Final Report

SJTPO Regional Freight Plan Data Collection and Analysis

July 26, 2022

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Abbreviations

- AADT: Annualized Average Daily Traffic
- ACS: American Community Survey
- AGOL: ArcGIS Online
- BTS: Bureau of Transportation Statistics
- FAF: Freight Analysis Framework
- FHWA: Federal Highway Administration
- INRIX: Not an abbreviation, but a vehicle probe data vendor
- LEHD: Longitudinal Employer-Household Dynamics
- LFIF: NJDOT Local Freight Improvement Fund
- NCFRP: National Cooperative Freight Research Program
- NJDOT: New Jersey Department of Transportation
- NPMRDS: National Performance Monitoring Research Data Set
- NTAD: National Transportation Atlas Database
- OD: Origin-Destination
- PDA: Probe Data Analytics
- RITIS: Regional Integrated Transportation Information System
- SJTPO: South Jersey Transportation Planning Organization
- TTRI: Travel Time Reliability Index
- USACE: United States Army Corps of Engineers

1 Study Introduction

The South Jersey Transportation Planning Organization (SJTPO) conducted this Regional Freight Plan Data Collection and Analysis study to better understand the movement of freight in and around the four component counties of Atlantic, Cape May, Cumberland, and Salem. The area is home to a population of nearly 600,000 people and approximately 230,000 jobs. Of these, 76,000—or roughly one out of every three jobs—are within a freight-related industry such as manufacturing, quarrying, or transportation and warehousing.

The goal of this study is to better understand freight industries and freight movement in the region so that freight needs and issues can be more fully integrated into the transportation planning process. Information on the freight industry and freight movements was collected through a combination of freight data collection from multiple sources, direct one-on-one interviews with local freight stakeholders, and an online survey open to the public and stakeholders alike. The data and information collected during this study will help to inform future freight plan development and will help SJTPO to represent the region during the state freight plan development process. The information will also be useful for regional freight stakeholders and could be used for other freight efforts such as corridor studies and grant funding applications.

2 SJTPO's Freight Landscape

The four counties of South Jersey have experienced economic shifts that force the freight industry to be adaptive. The sections below share the story of the economic shifts and opportunities and the freight impacts.

2.1 Industry Transition

Thanks to a wealth of natural resources such as silica sand and easy access to navigable waterways, South Jersey has been known as the birthplace of the American glass industry. For many years, Atlantic City and other South Jersey destinations along the shore have also been major tourist destinations for conventions, gaming, and entertainment. However, both of these industries have declined in recent years due to changes in competition, consumer needs, and the global supply chain. This section outlines the region's transition from legacy freight industries to potential new industry opportunities.

Figure 2-1. An abandoned sand and gravel mining pit in Downe Township, Cumberland County, owned by Natural Lands

JASON NARK / Philadelphia Inquirer

A large portion of the region's outgoing freight transports still includes raw materials such as sand and gravel and this industry is likely to continue into the near future as globally the demand for sand continues to grow, with sand being needed for glass, concrete, frac sand mining, and other uses. The price of sand supports this shift with the *Philadelphia Inquirer* reporting that, "the price of sand and gravel has risen steadily over the last decade, from $7.06 per ton in 2007 to $8.70 per ton in 2017."[1] However, the glass manufacturing industry, while still present in south Jersey, is not as dominant on the world stage as production of glass products has largely shifted to other areas. Chine now makes up 25 percent of the global exports of glass and glassware globally.

Although other bulk materials continue to be a regional export, there is not the same supply as Matt Riggins from Riggins Oil shared during his interview. He cited supply chain impacts as a major issue for freight transportation issues because refineries in the area have closed while the consumer demand for oil and gas continues. Similar to Riggins Oil, other raw good distributors continue to operate with fewer resources and higher operation costs.

The entertainment and casino sector in Atlantic City share a similar story with the glass manufacturing industry. In 1978, New Jersey and Nevada were the only states with casinos. Atlantic City quickly grew to be a casino destination without competition from neighboring states. The monopoly did not last forever and in the early 2000s, Pennsylvania also joined the casino industry. In 2006, Pennsylvania casinos made up a $5.2 billion industry and surpassed New Jersey in 2012, the New Yorker reports.[2] With increased competition, many casinos in Atlantic City have been forced to shut down operations, with multiple closures occurring in the 2010s.

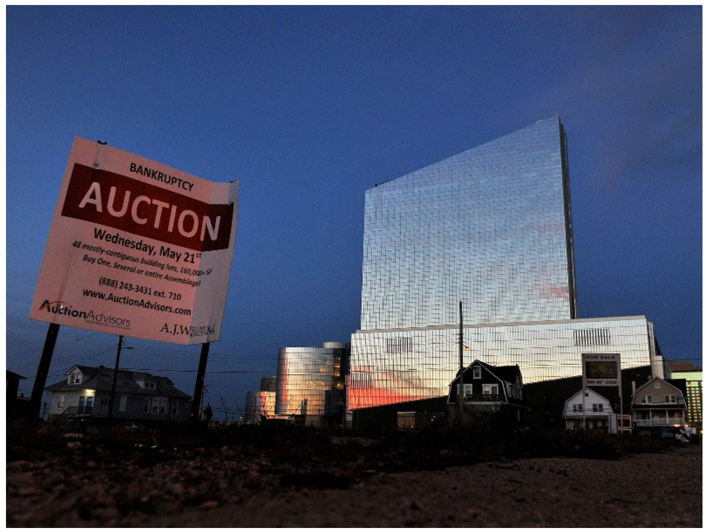

Figure 2-2. Several bank-owned lots for sale next door to the shuttered Revel casino, in Atlantic City

Photograph by Michael S. Williamson/The Washington Post via Getty

What does this mean for the future of South Jersey? Throughout the project interviews, many stakeholders shared observations and comments about the declining industries and how many different stakeholders in South Jersey are purposefully working to diversify the local economy. New industries and efforts being pursued include fast-freeze produce, the development of an aviation research park near the Atlantic City International Airport, and the development of the Vineland Industrial Park. While not all of these industries directly impact freight movement, there is an indirect benefit as an increase in the economy increases movement and demand of goods.

[1] Nark, Jason. "Fearing What Sand Miners Leave Behind." Philadelphia Inquirer, 23 Sept. 2018.

[2] Wolfson, John, and Adrienne Raphel. "America's Casino-Saturation Problem." The New Yorker, 18 Nov. 2014, https://www.newyorker.com/business/currency/americas-casino-saturation-problem.

2.2 Port of Salem

Established as a port of entry in 1682, the Port of Salem is one of the oldest ports on the east coast. It primarily handles sand and gravel shipments, but also handles other goods including dry bulk goods, clothing and garments, and motor vehicles. handle four million tons of cargo per year. The Port of Salem is currently leased by US Concrete.

During an interview with the South Jersey Port Corporation's executive director Andy Saporito, chief of staff Jonathan Atwood and assistant executive director of business development Brendan Dugan, they shared that the Port of Salem is ripe for economic development. The port is well positioned for economic growth with a rail connection at the port and being located near Highway 49, however, it can only serve shallow draft barges due to the Salem River's depth (16 feet). Serving deeper draft vessels would require dredging of the Salem River. Another constraint is the low clearance of Highway 49 bridge which means that the Port is restricted to its current space instead of expanding closer to the bridge.

Figure 2-3. South Jersey's Port of Salem
American Journal of Transportation

In July 2021, Southern New Jersey Development Council announced USDOT's proposal for $9 million in infrastructure improvements for the Port of Salem and surrounding roads.[3] The project includes dredging the Salem River, refurbished multimodal rail connection and much more.

Figure 2-4. The Port of Salem is one of the oldest ports on the East Coast
Photo – South Jersey Port Corp.

The assistant executive director of business development Brendan Dugan sees the rail connection as a gateway to support the growing offshore wind industry in South Jersey. He shared, "the development of the wind connection could add and opportunity for the [Port of] Salem to be a secondary facility for parts" to the wind port under construction in Lower Alloways Creek.

With the slated infrastructure improvements, existing rail connections, and potential to support offshore wind production, the Port of Salem could be well positioned to support an increase of freight movement in South Jersey. This would add to the diversity of goods and potential increase the demands on freight infrastructure in the region.

[3] Southern New Jersey Development Council. Afternoon Break, 12 July 2021.

2.3 Wind Port

> “Offshore wind is a **once-in-a-generation opportunity** to not only protect our environment but also greatly expand our state economy in a way that has immediate impacts and paves the way for long-term growth,” said Governor Murphy. “The New Jersey Wind Port will create thousands of high-quality jobs, bring millions of investment dollars to our state, and establish New Jersey as the national capital of offshore wind. This is a vital step forward in achieving our goal of reaching 7,500 megawatts of offshore wind power by 2035 and 100 percent clean energy by 2050.”

Offshore wind is gaining attention across New England as an opportunity to reduce the region’s carbon footprint. South Jersey is well positioned to support New Jersey Governor Murphy’s goal of 100 percent clean energy by 2050.[4] Construction is underway for a wind farm off the shore of Atlantic City. This will be supported by a new wind port developed in Lower Alloways Creek in Salem County.

While interviewing Geoffrey Storr at New Jersey Economic Development Authority, he emphasized the critical role the wind port will play to support the region’s offshore wind. This wind port will receive parts from Europe and serve as the assembly location for the turbines and other large equipment. The wind port will be well positioned to barge the materials in from a larger vessel and transport the materials to the wind farm. The wind port will be the first port on the East Coast developed explicitly for the servicing of wind energy infrastructure. Upon construction, the port will have access to more than half of the available U.S. offshore wind lease areas.

Figure 2-5. Rendering of Proposed Wind Port
New Jersey Wind Port website

While the port is in early construction phases, Storr did share that rail and freight could support the port in the future, especially with sub-components that are easier to maneuver via land. The Port of Salem also has the potential to be developed into a supporting port, functioning as a feeder for smaller parts and materials. The wind port is anticipated to have a large impact on regional employment, with many opportunities for development of future freight industries and infrastructure.

[4] State of New Jersey, Office of the Governor. “Official Site of the State of New Jersey.” Governor Murphy Announces Plan to Develop the New Jersey Wind Port: First Purpose-Built Offshore Wind Port in the U.S., 16 June 2020, https://www.nj.gov/governor/news/news/562020/20200616a.shtml.

2.4 Aviation Research and Technology Park

Following the decline of casinos in Atlantic City, the county has been actively reevaluating its economic opportunities. After speaking with the Atlantic County planning director John Peterson and Max Slusher at the Atlantic County Economic Alliance (ACEA), it was clear that diversifying the local economy was a priority and high-tech industries could be an opportunity to be attract more sustainable and high-paying jobs.

Figure 2-6. Rendering of National Aerospace Research & Technology Park
NARPT Website

The ACEA has turned its attention to economic opportunities at the county's airport, specifically developing an aviation research park. Since 2009, the vision has been to develop a 58-acre National Aviation Research and Technology Park reports *ROI*.[5] This vision is becoming a reality with a partnership with NASA for this facility to be the leader in aerospace research. Slusher shared that this facility will include a FAA testing center which will employ 1,500 employees. Furthermore, there are tax incentives to attract additional investors to the area.

As this park expands, the need for freight transport via truck and air cargo will likely grow to support the logistics needs of the Park tenants. A facility of this size will have a ripple effect for the neighboring communities and transportation network. Continued coordination between the SJTPO and ACEA will help to support future freight needs as they arise.

[5] Khemlani, Anjalee, and -. "Longtime Dream to Create National Aviation Research and Technology Park in Atlantic City Close to Reality: Roi-NJ." ROI, 6 Aug. 2018, https://www.roi-nj.com/2018/07/31/real_estate/longtime-dream-to-create-national-aviation-research-and-technology-park-in-atlantic-city-close-to-reality/.

2.5 Cold Chain Distribution Infrastructure

One of the promising new industries discussed during many of the stakeholder interviews was fast-freeze produce and the associated cold storage facilities required to facilitate this industry. Many noted that Vineland and Millville in particular have capitalized on being well positioned relative to major markets including New York and Philadelphia while also being close to the region's agricultural production areas. During the interview with NFI Industries, the stakeholders shared how goods are freighted along Route 55 to the industry parks in Vineland, Millville, Bridgeton, and Salem prior to the final mile route on smaller trucks. Furthermore, Doug Whitaker, Assistant County Engineer to Cumberland County noted the proposed industrial park by the Millville airport as a potential key component of these new industries.

As Millville and Vineland continue to expand freight capacity through the development of industrial parks, the agriculture industry is capitalizing with cold storage facilities. *The Daily Journal* reported that constructing the cold storage facility in the Vineland Industrial Park is an opportunity to cut the middleman between products and consumers.[6] With agriculture being a large export for South Jersey, adding cold storage can expand the distance that the food can travel and increase the viability of the industry for the region.

Figure 2-7. A rendering of a cold storage and freezer facility to be built in Vineland Industrial Park-North for KRES Cold Storage

KRES Cold Storage

This growth directly impacts freight movement throughout the region. With an increase in industrial parks in a concentrated area, there are considerations to the impacts of large freight trucks moving throughout smaller cities. Impacts could include freight trucks queuing outside causing congestion, increased demand to parking, and noise impacts with freight trucks.

[6] Smith, Joseph P. "Vineland Says Yes to Cold Storage Facility in Industrial Park." The Daily Journal, The Daily Journal, 16 Aug. 2019, https://www.thedailyjournal.com/story/news/2019/08/15/nj-vineland-kres-homiak-transport-cold-storage-planning-approved-construction-mill-road-industrial/2020726001/.

3 Stakeholder Outreach

Stakeholder outreach is a critical component of any freight data collection effort as it helps to inform and provide context to the freight network data. The following stakeholder outreach strategies were deployed to ensure that the Regional Freight Plan Data Collection and Analysis reflected the freight users in the region:

- Stakeholder Interviews
- Online Survey
- Freight Advisory Committee

3.1 Stakeholder Interviews

3.1.1 Approach

The purpose of engaging freight stakeholders was to better understand freight movement and needs throughout South Jersey, improve communication with freight businesses and learn about changing business needs that could impact freight movement. Using the SJTPO stakeholder database and initial data findings for freight generated trips, the project team created a refined list of stakeholders to interview representing the following categories:

- Economic Development
- Manufacturers/Freight Generators
- Carriers, Logistics, and Warehousing
- Ports
- Public Works Departments
- Rail and Industry Parks
- Railroads

The team interviewed 12 regional freight stakeholders to understand their individual needs, key freight routes within the region, and expanding business and development opportunities. See Appendix A for the list of business professionals interviewed.

3.1.2 Interview Questions

The freight stakeholders were asked a series of questions to understand how they and their business or organization interacts with the freight network throughout South Jersey. These questions covered a range of topics including the business's freight network needs in the region, potential economic growth in the area and policy and planning impacting the business's freight needs. See Appendix B for the full list of interview questions.

3.1.3 Interactive Map

The interactive map of SJTPO helped guide the conversation with the stakeholder interviews. Designed using ArcGIS Online, the map included a variety of layers from the different freight modes to live traffic. During the interview, the stakeholder could point out specific areas on the map to stress a road concern. Following the interviews, all location-relevant comments were added to the map as a visual summary as shown in Figure A. Click here to explore the interactive map.

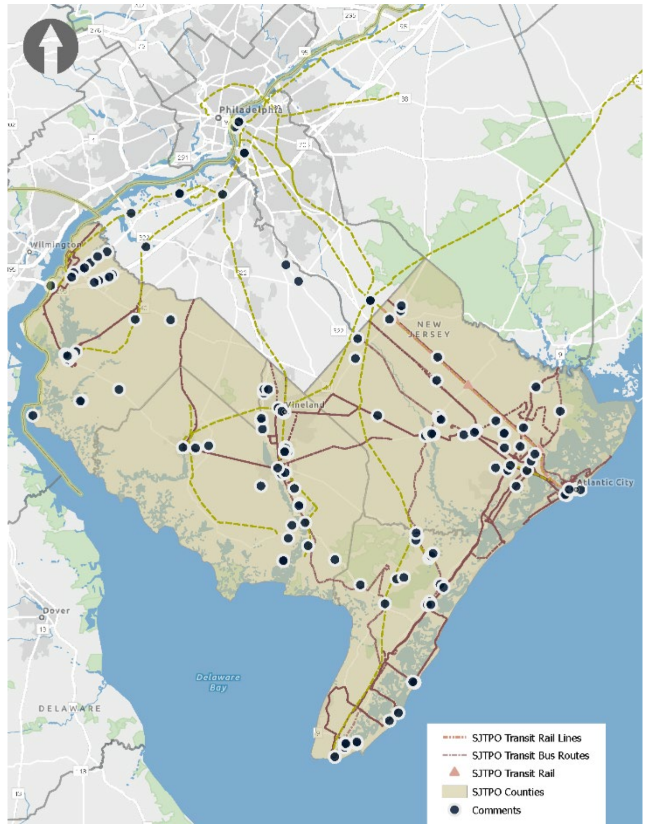

Figure 3-1. Online Comment Locations

3.1.4 Key Themes and Findings

Overall, the interviews shared positive feedback on the existing freight infrastructure in the region. The region serves many types of freight modes including truck, rail, water ports, and air cargo. While trucks are the primary mode of transport, rail and ports support the region specifically with the transport of bulk goods such as sand and gravel. Other bulk goods, agricultural produce, and seafood are all commonly trucked throughout the area. Industry parks in Vineland and Millville support the agriculture business with fast-freeze operations so food can be transported outside of New Jersey.

Major Freight Route Findings

Based on stakeholder interview feedback, freight movement in the region is generally smooth with only a few issues of delay or congestion to be addressed. Many of the major routes are used to move goods throughout the state and to larger distributions centers in Pennsylvania and New York. The heatmap to the right highlights the locations of interview responses related to congestion and bottlenecks.

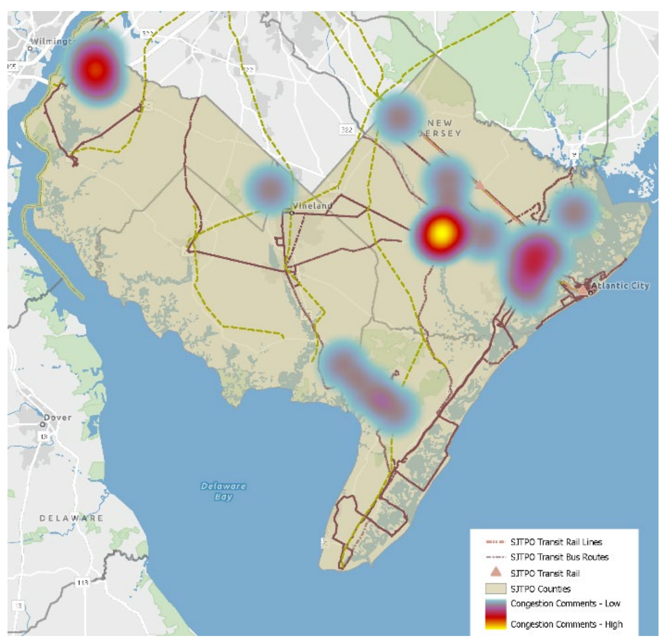

Figure 3-2. Online Comment Heatmap Showing Comments Related to Congestion

Key issues and comments addressing freight routes in the area include:

- The lane reduction on Route 47 and Route 55 heading south to Cape May creates a bottleneck for trucks.
- Congestion on Route 295 to enter the Turnpike.
- Some trucks avoid Route 9 due to congestion, especially during peak tourist season.
- Mixed concerns about tolling on the Expressway and Parkway. While tolling is an added expense, tolled roads tend to have less congestion.

Other interview participants, particularly those in the public sector, indicated that the threshold of 10 percent trucks to qualify for application to the NJDOT Local Freight Impact Fund (LFIF) was a high barrier for funding opportunities. Many roadways that are important for freight movement are also important for passenger vehicle movement, meaning that the truck percentage on a key freight route may be less than 10 percent.

Changing Economy

Looking past the existing freight network, the interview participants shared that economic changes in South Jersey could impact the freight industry. An economy once based on glass manufacturing and entertainment is working to diversify and pursue new economic opportunities. Here are economic opportunities that could impact the freight industry:

- **Industry parks and fast-freeze produce:** Industry parks are investing in fast-freeze produce which allows the agriculture in South Jersey to move further and be stored longer. Industry parks in Millville and Vineland are growing and investing in fast-freeze operations.
- **New Jersey offshore wind port:** The image to the right is a rendering of the new wind port in Salem County of a new offshore wind port has begun to support the wind farms along the coast of New Jersey. While most of the goods will be received by the port directly via water freight, there could be trucking needs in the future.

Figure 3-3. Wind Port Rendering

- **Offshore wind farm:** A future offshore wind farm, Atlantic Shores, will be located off the shore of South Jersey, between Atlantic City and Barnegat Light. Construction will begin in 2024.
- **National Aerospace Research and Technology Park:** A new campus is being built near the Atlantic City International Airport for aerospace innovation. While there is not a regular freight need at this time, the park is an example of the changing economic landscape in South Jersey.

3.2 Freight Advisory Committee

Concurrent with the stakeholder interviews, a Freight Advisory Committee (FAC) was assembled to continue stakeholder feedback throughout the data collection and analysis process. The FAC membership was comprised of business and freight professionals from public and private sector, covering multiple freight modes and an economic development perspective. The full membership list can be found in Appendix C.

Meetings were hosted on Monday, November 8, 2021, and Thursday, March 24, 2022.

3.3 Online Survey

To complement the stakeholder interviews, a virtual survey was sent to freight organizations and companies in South Jersey to gather insight on broader freight needs throughout the SJTPO area. Survey respondents included government agencies as well as carriers and manufacturers transporting a variety of goods such as food, raw materials, and chemical products. Findings from the survey generally matches those received during the one-on-one stakeholder interviews. Respondents indicated an average approval rating of the regional freight infrastructure and networks. Participants were encouraged to identify specific locations of concern to help identify potential improvement opportunities. Key feedback from the survey results include:

- Safety concerns exiting and entering Route 55, especially at Exit 26 to Main Road, pose a hazard for both traffic and large trucks. An additional stoplight may improve these conditions and prevent incidents caused by the blind spot at that intersection.
- Focus on road conditions and the desire for funding to conduct more regular repair and inspection.
- Desire to allow delivery of oversized loads outside of daytime hours to avoid peak hour congestion. Specifically noted as an issues around Highway 295 and Highway 42 interchanges.
- Truck drivers noted the following streets and intersections as areas of concern:
  - Pacific Avenue in Wildwood
  - The Pacific Avenue and Main Street area in Cape May Court House
  - Main Road in Vineland

4 Data Analysis Key Findings

Multiple data analyses were completed as part of Tech Memo 1: Regional Core Freight Dataset and Tech Memo 2: Freight Performance Analysis. This section summarizes the key takeaways and findings from these analyses. The full tech memo documents are included as Appendix B – Tech Memo 1: Regional Core Freight Dataset Technical Memo and Appendix C – Tech Memo 2: Freight Performance Analysis Technical Memo. For a full list of data sources used for this study and instructions for how to access and update this data for future iterations of this document, please see Appendix A.

4.1 Freight Generators and Truck Trip Estimates

A key assumption used throughout this study was that no single data source can be trusted to tell the complete story of freight activity in the region. Multiple data sources were used and combined to identify key freight generating activity centers in SJTPO. Data sources included:

- Population and employment data from the U.S. Census
- Business establishment (Manufacturing, Agricultural, Quarrying, and Transportation Warehousing industries) from Data Axle Reference Solutions
- A truck trip generation methodology applied to localized employment data
- Stakeholder identified locations of high freight activity
- Multimodal connection points (air, water, rail yards, pipeline terminals)
- Truck probe activity from the RITIS PDA Suite
- Existing truck classification counts from NJDOT
- National truck flow estimates from the FHWA Freight Analysis Framework

An example of this combination of sources can be seen in Figure 4-1. This figure shows the locations of existing NJDOT classification count locations (black dots) as well as the estimates of freight trip generation (FTG) in units of estimated trucks per day at the census block level. The centroids of these census block polygons were used as key points in the estimation of segment-level truck volumes and truck percentages.

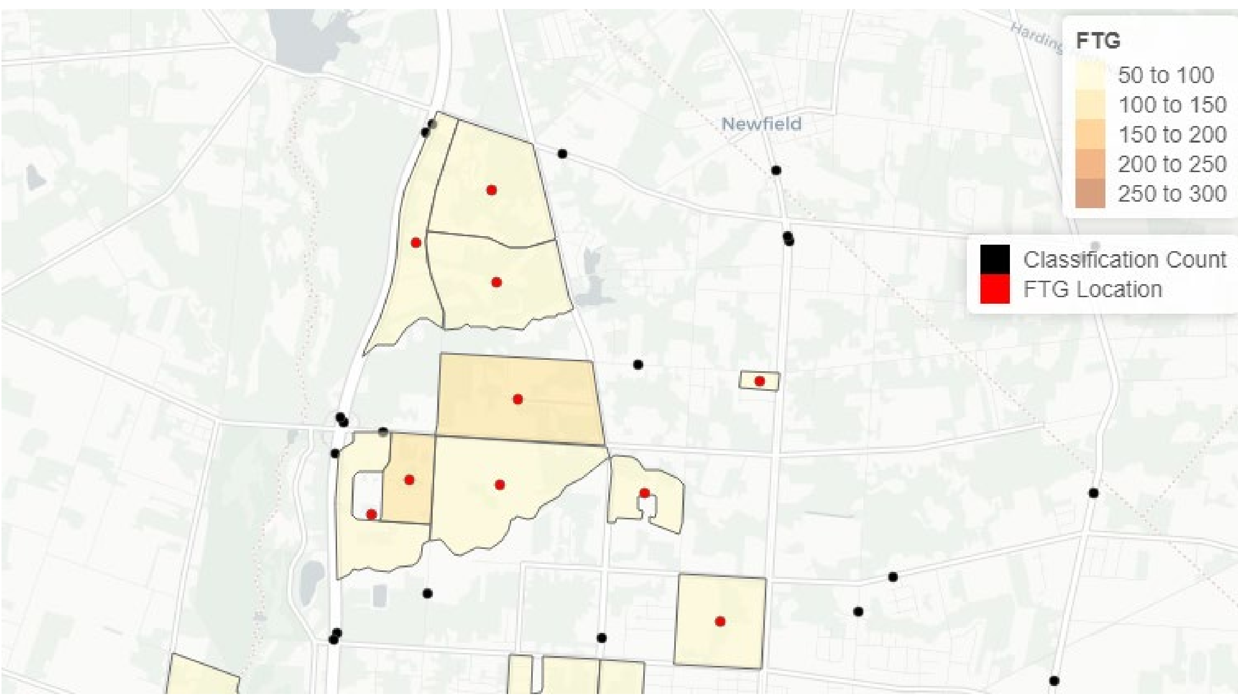

Figure 4-1. NJDOT Classification Counts and FTG Points near Vineland Industrial Park

Another example of these combinations of data sources is shown in Figure 4-2. This figures shows multiple overlapping data sources including freight-related employment data, population density, freight establishments, and freight trip generation estimates. This figure is a screen shot taken from the online StoryMap discussed further in Section 5. The figure highlights key area of activity in areas around Vineland, Hammonton, Pleasantville, and Atlantic City.

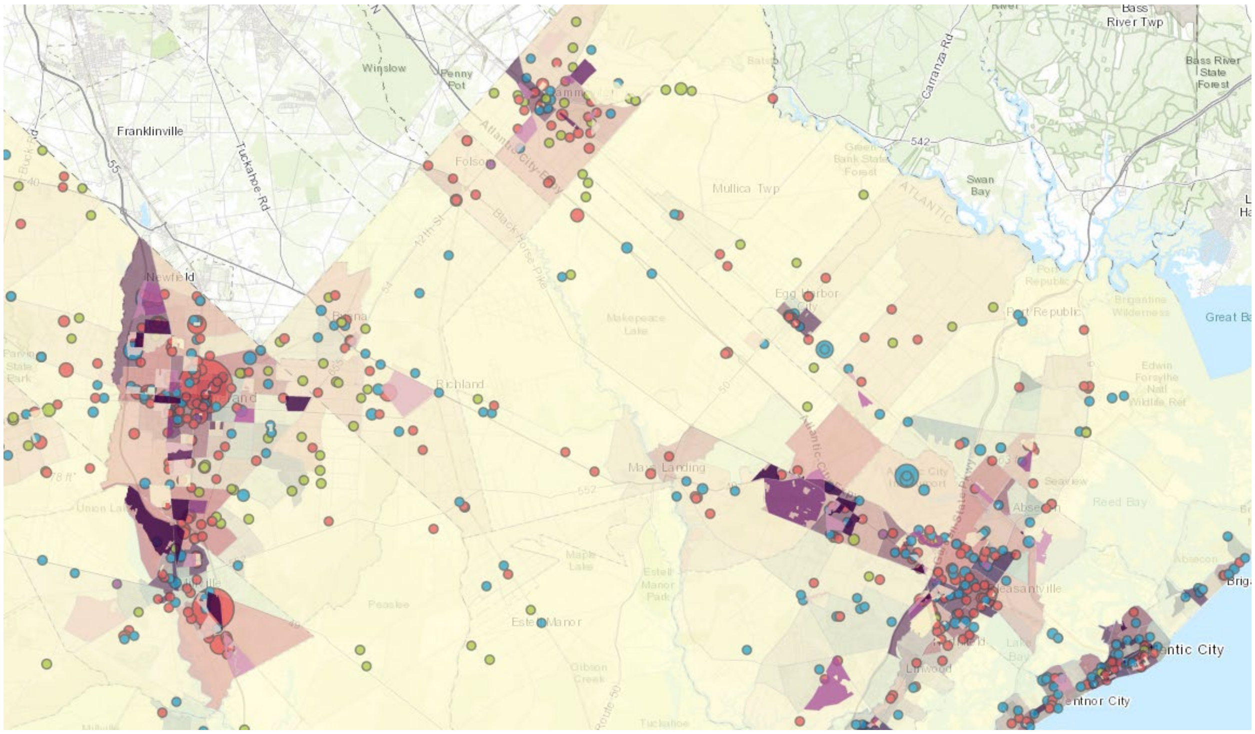

Figure 4-2. FTG Estimates, Data Axle Establishments, Employment, and Population Data

As described in Tech Memo 1, these various data sources were used to identify areas of high truck activity. The data sources were then compared to the locations of existing truck classification counts from NJDOT, a recent Cumberland County truck study, and other sources. In coordination with local freight stakeholder, 21 additional locations were selected to the collection of new truck classification counts specifically for this study. These locations were selected for areas which were likely to experience high levels of truck activity, but which did not have an existing classification count.

In total, this study identified the following number of point locations used for the estimation of truck volumes in the SJTPO area:

- 448 points from NJDOT Classification Counts
- 443 points from Freight Analysis Framework Estimates
- 79 points from the Cumberland County Truck Corridor Study
- 21 points collected as part of this study

To estimate the truck volumes and percentage on the roadway segments between these points, this study employed a truck volume extrapolation methodology discussed in detail in Tech Memo 1. The final results of these exercise are shown below in Figure 4-3. Final Estimated Truck ADT, Figure 4-4. Final Estimated Combination Truck ADT, and Figure 4-5. Final Estimated Truck Percentage. This data can be explored in further detail using the online StoryMap discussed in Section 5.

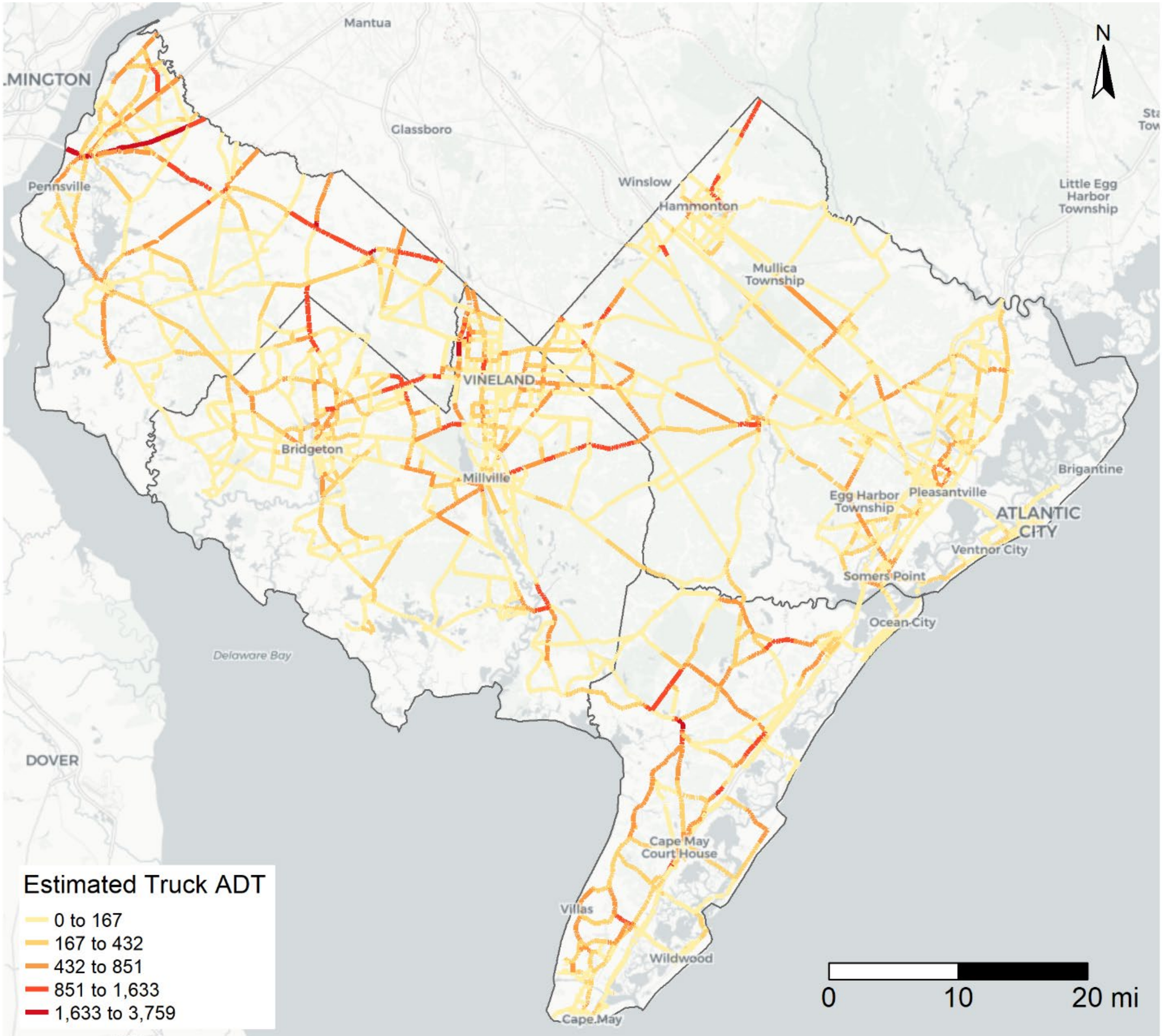

Figure 4-3. Final Estimated Truck ADT

Source: HDR analysis of NJDOT truck classification counts, freight trip generation estimates using the NCFRP Report 37 methodology applied to LEHD data and FAF5 truck flow network assignments.

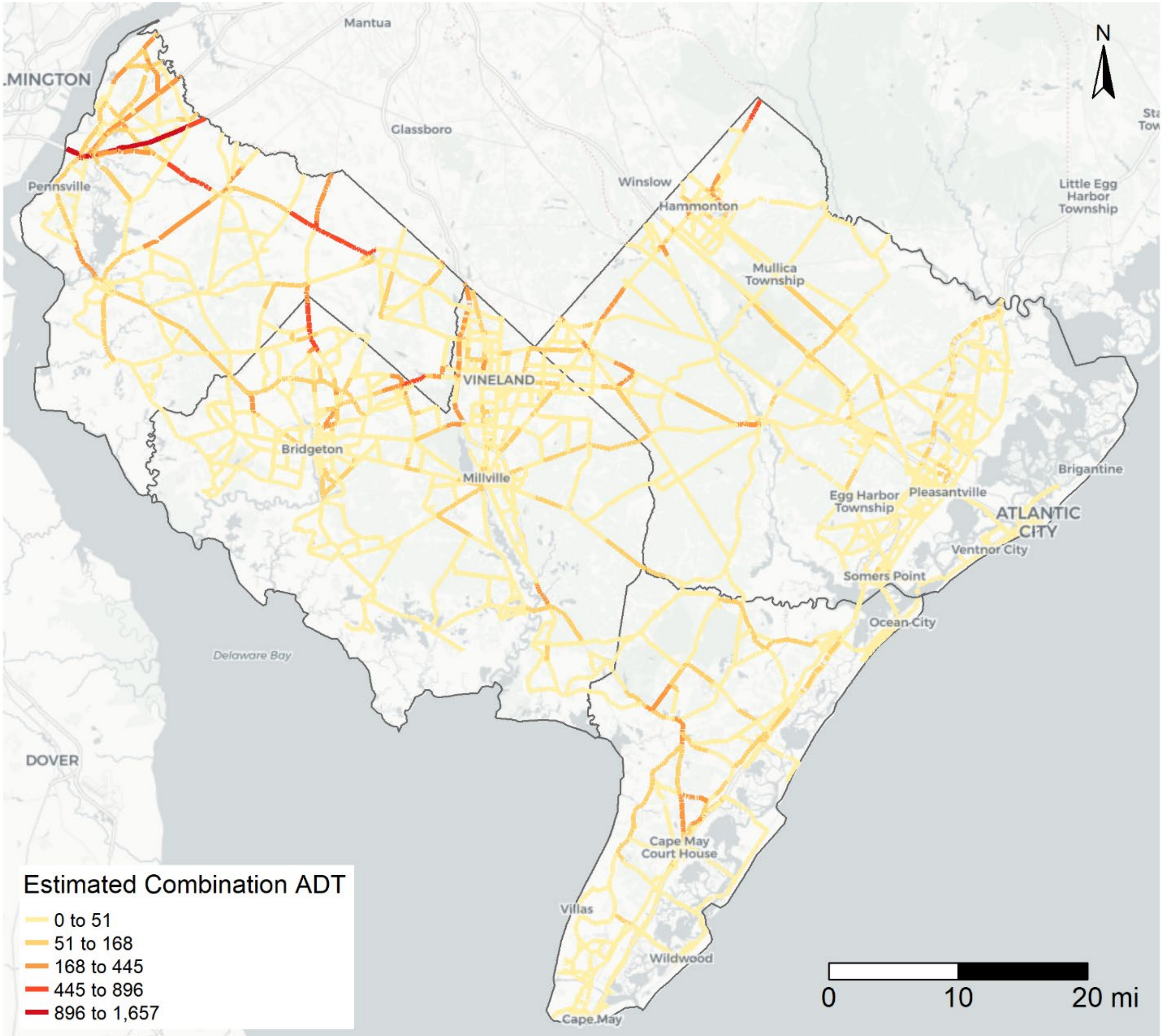

Figure 4-4. Final Estimated Combination Truck ADT

Source: HDR analysis of NJDOT truck classification counts, freight trip generation estimates using the NCFRP Report 37 methodology applied to LEHD data and FAF5 truck flow network assignments.

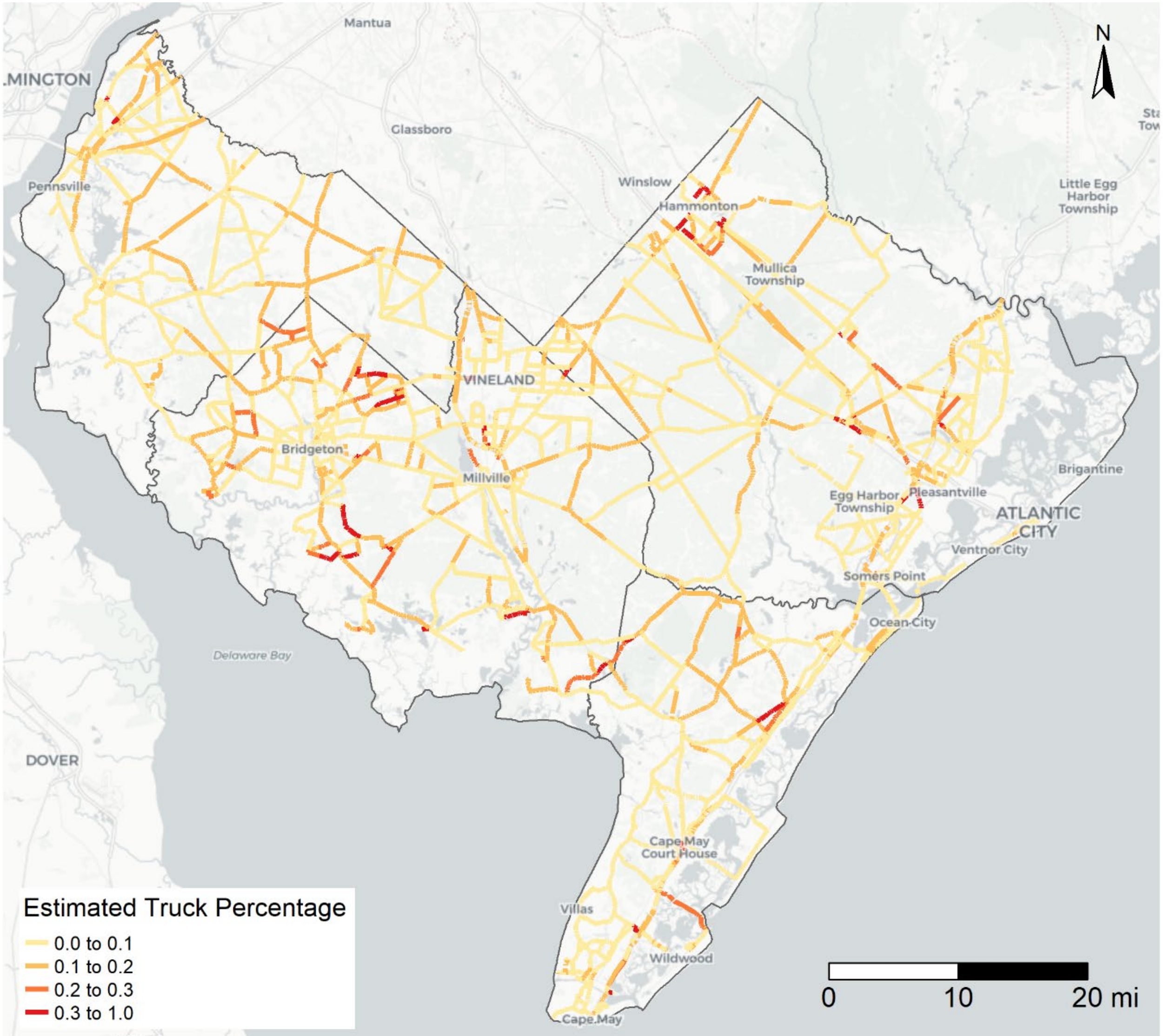

Figure 4-5. Final Estimated Truck Percentage

4.2 Truck Freight Summary

Additional analyses were conducted to assess multiple aspects of the truck freight transportation system in SJTPO. These included the following:

Congestion and Travel Time Reliability (TTRI)

Congestion was measured using INRIX and NPMRDS data downloaded from the from the RITIS PDA Suite. The locations of congested roadways in SJTPO during the peak summer season are shown in Figure 4-6. Some of the roadway segments (> 0.25 miles in length) with the highest levels of peak congestion include:

- Fire Road and New Road in Atlantic County
- Swainton Goshen Road, Highway 47, East 9th Street, and Ferry Road in Cape May County
- Station Road, Hunters Mill Road, Hands Mill Road, East Main Street, West Road, and High Street in Cumberland County

- Walnut Street, Industrial Road, Fort Mott Road, Highland Avenue, and Hawks Bridge Road in Salem County

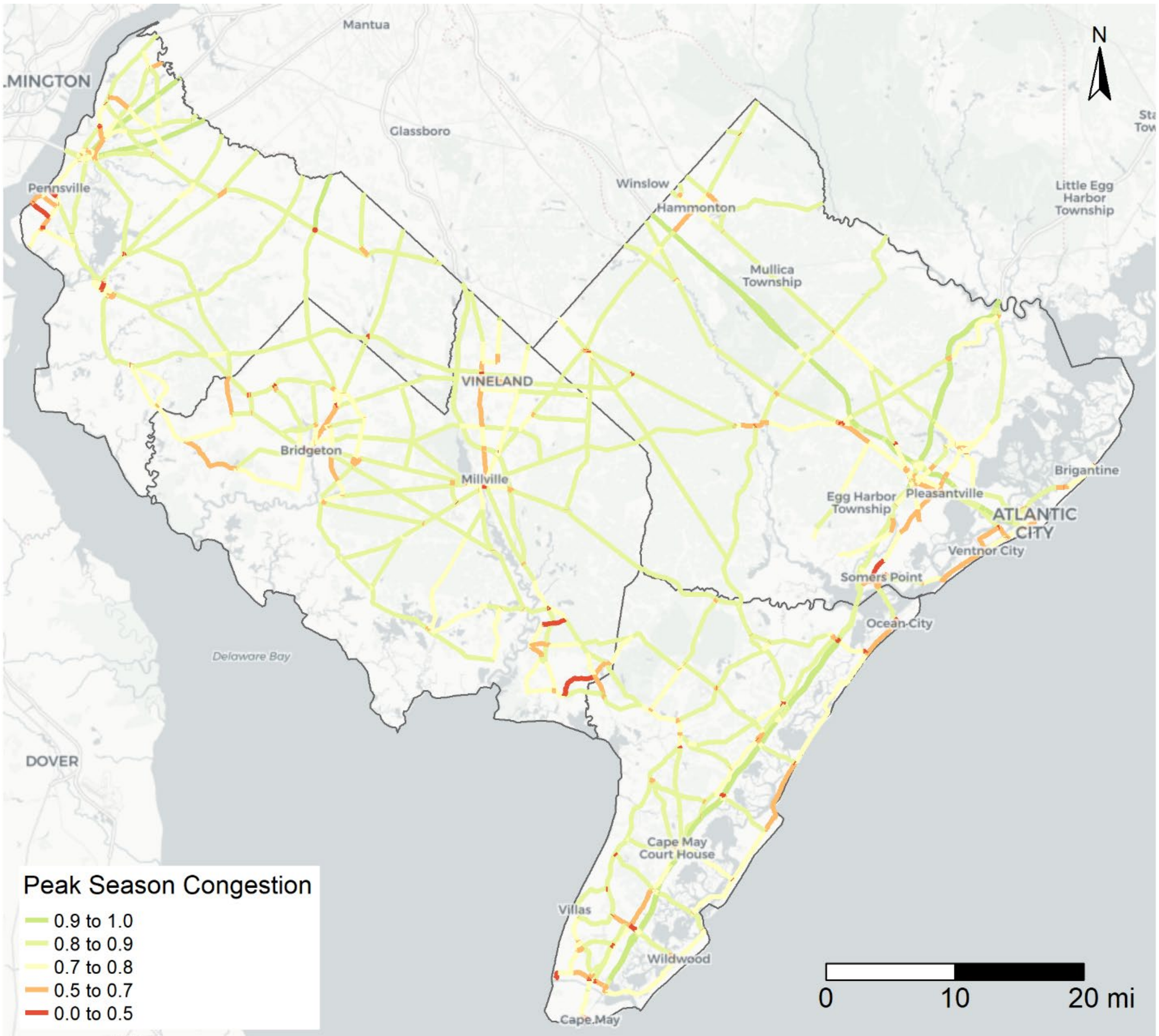

Figure 4-6. Peak Season Peak Hour Congestion (All Vehicles, INRIX)
Source: INRIX Data, Jan-Dec 2021

Truck Mobility Impediments

A key focus of this aspect of the study was the potential impact of bridges with either low vertical underclearance or low load ratings. In total, nine bridges were identified as having low clearance, nearly half of which were railroad-over-highway bridges. Additionally, five bridges were identified as having a load rating less than 26,000 Lbs. These bridges are anticipated to have a relatively minimal impact on overall truck movements due to multiple alternative routes available to connect major highways with areas of freight activity.

Highway-Rail Grade Crossings

SJTPO has a total of 329 highway-rail grade crossings. Of these, 251 are public highway crossings. This analysis focused on crossing safety as well as the potential for blocked crossing to impact freight and other traffic. In the past 10 years, there have been nine crashes at highway-rail grade crossings in SJTPO. Of these, three were fatal**.** Two of the nine crashes involved trucks. There have been no reports of blocked rail crossings reported through the FRA blocked crossing portal. Crossings with the potential for blockages that could impact truck freight (crossings with 5+ trains per day and 10+ trucks per day) were identified by this study. In total 14 crossings meet these criteria, primarily located along the Atlantic City Line Commuter rail corridor and in Vineland.

Truck Origin-Destination Data

This data represents a sample of truck activity and can be used to identify key origins and destinations of truck trips starting or ending with SJTPO. Overall, the areas found to be key activity areas for origins and destination of truck trips largely matched with the other data sources showing high activity in Vineland, Bridgeton, Millville, and the corridor between Atlantic City and Hammonton. However, the area with the largest number of truck origins and destinations was located near the Hawks Bridge Road interchange in the northwest portion of Salem County. This single area has multiple major truck parking facilities and accounts for nearly five percent of all truck trips into or out of SJTPO. A review of the connection origin-destination pairs for trips starting or ending in SJTPO (Figure 4-7) shows a high proportion of trucks traveling north along the I-95 corridor to the New York City area and beyond and south along the I-95 corridor to Baltimore, Washington, D.C., and points south. Many truck trips also connect to multiple destinations along the New Jersey shore.

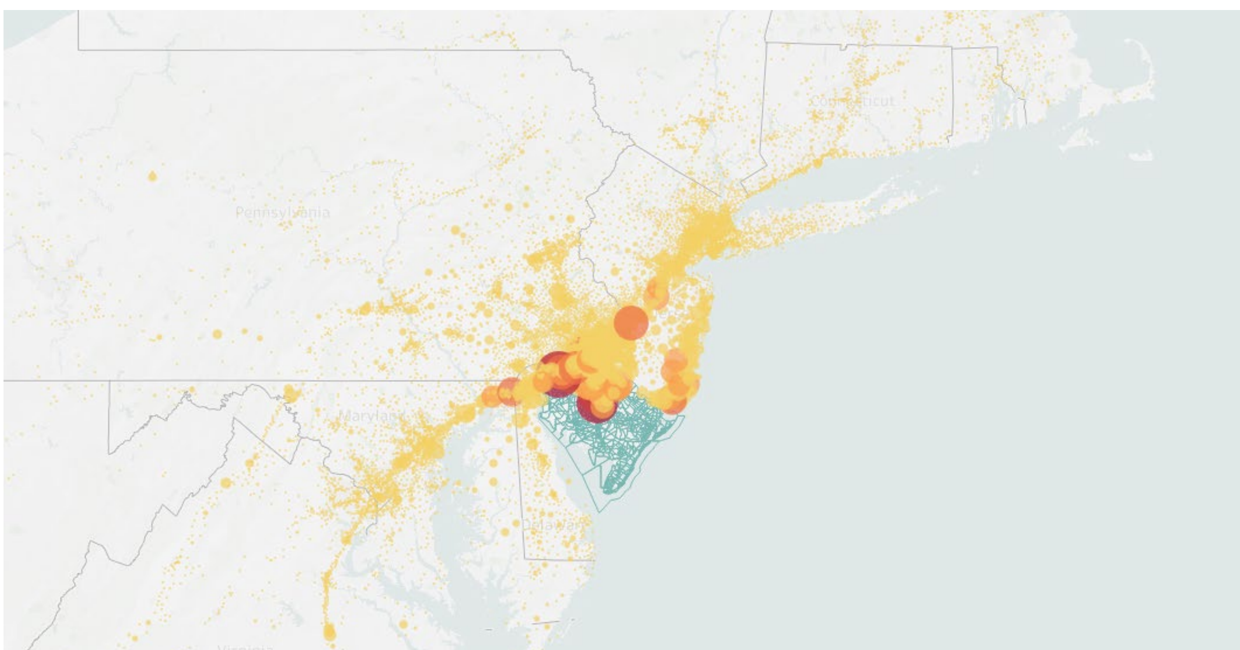

Figure 4-7. Origins and Destinations for Trips Starting or Ending in SJTPO
Source: RITIS Trip Analytics Origin-Destination Data

Highway Safety

Truck crash data was collected from the NJDOT Safety Voyager platform for years 2015 through 2019. The data was filtered to include only crashes involving at least one commercial truck vehicle type (e.g., Single Unit trucks, Tractor Semi-Trailer). In total, 3,927 crashes meeting these criteria occurred within SJTPO. This study created a heat map of crash locations based on the crash weighting methodology described in the NJDOT Highway Safety Improvement Manual. The results of this analysis showed multiple crash hot spots in Vineland, Atlantic City, and Hammonton. However, it should be noted that approximately 11 percent of the crashes in the data set did not include information for latitude or longitude. Because of this, the location of these crashes could not be easily determined. This was primarily an issue in portions of Salem and Cape May Counties.

Truck Parking

Multiple public and private truck parking facilities are located within SJTPO. The largest of these facilities are the private truck stops located near the Hawks Bridge Road interchange of I-295 and the New Jersey Turnpike. The Flying J truck stop located here is the second largest single truck parking facility in the state with a total of 350 spaces. Other smaller facilities are located throughout SJTPO with three private facilities in the Vineland area and three public facilities along the Garden State Parkway and Atlantic City Expressway.

On-street truck parking near the Vineland Industrial Park was identified through stakeholder engagement as a potential concern. With the growth of freight activity in this area, many trucks are forced to park on the street while they wait for their final destination to open for business. Potential solutions to this issue include reconstruction of the roadway to allow for this parking activity without impeding other vehicles, the construction of additional truck parking facilities in the area, or the coordination with local businesses to allow to on-site truck parking.

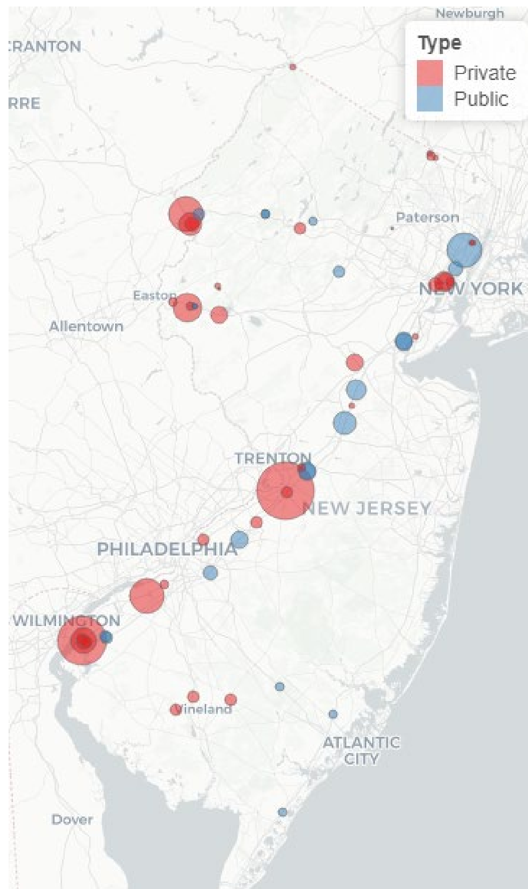

Figure 4-8. New Jersey Truck Parking Facilities

Source: Jason's Law Survey and truckstopsandservices.com

4.3 Multimodal Freight Summary

A map of multimodal freight corridors and terminals is shown in Figure 4-9.

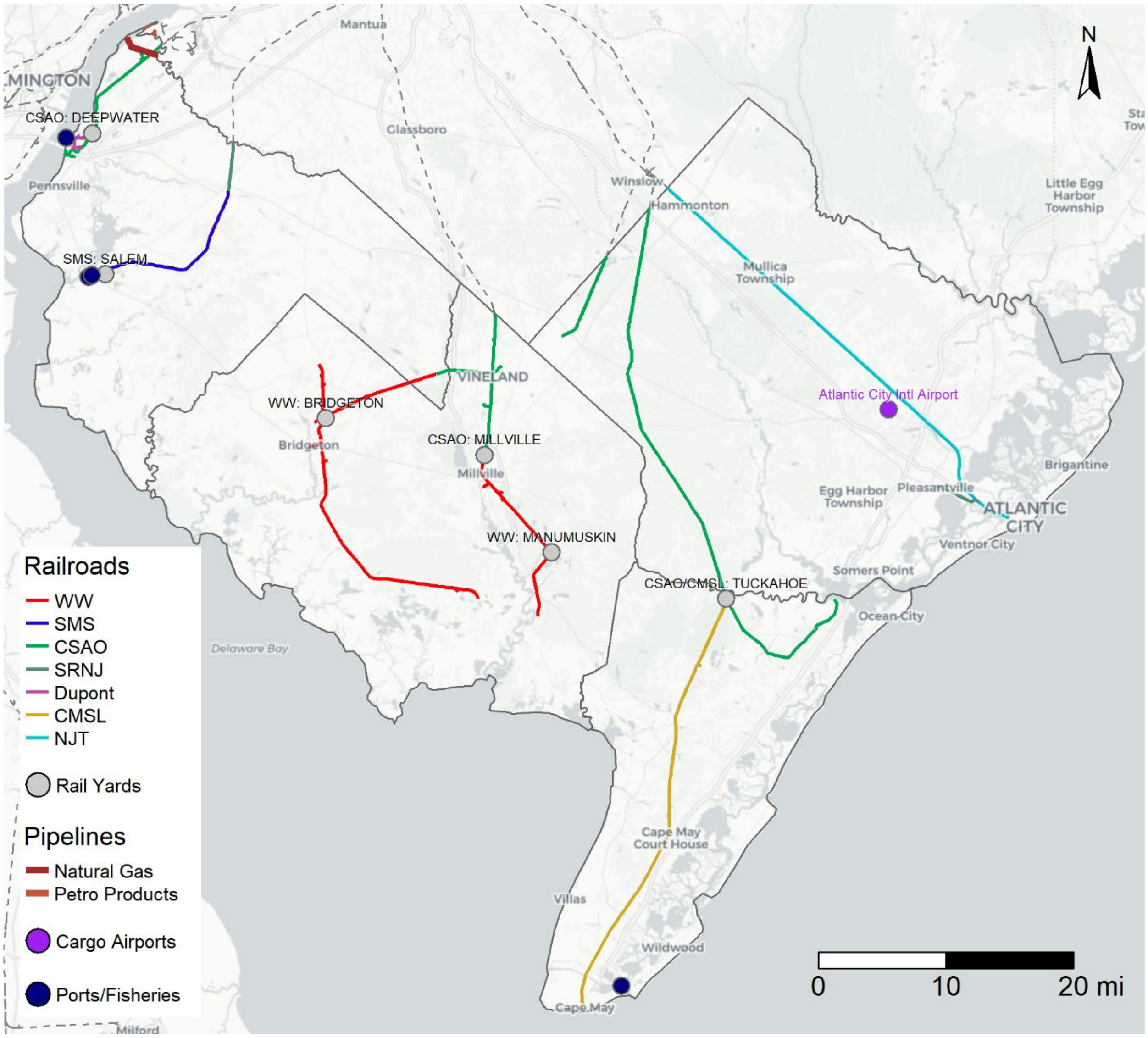

Figure 4-9. Multimodal Freight Infrastructure in SJTPO

Freight rail service in SJTPO is provided through a combination of five distinct railroads and one commuter rail line. The Atlantic City Line operates the fastest rail service in SJTPO with maximum speeds of 80 mph and an estimated 26 trains per day. The remaining rail lines range in speeds from 5 to 20 mph with an average speed of approximately 12 mph. The range of estimated train volumes on these other lines is also lower with four or fewer estimated trains per day.

Air cargo for the SJTPO is predominately handled by the Philadelphia International Airport, which handled approximately 1.2 Million Lbs. of freight per year. Locally, the Atlantic City International Airport also handle some freight shipments. However, these are generally sporadic, one-time shipments rather than ongoing monthly volumes. The Atlantic City Airport handled approximately 16,000 Lbs. of freight in 2020, with smaller volumes handled in 2019 and 2021. However, this airport has future freight potential as the location of the new National Aerospace Research and Technology Park.

Maritime freight shipments in SJTPO are primarily handled by the Port of Salem and the Dupont Chemours Chambers Works locations. Other notable locations include the planned wind port in Lower Alloways Creek, known sand and gravel barge activity occurring near Port Norris, and multiple fishery operations located in Cape May. Approximately 62 Million tons of maritime freight is handled annually along the Delaware River, with crude petroleum making up a large portion of this activity.

Pipeline activity within SJTPO is minimal with no known pipeline terminals located within the four counties and only small portions of pipelines carrying petroleum products and natural gas located at the northernmost point of Salem County.

5 Online StoryMap and Dashboards

An online StoryMap (Figure 5-1) was developed to supplement this study by providing many of the results in an online, interactive format. The StoryMap is hosted on the SJTPO ArcGIS Online account and may be added to or modified with additional or updated information in the future. Users can access the StoryMap at the following link:

- SJTPO ArcGIS Freight StoryMap: https://arcg.is/0Pq4151

Figure 5-1. Online StoryMap Cover Page

The StoryMap is broken down into six primary sections:

- **Freight Generators:** This section includes information related to the identification of major freight activity centers in the region including employment and business establishment data, freight trip generation estimates, and truck probe activity data. This section can be used to better understand the distribution of freight business and employment clusters within SJTO.
- **Estimated Daily Truck Volumes and Percentages:** This section displays the results of the truck trip interpolation methodology described in Tech Memo 1. The map includes information on known locations where the truck percentages are at least 10% trucks by volumes. This section can be used to identify roadways that are eligible for LFIF funding, or roadways which are likely to be eligible but require confirmation through physical classification counts.
- **Truck Origins-Destinations:** This section includes a dashboard summarizing the truck probe origin-destination data available from the RITIS PDA Suite. The data may be used for planning purposes to better understand the regional origins and destination for truck trips starting and ending within specific locations in SJTPO.
- **Truck Performance and Mobility:** This section summarizes the truck congestion and travel time reliability measures evaluated in Tech Memo 2. It also includes information on potential bridge impediments including bridges that have low vertical underclerance, have low load ratings, or are in poor condition.
- **Multimodal Freight:** This section highlights the locations of multimodal freight infrastructure including railroads, maritime ports, airports, and pipelines and pipeline terminals. This information may be used to better understand the locations of key freight nodes in the region.
- **Stakeholder Engagement:** This section displays the locations of comments received during the stakeholder outreach component of this study. This section may be used to better understand the locations and types of specific freight issues on the SJTPO freight transportation system.

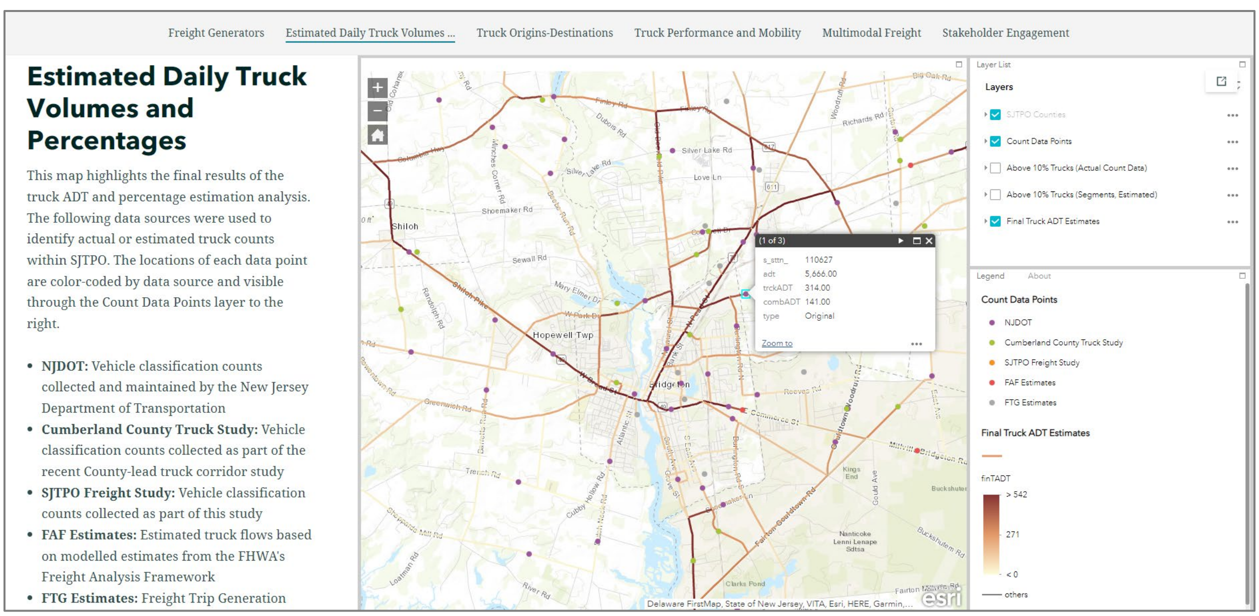

Figure 5-2. Online StoryMap Estimated Daily Truck Volumes and Percentages

6 Next Steps/Recommendations

The overarching goals of this study have been to gain a better understanding of regional freight industries and freight movement in SJTPO through both data collection and stakeholder outreach and to help inform future freight planning efforts for SJTPO and other local freight partners. The following section provides recommendations on the different ways that the data collected for this study can be used to inform future freight planning efforts. The section also provides recommendations for additional data analysis and stakeholder outreach activities that could be pursued to further supplement this study's data.

6.1 Additional Stakeholder Outreach

One key challenge faced during this study was gathering a sufficient response from local freight businesses to requests for interviews. This has been a common issue for many recent freight planning efforts across the country, particularly in the past two years. This lack of response is likely a combination of two key issues: 1) With additional strains on many supply chains due to increased consumer demand and ongoing labor shortages, many businesses feel they do not have time to take part in an interview, regardless of the interview duration, and 2) Many businesses do not see a personal or company benefit to participation in such interviews, particularly if they are not currently experiencing any major freight transportation issues with their operations.

Despite these challenges, it is recommended that SJTPO continue to try to establish connections with additional freight businesses and industries in the region. The following industries are of particular interest due to their importance and/or unique role in the local freight economy:

- **Quarrying Operations:** Given the many complexities involved in sand and gravel quarrying, from potential environmental impacts to the growing global demand for these materials, it is likely that quarrying will continue to be a major industry in SJTPO for the foreseeable future.
- **Agriculture:** As discussed previously, one of the major potential growth areas for future freight industries in SJTPO is the potential expansion of fast-freeze produce. Agricultural producers will play a key role in pursuing those areas and ongoing coordination with SJTPO and other local freight stakeholders will help to foster growth in this area.
- **Industrial Parks:** The recent growth in local industrial parks has fueled changes in truck trip generation and travel patterns. Also, as identified by some stakeholders during study outreach, increases in truck trip generation for businesses in the parks has led to issues such as instances of truck parking on local roadways. Increased coordination with the industrial parks and associated businesses will help to identify solutions to these and other issues.

6.2 Future Data Collection Recommendations

The availability of freight data continues to evolve and allow for more in-depth evaluations of freight issues and conditions at regional and local levels. This section outlines three potential focus areas for SJTPO to be aware of for future freight planning and analysis efforts.

6.2.1 NJDOT Truck Count Availability

A sizeable portion of this study was focused on downloading and processing the available NJDOT truck classification count data for use with truck volume and percentage estimation described in Tech Memo 1. While this classification data is available through the NJDOT's interactive traffic count website, it can only be reviewed one location at a time by manually opening and viewing the raw data in PDF format. With over 400 classification count locations in SJTPO alone, this presents a very time-consuming process. This process can be sped up somewhat through the use of automated scripts, but this adds complexity to the process. It would substantially help with freight planning efforts if daily truck volume data were available as easily as the all-vehicle volume data is. SJTPO should request from NJDOT that the truck volume data be made more readily available.

6.2.2 Data on E-Commerce Deliveries

In the past 20 years, e-commerce as an industry has grown from less than one percent of total retail sales to approximately 15 percent by 2020.[7] The industry is expected to continue to increase in the near future. However, data on the logistics of e-commerce deliveries for freight planning purposes has been fairly limited. Many of the commonly available truck probe data vendors such as INRIX, StreetLight, and ATRI (American Transportation Research Institute), primarily focus on the heavier truck classification vehicles like large straight trucks and tractor trailers. However, the smaller delivery vehicles used to deliver e-commerce packages to residential areas are typically not included in these datasets. Two relatively new data providers that are attempting to address this missing e-commerce data piece are described below:

- **Geotab** is a company that originally began as a provider of fleet management solutions for private truck fleets. Recently they have expanded to offer data solutions that use their underlying data to provide insights into freight movements. Of specific note is the way that Geotab categorizes their trips into specific trip types. One of these, the Door to Door trip type, focuses on the types of delivery vehicle most likely to be used for delivery of e-commerce deliveries.

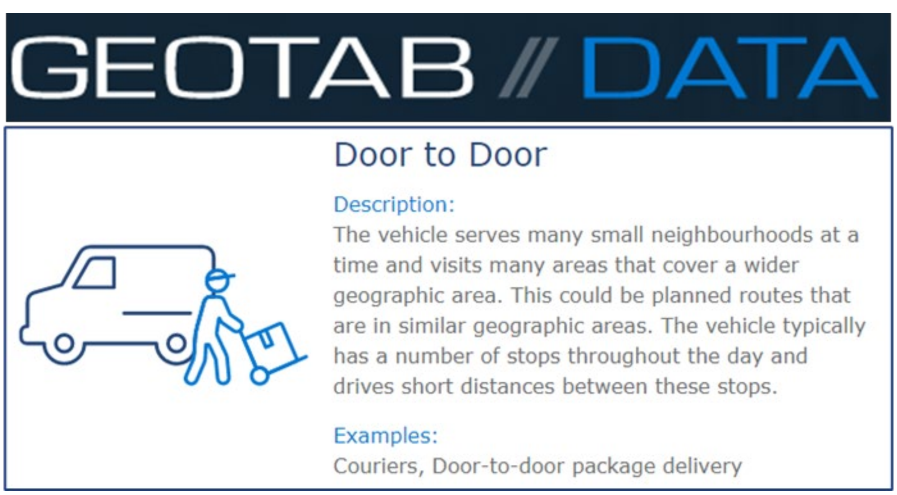

Figure 6-1 Geotab Data, Door to Door Trip Type Description

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[7] U.S. Census Quarterly Retail E-Commerce Sales 1st Quarter 2022: https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf

- **Rakuten Intelligence** is another data provider that has been used to measure factors such as e-commerce demand by zip code. Combined with knowledge about the locations of distribution centers and transportation modeling capabilities, this information can be used to estimate the number of e-commerce deliveries on specific roadways for a given area. This approach was recently used by the North Jersey Transportation Planning Authority as part of their Regional Freight Commodity Profile development.[8]

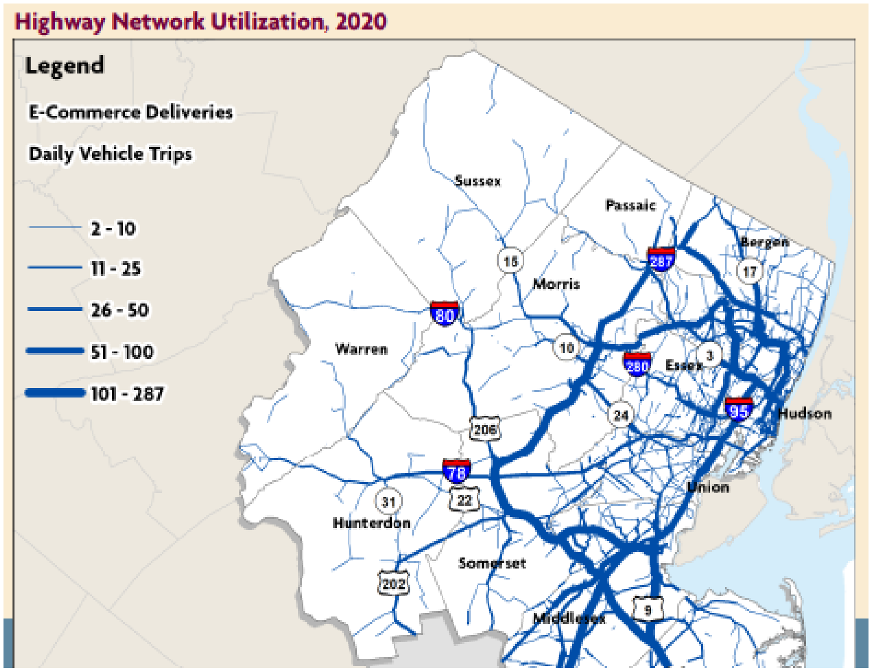

Figure 6-2. NJTPA Regional Freight Commodity Profile, E-Commerce Deliveries

6.2.3 RITIS Nextgen Trip Analytics (Beta)

Access to the standard RITIS Trip Analytics tool was provided for this study, allowing for various analysis tools. The primary tool used to gather data for this study was the Origin-Destination Analysis. RITIS has continued to develop and refine the Trip Analytics tool and a revised version of the tool, known as "Nextgen Trip Analytics" is currently available in a beta version. The tool seeks to make it easier for users to create analyses for custom study areas and provide more information about vehicle movements. SJTPO should continue to coordinate with NJDOT and RITIS to stay abreast of new developments with this tool to identify potential applications of the tool in day-to-day freight planning efforts.

6.3 Considerations for Future Freight Planning Efforts

The focus of this study has been the collection and development of freight data and stakeholder engagement to better understand the freight-related issues within SJTPO. The next steps for SJTPO will be to take this information and use it to identify goals, strategies, and priorities to best support freight in the region.

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[8] NJTPA Regional Freight Commodity Profile, E-Commerce Deliveries: https://www.njtpa.org/NJTPA/media/Documents/Planning/Regional-Programs/Studies/2050%20Freight%20Industry%20Level%20Forecasts/12-Ecommerce-ScreenView2020.pdf

6.3.1 Identification of Freight Improvements

The data collected for this study can be used to identify potential areas for freight improvements. There is no singular approach that states and MPOs typically use to identify these areas. However, one somewhat common approach is to review the data and stakeholder feedback through the lens of three key factors: Safety, Mobility, and Condition.

Safety

This category concerns the overall safety of the freight transportation system. Key data sources used to assess safety needs are the truck-related crash records provided via the NJDOT Safety Voyager platform and the FRA highway-rail grade crossing accident/incident records. Safety issues for other modes generally must be gathered through stakeholder feedback.

Mobility

This category includes all aspects of the freight transportation system that impact the ability of freight goods to move freely. This can include congestion, travel time reliability, bridge underclearance, and bridge load ratings.

Condition

This category relates to the physical condition of freight infrastructure. For truck freight, this primarily includes pavement quality and bridge condition ratings. Less public data is available for other freight modes and generally must be collected through stakeholder outreach and coordination.

Final Scoring and Weighting Factors

A final freight need score can be calculated by developing scoring factors for each of the above categories. For example, a score for truck mobility could be based on the percentile of each roadway segment for congestion. Roadways segments above the 90th percentile could be scored as a 10. Segments above the 80th percentile could be scored as a 9, etc. Following a similar approach for each of the data characteristics within the safety, mobility, and condition categories, a combined total freight score can be developed. This is a highly simplified description of the process and there is much leeway for transportation agencies to develop freight need scoring criteria to best suit their needs. For example, an agency may decide that scores for safety should be weighted more highly than other needs, meaning that areas with safety issues will tend to rank higher than other areas.

Beyond the distinction between the three categories above, another important factor to consider is the potential impact of the freight need and the potential solutions. All things being equal, a congested highway with 1,000 trucks per day should be given priority over a congested highway with only 100 trucks per day. The incorporation of a freight volume scoring factor as a measure of potential impact is highly recommended.

Another challenge faced by many transportation agencies is the question of how to prioritize freight needs and projects across the various freight modes. How can an air cargo project be compared to a maritime cargo project? Some agencies have taken the approach of comparing the impact of total freight volume throughput as the key comparison between modes. That is, a project that increase the throughput of air cargo by 10 percent over the baseline condition would be considered equivalent to a roadway project that increase the throughput of trucks by 10 percent. Alternatively, other agencies have taken the approach of focusing primarily on truck freight needs and projects given the greater jurisdictional authority over these systems by most transportation agencies. In some cases, a set proportion of available funding may be set aside for multi-modal project types.

6.3.2 Coordination with State Freight Planning Efforts

SJTPO should continue coordination efforts with NJDOT and other local and regional freight stakeholders. Specific areas of coordination include:

- **NJDOT Local Freight Impact Fund (LFIF):** As one of the key funding mechanisms for NJDOT to support local freight projects, SJTPO should work to stay current on the most recent program eligibility criteria (e.g., the requirement that eligible roadways must have at least 10 percent truck volumes, and the requirement that applicants demonstrate that the project will provide access to a freight node). This will help both SJPTO and other local freight stakeholders such as counties and cities as they support and pursue local freight funding opportunities. The data results included in this study will help to inform all stakeholders of which roadway segments currently meet these criteria and which are likely to meet the criteria but require confirmation through physical counts. The data will also help to inform the development of the application narrative describing how a proposed project will help to improve the freight transportation system.
- **Periodic Updates to the National Highway Freight Network (NHFN):** Under the current federal transportation bill, each state is allotted a set mileage that can be designated as Critical Urban Freight Corridors (CUFCs) or Critical Rural Freight Corridors (CRFCs). In New Jersey, these mileages are up to 300 miles of CUFCs and up to 150 miles of CRFCs.[9] Designation of the CUFCs are typically coordinated between the state DOT and MPOs in the state. SJTPO should use the information collected during this study to argue for adequate designation of these freight corridors in the region. For example, Highway 55 represents a key freight link between the Interstate Highway Network and local freight clusters, specifically in the Vineland and Millville areas.
- **New State Freight Planning Requirements:** Under the recently authorized Bipartisan Infrastructure Law (BIL), multiple new requirements were appended to the existing state freight planning requirements. These include the following:
    - The most recent commercial motor vehicle parking facilities assessment conducted by the State;
    - The most recent supply chain cargo flows in the State, expressed by mode of transportation;
    - An inventory of commercial ports in the State;
    - If applicable, consideration of the findings or recommendations made by any multi-State freight compact to which the State is a party;
    - The impacts of e-commerce on freight infrastructure in the State;
    - Considerations of military freight;
    - Strategies and goals to decrease

[9] FHWA NHFN Mileages by State: https://ops.fhwa.dot.gov/freight/infrastructure/nfn/maps/nhfn_mileage_states.htm

- the severity of impacts of extreme weather and natural disasters on freight mobility;
- the impacts of freight movement on local air pollution;
- the impacts of freight movement on flooding and stormwater runoff; and
- the impacts of freight movement on wildlife habitat loss.

Much of the data collected for this study will help SJTPO to inform and provide feedback in regard to these issues during the next iteration of the State Freight Plan Update.

Appendix A: Data Products and Sources

This appendix provides additional details regarding the data products and sources used for the analyses in Tech Memos 1 and 2. The table includes:

- Information on the locations within each Tech Memo where the data is used.
- The source of the data.
- A summary of the steps required to acquire the data for the purposes of updating the report in the future.
- A description of the data format in which the data collected for this study has been provided to SJTPO. Note that the majority of data has been uploaded to the SJTPO ArcGIS Online account

Table A-1. Data Sources Summary

Tech Memo Section	Data Description	Source	Update Instructions	Data Format Provided
Various Sections	Census Block and Block Group Spatial Files	2010 TIGER/Line Shapefiles	Block-level spatial files can be downloaded from : https://www.census.gov/cgi-bin/geo/shapefiles/index.php?year=2020&layergroup=Blocks+%282020%29 Block-group-level spatial files can be downloaded from: https://www.census.gov/cgi-bin/geo/shapefiles/index.php?year=2020&layergroup=Block+Groups Note that any updates to the data should use the 2020 geographies.	None provided specifically for Census geographies alone. See Population and Employment data for Block Group spatial layers.
TM 1: 2.1.1	Population Estimates by Census Block Group	2019 ACS 5-Year Estimates, Variable B01001-001	Data can be downloaded using the data.census.gov by specifying the ACS variable and geographic extents (All block groups within Atlantic, Cape May, Cumberland, and Salem Counties). Data can also be downloaded via the Census API via the tidycensus package within an R environment.	Shapefile uploaded to AGOL.
TM 1: 2.1.2	Employment by 2-Digit NAICS Industry	LEHD Data	Data can be downloaded from: https://lehd.ces.census.gov/data/. Under "LEHD Origin-Destination Employment Statistics (LODES)", use the dropdown menus to select the most recent version of LODES, the state of New Jersey, and Workplace Area Characteristics (WAC). Click the "View Files" button and download the csv.gz file that includes S000 (Total Number of Jobs) and JT00 (All Jobs). Unzip the data and either join to the block level spatial file or consolidate the data to a block group level and join to the block group spatial file. Additional detail regarding the variable names and the associated industry types can be found in the LODES technical documentation: https://lehd.ces.census.gov/data/lodes/LODES7/LODESTechDoc7.5.pdf	Shapefile uploaded to AGOL.
TM 1: 2.2	Data Axle Establishment Data	Data Axle Reference Solutions	Data Axle data can be purchased by contacting the company via their website: https://www.data-axle.com/our-data/business-data/. Alternatively, Data Axle Reference Solutions data is also available through many public library systems (https://www.data-axle.com/what-we-do/reference-solutions/). The interface and details for access will vary by library system, but the interactive tool allows filtering by geography, NAICS industry code, employment size, and many other business characteristics. Note that the locations provided via Data Axle Reference Solutions must be geocoded using the mailing address to identify their specific location. Data purchased directly through Data Axle will include lat/long information.	Shapefile of select industries uploaded to AGOL.
TM 1: 2.3	Truck Trip Generation Estimates (Polygons)	NCFRP Report 37 Methodology Applied to LEHD Employment Data	The full research report can be accessed at: https://www.trb.org/NCFRP/Blurbs/175283.aspx Per instructions within the report, the linear model should be used for data that includes multiple business establishments. The non-linear model is more suited to estimates of freight trip generation at individual establishments. The model formulas for the combined New York City and Capital Region areas were used for this report. The models can be applied within a spreadsheet, ArcGIS environment or other platform allowing for the manipulation of tabular data.	Shapefile uploaded to AGOL.
TM 1: 2.4	Stakeholder Identified Freight Activity Locations	Stakeholder Interviews	Identify more locations via additional interviews or online surveys. Geolocate using ArcGIS or other geospatial platforms.	Shapefile uploaded to AGOL.

Tech Memo Section	Data Description	Source	Update Instructions	Data Format Provided
TM 1: 2.5	Rail Yard Locations	NTAD: North American Rail Network Lines	Spatial file is available here: https://data-usdot.opendata.arcgis.com/datasets/usdot::north-american-rail-network-lines/about. Yard locations were identified by filter for features where the attribute NET = "Y". The attribute YARDNAME includes information on the name of the yard feature.	Shapefile uploaded to AGOL.
TM 1: 2.5	Water Port Locations	NTAD: Ports	Locations of Ports and other water cargo infrastructure such as locks, dams, and mooring stations were downloaded from : https://data-usdot.opendata.arcgis.com/datasets/usdot::ports/about. The data was manually filtered to include only point locations that included at least one of the following terms within the PURPOSE attribute: Receipt, Shipment, Loading, Unloading, Handling, Shipment, Loading, Fisheries	Shapefile uploaded to AGOL.
TM 1: 2.5	Airport Locations	NTAD: Airports	A spatial file of airport locations can be downloaded from: https://data-usdot.opendata.arcgis.com/datasets/usdot::airports-1/about	Shapefile of airports that have handled cargo in 2019-2021 in SJTPO and in adjacent areas.
TM 1: 2.5	Airport Cargo Data	BTS T-100 Market Data (All Carriers)	BTS T-100 data can be downloaded from: https://www.transtats.bts.gov/DL_SelectFields.aspx?gnoyr_VQ=FMF&QO_fu146_anzr=Nv4+Pn44vr45. Data must be downloaded one year at a time. Data is periodically updated. The volumes of freight, mail, and passengers travelling between airports can be assessed by filter for the ORIGIN and DEST airports (ACY for the Atlantic City International Airport).	CSV files of BTS T-100 data for 2019, 2020, and 2021 (through September).
TM 1: 2.6	Truck Probe Origin-Destination Data	RITIS Trip Analytics	If updated RITIS data is purchased by NJDOT, SJTPO, or other freight partner agency, it can be downloaded using the Trip Analytics Tool (https://trips.ritis.org/). Select OD Matrix as the analysis type, then select Custom Axes. Choose All TAZs for New Jersey as the origin, All TAZs as the Origins and All TAZs for the target state as the Destinations. Click Generate Matrix to run the analysis and view the results. Adjust Trip Filter dropdown to exclude Light vehicles. Adjust Matrix Controls to show Total Counts instead of Percentages. Click the save button to download a csv of the data table shown. Repeat these steps for each target state included in the analysis. Then repeat the steps again by setting the target states as the Origins and New Jersey as the Destinations. The multiple CSV files are then consolidated into a single OD matrix file in post processing steps. This step could be completed using Excel or similar spreadsheet programs, but it is recommended that R or similar programs be used for this process.	Tableau Dashboard Workbook and associated OD table in CSV format. Shapefile of Truck Probe Activity by TAZ uploaded to AGOL.
TM 1: 3.1	Existing NJDOT Truck Classification Counts	NJDOT	A CSV file of existing count locations in CSV format can be downloaded from: https://www.state.nj.us/transportation/refdata/roadway/mdb/TMS2012-2020.csv. This includes information on station number, AADT, station type, and collection year. Data for vehicle classification counts are provided via an interactive website (https://www.njtms.org/map/). PDF reports of these classification counts can be downloaded by clicking the point feature for 48 Hour Classification Count features and clicking the PDF symbol for the most recent count. The PDF document will include information on the percentage of "Trucks" and "Combo Trucks" that can be applied to the AADT value of the count to measure the number of trucks at each location. Note that a custom code script was developed for this project to download the PDF files and scrape the relevant information from them. It is recommended that SJTPO urge NJDOT to make the truck ADT counts as available as the All Vehicle AADT counts so that this information can be more easily incorporated into local freight stakeholder efforts.	Shapefile uploaded to AGOL.

Tech Memo Section	Data Description	Source	Update Instructions	Data Format Provided
TM 1: 3.2	Cumberland County Truck Study Counts	Cumberland County	Data for the Cumberland County Truck Study was provided in a similar PDF format to the existing NJDOT classification count data and was processed in a similar manner using a custom code script.	Shapefile uploaded to AGOL.
TM 1: 3.3	Truck Trip Generation Estimates (Points)_	NCFRP Report 37 Methodology Applied to LEHD Employment Data	This data is identical to that described in TM 1: 2.3 above. One additional step taken for this data was converting the polygon spatial file to a point file based on the centroid locations. This data was then added to the other classification count data.	Shapefile uploaded to AGOL.
TM 1: 3.4	FAF Estimates	FAF5 Data Products	Additional information regarding the FAF5 dataset can be found here: https://ops.fhwa.dot.gov/freight/freight_analysis/faf/. The FAF Data Tabulation Tool linked on that web page can be used to review estimated freight flows between designated FAF Zones (SJTPO is located within zone *342 – Philadelphia PA-NJ-DE-MD (NJ Part)*). The shapefile containing the FAF5 Estimates of Truck Flow for Year 2022 – Base Line Scenario can also be downloaded from that web page. This shapefile was used as the baseline for the generation of point estimates of truck flows by converting the line features to point features using the midpoint of each line segment.	FAF5 Estimates of Truck Flow for Year 2022 converted to point features and added to classification count shapefile uploaded to AGOL.
TM 1: 3.5	Additional Truck Count Data	Truck counts collected as part of this study.	21 classification count locations were identified in coordination with SJTPO and other freight stakeholders. 48-hour classification counts were collected at these locations and the resulting data was added to the classification count data	Shapefile uploaded to AGOL. PDF and Excel records of the classification count raw data.
TM 1: 4.0	Final Truck Volume Estimates	Extrapolation methodology developed for the SJTPO Study	Using the combined classification count data items listed above, the AADT volumes, truck volumes, and combination truck volumes from each point were extrapolated to the network based on the methodology described in Tech Memo 1. This was completed using a custom R script based on the HERE Routing API and other geospatial analysis steps. However, the process could also be completed manually using the point classification data to identify the surrounding features that act as the major draw for vehicle trips.	Shapefile uploaded to AGOL.
TM 2: 2.1	Congestion Data	RITIS Massive Data Downloader using NPMRDS and INRIX Data	Data can be downloaded for both data sources using the Massive Data Downloader tool via the RITIS PDA Suite platform: https://pda.ritis.org/suite/download/. Within the tool, use the Map tab to select the roadways within the desired area of analysis. Click the Add Segments button once the appropriate roadways have been selected. Choose additional settings include date range, days of week, times of day, and data sources. Note that NPMRDS data can only be downloaded if the date range is selected within one single calendar year. Averaging can be selected to reduce the size of the data output. One hour averaging was used for this study. The data output can be downloaded in CSV format. Spatial line features for the NPMRDS data can be downloaded from: https://pda.ritis.org/suite/shapefiles. Spatial line features for the INRIX data are available as part of the RITIS data purchase but must be requested from INRIX customer support directly.	Shapefile of average congestion levels uploaded to AGOL. CSV file of average hourly congestion by segment by season.

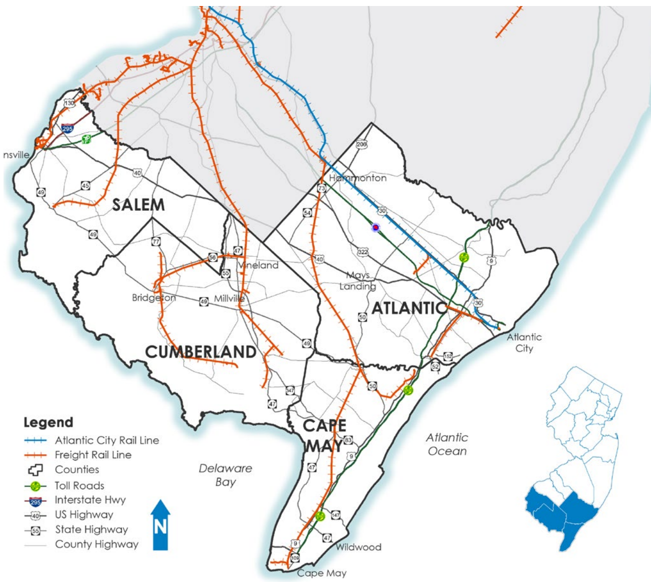
Tech Memo Section	Data Description	Source	Update Instructions	Data Format Provided
TM 2 2.2	TTRI Data	RITIS Massive Data Downloader using INRIX Data	The INRIX data downloaded for the previous item can be repurposed for the calculation of TTRI measures. The TTRI values can be calculated for each segment and each time period by dividing the 95th percentile travel time by the 50th percentile travel time as described in Tech Memo 2.	Shapefile of TTRI measure uploaded to AGOL.
TM 2: 2.3	Highway over Highway Bridge Data	National Bridge Inventory	National Bridge inventory data be downloaded by state directly from the FHWA site: https://www.fhwa.dot.gov/bridge/nbi/ascii2021.cfm. Further information on each attribute can be found here: https://www.fhwa.dot.gov/bridge/mtguide.pdf. Attributes used for this study included Item 54 – Minimum Vertical Underclearance, Item 66 – Inventory Rating, and Items 58-60 – Condition Ratings for Deck, Superstructure, and Substructure. Alternatively, similar data may be requested directly from NJDOT.	Shapefile uploaded to AGOL.
TM 2: 2.3	Railroad over Highway Bridge Data (For Vertical Underclearance only)	FRA Crossing Inventory and Google Street View	Data on the locations for railroad over highway bridges can be downloaded from the FRA Office of Safety Analysis site: https://safetydata.fra.dot.gov/OfficeofSafety/publicsite/DownloadCrossingInventoryData.aspx. The data can be downloaded at a statewide level and further filtered by using the attributes of PosXing = 3 to identify crossings where the railroad cross over the highway, and ReasonID != 16 to exclude crossings that have been closed. Once these locations are downloaded, they must be manually reviewed either through field review or virtual Street View review to identify the posted maximum clearances.	Shapefile uploaded to AGOL.
TM 2: 2.4	Highway Rail Grade Crossings	FRA Crossing Inventory	Follow the same instructions as the previous item to download the FRA grade crossing inventory data. Important attributes needed for data filters include PosXing = 1 to identify at-grade crossings, ReasonID != 16 to exclude closed crossings, TypeXing = 3 to identify Public crossings, and XPurpose = 1 to identify highway crossings. Additionally, data on grade crossing accidents/incidents can be downloaded from the FRA Office of Safety Analysis site: https://safetydata.fra.dot.gov/OfficeofSafety/publicsite/on_the_fly_download.aspx. Highway Rail Accidents should be selected from the Table Name dropdown as well as the year of interest and the preferred output format. After downloading, the count and/or type of accidents can be summarized by Crossing ID and joined to the crossing inventory data. More information on the structure of the Crossing Inventory Data can be found here: https://safetydata.fra.dot.gov/officeofsafety/publicsite/Newregulation.aspx?doc=GCIS%20Data%20Dictionary%20External%20Use%20v2.5.0.0%20Rel%2012-28-2016.pdf More information on the structure of the Accident/Incident data can be found here: https://safetydata.fra.dot.gov/officeofsafety/publicsite/Newregulation.aspx?doc=gxirfile_EFFECTIVE_060111.pdf	Shapefile uploaded to AGOL.
TM 2: 2.4	Blocked Crossing Incidents	FRA Blocked Crossing Portal	Blocked crossing incidents can be reported by the public or law enforcement using the Blocked Crossing Portal: https://www.fra.dot.gov/blockedcrossings/ The reported data can be found here: https://www.fra.dot.gov/blockedcrossings/incidents	None: Provided for context only
TM 2: 2.5	Truck Probe Origin-Destination Data	RITIS Trip Analytics	See Item TM 1: 2.6 above for details	-

Tech Memo Section	Data Description	Source	Update Instructions	Data Format Provided
TM 2: 2.6	Truck Crash Data	NJDOT Safety Voyager Platform	Data can be filtered through the platform to include only crashes of specific vehicle types. Select crashes that have involved any of the following categories: • Single Unit (2-axle) • Single Unit (3-axle+) • Single Unit Truck w/ Trailer • Other Truck • Light Truck w/ Trailer • Truck Tractor (Bobtail) • Tractor Semi-Trailer • Tractor Double • Tractor Triple To create the crash heat map, first assign a crash weight to each incident based on the weighting factors provided by NJDOT and the methodology summarized in the NJ Highway Safety Improvement Manual. Create a ½-mile hexagonal grid of spatial features across the SJTPO areas using a geospatial analysis platform such as ArcGIS or R. Tally the combined weighted crash sums within each hexagon and identify the top areas of freight-related crashes. Potential safety improvements can be identified through a review of the type and location of these crashes.	Shapefile of Weighted Crash Total Polygons uploaded to AGOL.
TM 2: 2.7	Truck Parking Facilities	FHWA Jason's Law Survey and Various Private Sources	The most recent data products from the Federal Jason's Law Survey can be downloaded here: https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/index.htm. A spatial file of both public and private truck parking facilities from the 2015 survey can be downloaded under the Jason's Law 2015 Truck Parking Survey and Assessment header. A spatial file for the 2019 data can be downloaded under the Jason's Law 2019 Truck Parking Survey and Assessment header. However, the 2019 data includes only public facilities. Information on private facility locations and truck parking capacity can be found through a variety of sites including: • DC Book Company Truck Stops & Services: https://www.truckstopsandservices.com/listcatbusinesses.php?id=19&state=30 • The Trucker Path App: https://truckerpath.com/ In most cases, the locations in these sources will need to be manually created as spatial points or geocoded from an address. Data can also be purchased from Trucker Path and other truck parking data vendors.	Shapefile uploaded to AGOL.
TM 2: 3.1	Rail Lines, Yards, and Maximum Train Speeds	NTAD: North American Rail Network Lines and FRA Grade Crossing Inventory	The development of the rail lines and rail yards shapefiles are based on the data sources noted above in and TM 1: 2.5 and TM 2: 2.4. Note that additional edits were made to the Rail Network Lines data based on stakeholder feedback regarding new railroad ownership. Future updates are likely to include only changes in ownership rather than the implementation of new rail lines. Additionally, rail segments identified as abandoned (NET = A) or out of service (NET = X) should be excluded from the shapefile. Information on the maximum timetable speeds can be determined by comparing this characteristic from the grade crossing inventory locations and assigning them to the rail network lines either manually or through an automated geospatial process.	Shapefiles uploaded to AGOL

Tech Memo Section	Data Description	Source	Update Instructions	Data Format Provided
TM 2: 3.2	Air Cargo	BTS T-100 Data	See process above in TM 1: 2.5 for downloading BTS T-100 data.	-
TM 2: 3.3	Maritime Cargo	NTAD: Ports and USACE Waterborne Commerce Data	See process above in TM 1: 2.5 for downloading Port location data. Additional information on the types and volumes of commodities shipped via maritime cargo is available from the USACE Waterborne Commerce website: https://www.iwr.usace.army.mil/About/Technical-Centers/WCSC-Waterborne-Commerce-Statistics-Center-2/WCSC-Waterborne-Commerce/ 5 Year Cargo Reports are available via the Waterborne Commerce Statistics Center linked from that web page. Select a year of analysis, select Region 1 – Atlantic Coast, and then type in the waterway (Salem River, NJ or Delaware River, Philadelphia, PA to the Sea.) Two reports will be available: A Cargo Report summarizing the receipts, shipments, intra-waterway activity, and through activity by commodity type; and a Trip Report summarizing the types of vessels involved in the shipments by draft and by direction.	Shapefile of Waterway Tonnage uploaded to AGOL. Excel Files summarizing 5-Year Cargo Report data for Salem River and Delaware River.
TM 2: 3.4	Pipeline	U.S. Energy Information Administration (EIA) NTAD: Intermodal Freight Facilities Pipeline Terminals	Updated data on pipelines can be downloaded from the EIA website: https://www.eia.gov/maps/layer_info-m.php. The relevant shapefiles include: • Crude Oil Pipelines • HGL Pipelines • Natural Gas Interstate and Intrastate Pipelines • Petroleum Product Pipelines A shapefile with additional information on the location of facilities and the types of products being handled can be downloaded from : https://hub.arcgis.com/datasets/usdot::intermodal-freight-facilities-pipeline-terminals/about	Shapefiles uploaded to AGOL.

Appendix B:

Tech Memo 1: Regional Core Freight Data



Regional Core Freight Dataset Technical Memo

SJTPO Regional Freight Plan Data Collection and Analysis

June 28, 2022

Contents

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1 Introduction

The South Jersey Transportation Planning Organization (SJTPO) is conducting this Regional Freight Plan Data Collection and Analysis project to better understand the movement of freight goods in southern New Jersey and to better integrate freight into its transportation planning process. SJTPO's overarching goal is to develop an optimal multimodal transportation network contributing to the region's economic development and its residents' wellbeing. This study will also help SJTPO to better represent the region's issues and needs in the New Jersey State Freight Plan.

This document summarizes the results of the first phase of the study, developing the regional core freight dataset. The next phase of the study will assess performance and condition of various freight infrastructure systems in the region including congestion, bottlenecks, and safety issues.

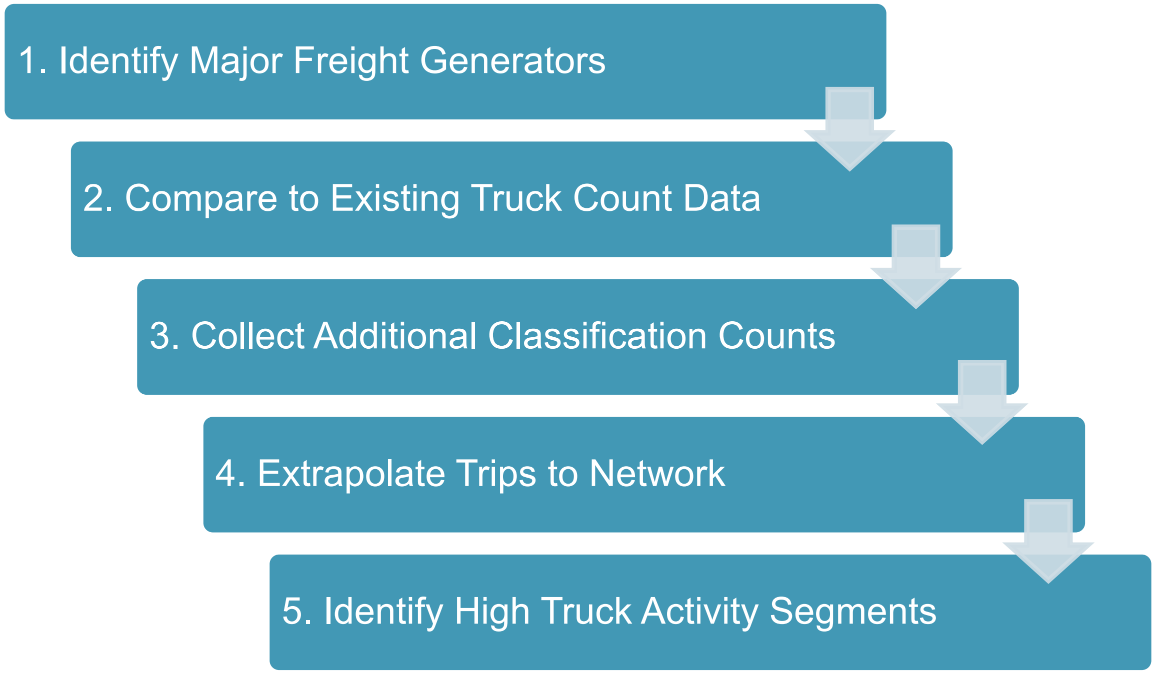
1.1 Regional Core Freight Dataset Approach

The first step in developing the Regional Core Freight Dataset is to identify the locations of major freight generators throughout the SJTPO area. Understanding these major sources of freight activity is critical for identifying key truck travel patterns and identifying roadway segments where truck volume and classification counts should be collected.

It is the opinion of the of the study team that no single data source can be trusted to tell the complete story of freight activity. For example, while truck probe GPS data can provide a high level of precision for specific freight business locations, it also has the potential to be misleading if it does not adequately represent all sectors of freight. Historically, freight sectors such as agriculture, mining, and logging have often relied on older vehicles that do not use the on-board navigation software that would be represented in many common truck probe data sets. To address this discrepancy, this study utilizes multiple different sources to identify those freight-generating activity centers.

The overarching goal of this task is to identify roadways within the SJTPO study area that are critical for the movement of freight. Additionally, this study seeks to identify roadways in the study area that have truck volumes exceeding 10 percent of total traffic. This is important for identifying roadways eligible for state freight funding. These goals were achieved using the multi-step process outlined in Figure 1-1. Each step of the process is described in more detail in the following sections.

Figure 1-1. Approach for Identifying Key Freight Corridors in SJTPO



2 Identify Major Freight Generators

The purpose of this analysis step is to identify locations within the SJTPO area that have high concentrations of freight activity. Since no single data source can provide a comprehensive picture of freight activity, a wide variety of data sources were used.

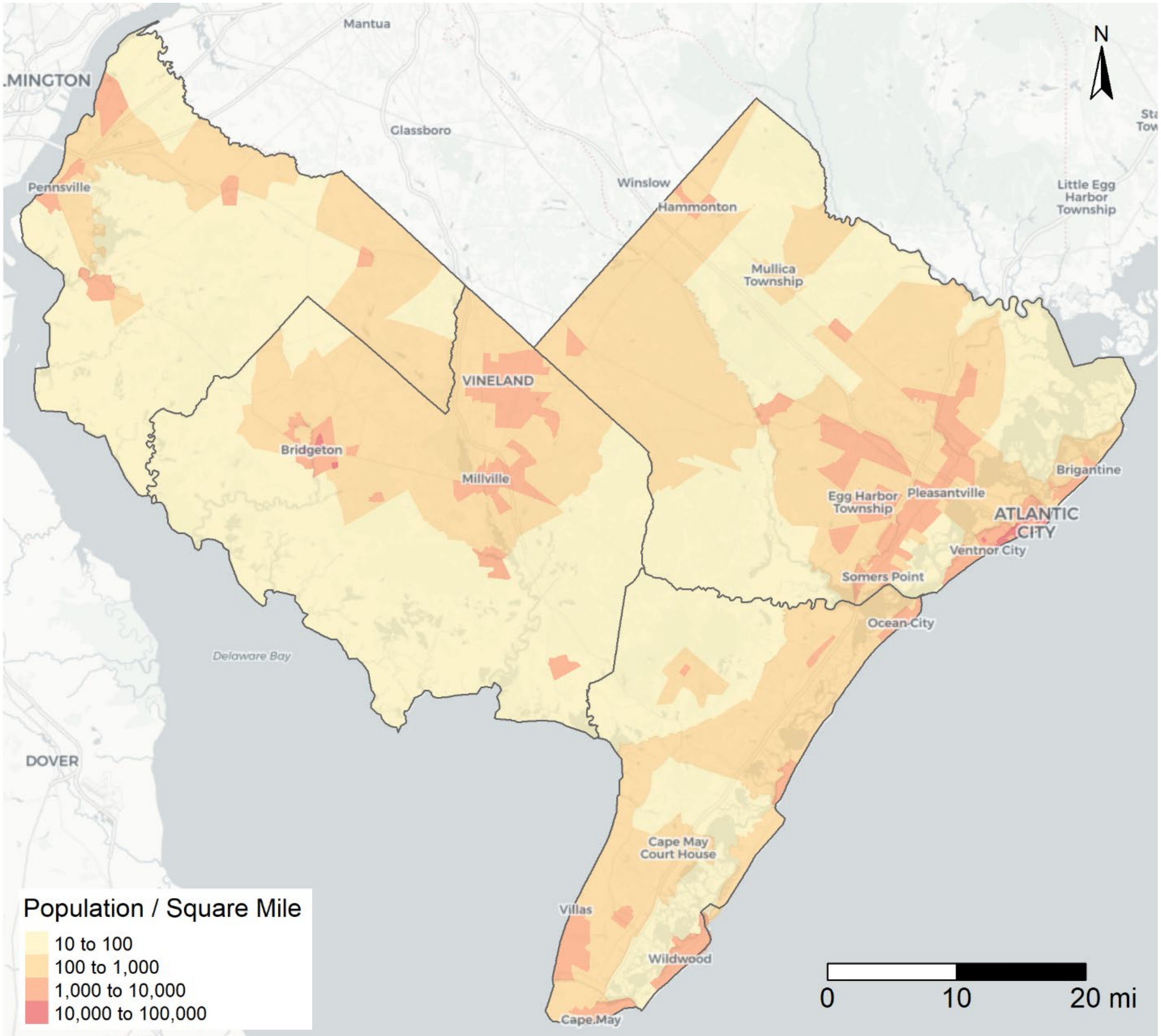
2.1 Population and Employment Data

Our first step in identifying areas of freight activity in the study area was to evaluate areas of population and freight-related employment concentration. Freight activity hotspots—particularly in sectors such as manufacturing—are typically correlated with the locations of population centers for the simple reason that proximity to infrastructure and workforce are necessary conditions for many freight-generating facilities.

2.1.1 Population

Figure 2-1 displays the population density for census block groups throughout the study area. The total population of the SJTPO area is approximately 574,000 according to the most recent 2019 American Community Survey (ACS) 5-year estimate data. The individual Census Designated Place (CDP) with the highest population in the study area is Vineland with a population of 60,000. The next highest population center is Atlantic City with a population of 38,000. However, the cluster of cities within 10 mile of Atlantic City contains a population well over 100,000. The most density populated areas are within Atlantic City with multiple block groups in excess of 10,000 population per square mile.

Figure 2-1. Population Density



Source: 2019 ACS 5-Year Population Estimates, Block Group

2.1.2 Employment

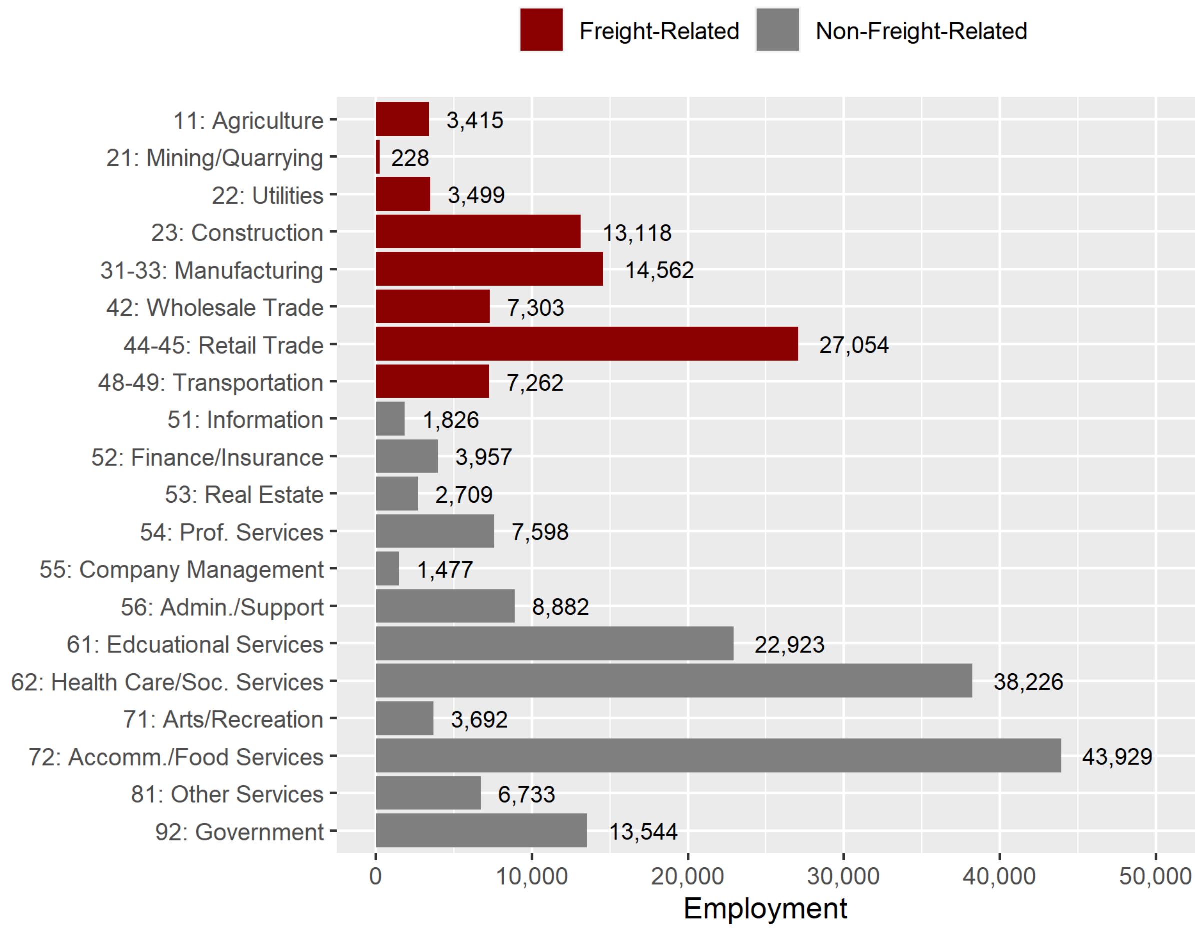
Our primary source for employment information comes from Longitudinal Employer-Household Dynamic (LEHD) data. The LEHD data is produced by the Center for Economic Studies at the U.S. Census Bureau and provides block and block group level estimates of employment by industry. For this study, block group level estimates of Workplace Area Characteristics were used to identify major freight employment areas.

The LEHD uses the North American Industry Classification System (NAICS) for industry categorization. This is a standard system used by many Federal statistical agencies and is useful for categorizing local and regional businesses for analysis. The NAICS system includes 20 primary (two-digit) categories ranging from agriculture to public administration. Consistent with the other national and regional freight studies, the following eight categories have been identified as “freight-related.” These industries account for the largest share of freight trip production and/or attraction.

- 11: Agriculture, Forestry, Fishing and Hunting
- 21: Mining, Quarrying, and Oil and Gas Extraction
- 22: Utilities
- 23: Construction
- 31-33: Manufacturing
- 42: Wholesale Trade
- 44-45: Retail Trade
- 48-49: Transportation and Warehousing

The SJTPO area supports more than 230,000 jobs. Of these, approximately 76,000 (33 percent) are within freight-related industries (Figure 2-2).

Figure 2-2. SJTPO Employment by Industry

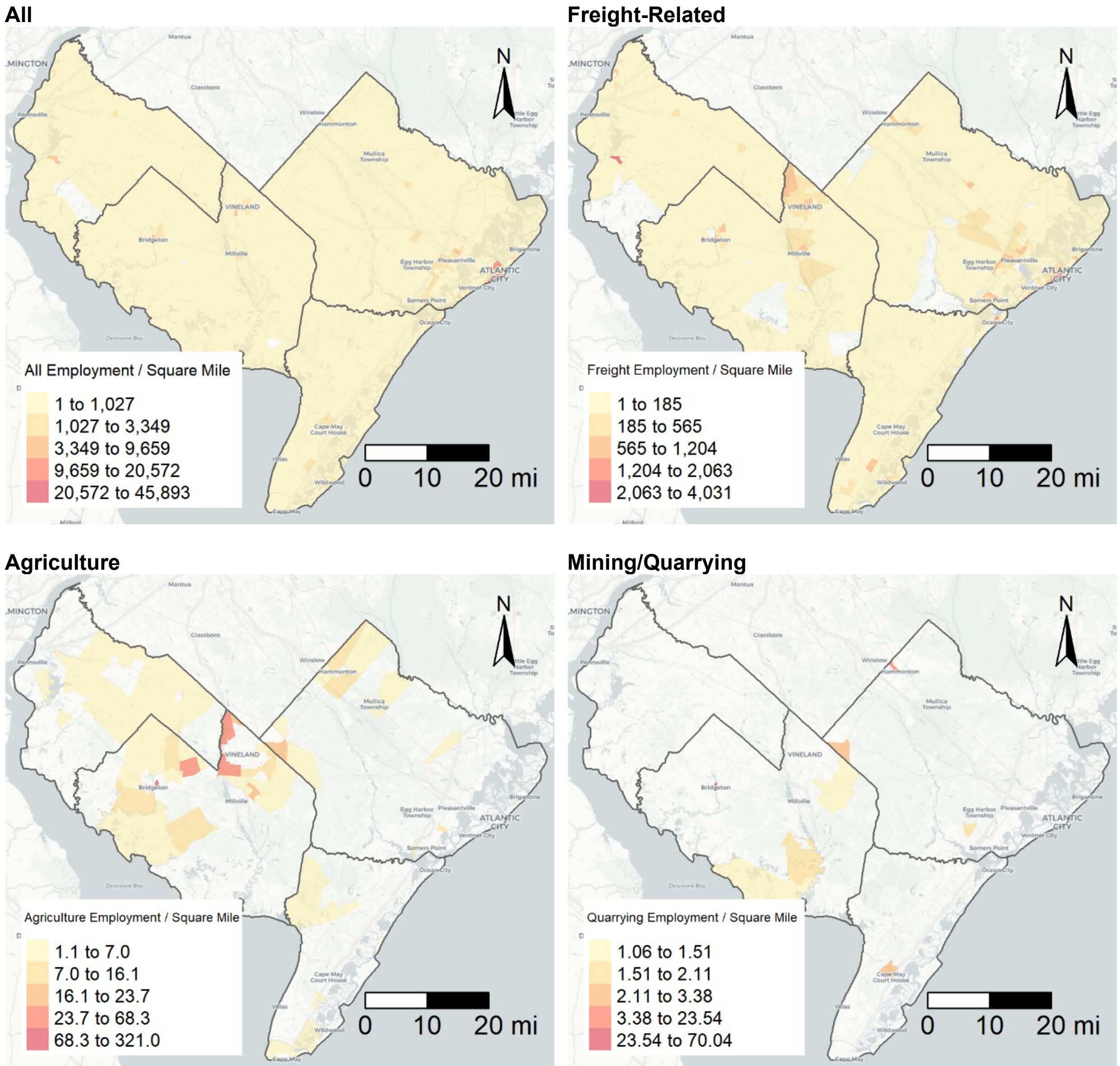


Source: 2018 LEHD Workplace Area Characteristics (WAC), All Jobs

Figure 2-3 displays a series of maps highlighting the distribution of employment density throughout the study area within the following four categories:

- **All Employment:** Looking at all employment in total, the single highest concentration by far is located in Atlantic City with up to 45,000 jobs per square mile in some areas.
- **Freight-Related Employment:** Narrowing this to only NAICS industries considered "freight-related" broadens this distribution to show many areas throughout the study area including Salem, Bridgeton, Vineland, Millville, Hammonton, Wildwood, Ocean City, Somers Point Pleasantville, and Atlantic City.
- **Agriculture, Forestry, Fishing and Hunting (Agriculture):** Agricultural employment is primarily concentrated in the areas around the Vineland, Bridgeton, and Millville.
- **Mining, Quarrying, and Oil and Gas Extraction (Mining/Quarrying**): Mining and Quarrying employment is primarily concentrated in a handful of areas between Vineland and Delaware Bay with some higher concentrations in Hammonton, Bridgeton, and Cape May Courthouse.

Figure 2-3. Employment Density



Source: LEHD Workplace Area Characteristics, Block Group

2.2 Data Axle Business Information

Individual business information was procured from Data Axle Reference Solutions. This data set is continually updated and includes information on NAICS industry code, number of employees, and other details. Information was collected for all businesses falling within the following NAICS industries:

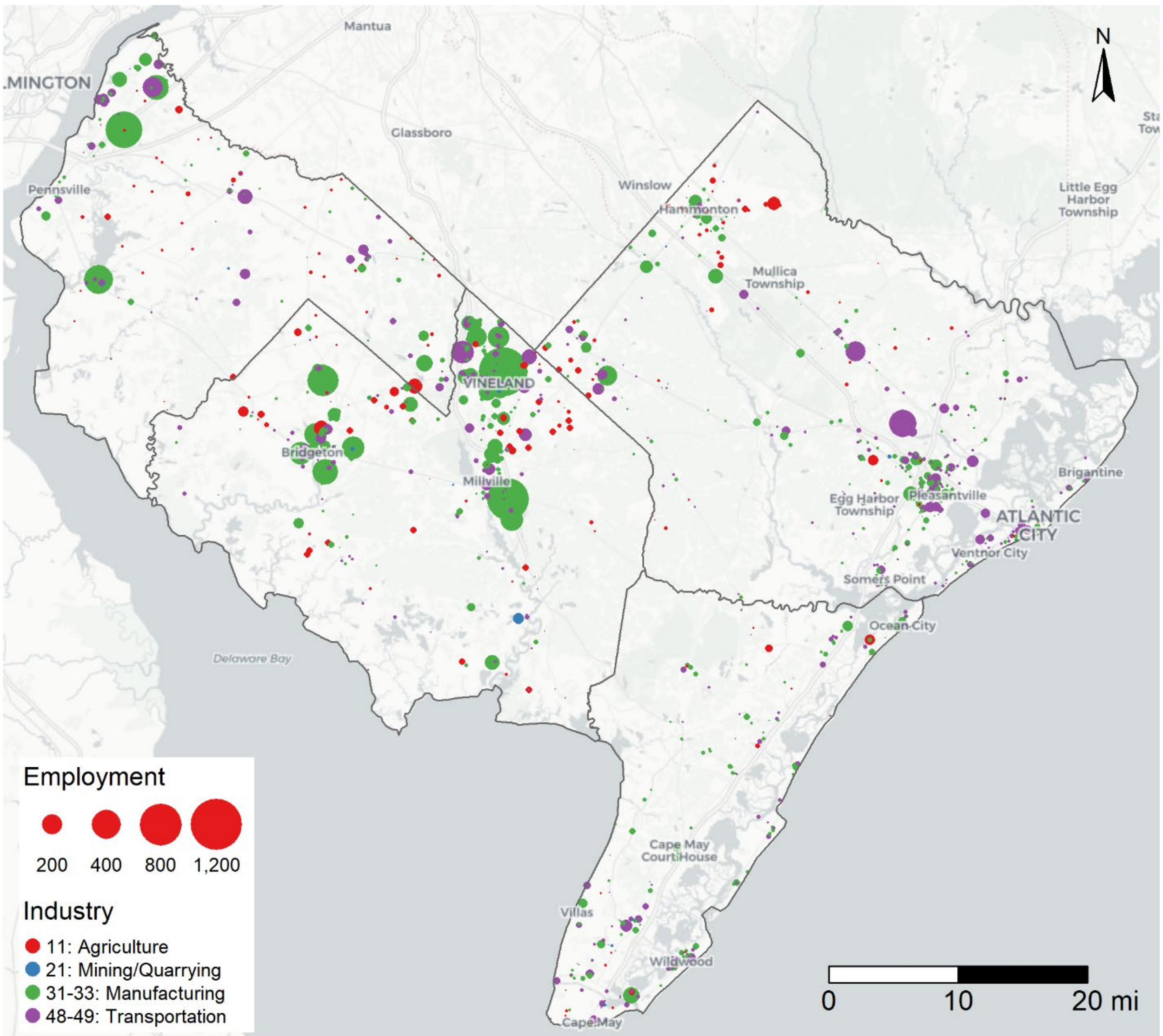
- 11: Agriculture, Forestry, Fishing and Hunting
- 21: Mining, Quarrying, and Oil and Gas Extraction
- 31-33: Manufacturing
- 48-49: Transportation and Warehousing

The locations of these businesses are shown in Figure 2-4 below. The locations are color-coded by industry and the point size is scaled to reflect the number of employees.

The figure highlights the cluster of manufacturing businesses located in the central SJTPO area around Vineland, Bridgeton, and Millville. Additional major manufacturing businesses are located in the western portion of SJTPO around Salem and across the river from Wilmington. Many transportation and warehousing businesses are clustered northwest of Atlantic City, near the Atlantic City International Airport. Businesses in both the agricultural and mining/quarrying industries are generally located more sporadically without strong clusters in individual regions.

In addition to helping to identify key freight industry clusters in the SJTPO area, the information was also used to help guide freight stakeholder outreach efforts.

Figure 2-4. Freight Business Locations



Source: Data Axle Reference Solutions for NAICS 11, 21, 31-33, and 48-49, collected July 2021

2.3 Truck Trip Generation Estimation

The employment information discussed in the previous two sections can also be used to develop estimates of freight activity and daily truck trip estimates. The project team's approach was to use freight trip generation and attraction formulas develop as part of *National Cooperative Freight Research Program (NCFRP) Research Report 37: Using Commodity Flow Survey Microdata and Other Establishment Data to Estimate the Generation of Freight, Freight Trips, and Service Trips: Guidebook*.[1] This guidebook provides a series of formulas that may be used to estimate average daily freight trip production and attraction based on the two-digit NAICS code and the number of employees within each industry. An example of the formula constants used for these estimates is provided in Table 2-1. This table represents the values to be used for an area that is similar to a blended average of New York City (NYC) and the Capital Region (CR) of Albany-Schenectady-Troy in New York State.

These formulas for the linear freight trip production model were applied to the LEHD employment data discussed in section 2.1.2. The freight trip production formula uses the following general formula:

$$FTP = \alpha \times \mathrm{E}\beta$$

Table 2-1. Freight Trip Production Formulas, Linear Model

NYC and CR - FTP [shipments/day]							
NAICS	Description	α	β	Obs.	Employment		
					Mi	Mean	Max
23	Construction	-	0.092	20	6	39	201
31-33	**Manufacturing**	**5.321**	**0.063**	**96**	**1**	**51**	**350**
31	Food, Beverage, Tobacco, Textile, Apparel	-	0.117	18	2	43	150
32	Wood, Paper, Chemical, Plastics, Nonmetals	5.511	0.135	36	2	45	300
33	Metal, Machinery, Electronic, Furniture & Misc.	5.769	0.021	42	1	59	350
42	Wholesale Trade	6.455	-	68	2	22	200
44-45	**Retail Trade**	**2.314**	**0.242**	**63**	**1**	**15**	**94**
44	Motor Vehicle, Furniture, Electronics, Clothing	-	0.321	42	1	15	77
45	Sporting Goods, Hobby, Book, & Music Stores	3.956	0.179	21	2	15	94
48	Modal Transportation & Support Activities	8.500	-	8	9	53	151
72	Accommodation and Food	-	0.114	12	5	35	159
All	**All Freight Intensive Sectors (FIS)**	**3.800**	**0.085**	**268**	**1**	**33**	**350**

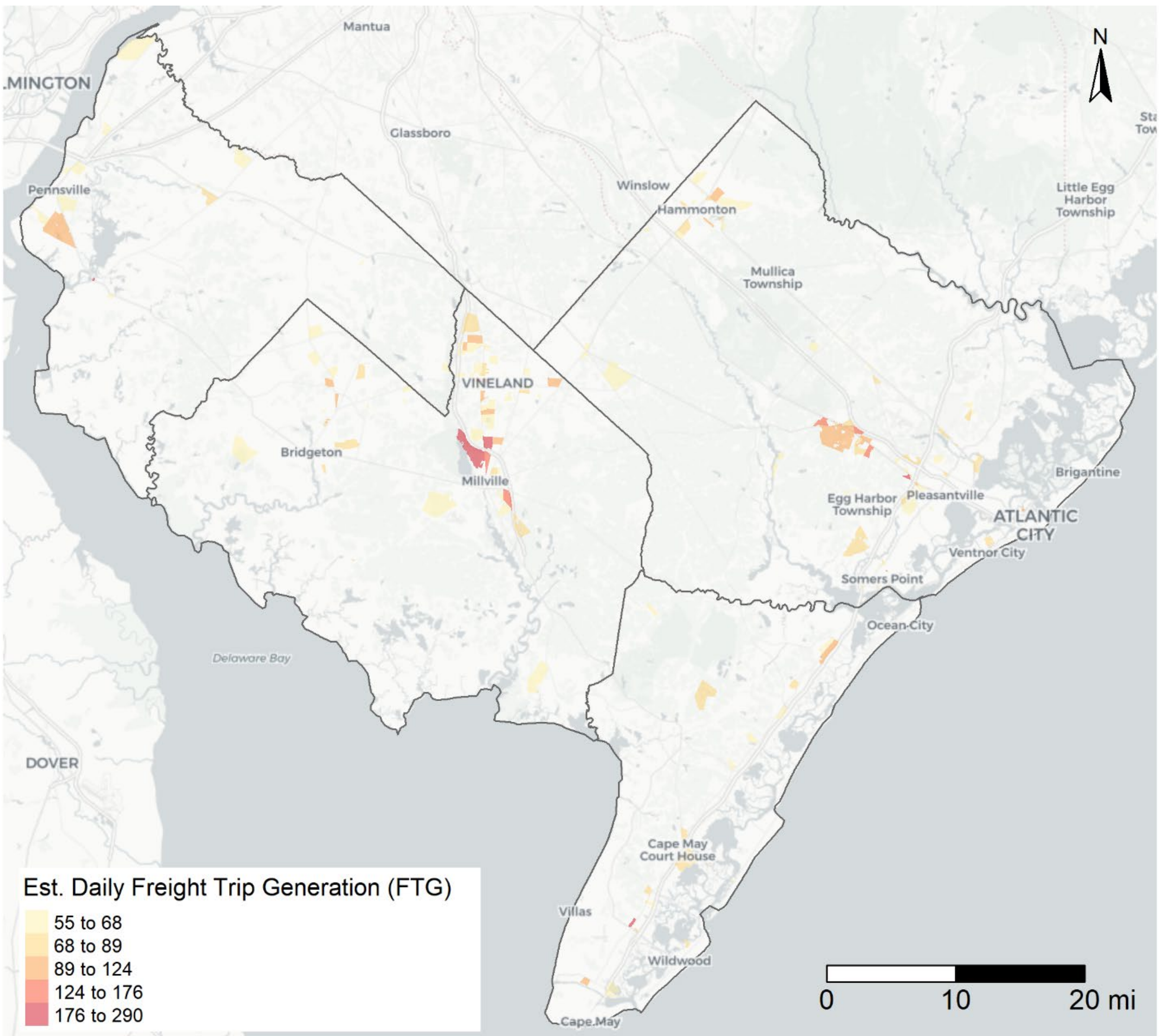
Source: NCFRP Report 37

Notably, the NCFRP Report 37 models do not include freight trip production estimates for either NAICS 11: Agriculture, Forestry, Fishing and Hunting or NAICS 21: Mining, Quarrying, and Oil and Gas Extraction. Therefore, while these formulas do provide useful tools for identifying freight activity hotspots, the industry specific data for NAICS codes 11 and 21 discussed in the previous sections is used in combination with the freight trip production estimates when identify potential data gaps.

[1] NCFRP Report 37: https://www.trb.org/NCFRP/Blurbs/175283.aspx

The results of this exercise are shown in Figure 2-5. This figure shows estimated daily freight trip generation (production and attraction) at the block group level in the SJTPO area. Key hotspot locations for freight trip generation include Millville, Vineland, areas south of Pennsville, and areas adjacent to US Highway 40 northwest of Pleasantville which include a Walmart Supercenter, a Home Depot, the Hamilton Mall, and other commercial establishments. These results will also be used later in this document to expand on the existing truck classification count locations in the trip extrapolation process.

Figure 2-5. Estimated Daily Freight Trip Generation

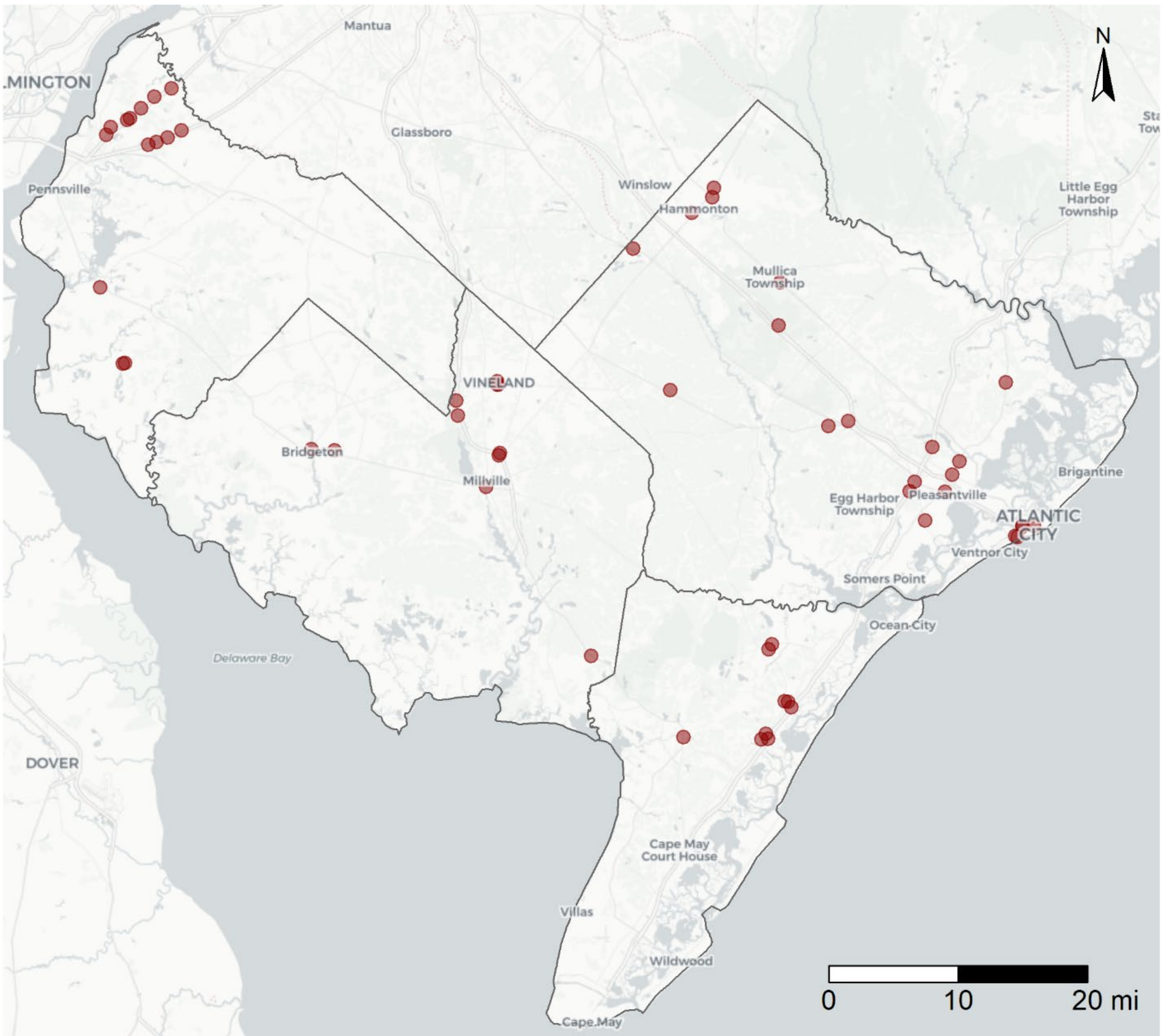


2.4 Stakeholder-Identified Locations

Engagement with a variety of stakeholder was conducted through this study. This included one-on-one teleconference interviews with twelve regional stakeholders including public entities such as counties and economic development associations as well as private freight industries including manufacturers and freight carriers. Among the questions asked were those relating to the locations of high freight activity. Interview participants were asked to identify their most heavily used routes for transporting freight shipments both locally and for long-distance shipments. Additionally, they were asked to identify locations of frequently used multi-modal facilities used during shipment such as ports, airports, and rail yards.

Figure 2-6 shows the locations of comments identifying these high freight activity areas. Multiple respondents indicated portions of I-295 and the New Jersey Turnpike near the Delaware Memorial Bridge as key routes they take to depart from the SJTPO region. Other freight activity hotspots include Vineland, Atlantic City, portions of Highway 9 and the Garden State Parkway between Cape May Township and Ocean City, and multiple locations in and around Pleasantville.

Figure 2-6. Stakeholder Comment Locations Related to Areas of High Freight Activity



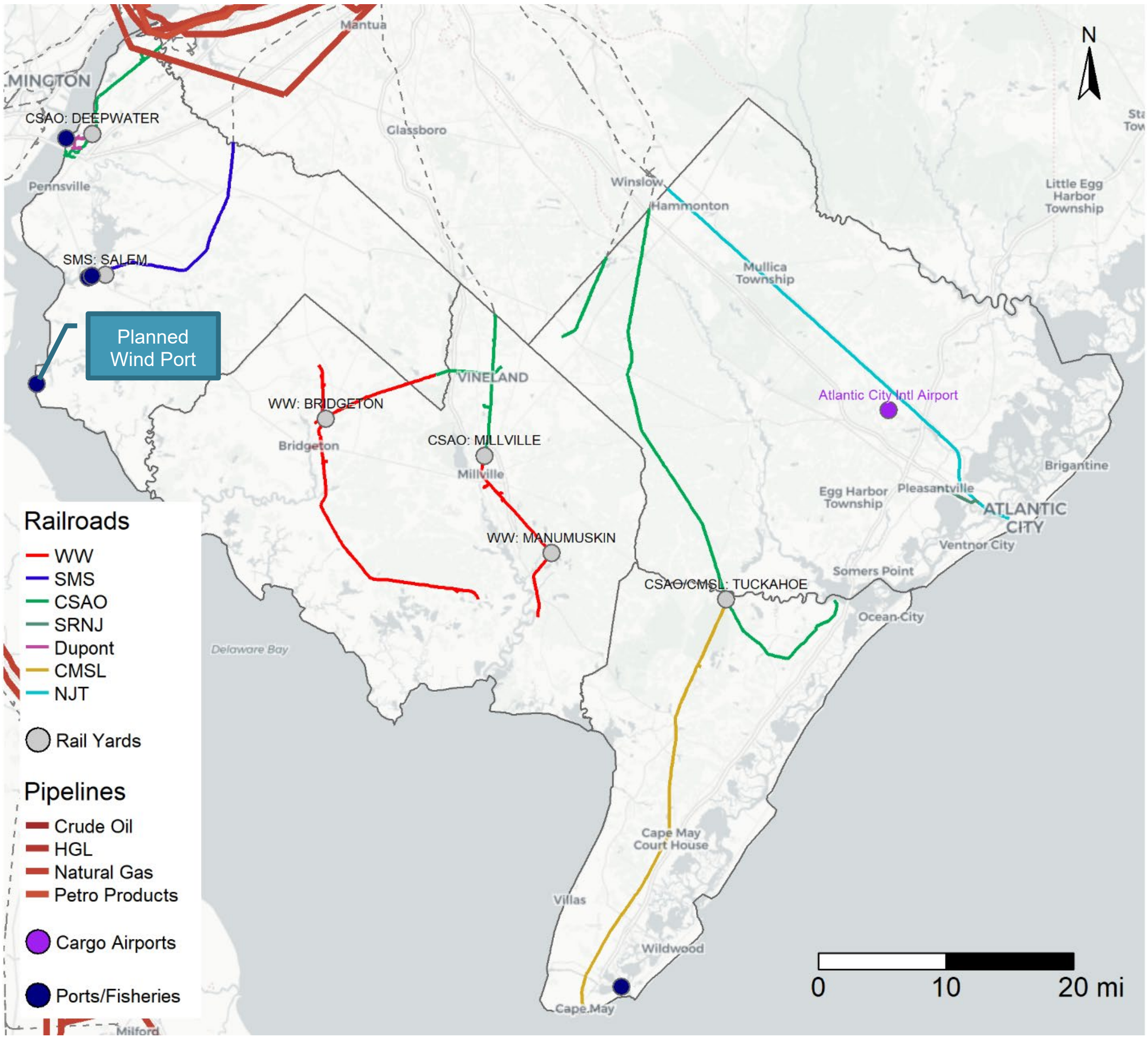
2.5 Multimodal Connection Points

Truck freight is the predominant mode of transport for the majority of freight movements in the country. Highways are also the component of the transportation network that public agencies such as SJTPO and counties have the most direct jurisdiction over. Therefore, the majority of this analysis has been focused on the truck freight mode. However, the connections of truck freight to other modes of freight transportation may also provide insights into locations of freight and truck activity. Multimodal connection points within the SJTPO area are shown in Figure 2-7 and described in more detail below.

- **Rail Yards:** Named rail yards were identified by reviewing the USDOT's North American Rail Lines spatial layer. This data is routinely updated to reflect current rail line conditions. The data used for this analysis was updated in January 2022. Six distinct named rail yards are included in the dataset: Deepwater, Salem, Bridgeton, Millville, Manumuskin, and Tuckahoe. Railroads in SJTPO include Winchester and Western (WW), Southern Railroad of New Jersey (SRNJ), Conrail Shared Assets Operations (CSAO), Cape May Seashore Lines (CMSL), and New Jersey Transit (NJT). A small amount of trackage in the CSAO Deepwater yard is listed as unknown ownership but is assumed to be owned by CSAO.
- **Water Ports:** Major docks and water port facilities were identified by reviewing the USDOT's Ports spatial layer available from the National Transportation Atlas Database (NTAD). These include
  - Two facilities in Salem involved in the shipment and receipt of multiple cargo types including conventional, containerized, and roll-on/roll-off cargo.
  - One facility just north of the Delaware Memorial Bridge involved in the shipment of acids and organic chemicals (Dupont Complex).
  - Multiple fisheries located in Cape May and Lower Township. While these facilities are not specifically noted in the USDOT databased, they were identified through stakeholder engagement and represent a major freight industry for the region.
  - While not yet included in the NTAD layer, a proposed wind port is planned for construction along Lower Alloways Creek, north of the nuclear power plant. This port would serve as a marshalling ground for construction of offshore wind energy infrastructure.
- **Airports:** Data on the locations of airports was downloaded from NTAD. Data on the monthly origins and destinations of passengers, freight, and mail shipped via airplane was downloaded from the Bureau of Transportation Statistics (BTS) T-100 dataset for years 2019, 2020, and 2021 (available through September). The data show that for this time period, the only airport within SJTPO that handled air cargo was the Atlantic City International Airport (ACY). However, this amount was small (15,870 lbs.) and only occurred in 2020. Negligible amounts of freight were handled at this airport in 2019 and 2021. The closest airport handling large volumes of freight is Philadelphia International Airport which handled over 1.2 billion pounds of freight in 2020.

- **Pipelines:** Pipeline infrastructure is extremely minimal within SJPTO. Data on pipeline and pipeline terminal locations for crude oil, hydrogen gas liquid, natural gas, and petroleum products pipeline types was downloaded from the U.S. Energy Information Administration. The data show only a small amount of natural gas and petroleum products pipelines located to the southwest of Bridgeport, and not major pipeline terminals in SJTPO. Note that for security reasons, the locations of the pipeline are highly generalized.

Figure 2-7. Multimodal Connection Points

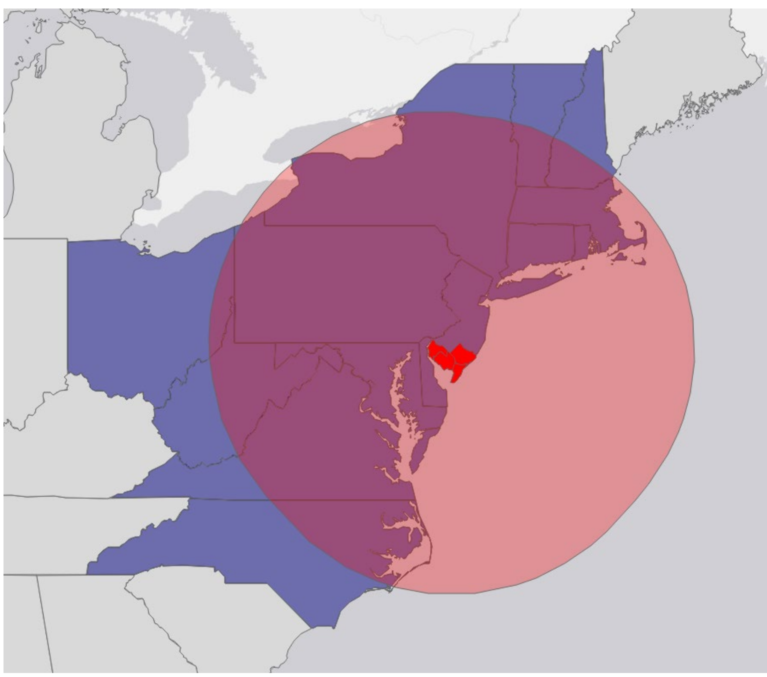


2.6 Truck Probe Activity

In early 2022, additional truck probe activity became available from the Regional Integrated Transportation Information System (RITIS) data platform. The data was purchased for the RITIS Trip Analytics platform by New Jersey DOT and was made available to the project team for analysis related to this study. The data includes processed INRIX truck trip data for April 2019, April 2020, and April – September 2021.

In total, these eight months of data include over 34 million individual records for truck trips either starting or ending within the State of New Jersey. The project team queried Origin-Destination matrix data from the RITIS Trip Analytics platform to identify all medium and heavy truck trips starting or ending their trip from Traffic Analysis Zones (TAZs) within the SJTPO study area and with a matching TAZ within any of the 15 states located within 300 miles of the SJTPO region (Figure 2-8). In total, this includes nearly three million individual truck trip records in the dataset for the SJTPO region. Note that the RITIS Trip Analytics Platform utilizes the 2010 Census TAZ delineations. These TAZ areas do not necessarily correlate with other local or regional delineation of TAZ areas.

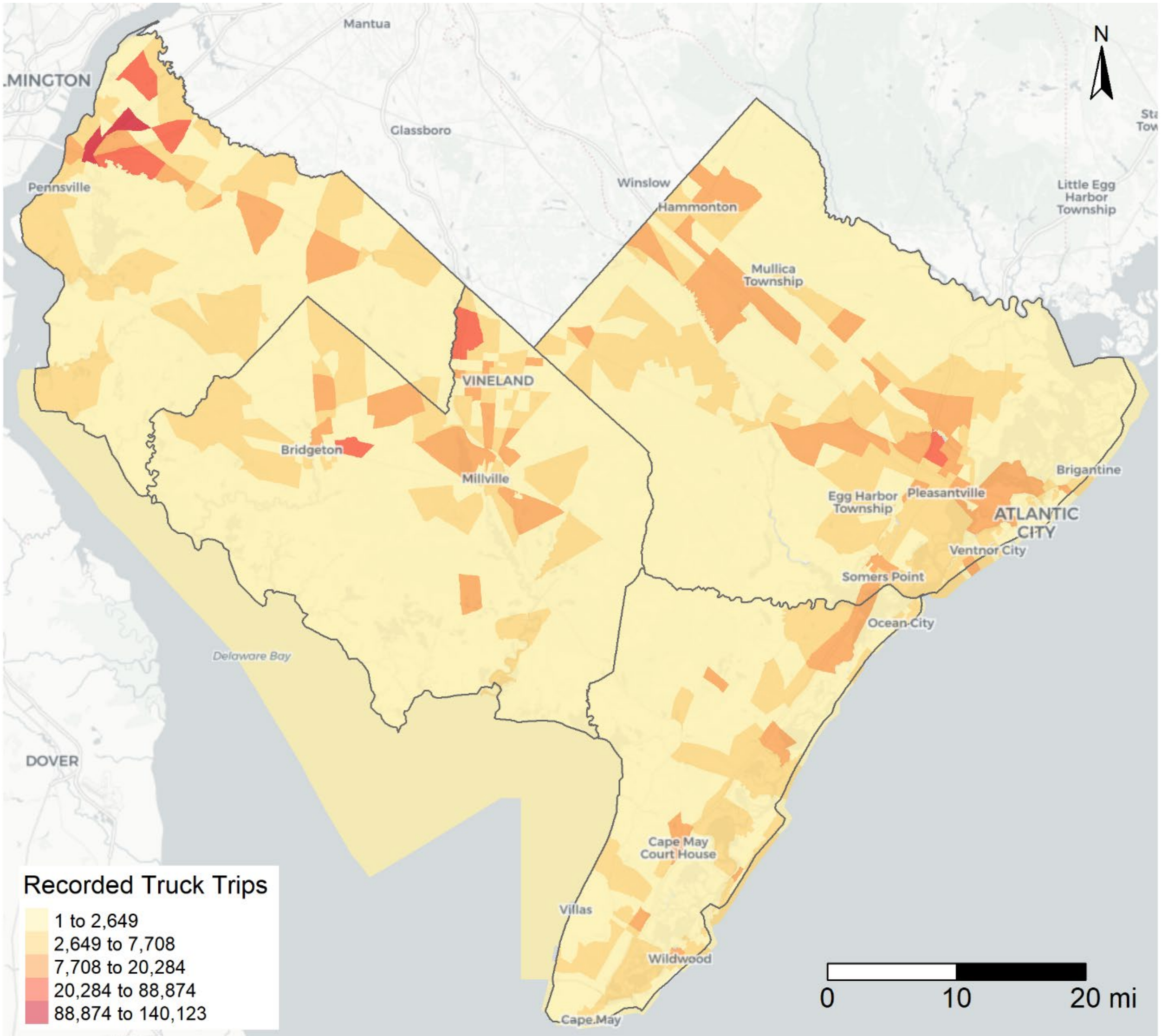
Figure 2-8. States within 300 Miles of SJTPO



The results of this exercise are shown in Figure 2-9. The TAZ with the highest levels of activity is located north of Pennsville adjacent to I-295 and the New Jersey Turnpike. This TAZ contains both a Flying J Travel Center and a Pilot Travel Center. Both of these facilities are used for overnight truck parking and explain the intense level of truck probe data in this TAZ. This TAZ alone account for nearly five percent of all trips starting or ending within the SJTPO area. Other areas of high truck probe activity are in the TAZs surrounding the two travel centers, Vineland, Bridgeton, Millville, and areas north of Pleasantville.

Not that this truck probe origin-destination data will be explored further in Tech Memo 2: Performance and Conditions.

Figure 2-9. SJTPO Truck Probe Activity by TAZ



3 Compare to Existing Truck Count Data

One of the key goals of this exercise is to develop a comprehensive freight roadway spatial network file to help SJTPO and other stakeholders better understand the magnitude of freight activity in the area. Specifically, this information seeks to help local stakeholders to determine whether individual roadway segments meet the criteria to be eligible for the New Jersey Department of Transportation (NJDOT) Local Freight Impact Fund (LFIF) program. NJDOT uses the following three criteria for determining eligibility:

1. Projects must be within the jurisdictional limits of the applicant's municipality and/or county unless filed jointly with an adjacent municipality and/or county.
2. Applicants must demonstrate that the project will provide access to a Port, Warehouse Distribution Center or any other Freight Node by providing a narrative and a map supporting their request.
3. Projects must have as a minimum 10% Large Truck Volume within the project limits. A traffic study must be submitted to support this information.

The identification of major freight generators completed in the previous sections will help to identify roadway segments that meet criteria 2. Roadways that serve the ports, rail yards, freight industry nodes, and areas with high truck probe activity should qualify under this measure.

This section seeks to address criteria 3 by reviewing available information on truck classification counts, collecting additional classification count data, and completing an interpolation process to estimate the truck percentages on intermediary roadway segments between the count locations. Additional details on the data sources and methodology of the process are described below.

3.1 Existing NJDOT Truck Counts

Vehicle classification counts are routinely conducted and recorded by the New Jersey Department of Transportation (NJDOT) to better understand the volume and types of vehicles traversing the State's roadways. This information is hosted on an interactive map available on the NJDOT websites (Figure 3-1). Each pink dot represents a 48-hour classification count location. NJDOT uses a vehicle classification system matching that of the Federal Highway Administration (FHWA). A breakdown of the various vehicle types under this classification scheme is shown in Figure 3-2. All vehicles Class 4 and above are considered "Trucks", while all vehicles Class 8 and above are considered "Combination Trucks".

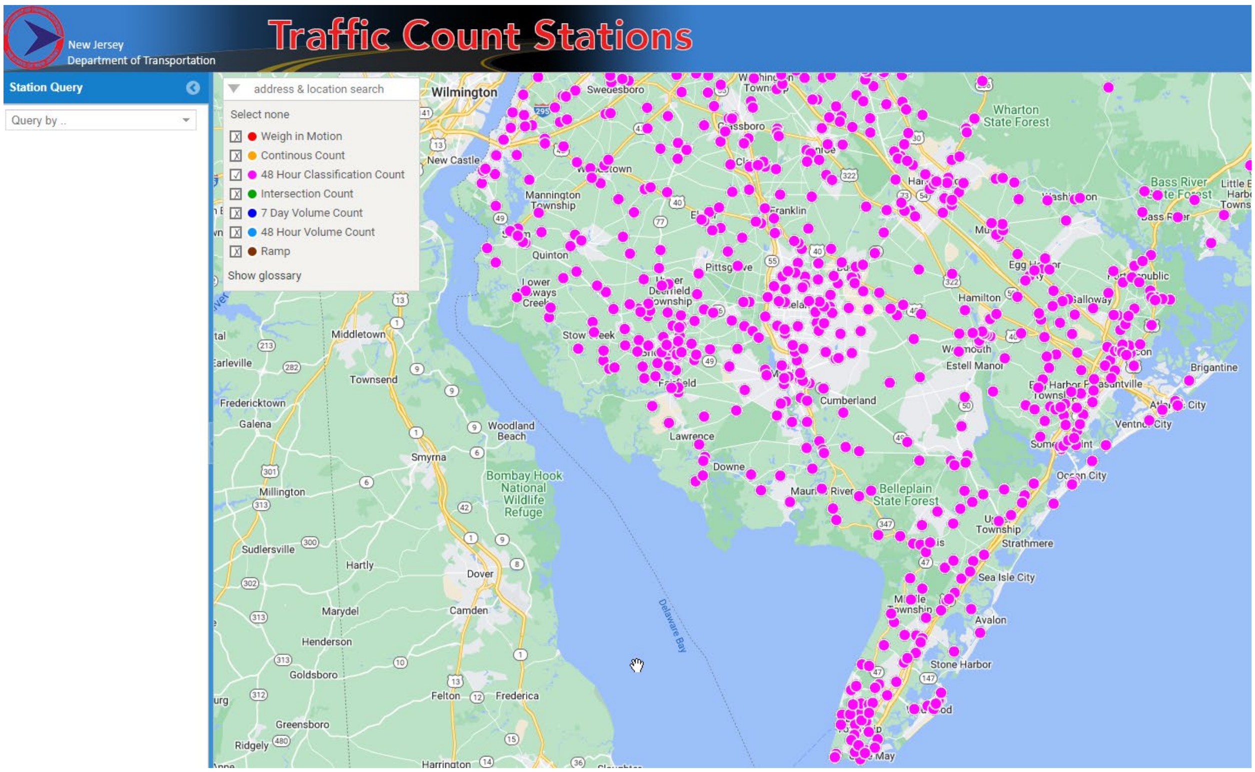
One key challenge in using this data is that while information on total annualized average daily traffic volumes (AADT) is available in downloadable spatial file from the NJDOT website, similar information on truck volumes is not available. Instead, the data can only be access via the interactive map by clicking on each location and then clicking on the PDF symbol to access the raw results of the classification count.[2] The study team

[2] Example Classification Count PDF: https://www.njtms.org/map/tms_reports/reports/DV03S_120106_8-20-2018.pdf

developed data analysis scripts to download the PDFs for each location and process the PDF text to identify the information for both truck volumes and combination truck volumes. This process was successfully completed for approximately 90 percent of the 48-hour classification count locations. The remaining locations were reviewed manually to complete the data collection process.

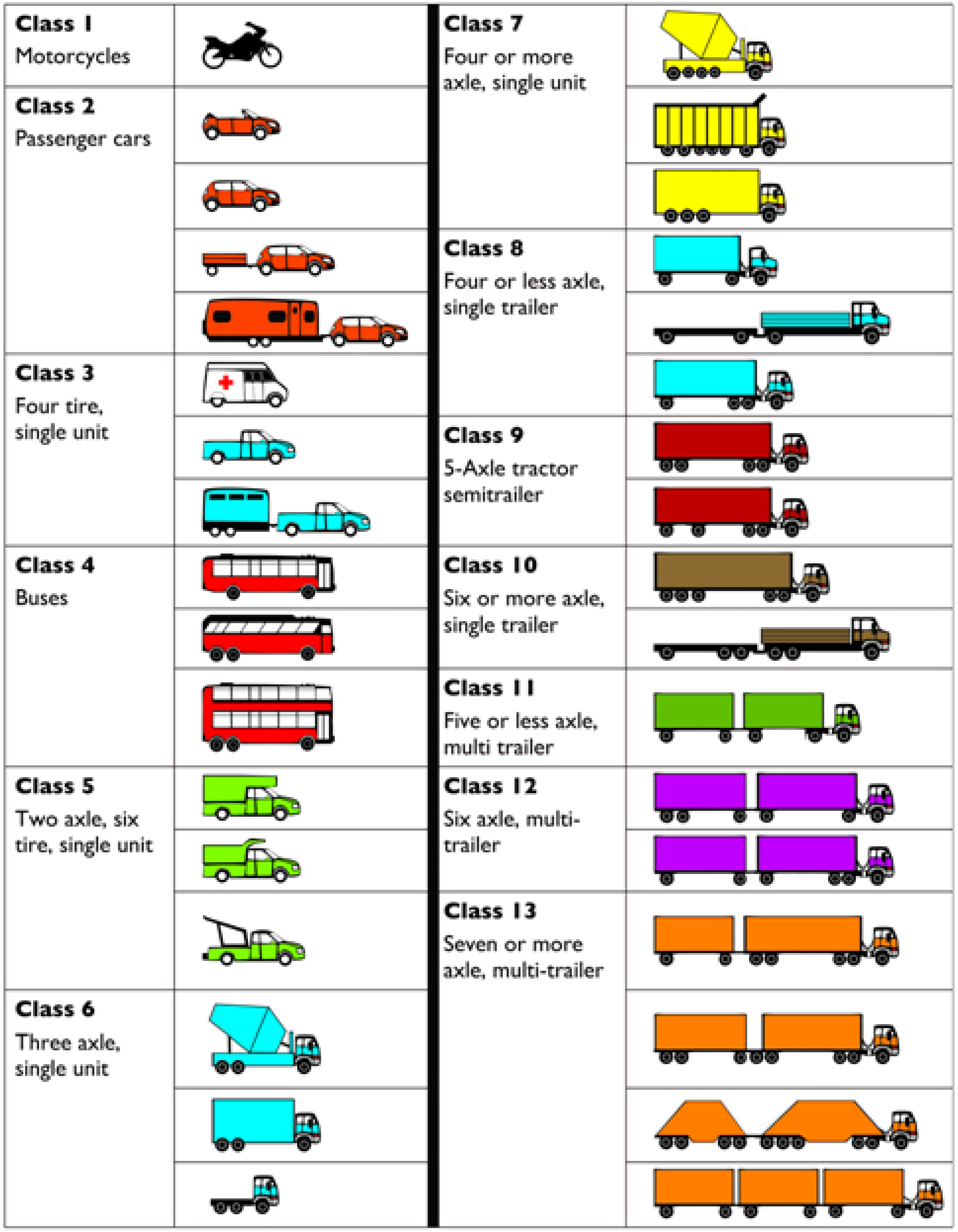
This process resulted in 426 unique classification count locations in the SJTPO study area.

Figure 3-1. NJDOT Traffic Count Station Map



Source: https://www.njtms.org/map/

Figure 3-2. FHWA Vehicle Classification Chart

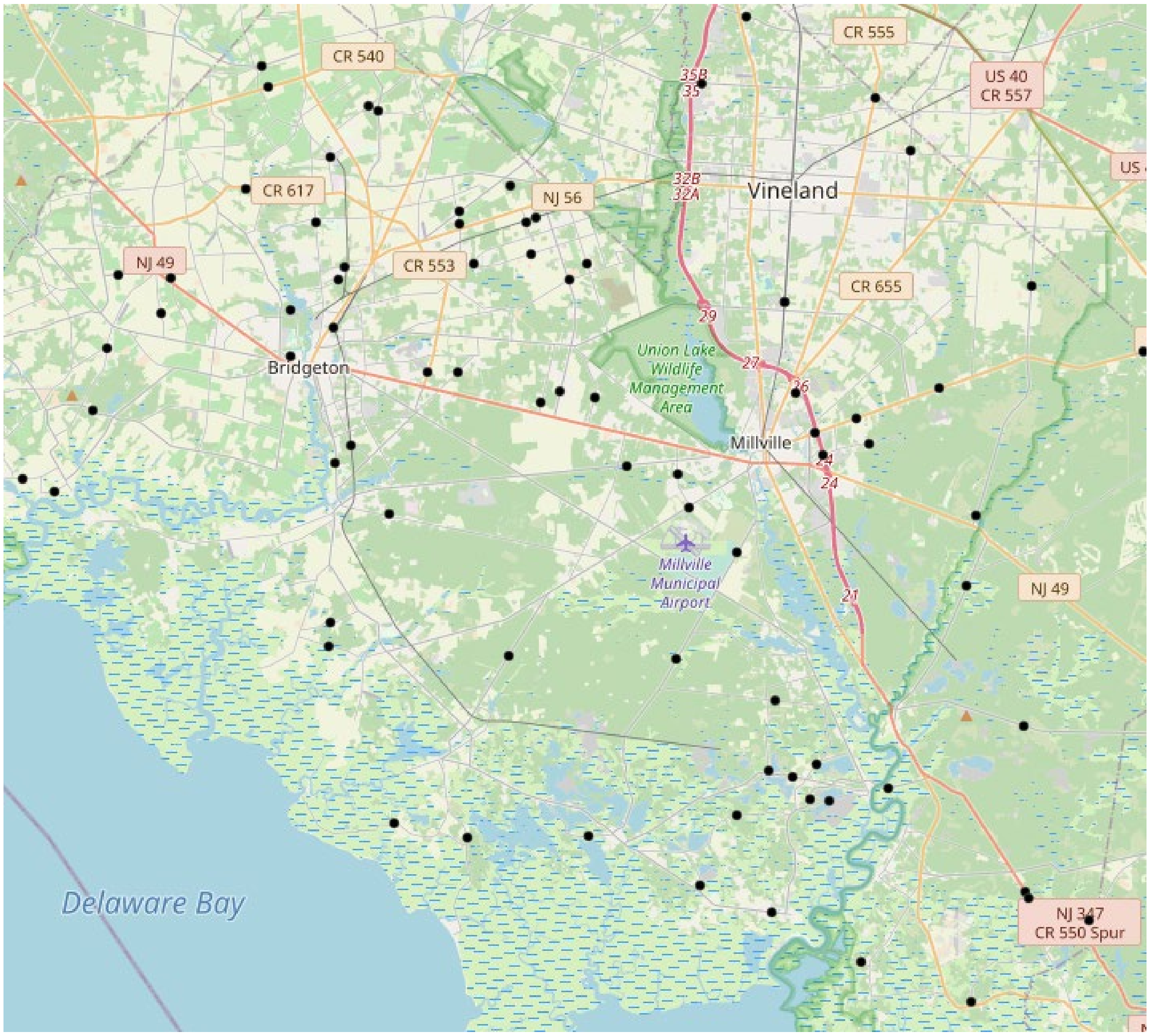


Source: FHWA Traffic Monitoring Guide (https://www.fhwa.dot.gov/policyinformation/tmguide/tmg_2013/vehicle-types.cfm)

3.2 Cumberland County Truck Study Counts

Cumberland County recently completed additional vehicle classification counts as part of a pair of Truck Route Identification Studies. The two studies were focused on the eastern and western portions of the county, respectively. In total, the study provided an additional 79 classification count locations to the dataset (Figure 3-3). The format of the classification count data matched that collected by NJDOT.

Figure 3-3. Cumberland County Truck Study Classification Count Locations

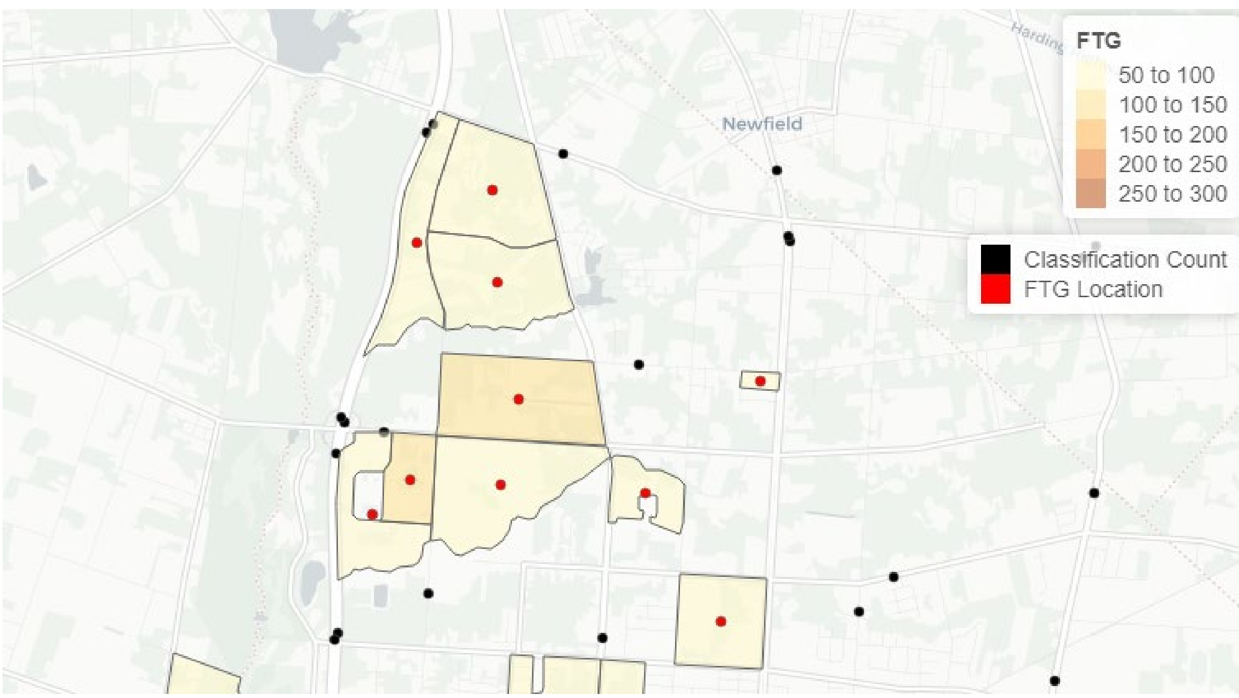


3.3 Freight Trip Generation Estimates

The process of estimating freight activity based on the industry type and number of employees within an area discussed in previous sections is used here to develop additional estimated classification count points in the SJTPO Region. While the freight trip generation values are considered only high-level estimates compared to the actual data represented by the classification counts, they are a useful tool for distributing trips along the network to areas which do not have real world data, but which are expected to have a large share of truck activity.

An example of this process is shown in Figure 3-4 for the Vineland Industrial Park area near N Mill Road and W Garden Road. Multiple census blocks within this area have estimated daily truck trips of 50 or more. For the incorporation of this data into the study, the block centroids were used as proxy classification count locations. The freight trip generation data does not distinguish between truck vehicle types. To approximate a value for the combination unit truck type, the surrounding classification count locations within a two-mile radius were used to estimate the ratio of combination trucks to all trucks. The freight trip generation estimates also do not produce any estimate of all-vehicle average daily traffic. Therefore, the average daily traffic values at the freight trip generation centroids were set to zero for the next analysis steps.

Figure 3-4. Freight Trip Generation (FTG) Point Locations

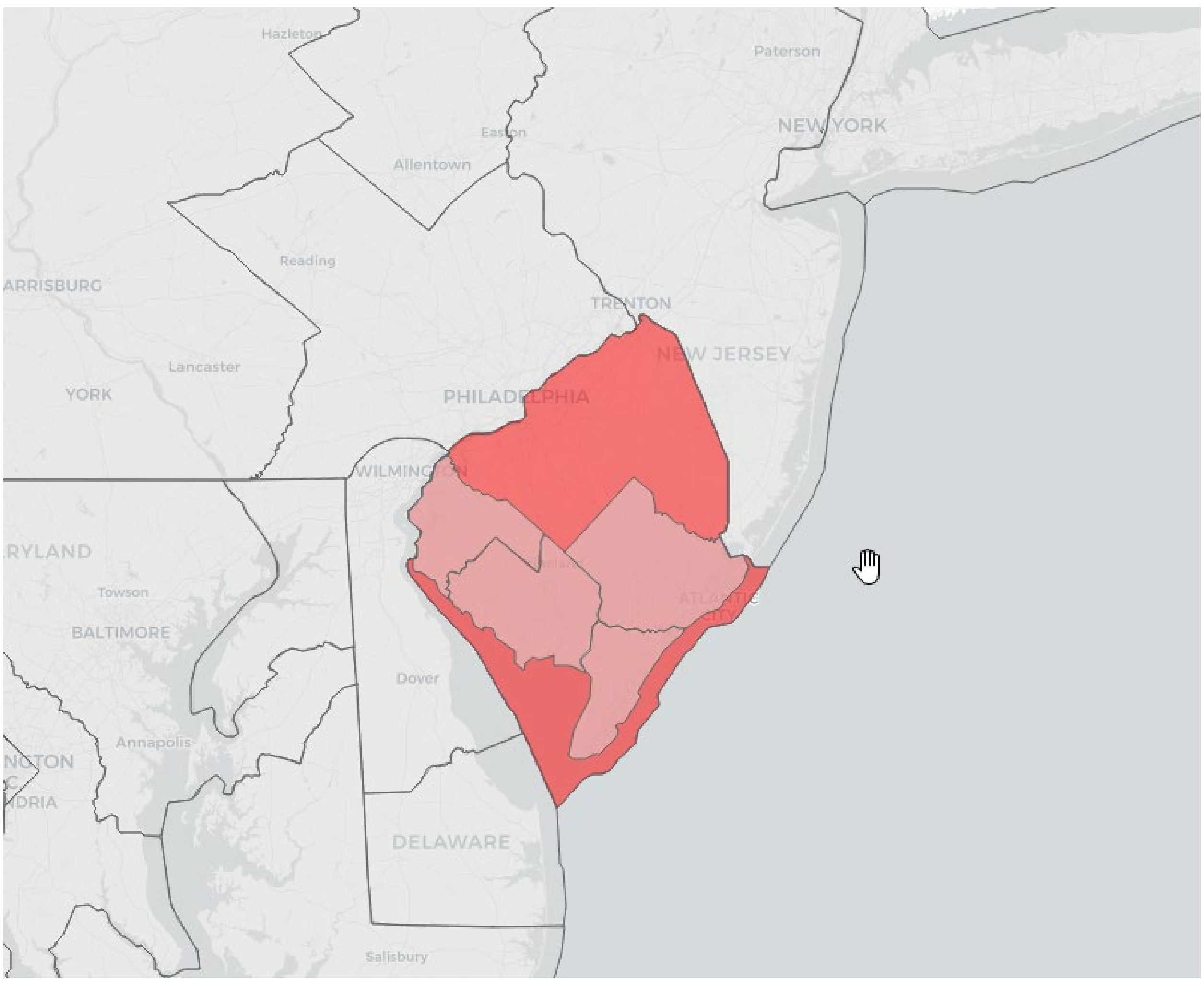


3.4 Freight Analysis Framework Estimates

The Freight Analysis Framework Version 5 (FAF5) is a data product developed in coordination between the Bureau of Transportation Statistics (BRS) and the Federal Highway Administration (FHWA). It combines data from the 2017 Commodity Flow Survey (CFS) with international trade data from the Census Bureau to incorporate data from agriculture, extraction, utility, construction, service, and other industry sectors. FAF data is release every five years, typically following the release of the CFS data. The most recent FAF data is Version 5 which was released in late 2021 with additional data products being release in the Spring of 2022.

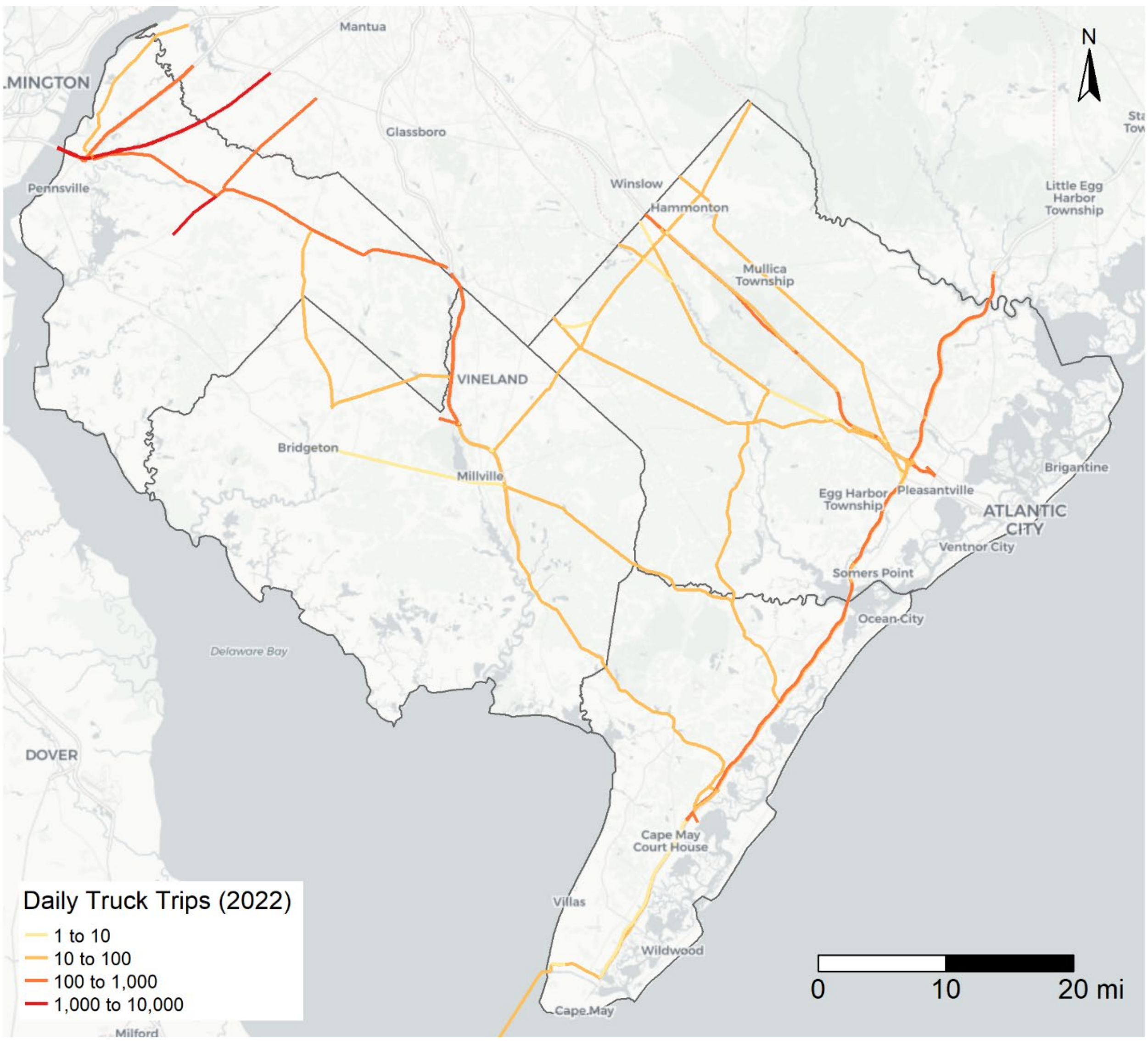
The primary product developed under FAF5 is the estimation of freight flows by industry and mode between and within each of the designated FAF areas. SJTPO falls entirely within the Philadelphia-Reading-Camden, PA-NJ-DE-MD FAF Area (NJ Part) as shown in Figure 3-5. The Philadelphia-Reading-Camden FAF area continues with a Pennsylvania counterpart. The remainder of New Jersey is included within the New York-Newark, NY-NJ-CT-PA FAF Area (NJ Part).

Figure 3-5. FAF5 Philadelphia-Reading-Camden, PA-NJ-DE-MD FAF Area (NJ Part)



A secondary data product released as part of the FAF5 dataset is the Estimates of Truck Flow on the nation's highway networks. This data is prepared as part of a multi-step process by which the FAF region origin-destination flow data is disaggregated to smaller geographies, the truck mode component is filtered out, the truck tonnage estimates are converted to estimated daily trucks, and these trucks are then assigned to specific routes on the roadway network. Note that the FAF model network primarily consists of higher classification roadways on the National Highway System such as Interstate, US, and Major State Highways. The estimated truck flows on highways within SJTPO is shown in Figure 3-6. This data is also further disaggregated into vehicle type (e.g., single unit trucks, combination unit trucks) and by commodity type including categories such as farm products; stone, sand, gravel, and ores; chemicals; and manufactured goods.

Figure 3-6. FAF5 Estimated Daily Truck Volumes



For this analysis, the all truck and combination unit truck flow estimates on each roadway segment were used to supplement the classification count data described in the previous sections. Individual points were created by taking the midpoint of each FAF5 network segment. Since many of the higher classification roadways included in this data set were not included in the classification count data, it helps to fill in the gaps to develop a more complete picture of freight activity in the region. Further evaluation of the FAF5 truck flows will be included in subsequent Tech Memos.

3.5 Additional Truck Count Data

The locations of the existing classification count data were compared against multiple datasets to identify potential candidate roadways for additional classification count data collection. First, the count locations were compared against the major freight generator information discussed in the previous sections. Roadway segments with no existing count data that were in proximity to major freight generators were flagged for potential consideration. Additionally, the study team conducted a preliminary routing interpolation process to estimate the truck volumes and percentages in between the point locations. Roadway segments with high estimated truck volumes or an estimated truck percentage greater than 10 were also flagged for potential consideration.

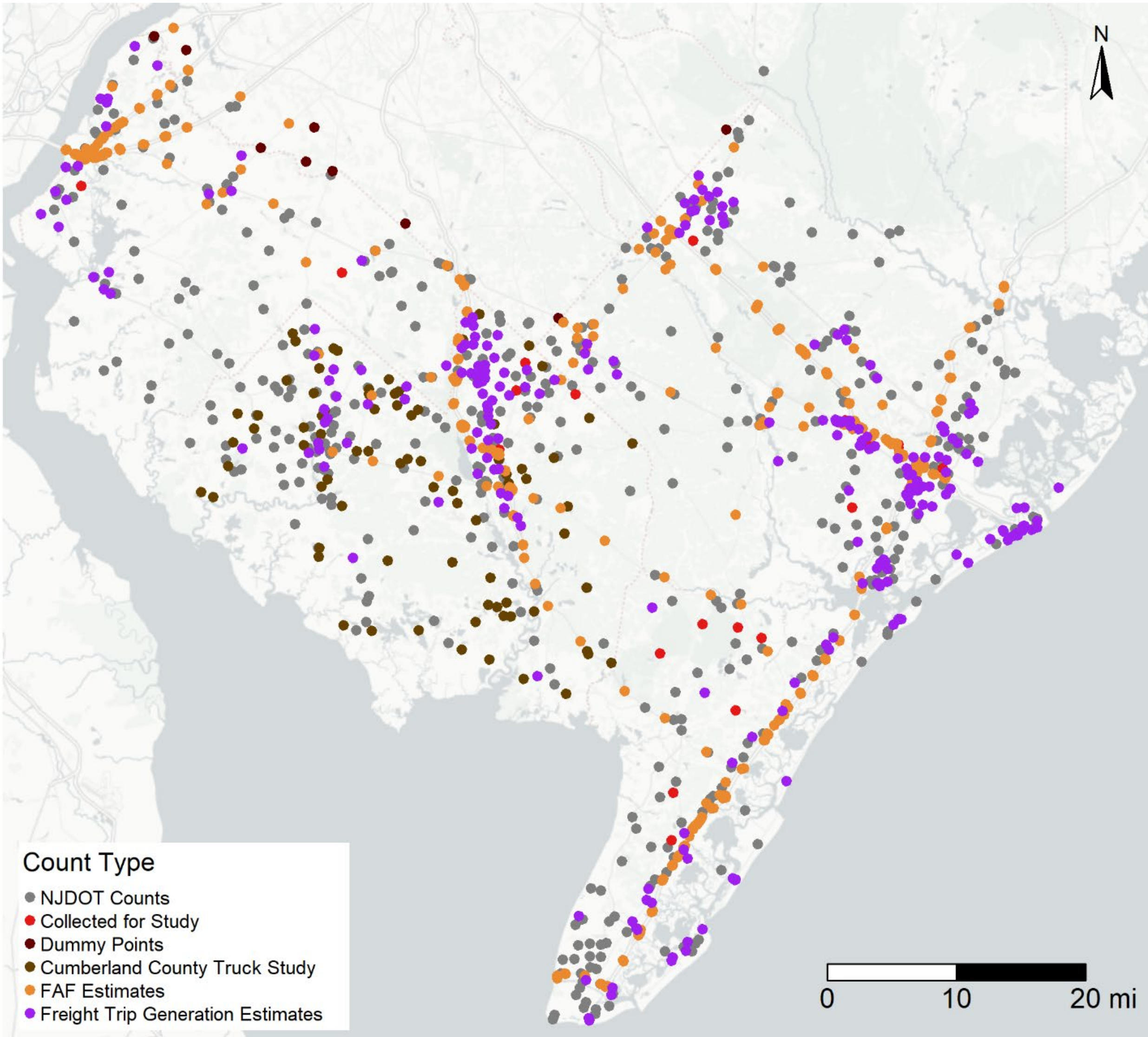
The proposed classification count locations were reviewed with staff from Salem, Cumberland, Cape May, and Atlantic Counties and staff from the City of Vineland. Through a combination of the data analysis and the local knowledge of county and city staff, additional classification count locations were identified. In total, 21 additional classification count locations were identified and collected by the study team in January 2022.

The locations of the classification count data points included in the analysis are shown in Figure 3-7.:

- Existing NJDOT classification count data is shown in gray
- Cumberland County Truck Study classification counts are shown in brown
- Additional classification counts collected as part of this study are shown in red
- FAF truck flow estimates are shown in orange
- Freight trip generation estimates are shown in purple
- “Dummy” points shown in black are duplicate locations placed on the periphery of the county boundaries to reflect actual conditions more accurately during the routing extrapolation phase of the study. The placement of these points results in the truck counts at the peripheral points being split evenly rather than all of the trucks being distributed to points within the SJTPO area.

Through a combination of these multiple data sources, the study area has thorough coverage of local, regional, state, and interstate highways in the region for use in the trip interpolation and extrapolation process described in the subsequent section.

Figure 3-7. Final Truck Classification Count Locations



4 Extrapolate Trips to Network

A unique approach undertaken by this study was the extrapolation of truck counts from the point locations to the surrounding highway network. This was accomplished through a combination of the HERE Routing API[3] and scripted geospatial processing. The following steps were taken:

1. For each individual classification count location, identify the 50 nearest adjacent count locations.
2. Use the HERE Routing API to map a route between the original point and the adjacent points and create a spatial line feature of this route.
3. Truncate the resulting routing spatial features to eliminate any routes that extend beyond one of the count locations. An example of this can be seen in Figure 4-1: Site 120622 would have been identified as one of the adjacent location connecting to site 8-4-431. However, the routing between these two points would have passed through side 552-1. Therefore, the route to 120622 was removed.
4. Filter out unrealistic routing results by eliminating routing shapes where the network distance of the route exceeds three times the straight-line distance between the start and end points. For example, this will eliminate routings from one side of a divided highway to the other.
5. Calculate the proportion of the truck trips estimated to travel to each of the adjacent point based on the volume of trucks at the adjacent locations. For example, if an originating point had two connecting points and their truck volumes were 60 trucks per day and 40 trucks per day, the process would estimate that 60 percent of trucks from the originating site would travel to the first site and the remaining 40 percent of trucks would travel to the second site. In this way, count locations with high truck volumes are likely to attract trips from other surrounding points while count locations with low truck volumes are less likely to attract trips.
6. Merge the results of the overlapping routings to combine the estimated truck volumes on individual segments.

This exercise was completed for all classification points in the data set and trip extrapolations were calculated separately for all average daily traffic (ADT), truck ADT, and combination truck ADT. The last step of this analysis was to calculate the percentage of trucks on each route by dividing the composite truck ADT value by the total ADT value.

The following figures highlight the results of this analysis on three adjacent count location on May's Landing Road east of Millville. Each site is labelled with its associated NJDOT site identification number. The extrapolation of trips from site 8-4-431 is relatively straightforward. Only three adjacent locations are identified within the immediate area. Of these, the sites at 552-1 and 8-6-116 on May's Landing Road have higher truck counts than the site at 160623. Therefore, the majority of trips from this site are expected to

[3] HERE Routing API v8 Documentation: https://developer.here.com/documentation/routing-api/dev_guide/index.html

continue along May's Landing Road. However, a small percentage of trucks are estimated to traverse north along New Panther Road to reach the site at 160623. Since New Panther Road does not currently have a classification count, this process provided additional information not included in the point data alone.

The extrapolation of trips from site 552-1 (Figure 4-2) is only somewhat more complicated than the previous example because it has four connecting count locations. However, as before, the majority of truck trips are expected to remain on May's Landing Road.

The extrapolation of trips from site 684-2 (Figure 4-3) is the most complex of these examples due to multiple adjacent count locations with similar traffic volume levels. Approximately 32 percent of the truck trips from this site are estimated to travel to site 552-1, 20 percent are estimated to travel to site 552S-2, 22 percent are estimated to travel to site 8-8-032, and 16 percenter are estimated to travel to site 4 in the northwestern area of the figure. The remaining 10 percent of trips are estimated to travel to other sites on the figure.

Figure 4-1. Extrapolation: Site 8-4-431

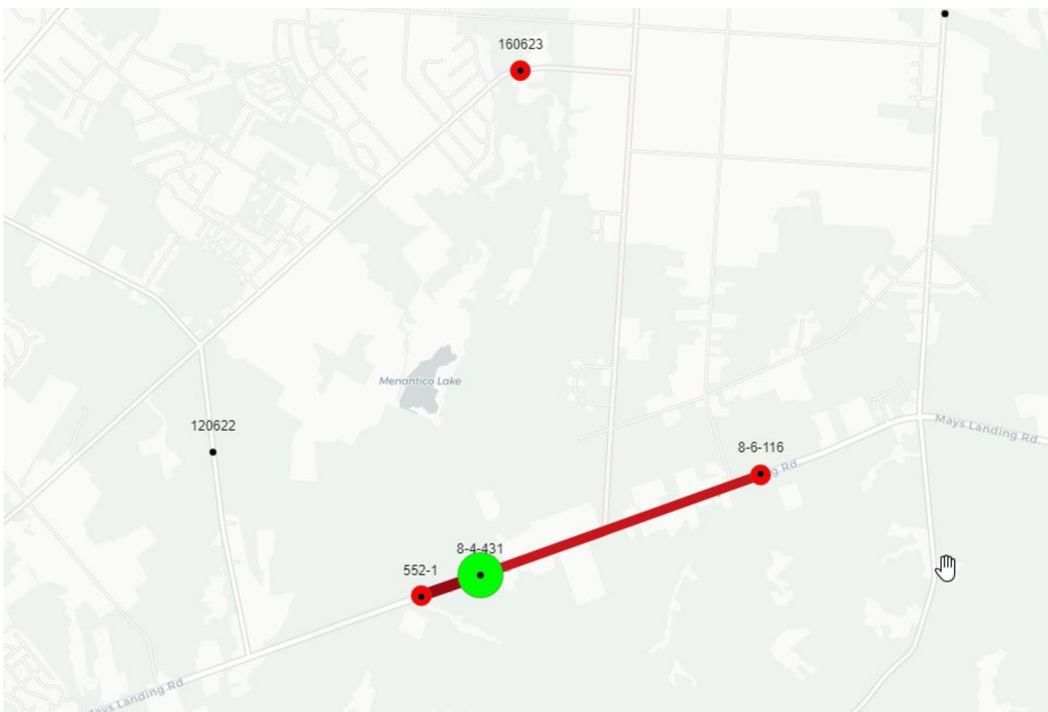


Figure 4-2. Extrapolation: Site 552-1

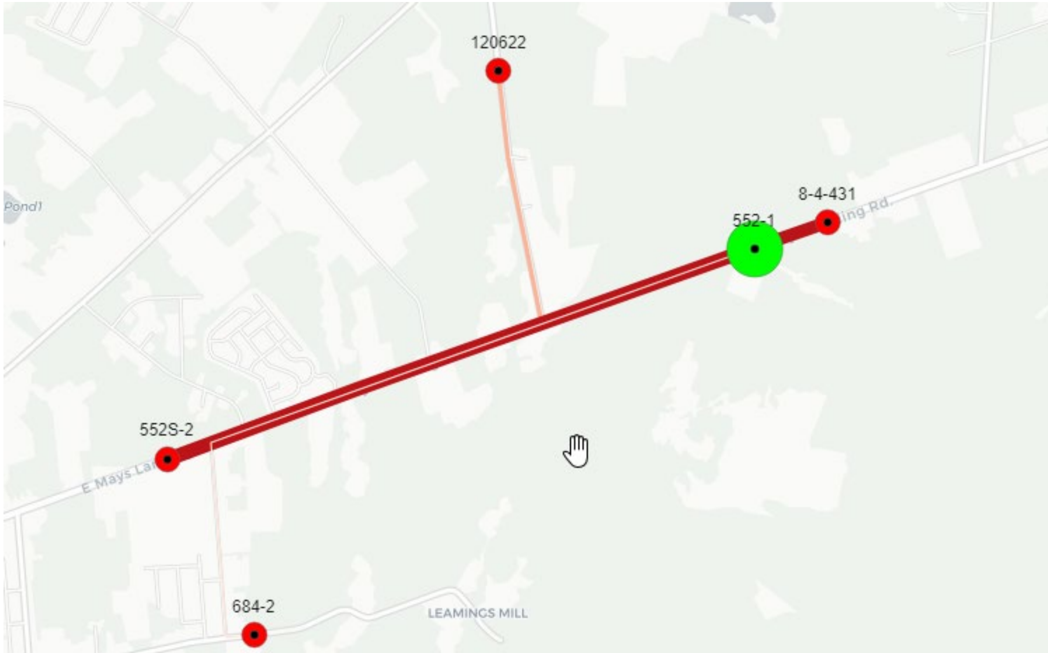
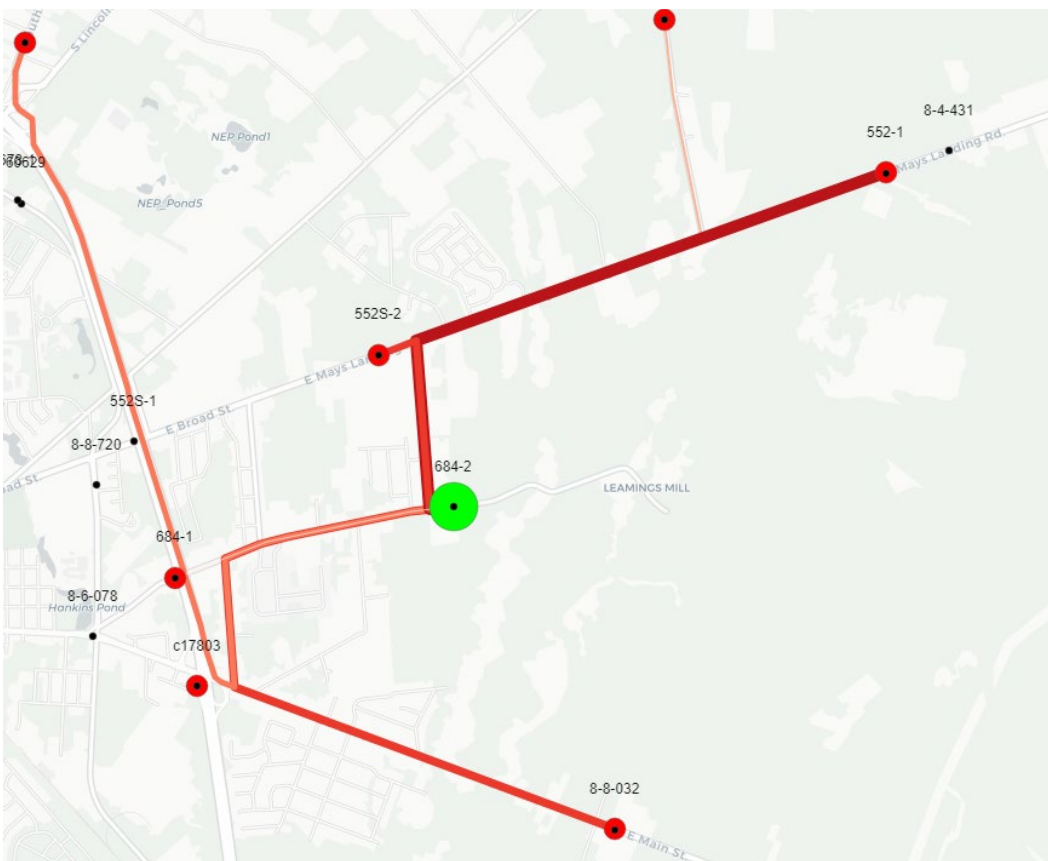
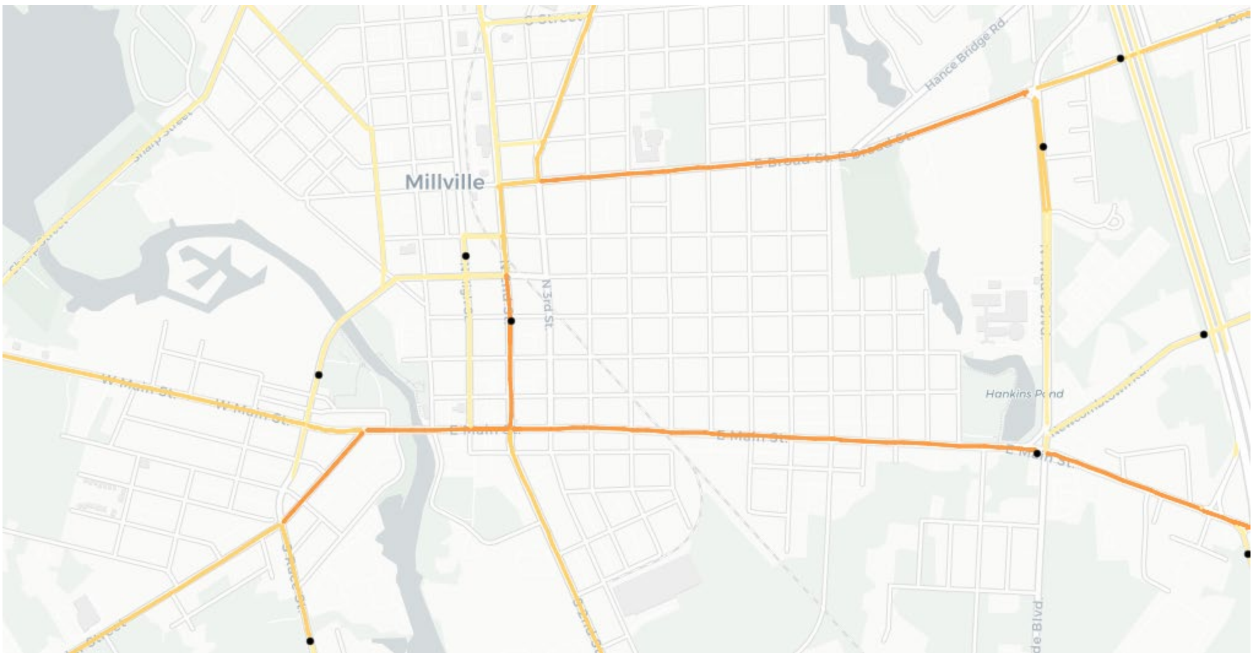


Figure 4-3. Extrapolation: Site 684-2



One key advantage of this methodology is that the allocation of trips to the network can help to fill in the information gaps between existing classification count locations. Figure 4-4 below highlights an example of this in Millville. Multiple segments of Main Street and Broad Street do not have existing classification counts but this methodology indicates the likelihood of higher truck volumes on these segments. Note this information represents only an estimated value based on this analysis methodology and should be used only as a guide. Prior to submitting funding applications to the NJDOT Local Freight Impact Fund or other uses, physical classification counts must be recorded to confirm actual truck volumes and percentages.

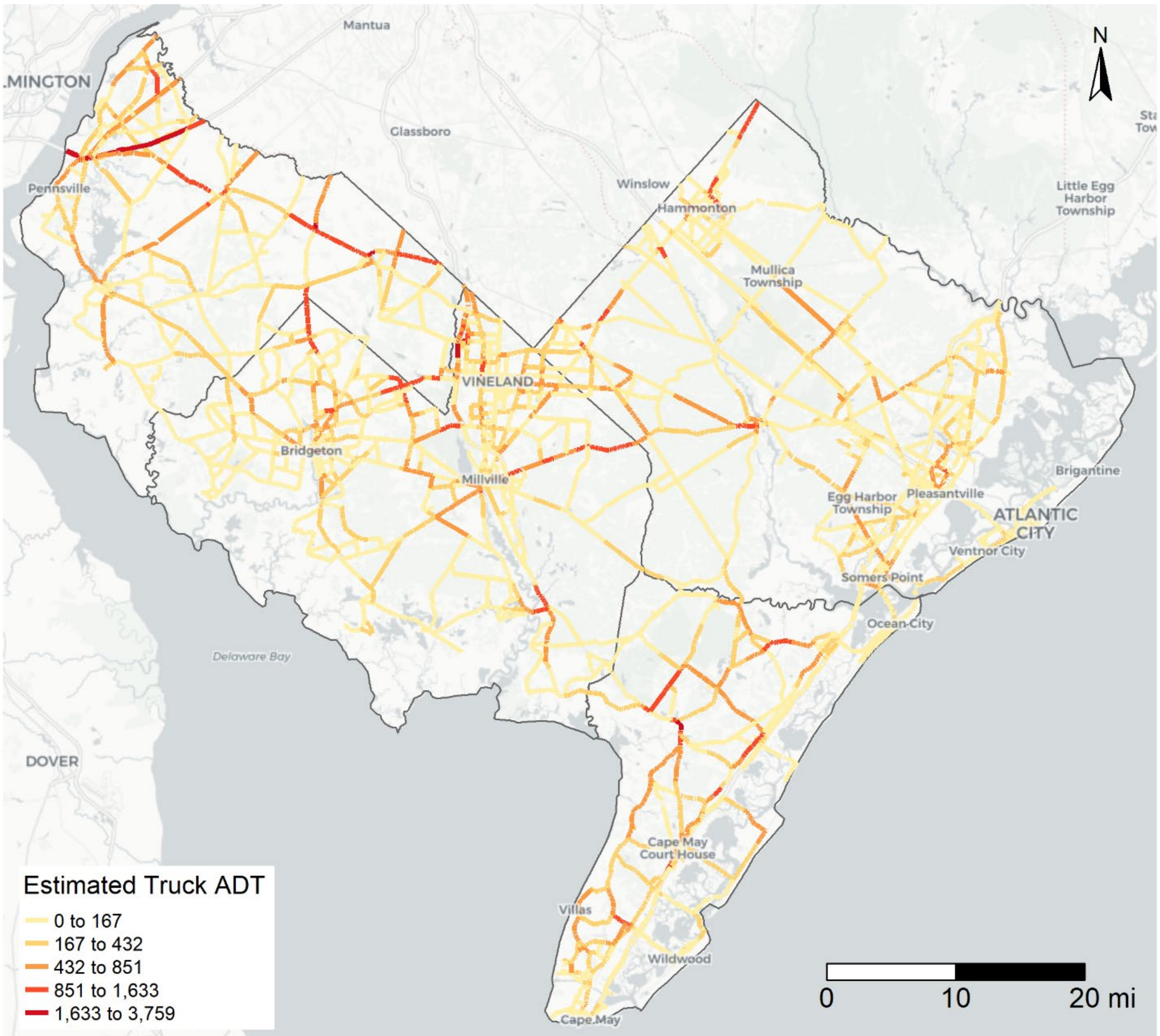
Figure 4-4. Example of Filling in Gaps Between Known Counts (Millville)



The final estimated truck ADT, combination truck ADT, and truck percentages on roadway segments throughout SJTPO are shown on the following pages. This data will also be presented in an interactive online map format to be discussed in later technical documentation.

Figure 4-5 highlights the estimated distribution of Truck ADT on roadway segments in SJTPO. The figure shows many areas of high truck activity in Vineland, Bridgeton, and Millville as well as other corridors near Cape May Township and Pennsville. Key truck freight corridors include US 40 (Harding Highway), NJ 49 (North Broadway/Shell Road), NJ 77, US 206, and NJ 47.

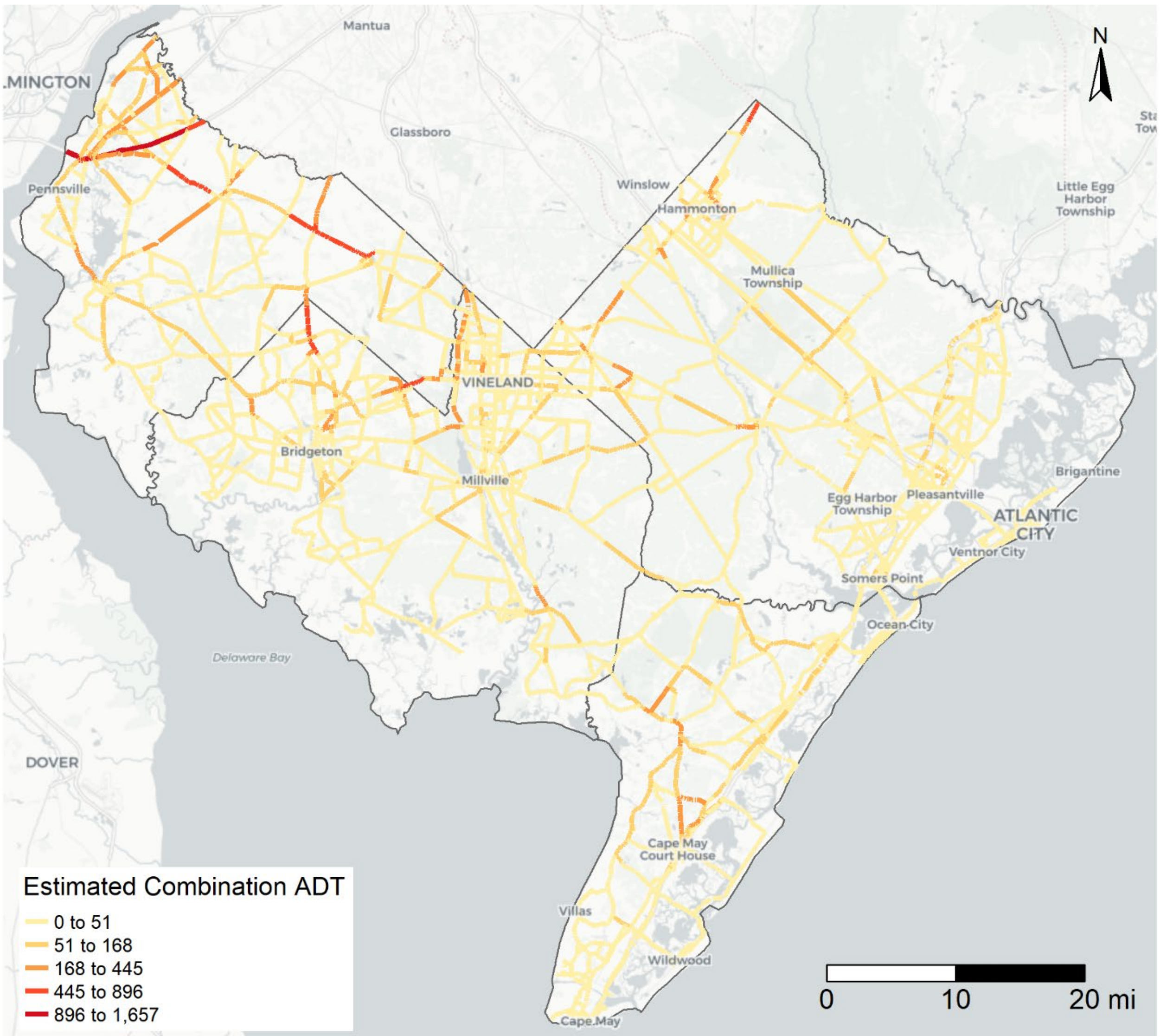
Figure 4-5. Final Estimated Truck ADT



Source: HDR analysis of NJDOT truck classification counts, freight trip generation estimates using the NCFRP Report 37 methodology applied to LEHD data and FAF5 truck flow network assignments.

Figure 4-6 highlights similar information for the larger single and multiple combination tractor trailers in the SJTPO region. Many of the roadways highlighted in the previous figure are also highlighted here. However, the combination truck traffic tends to be more heavily concentrated onto a smaller selection of roadway segments. In particular, US 40 (Harding Highway), NJ77, and US 206 all have fairly high concentrations of these larger freight vehicles.

Figure 4-6. Final Estimated Combination Truck ADT

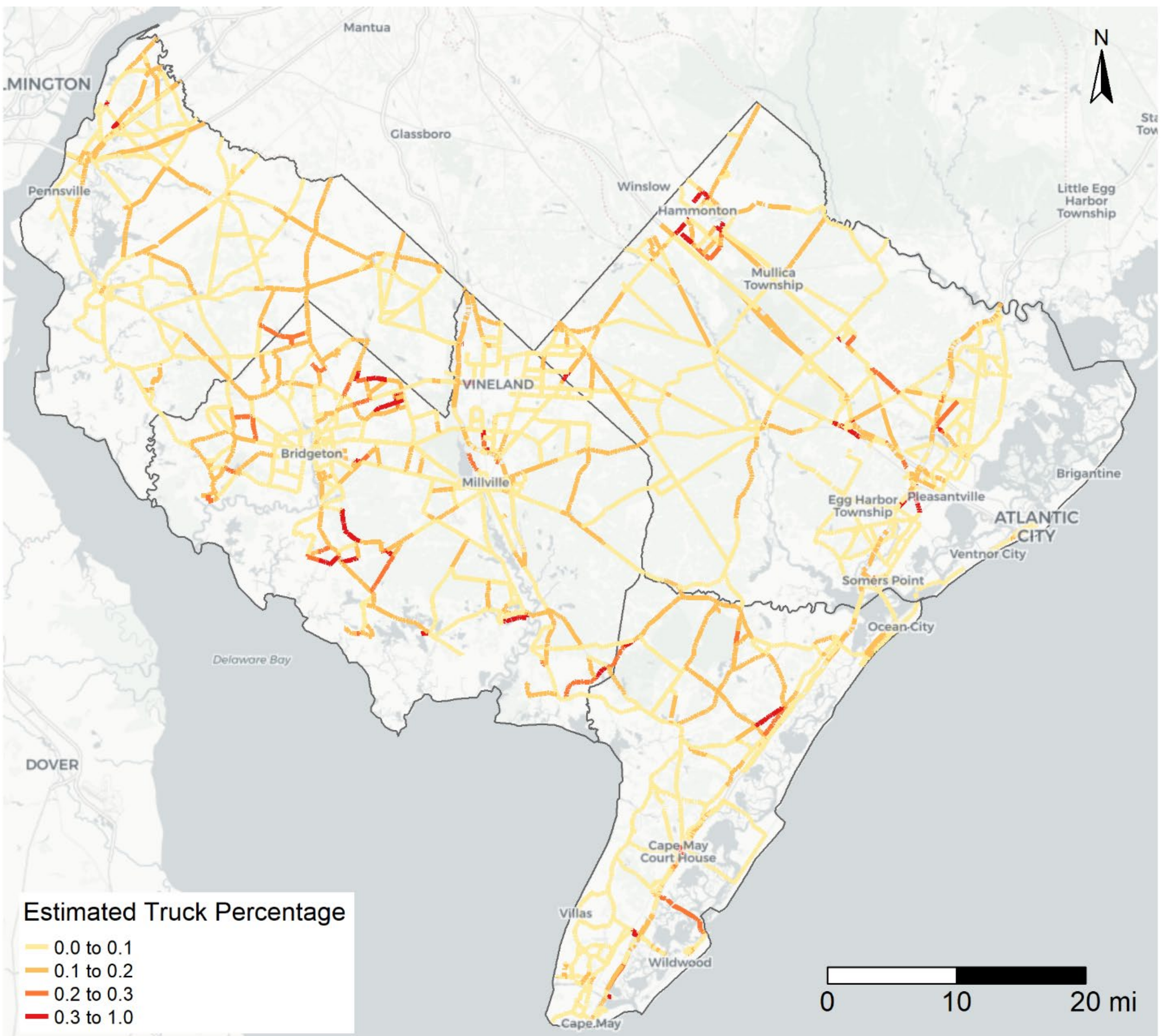


Source: HDR analysis of NJDOT truck classification counts, freight trip generation estimates using the NCFRP Report 37 methodology applied to LEHD data and FAF5 truck flow network assignments.

Lastly, Figure 4-7 highlights the estimated truck percentage on roadway segments in SJTPO. While there is some overlap between the previous figures and this figure, higher truck percentages are more likely to occur on local and county roads that have relatively lower total traffic volumes. Note however, that the classification count points developed through the freight trip generation estimates do not include estimates of average daily traffic. Because of this, roadways on or near these points may show an ADT value of zero. To avoid the appearance of artificially high truck percentages, Figure 4-7 excludes roadway segments that resulted in positive truck volumes and zero ADT volumes.

As noted earlier, this information will be made available in an interactive online map format that will make it easier to identify the individual roadway segments that meet the 10 percent truck criteria for the NJDOT Local Freight Impact Fund eligibility. The maps will also show the location of existing classification counts and the locations of major freight generators discussed in previous sections.

Figure 4-7. Final Estimated Truck Percentage



5 Next Steps

The next phase of this study will focus on the evaluation and assessment of freight performance measures. Specifically, the study will review available truck probe data sets available from the Trip Analytics and Massive Data Downloader tools available from the RITIS tool suite. The study will also evaluate freight mobility barriers such as bridges with low vertical underclearance and low permissible loads as well as evaluate safety issues related to truck crashes including both crash type and severity.

Finally, all of the data analysis products displayed for these technical memos will be displayed in an online StoryMap format including both descriptive text narration and interactive maps of the materials being presented. The StoryMap will be developed using the ArcGIS Online (AGOL) platform and will be hosted on SJTPO's AGOL servers.

Appendix C:

Tech Memo 2: Freight Performance Measures

Freight Performance Analysis Technical Memo

SJTPO Regional Freight Plan Data Collection and Analysis

June 28, 2022

Contents

Tables

Figures

1 Introduction

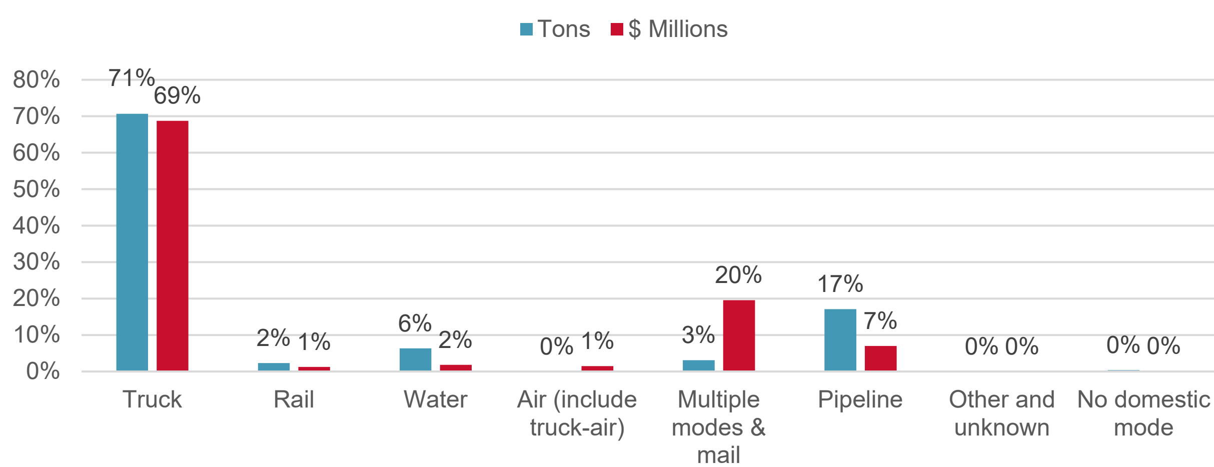
The South Jersey Transportation Planning Organization (SJTPO) is conducting this Regional Freight Plan Data Collection and Analysis project to better understand the movement of freight goods in southern New Jersey and to better integrate freight into its transportation planning process. SJTPO's overarching goal is to develop an optimal multimodal transportation network contributing to the region's economic development and its residents' wellbeing. This study will also help SJTPO to better represent the region's issues and needs in the New Jersey State Freight Plan.

This document summarizes the results of the second phase of the study, evaluating available freight data to assess performance measures for truck movements and other freight modes in the region, including congestion, bottlenecks, and safety issues.

2 Truck Performance Measures

This first section of this document focuses on the evaluation of truck freight flows. A greater emphasis is placed on truck freight movements relative to other modes due to the fact that truck freight makes up approximately 70 percent of the freight tonnage and value shipped into, out of, and within the region (Figure 2-1). SJTPO and other local freight partners such as counties, cities, and townships also have much greater jurisdictional authority over the roadway system compared to other freight modes.

Figure 2-1. Southern New Jersey Inbound/Outbound Freight Flow Proportions



Source: FAF5 Data Tabulation Tool, Philadelphia PA-NJ-DE-MD (NJ Part). Includes counties outside of SJTPO area.

2.1 Congestion

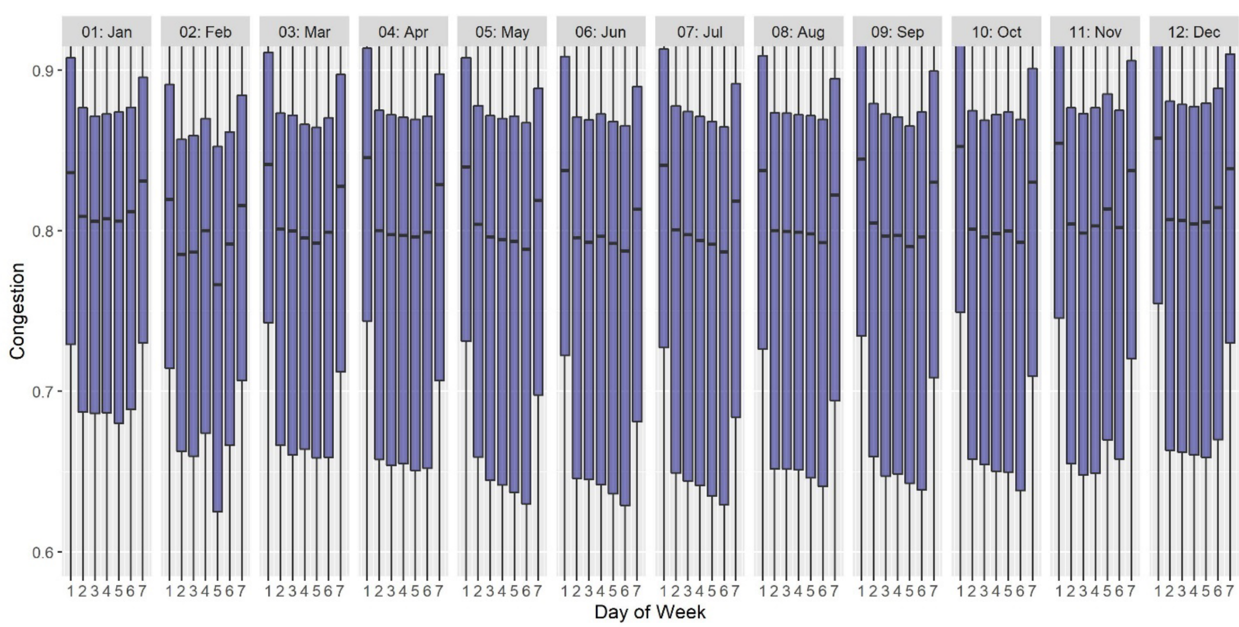
Data for this evaluation of roadway congestion in the SJTPO region was collected from the Regional Integrated Transportation Information System (RITIS) Probe Data Analytics (PDA) Suite Massive Data Downloader. This tool allows for the collection of data from INRIX and the National Performance Management Research Data Set (NPMRDS). Important distinctions between these two data sets are discussed in further detail below.

National Performance Management Research Data Set (NPMRDS)

The NPMRDS is a national dataset made available by the FHWA to state and local transportation agencies for the purpose of monitoring and reporting on various transportation performance measures. The data sources include vehicle probe data from INRIX, TomTom, and HERE. A useful feature of this data is that truck vehicles can be analyzed separately from other vehicles. However, one key limitation of the data is that it is only available on National Highway System (NHS) roadways. For this analysis, truck probe data was collected for the full calendar year of 2021.

One known feature of traffic in the SJTPO area is the seasonal impacts of tourists and summer-focused events. This aspect of local travel patterns is highlighted in Figure 2-2 below. In this context, the measure of congestion is calculated as the average speed divided by the 99^{th} percentile speed for each segment. The 99^{th} percentile speed is assumed to be equal to the free flow speed for each segment and was used in place of the reference speed provided by the NPMRDS after a detailed review found the reference speed to be substantially different from what would be expected on many roadway segments. The results are shown as a box plot where the median value for all segments for each hour is shown with a horizontal black bar. The blue area represents the interquartile range (25^{th} percentile to 75^{th} percentile) within each time period. The figure shows that the summer months in the SJTPO region exhibit a greater likelihood for congestion levels less than 70 percent of free flow speed. This is most noticeable during the months of May through July. Notably, there are many instances of high congestion during the month of February. This is a direct result the record snowfall events which occurred in February 2021. For the purposes of further evaluating the impacts of seasonal traffic on truck travel, this analysis will define May through July as the “Peak Season” and the months of November through January as the “Off-Peak Season”. Note that these peak and off-peak seasons are specific to truck behavior and may not fully represent the peak congestion for all vehicles.

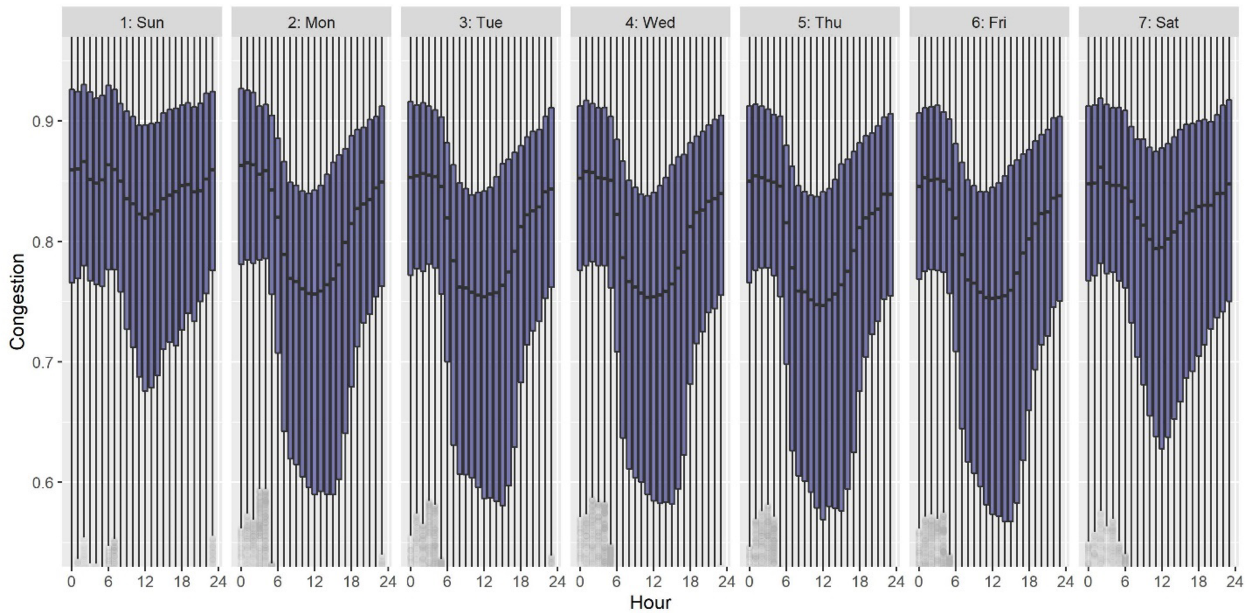
Figure 2-2. Congestion by Month and Day of Week (NHS Roads in SJTPO)



Source: NPMRDS Data, Jan-Dec 2021

Additional results from the NPMRDS data are shown in Figure 2-3. This figure shows the truck congestion levels by hour and day of week in the boxplot format. Peak truck congestion in SJTPO occurs between approximately between 10 A.M. and 4 P.M. on weekdays. Truck congestion levels are much less on Saturdays and Sundays with peak congestion occurring at approximately noon.

Figure 2-3. Congestion by Day and Hour (NHS Roads in SJTPO)



Source: NPMRDS Data, Jan-Dec 2021

The extents of this data on SJTPO roads are shown in Figure 2-4. This figure shows the peak hour congestion levels for trucks on NHS roadways in the region during the peak season months described in the previous section. The peak hour values shown on this map represent the peak hour for the individual segment. Roadway segments in red indicate that the truck travel speeds on these segments are less than half of the free flow speed.

Segments of heavy congestion are primarily located in and near more heavily populated areas of Atlantic City, Cape May, and the near the interchange of the New Jersey Turnpike and I-295. Similar information for the off-peak season is shown in Figure 2-5. While there is much overlap between the locations of the highest congestion, the overall congestion levels for trucks in the off-peak season are slightly lower than the congestion levels during the peak season. However, the peak hour congestion levels on Highway 55 near Vineland are higher during the off-peak season.

Figure 2-4. Peak Season Peak Hour Congestion (Trucks Only, NPMRDS)

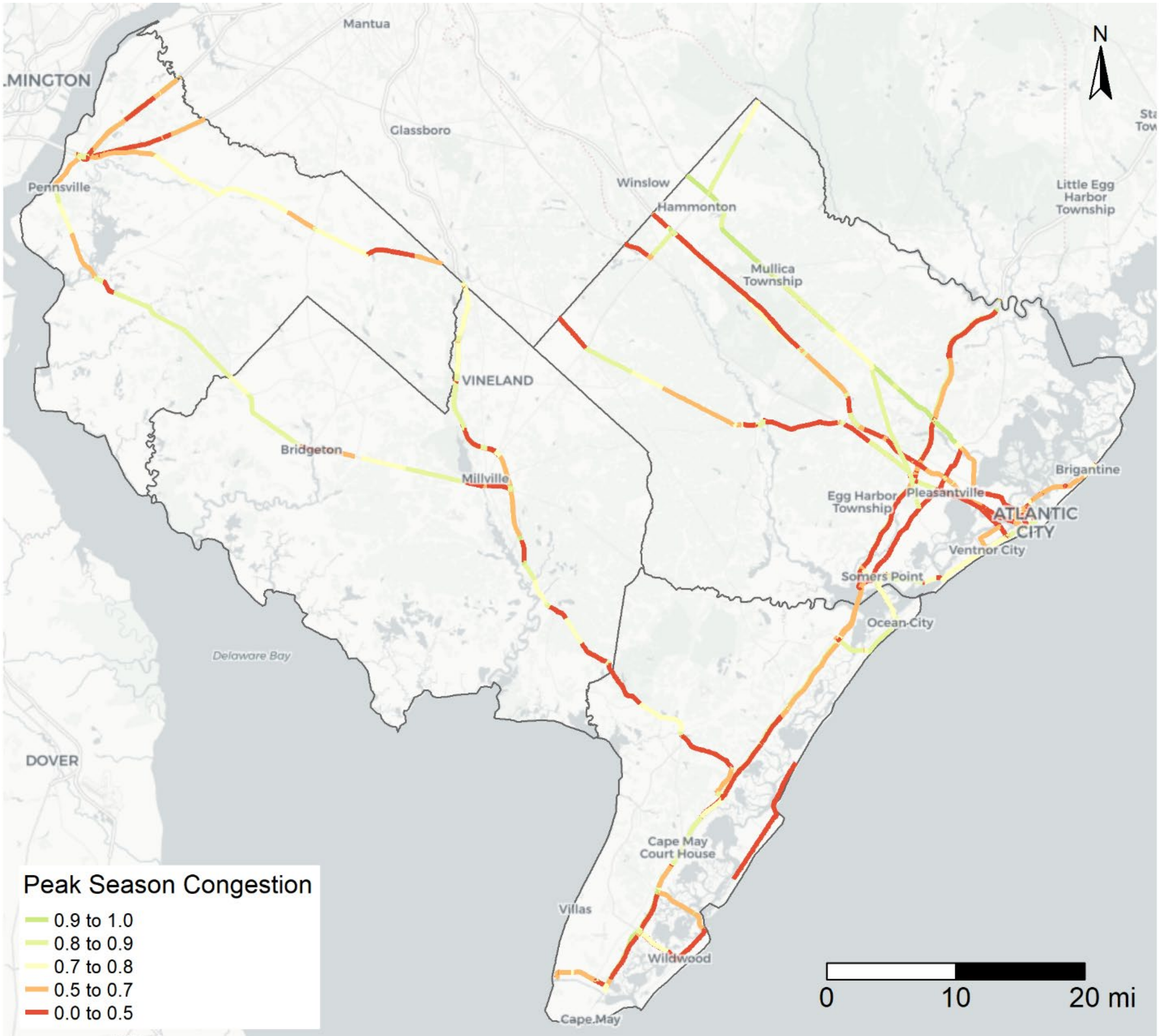
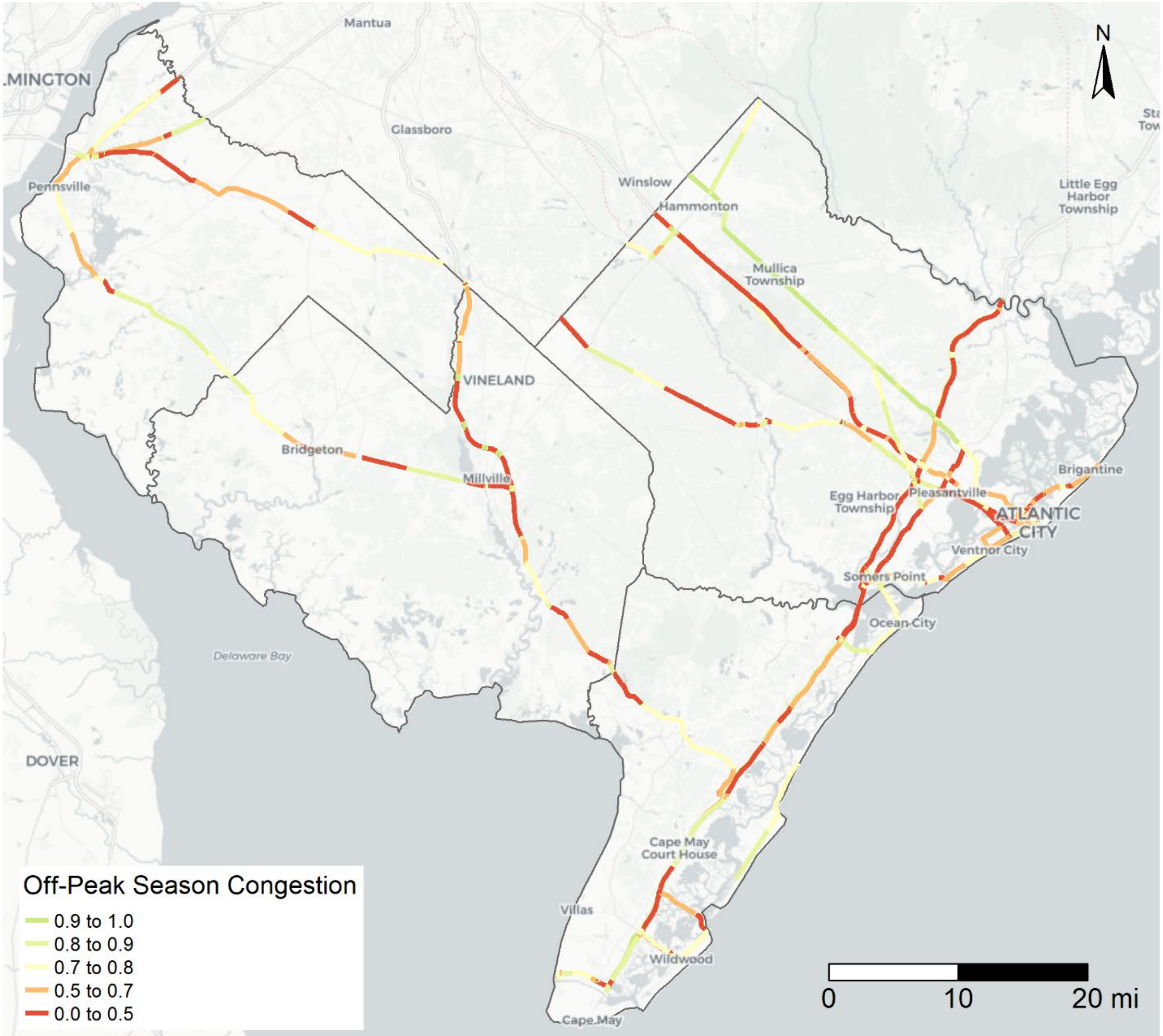


Figure 2-5. Off-Peak Season Peak Hour Congestion (Trucks Only, NPMRDS)



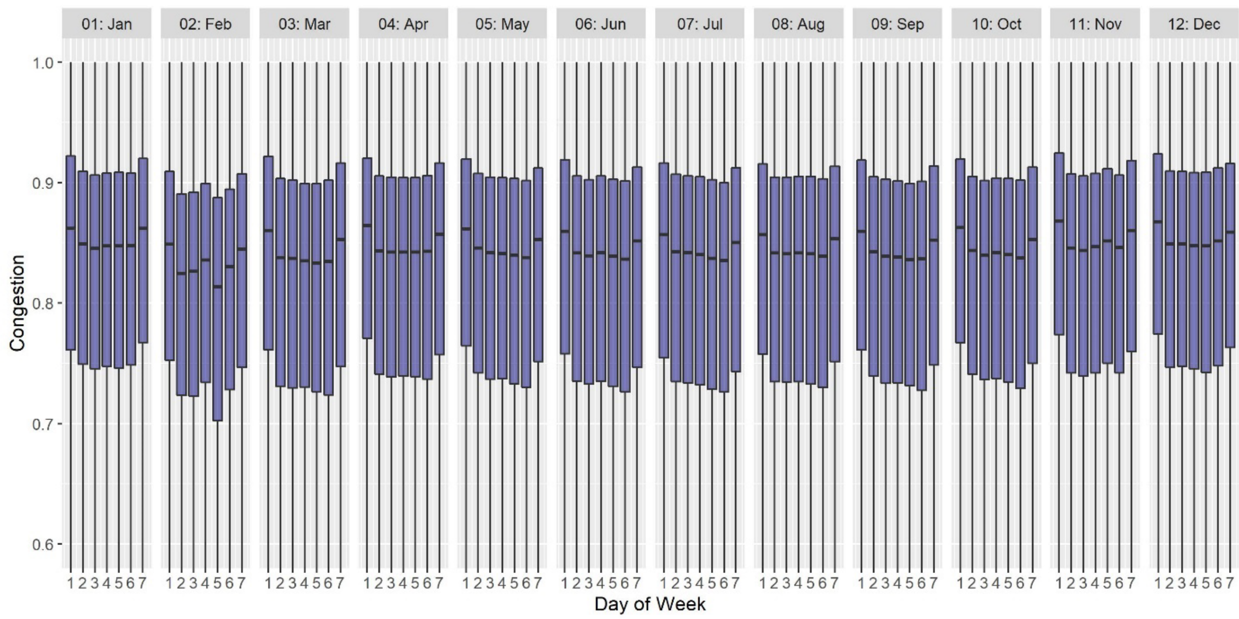
INRIX

INRIX vehicle probe data is another data source made available through the RITIS PDA Suite. This data is provided for a broader coverage area beyond the NHS roadway segments included in the NPMRDS data. However, a major limitation of this data sources is that it is only made available for all vehicles, unlike the NPMRDS data which can be disaggregated to include only trucks.

INRIX data for SJTPO roadway segments is shown in the figures below for congestion by month and day of week (Figure 2-6) and congestion by day and hour (Figure 2-7). The first figure shows that the majority of roadway segments remain between 70 percent and 90 percent of free flow speed throughout the course of the day. This is both higher than the range of congestion for trucks and shows less variability from month to month. This indicates that truck trips may be more heavily impacted by seasonal traffic congestion than all vehicles combined. While the INRIX data includes additional roadway segments beyond the NHS system covered by the NPMRDS, a direct comparison between only the NHS roadway segments showed similar findings.

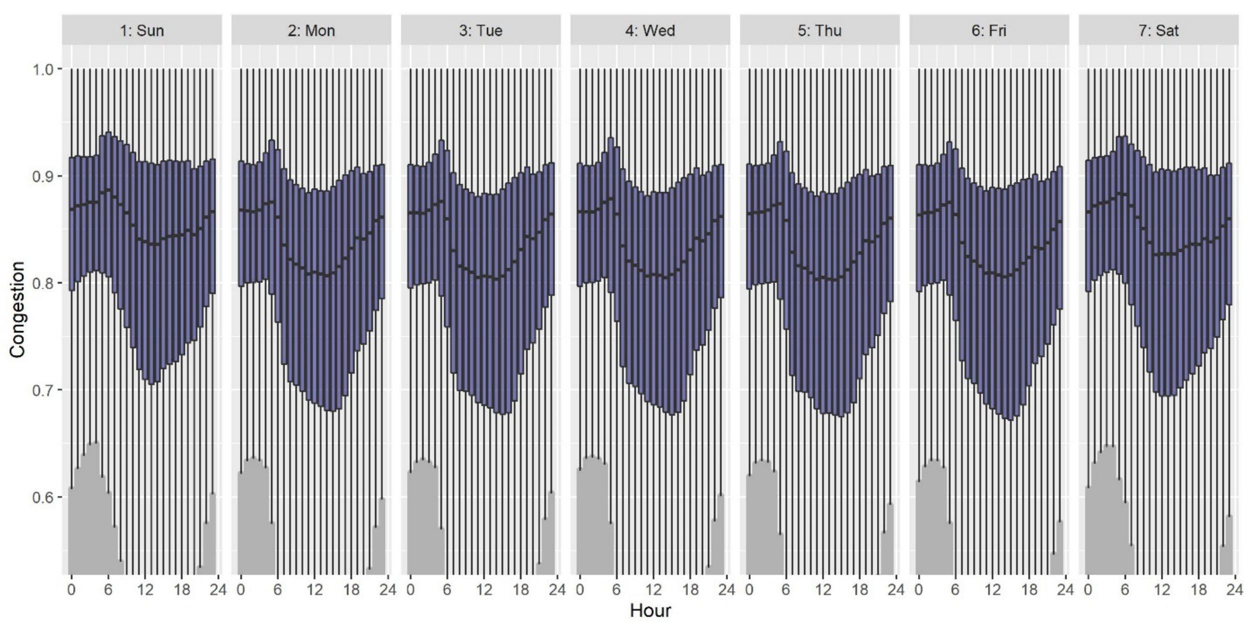
Similar results are found for the second figure showing the congestion by day and hour. Congestion levels for all vehicles are less severe throughout the course of the week than they are for truck vehicles specifically. There is also less of a difference between weekday and weekend congestion levels for all vehicles.

Figure 2-6. Congestion by Month and Day of Week (All Vehicles)



Source: INRIX Data, Jan-Dec 2021

Figure 2-7. Congestion by Day and Hour (All Vehicles)

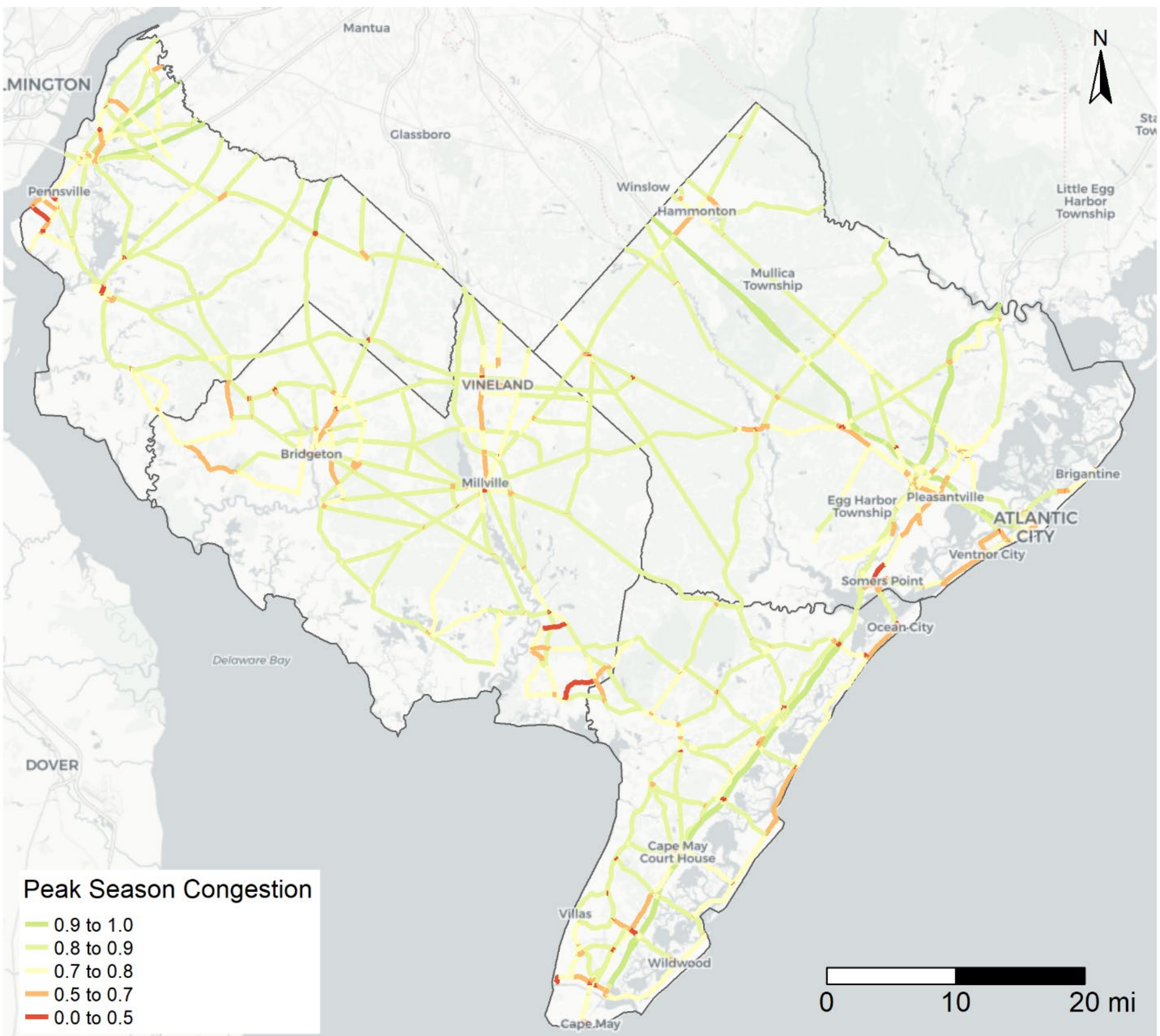


Source: INRIX Data, Jan-Dec 2021

As with the NPMRDS data, the INRIX data was summarized for the peak and off-peak seasons to highlight differences in travel patterns. Figure 2-8 shows the peak hour congestion levels for all vehicles during the peak season while Figure 2-9 shows the peak hour congestion levels for all vehicles during the off-peak season.

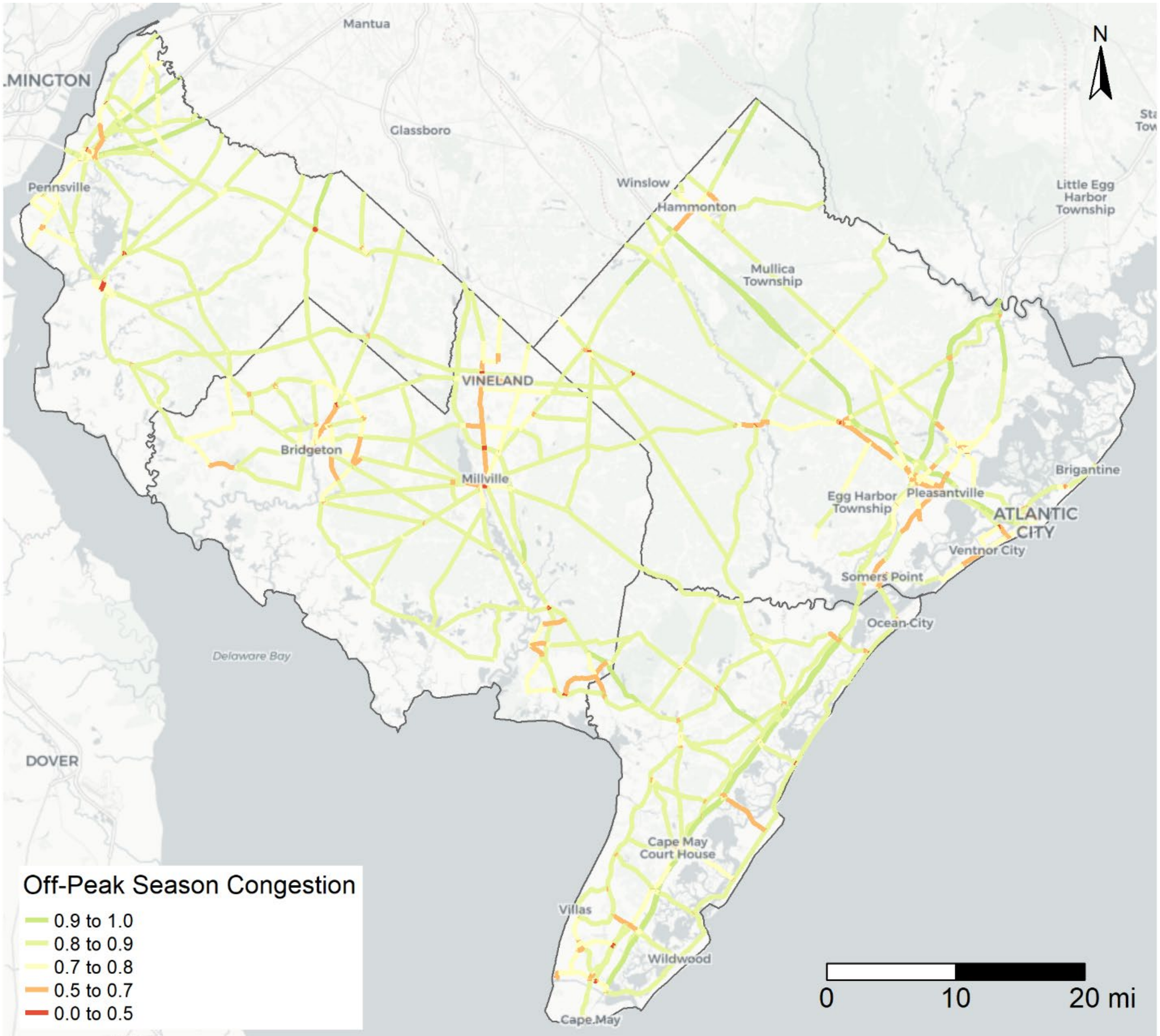
Notably, these maps show that the congestion levels for all vehicles do not vary as widely as those for trucks only. Where many segments on the NPMRDS network showed average speeds at less than half of the free flow speed, there are very few roadway segments within the INRIX data that have congestion that severe. Part of this difference between the two data sources is likely due to the differing performance of trucks compared to passenger vehicles. Trucks take longer to accelerate and decelerate along segments, and in many cases do not travel at speeds as high as passenger vehicles. Comparing matching segments between the two data sources shows that truck travel as speeds six percent slower than passenger vehicles on average.

Figure 2-8. Peak Season Peak Hour Congestion (All Vehicles, INRIX)



Source: INRIX Data, Jan-Dec 2021

Figure 2-9. Off-Peak Season Peak Hour Congestion (All Vehicles, INRIX)



Source: INRIX Data, Jan-Dec 2021

Table 2-1 summarizes the roadways in SJTPO that have a peak hour congestion level of 0.50 or less for either the peak season or the off-peak season and which are at least one quarter mile in length. Roadway segments shorter than this are likely to include highway interchange on and off ramps and other short segments that are more susceptible to variations in speed due to the proximity of signalized intersections. The roadway descriptions are based on INRIX Traffic Message Channel (TMC) roadway features made available through the NJDOT license with RITIS. Note that the Intersecting Roadway column indicates one terminal end of the segment. The Direction and Miles columns indicate the direction and distance to the other terminal end of the roadway, but this does not necessarily correlate to traffic direction.

Table 2-1. Summary of Congested Roadways

Was	Road Name	Intersecting Roadway	Dir.	Miles	County	Peak Cong.: Peak	Peak Cong. Hour	Peak Cong.: Off-	Peak Cong. Hour
103-10244	E 9TH ST	CR-619/Central Ave	SB	0.27	CAPE MAY	0.49	12	-	-
103+10245	E 9TH ST	CR-656/Bay Ave	NB	0.27	CAPE MAY	0.45	16	-	-
103-05692	E MAIN ST	RT-47/2nd St	EB	0.27	CUMBERLAND	0.43	16	0.50	15
103+11455	E MAIN ST	RT-47/2nd St	NB	0.27	CUMBERLAND	0.43	16	0.50	15
103-17256	FERRY RD	Cape May-Lewes Fry	SB	0.36	CAPE MAY	0.44	5	0.49	Multiple
103+17257	FERRY RD	US-9/Lincoln Blvd	NB	0.36	CAPE MAY	0.42	8	-	-
103-15492	FIRE RD	Garden State Pky	SB	0.27	ATLANTIC	0.49	16	0.49	16
103-11642	FORT MOTT RD	CR-632/Lighthouse Rd/Lehigh Rd	SB	0.65	SALEM	0.46	6	-	-
103+51956	HANDS MILL RD	CR-679/Mosslander Rd	NB	2.42	CUMBERLAND	0.34	7	-	-
103+10261	HAWKS BRIDGE RD	US-130/Shell Rd	NB	0.29	SALEM	-	-	0.46	3
103-51935	HIGH ST	CR-739/High St	SB	0.98	CUMBERLAND	-	-	0.48	11
103+12856	HIGHLAND AVE	Riviera Dr	WB	0.66	SALEM	0.48	6	-	-
103+51952	HUNTERS MILL RD	RT-47/Delsea Dr	EB	0.58	CUMBERLAND	0.29	6	-	-
103+51953	HUNTERS MILL RD	RT-347/New Stage Rd	EB	0.83	CUMBERLAND	0.42	6	-	-
103-12924	INDUSTRIAL RD	CR-630/Fort Mott Rd	SB	1.25	SALEM	0.35	6	-	-
103+12925	INDUSTRIAL RD	Riviera Dr	NB	1.25	SALEM	0.45	6	-	-
103-05773	NEW RD	RT-52/MacArthur Blvd/W Laurel Dr	SB	1.26	ATLANTIC	0.49	12	-	-
103+05774	NEW RD	CR-559-ALT/W Ocean Heights Ave	NB	1.26	ATLANTIC	0.50	13	-	-
103+09581	RT-47	US-9	NB	0.51	CAPE MAY	0.38	16	-	-
103-51942	STATION RD	CR-616/High St	WB	0.89	CUMBERLAND	0.13	6	0.16	6
103-52083	SWAINTON GOSHEN RD	CR-615/Goshen Rd	WB	1.64	CAPE MAY	0.43	6	-	-
103-52084	SWAINTON GOSHEN RD	CR-657/Court House South Dennis Rd	WB	1.61	CAPE MAY	0.27	5	-	-
103-51834	WALNUT ST	Grieves Pkwy	SB	0.42	SALEM	0.40	9	0.46	9
103+51835	WALNUT ST	RT-49/E Broadway	NB	0.42	SALEM	0.32	8	0.36	8
103-51846	WEST RD	CR-647/Marlboro Rd	WB	1.14	CUMBERLAND	0.46	5	-	-

Source: HDR Analysis of 2021 INRIX Data from RITIS Massive Data Downloader. (Peak Congestion ≤ 0.50, Roadway Segment > 0.25 Miles)

2.2 Travel Time Reliability Index

An alternative measure of truck mobility is the Travel Time Reliability Index (TTRI). This federal performance measure is defined as the ratio between the 95th percentile travel time (representing traffic when it is slow and congested) and the 50th percentile time (representing average traffic conditions). A higher TTRI value indicates more variability in travel time, and therefore less reliability. A TTRI of 1.0 indicates a roadway segment that never varies in travel time (very reliable) while a TTRI of 2.0 indicates a roadway segment where the travel times during the slowest conditions are twice as slow as on average (less reliable). The federal measure requires that the TTRI value be calculated for a range of days and times as follows:

- Weekday AM Peak (6 A.M. - 10 A.M.)
- Weekday Midday (10 A.M. - 4 P.M.)
- Weekday PM Peak (4 P.M. - 8 P.M.)
- Weekend All Day (6 A.M. - 8 P.M.)
- All Days Overnight (8 P.M. - 6 A.M.)

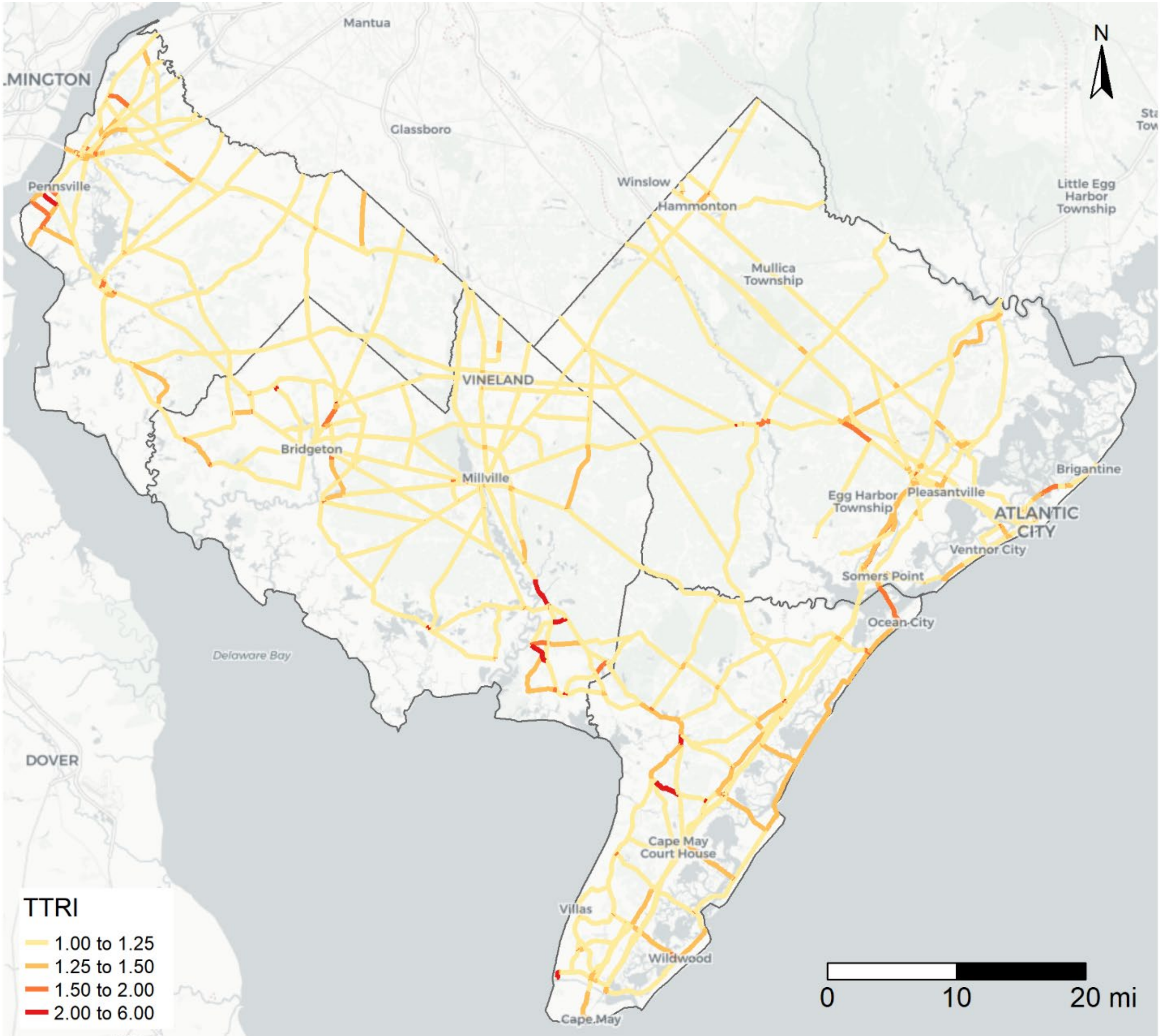
The overall road segment TTRI measure is determined by the highest TTRI calculated among this grouping of five distinct time periods. However, TTRI on individual time periods can also be used as a useful performance measure. For this analysis, the full 2021 data set was used.

Travel time reliability is an especially important performance measure for commercial truck trips, in some cases being more important than overall travel speeds. If a truck travels on a roadway segment that is not reliable, this often means the trucking company will have to choose between leaving “on-time” and risking a late delivery or leaving early and potentially wasting potentially productive time while they wait for their destination location to open for business.

The TTRI measures on SJTPO roadways are shown in Figure 2-10 below. The majority of roadway segments in SJTPO exhibit a TTRI level between 1.00 and 1.25, indicating relatively reliable travel speeds under most circumstances. Some areas that exhibit more unreliable travel speeds are roads in Pennsville Township, portions of Highway 55 south of Millville, and multiple segments along Ocean Drive southwest of Atlantic City.

Note that the information provided in the figure represents the data for all vehicles from the INRIX dataset. Comparing this data between all roadway segments and roadway segments more heavily traveled by trucks shows no substantial difference in TTRI. The weighted average TTRI for all roadway segments in SJTPO is 1.18. The weighted average TTRI for roadway segments in SJTPO with an estimated 200 or more trucks per day is 1.17.

Figure 2-10. Travel Time Reliability Index (All Vehicles, INRIX)



Source: INRIX Data, Jan-Dec 2021

2.3 Bridges

Bridges provide key links in the freight transportation system but can also pose potential impediments if they are not built to sufficient load limits, have low vertical underclearance, or have not been maintained in sufficient condition. For this analysis, the National Bridge Inventory (NBI) maintained by the FHWA was used as the primary data source. States report information on bridge characteristics and conditions to this central database.

One limitation of this data source is that railroad-over-highway bridges are not included. Importantly, it is this specific bridge configuration which is most often associated with lower vertical underclearances and other freight impediment issues. Additional data was collected from the Federal Railroad Administration's crossing inventory to identify these bridge types. This data includes the locations of grade separated rail crossings.

Information on vertical underclearance for the railroad-over-highway briges was collected through a manual assessment of Google Street View imagery. Information is not available regarding bridge condition and inventory rating.

In total, the NBI data includes 493 highway bridges within the SJTPO area. The FRA data review identified an additional six rail-over-highway bridges, primarily located in Pleasantville and Absecon.

Vertical Underclearance

Vertical underclearance is defined as the distance between the lowest point of a bridge span and the roadway or other surface underneath that span. For the purposes of this freight data collection effort, the primary interest is in vertical underclearance when a highway is running under the bridge. Using this criteria, there are 147 bridges in SJTPO with a highway-over-highway configuration and an additional six bridges with a railroad-over-highway configuration.

Currently, New Jersey uses 13'-6" as the maximum vehicle height allowable without an oversize/overweight permit. To identify bridges that potentially function as impediments to truck freight traffic this study uses the following thresholds to categorize the bridge vertical underclearance:

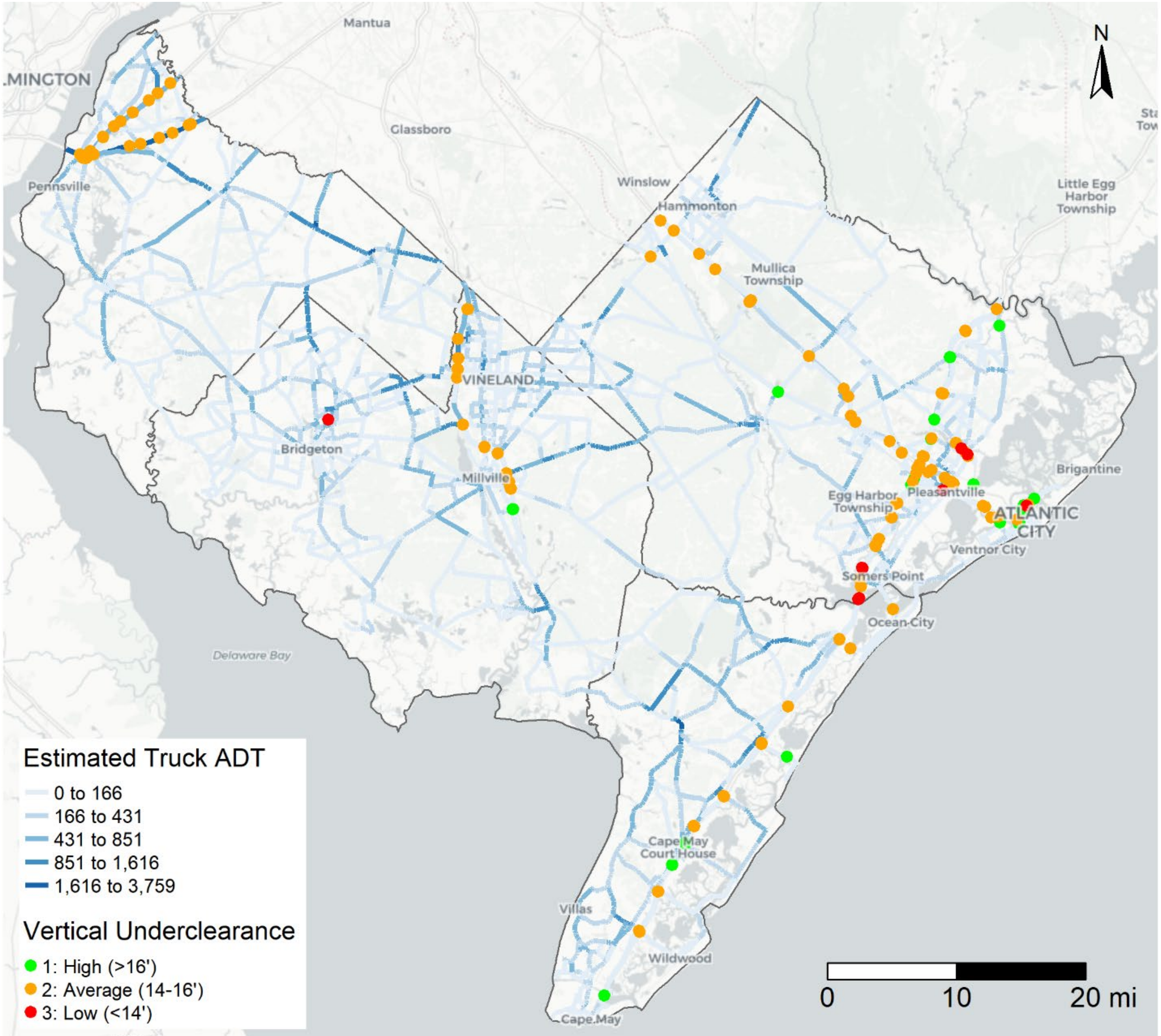
- High: > 16'-0"
- Average: 14'-0" – 16'-0"
- Low[1]: < 14'-0"

Of the 148 bridges over highways in SJTPO, 29 are categorized as high, 110 are categorized as average, and 9 are categorized as low. The locations of bridges over highways in SJTPO is shown in Figure 2-11. This figure also shows the distribution of estimated truck volumes based on the analysis completed for Tech Memo 1. Of these nine low bridges, four are railroad-over-highway configuration.

It should be emphasized that the minimum vertical underclearances for highway over highway bridges described in this data should not be expected to correspond directly with posted bridge clearance signs. Posted clearance signs will typically be between three and six inches lower than the minimum vertical underclearance to provide a minimum clearance space between vehicles and the bridge structure.

[1] Note that per the NJDOT Design Manual for Bridges and Structures, the minimum vertical underclearance for bridges are defined as 16'-0" for interstates, freeways, expressways, and arterials and 14'-6" for local and collector roads.

Figure 2-11. Bridge Vertical Underclearance



Source: 2021 National Bridge Inventory, FRA

Table 2-2 provides a summary of these nine low bridges. The table includes the NBI bridge identification number in the case of highway bridges and the FRA crossing inventory number in the case of grade separated rail crossings. The table also includes a description of the bridge, the vertical underclearance, and a high-level summary of the potential impacts to truck freight movements due to the placement of this bridge on the freight highway network.

Table 2-2. Summary of Bridges with Low Vertical Underclearance

Bridge ID / FRA ID	Description	Vertical Under-clearance	Impacts to Truck Freight
360280N	Garden State Parkway NB over Harbor Road	9’-10”	Minimal: Harbor Road serves only residential areas to the east of the Parkway.
370280S	Garden State Parkway SB over Harbor Road	12’-10”	Minimal: Harbor Road serves only residential areas to the east of the Parkway.
360300N	West Laurel Drive off-ramp over Garden State Parkway NB	13’-11”	Some potential impact: Some truck traffic on the Garden State Parkway may be required to detour to alternate routes. However, the clearance is only 1” shorter than the ideal minimum clearance.
360300S	West Laurel Drive off-ramp over Garden State Parkway SB	13’-11”	Some potential impact: Some truck traffic on the Garden State Parkway may be required to detour to alternate routes. However, the clearance is only 1” shorter than the ideal minimum clearance.
586137N (FRA)	Railroad over Black Horse Pike (US 40/US322)	13’-10” (Posted)	Some potential impact: Through and local truck trips make be impacted by this bridge, but alternate routes are readily available. The posted clearance also exceeds the maximum standard truck height.
586109K (FRA)	Railroad over South New Road	13’-10” (Posted)	Potential impact: South Mill Road to the west is currently used more heavily by north-south truck travel, but South New Road might provide a more direct route for some trips. The posted clearance also exceeds the maximum standard truck height.
586110E (FRA)	Railroad over Station Avenue	12’-6” (Posted)	Minimal: This route does not provide through access for north-south trips and alternate routes are available to the east and west. The posted clearance is equal to the maximum standard truck height.
Unknown (FRA)	Railroad over Shore Road	13’-11” (Posted)	Potential impact: South Mill Road to the west is currently used more heavily by north-south truck travel, but Shore Road might provide a more direct route for some trips. The posted clearance also exceeds the maximum standard truck height.
4200004	Borgata Casino Parking Ramp Access Crossover	10’-4”	Minimal: Route used for passenger vehicle access to casino parking ramp.
172187W (FRA)	Railroad over NJ 77	13’-7” (Posted)	Potential impact: NJ 77 is heavily used by trucks. However, the posted clearance exceeds the maximum standard truck height.

Note that the FRA vertical underclearance values in this table are based on the posted height restriction while the vertical underclearance for non-railroad bridges is based on the actual height from the NBI.

Inventory Rating

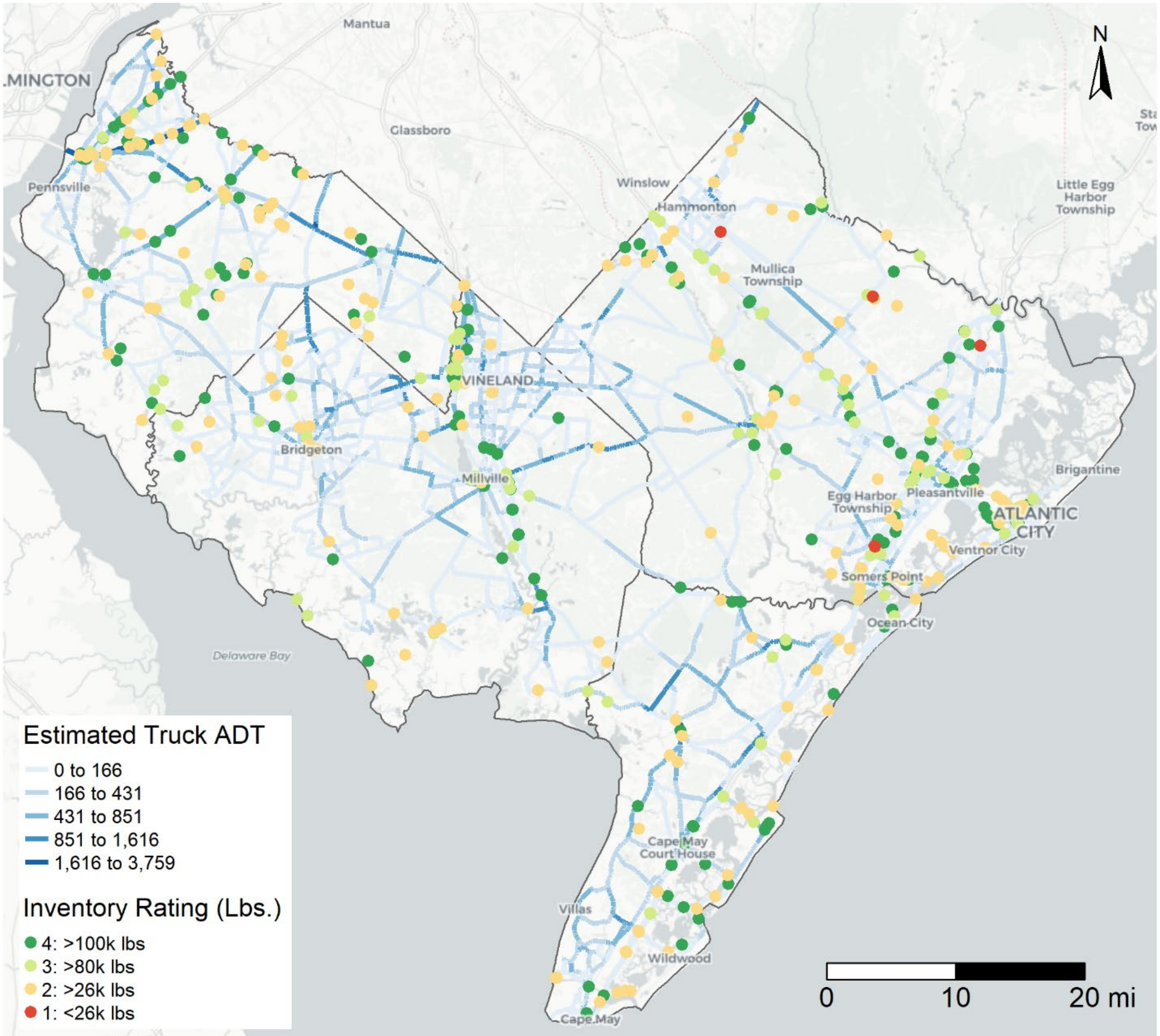
The measure of Inventory Rating used in the NBI dataset refers to the maximum vehicle load that can safely utilize a bridge structure for an indefinite period of time. This rating is distinct from—and less than—the operating rating, which refers to the absolute maximum vehicle weight that can safely utilize the bridge structure. For this study, the inventory ratings for bridges in SJTPO were divided into the following categories:

- **>100k lbs. (176 in SJTPO):** These bridges are built to an exceptionally high inventory rating and are able to handle all standard truck vehicles[2] as well as many overweight vehicle loads requiring a permit.
- **>80k lbs. (114 in SJTPO):** These bridges are able to handle all standard truck vehicles and have the potential to handle some overweight vehicle loads.
- **>26k lbs. (197 in SJTPO):** These bridges can handle all Class 6 medium duty trucks and some Class 7 and 8 heavy duty trucks. These bridges may impact the routes taken by heavy duty trucks in some instances.
- **<26k lbs. (6 in SJTPO):** These bridges pose a potential impediment to nearly all truck freight vehicles and should be evaluated further to identify these potential impacts.

Figure 2-12 shows the distribution of bridges in SJTPO based on these categories of inventory load rating. The five bridges with an inventory rating below 26,000 lbs. are predominantly located in Atlantic County. Further review and details of these bridges are summarized in Table 2-3.

[2] The maximum gross vehicle weight limit in New Jersey 80,000 lbs.

Figure 2-12. Bridge Inventory Rating



Source: 2021 National Bridge Inventory

Table 2-3. Summary of Bridges with Low Inventory Rating (<26k lbs.)

Bridge ID	Description	Inventory Rating (lbs.)	Impacts to Truck Freight
0162150	Weymouth Road (CR 640) over Atlantic City Line	24,000	Potential impact: Improved weight limits on this bridge would provide a more direct route for truck freight movements between Hammonton and points to the south. Further study would be required to compare the benefits and costs of this improvement.
01EHC39	Indian Cabin Road 0.4 miles east of CR 563	22,000	Minimal: This road does not directly connect to any major freight generators or roadways with high truck volumes.
01PR007	Old New York Road 0.28 miles south of Main Street	18,000	Minimal: This road does not appear to offer a useful alternative to existing truck movements.
360316N	Garden State Parkway NB over Ocean Heights Avenue	20,000	Some potential impact: While the Garden State Parkway is not heavily used by truck freight, improving the load capacity of this bridge could provide additional options for some freight haulers.
360316S	Garden State Parkway SB over Ocean Heights Avenue	21,000	Some potential impact: While the Garden State Parkway is not heavily used by truck freight, improving the load capacity of this bridge could provide additional options for some freight haulers.

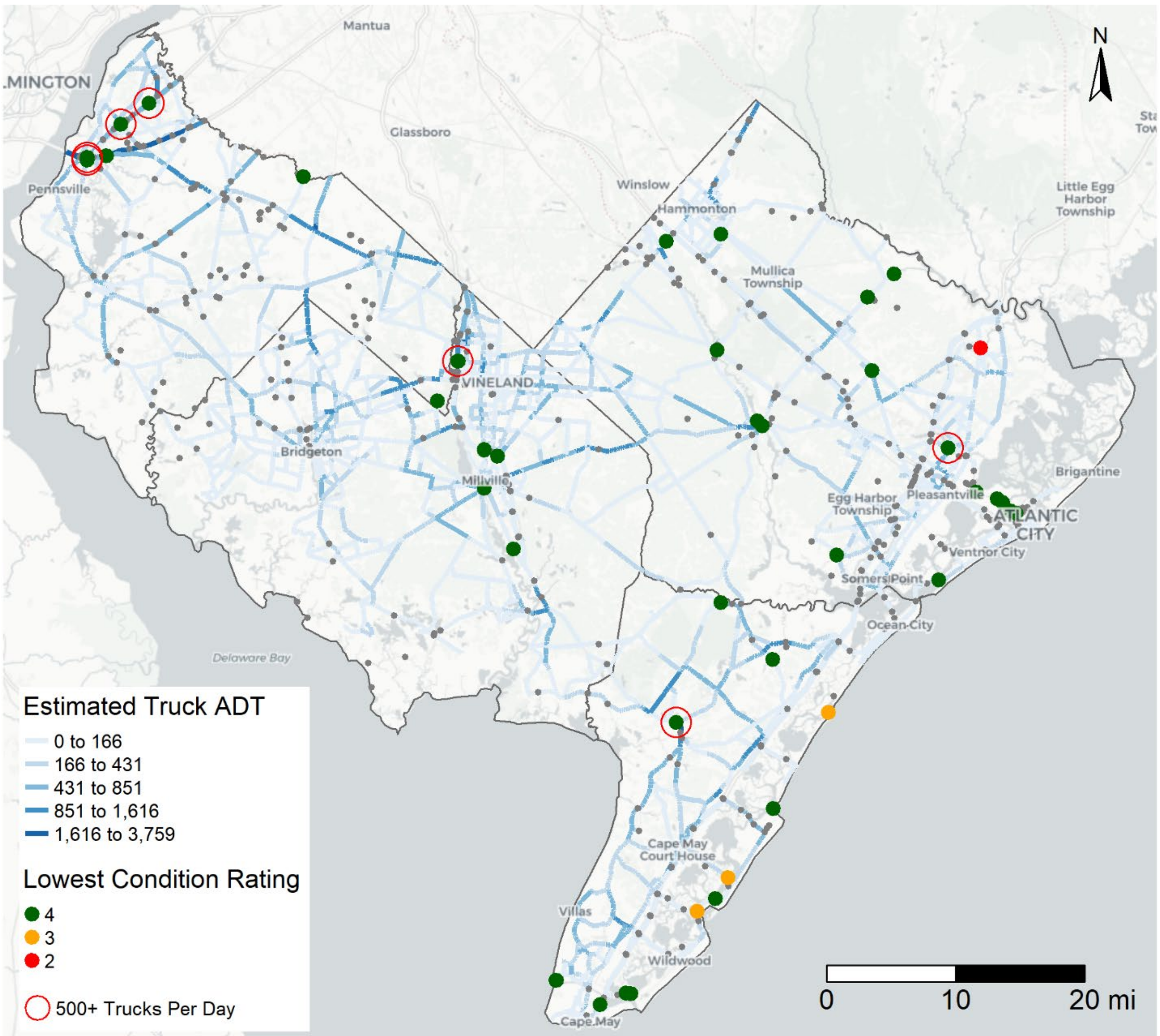
Bridge Condition

The NBI records conditions for three components of each bridge, the bridge deck, the superstructure, and the substructure. Each component is ranked on a scale of 0 through 9 based on the condition of the bridge at the time of inspection. The guidelines for this rating system are as follows:

- **9: Excellent Condition**
- **8: Very Good Condition** – No problems noted.
- **7: Good Condition** – Some minor problems.
- **6: Satisfactory Condition** – Structural elements show some minor deterioration.
- **5: Fair Condition** – All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
- **4: Poor condition** – Advanced section loss, deterioration, spalling or scour.
- **3: Serious Condition** – Deterioration has seriously affected primary structural components. Local failures possible.
- **2: Critical Condition** – Advance deterioration of primary structural elements. May be necessary to close bridge.
- **1: Imminent Failure Condition** – Major deterioration or section loss present in critical structural components. Bridge closed to traffic.
- **0: Failed Condition** – Bridge is out of service

For this evaluation, each bridge was evaluated based on the lowest condition score within each of the three bridge components. Of the 493 highway bridges in SJTPO, 91 percent have a condition rating of 5 or higher. No bridges are rated at 0 or 1. Only one bridge has a condition rating of 2, and three bridges have a condition rating of 3. Another 40 bridges have a rating of 4. The distribution of bridges in SJTPO based on the lowest condition rating is shown in Figure 2-13. Bridges with a condition score of 5 or higher are shown as gray dots. Bridges on or over roadway segments with estimated daily truck volumes of 500 or more are circled in red. These bridges represent locations that could have potentially substantial impacts to truck freight movements if they were to deteriorate to a point that trucks could no longer traverse them. Additional details for these bridges are provided in Table 2-4.

Figure 2-13. Bridge Condition Rating



Source: 2021 National Bridge Inventory

Table 2-4. Summary of Bridges with Low Condition Rating and High Truck Volume

Bridge ID	Description	Deck Condition Rating	Superstructure Condition Rating	Substructure Condition Rating
1711156	I-295 SB Ramp to CR 551	6	6	4
1711150	I-295 NB Ramp over Salem Canal	4	7	6
1712153	NJ 48 over I-295	4	7	6
1712157	Perkintown Road over I-295	4	6	6
0610163	NJ 55 over West Oak Road (CR 681)	4	7	5
01A0004	Mill Road (CR 651) 0.52 Miles south of US 30	5	4	5
0508151	NJ 47 0.93 Miles north of NJ 83	4	4	6

Source: 2021 National Bridge Inventory

Note that for the Perkintown Road bridge (Bridge 1712157), the high truck volumes are almost entirely from I-295 rather than Perkintown Road itself and Perkintown Road is not an interchange location. Therefore, a closure of this bridge would not have as much impact as the other bridges on this list, which have high truck volumes on the road carried by the bridge.

2.4 Highway-Rail Grade Crossings

Similar to bridges, highway-rail grade crossings are key components of the freight transportation system that can sometimes pose impediments to truck freight movement. This review of highway-rail grade crossings in the SJTPO area is based on data collected from the FRA's Grade Crossing Inventory System (GCIS), commonly known as the crossing inventory. Data in this inventory is compiled through a combination of state DOT, railroad, and FRA input. The inventory includes up-to-date information on roadway and crossing characteristics such signal systems, signage, lane configuration, train volumes, and other relevant information

SJTPO has a total of 329 highway-rail grade crossings. Of these 258 are under public jurisdiction with the remaining 71 being privately owned crossings typically providing access to private residences or businesses. A total of seven grade crossings are classified as pathway grade crossings which include pedestrian or bicycle pathways distinct from other vehicular crossings. Sidewalks and pathways adjacent to typical roadway grade crossings are not considered to be pathway grade crossings. For the purposes of this study, the primary interest is in evaluating public highway crossings which have the greatest potential impact on truck freight movements.

Table 2-5. Summary of SJTPO Highway-Rail Grade Crossings

Crossing Type	Highway	Pathway	Total
Public	251	7	**258**
Private	71	0	**71**
Total	**322**	**7**	**329**

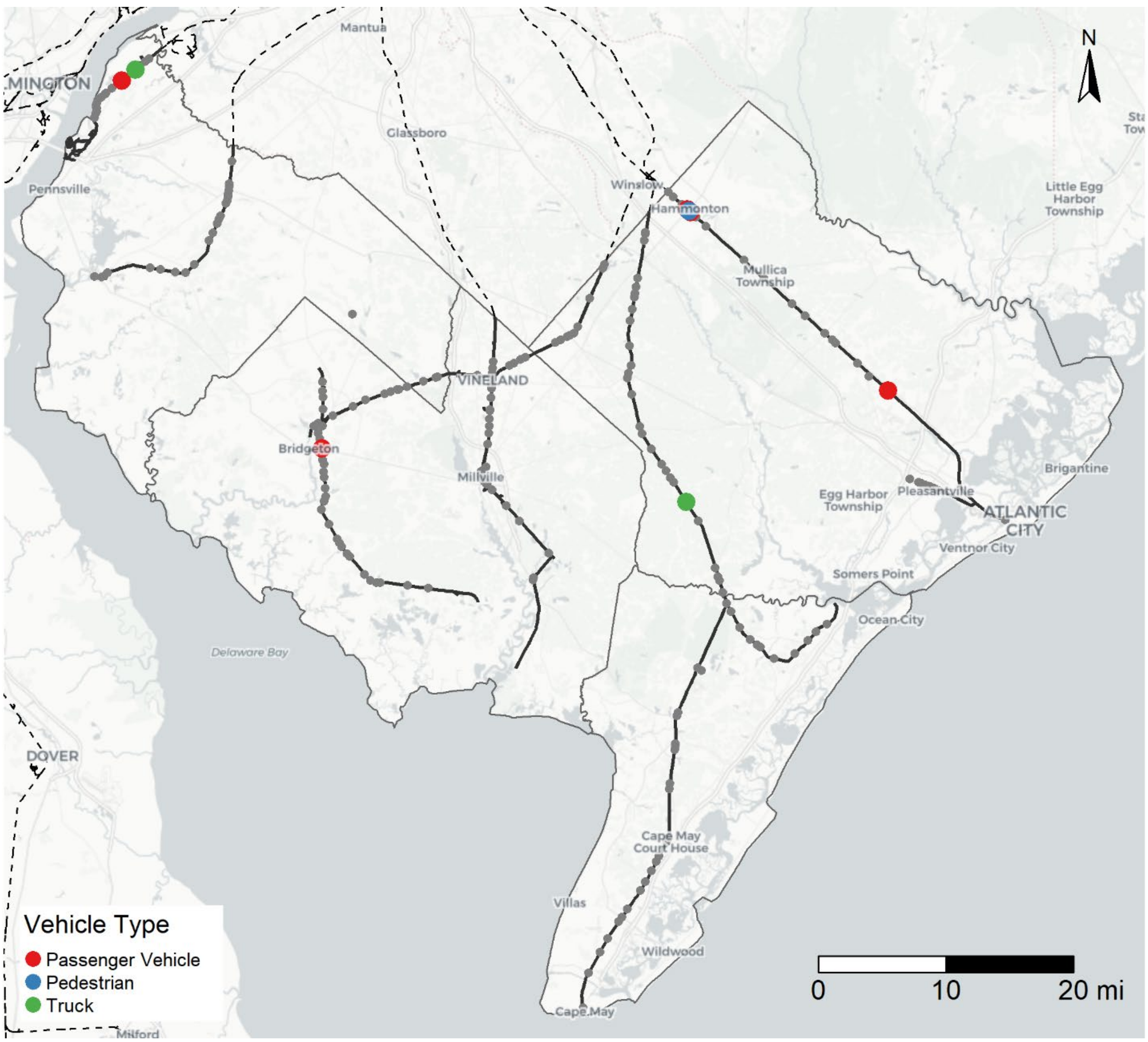
Highway-Rail Grade Crossing Crashes

This study reviewed the past 10 years of highway-rail crash data. Data was collected from the FRA's Accident/Incident Report database and includes data for all crossings in SJTPO for years 2012 through 2021. Over this time period, nine highway-rail grade crossing crashes have been recorded in SJTPO. The locations of these crashes are shown in Figure 2-14.

Of these crashes, three resulted in fatal outcomes. All three fatal crashes occurred in Hammonton and include two instances of vehicles driving around crossing gates and one instance of a train striking a trespassing pedestrian.

Two of the nine crashes involved trucks. These crashes occurred at the Cumberland Avenue crossing near the intersection with Tuckahoe Road and at the Pennsgrove Pedricktown Road crossing in Oldmans. Both incidents involved a truck proceeding across the tracks without stopping for the oncoming train.

Figure 2-14. Highway-Rail Grade Crossing Crashes



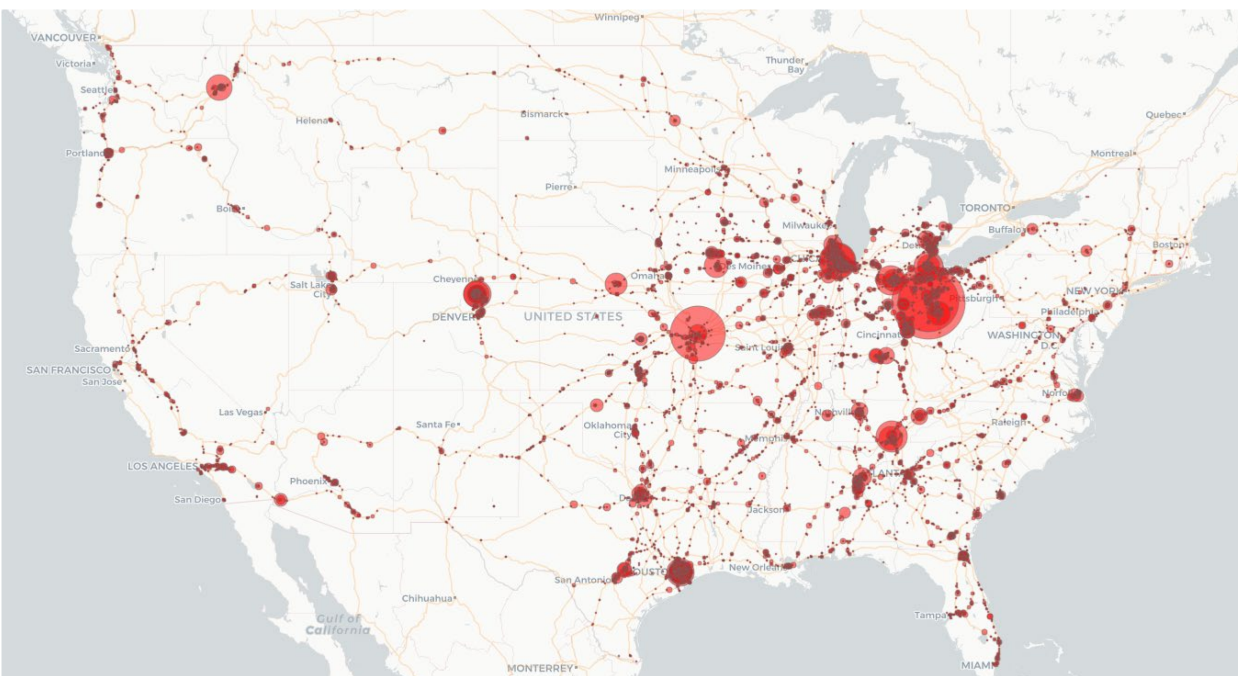
Source: FRA Grade Crossing Inventory System

Blocked Highway-Rail Grade Crossing Delays

Complaints and issues with delays due to blocked grade crossings have increased substantially in recent years across the country. The FRA defines a blocked crossing as a situation where "stopped trains impede the flow of motor vehicle or pedestrian traffic at railroad tracks for extended periods of time."[3] This trend has been exacerbated by increasing train volumes and the use of longer trains in many parts of the country. The FRA recently established a blocked crossing portal which allows for law enforcement and members of the public to record complaints about blocked crossings. The online form records information detailing the reason for the blocked crossing, the time and duration of the blockage, and the effect of the blockage on emergency responders or pedestrians. The locations of these complaints in the continental US are shown in Figure 2-15. To date, no complaints of blocked crossings have been recorded in SJTPO.

Upon further review of the data, it is not surprising to find relatively little impact of blocked crossings. The average number of total daily trains at public crossings in SJTPO is only 7, with the highest volumes occurring along the Atlantic City Line in Atlantic County. Further analysis shows that there are only 14 grade crossings that have at least five trains per day and also have at least 100 estimated truck trips per day (Figure 2-16). These are located almost exclusively along the Atlantic City Line with additional crossings at Chestnut Avenue and Burns Avenue in Vineland.

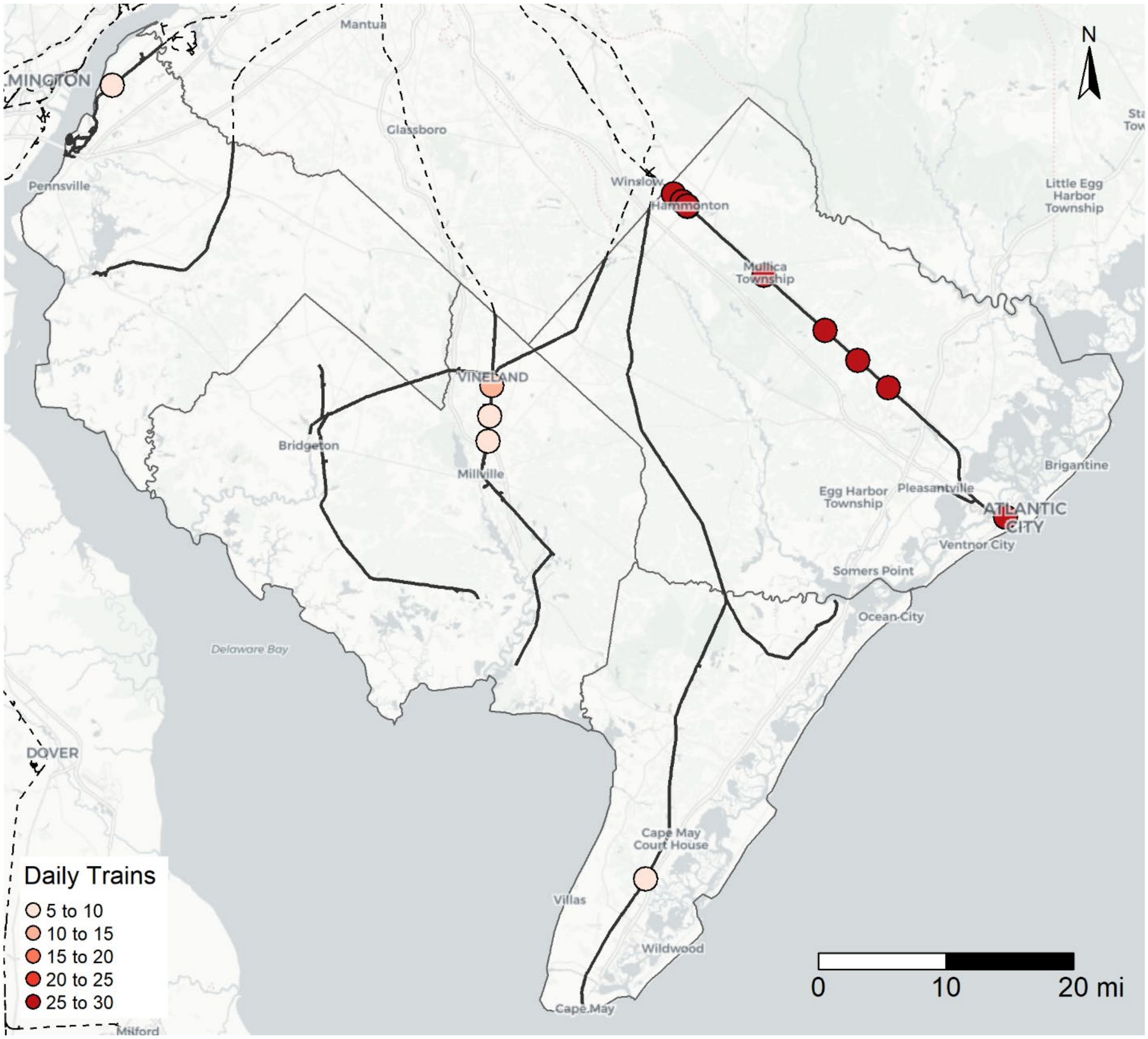
Figure 2-15. FRA Blocked Crossing Reports



Source: FRA Blocked Crossing Portal (https://www.fra.dot.gov/blockedcrossings/)

[3] https://railroads.dot.gov/newsroom/press-releases/federal-railroad-administration-launches-web-portal-public-report-blocked-0

Figure 2-16. Highway-Rail Grade Crossings with 5+ Daily Trains and 100+ Trucks Per Day



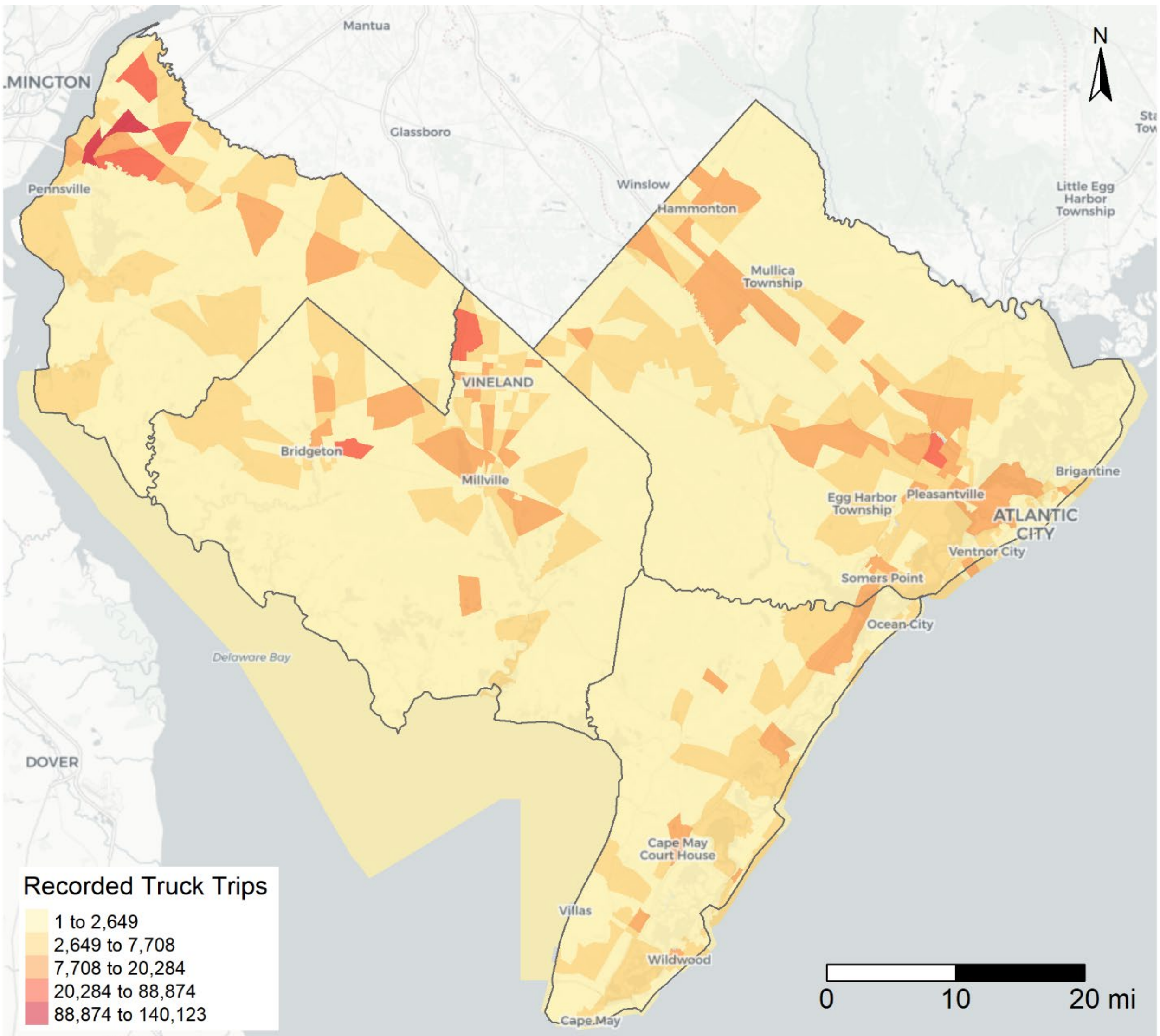
Source: FRA Grade Crossing Inventory

2.5 Origin-Destination Information

Data for truck trip origins and destinations was made available through the RITIS Trip Analytics platform. Data was available for April 2019, April 2020, and April through September 2021 and included truck probe sample data for medium duty trucks (14,000 – 26,000 lbs.) and heavy duty trucks (26,000+ lbs.). In total, this dataset includes records for nearly three million distinct truck trips either starting or ending a trip within a Traffic Analysis Zone (TAZ) in the SJTPO region. Note that the RITIS Trip Analytics Platform utilizes the 2010 Census TAZ delineations. These TAZ areas do not necessarily correlate with other local or regional delineation of TAZ areas.

The SJTPO TAZ with the highest level of recorded activity is located near the Hawks bridge road interchange in the northwestern portion of Salem County. This single TAZ accounts for nearly five percent of all truck trips into or out of SJTPO. The explanation for this high activity is the presence of multiple truck parking facilities near the interchange including both a Pilot and a Flying J. The location of these facilities just east of the Delaware Memorial Bridge make them an ideal stopping point for trucks just entering New Jersey or just about the depart for Delaware. Other hotspots of truck probe activity include the Vineland Industrial Park, areas of Bridgeton and Millville, and multiple areas in and around Atlantic City and Pleasantville.

Figure 2-17. RITIS Truck Probe Trips by TAZ Origin/Destination



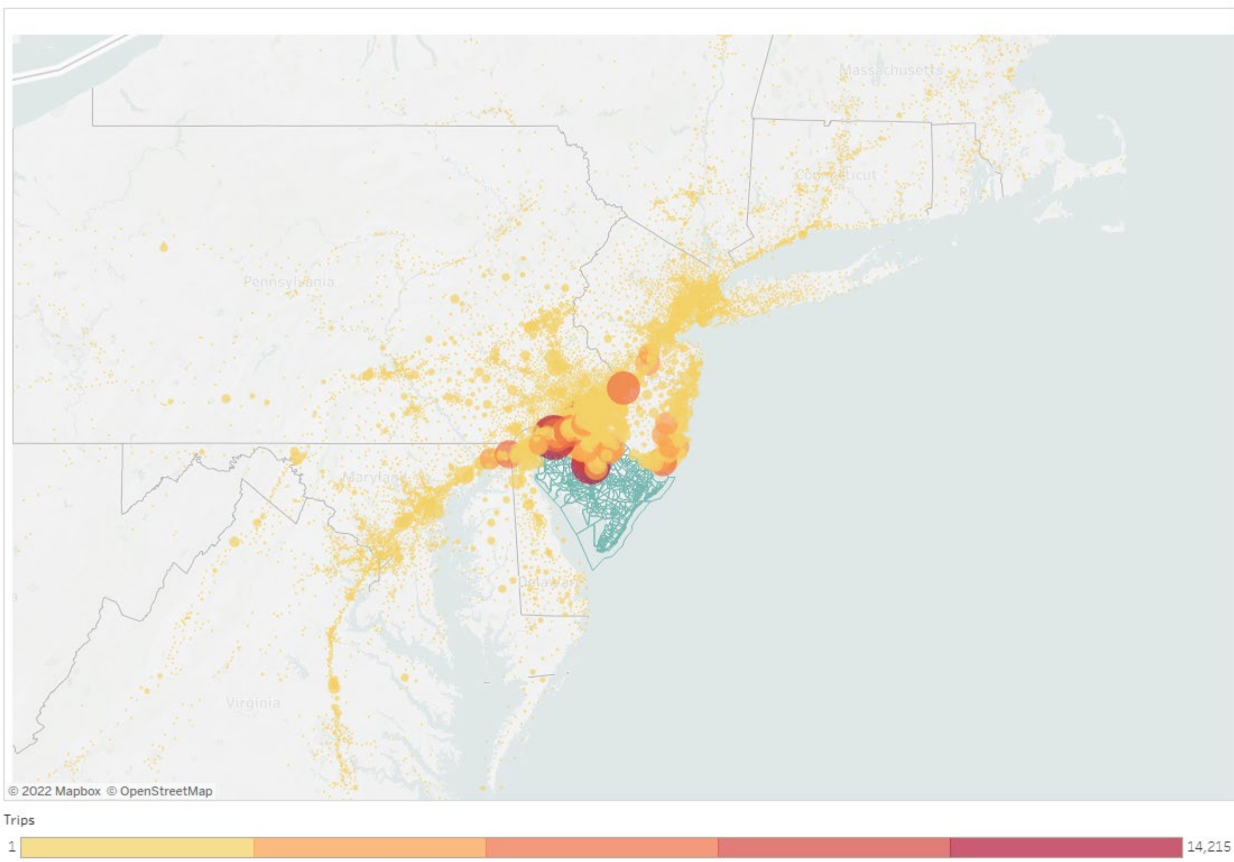
Source: RITIS Trip Analytics Origin-Destination Data

Origin-Destination Interactive Tool

The origin-destination data collected from the RITIS Trip Analytics platform was used to develop an interactive online tool to facilitate the summary of truck travel patterns in the broader region. Figure 2-18 displays results showing the magnitude of truck trips connecting to TAZs outside of the SJTPO. Each connecting TAZ is represented by a single point and is color- and size-coded to correspond to the number of trips connecting to it. The figure shows two major connecting TAZs just outside of the SJTPO boundary which appear to correspond to the locations of truck parking facilities discussed later in this document. Beyond these key destinations, the figure highlights the importance of the I-295 and New Jersey Turnpike as key corridors for freight entering and leaving SJTPO. The figure also highlights key connecting regions including Philadelphia, New York City, and multiple destination along the shore.

A more detailed description of the use of this interactive tool will be provided in the study Final Report.

Figure 2-18. Origins and Destinations for Trips Starting or Ending in SJTPO



Source: RITIS Trip Analytics Origin-Destination Data

2.6 Truck Crash Rates

Crash data for the SJTPO region was collected from the NJDOT Safety Voyager platform. The following criteria were used in the collection of the data for this study:

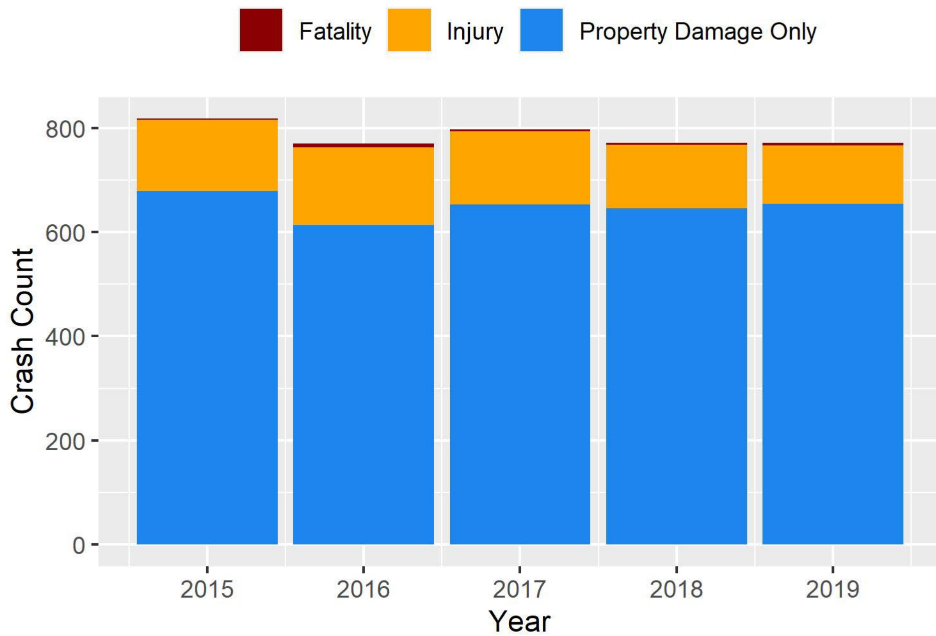
- Included only crashes that included the following commercial and truck vehicle types:
  - Single Unit (2-axle)
  - Single Unit (3-axle+)
  - Single Unit Truck w/ Trailer
  - Other Truck
  - Light Truck w/ Trailer
  - Truck Tractor (Bobtail)
  - Tractor Semi-Trailer
  - Tractor Double
  - Tractor Triple
- Included years 2015 through 2019, inclusive

In total, 3,927 crashes matched these criteria. The data provided through Safety Voyager also included attributes for latitude and longitude for the majority of crashes. However, 437 crash records (11.1 percent) did not include this information, making it impossible to pinpoint the exact location of the incident. These missing records were distributed across all four counties in the SJTPO area with 234 missing lat/long records for Atlantic County, 19 missing records for Cape May County, 168 missing records for Cumberland Count, and 16 missing records for Salem County. Upon review of the data, it appears that the cause of this discrepancy is likely inconsistent reporting of crashes between law enforcement jurisdictions. There are many areas, particularly around Salem and Cape May, where no crash records exist due to this lack of information. For the purposes of this study, crash summaries will include all of the crashes, but crash maps and segment-level crash rates will show only those with lat/long information.

Crash Type Summary

The following tables summarize key aspects of the crash data to identify common themes or issues. Figure 2-19 shows the annual count of truck-related crashes in SJTPO by severity. The total number of crashes has held relatively stable at approximately 800 per year with a high of 818 in 2015 and a tie for lowest of 771 in 2018 and 2019. Fatal crashes make up only 0.5 percent of all truck-related crashes while Injury crashes make up 16.8 percent. The remaining 82.6 percent of truck-related crashes are Property Damage Only.

Figure 2-19. Annual Truck Crashes by Severity



Source: NJDOT Safety Voyager

Table 2-6 summarizes the top ten municipalities based on the total number of truck-related crashes. At the top of the list is Vineland City with 674 crashes following by Atlantic City at 482 crashes and Egg Harbor Township at 401 crashes. Combined, these three municipalities account for 40 percent of all SJTPO truck crashes. Vineland City also has the highest number fatal and injury truck crashes with a total of 4 and 119 over this time period, respectively.

Table 2-6. Top 10 Municipalities for Truck Crashes

Rank	Municipality	Fatal	Injury	PDO	Total
1	VINELAND CITY	4	119	551	674
2	ATLANTIC CITY	0	63	419	482
3	EGG HARBOR TWP	1	74	326	401
4	HAMILTON TWP	2	49	208	259
5	MILLVILLE CITY	1	37	216	254
6	GALLOWAY TWP	2	27	163	192
7	HAMMONTON TOWN	2	41	143	186
8	UPPER DEERFIELD TWP	1	24	108	133
9	PLEASANTVILLE CITY	1	15	102	118
10	OCEAN CITY	0	4	106	110

Source: NJDOT Safety Voyager

Crash Heat Map

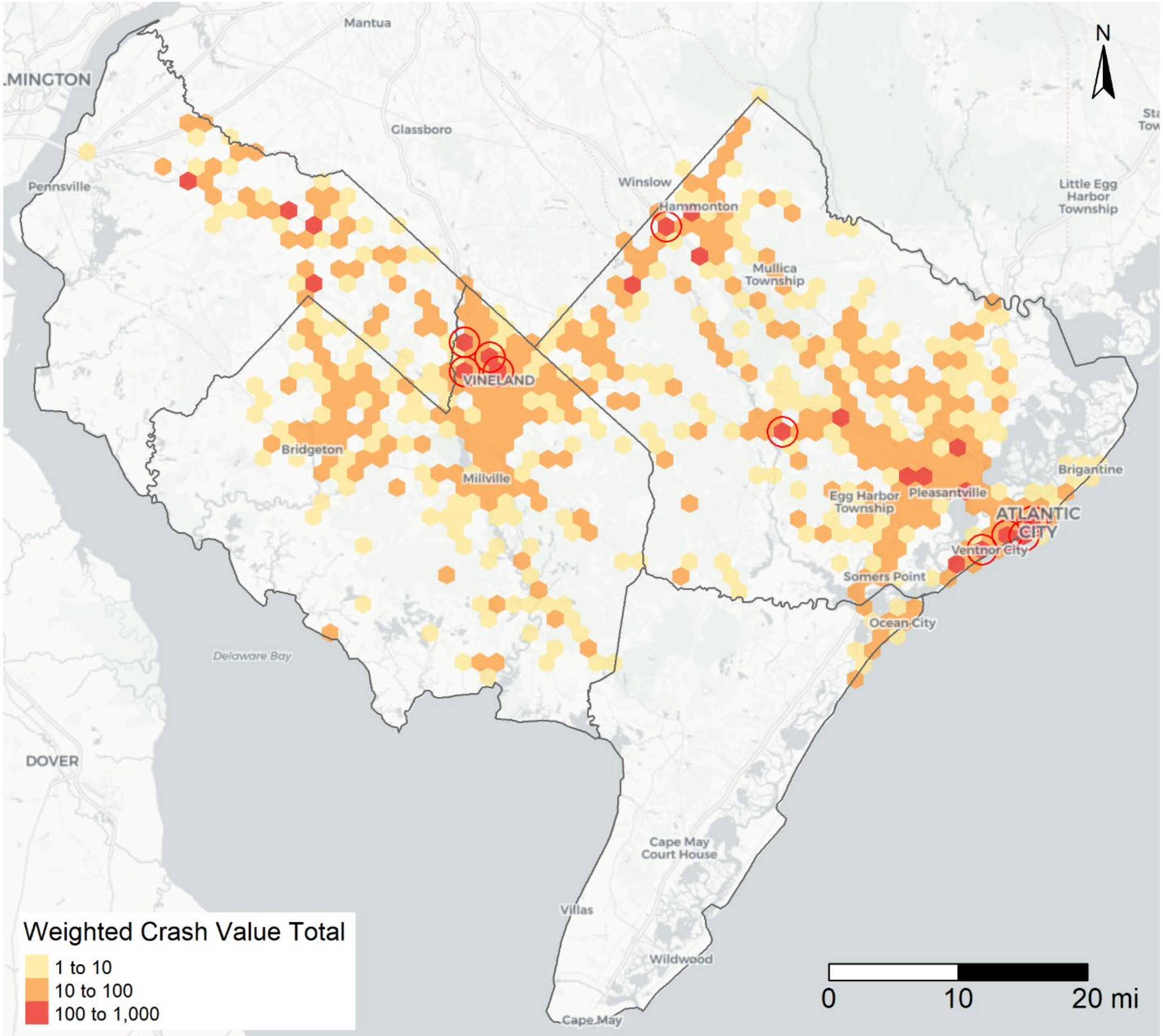
A crash heat map was developed to identify specific locations with higher relative crash rates compared to other areas within the region. The following process was used to develop the heat map:

1. Calculate adjusted crash weights using the methodology summarized in the New Jersey Highway Safety Improvement Manual[4]. This analysis used updated weighting values based on 2022 crash costs provided by the NJDOT Bureau of Safety, Bicycle, and Pedestrian Programs. The following weighting factors were used. The bracketed text indicates the matching terminology used in the NJDOT crash data:
    a. Fatal [Fatal Injury] = 57.7133
    b. Disabling Injury [Suspected Serious Injury] = 57.7133
    c. Evident Injury [Suspected Minor Injury] = 17.4169
    d. Possible Injury [Possible Injury] = 10.9735
    e. PDO [No Apparent Injury] = 1.0
2. Create a ½-mile hexagonal grid covering the SJTPO area
3. Calculate the total adjusted crash weights within each hexagon

The results of this heat map approach are shown in Figure 2-20. The locations of the top 10 hexagons based on this weighted crash rate value are circled in red. These locations are concentrated in Vineland, Atlantic City, Hammonton, and Egg Harbor Township.

[4] New Jersey HSIP: https://www.state.nj.us/transportation/about/safety/pdf/2016hsipmanual.pdf

Figure 2-20. Crash Heat Map



2.7 Truck Parking

Truck parking facilities are a critical feature of the truck freight network. Truck drivers are required to abide by the hours of service regulations maintained by the Federal Motor Carrier Safety Administration (FMCSA). In general, drivers are not allowed to drive more than 8 hours without taking at least a 30-minute rest and are allowed no more than 11 hours of total driving time following a 10-hour rest. Additional details can be found at the FMCSA website.[5]

To help satisfy these rest requirements, truck parking facilities are provided by both the public and private sectors in the form of rest areas (public) and truck stops (private).

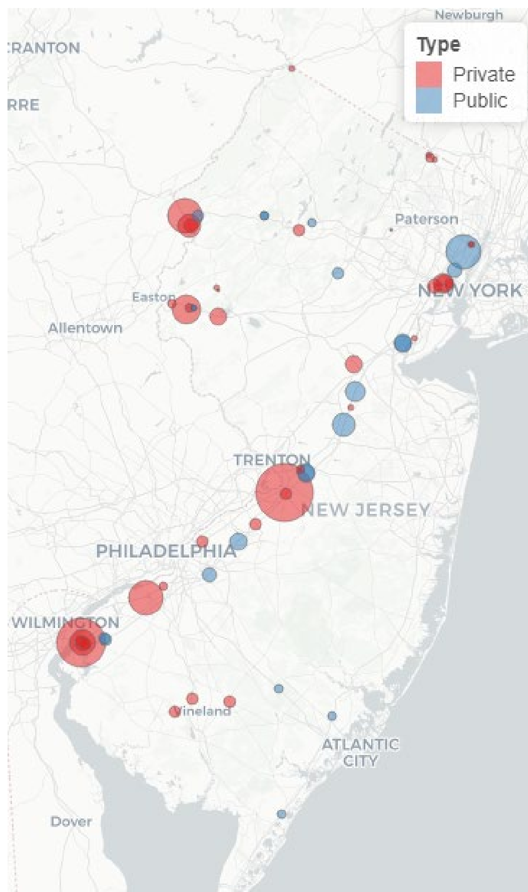
[5] FMCSA HOS Summary: https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations

Many of the public truck parking facilities in New Jersey—specifically those located on the New Jersey Turnpike, the Garden State Parkway, and the Atlantic City Expressway—represent a relatively unique case in which the public facilities include private accommodations such as fuel stations, restaurants, and other accommodations.

Information for public truck parking facilities was collected from the FHWA's 2019 Jason's Law Survey.[6] This national truck parking survey collects information from all 50 states to develop a comprehensive data source for truck parking facilities nationwide. However, the most recent iteration of this survey has not provided location-specific information for private truck parking facilities as of the date of this writing. Information for private truck parking facilities was gathered from DC Book Company, which maintains an online repository of truck stop locations, parking space counts, and other amenities for truck stops across the country.[7]

In total, the State of New Jersey has an estimated 2,797 truck parking spaces at 118 distinct locations. These facilities are largely concentrated along the New Jersey Turnpike (Figure 2-21). Of these, 735 (26 percent) are provided at public truck parking facilities. Nationally, approximately 12 percent of all truck parking spaces are provided at public facilities.

Figure 2-21. New Jersey Truck Parking Facilities



Source: Jason's Law Survey and truckstopsandservices.com

Within the SJTPO area there are a total of 627 truck parking spaces at 13 distinct locations (Figure 2-22). The majority of these spaces are located at private truck parking facilities near the interchange between the New Jersey Turnpike and I-295. This includes a Flying J Travel Center with an estimated 350 truck parking spaces, the second largest facility in the state. Combined with the other facilities at this location, there are a total of 515 truck parking spaces in this area. As a major entry and exit point for the state, this area is a natural location for trucks to rest to meet their hours of service requirements and as a location at which to stage prior to making deliveries at the final delivery location.

This study does not include an assessment of truck parking demand. However, per recent changes under BIL/IIJA, all

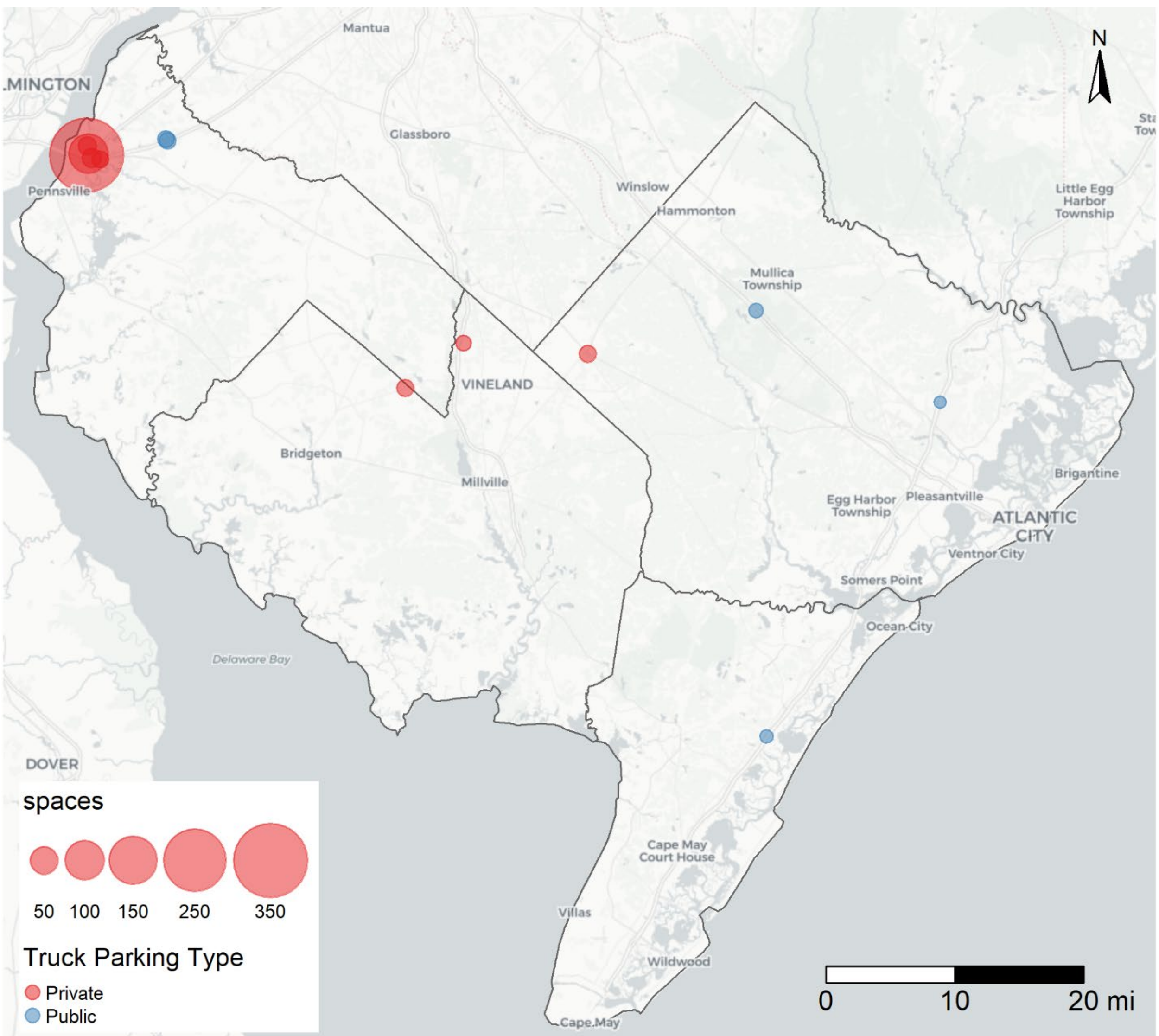
[6] FHWA Jason's Law Survey: https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/index.htm

[7] DC Book Company NJ Truck Stops: https://www.truckstopsandservices.com/listcatbusinesses.php?id=19&state=30

state freight plans will be required to provide an update on the most recent assessment of truck parking facilities that identifies areas of unmet demand. One comment received during stakeholder outreach was in regard to trucks frequently parking on North Mill Road near the Vineland Industrial Park. It is likely that these trucks are parking to stage for a delivery to a location that is not open yet. The current configuration of the roadway does not include a sufficiently wide shoulder for trucks to parking without impacting the flow of traffic. Potential solutions to this issue include:

- Reconstruction of the roadway with a wider shoulder lane to permit this parking activity
- Construction of a separate truck parking facility in the area
- Coordination with local facility owners to permit short duration parking while staged for delivery

Figure 2-22. SJTPO Truck Parking Facilities



3 Multimodal Performance Measures

This document has so far focused primarily on the evaluation of truck freight movements in SJTPO. This section supplements this analysis by reviewing additional data sources and results for other freight modes including rail, air cargo, maritime, and pipeline.

3.1 Rail

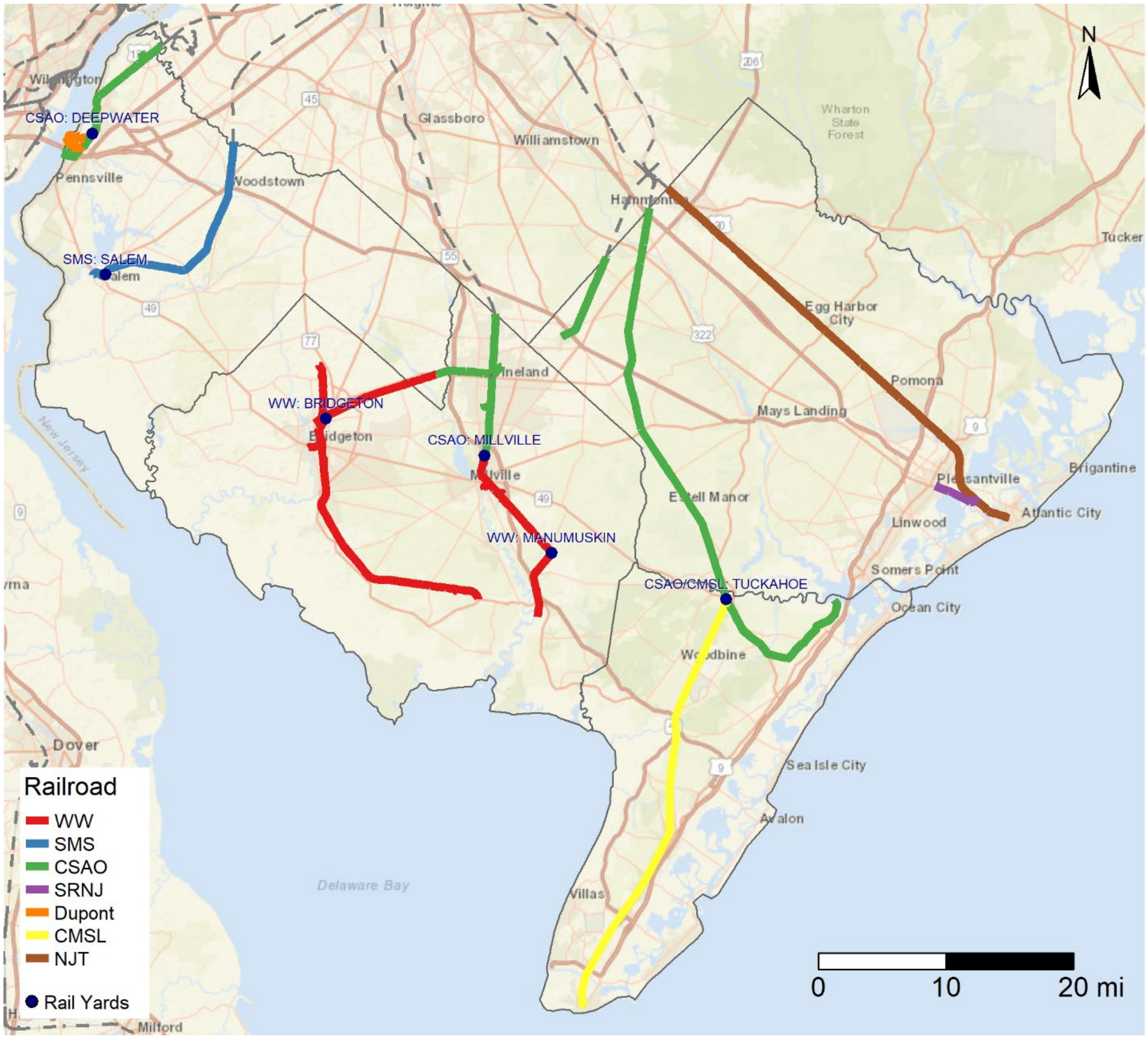
Rail service in SJTPO is provided through a combination of five distinct railroads. (Table 3-1. At roughly one-third of all track mileage in region, Conrail Shared Assets Operation makes up the largest share of railroad operations, followed by Winchester and Western. The remaining tracks are operated by New Jersey Transit which operates the Atlantic City Commuter Rail Line between Philadelphia and Atlantic City, the Southern Railroad of New Jersey, and Cape May Seashore Lines which operates both freight and passenger rail service. Additionally, approximately 18 miles of yard tracks are owned by Dupont as part of the Chemours Chambers Works facility in Deepwater.

Table 3-1. Approximate Track Mileage by Railroad

Railroad	Track Mileage
Conrail Shared Assets Operation (CSAO)	79.6
Winchester & Wester (WW)	52.5
New Jersey Transit (NJT)	30.2
Cape May Seashore Lines (CMSL)	28.3
Dupont (Yard Tracks)	17.6
SMS Rail Lines	15.4
Southern Railroad of New Jersey (SRNJ)	3.1
Total	**230**

The locations of these railroads are shown in Figure 3-1. This figure also shows the locations of the six named railyards in SJTO, including CSAO: Deepwater, SMS: Salem, WW: Bridgeton, CSAO: Millville, WW: Manumuskin, and CSAO/CMSL: Tuckahoe. These locations represent key staging locations for the classification and sorting of rail freight in the region.

Figure 3-1. Railroads and Rail Yards in SJTPO



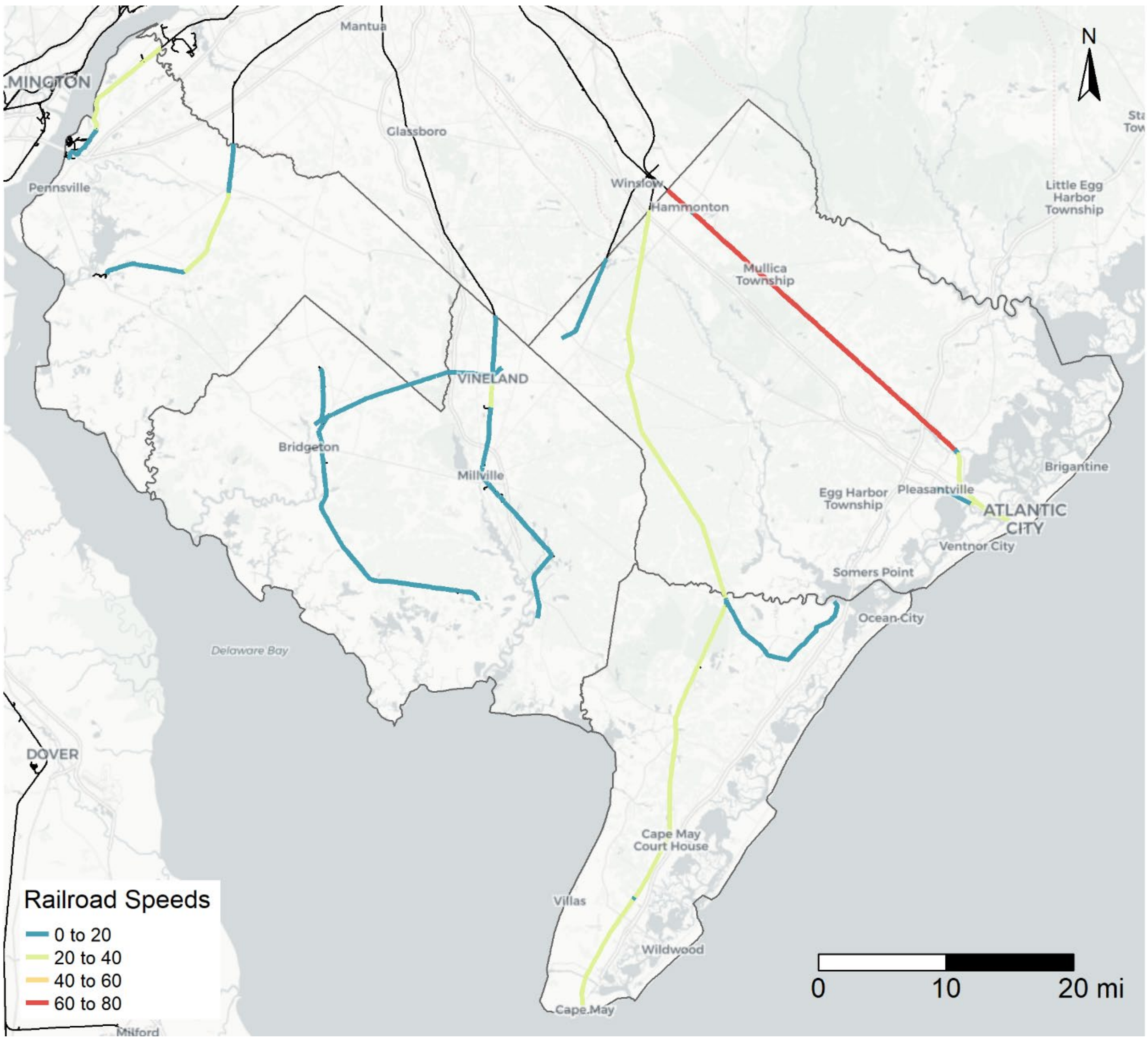
Source: BTS North American Rail Lines

Estimated Trains and Train Speeds

Daily train counts and maximum train speeds are important elements of train operations as well as key considerations for railroad safety evaluation. Limited public data is available to assess maximum train speeds. For this analysis, the FRA grade crossing inventory was used to geospatially join information to the Bureau of Transportation Statistics (BTS) North American Rail Line spatial file. The maximum timetable speed and combined Day Through Trains (6 A.M. – 6 P.M.) and Night Through Trains (6 P.M. – 6 A.M.) factors from the FRA grade crossing inventory database were used to estimate speed and daily train volumes in the region.

The results of this analysis are shown in Figure 3-2. At a maximum speed of 80 mph and an estimated daily train count of 26, the Atlantic City Line represents both the fastest and busiest rail line in the SJTPO area. The remaining rail lines range in speeds from 5 to 30 mph with an average speed of approximately 10 mph. Likewise, the range of estimated through train volumes on the other lines is also lower with four or fewer estimated trains per day. Multiple rail segments, particularly along the CMSL line and the WW line between Hammonton and Ocean City show an estimated train count of less than one per day.

Figure 3-2. Estimated Maximum Train Speeds



Source: BTS North American Rail Lines and FRA Grade Crossing Inventory

3.2 Air Cargo

The evaluation of air cargo freight movements was completed primarily using the BTS T-100 dataset. This data is recorded by U.S. and International carriers operating in the U.S. and includes detailed information regarding passengers, freight, and mail transported by planes between airports. Data was collected for 2019 through 2021.

While there are 51 airports located within SJTPO, only the Atlantic City International Airport (ACY) showed a measurable amount of freight shipments over this time period, recording a total of 16,000 lbs. of freight handled. The majority of this freight was handled in 2020 within negligible amounts of freight recorded in either 2019 or 2021.

However, the air cargo handled at ACY is dwarfed by the amount handled at Philadelphia International Airport (PHL), the nearest major air cargo airport. Over this same three-year time period, PHL has averaged approximately 1.2 Million lbs. per year of freight handled. Of the outgoing air cargo shipments, 14.9 percent departs to the Louisville Muhammad Ali International Airport (SDF) and another 11.5 percent departs to the Memphis International Airport (MEM). These two airports are major national hubs for UPS and FedEx, respectively. Inbound air freight to PHL arrives in similar proportions.

While it is likely that Philadelphia will remain the primary regional destination for inbound and outbound air cargo shipments for the foreseeable future, there is room for expansion of current services at the Atlantic City International Airport, particularly within the fast-freeze produce industry. The details of this potential development are discussed further in the study Final Report.

3.3 Maritime

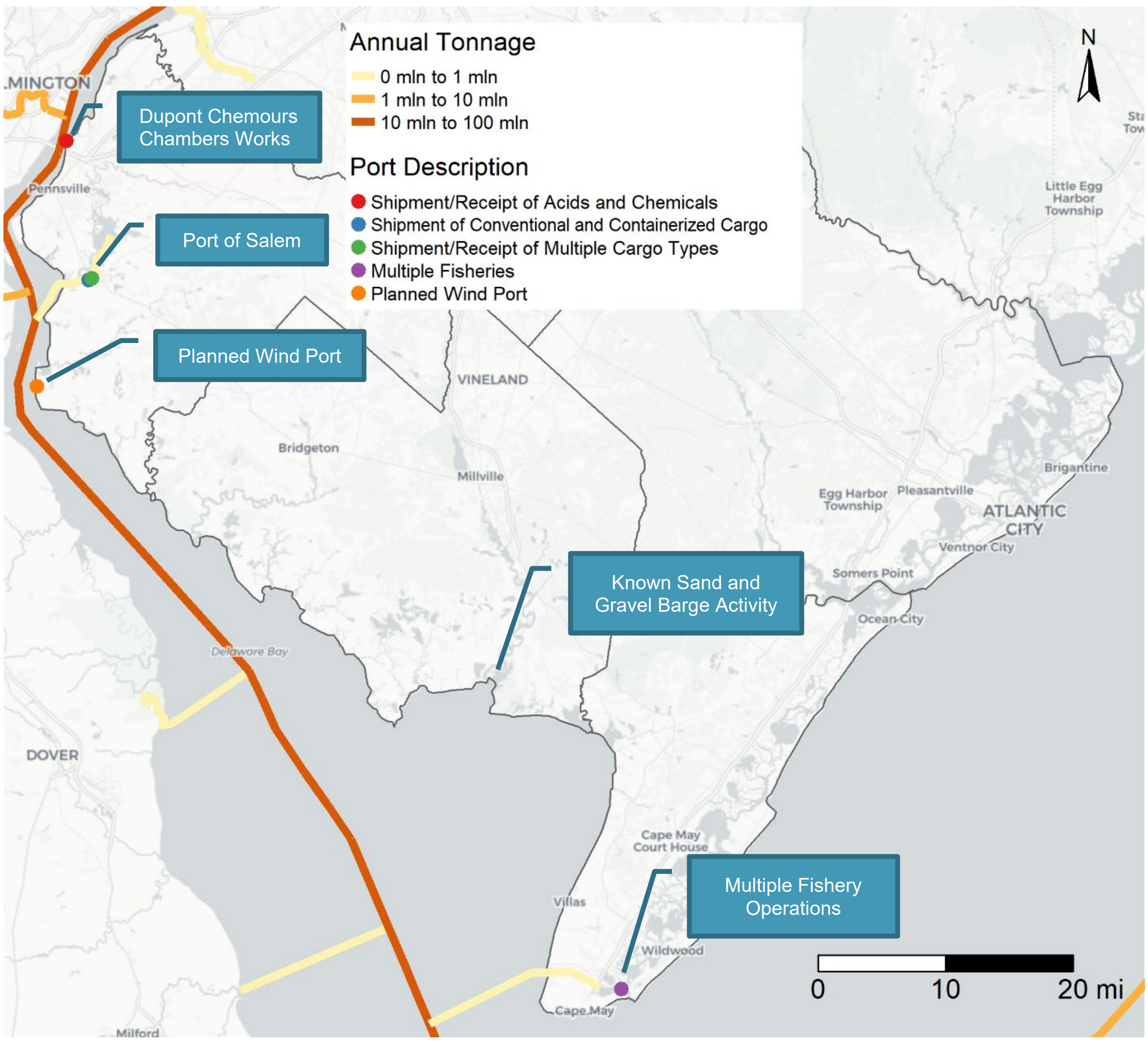
This review of maritime freight relies primarily on data provided by the U.S. Department of Transportation and the Army Corps of Engineering (USACE). Information on port locations, port purpose, and other key characteristics was collected from the BTS Ports dataset. The data includes multiple points that represent a maritime freight features such as docks, fleeting areas, repair stations, and other facility types. The data was filtered for this study to include facilities with the stated purposed of shipping, receiving, or otherwise handling material goods. Based on this definition, four maritime freight locations were identified in the SJTPO region. An additional fifth location was identified for a planned port development project. These locations are shown and further described in Figure 3-3. In addition to these known locations, local freight stakeholders also indicated the presence of barge activity near Port Norris and the Maurice River related to quarrying activity.

Commodities

Data on the types of commodities transported via maritime freight in the SJTPO area was collected from the USACE Waterborne Commerce Statistics Center. Information was collected for two waterways: Delaware River, Philadelphia to the Sea, and the Salem River.

- **Delaware River:** In 2020, this portion of the Delaware River handled approximately 62 Million tons of maritime freight. Crude petroleum made up half of the inbound shipments and nearly two-thirds of the intraport shipments. The primary outgoing shipment from this portion of the river was hydrocarbon and petrol gases, making up one third of outgoing shipments. At 14 percent, the largest commodity group passing through this portion of the river was bananas and plantains.
- **Salem River:** In 2020, ports in the Salem River handled approximately 23,000 tons of maritime freight. Nearly one quarter of the outgoing shipments from this river were classified as Unknown, with alcoholic beverages, food products, and animal feed making up a combined 23 percent of outgoing shipments. The largest incoming commodity group by far was manufactured products at 77 percent of all shipments. This was followed by sand and gravel at 11 percent and textile products at 3 percent.

Figure 3-3. Maritime Port Facilities



Source: USACE/BTS Ports Layer, USACE Link Tonnages 2019

3.4 Pipeline

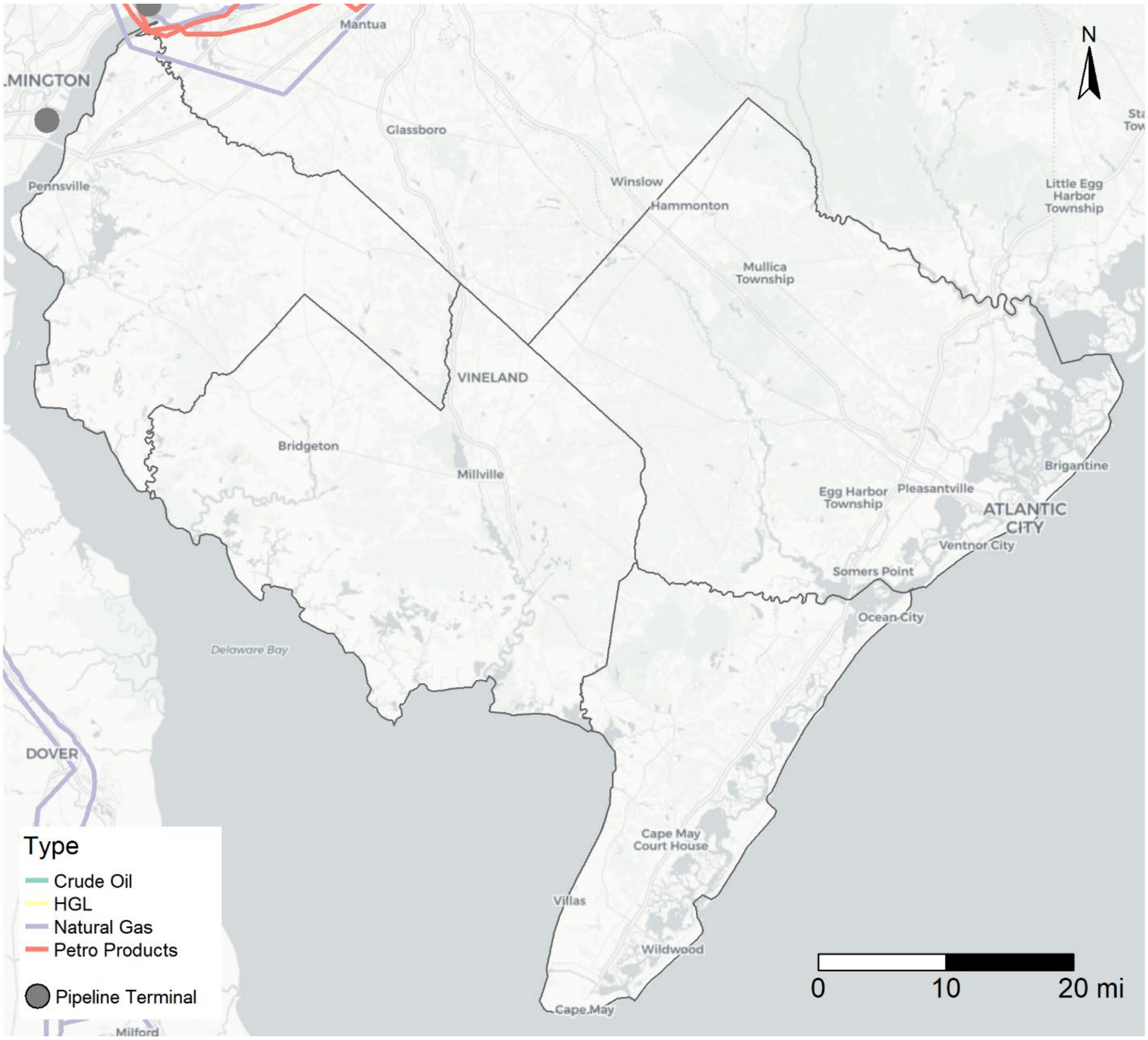
Despite the fact that the pipeline mode makes up 17 percent of freight tonnage and 6 percent of freight value shipped in the U.S.[8], the majority of freight planning efforts at the state and local level typically give little attention to pipelines as a freight mode. This is largely due to the fact that states, MPOs, and local roadway authorities generally have little to no jurisdiction over the development of pipeline infrastructure. In many cases, the most important consideration for pipeline freight is the impact it can potentially have on other freight modes. For example, expanded development and use of pipelines can shift crude oil shipments from rail to pipeline as a more cost-effective shipping option.

Figure 3-4 displays the locations of pipelines and pipeline terminals in the SJTPO region. This information is collected from the U.S. Energy Information Administration (EIA). However, the spatial information is purposefully kept at a relatively high level for security reasons. No pipeline terminals are located within SJTPO. The nearest terminals are located in Wilmington, Delaware and in Marcus Hook, Pennsylvania. Similarly, the figure shows that portions of natural gas and petroleum product pipelines travel through the northernmost corner of Salem County. However, the exact locations of these pipelines are unknown.

Overall, pipeline freight is not expected to have a substantial impact on the overall freight transportation system in SJTPO.

[8] BTS 2017 North American Freight Numbers: https://www.bts.gov/newsroom/2017-north-american-freight-numbers

Figure 3-4. Pipelines and Pipeline Terminals



Source: U.S. Energy Information Administration

3.5 Last-Mile Multimodal Highway Connections

An important consideration for all of the multimodal facilities discussed in this section is the local and regional roadways used to connect these facilities to the national highway freight system. To identify the roadways most critical for this purpose, this analysis first identified the locations to be used as the key multimodal connectors. These included the named rail yards, cargo airports, and maritime ports discussed in the previous sections located within SJTPO. The HERE Routing API was used to calculate routes between these origin locations and a series of destination points created outside the SJTPO boundary. The routes were then truncated to show only those portions of the routes between the starting locations and the first intersection with the National Highway System. Roadways identified through this process (Figure 3-5) should be considered to meet the NJDOT Local Freight Impact Fund eligibility criteria of demonstrating that a proposed project will provide access to key freight nodes.

Figure 3-5. Last-Mile Multimodal Highway Connections