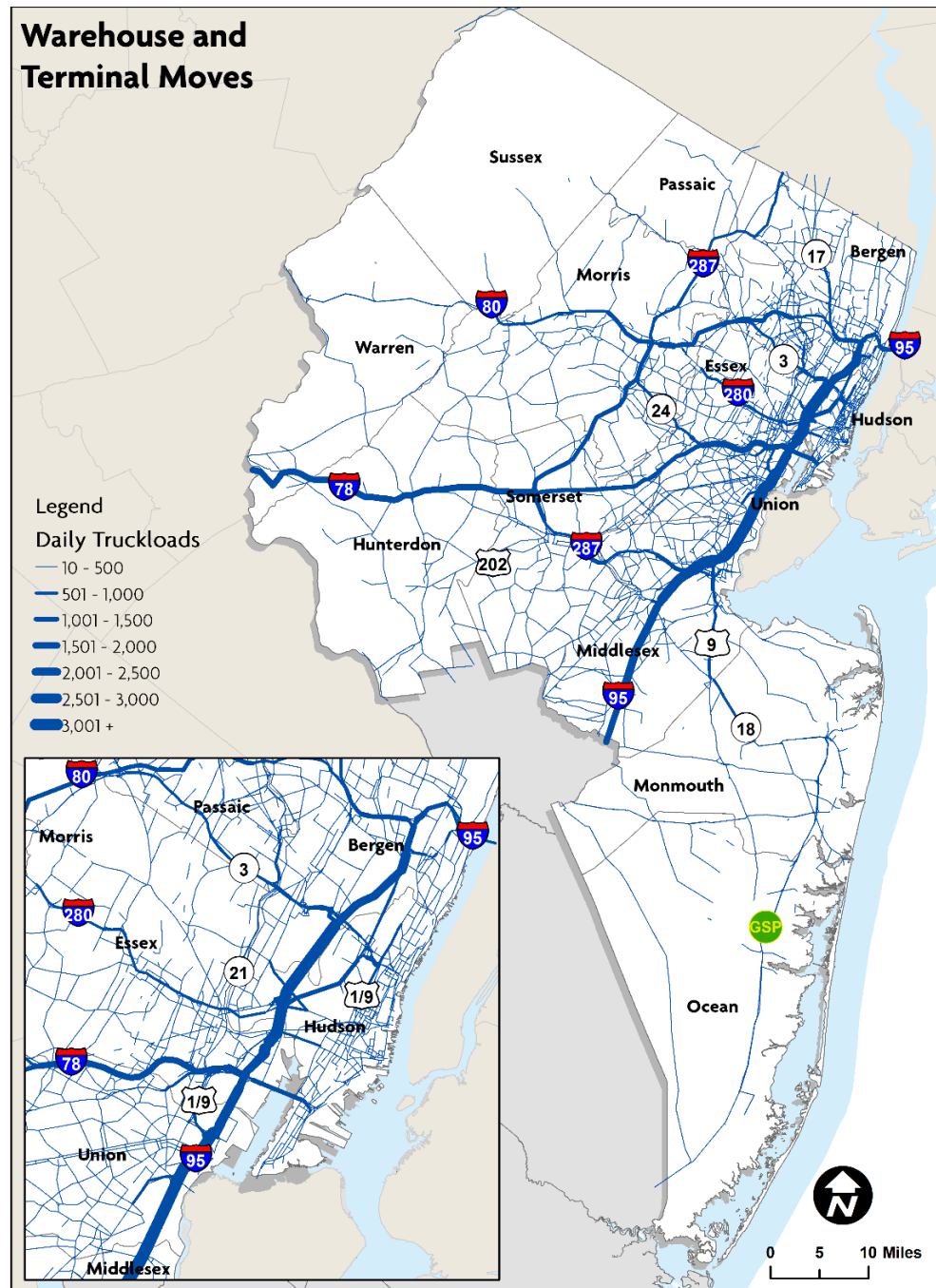
Three scripts were produced, one which transforms the FFT truck trip table into TAZ-level truck trip matrices, a second, which adjusts the truck trip matrices to correspond with the NJRTM-E truck trip table, and a third, which assigns the adjusted truck trip matrices to loaded time-of-day highway networks and produces network files with the commodity truck volumes on the network links.

Running these scripts allows the user to produce an illustrative, all-or-nothing assignment of truck trip tables for each of the 11 commodity bundles, plus all other commodity trucks, to a loaded NJRTM-E network for the appropriate analysis year.

Figure 2.1 illustrates an example of a commodity truck assignment produced by this assignment process in CUBE, the software application NJTPA uses to run the NJRTM-E, assigning a 2010 commodity truck trip table for warehouse and terminal moves to the 2010 NJRTM-E loaded network. Similar maps, developed for each of the Top 11 Regional Commodity Bundles, were prepared and presented in the Regional Freight Commodity Profile documents described in Section 5.

CS also developed an assignment of 2040 truck trip tables to the 2040 NJRTM-E loaded time-of-day networks. Appendix B demonstrates how a 2040 freight forecast and truck trip table can be developed using the FFT and assigned to the 2040 NJRTM-E time-of-day networks.

Figure 2.1 NJRTM-E Assignment Example: Bundle 1, Warehouse and Terminal Moves, 2010



3.0 Top Commodity Groups

The analysis performed in this study aims to achieve a fuller understanding of key commodity groups that move in the NJTPA Region. Determining which commodity groups qualify as “top commodity groups” was the objective of this task, which involved analysis and input from the TAC. A wide range of criteria could be used to identify and select a set of “top” commodity groups (ultimately eleven groups were selected). The definition of a “top” commodity group could include reference to the commodity groups that represent:

- The greatest shares of goods moved in the region by weight or value;
- The groups projected to grow by the greatest rate by weight or value between 2010 and 2040;
- The groups ranking among the top by weight by county;
- Those expected to change in modal utilization, thus representing changing transportation needs over time;
- Those related to key legacy industries or emerging industries in the region; or
- Any number of other regional or subregional priorities.

The consultant team and NJTPA staff, referred to collectively as the “Project Team,” worked together and engaged the project’s TAC in the following work steps, which were employed to identify and select eleven commodity bundles that were analyzed and reported on throughout the remaining tasks of the study:

- Review commodity flow and economic data in the FFT;
- Organize commodity groups into logical bundles of related commodities;
- Prepare “ranking lists” of the commodity bundles against several selection criteria; and
- Consult with the project TAC to revise the logical bundles and select the top bundles that would be analyzed in greater detail.

The Project Team performed queries of the data in the Freight Forecasting Tool to identify which commodity groups would rank among the top ten in each of the criteria identified above, and to determine whether a core group of commodities ranked high across multiple criteria.

3.1 REVIEW COMMODITY FLOW DATA IN FFT

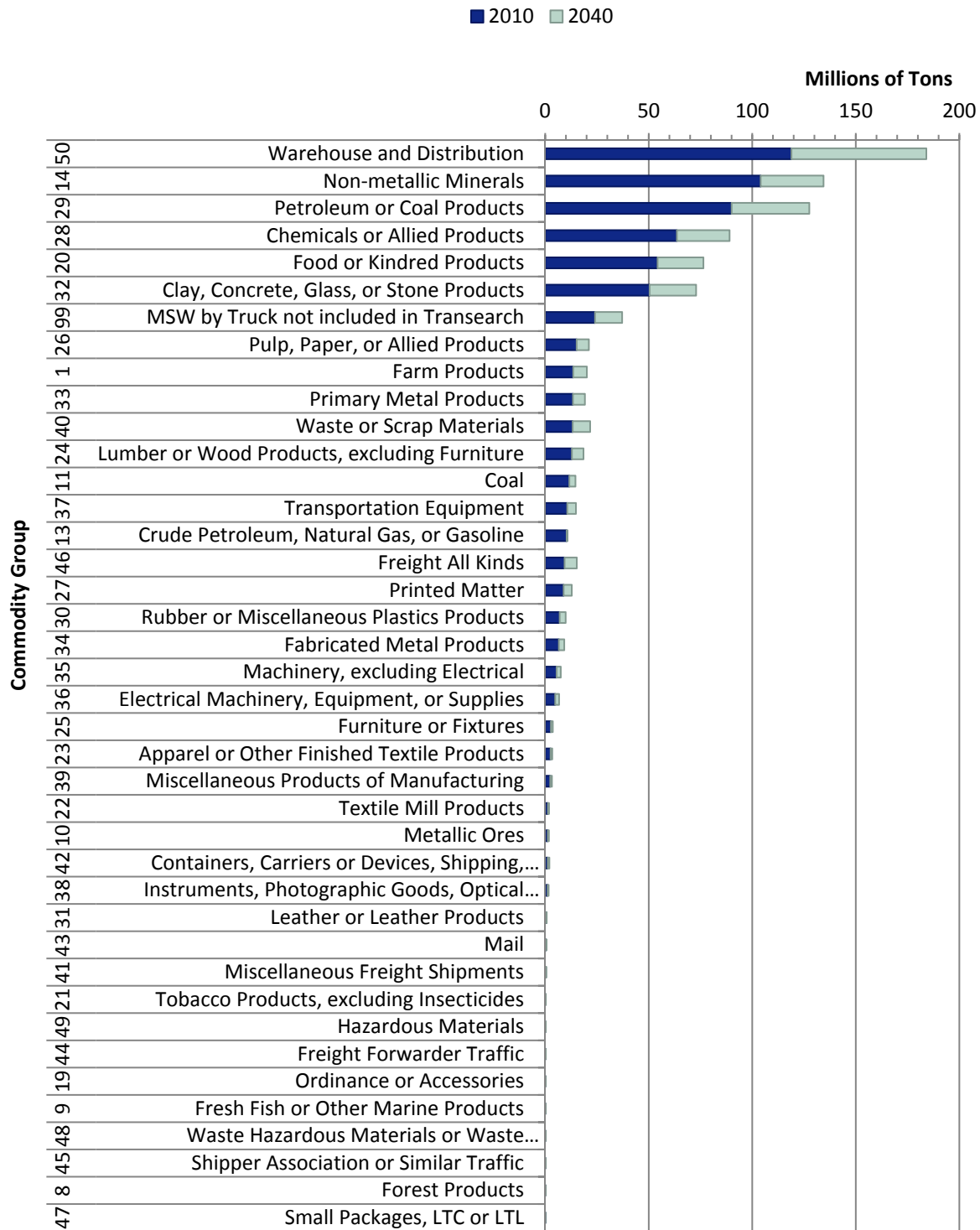
The study team performed a series of high-level query analyses of the commodity flow and economic data and forecasts, which are inputs to the Freight Forecasting Tool, to identify top commodity groups which met several basic criteria. Commodity data, grouped by two-digit standard transportation commodity code (STCC)² were queried and arranged into ranked lists by:

- Greatest tonnage (2010 and in 2040), as Figure 3.1 shows;
- Greatest value (2010 and in 2040), as shown in Figure 3.2;
- Greatest forecasted growth in tonnage, 2010-2040, as Figures 3.3 and 3.4 show;
- Greatest forecasted growth in value, 2010-2040, as illustrated in Figures 3.5 and 3.6;
- Greatest forecasted mode shift, 2010-2040, shown in Figure 3.7. For example, a significant shift in inbound crude petroleum to Bayway Refinery from international sources by water to domestic sources by rail could impact the operations of the rail network, requiring new investments in infrastructure, and bring to light public safety issues associated with transporting hazardous materials by rail. Identifying potential future shifts in modes will help the region's stakeholders plan for these types of issues;
- Commodity groups that are key inputs and outputs serving the top 10 industries in the region by employment (the top ten industries and related commodities are listed in Table 3.1); and
- Commodity groups that are key inputs and outputs serving the region's top projected "growth" industries, according to the R/ECON model forecasts in the Freight Forecasting Tool (see Table 3.1).
- Top three commodity groups by weight by county, to identify any patterns in the regional distribution of commodity flows that could signify differing subregional priorities, as shown in Figure 3.8.

These queries produced many "top 10" lists, which were used to inform the process of selecting the criteria factors, or combination of factors, that are most important to reflect in the analysis performed later in this study.

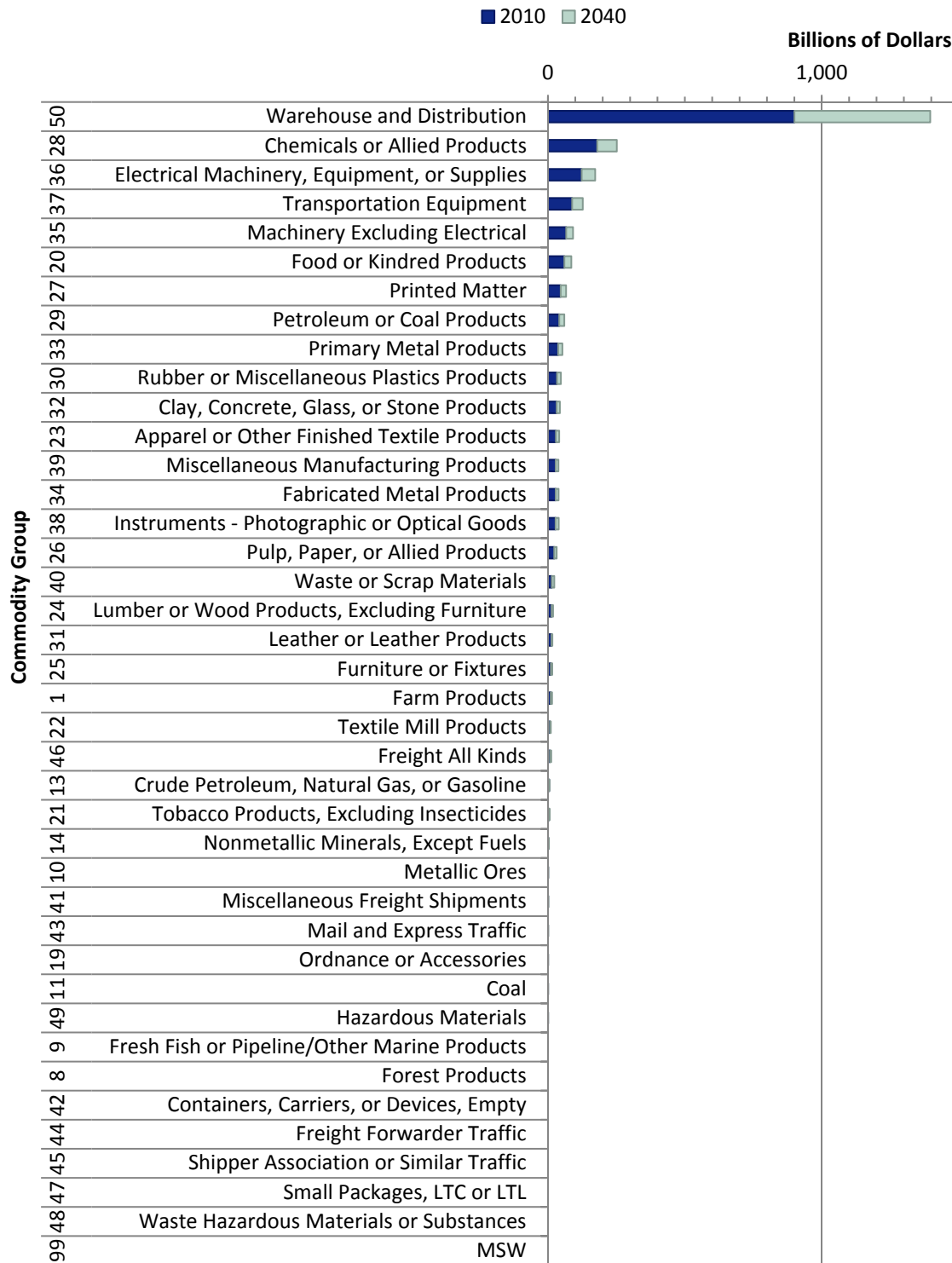
² A full list of two-digit and four-digit STCCs is provided as Appendix A.

Figure 3.1 Two-Digit STCC Commodity Groups Ranked by Weight, 2010 and 2040



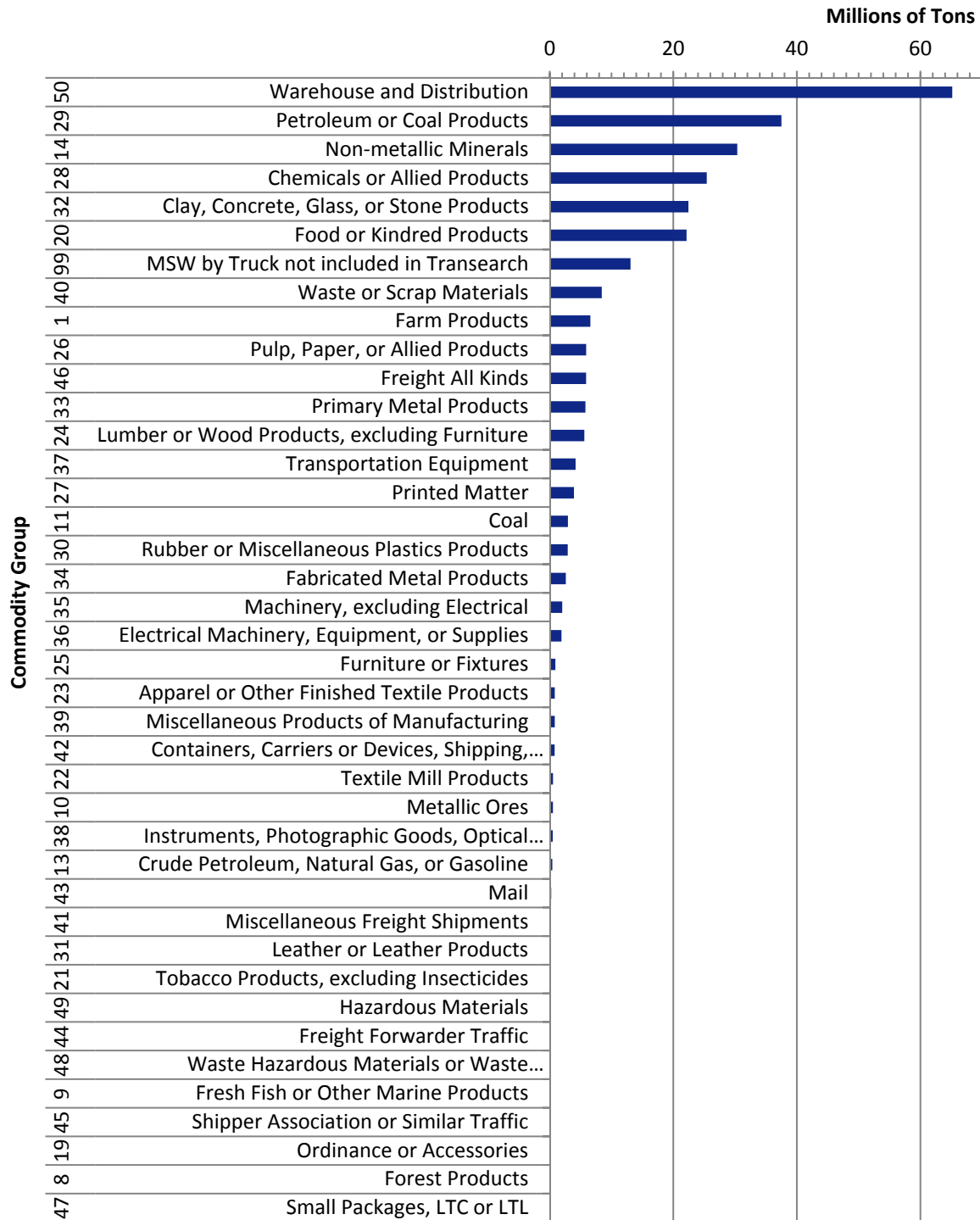
Source: NJTPA Freight Forecasting Tool, 2012.

Figure 3.2 Two-Digit STCC Commodity Groups Ranked by Value (Constant 2010 Dollars), 2010 and 2040



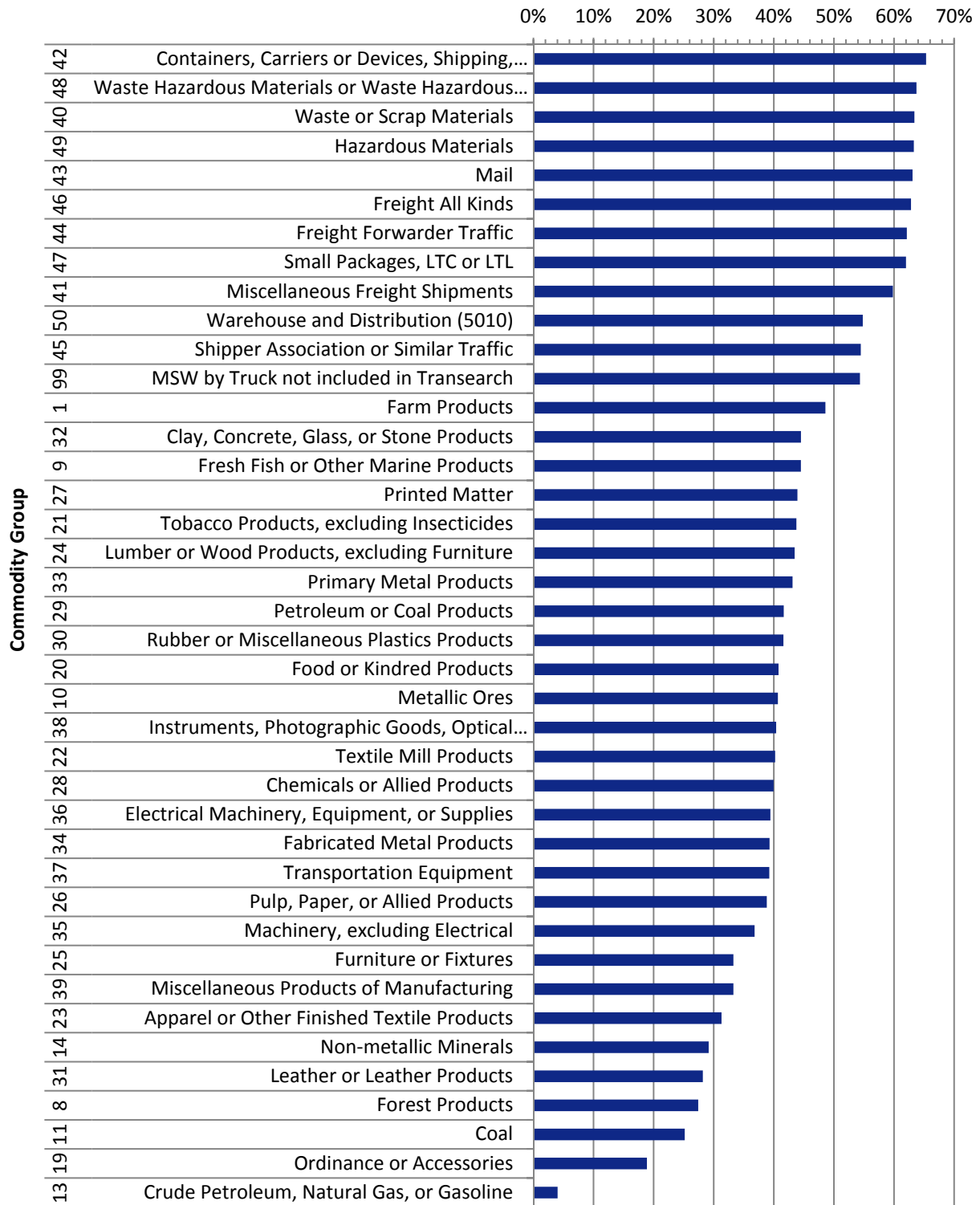
Source: IHS Global Insight TRANSEARCH Database, analyzed for 2040 Freight Industry Level Forecasts Study.

Figure 3.3 Two-Digit STCC Commodity Groups Ranked by Change in Weight (Tons), 2010-2040



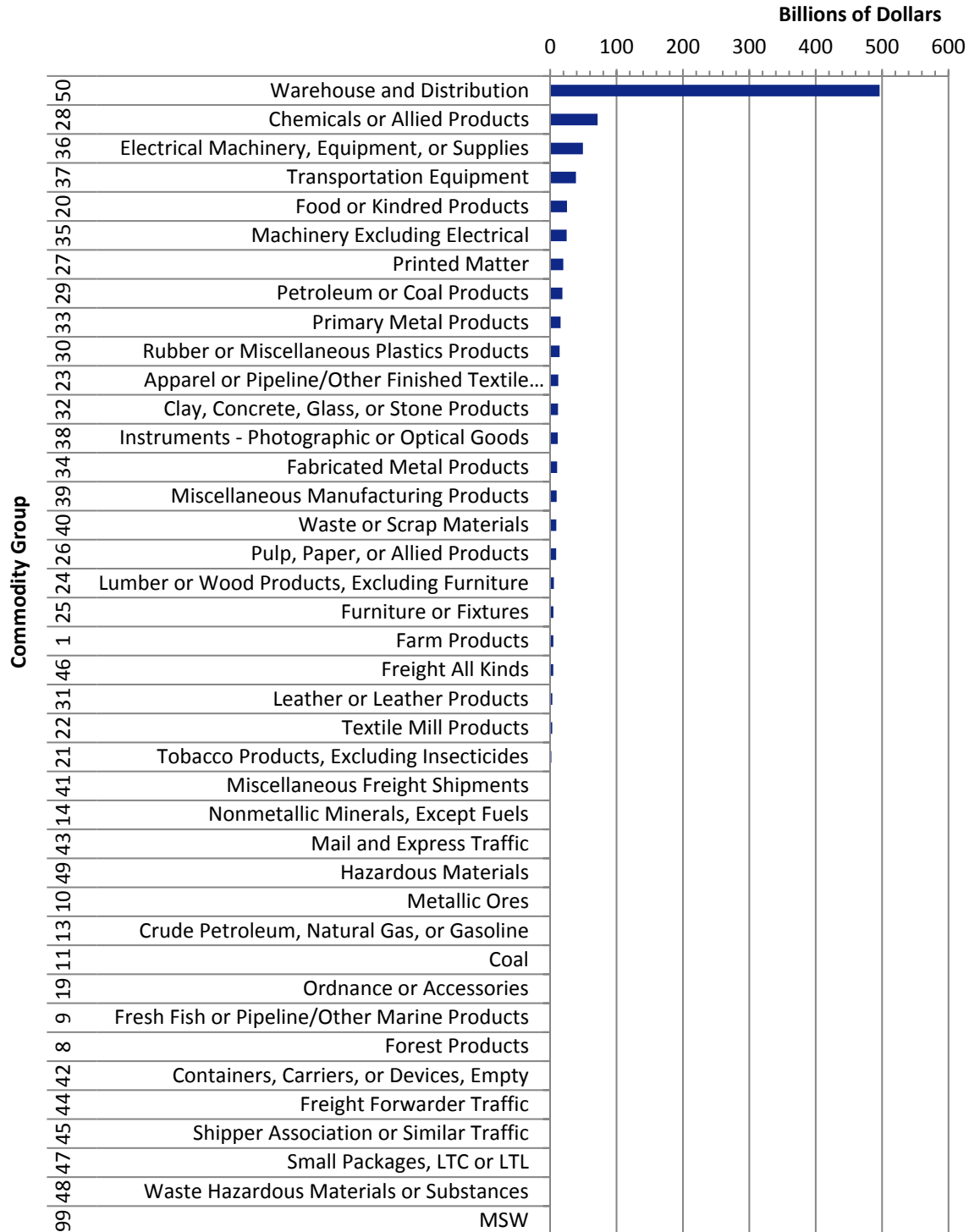
Source: NJTPA Freight Forecasting Tool, 2012.

Figure 3.4 Two-Digit STCC Commodity Groups Ranked by Percent Growth Projected by Weight (Tons), 2010-2040



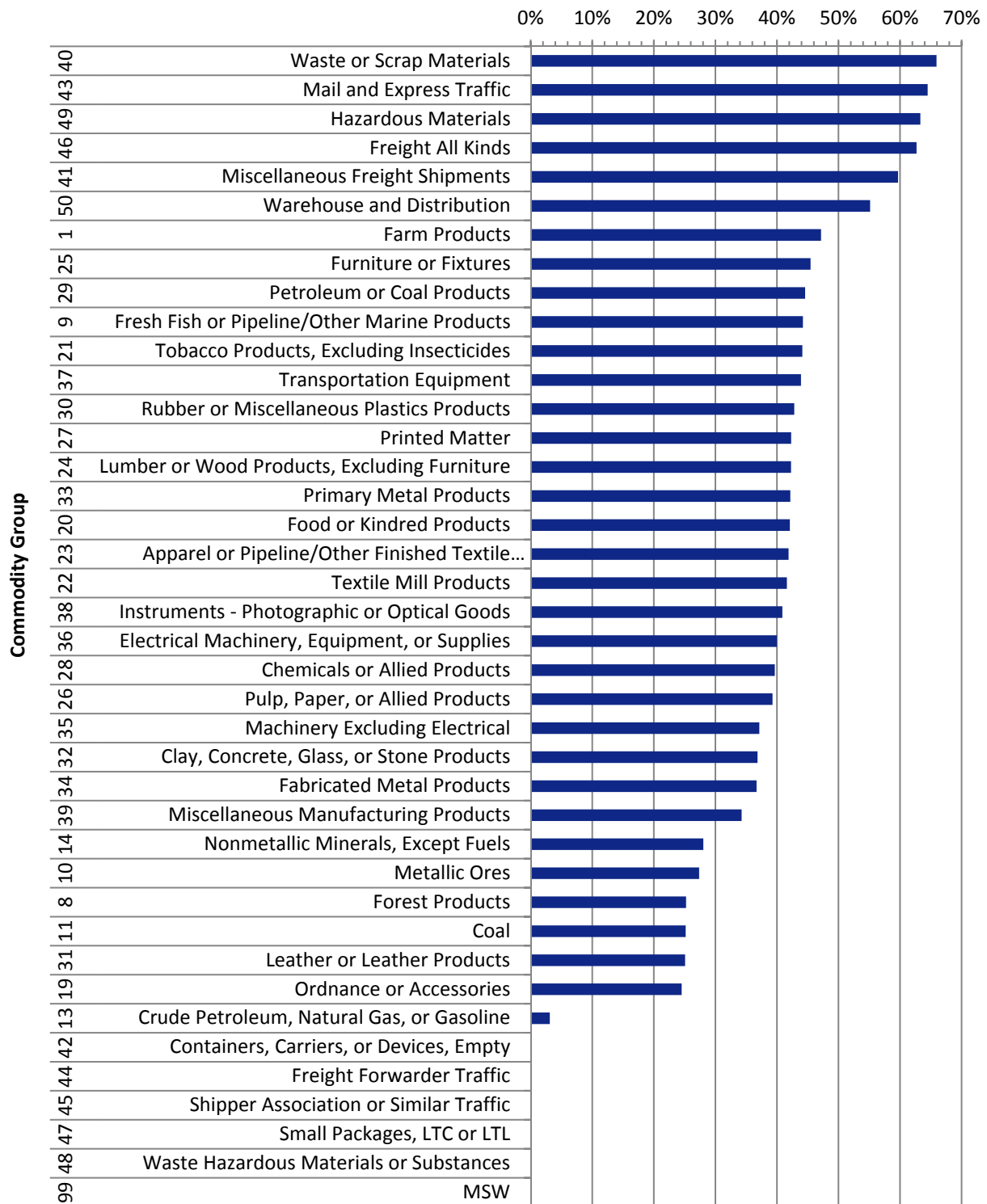
Source: NJTPA Freight Forecasting Tool, 2012.

Figure 3.5 Two-Digit STCC Commodity Groups Ranked by Change in Value (Constant 2010 Dollars), 2010-2040



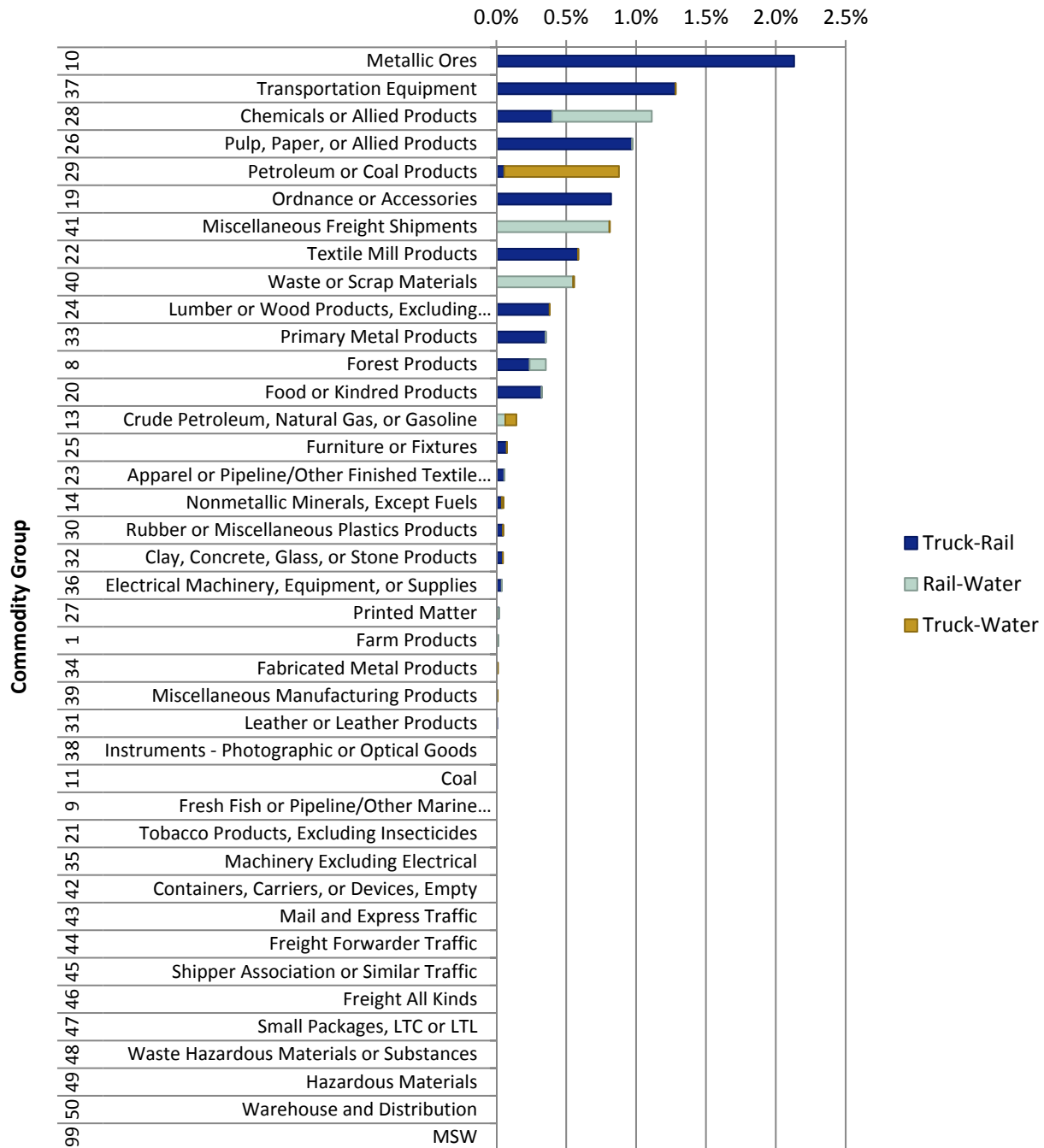
Source: IHS Global Insight TRANSEARCH Database, analyzed for 2040 Freight Industry Level Forecasts Study.

Figure 3.6 Two-Digit STCC Commodity Groups Ranked by Percent Growth Projected by Value, 2010-2040



Source: IHS Global Insight TRANSEARCH Database, analyzed for 2040 Freight Industry Level Forecasts Study.

Figure 3.7 Two-Digit STCC Commodity Groups Ranked by Shift in Mode Projected by Weight (Tons), 2010-2040³



Source: NJTPA Freight Forecasting Tool, 2012.

³ The projected shift in mode is generally due to changing composition of the commodity group, and changes in the proportion of commodities moved by specific modes. This graph does not reflect policy or logistics factors that lead to changes in mode choice.

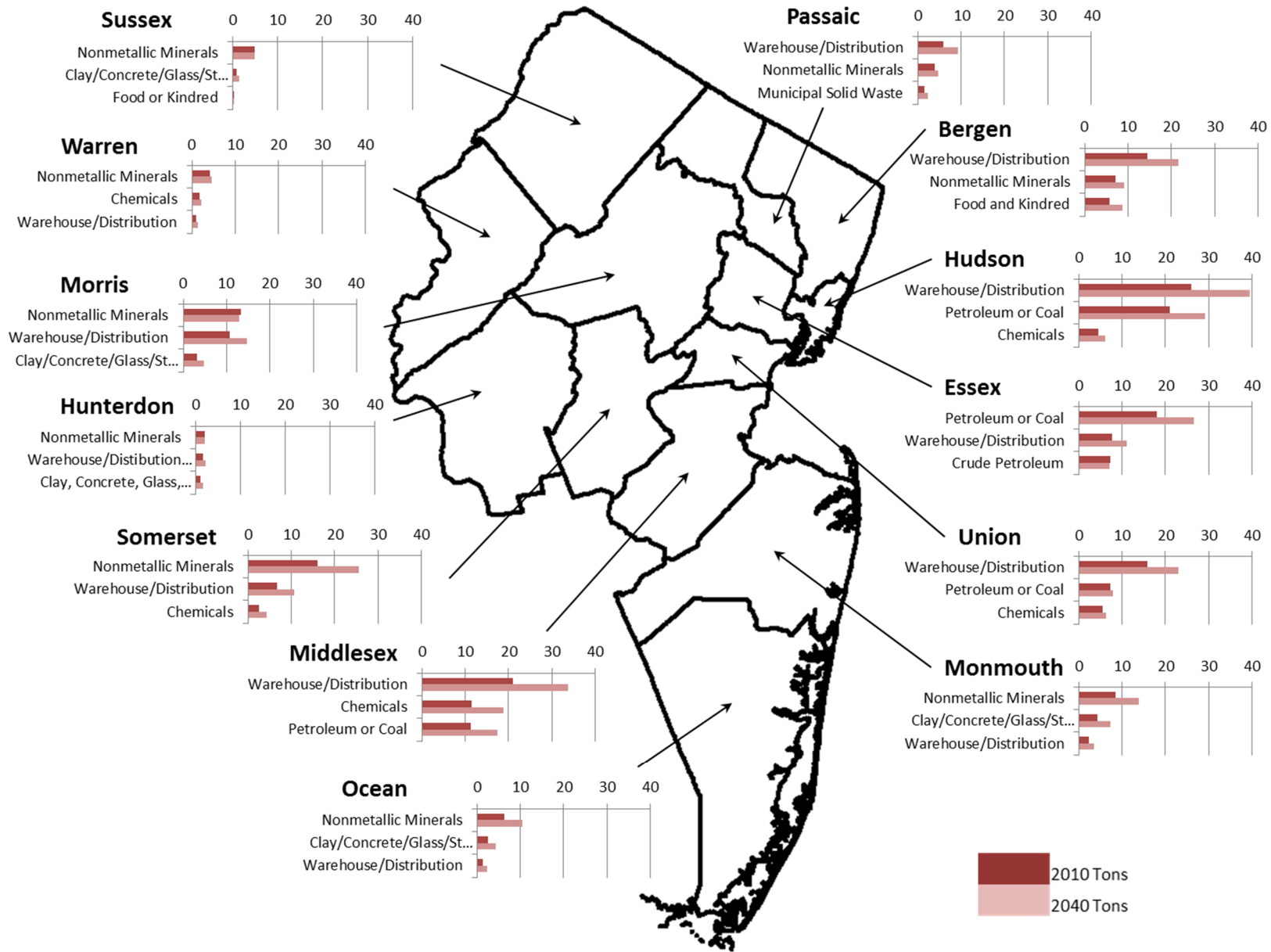
Table 3.1 Major Industry Sectors by Employment, and Associated Commodity Groups

Industry	2-Digit STCC	STCC Description	2010 Employment in Thousands (Rank)	2040 Employment in Thousands (Rank)	Change in Employment in Thousands (Rank)	Percent Growth (Rank)
Retail Trade			319.6 (1)	458.0 (1)	138.4 (1)	43% (2)
	20	Food Products				
	22	Textiles				
	23	Apparel				
	25	Furniture				
	31	Leather products				
	36	Electrical machinery, electronics				
	38	Instruments, watches, clocks				
	39	Misc. products				
	46	Mixed shipments				
	50	Secondary				
Wholesale Trade			172.5 (2)	247.4 (2)	74.9 (2)	43% (3)
	20	Food Products				
	22	Textiles				
	23	Apparel				
	25	Furniture				
	31	Leather products				
	36	Electrical machinery, electronics				
	38	Instruments, watches, clocks				
	39	Misc. products				
	50	Secondary				
Transportation, Warehousing, Utilities			134.6 (3)	193.2 (3)	58.6 (3)	44% (1)
	37	Transportation equipment				
	42	Empty containers				
	50	Secondary				
Agriculture, Mining, Construction			94.6 (4)	112.1 (4)	17.5 (4)	18% (8)
	1	Farm products				
	8	Forest products				
	13	Crude Petroleum				
	14	Nonmetallic minerals				
	24	Lumber				
	32	Clay, concrete, glass, stone				
Other Nondurable			49.3 (5)	56.4 (5)	7.1 (6)	14% (10)
	22	Textiles				
	23	Apparel				
	30	Rubber and Plastics				
	31	Leather products				
	50	Secondary				
Chemical			47.4 (6)	55.2 (6)	7.8 (5)	16% (9)
	28	Chemicals or allied				

Industry	2-Digit STCC	STCC Description	2010 Employment in Thousands (Rank)	2040 Employment in Thousands (Rank)	Change in Employment in Thousands (Rank)	Percent Growth (Rank)
Machinery			20.7 (7)	23.7 (7)	2.9 (8)	14% (11)
	35	Machinery				
	36	Electrical machinery, electronics				
Fabricated Metal			18.4 (8)	20.9 (8)	2.5 (9)	14% (12)
	33	Primary metal products				
	34	Fabricated metal				
Food and Drink			16.0 (9)	18.0 (9)	2.0 (11)	12% (13)
	1	Farm products				
	9	Fish				
	20	Food Products				
Computers and Electronics			14.7 (10)	17.8 (10)	3.1 (7)	21% (7)
	36	Electrical machinery, electronics				
	38	Instruments, watches, clocks				
	50	Secondary				
Printing			12.0 (11)	12.8 (11)	0.8 (14)	7% (14)
	26	Pulp, paper, or allied products				
	27	Printed matter				
Plastics			9.6 (12)	12.2 (12)	2.5 (10)	26% (5)
	28	Chemicals or allied				
	30	Rubber and Plastics				
Paper			7.1 (13)	8.7 (13)	1.6 (12)	22% (6)
	8	Forest products				
	26	Pulp, paper, or allied products				
Other Durable			2.3 (14)	3.2 (14)	0.9 (13)	37% (4)
	25	Furniture				
	37	Transportation equipment				
	39	Misc. products				

Source: Cambridge Systematics, Using Employment Projections in the NJTPA Freight Forecasting Tool

Figure 3.8 Top Three Commodity Groups by County (Millions of Tons), 2010 and 2040



Source: NJTPA Freight Forecasting Tool, 2012.

3.2 ESTABLISH LOGICAL COMMODITY BUNDLES

Many two-digit STCC groups are closely-related or overlap. For example, STCC 46 Freight All Kinds, STCC 49 Freight forwarder traffic, and STCC 47 Small packages/less-than-truckload/less-than-carload all include small shipments of unspecified or miscellaneous goods, much of which is being transported to a distribution center, an intermodal terminal, or to a customer. That travel pattern also likens these commodity groups to STCC 50 Secondary traffic, which includes movement of shipments from a warehouse or distribution center, or drayage from a rail or air cargo terminal. Similarly, the distinction between STCC 14 Nonmetallic minerals, which includes clay, gravel, sand, and broken stone (among other commodities), and STCC 32 Clay, Concrete, Glass, Stone Products, which includes processed clay, concrete, glass, and stone and miscellaneous nonmetallic minerals, is not always clearly defined.

These overlapping relationships between commodity groups indicated that data collection and analysis and information-gathering interviews could be needlessly complicated if adherence to abstract commodity codes was a priority. A process to bundle related commodity groups into “commodity bundles” was therefore initiated.

The Project Team identified 15 bundles of commodity groups that have a close relationship due to the specific commodity components being similar goods, and/or include commodities used in individual industries’ production and/or distribution processes. STCC 28 Chemicals was separated to isolate pharmaceutical chemicals, which support a major legacy industry in the region, from industrial and agricultural chemicals. The 15 commodity bundles and the STCC groups included in each are listed as follows:

Warehouse and Distribution, and Unspecified Commodities and Parcels

- 50 Secondary Freight/Warehouse and Distribution
- 46 Freight All Kinds
- 39 Miscellaneous Products of Manufacturing
- 42 Carriers or Devices, Shipping Containers, Empty Containers
- 43 Mail
- 41 Miscellaneous Freight Shipments
- 44 Freight Forwarder Traffic
- 45 Shipper Association or Similar Traffic
- 47 Small Packages, Less-than-Carload, or Less-than-Truckload

Food, Beverages, Farming, Fishing, and Tobacco

- 20 Food or Kindred Products
- 01 Farm Products
- 09 Fresh Fish or Other Marine Products
- 21 Tobacco Products, Excluding Insecticides

Apparel, Textiles, and Leather

23	Apparel or Other Finished Textile Products
22	Textile Mill Products
31	Leather or Leather Products
Paper and Printing	
26	Pulp, Paper, or Allied Products
27	Printed Matter
Rubber and Plastics	
30	Rubber or Miscellaneous Plastics Products
Waste	
99	Municipal Solid Waste by Truck (estimated by FFT)
40	Waste or Scrap Materials
Construction	
14	Non-metallic Minerals
32	Clay, Concrete, Glass, or Stone Products
24	Lumber or Wood Products, excluding Furniture
10	Metallic Ores
Machinery, Electronics, Transportation Equipment, and Instruments	
37	Transportation Equipment
35	Machinery, excluding Electrical
36	Electrical Machinery, Equipment, or Supplies
38	Instruments, Photographic Goods
Metals	
33	Primary Metal Products
34	Fabricated Metal Products
Durable Goods	
25	Furniture or Fixtures
08	Forest Products
19	Ordinance or Accessories
Energy	
29	Petroleum or Coal Products
11	Coal
13	Crude Petroleum, Natural Gas, or Gasoline
Pharmaceutical Chemicals	
2830	Drugs
Fertilizers and Agricultural Chemicals	
2870	Agricultural Chemicals
2871	Fertilizers
2879	Misc. Agricultural Chemicals
Chemicals (Other)	
28	Chemicals or Allied Products (other than those listed in Pharmaceutical or Fertilizers and Agricultural Chemicals)
Hazardous Materials and Waste	
49	Hazardous Materials
48	Waste Hazardous Materials or Waste Hazardous Substances

3.3 REVIEW AND SELECT TOP COMMODITY BUNDLES

In consultation with the TAC, the Project Team reviewed the data associated with each of the 15 commodity bundles and selected 11 to be analyzed in greater detail in Task 3. The data criteria described in Section 3.1 were employed to evaluate and prioritize the bundles. Figure 3.9, for example, shows the ranking order of each bundle according to commodity flow data criteria. Although the goal of the exercise was to select ten top commodity bundles, eleven were selected.

Figure 3.9 Ranking Order of 15 Commodity Bundles By Commodity Flow Data Criteria

Summary

Commodity Bundle	Ranking Classification						
	Tons 2007	Tons Future	% Growth Tons 2007-2040	Value 2007	Value Future	% Growth Value 2007-2040	Truck<->Rail Mode Shift 2007-2040
WH & Distribution, and Unspecified Commodities and Parcels	2	2	3	1	1	3	4
Food, Beverages, Farming, Fishing and Tobacco	4	4	4	4	4	5	7
Apparel, Textiles and Leather	11	12	12	7	7	13	8
Paper and Printing	7	7	7	5	5	7	3
Rubber and Plastics	10	10	6	10	10	6	13
Waste	6	6	2	11	11	1	1
Construction	1	1	11	8	9	12	12
Machinery, Electronics, Transportation Eq., and Instruments	8	8	9	2	2	8	2
Metals	9	9	5	6	6	10	6
Other Durable Goods	13	13	13	13	13	4	10
Energy	3	3	10	9	8	9	14
Other Chemicals	5	5	8	3	3	11	5
Pharmaceuticals	14	14	8	12	12	11	11
Fertilizers and Agricultural Chemicals	12	11	8	14	14	11	9
Hazardous	15	15	1	15	15	2	15

Color Scales for Ranking

1	High
8	Medium
15	Low

The eleven bundles and the reason(s) for their selection are listed as follows:

1. **Warehouse and Terminal Moves.** This bundle is the largest in the region by value today and in the future, fourth-largest in weight today and in the future, and ranks third in percentage growth between 2010 and 2040.
2. **Food and Beverages.** This bundle ranks 4th in weight and value in 2010 and 2040, and includes a vast array of individual commodity types with changing logistics patterns.
3. **Apparel and Textiles.** This bundle ranks near the middle by value compared to other bundles. Goods in this bundle represent a significant share of e-commerce sales and more information about how this bundle moves is desired.
4. **Paper and Printed Materials.** This bundle ranks fifth in value and third in potential change in mode split over the forecast period.
5. **Waste.** This bundle ranks first in growth by weight and potential change in mode split, and ranks second in growth by value.
6. **Construction.** This bundle is the largest in the region by weight in the base and future forecast years.
7. **Machinery, Electronics, and Transportation Equipment.** Despite a relatively low ranking by weight, this bundle ranks second by value and second by potential change in mode split between 2010 and 2040.
8. **Durable Goods.** This bundle includes furniture, which is one of the major imported commodities coming into the Port of New York and New Jersey.
9. **Energy.** This bundle ranks third by weight in 2010 and 2040, and is currently undergoing changes in how it is handled. Trends such as growing volumes of crude moving by rail in the region should be analyzed.
10. **Pharmaceuticals.** This commodity supports an important legacy pharmaceuticals industry and a growing health care services industry in the region.
11. **Chemicals.** This bundle includes commodities used in manufacturing processes and hazardous materials, and more information about the travel patterns of these products is desired. In discussion with the TAC, the Fertilizers and Agricultural Chemicals, Hazardous, and Other Chemicals bundles were combined.

Table 3.1 shows the commodity groups included in each of the 11 selected bundles.

Table 3.2 Commodity Bundle Components

Bundle Number	Bundle Name	STCC Codes Included
1	Warehouse and Terminal Moves	50-Secondary Freight/Warehouse and Distribution; 46-Freight All Kinds; 39-Miscellaneous Products of Manufacturing; 42-Carriers or Devices, Shipping Containers, Empty Containers; 43-Mail; 41-Miscellaneous Freight Shipments; 44-Freight Forwarder Traffic; 45-Shipper Association or Similar Traffic; 47-Small Packages, Less-than-Carload, or Less-than-Truckload
2	Food and Beverages	20-Food or Kindred Products; 01-Farm Products; 09-Fresh Fish or Other Marine Products; 21-Tobacco Products, Excluding Insecticides
3	Textiles and Apparel	23-Apparel or Other Finished Textile Products; 22-Textile Mill Products; 31-Leather or Leather Products
4	Paper and Printed Materials	26-Pulp, Paper, or Allied Products; 27-Printed Matter
5	Waste	99-Municipal Solid Waste by Truck (estimated in FFT); 40-Waste or Scrap Materials; 48-Waste Hazardous Materials or Waste Hazardous Substances
6	Construction Materials	14-Non-metallic Minerals; 32-Clay, Concrete, Glass, or Stone Products; 24-Lumber or Wood Products, excluding Furniture; 10-Metallic Ores
7	Machinery, Electronics, and Transportation Equipment	37-Transportation Equipment; 35-Machinery, excluding Electrical; 36-Electrical Machinery, Equipment, or Supplies; 38-Instruments, Photographic Goods
8	Durable Goods	25-Furniture or Fixtures; 08-Forest Products; 19-Ordinance or Accessories
9	Energy	29-Petroleum or Coal Products; 11-Coal; 13-Crude Petroleum, Natural Gas, or Gasoline
10	Pharmaceuticals	283 -Drugs
11	Chemicals	28-Chemicals or Allied Products (other than those listed in Bundle 10)

4.0 Data Collection and Analysis

Having identified the Top Commodity Bundles, the Study Team proceeded to estimate, using available data, the composition and volumes of commodity subgroups, their origins, destinations, handling facilities, modes, and key routes used to convey them. To accomplish this estimation, the Study Team collected and analyzed commodity flow and industry location data, identified inconsistencies and gaps in the data, and developed and deployed an outreach program to collect information from private sector businesses in order to validate data findings, fill the data gaps, and develop a fuller understanding of how goods in each commodity bundle are moved into, out of, through, and within the region.

The data sources used to complete this task include commodity flow data, consisting of the NJTPA Freight Forecasting Tool and IHS Global Insight TRANSEARCH data that was analyzed for the 2040 Freight Industry Level Forecasts Study, and industry location data, including data collected and analyzed for the 2040 Freight Industry Level Forecasts Study and the CoStar Database purchased by NJTPA.

The data inputs, analysis methodology, and outcomes of the commodity flow analysis, industry location analysis, gaps identification, and industry outreach are described in greater detail in this section. The key outcomes of this task include data analysis summaries and logistics summary flow charts for each commodity bundle. These summaries and charts were the building blocks of the Regional Freight Commodity Profiles.

4.1 TOP BUNDLES COMMODITY FLOW ANALYSIS

The composition, direction of movement, origins and destinations, and transportation modes are reported, by weight in tons, in the Freight Forecasting Tool for 2010, 2040, and all years in between. This analysis focused on data points for the base year 2010 and for 2040. To find the value of these commodity flows, the commodity flow analysis performed for the 2040 Freight Industry Level Forecasts Study, which was based primarily on an enhanced version of IHS Global Insight's TRANSEARCH database, and the Surface Transportation Board's Rail Waybill sample were used to estimate value-per-ton factors for each commodity code for 2010 and 2040, which were then applied to the tons of freight in each commodity code reported in the FFT for 2010 and 2040. The resulting data table included tons by commodity and estimated value by commodity, with origins, destinations, direction of movement, and mode attributes included.

The commodity flow data was queried by commodity code to develop a commodity flow table for each of the 11 commodity bundles. The records returned by each query were then copied and pasted into a spreadsheet, which was then analyzed and reported upon. Tables 4.2 through 4.12 present some selected

commodity flow data analysis highlights. The Regional Freight Commodity Profiles display graphs and narrative describing the data analysis results in greater detail for each of the 11 commodity bundles.

4.2 TOP BUNDLES INDUSTRY LOCATION ANALYSIS

The analysis took advantage of industry location data collected and analyzed for the 2040 Freight Industry Level Forecasts Study, including IHS Global Insight's Freight Locator Database, Dun and Bradstreet's Selectory Database, and CB Richard Ellis' Torto Database. The contents of these databases are described in greater detail in the 2040 Freight Industry Level Forecasts Study Final Report.

In addition, NJTPA purchased a subscription to CoStar Realty Information, Inc.'s business and real estate databases, and made this subscription available to the project team. The CoStar Property database and CoStar Tenant database were key inputs to this study.

The CoStar Property database includes retail, industrial, flex, office, medical, and entertainment properties. Attributes in the database include address, size in square feet, ceiling height, year built, construction material, various amenities, occupancy or vacancy status, and geographic coordinates that can be used to map the data points. The CoStar Tenant database includes information about the businesses that occupy the properties. Tenant attributes include business name, contact information, industry code (North American Industry Classification System, or NAICS), number of square feet occupied in the property, number of employees, and a link to the business website (for some, not all, records).

The CoStar Property data records were downloaded, 500 records at a time, and consolidated into a single spreadsheet with 57,176 property records. More than 38,000 tenant records were downloaded, 500 records at a time, and consolidated in a similar matter. Using a lookup query, the property and tenant records were linked using the address and zip code fields. A spreadsheet with property records and associated tenants was prepared as a result.

In order to identify business establishments that are likely shippers, receivers, or handlers of goods in the Top 11 Commodity Bundles, the research team associated industry codes with commodity codes. A "crosswalk" between industry types, based on NAICS code, and commodity types, based on STCC, was prepared and reviewed for correctness and suitability. Table 4.1 lists the Top 11 Commodity Bundles and the associated industry NAICS developed for this exercise.

Table 4.1 Commodity Bundles and Associated Industries

Commodity Bundle	Associated Industries	
1. Warehouse and Terminal Moves	<ul style="list-style-type: none"> • Manufacturing • Wholesale Trade • Retail Trade • Warehousing 	<ul style="list-style-type: none"> • Freight Transportation Services • Cargo Handling • Couriers and Delivery
2. Food and Beverages	<ul style="list-style-type: none"> • Agriculture • Food/Beverage Manufacturing 	<ul style="list-style-type: none"> • Food/Beverage Retail • Restaurants/Hospitality
3. Textiles and Apparel	<ul style="list-style-type: none"> • Apparel, Textiles, Leather Manufacturing • Fabric or Rug Mills 	<ul style="list-style-type: none"> • Clothing Wholesale • Clothing Retail
4. Paper and Printed Materials	<ul style="list-style-type: none"> • Book Wholesale, Retail Trades • Stationery Manufacturing • Office Supply 	<ul style="list-style-type: none"> • Printing • Labeling and Shipping
5. Waste	<ul style="list-style-type: none"> • Solid Waste Landfill • Materials Recovery 	<ul style="list-style-type: none"> • Recyclable Materials
6. Construction	<ul style="list-style-type: none"> • Building and Home Construction • Mining • Concrete, Glass, Iron/Steel, Lumber Production 	<ul style="list-style-type: none"> • Construction Contractors • Hardware/Construction Materials Wholesale and Retail Trades
7. Machinery, Electronics, and Transportation Equipment	<ul style="list-style-type: none"> • Transportation Equipment Manufacturing • Automobile Sales 	<ul style="list-style-type: none"> • Machinery Manufacturing • Machinery/Equipment Rental and Leasing
8. Durable Goods	<ul style="list-style-type: none"> • Furniture and Home Goods Manufacturing • Recreational Goods 	<ul style="list-style-type: none"> • Furniture and Home Goods Wholesale and Retail Trades • Industrial Supply
9. Energy	<ul style="list-style-type: none"> • Natural Gas, Petroleum, etc. Distribution • Coal, Natural Gas, Crude Extraction 	<ul style="list-style-type: none"> • Petrochemical Manufacturing • Petroleum Refineries
10. Pharmaceuticals	<ul style="list-style-type: none"> • Pharmaceutical Manufacturing 	<ul style="list-style-type: none"> • Health Care
11. Chemicals	<ul style="list-style-type: none"> • Manufacturing 	<ul style="list-style-type: none"> • Paint, Varnish Wholesale and Retail Trades

This exercise produced a table of business establishments, with all tenant and building attributes attached, which are likely shippers/receivers and handlers of goods in each commodity bundle. This table was used to identify the number establishments, total employees, square footage, median building age, and can be

used by NJTPA to query all tenant and building features and by commodity bundle. The geocoded data was also used to create GIS shapefiles, so that thematic maps could be created to illustrate business establishment locations and attributes by commodity bundle.

Upon thorough review of the bundle-classified industry location data, a number of changes were made to correct industry codes to more accurately represent the activity occurring at the business location. Internet research, consisting of finding and reviewing company websites, was the primary source of information on which these changes were based. A summary of industry classification changes includes:

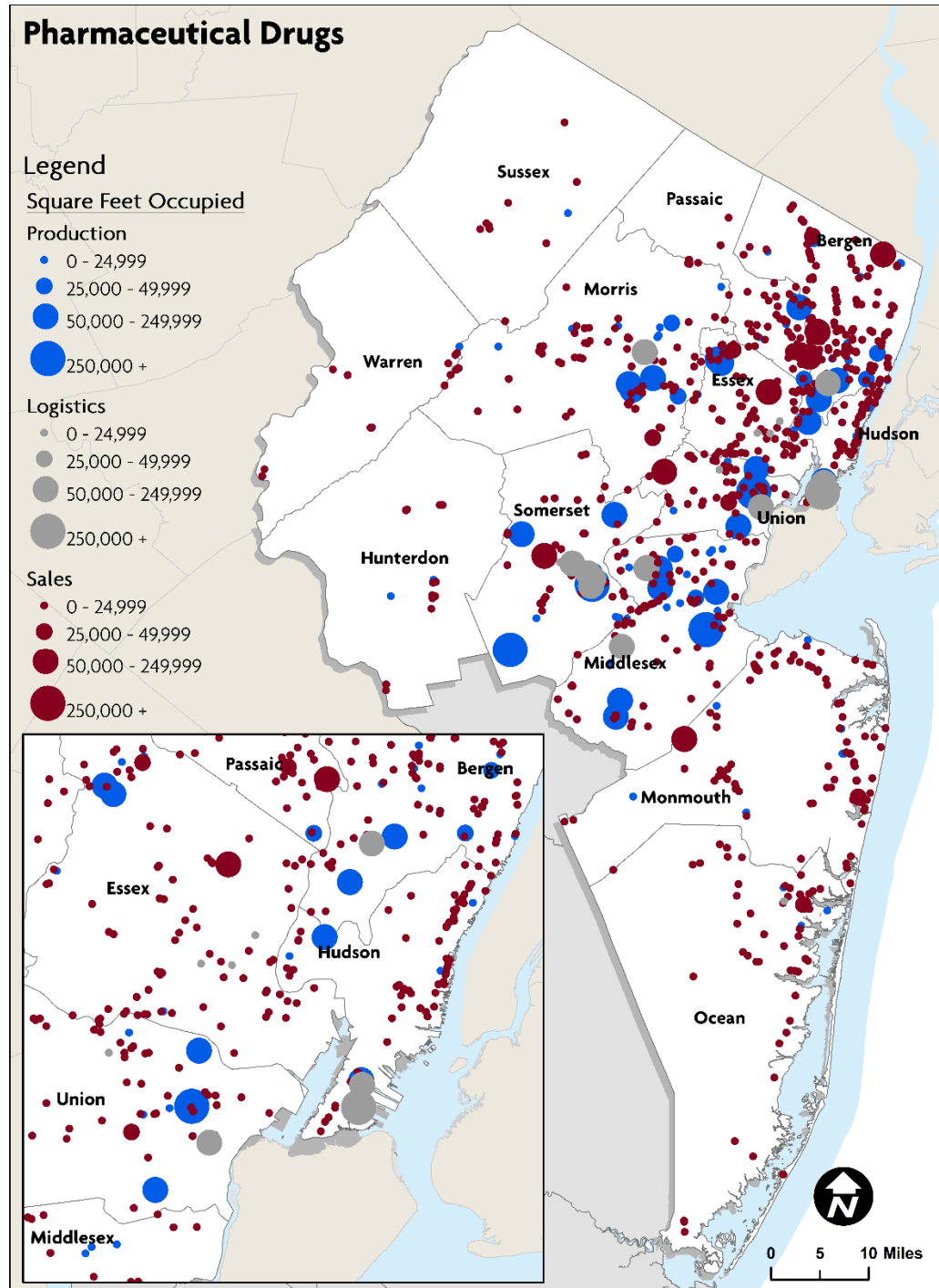
- ColArt Fine Art and Graphics Limited (<http://www.colart.com>), moved from Bundle 2 to Bundles 4 and 1;
- Infinity Headwear & Apparel Inc, moved from Bundle 2 to Bundle 3;
- Mega Pumps, L.P., moved from Bundle 2 to Bundle 7;
- Vo-Toys Incorporated (<http://www.vo-toys.com>), moved from Bundle 2 to Bundle 8;
- CORY Home Delivery Service (<http://www.corycompanies.com/preparation-services/>), moved from Bundle 2 to Bundle 1.
- Calrstadt Consumer Ice Corporation and Fish Fish Fish, Inc., moved from Bundle 3 to Bundle 2;
- M. Tucker Co. (<http://www.mtucker.com/>), moved from Bundle 4 to bundles 1, 7, and 8;
- EBP Supply Solutions (<http://www.ebpsupply.com/wholesale-cleaning-products/>), added to bundles 1, 7 and 11.
- Middle Atlantic Products (<http://www.middleatlantic.com/>) added to bundles 1, 7, and 8.
- Alcoa Power and Propulsion (<https://www.alcoa.com/app/en/home.asp>), moved from Bundle 6 to Bundle 7;
- Silgan Containers Corporation (<https://www.silgancontainers.com/>), moved from Bundle 6 to bundles 1 and 8;
- APA Logistics, LLC. (<http://www.apalogistics.com/>), added to bundles 2, 3, 4, 7, 8, 10 and 11;
- Region Oil (<http://www.regionoil.com/Category/105/about-region-oil.html>), moved from Bundle 6 to bundles 7 and 9;
- The Trane Company (http://www.trane.com/about_trane.aspx), added to bundle 7;

- Cooper Electric Supply Company (<https://www.cooper-electric.com/webapp/wcs/stores/servlet/TopCategoriesDisplay?langId=-1&storeId=11201&catalogId=10151>), added to bundle 7;
- Compass Display & Promotion Company, Inc. (<http://www.compassdisplayinc.com/about.html>), added to bundles 1 and 4.
- Aaron & Company (<http://www.aaronco.com/home.htm>), added to Bundle 7.
- Consolidated Carpet, added to bundle 3.
- Johnson & Johnson and Brook Warehousing Corp. (<http://www.brookwarehouse.com/>), added to bundles 10 and 11.
- Kanematsu USA Inc., added to bundles 1, 2, 10 and 11.
- FAPS, Inc., added to bundles 1 and 7.
- GRM Information Management Services (<http://www.grmdocumentmanagement.com/>), removed from Bundle 8;
- Century 21 Department Store, moved from Bundle 8 to Bundle 3;
- ASCO Valve Inc.; (<http://www.ascovalve.com/Applications/Products/ElectronicallyEnhancedSolenoidValves.aspx>), moved from Bundle 8 to Bundle 7;
- Imperial Bag and Paper Company, LLC, moved from Bundle 8 to bundles 1, 4, 11;
- Gordon Terminal (<http://www.gordonterminal.com/>), moved from bundles 2, 3, 7, and 8 to bundles 9 and 10.
- Olive Oil Imports LLC, moved from Bundle 9 to Bundle 2;
- Sprint, Sprint Stores, Sprint Spectrum LP and add to bundle 7;
- T & G Gas Station, moved from Bundle 11 to Bundle 9.
- Valvoline Instant Oil Change, added to bundle 9.
- T & R Oil Co Inc., added to bundle 9.
- Motown Tress (http://motowntress.com/menu_list.php?cid=412), removed from Bundle 10.
- Dupont, added to bundles 6, 9 and 10.
- MediMedia (<http://www.medimedia.com/>) removed from bundles 10 and 11.

Figure 4.1 provides an example of an industry location map for one of the top commodity bundles. For all bundles, the industry locations were separated into

one of three classifications – production locations, consisting of businesses that extract, produce, or manufacture goods; logistics locations, consisting of businesses that transport, store, or distribute goods; and sales locations, consisting of retail establishments or other “end users” of goods. Examples of “end users” of pharmaceutical drugs include a doctor’s office or other health care facility that receives inbound shipments of pharmaceutical drugs.

Figure 4.1 Industry Locations, Bundle 10, Pharmaceuticals



Source: Co-Star, 2014; NJOIT, 2008; Esri, 2014.
 Note: "Production" includes Manufacturing, Utilities, Mining & Agriculture, corresponding to Step 1 in the Logistics Summary on Pages 2-3.
 "Logistics" includes Wholesale Trade and Warehousing, corresponding to Steps 2-5 in the Logistics Summary on Pages 2-3.
 "Sales" includes Retail, Health Care, and Professional Services, corresponding to Step 6 in the Logistics Summary on Pages 2-3.

4.3 SELECTED SUMMARY STATISTICS BY BUNDLE

Tables 4.2 through 4.12 present a selection of commodity flow and industry location database statistics for each of the Top 11 Commodity Bundles using the data sources described in Sections 4.1 and 4.2. Statistics cited include:

- Inbound tons, 2010;
- Outbound tons, 2010;
- County's share of regional inbound and outbound tons, 2010;
- Inbound value of goods in constant 2010 dollars;
- Outbound value of goods in constant 2010 dollars;
- County's share of regional inbound and outbound value of goods in constant 2010 dollars;
- Employment in industries associated with the commodity bundle, 2014;
- Estimated square feet of space occupied by businesses in industries associated with the commodity bundle, 2014;
- County's share of the space occupied by businesses associated with the commodity bundle regionally, 2014;
- Number of companies associated with the commodity bundle, 2014;
- Mode splits based on weight (tons) and value of goods, 2010.

Additional data analysis results are presented in each of the Regional Freight Commodity Profile documents.

Table 4.2 Data Summary: Commodity Bundle 1, Warehouse/Distribution Center and Unspecified Commodities

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	1,808,285	4,323,642	11%	12,194,558,471	31,801,846,423	12%	12,335	15,514,529	15%	1,349
Essex	1,909,647	2,561,318	8%	11,531,111,008	18,575,079,594	8%	4,158	5,119,546	5%	842
Hudson	4,348,721	12,146,507	29%	10,960,060,866	71,323,251,887	23%	7,849	12,601,703	12%	844
Hunterdon	468,473	39,891	1%	3,667,560,559	254,457,664	1%	344	961,917	1%	74
Middlesex	3,370,333	6,254,598	17%	26,331,883,072	49,066,768,806	21%	15,429	32,701,928	32%	1,013
Monmouth	381,535	619,698	2%	3,094,125,460	4,899,249,891	2%	2,626	5,429,923	5%	626
Morris	2,234,731	1,118,225	6%	17,484,359,326	8,648,290,694	7%	4,525	7,325,398	7%	514
Ocean	319,693	236,642	1%	2,558,679,592	1,843,922,976	1%	1,567	3,426,560	3%	400
Passaic	714,458	1,773,394	4%	5,628,972,137	14,047,369,095	5%	4,608	4,556,383	4%	468
Somerset	989,822	1,672,211	5%	7,690,111,646	13,085,270,379	6%	2,372	4,844,088	5%	327
Sussex	46,075	13,206	0%	368,574,791	101,200,478	0%	166	455,337	0%	64
Union	4,126,782	5,747,280	17%	17,011,466,114	29,943,425,769	13%	5,271	6,830,509	7%	556
Warren	188,937	199,573	1%	1,484,365,930	1,567,443,504	1%	502	1,599,703	2%	97
NJTPA Region	20,907,494	36,706,186	100%	120,005,828,970	245,157,577,160	100%	61,752	101,367,524	100%	7,174

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.3 Data Summary: Commodity Bundle 2, Food and Beverages

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	4,310,157	1,273,702	20%	3,915,189,641	1,871,288,480	19%	5,114	4,092,905	14%	607
Essex	2,450,927	3,602,338	21%	2,699,126,123	2,451,491,670	17%	2,945	2,236,771	8%	460
Hudson	2,456,114	1,222,288	13%	2,531,420,294	1,857,228,230	15%	3,552	3,679,974	13%	499
Hunterdon	649,414	353,051	4%	552,786,368	443,966,517	3%	307	236,759	1%	38
Middlesex	2,441,735	890,044	12%	2,367,073,179	1,123,252,527	12%	6,131	8,210,068	28%	461
Monmouth	1,170,167	85,821	4%	1,421,095,651	141,490,829	5%	1,125	2,185,644	7%	292
Morris	1,299,114	139,909	5%	1,617,648,164	174,690,514	6%	1,062	1,308,153	4%	229
Ocean	615,710	115,829	3%	737,674,716	176,886,799	3%	592	1,131,069	4%	216
Passaic	572,829	65,292	2%	421,442,801	101,511,065	2%	2,048	1,493,105	5%	233
Somerset	1,170,348	115,573	4%	1,323,417,478	180,209,335	5%	454	1,169,902	4%	139
Sussex	347,360	23,600	1%	283,619,807	32,667,201	1%	70	283,927	1%	39
Union	1,281,573	1,712,123	10%	1,536,870,197	1,649,010,424	11%	2,716	2,935,052	10%	250
Warren	148,199	98,842	1%	191,353,170	131,418,653	1%	141	310,968	1%	48
NJTPA Region	18,913,648	9,698,411	100%	19,598,717,588	10,335,112,243	100%	26,257	29,274,297	100%	3,511

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.4 Data Summary: Commodity Bundle 3, Apparel and Textiles

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	185,324	50,724	11%	2,475,154,960	764,947,938	16%	12,335	15,514,529	15%	1,349
Essex	95,561	681,507	36%	996,493,754	5,513,607,124	33%	4,158	5,119,546	5%	842
Hudson	101,991	334,022	20%	1,070,802,375	2,765,003,700	19%	7,849	12,601,703	12%	844
Hunterdon	12,790	40	1%	160,718,409	172,046	1%	344	961,917	1%	74
Middlesex	128,415	26,318	7%	1,274,838,642	399,087,604	8%	15,459	32,737,928	32%	1,014
Monmouth	44,350	2,613	2%	563,213,817	36,490,025	3%	2,626	5,429,923	5%	626
Morris	57,416	1,797	3%	743,785,529	23,271,450	4%	5,225	7,661,426	8%	515
Ocean	22,375	10,093	1%	269,830,594	102,409,557	2%	1,567	3,426,560	3%	400
Passaic	15,526	5,377	1%	163,461,757	58,032,571	1%	4,608	4,556,383	4%	468
Somerset	41,587	6,041	2%	553,094,189	122,532,404	3%	2,372	4,844,088	5%	327
Sussex	5,216	474	0%	39,255,094	8,129,013	0%	166	455,337	0%	64
Union	75,143	261,140	16%	770,894,333	970,725,138	9%	5,270	6,830,009	7%	555
Warren	2,433	31	0%	24,552,184	118,836	0%	502	1,599,703	2%	97
NJTPA Region	788,127	1,380,178	100%	9,106,095,639	10,764,527,404	100%	62,481	101,739,052	100%	7,175

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.5 Data Summary: Commodity Bundle 4, Paper and Printed Materials

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	886,641	1,167,960	22%	2,390,722,151	2,419,621,734	24%	1,453	1,148,075	11%	140
Essex	703,606	919,092	18%	1,420,702,221	1,657,829,229	16%	749	157,248	1%	87
Hudson	455,287	425,977	10%	957,833,371	1,122,942,503	11%	1,927	1,236,949	11%	55
Hunterdon	122,925	79,181	2%	264,030,812	162,225,188	2%	64	16,400	0%	6
Middlesex	697,608	713,541	15%	1,393,253,948	1,389,101,635	14%	5,510	5,963,027	55%	136
Monmouth	263,878	57,496	3%	605,401,350	103,433,478	4%	650	243,759	2%	56
Morris	402,572	55,446	5%	979,067,973	127,020,865	6%	841	480,016	4%	60
Ocean	126,685	35,582	2%	272,148,317	95,760,205	2%	139	68,397	1%	35
Passaic	89,671	60,240	2%	176,184,253	63,942,645	1%	1,273	726,783	7%	50
Somerset	299,850	83,331	4%	727,353,171	251,215,169	5%	1,453	288,265	3%	25
Sussex	67,656	21,855	1%	121,254,237	44,414,597	1%	4	36,699	0%	4
Union	473,289	962,617	16%	938,687,962	1,842,220,055	14%	2,695	400,425	4%	70
Warren	38,342	43,350	1%	55,487,134	70,075,993	1%	81	23,388	0%	8
NJTPA Region	4,628,011	4,625,668	100%	10,302,126,900	9,349,803,295	100%	16,839	10,789,431	100%	732

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.6 Data Summary: Commodity Bundle 5, Waste

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	57,252	1,083,225	8%	9,945,887	315,235,868	3%	140	81,093	14%	12
Essex	3,922,878	2,538,106	43%	580,745,152	4,349,361,827	43%	337	49,200	8%	17
Hudson	778,765	1,975,494	18%	127,630,348	4,399,806,081	40%	91	39,872	7%	10
Hunterdon	710	100,251	1%	1,351,263	615,409	0%	0	0	0%	0
Middlesex	485,953	575,684	7%	202,909,821	68,349,073	2%	76	203,187	35%	12
Monmouth	1,020	148,142	1%	1,822,295	1,290,384	0%	67	8,188	1%	7
Morris	1,936	381,534	3%	3,577,443	2,784,801	0%	87	25,300	4%	6
Ocean	846	22,935	0%	1,602,629	2,172,197	0%	70	0	0%	1
Passaic	374,431	393,436	5%	4,572,965	200,171,567	2%	91	2,500	0%	6
Somerset	4,260	235,279	2%	2,749,095	53,627,948	0%	2	500	0%	1
Sussex	517	561	0%	999,398	291,374	0%	0	0	0%	0
Union	556,960	1,355,268	13%	30,863,880	1,033,798,701	9%	192	174,005	30%	11
Warren	77,649	13,225	1%	8,493,898	865,245	0%	5	500	0%	1
NJTPA Region	6,263,177	8,823,140	100%	977,264,073	10,428,370,474	100%	1,158	584,345	100%	84

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.7 Data Summary: Commodity Bundle 6, Construction Materials

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	7,956,968	1,555,495	13%	1,756,278,565	1,418,093,234	16%	2,306	1,413,414	12%	243
Essex	5,117,590	3,636,207	12%	1,220,707,255	5,869,905,159	35%	2,841	1,191,232	10%	221
Hudson	2,565,328	263,354	4%	714,166,605	197,667,625	4%	792	721,635	6%	107
Hunterdon	1,516,967	636,954	3%	259,334,725	176,411,039	2%	117	212,349	2%	20
Middlesex	5,258,079	2,139,848	10%	1,655,069,930	470,778,131	10%	5,370	3,664,035	32%	222
Monmouth	5,814,567	1,104,147	9%	1,057,036,383	239,251,243	6%	1,114	269,446	2%	85
Morris	6,693,806	4,504,372	15%	1,193,658,880	278,116,671	7%	1,391	1,183,954	10%	132
Ocean	3,356,571	2,057,809	7%	431,710,034	250,254,791	3%	582	534,069	5%	78
Passaic	2,211,595	581,027	4%	253,755,577	116,499,470	2%	1,415	445,156	4%	129
Somerset	2,748,832	4,754,855	10%	631,743,800	354,851,492	5%	626	1,012,422	9%	58
Sussex	747,756	2,202,329	4%	142,068,111	173,452,656	2%	116	51,761	0%	21
Union	3,101,231	617,940	5%	839,346,068	444,611,886	6%	2,136	603,487	5%	182
Warren	1,232,928	2,754,972	5%	103,305,117	198,565,547	1%	133	190,340	2%	17
NJTPA Region	48,322,217	26,809,308	100%	10,258,181,050	10,188,458,943	100%	18,939	11,493,300	100%	1,515

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.8 Data Summary: Commodity Bundle 7, Machinery, Electronics, and Transportation Equipment

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	1,030,718	380,995	16%	12,897,008,726	10,168,348,907	19%	6,061	4,713,557	16%	379
Essex	1,370,941	1,987,004	38%	16,665,426,702	15,768,511,832	27%	3,793	2,526,792	8%	178
Hudson	441,774	127,679	6%	6,130,776,620	2,111,372,069	7%	845	1,854,165	6%	79
Hunterdon	66,302	24,826	1%	766,557,735	619,060,046	1%	483	250,561	1%	18
Middlesex	494,886	206,972	8%	8,192,337,025	4,111,489,811	10%	4,659	10,117,298	34%	273
Monmouth	309,712	73,285	4%	4,213,202,412	1,254,838,743	5%	1,677	678,331	2%	118
Morris	405,938	64,626	5%	6,275,023,836	1,897,757,276	7%	4,476	3,066,350	10%	165
Ocean	146,291	28,816	2%	1,678,258,222	655,020,081	2%	445	327,397	1%	50
Passaic	136,301	48,931	2%	1,706,620,083	715,131,812	2%	3,381	2,329,720	8%	121
Somerset	232,672	93,883	4%	3,903,738,938	2,532,639,952	5%	2,118	2,356,640	8%	84
Sussex	41,416	9,101	1%	388,051,935	462,216,203	1%	118	43,278	0%	19
Union	348,149	797,200	13%	5,476,740,169	10,752,543,878	13%	2,946	1,482,357	5%	136
Warren	29,615	19,491	1%	379,663,860	606,294,468	1%	250	148,371	0%	29
NJTPA Region	5,054,717	3,862,809	100%	68,673,406,263	51,655,225,078	100%	31,252	29,894,817	100%	1,649

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.9 Data Summary: Commodity Bundle 8, Other Durable Goods

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	142,120	17,187	12%	816,533,684	96,655,022	24%	1,599	3,587,574	14%	231
Essex	69,042	447,018	37%	352,636,604	84,395,759	12%	1,000	1,496,866	6%	160
Hudson	46,704	31,799	6%	239,302,075	45,048,957	7%	1,291	3,492,449	13%	124
Hunterdon	8,815	134	1%	44,243,167	958,791	1%	225	131,926	1%	9
Middlesex	73,812	61,577	10%	383,083,071	421,733,042	21%	4,062	9,627,450	37%	201
Monmouth	38,329	1,215	3%	193,408,370	7,579,747	5%	647	1,213,290	5%	83
Morris	60,419	2,993	5%	306,634,895	15,269,977	8%	1,096	1,634,771	6%	86
Ocean	18,944	8,130	2%	95,085,545	56,180,285	4%	352	730,529	3%	59
Passaic	7,518	1,198	1%	37,071,027	6,680,179	1%	886	571,611	2%	115
Somerset	36,509	4,334	3%	189,253,935	27,976,730	6%	445	1,481,471	6%	57
Sussex	6,122	36	0%	31,374,001	163,504	1%	106	80,262	0%	12
Union	34,887	260,904	21%	174,590,435	161,356,297	9%	1,618	1,813,884	7%	142
Warren	1,610	111	0%	7,664,490	620,036	0%	52	394,949	2%	15
NJTPA Region	544,831	836,637	100%	2,870,881,298	924,618,327	100%	13,379	26,257,032	100%	1,294

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.10 Data Summary: Commodity Bundle 9, Energy

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	859,656	53,813	2%	325,317,754	8,995,914	1%	36	396,886	15%	17
Essex	18,189,368	1,279,904	34%	9,303,018,204	431,617,314	41%	157	83,036	3%	21
Hudson	5,703,314	11,564,519	30%	3,031,554,316	3,791,796,760	29%	153	740,643	28%	17
Hunterdon	121,869	461	0%	44,243,235	275,159	0%	0	0	0%	0
Middlesex	2,349,528	5,229,099	13%	1,275,935,504	2,904,852,278	18%	144	860,410	33%	20
Monmouth	529,739	637,175	2%	188,091,137	113,147,442	1%	10	10,804	0%	6
Morris	483,743	288,505	1%	199,747,767	76,835,212	1%	194	306,700	12%	9
Ocean	274,637	481,176	1%	98,928,434	37,283,764	1%	8	68,483	3%	9
Passaic	318,698	457,354	1%	104,727,927	42,371,455	1%	11	3,000	0%	5
Somerset	284,384	670,003	2%	128,946,202	79,209,613	1%	121	96,503	4%	8
Sussex	86,718	267	0%	37,338,374	263,556	0%	0	3,000	0%	1
Union	889,770	5,525,706	11%	354,868,933	710,944,619	4%	356	74,939	3%	12
Warren	1,335,325	1,110	2%	497,131,814	369,616	2%	0	0	0%	0
NJTPA Region	31,426,748	26,189,091	100%	15,589,849,600	8,197,962,701	100%	1,190	2,644,404	100%	125

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.11 Data Summary: Commodity Bundle 10, Pharmaceuticals

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	SF Occupied	% SF Occ.	# Companies
Bergen	9,681	44,529	5%	112,975,401	333,387,506	6%	3,276	1,197,011	13%	194
Essex	53,584	62,009	10%	245,614,700	532,792,332	10%	1,209	565,178	6%	100
Hudson	18,599	39,601	5%	60,388,781	300,940,412	5%	410	1,146,910	12%	77
Hunterdon	2,392	622	0%	31,616,066	6,604,134	0%	36	26,440	0%	16
Middlesex	6,460	105,316	10%	91,789,161	779,451,749	11%	1,021	1,756,569	19%	128
Monmouth	14,825	12,593	2%	76,731,342	96,644,601	2%	980	330,545	4%	107
Morris	21,815	27,263	4%	104,967,089	211,940,538	4%	768	850,774	9%	101
Ocean	7,621	6,780	1%	50,202,876	49,241,013	1%	471	255,231	3%	65
Passaic	10,769	3,020	1%	51,105,206	27,638,960	1%	312	386,405	4%	72
Somerset	28,197	134,751	14%	123,440,245	982,679,155	14%	1,378	1,827,180	20%	64
Sussex	2,773	1,249	0%	31,058,976	9,091,614	1%	37	40,391	0%	12
Union	105,432	402,780	45%	411,487,648	2,929,037,115	43%	1,062	943,199	10%	64
Warren	2,100	11,460	1%	30,513,491	86,231,488	2%	40	33,373	0%	15
NJTPA Region	284,247	851,974	100%	1,421,890,983	6,345,680,618	100%	11,000	9,359,206	100%	1,015

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

Table 4.12 Data Summary: Commodity Bundle 11, Other Chemicals

County	Tons Inbound	Tons Outbound	% In+Out Tons	Value Inbound (2010 \$)	Value Outbound (2010 \$)	% In+Out Value	Employment	Warehouse Sq Ft. Occupied	% Warehouse Sq Ft. Occupied	# Companies
Bergen	1,077,203	3,339,064	12%	1,899,712,751	11,814,532,065	13%	4,902	2,880,055	13%	232
Essex	1,606,830	3,733,824	15%	2,276,056,029	9,908,823,980	12%	3,521	1,149,983	5%	229
Hudson	1,256,844	2,829,236	11%	1,634,061,323	9,265,639,798	10%	1,756	1,346,912	6%	131
Hunterdon	70,249	98,968	0%	152,722,891	264,048,402	0%	142	57,737	0%	9
Middlesex	4,731,234	5,702,762	29%	7,593,108,557	24,899,591,456	31%	10,263	8,964,493	42%	293
Monmouth	415,543	312,503	2%	1,330,661,662	1,687,645,697	3%	642	233,992	1%	93
Morris	247,990	566,093	2%	444,207,042	1,679,982,662	2%	3,222	1,462,716	7%	129
Ocean	210,598	364,664	2%	678,320,245	2,272,251,022	3%	373	335,848	2%	57
Passaic	267,329	706,351	3%	493,684,635	1,862,418,776	2%	3,442	1,539,099	7%	173
Somerset	846,867	1,031,088	5%	1,727,159,092	4,136,708,236	6%	3,000	2,337,665	11%	88
Sussex	117,556	38,815	0%	184,941,690	19,594,317	0%	101	22,820	0%	20
Union	1,505,221	3,066,119	13%	3,067,024,013	9,485,869,752	12%	2,388	934,043	4%	194
Warren	486,534	1,262,800	5%	1,326,340,831	3,833,844,623	5%	88	252,000	1%	9
NJTPA Region	12,839,998	23,052,288	100%	22,808,000,759	81,130,950,786	100%	33,840	21,517,363	100%	1,657

Source: NJTPA Freight Forecasting Tool, 2012; Co-Star Database, 2014.

4.4 DATA COMPARISON AND GAPS IDENTIFICATION

At the conclusion of the steps described above, the project team had a comprehensive industry location and freight transportation database utilizing the best available data, providing an understanding of the composition of the Top 11 Regional Commodity Groups, the locations where the commodities are handled, direction of movement of the commodity flows, and volume by mode. This database has significant gaps, however, due in large part to the fact that it will be based upon secondary (modeled) and/or aging data. The project team identified instances in which disagreement or discrepancies existed between data sources. For example:

- Hudson County ranks third in the region in square feet of space dedicated to businesses shipping or receiving durable goods, yet accounts for only 6 percent of the inbound and outbound tonnage of durable goods in the region. Could this discrepancy be due to miscoded data, unique attributes of the types/size of businesses located in Hudson County, are Hudson County businesses sending or receiving goods that are moving intra-regionally, and therefore not appearing in the inbound/outbound totals? There are a number of similar discrepancies between commodity flows and business location clusters across several of the commodity bundles.
- A large share (56 percent) of energy products (Bundle 9) move by water. Is this realistic given the types of businesses located in the region and their logistics patterns?

Further, the data does not tell the full story of how goods move through the logistics chain. The dots on the map in Figure 4.1 illustrate activity centers, but the data points do not explain whether those activity centers are linked with other activity centers in the region, or beyond the boundaries of the region. For example, whether manufacturing or warehousing facilities in the NJTPA region are serving retailers located in this region or elsewhere in the world is not clear based upon the data alone.

4.5 INDUSTRY OUTREACH

In order to acquire supplemental information that was used to validate and/or modify the data gaps analysis findings, the project team conducted an extensive research- and outreach-based data collection program. The program featured interviews with key shippers, receivers, and logistics professionals, who provided more specific information on the features of each commodity bundle's logistics chain that are located in the NJTPA region, and how those features support and/or depend upon facilities outside the region. Unlike the commodity flow and industry location data, the information collected in this program consisted of primary/observed data and information, and served as supporting information to

validate or to justify modifications to the commodity flow and industry location data.

The outreach program consisted of three key steps, including:

- Step 1: Develop an Outreach Plan to set goals and to guide the outreach activities;
- Step 2: Identify the key “players” who own or move freight in each of the top commodity bundles. This step consisted of an interview with Choose New Jersey, a request for information and contacts from the RTAC, and interviews with several industry associations. This outreach validated the key industries and commodity bundles previously identified, articulated high-level trends, and enhanced the target roster of shippers, carriers, and logistics firms to interview;
- Step 3: Talk with shippers, receivers, and logistics professionals to better understand the patterns and trends regarding the mix of commodities, direction, origins and destinations, modes, and routes. The objective of Step 2 was to collect, validate, and augment information previously assembled through the conduct of interviews with shippers, receivers, and carriers, that can enhance the Project Team’s understanding of commodity-specific logistics.
- Step 4: Summarize the information collected and make appropriate adjustments to the commodity flow and industry location data, Freight Forecasting Tool, and the Regional Freight Commodity Profiles.

The Step 1 and 2 activities yielded a “long list” of over 200 businesses in the region. The Study Team reviewed this list and selected more than 30 prospective interview targets, representing all of the commodity bundles. The list of interviewees targeted was developed and revised over the course of the study to ensure that the interviews assist the team in filling gaps in our understanding of how specific commodity groups move in the region. Instead of reaching out to long marketing lists and attempting to contact “any” firm in each bundle, a great deal of effort was invested into the recruiting process, to ensure that the participants are moving the products contained in the bundle classifications, that their operations in some way represent the movement of these commodity bundles in the NJTPA region, and that the information shared would be current and thorough. Consideration to the balance of company sizes, locations throughout the region, modes used, and representation of “typical” versus “unique” supply chains was applied when developing the list of interview targets.

The interview targets were contacted by email and telephone and recruited to participate in a telephone interview with representatives from the Project Team. An interview guide was developed and shared with interview targets in advance of the scheduled interview. Figure 4.2 shows the Interview Guide document. Interview questions sought background information on the business’ product lines, customers, locations of production facilities, commodity supply chains, and

trends and/or projections that influence demand for goods or how goods are moved.

Figure 4.2 Interview Discussion Guide

The North Jersey Transportation Planning Authority ([NJTPA](#)) is requesting your assistance in support of the Regional Freight Commodity Profiles Study. This study aims to achieve a more complete understanding of how specific types of goods move into, out of, and within the northern New Jersey region to better-inform the region's transportation planning activities. As the agency that oversees \$2 billion in transportation improvement projects, it is important to have an understanding of how critical products move in the area. This discussion will take no more than 30 minutes. All individual company information will remain confidential. We are building a composite profile of the commodity. For more information on the [NJTPA Regional Freight Commodity Profiles Study](#), please visit the [study's page on the NJTPA website](#). THANKS!

Background

1. Please tell us briefly about your company and your products.
2. What types of customers do you serve?
3. Where are the production facilities that serve US markets located?

Commodity Supply Chain

The diagram below is a draft depiction of how the commodities typically associated with your business move into, out of, and within the [NJTPA](#) region as a starting point for the next several questions.

4. Please walk us through the commodity's supply chain from your company's perspective – How do your products generally flow from the production facilities to your end users?
5. What facilities – production and distribution – are located in the [NJTPA](#) region?
6. What market areas are served by these facilities?
7. Do you serve the [NJTPA](#) or broader NY-NJ market from facilities outside of the region? If yes, where are these facilities located?
8. How do your facilities typically receive inbound products for the facilities located in the [NJTPA](#) region – truck, rail, ocean, air?
9. What entity controls the inbound movement mode and route selection – you or your vendor?
10. How do your facilities typically ship outbound products from facilities in the [NJTPA](#) region?
11. What entity controls the outbound movement mode and route selection – you or your vendor?
12. How would you characterize any unique requirements or considerations in serving or moving products to, from or through the [NJTPA](#) region?
13. Are the commodity movements involving the [NJTPA](#) region different from ones that you use elsewhere in the U.S.? How and why?
14. How have these commodity supply chains changed in the last five years?
15. How do you see these commodity movements evolving in the next five years?

Wrap Up and Thanks

16. Are there other companies that we should speak with regarding our work?
17. What thoughts do you have regarding commodity movements in the [NJTPA](#) area?

Thanks very much for your input. Can we talk with you further as we proceed with our work?

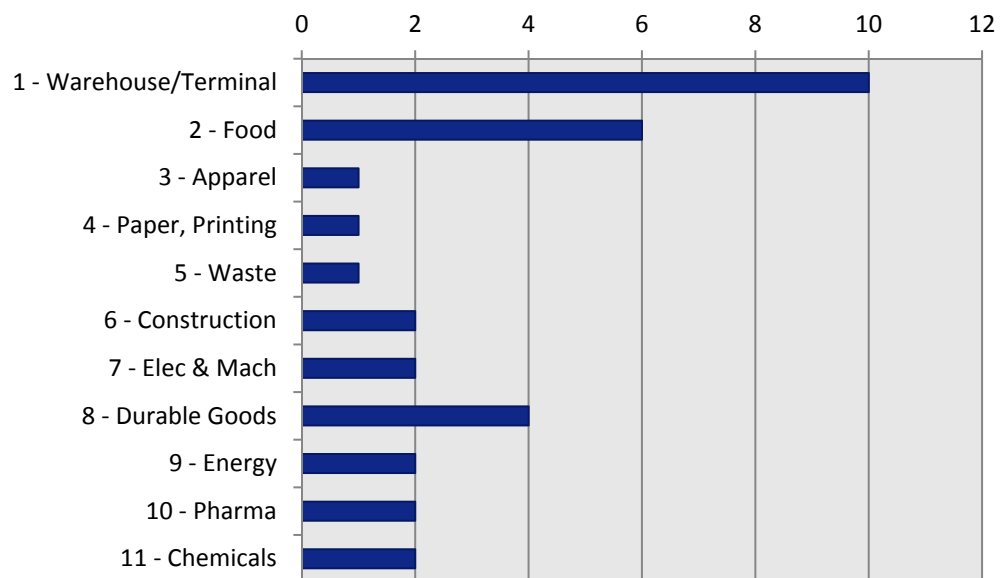
Map of the NJTPA Region (Counties Shaded in Blue)

In addition to engaging business representatives in one-on-one interviews, the completed outreach activities include the collection of information from other agencies' outreach to shippers and receivers in this region, which have yielded

information useful to this study. The inclusion of this information comes with the approval of the owners of the information and at no cost to this project.

In total, 24 interviews were completed or collected. Figure 4.3 shows the representation of each commodity bundle among the interviews completed. It is important to note that some interviewees represent more than one commodity bundle, and therefore, the number of data points shown in Figure 4.3 exceeds the 24 interviews completed.

Figure 4.3 Number of Interviews Completed by Bundle



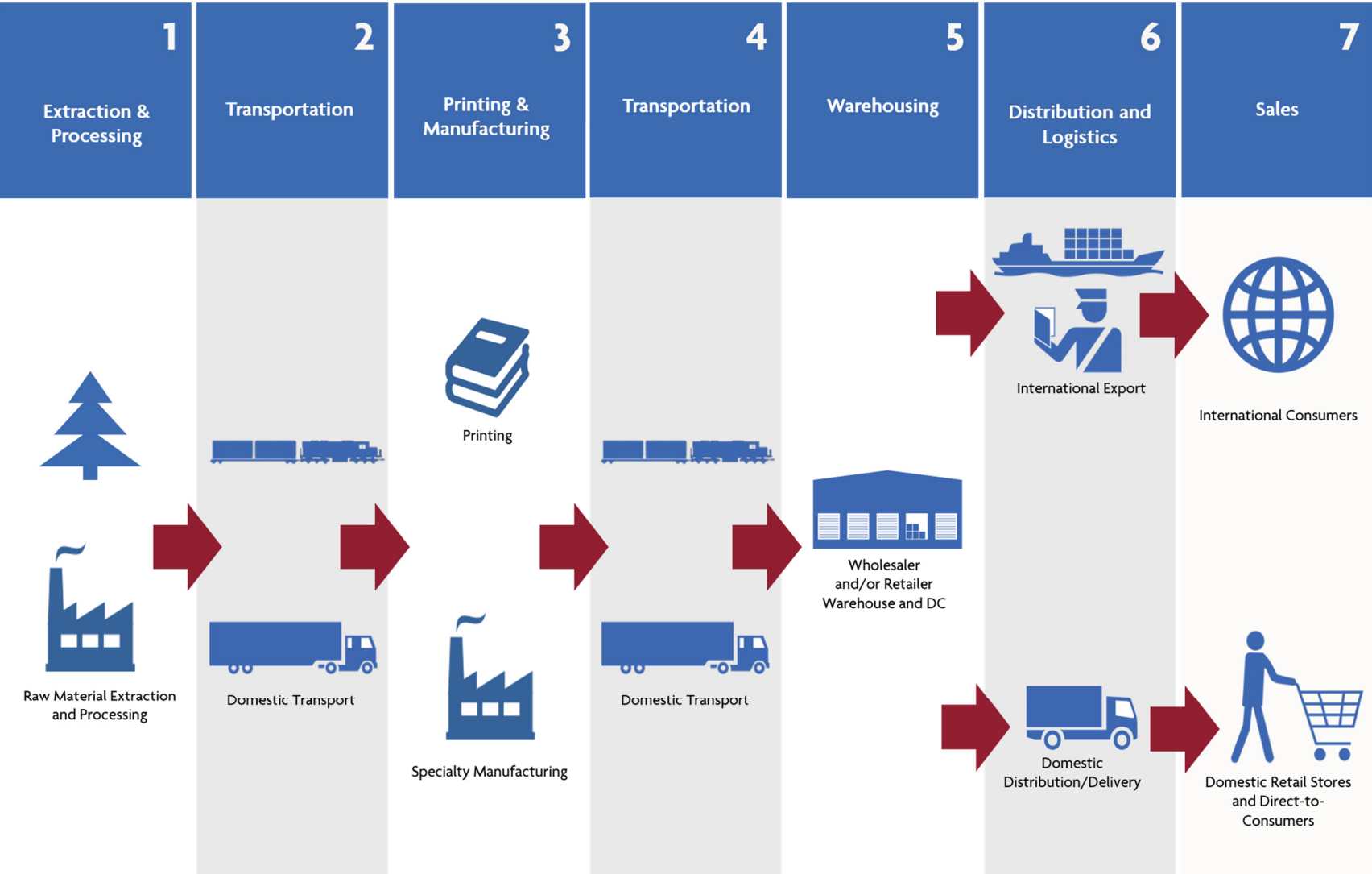
The Project Team reviewed the findings of the outreach, and found that the freight databases and Freight Forecasting Tool did not require significant adjustments to account for the outreach findings. The most valuable outcome of the outreach was, instead, the information gathered on how the steps of the supply chain for each commodity bundle are sequenced and connected, and key trends and issues that are likely to shape demand and logistics patterns for goods in each bundle. These findings were key inputs in the development of logistics chain summary flow charts that were developed for each commodity bundle and published in the Regional Freight Commodity Profiles. Figure 4.4 shows the logistics flow chart for Bundle 4, Paper and Printed Materials, as one example.

The Figure 4.4 graphic represents the supply chain for the paper and printed materials commodity bundle, illustrating the process of producing books, other printed materials, and specialty paper products, and distributing those products to retail stores, institutions, and directly to consumers. This supply chain consists of seven steps:

1. Raw material is extracted, or recycled pulp is produced, and sent for initial processing to produce raw paper, pulp, and allied products.

2. Products are transported by truck or rail carload.
3. Printing facilities or specialty paper product manufacturers, such as a cardboard box or cardstock manufacturer, produce finished goods.
4. Finished products are transported by truck or by rail.
5. Goods are processed through a warehouse or distribution center, and shipments are prepared for delivery to customers. The warehouse or distribution center may be owned by the publisher, a wholesaler, or a retailer.
6. Shipments are then distributed via one of the following two routes:
 - a) By truck or rail intermodal to an export distributor or freight forwarder for export by ocean vessel to international customers.
 - b) By truck directly from the distribution center to retail stores, institutional customers, or to fulfill direct-to-consumer orders.
7. Shipments are delivered to international and domestic customers, according to the customers' specifications.

Figure 4.4 Logistics Summary Flow Chart for Bundle 4, Paper and Printed Materials



5.0 Regional Freight Commodity Profiles

To communicate the key findings of the data analysis and outreach, a package of Regional Freight Commodity Profile documents was developed. These profiles are intended to present summary statistics and use maps, graphs, and narrative to summarize the composition, commodity flows, industry locations, highway network volumes, and logistics chain for each of the Top 11 Commodity Bundles. The documents are intended to be similar in style of narrative and graphics as the Subregional Freight Profiles developed for the 2040 Freight Industry Level Forecasts Study.

The conceptual outline for the Regional Freight Commodity Profiles includes the following elements for each of the Top 11 Commodity Bundles:

- Introduction to the commodity bundle
- Highlights of the commodity flow analysis (tons, value, direction, mode splits, top trading partners, top counties by inbound and outbound tonnage);
- Map of industry locations handling the goods in the commodity bundle;
- Highway network flows;
- Description of the logistics chain for the commodity bundle;
- Key industry trends influencing freight demand; and
- List of references for more information.

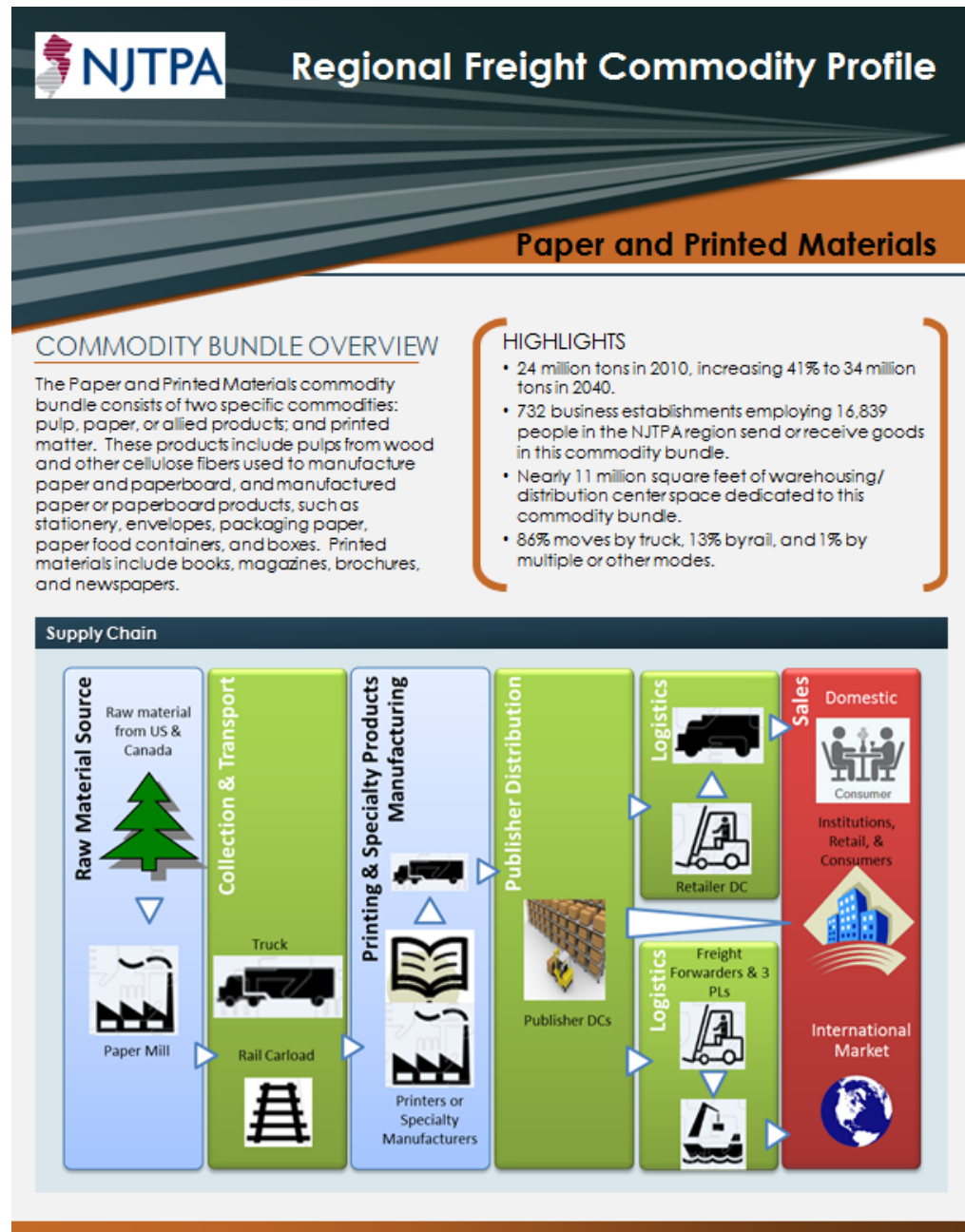
Charts and graphs summarizing the commodity flow data were developed using data from the FFT. Thematic maps illustrating the industry locations were developed using the industry location data described in the previous task, and mapped highway assignments were developed using the NJRTM-E assignment results developed in Task 1.

Working with NJTPA, CS developed a set of “logistics summary flow charts,” one for each commodity bundle, which summarize the flow of goods from raw materials extraction and goods production, through various transportation and logistics stages, to retail sales and institutional and individual consumers. The logistics summary flow charts are intended to provide a high-level overview of the sequence of steps required to produce and distribute goods that is general enough to serve as a representative of a wide range of goods and industries in each bundle, yet with sufficient detail to illustrate some of the distinguishing characteristics of each bundle. In accomplishing this balance, the differing stages, modes, and geographic coverages of various industry supply chains could be observed when

comparing flow charts representing different commodity bundles. The data and interview findings were the primary sources of information used to develop the flow charts.

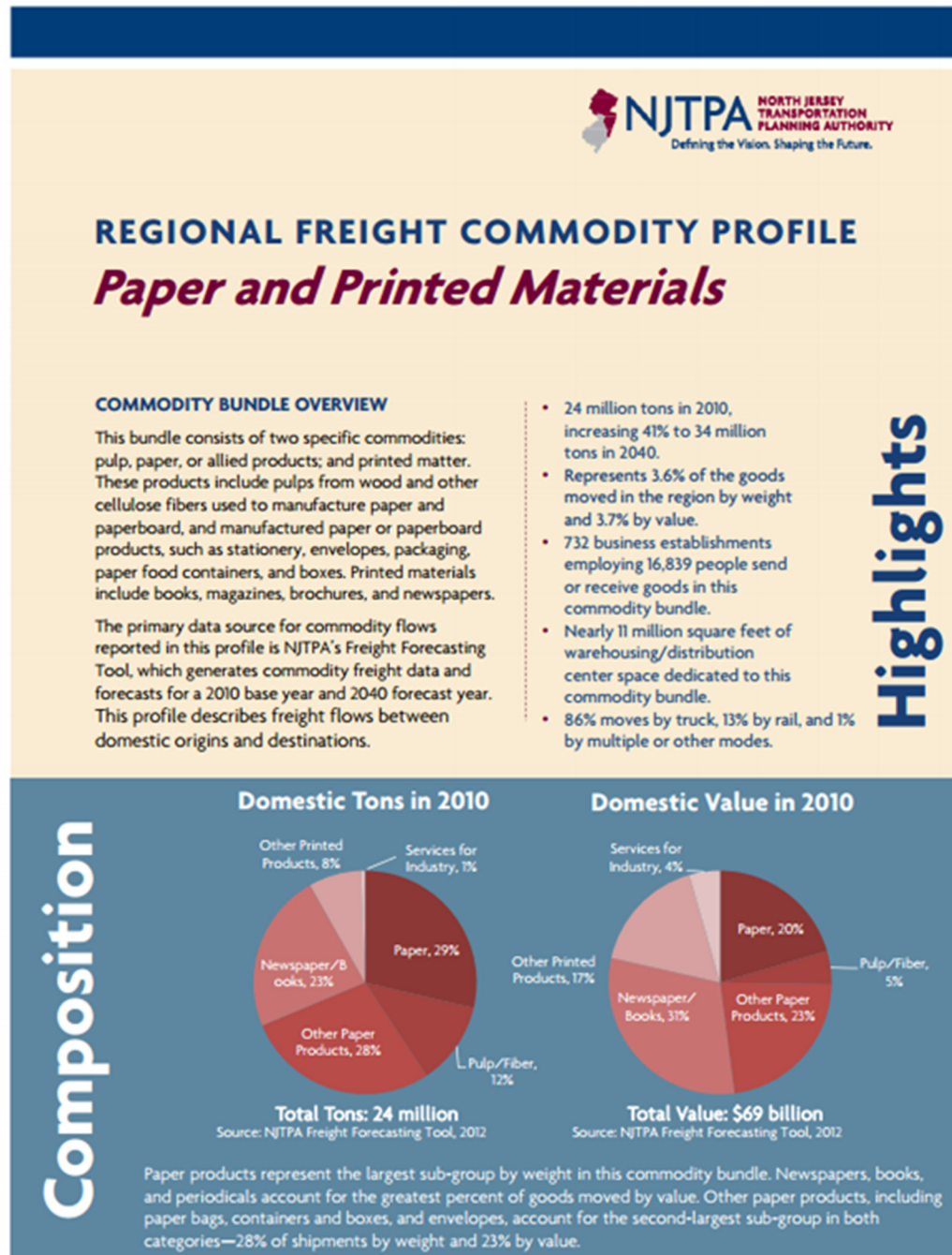
An initial draft Regional Freight Commodity Profile was developed for the Paper and Printed Materials commodity bundle (Figure 5.1). The draft was shared with the TAC in advance of the March 11, 2015 TAC meeting. The TAC provided valuable input on graphic design, narrative style, and other suggestions.

Figure 5.1 First Draft Regional Freight Commodity Profile for Paper and Printed Materials, Front Page



Graphics designers from NJTPA and CS contributed to the development of a revised design template, graphics, and narrative style that ultimately led to the final version of the set of Regional Freight Commodity Profiles that are currently available on the NJTPA website (Figure 5.2). The profiles were also expanded from 8 to 12 pages in length to accommodate a two-page logistics summary flow chart layout, photographs, and additional narrative.

Figure 5.2 Final Draft Regional Freight Commodity Profile for Paper and Printed Materials, First Page



The full set of Regional Freight Commodity Profiles is available on the NJTPA website, at <http://njtpa.org/Planning/Regional-Studies/Studies/Regional-Freight-Commodity-Profiles/Regional-Freight-Commodity-Profiles.aspx>.

A. List of 2-Digit and 4-Digit Standard Transportation Commodity Codes (STCC)

STCC2	STCC4	Name
01	0100	Farm Products
	0112	Cotton, Raw
	0113	Grain
	0114	Oil Kernels, Nuts or Seeds
	0115	Field Seeds
	0119	Misc. Field Crops
	0121	Citrus Fruits
	0122	Deciduous Fruits
	0123	Tropical Fruits
	0129	Misc Fresh Fruits or Tree Nuts
	0131	Bulbs, Roots or Tubers
	0133	Leafy Fresh Vegetables
	0134	Dry Ripe Vegetable Seeds
	0139	Misc Fresh Vegetables
	0141	Livestock
	0142	Dairy Farm Products
	0143	Animal Fibers
	0151	Live Poultry
	0152	Poultry Eggs
0191	Horticultural Specialties	
0192	Animal Specialties	
0199	Farm Prod, Nec	
08	0800	Forest Products
	0842	Barks or Gums, Crude
	0861	Misc Forest Products
09	0900	Fresh Fish or Marine Products
	0912	Fresh Fish or Whale Products
	0913	Marine Products
	0989	Fish Hatcheries
10	1000	Metallic Ores
	1011	Iron Ores
	1021	Copper Ores
	1031	Lead Ores
	1032	Zinc Ores
	1033	Lead and Zinc Ores Combined
	1041	Gold Ore
1042	Silver Ore	

STCC2	STCC4	Name
	1051	Bauxite or Other Alum Ores
	1061	Manganese Ores
	1071	Tungsten Ores
	1081	Chromium Ores
	1092	Misc Metal Ores
11	1100	Coal
	1111	Anthracite
	1121	Bituminous Coal
	1122	Lignite
13	1300	Crude Petrol. or Natural Gas
	1311	Crude Petroleum
	1312	Natural Gas
	1321	Natural Gasoline
14	1400	Nonmetallic Minerals
	1411	Dimension Stone, Quarry
	1421	Broken Stone or Riprap
	1441	Gravel or Sand
	1451	Clay Ceramic or Refracted Minerals
	1471	Mineral Fertilizer, Crude
	1491	Misc Nonmetallic Minerals, NEC
	1492	Water
19	1900	Ordnance or Accessories
	1911	Guns, Howitzers, Mortars, Etc.
	1925	Guided Missiles or Space Vehicle
	1929	Ammo or Related Parts, NEC
	1931	Tracked Combat Vehicles or Parts
	1941	Military Fire Control Equipment
	1951	Small Arms, 30mm or Less
	1961	Small Arms Ammo, 30mm or Less
	1991	Misc Ordnance or Accessories
20	2000	Food or Kindred Products
	2011	Meat, Fresh or Chilled
	2012	Meat, Fresh Frozen
	2013	Meat Products
	2014	Animal By-prod, Inedible
	2015	Dressed Poultry, Fresh
	2016	Dressed Poultry, Frozen
	2017	Processed Poultry or Eggs
	2021	Creamery Butter
	2023	Condensed, Evaporated, or Dry Milk
	2024	Ice Cream or Related Frozen Desserts
	2025	Cheese or Special Dairy Products
	2026	Processed Milk
	2031	Canned or Cured Sea Foods
	2032	Canned Specialties
	2033	Canned Fruits, Vegetables, Etc.
	2034	Dehydrated or Dried Fruit or Vegetables
	2035	Pickled Fruits or Vegetables

STCC2	STCC4	Name
	2036	Processed Fish Products
	2037	Frozen Fruit, Vegetables or Juice
	2038	Frozen Specialties
	2039	Canned or Pres Food, Mixed
	2041	Flour or Other Grain Mill Products
	2042	Prepared or Canned Feed
	2043	Cereal Preparations
	2044	Milled Rice, Flour or Meal
	2045	Blended or Prepared Flour
	2046	Wet Corn Milling or Milo
	2047	Dog, Cat or Other Pet Food, NEC
	2051	Bread or Other Bakery Prod
	2052	Biscuits, Crackers or Pretzels
	2061	Sugar Mill Prod or By-prod
	2062	Sugar, Refined, Cane or Beet
	2071	Candy or Other Confectionery
	2082	Malt Liquors
	2083	Malt
	2084	Wine, brandy or Brandy Spirit
	2085	Distilled or Blended Liquors
	2086	Soft Drinks or Mineral Water
	2087	Misc Flavoring Extracts
	2091	Cottonseed Oil or By-prod
	2092	Soybean Oil or By-products
	2093	Nut or Veg Oils or By-products
	2094	Marine Fats or Oils
	2095	Roasted or Instant Coffee
	2096	Margarine, Shortening, Etc.
	2097	Ice, Natural or Manufactured
	2098	Macaroni, Spaghetti, Etc.
	2099	Misc Food Preparations, NEC
21	2100	Tobacco Products
	2111	Cigarettes
	2121	Cigars
	2131	Chewing or Smoking Tobacco
	2141	Stemmed or Re-dried Tobacco
22	2200	Textile Mill Products
	2211	Cotton Broad-woven Fabrics
	2217	Cotton Broad-woven Fabrics
	2221	Man-made or Glass Woven Fiber
	2222	Silk-woven Fabrics
	2231	Wool Broad-woven Fabrics
	2241	Narrow Fabrics
	2251	Knit Fabrics
	2271	Woven Carpets, Mats or Rugs
	2272	Tufted Carpets, Rugs or Mats
	2279	Carpets, Mats or Rugs, NEC
	2281	Yarn

STCC2	STCC4	Name
	2284	Thread
	2291	Felt Goods
	2292	Lace Goods
	2293	Paddings, Upholstery Fill, Etc
	2294	Textile Waste, Processed
	2295	Coated or Imprinted Fabric
	2296	Cord or Fabrics, Industrial
	2297	Wool or Mohair
	2298	Cordage or Twine
	2299	Textile Goods, NEC
23	2300	Apparel or Related Products
	2311	Men's or Boys Clothing
	2331	Women's or Children's Clothing
	2351	Millinery
	2352	Caps or Hats or Hat Bodies
	2371	Fur Goods
	2381	Gloves, Mittens, or Linings
	2384	Robes or Dressing Gowns
	2385	Raincoats or Other Rain Wear
	2386	Leather Clothing
	2387	Apparel Belts
	2389	Apparel, NEC
	2391	Curtains or Draperies
	2392	Textile House Furnishings
	2393	Textile Bags
	2394	Canvas Products
	2395	Textile Prod, Pleated, Etc.
	2396	Apparel Findings
	2399	Misc Fabricated Textile Products
24	2400	Lumber or Wood Products
	2411	Primary Forest Materials
	2421	Lumber or Dimension Stock
	2429	Misc Sawmill or Planing Mill
	2431	Millwork or Cabinetwork
	2432	Plywood or Veneer
	2433	Prefab Wood Buildings
	2434	Kitchen Cabinets, Wood
	2439	Structural Wood Prod, NEC
	2441	Wood Cont. or Box Shooks
	2490	Miscellaneous Wood Products
	2491	Treated Wood Products
	2492	Rattan or Bamboo Ware
	2493	Lasts or Related Products
	2494	Cork Products
	2495	Hand Tool Handles
	2496	Scaffolding Equip or Ladders
	2497	Wooden Ware or Flatware
	2498	Wood Prod, NEC

STCC2	STCC4	Name
	2499	Misc Wood Products
25	2500	Furniture or Fixtures
	2511	Benches, Chairs, Stools
	2512	Tables or Desks
	2513	Sofas, Couches, Etc.
	2514	Buffets, China Closets, Etc.
	2515	Bedsprings or Mattresses
	2516	Beds, Dressers, Chests, Etc.
	2517	Cabinets or Cases
	2518	Children's Furniture
	2519	Household or Office Furniture, NEC
	2531	Public Building or Related Furniture
	2541	Wood Lockers, Partitions, Etc.
	2542	Metal Lockers, Partitions, Etc.
	2550	Pallets
	2551	Pallets
	2591	Venetian Blinds, Shades, Etc.
	2599	Furniture or Fixtures, NEC
26	2600	Pulp, Paper or Allied Products
	2611	Pulp or Pulp Mill Products
	2621	Paper
	2631	Fiber, Paper or Pulpboard
	2642	Envelopes
	2643	Paper Bags
	2644	Wallpaper
	2645	Die-cut Paper or Paperboard Products
	2646	Pressed or Molded Pulp Goods
	2647	Sanitary Paper Products
	2649	Misc Converted Paper Products
	2651	Containers or Boxes, paper
	2654	Sanitary Food Containers
	2655	Fiber Cans, Drums or Tubes
	2660	Paper or Building Board
	2661	Paper or Building Board
27	2700	Printed Matter
	2711	Newspapers
	2721	Periodicals
	2731	Books
	2741	Misc Printed Matter
	2761	Manifold Business Forms
	2771	Greeting Cards, Seals, Etc.
	2781	Blankbook, Loose Leaf Binder
	2791	Svc Indus For Print Trades
28	2800	Chemicals or Allied Products
	2811	Industrial, Inorganic, or Organic Chemicals
	2812	Potassium or Sodium Compound
	2813	Industrial Gases
	2814	Crude Prod Of Coal, Gas, Petroleum

STCC2	STCC4	Name
	2815	Cyclic Intermediates or Dyes
	2816	Inorganic Pigments
	2818	Misc Industrial Organic Chemicals
	2819	Misc Indus Inorganic Chemicals
	2821	Plastic Mater or Synth Fibers
	2831	Drugs
	2841	Soap or Other Detergents
	2842	Specialty Cleaning Preparations
	2843	Surface Active Agents
	2844	Cosmetics, Perfumes, Etc.
	2851	Paints, Lacquers, Etc.
	2861	Gum or Wood Chemicals
	2871	Fertilizers
	2879	Misc Agricultural Chemicals
	2891	Adhesives
	2892	Explosives
	2893	Printing Ink
	2899	Chemical Preparations, NEC
29	2900	Petroleum or Coal Products
	2911	Petroleum Refining Products
	2912	Liquefied Gases, Coal or Petroleum
	2951	Asphalt Paving Blocks or Mix
	2952	Asphalt Coatings or Felt
	2991	Misc Coal or Petroleum Products
30	3000	Rubber or Misc Plastics
	3011	Tires or Inner Tubes
	3021	Rubber or Plastic Footwear
	3031	Reclaimed Rubber
	3041	Rubber or Plastic Hose or Belting
	3061	Misc Fabricated Products
	3071	Misc Plastic Products
	3072	Misc Plastic Products
31	3100	Leather or Leather Products
	3111	Leather, Finished or Tanned
	3121	Industrial Leather Belting
	3131	Boot or Shoe Cut Stock
	3141	Leather Footwear
	3142	Leather House Slippers
	3151	Leather Gloves or Mittens
	3161	Leather Luggage or Handbags
	3199	Leather Goods, NEC
32	3200	Clay, Concrete, Glass or Stone
	3211	Flat Glass
	3213	Laminated Safety Glass
	3221	Glass Containers
	3229	Misc Glassware, Blown or Pressed
	3241	Portland Cement
	3251	Clay Brick or Tile

STCC2	STCC4	Name
	3253	Ceramic Floor or Wall Tile
	3255	Refractories
	3259	Misc Structural Clay Products
	3261	Vitreous China Plumbing Fixtures
	3262	Vitreous China Kitchen Articles
	3264	Porcelain Electric Supplies
	3269	Misc Pottery Products
	3271	Concrete Products
	3273	Ready-mix Concrete, Wet
	3274	Lime or Lime Plaster
	3275	Gypsum Products
	3281	Cut Stone or Stone Products
	3291	Abrasive Products
	3292	Asbestos Products
	3293	Gaskets or Packing
	3295	Nonmetal Minerals, Processed
	3296	Mineral Wool
	3299	Misc Nonmetallic Minerals
33	3300	Primary Metal Products
	3311	Blast Furnace or Coke
	3312	Primary Iron or Steel Products
	3313	Electrometallurgical Products
	3315	Steel Wire, Nails or Spikes
	3316	Cold Finishing Of Steel Shapes
	3321	Iron or Steel Castings
	3331	Primary Copper Smelter Products
	3332	Primary Lead Smelter Products
	3333	Primary Zinc Smelter Products
	3334	Primary Aluminum Smelter Products
	3339	Misc Primary Smelter Products
	3351	Copper or Alloy Basic Shapes
	3352	Aluminum or Alloy Basic Shapes
	3356	Misc Nonferrous Basic Shapes
	3357	Nonferrous Wire
	3361	Aluminum or Alloy Castings
	3362	Copper or Alloy Castings
	3369	Misc Nonferrous Castings
	3391	Iron or Steel Forgings
	3392	Nonferrous Metal Forgings
	3399	Primary Metal Products, NEC
34	3400	Fabricated Metal Products
	3411	Metal Cans
	3421	Cutlery ,not Electrical
	3423	Edge or Hand Tools
	3425	Hand Saws or Saw Blades
	3428	Builders or Cabinet Hardware
	3429	Misc Hardware
	3431	Metal Sanitary Ware

STCC2	STCC4	Name
	3432	Plumbing Fixtures
	3433	Heating Equipment, not Electrical
	3441	Fabricated Structural Metal Products
	3442	Metal Doors, Sash, Etc.
	3443	Fabricated Plate Products
	3444	Sheet Metal Products
	3446	Architectural Metal Work
	3449	Misc Metal Work
	3452	Bolts, Nuts, Screws, Etc.
	3461	Metal Stampings
	3481	Misc Fabricated Wire Products
	3491	Metal Shipping Containers
	3492	Metal Safes or Vaults
	3493	Steel Springs
	3494	Valves or Pipe Fittings
	3499	Fabricated Metal Products, NEC
35	3500	Machinery
	3511	Steam Engines, Turbines, Etc.
	3519	Misc Internal Combustion Engines
	3522	Farm Machinery or Equipment
	3523	Farm Machinery or Equipment
	3524	Lawn or Garden Equipment
	3531	Construction Machinery or Equipment
	3532	Mining Machinery or Parts
	3533	Oil Field Machinery or Equipment
	3534	Elevators or Escalators
	3535	Conveyors or Parts
	3536	Hoists, Industrial Cranes, Etc.
	3537	Industrial Trucks, Etc.
	3541	Machine Tools, Metal Cutting
	3542	Machine Tools, Metal Forming
	3544	Special Dies, tools, jigs, etc.
	3545	Machine Tool Accessories
	3548	Metalworking Machinery
	3551	Food Prod Machinery
	3552	Textile Machinery or Parts
	3553	Woodworking Machinery
	3554	Paper Industries Machinery
	3555	Printing Trades Machinery
	3559	Misc Special Industry Mach
	3561	Industrial Pumps
	3562	Ball or Roller Bearings
	3564	Ventilating Equipment
	3566	Mechanical Power Transmission Equipment
	3567	Industrial Process Furnaces
	3569	Misc General Industrial
	3572	Typewriters or Parts
	3573	Electronic Data Processing Equipment

STCC2	STCC4	Name
	3574	Accounting or Calculating Equipment
	3576	Scales or Balances
	3579	Misc Office Machines
	3581	Automatic Merchandising Machines
	3582	Commercial Laundry Equipment
	3585	Refrigeration Machinery
	3589	Misc Service Industry Machinery
	3592	Carburetors, Pistons, Etc.
	3599	Misc Machinery or Parts
36	3600	Electrical Equipment
	3611	Electric Measuring Instruments
	3612	Electrical Transformers
	3613	Switchgear or Switchboards
	3621	Motors or Generators
	3622	Industrial Controls or Parts
	3623	Welding Apparatus
	3624	Carbon Prod For Electric Uses
	3629	Misc Electrical Industrial Equipment
	3631	Household Cooking Equipment
	3632	Household Refrigerators
	3633	Household Laundry Equipment
	3634	Electric Housewares or Fans
	3635	Household Vacuum Cleaners
	3636	Sewing Machines or Parts
	3639	Misc Household Appliances
	3641	Electric Lamps
	3642	Lighting Fixtures
	3643	Current Carrying Wiring Equipment
	3644	Noncurrent Wiring Devices
	3651	Radio or TV Receiving Sets
	3652	Phonograph Records
	3661	Telephone or Telegraph Equipment
	3662	Radio or TV Transmitting Equipment
	3671	Electronic Tubes
	3674	Solid State Semiconductors
	3679	Misc Electronic Components
	3691	Storage Batteries or Plates
	3692	Primary Batteries
	3693	X-ray Equipment
	3694	Elec Equipment For Intern Comb Engine
	3699	Electrical Equipment, NEC
37	3700	Transportation Equipment
	3711	Motor Vehicles
	3712	Passenger Motor Car Bodies
	3713	Motor Bus or Truck Bodies
	3714	Motor Vehicle Parts or Accessories
	3715	Truck Trailers
	3721	Aircraft

STCC2	STCC4	Name
	3722	Aircraft or Missile Engines
	3723	Aircraft Propellers or Parts
	3729	Misc Aircraft Parts
	3730	Ships or Boats
	3732	Ships or Boats
	3741	Locomotives or Parts
	3742	Railroad Cars
	3751	Motorcycles, Bicycles or Parts
	3769	Missile or Space Vehicle Parts
	3791	Trailer Coaches
	3799	Transportation Equipment, NEC
38	3800	Instruments, Photo Equipment, Optical Equipment
	3811	Engineering, Lab or Scientific Equipment
	3821	Mechanical Measuring or Control Equipment
	3822	Automatic Temperature Controls
	3831	Optical Instruments or Lenses
	3841	Surgical or Medical Instruments
	3842	Orthopedic or Prosthetic Supplies
	3843	Dental Equipment or Supplies
	3851	Ophthalmic or Opticians Goods
	3861	Photographic Equip or Supplies
	3871	Watches, Clocks, Etc.
39	3900	Misc Manufacturing Products
	3911	Jewelry, Precious Metal, Etc.
	3914	Silverware or Plated Ware
	3931	Musical Instruments or Parts
	3941	Games or Toys
	3942	Dolls or Stuffed Toys
	3943	Children's Vehicles or Parts, NEC
	3949	Sporting or Athletic Goods
	3951	Pens or Parts
	3952	Pencils, crayons, or Artists Materials
	3953	Marking Devices
	3955	Carbon Paper or Inked Ribbons
	3961	Costume Jewelry or Novelties
	3962	Feathers, Plumes, Etc.
	3963	Buttons
	3964	Apparel Fasteners
	3991	Brooms, Brushes, Etc.
	3992	Linoleum or Other Coverings
	3993	Signs or Advertising Displays
	3994	Morticians Goods
	3996	Matches
	3997	Furs, dressed or Dyed
	3999	Manufactured Prod, NEC
40	4000	Waste or Scrap Materials
	4011	Ashes
	4021	Metal Scrap or Tailings

STCC2	STCC4	Name
	4022	Textile Scrap or Sweepings
	4023	Wood Scrap or Waste
	4024	Paper Waste or Scrap
	4025	Chemical or Petroleum Waste
	4026	Rubber or Plastic Scrap
	4027	Stone, Clay or Glass Scrap
	4028	Leather Waste or Scrap
	4029	Misc Waste or Scrap
41	4100	Misc Freight Shipments
	4111	Misc Freight Shipments
	4121	Special Commodities
	4192	Special Commodities
42	4200	Shipping Containers
	4211	Shipping Containers
	4221	Semi-trailers Returned Empty
	4231	Empty Equipment, Reverse Route
43	4300	Mail or Contract Traffic
	4311	Mail and Express Traffic
	4321	Other Contract Traffic
44	4400	Freight Forwarder Traffic
	4411	Freight Forwarder Traffic
45	4500	Shipper Association Traffic
	4511	Shipper Association Traffic
46	4600	Misc. Mixed Shipments
	4611	Freight All Kinds Shipments
	4621	Mixed Shipments, Multi-STCC
47	4700	Small Packaged Freight Shipments
	4711	Small Packaged Freight Shipments
48	4800	Hazardous Waste
	4804	Waste Nonflammable Compressed Gases
	4805	Waste Flammable Compressed Gases
	4807	Waste Flammable Liquids
	4808	Waste Flammable Liquids
	4809	Waste Flammable Liquids
	4812	Flammable Liquids
	4813	Waste Combustible Liquids
	4814	Combustible Liquids
	4815	Waste Combustible Liquids
	4816	Waste Flammable Solids
	4817	Waste Flammable Solids
	4818	Waste Oxidizing Materials
	4821	Waste Poison B, Organic
	4823	Waste Poisonous Materials
	4825	Waste Etiologic Agents
	4829	Waste Radioactive Materials
	4831	Waste Corrosive Materials
	4832	Waste Corrosive Materials
	4835	Waste Corrosive Materials

STCC2	STCC4	Name
	4836	Waste Corrosive Materials
	4845	Waste Other Regulated Materials, Group C
	4861	Waste Misc Hazardous Materials
	4862	Waste Misc Hazardous Materials
	4863	Waste Misc Hazardous Materials
	4866	Waste Misc Hazardous Materials
	4875	Waste Stream Other Regulated
49	4900	Hazardous Materials
	4901	Ammunition & Class A Explosives
	4902	Class B Explosives
	4903	Class C Explosives
	4904	Non Flammable Compressed Gases
	4905	Flammable Compressed Gases
	4906	Flammable Liquids
	4907	Flammable Liquids
	4908	Flammable Liquids
	4909	Flammable Liquids
	4912	Combustible Liquids
	4913	Combustible Liquids
	4914	Combustible Liquids
	4915	Combustible Liquids
	4916	Combustible Solids
	4917	Flammable Solids
	4918	Oxidizing Materials
	4919	Organic Peroxides
	4920	Poisons A
	4921	Poisons B, organic
	4923	Poisons B, inorganic
	4925	Irritating Materials - Etiologic Agents
	4926	Radioactive Materials
	4927	Radioactive Materials, Fissile Cl Iii
	4928	Radioactive Materials, Fissile Cl Ii
	4929	Radioactive Materials, Fissile Cl I
	4931	Corrosive Materials
	4932	Corrosive Materials
	4933	Corrosive Materials
	4934	Corrosive Materials
	4935	Corrosive Materials
	4936	Corrosive Materials
	4941	Other Regulated Materials Group A
	4944	Other Regulated Materials Group B
	4945	Other Regulated Material
	4960	Division 9 Environmentally Hazardous
	4961	Other Regulated Materials Group E
	4962	Other Regulated Materials Group E
	4963	Other Regulated Materials Group E
	4966	Other Regulated Materials Group E
50	5000	Secondary Traffic

STCC2	STCC4	Name
	5010	Warehouse & Distribution Center
	5020	Rail Intermodal Drayage
	5021	Rail Intermodal Drayage to Ramp
	5022	Rail Intermodal Drayage from Ramp
	5030	Air Freight Drayage
	5031	Air Freight Drayage to Airport
	5032	Air Freight Drayage from Airport
60	6000	Unclassified
99	9900	Municipal Solid Waste Not Present in Commodity Flow Database

B. NJTPA Freight Forecasting Tool User Guide – 2015 Update

ABOUT THE NJTPA FREIGHT FORECASTING TOOL

The NJTPA Freight Forecasting Tool (FFT) is a large spreadsheet model developed in the latest version of Microsoft Excel. The FFT meets the specifications of the North Jersey Transportation Planning Authority, Inc. (the Metropolitan Planning Organization for thirteen counties in North Jersey), its subregional clients (counties and cities), and other Technical Advisory Committee (TAC) representatives (including the New Jersey Department of Transportation and the Port Authority of New York and New Jersey).

The FFT was originally prepared as part of the NJTPA's *Freight Industry-Level Forecasts to the Year 2040* project. The Freight Forecasting Tool was created by Cambridge Systematics, Inc., in association with Parsons Brinckerhoff, the Rutgers University Center for Urban Policy Research, and A. Strauss-Weider Inc. It was subsequently updated in 2015 by Parsons Brinckerhoff as part of the NJTPA's *Regional Commodity Flow Profiles* project.

The FFT contains a TRANSEARCH freight flow database for year 2007. The database was developed using data from the Bureau of Transportation Statistics' 2007 Commodity Flow Survey. This is also the base year of analysis used for most freight planning activities in the region, including NJDOT's Freight Plan Phase 2, NYMTC's Regional Freight Plan Update, Port Authority of New York and New Jersey's Cross Harbor Freight Program. The TRANSEARCH database can be replaced with data developed using the 2012 and subsequent Commodity Flow Survey updates, as those products become available. TRANSEARCH is a commercial product of IHS Global Insight, purchased by NJTPA, containing confidential information subject to a restricted use license. TRANSEARCH, and by extension the Freight Forecasting Tool itself, cannot be shared or used in a manner not consistent with the license.

The FFT also includes a set of New Jersey economic and employment forecasts produced by Rutgers using its R/ECON model. The R/ECON forecasts are the most widely-accepted economic forecasts in the state.

Both TRANSEARCH and R/ECON forecasts are available independently. What is unique about the NJTPA FFT is how it:

- Integrates these two primary inputs, using the employment forecasts to grow current freight tonnages to projected future levels

- Applies a set of highly customized “what if” analysis factors to further modify the freight tonnage forecast
- Automatically generates detailed summary reports
- Automatically generates heavy truck trip tables for the NJTPA Regional Transportation Model – Enhanced (RTM-E)

Finally, it should be noted that the Tool is targeted at users who have a basic knowledge of economic forecasting and freight movement. With a suitable degree of user experience being assumed, development efforts were focused on the functionality and economy of the Tool.

COMPONENTS AND PROCESSING

The FFT consists of 25 worksheets within a single spreadsheet file. Most user interaction with the Tool will be on the first seven worksheets, with inputs on the first two worksheets and outputs on the next five worksheets; the use of these sheets is described in detail in the following section on “Running the Tool.” Below is a list of the worksheets by name, and a brief description of their contents and functions.

- **USER INPUTS MODEL.** This is the first worksheet, and the primary user interface area. On this worksheet, the user specifies the years to be forecast, the employment forecast to be used (one of the five R/ECON forecasts or a set of user-defined values), and two optional adjustments (employee productivity and allocation of regional warehouse growth). The User Input screen also contains instructions on the use of Macro commands to run the model.
- **WHAT IF.** This sheet contains a set of “What If” tables where the user can enter different values for employment growth, global and national trade and economic factors, and transportation logistics factors. Freight forecasts are driven primarily by the employment forecasts (from R/ECON or user-entered values), but can be significantly modified based on values entered in these tables.
- **COUNTY TABLES Employment** and **COUNTY TABLES Freight.** A set of worksheets where detailed results (employment forecasts and freight forecasts) are reported and stored. High-level summary results are also reported to the USER INPUTS MODEL worksheet for quick review.
- **EMPLOYMENT No What-If** and **FREIGHT No What-If.** After creating a forecast based on employment, prior to the application of any What-If adjustments, the user has the option to save the results to these two worksheets, for comparison with the results following the application of What-If adjustments.
- **RTME Adjusted.** This worksheet generates commodity truck trip tables for the NJTPA Regional Transportation Model-Enhanced, based on the freight forecast results and processing steps. The output includes a single table

including all commodity types, along with individual commodity truck trip tables for each of 12 commodity “bundles.” Eleven “bundles” were identified in the *Regional Commodity Flow Profiles* project; the twelfth is the remaining commodities not included in one of the eleven defined bundles.

- **SELECTED FORECAST.** Based on the user’s choice of employment forecasts, this worksheet populates with the correct employment information.
- **CHANGE BY CNTY-IND.** This worksheet disaggregates the NJTPA regional employment estimates by county and industry, based on factors provided by Rutgers along with the R/ECON forecasts.
- **WAREHOUSE ADJ.** This worksheet applies an optional calculation, recommended by ASW Inc., to reallocate warehouse and distribution center related employment from one NJTPA county to another, based on the most recent available information from the real estate development community.
- **ADJ CHANGE BY CNTY-IND.** This worksheet updates the disaggregated NJTPA regional employment to reflect the warehouse/distribution center adjustment, if applied.
- **EMPLOYMENT DRIVERS.** This worksheet extracts the employment growth rates by county and industry for the selected forecast years, and also provides a location for these growth rates to be modified based on information entered on the “What-If” worksheet.
- **MAKE-USE TABLES.** This worksheet contains tables that relate changes in industry employment to changes in the demand for certain types of commodities as inputs (USE) or outputs (MAKE).
- **FORECAST BASED ADJ MATRIX.** This worksheet takes the county-industry growth rates from the Employment Drivers worksheet and applies factors from the Make-Use tables to generate commodity class growth rates, differentiated by county, direction of move (inbound, outbound, internal or through), and mode of transportation. The base case assumption is that each TRANSEARCH record is grown without changing the mode associated with that record; however, there may be changes in modal shares because truck-oriented commodities may grow at a different rate than rail-oriented commodities. Mode share is a factor that can be manipulated by the user as a What-If adjustment.
- **SECTION II PIVOTS.** The “What-If” adjustment process actually takes place in two stages. The first stage affects the volume of freight moved and its origins and destinations. The second stage affects primarily how it is moved – shifting it from one mode to another, or one county to another. To properly calculate the adjustments, the second stage has to know the results of any changes made in the first stage. This worksheet creates a pivot table of results following the first stage of adjustments, from which the second stage of adjustments can look up the appropriate values.

- **PROCESSED TS 2007.** This worksheet contains a processed version of the NJTPA TRANSEARCH dataset. Compared to the original data, it contains additional lookup and sort fields, but less commodity specificity (2-digit code as opposed to the original 4-digit code). Each record in TRANSEARCH provides an origin, destination, mode, commodity, and volume. Freight flows between the years 2007 and 2010 were relatively flat, due to the recession, and the 2007 data is considered applicable to the current year. Columns appended to the TRANSEARCH freight flow database look up growth factors from other worksheets depending on the particular attributes of the individual record (county, type of flow, mode, commodity, and international vs. domestic). All records look up an employment-related growth factor from the FORECAST BASED ADJ MATRIX. Some records, but not others, look up other growth factors from the “What If” tables. For each record, the growth factors are summed and applied to the current year volumes, to produce a future year forecast.
- **Recon base, recon hi pop, recon low pop, recon high CPI, recon low CPI.** These are five alternative R/ECON forecasts for NJTPA regional employment. The differences between them are summarized on the USER INPUTS MODEL worksheet to assist the user in selecting the most appropriate forecast; these sheets provide details for the interested user.
- **User defined.** This worksheet allows the user to input their own employment growth forecasts for the NJTPA region. The User forecast can be selected and applied from the USER INPUTS MODEL worksheet.
- **Recon drivers.** This worksheet describes national forecast drivers that are part of R/ECON, presented for the interested user.
- **Moody's.** At the request of NJTPA, as a backcheck on R/ECON, a Moody's Economy.com forecast was acquired and is presented for the interested user.
- **Notes.** This worksheet presents the User Guide, for ready reference.

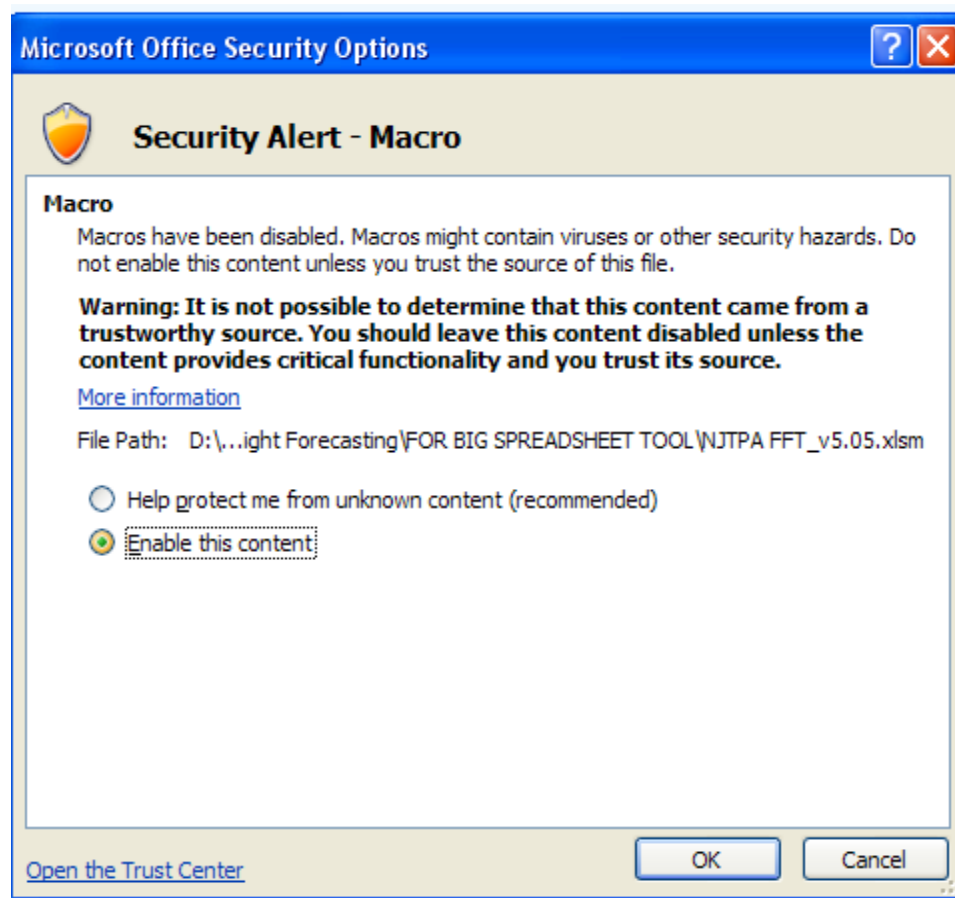
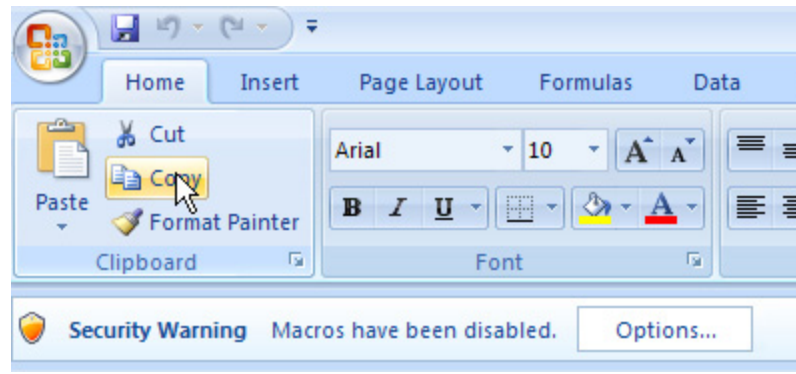
RUNNING THE FREIGHT FORECASTING TOOL

Step 0 -- Open the FFT File

Open Excel.

Then open the NJTPA Freight Forecasting Tool file. This may take up to five minutes, depending on your machine, so please be patient.

When you see the Security Warning, click Options, then “Enable this content” so the macro scripts in the Tool will run properly.



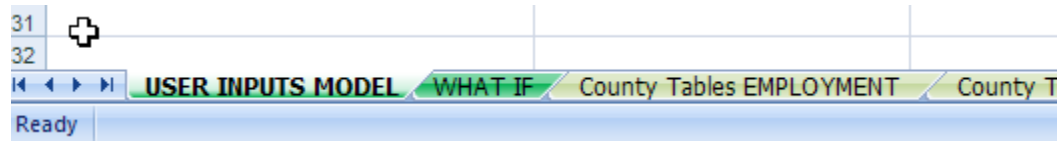
On older computers, the FFT excel file tended to load slowly and could occasionally hang and freeze. This seems to be a diminishing issue, as computer speed and memory has improved.

However, for power users, a special "QuickRun" application - where FFT's Excel files are moved to and from Access, with improve loading and running times - has been developed. Application in QuickRun mode is entirely optional, and is not

necessary for successful use of the FFT. The procedures are described at the end of this User Guide.

Step 1 – Set Forecast Assumptions

Make sure you are on the USER INPUTS MODEL worksheet. It is the first tab in the list of worksheets.



From the pull-down menus, select a forecast start year and a forecast end year.

4	Step 1: Set Forecast Assumptions	User Entry Area
5		
6	a. Enter Forecast Start Year >>>	2010
7	b. Enter Forecast End Year >>>	2040
8		2033
9		2034
10		2035
11		2036
12		2037
		2038
		2039
		2040

Next, from the pull-down menu, select one of the six options for a “seed” forecast.

25	c. Select "Seed" Forecast >>>	Base RECON Forecast
26		Base RECON Forecast
27		Alt (Higher Pop) RECON Forecast
28		Alt (Lower Pop) RECON Forecast
		Alt (Higher CPI) RECON Forecast
		Alt (Lower CPI) RECON Forecast
		User Defined

To assist in selecting the most appropriate seed forecast, the USER INPUTS MODEL provides summaries of the key values and differences associated with these forecast variations.

Indexed US Factors 2010-2040										
	US GDP	US Pop	US CPI	NF Emp	Ret Sales	Imp Val	Exp Val			
Factors from RECON	2.21	1.31	2.01	1.36	4.04	4.93	6.91			
Factors from Moody's	1.96	1.31	1.91	1.32	2.48	5.47	6.73			
Indexed NJ Factors 2010-2040										
	NJ GSP	NJ Pop	NJ CPI	NJ NF Emp	NJ Ret Sales	NJTPA Pop	NJTPA NF Emp			
Base RECON Forecast	1.81	1.23	1.80	1.34	3.34	1.22	1.32			
Alt (Higher Pop) RECON Forecast	1.90	1.36	1.79	1.41	3.72	1.34	1.40			
Alt (Lower Pop) RECON Forecast	1.73	1.17	1.80	1.29	3.23	1.16	1.28			
Alt (Higher CPI) RECON Forecast	1.77	1.22	1.89	1.31	3.31	1.21	1.28			
Alt (Lower CPI) RECON Forecast	1.87	1.24	1.69	1.37	3.37	1.23	1.38			
Selected Start Year Values										
	NJ GSP (\$2000 bil)	NJ Pop (000)	NJ CPI (1982=100)	NJ NF Emp (000)	NJ Ret Sales (\$bil)	NJTPA Pop (000)	NJTPA NF Emp (000)			
Base RECON Forecast	434	8,792	234	3,854	121	6,580	2,847			
Alt (Higher Pop) RECON Forecast	434	8,792	234	3,854	121	6,580	2,847			
Alt (Lower Pop) RECON Forecast	434	8,792	234	3,854	121	6,580	2,847			
Alt (Higher CPI) RECON Forecast	434	8,792	234	3,854	121	6,580	2,847			
Alt (Lower CPI) RECON Forecast	434	8,792	234	3,854	121	6,580	2,847			
Selected End Year Values										
	NJ GSP (\$2000 bil)	NJ Pop (000)	NJ CPI (1982=100)	NJ NF Emp (000)	NJ Ret Sales (\$bil)	NJTPA Pop (000)	NJTPA NF Emp (000)			
Base RECON Forecast	786	10,805	421	5,151	403	8,003	3,768			
Alt (Higher Pop) RECON Forecast	825	11,972	420	5,441	449	8,848	3,975			
Alt (Lower Pop) RECON Forecast	749	10,323	421	4,962	389	7,655	3,631			
Alt (Higher CPI) RECON Forecast	769	10,729	442	5,066	400	7,947	3,654			
Alt (Lower CPI) RECON Forecast	812	10,909	396	5,275	407	8,081	3,917			

HINT: SELECT FORECAST THAT MOST CLOSELY REFLECTS YOUR TARGET FOR END YEAR VOLUMES.

If you have selected the User Defined forecast, please make sure you have entered forecast values in the USER DEFINED worksheet. The values must be entered in this format, for as many years as your forecast needs to cover, or the Tool will not process the data correctly.

Employment in Goods Producing Industries by Labor				
	2007	2008	2009	2010
NJTPA	500	1,000	1,500	2,000
Employment in Private Service Producing Industries by Labor				
	2007	2008	2009	2010
NJTPA	500	750	1,000	1,250
Employment in Government by Labor Area, in Thousands				
	2007	2008	2009	2010
NJTPA	100	100	100	100

Next, decide whether to accept the optional Warehouse Employment adjustment, which shifts some of the forecast growth in warehouse/distribution industries from Bergen to Middlesex. We recommend accepting this adjustment by selecting "Yes" from the pull down menu.

28			
29	d. Adjust Warehouse Employment? >>>	Yes	APPLIED
30			

Next, decide whether to apply labor productivity changes. With no changes, these values are set at 1.0, and freight tonnage increases at the same rate as employment in the industries that generate particular types of freight. With higher values, future employees are assumed to produce more freight than current employees,

and freight tonnage will grow faster than employment. We recommend a value of 1.20 for the year 2040, which represents productivity gains of 0.0067 per year between 2010 and 2040. To adjust labor productivity, select “Yes” from the pull down menu and enter scalar values for each type of industry. Changes of .01 or more per year are not recommended.

32			
33	e. Adjust Labor Productivity? >>>	Yes	APPLIED
34			

Indexed Output per Employee	Ag Mining	Construction	Manufacturing
Default Factors	1.00	1.00	1.00
User Adjustment (per year)	0.0067	0.0067	0.0067
Alternate Factor	1.20	1.20	1.20

Step 2 – Process the Forecast

Once Step 1 is completed, go to the Step 2 area and select “Yes” from the pull down menu.

39	Step 2: Process Forecast	
40		
41	a. Finished? >>>	Yes

You will then see the following instructions. It is critical to follow these instructions, and to perform them in the correct order.

<i>IF you want to clear any prior What-If Values, hit CTRL-SHIFT-C FROM THIS SCREEN.</i>
<i>THEN hit CTRL-SHIFT-F to update the Transearch Forecast</i>
<i>THEN hit CTRL-SHIFT-R to refresh the output reports.</i>

- CTRL-SHIFT-C clears any data that may be in the What-If area from previous sessions. If you leave that data there, the Tool will use it in processing the forecast, and you will not get the expected results. This macro may take 2-3 minutes to run.
- CTRL-SHIFT-F refreshes the TRANSEARCH forecast. It updates pivot tables and performs copy/paste values calculations within the Tool to “lock in” the changes. This macro typically runs in about a minute.

- CTRL-SHIFT-R creates detailed output reports. This macro may take 1-2 minutes to run.

Once each of these macros has been run, detailed results will be stored in the COUNTY TABLES Employment and COUNTY TABLES Freight worksheets. Summary results will be reported and displayed on the USER INPUTS MODEL worksheet (shown on the following page).

With respect to the reported tonnage, it is very important to remember that TRANSEARCH does not include international air and water tonnage. It includes only domestic and cross-border surface trade tonnage. Therefore, international air and water tonnage is not forecast within TRANSEARCH. However, the landside traffic (by truck, rail, and water) moving to and from international gateways is part of TRANSEARCH. Several of the “What If” adjustments specifically target international trade volumes, and directly impact these landside connecting moves.

45	NON-FARM EMPLOYMENT (in thousands)	2010	2040	Change	Percent	CAGR
46						
47	Agriculture and Mining	52.0	56.2	4.1	108%	0.3%
48	Chemical	47.4	50.3	2.9	106%	0.2%
49	Computers & Electronics	14.7	16.2	1.5	110%	0.3%
50	Construction	42.6	46.0	3.4	108%	0.3%
51	Fabricated Metal	18.4	19.1	0.7	104%	0.1%
52	Federal and State Government	437.0	526.8	89.8	121%	0.6%
53	Finance, Insurance, real estate, rental, and leasing	239.0	331.3	92.3	139%	1.1%
54	Food (Food & Drink)	16.0	16.4	0.4	102%	0.1%
55	Information	76.8	106.2	29.4	138%	1.1%
56	Machinery	20.7	21.6	0.8	104%	0.1%
57	Other Durables	2.3	2.9	0.6	125%	0.8%
58	Other Nondurable and Unspecified	49.3	51.4	2.1	104%	0.1%
59	Other Services	1,174.8	1,625.9	451.1	138%	1.1%
60	Paper	7.1	7.9	0.8	111%	0.3%
61	Plastics	9.6	11.1	1.5	115%	0.5%
62	Printing	12.0	11.7	(0.4)	97%	-0.1%
63	Retail trade	319.6	442.1	122.5	138%	1.1%
64	Transportation, Warehousing, Utilities	134.6	186.5	51.9	139%	1.1%
65	Wholesale trade	172.5	238.9	66.3	138%	1.1%
66	Grand Total	2,846.6	3,768.2	921.6	132%	0.9%
67						
68	Bergen	453.4	601.7	148.3	133%	0.9%
69	Essex	361.2	458.8	97.6	127%	0.8%
70	Hudson	232.3	314.1	81.8	135%	1.0%
71	Hunterdon	54.9	69.8	14.9	127%	0.8%
72	Middlesex	391.6	541.0	149.4	138%	1.1%
73	Monmouth	262.4	355.8	93.5	136%	1.0%
74	Morris	281.2	362.6	81.4	129%	0.9%
75	Ocean	160.9	218.1	57.2	136%	1.0%
76	Passaic	172.7	230.1	57.4	133%	1.0%
77	Somerset	169.6	230.8	61.1	136%	1.0%
78	Union	224.2	281.6	57.4	126%	0.8%
79	Warren	37.3	46.6	9.2	125%	0.7%
80	Sussex	45.0	57.3	12.3	127%	0.8%
81	Grand Total	2,846.6	3,768.2	921.6	132%	0.9%
82						

	2010	2040	Change	Percent	CAGR
FREIGHT TONS, NJTPA REGION					
Outbound	147,888,783	201,825,582	53,936,799	136%	1.0%
Inbound	156,607,268	229,835,937	73,228,669	147%	1.3%
Internal	92,622,431	136,829,665	44,207,234	148%	1.3%
Through	265,617,202	374,881,559	109,264,357	141%	1.2%
Total	662,735,684	943,372,743	280,637,059	142%	1.2%
Air	479,810	637,364	157,554	133%	1.0%
Rail Carload	31,173,074	46,487,229	15,314,155	149%	1.3%
Rail Intermodal	12,295,420	19,804,304	7,508,884	161%	1.6%
Rail NEC	2,154,368	3,064,383	910,015	142%	1.2%
Truck	537,611,540	763,602,437	225,990,898	142%	1.2%
Water	76,352,515	106,629,199	30,276,684	140%	1.1%
Pipeline/Other	2,668,956	3,147,827	478,870	118%	0.6%
Total	662,735,684	943,372,743	280,637,059	142%	1.2%

Step 3 - What-If Adjustments

If the user simply wants to generate a freight forecast directly from the employment forecasts, this step can be skipped. However, if the user wants to make “surgical” changes to the employment and freight forecasts, Step 3 is the opportunity to do so.

Through Steps 1 and 2, all user inputs to the Tool have been in the USER INPUT MODEL worksheet. In Step 3, the user will work with the WHAT IF worksheet.

On the USER INPUT MODEL worksheet, there is a short list of instructions for how to perform and apply the “What If” changes. As in Step 2, it is critically important to perform each of these steps, and to perform them in the correct order, or the Tool may produce unexpected results.

104	Step 3: What-If Adjustments								
105									
106		If What-If Adjustments are desired: 1) Hit CTRL-SHIFT-K to save the original results prior to the What-If Adjustments							
107		2) Go to the What-If worksheet and follow these steps carefully:							
108		a) Do you have CHANGES FOR SECTION I? If NO, skip to B. If YES, enter changes, and hit CTRL-SHIFT-F to update the forecast.							
109		b) Do you have CHANGES FOR SECTION II? If NO, skip to C. If YES, hit CTRL-SHIFT-U to update lookups, enter changes, and hit CTRL-SHIFT-F.							
110		c) Hit CTRL-SHIFT-R to update the reports.							
111									
112									
113									
114									
115									

- First, hit CTRL-SHIFT-K. This saves the results from Step 2 to the EMPLOYMENT No What-If and FREIGHT No What-If worksheets, so they can be compared to the results after applying the What-If adjustments. Also, the No What-If results are reported in summary form on the USER INPUTS MODEL worksheet.

- Next, go to the WHAT IF worksheet. Data entry on this worksheet is divided into two Sections. Any data entered in Section I must be fed back into the Tool, processed, and read by Section II before data is entered in Section II.
- If you have any changes to the items listed in Section I, enter them and hit CTRL-SHIFT-F to refresh the TRANSEARCH forecast.
- If you have any changes to the items listed in Section II, hit CTRL-SHIFT-U to update the lookup tables that are required by the variables in Section II. Then enter data and hit CTRL-SHIFT-F to refresh the TRANSEARCH forecast. If you have no changes to Section II, skip this step.
- Finally, hit CTRL-SHIFT-R to update the reports. The forecasts with the What-If adjustments applied will be stored in the COUNTY TABLES Employment and COUNTY TABLES Freight worksheets. Summary results will be reported and displayed on the USER INPUTS MODEL worksheet, side by side with the No What-If results; the gray shaded column between them shows the difference between the end year values for the two forecasts, so the user can see at a glance the effect of the “What If” changes.

Detailed explanations of the various What-If adjustments available to the user are presented at the end of this User Guide, following the discussion of Step 4.

Step 4 - NJRTM-E Trip Table Generation

Once the desired freight forecast has been generated, the user can hit CTRL-SHIFT-T to generate the corresponding heavy truck trip tables for the NJTPA Regional Transportation Model - Enhanced (NJRTM-E). The tables are created and stored in the RTME ADJUSTED worksheet. The user can then use Excel’s “copy/paste values” function to move the information to an external location for post-processing and use in RTM-E.

From the USER INPUTS MODEL worksheet, the user can change two of the key conversion factors - tons per truck and travel days per year. There is also a cell that provides verification that the trip tables have been successfully created.

9			
0	Step 1:	18.0	Enter Tons per Truck in cel
1			
2	Step 2:	295	Enter Days per Year to cor
3			
4	Step 3:	RTME Table Created -- Have Fun!	
			The cell to the left will che

The primary new functionality introduced in 2015 is the creation of separate trip tables for all trucks combined, and for twelve individual and distinct commodity groupings - eleven representing “commodity bundles” defined in the Regional Freight Flow Profiles study, and the twelfth including the remainder commodity classes not included in one of the commodity bundles. The USER INPUTS MODEL worksheet provides a summary of annual tons and daily loaded

commodity trucks associated with each of the twelve groupings, and for the total of all groupings, for ready reference.

	Future Tons	Daily Truck Trips
TOTAL ALL COMMODITIES	793,385,706	149,414
BUNDLE 1: WH & Distribution, and Unspecified Commodities and Parcels	193,751,814	36,488
BUNDLE 2: Food, Beverages, Farming, Fishing and Tobacco	92,670,463	17,452
BUNDLE 3: Apparel, Textiles and Leather	5,828,272	1,098
BUNDLE 4: Paper and Printing	30,295,617	5,705
BUNDLE 5: Waste	38,930,911	7,332
BUNDLE 6: Construction Material (including lumber, wood products, CCGS, nonmetallic min, metallic ores)	233,520,116	43,977
BUNDLE 7: Machinery, Electronics, Transportation Equipment, and Instruments	28,714,210	5,408
BUNDLE 8: Other Durable Goods (e.g. furniture and fixtures)	3,777,634	711
BUNDLE 9: Energy (including, crude oil, refined petroleum, and coal)	58,862,680	11,085
BUNDLE 10: Pharmaceuticals	2,988,986	563
BUNDLE 11: Hazmat and Chemicals ex Drugs or Ag	61,203,043	11,526
REMAINDER 12: Rubber, Plastics, Metals, Ag Chemicals	42,841,960	8,068

Additional Detail on the What-If Adjustments

The discussion above provides a basic overview of the structure and functionality of the NJTPA Freight Forecasting Tool. Most of the functions are straightforward and relatively easy to explain and understand. However, some of the “What If” adjustments are not intuitive, and all of them warrant further discussion.

So: let’s walk through each of the “What If” adjustment steps in more detail.

First, remember to hit CTRL-SHIFT-K to save the No What-If forecast results.

Next, go to the WHAT IF worksheet. As mentioned earlier, the WHAT IF worksheet is divided into two Sections which are processed separately. Section I contains adjustments to Employment Drivers and Import/Export/Domestic Balance. Section II contains adjustments to Mode Choice and Logistics Factors.

Starting with Section I: to adjust Employment Drivers, look for Section 1A and the long list of industry classes and counties, starting in row 14. In this area, the current and future employment from the selected seed forecast is displayed. For any given line, the user can override these values, by entering either a Compound Annual Growth Rate or an Alternative Future Employment. Any number other than zero is read as a change to the seed forecast, and processed accordingly.

	I	J	K	L	M	N	O	P	Q
14	1A. ADJUSTMENTS TO THE EMPLOYMENT DRIVERS TABLE								
15		2010	2040	Change (000)	CAGR		Enter Alternative CAGR (<>0)	Enter Alternative Future Employment (<>0)	Adjusted 2040 Employment (000)
16		Employment (000)	Employment (000)						
17	Agriculture and Mining								
18	Bergen	7.5	7.9	0.5	0.2%		1.0%		10.1
19	Hudson	2.4	2.6	0.1	0.2%			4.0	4.0
20	Passaic	3.9	4.1	0.2	0.2%				0.0
21	Essex	4.8	3.8	(1.0)	-0.8%				0.0
22	Hunterdon	1.8	1.4	(0.4)	-0.8%				0.0
23	Morris	5.4	4.2	(1.1)	-0.8%				0.0
24	Sussex	1.5	1.2	(0.3)	-0.8%				0.0
25	Union	4.4	3.5	(0.9)	-0.8%				0.0
26	Warren	0.9	0.8	(0.1)	-0.3%				0.0
27	Middlesex	5.8	7.9	2.1	1.0%				0.0
28	Monmouth	6.2	8.5	2.3	1.0%				0.0
29	Ocean	4.7	6.4	1.7	1.0%				0.0
30	Somerset	2.9	4.0	1.1	1.0%				0.0

In the example above, we increased the CAGR for Agriculture and Mining employment in Bergen County from 0.2% to 1.0%, for a forecast through 2040. We specified a value of 4,000 employees for Hudson County. The resulting adjustments are shown in Column G, Adjusted Employment. Similar adjustments can be made in every other industry class in the same way – with two exceptions.

The exceptions are the Manufacturing and the Other Services (Including Information) industry groups, where it is necessary to first calculate the change in employment, and then allocate it across specific industries. In the example below, we increased the CAGR for Manufacturing employment in Bergen County from 0.2% to 1.0%, for a forecast through 2040. We specified a value of 15,000 employees for Hudson County. The resulting adjustments are shown in Column G, Adjusted Employment.

	I	J	K	L	M	N	O	P	Q
14	1A. ADJUSTMENTS TO THE EMPLOYMENT DRIVERS TABLE								
15		2010	2040	Change (000)	CAGR		Enter Alternative	Enter Alternative	Adjusted 2040
16		Employment (000)	Employment (000)				CAGR (<>0)	Future Employment (<>0)	Employment (000)
47	Manufacturing								
48	Bergen	33.4	35.5	2.0	0.2%		1.0%	15.0	45.1
49	Hudson	10.7	11.3	0.6	0.2%				15.0
50	Passaic	15.2	16.1	0.9	0.2%				0.0
51	Essex	21.0	16.6	(4.4)	-0.8%				0.0
52	Hunterdon	2.7	2.1	(0.6)	-0.8%				0.0
53	Morris	20.9	16.5	(4.4)	-0.8%				0.0
54	Sussex	1.8	1.4	(0.4)	-0.8%				0.0
55	Union	24.2	19.1	(5.1)	-0.8%				0.0
56	Warren	5.4	4.9	(0.5)	-0.3%				0.0
57	Middlesex	34.7	47.4	12.7	1.0%				0.0
58	Monmouth	8.4	11.4	3.0	1.0%				0.0
59	Ocean	4.7	6.4	1.7	1.0%				0.0
60	Somerset	14.4	19.7	5.3	1.0%				0.0

Looking to the right of the Manufacturing employment data entry area, there is a column reporting the changed employment to the user, and a set of industries where values may be entered. The user has to assign all of the employment in the “ALLOCATE THIS CHANGE” column to the industries listed in the columns to the right. In the example below, we created 13,300 new employees but did not allocate them to industries, and the Tool provided a friendly reminder to do so. When the employment is correctly assigned, the reminder disappears.

Q	R	S	T	U	V
Adjusted 2040					
Employment (000)					
	ALLOCATE THIS CHANGE	Chemical	Computers and Electronics	Fabricated Metal	Food
45.1		9.6			
15.0		3.7			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
		13.3	0.0		
	WARNING, CHANGE NOT ALLOCATED, PLEASE ASSIGN TO INDUSTRIES				

Q	R	S	T	U	V
Adjusted 2040					
Employment (000)					
	ALLOCATE THIS CHANGE	Chemical	Computers and Electronics	Fabricated Metal	Food
45.1		9.6	9.6		
15.0		3.7		3.7	
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
0.0		0.0			
		13.3	13.3		

For Other Services (Including Information) the same allocation step is required.

The Tool will calculate whatever changes the user specifies, but unless extreme effects are the user's goal, it is suggested that changes to the seed forecast values not be less than 1/3 or more than 3 times the original values. Where possible, changes should relate to known industrial development projects, or to employment forecasts developed by or for each county.

Still in Section I, and moving on to Import/Export/Domestic Balance: look for Section 1B, starting in row 188. You will see a list of factors: World GDP; US GDP; World Fuel Price; US Fuel Price; Exchange Rates; Other Adjustments to Imports; and Other Adjustments to Exports and Domestic Production.

	I	J	K	L	M	N	O
188	1B. Adjustments to Import/Export/Domestic Balance						
189		DEFAULT EST	NEW	RESULT	ADJUSTMENT	SENSITIVITY	SCALAR
190		for analysis year	(one cell only)		RATIO		
191	GDP, World						
192	CAGR (must be <> 0)	4.40%		0.00%			
193	End/Begin	3.64		-	1.00	100.0%	1.00
194	Start Value (\$2005 bil)	63,123					
195	End Value (\$2005 bil)	229,980		-			
196	Added Value (\$2005 bil)	166,857		-			
197							
198	GDP, US						
199	CAGR (must be <> 0)	2.68%		0.00%			
200	End/Begin	2.21		-			
201	Start Value (\$2005 bil)	13,249					
202	End Value (\$2005 bil)	29,271		-	1.00	100.0%	1.00
203	Added Value (\$2005 bil)	16,022		-			
204							
205							
206	Fuel Price, World (assumes same avg as US)						
207	CAGR (must be <> 0)	2.54%		0.00%			
208	End/Begin	2.13		-	1.00	33.0%	1.00
209	Start Value (\$2005 barrel)	85.03					
210	End Value (\$2005 barrel)	181.22		-			
211	Added Value (\$2005 barrel)	96.19		-			
212							
213							
214	Fuel Price, US						
215	CAGR (must be <> 0)	2.54%		0.00%			
216	End/Begin	2.13		-	1.00	33.0%	1.00
217	Start Value (\$2005 barrel)	85.03					
218	End Value (\$2005 barrel)	181.22		-			
219	Added Value (\$2005 barrel)	96.19		-			

	I	J	K	L	M	N	O
188	1B. Adjustments to Import/Export/Domestic Balance						
189		DEFAULT EST	NEW	RESULT	ADJUSTMENT	SENSITIVITY	SCALAR
222	Exchange Rate						
223	CAGR (must be <> 0)	-0.30%		0.00%			
224	End/Begin	0.93		-	1.00	100.0%	1.00
225	Start Value (indexed)	99.46					
226	End Value (indexed)	92.01		-			
227	Added Value (indexed)	(7.45)		-			
228							
229							
230	Other Adjustments to Imports						
231	CAGR	5.46%		0.00%			
232	End/Begin	4.93		-	1.00	100.0%	1.00
233	Start Value (\$2005 bil)	1,757					
234	End Value (\$2005 bil)	8,662		-			
235	Added Value (\$2005 bil)	6,904		-			
236							
237							
238	Other Adjustments to Exports and Domestic Production						
239	CAGR	6.66%		0.00%			
240	End/Begin	6.91		-	1.00	100.0%	1.00
241	Start Value (\$2005 bil)	1,207					
242	End Value (\$2005 bil)	8,341		-			
243	Added Value (\$2005 bil)	7,134		-			

For each factor, the Tool reports “default values” from the R/ECON forecast and its underlying IHS Global Insight national forecast: the CAGR for that factor for the forecast period; the ratio of end value to start value; the start value; the end value; and the added value. In Column K, the user can enter a new value for any of these except the start value, and the Tool will use it to override the default values.

In the example below, we specify that US GDP will grow at 3.00% per year through the forecast period, up from the 2.68% assumption built into the seed forecast. This creates a higher end year value, more added value, and a higher ratio of end year to start year value – all of which is calculated for the user.

	I	J	K	L	M	N	O
	1B. Adjustments to Import/Export/Domestic Balance						
		DEFAULT EST	NEW	RESULT	ADJUSTMENT	SENSITIVITY	SCALAR
	GDP, US						
	CAGR (must be <> 0)	2.68%	3.00%	3.00%			
	End/Begin	2.21		2.43			
	Start Value (\$2005 bil)	13,249					
	End Value (\$2005 bil)	29,271		32,159	1.10	100.0%	1.10
	Added Value (\$2005 bil)	16,022		18,910			

Note that the “Scalar” column is no longer 1.00; it is now 1.10. This is the ratio by which freight movements which are advantaged by higher GDP should be increased, and freight movements which are disadvantaged should be decreased. The Scalar value is based on the Adjustment, times the Sensitivity. Changes in GDP and freight tonnage are closely correlated, so we assume a Sensitivity of 100%. (For other factors which are less closely correlated with freight tonnage, such as the effect of fuel price changes, we use a reduced Sensitivity to dampen down the effects of the Scalar.)

In this example, we see that a higher US GDP produces increased domestic freight tonnage in all directions (outbound, inbound, internal, and through), as well as increased exports and export-related landside tonnage (due to stronger domestic production), but decreases imports and import-related landside tonnage (due to reduced reliance on imported goods). The PROCESSED TS 2007 worksheet “knows” to look for scalar factors in this table and apply them when it calculates future growth; which cell it looks in depends on whether the record represents domestic or international traffic, and in what direction.

	I	Q	R	S	T	U	V	W	X	Y
188	1B. Adjustments to Import/Ex									
189		INTERNATIONAL EFFECTS IN REGION				DOMESTIC EFFECTS IN REGION				
190		Import	Export	Import Related	Export Related		Outbound	Inbound	Internal	Through
198	GDP, US									
199	CAGR (must be <= 0)									
200	End/Begin									
201	Start Value (\$2005 bil)									
202	End Value (\$2005 bil)	0.91	1.10	0.91	1.10		1.10	1.10	1.10	1.10
203	Added Value (\$2005 bil)									

The effects of higher/stronger values for each of these factors are as follows, with lower/weaker values producing the opposite effects:

- World GDP – higher import and import-related landside tonnage; higher export and export-related landside tonnage
- US GDP – higher domestic tonnage; higher export and export-related tonnage; lower import and import-related tonnage
- World Fuel Price – lower import and import-related landside tonnage; lower export and export-related landside tonnage
- US Fuel Price – lower domestic tonnage
- Exchange Rates – higher import and import-related landside tonnage; lower export and export-related landside tonnage
- Other Adjustments to Imports – higher import and import-related landside tonnage
- Other Adjustments to Exports and Domestic Production – lower import and import-related landside tonnage; higher export and export-related landside tonnage; higher domestic tonnage

Our general recommendation is to not make any significant adjustments to these factors unless the changes are supported by reliable sources. However, it is not unreasonable for analysts to test risk and uncertainty by asking “what if” the default forecasts are not realized, by varying the end year values upward or downward by not more than 10%.

After your Section I changes are complete, you must hit CTRL-SHIFT-F to update the TRANSEARCH forecast. If you have changes for Section II, proceed as described below. Otherwise, just hit CTRL-SHIFT-R to generate reports, and you are finished.

Assuming you have changes to Section II, here is how to make them.

Before doing anything else, make sure you hit CTRL-SHIFT-U. Anything you entered in Section I had the effect of altering the freight forecast you generated way back in Step 2. In Section II, the adjustments focus on shifting freight tonnage between modes and origins and destinations, so Section II has to know about any changes you made in Section I in order to reallocate the tonnage accurately. CTRL-SHIFT-F updates the TRANSEARCH forecast, and CTRL-SHIFT-U generates lookup tables from that forecast.

Section II addresses two primary types of factors: truck/rail balance and mode choice; and port/distribution center utilization. In practice these are complex issues but with some reasonable simplifying assumptions they can be addressed.

Starting in row 258, there are two truck/rail balance adjustments. The user is presented with starting and ending Long Haul Truck and Rail tons, and the truck share of the combined Long Haul Truck-Rail market.

	I	J	K	L	M	N	O
256	2. Adjustments to Mode Choice and Logistics Factors						
257		VALUES FOR	NEW	RESULT	ADJUSTMENT	SENSITIVITY	SCALAR
258		ANALYSIS YEAR			RATIO		
259							
260	TR1. Fuel Costs (ENTER "YES" TO APPLY ADJUSTMENT)				1.14	33.0%	1.05
261	Start LH Truck Tons	284,622,625	yes	284,622,625			
262	End LH Truck Tons	402,285,924		384,660,816			
263	Change in LH Truck Tons	117,663,298		100,038,190			
264	LH Truck CAGR	1.2%		1.0%			
265	Start LH Rail Tons	44,774,570		44,774,570			
266	End LH Rail Tons	68,123,022		85,748,130			
267	Change in LH Rail Tons	23,348,452		40,973,560			
268	LH Rail CAGR	1.4%		2.2%			
269	Start Truck Share of LH Truck-Rail Market	86.4%		86.4%			
270	End Truck Share of LH Truck-Rail Market	85.5%		81.8%			
271							
272							
273	TR2. Other Trucking Costs (Tolls, Drivers, Congestion, Compliance, Capacity, etc.) or Policy Changes Affecting Truck/Rail Mode Share						
274	Start LH Truck Tons	284,622,625		284,622,625			
275	End LH Truck Tons	384,660,816		384,660,816			
276	Change in LH Truck Tons	100,038,190		100,038,190			
277	LH Truck CAGR	1.0%		1.0%			
278	Start LH Rail Tons	44,774,570		44,774,570			
279	End LH Rail Tons	85,748,130		85,748,130			
280	Change in LH Rail Tons	40,973,560		40,973,560			
281	LH Rail CAGR	2.2%		2.2%			
282	Start Truck Share of LH Truck-Rail Market	86.4%		86.4%			
283	End Truck Share of LH Truck-Rail Market	81.8%		81.8%			

In the example above, we entered “yes” to apply a fuel price adjustment. The assumption is that higher US fuel prices will tend to shift freight from truck to rail. In this example, we assumed that fuel prices would grow at 3% per year, rather than 2.5% per year as assumed by the forecast. The Adjustment Factor is actually carried down from the US Fuel Price line in Section I. The higher growth produces a higher adjustment factor, which means a greater reduction in truck volumes. In this case, applying the adjustment reduced the end year long haul truck tonnage from 402 million tons to 385 million tons, increased the end year rail tonnage by an equal amount, and reduced the future truck mode share from 85.5% to 81.8%.

The Tool also allows for a second adjustment. Truck and rail are competing modes; trucking costs can vary depending on driver availability, highway congestion, regulation, industry and infrastructure capacity, and other factors; rail costs can vary depending on business factors and infrastructure conditions; and public policy decisions on how to regulate, where to invest, etc. can influence modal shares as well. The default mode share estimate, carried down from the fuel price adjustment, is 81.8% for trucks; if the user enters a different value, the Tool reduces the amount of truck tonnage and increases the amount of rail tonnage by a corresponding amount.

After these two adjustments are calculated, they are combined as scalar factors affecting long haul truck records and rail records, and the PROCESSED TS 2007 worksheet “knows” to look for and apply them.

Next, starting in row 288, there are two port-related adjustments – one for Panama Canal effects, and the other for effects related to not improving the Bayonne Bridge height clearance. These are the most complicated adjustments to implement in the model, but they are not too difficult to explain.

The consultant team believes that the Panama Canal, Suez Canal, and rail “landbridge” services from other ports into the region will all continue to carry traffic, and will compete with each other. With widening of the Panama Canal, it will gain some cost advantage over the other two routes. Those routes may in turn reduce their prices, or the Panama Canal might raise its prices (to better pay off its debts). In any case, the net cost effect for the region’s shippers and receivers is likely to be small, compared to the total end-to-end cost of the international freight move – so the total amount of import and export traffic is not changed. What the Panama Canal will do is: a) reduce rail landbridge arrivals into the region, along with truck deliveries from the region’s railyards to end users; and b) increase marine cargo arrivals at the region’s container terminals, along with rail traffic to inland destinations and truck traffic to local destinations. For the Tool, the complication is that the landbridge railyards are located in two different counties; the marine terminals are located in three different counties; and the effects are different depending on the direction of traffic (inbound, outbound, or internal) and the import/export trade balance.

Interestingly, the same argument applies to any Port competitiveness argument. For example, if we assume that the region does not modernize and expand its container handling capacity, it will likely be served by other ports through a combination of truck and rail; however, the nearest “truck” ports provide far less capacity than would be required, and replacement service from “rail” ports is far more likely. Therefore, the “Panama Canal” adjustment also serves as a “Port Competitiveness” adjustment.

To apply the adjustment, the user must enter values for each cell highlighted in green below. Values suggested by the consultant team are presented for illustrative purposes, but the user may substitute other values as established by market studies, or according to preference. In the example below, the default values were accepted. The net effect is 1,000,000 TEU increase in waterborne container traffic compared to base case PANYNJ forecasts; the import share is 60%; the inland rail market share is 30%; and traffic is allocated between Hudson, Essex and Union counties. In columns M and N, the increases and decreases in rail and truck traffic by county by direction are calculated; in other columns, not shown below, these are translated into adjustment factors which are read by the PROCESSED TS 2007 worksheet and applied to the appropriate records.

	H	I	J	K	L	M	N
	SUGGESTED TEST VALUES				TEUs	Inbound to Port/Region	Outbound from Port/Region
287	Port and DC Factors						
288	PDC1. Change from Current Baseline Forecast Due to Panama Canal, Port Competitiveness, or Other Port-Wide Factors						
289		Effect on Waterborne TEUs	1,000,000	1,000,000	1,000,000		
290		Import Share of Affected TEUs	60%	60%		2,800,000	4,200,000
291		Inland Market (Rail IMX) Share of Affected TEUs	30%	30%			
292		Rail IMX Tons Generated				840,000	1,260,000
293		Truck Tons Generated				1,960,000	2,940,000
294		Rail IMX Share Assigned to Hudson; other end follows TS distribution	25%	25%		210,000	315,000
295		Rail IMX Share Assigned to Essex; other end follows TS distribution	25%	25%		210,000	315,000
296		Rail IMX Share Assigned to Union; other end follows TS distribution	50%	50%		420,000	630,000
297		Truck STCC 5010 Share Assigned to Hudson; other end follows TS distribution	25%	25%		490,000	735,000
298		Truck STCC 5010 Share Assigned to Essex; other end follows TS distribution	25%	25%		490,000	735,000
299		Truck STCC 5010 Share Assigned to Union; other end follows TS distribution	50%	50%		980,000	1,470,000
300		Rail IMX Landbridge Imports Impacted, Hudson from all	50%	50%		(2,100,000)	-
301		Rail IMX Landbridge Imports Impacted, Union from all	50%	50%		(2,100,000)	-
302		Rail Drayage STCC 5021 5022 Impacted, Hudson to all				-	(2,100,000)
303		Rail Drayage STCC 5021 5022 Impacted, Union to all				-	(2,100,000)
304		Net Effects (for Backcheck)				(1,400,000)	-

The project to raise the Bayonne Bridge, which imposes a height restriction on marine cargo vessels transiting the Kill van Kull to access container terminals in Newark Bay, will likely prevent the region from losing marine cargo. As with the Panama Canal, we would argue that cargo not arriving by water will instead arrive by rail. So the calculation of effects is similar to the Panama Canal case, except here we are avoiding the loss of marine cargo, rather than capturing additional cargo. As with the Panama Canal adjustment, the Tool includes illustrative values suggested by the consultant team, but the user may enter any values, based on market studies or preference. In the illustration following, we assume that failure to improve the Bayonne Bridge would result in the loss of 750,000 TEUs of marine container traffic in Essex and Union counties (Hudson is not affected), a corresponding increase in rail landbridge arrivals, and secondary changes in truck and rail trip generation.

					TEUs	Inbound to Port/Region	Outbound from Port/Region
306	PDC2. Effects if Bayonne Bridge Clearance is Not Improved						
307		Effect on Waterborne TEUs	(750,000)	(750,000)	(750,000)		
308		Import Share of Affected TEUs	60%	60%		(2,100,000)	(3,150,000)
309		Inland Market (Rail IMX) Share of Affected TEUs	30%	30%			
310		Rail IMX Tons Generated				(630,000)	(945,000)
311		Truck Tons Generated				(1,470,000)	(2,205,000)
312		Rail IMX Share Assigned to Hudson; other end follows TS distribution	0%			-	-
313		Rail IMX Share Assigned to Essex; other end follows TS distribution	33%	33%		(210,000)	(315,000)
314		Rail IMX Share Assigned to Union; other end follows TS distribution	67%	67%		(420,000)	(630,000)
315		Truck STCC 5010 Share Assigned to Hudson; other end follows TS distribution	0%			-	-
316		Truck STCC 5010 Share Assigned to Essex; other end follows TS distribution	33%	33%		(490,000)	(735,000)
317		Truck STCC 5010 Share Assigned to Union; other end follows TS distribution	67%	67%		(980,000)	(1,470,000)
318		Rail IMX Landbridge Imports Impacted, Hudson from all	50%	50%		1,575,000	-
319		Rail IMX Landbridge Imports Impacted, Union from all	50%	50%		1,575,000	-
320		Rail Drayage STCC 5021 5022 Impacted, Hudson to all				-	1,575,000
321		Rail Drayage STCC 5021 5022 Impacted, Union to all				-	1,575,000
322		Net Effects (for Backcheck)				1,050,000	-
323							
324							

The project to construct an intermodal rail terminal at Greenville Yard, adjacent to the GCT Bayonne/MOTBY container terminal complex, has simpler effects. If the project is not built, local trucks would have to dray containers between the marine terminal and off-site railyards, creating truck trips that would not otherwise exist. The user needs to enter the total TEUs handled at the terminal and the anticipated rail share, and the Tool calculates truck tons created without the project and applies the corresponding adjustments to TRANSEARCH records.

325	PDC3. Effects if Greenville Intermodal Yard is Not Constructed			TEUs
326	Total Waterborne TEUs at Global/MOTBY	2,000,000	2,000,000	2,000,000
327	Inland Market (Rail IMX) Share of Affected TEUs	30%	30%	600,000
328	Yard Constructed?	NO	NO	
329	Rail Drayage 5021 5022 Tons Created, Internal, Hudson County			

Finally, there are two What-If adjustments relating to warehouse and distribution center development.

- The first adjustment examines a scenario where port-related warehouse and distribution traffic is developed in Pennsylvania, rather than in the NJTPA region. The user specifies the square footage involved, the typical freight tonnage moved per square foot per year, and the share of port traffic associated with Hudson, Essex, and Union counties. The Tool calculates adjustments for added truck trips between these counties and Pennsylvania, reduced truck trips between these counties and other locations, and increased truck trips from Pennsylvania back into the NJTPA region.
- The second adjustment examines a scenario in which future demand for Warehouse/Distribution activity is reduced due to these functions being performed overseas. The user specifies the amount of the reduction, and the Tool calculates the corresponding reduction in warehouse/distribution related traffic in the NJTPA region.

334	PDC4. Effects if NJTPA Port-Related Warehousing is Shifted to PA			
335	SF of Port-Related Warehouse SF Shifted to PA	50,000,000	50,000,000	
336	Tons per SF per Year	0.16	0.16	
337	Truck STCC 5010 Share Assigned to Hudson	25%	25%	
338	Truck STCC 5010 Share Assigned to Essex	25%	25%	
339	Truck STCC 5010 Share Assigned to Union	50%	50%	
340	Truck STCC 5010 Tons, Hudson-PA			
341	Truck STCC 5010 Tons, Essex-PA			
342	Truck STCC 5010 Tons, Union-PA			
343	Truck STCC 5010 Tons, Hudson-Other			
344	Truck STCC 5010 Tons, Essex-Other			
345	Truck STCC 5010 Tons, Union-Other			
346	Truck STCC 5010 Drayage Effects, PA to NJTPA			
347	Net Effects (for Backcheck)			
348				
349				
350				
351	PDC5. Effects of Changes in NJTPA-Related Warehouse-Distribution Activity			
352	Change in Warehouse-Distribution Related Tonnage	-25%	-25%	
353	Truck STCC 5010 Drayage Effects, NJTPA			
354	Net Effects (for Backcheck)			

Once all the Section II What-If adjustments are completed, the user must hit CTRL-SHIFT-F (to update the TRANSEARCH forecast for the last time) and CTRL-SHIFT-R (to generate output reports.) You are finished. Congratulations!

OPTIONAL “QUICKRUN” MODE COMBINING EXCEL AND ACCESS FILES

Running the FFT directly from the Excel file only, as described above, has the virtue of relative simplicity, and is recommended for users who are not completely comfortable with their database software skills.

However, for “power users,” we have developed a protocol for integrating Excel and Access. Basically, this allows most of the heavy processing to be done within Access with smaller file sizes, which in turn allows for faster file loading and processing. The trade-off comes in the form of additional demands on the user.

File Names and Locations

The Access file and Excel file can be located anywhere. The Access file (NJTPAFFT.accdb) has a default location where it looks for the Excel file (C:\NJTPA\NJTPA FFT.xlsm) but this location can be changed when running the Access application. The user may wish to rename and relocate the FFT file to the default, and to locate the Access file in the same directory, for simplicity – but this is not required.

Run Instructions

1. First, the user opens the FFT spreadsheet and completes the forecast update process in the usual manner.
2. Next, the user opens the Access file. The Access file includes a restructured Transearch database previously stored in the NJTPA FFT Excel file (in the Processed TS 2007 tab) is now in the TonsOD Access table and includes 510,131 records. No action is required to modify this historical data. The Access file also contains a series of processing steps and macros to generate the new forecast, based on variables and specifications that were entered into the Excel file. To do so:
3. Within Access, the user imports a set of 17 variables that modify the historical data from the Excel file into Access tables by using the Linked Table Manager under the Access External Data tab. These tables represent named ranges with the same names in the Excel NJTPA FFT Excel file. (The Linked Table Manager in the Access file shows these ranges in the C:\NJTPA\NJTPA FFT.xlsm file but there is an option for prompting for a new location.)
4. Then, still within Access, the user executes a single macro, RunUpdateQueries, under the Database Tools Tab, Run Macro in Access.

This controls a series of separate macros which update the forecast variables, create the forecast, and extract the forecast.

The 17 variables are updated in the TonsOD table in a series of 5 queries:

STCC Growth Factors

Three sets of STCC growth factors are combined into a STCCGrowth factor using three queries:

DESTGrowth using the UpdateDestGrowth query
ORIGGrowth using the UpdateOrigGrowth query
OTHGrowth using the UpdateOTHGrowth query

Flow Multipliers

The following four variables are combined to form an overall flow multiplier through the UpdateFlows query:

INBMult
OUTMult
INTMult
THRUMult

Import/Export Multipliers

The following two variables are combined into the EXIM multiplier through the UpdateExIm query:

ImportMult
ExportMult

Long Haul Multipliers

Four variables are combined into the LH multiplier with the UpdateLH query:

LHIMult
LHNMult
LHRMult
LHTMult

Modal Multipliers

The following four modal multipliers use the UpdateModal query:

RailIMX
RailDray
TruckWR
TruckWD

The forecast is computed adding the STCC growth factor to the Tons07 variable and then multiplying that sum by the four aggregate multipliers above (through the Update Forecast query). This forecast is extracted into a separate Access table with the ExtractForecast query.

5. After completing steps 3 and 4, the user may close the Access database.
6. The last step in the process is importing the forecast into the Excel FFT file by executing the FetchForecast macro under the Excel Developer/Macro tab. Following this step, the FFT spreadsheet reports data and results as previously described in this User Guide.

ASSIGNING THE TRUCK TRIP TABLE TO THE NJRTM-E NETWORK

The truck trip table that the FFT generates can be assigned to the North Jersey Regional Transportation Model-Enhanced (NJRTM-E) regional travel demand model network to produce a network file (exportable to a GIS shapefile) that includes truck volumes on highway network links for each of the 11 commodity bundles and all other commodity trucks.

The FFT generates the inputs, which are used in scripts to assign truck trips to the NJRTM-E model network using CUBE software. The consultant team developed three scripts that process and assign the FFT truck trip table to the NJRTM-E network:

1. The consultant team developed a script that processes the FFT truck trip table, which uses TRANSEARCH geographic zones, to match the traffic analysis zones (TAZs) in the NJRTM-E network, and to assign flows to or from locations outside the NJRTM-E model region to the appropriate external station. The script process generates a CUBE truck table in origin-destination format, where origins are NJRTM-E TAZs or external stations, where destinations are NJRTM-E TAZs or external stations, and where the flow unit is truck trips by each of the 11 commodity bundles and a 12th bundle that includes all other commodity trucks for each time period in the NJRTM-E (morning [AM], midday [MD], evening [PM], and nighttime [NT]).
2. The team also developed a script that calculates the difference between FFT-projected truck volumes and all heavy truck volumes in the NJRTM-E truck trip table, assigns the difference in a “non-freight” heavy truck category, and adjusts the commodity truck trip table to ensure that the volume of commodity trucks does not exceed the model volume of all heavy trucks between any given origin-destination pair.
3. A third script was developed to assign the adjusted truck trip tables to the NJRTM-E loaded networks for each time-of-day period, accounting for all of NJTPA’s assignment routine protocols (e.g., avoiding assignment of trucks to the Garden State Parkway north of Exit 105, etc.).

The result of this process is a series of network files that contain link volumes for each of the commodity bundles and non-commodity trucks during each time-of-

day. The network file can be analyzed within the CUBE software application or exported as a shapefile for analysis in a variety of GIS applications.

NETWORK ASSIGNMENT – 7 STEPS

Step 1. Locate and Adjust the Input Files

The input files needed to run the three scripts include:

- **RTME_Table_2040.xlsx.** This is a Microsoft Excel file containing the output table from the FFT and the commodity flow matrix needed as an input to the model. This workbook contains five worksheets, including:
 - The “FFT RTME Table” worksheet contains the output of the FFT, as calculated on the “RTME Table” worksheet of the NJTPA FFT.xlsm workbook. When new forecasts are generated using the FFT, replace the records in the “FFT RTME Table” worksheet with the data in the “RTME Table” worksheet of the NJTPA FFT.xlsm workbook.
 - The “calc” worksheet consolidates the flows between each origin-destination pair in the “FFT RTME Table” worksheet into a concise table of flows by bundle.
 - The “correspondence” worksheet lists TRANSEARCH zone codes (mostly five-digit county FIPS codes) and the associated four-digit “dummy codes” used in the model.
 - The “TRK_TABLE_temp” worksheet includes a lookup query that returns the bundle-specific flows between each origin-destination pair by dummy code. Values will be recalculated automatically when the “FFT RTME Table” worksheet is replaced with new values.
 - The “TRK_TABLE.dbf” worksheet is a pasted (values only, no formulas) copy of the “TRK_TABLE_temp” table. The scripts described later in this guide will reference this worksheet. When the FFT is run and new results are produced, this worksheet must be re-created manually by copying the values in the “TRK_TABLE_temp” worksheet and pasting values-only in this worksheet, and then saving this file.
- **CTY_NJTPA_TAZ_03_10_15.xlsx.** This workbook includes matrices containing the distribution of truck trips from NJRTM-E regional counties to external regions, from external regions to NJRTM-E regional counties, and internal trips within the NJRTM-E model territory, along with “lookup” worksheets that correspond NJRTM-E TAZs to external stations at the edges of the NJRTM-E model network. The workbook contains 17

worksheets, many of which are lookup reference tables. The three most important worksheets include:

- The “From_cty-to_externals” worksheet contains a matrix of origins outside and inside the NJRTM-E model territory, and the external zones through which inbound and outbound trips pass. The values in the matrix cells in columns B through BQ represent the number of truck trips from the origins in column A through the external zones in columns B through BP based upon an assignment of the NJRTM-E truck trip table and select link analysis of the boundary links at the external stations. The values in columns BR through EG are the shares of truck trips from each origin through each external zone based upon the share of the values in columns B through BP to the total in column BQ.
- The “From_ext_to-cty” worksheet contains the distribution of inbound trips through external zones, where the external zones are listed in column A and the internal destinations are arrayed in columns B through FQ. The shares of truck trips (as a percentage of the total) are presented in columns FR through MG.
- The Internal_TAZ_County” worksheet contains the productions and attractions in each TAZ in the NJRTM-E model territory and each TAZ’s share of the total productions and attractions in each county. The internal trip shares by TAZ are developed in the INTRUCK.trp file (described below). This worksheet provides the correspondence between NJRTM-E TAZ and county that is used to create the TAZ_DUMMYCOUNTY.prn file (described below).

If NJTPA were to change the TAZ structure, the routing of truck trips through external stations will have to be re-done by assigning the trip table and conducting a select link analysis at the external stations. Also, proportioning factors for each TAZ’s share of county productions and attractions will have to be recalculated based upon the productions and attractions of the new TAZs.

- **INTRUCK.trp.** This is the truck trip table used in the NJRTM-E. This table will be used as a reference for the adjustment script.
- **TAZ_DUMMYCOUNTY.prn.** This is a matrix that links NJRTM-E TAZs to counties in the NJRTM-E model territory, to match the county-to-county geographic detail prepared by the FFT truck table. If and when NJTPA changes its TAZ structure, a new crosswalk spreadsheet will have to be developed, linking the new TAZs to the appropriate county codes. That new file could replace this version.
- **EI_TRK_CALC_New.xlsx:** This workbook contains worksheets that the Create_Freight_Table script will use to calculate the proportions of internal-to-external (IE), external-to-internal (EI), and external-to-external

(EE) truck trip productions originating in or destined to each TAZ in the NJRTM-E model territory. The five most important worksheets include:

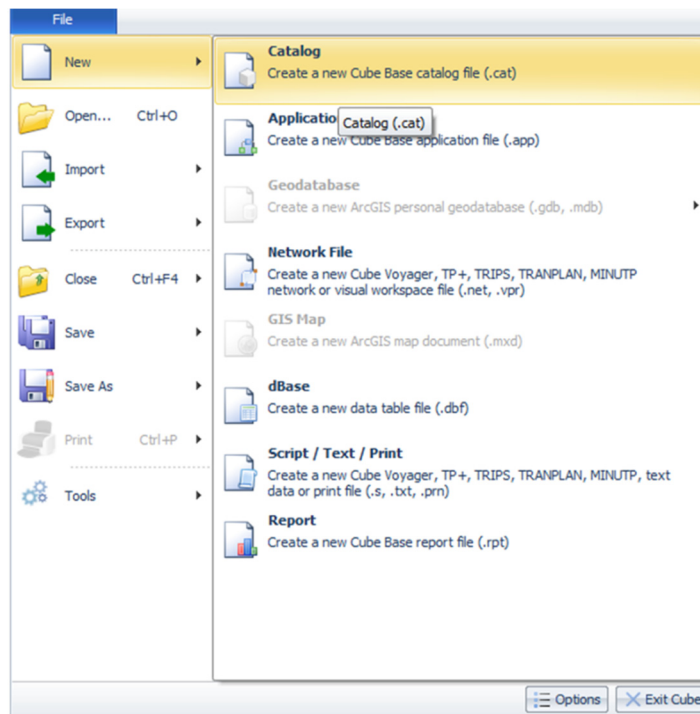
- The “EE.csv” tab contains the proportion of truck trips from each external zone that pass through each external station at the edge of the NJRTM-E model territory. This proportion was determined by conducting an assignment of national truck flows to the USDOT Freight Analysis Framework (FAF) national highway network and conducting a select link analysis on the FAF network links connecting to the NJRTM-E external stations to observe the origins/destinations of truck flows at the external stations. The Create_Freight_Table.S script uses this file as an input to create the EE.prn file. In the event FAF data/networks are changed and updated in the future, this process may be repeated, and this table may be replaced with data resulting from a new FAF assignment and select link analysis.
- The “Calc2_EI” worksheet identifies the origin and destination proportions from each external county to the external stations at the edge of the NJRTM-E model territory. This worksheet is calculated using lookup formulas referencing the “Calc_EI” worksheet, which is copied from the CTY_NJTPA_TAZ_03_10_15.xlsx workbook.
- The “EI_Only.dbf” worksheet is calculated using lookup queries referencing the “Calc2_EI” worksheet. The Create_Freight_Table.S script combines this worksheet with the internal truck trip table to create EI.prn. If the external station proportions are changed in the future, a new select link analysis will have to be performed, and a new version of this file will have to be calculated and produced.
- The “Calc2_IE” worksheet contains the origin and destination proportions from each external station to external counties. This worksheet is calculated using lookup formulas referencing the “Calc_IE” worksheet, which is copied from the CTY_NJTPA_TAZ_03_10_15.xlsx workbook.
- The “IE_Only.dbf” worksheet is calculated using lookup queries referencing the “Calc2_IE” worksheet. The Create_Freight_Table.S script combines this worksheet with the internal truck trip table to create IE.prn. If the external station proportions are changed in the future, a new select link analysis will have to be performed, and a new version of this file will have to be calculated and produced.
- **HWANTP.crd.** This file contains delays and penalties associated with traversing specific links or intersections in the model network;
- **AMHWYLOAD.net.** This is the 2040 loaded NJRTM-E highway network for the morning period (AM);

- **MDHWYLOAD.net.** This is the 2040 loaded NJRTM-E highway network for the midday period (MD);
- **PMHWYLOAD.net.** This is the 2040 loaded NJRTM-E highway network for the evening period (PM);
- **NTHWYLOAD.net.** This is the 2040 loaded NJRTM-E highway network for the nighttime period (NT);

These input files have been delivered to NJTPA in a .zip file, and should be updated and replaced as baseline freight data and/or model networks change, as described above.

Step 2. Launch CUBE v.6.0 and Load the Input Files

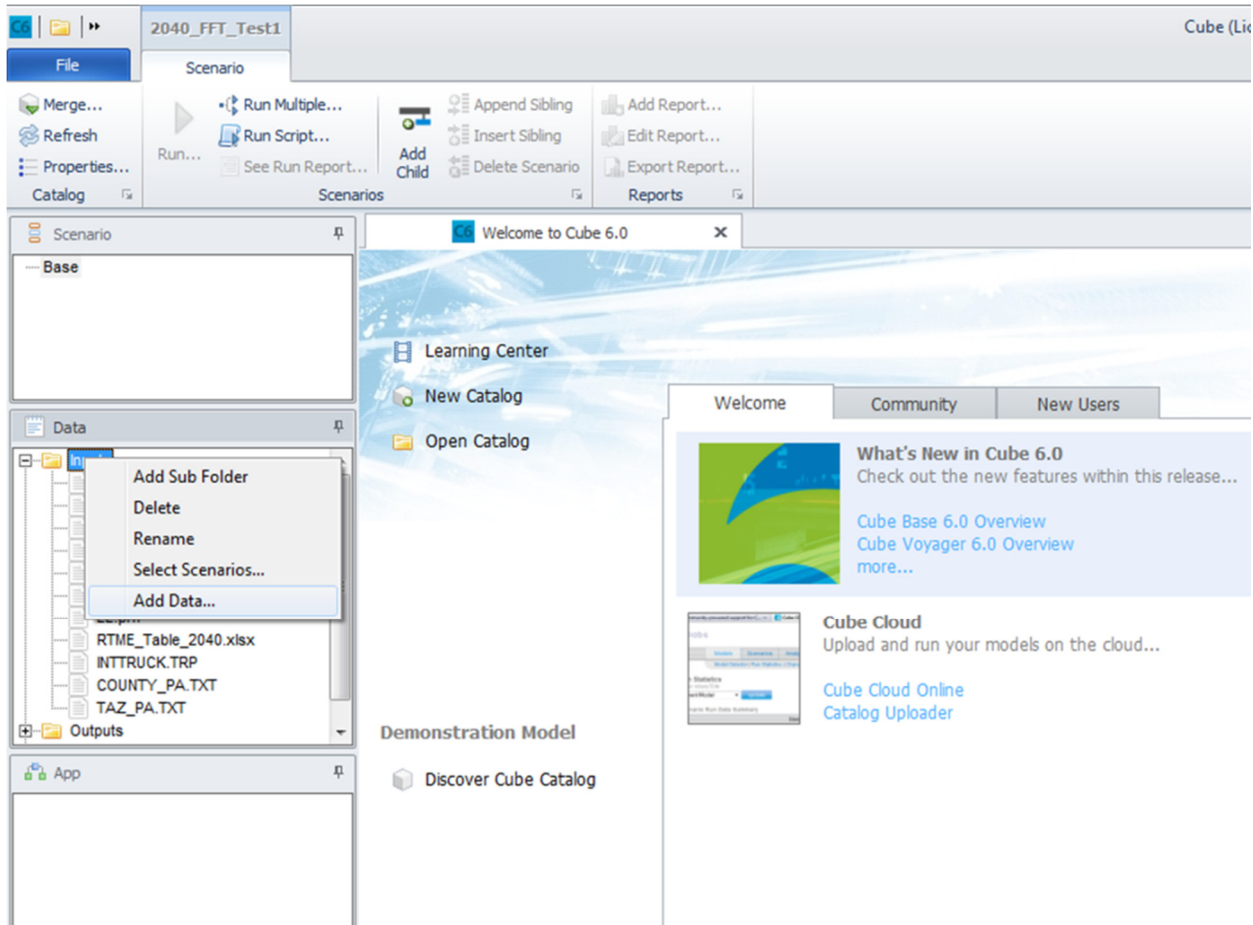
Launch the CUBE v.6.0 application. The “Welcome” tab should appear. You may open a catalog file that you have already loaded with all of the input and output files, applications (scripts), along with any base scenario files you have worked with previously. Otherwise, you may create a new catalog by clicking “File,” scrolling to “New,” and clicking on “Catalog.” You may name your catalog file and save it as a .CAT file in an appropriate directory.



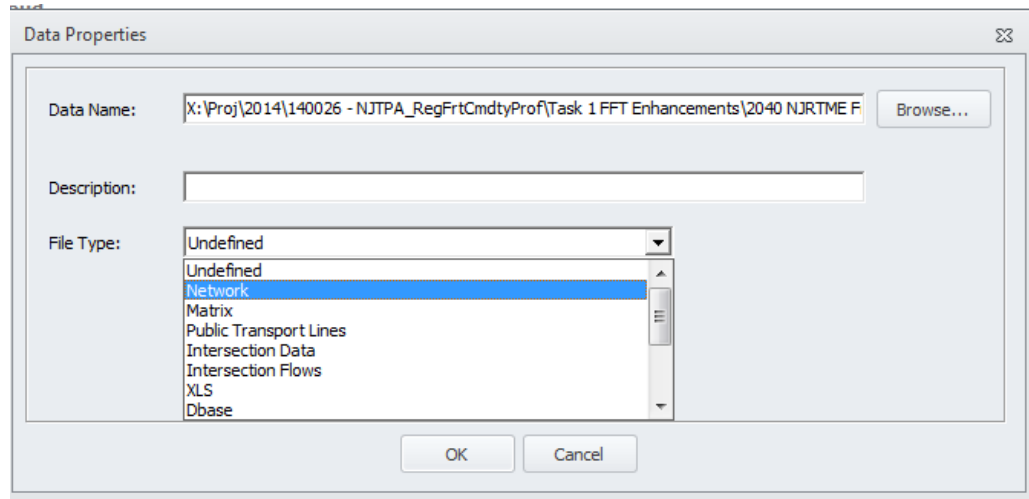
For this walk-through, we have created a new .CAT file named “2040_FFT_Test1.cat.”

Now, let us load the input files. Importing the files will allow the user to check the contents of the files within the CUBE application prior to running the scripts.

To import the input files look for the “Inputs” folder in the “Data” window pane. Right-click on the “Inputs” folder and click on “Add Data...”



A “Data Properties” window will pop up, allowing you to browse to the directory where the input files are saved. Find them and click on the first (you may import one file at a time). Once you have clicked on the file name, the path to the file will appear in the “Data Name” portion of the Data Properties window. You may specify whether the file type is a “network file,” (i.e. .net files), a “matrix file, (i.e., .mat, .dbf, .prn, .txt, etc.), or unspecified or other.



Repeat this process until all of the input files specified at the beginning of this section appear in the “Inputs” folder.

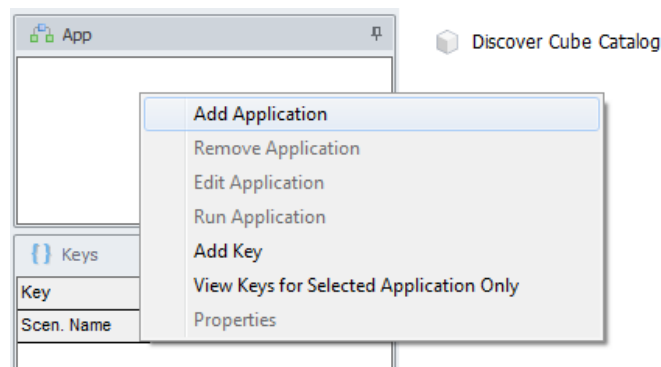
You may double-click each input file to open the file in a new tab and examine the contents.

Step 3. Load the Applications (Scripts)

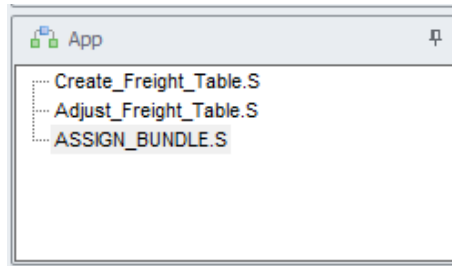
Locate the three script files (the function of each script will be explained as the instructions for running them are presented in later steps):

- Create_Freight_Table.S;
- Adjust_Freight_Table.S; and
- ASSIGN_BUNDLE.S.

To load the three script files in the “App” pane, hover the mouse in the pane and right-click. A pop-up menu will appear. Select “Add Application.”



A window will appear allowing you to browse to the location where the three script files are located. You may select one file at a time and select “Open.” Repeat until all three scripts appear in the “App” pane.



Step 4. Create the Freight Table

Now that the files are all located and loaded, we are ready to run our first script. The "Create_Freight_Table" script transforms the county-to-county truck trip table matrix from the FFT into a group of truck trip table matrices that distinguish internal-internal, internal-external, external-internal, and external-external travel patterns, using TAZ and county lookups.

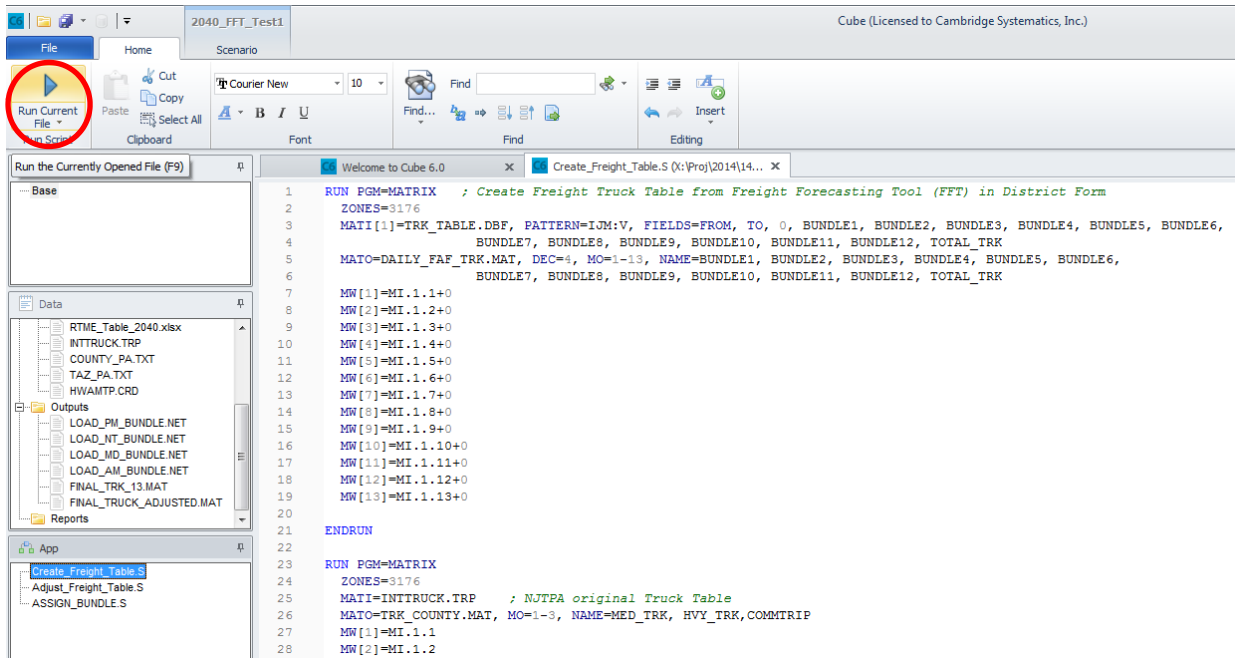
The script produces production and attraction tables for counties and NJRTM-E TAZs. The "COUNTY_PA.txt" file lists production and attraction rates at the county level, and the "TAZ_PA.txt" file lists production and attraction rates by TAZ. The script calculates these rates based on the distribution of truck trip ends in the NJRTM-E truck trip table. The script then uses these tables to disaggregate the FFT truck trips for each bundle to the TAZ level.

Note: If and when NJTPA adjusts its TAZ structure and produces new versions of the input files that reflect the new TAZ structure, the script will automatically generate COUNTY_PA.txt and TAZ_PA.txt files with the new TAZ structure.

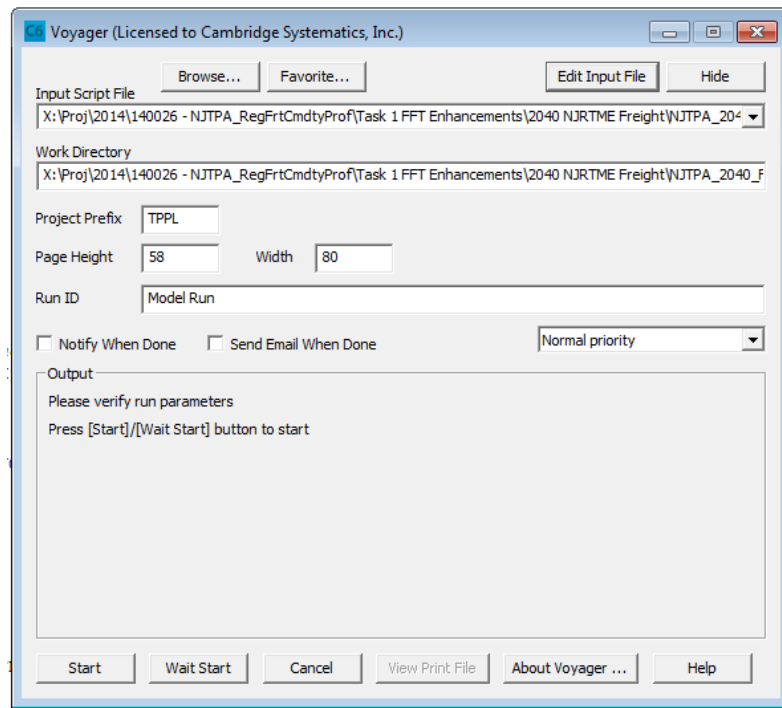
To run the Create Freight Table script:

Double-click on the Create_Freight_Table.S. A new tab will open and reveal the script language.

To run the script, click on the "Run Current File" button in the top-left corner of the screen.

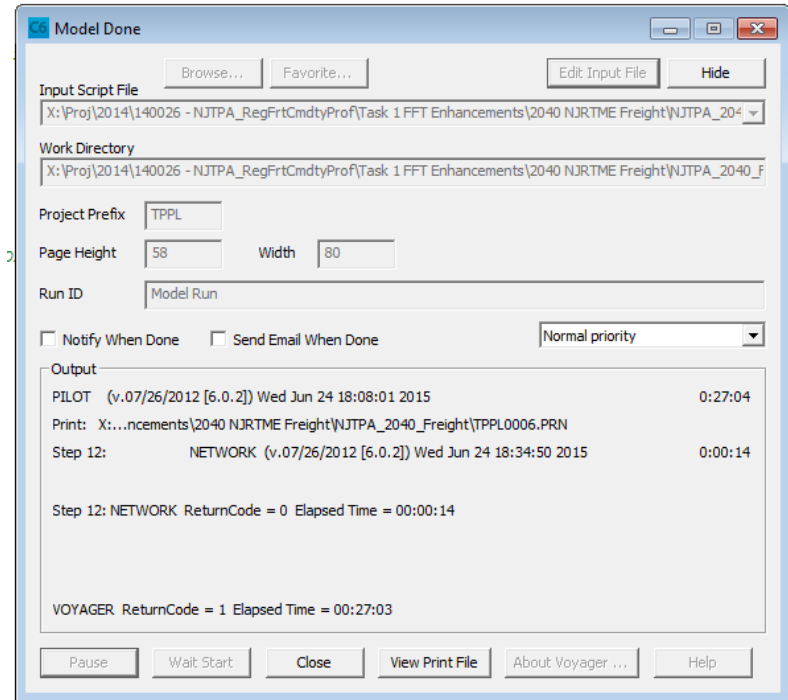


A pop-up window will appear. You may verify the input script file and work directory locations (the folder where your input and output files are to be referenced/created) are correct, and then click on the “Start” button at the bottom of the window.



The script will begin to run. You may monitor the progress of the run, pause, or abort the run using buttons on the pop-up window.

Once the script has completed its run, the pop-up window title will change to “Model Done.”



You will be presented with the options of closing the pop-up window or viewing the Print File. The Print File summarizes the outcomes of the script run.

```

C:\ Voyager (Licensed to Cambridge Systematics, Inc.) X:\Proj\2014\140026 - NJ
Exit Find Find Again (F3) Go to Editor

Page 1 (VOYAGER PILOT) Model Run
Cambridge Systematics, Inc.
-----
PILOT (v.07/26/2012 [6.0.2]) Wed Jun 24 18:08:01 2015
Args: X:\Proj\2014\140026 - NJTPA_RegFrtCmdtyProf\Task 1 FFT Enhancements\2040 NJRTM
Input: X:\...nts\2040 NJRTME Freight\NJTPA_2040_Freight\ASSIGN_BUNDLE.002

LOOP P=1,4,1
IF (P=1) PER='AM'
IF (P=2) PER='MD'
IF (P=3) PER='PM'
IF (P=4) PER='NT'
RUN PGM=NETWORK,102
RUN PGM=HIGHWAY,222
RUN PGM=NETWORK,4041
ENDLOOP

PILOT Stack Size = 566 bytes.
.....

Page 2 (VOYAGER NETWORK) Model Run
Cambridge Systematics, Inc.
-----
NETWORK (v.07/26/2012 [6.0.2]) Wed Jun 24 18:08:02 2015

NETI=AMHWYLOAD.NET
NETO=AM_FREIGHT.NET

TO=TIME_1
TIME=TIME_1

NETWORK Stack Size = 170 bytes.
.....

AMHWYLOAD.NET (VOYAGER):
NET PGM=HIGHWAY (v.05/01/2013 [6.1.0]) DATE=Thu Feb 27 00:26:18 2014
ID=NJT Model - Combine Transit Paths -PK
PAR Zones=2553 Nodes=62000 Links=57218 NodeRecs=22447
NVR 22 N X Y APPNUM EXTNUM APPMAX APPMIN APPMIN
EXTMAX APPLCM APPOWR EXTOWR APPLMX APPLMN LINKCNT
UNUSED NUJDF NUCT NTSG NYLD NSTPMAX NSTPMIN
LVR 106 A B DISTANCE CAPACITY FT AT LANESAM LANESPM
LANESOP LINKTYPE TERTYPE NLTLANE NRTLANE LWIDTH LSHOULD
TCD NSIG SIGCYC SIGCOR GC ALCOEFF BTCEFF JFACT
ACCPY FIXCAP FIXTOLL FIXTIME TOLL MCTOLL TOLLAPC
TOLLCLASS PARK QUEFLG ZDELAY ADDDELAY SPEED TO TCODEAM
TCODEOP TADDAM TADDOP TSCALEAM TSCALEOP NAME=26 SRI=10
BEGIN_MP END_MP RT_LTR=33 COUNTY=5 COUNT2 YEARCT2 COUNT3
YEARCT3 REFZONE COUNT1 YEARCT1 JAFAC TOLLFACAM TOLLFACPM
TOLLFACMD TOLLFACNT PROJN=8 CODESTATUS=7 SCRLINE NONWALK
CMPFLAG TAG AREATYPE SPDCLASS TOLLSCALE ORIGTOLL OTOLL
LANES CNT TSIN CAPCLASS TR SOVTOLL HOVTOLL TRKTOLL
V_1 TIME_1 VC_1 CSPD_1 VDT_1 VHT_1 V1_1 V2_1 V3_1
V4_1 V5_1 V6_1 V7_1 V8_1 V9_1 VT_1 V1T_1 V2T_1
V3T_1 V4T_1 V5T_1 V6T_1 V7T_1 V8T_1 V9T_1
LW_CAPACITY_1

Begin PROCESS PHASE NODEMERGE
22,447 records merged from NODEI[1]: AMHWYLOAD.NET
22,447 data base records.

Page 3 (VOYAGER NETWORK) Model Run
Cambridge Systematics, Inc.
-----
Variable Obs<>0 Total Ave Min Max RMS
-----
N 22,447 -- -- 1 62,000 --
X 22,447 -1,670,520.1 -74.42 -76.31 -72.79 74.42
Y 22,447 910,903.55 40.58 39.3 41.94 40.58
APPNUM 22,443 57,218 2.55 1 12 2.79
EXTNUM 22,438 57,212 2.55 1 12 2.79
APPMAX 22,443 127,966 5.7 1 12 6.58

```

Using Windows Explorer, navigate to the Work Directory location. You will see more than 100 new or updated files resulting from the run. The key files include the “FINAL_TRK_#” series of matrix files. These are the truck tables for each commodity bundle, plus one for all other commodity trucks, and one for all heavy trucks (13 in total). Each matrix includes internal-to-internal, internal-to-external, external-to-internal, and external-to-external truck matrices for its respective bundle. You may review the FINAL_TRK_# matrices, but no action needs to be taken prior to advancing with the assignment process. These files will be inputs for the next script.

Name	Date modified	Type	Size
FINAL_TRK_1	6/23/2015 4:59 PM	Microsoft Access ...	16,901 KB
FINAL_TRK_2	6/23/2015 5:01 PM	Microsoft Access ...	13,586 KB
FINAL_TRK_3	6/23/2015 5:03 PM	Microsoft Access ...	3,788 KB
FINAL_TRK_4	6/23/2015 5:05 PM	Microsoft Access ...	11,742 KB
FINAL_TRK_5	6/23/2015 5:07 PM	Microsoft Access ...	5,971 KB
FINAL_TRK_6	6/23/2015 5:09 PM	Microsoft Access ...	16,190 KB
FINAL_TRK_7	6/23/2015 5:10 PM	Microsoft Access ...	6,823 KB
FINAL_TRK_8	6/23/2015 5:11 PM	Microsoft Access ...	2,600 KB
FINAL_TRK_9	6/23/2015 5:13 PM	Microsoft Access ...	10,877 KB
FINAL_TRK_10	6/23/2015 5:15 PM	Microsoft Access ...	3,899 KB
FINAL_TRK_11	6/23/2015 5:17 PM	Microsoft Access ...	10,244 KB
FINAL_TRK_12	6/23/2015 5:19 PM	Microsoft Access ...	10,132 KB
FINAL_TRK_13	6/23/2015 5:21 PM	Microsoft Access ...	19,104 KB

Step 5. Adjust the Freight Table

The second script adjusts the commodity and heavy truck trip tables created by the Create_Freight_Table.S script to balance with the heavy truck volumes in the NJRTM-E heavy truck trip table. The script accomplishes this by subtracting the sum of FFT commodity trucks from the sum of heavy trucks in the NJRTM-E heavy truck trip table. Where a negative value results (where more commodity trucks appear than heavy trucks in total), the difference is shifted to other cells in the matrix where excess capacity exists.

Double-click the “Adjust_Freight_Table.S” script in the “Apps” pane. A new tab will open and reveal the script language.

To run the script, click on the “Run Current File” button in the top-left corner of the screen.

A pop-up window will appear. You may verify the input script file and work directory locations (the folder where your input and output files are to be referenced/created) are correct, and then click on the “Start” button at the bottom of the window.

Once the script has completed its run, you may close the pop-up window or view the print file.

This script will have produced 14 new files, including a series of adjusted truck matrices, one for each time-of-day period. These files include:

- FINAL_TRUCK_ADJUSTED_AM.MAT;

- FINAL_TRUCK_ADJUSTED_MD.MAT;
- FINAL_TRUCK_ADJUSTED_PM.MAT; and
- FINAL_TRUCK_ADJUSTED_NT.MAT.

These matrices contain commodity truck and non-commodity truck volumes between origins and destinations during the morning (AM), midday (MD), evening (PM), and nighttime (NT) periods. These time-of-day truck trip tables will be assigned to the time-of-day loaded NJRTM-E networks in the next step.

Step 6. Assign the Adjusted Freight Table to the NJRTM-E Network

With an origin-destination matrix for each time-of-day period, each of which contains commodity truck volumes and non-commodity truck volumes that align with the NJRTM-E heavy truck trip matrix, we are ready to assign our matrices to the NJRTM-E model network.

The assignment produces a network file with truck volumes for each commodity bundle and non-commodity trucks on each link in the model network, thus simulating the travel pattern of these trucks over the region's highways. The assignment script assumes an "all or nothing" scenario, meaning all truck volumes between point A and point B will use the optimal route, and no trips will use alternative, sub-optimal routes.

NJTPA's assignment protocols, including truck restrictions on parkways, delay penalties for crossing Manhattan, and other impedances, are applied, as specified in the penalty input file (HWANTP.crd).

Double-click the "ASSIGN_BUNDLE.S" script in the "Apps" pane. A new tab will open and reveal the script language.

To run the script, click on the "Run Current File" button in the top-left corner of the screen.

A pop-up window will appear. You may verify the input script file and work directory locations (the folder where your input and output files are to be referenced/created) are correct, and then click on the "Start" button at the bottom of the window.

Once the script has completed its run, you may close the pop-up window or view the print file.

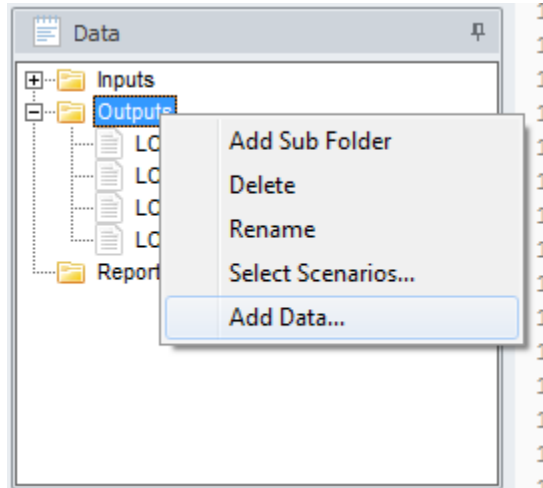
This script will have produced 4 time-period loaded networks with truck volumes for all 12 commodity bundles and non-commodity trucks included in them. The 4 network file outputs include:

- LOAD_AM_BUNDLE.net;
- LOAD_MD_BUNDLE.net;
- LOAD_PM_BUNDLE.net; and
- LOAD_NT_BUNDLE.net.

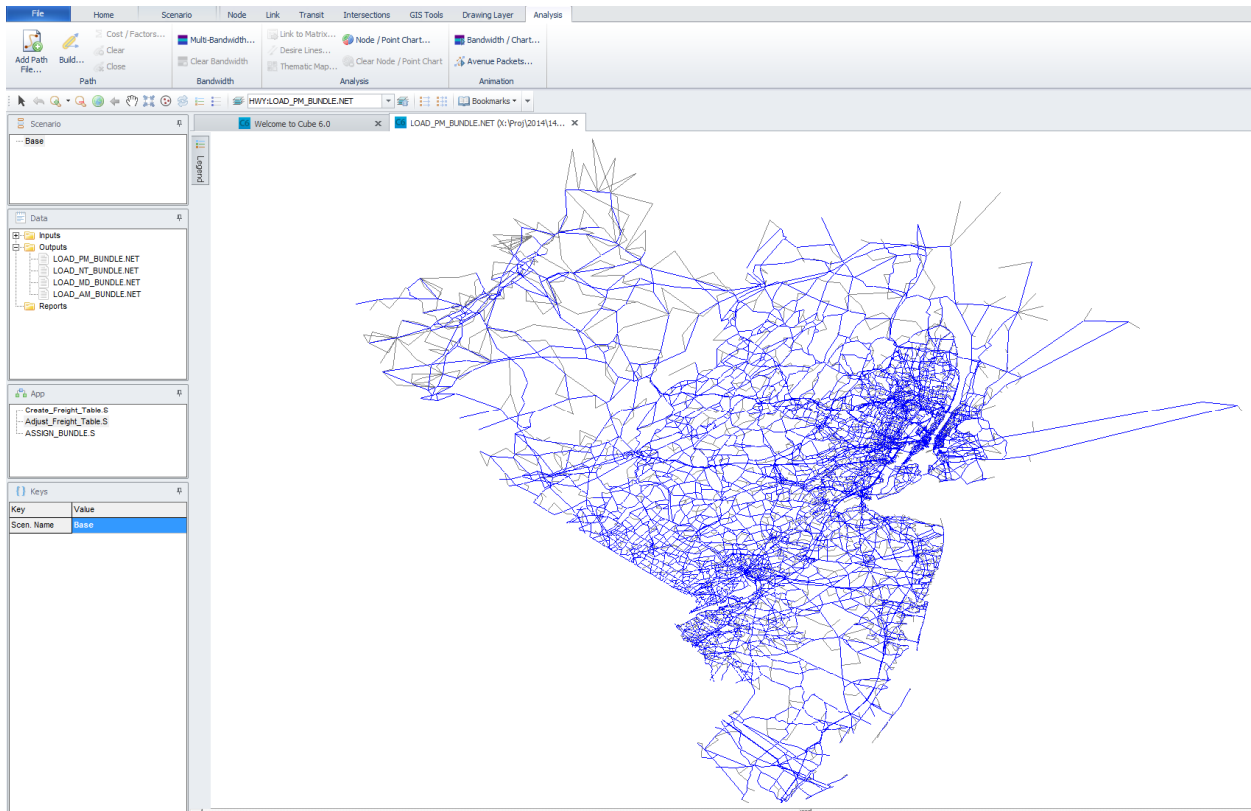
Step 7. Review and Export Results

With all of the scripts run, and time-of-day networks with commodity truck link volumes produced, it is time to review our results.

Load the LOAD_XX_BUNDLE.net networks into the “Outputs” folder in the “Data” pane. You can do this by right-clicking on the “Outputs” folder, selecting “Add data...” and browsing to the location of the loaded network files.



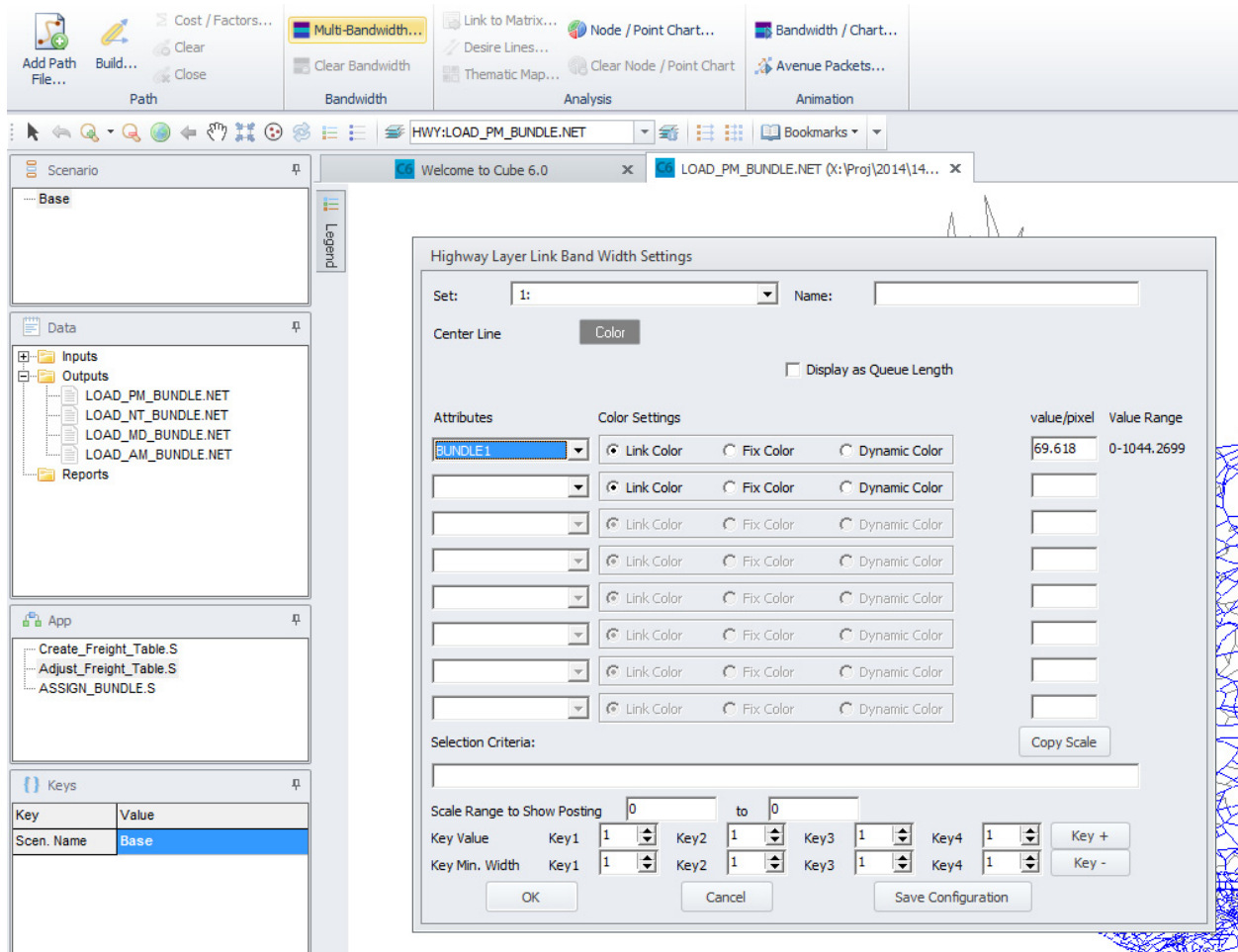
Once you have imported the network files, double-click on one to view the network. For this walk-through, we selected the LOAD_PM_BUNDLE.net network. A new tab will open, and a sketch of the model’s highway network will appear.



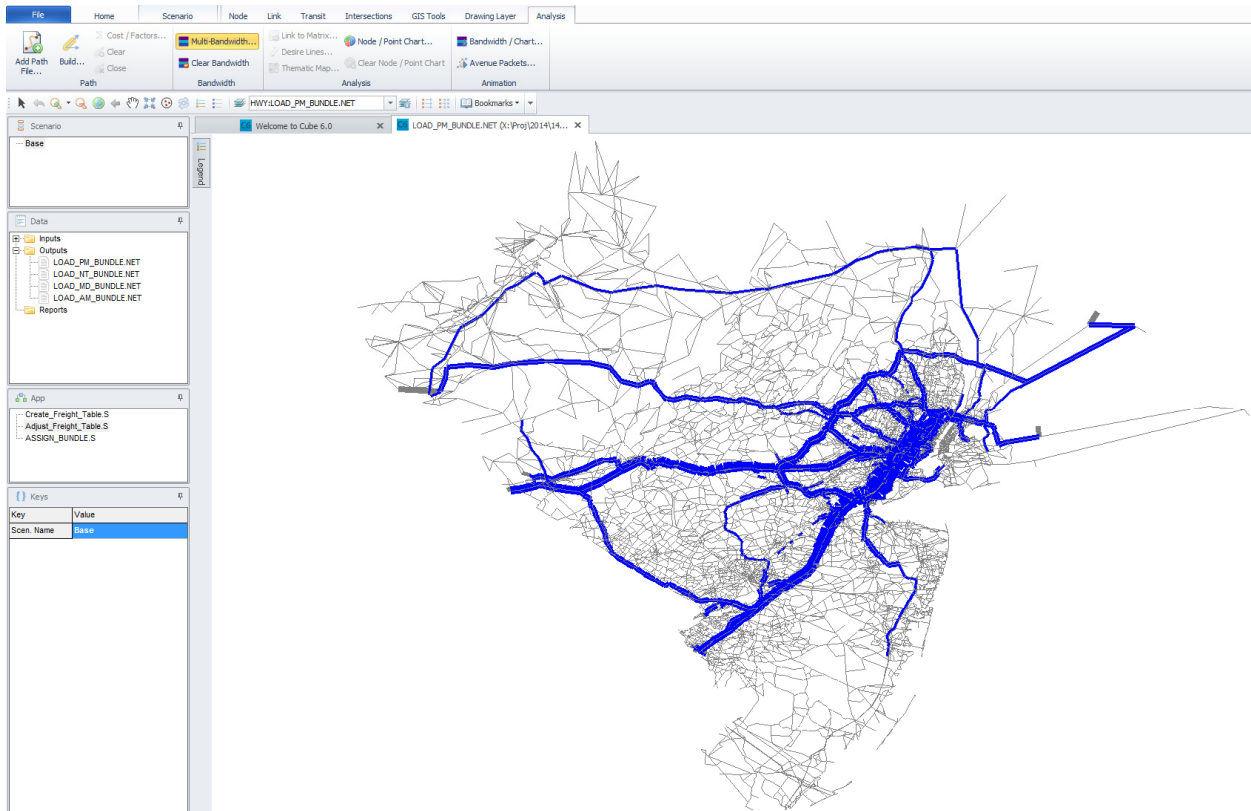
You may pan, zoom, and/or click on a link to view the link attributes and review the results of the assignment process. One quick way to check the results is to have the network shown in bandwidths corresponding to the truck volume on each link. This will show you the highest-volume links standing out from lower-volume links. In most cases, you would expect major highways, such as the NJ Turnpike and interstate highways to have the greatest volumes of truck traffic in the region.

To make the links display at varying widths to correspond to link volumes, click on the “Multi-Bandwidth” button at the top of the screen. A pop-up window will appear providing you with an opportunity to establish your bandwidth settings for this network. Under “Attributes,” click on the first drop-down menu. You may scroll through the fields in the network file until you see the “Bundle 1,” “Bundle 2,” etc., fields. These fields contain the assigned truck volume for the respective commodity bundle.

For this walk-through, we selected Bundle 1. The value range for this field will be shown to the right, and the value-per-pixel will be shown as well. You may adjust the value-per-pixel to satisfy any preference you have for how wide or narrow you want the bandwidths to be. We have left the default value unchanged.

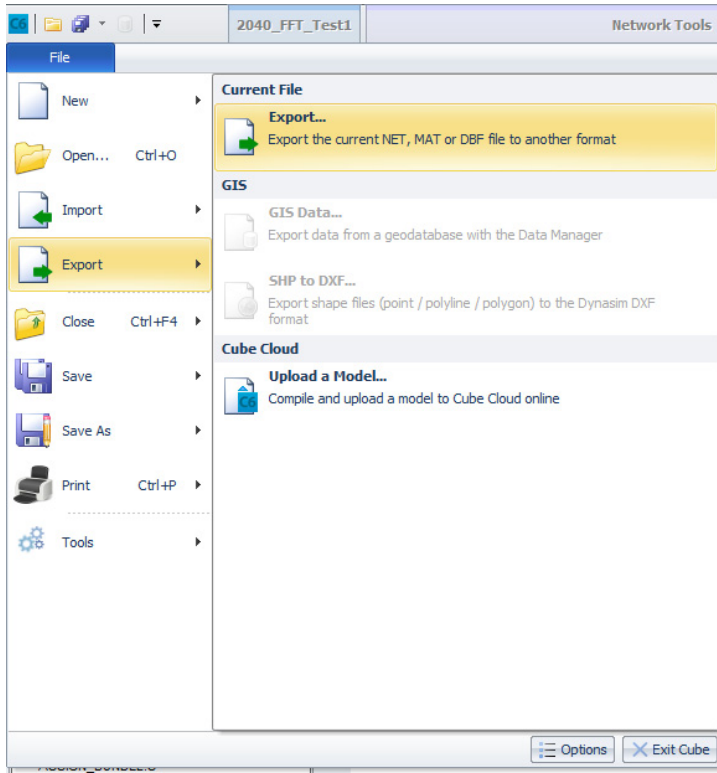


When you are ready to see the network lines displayed by bandwidths corresponding to link volumes for your preferred bundle(s), click the “OK” button. The network will be re-drawn with the bandwidth settings you’ve specified.

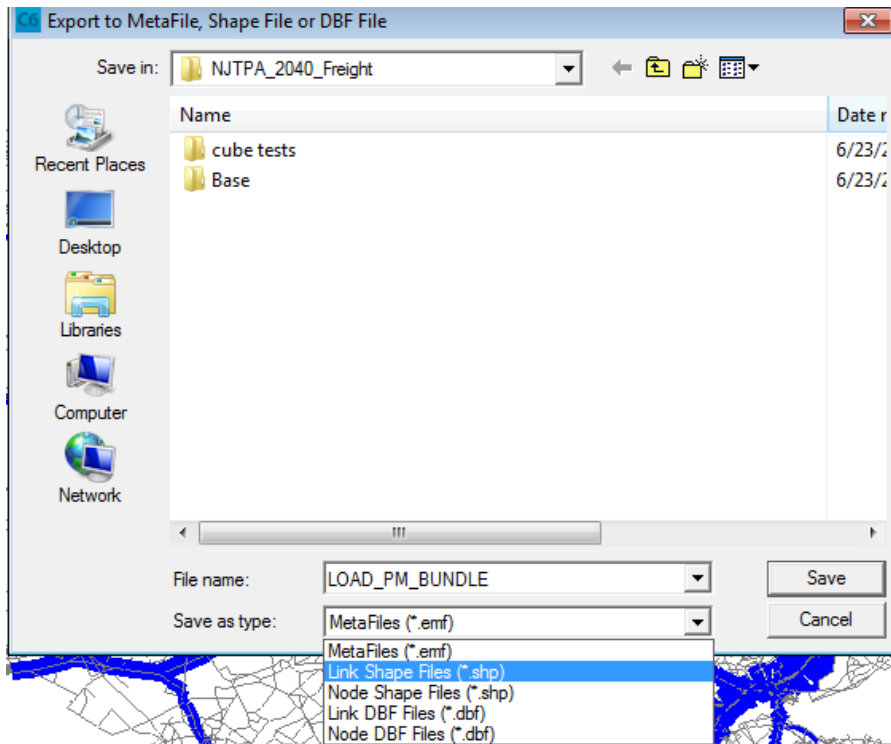


The network above shows the link volumes for trucks carrying goods in commodity bundle 1. As before, you may pan, zoom, and/or click on network links to view attributes.

If you are satisfied with the network assignment results and/or wish to export the network file as a shapefile (.shp) to review, analyze, or use for thematic mapping in GIS applications, you may do so by clicking "File," scrolling to "Export," and selecting "Export..."



A new pop-up window will appear, allowing you to browse to the location to which you wish to save the file, and to specify the format you wish to save it as. Select "Link Shape Files (*.shp)." Your shapfile will be exported to the specified location.



Prior to exiting CUBE, be sure to save your work! You may save the catalog file (.cat), which stores the path names to your input, output, and application files, and/or you may save your assignment network maps as a "project" file (.vpr).

Once your files are saved, you may exit the CUBE application.

