# FREIGHT PLANNING SUPPORT SYSTEM

# FINAL SUMMARY REPORT

Prepared for:
North Jersey Transportation Planning Authority

Prepared by:
New Jersey Institute of Technology
National Center for Transportation and Industrial Productivity
July 2003

New Jersey Institute of Technology
*A Public Research University*

NCTIP

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**TECHNICAL REPORT STANDARD TITLE PAGE**

| 1. Report No. | 2. Government Accession No. | 3. Recipient's Catalog No. |
|---|---|---|
| | | |

| 4. Title and Subtitle | 5. Report Date |
|---|---|
| Freight Planning Support System – Final Summary Report | July 2003 |
| | 6. Performing Organization Code |

| 7. Author(s) | 8. Performing Organization Report No. |
|---|---|
| George Fallat, Keir Opie, Joshua Curley, Jakub Rowinski, Rongfang Liu | |

| 9. Performing Organization Name and Address | 10. Work Unit No. |
|---|---|
| National Center for Transportation and Industrial Productivity<br>New Jersey Institute of Technology<br>323 Dr. Martin Luther King, Jr. Blvd.<br>University Heights<br>Newark, NJ 07102-1982 | 11. Contract or Grant No. |

| 12. Sponsoring Agency Name and Address | 13. Type of Report and Period Covered |
|---|---|
| North Jersey Transportation Planning Authority<br>One Newark Center, 17th Floor<br>Newark, NJ 07102 | Final Report<br>July 2002 – June 2003 |
| | 14. Sponsoring Agency Code |

15. **Supplementary Notes**

**16. Abstract**

This report summarizes the activities and the findings of the Freight Planning Support System (FPSS) project conducted for the North Jersey Transportation Planning Authority (NJTPA). The underlying purpose of the project is to allow for better project planning and implementation to deal with the forecasted ballooning of freight movements into New Jersey's ports and on northern New Jersey's railways and highways. The FPSS project developed goods movement transportation indicators, data and performance measurements, and goods movement strategies that will support the NJTPA's performance-based planning process. It also recommends a framework of issues, studies and analyses to enhance the freight planning process and agenda for northern New Jersey. In addition, the FPSS project also examined the interruption in freight movement caused by the September 11, 2001 terrorist attack on New York City. The FPSS project also identified potential freight system impacts, system redundancies and appropriate strategies to respond to, or prevent system failure in the event of another major disaster affecting the movement of goods and people within the northern New Jersey region.

| 17. Key Words | 18. Distribution Statement |
|---|---|
| freight transportation planning, intermodal transportation | No Restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161. |

| 19. Security Classif (of this report) | 20. Security Classif. (of this page) | 21. No of Pages | 22. Price |
|---|---|---|---|
| Unclassified | Unclassified | 137 | |

Form DOT F 1700.7 (8-69)

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## 1.0 INTRODUCTION

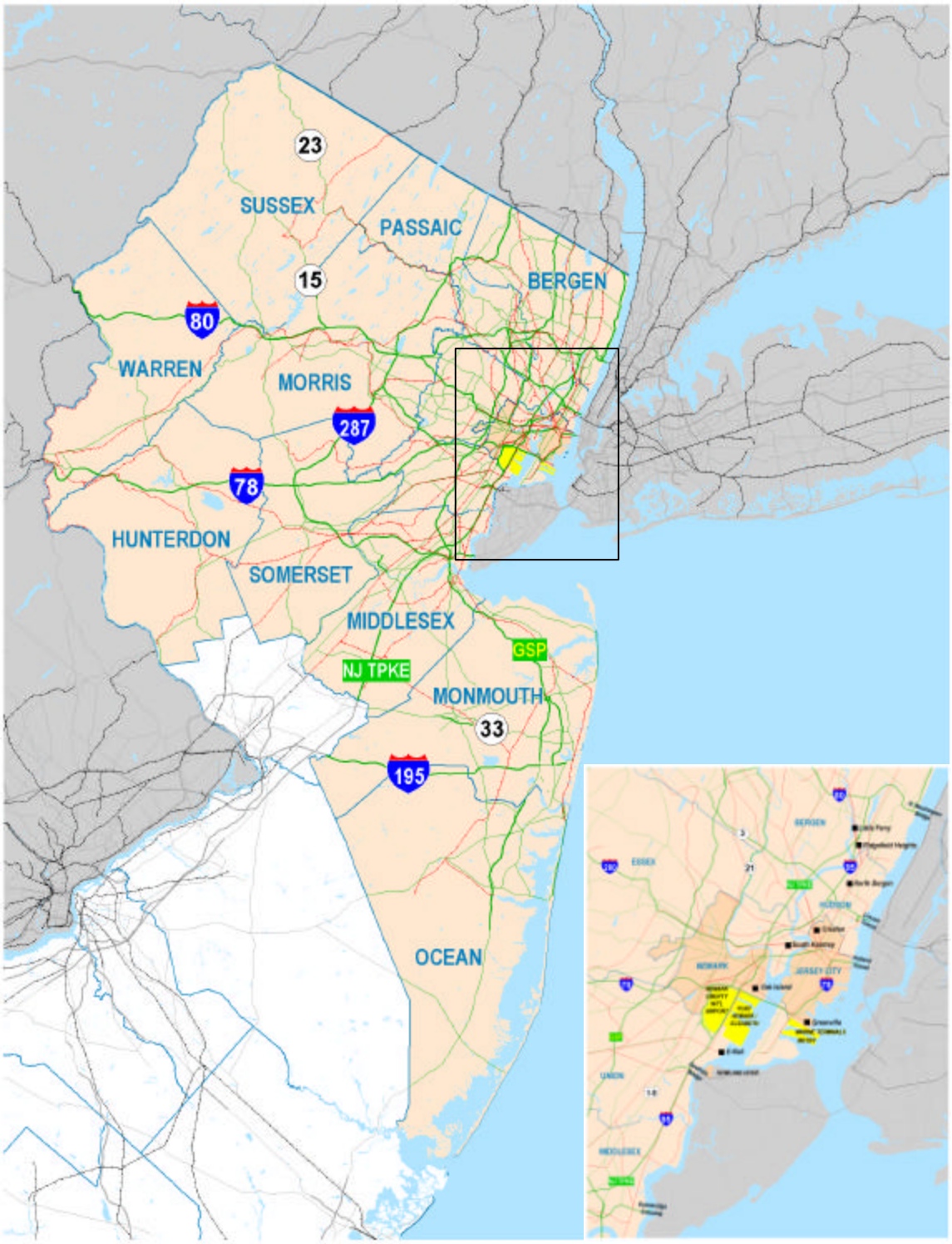
First-time visitors to the northern New Jersey region are often overwhelmed by the staggering intensity of land use and complex network of transportation facilities. Indeed, northern New Jersey represents the most densely populated region of a state, which outranks all other states in population density and represents the central hub of the Boston to Washington corridor. Unquestionably, northern New Jersey encompasses one of the most highly evolved, intricate networks of highway, rail, and marine port transportation systems in the nation. A map of the existing transportation infrastructure in Northern New Jersey is shown in Figure 1.1.

The tremendous influx of goods coupled with the fact that the region is located within the largest consumer market in the world only intensifies the need to accommodate freight and goods movement in the northern New Jersey region. Consider some other interesting freight statistics, which are provided below:

- According to the New Jersey Turnpike Authority, over 20,000 trucks per day used the New Jersey Turnpike near Port Newark / Elizabeth. (New Jersey Turnpike Authority)
- According to a recent study conducted by the New York Metropolitan Transportation Council (NYMTC) 1.1 million carloads moved through New Jersey rail terminals
- In 2002, Port Newark / Elizabeth handled 70 million tons of cargo and 3.75 million TEUs; the automobile import / export center processed 589,000 vehicles; and the value of freight handled was $90 billion. The port handled 60% of the domestic North Atlantic market share. (PANYNJ)
- Newark Liberty International Airport handled 1.1 million tons of air freight in 2000; as a growing share, this is more than 1/3 of the New York Metropolitan regional total. (PANYNJ).

This intense level of activity is only expected to increase. The Port Authority of New York and New Jersey (PANYNJ) projects tremendous growth of freight traffic at the port, airport, and rail terminals in northern New Jersey. Serving 38 percent of the US population, Port Newark/Port Elizabeth current volume of nearly 4 million twenty-foot equivalent container units (TEUs) is projected to double within ten years. By the year 2040, according to conservative projections, port container traffic will increase more than six fold over current levels. Deepening shipping channels that access the ports to 50 feet will foster much of this growth. The deepened channels will enable the region to accommodate a new class of mega-ships – with up to twice the capacity of most current vessels – that increasingly is being used for international goods movement. The deepened channels will enable Asian goods to be transported more economically to East Coast ports, taking a route through the Suez Canal and across the Atlantic Ocean with

**Figure 1.1: Transportation Infrastructure**



intermediate stops along the way[1] (Figure 1.2). The Suez Canal currently allows for vessels with up to a 58 draft, however, plans exist to deepen and widen the canal to allow for vessels with drafts up to 66 feet by 2005 and up to 72 feet by 2010[2].

At the same time, many of the region's passenger and freight transportation facilities are facing a number of issues. Consider the following:

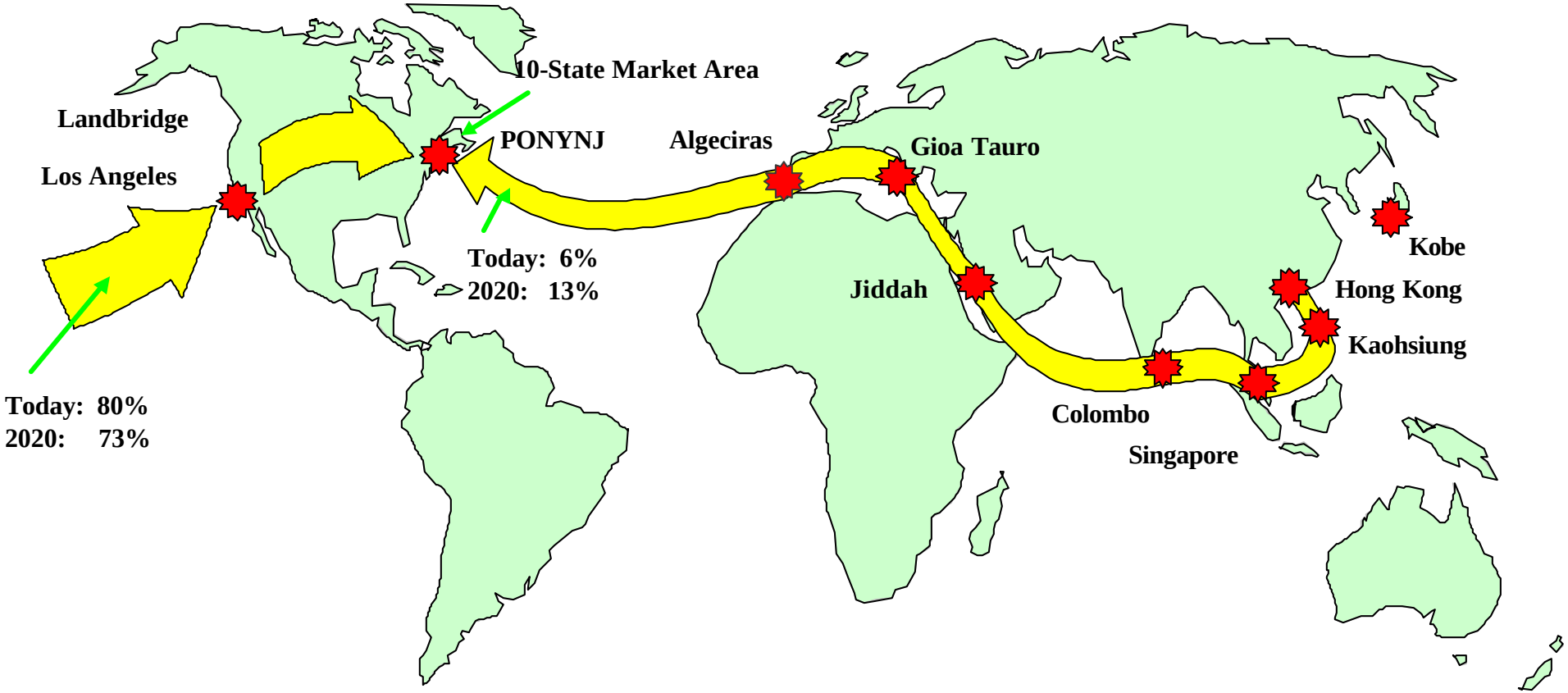
- Rail Terminals – Northern New Jersey houses the largest port and rail intermodal yards on the East Coast. Major rail terminals, including Croxton Yard and South Kearny Yard accommodate as much or more container traffic through the min-land bridge originating from the West Coast as is imported through the Elizabeth and Newark Seaports. Oak Island Yard is the largest marshalling yard on the East Coast handling the import and export of autos and bulk commodities. There is a strong demand for dual freight /passenger use of rail lines in our region. New Jersey Transit owns some lines while others are owned by the freight railroads. This trend is expected to continue, as there is significant pressure to increase passenger rail service. However, increasing passenger use of the rail system reduces the times and operation of freight traffic thus impinging on terminal throughput and efficiency.
- Newark Liberty International Airport – According to the PANYNJ, Newark Liberty International Airport in 2001 handled over 1millioin tons of airfreight making it the 7th busiest airport in the nation in terms of freight movement and 18th busiest in the world and is projected to increase its air cargo traffic by 50% in ten years. The airport is currently undergoing a multi-billion dollar expansion program to increase capacity. Fueling its rapid growth is the airport's close proximity to a huge consumer market and access the supportive warehouse and transportation infrastructure. A challenge is locating airport space for suitable distribution centers.
- New Jersey Turnpike – the New Jersey Turnpike serves as the regional north-south route throughout the state. As the major north-south link to major port facilities, the Turnpike plays a vital role in accommodating freight movement throughout not only New Jersey, but in the Eastern Unites States. Plans and projects in the NJTPA region include reconstruction of Interchange 12, which will provide a direct connection between a major industrial area and the Turnpike and the new Secaucus Interchange, which will provide direct access to the recently constructed NJ Transit Secaucus Transfer Station on the Northeast Corridor Line.
- I-78, I-80, I-280 – these three major interstates accommodate the majority of east-west cargo movements from the port area to points west. With port traffic expected to double over the next ten years and increase six fold over the next 40 years, operational conditions on these roadways, already at problematic levels, are expected to deteriorate significantly. However, roadway capacity improvements are prohibitively expensive and fraught with environmental consequences. Truck VMT could be reduced through expanded intermodal rail service, but it is likely that its impact on reducing congestion would be minimal. Therefore, enhancements to

[1] Building a 21st Century Port, Port Authority of New York & New Jersey
[2] "Suez Deepening Proceeds", www.marinelink.com, News Article, Jan 29,2001

freight mobility along these corridors can, at best, be facilitated by upgrading existing facilitates and targeting investments to achieve the maximum multimodal impact.

- Portway – NJDOT's Portway is being planned multi-phase semi-dedicated trucking corridor that is intended to provide fast and efficient movement of goods among key port, airport and intermodal rail terminals. It is being undertaken as a series of discrete projects that will improve existing road and bridge infrastructure. Phase 1, approximately six miles in length, is currently underway. Portway will incorporate features such as overweight container handling capability and intelligent transportation systems (ITS) technology. In addition to speeding goods movement and helping relieve congestion on local roads, Portway will open up redevelopment opportunities for Brownfields and old industrial properties along and near to its alignment. NJDOT is also undertaking the Portway Extensions and Concept Development connections between port facilities and other rail terminal warehouse/distribution areas within a defined radius of the major port facilities. This will also incorporate an upgrade to the currently proposed Portway alignment with improved access to the port complex of Global/Military Ocean Terminal in Bayonne (MOTBY) and to highways accessing Howland Hook port terminals in Staten Island. NJTPA is hosting public outreach of the Portway Extensions Study.
- Northeast Corridor and Chemical Coast Rail Lines — The region's extensive rail freight network is in need of being upgraded and expanded as a result of the acquisition of Conrail by Norfolk-Southern and CSX railroads. Both Norfolk Southern (NS) and CSX railroads provide interstate freight rail service in the region and must compete with AMTRAK and NJ Transit passenger services for access. As a result of projected demands for greater public use of the rail line's rights of way, there have been discussions amongst the private railroads, NJDOT, NJ Transit and the Port Authority of NY/NJ to develop a joint public private investment program for significant infrastructure improvements. Additionally, there is a proposal to remove

**Figure 1.2: Shift in Freight Flow**



significant bottlenecks along major rail corridors and increase capacity through the construction of more double-track and increasing bridge height clearances.[3]

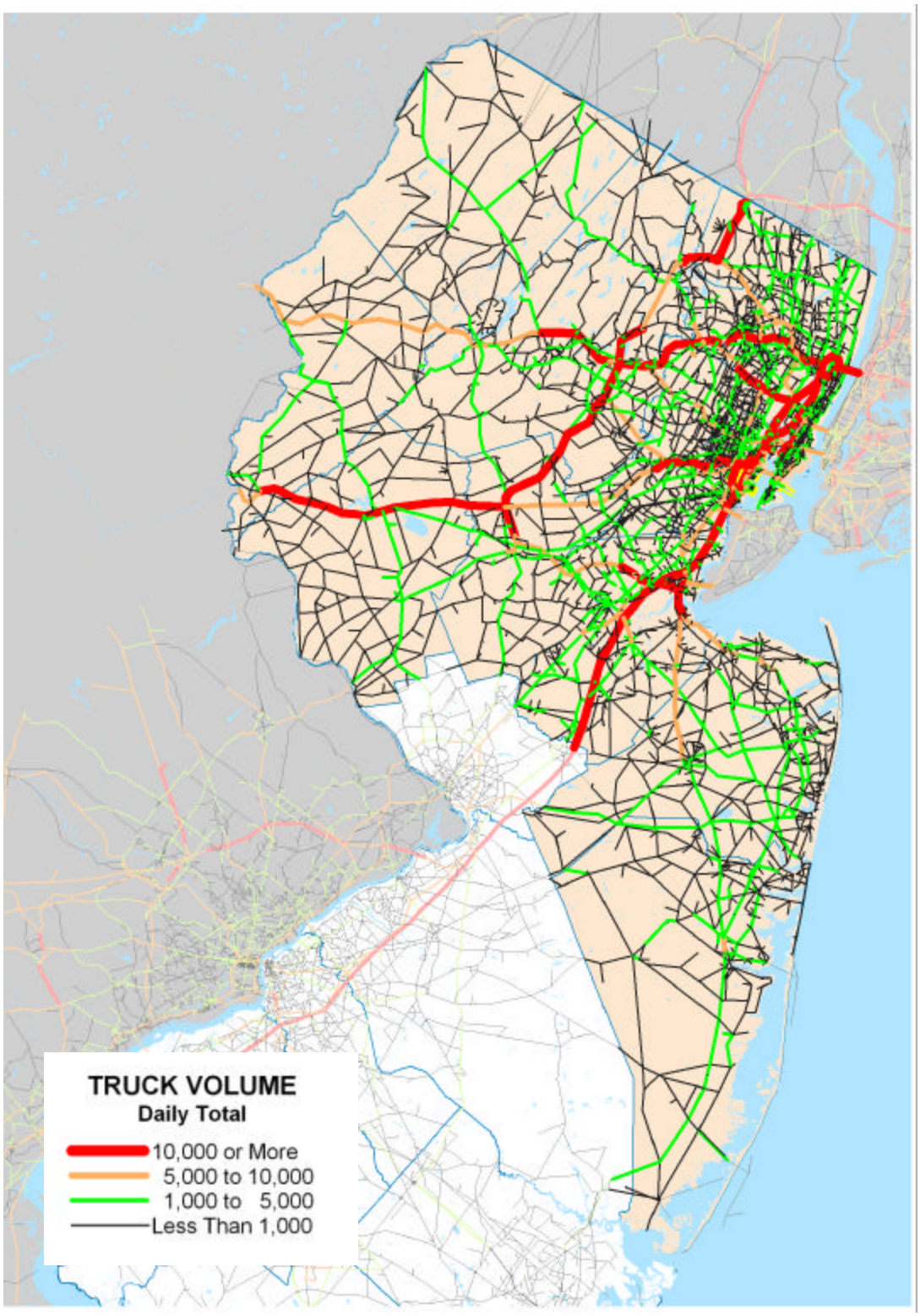
Other key initiatives are also underway in an effort to foster economic vitality to the region:

- The International Intermodal Transportation Corridor and Center (IITCC) - The Portway project has been incorporated into a larger federally financed economic and transportation corridor termed the "International Intermodal Transportation Corridor and Center" (IITCC). Federal funding has been earmarked in the Transportation Equity Act for the 21st Century (TEA-21) towards economic development planning of for the Corridor. The IITCC envisions an economic zone of interlinked businesses including major New Jersey industries such as transportation, pharmaceuticals, telecommunications, petrochemicals and others, served by efficient goods movement infrastructure. NJIT has been designated as the "Center" of the International Corridor effort and will provide support resources to the state, the NJTPA, and other entities involved in the movement of goods. Efforts are underway to coordinate IITCC plans with the NJTPA-NJIT Brownfields project. Staff members from the Corridor Center are serving on the NJTPA-NJIT Project Team.
- Comprehensive Port Improvement Plan – The Comprehensive Port Improvement Plan (CPIP) and an accompanying Environmental Impact Statement are being undertaken by the USEPA and the Army Corps of Engineers in conjunction with a landside impacts consortium of New York and New Jersey agencies. It is intended to guide and coordinate the various port planning activities underway in the region. The Port of New York & New Jersey has released "Building a 21st Century Port" which outlines its plans to expand capacity within the port to meet growing international trade demands
- Port Inland Distribution Network (PIDN) –. Part of the PANYNJ plan includes expanding existing terminals, developing new terminals, deepening channels, and the consideration of establishing a Port Inland Distribution Network (PIDN) composed of private inland container terminals located 100 miles or more from the port and served by rail and barge. AS a test, CPIP inaugurated barge service from the Ports of Newark and Elizabeth to Albany, New York in January, 2003 with twice daily sailings.

While these plans strongly focus on required waterborne access and needed terminal layout and operation improvements, less attention has been given to landside access and future port links to related ground transportation network. Existing truck volumes, as depicted in Figure 1.3, are expected to increase significantly as port volume increases. Since many of these roadways are near or at capacity, even minimal increases in volume (truck or otherwise) significantly increases congestion and delay.

[3] "State Rail Plan", NJDOT, December 2002

**Figure 1.3: Existing Truck Volumes**




Source: New Jersey Statewide Truck Model (2000 Base), NJDOT

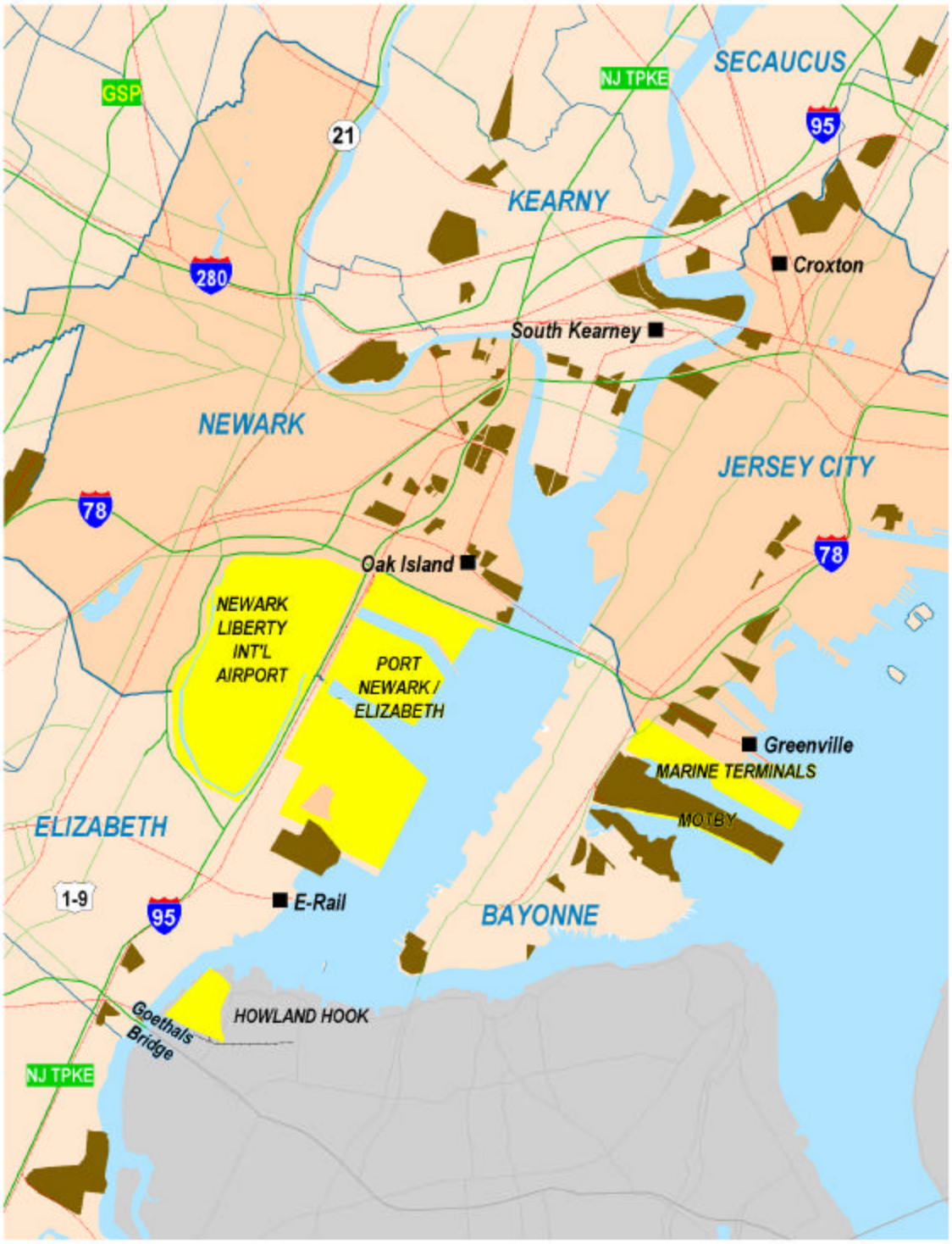
Land use patterns also affect the movement and logistics of freight. Undeveloped properties south of the port district and at the western fringe of the state are increasingly being used for major distribution centers. While there are some immediate economic benefits to the local area, this pattern of development significantly increases vehicles miles traveled (VMT), particularly where the site requires goods movement to and from the port.

Brownfields are described as currently vacant or underutilized properties with real or perceived environmental contamination. Many of these properties are former industrial sites and because of their relatively large size and close proximity to key transportation infrastructure (See Figure 1.4), could be effectively re-used for freight and logistics uses. Furthermore, redevelopment of these properties for value-added warehouse and distribution facilities as opposed to development of new sites on the outer rural fringes of the northern New Jersey region has several important benefits, such as reducing the burden to the transportation infrastructure, responsibly addressing environmental contamination and providing valuable job opportunities within close proximity to low-income urban communities. Unfortunately, there are a number of barriers to redevelopment of these properties, including intense competition for cargo container storage and the often lengthy environmental remediation process.

Another important issue to consider is the ability to transport overweight containers. Loaded cargo containers that come into the port via ship from foreign origins can sometimes exceed the legal weight limit that can be accommodated on conventional roadways. Restrictions are necessary to ensure the structural integrity and safety of the roadway system but at the same time they create inherent inefficiencies for container transport via truck. Consequently, overweight containers from ships must be unpacked and reloaded so that trucks do not exceed the 80,000 pound weight restriction. Therefore, transport systems that do not have these restrictions, such as on-dock rail and barges and can accommodate the same container without repacking become highly desirable.

Coordination of public and private entities also poses a looming challenge. The NJTPA region encompasses 385 separate municipal entities including two major cities: Jersey City and the City of Newark. The Meadowlands Commission (formerly HMDC) is a state-created entity that has zoning authority in portions of Bergen, Hudson, Passaic and Union Counties, which are all within the NJTPA region. The Port Authority of New York and New Jersey, a bi-state agency responsible for the planning, construction, operations and maintenance of Ports Elizabeth, Newark and Liberty International Airport as well as several major bridges connecting New York and New Jersey, is also is a key player in the region. Transportation decisions are also of course impacted by the New Jersey Department of Transportation, New Jersey Transit as well as three Class I freight rail service providers and several Short Line rail operators. Use of the intricate system of navigable waterways also requires coordination with federal agencies such as the Army Corps of Engineers and the US Coast Guard. Finally, in the wake of the September 11 terrorist attack on the World Trade Center, transportation security has become a key issue, involving emergency response personnel at all levels of government.

**Figure 1.4: Vacant Underutilized Properties around the Port**



In summary, northern New Jersey is poised to reap tremendous economic benefits for freight and logistics services, but the region also faces serious challenges, many of which are unique to the NJTPA region. Under its FY 2003 Unified Planning Work Program (UPWP), the North Jersey Transportation Planning Authority (NJTPA) is seeking to address these important issues through the development of goods movement indicators, data and performance measurements, and goods-movement strategies that will support the NJTPA's performance-based planning process now and well into the future. In addition, NJTPA is seeking to establish a comprehensive framework for its freight planning activities. This study, entitled Freight Planning Support System (FPSS), is being conducted by the New Jersey Institute of Technology working in collaboration with NJTPA's Freight Initiative Committee and staff.

The FPSS study expands upon freight performance analyses developed as part of NJTPA's Strategy Evaluation Project and develop indicators of goods movement such as travel time, reliability, and highway conditions measures. Terminal landside access, terminal congestion, clusters of freight activity, and key freight routes by mode are also examined. Drawing on relevant data sources and gathering new data where necessary, the FPSS study uses the indicators to assess the performance of freight movement in the region, forecast future conditions, identify current and future needs, and develop strategies to address these needs. A sub-component of this study also includes a review of system impacts and appropriate responses arising out of the September 11, 2001 terrorist attack in New York.

These results of these activities provide the foundation for investigating new project proposals that could be included the northern New Jersey project development pipeline. These project proposals will be considered by the NJTPA Freight Initiatives Committee and the Board of Trustees within the context of other regional priorities to insure the provision of effective, efficient and safe movement of freight traffic in the NJTPA Region.

The FPSS study will address the following three main areas of task work:

- Identification of appropriate freight performance indicators that are applicable to the region's freight distribution and logistics system
- Freight system vulnerability to emergencies and unforeseen disruptive events coupled with strategies for response and operational redundancy
- Ongoing technical support to NJTPA committees and staff

In addressing the major tasks listed above, the FPSS study has been divided into seven (7) subtasks. The full scope of work is contained in Appendix A. This report describes the study methodology, and contains a discussion of findings, conclusions and recommendations are contained in the following sections.

## 2.0 STUDY METHODOLOGY

The Freight Planning Support System (FPSS) study develops goods movement transportation indicators, data and performance measurements, and goods-movement strategies that will support the NJTPA's performance-based planning process. The study also provides a recommended framework for addressing freight mobility and as well as recommended next steps for enhancing the freight planning process and agenda for northern New Jersey. Impacts on freight movement caused by the September 11, 2001 terrorist attack on New York City, which has placed the NJTPA's ongoing planning and analysis in a new and more urgent context are also examined. Therefore, this work identifies freight system impacts, system redundancies and appropriate strategies to respond to, or prevent system failure in the event of another major disaster affecting the regions movement of goods and people.

The study adds new scope and depth to the products of the NJTPA's Strategy Evaluation Project, which has developed freight performance measurements to address accessibility, mobility and congestion on the region's transportation network. The FPSS study expands the Strategy Evaluation Project's freight performance analysis while developing performance indicators of goods movement. Drawing on relevant data sources and gathering new data where necessary, the FPSS uses identified indicators to assess the performance of freight movement in the region, forecast future conditions, identify current and future needs, and develop strategies to address these needs.

These activities provide the foundation for establishing a comprehensive framework for freight planning and identifying new project proposals that could be included the northern New Jersey project development pipeline. These project proposals can subsequently be advanced towards implementation by the NJTPA Freight Initiatives Committee and the Board of Trustees within the context of other regional priorities to insure the provision of effective, efficient and safe movement of freight traffic in the Region.

Products of the FPSS study address three main areas of task work:

- Development of northern NJ freight indicators, data, practices and other factors that comprise the region's freight distribution and logistics system
- Freight system vulnerability to emergencies and unforeseen disruptive events coupled with strategies for response and operational redundancy
- Ongoing technical support to NJTPA committees and staff

This study is a collaborative effort between the NJTPA and the New Jersey Institute of Technology and relies on the parallel and continuing data collection and analysis of the International Intermodal Transportation Center at NJIT relating to the proposed International Intermodal Corridor (IIC). Additional data needs have been identified and collected as required to measure freight indicators within the NJTPA region that are outside the International Intermodal Corridor. However, these data and indicators are complimentary and inclusive of similar measures being developed for the IIC.
A description of the study methodology is provided below.

**2.1 Task 1**: Identify and Inventory Data products and of Goods Movement In New Jersey and Identify Indicators that Measure the Performance of Freight Movement in the Region

Task 1 included identification and procurement of available data resources that describe the freight system and freight movements in northern New Jersey. Sources were used to identify the transport mode and facility as well as clusters of activity. The approach to this task was intended to determine which data modeling products and sources are most reliable and useful for regional and state transportation planning purposes and procure, with consultation, appropriate data products for planning and forecasting.

Discussions with NJTPA staff as well as several internal meetings were held to identify potential data sources and discuss the necessary steps needed to obtain freight-related information. Data gathering activities also included contacts with representatives from CSX, Norfolk Southern, the Port Jersey Railroad Company, the Port Authority of New York and New Jersey, the New York Metropolitan Planning Commission, and the Delaware Valley Regional Planning Commission. Additionally, the study team obtained existing regional travel demand models and freight networks to determine how they could be integrated into the overall freight model developed under Task 2.

As part of the data collection process, all data were integrated into a geographic information system (GIS). By geocoding all data, maps displaying the regional freight system can be quickly developed, thereby being able to identify clusters of activity and areas of the transportation system that the freight system is dependant on.

Task 1 also included identification of appropriate indicators of goods movement in northern New Jersey. These indicators are measurable operational factors that describe the characteristics of freight activity in the NJTPA region and will be used to set performance standards and monitor conditions under which freight movement occurs.

The study team undertook a comprehensive review of available literature pertaining to freight modeling practices and freight performance indicators. A summary is discussed in detail in the following sections of this report. We also discussed the results of our findings with key individuals involved in freight movement and logistics to identify additional performance indicators and rule out indicators that may not be appropriate for in meeting the objectives of our study. These results of these discussions, as well as our recommendations and suggested next steps are also included in the sections that follow.

Also as part of the Task 1, several professionals in the regional freight industries were invited to sit on an advisory committee to assess and guide the work being done as part of the FPSS study. During the concluding phases of the Task 1 work, the list of potential freight performance indicators determined from the literature review was presented the advisory committee for review. Issues regarding the potential indicators were discussed, including the modal applicability of indicators, and are summarized in the following sections.

**2.2 Task 2**: Select appropriate indicators and measure 2000 and 2025 Performance of the Freight System:

The resources and data gathering activities in Task 1 provide the basis for establishing base year flows, forecasting future year (Year 2025) flows and selecting freight performance indicators. The movements of goods throughout the NJTPA region as well as national and international flows are depicted in tables and figures. Information layering by use of GIS software provides the following:

- Areas of concentration of freight distribution terminals
- Rail and highway infrastructure
- System restrictions such as clearance, weight, hazmat, tandem trucks and other operational measures
- Access roads to major terminal areas such as port, air, and rail and warehouse centers

The TRANSEARCH database maintained by Reebie Associates is widely accepted as the most comprehensive and complete source of freight flow data. The initial database was developed by DRI McGraw Hill in the early 1990's and was subsequently purchased by Reebie Associates, which updates the database on an annual basis. The database provides a national and multi-modal commodity flow matrix as well as a methodology for assigning freight tonnage to specific transportation links. The database was purchased and was used to develop a commodity flow matrix for the 13-county NJTPA region.

In addition to freight flow information, it was also necessary to compile infrastructure data. Multi-modal networks developed by Center for Transportation Analysis (CTA) at Oak Ridge National Laboratory (ORNL) were obtained. Several national networks were also obtained, including a rail network, a national highway network, a global waterway network, and a nationwide intermodal terminal database. These networks were developed so that the freight flow assignments obtained from Reebie Associates could be assigned.

Recognizing the need to develop a statewide travel demand model that could estimate both auto and truck flows throughout the entire State of New Jersey as well as across adjoining regions, the NJDOT undertook the development of New Jersey Statewide Truck Model (NJSTM). The NJSTM was created through an assemblage of five different transportation demand models developed for New Jersey and regions outside of New Jersey. They are: the NJRTM; the South Jersey Regional Transportation Model; the Delaware Valley Regional Planning Commission Model; the Port Authority of NY/NJ Interstate Network Model; and the New Castle County Model from Delaware DOT. The NJRTM served as the foundation of the STM with the other models converted to be consistent with the NJRTM. Additional model features, such as the coding of truck regulations and prohibitions were also incorporated into the STM. The model was initially developed using TRANPLAN software, but under subsequent updates was

revised to run under TP+ software. The NJIT team used the NJSTM as the basis for freight modeling.

A Freight Advisory Group was formed under Task 1 and included representatives from NJDOT, CSX, NJTransit, Conrail and the Port Authority of New York and New Jersey. Meeting discussions that came out of the Advisory Group meeting as well as information gathering activities in Task 1 and a determination of the availability and appropriateness of indicators to measure existing and future freight performance were used to generate a list of six categories freight performance indicators and their respective performance measures. These are listed below.

1. **System Use.** System use would be measured by ***Truck Miles Traveled***. Specific strategies may include shifting freight movements onto rail, barge, or some innovative freight mover would reduce truck miles traveled. In addition, strategies aimed at reducing hauling distances such as construction and relocation of warehouse and distribution facilities closer to the principal marine, rail and air freight hubs could also be quantified. This indicator will be measured from the NJSTM outputs for both the current year and forecast year as well as from the commodity flow forecasts.

2. **System Efficiency.** System efficiency would consider the ability to move freight more quickly. Thus, travel delay as a function of miles traveled, or ***Ratio of Truck Delay per Mile Traveled*** would be measured**.** The delay component of this measure would be split into two forms: recurring delay and non-recurring delay. Recurring delay (delay due to congestion) is detrimental to the movement of freight on the highway. But when anticipated, recurring delay can be accounted for within trucking companies' cost calculations and scheduling. Non-recurring delay (delay caused by incidents and accidents) cannot be anticipated due to the unpredictable nature of its occurrence. As such, trucking companies cannot adjust cost calculations and schedules, giving less reliability in the delivery time of goods (especially in congested urban areas during peak hours).

   This measure is well suited for evaluating strategies that reduce overall system congestion and truck congestion (e.g. implementation of truck only lanes, Portway, etc). It is also appropriate for evaluating an increased time of port operations, moving highway freight during roadway non-peak hours. This measure could also be used to evaluate the shifting of freight movements to non-highway modes. However, alternative modes would reduce both truck hours of delay (by just reducing the number of trucks and the congestion) as well as truck miles. Therefore, this measure is not as direct in evaluating alternative mode shift strategies as Indicator 1 above. System efficiency could also be measured by determining the ***Ratio of Tons or Volume of Goods Moved to Truck Miles Traveled***. Data for this measure would come from NJSTM with the New Jersey Congestion Management System (NJCMS) for hourly recurring and nonrecurring congestion delays.

Equating a measure of system efficiency (delays) for modes other than highway is deemed not feasible at this time due to the absence of delay models for other modes. The development of such delay models for non-highway modes could be considered as future projects to enhance the FPSS work effort

3. **Infrastructure**. Measures for the infrastructure measure would be: (1) ***Truck volume, Tons or Volume of Goods Moved Over Highway Structures Having A Substandard Sufficiency Rating***; (2) ***Truck volume, Tons or Volume of Goods Moved Over Miles of Pavement Having a Low Condition Rating***. Continued dialogue is necessary to establish suitable thresholds for what is deemed "substandard" and "low". Strategies could include shifting highway freight movement to better quality structures and pavement or allocating resources to improving substandard pavement and structural conditions. A similar measure for rail would be the number of track miles limited by weight or height restrictions that accommodate only less than 263' weight or single stacked container trains. This indicator would enable priority to be given to highway and rail infrastructure that carries or has the potential to carry larger volumes of freight. Strategies would look to decrease this value of indicator. NJDOT Bridge and Pavement Management Systems will be used with NJSTM and TRANSEARCH for calculating this measure. Rail infrastructure would be obtained through Conrail and other regional railroads.

   An indicator to evaluate access to the National Highway System Network was also considered, with a possible measure being the number of National Highway System Network connectors within a specific travel distance to a freight trip generator. However, such a measure would need to be calculated on a site-by-site basis rather than an area based aggregation.

   A surrogate for this site-specific measure for the region level would be the number of truck viable road miles (lane miles or centerline miles) per square mile. Viable road miles would be determined based on current truck prohibition regulations and geometric restrictions. At this point it is not clear how this would be forecasted for horizon year analyses. This measure could be a successful indicator of the level of truck accessibility for different areas of the region and could indicate where freight related development might be favorable from a transportation perspective. Similar qualitative measures have been used by DVRPC in the evaluation of the freight system and goods movement.

4. **Safety**. This indicator would measure the ***Annual Number Of Freight Related Accidents***. It is assumed that freight related accident rates are generally consistent year to year. The differential of the accident rates of differing modes would result in the increase / decrease of the number of accidents occurring within the freight movement system. This would allow the societal savings of freight movement to be measured for various strategies.

As a result of the work done on the ATA Lawsuit against the State of New Jersey, NJIT has collected a large amount of information regarding truck accidents from NJDOT. Some information regarding rail freight accidents are available on the national level, however, no information has been found regarding air or water freight accidents. This would need to be resolved for this indicator to be considered.

In order to use Annual Number of Freight Related Accidents as a performance measure, we would also need to identify the safety impact of certain strategies and then be able to quantify those impacts. For example, if implementation of truck only lanes were to be considered as a strategy, we would need data from other studies to quantify the impact on accident rates. Unfortunately, this data may not be available. Therefore, while safety is a very important issue, this indicator may be difficult to quantify. However, once we have determined an accident rate, we can forecast the number of accidents based on the forecasted number of trucks from NJSTM.

5. **Environmental**. One indicator would be similar to conventional air quality measures used to evaluate transportation investments. Indicators include system-wide ***Tons of NO Emissions, Tons of $CO_2$ Emissions***, etc. Air quality indicators for freight would require number of truck miles traveled, which can be readily obtained and forecasted, as well as highway speeds. We would have to determine emission rates associated with freight rail, air and barge, if a given strategy were to increase use of these modes. The NJSTM and TRANSEARCH data will be used with the MOBILE6 program for calculating this measure for trucks. Separate models will be needed for the other modes.

6. **System Redundancy**. In the aftermath of the 9/11 tragedy, system redundancy was raised as an important issue for the freight transportation industry. Over a series of system disruption scenarios, the level of redundancy of a certain facility could be determined by measuring the ***Additional Ton-miles Traveled*** under an analysis of freight movement without the facility in question. A small increase of ton-miles would indicate a high level of redundancy (goods easily rerouted) and a large increase in the number of ton-miles traveled would indicate a system critical facility that would be difficult to operate without.

   Determining modal switches of freight is also problematic in measuring system redundancy. Also, due to the calculation intensive nature of this indicator, only a limited number of key facilities could have a measure of its redundancy determined using NJSTM. It would also likely be necessary to look at the impacts to Indicators 1 and 2 under the same disruption scenarios.

After review of the freight modeling methods used at MPO's and DOT's across the nation, the consensus was to use a commodity based modeling approach. By modeling

the underlying cause of freight movements – the transport of commodities from production to distribution to consumption centers – forecasted changes in economic conditions and consumption patterns can be translated into a flow of freight across the nation and the region. The Transearch database obtained under Task 1 was used as the primary source for commodity flows (in tonnage and value) between the NJTPA counties and other points in North America.

In order to measure the impact of freight flows on the regional transportation network, it is necessary to convert the tonnage flows into vehicle units. This can be accomplished by using the average payload characteristics by commodity to convert the commodity tonnage flows into modal vehicle flows for assignment over the assembled modal transportation networks. Network performance would then be measured from the assigned vehicle flows.

Utilizing the ESRI BIS business database for New Jersey and microdata from the 1997 Vehicle Inventory and Use Survey, the tonnage to vehicle conversion was completed for highway flows. In the absence of an empty trips model or a backhaul database for the region, a global factor of 1.33 was applied to add empty trips to the vehicle flow table. This represents the assumption that 25% of truck miles traveled are empty. This is a general assumption based on knowledge of the freight industry that has been made for lack of better information on empty miles. To convert from the annual commodity based flows to the daily truck trips needed for performance measure calculations, the standard assumption of 300 working days per year[1] was assumed.

The Reebie dataset was intended to serve as the basis for establishing Base Year (Year 2001) and Future Year (Year 2025) commodity flows for the NJTPA region. The database was also intended to serve as a means of establishing base truck flows and forecasting truck volumes on the roadway network. In order to determine the number of trucks as a result of increased future commodity flow, it is necessary to develop a methodology for translating the Reebie data into average daily truck trips. As part of the validation process of this conversion, it was necessary to compare the results of the existing commodity flow data with truck trips contained in the NJSTM. Unfortunately, there are a number of discrepancies between the data sets. Consequently, the team decided to proceed with the forecasts using the NJSTM. (Further details are provided in the Task 2 Report).

In order to evaluate the performance measures outlined in the above sections, the 24-hour flows produced by the NJSTM need to be enhanced. By developing a linkage between the North Jersey Regional Transportation Model (NJRTM) and the NJSTM, the 24-hour flows can be broken down into a morning peak period, an evening peak period, and the remaining off-peak period. By developing the post-processor system of programs (PPAQ, PPCMS, and PEQUEST) utilized by the NJRTM, the daily flows can be further broken down to estimates of hourly flows, delays, and level of service.

[1] Assumed 6 days per week (Monday – Friday plus ½ day per Saturday and Sunday) minus 12 holidays per year equals 300 days per year.

The FPSS team examined several approaches for establishing base year flows. The Transearch database lists commodity flows in terms of tons and then assigns these flows to various modes. The database provides a matrix of commodity flows between counties as well as regions. Multi-modal networks developed by the Center for Transportation Analysis (CTA) at the Oak Ridge National Laboratory (ORNL) were used to assign these commodity flows across North America to specific facilities. Centroids were added to the multi-modal networks to represent the zonal system contained in the Transearch database, and tonnage flows were assigned to the modal networks.

As discussed in the previous section, the conversion of tonnage into vehicular movements proved problematical given the data available. For this reason, existing conditions were established from the 2000 NJSTM model. The model is an update of the original NJSTM model (1990 based). The updates include developing a 2000 base year traffic flow, new truck prohibitions and the ability for truck-only lane modeling, and an enhanced network and zonal structure surrounding the Port Elizabeth / Port Newark and PORTWAY areas.

The FPSS work plan included the development of base year freight movements, and then forecasting flows to Year 2025. These forecasts would provide the basis for quantifying the specific measures listed above. So for example, the total number of truck miles traveled for Essex County in Year 2025 would be estimated. The forecasts must provide enough detail such that performance measure can be calculated to determine the future needs and deficiencies of the freight transportation network.

Forecasts come from many different sources, and much work has been done under varying other studies and from various transportation and economic agencies. The main sources used in determining the growth for this study include New Jersey Department of Labor employment work force projections, FHWA's Freight Analysis Framework (FAF) project, the Comprehensive Port Improvement Project (CPIP), and the NJDOT Statewide Truck Model.

While commodity based forecasts from different projects were made at varying geographic levels of detail and for varying years with differing commodity coding systems, the sources were combined together to arrive at the 2025 growth scenario prepared for this study. Further details of the forecasting methodology are outlined in the Task 2 Report.

Again, due to the complexity and shortcomings of the conversion of commodity flows into vehicle movements, the 2025 forecasted volumes from the NJSTM were used for detailed operations analysis and performance measures of freight movement on the highway network.

**2.3 Task 3**: Establish 2025 Performance Goals and Identify Needs

Task 3 analyzes the performance measurements generated in Task 2 and establishes a set of performance goals that reflect the goods movement mobility and accessibility

aspirations of the region. These goals consider the congestion management freight performance goals used in the Strategy Evaluation project.

A validation or refinement of the freight performance goals produced by the NJTPA's Strategy Evaluation Project has been undertaken relying on the tools and procedures provided by that Project. These performance goals encompass the issues and types of transportation systems that support goods movement in the region. Based on the refined performance goals, this task identifies regional freight needs, including locations where performance is below target levels for the various freight indicators.

A separate analysis was also conducted as part of this task that identifies freight system redundancy needs under the scenario of a disruption of traffic on key segments identified in Task 2 due to an emergency event.

### **2.4 Task 4**: Identify New/Validate Existing Freight Transportation Strategies to Address Identified Needs

This task identifies appropriate and implementable strategies to address the goods movement needs identified in Task 3. These strategies were evaluated within the context of the Strategy Evaluation Project. This ranked list of strategies can be incorporated into the Regional Transportation Plan for subsequent incorporation into the northern New Jersey project development process and pipeline. Specifically, this task:

- Develops strategies to address identified freight system needs, including strategies that can be employed in an event-based emergency
- Refines and enhances the Strategy Evaluation Methods for Freight Measures
- Develops selection criteria to prioritize the strategies. These strategies will be implementable by the Board of Trustees of the NJTPA within its constrained budgets and timeframes
- Applies criteria to select recommended strategies
- Prioritizes identified strategies using the RTP Evaluation Framework or other appropriate measures.

In the development of improvement strategies for enhancing the movement of goods in the NJTPA region, the research team performed an extensive review of available resources. The list contains information from NJTPA, NYMTC, DVRPC, Congestion Buster Task Force, and Metroplan Orlando. A full list was compiled and then narrowed down by grouping and removing duplicate and determining their applicability to the NJTPA region. The potential strategy list is organized in several categories: Truck, Intermodal, Rail, Port Landside, Airport and Economic Development. Each category is further subdivided into infrastructure, policy and operating/technology improvements. Examples are provided for some of the broader strategies in order to identify the kind of work intended.

Finally, freight mobility strategies consider federal policy and legislative requirements. Since strategies must be capable of being measured and evaluated, methods by which these strategies can be evaluated have also been identified.

**2.5 Task 5:** Establish the Support Systems for Ongoing Freight Planning

In response to meeting the challenges for freight planning, Task 5 seeks to build the framework for an ongoing freight planning process at the NJTPA within which assessments can be made regarding goods movement and freight logistics in the NJTPA region. Task 5 includes a summary of current freight planning activities and initiatives being undertaken by NJTPA as well as a description of other agency freight planning initiatives, strategies and frameworks. Task 5 also identifies new sketch planning tools and methods that can be applied by the NJTPA to its freight planning activities. This task gleans from a comprehensive literature search and other sources the most appropriate techniques, tools and methods to deploy in the NJTPA region. Data deficiencies and specific action items that can be undertaken by the NJTPA Freight Committee are recommended. NJTPA's current freight planning program is compared with the current state of the practice as well as other freight planning research initiatives to determine potential future actions of the NJTPA Freight Initiatives Committee.

**2.6 Task 6:** Ongoing Technical Support to the NJTPA Freight Initiatives Committee Including Production of Informational Materials

Through the course of this project, staff at NJIT have attended NJTPA's Freight Committee meetings as well as other meetings relevant to this project. It is anticipated that further presentations on work products garnered through this project will be made subsequent to the completion of this study.

**2.7 Task 7**: Summarize Post 9-11 Issues and Provide Strategy Recommendations

Task 7 assesses the changes in freight movement and examines changes in freight transportation providers' operations as a result of the 9/11. Task 7 also looks at critical transportation infrastructure from the perspective of freight transportation operators through the administration of surveys as well as interviews with selected freight supply chain entities including shippers ocean carriers, freight railroad and terminal operators, Third Party Logistics companies and motor carriers. Finally, Task 7 contains recommendations to address specific issues that have been identified. Further details of the survey design and Task 7 study methodology are contained in the Task 7 Report.

# 3.0 FINDINGS

## 3.1 Task 1A – Data Collection

A large component of the FPSS study is to inventory and obtain the data items needed to assess the current and future performance of the freight system. This inventory is divided into two main sections: infrastructure data and commodity flow data. Infrastructure includes highway and rail networks. Commodity flow data includes the 1997 Commodity Flow Survey, TRANSEARCH Freight Flow Database, PIERS Maritime Database and the FRA Rail Waybill Sample. Brief descriptions along with associated figures of in-house data, data obtained, and data that needs to be obtained are provided below.

### 3.1.1 Infrastructure Data

*Highway Network Data*

The study team obtained the New Jersey Statewide Truck Model (NJSTM) as the base network for the highway analysis. The model is based on a TP+ software platform and was developed by URS Greiner Woodward Clyde for the NJDOT. Beginning with the regional travel demand models of the NJTPA, DVRPC, and South Jersey Transportation Planning Organization (SJTPO) regions, the NJSTM developers created and calibrated a 1990 base year model with capacity constrained multi-class (auto, medium truck, and heavy trucks) assignment. Recent update work completed on the model includes the creation of 2000 base year and 2025 forecasted trip tables and an increase of network coverage surrounding Port Newark / Port Elizabeth and other major truck trip generators.

On a larger scale, the national highway network developed by the Center for Transportation Analysis (CTA), part of the Oak Ridge National Lab (ORNL), has also been obtained. The network was developed as a tool for calculating distances for the 1997 Commodity Flow Survey. While the CTA national network the network lacks the coverage and detail of the NJSTM, it is sufficient to perform an unconstrained assignment of truck trips on a national level.

Other highway network resources available include the New Jersey Congestion Management System (NJCMS), which consists of related highway and rail network files. The NJCMS also contains programs and algorithms that could be used to expand the detail of the results of the NJSTM. The regional model developed by NJTPA and its consultants, the North Jersey Regional Transportation Model (NJRTM), is also available as an additional resource.

*Rail Network*

As part of the IITC work effort with NJDOT, NJIT has developed a GIS rail network of regional railways. The network is based on the national Caliper rail network[1] and National Transportation Atlas Database (NTAD) GIS layers that have been enriched with various data sources as obtained by the NJIT research team. Additionally, there has been an ongoing effort to enrich the rail network with more rail network attributes and detail through direct contact with CSX, NS, and Conrail representatives.

In addition to the IITC rail network, the CTA national rail network[2] was also obtained. As with the CTA national highway network, the CTA national rail network was developed as a tool for the 1997 Commodity Flow Survey. The primary base for this network is the raw Federal Railroad Administration (FRA) strategic rail network.

*Terminals*

The research team has brought together a series of databases that cover each mode of freight transportation in the North Jersey Region. All of the information has been merged together into a cohesive GIS package. The information collected includes the following:

1. NYMTC Terminal Database
2. Louis Berger (LBI) Warehouse Survey Database
3. BTS Intermodal Terminal Database (NTAD 2002)
4. PANYNJ Air Terminal Database
5. United States Army Corps of Engineers Piers Database (NTAD 2002)
6. Department of Commerce Wholesale Distributors Database
7. Liquor License Facilities Database

The above list of terminal databases covers the entire necessary regional terminal data identified by the NJIT research team.

### 3.1.2 Commodity Flow Data

A major part of a freight study is the determination of what goods and how much of it are moving from point A to point B. This information is hard to come by, as much of the information is of a proprietary nature and is not disclosed by individual companies. However, the following data sources have been identified as available data resources to identify goods moving by mode and commodity codes.

*1997 Commodity Flow Survey*

Performed by the U.S. Department of Commerce Census Bureau, the Commodity Flow Survey (CFS) is a goods movement survey conducted every four years. Freight transporters are surveyed as to their shipments. The survey is then increased to represent the entire domestic freight shipment population. The survey classifies shipments by mode, commodity, origin and destination. Survey results are released

[1] "Rail100k" network Rail network used from Caliper Corporation Data CDs.
[2] CTA National Rail Network, "QC01" network.

aggregated to a state level, with some less detailed information released at a Metropolitan Statistical Area (MSA) level. The product is available from the Bureau of Transportation Statistics (BTS). Data items deemed statistically non-reportable (confidence levels are too low due to small sample sizes) or information that would reveal specific information about individual companies are withheld from the released survey. While not identical in detail to the 1997 CFS, the 1993 CFS is available for historical trend analysis. The 1993 and 1997 survey results are available from the BTS at no cost and have been obtained by NJIT.

As an extension of the 1997 CFS, the study team has developed a county level highway OD model for New Jersey based on the 1997 CFS, the 1997 Economic Survey, and 2000 County Business Patterns Data[3]. This commodity flow model can be used to predict goods movement on the highway system. However, additional data is needed to predict freight movements via rail. This model will be useful in comparing, supplementing, and validating other available transportation commodity flow studies.

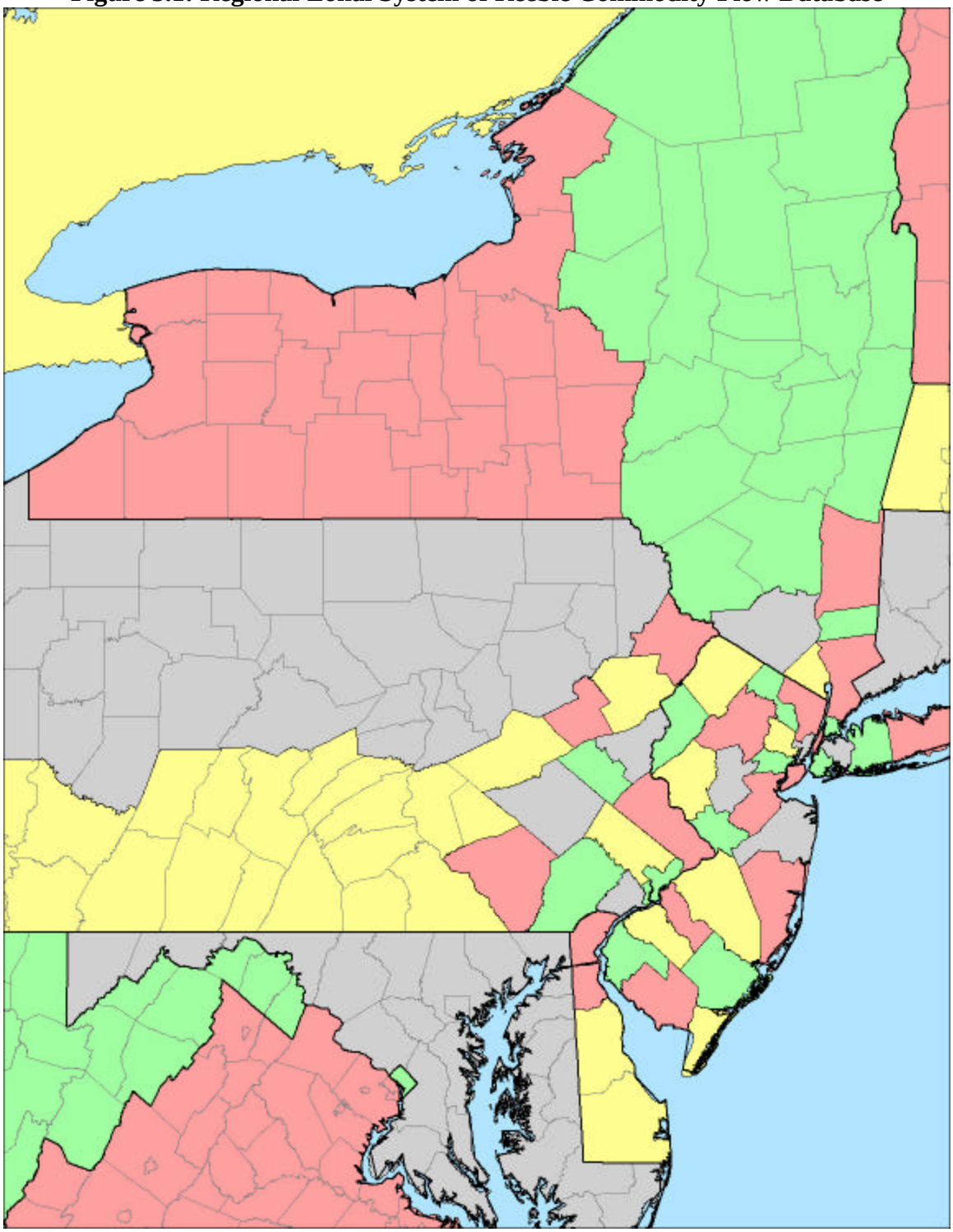
*TRANSEARCH Freight Flow Database (Reebie Associates)*

Consulting company Reebie Associates' TRANSEARCH database (commonly referred to as the Reebie database) is the primary source of detailed commodity flow information in the nation. Reebie Associates will build a custom database to the user's specifics based on their extensive collection of commodity flow and freight information. Through non-disclosure agreements with freight industry companies, Reebie has been able to enrich and expand the detail level of the commodity flow information contained in the 1997 CFS. Reebie Associates will sell information from the TRANSEARCH database geared to the user's needs.

NJIT had discussions with NJDOT, NJTPA, DVRPC, and other regional interests regarding the design specifications of the database to collectively enhance the understanding of freight flows in and around the region. The Reebie database serves as the primary trip matrix for all of the modeling efforts to be completed in upcoming tasks. It covers all modes of freight transport for the region using county level origins/destinations. Through future agreements with regional planning organizations, NJIT will obtain additional information or databases from Reebie that are compatible with the existing database. The 103-zone system for the database is illustrated in Figure 3.1.

[3] Both the 1997 Economic Survey and 2000 County Business Patterns data are both compiled and released by the U.S. Department of Commerce, Census Bureau

**Figure 3.1: Regional Zonal System of Reebie Commodity Flow Database**



*PIERS Maritime Database*
An enhancement to the both the 1997 CFS and the Reebie database is the Port Import Export Reporting System (PIERS) database. Collected through the U.S. Customs office, PIERS has representatives stationed in all maritime import/export ports in the nation to collect waybills from all imports and exports. This coverage provides PIERS with a one hundred percent sampling rate of goods shipped in and out of the nation on maritime vessels. The details regarding the shipment are highly detailed and include the foreign country origin/destination, foreign port origin/destination, national port of import/export, commodity, size or units, consignee (name and address), and the notify party (name and address). Some import/export information can be purchased from Reebie Associates, however, the data prepared by PIERS is significantly more detailed.

*FRA Rail Waybill Sample*
An additional data source of freight flows on the national rail network is the Federal Railway Administration (FRA) Rail Waybill Sample Database. The database identifies details regarding freight shipments across the nation's railways. Details reported include origin and destination data, commodity codings, type of rail car, station and junction information, revenue, and tonnage. As the FRA waybill sample does not contain substantially more information than the Reebie database, and as Reebie Associates use the FRA waybill sample database as an input to their database, NJIT did not pursue the purchase of this database.

## 3.2 Task 1B – Freight Performance Measures

To determine what strategies will be effective in improving the performance of a freight transportation system, it must first be determined what to use as a measure of performance. An indicator of performance could be either a physical measure (e.g. volume, number of intermodal container transfers, sufficiency of bridges, sufficiency of facility design to accommodate the size and weight of modern vehicles, etc.) or an operational measure (e.g. levels of service, environmental impact, delay, vehicle miles traveled by route mode and segment, route choices, etc.).

A valid performance measure for use in the FPSS study needs to be:

Capable of being measured. While a performance measure may be able to indicate reams of information regarding the performance of the transportation system, if it cannot be measured then it is not suitable for the FPSS study. Despite this, if certain measures cannot be made due to insufficient or missing data that is either not collected or not available, it should not be eliminated. While these measures may not be feasible for the FPSS study, the consideration of indicators may be useful in developing future data collection activities.

Capable of being forecasted. As the title of the study suggests, the FPSS study is a planning study. The indicators used in the study must not only be capable of

measuring today's performance, but tomorrow's as well. While forecasting transportation related data 25 years is always a combination of science and art, a forecast must be determinable. In worst cases, a series of low, medium, and high forecasts can be used to determine the sensitivity of future system performance.

Capable of measuring transportation systems operations and deficiencies. The ideal indicator for the FPSS study does not only be able to measure the performance of the transportation system and operational characteristics, but determines its deficiencies and their causes. The goal of the FPSS is not only to take the pulse and blood pressure of the freight transportation system, but also to determine the underlying disease.

Capable of being measured over time intervals and for ongoing performance. The measures used should be of a standardized to provide comparisons over time. A value in for the year 2000 must be able to be directly compared to the same measure in the year 2025. For example, as volumes increase, total delay will also increase, therefore the better indicator of delay would be standardized, such as delay per mile or delay as a percentage of total travel time.

Capable of being understood by decision-makers and stakeholders. Transportation planners and engineers commonly use complex formulae (e.g. vehicle density per lane mile, delay per ton-mile, etc.) to describe network performance. However, performance measures need to be comprehended by the people making the decisions regarding what projects to fund and how varying strategies improve conditions relative to each other. However, systems can be used to convert convoluted measures into laymen's terms (e.g. level of service designation of A through F as a representation of vehicle density for highway sections) to make performance measures more understandable by decision-makers and stakeholders.

As part of the FPSS study, an extensive literature evaluation was conducted on freight performance measures and indictors being used or considered in various freight planning studies across the nation. The Federal Highway Administration (FHWA) completed a similar effort recently and released a synthesis report of freight performance measures. The FHWA report[4] is an extensive review of freight performance measures throughout the country. While the report focuses mainly on highway and intermodal facilities, it is still the most comprehensive list of freight performance measures available and was selected as the primary source of information for this study. Many different studies were reviewed in the preparation of the FHWA report, but studies can be classified to one of the following three categories:

- United States Department of Transportation (USDOT) efforts: These were papers that were sponsored by the FHWA or other parts of the USDOT.

[4] Federal Highway Administration, Office of Freight Management and Operations, "Measuring Improvements in the Movement of Highway and Intermodal Freight, Final Report", 2000.

- State and Local Efforts: These primarily focus on effort funded by State Departments of Transportations, Metropolitan Planning Organizations or local transportation agencies.
- Academic Efforts: These are efforts undertaken by universities, usually with the focus of a theoretical nature.

It was the intent of the FHWA report to identify and focus on attributes of the highway system that have significance for freight movement and the relationship to the characteristics of feight service that is important to shippers. Throughout this study indicators were identified and evaluated for certain criteria, such as value vs. cost.

Seven main categories of indicators were identified in the FHWA report. Modified by FPSS staff, those seven categories, plus one additional category created by NJIT and NJTPA central staff (Freight Growth Measures), are used here to list potential indicators. Indicators and potential measures listed here are a culmination of those identified in the FHWA report, other reports reviewed as part of the literature review, and professional judgment and experience. Table 3.1 contains a summary list of performance indicators identified.

**Table 3.1: Potential Indicators Identified**

| Category | Potential Indicators |
|---|---|
| Average Travel Time Measures | • Congestion Delay<br>• Delay Incurred In Severe Congestion |
| Reliability of Travel Time Measures | • Incident / Accident Delay<br>• Variance In Travel-Time<br>• Percent On-Time Arrivals |
| Private Sector Cost Measures | • Fuel Costs Per Mile<br>• Maintenance Costs<br>• Insurance Costs-Carrier<br>• Insurance Rate - Cargo (By Type)<br>• Labor Costs<br>• Toll Costs<br>• Idling Costs |
| Public Impact Measures | • Freight Related Accident Rates<br>• Noise Pollution<br>• Emissions |
| Infrastructure Measures | • Facility Quality (Pavement Conditions, Bridge Conditions, Etc)<br>• Delays At Border Crossings, Weigh Stations, Toll Plazas<br>• Access To Intermodal Stations (Distance From National Network, Signage, Facility Design Adequacy For Freight)<br>• Impediments To Freight Movement (Missing Links, Bridge Clearance, System Bottlenecks, Etc.)<br>• Average Container Dwell Time At Transfer Stations |
| Economic Impact Measures | • Impact Of Transportation Investments To Regional Economy<br>• Employment In Transportation Related Sectors<br>• Regional Economic Strength<br>• Value Of Transportation Goods |
| Transportation Industry Productivity Measures | • Vehicle Miles Traveled (VMT) or Ton-Miles Traveled (TMT)<br>• Average Load Factors / Percent Of Vehicle Empty Miles<br>• Average Haul Length<br>• Annual Miles Per Vehicle<br>• Ton-Miles Per Unit Of Labor<br>• Fuel Consumption / Ton-Mile (Heavy Trucks)<br>• Customer Satisfaction<br>• System Performance. Degree Of Satisfaction<br>• By System Users (Carriers And Dependent Firms) |
| Freight Growth Measures | • Air: Amount Of Domestic/International Cargo Moving Through EWR<br>• Roadway: Truck Crossings At Interchanges / Bridge<br>• Rail: Car Loadings / Container Lifts Originating From Port, And Unloadings Originating From Eastern Terminus Continental Landbridge. Kearny Yard<br>• Marine: NYNJ Ports Container Imports / Exports<br>• Marine: NYNJ Ports General Cargo/Break-Bulk Imports<br>• Marine: NYNJ Ports Bulk Cargo Imports |

The following sections define the potential performance indicators as identified in Table 3.1 above. The listed indicators are inclusive of all potential indicators, regardless of the needed criteria for inclusion in the FPSS study, as outlined in the beginning of this chapter.

*Average Travel Time Measures*

Any measure of travel time is critical to the freight industry as a whole. The shippers' profit margins are directly affected by travel time and delays experienced during goods transport. In a region as densely populated as the NJTPA region, trucks using the highway system will inevitable experience delays. The effect of increased delivery time on the region's roadways becomes obvious when drayage costs for different regions of the country are compared. Delays in the NJTPA region are increasing the cost of moving goods, which in turn increases the cost of doing business in the region. Lower delays on the roadways would not only benefit the region's citizens, but would increase the economic competitiveness of the region within the nation.

As the combinations of origin and destinations of freight movements in the region are virtually limitless, the focus must be on travel times and delays experienced on certain corridors (including the I-95 / New Jersey Turnpike, I-80, and I-78 corridors) that are vital to the region's freight movements.

- Congestion Delay. Measuring the amount of delay experienced on a route or corridor will give an illustration of the performance of the system relative to free flow or uncongested conditions. Possible measures that for congestion delay in the highway system include delay per truck or delay per ton-mile. Time of day measurements are required as peak commuter periods are the primary cause of transportation system delays.

- Delay Incurred in Severe Congestion. Congestion delays are an inevitable part of using the highway system. Setting a threshold of 'acceptable delay' and measuring only delay experienced in severe conditions may achieve a better understanding of the nature of delay on the system. Possible measures include the delay per truck or ton-mile incurred over a volume to capacity for 0.80. Time of day measurements are required as peak commuter periods are the primary cause of transportation system delays.

- Vehicle Hours Traveled. Vehicle hours traveled could be measured by for both peak and non-peak hours on key transportation system links.

*Reliability of Travel Time Measures*

In today's businesses, Just-In-Time (JIT) logistics is a common approach to inventory management. Businesses are demanding delivery of their goods on schedules that need to function like clockwork. The transportation system must be able to provide shippers with an adequate system to transport goods in a reliable manner. Where as an average

travel time measure allows for the ability to schedule routes and delivers, the variability in that travel time is vital to freight shippers. Surveys have shown between the measures of average travel time and the reliability of the average travel time, the later is the more important.

One must be cautioned that this measure becomes less effective if the focus is on all forms of travel on the system. The measurements must concentrate on facilities, routes, or corridors within the network that are important to freight movement.

- Incident / Accident Delay. This measure reflects the amount of unexpected delay experience by system users, which is of great importance for freight delivery. While this information is difficult to collect for the highway system, analytical models using accident and incident rates combined with response and clearance times can be used to estimate the non-recurring delay on the highways. Measurements would need to be averaged over time by route or corridor (e.g. annual non-recurring delay per ton-mile or truck). As the rail system is far more controlled system than highways, this indicator loses meaning for rail freight.

- Variance In Travel-Time. Unanticipated delays will always exist and will always affect shipments, however, the smaller the variance in the travel time and the more predictable the travel time is, the better shippers will perform, which in turn minimize shipping costs. Measuring the variation in travel time would illustrate useful when applied on routes of importance to freight. This measure can be develop to reflect not only incident-based delay but also more expected seasonal, day of week, or time of day fluctuations in travel time.

- Percent On-Time Arrivals This measure is of great potential as it reflects the transportation system's performance as it relates to freight. The on-time arrival rate is important to shippers, as with some shipment contracts paying penalty fees for not arriving on schedule (neither early nor late). While most shippers track this variable to monitor their own performance, the collection of the information may be considered sensitive by individual companies and may not be released.

*Private Sector Cost Measures*

As a transportation system indicator, private sector cost has been identified in several reports and studies. The measurement is of extreme importance to shippers as a lower cost per unit shipped is beneficial to both shippers and consumers. Lower transport costs can contribute to more efficient use of resources in production and distribution.

One concern of cost as an indicator is that the lowering of carrier costs could possibly exists as a trade off for lowered quality of service. Many trackable types of transportation cost are available. Potentially useful cost measures focus on the costs associated to freight transportation. It should be noted that some private sector costs might not be available due to company non-disclosure. Private sector costs also vary

from carrier to carrier, and may therefore possibly not truly indicate the performance of the transportation system.

- Fuel Costs Per Mile. While related to vehicle efficiency, fuel costs per mile can be a measure of the performance of the carrier. Variations in fuel costs over time are also an issue that should be addressed in using this indicator of performance. Measuring fuel consumption per mile would eliminate the effect of variable fuel prices. Changing vehicle technology and efficiencies over time would also need to be addressed to use this indicator.

- Maintenance Costs. Maintenance costs are an indirect way of measuring the quality of the transportation system. Facilities in states of disrepair will increase the maintenance costs of vehicles operating on those facilities.

- Insurance Costs – Carrier. Insurance costs are part of doing business. Costs would only be available on a company-wide or industry-wide basis, and may also considered sensitive information and not obtainable. A premium for "alert Level" may be charged from time to time, somewhat similar to "Extra War Risk" for shipping.

- Insurance Rate - Cargo (by type). The insurance rates applied to different commodities of goods indicate the level of loss and damage, an important quality of service issue. A limitation is that insurance rates reflect conditions outside of the transportation system (e.g. operator experience, cost of goods, etc.). Costs may also be considered sensitive information and may not be obtainable. Again, a premium for "alert Level" may be charged from time to time

- Labor Costs. As a result of many unions in the freight transportation industry, labor costs are usually not variable. Overall labor costs could reflect the efficiency of a particular company, however, these expenses would be difficult to obtain, as it is of a sensitive nature.

- Toll Costs. Toll costs are another cost of doing business on the region's highway facilities. Many tolls are unavoidable, due to the many bridge crossings in and out of the region. However, monitoring toll costs would prove useful to measure the impact of a variable pricing strategy such as off-peak toll discounts to encourage travel outside of the peak periods. Toll costs are not applicable to rail freight.

- Idling Costs. Monitoring idling costs would indicate a form of delay not detectable in any other way. As freight shippers are forced to wait for port gates to open, containers to be released, or slots on a railway, efficiency drops and profit margins are narrowed. Information as to idling costs may be difficult to gather, but are valid for both truck and rail freight systems.

*Public Sector Cost Measures*

While private sector costs are more tangible, public sector costs are harder to quantify. The costs are often of an intangible nature, but are very important in the eyes of the public and for the common societal good. Any use of public funds, whether state or federal, should address some of the following indicators. Decision makers (politicians) will more easily able to convince their constituents on investing public funds in the private freight industry if able to show the benefits to society.

- Freight Related Accident Rates. Safety is an important issue to the public, and a major concern with trucking operations on highways. Increased truck volumes associated with the projected increases in port activity will cause concern about truck accidents and roadway safety. While still important to the rail transportation system, rail freight has a much smaller impact on the general public and is therefore less of a concern of society. The measure would likely take the form of freight related fatalities or incidents per million ton-mile, and would be comparable across modes.

- Noise Pollution. Increase freight movements along freight related highways and railways would carry with it increase noise pollution. This would be an indicator to pay attention to with the increase in public nuisance from the proposed increase in hours of operations at the port and other transfer facilities.

- Emissions. Air quality issues are important to the public, and will continue to be more so. Federal regulations demand attention to emissions, and air quality conformity requires that strategies employed do not increase the emissions. Measures would be in the form of tons of various pollutants (e.g. NOx, particulates, etc.) per ton-mile or vehicle-mile. Analytical models such as MOBILE would need to be employed on the highway facilities to measure emission levels. A similar tool would need to be used / developed for locomotives on the rail system. An indicator of emissions could prove to be an important measure in determining the public good of moving freight off trucks and the highway system onto trains and the rail system, as emissions would be comparable across modes. Emerging technologies, such as electric hybrids and fuel cell engines, would need to be addressed in future forecasts of emission levels.

*Infrastructure Measures*

In the context of this report, infrastructure is the components of the freight transportation system. This includes all roadways, railways, bridges, signals, transfer stations, and freight processors. Infrastructure indicators are one of two types: those that measure the physical nature of the facilities and those that measure the operational capacity of the facilities.

- Facility Quality (Pavement Conditions, Bridge Conditions, Etc). The quality of the facilities that comprise the freight transportation system is an important

measure of performance, not only on an operational level, but also on a system redundancy or flexibility level as well. Data sources already exist for some of the potential measures (e.g. Pavement Management System, Bridge Management System, etc.).

- Delays At Border Crossings, Weigh Stations, Toll Plazas. While a component of delay and an influence on travel time, the delays at freight processing facilities is of a different nature. Traditional modeling techniques do not capture such information, and other measures need to be added to account for the sometimes extensive delays that can arise at facilities such as border crossings, weigh stations, toll plazas, and import / export customs processing centers. Studies would need to be completed to measure delays at these facilities if such surveys do already exist. The magnitude of improvement in delays in the freight transportation system could be readily measured by improving the capacity of such processing facilities.

- Access To Intermodal Stations (Distance From National Network, Signage, Facility Design Adequacy For Freight). This indicator is multifaceted, with several measures available to judge the adequacy of access to the intermodal facilities. FHWA has completed work in this area by summarizing some components of the access from official intermodal transfer facilities to an entrance/egress point on the National Highway System (NHS).

- Impediments To Freight Movement (Missing Links, Bridge Clearance, Capacity Bottlenecks, Etc.). Identification of impediments to the freight transportation system that constrict freight movement is an important indicator of system deficiencies. The identification of system impediments is not a performance measure in the sense of most indicators identified in this report, however, a measure of the impact of an impediment can be quantified by determining the percent reduction in total vehicle-miles traveled or ton-miles traveled as a result of removing the impediment. Demand models would need to be utilized to reroute freight flows as a result of changing the transportation system characteristics and impedances.

- Average Container Dwell Time at Transfer Stations. A measure of transfer facility performance, the average container dwell time is an important indicator. It must be considered, however, that depending on the commodity, the modes involved, and even the container client the 'acceptable' dwell time of a container will change. Data collection of such information for privately operated facilities may prove difficult.

*Economic Impact Measures*

Smart investments in transportation can improve freight movement, however, the residual economic impacts of infrastructure improvements are far more important. All users benefit, both the shippers and consumer, with infrastructure investments. By conducting

a cost-benefit analysis, the following indicators provide substantial promise in being understood by decision makers.

- Impact Of Transportation Investments To Regional Economy. Investments in the region infrastructure carry not only immediate benefits to the economy (e.g. jobs created at a new intermodal facility), but also secondary and tertiary benefits (e.g. construction jobs, increase productivity and competitiveness of local manufacturers and distributors, etc.). To measure all the economic impacts of investments, an input-output model could be utilized. Research coming out of New York University shows a statistical analysis of the relationship of cost incurred by businesses to highway investment. For this indicator to be effective as a performance measure, supporting analysis would have to be performed on an annually or biennial basis.

- Employment In Transportation Related Sectors. The number of jobs in transportation and transportation related sectors are an indication of the importance of the transportation system to the local economy. For future year analysis, an economic input-output model could be used to determine the change in employment figures as a result of investment in the freight transportation system. Trends in regional employment would also need to be considered in using this indicator.

- Regional Economic Strength. Goods movement is a major component of a health economy. An efficient and reliable freight transportation system encourages local business growth and attracts outside investors to the region. Measuring the regional economic strength serves as a surrogate for the health of the freight transportation system.

- Value Of Transportation Goods. By indicating the value of goods transported not only in and out of, but also through the NJTPA region, the importance of the freight transportation system on both a regional and national level can be established. By realizing the monetary value of goods traveling through the region, arguments could be made supporting further investment in the system to improve performance and expand capacity.

*Transportation Industry Productivity Measures*

Several studies outlined general productivity measures as an indicator of performance. Although the measures listed below do not directly indicate deficiencies or their causes in the system they are good benchmarks to determine strategy impact on the system and are a good check of the system as a whole.

- Vehicle Miles Traveled (VMT) or Ton-Miles Traveled (TMT)
- Average Load Factors / Percent Of Vehicle Empty Miles
- Average Haul Length (Miles / Trip)
- Annual Miles Per Vehicle
- Ton-Miles Per Unit Of Labor
- Fuel Consumption / Ton-mile (heavy trucks)
- Customer Satisfaction
- Degree of Satisfaction by System Users (Carriers and Dependent Firms)

*Freight Growth Measures*

Measuring the shear magnitude of freight being transferred through the region and comparing that value over time gives an indication of the growth of regional freight activity. It is important to separately identify imports and exports through both the region's ports, the New York / New Jersey (NYNJ) Ports and Newark Liberty International Airport (EWR), in an effort to track the NYNJ Ports growth in relation to the national share of imports and exports. The following are measures of the girth of the regional freight movements by mode.

- Air: Amount Of Domestic/International Cargo Moving Through EWR
- Roadway: Truck Crossings At Interchanges / Bridge
- Rail: Car Loadings / Container Lifts Originating From Port, And Unloadings Originating From Eastern Terminus Continental Landbridge. Kearny Yard
- Marine: NYNJ Ports Container Imports / Exports
- Marine: NYNJ Ports General Cargo/Break-Bulk Imports
- Marine: NYNJ Ports Bulk Cargo Imports

*Freight Facility Performance Measures*

The Delaware Valley Regional Planning Commission (DVRPC) examined freight facility performance indicators in their 1998 study "Intermodal Management System – New Jersey Report". The DVRPC report listed nineteen performance measures in five categories and focused on the connections between the highway system and facility entrance. Internal measures of the facility performance were generally unavailable due to the fact that most of the freight terminals were privately owned. Table 3.2, reproduced from the DVRPC report, contains the performance measures identified and the associated scoring system to measure access to and from freight facilities.

**Table 3.2: DVRPC Freight Facility Performance Measures[5]**

| Performance Measures | Number of Points | | |
|---|---|---|---|
| | **0** | **1** | **2** |
| **Access (0-8 Points)** | | | |
| Interchange/Intersection Configuration | Partial Interchange | Full Interchange With On And Off Ramps Located On Different Streets | Full Interchange With On And Off Ramps Located On Same Streets |
| Directness Of Route | Circuitous Or Confusing | Long Or Indirect But Easy To Follow | Direct With Few Turns |
| Alternate Routing | Only One Route Available | - | Multiple Routes Available |
| On-Site Queuing Area For Trucks | All Trucks Must Queue On Street | Some Trucks Spillback Into Street | All Trucks Queue On-Site |
| **Roadway Geometrics/Condition (0-10 Points)** | | | |
| Interchange, Ramp Acceleration/Deceleration Lanes | All Ramps Are Deficient | Some Ramps Are Deficient | All Ramps Are Adequate |
| Turning Radii | Inadequate | - | Adequate |
| Pavement Integrity | Extensive Deficiencies | Some Deficiencies | Good |
| Vertical Clearance Restrictions | Posted Restrictions | - | None |
| Bridge Weight Restrictions | Posted Restrictions | - | None |
| **Traffic Operations (0-8 Points)** | | | |
| Traffic Congestion On Connector | Persistent And Recurring | Minor Or Expected To Become A Problem | None |
| Parked Vehicles And Other Obstructions To Traffic | Frequent | Occasional | None |
| Traffic Signals/Stop Signs | Frequent | Some | None |
| Railroad Grade Crossings | Create Delay | Some Delay | No Delay |
| **Signs (0-6 Points)** | | | |
| Signs On Major Roads | No Signs | Some Roads | All Roads |
| Trailblazer Signs On Connector Roads | No Signs | Some Roads | All Roads |
| Facility Entrance Signs | No Signs | Partially Signed | Fully Signed |
| **Safety (0-6 Points)** | | | |
| Police Or Private Security | None | - | Yes |
| Lighted Access Route | No | - | Yes |
| Lighted Waiting Area | No | - | Yes |
| **Total Facility Score (0-38 Points)** | | | |

[5] Source: Delaware Valley Regional Planning Commission (DVRPC), "Intermodal Management System-New Jersey Report", 1998.

*Freight Modeling Methodologies*

One of the objectives in reviewing freight modeling procedures and freight demand models was to isolate methodologies that will be beneficial and applicable to the FPSS study. The following were reviewed and deemed as possible approaches to completing the future tasks. The reviewed freight planning models fell into two categories: trip-based models, and commodity-based models.

In a trip-based (or vehicle-based) model, truck trips are generated directly, usually as a function of land uses and economic variables. The focus is on modeling vehicle-trips as the mode selection and vehicle selections are already completed.

*Quick Response Freight Manual* (Cambridge Systematics, Inc. 1996). The Quick Response Freight Manual (QRFM) was developed as a tool to help planning organizations prepare for the freight planning requirement Intermodal Surface Transportation Efficiency Act (ISTEA) in established by congress in 1991. The procedure is as follows:

- Obtain data on economic activity for traffic analysis zones (including employment by type and the number of households).
- Apply trip generation rates to estimate the number of commercial vehicle trips for each traffic analysis zone.
- Estimate commercial vehicle volumes at external stations.
- Estimate the number of commercial vehicle trips between pairs of traffic analysis zones or external stations.
- Estimate the mode share for each trip.
- Load the O-D trip to the network.
- Compare control VMT with estimated VMT.

*Marker and Goulias* (1998). Marker and Goulias prepared an application of the QRFM for a truck study in Pennsylvania. The study's objective was to investigate the impacts of different degree of geographic resolution on traffic assignment. The traffic assignment was done based on the user equilibrium method.

Commodity-based models focus on amount of freight measured in units of weight (for example tons). The models' focus on individual commodities enables them to capture the fundamental economic mechanisms driving freight movements. Although different versions of this approach are presented in literature, there are several steps that are common to all commodity-based models:

- Obtain commodity specific trip generations and attractions from commodity flows with specific origin and destinations (e.g. Reebie, Commodity Flow Survey)
- Disaggregate commodity specific trip generations and attractions to more detailed zonal geographic areas (e.g. three digit zip code, TAZs)
- Create commodity specific trip table from the disaggregated generations and attractions

- Determine modal share of transport for each commodity and origin-destination combination
- Convert modal origin-destination pairs from tonnage to vehicles
- Add empty trips to the trip table
- Assign freight traffic to multi-modal network

Some of the above steps may be omitted depending on the amount and level of data that is available. The following is a brief review of the more recent commodity-based models found in the literature.

*Souleyrette et al* (1998). Souleyrette et al (1998) present a statewide commodity-based freight transportation model for Iowa. In this model, each selected commodity was assigned as a separate layer in GIS. Reebie freight flow O-D data was used for flow disaggregation from the level of Business Economic Areas to county level for both origin and destination areas.

*Krishnan and Hancock* (1997). Krishnan and Hancock (1997) present a freight study based on state level Commodity Flow Survey (CFS) data for Massachusetts. The analysis involved disaggregating the state level data into zones smaller than three digit zip-code regions but larger than five digit zip-code regions. Problems with CFS data resulted in aggregating flows that had the same origin and destination but different SIC categories. The flows were then converted to truck flows based on historic data. The traffic assignment was done using all or nothing, capacity restraint, and user equilibrium methods. The assignment results were further validated based on the data from the Highway Performance Monitoring Systems (HPMS).

*Huang and Smith* (1999). Huang and Smith created commodity flow based models for the State of Wisconsin. The authors calibrated a gravity model based on 1993 CFS data. The model was used to generate a trip table that was then assigned to a statewide transportation network. Ground count data and license plate O-D data were compared to the assigned volumes and trip generation and distribution were adjusted until a desired fit was obtained. Once trip generation and distribution were adjusted, they were used to develop a trip generation and attraction rate for each zone through relating them to social economic indicators such as employment and population. As a result of this process the developed model can be used for prediction based on projected economic growth.

*Sorratini and Smith* (1999). Sorratini and Smith further developed the Huang and Smith Wisconsin Statewide Freight Model by employing a gravity model and an Input-Output (I-O) model for developing a trip distribution matrix. All of the trip production data was taken from the 1993 CFS and TRANSEARCH databases. The state-level production in tons to economic sector production rate per employee was converted from employment data based on the State Census. Estimation of the truck tons produced at the country level was done sector-by-sector by using employment data. IMPLAN was employed in the trip attraction step. The commodity flows were viewed as having the origin with the "input" sector (freight productions) and the

destination (freight attractions) with the "output" sector. The trip attraction model started with a table for each sector I-O. I-O direct coefficients were employed to derive total freight tons by commodity at the state level. The resulting freight tons were converted to truck tons based on 1993 CFS. Sector employment was used to estimate truck tons at the county level and population was used to bring that down to the TAZ level. TRANPLAN's Gravity Model and Fratar Growth Model were utilized to distribute the trips. The resulting trip table was then assigned to the network based on a Selected Link Analysis procedure.

## 3.3 Task 2 – Select Indicators and Measure System Performance

### 3.3.1 Selection of Indicators

A list of six freight performance indicator categories and their respective performance measures were developed as part of Task 2 and are described in Section 2, Methodology. The final list of Freight Performance Indicators that were or could potentially be measured using the freight forecasting and modeling procedures developed for this study are indicated below.

- System Use: Truck Miles Traveled.
- System Efficiency: Ratio of Truck Delay per Mile Traveled
- Infrastructure: Truck Volume Over Highway Structures Having Sufficiency Rating of 50 or less;
- Infrastructure Truck Volumes Over Miles of Pavement Having a Low Condition Rating.
- Safety: Annual Number Of Freight Related Accidents.
- Environmental: Tons of NO Emissions,
- Environmental: Tons of $CO_2$ Emissions
- Redundancy: Additional Ton-miles Traveled

### 3.3.2 Selected Freight Modeling Methodologies

After review of the freight modeling methods used at MPO's and DOT's across the nation, the consensus was to use a commodity based modeling approach. The Transearch database obtained under Task 1 was used at the primary source for commodity flows (in tonnage and value) to between the NJTPA counties and other points in North America. The intent was to use average payload characteristics by commodity to convert the commodity tonnage flows into modal vehicle flows for assignment over the assembled modal transportation networks. Network performance would then be measured from the assigned vehicle flows.

The application of the tonnage to vehicle unit methods revealed a large gap in the commodity flow data. While much of the long-distance freight haulage is included in the Transearch database, it appears that much of the shorter secondary movements (e.g. short distance haulage, distribution center to warehouse flows, and delivery flows) are not

accounted for. The discrepancy is largely found on the highway network, as goods movements on other modes are more strictly recorded.

As a result, highway performance measures were based on the existing flows contained as part of the NJDOT Statewide Truck Model, as validated against ground counts. The disconnect between the commodity flow table and vehicle flow table is a large stumbling point in the freight planning process that should be given extra resources in the future.

Further details of the freight modeling methodologies and calculation procedures for the performance measures are listed in the FPSS Task 2 Summary Report.

### 3.3.3 Forecasting 2000 Flows to 2025 Flows

The FPSS work plan includes the development of base year freight movements, and then forecasting flows to Year 2025. These forecasts will provide the basis for quantifying the specific measures listed above. So for example, the total number of truck miles traveled for Essex County in Year 2025 would be estimated.

Forecasts come from many different sources, and much work has been done under varying other studies and from various transportation and economic agencies. The main sources used in determining the growth for this study include New Jersey Department of Labor employment work force projections, FHWA's Freight Analysis Framework project, the Comprehensive Port Improvement Project (CPIP), and the NJDOT Statewide Truck Model. While the forecasts from different projects were made at varying geographic levels of detail and for varying years, the sources were combined together to arrive at the 2025 growth scenario prepared for this study. Further details of the forecasting methodology are available in the FPSS Task 2 Summary Report.

NJIT generated a series of summaries that includes a breakdown of commodity flows for each county within the NJTPA region. A summary for the entire NJTPA region is provided below in Figure 3.2. Summaries for each county in the NJTPA region as well as national and regional freight movements by mode are depicted in the Task 2 Summary Report.

A common measure of the performance of a transportation highway network is the amount of delay encumbered by users of that network. Following the lead set forth by the recently completed NJTPA Strategy Evaluation project, the amount of delay experienced by system users is calculated for each highway link and then aggregated up to a district level. The 158 districts used here are consistent with those used in the Strategy Evaluation project. However, the delays reported here are those experienced only by trucks. Delay experienced by network users can be divided into two categories: recurring delay, and non-recurring delay. Recurring delay is the additional amount of travel time attributed to congestion and signals that is experienced on a daily basis. Figure 3.3 illustrates the estimated amount of recurring delay that is experienced on roadways in 2000. Figure 3.4 estimates the average daily recurring delay for Year 2025.

Non-recurring delay is time lost due to unforeseen incident events. Examples of such events are mechanical breakdowns, flat tires, and accidents that block either shoulders and / or travel lanes that create a reduced capacity for travelers. As these events are more sporadic, estimates of non-recurring delay is computed on an annual basis. Non-recurring delays for Years 2000 and 2025 are depicted in Figures 3.5 and 3.6.

**Figure 3.2: NJTPA Commodity Flow Summary**

Table 1: Tonnage By Mode

| Mode | Import - In-Region Destination | Export - In-Region Origin | Total Freight |
|---|---|---|---|
| All Truck Modes | 187,833,463 | 156,614,135 | 267,898,143 |
| All Rail Modes | 22,086,530 | 9,460,437 | 31,474,981 |
| Water | 262,527 | 419,366 | 681,892 |
| Air | 18,682,021 | 24,775,059 | 41,378,086 |
| Total Tonnage | 228,900,929 | 191,317,884 | 341,518,378 |
| | | | |
| Total Value ($ Million) | $ 439,950 | $ 295,167 | $ 672,480 |

Table 2: Top Export Commodities (In-Region Origin) by Tonnage, All Modes

| SCTG | Commodity | Tonnage |
|---|---|---|
| 43 | Mixed freight | 76,884,754 |
| 19 | Coal & petroleum products, n.e.c. | 39,102,301 |
| 10 | Monumental or building stone | 13,346,366 |
| 31 | Nonmetallic mineral products | 8,590,156 |
| 7 | Other prepared foodstuffs & fats & oils | 5,106,739 |

Table 3: Top Import Commodities (In-Region Destination) by Tonnage, All

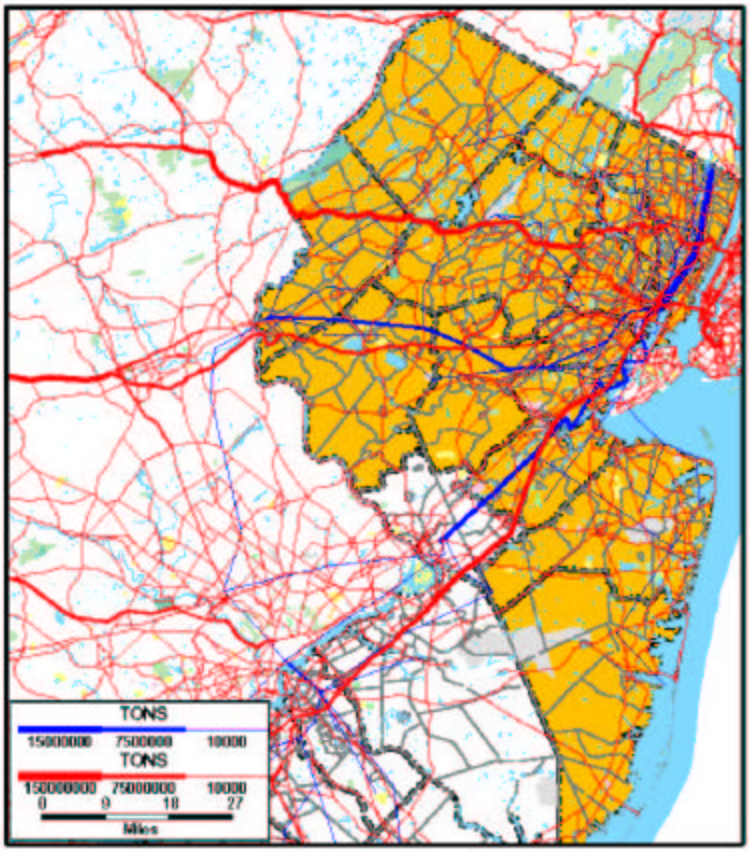
| SCTG | Commodity | Tonnage |
|---|---|---|
| 43 | Mixed freight | 70,011,033 |
| 19 | Coal & petroleum products, n.e.c. | 35,038,125 |
| 10 | Monumental or building stone | 22,073,924 |
| 31 | Nonmetallic mineral products | 15,906,596 |
| 7 | Other prepared foodstuffs & fats & oils | 9,066,555 |

Table 4: Top Export Market Regions (In-Region Origin) by Tonnage, All Modes

| Destination | Tonnage |
|---|---|
| NJTPA | 78,700,435 |
| NYMTC | 14,899,987 |
| DVRPC (NJ) | 14,176,046 |
| Interior Pennsylvania | 11,229,504 |
| Upstate New York | 10,339,954 |

Table 5: Top Import Market Regions (In-County Destination) by Tonnage, All

| Origin | Tonnage |
|---|---|
| NJTPA | 78,700,435 |
| DVRPC (NJ) | 20,705,101 |
| NYMTC | 17,022,998 |
| Interior Pennsylvania | 14,288,708 |
| ONTARIO, CANADA | 12,532,779 |




*Source: NJIT Analysis of 2001 Transearch Database

**Figure 3.3: Year 2000 Mobility**

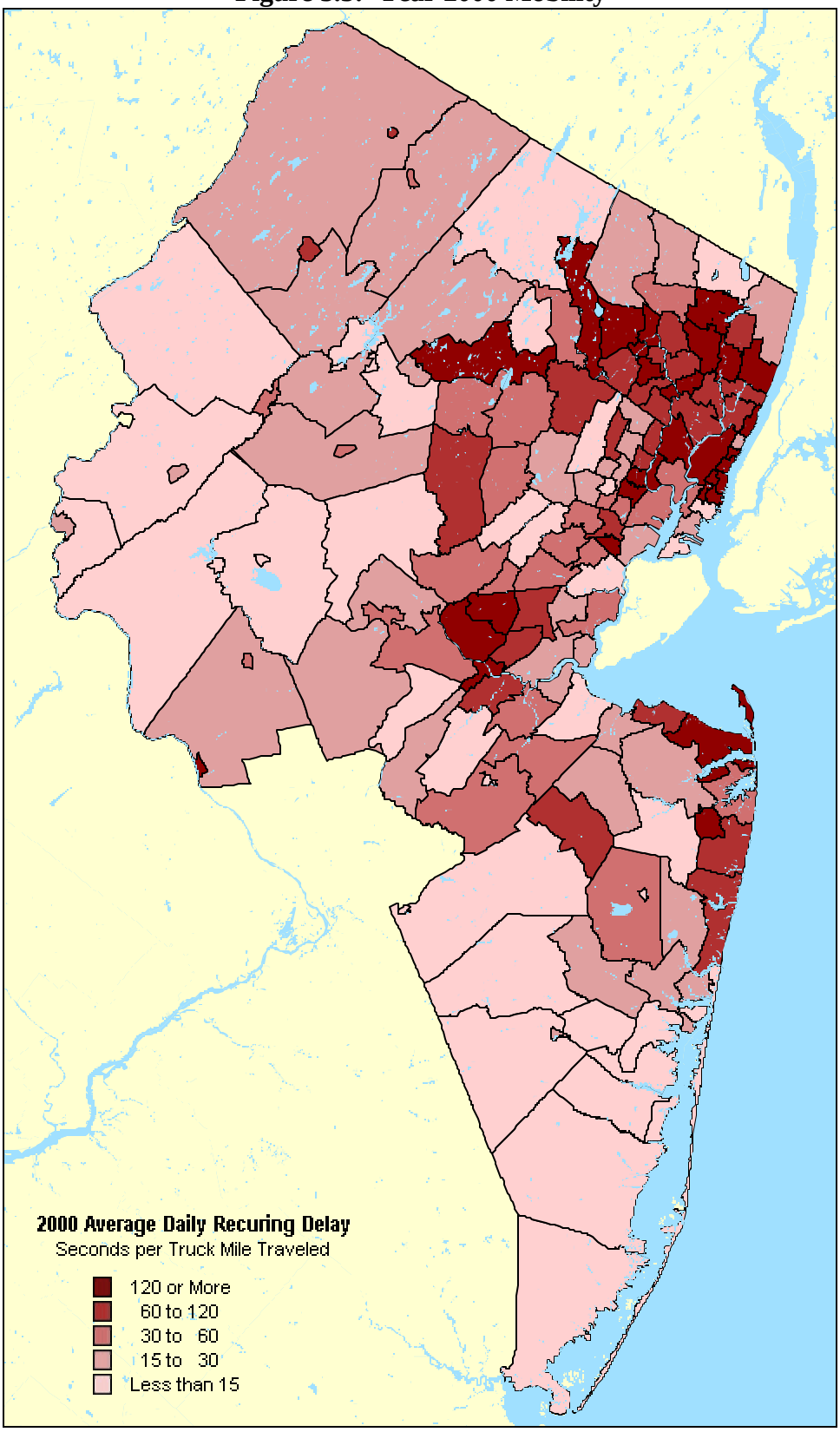


**Figure 3.4: Year 2025 Mobility**

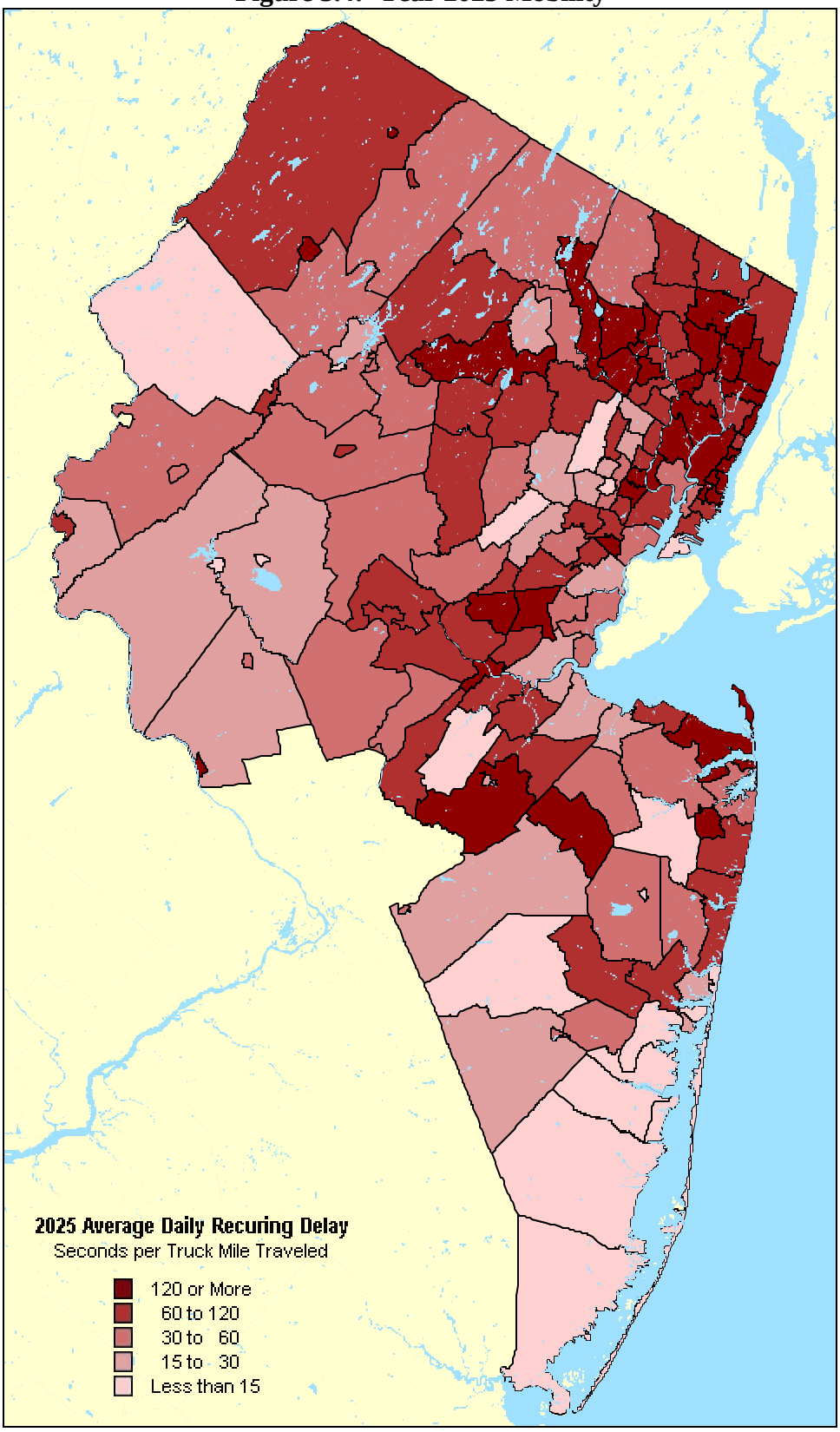


**Figure 3.5: Year 2000 Reliability**

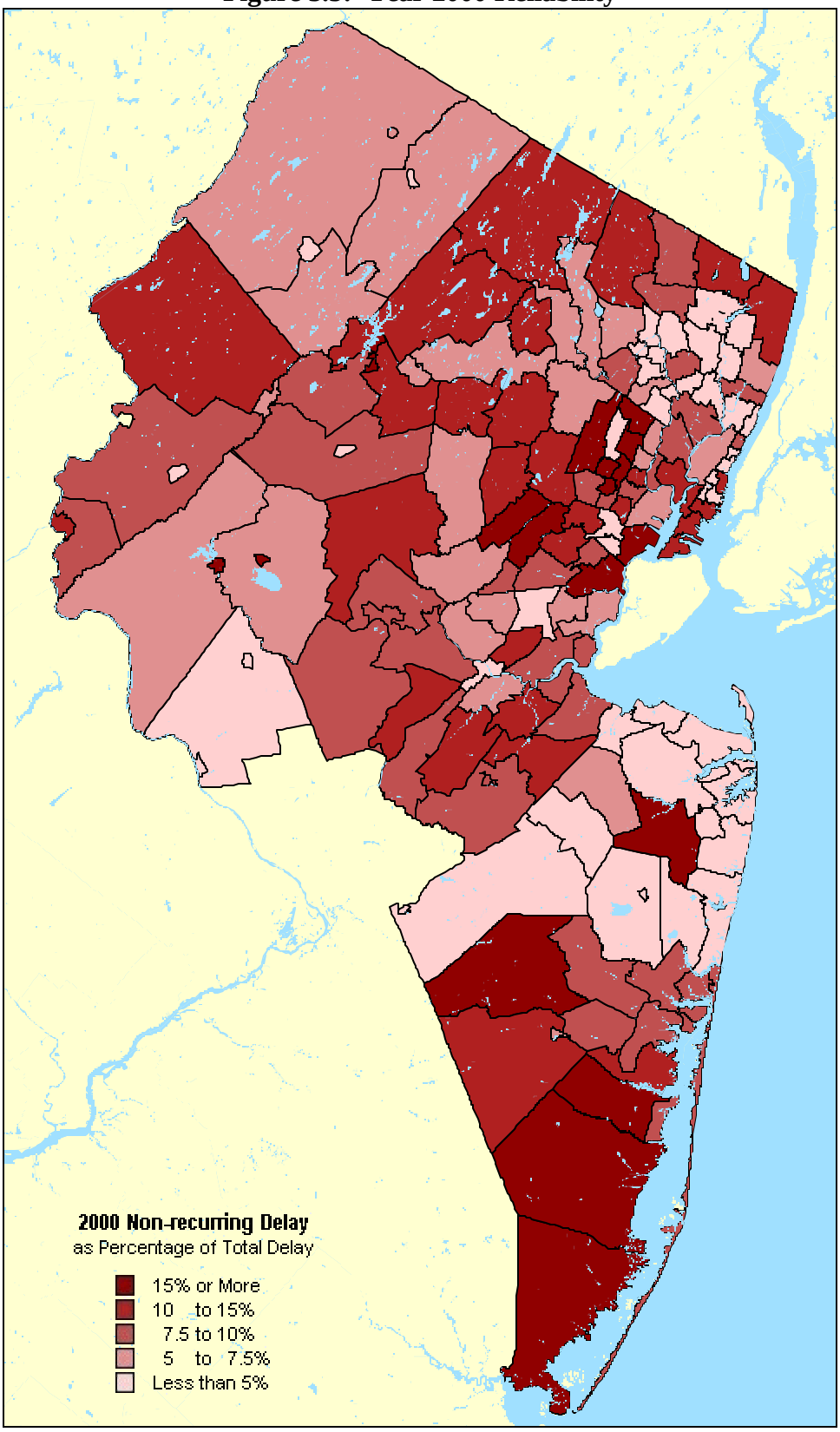
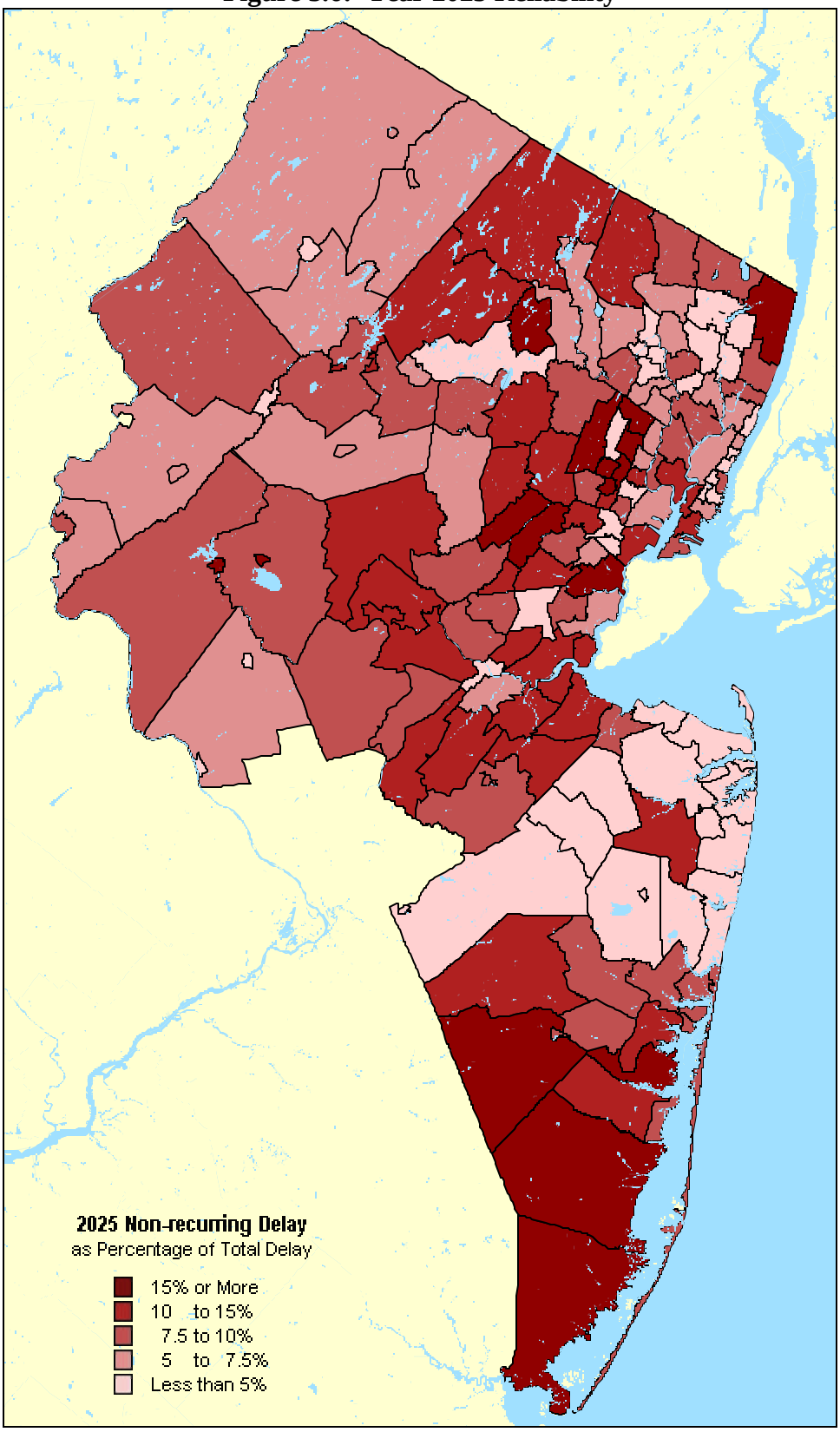


**Figure 3.6: Year 2025 Reliability**



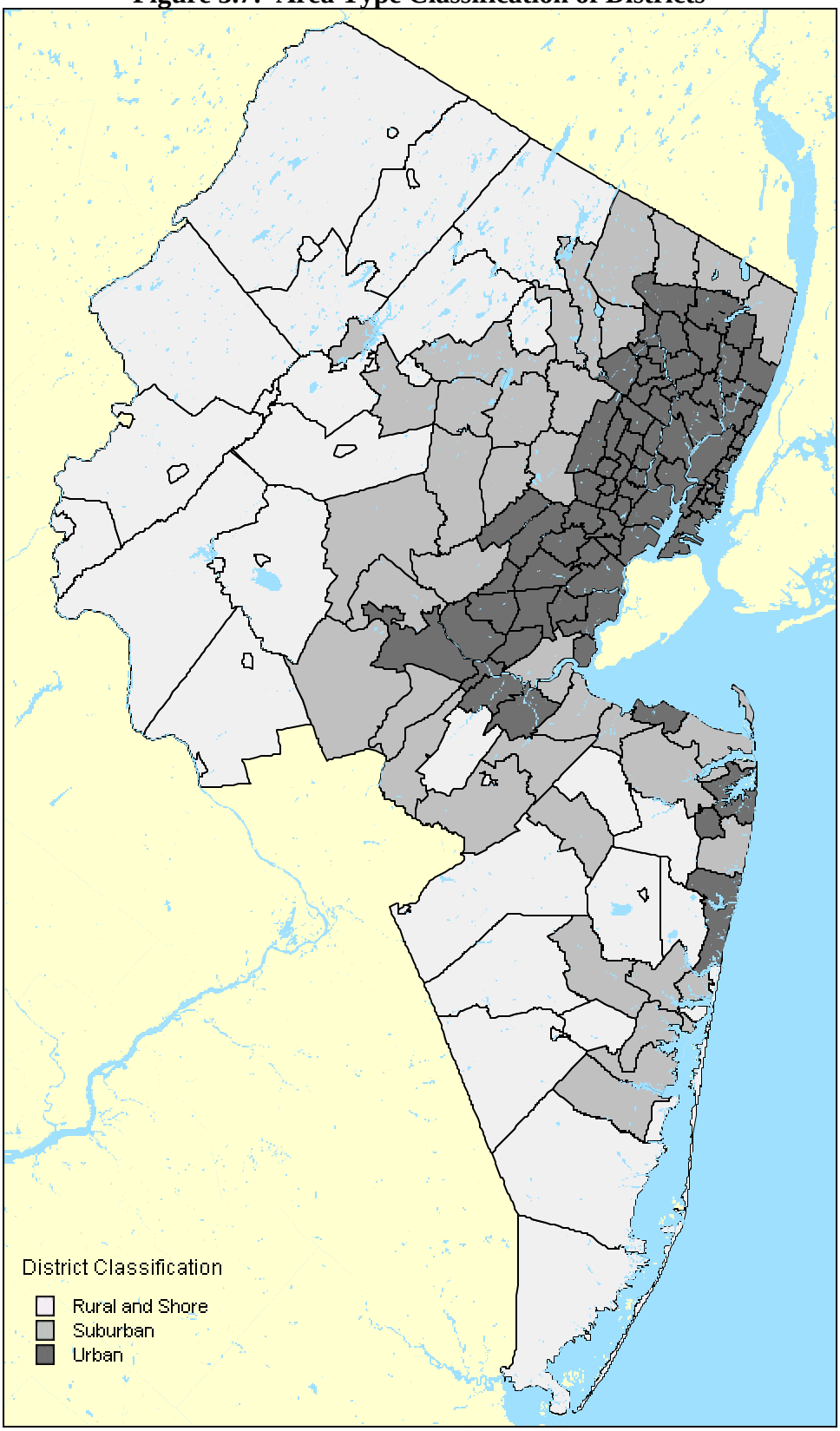
## 3.4 Task 3 – Establish 2025 Performance Goals and Identify Needs

In order to determine the adequacy of the freight transportation system, goals are developed to determine the acceptable level of performance. By setting a goal for performance and comparing to the measured performance, needs are quantified by the general equation:

***NEEDS = GOALS – PERFORMANCE***

As not all areas within the NJTPA region are the same, different levels of acceptability must exist for the different regions. Following the system set forth in the NJTPA Strategy Evaluation project, different goals are set for different levels of urbanization. The stratification of district area types is simplified in the FPSS and ignores the differing levels of subcategories within each area type. The three resulting area types are urban, suburban, and rural communities. The classification of the 158 districts is illustrated in Figure 3.7. Where appropriate, goals for performance vary by the area type.

**Figure 3.7: Area Type Classification of Districts**



The goals outlined here state a starting point. The goals may need to be refined upon review from the FPSS advisory group members or from learned experience in applying the FPSS system in the future. For some of the performance indicators outlined in Task 2 of the FPSS, acceptable levels or goals are easier to define than others. The following suggests goals for each of the performance measures.

### 3.4.1 System Use

Determining a goal for the system use is impractical. While the amount of freight being shipped through the area is important to the regional economy, there is no ideal amount of freight movements. Still, the volume of freight tonnage and freight carrying vehicles flowing across the region serves as an indication of the magnitude of freight movements in the region, and provides a valid argument for the support of transportation projects that will improve the movement of freight. As such, the FPSS system will state these system usage indicators without setting goals or determining needs.

Growth is an indicator that could have a goal associated with it. For example, the region could aspire to maintain or even grow the national share of imports and exports through the air and maritime ports. However, to be able to model the growth of regional cargo flows and changes to the global trade patterns would require a very sophisticated economic model. As such a model is not readily available for the NJTPA to test development scenarios, changes in import and export growth and global trade must be assumptions made in the development of future forecasted commodity flows and the freight vehicle flow that derive from those flows, which are inputs to the evaluation of the performance of the freight transportation network. Since growth conditions are stated inputs into the development of forecast scenarios, setting a goal for growth to determine the performance of the transportation system is illogical. Instead, the region should set import and export growth or market share goals (in coordination with the Port Authority of New York and New Jersey, private port operators, and private railroads) and monitor changing trade patterns to determine when strategies should be implemented to attract more import and export traffic.

### 3.4.2 System Efficiency

The measures of system efficiency, including estimates of the mobility and reliability of the transportation network are traditional performance measures for transportation networks. The FPSS measures of freight mobility and network reliability are discussed below.

Due to difficulties relating commodity flows to vehicular flows outlined in the Task 2 Summary Report, at this point in time, the FPSS system does not maintain a relationship between the average payload of a rail car, trailer, or container. As such the efficiency of the tonnage per vehicle mile traveled cannot be calculated. In addition, without better data to calibrate a model to estimate the number of empty, backhaul, or relocation movements, the FPSS system cannot report on the number of empty travel miles that are occurring within the region. However, since both of these system efficiencies affect the

profitability of private freight companies, the companies will independently attempt to optimize these measures and meet their own internal goals.

### 3.4.3 Freight Mobility

Through discussions with the FPSS advisory group members, the desire for increased mobility was paramount for the trucking industry. The measure of recurring delay per vehicle mile traveled was chosen as a method to standardize the amount of delay experienced on the roadways across different horizon years.

By examining the changes in travel times due to a percentage decrease in travel speeds from various free flow conditions, the following goals for seconds of recurring delay per truck mile traveled have been established as:

- 45 seconds in urban areas,
- 30 seconds in suburban areas, and
- 30 seconds in rural areas.

Due to the higher number of traffic signals in more urbanized areas, the acceptable travel speed would be lower and thus the acceptable travel times would be higher.

### 3.4.4 Network Reliability

While the mobility is important for the trucking industry, anticipated delays can often be accommodated for in scheduled delivery time. If a section of roadway has consistent delays during particular hours of the day, dispatchers and drivers can still predict when a delivery will reach its destination. Problems (and lost profits) are often experienced when the travel time between two points cannot be accurately estimated.

In order to standardize the amount of non-recurring delay experienced by freight on the transportation system for comparison across different districts and horizon years, the amount of nonrecurring delays is reported as the percentage share

The goals established for the prevalence of non-recurring delay are:

- 10% or less in urban areas,
- 5% or less in suburban areas, and
- 2.5% or less in rural areas.

The selections of these goals were somewhat arbitrary, but were generally done by examining existing conditions and the acceptability of those conditions.

### 3.4.5 Infrastructure

The maintenance of all system bridges to sufficient standards (both functional and structural) is the ultimate goal for system infrastructure, but considering the limited

financial resources and the rapidly aging regional infrastructure, priority decisions regarding which deficient bridges are the most critical to the flow of truck freight.

The New Jersey Department of Transportation generally considers that structures with a sufficiency rating of below 80 (of 100) are in need of improvement. With the age of much of the infrastructure in the NJTPA region, many bridges are considered in need of attention. For the sake of identifying those bridges that are truly substandard, the breakpoint of deficiency is lowered to a score of 50. This also determines the goal for the condition of bridge infrastructure to a sufficiency rating of 50 and higher. While this is 'setting the bar low' for the condition of bridges, it is the first step in obtaining a reachable infrastructure performance.

### 3.4.6 Safety

The ideal goal for safety in freight transportation is zero accidents. However, accidents will occur in any transportation system, and freight transportation is no different. The creation of a goal for safety is therefore invalid. However, by comparing accident rates between different modes of freight transportation and the amount of vehicle miles traveled under differing proposed project development scenarios, it is possible to forecast the number of accidents that would occur. This would allow a relative indicator of how a selected strategy or project, if implemented, would affect the social costs of transportation accidents.

Any project or strategies that would cause changes to the existing accident rates would need to be assumed or calculated outside of the FPSS processes. The estimate of the new accident rates could potentially introduce some bias in the findings, and needs to be considered when comparing performance scenarios.

### 3.4.7 Environmental

The tonnage of pollutants entering the system from highway vehicles could be estimated with MOBILE software through processes contained within the FPSS. However, the overriding goal definition for air quality emissions is governed by federal air quality and conformity regulations.

To avoid the consequences of producing analyses that contradict with conformity work done by NJTPA, the FPSS system will not report an estimate of air quality emissions. It would be possible, however, to report the differential in pollutants from different development scenarios or strategy implementations. This would provide an indicator of how the air quality would improve or suffer as a result of particular scenarios.

In addition, no model was located that could sufficiently model the pollutants emitted by non-highway freight transportation modes, and as such, pollutant estimation is limited to highway sources. This would still be useful for evaluating air quality impacts of scenarios that do not alter the mode share between highway and other modes, for example, altering the land use patterns around the port resulting in fewer truck miles

carrying the same tonnage of goods. Further research would need to be completed to see the full impact of a mode share in goods movements on the environment.

### 3.4.8 System Redundancy

Proposed projects providing an increase in system redundancy to major facilities and critical infrastructure should be given extra consideration. Increased system redundancy will not be the driving force in the majority of projects, but can be a by-product. However, when the ratio of reduced truck miles traveled (TMT) and truck hours traveled (THT) to project cost is higher, the more effective the project is for providing system redundancy. This equates to a generalized cost – benefit ratio to evaluate and compare the redundancy impacts of competing projects.

The balance between increased system redundancy and project costs must be balanced. It is not possible to determine a singular goal for this indicator. For each proposed project or combination of projects, a comparison of the additional TMT and THT can be made between the build and no-build scenarios. The FPSS system can be used to estimate the differential in TMT and THT for differing project evaluation scenarios.

## 3.5 Task 4 – Identify new/validate existing freight transportation strategies to address identified needs

The NJIT research team performed an extensive review of available resource in order to compile a list of improvement strategies to improve the movement of goods in the NJTPA region. The list presented results contains information from NJTPA, NYMTC, DVRPC, Congestion Buster Task Force, and Metroplan Orlando. Once the full list was compiled, the NJIT team narrowed the list down through internal meetings that resulted in merging strategies, removing duplicate strategies and, most importantly, looking at applicability to the NJTPA region. The potential strategy list is organized in several categories: Truck, Intermodal, Rail, Port Landside, Airport and Economic Development. Each category is then further divided into infrastructure, policy and operating/technology improvements. While majority of the strategies are straightforward, some examples are provided for the broader strategies in order to identify the kind of work that is intended.

### 3.5.1 Strategy Evaluation Approaches

The NJIT research team identified three possible approaches, Transportation Modeling (TM), Economic Modeling (EM) and the Delphi Method (DM), to evaluating the strategies. It is certainly possible that a strategy may be evaluated using more than one approach but the objective in developing the strategy matrix was to identify the preferred evaluation technique.

***Transportation Modeling (TM)***. A robust transportation modeling process is developed in Task 2 of the FPSS which enables a particular strategy to be evaluated in terms of direct vehicle-miles traveled (VMT), delay, environmental, safety and redundancy

impacts. However, in order to utilize the TM approach, it is necessary to obtain specific information dealing with improvements to the transportation network (e.g. new access link) or information on potential changes to the number of truck trips (e.g. 5 percent reduction in the regional trip table as a result of freight shift to rail). An example of utilizing the TM in evaluating a strategy is looking at a land use development impact on the regional movement of freight (e.g. redevelopment of a brownfield site or clustering of warehouses and freight related facilities such as a freight village). The impact of the land use redevelopment, in terms of truck trips generated and attracted, can be estimated using the ITE Trip Generation data. The truck trips estimated are then incorporated into the TM developed in Task 2 and the model is rerun resulting in values for each of the freight performance measures selected in Task 1. Another example of evaluating a strategy using the TM is an analysis to measure the impacts of adding a connector to improve access to a major freight terminal. In this case, the network is modified to reflect the new highway link and the model is rerun to obtain the strategy impacts.

***Economic Modeling (EM).*** Economic Modeling (EM), oftentimes referred to as Input-Output (IO) Modeling is an approach that can be used alongside transportation modeling or as a substitute if all of the data required to run a transportation model is not available. IO regional models are designed to look at the interconnectivity of regional economies. In other words, the models are capable of measuring the impacts of investments in one industry on other related industries. An example of this approach is NJIT's TELUS Center's Economic Input Output Model that is currently being finalized. TELUS will be capable of measuring the impacts of investments in a variety of transportation improvement projects. This model is available and can be used to evaluate a single project or a group of projects. The model inputs are project specific data such as total cost ($), project schedule, type of project and project location and the outputs are economic impacts in terms of the number of jobs created, earnings (labor income), gross product (includes earnings, property and non-labor income), and taxes (local, state and federal). All of the outputs can be displayed as totals for the project duration or annual numbers. Additionally, the impacted categories can be grouped into Major Division Industries of the Standard Industrial Classification (SIC) System: Agriculture; Mining; Construction; Manufacturing; Transportation and Public Utilities; Wholesale Trade; Retail Trade; Finance, Insurance and Real Estate (FIRE); Services; and Government.

***Delphi Method (DM)***. There are some strategies that cannot be evaluated using either transportation or economic models because of the lack of specific input data. Such strategies would then be evaluated using the Delphi Method (DM). As part of Task 1, an advisory group of public and private sector stakeholders was set up to guide the project along. The Delphi Method would build on input from the advisory group in evaluating the freight-specific strategies. During the evaluation process, a panel of experts completes several consecutive questionnaires. In order to maintain the integrity of the answers to each questionnaire, there is no interaction between the panel of experts for the duration of the testing process. Once the first series of questions is administered, the results are tabulated into quartiles. These results are then disclosed to the panel of experts. Following their review of the findings, the panel is asked to reconsider their answers. Panelists whose answers fall within the two outside quartiles are asked to justify

their responses. Again, all answers are tabulated and sent back to the panelists. On this occasion, any panelist that falls outside the two quartiles will be asked to provide an argument to justify his/her opinion. The ultimate goal of this strategy evaluation method is for the panel (advisory group) to reach a consensus.

### 3.5.2 Strategy Matrix

The Strategy Matrix has been broken up into five tables for clarity: Truck, Intermodal, Rail, Port Landside/Marine, and Economic Development. The strategies are listed in the rows of each table, the goals are shown in the columns and the individual cells show which approach is recommended to evaluate a particular strategy. For each strategy, only the goals where an evaluation approach is shown are anticipated to be impacted.

| Truck Strategies | Goal 1: Improve Freight Mobility | Goal 2: Improve Reliability | Goal 3: Reduce Environmental Impacts | Goal 4: Improve Safety/ Reduce Accidents | Goal 5: Create System Redundancy | Goal 6: Enhance Existing/ Create New Infrastructure |
|---|---|---|---|---|---|---|
| **Infrastructure** | | | | | | |
| Construct new roadway to major truck trip generators | TM | TM | | | TM | TM |
| Improve existing roadway to regional freight facilities (e.g. geometry) | TM | TM | | | TM | TM |
| Eliminate congestion "choke points" | TM | TM | TM | | | |
| Create through corridors for interstate standard trucks | TM | TM | | TM | TM | TM |
| Develop continuous service roads along major highways to provide alternate truck routing in case of incidents | TM | TM | TM | TM | TM | TM |
| Create truck only lanes in highly congested roadways | TM | TM | | TM | | TM |
| Provide adequate rest areas | | | | TM | | TM |
| **Policy** | | | | | | |
| Coordinate toll pricing management plan to influence truck route and timing choice | TM | TM | | | | |
| Enforce current truck routes and restrictions | | | | TM | | |
| Encourage off-peak deliveries in the CBD through a combination of incentives and curbside regulations | TM | TM | | | | |
| Review/update current truck route network to maximize commercial accessibility and minimize community impacts | TM | TM | TM | TM | TM | TM |
| Review/enforce truck geometric restrictions | DM | DM | | DM | | |
| Better manage commercial curbside space | TM | TM | TM | | | |
| Increase the level of investment in transportation facilities that promotes freight movement and economic development | | | | | | |
| Create public/private partnerships for programming/funding transportation improvements | DM | DM | DM | DM | DM | DM |
| Study feasibility of innovative financing methods for freight transportation projects | DM | DM | DM | DM | DM | DM |
| Involve the private sector in programming and integrating needed freight projects into the Transportation Improvement Program. | DM | DM | DM | DM | DM | DM |
| **Operating/ Technology** | | | | | | |
| Accelerated expansion of Intelligent Transportation System (ITS) | TM | TM | TM | TM | | TM |
| a. Signage, Motorist Information Systems | | | | | | |
| Greater coordination between private logistics and public ITS systems | DM | DM | DM | DM | | DM |

| Intermodal Strategies | Goal 1: Improve Freight Mobility | Goal 2: Improve Reliability | Goal 3: Reduce Environmental Impacts | Goal 4: Improve Safety/ Reduce Accidents | Goal 5: Create System Redundancy | Goal 6: Enhance Existing/ Create New Infrastructure |
|---|---|---|---|---|---|---|
| **Infrastructure** | | | | | | |
| Improve/add truck to rail/barge intermodal freight transfer facilities to reduce truck VMT | TM | TM | TM | TM | TM | TM |
| Improve safety of highway/railway at grade crossings and, where feasible, eliminate crossings. | | | | TM | | TM |
| **Policy** | | | | | | |
| Planning and zoning | | | | | | |
| Zone for freight staging facilities | TM | TM | | | | |
| Update zoning classifications | TM | TM | | | | |
| Cluster warehousing activities | TM | TM | | | | |
| Transportation planning and design | | | | | | |
| Plan/design for adequate mobility within intermodal facilities | DM | DM | | | | |
| Identify data needs for system monitoring | DM | DM | | | | |
| **Operating/ Technology** | | | | | | |
| Operational freight facility improvements | | | | | | |
| Improve access | TM | TM | | | | TM |
| Address operational/compatibility issues | DM | DM | | | | |
| Improve intermodal freight transfer facilities | TM | TM | | | | TM |
| Collect, analyze, and share goods movement data and trends | DM | DM | DM | DM | DM | DM |
| Identify needed improvements through the management systems, corridor and other technical studies, and NHS connector evaluations | DM | DM | DM | DM | DM | DM |

| Rail Strategies | Goal 1: Improve Freight Mobility | Goal 2: Improve Reliability | Goal 3: Reduce Environmental Impacts | Goal 4: Improve Safety/ Reduce Accidents | Goal 5: Create System Redundancy | Goal 6: Enhance Existing/ Create New Infrastructure |
|---|---|---|---|---|---|---|
| **Infrastructure** | | | | | | |
| Increase weight limits on select railroad lines to 286 | TM | TM | TM | TM | TM | TM |
| Create sufficient vertical and lateral clearances | TM | TM | TM | TM | TM | TM |
| Improve rail line and terminal capacity | TM | TM | TM | TM | TM | TM |
| Construct a permanent Cross-Hudson freight rail connection | TM | TM | TM | TM | TM | TM |
| **Policy** | | | | | | |
| Monitor impacts of toll pricing on river crossings and rail mode share to shift discretionary traffic away from the most congested periods | TM | TM | TM | TM | | |
| Eliminate or reduce railroad property taxation to spur railroad investment in infrastructure improvements | EM | EM | EM | EM | EM | EM |
| **Operating/ Technology** | | | | | | |
| Continue coordination between passenger and freight rail operations | DM | DM | DM | DM | DM | DM |

| Port Landside/Marine Strategies | Goal 1: Improve Freight Mobility | Goal 2: Improve Reliability | Goal 3: Reduce Environmental Impacts | Goal 4: Improve Safety/ Reduce Accidents | Goal 5: Create System Redundancy | Goal 6: Enhance Existing/ Create New Infrastructure |
|---|---|---|---|---|---|---|
| **Infrastructure** | | | | | | |
| Dredge channels to 50 feet | EM | EM | | | | EM |
| Maintain vertical draft | EM | EM | | | | EM |
| Increase availability of "ExpressRail" style on-dock rail | TM | TM | | | TM | TM |
| Improve truck circulation and port access | | | | | | |
| New Port Newark exit on the New Jersey Turnpike | TM | TM | | | TM | TM |
| "Portway" in northern New Jersey | TM | TM | | | TM | TM |
| Add/reconfigure gates | TM | TM | | | | TM |
| **Policy** | | | | | | |
| Combat "freight sprawl" by adopting land use policies that encourage warehouse and distribution center development in the existing metropolitan area; i.e., "global freight villages" | EM | EM | EM | EM | | EM |
| Encourage Expanding Hours of Operation to Coordinate Truck Movements During Off-Peak Hours | TM | TM | | | | |
| **Operating/ Technology** | | | | | | |
| Use dedicated "inland distribution networks" to move port commodities through limited terminal space rapidly and efficiently utilizing all potential land and water-based modes | TM | TM | TM | TM | TM | TM |
| Use information systems to manage terminal resources | | | | | | |
| Coordinate empty container supply to avoid excessive stacking of empties | TM | TM | | | | |
| Schedule container pickups or use incentive pricing to manage gate traffic | TM | TM | | | | |

| Economic Development Strategies | Goal 1: Improve Freight Mobility | Goal 2: Improve Reliability | Goal 3: Reduce Environmental Impacts | Goal 4: Improve Safety/ Reduce Accidents | Goal 5: Create System Redundancy | Goal 6: Enhance Existing/ Create New Infrastructure |
|---|---|---|---|---|---|---|
| **Policy** | | | | | | |
| Develop a coordinated regional transportation land needs plan | DM | DM | DM | DM | DM | DM |
| Inventory available parcels on an ongoing basis | DM | DM | | | | |
| Protect identified parcels using "transportation use" zoning | DM | DM | DM | DM | DM | DM |
| Develop "brownfields" sites for transportation land uses | TM | TM | TM | TM | TM | TM |

## 3.6 Task 5 – Establish the Support Systems for Ongoing Freight Planning

The NJIT research team identified several MPOs that have a specific focus on freight planning is somewhat distinct from its other planning functions. We also reviewed MPOs with active marine ports within their respective regions. A list of specific MPOs we investigated and information provided by the respective MPOs is provided below:

*The Chicago Area Transportation Study Policy Committee*
The Chicago Area Transportation Study Policy Committee (CATS) is the designated Metropolitan Planning Organization (MPO) for the northeastern Illinois region, encompasses six counties and a portion of one other county. In addition to several major interstate highways, transportation facilities include two major commercial airports, O'Hare and Midway, and three major water terminal clusters. The region also serves as a crossroads for several major freight transfer points between eastern and western railroad carriers.

CATS was found to have a strong freight component in its overall transportation planning process. Freight mobility issues are addressed through the Intermodal Advisory Task Force, which includes representation from several private and public sector entities including state transportation agencies, the port, railroads, trucking companies, freight forwarding companies intermodal associations, shippers, marine operator, air carriers, and business commerce groups. The Intermodal Advisory Task Force is charged with identifying, assessing and responding to issues and opportunities affecting intermodal transportation facilities and resources and providing overall guidance for the development of the intermodal component of the Regional Transportation Plan. Their Transportation Improvement Program (TIP) lists specific freight projects and identifies freight corridors. However, we found that neither freight-specific project evaluation criteria nor freight-specific analytical tools are used in the overall planning process.

*Delaware Valley Regional Planning Commission*
The Delaware Valley Regional Planning Commission (DVRPC) encompasses nine counties, four of which are located in New Jersey and five in Pennsylvania. As implied by its name, each county borders the Delaware River and is adjacent to or within close proximity to the City of Philadelphia. In addition to several major highways, the region possesses one of the world's busiest freshwater ports; as well as freight service from three large Class I railroads and 12 smaller short lines, and Philadelphia International Airport, which is expanding international cargo services.

Freight initiatives at the *Delaware Valley Regional Planning Commission* (DVRPC) are guided primarily through an advisory group of the Council, the Delaware Valley Goods Movement Task Force. The Task Force is open to all freight practitioners and experts including trucking, railroad, port, airport, shipper, freight forwarder, economic development, and member government representatives, and meets on a quarterly basis. The Task Force consists of three subcommittees (Data, Planning, and Shippers).

Freight mobility is included in DVRPC's long-rang planning activities, and specific freight improvement projects are included in the TIP. Freight corridors within the DVRPC metropolitan planning area are also identified. The DVRPC has completed a series of studies that examine freight transportation, analyzing individual modes, intermodal movements as well as access to marine and intermodal facilities. While the DVRPC does not utilize freight-specific evaluation criteria, it does use multiple regression analysis as a way to estimate the number of freight trips generated within its region. At the time of the survey, DVRPC was also in the process of obtaining freight-specific data in the form of commodity flows.

*Miami-Dade MPO*

The Miami-Dade MPO guides the transportation planning process in Miami-Dade County, Florida. A 21-member Governing Board, which includes representatives from various transportation agencies and local communities, act as authority on local transportation planning matters for the Miami-Dade County region. The region is also home to the Port of Miami, a principal freight shipping hub in the southeastern United States. In fiscal year 2002, the volume of cargo moving through the Port of Miami was 8.7 million tons and the number of TEUs (twenty-foot equivalent units) was nearly one million.

Citizens Transportation Advisory Committee (CTAC), an entity under the Governing Board, consists of several subcommittees, each dealing either directly or indirectly with freight matters. One subcommittee is specifically designated to address maritime transportation issues.

The Freight Movement Study, completed in December, 1996 examines freight planning in the Miami-Dade MPO region. The study found that while freight mobility is becoming an increasingly important issue, "there is no consistent approach to freight movement planning; rather, local governments appear to be tailoring their planning to local conditions." The study also found a lack of an overall database to track truck movements in the county, and that there is no mechanism to forecast truck travel patterns. However, our recent investigation found that the MPO includes freight projects in its TIP and identifies freight corridors in the region. Freight-specific evaluation criteria for improvement projects are not utilized. However, truck counts, classification counts and trend analysis tools are used to look at freight movements in the area.

*New York Metropolitan Transportation Council*

The New York Metropolitan Transportation Council (NYMTC) region includes Nassau, Putnam, Suffolk, Rockland, and Westchester counties, and the City of New York. The NYMTC region also encompasses the Port Authority of New York and New Jersey's marine and airport facilities east of the Hudson River.

Not surprisingly, specific NYMTC staff members are designated to deal with freight related issues as well as data collection and data management activities. NYMTC includes freight in its long-range planning, has freight projects in its TIP and identifies freight corridors in the region. The MPO has completed a number of freight related studies that have resulted in an extensive inventory of data for freight facilities in the

area. NYMTC does not utilize freight-specific criteria for evaluating improvement projects. However, several planning initiatives examine freight forecasting, cost-benefit analysis and market analysis to better understand the importance of freight issues to the region.

*Portland Metropolitan Planning Organization*

Portland Metropolitan Planning Organization (Metro) serves over than 1.3 million residents in Clackamas, Multnomah and Washington counties, and the 24 cities in the Portland, Oregon metropolitan area. The Port of Portland is the second largest exporter of wheat in the United States. In addition, the Port of Portland is the eighth largest U.S. Port in terms of total tonnage, the fourteenth largest container port, and the number one auto port on the West Coast, handling the third highest volume of autos in the country. In addition, Portland International Airport serves more than a quarter million tons of air cargo.

Metro has a freight component in its long-range planning, includes freight projects in TIP and identifies freight corridors in the area. Portland Metro has collaborated with the Port of Portland and Oregon DOT in studying regional freight movements. The MPO also completed an industrial land supply study and several shipper/carrier surveys. Metro uses EMME2 for its modeling work, and has developed a truck forecasting submodel. Freight-specific evaluation criteria have also been developed in its overall freight planning process. Metro also integrates the use of private sector partnerships in its freight planning activities.

*Puget Sound Regional Council*

Puget Sound Regional Council (PSRC) is the designated MPO for King, Kitsap, Pierce and Snohomish counties located in northwestern Washington State. PSRC encompasses the Ports of Tacoma and Seattle, which are the second largest marine container terminals in North America. Together these ports account for approximately 10 per cent of all US waterborne imports by value and approximately 6 per cent of all imports by mode. The region also encompasses the Seattle-Tacoma Airport International Airport (Sea-Tac).

PSRC has a very active freight planning program. The MPO includes freight in its long-range planning, has freight projects in its TIP and identifies freight corridors in the region. One such corridor, The FAST Corridor, was developed as a partnership co-sponsored by the Washington State Department of Transportation and the Puget Sound Regional Council. The partnership includes affected cities and counties, ports, and the Burlington Northern Santa Fe and Union Pacific railroads. The FAST Corridor is managed through a multi-agency staff team known as the FAST Cast. PSRC has also established the Regional Freight Mobility Roundtable, which is a public-private forum to set up to define and recommend actions serving freight mobility needs in and through central Puget Sound.

The MPO uses freight-specific evaluation criteria for improvement projects and estimates freight demand based on truck surveys and marine cargo forecasts. Additionally, the PSRC used input-output modeling techniques to create its own regional commodity flow database based on data from Washington Public Ports Association, Washington DOT,

and federal sources in combination with employment data. The private sector partnership is an important component of the MPO's freight planning activities.

*Southern California Association of Governments*
Southern California Association of Governments (SCAG) is the designated MPO for the southern California region surrounding the City of Los Angeles and includes six counties: Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial. The region houses a population exceeding 15 million in an area of approximately 38,000 square miles. The Port of Los Angeles/Long Beach accommodated approximately 5.6 M TEUs over the past year making it the busiest port in the country and the eighth busiest in the world.

Organizationally, there is no separate staff designated to address freight issues. However, the Goods Movement Advisory Committee, an advisory group to the full body of voting members, meets regularly to addresses specific freight related matters. In addition, SCAG has conducted several recent studies that deal with freight mobility and goods movement issues.

## 3.7 Task 7 – Summarize Post 9-11 Issues and Provide Strategy Recommendations

Task 7, includes a review of post 9/11 impacts on freight flow systems in North Jersey, security measures, and system strategies for responding to or preventing substantial impacts on freight flow which could result from a subsequent terrorist attack. A discussion of issues relevant to freight security is provided in the sections below along with the results of the surveys and interviews with key freight transportation stakeholders.

### 3.7.1 Freight Security Issues Overview

There are a number of vital entities that make up in the freight transportation supply chain. They include:

- Shippers
- Freight forwarders/consolidators
- Ocean carriers
- Railroad operators
- Motor carriers,
- Warehouse/distributors, and
- Freight terminal operators.

Each has its own unique characteristics, needs and moreover, there is an intricate logistics network among these various components. There is also a complex regulatory process that is intended to ensure safety and security of goods and goods movement.

The sequence of information and cargo flow to US ports is composed of eight major steps. Each step is associated with particular action item and timeline, which are described below:

1. The shipper, Non Vessel Operating Common Carriers (NVOCC), freight forwarder, or third party logistics provider (3PL) makes a booking with an ocean carrier. The ocean carrier confirms the booking.

2. Empty container(s) are dispatched to warehouses where cargo is loaded into containers. Loaded containers are then delivered to the port.

3. Communication takes place among various parties regarding shipping instruction, Bill of Lading (B/L) information, and last minutes changes.

4. Loaded containers are stowed on the vessel, which sails to its destination port.

5. After vessel departure, the carrier compiles all B/L information and submits a Cargo Manifest before arrival of the vessel at the US port.

6. The vessel arrives at the US port and containers are discharged.

7. Upon receiving the Cargo Manifest from the carrier, US Customs officials review cargo contents and decide whether to release or withhold specific containers for inspection.

8. Upon receiving releases from US Customs and the carrier, containers are delivered to their respective consignees.

The security process is seemingly relaxed within the sequence depicted above. Receiving ports have no advanced information about incoming cargo until it reaches the port. All B/L information and the Cargo Manifest are submitted *after* the vessel departs the port of origin. While this information is received prior to cargo arriving at the US port, there is generally not much time to check or verify the container contents or sources.

The freight transportation industry and freight transportation regulators recognize the vulnerability gaps along other entities in the global supply chain as well. In order to achieve the so call end-to-end control over the supply chain, the US Customs and Border Protection (referred to herein as "US Customs") has implemented the following in an effort to improve supply chain security (Carlstedt, 2003):

- Container Security Initiative (CSI)
- 24 Hour Advance Manifest Rule
- Customs – Trade Partnership Against Terrorism (C-TPAT)
- Highway Watch

A brief description of each is provided below.

*Container Security Initiative (CSI)*
CSI is a reciprocal government-to-government program that operates on a voluntary basis. The principal objective of CSI is to enhance security of cargo containers at the port or origin before cargo is loaded on the vessel. US Customs Commissioner Bonner proposed this initiative a few months after 9/11.

There are four core elements in CSI (Carlstedt, 2003):

- Establish security criteria to identify high risk containers
- Pre-screen containers before they arrive at US ports
- Use technology to pre-screen high risk containers
- Develop and use smart and secure containers

US Customs has identified the top 20 seaports and the top 3 border ports in Canada by volume of container bound for the US. Together, they account for three-fourths of all container traffic destined to or through the US. The CSI initiative is carried out through cooperative agreements with each of the host governments of these 23 ports.

Under the CSI initiative, a significant number of US Customs inspectors are sent abroad to work within a host nation framework to target high-risk cargo containers. US inspectors and their counterparts then review advance manifest data. If either party deems a container high risk, the host nation's officials will inspect the contents with US Customs officials present. Once the security of the container is ensured, US Customs approves export of the container to the US. Host agency government customs officials have a reciprocal arrangement with US Customs for shipments originating from the United States.

In June 2002, the World Customs Organization unanimously passed a resolution that will enable all 161 ports and its host government nations to begin developing similar programs based on the CSI initiative. However, this could require years to implement. But in the meantime, several other countries have adopted cargo security guidelines based on the CSI approach.

The CSI initiative enables cargo containers that are prescreened at a CSI port to receive expedited clearance. Consequently, cargo containers cleared from CSI ports would have a competitive advantage in terms of security processing.

*The 24-Hour Advance Manifest Rule*
The 24-Hour Advance Manifest Rule was a modification to existing US regulations and was intended to support the CSI imitative. The 24 Hour Rule requires that the manifest data be submitted to US Customs at least 24 hours before cargo is loaded on vessels destined to the United States. In addition, NVOCCs, carriers, and shippers are required to provide a more accurate description of the cargo contents.

While these changes may be seemingly simple, the 24 Hour Advance Manifest Rule has been on of the most significant changes in customs regulations compared to pre 9/11 conditions.

*Customs Trade Partnership Against Terrorism (C-TPAT)*

Customs Trade Partnership Against Terrorism (C-TPAT) is a voluntary program designed collaboratively by US Customs and the international trade community. The program is intended to prevent terrorists from taking the advantage of commercial supply chains for transporting terrorist weapons such as bombs, weapons of mass destruction, biological or chemical weapons, and component parts for assembly of such items.

C-TPAT is open to US entities that deal with international trade and soon will accept non-US membership (foreign manufacturers or producers trading with US. The program addresses the following freight supply chain elements:

- Procedural security
- Physical security
- Access controls
- Personnel security
- Education and training awareness
- Manifest procedures
- Conveyance security

Participants in the program would gain the following benefits:

- Reduction of inspections
- Appointed account manager from US Customs to US entities
- Eligibility for account based processes for US importers
- An emphasis on self-policing, not US Customs verifications

In order to be considered for the C-TPAT program, the following enrollment steps must be undertaken:

1. The trade entity must submit a Memorandum of Understanding (MOU) signed by a corporate officer, indicating the company is committed to participation in the program.
2. After the MOU, the company must submit a Supply Chain Security Questionnaire within a specified time frame. This is commonly referred to as "enrollment".
3. The company must adhere to its submission through self-policing.
4. Upon receiving the MOU, US Customs would conduct a cursory background check on the company. The MOU would then be signed by US Customs official and returned to the company.
5. US Customs would provide its questions or recommendations as deemed necessary after reviewing the Supply Chain Security Questionnaire.

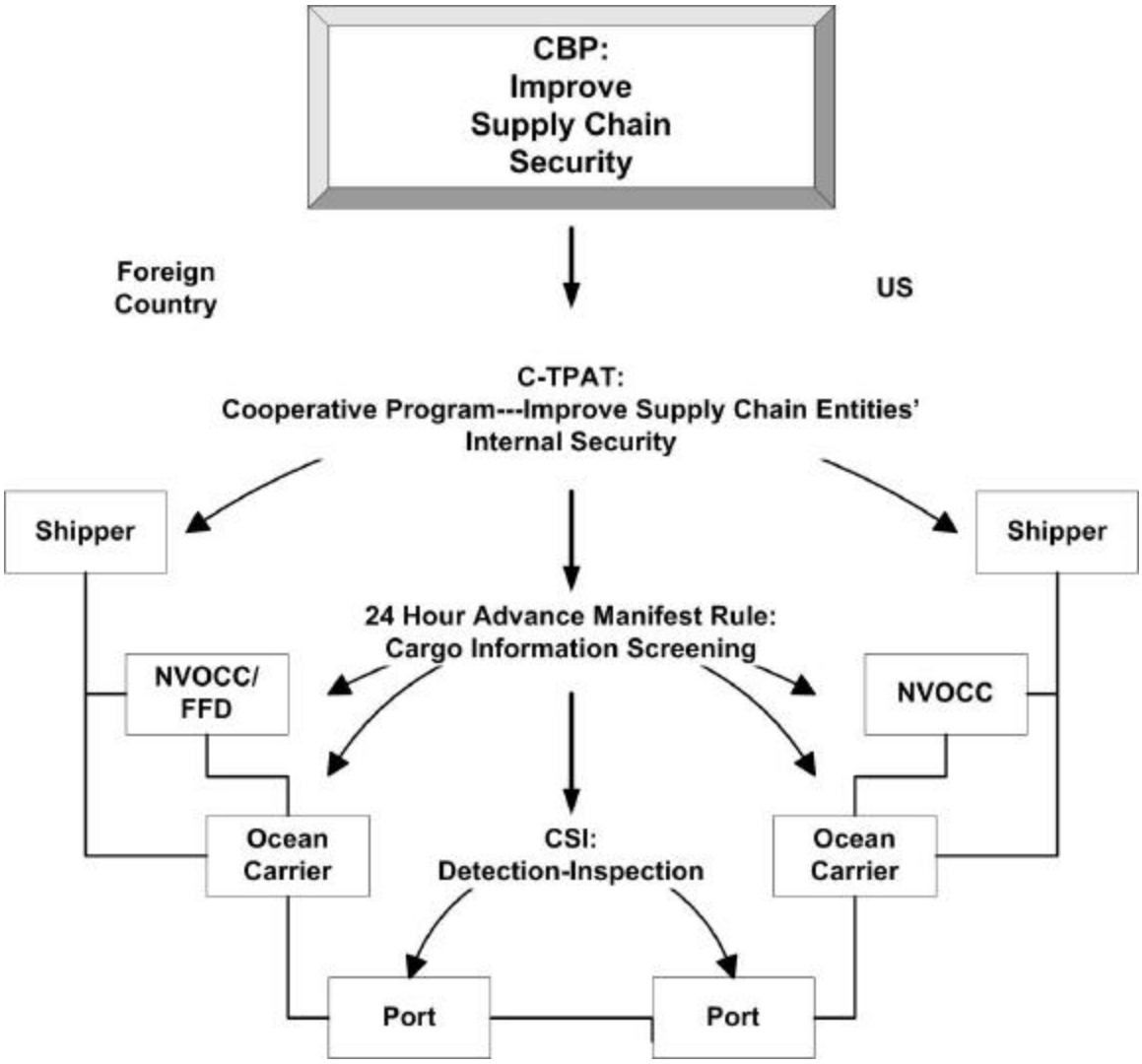
The threat of a terrorist attacks using weapons of mass destruction illegally transported in a cargo container was a major concern among security officials. Since cargo container transportation was identified as a potential high security risk, swift implementation of additional cargo container security measures was a high priority. Therefore, US Customs Commissioner Robert Bonner quickly pushed the above new initiatives and regulations in place and started to implement them after consulting with the freight community.

Federal freight security regulations and the overall freight security process, as depicted in Figure 3.8, will have major impacts on the freight community in various forms. Some regulations are federal mandates, while others are in the form of public-private partnership and private initiatives. The objectives of these regulations include protecting vulnerable points in the freight supply chain, enhancing security cooperation and protocols, and identifying and applying appropriate technologies. Since the tragic events of 9/11, security procedures have been changed and security awareness and training initiatives have been increased.

*Highway Watch*

New Jersey will become the 28th state to institute this Federal Motor Carrier Safety Administration program, which is being administered by the American Trucking Association nationally and the New Jersey Motor Truck Association at the New Jersey state level. Roll out is scheduled for September 13, 2003 and eventually NJTMA hopes to certify 20,000 New Jersey truck drivers. The program is designed to thwart cargo thefts and highjackings. Of equal importance, and from a security standpoint, drivers will be encouraged to report suspicious behavior encountered at truck stops and report suspicious activity seen in and around transportation infrastructure such as bridges, overpasses, tunnels as well as federal buildings. This is a national program with one national phone number with direct links to local and state police and other agencies. The training program is voluntary and takes about one and a half hours to complete. It is anticipated that this program can pay big dividends in security as professional drivers can be on the watch for suspicious activity on the nation's highways.

**Figure 3.8: New Control Regime of Supply Chain Security**



3.7.2 Survey Findings

*Company Profile*

The first section of the survey is focused on company's general background information: type of business, number of employees, and annual revenue. The survey team received a total of 35 responses to the survey. Company profile information is summarized in the figures and tables presented below.

**Figure 3.9: Types of Business**

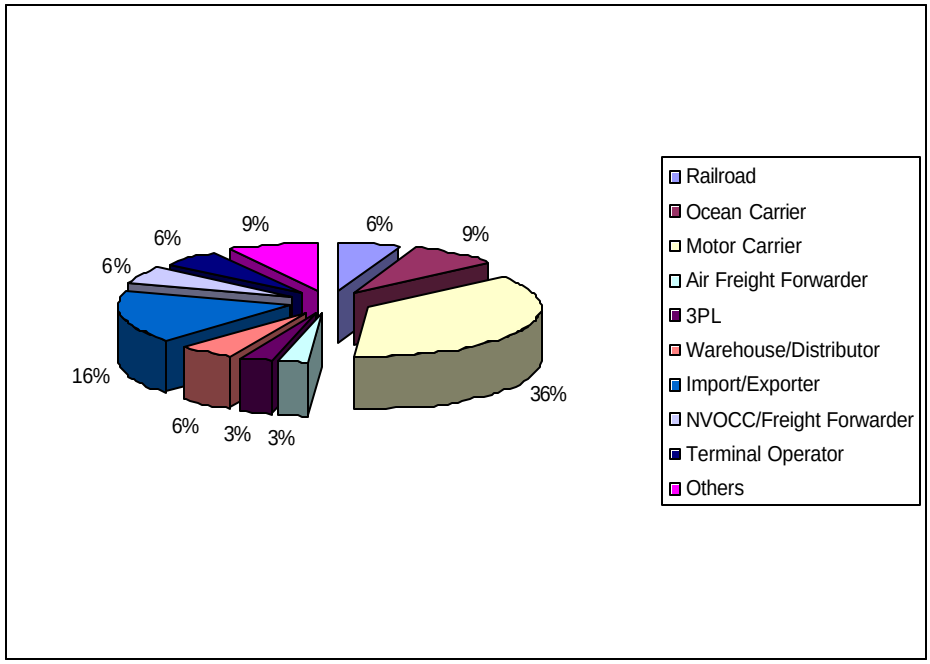



**Table 3.3: Company Size**

| Number of Employees | Number of Companies | Rounded Percentage |
|---|---|---|
| <99 | 18 | 51 % |
| 100-199 | 4 | 11 % |
| 200-499 | 4 | 11 % |
| 500-999 | 0 | 0 |
| 1000-4999 | 4 | 11 % |
| >5000 | 5 | 14 % |
| | **35** | **100 %** |

**Table 3.4: Number of Employees**

| *Revenue (Millions of $)* | *Number of Companies* | *Rounded Percentage* |
|---|---|---|
| <1 | 3 | 9% |
| 1-9 | 8 | 23% |
| 10-99 | 12 | 34% |
| 100-499 | 2 | 6 % |
| 500-999 | 0 | 0 |
| >1,000 | 6 | 17% |
| Not reporting | 4 | 11% |
| **Total** | **35** | **100%** |

*Impacts of 9/11 on Freight Operations*
Survey participants were asked a number of questions regarding operational and security issues in the aftermath of 9/11. The following issues were addressed:

- Increased/Decreased cargo volume
- Changes in cargo routing
- Provisions for backup routes
- Changes in operating procedures

A summary of responses in provided in Table 3.5.

**Table 3.5: Summary of Operational Impacts Responses**

| | Cargo volumes have increased | Cargo routing has changed | Back-up or alternate routes are provided | Operating Procedures have been changed |
|---|---|---|---|---|
| **Yes**<br>Number of responses<br>(Percentage) | 11<br>(31%) | 9<br>(26%) | 20<br>(57%) | 12<br>(34%) |
| **No**<br>Number of responses<br>(Percentage) | 24*<br>(69%)* | 24<br>(69%) | 15<br>(43%) | 21<br>(60%) |
| **N/A**<br>Number of responses<br>(Percentage) | | 2<br>(6%) | | 2<br>(6%) |

*Of these responses, 9 respondents or 26 % indicated no change in cargo volumes.

Of the respondents, the three ocean carriers and the large railroad operator reported increase in cargo volume. As the primary carriers for international trade, the indication of increased cargo volume for these respondents corresponds to the Port Authority of New York/New Jersey's reported increases in cargo volumes. The port's container volume increased as much as 13% in 2002. However, 9 of the 13 motor carriers surveyed indicated decreases in cargo volume. Since the majority of motor carrier respondents are domestic haulers, this contrast could be explained by the growth of international trade on one hand and the general decrease in domestic economic activities on the other.

The majority of respondents indicated no change in cargo routing. However, those that did report routing changes gave the following reasons:

- Restrictions in Holland Tunnel
- Long waiting time at bridge and tunnel entrances
- Relocation of business of the clients
- Change of trade pattern for particular commodity
- Change certain routing in New York City due to new restrictions

With regard to back-up or alternative routes, the results were split. Few respondents provided details. However, one large ocean carrier company, which operates 140 ships on more than 70 trade routes, responded that it has contingency plans for re-routing but that such contingency plans remain confidential. This is likely the case for other companies that have contingency plans.

Finally, the majority of survey respondents reported changes to their operating procedures since 9/11. Ocean carriers and railroad operators further expressed security measures have been increased both on their company's own initiative and in response to US government programs.

Approximately one-half of the motor carriers surveyed indicated changes in operating procedures, including the following:

- Issuing photo ID's
- Conducting more thorough background checks on employees and drivers
- Increasing security at pick up & delivery places
- Requiring drivers to report at least once a day to operation department
- Developing and updating emergency response procedures and flexible start time

Other changes included the following:

- Complying with US government security regulations
- Increasing manpower in security
- Enhancing access control
- Allocating increasing financial resources for security programs

*Cargo Security Measure Before and After 9/11*
Survey respondents were also asked about security measures prior to and following 9/11. Of the companies surveyed, 20 or 74% already had security measures in place. Among the remaining 15 companies that did not have any security measures prior to 9/11, only one chose to increase its security. The following provides additional details both pre and post 9/11 by company type:

***Pre 9/11***

- Ocean carriers and railroad operators had existing security measures prior to 9/11
- Only 2 out of 13 motor carriers did not have security measure prior to 9/11.
- Terminal operators had existing security measures prior to 9/11.
- Logistics firms and Non-Vessel Operating Common Carriers (NVOCCs)/freight forwarders reported no security measures were in place prior to 9/11.

***Post 9/11***

- Railroad operators, ocean carriers, and terminal operators continue to increase their security.
- 6 of the 11 motor carrier companies that already had security measures prior to 9/11 increased their security; the remaining 5 did not.
- Of the 2 motor carriers that did not have security measures prior to 9/11 only one chose to increase security.
- Among NVOCC/freight forwarders, Third Party Logistics (3PL) firms, and warehouse/distributors, responses varied. Some companies now have security measures in place that did not have security measures in place prior to 9/11, while others do not.

Although a number of companies reported no increase in security following the tragic events of 9/11, it was found that in general, large companies with heavy capital have increased security since 9/11. Of the 20 companies that reported increased security

measures, costs increases ranged from 1% to 25%. The remaining 10 companies were unable to accurately quantify cost increases, but indicated that the implementation of new security program has been costly.

Another important component of Task 7 includes identification, from the perspective of key freight transportation users and providers, of critical points in the freight transportation supply chain. The following summarizes the survey respondents' feedback regarding this issue:

- Of the companies surveyed, 17 indicated freight terminals as their critical traffic flow points;
- 5 companies indicated that line haul routes are the critical traffic flow points and another 11 companies indicated that the freight terminal together with either (or the combination of) line haul routes, gates, and warehouses as critical flow points.
- Ocean carriers and railroad operators indicated that freight terminals and gates are the critical points.

Overall, freight terminals, line haul routes, and gates accounted for the majority of the opinion as the critical traffic flow points.

The survey also included the identification of internal and external security issues. The majority, 29 companies, indicated that the current internal security is sufficient. However, 6 companies, two out of three ocean carriers, one terminal operator, and two of the importer/exporters indicated that their internal security measures are sufficient. Also, nearly all NVOCC/freight forwarders, motor carriers, and 3PL indicated that their internal security measures are sufficient.

Opinions are more or less split regarding the effectiveness of cargo inspection. Of those surveyed, less than half responded that cargo inspection is effective. The general opinion is that inspection of cargo containers after they are within the confines of a US port is pointless as it would be too late to stop a potential disaster. .

While the majority of the companies, 20 out of 35, indicated that the government is doing enough to provide security against future terrorist attack, 13 companies hold the opposite opinion and two did not provide any opinion. Areas of concerns are the following:

- Port security is not sufficient with regard to HAZMAT and cargo security.
- Low priority, on the part law enforcement agencies, in the area of cargo theft.
- Security of "tank farms" around the port

Survey respondents had a number of suggestions, which are summarized below:

- Survey industry and publish feedback, establish focus groups, fund research, furnish opportunities and empower providers to recover costs of enhanced security.
- Share intelligence information.

- Develop and implement uniform security measures.
- Improve port security measures.
- Establish the Office of Homeland Security as the government agency that receives and distributes appropriate information in a way that ensures better safety standards without penalizing the way business is done.
- Place more controls on our borders.
- Increase inspections of inbound container vessels with more highly trained inspection personnel to avoid any import/export delays.
- Enhance US immigration policy and increase manpower to track down illegal aliens.

*Impact of Key Security Regulation or Initiatives*

The Customs – Trade Partnership Against Terrorism (C-TPAT) program, described in detail previously, is a voluntary public-private partnership program that was initiated by US Customs after 9/11. Of the companies surveyed, only eight currently participate in C-TPAT: one railroad operator, all three ocean carriers, one 3PL, one importer/exporter, and two motor carriers. Four companies indicated interest in joining the program: one airfreight forwarder, one terminal operator, one NVOCC, and a customs broker.

The survey also solicited input regarding the 24 Hour Rule, described earlier in this report. Of the companies surveyed, 21 indicated that they are affected by the 24 Hour Rule. Among these 21 respondents, 2 are railroad operators, 11 are motor carriers, one is a 3PL firm, one is a warehouse/distributor, four are importer/exporter companies, and one is a terminal operator. Twelve companies responded that they are not affected and the remaining two indicated that the 24 Hour Rule does not apply.

For those companies indicating they are impacted by the 24 Hour Rule, the following comments were offered:

- The 24 Hour Rule causes substantial delay in picking up and delivering cargo at marine terminals
- The 24 Hour Rule increases time in monitoring shipment
- The 24 Hour Rule causes some inconveniences
- Because the new rule, all vessels coming to the container terminal are affected due to lengthened time frame for container clearance and release.

The 24 Hour Rule, proposed by US Customs in Summer, 2002, was met with a wide spectrum of mostly negative comments from the industry, ranging from irritations to doomsday scenario predictions. The 24 Hour Rule changes the sequence that importers must provide cargo information to US Customs, requiring that part of the information on the manifest be provided much earlier in the process; that is, before the cargo is loaded in a foreign port.

*Summary of Survey Findings*
In summary, the survey results indicate that freight volume and freight movement patterns have not changed significantly in the aftermath of 9/11, which is also supported by recent trends in international trade as well as well as economic indicators. The survey also points out that the most vulnerable points in the freight transportation system, from the perspective of the freight industry are terminals, gates and line haul routes. Most companies surveyed have increased their cargo security training, operating procedures, and established some sort of protocols with government agencies and as a result have increased their security costs. The majority of companies indicated that the government has done enough in the area of freight security. However, security regulations, such the 24 Hour Rule, have affected close to two-thirds of the companies surveyed.

### 3.7.3 Interview Findings

The research team conducted interviews with selected companies from different sectors of the freight community, including motors carriers, ocean carriers, terminal operators, Non-Vessel Operating Common Carriers (NVOCCs)/freight forwarders and overseas third party logistics firms. The purpose of these interviews was to supplement the survey with more extensive feedback regarding cargo security issues. Interview discussions are presented below.

*Motor Carriers*
The New Jersey Motor Carrier Association (NJMTA) is a non-profit organization that represents about 350 truckers, and includes membership from large trucking companies such Schneider, Yellow Freight, and J.B Hunt as well as smaller trucking companies. NJMTA is also affiliated with the American Trucking Association (ATA). The primary functions of the NJTMA include promoting trucking business, addressing industry concerns, political lobbying, and coordinating industry-related business communications. The NJTMA was very helpful in helping the team to reach out to a range of trucking companies in terms of size and operation. The following summarizes the team's discussions with NJTMA member representatives regarding the events of 9/11 and its impacts on the trucking industry.

- The trucking industry played an indispensable role in assisting emergency response personnel and ensuring the movement of goods was maintained in the wake of events immediately following 9/11. The NJTMA was instrumental in providing essential supplies and equipment such as flatbeds, special handling equipment, cranes, and supplies for rescue operations. In addition, the NJMTA closely coordinated with FEMA, police, and TRANSCOM and made available to various government agencies.

- Within two hours of the 9/11 terrorist attacks, the NJMTA started to coordinate with the American Trucking Association (ATA), the state police, and FEMA to stop, re-route, or temporarily store goods of truck traffic destined for New York City, except for emergency supplies. This enabled government officials to concentrate on rescue operations without the interference of unwanted truck

traffic. The second day following the attacks, the NJMTA coordinated with the ATA and other government agencies to allow necessary deliveries into the city to reduce the burden of traffic control.

- With the outpouring of donations following 9/11to the New York City area from locations throughout the country, it was necessary to coordinate the accumulation and distribution of donated goods. Again, NJMTA coordinated with FEMA to set up six designated warehouses in New Jersey to store and distribute donated goods. The inflow of donated goods continued six months after 9/11.

- In the aftermath of 9/11, NJMTA has taken the following steps to decrease security risks from future terrorist attacks:

  - *Membership in the NJ Homeland Security Task Force*. The NJTMA is a member of the NJ Homeland Security Task Force and is responsible for coordinating truck security issues in the state. The NJTMA's ability to connect all trucking associations on a national basis is a valuable asset as demonstrated in the aftermath of 9/11.
  - *Establishing protocols.* The NJTMA has established protocols with various government agencies to coordinate emergency situations. This includes setting up DOT designated "Safe Havens", which are privately owned sites that provide parking during emergency situations. Site owners provide these parking areas on a on a voluntary basis.
  - *Disseminating information*. NJMTA has compiled a database of drivers, "safe havens', warehouses, equipment, telephone numbers, e-mail addresses, and an emergency 24/7 telephone number. In case of emergency, NJMTA can reach out to its member to provide timely information. In addition, websites have been set up to provide security tips to its members
  - *Participating in security awareness programs.* The NJTMA has set up programs to increase security awareness and improve safety. All trucks are equipped with fire extinguisher and all drivers are CPR certified. In addition, the NJTMA participates in the National Highway Watch Program, a federally funded initiative that includes the establishment of procedures to report suspicious activities and real emergency situations.

The team solicited input from regarding the impacts of 9/11 and new government security measures. Some of the opinions regarding expressed by the NJTMA are summarized below.

- Unfortunately, many of the increased security requirements are knee jerk reactions, and not part of a well thought plan. While regulators understand the concern of security, overreaction has only caused unnecessary delays and congestion. For example, tanker trucks have been unfairly targeted for stops and inspections even though HAZMAT and tank truck drivers have had to go through a vigorous licensing process including background checks and successful completion of different exams. Furthermore, tanker trucks many times do not

carry hazardous materials yet have been unfairly targeted for the majority of inspections. In fact, railroad companies, not truckers, carry most of the hazardous cargo.

- Large trucking companies can afford to participate and implement different programs in compliance with or in response to increased security requirements of. Actually, the weakest links are the "mom and pop shops" that lack many of the necessary resources to undertake the same precautions large companies must undertake and as a result, proper background checks do not occur. Sometimes owner-operators themselves have questionable backgrounds. However, with the large number of owner-operators, it is impractical to check every one.

- Seaport security is another weak link. There is no effective way to deal with security issues at seaports, especially container ports. Consequently, it is difficult to prevent the use of a container for a terrorist attack.

- There are too many security programs required by the government such as Patriot Act, C-TPAT, Maritime Security Act, Airline Security Act, etc. Even though the programs are similar, they differ slightly in terms of implementation. Since the truck is the most frequently used mode for picking up and delivery of goods, the trucking industry has had to bear all the additional expenses. The cost of compliance has a negative impact on the industry. The paradox is that large companies such as UPS, Fedex, Yellow Freight, Roadway and Flex Van have already implemented those programs. It is actually the smaller companies and owner-operators that are falling behind. Using the 20-80 rule, 20% of the companies account for 80% of the freight volume. The remaining 80% of the trucking companies though small; represent greatest security risk.

- Standard security requirements for fingerprints, criminal background checks and background checks are lacking. And while there are differences between criminal background checks and background checks, people often confuse and interchange the two. Furthermore, since there is a lack of coordination among government agencies in the implementation of security programs, the cost of these checks falls upon individual drivers.

- Stepped up security measures have increased congestion, which has lead to higher fuel consumption and lost wages. For example, the cost of delay is as high as $175 an hour and, as many drivers make their living based on the miles they drive, longer driving times for the same number of miles is highly inefficient and costly. Unfortunately, the trucking industry has had to absorb the cost for additional security training, security plan, and procedures with no relief in sight.

- Currently, new technologies such as Global Positioning Systems (GPS) and other software applications are designed to improve efficiency, but do not necessarily improve security. For example, GPS is currently being used by management to monitor driver performance and behavior. In the future, GPS could be used to

shut down a truck engine using remote satellite control. However, the cost of a GPS unit is still expensive, about $1,500 to $2,000 per unit and as a consequence, they are primarily used in long haul trucks only. It should be noted that GPS units and SAT phones have been employed on European long-haul trucks serving eastern Europe, Central Asia, and the FSU for a number of years. The cost per unit in the mid 90's was 5,000 – 7,000 USD per unit.

- Cargo theft continues to be a major issue. Last year alone, losses from cargo theft totaled $15 billion. Unfortunately, cargo theft is not a high priority among law enforcement officials. NJMTA will be playing an active role in cooperating with law enforcement agencies to crack down on this problem.

- NJTMA representatives suggested the following to enhance cargo security:

  - There should be a single standard for security programs. A panel of experts in the transportation industry should be formed to study security issues and solicit input from stakeholders in developing uniform security standards. Furthermore, different government agencies should closely coordinate with each other to streamline procedures, protocols, and implementation standards. No single industry or government agency can address these issues alone.

  - The federal government should provide resources to improve security against future terrorist threats and not just enact new rules and new regulations. In addition, greater emphasis should be placed on intelligence gathering.

  - Infrastructure security should be a priority. Intermodal connectors are the major choke points and maintaining security at such locations would ensure safe and efficient flow of goods. The George Washington Bridge is a prime example as it is probably the busiest crossing point in the nation. Its shut down would be irreparable to the regional economy. Attention should also be paid to major intermodal cargo hubs, seaports, airports, and connectors. As the country relies more heavily on international trades, the shutdown of major seaports will cause far more extensive damage than an attack on landmark building or commercial properties.

  - Set a national standard for background checks, electronic fingerprints (biometric card) for all drivers. A national ID card would help to improve security.

  - Security experts, not regular government agency staffs, should serve on committees and relevant agencies in making security regulations. For every new rule made, there is consequence and cost involved. Too often, people in decision-making circles do not understand the consequences of their actions. This only frustrates the industry.

*Ocean Carriers*

The research team interviewed the Director of Trade Administration/Corporate Security Officer of one of the largest global ocean carriers in the world. The company consists of several different divisions including bulk carrier, car carrier, tankers, logistics and container terminal management. The company operates at a global scale with its container liner company providing services for major trade routes in the world and North America. Trade within the US represents the largest portion of the total revenue in its liner division. The name of the company has been withheld for confidentiality reason.

The Director is responsible for government regulatory issues with US Customs and the Federal Maritime Commission, compliance with trade policy, development of company security procedures, and technical review of trade and service contracts. Interview discussions are summarized below:

- The carrier has been very serious about safety and security. Lessons were learned in the past when the company did not exercise tight control over safety and security issues. Since late 1980's, however, the company has developed, implemented, and upgraded comprehensive vessel safety and security procedures. Recently, the company has been ISO certified in the area of safety.

- Following 9/11, the company was the first sea carrier to join C-TPAT. In addition, the carrier has been actively coordinating with import/exporters as well as vendors to improve cargo security. The company even has its vendors certified with formal documented security commitments. Internally, the company is in the process of developing training programs to heighten security awareness and improve security process.

- Since the company is engaged in global trade, the liner services cover major trading routes. Containers destined for New York from Far East/Asia enter the region from the transcontinental intermodal landbridge as well as water routes (Panama Canal and Suez Canal). The cargo routed through the intermodal landbridge is discharged in West Coast ports and then moved to destinations by rail. Approximately 65% of the incoming goods are transported by water and 35 % enter the region intermodally.

- The impact of 9/11 on cargo volume is minimal with volumes having increased slightly and vessels, at present, are full. The company has changed its cargo routing and also has elaborate routing options and contingency plans to deal with emergency situations. However, these contingency plans are internally held and are not revealed to the general public for security purpose.

- After 9/11, US Customs has implemented the 24 Hour Rule for all import/export cargo. The rule requires that cargo manifests for both imports and exports have to be filed 24 hours before vessel *departure from load port.* Prior to the 24 Hour Rule, importers had up to 48 hours to file the inbound cargo manifest prior to the vessel *arriving* in the US. This change was intended to provide customs

inspectors with sufficient time to undertake cargo screening and weed out suspicious cargo before loading on vessel. As a result of the new 24 Hour Rule, the company has had to undertake system changes and reprogramming. The cost for this undertaking was estimated at $113,000. In addition, the company has had to hire an additional 47 people to deal with the 24 Hour Rule. Normal business hours have been replaced with a 24/7 operation.

- As a result of increased security, the average container turn-time, the time required for a container to be discharged from a vessel as an import move and then loaded back to the vessel as an export move, increased from 19 days to 23 days. This means that the inventory turnover rate is decreased, which, in turn, requires more space to store containers.

- The company believes that increased security across the supply chain will yield benefits. Furthermore, programs and procedures have been established to increase security awareness among all participants including freight vendors. However, supply chain security does not go beyond the container seal, meaning that the carrier's security coverage does not include the contents inside the container.

- According to some, the 24 Hour Rule does not provide tangible benefits. It was suggested that the government sponsor a neutral party consisting of all participants in the supply chain to study security issues across the freight supply spectrum and develop recommendations. It was also suggested that the government monitor the effectiveness of the security measures resulting from the recommendations. Finally, the government needs to work on the basis of public-private partnerships in dealing with the cargo security issues.

*Terminal Operators*

The research team conducted an in-depth interview with a container terminal operator company located at Port Newark. The company is actually a division of a large container carrier, one of the top five container carriers in the world. Interview discussions are summarized below:

- The terminal has 176 acres for vessel operations, container storage, maintenance, cargo receiving and delivering, and administration functions. The terminal is designed to accommodate a throughput capacity of one million TEUs and has just completed redevelopment plans that include strengthening and deepening berths in order to accommodate the newest class of container vessels. In addition, the terminal uses the latest cargo handling technology such as OCR gate and advanced terminal management information system to deal the growing volume of containers.

- After 9/11, the company has doubled the number security guards at the terminal. Also, a representative from the terminal serves on the sub-committee of port security of the Port Authority of NY/NJ to coordinate security matters. Based on

the requirements of Maritime Transportation Security Act, the terminal has developed operating plans according to different threat levels: MARSEC Level I (Homeland Advisory Levels – Low/Green, Guarded/Blue, and Elevated/Significant Risk), MARSEC Level II (Homeland Advisory Levels - High/Orange), and MARSEC Level III (Homeland Advisory Level – Red/severe).

- Several other security measures have been implemented. The terminal is a member of the Operation Safe Commerce Program (OSC) and will also become a C-TPAT member, requiring that further steps be undertaken to enhance its internal security. Also, security technology has been or will be deployed in the future. Global Positioning Systems (GPS) technology and the use of electronic seals on containers ensure that the integrity of the container can be monitored from the point of origin to destination. The terminal is in the process of applying for federal grants to purchase CCTV, sweep card readers, electronic boom gates, and other security equipment. Cargo theft is not a problem because the terminal uses straddle carriers to handle container transfer in the yard and nobody is allowed in the straddle carrier operation area.

- While the terminal puts a great deal of effort in cargo safety and security measures, there are a number of concerns regarding security and non-security personnel employed at the terminal. Currently all 11 security guards are union workers with relatively low paying scale. Only three of the 11 are employed by the terminal on a full time basis. The other eight are temporary workers. Due to union rules and the lack of regularity of the security force, it is difficult to train security personnel and maintain a high level of proficiency. Furthermore, background checks on Longshoremen, conducted by the NY/NJ Waterfront Commission, only include personal and work histories in the US.

- Another area of concern, but one that is often overlooked, is access to ship stores. Ships often take delivery of provisions and spare parts to replenish supplies. Prior to arrival at the port, the ship owner's office place orders to chandlers onshore via the ship's agent or owner's representative. When the vessels arrive at port to perform cargo operations, chandlers (vendors) deliver ordered goods dockside. Delivery vehicles enter the terminal alongside the ship and crewmembers load the stores onboard. However, there are no security checks of the contents. This is a security gap.

- Increased container inspections have had a major impact on container operations. Prior to a vessel arriving at the port, a list of containers to be inspected is presented to the terminal operator by US Customs. The terminal operator is then required to develop a plan to locate these containers to a designated area for inspection. Therefore, in addition to routine vessel operations, equipment and personnel have to be assigned to handle containers requiring inspection. Prior to 9/11, only 1% to 2% of the containers were inspected. Now, up to 5% of the containers are inspected. These additional inspections not only reduce

productivity and increase costs, but result in longer port stays which compromise vessel schedule integrity and ultimately reduce a ship's service level.

*NVOCC/Freight Forwarder*

A Non-Vessel Operating Common Carrier (NVOCC) is a private firm that consolidates and disperses international containers. It serves as a third party transportation service provider that does not operate vessels, but issues cargo documents such as bills of lading and undertakes cargo liability. It also acts on a shipper's behalf to secure vessel space, arrange inland transportation moves and facilitate cargo documentation. The following summarizes interview discussions with one NVOCC firm.

- Since the NVOCC does not actually move goods, the impact of increased security is less severe than other supply chain entities. However, post 9/11 freight security regulations, particularly the 24 Hour Rule, have significantly impacted operating procedures and costs. Prior to the implementation of the 24 Hour Rule, the NVOCC would book cargo space with ocean carriers before vessel arrived at port and then would send the complete cargo manifest information to carriers after vessel departure. The carrier would then submit electronically the vessel cargo manifest to US Customs for clearance. However, 24 Hour Rule has changed the sequence information submission US Customs. Because the new rule requires that the cargo manifest has to be submitted 24 hours prior to vessel loading and a precise cargo description has be provided, many NVOCC firms started to file cargo manifest information to US Customs directly without using the carrier in order to maintain the confidentiality of their clients' information.

- In order to be able to file a cargo manifest with US Customs directly, many NVOCC firms were required to set up a system capable of transmitting and receiving information to and from US Custom's AMS (Automated Manifest System). While filing cargo manifests with US Customs electronically did not appear at first so difficult, there was an unintended effect that caused some chaos. Since some NVOCC firms file their cargo manifest with US Customs directly, ocean carriers have no way of knowing which containers have been cleared or approved by US Customs for loading. With no direct link between NVOCC firms and ocean carriers, many NVOCC firms were required to fax the approvals to carriers before carriers could reserve cargo space and load the containers. Furthermore, some intermodal moves require NVOCC firms to purchase special bonds with US Customs. Now, many NVOCC firms have hired additional personnel to deal specifically with 24 Hour Rule compliance issues.

*Overseas Third Party Logistics Firm*

The research team also conducted a telephone interview with one overseas Third Party Logistics (3PL) firm that conducts business in the US. Inevitably, 3PL firms are also affected by the 24 Hour Rule and the 3PL representative with whom we spoke, had similar comments to those of the NVOCC firm representative:

- Generally speaking, the 24 Hour Rule has caused the company to change operating procedures and has incurred additional costs. Additional staff time is required to monitor cargo bookings, deal with US Customs approvals and track shipments. Furthermore, in order to comply with shipment documentation reporting requirements, the 24 Hour Rule has forced manufacturers to work on a more stringent production timeline. This has reduced the level of flexibility in the supply chain. Overall, the 24 Hour Rule has no benefits but has resulted in additional time and costs.

# 4.0 CONCLUSIONS

The conclusions provided below are grouped into the following sub-categories: Identification of Data Needs; Critical Freight Needs for the NJTPA region; Freight Planning Process and Freight Related Impacts of 9-11.

## 4.1 Identification of Data Needs

As part of the work done during the initial phase of this study, the research team completed a thorough process of identifying any and all potential data needs. While some of the data necessary is readily available in-house or would be easy to obtain, there are several items that required some outside assistance. The study team presented their data needs at one of NJTPA's Freight Initiative Committee Meetings. The following summarizes potential data needs by category.

### 4.1.1 Potential Data Needs – Highway Network

*Roadway Capacity*

- Number of Lanes
- Geometry (Grade, Curvature, Clearances, Etc.)
- Speed Limit

*Roadway Usage*

- Truck Percentage (By Time Of Day)
- Ton-Miles Traveled (by Commodity)
- Congestion

*Other Issues*

- Tolls (by Truck Class and Time Of Day)
- Safety (Accident Rates, Truck Accident Rates)
- Routing Regulations and Truck Bans
- ITS Implementation

### 4.1.2 Potential Data Needs – Truck Terminals

*Terminal Capacity*

- Number of Bays
- Storage Area
- Hours Of Operation

*Terminal Usage*

- Trucks Per Day (Arrivals And Departures)
- Tonnage Handled (By Commodity)
- Terminal Configuration / Layout
- Wait Times
- Cargo Dwell Times

*Other Issues*

- Access To / From Terminal To Regional Road Network (Distance, Geometric Adequacy, Signage, Capacity)
- Known Specific Terminal Constraints
- Planned Physical / Operational Improvements

Intermodalism
ITS Implementation

4.1.3 Potential Data Needs – Rail Network

*Rail Line Capacity*
- Number Of Tracks
- Geometry (Grade, Curvature, Clearances, Etc.)
- Speed Limit
- Shared Passenger / Freight Usage
- Signal Adequacy

*Rail Line Usage*
- Number Of Trains
- Tonnage Carried (by Commodity)
- General Origin / Destination Data

*Other Issues*
- Customs Clearances (EWR vs. JFK bond clearance)
- Switching Locations
- Known Specific Line Constraints
- Planned Physical / Operational Improvements
- ITS Implementation

4.1.4 Potential Data Needs – Rail Terminal

*Terminal Capacity*
- Tracks
- Storage Area
- Hours Of Operation

*Terminal Usage*
- Trains Per Day (Arrivals And Departures)
- Tonnage Handled (By Commodity)
- Terminal Configuration / Layout
- Wait Times
- Cargo Dwell Times

*Other Issues*
- Access To / From Terminal To Regional Road Network (Distance, Geometric Adequacy, Signage, Capacity)
- Known Specific Terminal Constraints
- Planned Physical / Operational Improvements
- Intermodalism
- ITS Implementation

4.1.5 Potential Data Needs – Marine Operations / Terminal

*Terminal Ownership / Operator*

*Terminal Capacity*
- Berths
- Acres / Storage Area
- Hours Of Operation

Gate Capacity
Number of Cranes

*Terminal Usage*

Tonnage Handled (By Commodity)
Terminal Configuration / Layout
Wait Times
Cargo Dwell Times
Lift Costs

*Other Issues*

Access To / From Terminal To Regional Road Network (Distance, Geometric Adequacy, Signage, Capacity)
Known Specific Terminal Constraints
Planned Physical / Operational Improvements
Intermodalism
ITS Implementation

4.1.6 Potential Data Needs – Air Freight Operations / Terminal

*Carrier Companies*

*Capacity*

Gate Capacity
Storage Area

*Terminal Usage*

Number of Flights
Tonnage Handled (By Commodity)
Terminal Configuration / Layout
Wait Times
Cargo Dwell Times

*Other Issues*

Access To / From Terminal To Regional Road Network (Distance, Geometric Adequacy, Signage, Capacity)
Known Specific Terminal Constraints
Planned Physical / Operational Improvements
Intermodalism
ITS Implementation

4.1.7 Potential Data Needs – Intermodalism

*Intermodal Terminals*

Rail / Truck, Marine / Truck, Air / Truck, Marine / Rail, Marine / Barge, Cross-Ship Marine Lightering

*Usage*

Tonnage Handled (By Commodity)
General Origin / Destination Data (By Commodity)

*Other Issues*

Drayage Cost Rates
Intermodal Inefficiencies

4.1.8 Potential Data Needs – Commodity Specific
*Origin / Destination Data By Mode*
*Tonnage By Mode*
*Value Of Goods*
*Ton-Miles Traveled By Mode*

4.1.9 Other Data Needs

In addition to the above, a number of other data needs were identified during the course of the study and are described in further detail below.

*Movement of non-container freight traffic*. The transport of goods via large metal boxes or "intermodal containers" is highly efficient in terms of freight intermodality, i.e. direct loading and unloading between freight transport modes. A single TEU intermodal container typically measures approximately 8 feet wide by 20 feet in length and 8 feet deep. More common, however, are the larger 40-foot long, 2 TEU, intermodal containers. The magnitude and content of containerized goods is well documented and, as such, goods movement via intermodal container can be modeled relatively easily. Unfortunately, non-containerized goods movement is not so readily determined. And while the TRANSEARCH database provides information on commodity flows and modes of travel, the relationship between commodity flows and truck volume is not clearly understood. The movement of non-commodity goods and secondary movement of freight, discussed below, further complicate modeling non-containerized movement of goods.

*Secondary movement of freight*. The PANYNJ reported that 3.7 Million TEUs entered its facilities in Year 2002, with New Jersey facilities handling the majority. Large numbers of containers also enter the NJTPA region through the land-bridge from the West Coast via freight rail and truck. While the number of containers entering the ports can be quantified and points of "first rest" identified, tracking subsequent moves is far more difficult to estimate. Therefore, these estimates are often inferred based on the STM. Even field counts are somewhat questionable due to the ability to "see" what is inside the container. Obtaining better information regarding these subsequent or "secondary" movements would provide a better understanding of goods movement and a greater ability to identify future problem areas. The impact of land use strategies could also be more accurately assessed. Data on secondary movements could possibly be obtained through an expansion of the TRANSEARCH database and/or a comprehensive survey of freight and logistics providers that is conducted on a regular basis.

*Rail freight movement*. Rail operators, as private, for profit businesses are understandably reluctant to publicly release rail freight goods movement data. The Rail Waybill Sample, which contains data on one percent of the overall goods movement via rail, is made available for public purchase, but unfortunately, does not fully encompass goods movement by rail. Expansion of the Rail Waybill Sample, possibly supplemented by additional information on short line rail operators, could greatly enhance the planning and prioritization of publicly funded initiatives to divert truck movements onto rail.

*Incoming freight into New Jersey ports.* The Port Import Export Reporting System (PIERS) database provides information on import and export flows into and out of international marine ports. PIERS data is derived from shipping waybills with the addition of shipper and consignee information. Much of PIERS data for northern New Jersey facilities is lumped together with information for the New York ports since all are under jurisdiction of a single entity, the Port Authority of New York and New Jersey (PANYNJ). Although this information is useful, it would be more beneficial to break down the data separately for New York and New Jersey and even for distinct PANYNJ facilities.

*Truck volume counts.* The Statewide Truck Model is a valuable tool that was developed to predict truck volumes on selected roadway links throughout the state. The model uses actual field truck count data and then estimates truck volumes where truck volume data is missing or incomplete. However, actual truck volume data, particularly on key links surrounding the ports, is limited. Additional field counts should be conducted programmatically and with this information then integrated into the STM.

*Freight movement by barge*. Movement of goods via barge has some promise for alleviating truck traffic, particularly within the context of Port Inland Distribution Network (PIDN), a concept being advanced by the PANYNJ and NJDOT. Additional information on existing and forecasted freight barge flow and the issues surrounding the movement of goods via barge should be expanded.

Enhancements to freight data sets could significantly improve the ability to better determine existing freight flow conditions, predict future freight flow and identify deficiencies and evaluate strategies. With limited resources for strategies and initiatives that can potentially improve freight flow, freight related data is critical in making decisions about where and how to allocate these limited resources and how freight improvement initiatives should be advanced and prioritized.

## 4.2 CRITICAL FREIGHT NEEDS FOR THE REGION

As discussed in Section 3, specific goals and therefore needs cannot be determined for system use, safety, environmental, and system redundancy indicators. Distinct goals and needs can be determined, however, for the system efficiency (mobility and reliability) and infrastructure (bridges) indicators can. The following section outlines the freight needs as described by the FPSS system for the existing (2000) and future (2025) conditions.

### 4.2.1 Freight Mobility

Summaries of freight mobility for the 158 districts are summarized in Figures 4.1 and 4.2 for the years 2000 and 2025, respectively. Existing freight mobility conditions fall short in much of southern Bergen County, eastern Morris County, and in parts of Essex,

Hudson, Passaic, Middlesex, Monmouth, and Union Counties. The general corridors with limited mobility are the I-287 corridor, and New Jersey Turnpike and I-95 corridor, and the eastern parts of the I-80 and I-78 corridors. Conditions worse dramatically in 2025, and begin to affect all counties within the NJTPA jurisdiction.

### 4.2.2 Freight Reliability

Freight reliability is reported in Figures 4.3 and 4.4 for Years 2000 and 2025, respectively. While the conditions deteriorate somewhat from 2000 to 2025, the change is not nearly as dramatic as that seen in changes to mobility. One possible explanation is that the large growth in volume increases recurring delay so much that increases in non-recurring delay do not register large changes by comparison.

**Figure 4.1: 2000 Freight Mobility Needs**

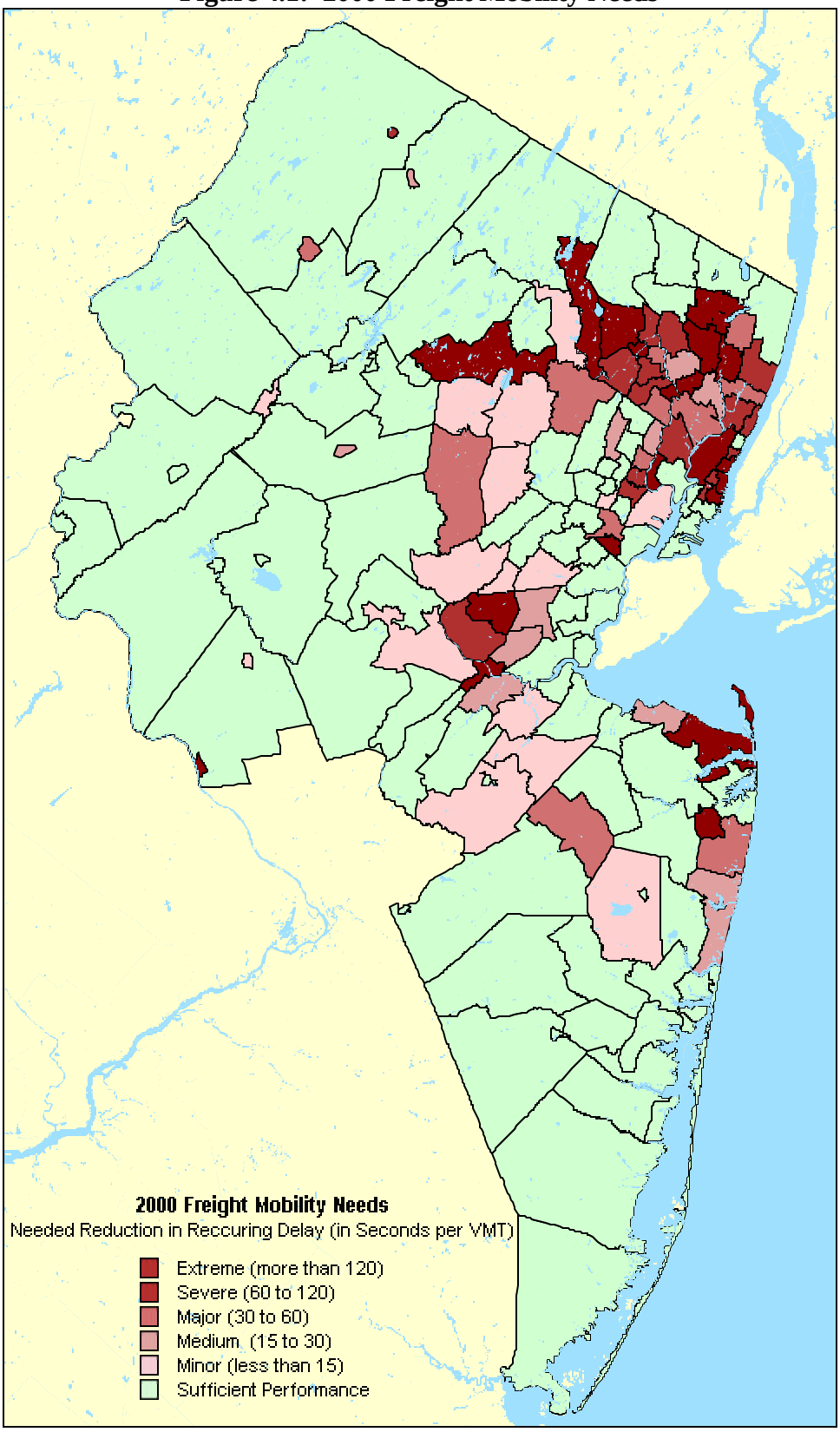


**Figure 4.2: 2025 Freight Mobility Needs**

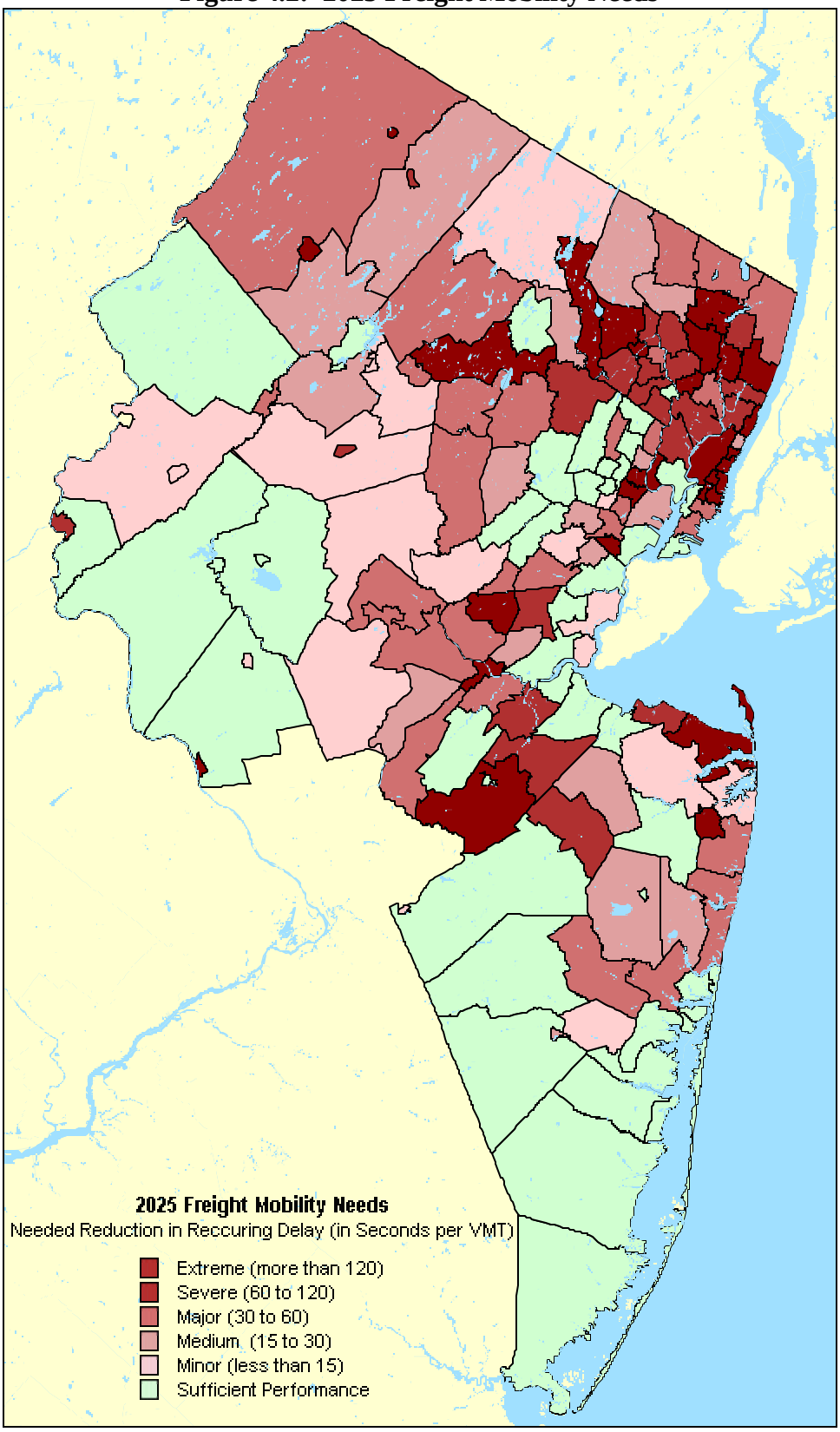


**Figure 4.3: 2000 Freight Reliability Needs**

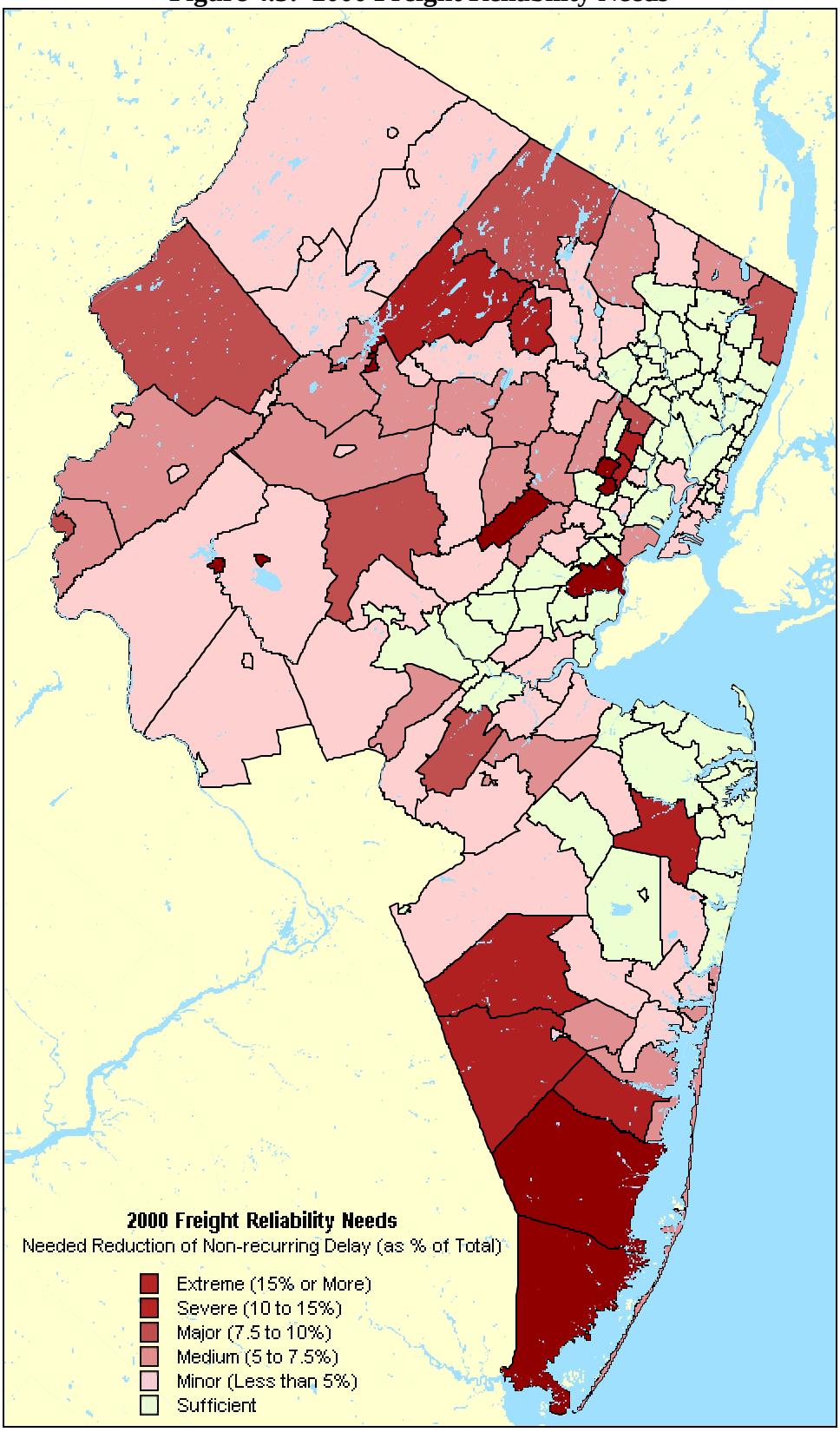
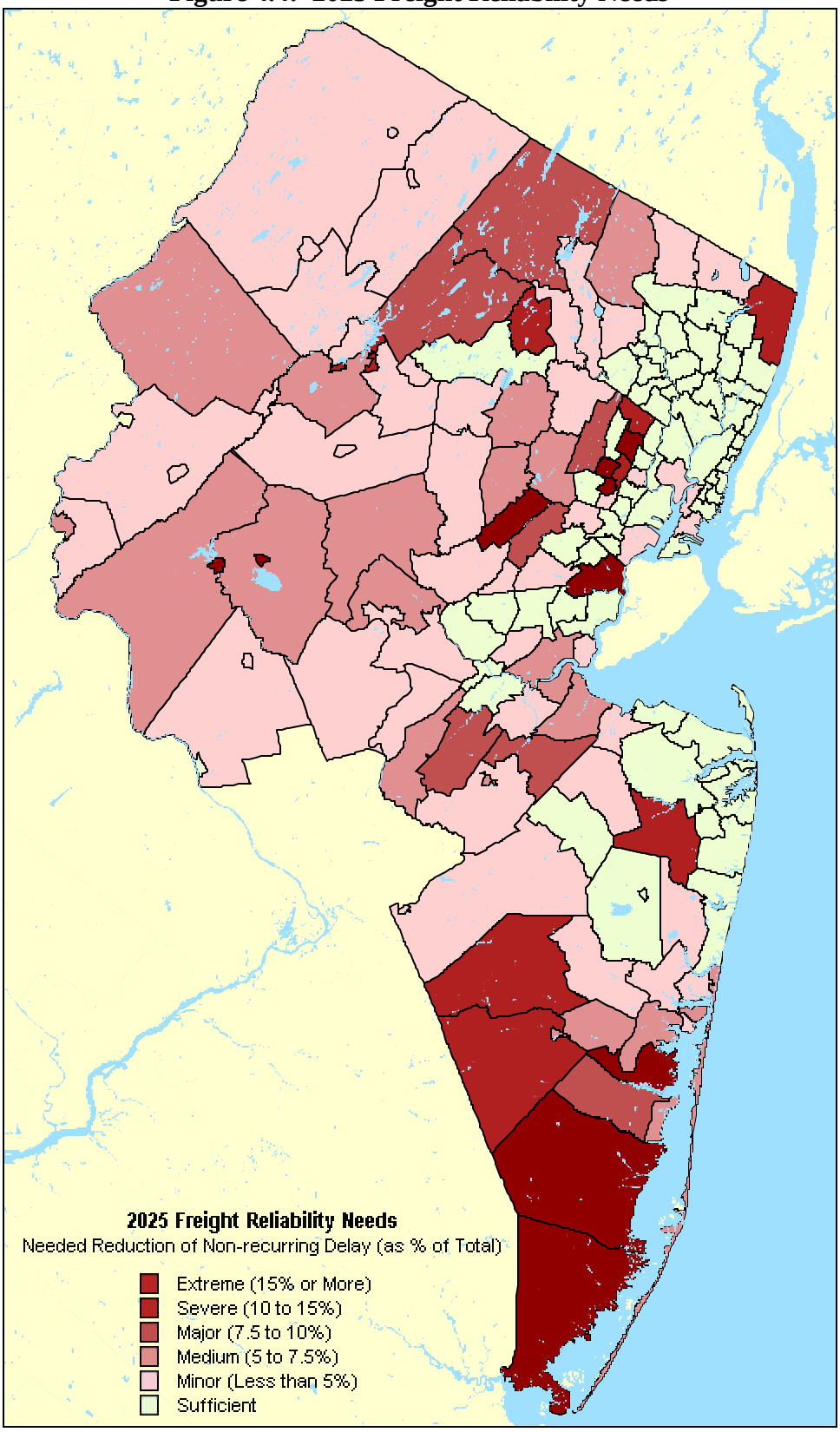


**Figure 4.4: 2025 Freight Reliability Needs**



### 4.2.3 Freight Infrastructure

For freight to be serviced well by the transportation system, the system infrastructure must be of a sufficient nature. The majority of freight moving through the region moves on trucks and therefore over the highway infrastructure. While autos account for the majority of daily traffic on the region's roadways, the additional weight of trucks has a greater detrimental effect on infrastructure.

In order to prioritize which bridges need upgrading and/or maintenance for serving the trucking industry, a composite index is created combining the sufficiency score of the bridge and the daily heavy truck volume using that bridge:

*Bridge Infrastructure Need = Daily Heavy Truck Volume * (50 – Sufficiency Score)*

This 'daily heavy truck deficiency volume' prioritizes the deficient bridges from a freight perspective. Figure 4.5 identifies the bridge infrastructure needs of insufficient bridges (those with a sufficiency score of less than 50) across the region for existing (2000) conditions. Needs for improvement for the year 2025 are shown in Figure 4.6.

**Figure 4.5: Highway Bridge Infrastructure Needs – 2000**

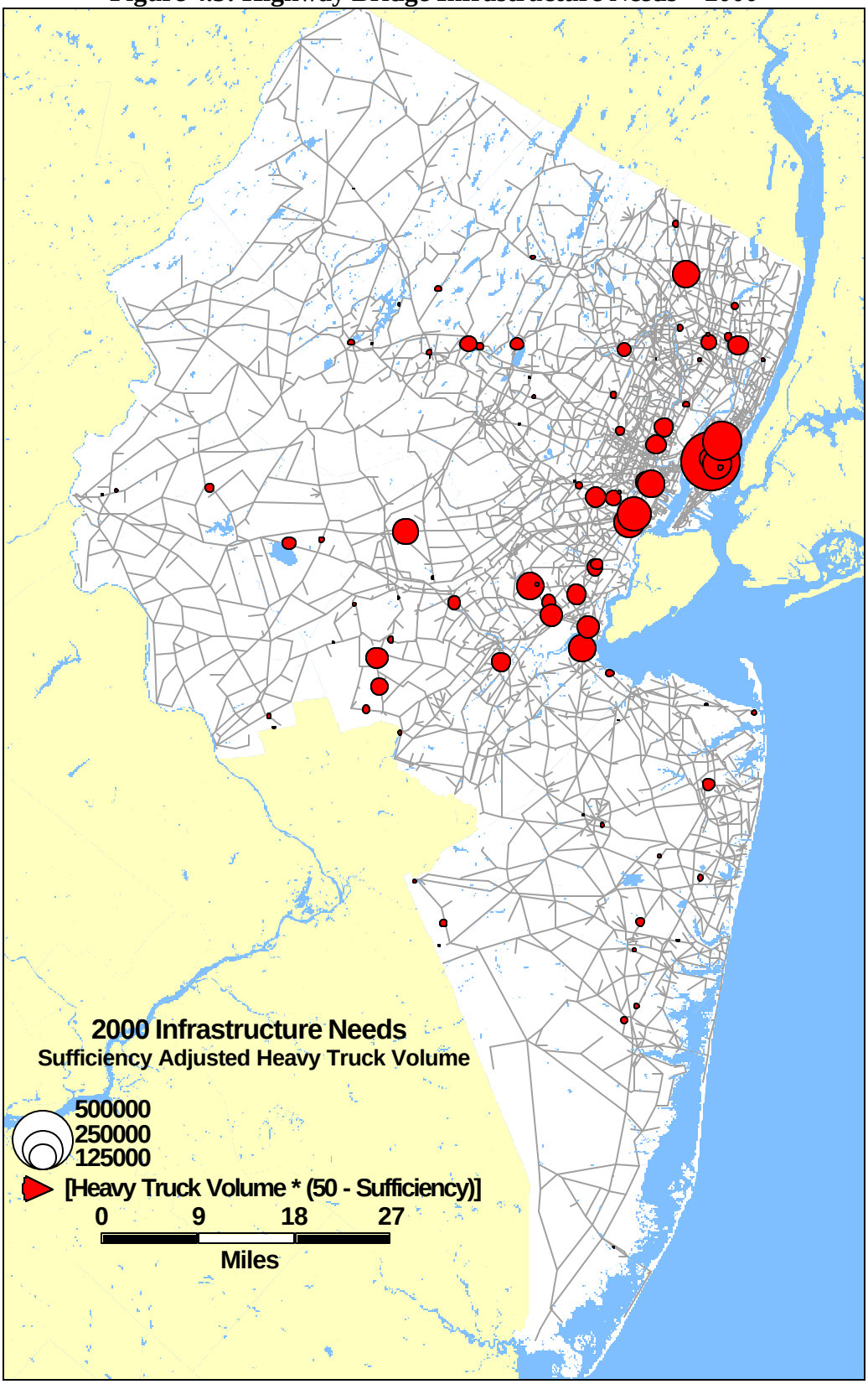
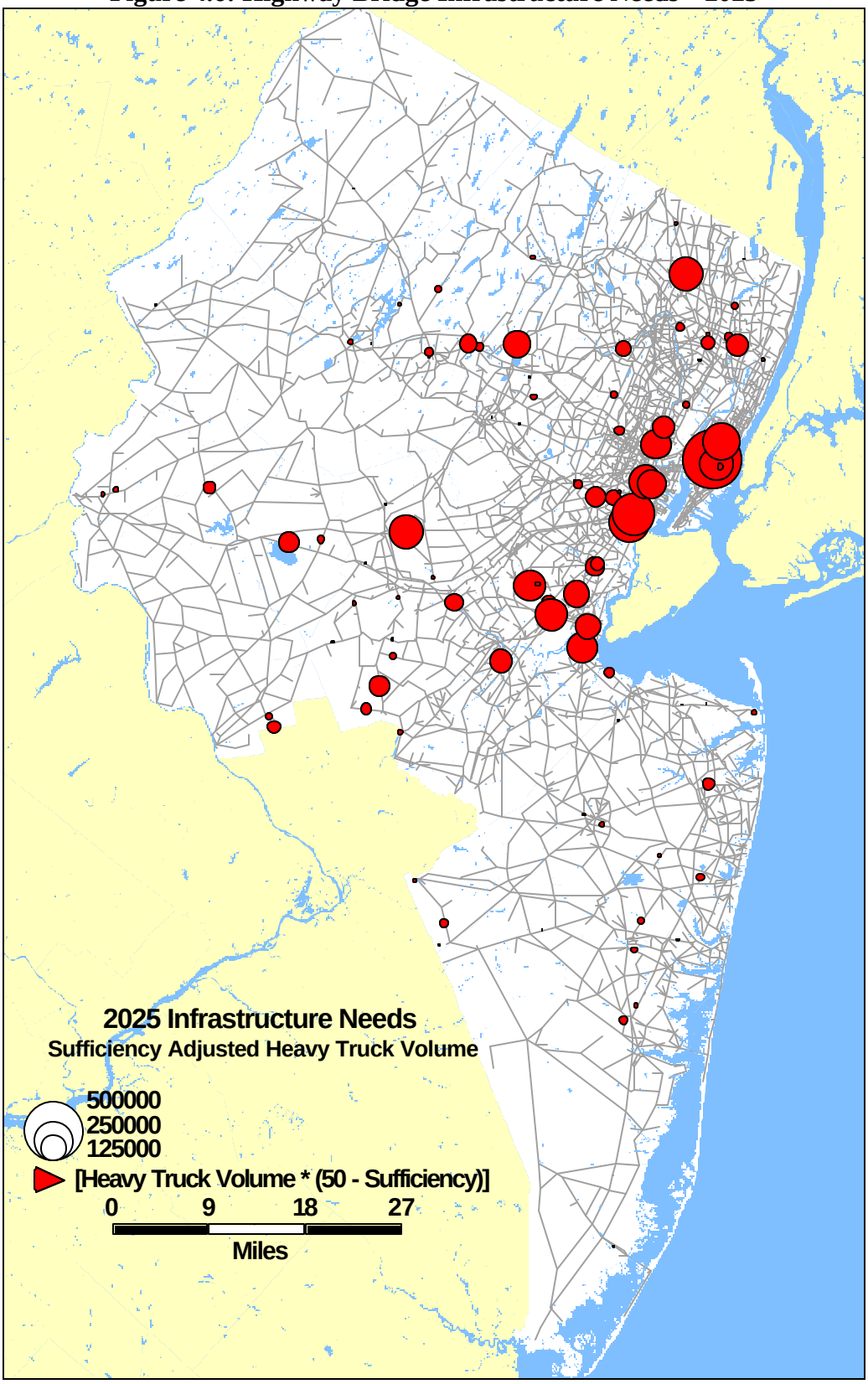


**Figure 4.6: Highway Bridge Infrastructure Needs – 2025**



## 4.3 FREIGHT PLANNING

### 4.3.1 Freight Planning Activities Nationwide

Section 1203 of the current Transportation Equity Act for the 21st Century (TEA-21), a Metropolitan Planning Organizations (MPO) is required to consider freight planning in the overall metropolitan transportation planning process. Specifically, the enabling legislation "shall provide for the consideration of projects and strategies that will…increase the accessibility and mobility of options available to people and for freight;". TEA-21 also requires that the planning process "enhance the integration and connectivity of the transportation system, across and between modes, for people and freight;". Forthcoming federal transportation legislation will likely include similar provisions. Hence, the need to accommodate freight mobility needs and integrate freight mobility in designated metropolitan planning areas is not only a logical element of the overall transportation planning process, but is and will continue to be mandated for designated MPOs.

In 2001, as a follow-up to the legislation, FHWA's Offices of Metropolitan Planning and Programs, Intermodal and Statewide Programs, and Freight Management and Operations conducted a series of surveys of state transportation departments and MPO freight transportation planning activities. Overall, 84 percent of the MPOs that took part in the FHWA survey were found to discuss freight in their respective long-range transportation plans. Of those surveyed, however, less than half have a specific freight related project included in their Transportation Improvement Program (TIP). In general, most TIP projects are not designed to specifically address freight issues. Therefore, freight mobility needs and initiatives that address freight mobility are essentially coincidental with other transportation needs.

Some of the more alarming results show that only 13 percent of the MPOs surveyed utilize freight specific data and/or analytical tools specifically designed to forecast and evaluate freight related strategies and initiatives. The Reebie TRANSEARCH Database and Port Import Export Reporting System (PIERS) database were the most common sources of freight related data. In estimating, forecasting and evaluating impacts associated with freight improvement initiatives, it was found that MPOs typically model truck volumes in the same manner in which passenger traffic is modeled and then apply equivalency factors (e.g. 1 truck = 2 or 3 passenger vehicles).

The NJIT research team identified several MPOs that have a specific focus on freight planning and have active marine ports within their respective regions. Specific MPOs the team reviewed along with information provided by each is provided in Section 3, Findings. It is noted that each has specific freight planning activities, including collection and assemblage of freight related data, establishment of freight advisory groups and committees, and integration of freight mobility projects in their overall planning process. Furthermore, nearly all include specific freight projects in their TIPs and identify specific freight corridors.

While federal transportation legislation makes MPOs responsible for addressing freight mobility, freight planning guidelines are not specific. Consequently, there are a wide range of MPO approaches to addressing freight planning. Clearly then, establishing a process to effectively deal with freight mobility is an evolving area, especially for MPOs, such as NJTPA, that experience a high level of freight activity.

### 4.3.2 NJTPA's Freight Planning Activities

Freight planning activities at NJTPA are largely integrated into the more comprehensive Strategy Evaluation Process, which identifies specific performance measures in a number of general transportation and land use efficiency categories. At the onset of the process, it was apparent that different regions have varying needs in terms of mobility. Furthermore, it was necessary to break down the region into analysis zones to evaluate the impact of specific strategies. Consequently, the region was divided into 158 "Needs Districts", recognizing that different areas with the NJTPA region have different characteristics and consequently different transportation needs.

The Strategy Evaluation Process also develops a set of geographical definitions or "scales", which were used to frame possible outcomes as well as identify how and by what agency or agencies could implement the strategy. The outcome of this comprehensive effort was a table listing a candidate strategy category, specific examples of each strategy and the respective scale. A total of 24 candidate strategies were determined. Of these 24, two candidate strategies, Operational Freight Facility Improvements and Intermodal Freight Transfer Facilities are directly related to freight mobility.

Recognizing that Operational Freight Facility Improvements would most likely be focused in and around the port area, 32 of the 158 Need Districts were identified as locations where such strategies would be implemented. The 32 "Intermodal Freight Locations" are clustered around the Newark and Elizabeth Seaports. Intermodal Freight Transfer Facility Improvements, which are aimed at improving rail operations and shifting freight movements from truck to rail are regional in scale.

Once projects and strategies have been identified, they are then evaluated using a variety of indirect and direct measurement techniques including transportation demand models, economic measures and demographic forecasts. A "score" is applied to the particular strategy or measure. Projects and strategies can then be "ranked" and compared to goals and as assessment can be made of whether the strategy helps to achieve the goal.

The Strategy Evaluation Process provides a platform from which to rank and prioritize a range of strategies and initiatives aimed at improving transportation access, mobility and safety. Freight mobility has also been incorporated into this process. One effort being undertaken by NJTPA to advance the importance of freight and freight mobility initiatives is the establishment of the Freight Initiatives Committee, which consists of representatives from a number of public, quasi-public and private sector transportation providers. This committee meets bimonthly to discuss and take action on a range of

transportation and land use issues that affect goods movement. Meetings are also open to the public, providing an opportunity for input and feedback from non-committee members.

The Freight Initiatives Committee can provide the necessary forum to fully develop and advance initiatives to improve freight mobility in the NJTPA region. Committee members represent many of the agencies that can effectively implement potential strategies, and the meetings provide the opportunity for public input, which can facilitate feedback from key freight transportation organizations, private sector transportation providers, and other public sector agencies representatives involved in land use and economic development activities. The Freight Initiatives Committee can also recommend specific actions that can be advanced to the full NJTPA Board of Trustees, which can then advance specific projects, studies and initiatives for funding. In summary, the Freight Initiatives Committee is a vital to freight planning in the NJTPA region because it can:

- Provide the necessary forum to develop and expand new strategies and initiatives
- Include a wide range of public and private sector representatives including freight and logistics operators, rail service providers, highway transportation providers, port terminal operators and marine transportation providers.
- Provide a process to disseminate information in a timely efficient manner
- Formally advance specific projects, studies and other initiatives to improve freight mobility in the region.

### 4.3.3 Freight Data

The ability to gather, organize and disseminate accurate, up-to-date freight related data and information is essential to effective freight planning. Through the course of the FPSS study, many relevant data sources have been identified and have been used to establish existing base freight flows and forecasts. Sources include the following:

- Army Corps of Engineers Pier Database for New Jersey.
- Reebie TRANSEARCH database
- Marine Facilities Data (NYMTC Freight Facilities and System Inventory) and Rail Yards Data (NYMTC Freight Facilities and System Inventory)
- Port Import Export System (PIERS).
- NTAD-based rail GIS-based map
- GIS database of New Jersey business locations (ESRI's GIS Database 2001)

However, gathering, and in some cases, interpreting this information was time-consuming and cumbersome. Adding to this complexity is the proprietary nature of freight related data and the understandable reluctance of rail and trucking companies to release information. Furthermore, the most relevant data sources, Reebie Transearch Commodity Flow and the and Port Import Export System (PIERS) databases, while available to the public, must be purchased. Other datasets provide a very limited amount

of data. For example, the Rail Waybill Sample, which also must be purchased, only provides a 1 percent sampling of all rail flow data.

### 4.3.4 Freight Modeling

A number of computer modeling tools have been developed and are capable of estimating roadway link volumes due to changes in the roadway network itself or other factors such as land use and socio-economic patterns. Being able to estimate roadway link volumes and using roadway link characteristics, including the number of lanes, lane widths and travel speeds, these models can also determine performance measures, such as travel time, travel delay, fuel consumption and vehicle emissions.

The NJTPA employs the North Jersey Regional Transportation Model (NJRTM) for forecasting total roadway link volumes. Initiated in 1986, the NJRTM is primarily based on the TRANPLAN software package and uses the four-step model process of trip generation, trip distribution, modal choice and traffic assignments.

Using census data as well as model linkages from NJ TRANSIT, the NJRTM estimates "person-trips" by mode and trip purpose. The model also breaks down the 24-hour flow estimates into three distinct periods: AM peak period, PM peak period and off-peak usage. The roadway network includes interstate, state, 500 series county roads, and some local roads in the 13 county NJTPA region. However, the NJRTM does not estimate truck volumes nor does the model estimate a breakdown of trucks by category (i.e. number of axles). In terms of using the NJRTM for freight planning, the model can provide background highway conditions and also serves as the basis for establishing the model of the regional highway network and zonal system employed for the Statewide Truck Model, which is discussed below. However, not having a stand-alone capability to model truck flows, the NJRTM, by itself, is not an effective tool for modeling goods movement.

Recognizing the need to develop a statewide travel demand model that could estimate both auto and truck flows throughout the entire State of New Jersey as well as across adjoining regions, the NJDOT undertook the development of New Jersey Statewide Truck Model (STM). The STM was created through an assemblage of five different transportation demand models developed for New Jersey and regions outside of New Jersey. They are: the NJRTM; the South Jersey Regional Transportation Model; the Delaware Valley Regional Planning Commission Model; the Port Authority of NY/NJ Interstate Network Model; and the New Castle County Model from Delaware DOT. The NJRTM served as the foundation of the STM with the other models converted to be consistent with the NJRTM. Additional model features, such as the coding of truck regulations and prohibitions were also incorporated into the STM. The model was initially developed using TRANPLAN software, but under subsequent updates was revised to run under TP+ software.

Truck trip tables were developed based on regional commodity flows. A series of algorithms were used to estimate truck trip productions and attractions and a gravity

model based distribution model was used to assign truck trips to each origin-destination pair. User equilibrium assignment is used to assign trips to routes in the network. Output results were then compared to and validated with actual truck flow data.

The STM provides 24-hour flows for autos, medium trucks, and heavy trucks. While 24-hour volumes are useful for general planning applications, hourly flows are far more practical for analysis and design. Furthermore, directionality characteristics, also important for specific freight planning purposes, are lost when considering only 24-hour flows. Therefore, use of the STM for freight and goods movement analysis needs to incorporate a methodology for converting the 24-hour flows into hourly directional flows. Also, since the STM is validated based on actual truck counts, obtaining and integrating additional truck volume counts would enhance the prediction capabilities of the model.

The TRANSEARCH database contains information on the tonnage of commodities and the modes of transport for domestic freight flows. In order to determine the number of trucks as a result of increased future commodity flow, a methodology was developed for translating this data into average daily truck trips. As part of the validation process of this conversion, it was necessary to compare the results of the existing commodity flow data with truck trips contained in the STM. Unfortunately, a number of discrepancies were found in the data sets. Resolving discrepancies between the TRANSEARCH database and the STM results should be undertaken as be a future initiative by NJTPA in their overall freight planning program.

## 4.4 Freight Related Impacts of 9-11

The tragic events of 9/11 have unquestionably influenced transportation security as well as the mindset of those responsible for ensuring the safe, efficient movement of cargo. However, while new freight security measures have been implemented since 9/11, the survey reveals that changes in cargo flow patterns, in terms of volume and routing have been minimal. In fact, the majority of the companies that were surveyed indicate cargo volumes have neither changed nor increased and, in general, overall traffic flow patterns within the region have remained similar to traffic flow patterns prior to 9/11.

For the freight industry, the most significant impact of 9/11, has been the changes in operating procedures to increase security, which has increased security costs. Survey respondents indicate cost increases ranging from 1% to 25%. Another significant impact is the implementation of the 24 Hour Rule, which has affected close to 2/3 of the companies surveyed. The 24 Hour Rule has reportedly caused companies to lengthen the supply chain timelines, which in turn has led to increased inventory levels and increased operating costs.

Most companies surveyed have established or increased internal security through a range of measures including adding responsibilities to existing staff, hiring consultants, training employees or hiring specialized security personnel. The survey also indicates these activities are not evenly applied to companies across the board. Therefore, while large

companies have been able to implement a number of security measures, smaller companies, lacking the necessary resources, are unable to do so. Unfortunately, larger companies have expressed that they see no tangible rewards for increasing security spending and have raised the lingering question: does increased security result in an increase in business?

While many of the participants acknowledge the severity of the security issues and expressed their support for the government anti-terror efforts, they expressed serious concern about impacts on productivity and efficiency. Survey results and interviews reveal that respondents are split on the question of effectiveness of increased cargo inspection, which reportedly has increased both processing time and operating costs. It has been estimated that inspection costs per container range from less than one hundred dollars to a few hundred dollars, and container dwell times at marine terminals have been increased by two or three days.

Survey respondents and those interviewed indicate that freight terminals are the most critical flow points in the freight supply chain. Other key infrastructure includes line haul routes, gates, and warehouses, all identified by respondents as significant security concerns. Port security is also a high priority. And while terminal operators have expressed their support and active participation in freight security initiatives, they are constrained by union restrictions and lack of funding. Furthermore, increased container inspection has had a negative impact on productivity and costs.

Survey respondents indicate that cargo theft is a serious problem but receives little attention. Although many billion dollars of cargo are lost to theft, it reportedly is not a top priority for law enforcement agencies. This appears as especially true at the federal law enforcement level as they are preoccupied with national security issues. However, cargo theft organizations are allegedly very sophisticated in obtaining information and targeting their victims. Survey respondents fear that these very organizations could provide the manpower and means to undertake terrorist activities against the US. At the very least, proceeds derived from theft activity could underwrite terrorist activities.

Following 9/11, there was urgency on the part of the government to quickly develop security regulations without adequate consultation with the private sector. As a result, many new regulations have reportedly not been effective and have significantly burdened the freight industry.

# 5.0 RECOMMENDATIONS

## 5.1 Overall Recommendations

The US DOT requires that freight planning be an integral part of the overall MPO project selection and prioritization process. Other federal agencies, under the umbrella of USDOT, are also an integral part of goods movement of. For example, the Army Corps of Engineers is responsible for maintaining shipping channels. The Federal Motor Carrier Administrating is responsible for enforcing truck safety regulations. Freight security issues have also become a rapidly increasing concern. NJTPA, as compared to most other MPOs across the country, has the added burden of including a number of public and quasi-public sector entities, including the PANYNJ, the New Jersey Turnpike Authority, which handles a vast amount of highway freight related traffic, CSX, NS, Conrail and many important short line rail operators. Therefore, freight planning initiatives at NJTPA must be cognizant not only of numerous local, county, state, quasi-public and private entities, but of the multiple federal jurisdictions connected to the mobility and safety of goods movement.

A future framework for freight planning and future planning initiatives must include a comprehensive strategy to include a multitude of private and public sector representatives in the overall planning process. This is complicated by the actual financing of potential improvements and the manner in which freight mobility strategies and initiatives are implemented. For example, the New Jersey Turnpike Authority funded solely through toll fares and has the authority to issue bonds for capital improvements. As such, the NJTurnpike Authority has its own process whereby improvements are identified and prioritized. Having its own funding source, this process is separate from other planning processes for publicly funded transportation improvements. Yet, freight mobility in the NJTPA region is highly dependent upon the capacity of the New Jersey Turnpike. Proposed operational strategies, such as innovative toll pricing, modified hours of operation, could have significant impacts on the New Jersey Turnpike.

NJTPA freight planning must also be responsive to a number of other unique situations and circumstances facing region. For example, much of the freight rail network is in the Conrail-Shared Assets region, requires integration of three rail companies, CSX, NS and Conrail into the freight planning process. Therefore, a recommended freight planning framework must be responsive to the unique conditions in northern New Jersey.

While the current freight planning process at NJTPA provides an opportunity for input and feedback at a variety of different levels, it is recommended that the following enhancements be considered:

*Ensure coordination of freight planning activities*. A number of separate freight planning projects and initiatives, including the Portway South Extensions Study, Comprehensive Port Improvement Program (CPIP) and NJDOT's Statewide Freight Plan, are running concurrently to this study. These efforts have resulted in the development of specific growth scenarios. All forecasted growth scenarios should be reviewed and compared to

determine any inconsistency in assumptions or resulting forecasted freight flows. Due to the large potential for negative impacts of poor freight planning in the nation, and in particular the east coast, all actors in the regional freight movement industry (all transportation agencies and private freight carriers) need to have a consistent idea as to what future freight flows are to be. Without this consensus and co-operation between all actors, future investments may not reap maximum benefits. In the worse case, investments put forth would contradict each other.

*Better integrate freight mobility needs in the formal planning process*. The Strategy Evaluation Process identifies candidate freight related strategies and recognizes specific zones primarily clustered around the Newark and Elizabeth Seaports for freight related improvements. However, freight mobility needs extend far beyond these zones. As demonstrated by a number of freight related activities in the region, there are distinct corridors, such as I-78, I-80 and the New Jersey Turnpike, along which freight mobility needs must be met. Consistent with the identifying corridors for "people movement", the NJTPA also needs to identify corridors for goods movement. Therefore, it is recommended that the NJTPA identify and integrate specific freight corridors into their Regional Transportation Plan (RTP). The TIP should also be expanded to include a section that addresses specific freight mobility projects. This is consistent with other MPO freight planning activities.

*Expand the Freight Initiatives Committee*. The NJTPA Freight Initiatives Committee provides an excellent forum to exchange ideas and advance initiatives for improving freight mobility. Furthermore, the Committee recognizes the need to actively seek participation of private sector representatives. Expansion of this committee to include key freight service providers, third party logistics companies and others involved in the safe and efficient distribution of freight could provide a broader range of understanding freight related issues. It is also recommended that the Freight Initiatives Committee be expanded to include representatives engaged in economic development and key land use decisions. Specifically, the Freight Initiatives Committee should include representatives from local, county and state economic development agencies and authorities such as the New Jersey Economic Development Authority and the Office of Smart Growth. Participation from these agencies is especially important in the discussion of land use policies focused on enhancing freight mobility. NJTPA should also consider reaching out to adjoining MPOs, Delaware Valley Regional Planning Commission (DVRPC) and New York Metropolitan Transportation Council (NYMTC) where freight issues being considered affect their respective jurisdictions.

*Develop a network of smaller advisory groups within the Freight Initiatives Committee*. Freight mobility issues are complex and, as noted in this report, involve a large number of representatives from both the private and public sectors. Because of the comprehensive level of coordination involved at these many different levels and from the sheer number of potential representatives, it is recommended that the planning process incorporate a network of smaller advisory groups consisting of core representatives that would be formed and meet to address specific freight mobility issues. An advisory group could be formed to address a specific area in the planning process such as data systems

management or more targeted areas such as implementation of a particular strategy. Advisory groups could be both on-going as well as established for resolution of a specific issue and then disbanded. In any case, representatives should consist of individuals with authority to effect change. Advisory groups should also have a designated leader and facilitator to ensure that specific items are addressed. Advisory groups would then report back to the full Freight Initiatives Committee.

*Create a freight data management system*. A number of data sources were identified that could be used for freight planning purposes. Many of these sources are developed and maintained by private companies and marketed for public sale. Public sector agencies maintain their own information and data sources. NJTPA maintains it own modeling tools and databases. The PANYNJ also maintains its own databases, some of which are not available for public distribution. With the abundant number of both private and public freight data sources, it is important that an effective system be developed and implemented for maintaining and disseminating information. It is recommended that data sources be housed in a centralized location that can be easily accessed. It is also important to recognize that while much of potentially useful freight related data is proprietary in nature, it may be possible to release portions of the data and information with appropriate legal constraints.

*Create a process for monitoring and self-evaluation*. A process must be in place to routinely monitor the progress of the initiatives being set forth by the Freight Initiatives Committee and ensuring that the overall goals established by the Freight Initiatives Committee are being met. Guidance and oversight could be provided by an outside advising entity with feedback to the committee made on some regular basis. This self-evaluation process should be incorporated into the NJTPA's Unified Public Work Program (UPWP) as a regular programmatic item.

## 5.2 Recommended Freight Planning Framework

The above recommendations have been incorporated into a recommended strategic framework for freight planning in the NJTPA region. This framework is depicted in Figure 5.1, with the various steps described in text.

*Determine Overall Freight Mobility Goals*. The development and formal adoption of overall goals and objectives for freight mobility in the NJTPA region provide the basis for future actions and initiatives that are undertaken by the Freight Initiatives Committee. The goals and objectives must be cognizant of a wide range of interests, be clearly established and be communicated effectively. While some degree of flexibility is necessary to meet the changing needs of the region, the goals and objectives must serve as the foundation for all future freight planning initiatives.

*Identify Freight Performance Indicators*. The impact of freight improvement strategies must be measurable and capable of being understood by members of the Freight Initiatives Committee and the NJTPA Board of Trustees. The NJTPA Strategy

Evaluation sets forth two strategies directly associated with freight mobility and the FPSS study significantly expands on this list.

*Create a Centralized Freight Data Management System*. As noted earlier, the sheer number of agencies involved in freight planning, both indirectly and directly, within the NJTPA region poses a significant challenge. One of these challenges is the tracking and management freight-related data and information. Since many of these resources are managed by a number of private and public sector entities, assembling and accessing the data is difficult. Consolidating and centralizing data and information resources can provide key decision makers with accurate, up to date information, facilitate better coordination and improve the overall effectiveness of proposed freight improvement strategies and initiatives.

*Establish Base Freight Flow*. While this may seem to be a seemingly straightforward task, establishing base freight flows is complicated due to both the multiple agencies involved in data collection, the proprietary nature of some freight data and the lack of data. However, establishing existing freight flow within the existing transportation network is vital in identifying the operational characteristics of the transportation system, where deficiencies in the system exist, and how the transportation system responds to implementation of strategies. The NJIT team developed a transportation model using the Statewide Truck Model (STM) that incorporates truck volume data and then estimates volumes where count data is missing. Outputs from the Reebie Transearch database were also used to verify data from the STM.

*Establish Acceptable Baseline Freight Flow*. A series of performance indicators should be established and should be used to develop specific quantifiable criteria against which to evaluate freight mobility. Establishing an "acceptable" value is a more cumbersome task. For the FPSS study, the study team examined existing and future freight flows to come up with acceptable baseline criteria. For example, truck-miles traveled were one of the performance measure selected. In determining what was "acceptable' it was first necessary to calculate existing and future values to determine what could realistically be achieved. Once these values were determined, a midway point was selected as the acceptable criteria. Different zones were allocated for each county.

*Estimate Future Freight Flow*. Estimating future flow of goods movement must consider not only future socio-economic forecasts, such as population and employment, but trends in global logistics and trade. In addition, future trends in freight logistics and how these trends impact land use and transportation patterns also need to be considered. For example, the large number of vacant, underutilized brownfield sites in the NJTPA region near the ports could potentially serve as the future freight distribution hubs. Future flow forecasts also need to be consistent with forecasts by other agencies that have a significant role in the movement of freight in the NJTPA region. Because of the importance of developing consistent reliable forecasts, coordination and associated technical functions should be part of the on-going freight planning activities at NJTPA. Consideration should be given to making an advisory group as part of the Freight Initiatives Committee to coordinate major players in the region, including NJDOT,

PANYNJ and conduct the data gathering and modeling activities necessary for developing reliable freight flow forecasts.

*Identify Strategies to Address Needs*. The process of developing freight improvement strategies is an integral part of the freight planning process. Freight mobility must also consider a range of strategies that can be undertaken by both public sector and private sector entities. Proposed strategies, to the extent possible, should also be capable of being measured and quantified so that freight improvements initiatives can complete effectively with other transportation enhancements. A comprehensive list of strategies was developed based on the results of a comprehensive review of other jurisdictions' practices. While there was some consistency of strategies among the various MPOs across the country, the manner in which strategy impacts could be measured and the level of specificity varied considerably. For example, NYMTC lists specific roadway improvements as "strategies". Other jurisdictions were much less specific. For example, DVRPC has more general strategies, such as access to interstate highways. NJTPA's freight planning initiatives must integrate development and evaluation of freight mobility improvement strategies into the NJTPA's overall Strategy Evaluation Process.

*Implement Strategies*. While developing and evaluating strategies are important components to the freight planning process, they must be capable of being implemented. Therefore and important step in freight planning is the development of strategy implementation plans. Since strategies should also include initiatives at the private sector level, the implementation process must include input from private sector representatives.

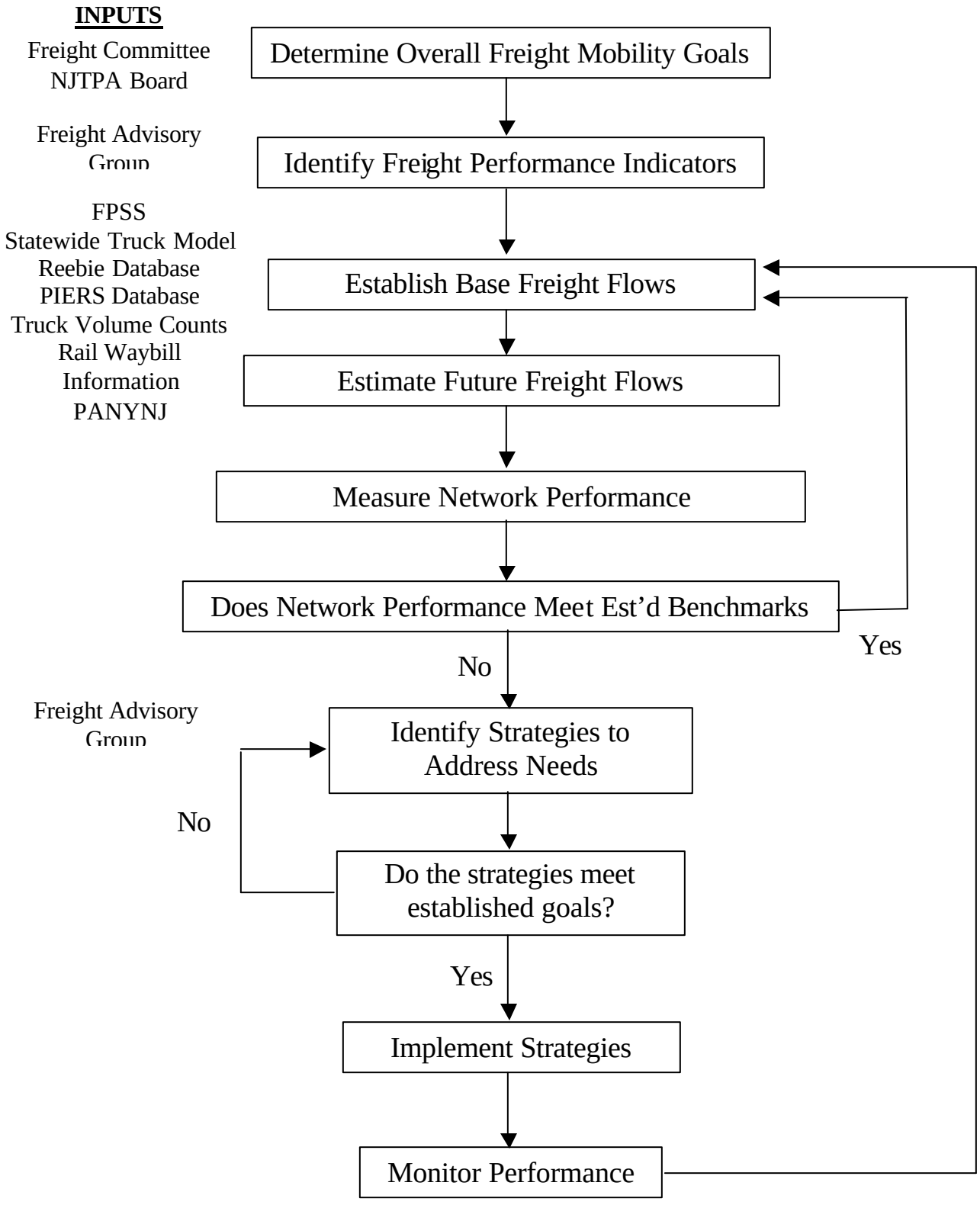
*Monitor Performance.* The success or failure of strategies must also be evaluated to determine their effectiveness. It is also imperative that a method to evaluate the effectiveness of implemented strategies be incorporated into the overall freight planning process. Finally, the process itself should be monitored to identify where data gaps and communication deficiencies exist and what actions should be undertaken to address these issues.

U.S. Secretary of Transportation Norman Y. Mineta recently unveiled the next round of federal transportation legislation. The Safe, Accountable, Flexible and Efficient Transportation Equity Act of 2003 (SAFETEA), is a six-year $247 billion surface transportation reauthorization proposal, and represents the largest surface and public transportation investment in U.S. history. SAFETEA seeks to enhance freight mobility by establishing a National Highway System (NHS) set-aside to fund highway connections between the NHS and intermodal freight facilities. SAFETEA also proposes continuation of the Transportation Infrastructure Finance and Innovation Act (TIFIA) program but lowers the program's project threshold from $100 million to $50 million, and expands it by allowing rail freight projects to qualify for credit assistance. SAFETEA also proposed the creation of a new category of tax-exempt private activity bonds to finance highway projects and freight transfer facilities.

This new round of legislation, if approved, would provide a greater opportunity to draw upon the resources of key stakeholders from the private sector. NJTPA's freight planning

process should therefore be prepared to respond to this opportunity and the wealth of knowledge from private sector representatives.

**Figure 5.1 Recommended Freight Planning Framework**



## 5.3 Recommended Freight Committee Action Items

While the framework set forth above recommends on-going activities that should be continued and supported by the NJTPA Freight Initiatives Committee, there are a number of recommended action items that the Freight Initiatives Committee can undertake presently.

1. *Develop and formally adopt a framework for freight planning*. The FPSS study includes a recommended framework for freight planning. This framework should be presented and discussed with the Freight Initiatives Committee and should be revised if necessary to incorporate feedback from Freight Initiatives Committee members. Once this framework is finalized, it should be formally incorporated into NJTPA's Regional Transportation Plan (RTP) as well as the Strategy Evaluation Process documentation. This framework should serve as the basis for freight planning for NJTPA. It is also important that the freight planning framework be a "living document" which can be reviewed, evaluated and, if necessary, modified on a routine basis and perhaps coincident with the adoption of the RTP.

2. *Develop and formally adopt specific goals and objectives for freight planning*. The NJTPA Freight Initiatives Committee serves an important function in serving as a forum for addressing specific freight related issues and advancing freight mobility improvement initiatives. It is recommended that specific goals of the committee be developed, formally adopted and that they be integrated into the overall freight planning process. This could be accomplished through workshop sessions with a facilitator to help encourage discussions and seek input on specific goals for freight planning in the NJTPA region.

3. *Establish a Freight Initiatives Committee Advisory Group framework*. There are a number of specific issues regarding freight planning which may be better addressed through interaction with specific experts and advisors on a particular subject. An advisory group could be established to address a specific issue and then upon resolving this issues, the advisory group disbanded. Other advisory groups could take on on-going issues or activities, such as data collection and freight modeling. In any case, a structure should be in place to identify a specific issue of concern or activity, select advisory group members and report back to the full Freight Initiatives Committee with specific actions that need to be undertaken.

4. *Initiate a regular program for education and awareness of freight issues*. It has been widely recognized and acknowledged that freight related issues have taken a secondary role to more traditional transportation planning activities. There are also a number of misconceptions about freight and the importance of dealing with freight related issues head on. In order to gain stronger support for freight mobility improvement initiatives at all levels, it is recommended that the Freight Initiatives Committee establish a regular program for freight education and awareness of freight issues. This should be an ongoing activity and should seek

outreach at all levels of government as well as private sector transportation providers and real estate experts. The Freight Initiatives Committee should seek to establish specific outcomes of this initiative, i.e. number of outreach sessions held, conferences attended, etc.

5. *Review and adopt a formal stance of upcoming SAFETEA transportation legislation*. The next round of upcoming transportation legislation is currently proposed at designating $243 billion. It is imperative that the Freight Initiatives Committee keeps abreast of changes and develop a position on funding issues related to freight mobility. This could be facilitated through one of the Advisory Groups and should be made part of the regular meeting agenda.

Freight planning in the NJTPA faces many unique challenges and while anticipated volumes of future freight flow in the NJTPA region may vary, *all* agree that the level of freight activity will increase. The planning process set forth NJTPA Freight Initiatives Committee must be poised to meet these challenges as well as future opportunities for greater involvement from the private sector.

## 5.4 Recommendations in the Aftermath Of 9/11

Maintaining freight mobility while carefully considering cargo security presents a serious challenge for the North Jersey Transportation Planning Authority (NJTPA). Furthermore, as pointed out by many of the survey and interview respondents, more regulations often result in a less efficient freight supply chain. Therefore, the key is not to make security and efficiency exclusive from one another; but rather make elements from each enhance one another. To accomplish this difficult undertaking, the following recommendations regarding cargo security issues are offered.

*Establish Public-Private Partnership.* It is essential for both the public sector and the private sector to understand each other's primary concerns. Since cargo security represents a new dimension for both sectors, it is recommended that a cargo security forum comprising of both private and public sector representatives be assembled. This may include extending the NJTPA Freight Committee to include shippers, ocean container carriers and freight forwarders. Regular meeting would be held to exchange information and address common interests. In this way, a closer relationship between the public and private sectors would be fostered.

*Establish Industry Advisory Group and Security Requirements.* Security regulations clearly need to be incorporated into business practices and management processes. Otherwise, they will not be effective and only end up choking the efficient flow of goods and stall an important element of the region's economy. Therefore, it is critical that an industry advisory group or a panel of experts draw members from different segments of the industry including carriers from different modes, freight terminal operators, warehouse/distributors, shippers, logistics firms and technology professionals. The principal objective of this group would be to identify and study relevant security issues,

and provide out-reach to the freight community. In this way, industry expertise can be leveraged to make the security requirements more effective while minimizing costs.

*Establish a Single Standard*. In today's multi-modal environment, single and separate mode oriented cargo security regulations will not be effective and could significantly drive up the cost of compliance. The above mentioned industry advisory group or panel could also provide input in developing a uniform national standard for security procedures, reporting protocols, and implementation standards for all transport modes and be applied to all parties involved in the supply chain.

*Focus on National Infrastructure Security.* Based on our surveys and interviews, those in the freight transportation industry agree that the most vulnerable elements of the freight transportation system are intermodal connectors such as cargo hubs, bridges, tunnels, and intermodal transfer points and that maintaining security at these facilities is absolutely critical. Therefore, dedication of more resources and not simply imposing new rules and regulations are the most effective means of ensuring freight security. In addition, greater emphasis should be placed on intelligence gathering for prevention of potential terrorist incidents.

*Develop Contingency Plans* Contingency planning is essential in order to quickly recover from a catastrophic event. Therefore, it is recommended that contingency plans be carefully developed and address the following issues:

- The nature of the event
- The degree of severity of the impact
- Change of points of entry
- Change of routing
- Infrastructure capacity
- Cargo handling capacity
- Cargo storage capacity
- Environmental impact
- Interaction and interference between passenger flow and freight flow
- Government institution relationship
- Public sector-private sector relationship
- Operating procedures and security protocols
- Other relevant elements

*Conduct Future Studies.* With the real threat of terrorism and the need to maintain a high level of freight security, particularly in the NJTPA region, additional studies should be undertaken to address the following issues:

- Forming of industry advisory group or expert panel
- Standards for security requirements
- Impact of freight movement under different terrorist threat levels established by the government

- Costs of increase security
- The goals and levels of the above mentioned contingency plans
- Institutional relationship to improve information sharing and communication.

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# APPENDIX: FPSS Scope of Work

# FREIGHT PLANNING SUPPORT SYSTEM
# For
# Northern New Jersey

## SCOPE OF WORK

**Focus of the Project**
This project will develop goods movement transportation indicators, data and performance measurements, and goods-movement strategies that will support the NJTPA's performance-based planning process. It will also recommend a framework of issues, studies and analyses to enhance the freight planning process and agenda for northern New Jersey.

The interruption in freight movement caused by the September 11, 2001 terrorist attack on New York City places the NJTPA's ongoing planning and analysis in a new and more urgent context. Therefore, this work will identify freight system impacts, system redundancies and appropriate strategies to respond to, or prevent system failure in the event of another major disaster affecting the regions movement of goods and people.

The work will add new scope and depth to the products of the NJTPA's Strategy Evaluation Project, which is developing freight performance measurements to address accessibility, mobility and congestion on the region's transportation network. The Freight Planning Support System (FPSS) Scope of Work will expand the Strategy Evaluation Project's freight performance analysis while developing indicators of goods movement such as intermodal terminal landside access; terminal congestion; clusters of freight activity; key freight routes by mode; route restriction related to low bridge clearances, and ramp turning radii, steep climbing lanes, and others; key roadway segments with high truck related incidents; and other appropriate indicators. Drawing on relevant data sources and gathering new data where necessary, the FPSS will use the indicators to assess the performance of freight movement in the region, forecast future conditions, identify current and future needs, and develop strategies to address these needs.

These activities will provide the foundation for investigating new project proposals that could be included the northern New Jersey project development pipeline. These project proposals will be advanced towards implementation by the NJTPA Freight Initiatives Committee and the Board of Trustees within the context of other regional priorities to insure the provision of effective, efficient and safe movement of freight traffic in the Region.

FPSS products will address and generate reports and other materials pertaining to three main areas of task work. Each summary report will be formatted to include an executive summary section discussing key findings and data.

- Development of northern NJ freight indicators, data, practices and other factors that comprise the region's freight distribution and logistics system

- Freight system vulnerability to emergencies and unforeseen disruptive events coupled with strategies for response and operational redundancy
- Ongoing technical support to NJTPA committees and staff

This project is a collaborative effort between the NJTPA and the New Jersey Institute of Technology. The Project will rely on the parallel and continuing data collection and analysis of the International Intermodal Transportation Center at NJIT relating to the proposed International Intermodal Corridor (IIC). It will collect data as required to measure freight indicators for areas of the Region that are outside the International Intermodal Corridor. These data and indicators will be complimentary and inclusive of similar measures being developed for the IIC.

**TASK 1: A) Identify and Inventory Data products and of Goods Movement In New Jersey**

Inventory, describe, assess, and, if warranted, procure appropriate data products, sources, and reports that describe the freight system in northern NJ by mode, major facility, clusters of activity and other measurements (i.e. Reebie Associates, Rail Freight Waybill Sample, PIERS, U.S. Census and Customs, Air Cargo sources, Warehouse and Real Estate databases, etc. that describe key activities and centers of freight traffic.)

- Determine which products and sources are most reliable and useful for regional and state transportation planning purposes.
- Procure, with consultation, appropriate data products for planning and forecasting.

This task will include an assessment of data needs and a catalog of existing available data sources, such as Reebie Associates. It will structure an approach for data collection to fill targeted gaps in data. Final decisions on data procurement will be based on achieving consensus about which criteria are the most appropriate to measure freight transportation activity.

**B) Identify Indicators that Measure the Performance of Freight Movement in the Region**

Identify appropriate indicators of goods movement in northern New Jersey. These indicators are measurable operational factors that describe the characteristics of freight activity in the Region and will be used to set performance standards and to monitor conditions under which freight movement occurs. In light of the September 11, 2001 terrorist incident, it will be important for this task to identify indicators that measure new patterns of freight movement that may have developed, whether they are temporary responses or long term adjustments.

Some indicators may not be suitable for current planning work because of insufficient or missing data. Such indicators, however, may be useful in developing future data collection activities. Decisions about indicators will take into account the needs and preferences of Central Staff and its planning partner agencies, decision-makers and stakeholders.

This task will consider that freight issues in long-range planning involve collecting and using complex data and analysis that go beyond traditional performance measures of the transportation system. The performance indicators of the freight transport industry involve understanding the wholesale and retail market generally, and land use development/redevelopment of distribution centers and other attractions of freight trips. These measures specifically target truck transport costs, vehicle miles traveled, multiple delivery points, per mile energy consumption, commodity movements, time sensitivity of deliveries, the value of freight traffic moving into and out of the region, distribution and concentrations of shipping establishments, freight dock availability, and more.

The performance indicators will be arrayed into:

- Physical Measures, i.e.: volume, type of traffic; transportation systems connections; bridge, rail and roadway weight and clearance sufficiencies and turning radii, etc; intermodal facilities as nodes of activity with volume, peak periods, and general origination and destination of traffic.
- Operational Measures, i.e.: levels of service; environmental impacts; delay; vehicle miles traveled by route mode and segment; route choices; costs where available, others

The indicators that are selected will meet the following criteria:

- Capable of being measured
- Capable of being forecasted
- Capable of measuring transportation systems, operations, deficiencies and their causes
- Measure conditions over time intervals and for ongoing performance
- Capable of being understood by decision-makers and stakeholders

The Indicators may include some of the following freight activities:

- Container and freight tonnage volume handled annually by major freight terminals such as port, rail, truck, air
- Seasonal and event-generated (such as 9/11) fluctuations of freight movement
- Average annual vehicle miles traveled by freight mode at key system segments
- Congestion on roadways near major freight terminals or distribution clusters.

**Work Products:** A report will be prepared that identifies indicators, their data requirements, availability (quality and quantity) of data to measure the indicators for our region. Provide recommendations for needed data resources. (Issues related to 9/11 will also be reflected in a separate report under Task 7).

**Deliverable due:** December 15, 2002

**TASK 2: Select appropriate indicators and measure 2000 and 2025 Performance of the Freight System**:

This task will measure current (2000) and forecasted (2025) performance using the most appropriate measurable freight indicators and data. The Strategy Evaluation Project is defining region-wide mobility strategies and performance measures that address the region's

movement of people and goods. Task 2 of this project will provide additional data for measuring freight performance using the indicators developed in Task 1. The work will incorporate similar indicators and data that are being developed in the parallel analysis of the IIC. These combined indicators will give a more robust and comprehensive foundation for establishing freight performance standards. Transportation redundancy will be considered as a key performance indicator. Specific "what-if" scenarios will be examined and modeled to identify vulnerable locations and evaluate the system's ability to provide alternative routing or mode in the event of a disaster.

The measurement of freight transportation indicators will be dimensioned (quantified and described) by:

- Mode of freight traffic utilizing: highway, rail, air, and barge (measurements of volume)
- Identify key freight routes, traffic segments, facilities and types of intermodal connections by mode
- Apply Census and other demographic data to profile economic impacts, such as job clusters, type of jobs by major service category, population characteristics etc.
- Geography: areas of freight generation, facility concentration, and traffic congestion using models and other tools to obtain routing assignments, traffic volumes over key route segments
- Time Frame: peak hours, seasonal adjustments, trends and plan forecasts
- Major New Jersey Originated or Destined (O/D) freight commodities using STCC identification (top twenty five by mode) handled by
    - trucks
    - rail
    - water
    - air

This Task will also map major freight networks of northern NJ through information layering by use of GIS software including:

- Areas of concentration of freight distribution terminals and warehouses by zip code, centroid or other geographical indices
- Routes such road, rail, and pipeline
- System restrictions such as clearance, weight, hazmat, tandem trucks and other operational measures
- Access roads to major terminal areas such as port, air, and rail and warehouse centers
- Use dynamic simulation model to simulate activity on these freight system elements, including diversions onto redundant routes and modes under event-based scenarios

**Work Products**: A Technical Report will be prepared assessing and describing the performance of the freight system including data tables, maps and example computer simulations. Forecasts of future conditions will also be developed with a 2025 horizon. Computer simulations will demonstrate route choices, key transportation links and segments and diversions to redundant routes and modes under controlled test conditions. Selected performance measures will be used in Task 3 to establish performance goals based on forecasted conditions . (Products of this task related to 9/11 will also be reflected in the report under Task 7).

**Deliverable due**: February 28, 2003

**TASK 3: Establish 2025 Performance Goals and Identify Needs**

This task will analyze the performance measurements generated in Task 2 and establish a set of performance goals that reflect the goods movement mobility and accessibility aspirations of the region. These goals will consider the congestion management freight performance goals used in the Strategy Evaluation project, which will have been completed by the time the work on this task starts.

A validation or refinement of the freight performance goals produced by the NJTPA's Strategy Evaluation Project will be undertaken relying on the tools and procedures provided by that Project. These performance goals will encompass the issues and types of transportation systems that support goods movement in the region. Therefore, this freight mobility analysis will not necessarily be confined solely to issues such as landside access, terminal congestion, intermodal opportunities and congestion. Based on the refined performance goals, this task will identify regional freight needs, including locations where performance is below target levels for the various freight indicators.

**Work Product**: A technical report will be prepared describing 2025 performance targets for the region and defining transportation deficiencies to be addressed.

A separate analysis as part of this Task will identify freight system redundancy needs under the scenario of a disruption of traffic on key segments identified in Task 2 due to an emergency event. This analysis will also be included in the report under Task 7.

**Deliverable due**: April 30, 2003

**TASK 4: Identify new/validate existing freight transportation strategies to address identified needs**

This task will identify appropriate and implementable strategies to address the goods movement needs identified in Task 3. These strategies will be evaluated and prioritized based on the methods developed in the Strategy Evaluation Project. Therefore strategies will address the mobility and accessibility needs of goods movement at varying levels of geography. This ranked list of strategies will be incorporated into the Regional Transportation Plan for subsequent incorporation into the northern New Jersey project development process and pipeline.

This work will specifically:

- Develop Strategies to Address the Freight System needs, including strategies that can be employed in an event-based emergency
- Refine or enhance the Strategy Evaluation Methods for Freight Measures
- Develop Selection Criteria to prioritize the strategies. These strategies will be implementable by the Board of Trustees of the NJTPA within its constrained budgets and timeframes

- Apply criteria to select recommended strategies
- Prioritize Strategies using the RTP Evaluation Framework or other appropriate measures.

A report will be prepared detailing this work.

**Deliverable due**: May 31, 2003

**TASK 5: Establish the Support Systems for Ongoing Freight Planning**

Tasks 1-4 focus on immediate actions to measure northern New Jersey's freight performance and recommend needed goods movement strategies. Task 5 will build the framework for an ongoing freight planning process at the NJTPA within which assessments will continually be made about the components of goods movement. These assessments will lead to policies and agendas that will be forwarded by staff for consideration as part of a larger, cooperative tri-state metropolitan area (New Jersey, New York and Connecticut) freight strategy.

This task will identify new sketch planning tools and methods that can be applied by the NJTPA to its freight planning activities. For instance, some of these tools use the outputs of transportation planning models to identify impacts in a more refined analysis. Default values substituting for missing data can help staff evaluate sub-area commercial trip-making activity generated by new land development. This task will glean from a literature search and other sources the most appropriate techniques, tools and methods to deploy in the NJTPA region. Furthermore, these techniques will be scoped by NJIT so that Central Staff can determine those that require professional consultant development and those that can be immediately applied.

Finally, this task will evaluate the NJRTM and NJDOT State Truck Model to make a critical assessment of their usefulness to freight planning. This assessment will make recommendations on how components of these models can be enhanced and how the models can handle new data sets to forecast various modes of goods movements.

A report describing planning activities, tools and needed improvements will be prepared.

**Deliverable due**: June 30, 2003

**TASK 6: Ongoing Technical Support to the NJTPA Freight Initiatives Committee Including Production of Informational Materials**

The staff at NJIT will produce informational materials under the direction of the NJTPA and NJDOT that will educate the general public and other target audiences on freight issues. These materials may be multi-media presentations, pamphlets or modeling exercises for demonstration purposes. Under the guidance of the NJTPA Freight Initiatives Committee and staff, NJIT staff will actively participate in committee and/or

sub committee meetings and make a minimum of two presentations on work products garnered through this project.

The NCTIP staff will provide data, analysis and other technical support as requested by the NJTPA Freight Initiatives Committee through June 30, 2003.

**TASK 7: Summarize Post 9-11 Issues and Provide Strategy Recommendations**

This task involves preparation of a report, which summarizes changes, both temporary and permanent, in freight related travel patterns and activities in the aftermath of the September 11, 2001 terrorist attack on the World Trade Center. The post 9/11 summary shall serve as part of a case study to identify and prioritize critical freight transportation facilities that are vulnerable to terrorist attack.

Drawing upon the work conducted in other FPSS tasks described above, the report will recommend specific strategies to insure the functioning and security of the freight system in future emergencies.

**Deliverable due** : June 30, 2003